

INTERCONNECTION SERVICE MANUAL

# INTERCONNECTION SERVICE MANUAL

VOLUME I

VOL I



 Bell System

JULY 1977

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**Interconnection Service Manual Vol. I**

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# **INTERCONNECTION SERVICE MANUAL VOL. I**

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# Introduction

This manual is a compilation of BSPs covering the more commonly used Interconnecting Arrangements. The manual is intended to support the Plant Craftsman in his daily work operations while installing and maintaining Interconnect Arrangements.

For information not contained in this manual, refer to the standard BSP files.

# TABLE OF CONTENTS

## VOLUME I

Section Number	Issue	Subject
<b>SELECTION AND COMMON EQUIPMENT</b>		
● 463-300-100	4	Interconnecting Devices — Selection and — General Information
463-300-101	1	Interconnecting Devices, Common Equipment — 604A-Type Panel
● Add 463-300-102	2	
463-300-102	2	Interconnecting Devices, Common Equipment — 604B and 604C Panels — and 21A Apparatus Unit
463-300-103	1	Interconnecting Devices, Common Equipment — 606A Panel
● Add 463-300-104	1	
● 463-300-104	2	Interconnecting Devices, Common Equipment — 615A Panel
463-300-109	1	Connecting Arrangement VCP — Customer-Provided Power — KS-20944 Protector
463-300-112	1	Interconnecting Devices Common Equipment — 75A Control Unit
● 463-300-113	2	Interconnecting Devices — Common Equipment — 142A Test Set

### TELEPHONE COMPANY PROVIDED STATION — WITH NETWORK ACCESS

463-311-100	5	Voice Connecting Arrangements QKT and QKTBT — 30-Type Voice Coupler
463-311-103	2	Voice Connecting Arrangements CDN and CD5 — 111A Interconnecting Unit, 69H Apparatus Mounting and 606A Panel
463-311-104	2	Voice Connecting Arrangements CEBAX and CEBBX — 111A Interconnecting Unit, 69H Apparatus Mounting and 606A Panel
Add 463-311-105	1	
463-311-105	3	Voice Connecting Arrangement LVH — 109A and 110A Interconnecting Units, 69H Apparatus Mounting and 606A Panel
463-311-106	2	Voice Connecting Arrangements CEBAV and CEBAW — 111A Interconnecting Unit — 69H Apparatus Mounting — 606A Panel
463-311-107	4	Voice Connecting Arrangement C2AKS
463-311-108	2	Voice Connecting Arrangement CEZ — KS-20893, List 10 Interconnecting Unit, KS-20893, List 11 Interconnecting Service Unit
463-311-109	1	Voice Connecting Arrangement QKP — 32A Voice Coupler

### TELEPHONE COMPANY PROVIDED STATION — WITHOUT NETWORK ACCESS

463-312-100	2	Voice Connecting Arrangement CDY — Pick-Up Button, Bell System Telephone Set
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### INTERFACE TERMINATION

463-322-100	1	Interface Termination JTC Used With Attested Customer-Provided Non-Powered Conferencing Devices
● Add 463-322-101	1	
463-322-101	1	Interface Termination JTA Used With Conforming Answering Devices Incorporating Authorized Protective Connecting Modules
463-323-100	1	Headset Interface Termination Used With Customer-Provided 4-Wire Head Telephone Sets

### TELEPHONE COMPANY PROVIDED SYSTEM — SWITCHBOARD ACCESS

463-331-101	1	Voice Connecting Arrangement CDB — J53050A, List 1 Interconnecting Unit
463-331-103	3	Voice Connecting Arrangement CD4
463-331-104	3	Voice Connecting Arrangement CDX Using 31B Voice Couplers
463-331-105	3	Voice Connecting Arrangement LOH — 110A Interconnecting Unit — 69H Apparatus Mounting — 606A Panel

### TELEPHONE COMPANY PROVIDED SYSTEM — SWITCHING SYSTEM ACCESS

463-332-100	2	Voice Connecting Arrangement DCK — J53050F Interconnecting Unit
463-332-110	1	Voice Connecting Arrangement DCT — J58827E Recorded Telephone Dictation Trunk Unit
463-332-120	1	Voice Connecting Arrangement DCW — J58824CD Interface Trunk Unit

### TELEPHONE COMPANY PROVIDED EXCHANGE LINE CONNECTION — SINGLE-LINE

463-340-100	4	Voice Connecting Arrangements CAU, SU3, SU4, SU6 and SU7
● 463-340-101	5	Protective Connecting Arrangements RDMZR and RDY — KS-20721 Station Coupler
● Add 463-340-102	1	
● 463-340-102	3	Protective Connecting Arrangements SU6AQ and STS — KS-20721 Station Coupler
● Add 463-340-103	1	
463-340-103	2	Voice Connecting Arrangement STC — KS-20721 Station Coupler

Section Number	Issue	Subject
● 463-340-104	3	Protective Connecting Arrangement SU7QW — KS-20721 Station Coupler
● 463-340-105	2	Protective Connecting Arrangement AD1 — 23A Coupler
463-340-110	4	Voice Connecting Arrangements RDL and RDM
Add 463-340-111	1	
463-340-111	2	Voice Connecting Arrangements RDL and RDM — KS-19522, List 1 or List 2 Recorder Coupler Used With KS-16765, List 1 Announcement Set
463-340-112	1	Voice Connecting Arrangement GTS

Section Number	Issue	Subject
● Add 463-340-120	1	
● 463-340-120	5	Protective Connecting Arrangements RCZ, RTT, and RC1 — and 4-Wire Service KS-19645 Type Recorder Connector

**TELEPHONE COMPANY PROVIDED EXCHANGE LINE CONNECTION — MULTILINE**

463-341-100	4	Voice Connecting Arrangement C2ACP
● 463-341-101	4	Protective Connecting Arrangements STP and C2F
463-341-102	1	Voice Connecting Arrangement FTP
● 463-341-103	1	Protective Connecting Arrangement FTM



# TABLE OF CONTENTS

## VOLUME II

Section Number	Issue	Subject	Section Number	Issue	Subject
<b>TELEPHONE COMPANY CENTRAL OFFICE TRUNK LINE CONNECTION — VOICE ONLY</b>			<b>REGISTERS, CALL TIMING AND STATION IDENTIFICATION</b>		
463-350-100	1	Voice Connecting Arrangement CDA — Interconnecting Service Unit F-58003 and Associated F-58004 KTU and F-58015 Console	463-380-100	3	Connecting Arrangement CEK — J53050E Interconnecting Unit
● 463-350-104	6	Protective Connecting Arrangements CDH and CBF	463-380-101	1	Connecting Arrangement C25 — 118A Interconnecting Unit
463-350-105	4	Voice Connecting Arrangement CD6	463-380-102	1	Connecting Arrangement C1Y — J92614E-1 Interface Unit
● 463-350-106	5	Protective Connecting Arrangements CD9, CD8, CD7 and Connecting Arrangement CBF	● 463-382-100	5	Protective Connecting Arrangements C1V, RCX, and GC2
● 463-350-107	5	Protective Connecting Arrangement CED	463-382-101	3	Connecting Arrangement CTD — J53050G-Type Interconnecting Unit
463-350-108	3	Voice Connecting Arrangement CET	● 463-382-102	2	Protective Connecting Arrangement HZM
463-350-109	2	Voice Connecting Arrangement C22 — 112A Interconnecting Unit — 607A Panel	463-382-103	1	Connecting Arrangement CTH — J53050K Interconnecting Unit
● 463-350-110	2	Protective Connecting Arrangement TAS	463-382-104	1	Connecting Arrangement KTX
<b>TELEPHONE COMPANY PROVIDED CHANNEL — TIE LINES</b>			Add 463-382-105	1	
● 463-360-100	3	Protective Connecting Arrangements CDQ4W and CDQ4X	463-382-105	1	Voice Connecting Arrangements TSPZ1 and TSPXY
● 463-360-101	3	Protective Connecting Arrangements CDQ2W and CDQ2X	<b>DATA COUPLERS</b>		
Add 463-360-102	1		590-103-103	3	1000A Data Coupler — Description, Installation, Maintenance, and Tests
463-360-102	2	Voice Connecting Arrangement C234W	● 590-103-104	4	100 1A Data Coupler — Description, Installation, Maintenance, and Tests
Add 463-360-103	1		● 590-103-106	3	100 1B Data Coupler — Description, Installation, Maintenance, and Tests
463-360-103	2	Voice Connecting Arrangement C232W	590-103-108	1	1000B Data Coupler — Description, Installation, Maintenance, and Tests
463-361-100	1	119A Interconnecting Unit — Identification, Installation, Connections, Operation, and Maintenance	● 590-103-109	2	100 1D Data Coupler — Description, Installation, Maintenance, and Tests
<b>CUSTOMER PROVIDED CHANNEL — TIE LINES</b>			● 590-103-111	2	100 1F Data Coupler — Description, Installation, Maintenance, and Tests
● 463-370-101	3	Protective Connecting Arrangements C24 and C2H			
463-370-102	1	Voice Connecting Arrangements C27 and C2K			

LISTING OF USOC CODES AND RELATED BELL SYSTEM PRACTICES

USOC CODE	BSP NUMBER	VOLUME	USOC CODE	BSP NUMBER	VOLUME
AD1	463-340-105	I	CD5	463-311-103	I
CAU	463-340-100	I	CD6	463-350-105	II
CBF	463-300-112	I	CD7	463-350-106	II
CBS	590-103-104	II	CD8	463-350-106	II
CBS	590-103-111	II	CD9	463-350-106	II
CBT	590-103-106	II	CEBAV	463-311-106	I
CBT	590-103-109	II	CEBAW	463-311-106	I
CDA	463-350-100	II	CEBAX	463-311-104	I
CDA	463-350-101	*	CEBBX	463-311-104	I
CDB	463-331-100	*	CED	463-350-107	II
CDB	463-331-101	I	CEK	463-380-100	II
CDH	463-350-104	II	CET	463-350-108	II
CDN	463-300-140	*	CEZ	463-311-108	I
CDN	463-311-103	I	CTD	463-382-101	II
CDQ2W	463-360-101	II	CTH	463-382-103	II
CDQ2X	463-360-101	II	C1V	463-382-100	II
CDQ4W	463-360-100	II	C1Y	463-380-102	II
CDQ4X	463-360-100	II	C2ACP	463-341-100	I
CDT	590-103-103	II	C2AKS	463-311-107	I
CDX	463-331-104	I	C2F	463-341-101	I
CDY	463-312-100	I	C2H	463-370-101	II
CD1	463-300-110	*	C2K	463-370-102	II
CD4	463-300-130	*	C22	463-350-109	II
CD4	463-331-103	I	C24	463-370-101	II
CD5	463-300-150	*	C25	463-380-101	II

LISTING OF USOC CODES AND RELATED BELL SYSTEM PRACTICES (Cont)

USOC CODE	BSP NUMBER	VOLUME	USOC CODE	BSP NUMBER	VOLUME
C27	463-370-102	II	RC1	463-340-120	I
C232W	463-360-103	II	RDL	463-340-110	I
C234W	463-360-102	II	RDL	463-340-111	I
DCK	463-332-100	I	RDM	463-340-110	I
DCT	463-332-110	I	RDM	463-340-111	I
DCW	463-332-120	I	RDMZR	463-340-101	I
FTM	463-341-103	I	RDY	463-340-101	I
FTP	463-341-102	I	RTT	463-340-120	I
GC2	463-382-100	II	STC	463-340-103	I
GTS	463-340-112	I	STP	463-341-101	I
HZM	463-382-102	II	STS	463-340-102	I
JTA	463-322-101	I	SU3	463-340-100	I
JTC	463-322-100	I	SUT	463-331-106	*
KTX	463-382-104	II	SU4	463-340-100	I
LOH	463-331-105	I	SU6	463-340-100	I
LVH	463-311-105	I	SU6AQ	463-340-102	I
PVF	463-390-100	*	SU7	463-340-100	I
QKP	463-311-109	I	SU7QW	463-340-104	I
QKT	463-311-100	I	TAS	463-350-110	II
RCX	463-382-100	II	TSPZ1	463-382-105	II
RCZ	463-340-120	I	TSPXY	463-382-105	II
			VCP	463-300-109	I

\* Because of limited application, BSP is not included in this manual.

## INTERCONNECTING DEVICES

### SELECTION AND GENERAL INFORMATION

	CONTENTS	PAGE
1.	<b>GENERAL</b> . . . . .	1
2.	<b>EQUIPMENT FEATURES</b> . . . . .	2
	<b>INTERCONNECTING UNITS, INTERFACE AND TRUNK UNITS, AND COUPLERS</b> . . . . .	2
	<b>A. Coded Units</b> . . . . .	2
	<b>B. Couplers</b> . . . . .	7
	<b>C. J-Coded Interconnecting Units</b> . . . . .	8
	<b>D. KS-Coded Interconnecting Units</b> . . . . .	11
	<b>E. F-Coded Interconnecting Units</b> . . . . .	15
	<b>ASSOCIATED EQUIPMENT</b> . . . . .	15
	<b>A. Panels</b> . . . . .	15
	<b>B. Apparatus Mountings</b> . . . . .	18
	<b>C. Service Units</b> . . . . .	18
	<b>D. Control Units</b> . . . . .	18
	<b>E. Protectors</b> . . . . .	18
	<b>F. Test Sets</b> . . . . .	18
3.	<b>SELECTION</b> . . . . .	19

1.02 This section is reissued to:

- Include additional connecting arrangements
- Update existing arrangements
- Provide related SD numbers where applicable
- Add new illustrations.

Due to extensive changes, marginal arrows have been omitted.

1.03 The protective connecting arrangements, with the criteria published in the tariffs and in the technical reference, provide the necessary network protection to allow connection of customer-provided equipment (CPE) to the Bell System network. These arrangements are designed to provide telephone company control of the critical signaling, transmission, and switching functions of the network.

1.04 For information on data access interconnecting arrangements, refer to Division 590.

1.05 Customer requests for technical references should be referred to the local Telephone Company Business Office or the Marketing Representative.

1.06 Table A provides Uniform Service Order Codes (USOC), Technical Reference numbers (PUB), section numbers, the interconnecting device, schematic drawing (SD) numbers where applicable, and a brief description of the arrangement-function.

#### 1. GENERAL

1.01 This section provides information for the identification and selection of interconnecting devices and general information on the associated equipment.

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## 2. EQUIPMENT FEATURES

## INTERCONNECTING UNITS, INTERFACE AND TRUNK UNITS AND COUPLERS

## A. Coded Units

**2.01 101A (MD) Interconnecting Unit**—An 8-inch circuit pack for use in the interconnection of a Bell System central office (CO) and a customer-provided PBX CO trunk where ground start signaling is required at the CO. This unit is intended to mount in a 604-type or 615A panel. (See Fig. 1.)

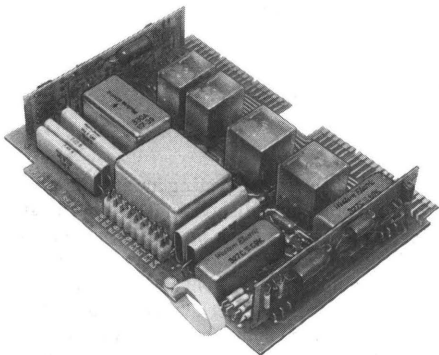


Fig. 1—101A (MD) Interconnecting Unit

**2.02 101B (MD) Interconnecting Unit**—An 8-inch circuit pack, an improved replacement version of the 101A. Provides line impedance matching and increases the range limitation to the CPE from 18 ohms to 100 ohms maximum on the supervisory leads. (See Fig. 2.) May be used with 75A control unit for data applications. Intended to mount in a 604-type or 615A panel.

**2.03 101C Interconnecting Unit**—An 8-inch circuit pack, an improved replacement version of the 101B. Provides line impedance matching to 600-ohm PBX trunk circuits and 600- or 900-ohm CO lines. (See Fig. 3.) May be used with 75A control unit for data applications. Intended to mount in a 604-type or 615A panel.

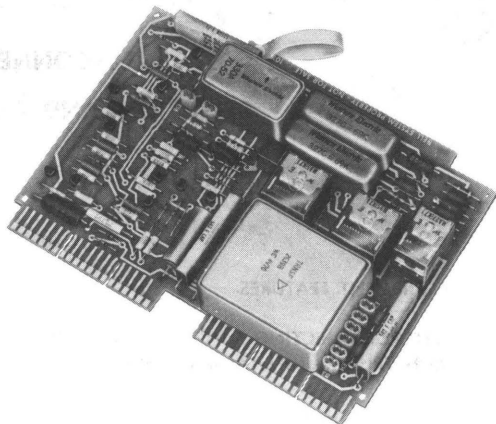


Fig. 2—101B (MD) Interconnecting Unit

**2.04 102A (MD) Interconnecting Unit**—An 8-inch circuit pack for use in the interconnection of a Bell System CO and a customer-provided PBX CO trunk where loop-start signaling is required. This unit is intended to mount in a 604-type or 615A panel. (See Fig. 4.)

**2.05 102B Interconnecting Unit**—An 8-inch circuit pack, an improved replacement version of the 102A. It provides line impedance matching and increases the range limitation to the CP equipment from 18 ohms to 100 ohms maximum on the supervisory leads. (See Fig. 5.) May be used with 75A control unit of data applications. Intended to mount in a 604-type or 615A panel.

**2.06 103A (MD) Interconnecting Unit**—An 8-inch circuit pack for use in providing percent break pulse correction where required for the CO trunk interconnecting units 101A and 102A. (See Fig. 6.) No longer required for 101- or 102-type IUs.

**2.07 105A Interconnecting Unit**—A console approximately 16-1/2 inches high, 13-1/2 inches wide, and 10-1/2 inches deep. It is equipped with one 599A key, two 598A keys, and one 8C dial. It is used in association with the 700A interconnecting service unit to provide 2-wire manual access between Bell System lines and a customer-provided manual PBX. (See Fig. 7.)



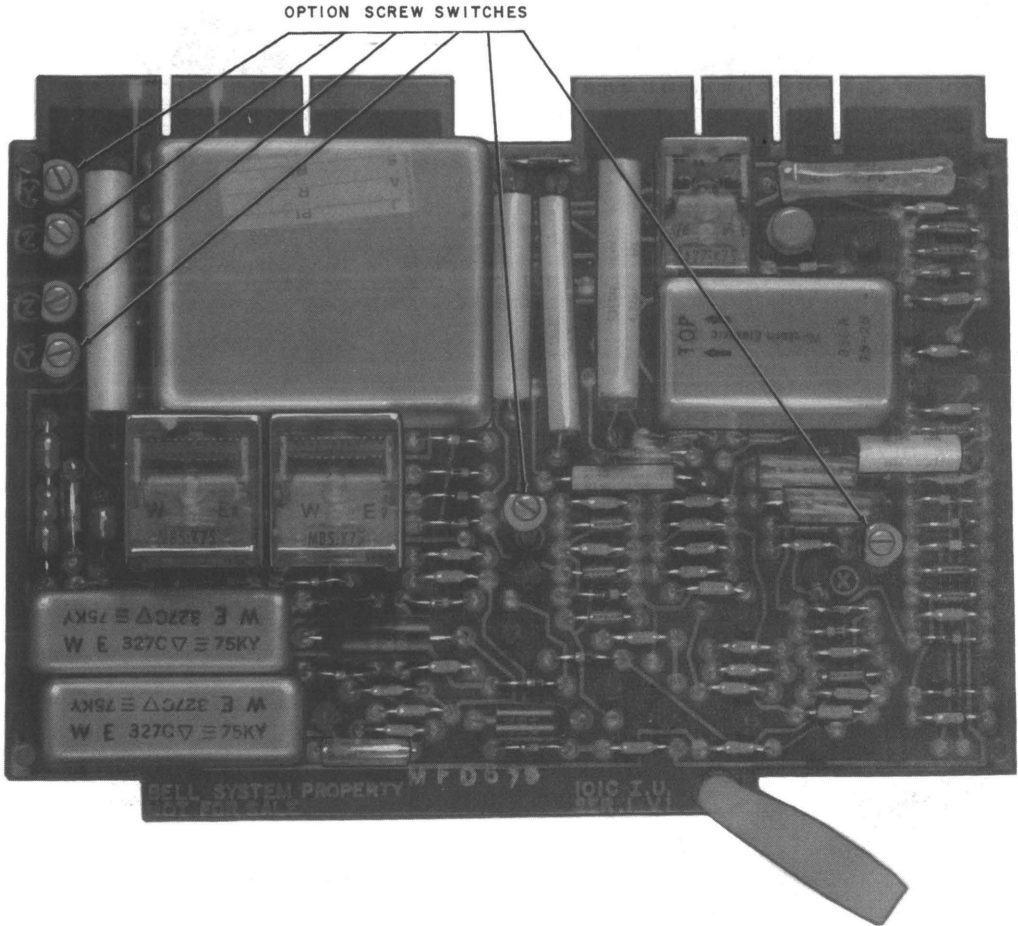


Fig. 3—101C Interconnecting Unit

**2.08 108A Interconnecting Unit**—A 4-inch circuit pack for use (a) in the interconnection of a Bell System CO line with a customer-provided manual cord switchboard with supervision (intended to mount in a 700A interconnecting service unit), or (b) in the interconnection of a Bell System CO line to a customer-provided one-way incoming trunk associated with the attendant position of a customer-provided PBX. For the latter application, the 108A interconnecting unit may be mounted in the 604-type or 615A panel. (See Fig. 8.)

**2.09 109A Interconnecting Unit**—A 4-inch circuit pack for use in the interconnection of a 1A2 KTS and a customer-provided audio source for use when the CO line is in the hold condition. This unit is intended to mount in a 69H apparatus mounting or 606A panel. (See Fig. 9.)

**2.10 110A Interconnecting Unit**—A 4-inch circuit pack for use in the interconnection of a cord switchboard or a 1A or 1A1 KTS and a customer-provided audio source for use when the

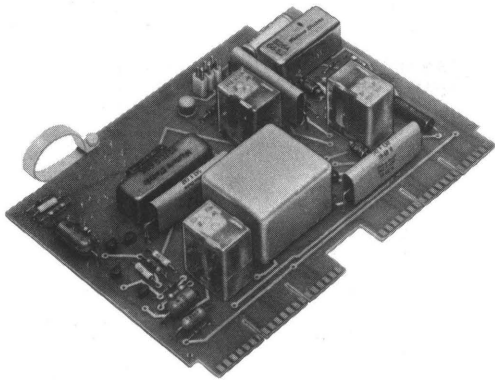


Fig. 4—102A (MD) Interconnecting Unit

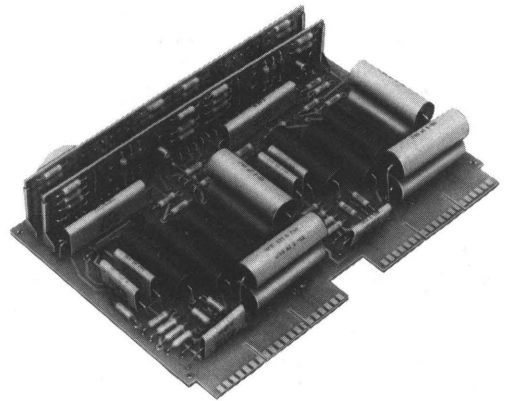


Fig. 6—103A (MD) Interconnecting Unit

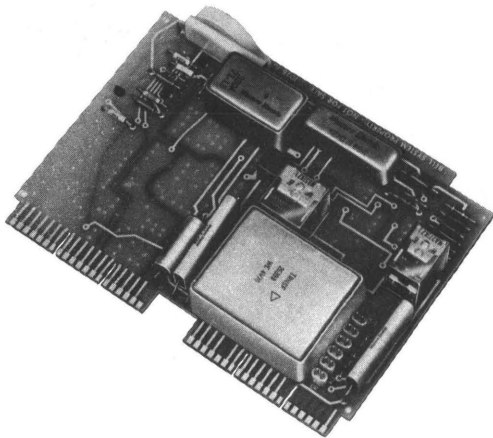


Fig. 5—102B Interconnecting Unit



Fig. 7—105A Interconnecting Unit (formerly F58015 [MD] Console)

CO line is in the hold condition. Intended to mount in a 69H apparatus mounting or 606A panel. (See Fig. 10.)

**2.11 111A Interconnecting Unit**—A 4-inch circuit pack for use in the interconnection of a Bell System CO line terminated on a key telephone set and customer-provided intercommunicating systems with or without supervision. This unit is

intended to mount in a 69H apparatus mounting or 606A panel. (See Fig. 11.)

**2.12 112A Interconnecting Unit**—An 8-inch circuit pack used to provide one-way direct-inward-dialing into a customer-provided PBX on a dial pulse basis. Intended to mount in the 607A panel. (See Fig. 12.)

**2.13 114A Interconnecting Unit**—A PICTURE-PHONE® connecting arrangement consisting of a voice coupler circuit and a video coupler circuit. It is 7-1/2 inches wide, 6 inches deep, and 12 inches long. (See Fig. 13.)

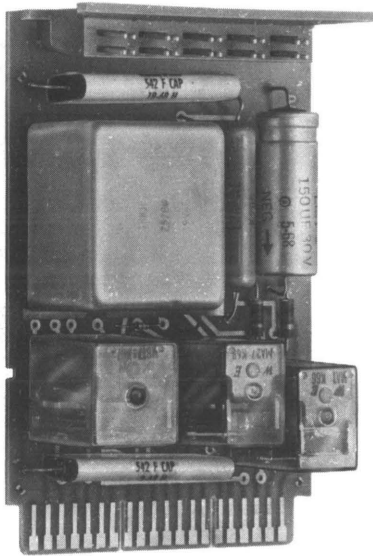


Fig. 8—108A Interconnecting Unit (formerly 433A [MD] KTU and F48004 [MD] KTU)

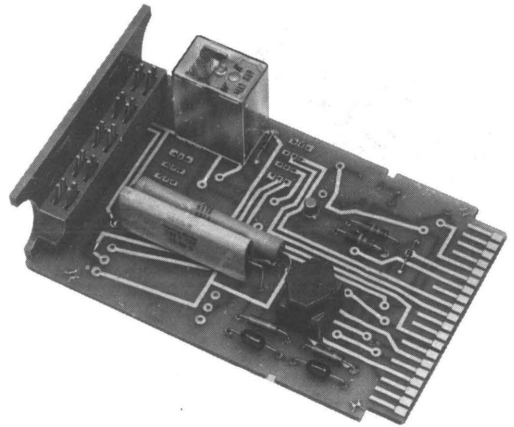


Fig. 10—110A Interconnecting Unit

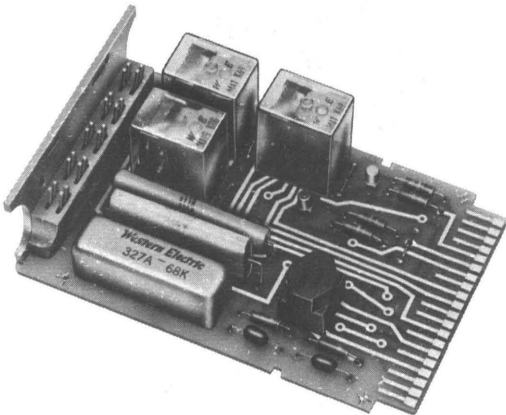


Fig. 9—109A Interconnecting Unit

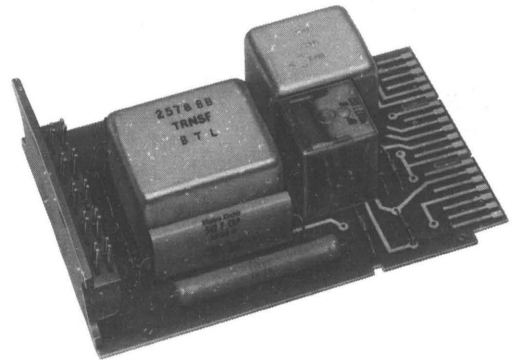


Fig. 11—111A Interconnecting Unit (formerly 432A [MD] KTU and F58006 [MD] KTU and F58007 [MD] 1U)

2.14 **117A Interconnecting Unit**—3-1/2 inches wide, 6 inches deep, and 7 inches long. One unit is required for every four lines. Used to

indicate the dc supervisory condition of a CO or tie line to CPE. Intended to mount in the 15A apparatus mounting; it can also be mounted on a 23-inch rack using 67B brackets. (See Fig. 14.)

2.15 **118A Interconnecting Unit**—6 inches wide, 8-1/2 inches deep, and 8 inches long, and consists of a 614A panel with an 8-inch HJ1 circuit pack. Provides automatic-identified-outward-dial capabilities to a customer-provided PBX. Intended

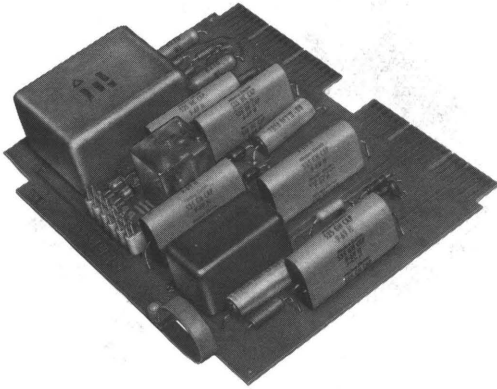


Fig. 12—112A Interconnecting Unit

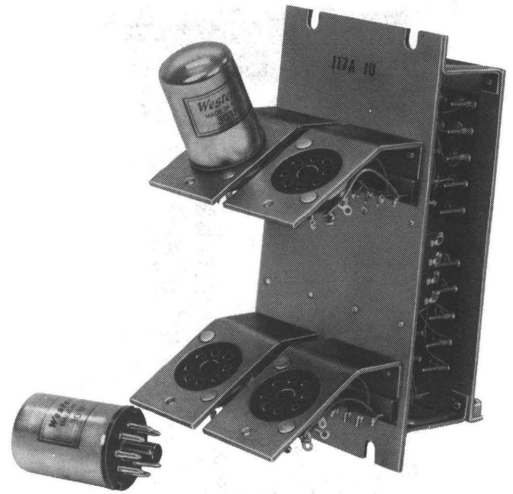


Fig. 14—117A Interconnecting Unit

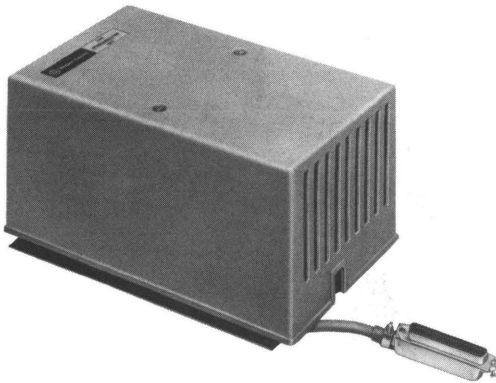


Fig. 13—114A Interconnecting Unit

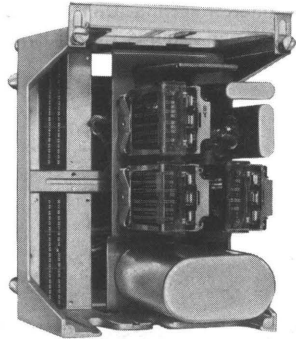


Fig. 15—118A Interconnecting Unit (614A Panel With HJ1 Circuit Pack)

to mount on a standard relay rack or in a 16C apparatus mounting using the 99B mounting bracket. (See Fig. 15.)

**2.16 119A Interconnecting Unit**—4-3/4 inches wide, 2 inches deep, and 7 inches long. Provides a 2-wire connection between customer-provided terminal equipment and Bell System metallic voice-grade private line facilities. Mounts on any wall or flat surface. (See Fig. 16.)

**2.17 120V Interconnecting Unit (MD)**—An 8-inch circuit pack used to connect a

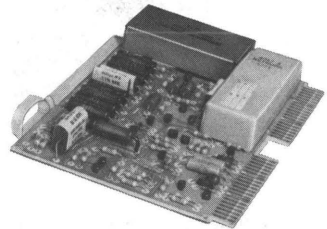




Fig. 16—119A Interconnecting Unit

customer-provided KTS to a Bell System CO or PBX line on a 2-wire basis. Mounts in a 604-type or 615A panel. (See Fig. 17.)

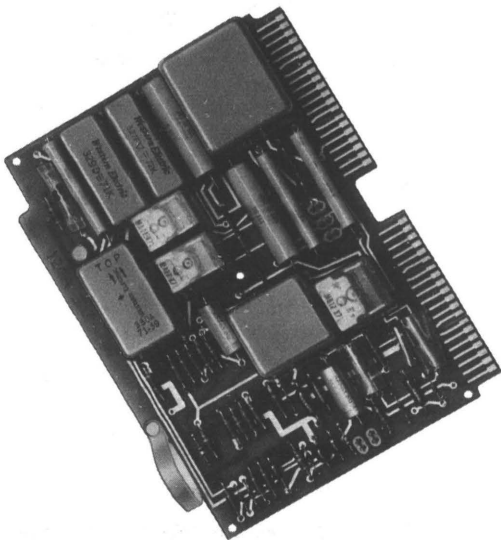


Fig. 17—120A Interconnecting Unit

**2.18 120B Interconnecting Unit**—An 8-inch circuit pack used to connect a customer-provided KTS to a Bell System CO or PBX line on a 2-wire basis. Mounts in a 604-type or 615A panel. (See Fig. 18.)

**2.19 122A Interconnecting Unit**—An 8-inch circuit pack used to provide access to a CO line for customer-provided call restriction equipment to detect off-hook, on-hook, and dialing signals on the line for outgoing calls. Transfers the originating station for the CO line to the CPE when signaled by the CPE. Permits the CPE to provide a restricted tone to the originating station. Detects CO ringing when circuit is in the call restricted mode. Forces cut-through of the station to the CO line on an incoming call when the station is in the call restricted mode. (See Fig. 19.)

**2.20 125A Interconnecting Unit**—Resembles a 66-type connecting block and provides up to 25 circuit connections which provide a connection between customer-provided traffic measuring equipment and Bell System station lines, PBX CO trunks, and tie lines. This equipment permits the CPE to detect on-hook, off-hook, dial pulse, TOUCH-TONE signals, call progress tones, and ringing signals on Bell System lines. (See Fig. 20.)

## B. Couplers

**2.21 23A Coupler**—Approximately 4 inches long, 2-3/4 inches wide, and 1-7/8 inches deep and is used to provide an interface between customer-provided dc dial pulse dialers (not to be used with TOUCH-TONE® dialers and CO or PBX station line). (See Fig. 21.)

**2.22 30B Voice Coupler**—Approximately 4-3/4 inches long, 2-3/4 inches wide, and 2 inches high and is used to provide 2-wire connection of customer-provided voice transmitting and/or receiving equipment to Bell System lines using a telephone set equipped with an exclusion key. Mounts on any flat surface. (See Fig. 22.)

**2.23 31B Voice Coupler**—Approximately 4-3/4 inches long, 2-3/4 inches wide, and 2 inches high and is used to provide a means of interconnecting a Bell System manual cord switchboard and a customer-provided dial intercom system. Mounts on any flat surface. (See Fig. 23.)



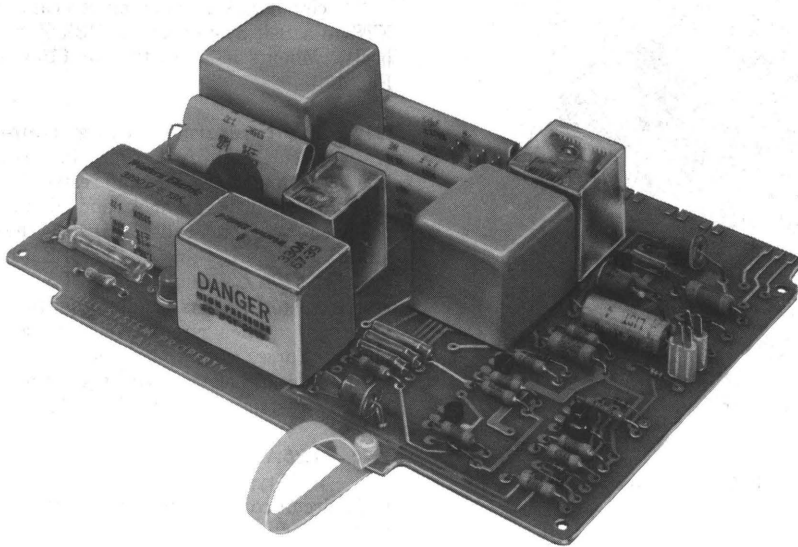


Fig. 18—120B Interconnecting Unit

**2.24 31C Voice Coupler**—Mounted on a metal base, equipped with a plastic cover and with overall dimensions of 4-3/4 inches long, 2-1/2 inches wide, and 2 inches high. The 31C is a general purpose voice coupler for application on voice-grade private line data channels which connect to customer-provided equipment. The circuit provides protection against longitudinal imbalance and hazardous voltages. (See Fig. 23.)

**2.25 32A Voice Coupler**—Permits a customer to connect voice transmitting or receiving equipment to a telephone company CO line through a jack and plug arrangement mounted in a telephone set. The coupler provides dc isolation and limits excessive signals. (See Fig. 24.)

**2.26 33A Voice Coupler**—Provides a high-fidelity connection between a customer-provided music or information source and the music-on-hold circuit and/or paging amplifier circuit in the 7A, 14A, or 21A Communication System for the music-on-hold feature and/or background music over the paging speakers when the paging circuit is not in use. (See Fig. 25.)

**2.27 34A Voice Coupler**—Approximately 4 inches long, 2-1/4 inches wide, and 2 inches high and provides a connection for music-on-hold between CO/PBX lines and a customer-provided music or information source which does not require a start signal. For use with Key Telephone Systems or 7A, 14A, and 21A Communication Systems. (See Fig. 26.)

#### C. J-Coded Interconnecting Units

**2.28 J53050A Interconnecting Unit**—Provides interconnection of the Bell System manual PBX switchboard with a customer-provided dial intercommunicating system with supervision. The apparatus is mounted on a 2- by 23-inch mounting plate, 1 circuit per unit, and is intended to be relay rack mounted. (See Fig. 27.) Replaces the F58005 (MD) interconnecting unit.

**2.29 J53050C Interconnecting Applique Unit**—Provides signaling for the interconnection of Bell System equipment and a customer-provided PBX dial repeating tie trunk circuit. The apparatus is mounted on a 4- by 23-inch mounting plate, 4

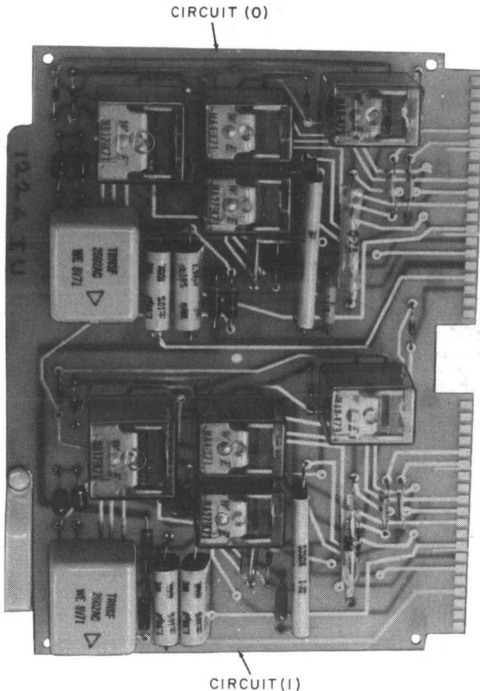


Fig. 19—122A Interconnecting Unit

circuits per unit, and is intended to be relay rack mounted. (See Fig. 28.)

**2.30 J53050D Interconnecting Unit**—Provides four voice coupler circuits for the interconnection of Bell System 2-wire private line facilities and a customer-provided 2-wire PBX. The apparatus is mounted on a 2- by 23-inch mounting plate, 4 circuits per unit, and is intended to be relay rack mounted. (See Fig. 29.)

**2.31 J53050E Interconnecting Unit**—Provides for the interconnection of a Bell System CO message register and customer-provided message registers. The apparatus is mounted on a 2- by 23-inch mounting plate, 10 circuits per unit, and is intended to be relay rack mounted. (See Fig. 30.) It replaces the F58356 (MD) interconnecting unit.

**2.32 J53050F Interconnecting Unit**—Provides connection via trunk level access between customer-provided dictation equipment, radio paging system or information retrieval system, and a Bell System PBX. The apparatus is mounted on a 2- by 23-inch mounting plate, 1 circuit per unit, and is intended to be relay rack mounted. (See Fig. 31.)

**2.33 J53050G Interconnecting Unit**—Provides for connecting customer-provided call diversion equipment to a Bell System CO trunk circuit equipped for reverse battery toll diversion associated with a Bell System PBX. The apparatus is mounted on a 2- by 23-inch mounting plate, 6 circuits per unit, and is intended to be relay rack mounted. (See Fig. 32.)

**2.34 J53050H Interconnecting Unit (MD)**—Replaced by 125A IU. Provides a connection between customer-provided traffic measuring equipment and Bell System station lines, PBX CO trunks and tie lines. The apparatus is mounted on a 2- by 23-inch mounting plate, 36 circuits per unit, and is intended to be relay rack mounted. (See Fig. 33.)

**2.35 J53050J Interconnecting Unit**—Provides an interface between a CO secretarial line and a one-way circuit associated with the CPE. The apparatus is mounted on a 4- by 23-inch mounting plate and is intended to be relay rack mounted. One J53050J,L1 will accommodate up to ten CO lines. (See Fig. 34.)

**2.36 J53050K Interconnecting Unit**—Provides a connection between CPE, call restricting equipment, and a Bell System CO trunk associated with a Bell System PBX. The apparatus is mounted on a 2- by 23-inch mounting plate and is intended to be relay rack mounted. One J53050K,L1 will accommodate two CO trunks. (See Fig. 35.)

**2.37 J53050L Interconnecting Unit**—Provides a voice-grade transmission path from PBX to CPE. For use on one-way outgoing ground start PBX CO trunks. The apparatus is mounted on a 4- by 23-inch mounting plate and is intended to be relay rack mounted. One J53050L will accommodate up to three CO trunks. (See Fig. 36.)

**2.38 J58827E Recorded Telephone Dictation Trunk Unit**—Provides connection between

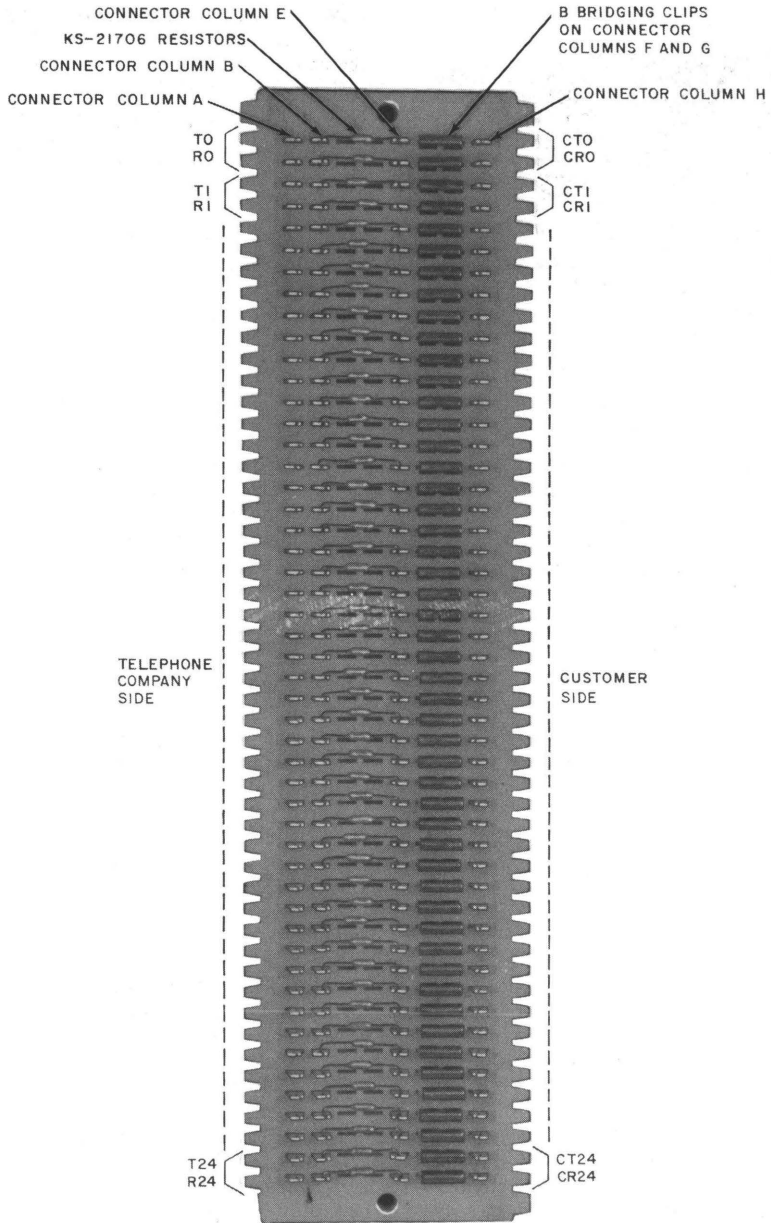


Fig. 20—125A Interconnecting Unit

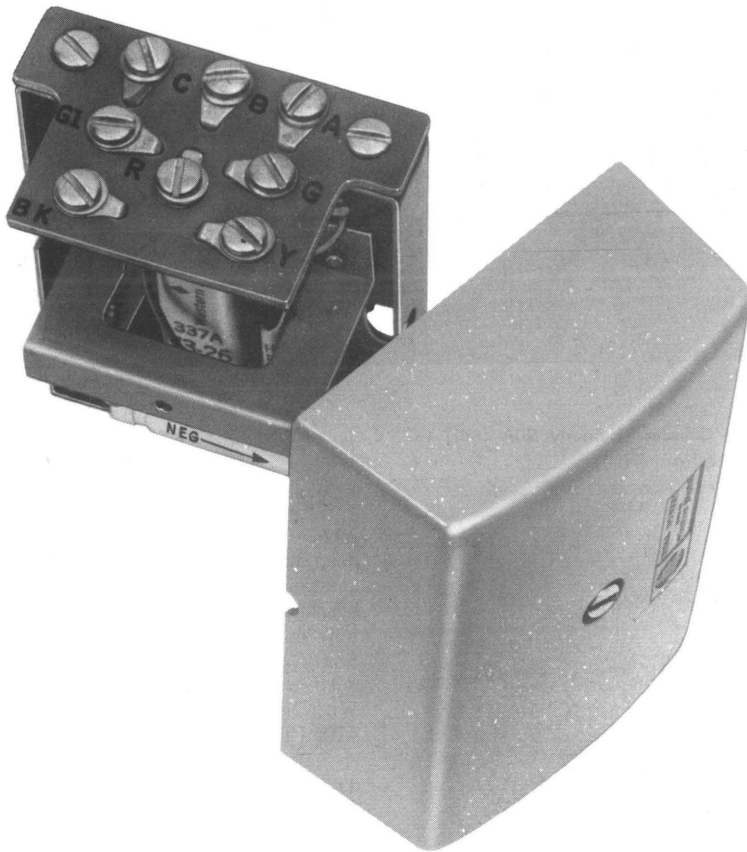


Fig. 21—23A Coupler

a Bell System PBX and customer-provided dictation equipment via a dial access code. The apparatus is mounted on a 4- by 23-inch mounting plate and is intended to be relay rack mounted. (See Fig. 37.) Additional equipment is required for TOUCH-TONE operation.

**2.39 J58824CD Interface Trunk Unit**—Provides connection between a Bell System PBX and customer-provided equipment via a dial access code. The apparatus is mounted on a 8- by 23-inch mounting plate and is intended for relay rack mounting. (See Fig. 38.) Additional equipment is required for TOUCH-TONE operation.

**2.40 J92614E Interface Unit**—Provides connection between Bell System traffic data register circuits and customer-provided monitoring equipment to furnish traffic usage data. Used with Bell System Automatic Call Distributing Systems (Types 2A and 3A). The apparatus is mounted on a 2- by 23-inch mounting plate and is intended for frame mounting. (See Fig. 39.)

#### D. KS-Coded Interconnecting Units

**2.41 KS-19522 Recorder Coupler**—An apparatus box 7 inches wide, 7-3/8 inches high, and 3-3/8 inches deep. The unit provides a mounting bracket assembly that will accommodate

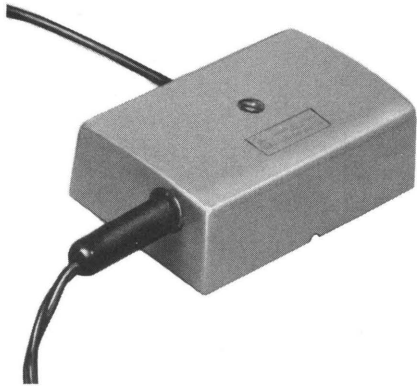


Fig. 22—30B Voice Coupler (formerly 30A [MD] VC and F57948 [MD] KTU)

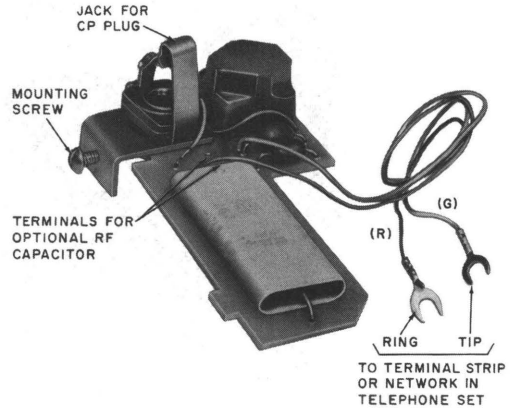


Fig. 24—32A Voice Coupler



Fig. 23—31B Voice Coupler (formerly 31A [MD] VC and F58008 [MD] KTU) or 31C Voice Coupler

two circuit boards. It is used with a telephone set to connect a customer-provided recorder for transmitting prerecorded messages and recording messages from the line. Not intended for recording 2-way conversations. Intended for wall mounting. (See Fig. 40.)

**2.42 KS-19645 Recorder Connector**—An apparatus box measuring approximately 7

inches wide, 7-3/8 inches high, and 3-3/8 inches deep and is intended for wall mounting. The unit contains a printed wiring board and mounting bracket assembly. It is used to provide “beep” tone on a Bell System CO line when recording a 2-way conversation over a Bell System network with a customer-provided recorder reproducer. With Service Center modification, it can be used with CP call duration timers. (See Fig. 41.)

**2.43 KS-20445 Control Unit**—Similar to the KS-19645 recorder connector and provides interconnection of customer-provided automatic dialing and message reproducing equipment to the Bell System CO line. Replaces the KS-20008 (MD) alarm coupler. (See Fig. 42.)

**2.44 KS-20721 Station Coupler**—A general purpose station coupler used to connect various types of customer-provided equipment to the telephone line. Measures approximately 9 inches square by 3 inches deep and is intended for wall or shelf mounting. Contains up to four printed circuit wiring boards. (See Fig. 43.)

**2.45 KS-20893 Multiline Station Coupler**— Provides for 2-wire voice connection between customer-provided conferencing equipment and Bell System 1A1 or 1A2 Key Telephone Systems. Measures approximately 8 inches square by 4-1/2 inches deep and is intended for wall or shelf mounting. Contains up to five plug-in printed



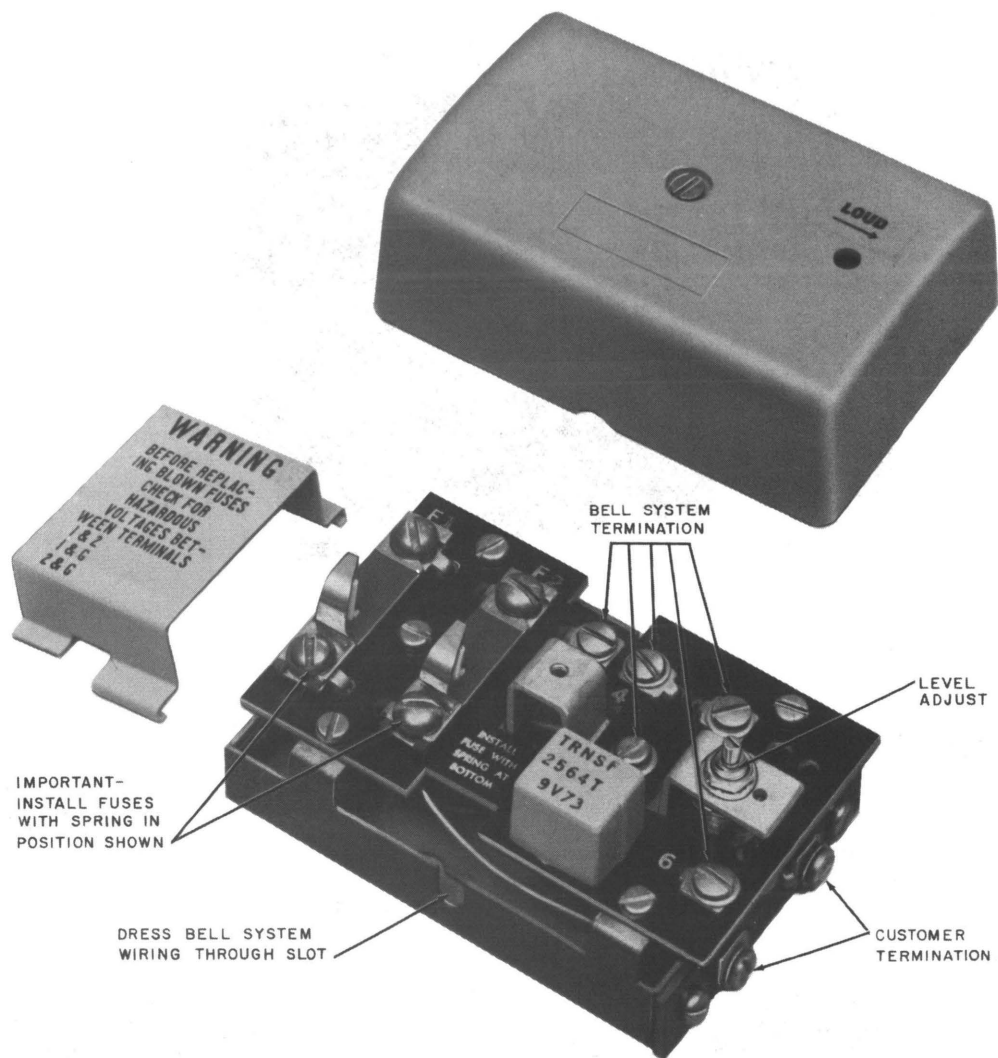


Fig. 25—33A Voice Coupler

circuit interconnecting units. The List 1 includes one L11 ISU and two L10 IUs. (See Fig. 44.)

**2.46 KS-21440 Coupler**—Provides a 2-wire interface between a telephone line and CPE,

such as answering sets, message recorders, dictation machines, etc. (See Fig. 45.)

**2.47 KS-21565 Switchboard Dial Coupler**—Provides access to the TOUCH-TONE dial circuit of a Bell System PBX switchboard for a

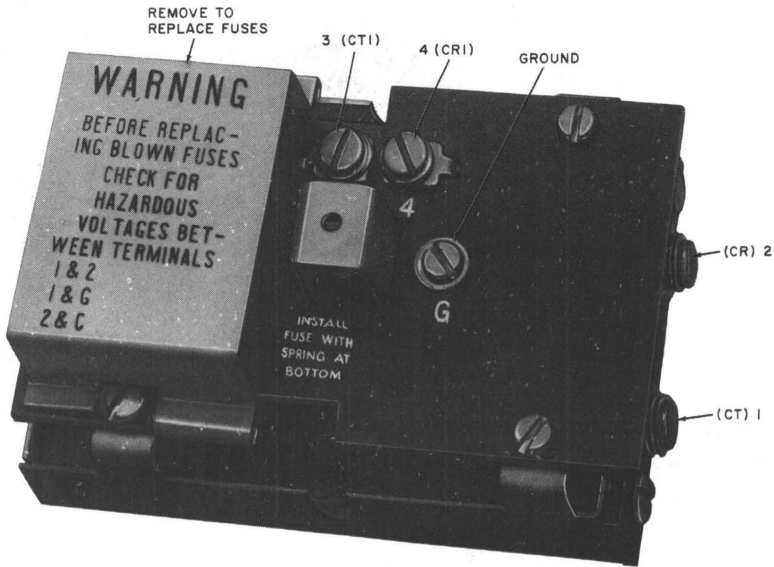


Fig. 26—34A Voice Coupler



Fig. 27—J53050A Interconnecting Unit (formerly F58005 [MD] IU)

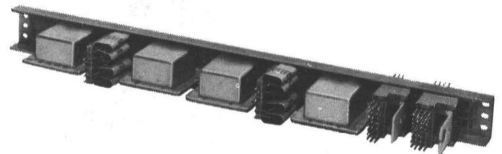


Fig. 29—J53050D Interconnecting Unit

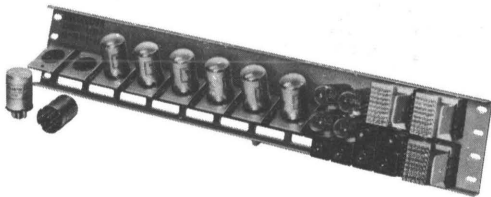


Fig. 28—J53050C,L2 Interconnecting Unit

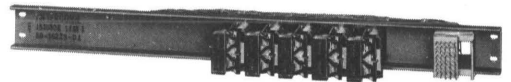


Fig. 30—J53050E Interconnecting Unit (formerly F58356 [MD] IU)

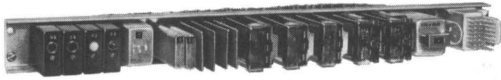


Fig. 31—J53050F Interconnecting Unit

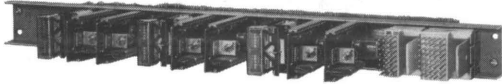


Fig. 32—J53050G Interconnecting Unit

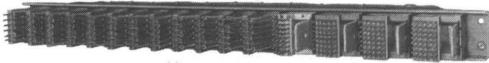


Fig. 33—J53050H Interconnecting Unit

line of a KTS installation by means of a telephone company-provided interface termination. (See Fig. 47.)

#### E. F-Coded Interconnecting Units

**2.49 F58010 (MD) Interconnecting Unit**—A console approximately 5-5/8 inches high, 10-1/2 inches long, and 6 inches deep. It is equipped with two rows of six 540G keys and one 8C dial. It is used to provide 2-wire access between Bell System lines and a customer-provided PBX equipped with a cord switchboard and not arranged for supervision. It is used in association with a 15D KTU. (See Fig. 48.)

#### ASSOCIATED EQUIPMENT

##### A. Panels

**2.50 604A Panel (MD)**—Approximately 23 inches wide by 16 inches high and 8-1/2 inches deep. Provides fusing and connections to

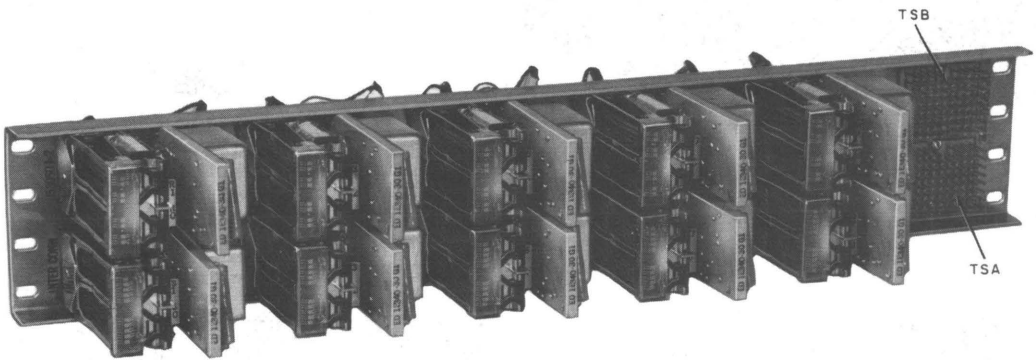


Fig. 34—J53050J Interconnecting Unit

customer-provided multifrequency tone address dialer. (See Fig. 46.)

**2.48 KS-21566 Adapter**—Permits direct electrical connection of a customer-provided conforming answering device incorporating Authorized Protective Connecting Module (APCM) to any one

the units for a maximum of fourteen 101-type or 102-type interconnecting units or eighteen 108A interconnecting units. It was used also for the 103A (MD) interconnecting unit, which is no longer required. All of the previous units may be accommodated in a given 604A panel. (See Fig. 49.) The 604A2 panel is equipped with a 19C2

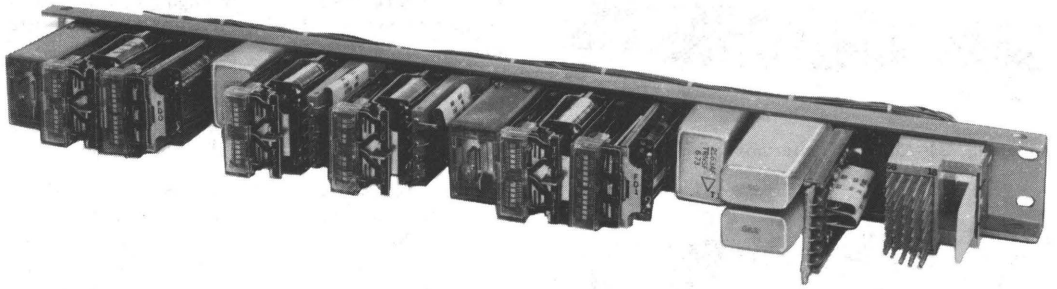


Fig. 35—J53050K Interconnecting Unit

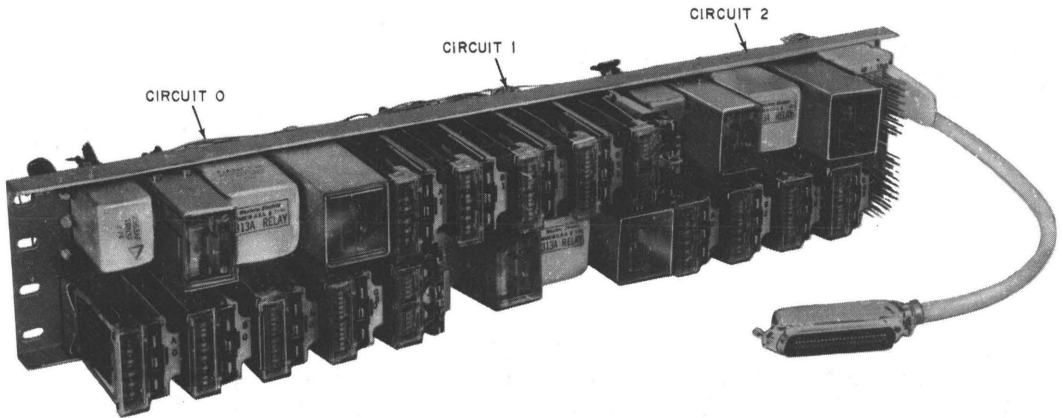


Fig. 36—J53050L Interconnecting Unit



Fig. 37—J58827E Recorded Telephone Dictation Trunk Unit

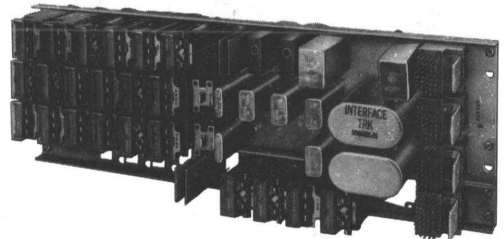


Fig. 38—J58824CD Interface Trunk Unit

power unit; the 604A1 panel is without a power unit.

2.51 **604B Panel (MD)**—Approximately 23 inches wide by 8 inches high and 10 inches

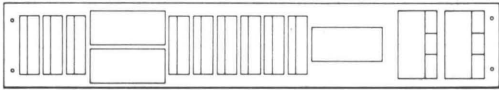


Fig. 39—J92614E Interface Unit

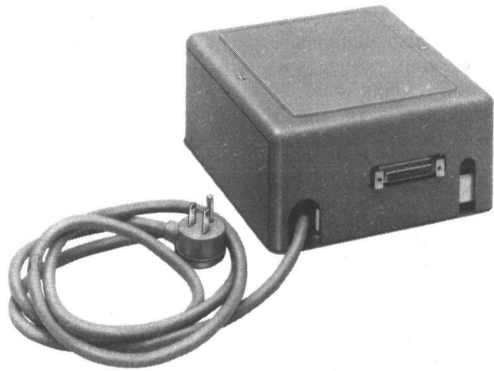


Fig. 40—KS-19522 Recorder Coupler

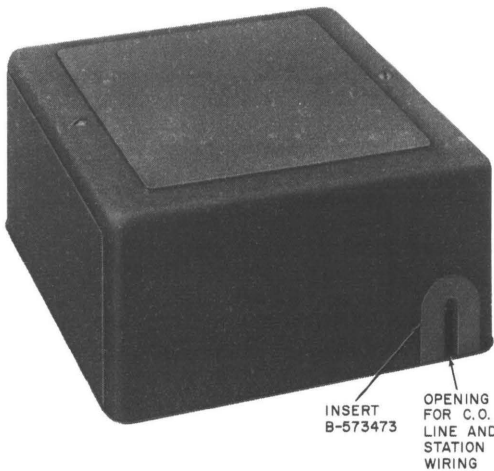


Fig. 41—KS-19645,L4 Recorder Connector



Fig. 42—KS-20445 Control Unit



Fig. 43—KS-20721 Station Coupler

deep. Provides fusing and connections for fourteen 101-type, 102-type, 108A or 120-type interconnecting units, or 12 IUs plus two 75A control units. Fuse protection is also provided for talk battery and ring supply. Option terminals are provided for 24-volt or 48-volt operation. Intended for relay rack mounting. (See Fig. 50.) Requires separate power supply.

**2.52 604C Panel**—Approximately 8 inches high by 23 inches wide and 10 inches deep. The carrier is equipped with 14 each 913A (20 pin) and 914A (40 pin) connectors for mounting 4- and/or 8-inch IUs (see Fig. 50). The 21A apparatus unit

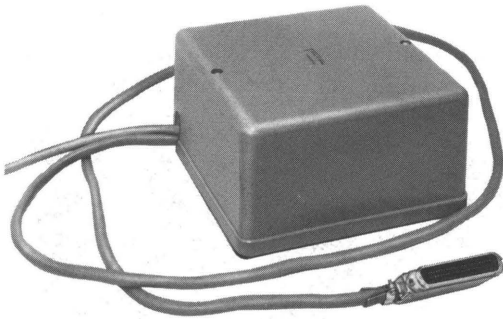


Fig. 44—KS-20893 Multiline Station Coupler

is required to convert the 604C panel to -48V operation.

**2.53 606A Panel**—Approximately 6 inches wide by 8 inches high and 9 inches deep. Provides fusing and connections for six 109A, 110A, or 111A interconnecting units. Intended for relay rack mounting on a 99B bracket. (See Fig. 51.) Requires separate power supply.

**2.54 607A Panel**—Approximately 8 inches high by 23 inches wide and 10 inches deep. Provides fusing and connections for fourteen 112A interconnecting units. Intended for relay rack mounting. Requires separate power supply. (See Fig. 52.)

**2.55 615A Panel**—Approximately 8 inches high by 6 inches wide and 9-1/4 inches deep. Equipped with three 914A connectors in the upper row and three 913A connectors in the lower row. Three 8-inch IUs (101-, 102-, or 120-type) or six 4-inch IUs (108A) can be mounted in a 615A panel. (See Fig. 53.) Intended for relay rack or in a 16C apparatus mounting on a 99B bracket.

#### B. Apparatus Mountings

**2.56 69H Apparatus Mounting**—Approximately 8 inches high by 1-3/4 inches wide and 8-1/2 inches deep. Equipped with two connectors aligned vertically to mount one 101- or 102-type interconnecting unit (8-inch) or by adding the 834045908 (P-40V590) guide assembly; will mount one 108A interconnecting unit (4-inch) in upper connector. A plug on the rear accepts A25B connector cables. Mounts on a

standard relay rack or in a 16C apparatus mounting using the 99B bracket. (See Fig. 54.)

#### C. Service Units

**2.57 700A Interconnecting Service Unit**—Approximately 15 inches high, 9 inches wide, and 5-1/2 inches deep and is equipped with an apparatus mounting and six 20-pin connectors to house six 108A interconnecting units. The 700A2 unit is also equipped with a 28A1 plug-in type power unit which supplies 24-volt battery and ground. This unit is intended to be used in association with the 105A interconnecting unit. (See Fig. 55.)

#### D. Control Units

**2.58 75A Control Unit**—An 8-inch circuit pack used with 101B, 101C, and 102B interconnecting units. The 75A control unit provides automatic level control (ALC) over data/voice signal voltages applied to customer tip and ring of voice type interconnecting units. Each control unit contains six ALC circuits and may be plugged into position 13 of the 604B or 604C panel to control units 1 through 6, and position 14 to control units 7 through 12. (See Fig. 56.)

#### E. Protectors

**2.59 KS-20944 Protector**—Approximately 8 inches high by 6-3/8 inches wide and 3-3/4 inches deep. It is intended for wall mounting. Provides a dc interface between Bell System interconnecting arrangements and a customer-provided dc power supply. Designed to trip in 25 milliseconds (maximum) on overvoltage of 38 volts (24-volt unit) and 68 volts (48-volt unit), on overload of 18.75 amperes (15-amp unit) and 36 amperes (30-amp unit). Will trip on reversed polarity or ac voltage greater than 18 volts or incorrect power supply ground. (See Fig. 57.)

#### F. Test Sets

**2.60 142A Test Set**—Permits field testing of various multilead interconnecting units (IUs) by simulating the input from the customer-provided equipment. The test set can be used for installation and maintenance tests of the 101-, 102-, 108-, and J53053J-type IUs. Refer to Section 463-300-113 for specific details. (See Fig. 58.)

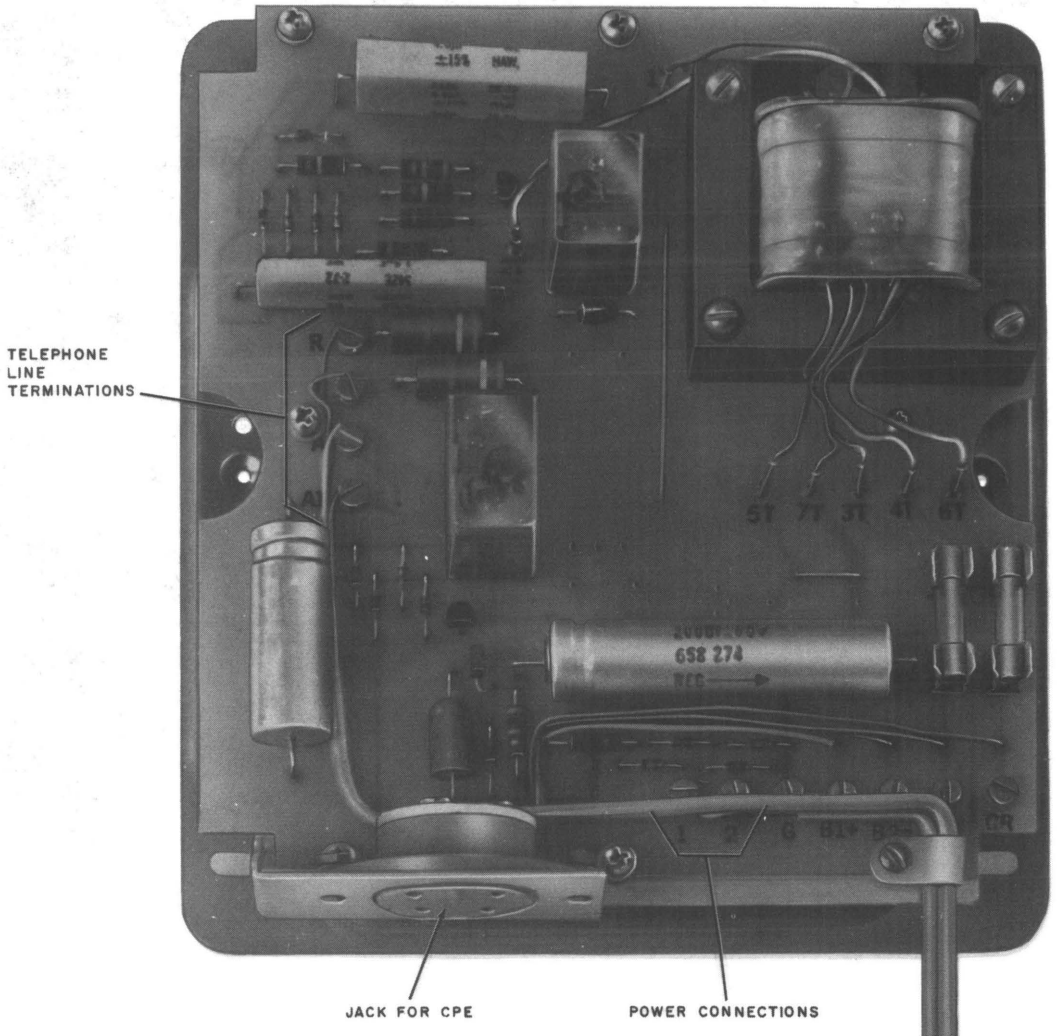


Fig. 45—KS-21440 Coupler

### 3. SELECTION

3.01 The associated apparatus and equipment used with the connecting arrangements are shown in Table A.

3.02 For detailed information on the various interconnecting devices, refer to the appropriate BSP.



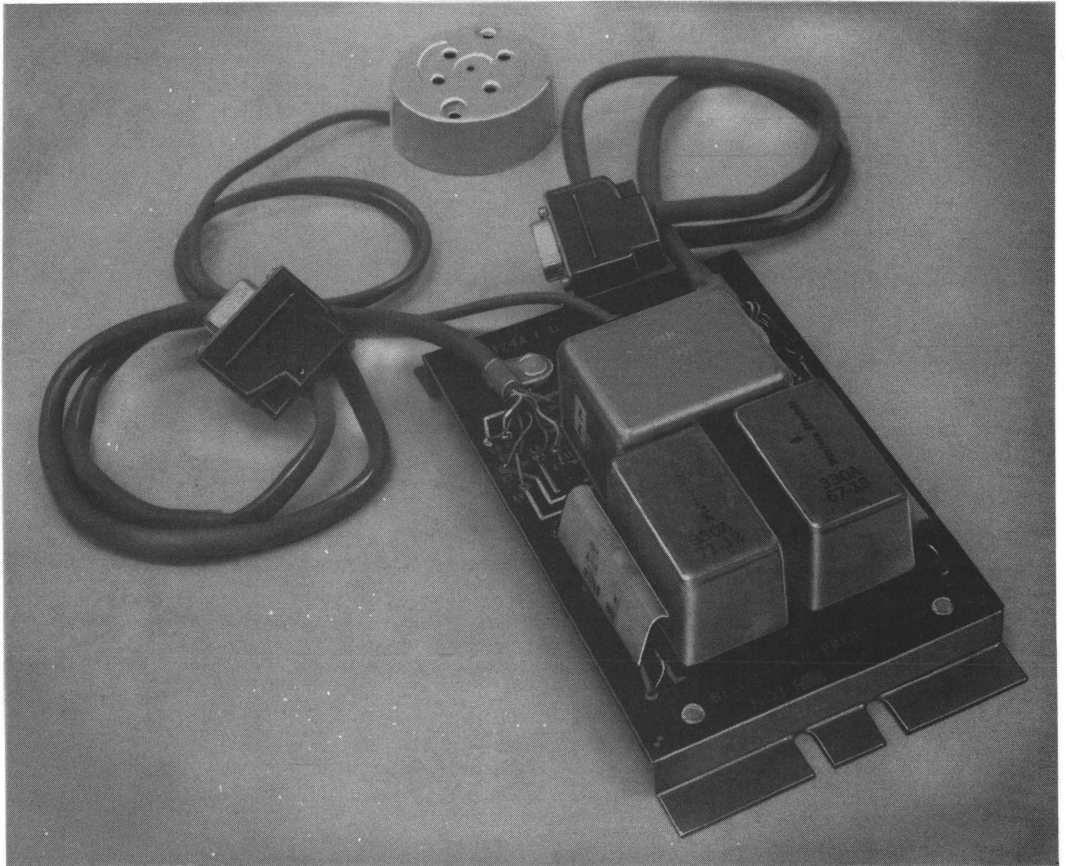


Fig. 46—KS-21565 Switchboard Dial Coupler

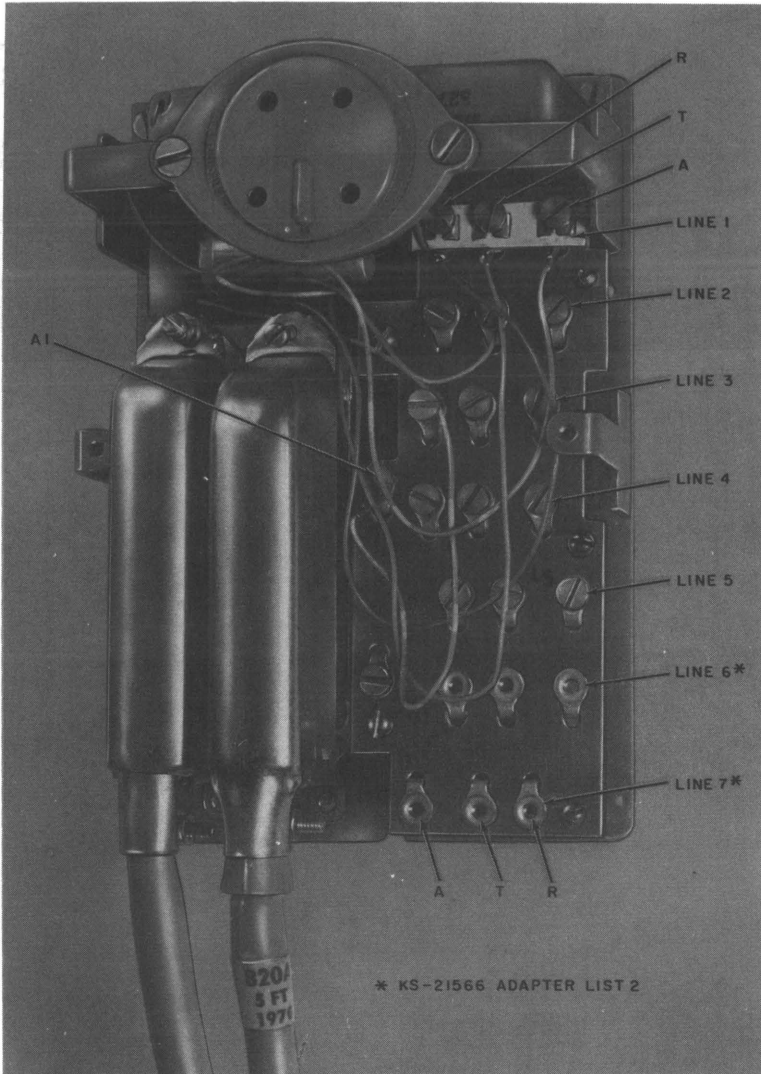


Fig. 47—KS-21566 Adapter

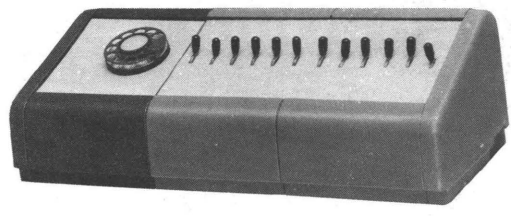


Fig. 48—F58010 (MD) Interconnecting Unit

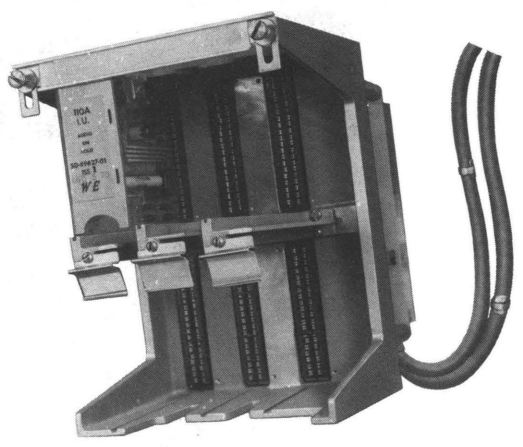


Fig. 51—606A Panel

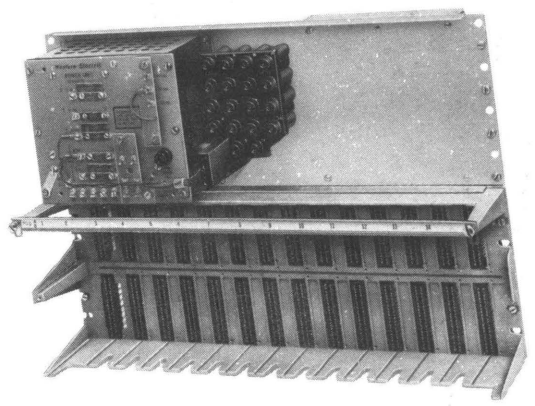


Fig. 49—604A-Type Panel (604A2 Shown)

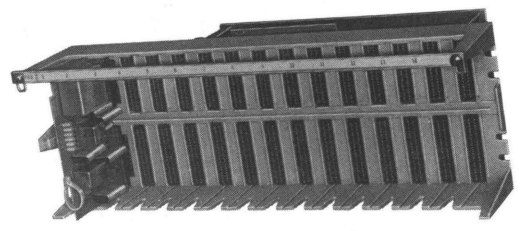


Fig. 52—607A Panel

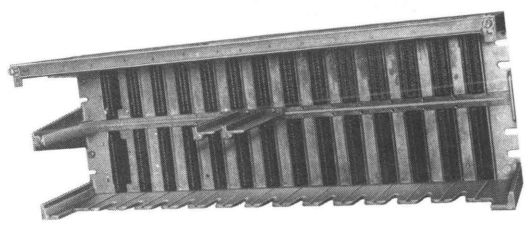


Fig. 50—604B (MD) or 604C Panel

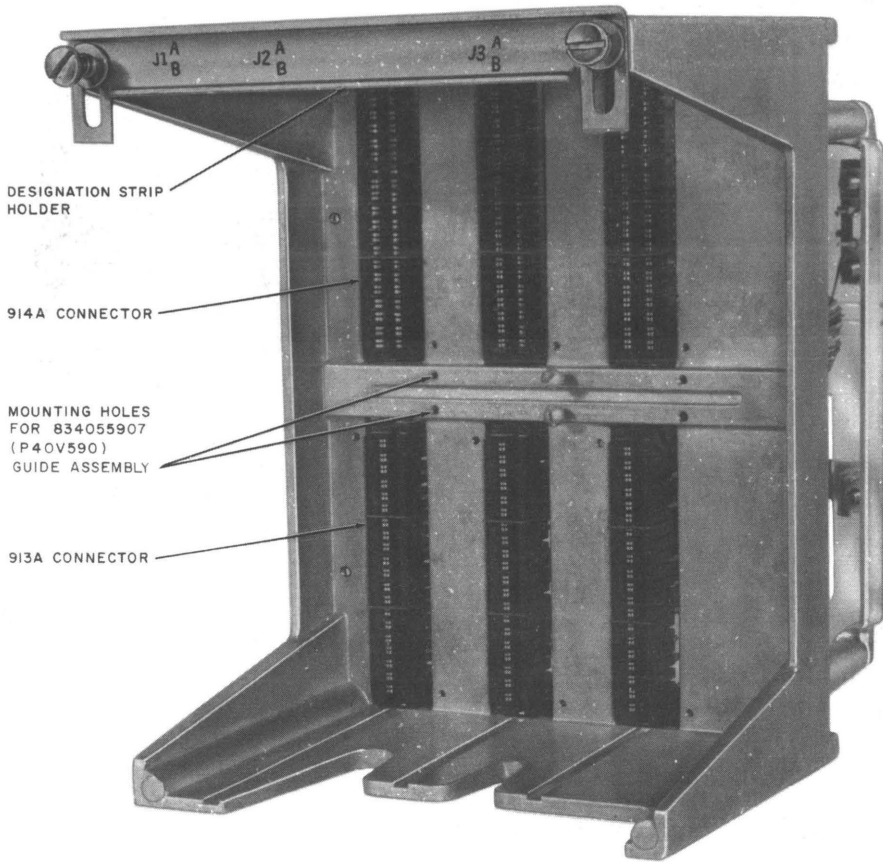


Fig. 53—615A Panel (Front View)

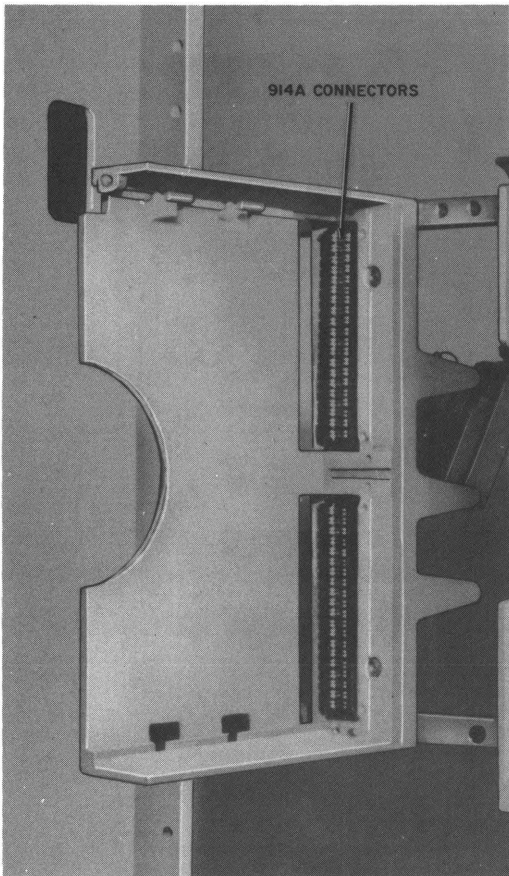


Fig. 54—69H Apparatus Mounting

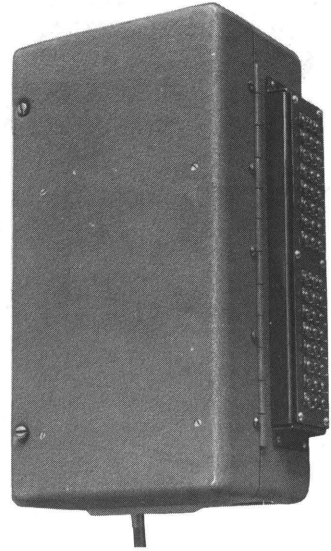


Fig. 55—700A Interconnecting Service Unit (formerly F58003 [MD] ISU)

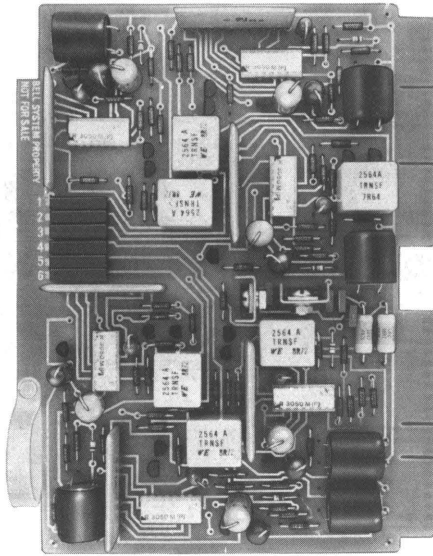


Fig. 56—75A Control Unit



Fig. 57—KS-20944 Protector

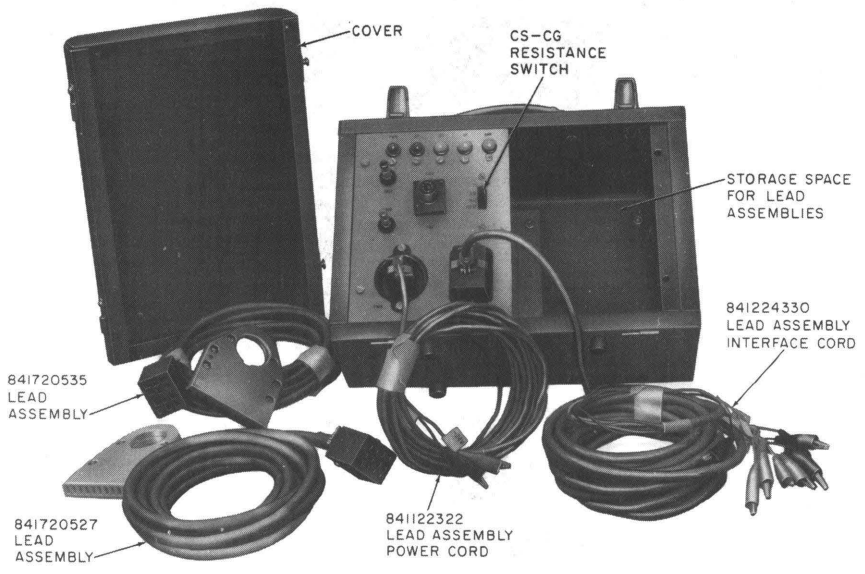


Fig. 58—142A Test Set

TABLE A

## INTERCONNECTING DEVICE APPLICATIONS

USOC	PUB NUMBER	SECTION NUMBER	INTERCONNECTING DEVICE	SCHEMATIC DRAWING	DESCRIPTION
AD1	42213	463-340-105	23A	SD-69912-01	Provides an interface between a customer-provided dc dial pulse dialer and a Bell System CO/PBX line.
CAU	42201	463-340-100	KS-20445	SD-69600-01	Permits dial pulse dialing and one-way outgoing transmission for use with customer-provided alarm signaling device.
CBF	42401 42402	463-300-112	75A Control Unit	SD-1E246	Used with CDH, CD7, CD8, CD9 to allow a customer to transmit data from behind a CP PBX.
CDA	42302	463-350-100	F58004 (MD)	SD-69611	Manually connects a cord switchboard position of a customer-provided system that provides supervisory signals to an exchange trunk line.
CDA	42302	463-350-101	108A		
CDB	42301	463-331-100	F58005 (MD)	SD-69612	Manually connects a line from a customer-provided dial intercom system that provides supervisory signals to an exchange trunk line through a Bell System-provided cord switchboard position.
CDB	42301	463-331-101	J53050A, L1		
CDH	42401	463-350-104	101-Type	SD-1E201-01 (101A) SD-1E238-01 (101B) SD-1E294-01 (101C)	Automatically connects an exchange trunk line arranged for 2-way combination (ground-start) service to and from the attendant position and from the dial switching equipment of a customer-provided system.
CDN	42303	463-300-140	F58006 (MD)	SD-69614-01	Manually connects a line from a customer-provided intercom system that provides supervisory signals to an exchange line through a Bell System-provided key station.
CDN	42303	463-311-103	111A		



TABLE A (Cont)

USOC	PUB NUMBER	SECTION NUMBER	INTERCONNECTING DEVICE	SCHEMATIC DRAWING	DESCRIPTION
CDQ2W	42502	463-360-101	J53050C, L1 (MD) or L3 J53050D, L1 J98605AG (MD) or AJ	SD-1E207-01 SD-97047-01 SD-1E206-01	Provides 2- or 4-wire tie line connection between Bell System facilities and customer-provided 2-way, 2-wire dial tie trunk designed for a contact-type signaling interface.
CDQ2X	42502	463-360-101	J53050C, L2 J53050D, L1 24V4 J98605AG (MD) or AJ	SD-1E207-01 SD-1E254-01 SD-97047-01	Provides 2-wire tie line connection between Bell System facilities and customer-provided 2-way, 2-wire dial tie trunk designed for an E&M type signaling interface.
CDQ4W	42501	463-360-100	J53050C, L1 (MD) or L3 44V4 J98605AG (MD) or AJ	SD-97047 SD-1E206-01	Provides 4-wire tie line connection between Bell System facilities and customer-provided 2-way, 4-wire dial tie trunk designed for a contact-type signaling interface.
CDQ4X	42505	463-360-100	J53050C, L2	SD-1E254-01 SD-97047-01	Provides 4-wire tie line connection between Bell System facilities and customer-provided 2-way, 4-wire dial tie trunk designed for an E&M type signaling interface.
CDX	42102	463-331-104	31B	SD-69614-01	Manually connects a customer-provided patching device that enables the connection of an incoming call on a trunk to a Bell System switchboard to an outgoing trunk from a Bell System switchboard.
CDY	42307	463-312-100	KTU Line Ckt	—	Terminates, without exchange connection, a line from a customer-provided system in a telephone company-provided key telephone station.

TABLE A (Cont)

USOC	PUB NUMBER	SECTION NUMBER	INTERCONNECTING DEVICE	SCHEMATIC DRAWING	DESCRIPTION
CD1	42304	463-300-110	F58010 (MD)	—	Manually connects a cord switchboard position of a customer-provided system that does not provide supervisory signals to an exchange trunk line.
CD4	42305	463-300-130	F58008 (MD)	SD-69613-01	Manually connects a line from a customer-provided intercom system that does not provide supervisory signals to an exchange trunk line through a Bell System-provided cord switchboard position.
CD4	42305	463-331-103	31B		
CD5	42306	463-300-150	F58007 (MD)	SD-69614-01	Manually connects a line from a customer-provided intercom system that does not provide supervisory signals to an exchange line through a Bell System-provided key telephone station.
CD5	42306	463-311-103	111A		
CD6	42404	463-350-105	108A	SD-69611-01	Automatically connects an exchange trunk line arranged for one-way incoming service to the attendant position of a customer-provided system.
CD7	42402	463-350-106	102-Type	SD-1E202-01 (102A) SD-1E238-01 (102B)	Automatically connects an exchange trunk line arranged for one-way outgoing service (loop-start) from the attendant position of a customer-provided system.
CD8	42402	463-350-106	102-Type		Automatically connects an exchange trunk line arranged for one-way outgoing service (loop-start) from the dial switching equipment of a customer-provided system.
CD9	42402	463-350-106	102-Type	—	Automatically connects an exchange trunk line arranged for 2-way service (loop-start) to and from the attendant position of a customer-provided system.

TABLE A (Cont)

USOC	PUB NUMBER	SECTION NUMBER	INTERCONNECTING DEVICE	SCHEMATIC DRAWING	DESCRIPTION
CEBAV	42106	463-311-106	111A	SD-69614-01	Permits the customer to manually connect and disconnect customer-provided equipment that answers an incoming call to a specific line terminated on a telephone company key set.
CEBAW	42107	463-311-106	111A		Permits the customer to manually connect and automatically disconnect customer-provided equipment to a specific line terminated on a telephone company key set.
CEBAX	42103	463-311-104	111A	SD-69614-01	Permits the customer to manually connect and disconnect customer-provided conferencing equipment to a specific line terminated on a telephone company key set. For use with customer-provided equipment with only one supervisory contact.
CEBBX	42103	463-311-104	111A		Permits the customer to manually connect and disconnect customer-provided conferencing equipment to a specific line terminated on a telephone company key set. For use with customer-provided equipment with two supervisory contacts.
CED	42405	463-350-107	101-Type	SD-1E201-01 (101A) SD-1E238-01 (101B) SD-1E294-01 (101C)	Automatically connects an exchange trunk line arranged for 2-way service, (ground-start), i.e., outward dialing by hotel/motel guests and ringback by the operator to the operator position of a telephone company long distance switchboard.
CEK	42601	463-380-100	J53050E F58356	SD-1E229-01	Connects customer-provided message registers, where the customer is providing the communications system and the necessary equipment to associate the station with the message registers, to a central office trunk message register circuit.

TABLE A (Cont)

USOC	PUB NUMBER	SECTION NUMBER	INTERCONNECTING DEVICE	SCHEMATIC DRAWING	DESCRIPTION
CET	42403	463-350-108	102-Type	SD-1E202-01 (102A) SD-1E238-01 (102B)	Automatically connects the dial switching equipment of a customer-provided PBX to a Bell System toll operator for toll terminal service (loop-start) without ringback.
CEZ	42211	463-311-108	KS-20893	SD-69952-01	Manually connects customer-provided conferencing equipment to Bell System Key Telephone System lines terminated on a 6-button plug-ended key telephone set or CALL DIRECTOR® set.
CTD	42605	463-382-101	J53050G	SD-1E245-01	Connects a customer-provided toll diverter to a central office trunk circuit equipped with reverse battery detection associated with a Bell System PBX.
CTH	42609	463-382-103	J53050K	SD-1E259-01	Connects customer-provided call diversion equipment to a Bell System CO trunk associated with a Bell System PBX.
C1V	42603	463-382-100	18D KTU	SD-69633-01	Provides line status information to customer-provided elapsed time or pen register equipment.
C1Y	—	463-380-102	J92614E	SD-99400-01	Provides for the connection of a customer-provided special purpose computer to the traffic data register circuits of the Force Administration Data System (FADS).
C2ACP	42207	463-341-100	102-Type	SD-1E202-01 (102A) SD-1E238-01 (102B)	Permits the automatic connection of customer-provided terminal equipment (typically key systems) to an exchange line or WATS access line, (loop-start).
C2AKS	42207	463-311-107	102-Type		Permits the automatic bridged connection of customer-provided equipment (typically call diversion or WATS extension equipment) to an exchange line or WATS access line (loop-start) to a line terminated on a Bell System station set.

TABLE A (Cont)

USOC	PUB NUMBER	SECTION NUMBER	INTERCONNECTING DEVICE	SCHEMATIC DRAWING	DESCRIPTION
C2H	42407	463-370-101	J53050C, L2 J98605AH	SD-1E254-01	Centrex application of C24 to connect customer-provided 4-wire facilities.
C2K	42408	463-370-102	J53050C, L2 J53050D, L1	SD-1E254-01 SD-1E207-01	Centrex application of C27 to connect customer-provided 2-wire tie line facilities.
C22	42406	463-350-109	112A	SD-1E240-01	Provides a connection to an exchange trunk line from customer-provided communications system for direct inward dialing (DID) service.
C232W	42504	463-360-103	J53050D 31B-49	SD-1E207-01 SD-69613	Provides 2-wire tie line connection between Bell System facilities and customer-provided 2-way, 2-wire tie trunks. No signaling is provided.
C234W	42503	463-360-102	44V4A	SD-97047-01	Provides 4-wire tie line connection between Bell System facilities and customer-provided 2-way, 4-wire tie trunks. No signaling is provided.
C24	42407	463-370-101	J53050C, L2	SD-1E254-01	Provides 2-wire tie line connection between Bell System PBX trunk circuit and customer-provided 4-wire facilities designed for E&M signaling interface.
C25	42604	463-380-101	118A	SD-1E239-01	Connects a customer-provided ANI System via a data link to a Bell System SIF for automatic identified outward dialing (AIOD) service.
C27	42408	463-370-102	J53050C, L2 J53050D, L1	SD-1E254-01 SD-1E207-01	Provides 2-wire tie line connections between Bell System PBX trunk circuits and customer-provided 2-wire facilities designed for an E&M interface.
DCK DCL	42703	463-332-100	J53050F	SD-1E255-01	Provides access to CPE on a trunk level basis from a Bell System PBX.

TABLE A (Cont)

USOC	PUB NUMBER	SECTION NUMBER	INTERCONNECTING DEVICE	SCHEMATIC DRAWING	DESCRIPTION
DCT	42701	463-332-110	J58827E	SD-5E038-01	Connects customer-provided dictation equipment to a Bell System PBX trunk level (recorded telephone dictation trunk circuit SD-5E038-01).
DCW	42702	463-332-120	J58824CD	SD-66926-01	Connects customer-provided radio paging equipment to a Bell System PBX trunk level (interface trunk circuit SD-66926-01).
FTM	42109	463-341-103	34A	SD-69911-01 SD-69922-01	Provides a connection for music-on-hold between a customer-provided music or information source and CO/PBX lines in a Key Telephone System. Uses a 451B KTU.
FTP	42108	463-341-102	33A	SD-69911-01	Provides a connection between a customer-provided music or information source and the music-on-hold and/or paging circuit in a 7A, 14A, or 21A COM KEY* System. Uses a 451B KTU.
GC2	42603	463-382-100	15D KTU	SD-69633-01	Provides line status information to customer-provided equipment when ringing is present on the line.
GTS	42214	463-340-112	KS-21440	SD-69918-01	Provides a 2-wire interface between a CO/PBX line and customer-provided answer-only equipment such as answering sets, message recorders, etc.
HZM	42606	463-382-102	J53059H, L1 or 125A	—	Provides line status information to customer-provided equipment through a high impedance interface.
JTA	46001	463-322-101	KS-21566 adapter	—	Permits direct electrical connection of a CP conforming answering device with an Authorized Protective Connecting Module (APCM) to any one line of a KTS.

TABLE A (Cont)

USOC	PUB NUMBER	SECTION NUMBER	INTERCONNECTING DEVICE	SCHEMATIC DRAWING	DESCRIPTION
JTC	45101	463-322-100	—	—	Provides an interface for the direct electrical connection of CP attested, nonpowered conferencing devices associated with a Bell System key telephone set.
KTX	42608	463-382-104	122A	SD-69659-01	Provides for connecting CPE such as call diverting equipment to a telephone company KTS.
LOH	42104	463-331-105	110A	SD-69627-01	Permits the connection of customer-provided background music or other recorded material to central office lines terminated in a telephone company-provided switchboard while the line is in the hold mode.
LVH	42105	463-311-105	109A 110A		Permits the connection of customer-provided background music, or other recorded material, to central office or PBX lines terminated in telephone company-provided key telephone set while the line is in the hold mode.
PFB	—	463-350-104	229B KTU 551A Key	SD-69631-01	Provides for automatic transfer of CO line from a CP telephone set to a Bell System telephone set when local power fails. Calls in progress while local power is out will be interrupted when local power is restored. During periods of local power, the Bell System telephone set will be inoperative.
PFC	—	463-350-104	229B KTU 551A Key	SD-69631-01	Provides for automatic transfer of CO line from a CP telephone set to a Bell System telephone set when local power fails. Calls in progress while local power is out will remain connected to Bell System equipment until the call is completed and then be automatically transferred back to CP equipment even though local power may resume during call.

TABLE A (Cont)

USOC	PUB NUMBER	SECTION NUMBER	INTERCONNECTING DEVICE	SCHEMATIC DRAWING	DESCRIPTION
PVF	44101	463-390-100	114A	SD-69904	Permits the connection of customer-provided video/audio terminal equipment to PICTUREPHONE <sup>®</sup> facilities using a telephone company-provided TOUCH-TONE <sup>®</sup> telephone set.
QKP	42101	463-311-109	32A	—	Permits a customer to connect voice transmitting or receiving equipment to a telephone company central office line through jack and plug mounted in a Bell System telephone set.
QKT	42101	463-311-100	30B	—	Manual connecting arrangement used for the connection of customer-provided equipment (typically phone patch equipment) to an exchange line through a Bell System-provided telephone set equipped with an exclusion key.
RCX	42603	463-382-100	117A	SD-69633-01	Provides line status and dial pulse information to customer-provided traffic measuring equipment.
RCZ	42205	463-340-120	KS-19645	SD-99414-01	Connects customer-provided recording equipment to a central office exchange line for the recording of 2-way conversations (KS-19645 recorder connector). Provides beep tone.
RC1	42206	463-340-120	KS-19645	SD-99414-01	Provides 1400 Hz tone to local party under control of customer-provided call duration timer. See RTT.



TABLE A (Cont)

USOC	PUB NUMBER	SECTION NUMBER	INTERCONNECTING DEVICE	SCHEMATIC DRAWING	DESCRIPTION
RDL	42204	463-340-110	KS-19522	SD-99356-01	Connects a customer-provided recorder/ announcement machine to an exchange line for one-way recording or one-way announcements—not arranged for both at the same time (KS-19522 recorder coupler).
RDL	42204	463-340-111	KS-19522		Voice Connecting Arrangement RDL using a KS-16765 Bell System announcement set as supplemental equipment.
RDM	42204	463-340-110	KS-19522		Connects a customer-provided recorder/ announcement machine to an exchange line for 2-way transmission (KS-19522 recorder coupler).
RDM	42204	463-340-111	KS-19522		Protective Connecting Arrangement RDM using a KS-16765 Bell System announcement set as supplemental equipment.
RDMZR	42209	463-340-101	KS-20721	SD-69903-01	Connects a customer-provided recorder/ announcement set to an exchange line for 2-way transmission (KS-20721 station coupler).
RDY	42209	463-340-101	KS-20721		Same as RDM but with voice control disconnect and automatic receive volume limiting.
RTT	42203	463-340-120	KS-19645	SD-99414-01	Generates a 440-Hz tone in both directions on a line under control of a customer-provided call duration timer.
STC	42208	463-340-103	KS-20721	SD-69903-01	Provides for the connection of a customer-provided telephone sets to a central office exchange line or PBX station line.
STP	42212	463-341-101	120A/B	SD-69646-01	Provides for the connection of customer-provided multiline key telephone system to CO or PBX lines on a 2-wire basis.

TABLE A (Cont)

USOC	PUB NUMBER	SECTION NUMBER	INTERCONNECTING DEVICE	SCHEMATIC DRAWING	DESCRIPTION
STS	42210	463-340-102	KS-20721	SD-69903-01	Automatically connects customer-provided equipment (typically alarm systems) using tone supervision to a central office exchange line or PBX station line (KS-20721 station coupler).
SUT	42705	463-331-106	KS-21565	SD-1E296-01	Provides access to the TOUCH-TONE dial circuit of a Bell System PBX SWBD for a customer-provided multifrequency (MF) tone address dialer.
SU3	42201	463-340-100	KS-20445	SD-69600-01	Tone signaling unit for use with Protective Connecting Arrangements CAU and SU6 to permit the operation of the alarm device to be tested or verified from a remote location.
SU4	42201	463-340-100	KS-20445		CAU plus SU3 to provide alarm coupler with remote testing feature for customer-provided alarm systems.
SU6	42201	463-340-100	KS-20445		Same as CAU but with modification to provide 2-way transmission to permit detection of dial tone or proper signal from remote point.
SU6AQ	42210	463-340-102	KS-20721	SD-69903-01	Automatically connects customer-provided equipment (typically alarm systems) to a central office exchange line or PBX station line (KS-20721 station coupler).
SU7QW	42202	463-340-104	KS-20721	SD-69903-02	Permits use of customer-provided dial pulse dialers that do not require a transmission path (KS-20721 station coupler).
TAS	42404	463-350-110	J53053J	SD-1E257-01	Provides an interface between a central office secretarial line and a one-way incoming line circuit associated with the CPE.

TABLE A (Cont)

USOC	PUB NUMBER	SECTION NUMBER	INTERCONNECTING DEVICE	SCHEMATIC DRAWING	DESCRIPTION
TSPXY TSPZ1	42704	463-382-105	J53053L	SD-1E295-01	Provides an interface between a PBX central office trunk and the CPE on one-way ground start outgoing trunks.
VCP	42607	463-300-109	KS-20944 Protector	—	Provides protection for customer-provided dc power supply.
—	—	463-300-112	75A	SD-1E246-01	Provides automatic level control to associated voice type IUs used for data.
—	—	463-361-100	119A	SD-1G286-01	Provides 2-wire connection between customer-provided equipment and Bell System metallic voice grade private line.
—	—	463-300-101	—	—	Provides information on 604A-type panel.
—	—	463-300-102	—	—	Provides information on 604B, 604C panel, and 21A apparatus unit.
—	—	463-300-103	—	—	Provides information on 606A panel.
—	—	463-300-104	—	—	Provides information on 615A panel.

## INTERCONNECTING DEVICES, COMMON EQUIPMENT

### 604A-TYPE PANEL

#### 1. GENERAL

**1.01** This section provides identification, installation and connection information for the 604A-type panel used to mount interconnecting units (IU).

**1.02** Only the internal wiring of the 604A-type panel is covered in this section. Refer to the section covering the specific Voice Connecting Arrangement (VCA) for input and output connections and schematics of the IU involved.

**1.03** This issue of the section is based on the following drawing:

SD-1E200-01, Issue 2D - 604A Panel

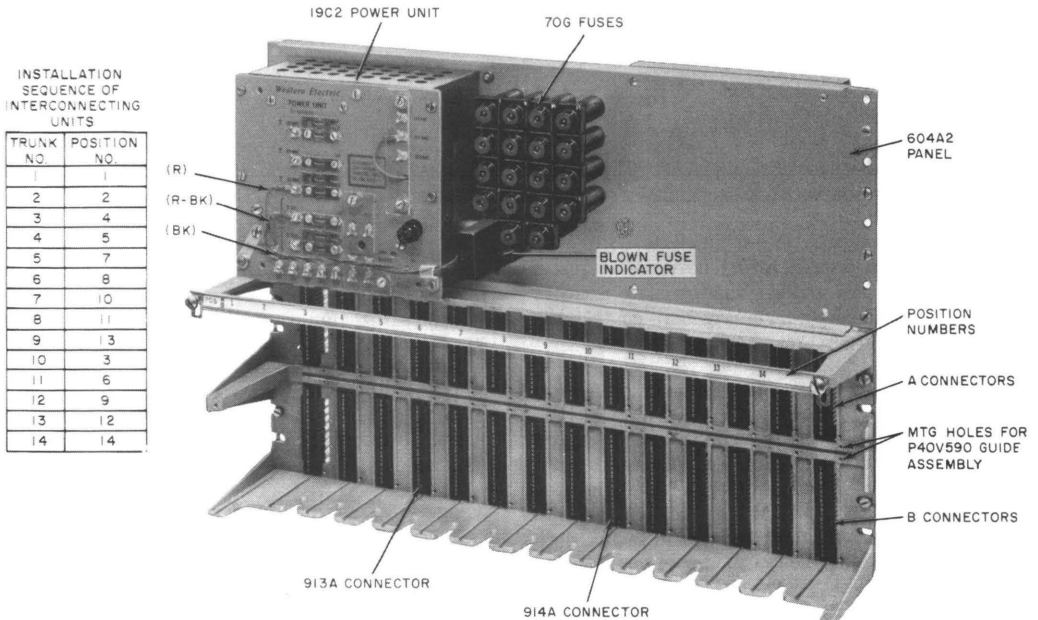
If this section is to be used with equipment or apparatus reflecting later issues of the drawings, reference should be made to the SDs and CDs to determine the extent of the changes and the manner in which the section may be affected.

#### 2. IDENTIFICATION

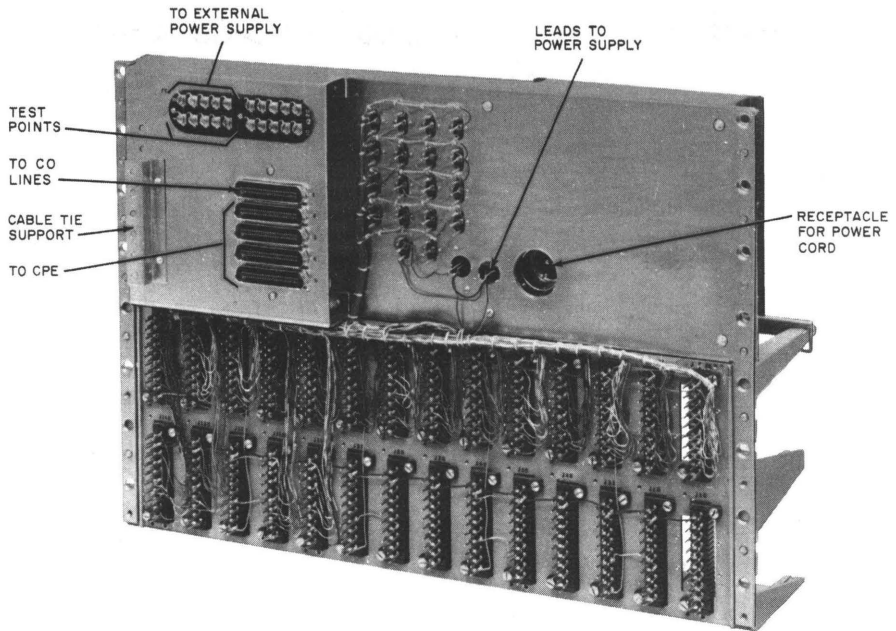
##### DESCRIPTION

**2.01** The 604A-type panel provides mounting facilities for 101-type, 102-type, 103A (MD), and 108A IUs, fused power and a fuse alarm lamp.

**2.02** The 604A1 and 604A2 panels are identical except that the 604A2 panel is provided with



**Fig. 1—604A2 Panel (Front View)**



**Fig. 2—604A2 Panel (Rear View)**

a 19C2 power unit (see Fig. 1 and 2). The 604A1 panel requires a separate power supply.

**2.03** The 604A-type panel consists of a cast aluminum printed wiring board receptacle 8 inches by 23 inches and a mounting plate 8 inches by 23 inches joined by mounting bars so that the vertical space required on a rack is 16 inches.

**2.04** The mounting plate is arranged for a power unit, fuses, and fuse alarm lamp on the front side, and connectors on the rear for access to installed IUs, voice, control and power circuitry. The panel will mount fourteen 8-inch IUs or eighteen 4-inch IUs. One P-40V590 guide assembly is required at the center of the panel to mount each of the 4-inch IUs installed in the upper connectors.

**2.05** The panel is arranged to accept a maximum of nine 2-way ground or loop-start trunks with pulse correction, fourteen 2-way trunks without pulse correction or eighteen one-way incoming

trunks. Fig. 3 shows the connector and trunk arrangement in the 604A-type panel.

**2.06** Positions 1 through 14 are equipped with an A and B connector. The arrangement of 913A (20 pin) and 914A (40 pin) connectors provides for mounting 4-inch IUs or using two vertical connectors for an 8-inch IU. The connectors are wired to accept the following units:

- (a) Positions 1 through 14—Interconnecting Units 101A or 101B (2-way ground-start trunk) or 102A or 102B (2-way loop-start trunk)
- (b) Positions 3, 6, 9, 12, 14—103A (MD) pulse corrector
- (c) Positions 1A through 14A and 10B, 11B, 13B, 14B—108A IU (one-way incoming trunk)

Fig. 4 shows the lead designations and pin numbers for the above IUs, and Table A shows the connectors in which they may be mounted.

**2.07** The power supply, fuses, and power distribution are shown in Fig. 5. The 19C2 power unit provides -24 volt (1.5 amperes) signal battery to the 604A2 panel through fuses F1 to F18. The -24 volt supply and the 10-volt ac lamp supply and their grounds are available on the terminal strip (TSA) for testing. When any of the fuses operate, the fuse alarm lamp will light. The fuses are of the indicating (pop up) type for quick location of the blown fuse. Table B shows the fuse assignment.

**2.08** The 913A and 914A connectors are factory-wired to five 50 pin KS-16671, List 1 plugs on the rear of the panel. Plug No. 1 provides for tip and ring connections between the CO and the 604A-type panel. Plugs 2, 3, 4, and 5 provide for connections between the customer-provided equipment (CPE) and the 604A-type panel. Fig. 6 shows connections to connectors J1 through J14. Fig. 7 shows connections to plugs P1 through P5.

#### ORDERING GUIDE

- Panel, 604A1 (Includes fuse panel only)
- Panel, 604A2 (Includes 19C2 power unit and fuse panel)
- Cord, Power (For 604A2 panel only)
  - P40J326 (1-1/2 ft)
  - P40J327 (2 ft)
  - P40J328 (4 ft)
  - P40J329 (6 ft)
  - P40J099 (12 ft)
- Cable, Connector (See Table C)
- Assembly, Guide, P-40V590 (14 per panel, for use with 108A IU only)

#### *Replaceable Components for 604A-Type Panel*

- Unit, Power, 19C2 (for 604A2 Panel)
- Lamp, A3 (fuse alarm)
- Fuse, 70G (1/2 ampere, 18 per panel)

### 3. INSTALLATION

**3.01** The 604A-type panel will mount on a standard relay rack or in an ED-91180-72, Group 21,

18-plate equipment cabinet (or equivalent). The equipment cabinet will hold two 604A-type panels when the drawing holder on the lower half of the cover is removed. The relay rack or cabinet should be grounded separately.

**3.02** Connection to the voice circuits is made on the rear of the 604A-type panels through connector cables. Arrangement of the KS-16671, List 1 plugs on the panel restricts the first plug (P1) to an A25B connector cable. Plugs P2 through P5 are arranged to adapt to a choice of cable sizes (see Table C).

**3.03** The stub end of the connector cable from plug 1 is terminated on a 66B4-25 (or equivalent) connecting block for the CO lines. The stub end of the connector cables from plugs 2, 3, 4, and 5 are terminated at the customer end on 66MI-50 (or equivalent) connecting blocks. Follow the wiring plan shown in the section for the VCA in use, and stencil lead designations on the fanning strip as shown in that section.

**3.04** The customer must provide a separately-fused 15-ampere outlet within reach of available power cords (see ordering guide for cord lengths). This outlet should not be under control of a wall switch.

**3.05** When using an external power supply (if required by VCA installation) connect the -24 volts to terminal 14 of TSA and ground to terminal 13 of TSA on the rear of the 604A1 panel. See Fig. 5. If the customer is providing power, it must be routed through the KS-20944 protector before connecting to 604A1 panel. Refer to Section 463-300-109 for information on the KS-20944 protector. Refer to the appropriate section in Division 518 for proper grounding of power plants. Proper grounding of equipment and power unit is important to prevent damage from power line surges.

**3.06** When installing the IUs in the 604A-type panel, position the board in the guide grooves and slide the unit in until it is properly seated in the connector. Lower the designation strip and lock down to hold the IUs in place. The P-40V590 guide assembly has a screw mounted clip retainer that is used to secure the 4-inch 108A IUs in positions 10B, 11B, 13B, and 14B (lower connectors). The designation strip will hold the 4-inch IUs in the upper connectors. Refer to Fig. 3 for the

installation sequence of the IUs in the 604A-type panel. The suggested sequence is established to correspond to the plug arrangement.

**3.07** After installation is complete, apply power and perform tests shown in the section for the particular VCA being installed. To protect the electrical components of interconnecting units, always remove the fuse associated with that particular circuit before removing or installing a unit. See Table B.

**4. CONNECTIONS**

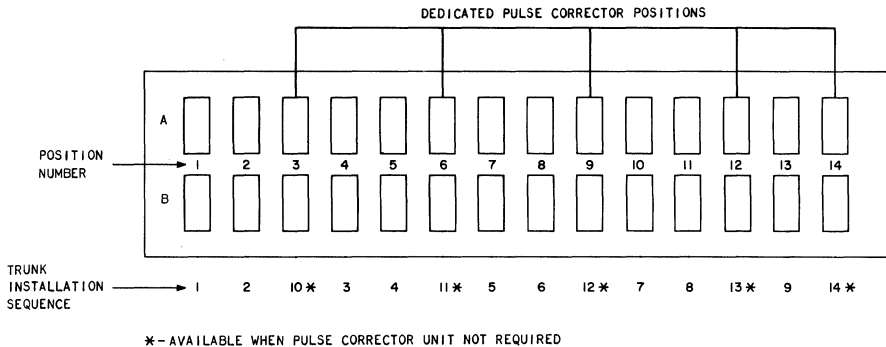
**4.01** Refer to Fig. 1, 2, and 5 for connections to 19C2 power unit or external power supply.

**4.02** Refer to Fig. 2 and 7 for connections to CO lines and to CPE.

**4.03** Refer to Fig. 4 for connections to IUs.

**4.04** Refer to Fig. 5 for connections to fuses, fuse alarm, and power distribution.

**4.05** Refer to Fig. 6 for connections to A and B connectors.



MAXIMUM NUMBER OF TRUNKS PROVIDED	
WITH PULSE CORRECTION	WITHOUT PULSE CORRECTION
9	14

**Fig. 3—Connector and Trunk Arrangement in 604A-Type Panel**

LEAD DESIGNATION FOR UNITS				CONN A AND B PIN NOS.
I01-TYPE	I02-TYPE	I08A	I03A	
-24V	-24V	-24V		→ A0
CS	CS	CS		→ A1
			GRD	→ A2
PCI1	PCI1			→ A3
R	R	R		→ A4
CT	CT	CT		→ A6
CBS1				→ A7
C1	C1	C1		→ A10
C2	C2	C2		→ A11
PC01	PC01			→ A12
T	T	T		→ A13
CRV1	CRV1			→ A14
CR	CR	CR		→ A15
CBS2				→ A16
CRV2	CRV2			→ A19
			-24V	→ A18
			PCI1	→ A23
			PC01	→ A32
				→ B2
GRD	GRD		GRD	→ B2
PCI2	PCI2			→ B3
PC02	PC02			→ B12
COST				→ B7
RINGT	RINGT			→ B8
RVT	RVT			→ B9
			-24V	→ B18
			PCI2	→ B23
			PC02	→ B32
		-24V		→ B0
		CS		→ B1
		R		→ B4
		CT		→ B6
		C1		→ B10
		C2		→ B11
		T		→ B13
		CR		→ B15

CONNECTORS  
J1A TO J14A

CONNECTORS  
J3A, J6A,  
J9A, J12A,  
J14A

CONNECTORS  
J1B TO J14B

FOR FACTORY  
TEST ONLY

CONNECTORS  
J3B, J6B,  
J9B, J12B

CONNECTORS  
J10B, J11B,  
J13B, J14B

Fig. 4—Lead Designations For Interconnecting Units



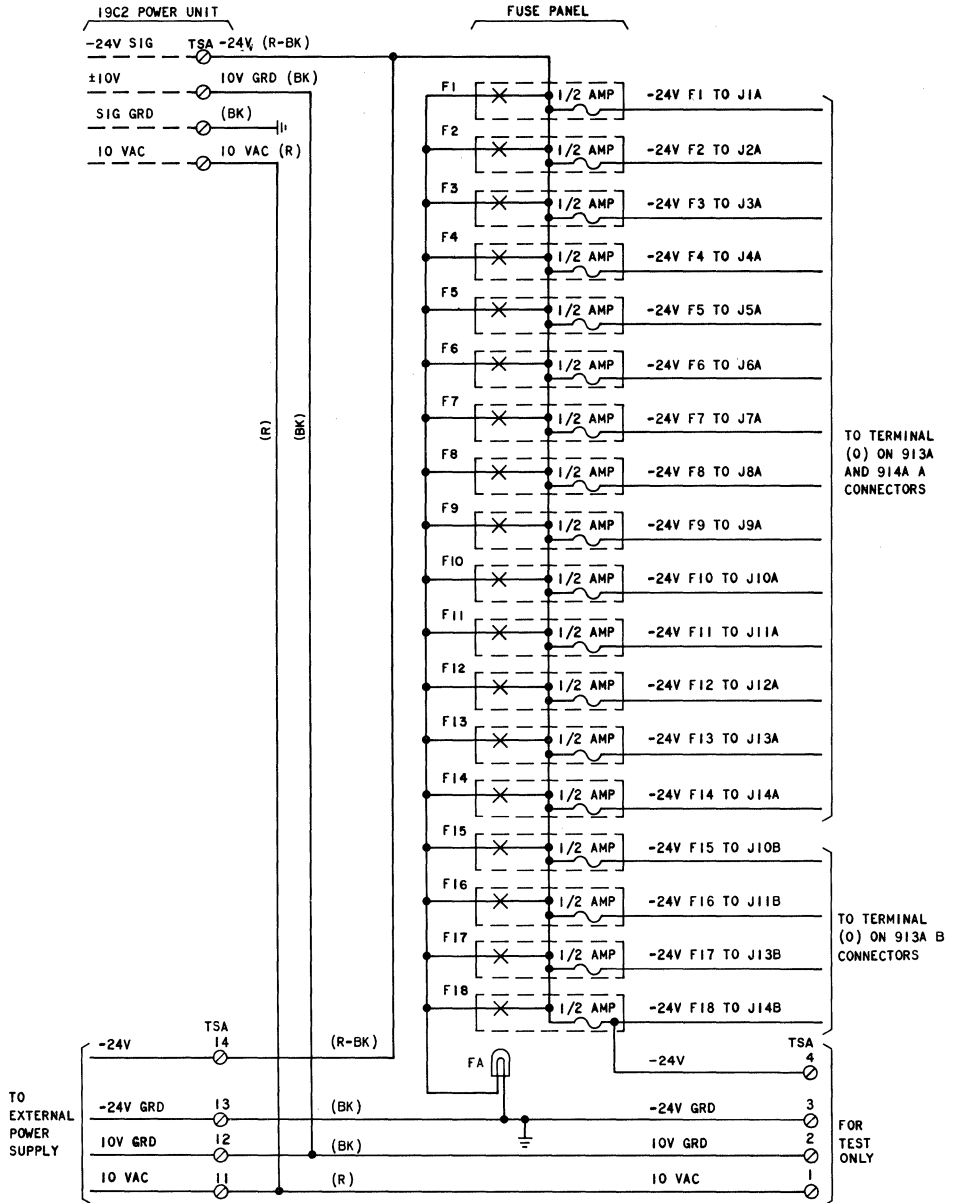


Fig. 5—Fuse and Power Distribution for -24 Volt Supply



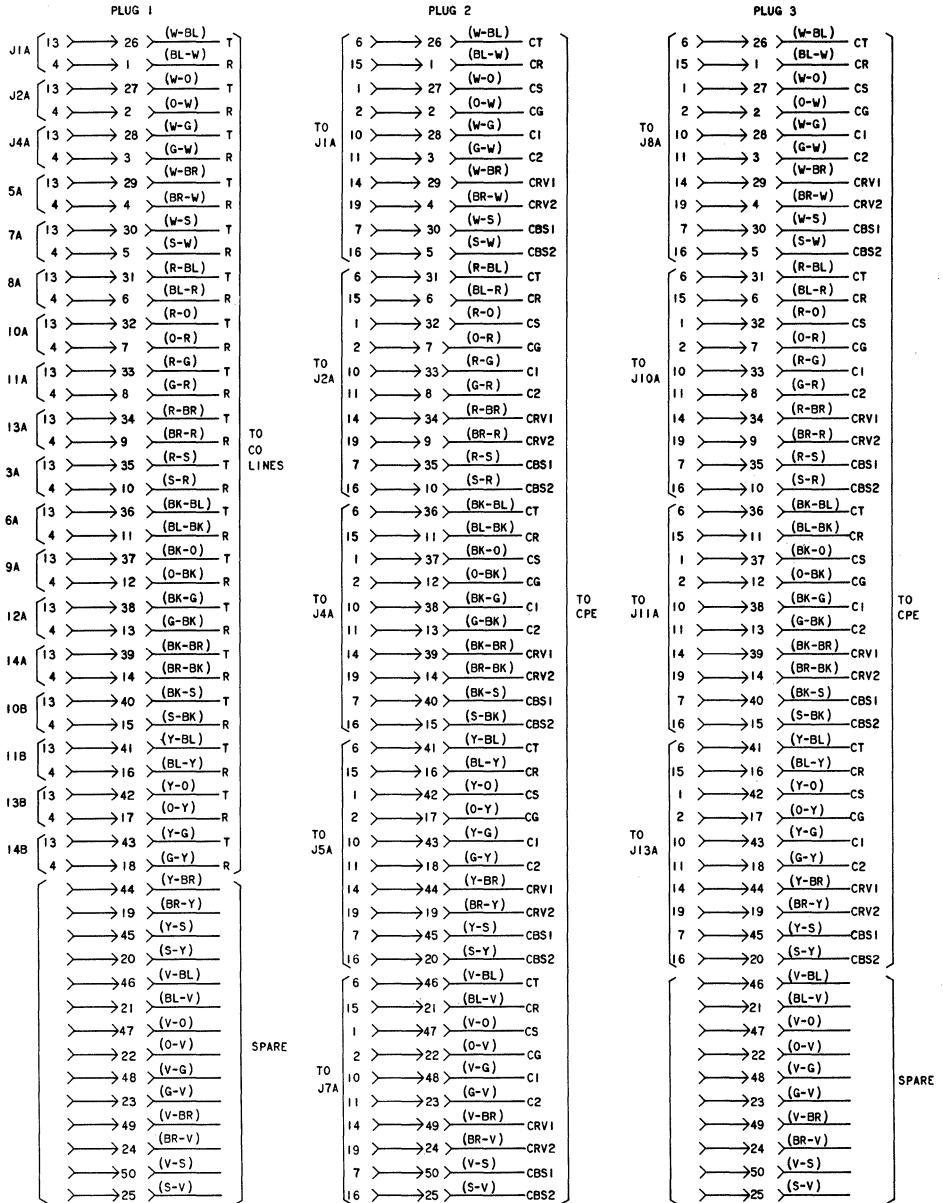


Fig. 7—Connections For Plugs P1 To P5 (Sheet 1 of 2)

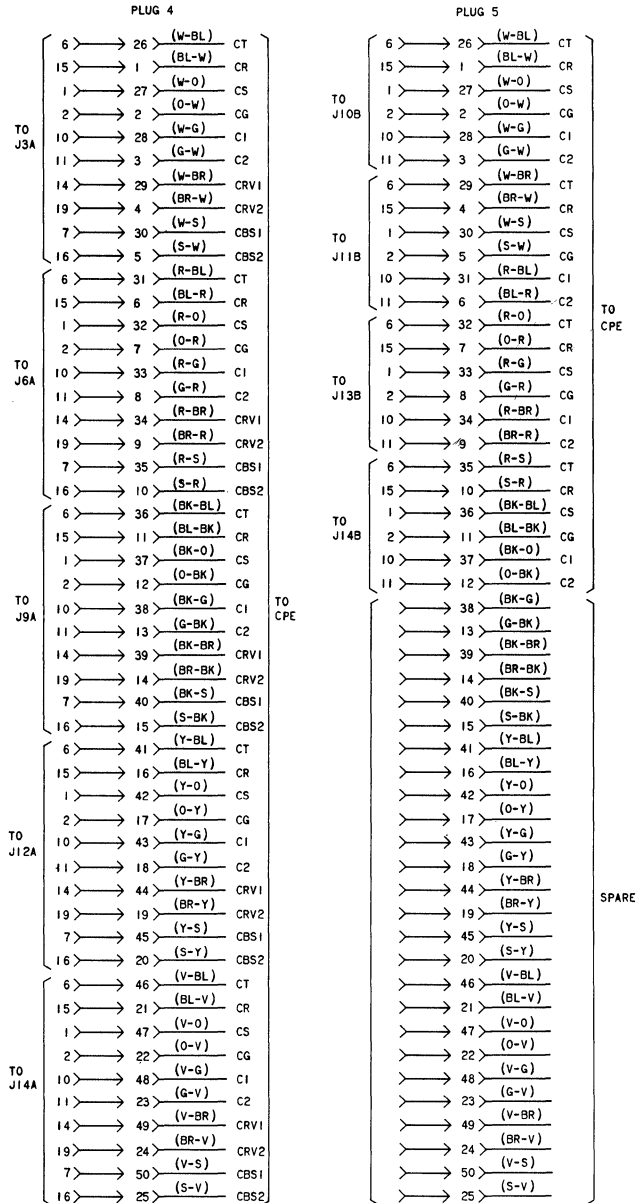


Fig. 7—Connections For Plugs P1 To P5 (Sheet 2 of 2)

**TABLE A**  
**CONNECTOR USE TABLE**

PANEL POSITION		CIRCUIT NO.	101-TYPE	102-TYPE	108A	103A †
J1	A	1	●	●	●	
	B				—	
J2	A	2	●	●	●	
	B				—	
J3	A	10	●	●	●	●
	B				—	
J4	A	3	●	●	●	
	B				—	
J5	A	4	●	●	●	
	B				—	
J6	A	11	●	●	●	●
	B				—	
J7	A	5	●	●	●	
	B				—	
J8	A	6	●	●	●	
	B				—	
J9	A	12	●	●	●	●
	B				—	
J10	A	7	●	●	●	
	B				●	
J11	A	8	●	●	●	
	B				●	
J12	A	13	●	●	●	●
	B				—	
J13	A	9	●	●	●	
	B				●	
J14	A	14	●	●	●	●*
	B				●	

● USABLE IN INDICATED CONNECTORS.

\* Position 14B is not equipped with pulse correcting leads.

† The 103A(MD) pulse corrector is no longer required. Remove existing 103A pulse correctors when replacing the existing 101A or 102A IUs with 101B or 102B IUs.

**TABLE B**  
**604A PANEL FUSE ASSIGNMENT**

DESIG	POSITION	TYPE
F1	J1A	70G 1/2 AMP
F2	J2A	70G 1/2 AMP
F3	J3A*	70G 1/2 AMP
F4	J4A	70G 1/2 AMP
F5	J5A	70G 1/2 AMP
F6	J6A*	70G 1/2 AMP
F7	J7A	70G 1/2 AMP
F8	J8A	70G 1/2 AMP
F9	J9A*	70G 1/2 AMP
F10	J10A	70G 1/2 AMP
F11	J11A	70G 1/2 AMP
F12	J12A*	70G 1/2 AMP
F13	J13A	70G 1/2 AMP
F14	J14A*	70G 1/2 AMP
F15	J10B	70G 1/2 AMP
F16	J11B	70G 1/2 AMP
F17	J13B	70G 1/2 AMP
F18	J14B	70G 1/2 AMP

\* When a 103A pulse corrector is used in these positions, power for the two pulse corrector circuits is drawn from the fuses for the corrected circuits. For example, a pulse corrector in position J3 draws power for one circuit from F1 and for the other circuit from F2.

**TABLE C**  
**OPTIONAL CABLE ARRANGEMENTS TO PROVIDE CONNECTIONS FOR FIVE PLUGS ON 604A-TYPE PANEL**

CABLE DESIGNATION (NOTE)	MAXIMUM NO. OF CABLES REQUIRED		
	ARRANGEMENTS (SEE 3.02)		
	1	2	3
A25B	1	1	2
A50B		2	
A75A			1
A100C	1		

*Note:* Arrangement of interconnecting units and local requirements will determine the size and maximum length of cable required

**INTERCONNECTING DEVICES, COMMON EQUIPMENT  
604B AND 604C PANELS  
AND 21A APPARATUS UNIT**

**1. GENERAL**

**1.001** This addendum supplements Section 463-300-102, Issue 2. Place this pink sheet ahead of Page 1 of the section.

**1.002** This addendum is reissued to clarify the requirements for battery supplies used to provide dc power for the panels.

**1.003** Issue 1 of this addendum was issued for the following reasons:

- (a) To reword Caution
- (b) To correct Table A.

**2. CHANGES TO SECTION**

**ISSUE 1 CHANGES**

**2.001** On Page 4, change the Caution to read:  
*Do not use a 101A or 102A IU as trunk 9 (position 13) or trunk 14 (position 14) if a 101B or C, or 102B is used as trunks 1 or 3 (positions 1 or 4) or trunks 5 or 7 (positions 7 and 10). Doing so may cause trouble in positions 1, 4, 7,*

*or 10 due to the internal wiring of the panel.*

**2.002** On Page 12, in Table A, under column J13 in row 102A and column J14 in row 101A, change bullets (•) to a double dagger (‡).

**ISSUE 2 CHANGES**

**2.003** On the bottom of Page 1, delete the copyright notice and add the following: Not for use or disclosure outside the Bell System except under written agreement.

**2.004** On Page 4, paragraph 2.08, add the following statement after the first sentence: ***Talk battery is required for the 120-type IUs, while signal battery should be used for the other IUs.***

**2.005** On Page 8, change Fig. 7 as follows: In the lower left area, add a double asterisk (\*\*) following the power input designation 24V OR 48V POWER SUPPLY. Add the following note: **\*\*TALK BATTERY IS REQUIRED FOR 120-TYPE IUs, SIGNAL BATTERY FOR 101-, 102-, AND 108-TYPES.**

**2.006** On Page 14, add new Table D.

**NOTICE**

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Bell System except under written agreement

TABLE D  
POWER CONNECTIONS

INPUT VOLTAGE		604B OR 604C PANELS*
120-TYPE IUs	OTHER IUs	
-24V TALK BAT.	-24V SIG BAT.	INPUT -24V
-48V TALK BAT. †	-48V SIG BAT.	INPUT -48V
TALK GRD	SIG GRD	INPUT GRD
or ±105V 20 Hz ±125V 30 Hz		RNG SIG ±
±GRD		RNG SIG GRD

\* Terminals on rear of panel stamped as shown. Position option straps for -24V or -48V.

† KS-15620, L22 (2-amp) or L23 (6-amp) rectifier is suitable for talk battery supply.



## INTERCONNECTING DEVICES, COMMON EQUIPMENT

### 604B AND 604C PANELS AND 21A APPARATUS UNIT

#### 1. GENERAL

**1.01** This section provides identification, installation and connection information for the 604B and 604C panels used to mount certain interconnecting units (IUs) and the 21A apparatus unit. The 604B panel has been rated Manufacture Discontinued (MD).

**1.02** This section is reissued to include the 604C panel and the 21A apparatus unit.

**1.03** The 604B and 604C panels are not wired for the 103A (MD) pulse corrector which is no longer required. In existing installations using pulse correctors, the 103A (MD) pulse correctors must be removed when replacing the 101A or 102A IUs with 101B or 102B IUs.

**1.04** The internal panel wiring is covered in this section. Refer to the section covering the specific Voice Connecting Arrangement (VCA) for connections to a particular IU and the customer-provided equipment (CPE).

**1.05** The 604C panel as supplied is used with a -24 volt supply only. If the 604C panel is to be used with a -48 volt supply, the 21A apparatus unit must be attached and wired to the 604C panel. Except for the supply voltage, the 604C panel is similar to the 604B panel in the construction and wiring.

#### 2. IDENTIFICATION

##### DESCRIPTION

**2.01** The 604B (Fig. 1 and 2) and 604C panels (Fig. 3 and 4) provide connecting facilities between Bell System central office (CO) lines or trunks and a customer-provided (CP) PBX. They also provide connections for power (from a separate external supply) fuses and an optional remote fuse alarm indicator for the 101- and 102-type, 108A- and 120-type IUs.

**2.02** The 604B and 604C panels have a cast aluminum carrier and 2-level full rear panel. The rear panel is mounted on six standoffs between the rack upright guides. The 604B and 604C panels are 10 inches deep and require 8 inches of vertical space. The carrier is equipped with 14 each, 913A (20 pin) and 914A (40 pin) connectors for mounting 4- and/or 8-inch IUs. A P-40V590 guide assembly is required at the center of the panel to support each 4-inch IU installed in an upper connector.

**2.03** The rear panel is arranged for power supply connections, fuses, and four plugs for voice control and alarm in and out connections.

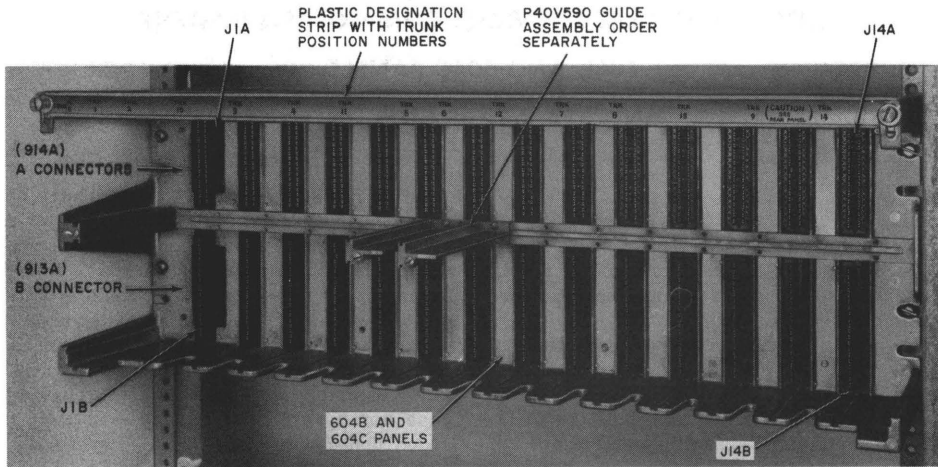
**2.04** The panel is arranged to accept fourteen (voice only) 2-way ground or loop-start trunks or twelve (voice and/or data) trunks with automatic level control (ALC). The 75A control unit provides ALC over excessive data/voice signals. Each 75A control unit contains six ALC circuits and may be plugged into position 13 to control IUs in positions 1 through 6 (trunks 1, 2, 10, 3, 4, and 11), and position 14 to control IUs in positions 7 through 12 (trunks 5, 6, 12, 7, 8, and 13). For information on the 75A control unit, refer to Section 463-352-100.

**2.05** Fig. 5 shows the relation between connectors and trunks in the panel. The IUs should be installed in the *trunk* sequence shown to appear on the interface blocks in order.

**Note:** On 604C and current production of the 604B panels, the designation strip will be of such a material that the line numbers may be written on it. Earlier production of the 604B showed position numbers.

The trunk and position numbers of the 604B/604C panels are the same as in the 604A panel to permit replacement or mixing of panels.

**2.06** Positions 1 through 14 are equipped with an A and B connector. The arrangement



INSTALLATION SEQUENCE OF INTERCONNECTING UNITS

TRUNK NO.	1	2	10	3	4	11	5	6	12	7	8	13	9	14
POSITION NO.	1	2	3	4	5	6	7	8	9	10	11	12	13	14

Fig. 1—604B and 604C Panels (Front View)

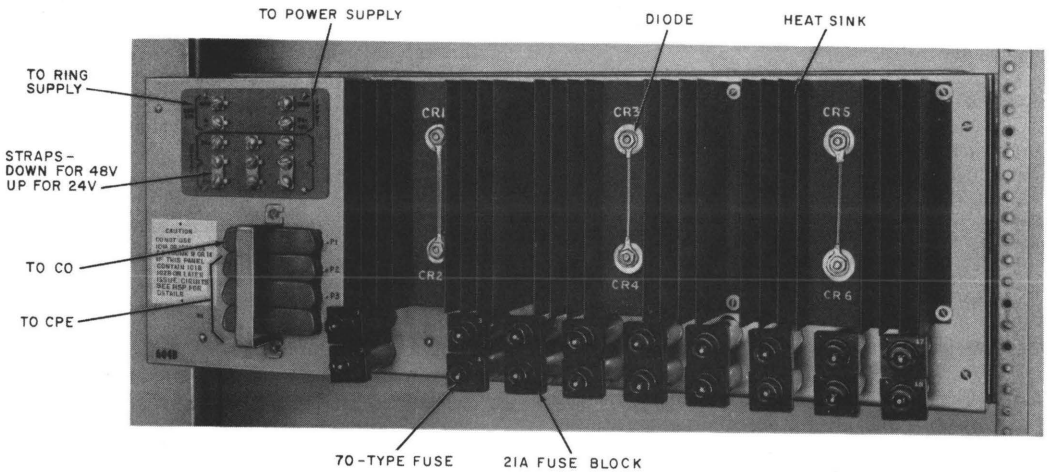


Fig. 2—604B Panel (Rear View)

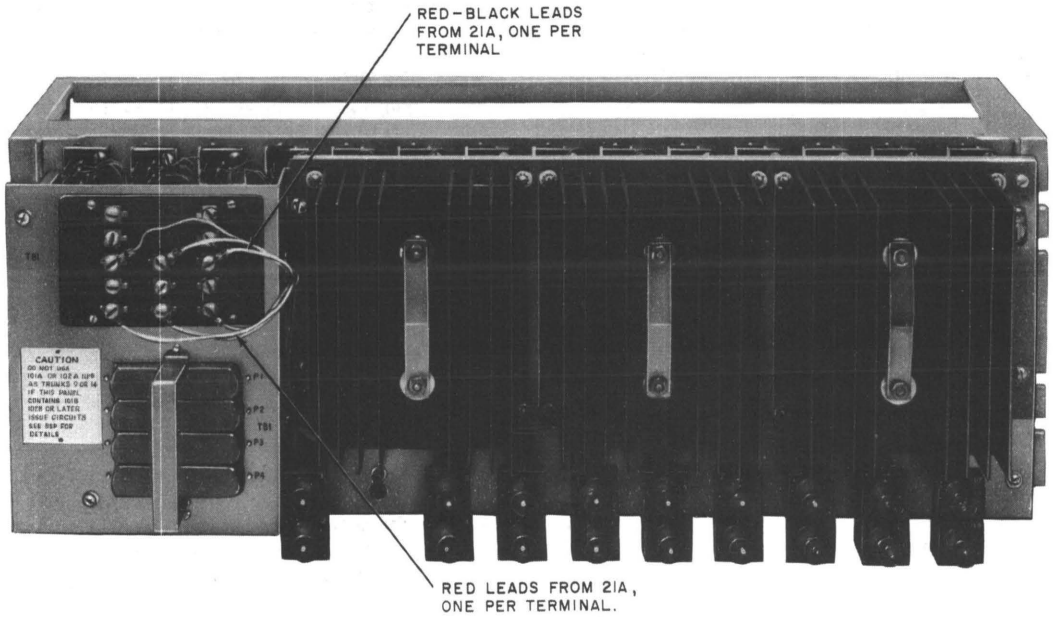


Fig. 3 - 604C Panel With 21A Apparatus Unit

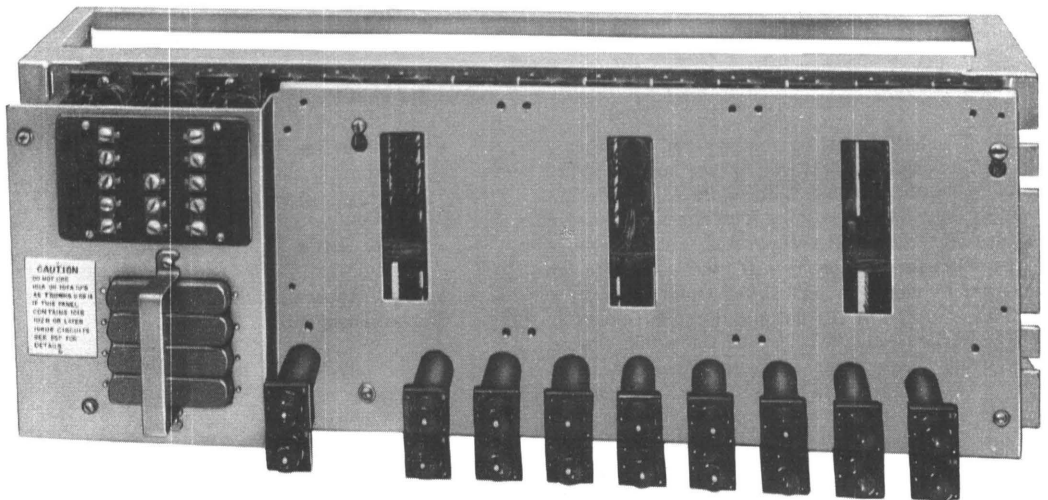


Fig. 4 - 604C Panel Without 21A Apparatus Unit

of the connectors provides for two vertical connectors to mount an 8-inch IU or a 4-inch IU using a guide assembly. The connectors are wired to accept the following units:

- (a) Positions 1 through 14—101-type IUs (2-way ground-start trunk) or 102-type IUs (2-way loop-start trunk)

**⚠Caution:** *Do not use a 102A IU as trunk 9 (position 13) if a 102B is used as trunk 1 or 3 (position 1 or 4). Do not use a 101A IU as trunk 14 (position 14) if a 101B or C is used as trunk 5 or 7 (position 7 or 10). Doing so may cause trouble in positions 1, 4, 7, or 10 due to the internal wiring of the panel.*

- (b) Positions 1A through 14A—108A IUs (one-way incoming loop-start trunk)
- (c) Positions 1 through 14—120A IUs (2-wire loop start)
- (d) Positions 13 and 14—75A control unit for use with 101B, 101C, 102B, 120A or 120B IUs, in positions 1 through 12.

Fig. 6 shows the lead designations and pin numbers for the above IUs and Table A shows the connectors in which they are used.

**2.07** The fuse and power distribution is shown in Fig. 7.

**2.08** The 604B panel can be powered by either a -48 volt or -24 volt power supply. ⚠The 604C panel as supplied is for -24 volts only but can be used with -48 volts with the addition of a separately ordered 21A apparatus unit. ⚠When a -48 volt power supply is used, the -48 volts are dropped by diodes to -24 volts. Option straps are provided to switch the voltage dropping diodes in or out of the circuit. With a -48 volt power source, the straps swing down connecting the diodes into the circuit (option Y in Fig. 7). With a -24 volt power source, the straps swing up removing the diodes from the circuit (option Z in Fig. 7). Fuses F2 through F15 feed -24 volts to the IUs in the panel. Fuses F1, F16, F17, and F18 are associated with the 120-type IUs only. Fuse F1 feeds  $\pm 105$  volts ac, 20 Hz, or  $\pm 125$  volts ac, 30 Hz, to provide ringing voltage to CPE. Fuses F16, F17, and F18

feed -48 volts to provide long-loop talk battery to the CPE when a -48 volt power supply is used.

**2.09** The 70-type fuses are of the indicating type (pop up) for quick location of an operated fuse. The 21A fuse holders have a colored designation pin and the color of the pin must match the color on the end of the fuse for correct fusing. Leads have been provided on plug P3 to provide voltage for operating optional remote attendant alarm indicators (17C49 indicator or equivalent). The M1 lamp under the red lens will light when a 48-volt fuse blows, and the A3 lamp under the green lens will light when a 24-volt fuse blows. Table B shows the fuse assignment.

**2.10** The 913A and 914A connectors are factory-wired to four 50-pin KS-16671, List 1 plugs on the rear of the panel. Plug P1 provides for tip and ring connections between the CO/PBX trunks and the 604B or C panels. Plugs P2, P3, and P4 provide for connections between the CPE and the 604B or Q panels. Fig. 8 shows the connections to connectors J1 through J14, A and B. Fig. 9 shows connections to plugs P1 through P4.

**2.11** The connectors in the 604B and ⚠604C panels are equipped with index clips to match the code slots in the 101B, 101C, 102B, 108A, 120A, 120B IUs and 75A control unit. When using 101A or 102A IUs, it will be necessary to pull out the clips between contacts 9 and 10 in the B connectors.

#### ORDERING GUIDE

- Panel, 604B ⚠(MD)⚠
- or
- ⚠Panel, 604C⚠
- ⚠Unit, Apparatus, 21A (required for 48-volt operation)⚠
- Assembly, Guide, P-40V590 (one per 4-inch IU)
- Cable (See Table C.)

#### Replaceable Components

- Fuse, 70A (1-1/3 ampere, three per panel)

- Fuse, 70G (1/2 ampere, two per panel)
- Fuse, 70F (1/4 ampere, thirteen per panel)

### 3. INSTALLATION

**3.01** The 604B or 604C panel will mount on a standard relay rack or in an ED-91180-72, Group 21 equipment cabinet. The cabinet will hold either two 604B or 604C panels and a power unit or three 604B or C panels when the power unit is externally mounted when the drawing holder on the lower half of the cover is removed. (Ground relay rack or equipment cabinet separately.)

**3.02** The 21A apparatus unit is attached to the rear of the 604C panel using four 8-32 by 3/16-inch screws supplied with the apparatus unit as a loose item. Electrical connection to the 604C panel is made by attaching any of the red lead wires to the 48-volt option terminals and any of the red-black lead wires to the 24-volt option terminals (one lead per terminal [total 6 leads]). (See Fig. 10.)

**3.03** Electrical connection is made to the panels through connector cables to four KS-16671, List 1 plugs (P1, P2, P3, and P4 on rear of panel). Arrangement of the KS-16671, List 1 plugs restricts the first plug to an A25B connector cable. Plugs 2, 3, and 4 are arranged to adapt to a choice of cable sizes. (See Table C.)

**3.04** Connect an A25B connector to P1 on the panel and terminate the other end on the 66B4-25 connecting block to the CO trunks. Refer to section on VCA being installed for connections.

**3.05** Connect the other connector cables to P2, P3, and P4 on the 604B or 604C panel and terminate at the customer end on the 66M1-50 interface connecting block to the CPE. (Stencil lead designations on the fanning strip as shown in section on VCA being installed.) Insulate and store spare leads.

**3.06** Either telephone company or CP ringing supply and dc power are connected to the terminals shown in Table D. Customer-provided dc power must be routed through the KS-20944 protector before connecting to the power terminals on the 604B and 604C panels. Refer to Section

463-300-109 for information on the KS-20944 protector (CA VCP).

**3.07** When telephone company-provided power supplies are used (if required by VCA installation), the customer must provide a 105- to 130-volt, 60-Hz outlet within reach of available power cords (locally furnished). This electrical outlet should not be under control of a wall switch.

**3.08** Refer to the appropriate section in Division 518 for proper grounding of power plants. Proper grounding of equipment and power unit is important to prevent damage from power line surges.

**3.09** When installing the IUs in the panel, position the board in the guide grooves and slide the unit in until it is properly seated in the connectors. Lower the designation strip to hold IUs in place. Refer to Fig. 1 for installation sequence of the IUs in the panel. The suggested sequence has been established to correspond to the plug arrangement.

**3.10** After installation is complete, apply power and perform tests shown in the section for the particular VCA being installed. To protect the electrical components of interconnecting units, always remove the fuse associated with that particular circuit before removing or installing an interconnecting unit. See Table B.

### 4. CONNECTIONS

**4.01** Refer to Fig. 7 and Table D for connections to power supplies.

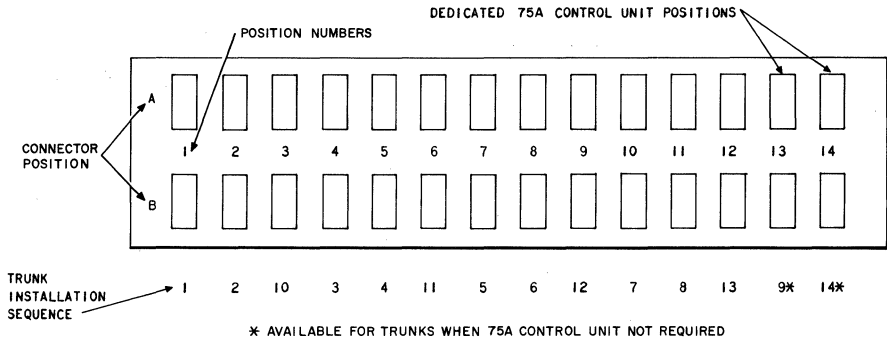
**4.02** Refer to Fig. 3, 9 and Table C for connections to CO lines and CPE.

**4.03** Refer to Fig. 6 for connections to IUs.

**4.04** Refer to Fig. 7 for connections to fuses, fuse alarm, and power distribution.

**4.05** Refer to Fig. 8 for connections to A and B connectors.

**4.06** Refer to Fig. 10 for connections of 21A apparatus unit to 604C panel.



MAXIMUM NUMBER OF TRUNKS PROVIDED	
DATA	VOICE
12	14

Fig. 5—Connector and Trunk Arrangement in 604B and 604C Panels

LEAD DESIGNATIONS FOR UNITS							A AND B CONN
101A	102A	101B/C	102B	120A/B	108A	75A	
-24V	-24V	-24V	-24V	-24V	-24V	-24V	→ A0
CS	CS	CS	CS		CS		→ A1
						AGC1-1	→ A2
						AGC2-1	→ A3
R	R	R	R	R	R		→ A4
						AGC1-2	→ A5
CT	CT	CT	CT	CT	CT		→ A6
CBS1		CBS1					→ A7
						AGC2-2	→ A8
						AGC1-3	→ A9
C1	C1	C1	C1		C1		→ A10
C2	C2	C2	C2		C2		→ A11
T	T	T	T	T	T		→ A13
CRV1	CRV1	CRV1	CRV1				→ A14
CR	CR	CR	CR	CR	CR		→ A15
CBS2		CBS2					→ A16
						AGC2-3	→ A17
				-48V			→ A18
CRV2	CRV2	CRV2	CRV2				→ A19
		AGC1	AGC1	AGC1			→ A24
		AGC2	AGC2	AGC2			→ A28
				RS			→ A35
GRD	GRD	GRD	GRD	GRD	GRD		→ B2
						AGC1-4	→ B3
						AGC2-4	→ B4
						AGC1-5	→ B10
						AGC2-5	→ B11
						AGC1-6	→ B18
						AGC2-6	→ B19

Fig. 6—Lead Designations for Interconnecting Units

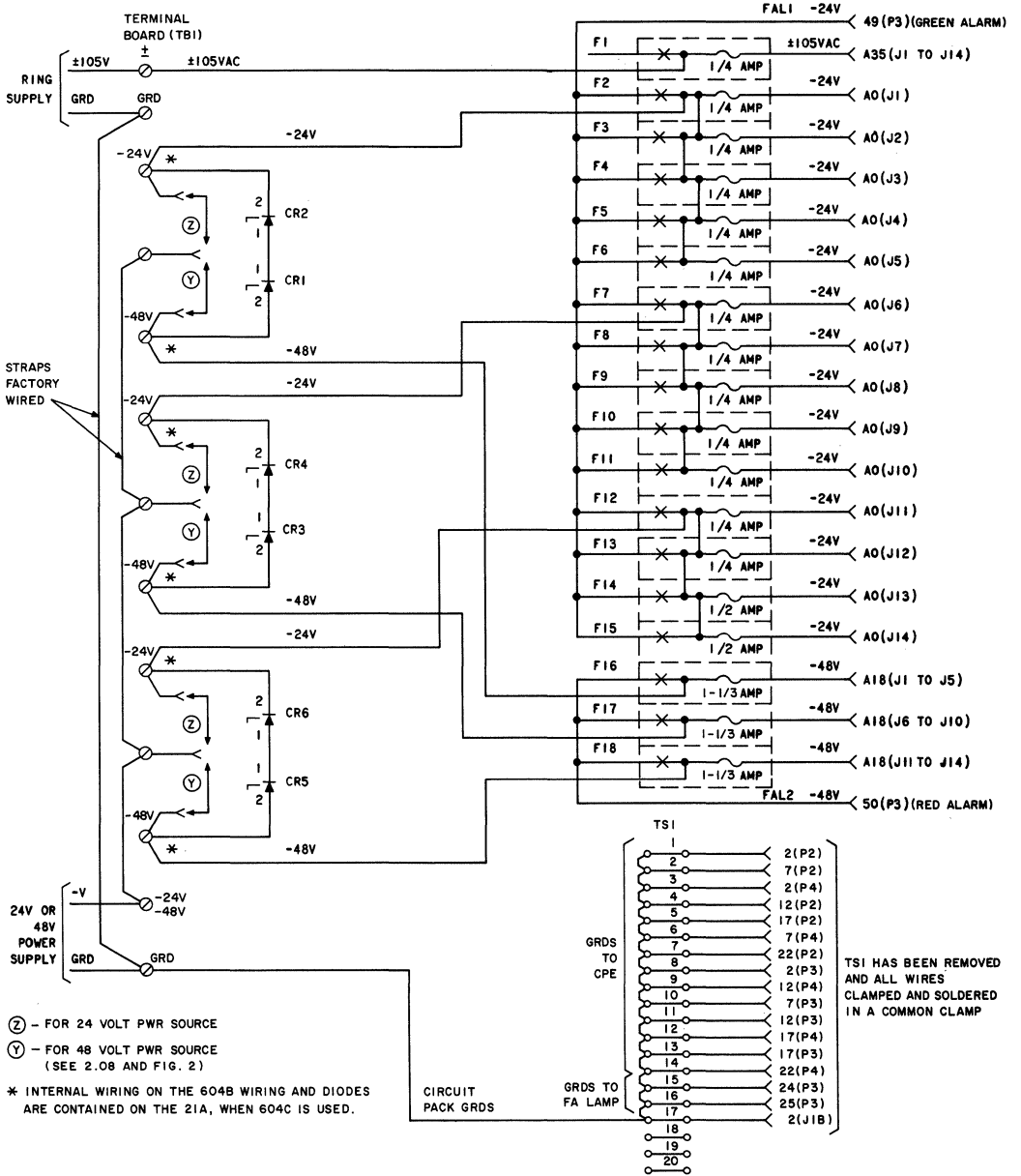


Fig. 7—Fuse and Power Distribution



J1A	J2A	J3A	J4A	J5A	J6A	J7A
13 T → 26(P1) 4 R → 1(P1) 6 CT → 26(P2) 15 CR → 1(P2) 1 CS → 27(P2) 10 C1 → 28(P2) 11 C2 → 3(P2) 14 CRV1 → 29(P2) 19 CRV2 → 4(P2) 7 CBS1 → 30(P2) 16 CBS2 → 5(P2) 0 -24V → F2 18 -48V → F16 24 AGC1 → 2(J13A) 28 AGC2 → 3(J13A) 35 RS → F1	13 T → 27(P1) 4 R → 2(P1) 6 CT → 31(P2) 15 CR → 1(P2) 1 CS → 32(P2) 10 C1 → 33(P2) 11 C2 → 8(P2) 14 CRV1 → 34(P2) 19 CRV2 → 9(P2) 7 CBS1 → 35(P2) 16 CBS2 → 10(P2) 0 -24V → F3 18 -48V → 18(J1A) 24 AGC1 → 5(J13A) 28 AGC2 → 8(J13A) 35 RS → 35(J1A)	13 T → 35(P1) 4 R → 10(P1) 6 CT → 26(P4) 15 CR → 1(P4) 1 CS → 27(P4) 10 C1 → 28(P4) 11 C2 → 3(P4) 14 CRV1 → 29(P4) 19 CRV2 → 4(P4) 7 CBS1 → 30(P4) 16 CBS2 → 5(P4) 0 -24V → F4 18 -48V → 18(J2A) 24 AGC1 → 9(J13A) 28 AGC2 → 17(J13A) 35 RS → 35(J2A)	13 T → 28(P1) 4 R → 3(P1) 6 CT → 36(P2) 15 CR → 11(P2) 1 CS → 37(P2) 10 C1 → 38(P2) 11 C2 → 13(P2) 14 CRV1 → 39(P2) 19 CRV2 → 14(P2) 7 CBS1 → 40(P2) 16 CBS2 → 15(P2) 0 -24V → F5 18 -48V → 18(J3A) 24 AGC1 → 3(J13B) 28 AGC2 → 4(J13B) 35 RS → 35(J3A)	13 T → 29(P1) 4 R → 4(P1) 6 CT → 41(P2) 15 CR → 16(P2) 1 CS → 42(P2) 10 C1 → 43(P2) 11 C2 → 18(P2) 14 CRV1 → 44(P2) 19 CRV2 → 19(P2) 7 CBS1 → 45(P2) 16 CBS2 → 20(P2) 0 -24V → F6 18 -48V → 18(J4A) 24 AGC1 → 10(J13B) 28 AGC2 → 11(J13B) 35 RS → 35(J4A)	13 T → 36(P1) 4 R → 11(P1) 6 CT → 31(P4) 15 CR → 6(P4) 1 CS → 32(P4) 10 C1 → 33(P4) 11 C2 → 8(P4) 14 CRV1 → 34(P4) 19 CRV2 → 9(P4) 7 CBS1 → 35(P4) 16 CBS2 → 10(P4) 0 -24V → F7 18 -48V → F17 24 AGC1 → 18(J13B) 28 AGC2 → 19(J13B) 35 RS → 35(J5A)	13 T → 30(P1) 4 R → 5(P1) 6 CT → 46(P2) 15 CR → 21(P2) 1 CS → 47(P2) 10 C1 → 48(P2) 11 C2 → 23(P2) 14 CRV1 → 49(P2) 19 CRV2 → 24(P2) 7 CBS1 → 50(P2) 16 CBS2 → 25(P2) 0 -24V → F8 18 -48V → 18(J6A) 24 AGC1 → 2(J14A) 28 AGC2 → 3(J14A) 35 RS → 35(J6A)
J1B	J2B	J3B	J4B	J5B	J6B	J7B
2 GRD → 17(TS1)	2 GRD → 2(J1B)	2 GRD → 2(J2B)	2 GRD → 2(J3B)	2 GRD → 2(J4B)	2 GRD → 2(J5B)	2 GRD → 2(J6B)
J8A	J9A	J10A	J11A	J12A	J13A	J14A
13 T → 31(P1) 4 R → 6(P1) 6 CT → 26(P3) 15 CR → 1(P3) 1 CS → 27(P3) 10 C1 → 28(P3) 11 C2 → 3(P3) 14 CRV1 → 29(P3) 19 CRV2 → 4(P3) 7 CBS1 → 30(P3) 16 CBS2 → 5(P3) 0 -24V → F9 18 -48V → 18(J7A) 24 AGC1 → 5(J14A) 28 AGC2 → 8(J14A) 35 RS → 35(J7A)	13 T → 37(P1) 4 R → 12(P1) 6 CT → 36(P4) 15 CR → 11(P4) 1 CS → 37(P4) 10 C1 → 38(P4) 11 C2 → 13(P4) 14 CRV1 → 39(P4) 19 CRV2 → 14(P4) 7 CBS1 → 40(P4) 16 CBS2 → 15(P4) 0 -24V → F10 18 -48V → 18(J8A) 24 AGC1 → 9(J14A) 28 AGC2 → 17(J14A) 35 RS → 35(J8A)	13 T → 32(P1) 4 R → 7(P1) 6 CT → 31(P3) 15 CR → 6(P3) 1 CS → 32(P3) 10 C1 → 33(P3) 11 C2 → 8(P3) 14 CRV1 → 34(P3) 19 CRV2 → 9(P3) 7 CBS1 → 35(P3) 16 CBS2 → 10(P3) 0 -24V → F11 18 -48V → 18(J9A) 24 AGC1 → 3(J14B) 28 AGC2 → 4(J14B) 35 RS → 35(J9A)	13 T → 33(P1) 4 R → 8(P1) 6 CT → 36(P3) 15 CR → 11(P3) 1 CS → 37(P3) 10 C1 → 38(P3) 11 C2 → 13(P3) 14 CRV1 → 39(P3) 19 CRV2 → 14(P3) 7 CBS1 → 40(P3) 16 CBS2 → 15(P3) 0 -24V → F12 18 -48V → F18 24 AGC1 → 10(J14B) 28 AGC2 → 11(J14B) 35 RS → 35(J10A)	13 T → 38(P1) 4 R → 13(P1) 6 CT → 41(P4) 15 CR → 16(P4) 1 CS → 42(P4) 10 C1 → 43(P4) 11 C2 → 18(P4) 14 CRV1 → 44(P4) 19 CRV2 → 19(P4) 7 CBS1 → 45(P4) 16 CBS2 → 20(P4) 0 -24V → F13 18 -48V → 18(J11A) 24 AGC1 → 18(J14B) 28 AGC2 → 19(J14B) 35 RS → 35(J11A)	13 T → 34(P1) 4 R → 9(P1) 6 CT → 41(P3) 15 CR → 16(P3) 1 CS → 42(P3) 10 C1 → 43(P3) 11 C2 → 18(P3) 14 CRV1 → 44(P3) 19 CRV2 → 19(P3) 7 CBS1 → 45(P3) 16 CBS2 → 20(P3) 0 -24V → F14 18 -48V → 18(J12A) 24 AGC1 → 24(J1A) 3 AGC2 → 28(J1A) 3 RS → 35(J12A) 9 AGC1 → 24(J3A) 17 AGC2 → 28(J3A) 5 AGC1 → 24(J2A) 8 AGC2 → 28(J2A)	13 T → 39(P1) 4 R → 14(P1) 6 CT → 46(P4) 15 CR → 21(P4) 1 CS → 47(P4) 10 C1 → 48(P4) 11 C2 → 23(P4) 14 CRV1 → 49(P4) 19 CRV2 → 24(P4) 7 CBS1 → 50(P4) 16 CBS2 → 25(P4) 0 -24V → F15 18 -48V → 18(J13A) 24 AGC1 → 24(J7A) 3 AGC2 → 28(J7A) 3 RS → 35(J13A) 9 AGC1 → 24(J9A) 17 AGC2 → 28(J9A) 5 AGC1 → 24(J8A) 8 AGC2 → 28(J8A)
J8B	J9B	J10B	J11B	J12B	J13B	J14B
2 GRD → 2(J7B)	2 GRD → 2(J8B)	2 GRD → 2(J9B)	2 GRD → 2(J10B)	2 GRD → 2(J11B)	2 GRD → 2(J12B) 3 AGC1 → 24(J4A) 4 AGC2 → 28(J4A) 10 AGC1 → 24(J5A) 11 AGC2 → 28(J5A) 18 AGC1 → 24(J6A) 19 AGC2 → 28(J6A)	2 GRD → 2(J13B) 3 AGC1 → 24(J10A) 4 AGC2 → 28(J10A) 10 AGC1 → 24(J11A) 11 AGC2 → 28(J11A) 18 AGC1 → 24(J12A) 19 AGC2 → 28(J12A)

Fig. 8—Connections For Jacks J1 to J14

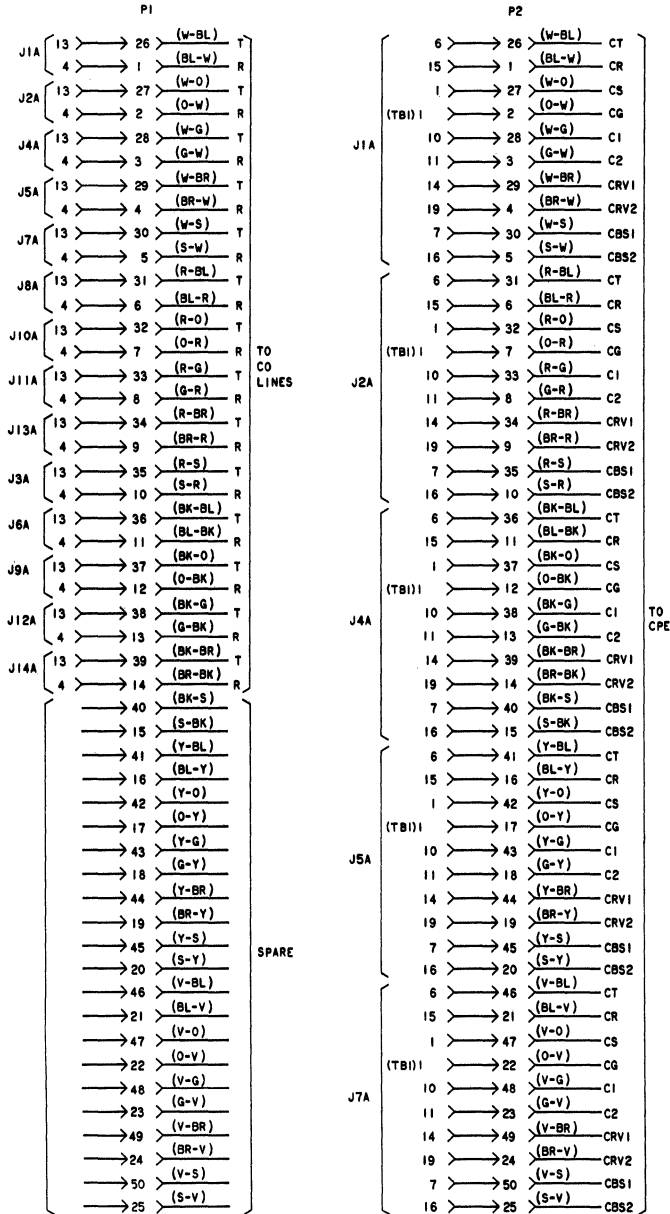


Fig. 9—Connections For Plugs P1 to P4 (Sheet 1)



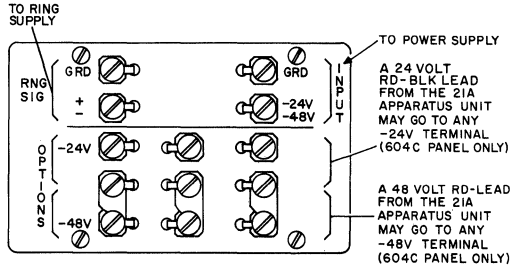


Fig. 10—Terminal Board on 604C Panel

TABLE A  
CONNECTOR USE TABLE—604B AND 604C PANELS

UNIT CODE	SIZE (IN)	USE	CONNECTOR POSITION														
			J1	J2	J3	J4	J5	J6	J7	J8	J9	J10	J11	J12	J13	J14	
75A	8	Data														●	●
101B/C	8	Data	●	●	●	●	●	●	●	●	●	●	●	●	●		
102B	8	Data	●	●	●	●	●	●	●	●	●	●	●	●	●		
120A/B	8	Voice	●	●	●	●	●	●	●	●	●	●	●	●	●		
101A†	8	Voice	●	●	●	●	●	●	●	●	●	●	●	●	‡	●	
101B/C	8	Voice	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
102A†	8	Voice	●	●	●	●	●	●	●	●	●	●	●	●	●	‡	
102B	8	Voice	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
108A*	4	Voice	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
120A/B	8	Voice	●	●	●	●	●	●	●	●	●	●	●	●	●	●	

● Usable in indicated position.

\* Mounts in upper connector only.

† Index clip between contacts 9 and 10 on B connectors must be removed to permit mounting 101A and 102A IUs in 604B or 604C panels.

‡See paragraph 2.06(a) for CAUTION.

**TABLE B**  
**604B AND 604C PANEL FUSE ASSIGNMENT**

FUSE NO.	PANEL POSITION	VOLTAGE
F1*	J1A thru J14A	±105V
F2*	J1A	-24V
F3*	J2A	
F4*	J3A	
F5*	J4A	
F6*	J5A	
F7*	J6A	
F8*	J7A	
F9*	J8A	
F10*	J9A	
F11*	J10A	
F12*	J11A	
F13*	J12A	
F14†	J13A	
F15†	J14A	
F16‡	J1A thru J5A	-48V
F17‡	J6A thru J10A	
F18‡	J11A thru J14A	

\* 70F fuses 1/4 Ampere.

† 70G fuses 1/2 Ampere.

‡ 70A fuses 1-1/3 Ampere.

**TABLE C**  
**OPTIONAL CABLE ARRANGEMENTS TO PROVIDE**  
**CONNECTIONS FOR FOUR KS-16671, L1 PLUGS**  
**ON 604B AND 604C PANELS**

CABLE DESIGNATION (NOTE)	MAXIMUM NO. OF CABLES REQUIRED		
	ARRANGEMENTS (SEE 3.03)		
	Arrangement 1	Arrangement 2	Arrangement 3
A25B	1	4	2
A50B			1
A75A	1		

*Note:* Arrangement of interconnecting units and local requirements will determine the size and maximum length of cable required.

**TABLE D**  
**POWER CONNECTIONS**

INPUT VOLTAGE	604B OR 604C PANELS*
-24V Talk Bat.	INPUT -24V
-48V Talk Bat.	INPUT -48V
GRD	INPUT GRD
or $\pm 105V$ 20 Hz $\pm 125V$ 30 Hz	RNG SIG $\pm$
$\pm$ GRD	RNG SIG GRD

\* Terminals on rear of panel stamped as shown. Position option straps for -24V or -48V.

## **INTERCONNECTING DEVICES, COMMON EQUIPMENT**

### **606A PANEL**

#### **1. GENERAL**

**1.01** This section provides identification, installation and connection information for the 606A panel used to mount interconnecting units (IU).

**1.02** The 606A panel provides connecting facilities between Bell System central office (CO) or PBX lines and customer-provided equipment (CPE). It also provides fused power for the 109A, 110A, and 111A IUs.

**1.03** The internal panel wiring is covered in this section. Refer to the section covering the specific Voice Connecting Arrangement (VCA) for connections for the CPE and the particular IU in use.

#### **2. IDENTIFICATION**

##### **DESCRIPTION**

**2.01** The 606A panel (Fig. 1 and 2) consists of a cast aluminum carrier equipped with six 914A connectors. The 6- by 8-inch carrier has a full rear panel mounted on four standoffs making it 9-1/4 inches deep. The vertical space required on a rack is eight inches.

**2.02** The rear panel is arranged for power supply connections, fuses, and two plugs for in and out connections. The panel will mount six IUs. Three P40V590 guide assemblies are mounted at the center of the panel to support the 4-inch IUs.

**2.03** The panel is arranged to accept six CO or PBX lines. Fig. 3 shows the connector and trunk arrangement in the 606A panel.

**2.04** Positions 1 through 3 are provided with an A and B connector. The arrangement of the 914A (40-pin) connectors provides connectors to mount six 4-inch 40-pin IUs. The connectors are wired to accept the 109A, 110A and 111A IUs. Fig. 4 shows the lead designations and pin numbers

for the above IUs and Table A shows the connectors they may be used in.

**2.05** The fuse and power distribution is shown in Fig. 5 and Table B. The 606A panel is designed to be powered by a -24 volt power supply and a 10 volt ac lamp supply.

**2.06** The 24E 1/2-ampere fuses attach to screw terminals on the rear of the panel as shown in Fig. 2.

**2.07** The six 914A connectors are factory-wired to two 50-pin KS-16671, List 1 plugs on the rear of the panel. P1 provides in and out connections for the A connectors (upper row) and P3 provides connections for the B connectors (lower row). Fig. 6 shows the connections for connectors J1 through J3, A and B. Fig. 7 shows the connections to plugs P1 and P3.

##### **ORDERING GUIDE**

- Panel, 606A (one per six IUs, three P40V590 guide assemblies, and eight 24E 1/2-ampere fuses are supplied with panel.)
- Cable, A25B (two per panel or equivalent)

#### **3. INSTALLATION**

**3.01** The 606A panel is mounted on a standard relay rack or 16C apparatus mounting (or equivalent) using the 99-type bracket. Remove the center mounting bar from the 16C apparatus mounting to avoid cover interference.

**3.02** Two A25B (or equivalent) connector cables are used to connect the 606A panel to the 66B4-25 intermediate connecting block. The A25B connector cables plug into the back (P1 and P3) of the 606A panel (Fig. 2).

**3.03** The stub ends of the A25B connectors are terminated on the 66B4-25 intermediate connecting block following the wiring plan shown in the section for the particular VCA being installed.

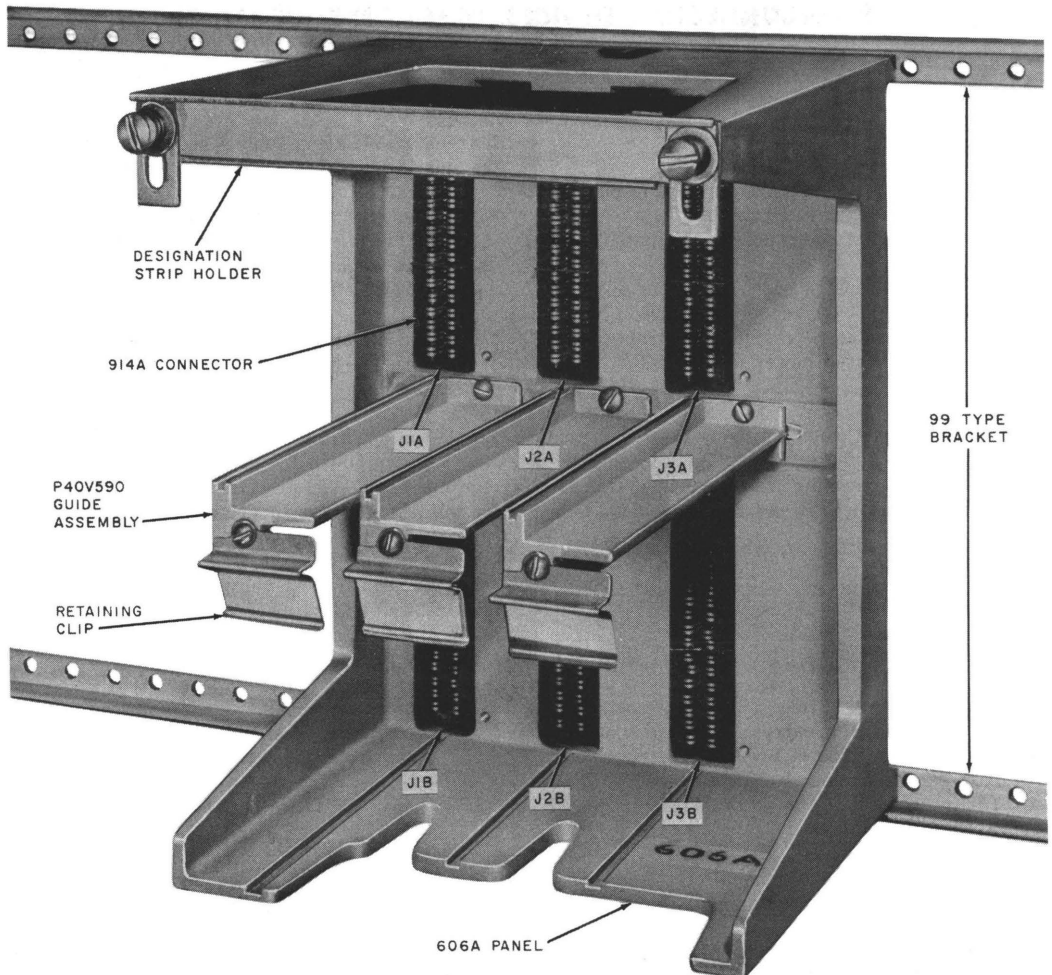


Fig. 1—606A Panel (Front View)

Unused leads should be insulated and stored if not cut down on the block.

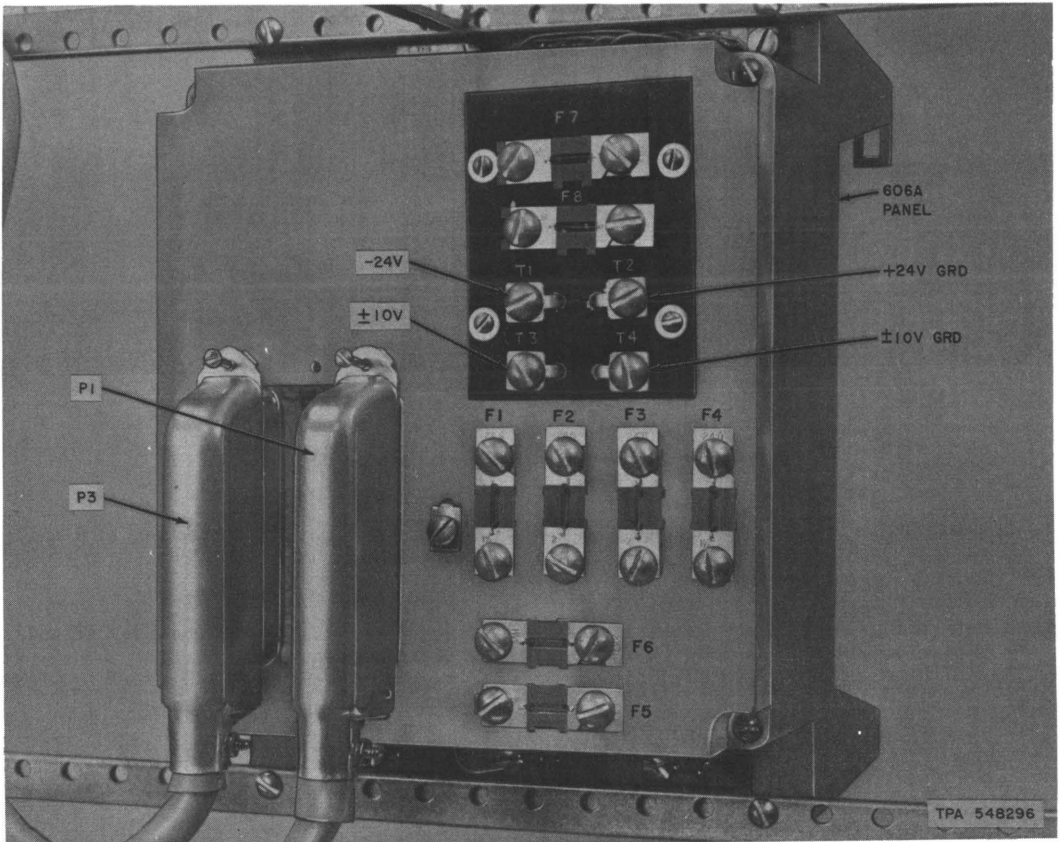
**3.04** Leads associated with the CPE are extended from the 66B4-25 intermediate connecting block and terminated on a 66M1-50 interface connecting block following the wiring plan shown in the section for the particular VCA being installed.

Stencil lead designations on the 66M1-50 interface connecting block as required.

**3.05** The customer must terminate the CPE on the 66M1-50 interface connecting block using the terminals on the customer side.

**3.06** The Telephone Company provided power is supplied from the associated equipment and





**Fig. 2—606A Panel (Rear View)**

is connected to the terminals on the rear of 606A panel as shown in Table B and Fig. 2.

**3.07** Refer to the appropriate section in Division 518 for proper grounding of power units. Proper grounding of equipment and power unit is important to prevent damage from power line surges.

**3.08** When installing IUs in the 606A panel, position the boards in the grooves of the panel and guide assembly and slide the unit in until it is properly seated in the connector. The code slots on the IUs match the index clips between contacts 5 and 6, and 12 and 13 in the connectors.

Lower the designation strip holder and lock down to hold the upper IUs in place. Lower the retaining clip on the guide assembly and fasten to hold the lower IUs in place. Refer to Fig. 3 for installation sequence of the IUs in the panel to correspond to the plug wiring arrangement.

**3.09** After installation is complete, apply power and perform tests shown in the section for the particular VCA being installed. To protect the electrical components of IUs, always remove the fuse associated with that particular circuit before removing or installing an IU. See Table B.

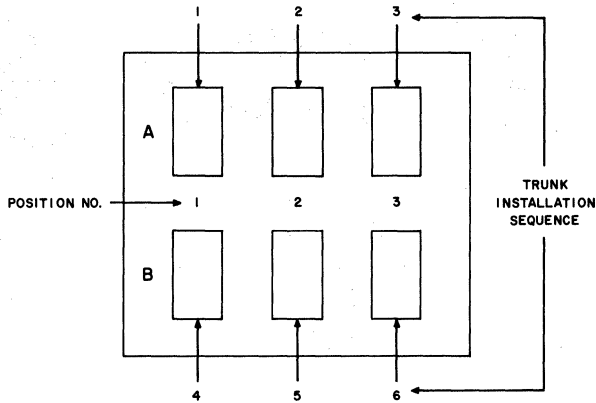


Fig. 3—Connector and Trunk Arrangement in 606A Panel

4. CONNECTIONS

4.01 Refer to Fig. 4 for connections to IUs.

4.02 Refer to Fig. 5 and Table C for connections to power supplies.

4.03 Refer to Fig. 6 for connections to A and B connectors.

4.04 Refer to Fig. 7 for connections to CPE and Bell System equipment.

LEAD DESIGNATIONS FOR UNITS			914A A AND B CONN
109A	110A	111A	
		±10V	4
		L(STA)	8
R(CO)	R(CO)	R(CO)	9
T(IA2)	T(IA1)	T(STA)	12
R(IA2)	R(IA1)	R(STA)	13
T(CO)	T(CO)	T(CO)	14
GRD	GRD	GRD	15
-24V	-24V	-24V	17
A(STA)		T(CUS)	24
H(NC)	H(IA1)	R(CUS)	25
BS2(CUS)	BS2(CUS)	A(IA2)	26
B2(NC)		T(IA2)	28
BI(NC)		R(IA2)	29
		A(IA2)	30
BS1(CUS)	BS1(CUS)	BL	32
R(CUS)	R(CUS)	S(CUS)	34
T(CUS)	T(CUS)	G(CUS)	36

TO  
J1A, J2A, J3A  
J1B, J2B, J3B

Fig. 4—Lead Designations For Interconnecting Units

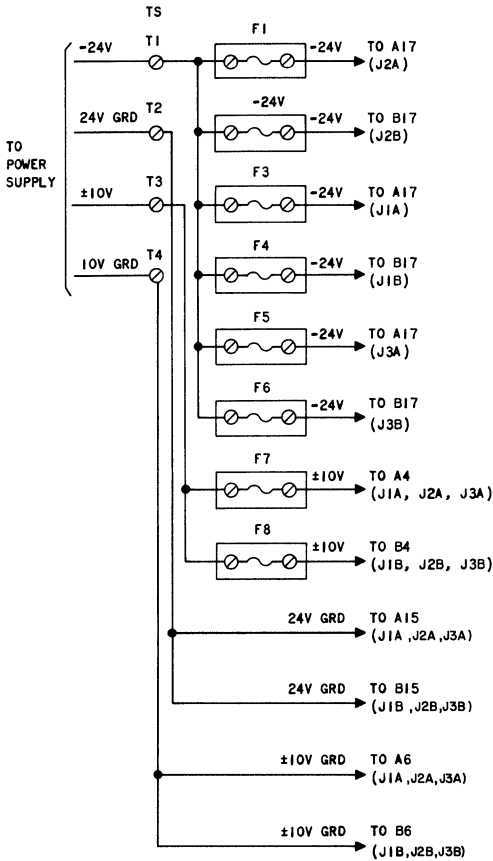


Fig. 5—Fuse and Power Distribution

TABLE A  
CONNECTOR USE TABLE

UNIT CODE	SERVICE FUNCTION	POSITIONS					
		1		2		3	
		J1A	J1B	J2A	J2B	J3A	J3B
109A	Audio on Hold	•	•	•	•	•	•
110A	Audio on Hold	•	•	•	•	•	•
111A	Key Tel. to CP Intercom	•	•	•	•	•	•

• Usable in indicated connectors.

TABLE B  
606A PANEL FUSE ASSIGNMENT

VOLTAGE	FUSE NO*	CONNECTOR
-24V	F1	J2A
	F2	J2B
	F3	J1A
	F4	J1B
	F5	J3A
	F6	J3B
±10VAC	F7	J1A, J2A, J3A
	F8	J1B, J2B, J3B

\*Fuses are 24E 1/2 ampere.

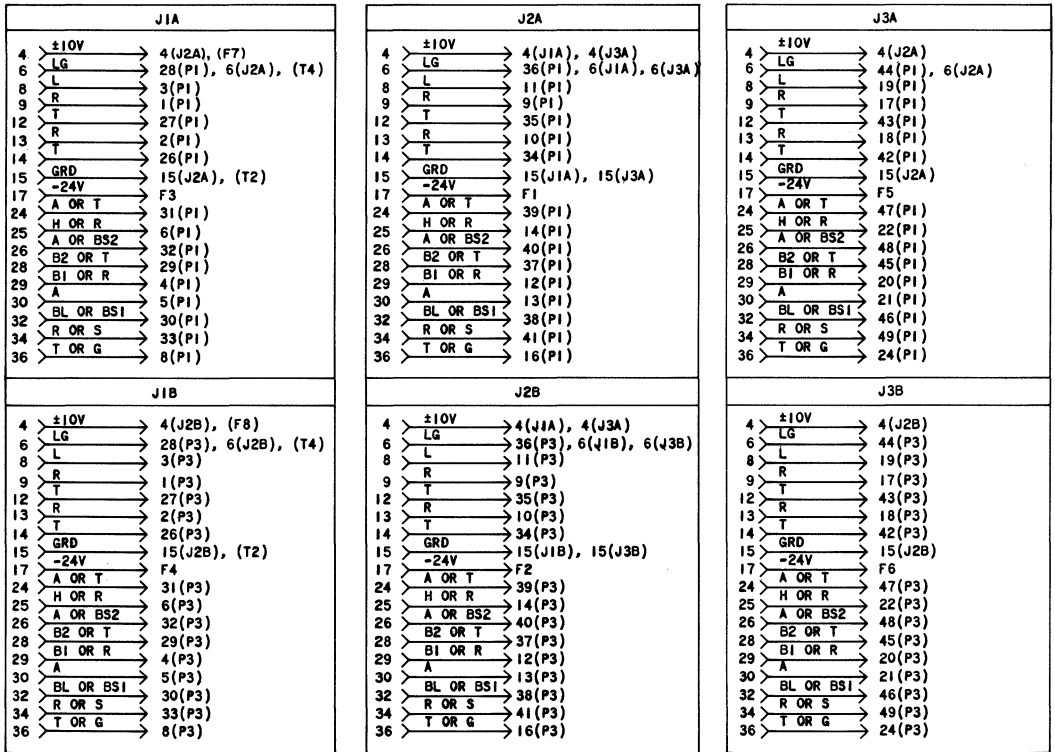


Fig. 6—Connections For Jacks J1 to J3

TABLE C  
POWER CONNECTIONS

VOLTAGE	606A PANEL*
-24V	T1
24V GRD	T2
±10VAC	T3
10V GRD	T4

\*Terminals on rear of panel are stamped as shown.

P1

P2

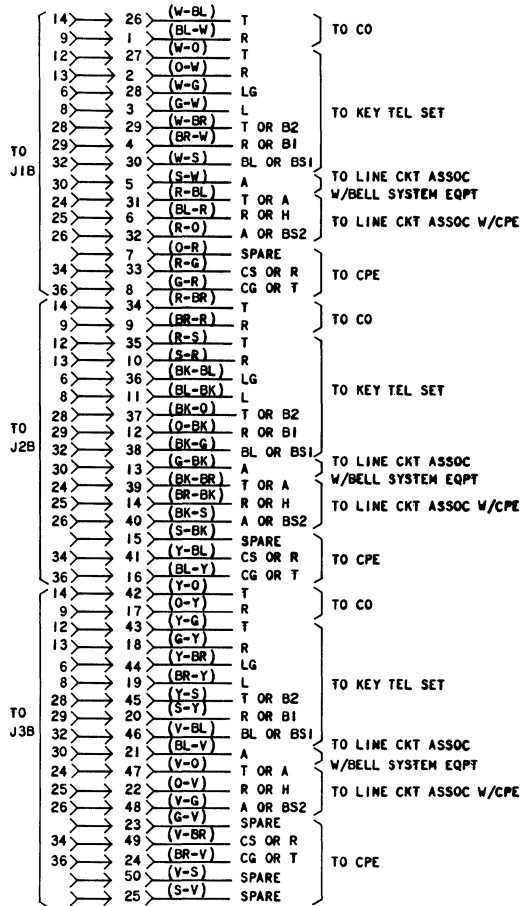
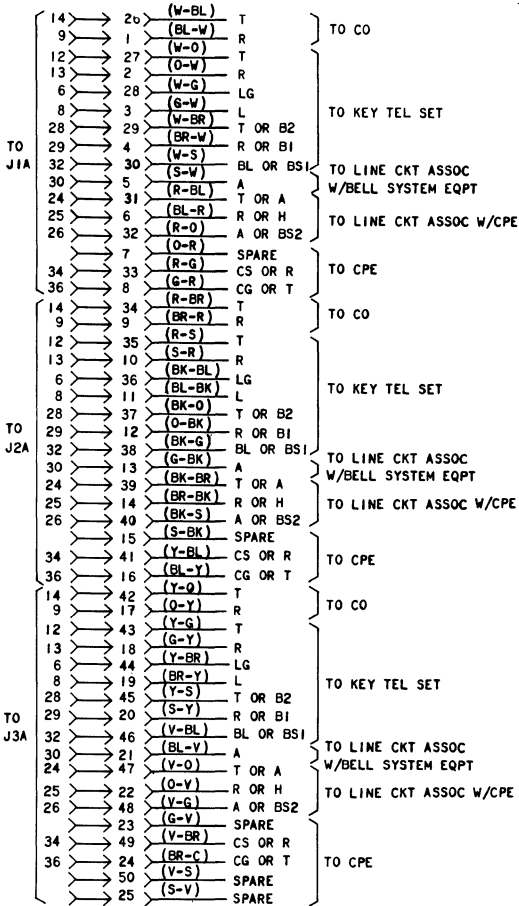


Fig. 7—Connections For Plugs P1 and P3

**INTERCONNECTING DEVICES, COMMON EQUIPMENT**  
**615A PANEL**

**1. GENERAL**

**1.001** This addendum supplements Section 463-300-104, Issue 2. Place this pink sheet ahead of Page 1 of the section.

**1.002** This addendum is issued to clarify the requirements for battery supplies used to provide dc power for the panel.

**2. CHANGES TO SECTION**

**2.001** On Page 1, paragraph 2.04, add the following statement after the second sentence: The 108A IU can be mounted in the 615A panel only for PCA CD6, not for CDA.

**2.002** On Page 2, add the following sentence at the end of paragraph 2.05: *Talk battery is required for the 120-type IUs, while signal battery should be used for the other IUs.*

**2.003** On Page 8, add new Table C.

**2.004** On Page 9, add new Fig. 6.

**TABLE C**

**POWER CONNECTIONS**

VOLTAGE		615A PANEL*
120-TYPE IUs	OTHER IUs	
-24V TALK BAT.	-24V SIG BAT.	2D
24V GRD	24V GRD	4D
-48V TALK BAT. †	-48V SIG BAT.	10D
48V GRD	48V GRD	12D
±105V AC		6D
±105V GRD		8D

\* Terminals on 66T1 connecting block.

† KS-15620, L22 (2-amp) or L23 (6-amp) rectifier is suitable for talk battery supply.

**NOTICE**

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Bell System except under written agreement



## **INTERCONNECTING DEVICES, COMMON EQUIPMENT**

### **615A PANEL**

#### **1. GENERAL**

**1.01** This section provides identification, installation, and connection information for the 615A panel used to mount interconnecting units (IUs).

**1.02** This section is reissued:

- To add information on the 262A adapter for mounting a 19- or 20-type power unit in a 16C apparatus mounting
- To include comcode numbers with piecepart numbers
- To add Fig. 9 and 10 to show the mounting of the 20-type power unit.

**1.03** The 615A panel provides connecting facilities between telephone company central office (CO) or PBX lines and customer-provided equipment (CPE).

**1.04** The internal panel wiring is covered in this section. Refer to the section covering the specific Protective Connecting Arrangement (PCA) for connections for the CPE and the particular IU in use.

#### **2. IDENTIFICATION**

##### **DESCRIPTION**

**2.01** The 615A panel (Fig. 1 and 2) consists of a cast aluminum carrier equipped with three 914A connectors in the upper row and three 913A connectors in the lower row. The 6- by 8-inch carrier has a full rear panel mounted on four standoffs making it 9-1/4 inches deep. The vertical rack space required is 8 inches (9 inches when mounted on 99B brackets).

**2.02** The 262A adapter consists of the following parts which are furnished when the adapter is ordered:

- Two metal bars, approximately 8-1/16 inches long and 3/4-inch wide, with slots for mounting on 99-type bracket and threaded holes for mounting a 19- or 20-type power unit (Fig. 9 and 10)
- Four .216-24 RHS screws, 1/4-inch long, to mount power supply on adapter
- Four .164-32 RHS screws, 7/16-inch long, with associated hex nuts and lockwashers
- Four 823111133 (P-31A113) bushings
- Four .216-24 RHS screws, 5/8-inch long, to fasten 99-type brackets to 16C apparatus mounting.

**2.03** The rear panel of the 615A panel is provided with a plug (P1) and a 66T1 connecting block. The 66T1 connecting block provides terminations for the incoming T and R leads, CT and CR leads from the 914A connectors, battery and ground, ringing supply, and for multiplying power to other 615A panels. The plug provides for circuit connections to CPE. Separate fuses are provided for each slot.

**2.04** Three 8-inch IUs (101-, 102- or 120-type) or six 4-inch IUs (108A) can be mounted in the 615A panel. It is not wired to accept the 75A control unit; PCAs requiring this unit must use the 604B or 604C panel. Each 8-inch IU plugs into a vertical arrangement of an A connector (914A, 40 pin) over a B connector (913A, 20 pin). The 4-inch IUs will plug into either connector. An 834055907 (P-40V590) guide assembly must be mounted in the center of each vertical position to support the 4-inch IUs. Fig. 3 shows the connector and trunk arrangement in the 615A

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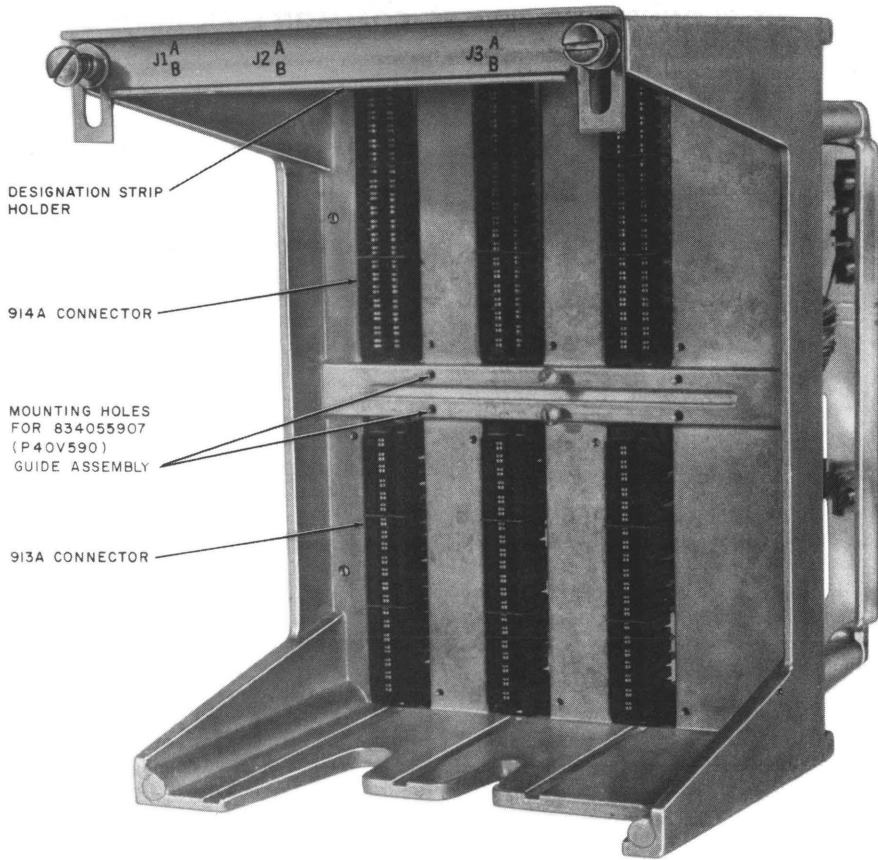


Fig. 1—615A Panel (Front View)◆

panel. Fig. 4 shows the lead designations and pin numbers for these IUs, and Table A shows the connectors in which they are used.

**2.05** The fuse and power distribution is shown in Fig. 5 and Table B. The 615A panel is designed to be used with a 24-volt or 48-volt power supply. The latter is used only when 120B IUs, arranged for 48-volt operation, are installed.

**2.06** The 24E 1/2-ampere fuses attach to screw terminals on the rear of the panel as shown in Fig. 2.

**2.07** The A and B connectors are factory-wired to the 66T1 connecting block and to the 50-pin KS-16671, List 1 plug (P1) on the rear of the panel. Fig. 6 shows connections to the 66T1 connecting block, Fig. 7 shows the connections to the A and B connectors, and Fig. 8 shows the connections to plug P1. ◆Fig. 9 shows a 19- or 20-type power plant mounted on the 262A adapter bracket.◆

#### ORDERING GUIDE

- Panel, 615A (fuses are supplied with panel)

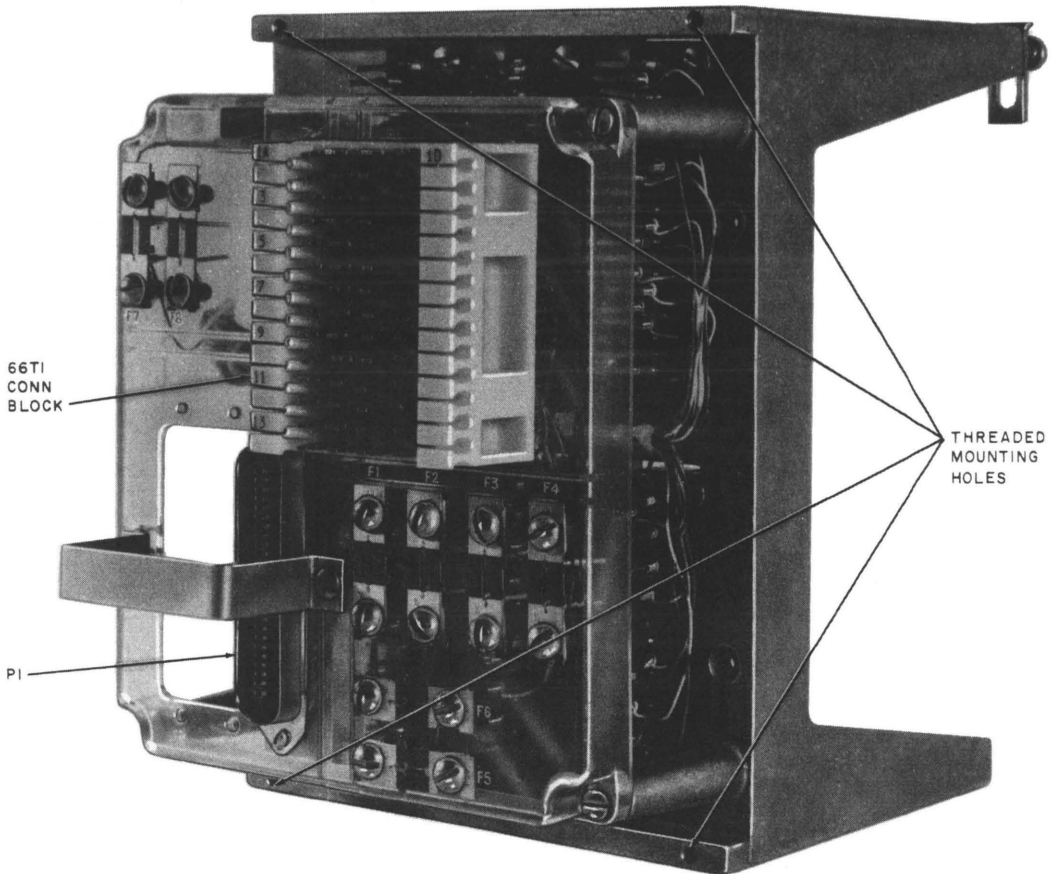


Fig. 2—615A Panel (Rear View)

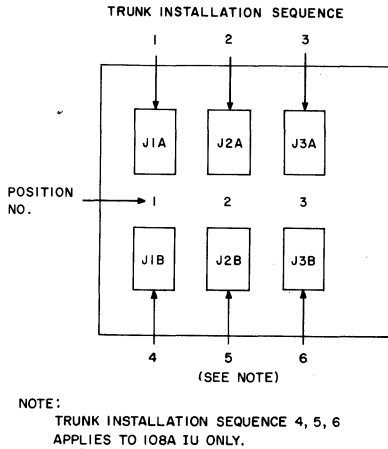
- Cable, A25B (one per panel)
- Assembly, Guide, 834055907 (P-40V590) (three per panel, required for 108A IU only)
- Adapter, 262A (one per 19- or 20-type power unit to be mounted on 99-type bracket).

### 3. INSTALLATION

- 3.01** Mount the 615A panel on a standard relay rack or 16C apparatus mounting (or equivalent)

using the 99-type bracket. When it is necessary to mount a 19- or 20-type power unit on the 99-type bracket adjacent to the 615A panels, mount the 262A adapter on the 99-type bracket as shown in Fig. 9 and 10. Refer to Section 167-400-200 for information on the proper installation of power units. Remove the center mounting bar from the 16C to allow the 615A to fit on the 99-type bracket.

- 3.02** Use an A25B (or equivalent) connector cable to connect the 615A panel to the 66M1-50 interface connecting block. Plug the A25B connector



**Fig. 3—Connector and Trunk Arrangement in 615A Panel**

cable into plug P1 on the rear of the 615A panel. Terminate the raw end of the A25B connector cable on the telephone company side of the 66M1-50 interface connecting block according to standard even count color code. Follow the wiring plan shown in the section for the particular PCA being installed. Stencil lead designations on the 66M1-50 interface connecting block as required.

**Note:** When only the CT and CR leads (which are terminated at both plug P1 and the 66T1 connecting block) are to be extended from the 615A to the interface block, D inside wiring cable may be used instead of the A25B cable.

- 3.03** The customer must terminate the CPE on the 66M1-50 interface connecting block using the terminals on the customer side.
- 3.04** Use D inside wiring cable to extend the T and R leads from the CO or PBX connecting block to the 66T1 connecting block on rear of the 615A panel as shown in Fig. 6.
- 3.05** Use 20-gauge wire to connect either telephone company or CP ringing supply and 24-volt or 48-volt dc power to the terminals on the 66T1 connecting block as shown in Fig. 5 and 6 and Table C. Customer-provided 24-volt or 48-volt dc

power must be routed through a KS-20944 protector before connecting to the power terminals on the 615A panel. Refer to Section 463-300-109 for information on the KS-20944 protector. If the customer furnishes 48-volt dc power, the 604B panel or the 604C with 21 apparatus unit installed must be used instead of the 615A for 101, 102, and 108-type IUs.

**3.06** When telephone company-provided power supplies are used (if required by PCA installation), the customer must provide a 105- to 130-volt, 60-Hz outlet within reach of available power cords (locally furnished). This electrical outlet should not be under control of a wall switch.

**3.07** Refer to the appropriate section in Division 518 for proper grounding of power units. Proper grounding of equipment and power unit is important to prevent damage from power line surges.

**3.08** When installing IUs in the 615A panel, position the boards in the grooves of the panel and slide the unit in until it is properly seated in the connector. The code slots on the IUs match the index clips between contacts 5 and 6, and 12 and 13 in the connector. Lower the designation strip holder to hold the IUs securely in place. Refer to Fig. 3 for installation sequence of IUs in the panel to correspond to the plug wiring arrangement.

**3.09** After installation is complete, apply power and perform tests shown in the section for the particular PCA being installed.

#### 4. CONNECTIONS

- 4.01** Refer to Fig. 4 for connections to IUs.
- 4.02** Refer to Fig. 5 and Table C for connections to power supplies.
- 4.03** Refer to Fig. 6 for connections to CO lines, power, and CPE by way of the 66T1 block on the 615A panel.
- 4.04** Refer to Fig. 7 for connections to A and B connectors.
- 4.05** Refer to Fig. 8 for connections to CPE through plug P1.

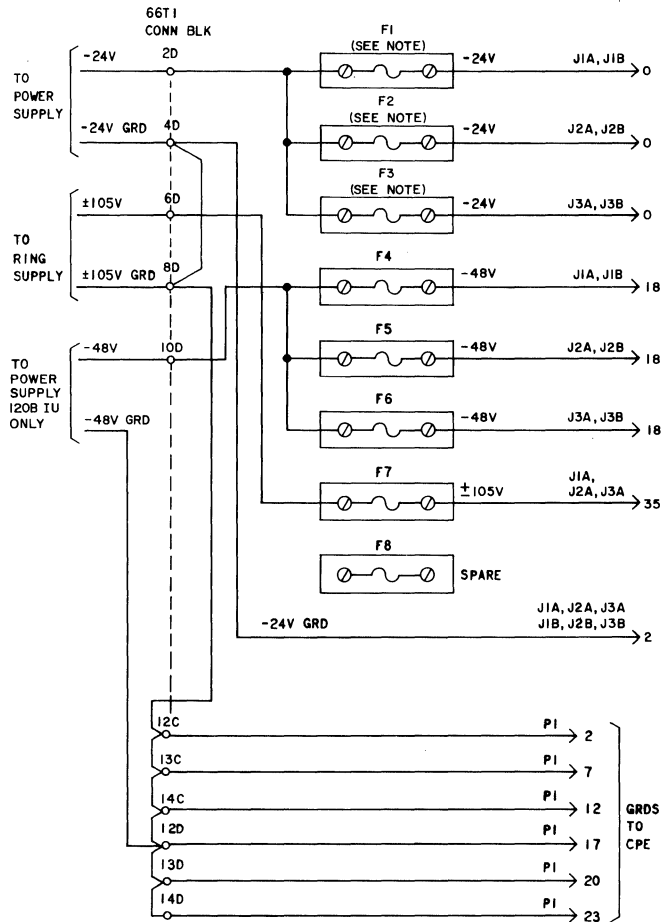
								A AND B CONN
I01A	I01B	I01C	I02A	I02B	I08A	I20A	I20B	→
-24V	-24V	-24V	-24V	-24V	-24V	-24V	-24V	→ A0
CS	CS	CS	CS	CS	CS			→ A1
R	R	R	R	R	R	R	R	→ A4
CT	CT	CT	CT	CT	CT	CT	CT	→ A6
CBS1	CBS1	CBS1						→ A7
C1	C1	C1	C1	C1	C1			→ A10
C2	C2	C2	C2	C2	C2			→ A11
T	T	T	T	T	T	T	T	→ A13
CRV1	CRV1	CRV1	CRV1	CRV1				→ A14
CR	CR	CR	CR	CR	CR	CR	CR	→ A15
CBS2	CBS2	CBS2						→ A16
							-48V	→ A18
CRV2	CRV2	CRV2	CRV2	CRV2				→ A19
						RS	RS	→ A35
					-24V			→ B0
					CS			→ B1
GRD	GRD	GRD	GRD	GRD		GRD	GRD	→ B2
					R			→ B4
					CT			→ B6
					C1			→ B10
					C2			→ B11
					T			→ B13
					CR			→ B15

Fig. 4 → Lead Designations for Interconnecting Units

**TABLE A**  
**CONNECTOR USE TABLE**

PCA	UNIT CODE	POSITIONS		
		1	2	3
		J1A J1B	J2A J2B	J3A J3B
CDH, CED	101-Type	•	•	•
CD-7, -8, -9, CET, C2ACP, C2AKS	102-Type	•	•	•
CD6	108A	• •	• •	• •
STP, C2F	120-Type	•	•	•

- Usable in indicated connectors.



NOTE:  
 -48V OPERATION PRESENTLY SPECIFIED  
 FOR I20B ONLY. IF -48V IS USED  
 REMOVE FUSES F1, F2 AND F3.

Fig. 5 → Fuse and Power Distribution

**TABLE B  
615A PANEL FUSE ASSIGNMENT**

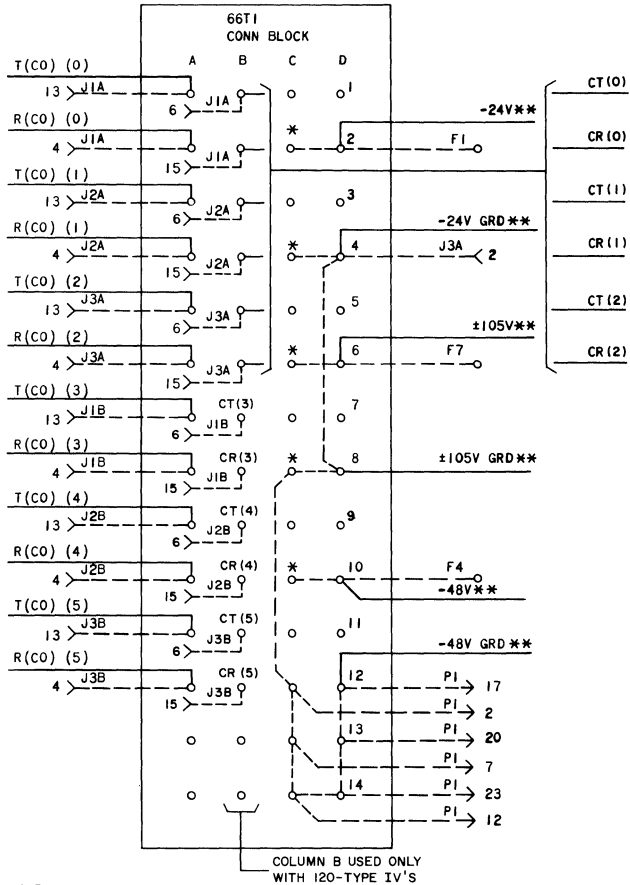
VOLTAGE	FUSE NO*	CONNECTOR
-24V	F1	J1A,B
	F2	J2A,B
	F3	J3A,B
-48V	F4	J1A
	F5	J2A
	F6	J3A
±105 VAC	F7	J1A, J2A, J3A
	F8	SPARE

\*Fuses are 24E, 1/2 ampere.

**TABLE C**

POWER CONNECTIONS	
VOLTAGE	615A PANEL *
-24V	2D
24V GRD	4D
-48V	10D
48V GRD	12D
±105VAC	6D
±105V GRD	8D

\* Terminals on 66T1 connecting block.

**NOTE:**

DASHED LINES INDICATE FACTORY WIRING ON REAR OF BLOCK. SOLID LINES ARE INSTALLER WIRING.

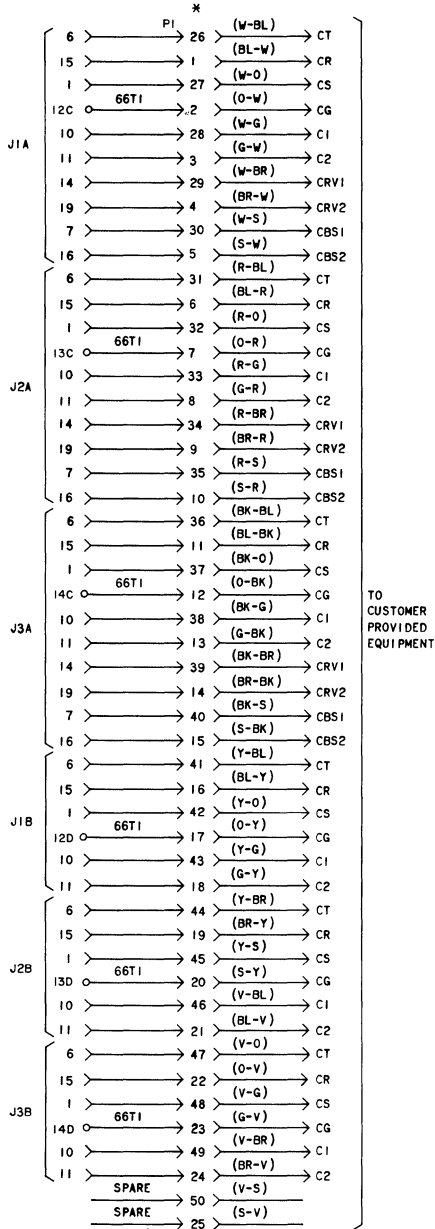
- \* TERMINALS FOR MULTIPLES TO SUCCESSIVE PANELS. MULTIPLE A MAXIMUM OF 3 PANELS (1 SHELF).
- \*\* USE 20 GAUGE WIRE FOR THESE CONNECTIONS. STRIP BEFORE PLACING IN QUICK CLIP TERMINAL.

**Fig. 6—Connections—66T1 Connecting Block**



J1A	J2A	J3A
0 > -24V → F1	0 > -24V → F2	0 > -24V → F3
1 > CS → 27(P1)	1 > CS → 32(P1)	1 > CS → 37(P1)
2 > GRD → 2(J3B), 2(J2A)	2 > GRD → 2(J1A), 2(J3A)	2 > GRD → 2(J2A), 4D(66T1)
4 > R → 2A(66T1)	4 > R → 4A(66T1)	4 > R → 6A(66T1)
6 > CT → 26(P1), 1B(66T1)	6 > CT → 31(P1), 3B(66T1)	6 > CT → 36(P1), 5B(66T1)
7 > CBS1 → 30(P1)	7 > CBS1 → 35(P1)	7 > CBS1 → 40(P1)
10 > CI → 28(P1)	10 > CI → 33(P1)	10 > CI → 38(P1)
11 > C2 → 3(P1)	11 > C2 → 8(P1)	11 > C2 → 13(P1)
13 > T → 1A(66T1)	13 > T → 3A(66T1)	13 > T → 5A(66T1)
14 > CRV1 → 29(P1)	14 > CRV1 → 34(P1)	14 > CRV1 → 39(P1)
15 > CR → 1(P1), 2B(66T1)	15 > CR → 6(P1), 4B(66T1)	15 > CR → 11(P1), 6B(66T1)
16 > CBS2 → 5(P1)	16 > CBS2 → 10(P1)	16 > CBS2 → 15(P1)
18 > -48V → F4	18 > -48V → F5	18 > -48V → F6
19 > CRV2 → 4(P1)	19 > CRV2 → 9(P1)	19 > CRV2 → 14(P1)
35 > RS → 35(J2A)	35 > RS → 35(J1A), 35(J3A)	35 > RS → 35(J2A), F7
J1B	J2B	J3B
0 > -24V → F1	0 > -24V → F2	0 > -24V → F3
1 > CS → 42(P1)	1 > CS → 45(P1)	1 > CS → 48(P1)
2 > GRD → 2(J2B)	2 > GRD → 2(J1B), 2(J3B)	2 > GRD → 2(J1A), 2(J2B)
4 > R → 8A(66T1)	4 > R → 10A(66T1)	4 > R → 12A(66T1)
6 > CT → 41(P1), 7B(66T1)	6 > CT → 44(P1), 9B(66T1)	6 > CT → 47(P1), 11B(66T1)
10 > CI → 43(P1)	10 > CI → 46(P1)	10 > CI → 49(P1)
11 > C2 → 18(P1)	11 > C2 → 21(P1)	11 > C2 → 24(P1)
13 > T → 7A(66T1)	13 > T → 9A(66T1)	13 > T → 11A(66T1)
15 > CR → 16(P1), 8B(66T1)	15 > CR → 19(P1), 10B(66T1)	15 > CR → 22(P1), 12B(66T1)

Fig. 7—Connections to Jacks J1 to J3



\* THIS ARRANGEMENT SHOULD NOT BE USED WITH 120-TYPE IUI'S. CONNECT CT-CR LEADS TO INTERFACE CONNECTING BLOCK WITH X-CONNECT WIRE ON COLUMN B OF 66T1 CONNECTING BLOCK

TO CUSTOMER PROVIDED EQUIPMENT

Fig. 8—Connections to Plug P1

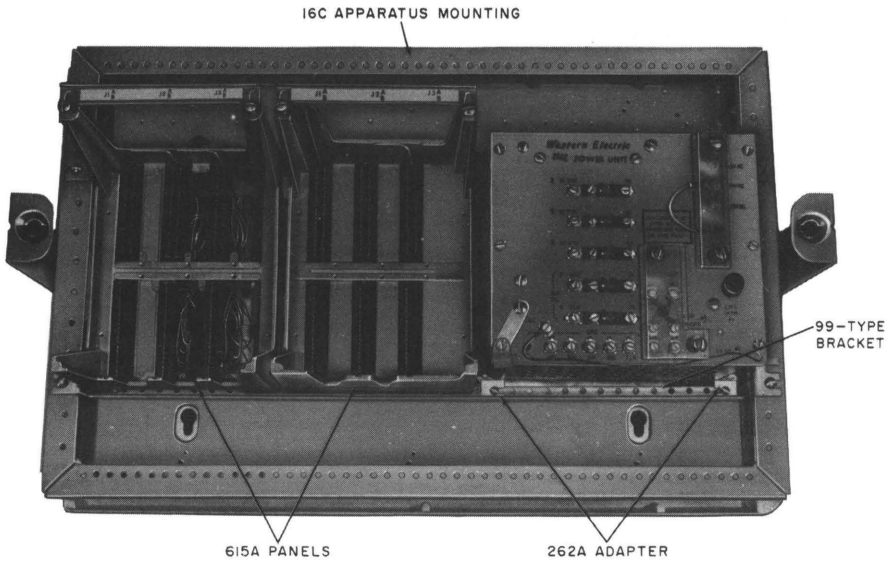
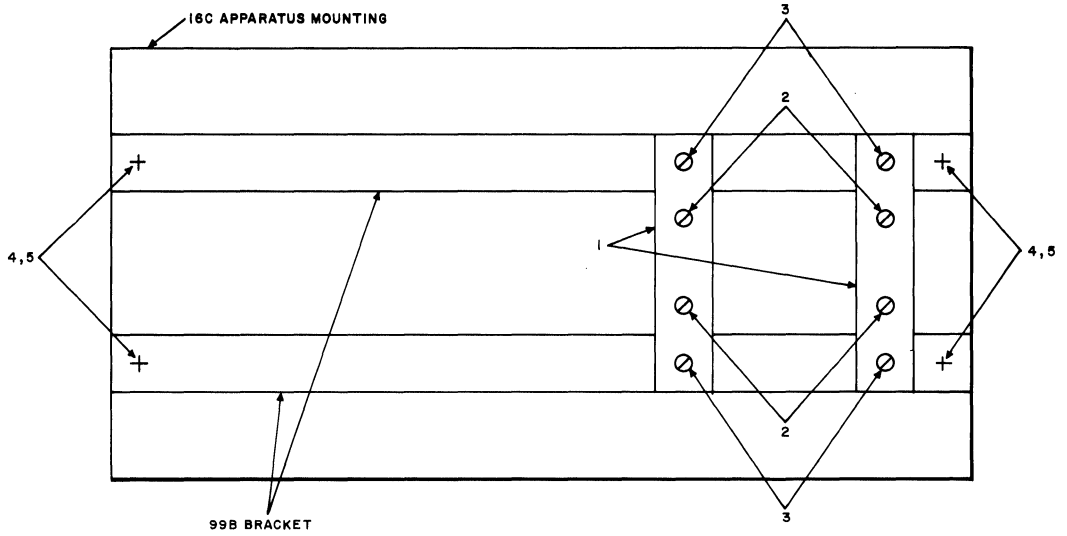


Fig. 9—16C Apparatus Mounting With 615A Panels Mounted on 99-Type Brackets and 20-Type Power Unit Mounted on 262A Adapter



- NOTES:
1. 262A ADAPTER MOUNTING BARS.
  2. 1/4" LONG SCREWS.
  3. 7/16" LONG SCREWS.
  4. BUSHINGS.
  5. 5/8" LONG SCREWS.

Fig. 10—262A Adapter Mounted on 99-Type Bracket

## CONNECTING ARRANGEMENT VCP

### CUSTOMER-PROVIDED POWER

### KS-20944 PROTECTOR

#### 1. GENERAL

**1.01** This section provides identification, installation, operation, maintenance, and connection information for connecting arrangement (CA) VCP using the KS-20944 protector to connect a customer-provided (CP) dc power supply to Bell System equipment.

**1.02** The KS-20944 protector is used with 604-type panels in various voice connecting arrangements. For information on the 604A-type panels, refer to Section 463-300-101. For information on the 604B panel, refer to Section 463-300-102.

**1.03** If the customer wants a copy of the Technical Notice which covers this interface unit, the customer should contact the local Telephone Company Business Office or the Marketing Representative.

#### 2. IDENTIFICATION

##### PURPOSE

The KS-20944 protector is used:

- As an interface between CP dc power and Bell System equipment.
- To limit excessive levels from CP power supplies and to provide protection for personnel against hazardous voltages or currents.

##### ORDERING GUIDE

- Protector, KS-20944, L1 (for 24V at 15 amp)
- Protector, KS-20944, L2 (for 48V at 15 amp)
- Protector, KS-20944, L3 (for 24V at 30 amp)
- Protector, KS-20944, L4 (for 48V at 30 amp)
- Wire, (P-384614 or equivalent, No. 14 AWG, [No. 10 AWG for 30 amp units] paired red

and black, length as required to connect protector to panel. See 3.01.)

- Block, Connecting, 66C1-16 (or equivalent, if required for multiple connecting arrangements. See 3.01.)
- Cordage, Flexible, KS-15143 (or equivalent, if required for cabling from 66C1-16 connecting block to panels. See 3.01.)

##### DESIGN FEATURES

- Approximate dimensions: 8 inches high, 6-3/8 inches wide and 3-3/4 inches deep (Fig. 1)
- Provides protection against excessive voltage or current, reversed polarity, incorrect ground or ac voltage from CP power supply
- Provides dc interface to CP equipment
- Equipped with a 3-pole, magnetic-type circuit breaker mounted on a hinged cover
- The breakers act as a switch to disconnect power supply voltage from connecting arrangement
- Equipped with two leads for connection to the CP power supply and a 2-terminal connecting block for connection to the connecting arrangement dc power leads
- Mounts on wall or flat surface.

#### 3. INSTALLATION

**3.01** Mount the KS-20944 protector on a wall or suitable flat surface close to the 604-type panel, or where power distribution is required at large installations, close to the 66C1-16 connecting block.

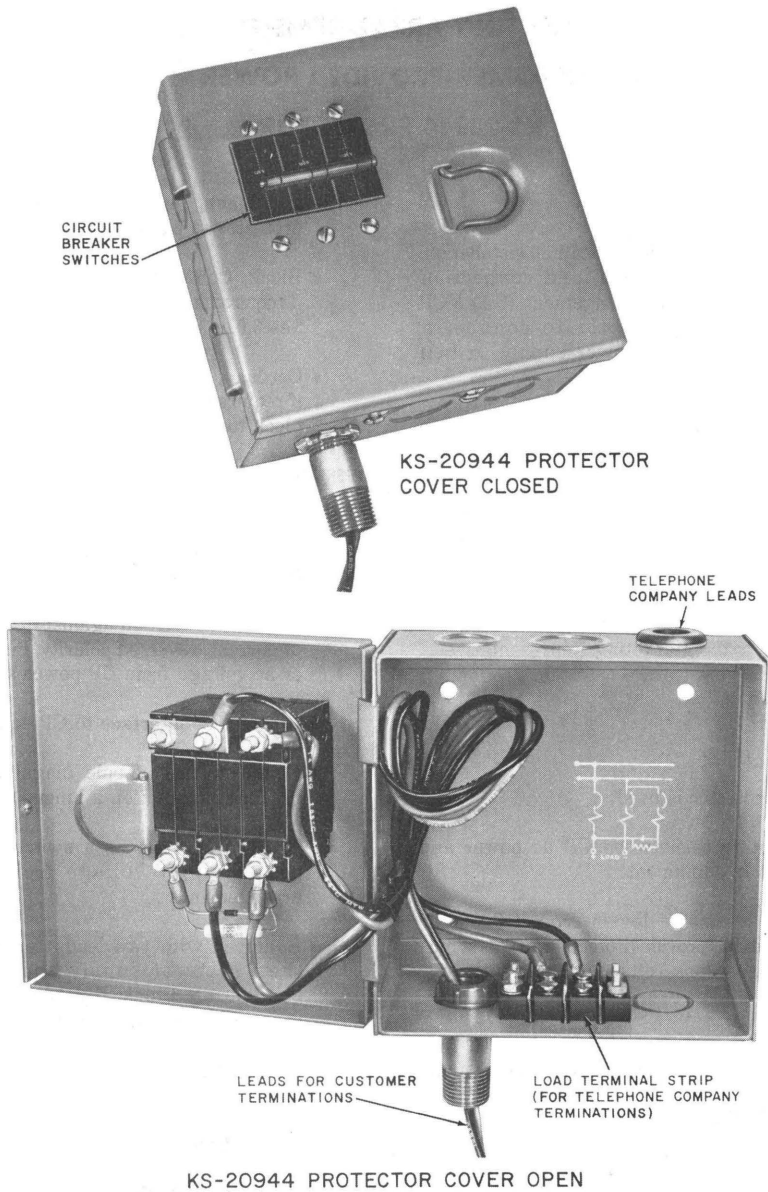


Fig. 1—KS-20944 Protector

**3.02** Connect protector using No. 14 AWG wire (or No. 10 AWG for 30 amp units). Insert the conductors through the rubber grommet on top of the protector and connect the red conductor to the positive (+) load terminal and the black to the negative (-) load terminal. Conduit knockouts are provided in the top of the protector box where local code or installation practices require conduit.

**3.03** Route the 14-gauge (or 10-gauge) wire pair to the 604-type panel power terminals, or 66C1-16 distribution connecting block. Connect the red wire to the ground terminal and the black to the -24 volt or -48 volt terminal. Follow local wiring instructions and the section for the particular connecting arrangement for power connections.

**3.04** When a distribution connecting block is required, KS-15143 flexible cordage (2-conductor, 18-gauge) or equivalent, may be used to cable between the connecting block and the 604-type panels.

**3.05** The customer must connect his power supply to the red (GRD) and black (-V) No. 10 or No. 14 gauge wires extending from the nipple in the bottom of the unit.

**Caution:** *If polarity to the 604B panel should be reversed, the interconnecting units in the panel may be damaged.*

**3.06** Always check for correct voltage, polarity, and ground on terminals connected to customer leads before closing circuit breakers.

**Warning:** *The circuit breakers remove voltage from the load (Bell System side) of the protector. Voltage will still be present on the upper terminals (terminals No. 1) of the three circuit breakers.*

#### 4. OPERATION

**4.01** The KS-20944 power protector is used to protect the Bell System personnel from hazardous voltages but may not protect the equipment from component failure. (Separate fuses are required for interconnecting units [IU]). The KS-20944 protector is equipped with a 3-pole magnetic toggle switch type circuit breaker which may be manually operated, without opening the front cover, to supply or remove power to the Bell System equipment as required. The toggle switches are

coupled together with a tie rod to act as a single lever in setting the protector to the ON or OFF position.

**4.02** The KS-20944 protector consists of a dc voltage-operated circuit breaker in series with a parallel resistor-diode combination connected across the line and two dc current-operated circuit breakers connected in each side of the line. The contacts on each breaker are connected in series with the coil of that breaker and all three breakers are mechanically interlocked externally by the tie rod and internally by a tripper bar. When any breaker operates all of the breakers are tripped. The breakers are of the trip free type so that the contacts cannot be closed by holding the lever to the ON position if the fault is still on the line.

**4.03** The KS-20944 protector trips in 25 milliseconds on dc overvoltage, current overload, reversed dc voltage, incorrect power supply ground, or ac voltage greater than 18 volts. It is available in four list numbers, physically alike, differing only in the trip rating of the coils.

**4.04** Complete ratings for the protectors are shown in Table A. The series connected (current) breakers are designed to carry rated current continuously and to trip in 25-milliseconds at 125 percent of rated current. The shunt connected (voltage) breakers will hold continuously at rated voltage and will trip in 0.1 second at the voltages shown in Table A.

**4.05** Common fault conditions are shown in Fig. 4. Protector operation is as follows:

- (a) Fig. 4A shows the normal protector connections. High voltage will cause CB3 to operate or high current would cause either CB1 or CB2 to operate.
- (b) Fig. 4B shows conditions where the polarity from the CP supply is correct but the wrong lead is grounded. The reversed ground effectively connects CB2 across the input voltage to the protector. Current will flow through CB2 and the two grounds causing CB2 to operate.
- (c) Fig. 4C shows conditions where the polarity of voltage from CP power supply is reversed and the wrong lead is grounded. This condition effectively connects CB2 across the input voltage

to the protector. Current will flow through CB2 and the two grounds causing CB2 to operate.

(d) Fig. 4D shows conditions where the polarity of the voltage from the CP power supply is reversed and the ground is correct. On reversed polarity or ac voltage, diode CR1 will conduct, shorting resistor R1 to increase current through CB3 causing CB3 to operate.

## 5. MAINTENANCE

**5.01** When the circuit breaker switch lever has tripped to the OFF position, reset lever to the ON position. If the fault is still on the line, the breakers will not reset to the ON position. In this case, the fault must be located and corrected as follows:

(a) **Determine Direction of Trouble:** Disconnect the CP power by operating lever switch to OFF position.

**Warning:** Use proper safety precautions as voltage will still be present on terminals 1 (upper terminals) of circuit breakers.

Open cover and disconnect black lead from the - load terminal. Do not disconnect the red lead from the + load terminal. Close cover and reset breaker switch lever to ON position. If breakers remain in ON position, trouble is indicated on the loadside; proceed to test (c). If breakers will still not reset to the ON position, trouble is indicated in the CP power supply; proceed to test (b).

(b) **Input Power Tests:** Open cover and check the CP power for the following on terminals No. 1 of the breakers (customer red and black leads) using an approved volt/ohm meter:

- Correct amount of voltage per list number of protector (between red and black leads)
- Correct polarity (black negative, red positive)
- Correct ground (red lead grounded)
- Correct type of voltage (ac or dc).

The dc input voltage should meet the requirements per list number of the protector as shown on Fig. 2 and Table A.

(c) **Output Power (Load) Tests:** Proceed to further isolate trouble between the IUs, the mounting, and the leads to the mounting by operating the protector lever switch to the OFF position and reconnecting the -V black lead to the - load terminal at the protector. Remove the IUs from the mounting and reset the lever switch to the ON position. If breakers hold, trouble is indicated in the IUs. Refer to the section for the particular connecting arrangement in use for tests on the IUs. If breakers do not reset, trouble is indicated in the mounting panel or the leads to the panel. Isolate the panel by disconnecting the black lead from -V terminal on rear of mounting and reset lever switch to ON position. If breakers hold, trouble is indicated in the mounting panel. Refer to the section for the type of mounting in use for further tests. If breakers do not reset, trouble is indicated in the leads to the mounting panel. Check the leads to the mounting panel for shorts between leads, correct ground, and correct polarity of connections to the power supply terminals on rear of panel.

**5.02** If trouble is suspected in the KS-20944 protector, replace with a new protector.

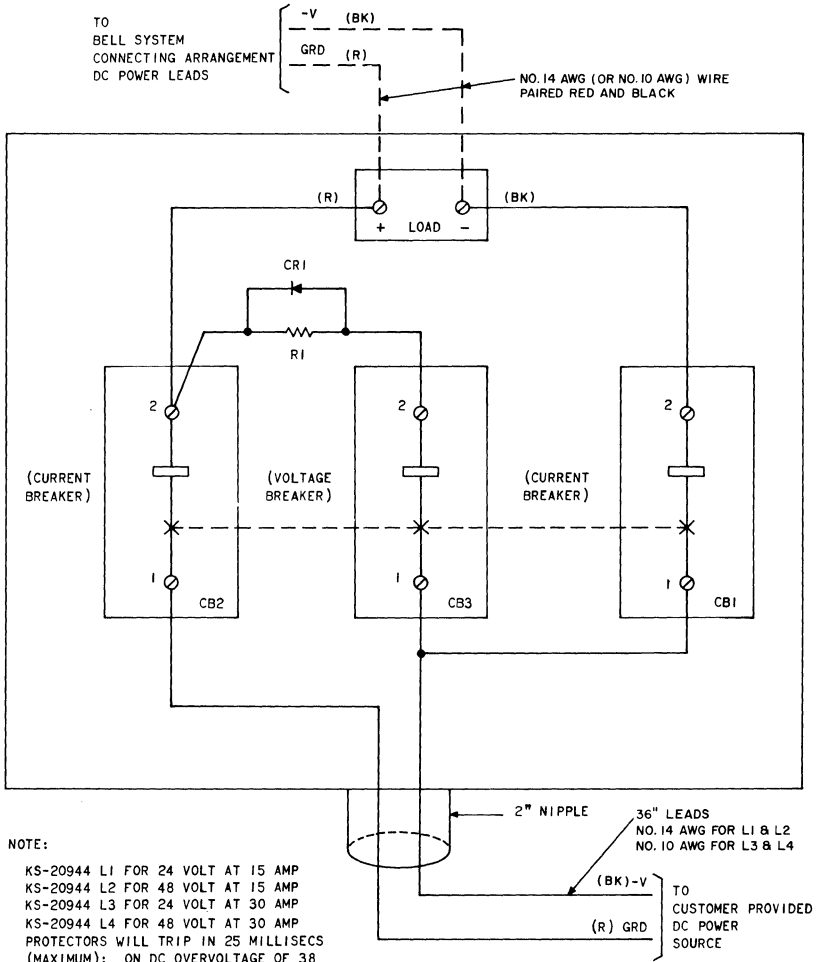
**5.03** If trouble is indicated in the CPE, follow local reporting procedures for trouble in CP equipment.



**Do not attempt any tests or repairs to the customer-provided equipment.**

**5.04** When in the repairman's judgment the trouble is located in the CPE, the Repair Service Bureau should be notified so that proper Maintenance of Service Charge billing can be initiated as outlined in BSP 660-101-312 entitled Maintenance of Service Charge on Services with Customer-Provided Equipment.

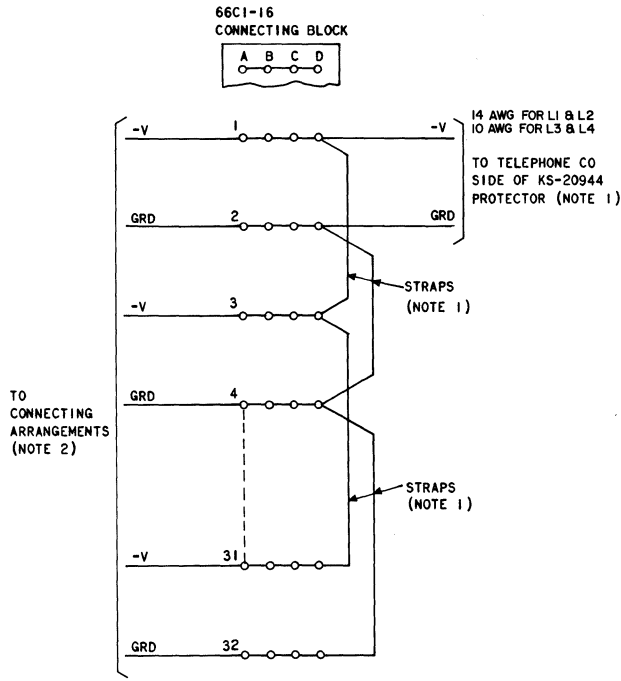




NOTE:

KS-20944 L1 FOR 24 VOLT AT 15 AMP  
 KS-20944 L2 FOR 48 VOLT AT 15 AMP  
 KS-20944 L3 FOR 24 VOLT AT 30 AMP  
 KS-20944 L4 FOR 48 VOLT AT 30 AMP  
 PROTECTORS WILL TRIP IN 25 MILLISECS (MAXIMUM): ON DC OVERVOLTAGE OF 38 VOLTS (24 VOLT UNIT) AND 68 VOLTS (48 VOLT UNIT), ON OVERLOAD OF 18.75 AMPERES (15 AMP UNIT) AND 37.5 AMPERES (30 AMP UNIT), ON REVERSED POLARITY, OR AC VOLTAGE GREATER THAN 18 VOLTS, OR INCORRECT POWER SUPPLY GROUND.

Fig. 2—Schematic - KS-20944 Protector



NOTES:

1. USE 14-GAUGE (OR 10-GAUGE) WIRE TO CONNECT FROM KS-20944 PROTECTOR TO CONNECTING BLOCK; PROVIDE MULTIPLE STRAPS AS DETERMINED BY NUMBER OF CONNECTING ARRANGEMENTS TO BE CONNECTED TO. USE SOLDER TO MAKE THE CONNECTION OF THE 14-GAUGE (OR 10-GAUGE) WIRE AND STRAPS TO THE CONNECTING BLOCK.
2. USE 18-GAUGE WIRE OR EQUIVALENT TO MAKE CONNECTIONS FROM CONNECTING BLOCK TO CONNECTING ARRANGEMENTS. EACH CONNECTING BLOCK PROVIDES MEANS FOR CONNECTING TO 16 CIRCUITS, HOWEVER, DO NOT EXCEED THE MAXIMUM CURRENT RATING OF THE KS-20944 PROTECTOR.

**Fig. 3—Typical Power Distribution for Multiple Connecting Arrangements**

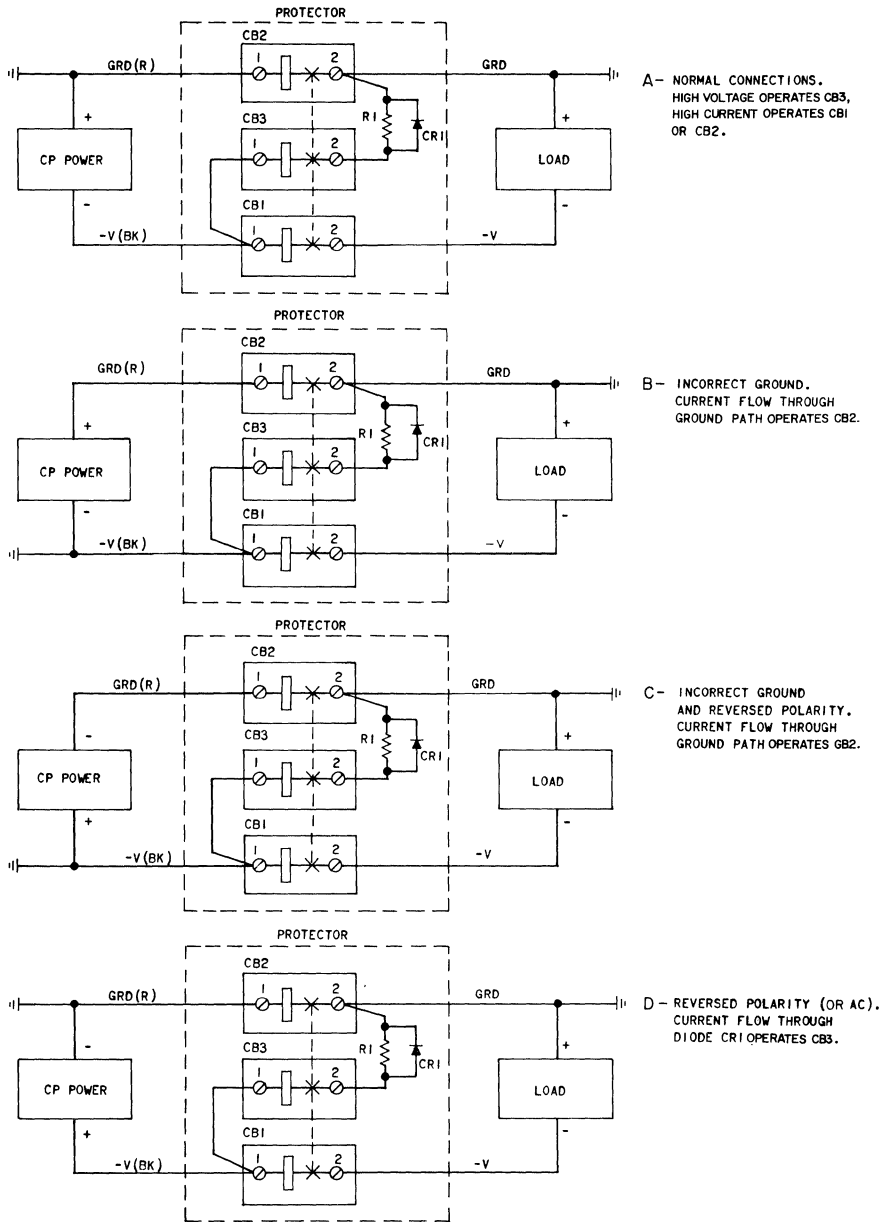


Fig. 4—Typical Protector Fault Conditions

TABLE A  
BREAKER RATINGS

LIST NO.	SHUNT BREAKER			SERIES BREAKERS		
	VOLTAGE AND POLARITY			CURRENT AMPERES		
	CORRECT		REVERSED POLARITY OR 60Hz AC	NON TRIP	TRIP	INCORRECT GROUND
	NON TRIP	TRIP	TRIP			
1	30	38	18	15	18.75	18.75
2	56	68	18	15	18.75	18.75
3	30	38	18	30	37.5	37.5
4	56	68	18	30	37.5	37.5

## INTERCONNECTING DEVICES COMMON EQUIPMENT

### 75A CONTROL UNIT

#### 1. GENERAL

**1.01** This section provides identification, installation, operation, and maintenance information for the 75A control unit used with the 604B panel to provide data transmission capabilities for various voice connecting arrangements (VCA).

**1.02** The 75A control unit has been designed to work with the 101B and 102B voice type interconnecting units (IUs).

**1.03** Refer to the section describing the specific VCA for the particular IU to use and for the VCA installation information.

**1.04** This issue of the section is based on the following drawings:

CD/SD-1E246-01 Issue 1—75A Control Unit

If this section is to be used with equipment or apparatus reflecting later issue(s) of the drawing(s), reference should be made to the SDs and CDs to determine the extent of the changes and the manner in which the section may be affected.

#### 2. IDENTIFICATION

##### PURPOSE

- To protect the network by linearly attenuating excessive voice and data signals from customer-provided (CP) PBX by means of automatic level control (ALC).

##### ORDERING GUIDE

- Unit, Control, 75A (one per six lines, Fig. 1)

##### DESIGN FEATURES

###### 75A Control Unit

- Components mounted on epoxy coated 8-inch 40-pin board.

- Limits excessive voice or data signals.
- Consists of six identical ALC circuits. Each ALC circuit is capable of automatically controlling the level of signals transmitted through its associated IU to limit the 3-second average power arriving at the CO to  $-12$  dBm (at  $+1$  TLP).
- Designed to mount in a 604B panel.
- Contains adjustable potentiometers for setting each ALC circuit to limit at any level between  $-14$  and  $-4$  dBm.
- Contains two voltage regulators to convert  $-24$  volt input dc voltage to a regulated  $-12$  volts dc.
- Operating temperature range of  $20^{\circ}\text{F}$  to  $140^{\circ}\text{F}$ .
- Requires a dc current input of 0.360 ampere (maximum) at 26 volts dc (maximum) at full load (only 0.1 ampere on standby).

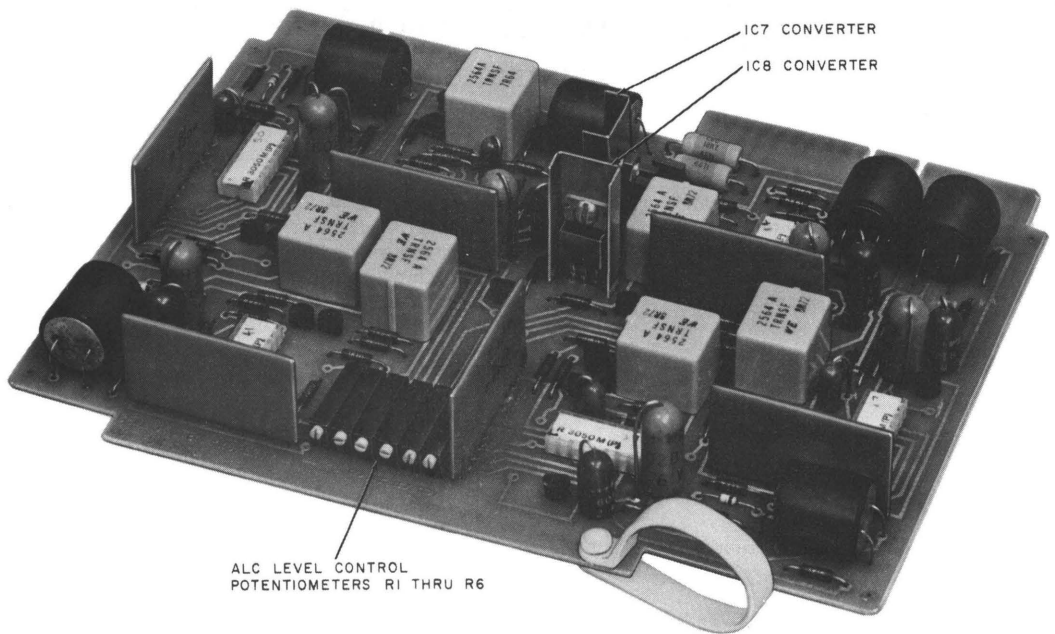
#### 3. INSTALLATION

**3.01** The 75A control unit is plugged into position 13 of the 604B panel to furnish ALC to IUs in positions 1 through 6 and/or plugged into position 14 for positions 7 through 12. Only trunks equipped for data transmission capabilities should be assigned to these positions. Since the 604B panel is prewired for the 75A, all connections are made when it is plugged into the panel.



*The electrical design of the 75A control unit protects it from voltage surges and it may be installed or removed without disturbing service to the associated IUs.*

**3.02** When installing the 75A control unit, raise the designation strip retainer bar and position the board in the guide grooves of the 604B panel. Slide the board in until the unit is properly seated



**Fig. 1—75A Control Unit**

in the connectors. Lower the designation strip retainer bar to hold the circuit boards securely in place.

**3.03** After installation adjust the limiting level threshold by setting the six level control potentiometers as described in 5.03 through 5.10.

#### **4. OPERATION (Fig. 2 and 3)**

**4.01** The 75A control unit consists of six identical ALC circuits, each connected across the tip and ring of an IU to protect Bell System equipment from excessive signal power. This protection is required for data transmission.

**4.02** The ALC circuit monitors the CP data/voice voltages applied to the IU. If the power exceeds a preset level, the ALC circuit will present a resistance shunt across the transmission circuit in the IU to linearly attenuate the signal to the preset level.

**4.03** Voice or data signals present in the IU are applied to transformer T1 in the 75A control unit (Fig. 3). The output of T1 is level adjusted, amplified, and ac coupled to the piecewise linear squaring circuit. The squaring circuit output is integrated to produce a dc voltage proportional to the 3-second average power of the signal passing through the IU. When this voltage exceeds the preset threshold voltage of the ALC circuit, the differential amplifier will drive current through the optical coupler (OC1) lamp, which illuminates the photoconductor (resistor) in OC1. Illumination causes the resistance of the photoconductor to decrease and shunt excess signal power away from the IU so as to hold the signal level at the IU constant at the preset level.

**4.04** The level adjusting potentiometers R1 through R6 are set to limit the customer signals to a level determined by the loop or trunk loss and impedance.

**4.05** Below the threshold level, the ALC circuit loads the transmitted signal by approximately

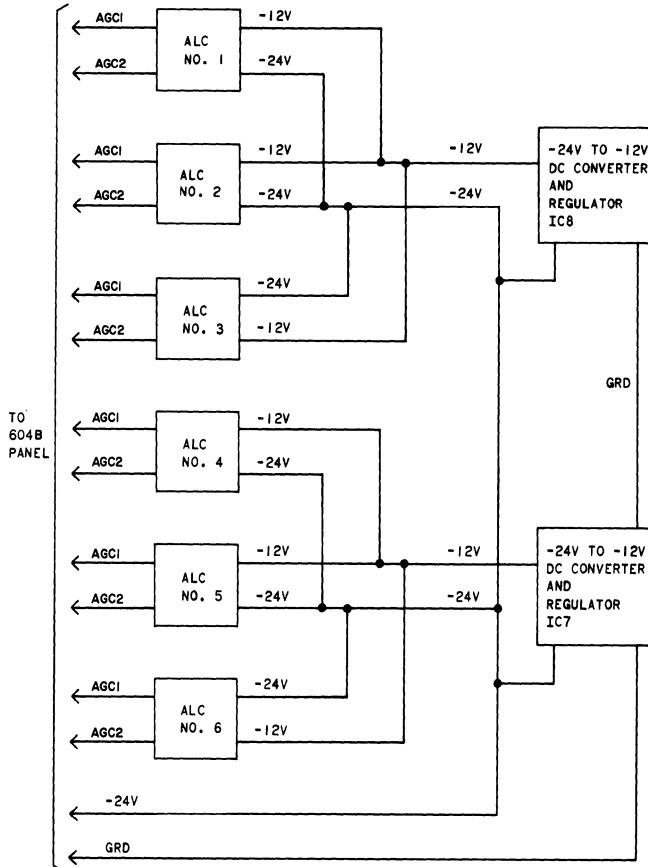


Fig. 2—Block Diagram of 75A Control Unit

0.1 dB. Complete dc isolation between the ALC circuit and its associated IU and customer-provided equipment (CPE) is provided by transformer T1 and optical coupler OC1.

**4.06** The six identical ALC circuits in the 75A control unit are powered by the two voltage regulators IC7 and IC8 (Fig. 4). Each voltage regulator supplies three ALC circuits. The two regulators convert the -24 volts dc supplied to the 75A into regulated -12 volt dc. Each voltage regulator supplies 180ma (60ma for each ALC) at  $12.0 \pm 0.5$  volt dc. The minimum current drain

for the 75A with all six circuits in the idle condition is 50ma. Each circuit when in use draws 60ma for a total maximum current drain of 360ma.

## 5. MAINTENANCE (Fig. 5 and 6)

**5.01** The 75A control unit may be used on trunks with losses up to 10 dB. The control unit may be adjusted to prevent the power arriving at the CO over a 3-second average from exceeding -12 dBm. The level adjusting controls provide a range of -14 dBm to -4 dBm.

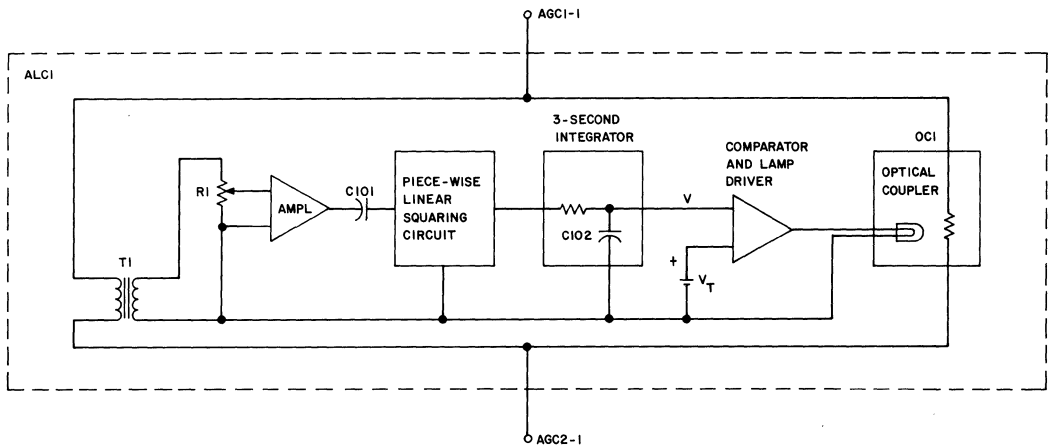


Fig. 3—Block Diagram of ALC Circuits in 75A Control Unit

### Equipment Required

5.02 The following are required in adjusting the ALC circuits:

- Oscillator, 600 ohm output impedance, 1000 Hz with adjustable output level (TMS 21A, KS-19353L4 or equivalent)
- Voltmeter, AC high impedance, greater than 50K, calibrated to read dBm. (Referenced to 1 milliwatt at 600 ohms)
- Resistor, 600 ohms 1/4 watt, 1 percent
- Hand test set, 1013A or equivalent

### Preparation

5.03 -Disconnect the CPE for all lines under test by removing the B bridging clips at the 66M1-50 interface connecting block. Make all test connections to the CT and CR terminals on the Telephone Company side of the interface connecting block. Refer to the section for the particular voice connecting arrangement in use to determine what straps may be necessary to cause the IU to operate and cut through the transmission path. Turn all six level adjusting controls on the 75A 20 turns counterclockwise. (The control is a 17 turn potentiometer without mechanical stops; the shaft

will continue to turn freely after resistance limit is reached.)

### Adjustment Procedure

**Note:** In 5.04 and 5.06, a voltmeter with an internal 600-ohm input termination may be used in place of the 600-ohm resistor and high-impedance voltmeter. In 5.07 and 5.09, the high-impedance voltmeter (without 600-ohm termination) must be used.

5.04 Measure the received power ( $P_R$ ) on the line as follows:

- (1) Connect test equipment as shown in Fig. 6A.
- (2) Using the 1013A hand test set or equivalent, place a call on the line under test to the milliwatt supply (1000 Hz test tone) at the serving CO. Terminate the CT and CR terminals to the IU in the 600-ohm resistor.
- (3) Measure the received power across the resistor in dBm and record.
- (4) Repeat for all lines under test.
- (5) Disconnect from milliwatt supply.



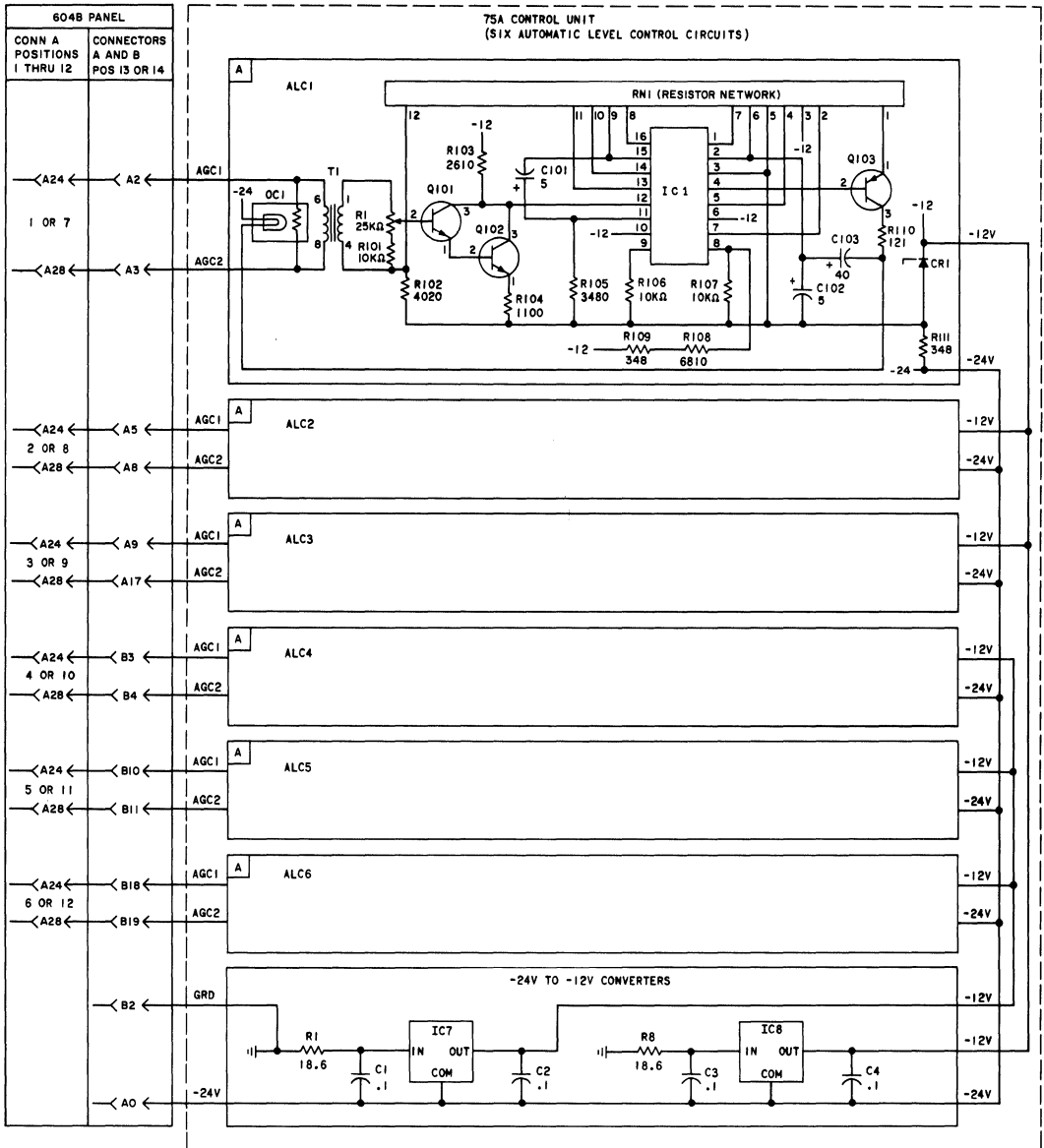


Fig. 4—Simplified Schematic—75A Control Unit

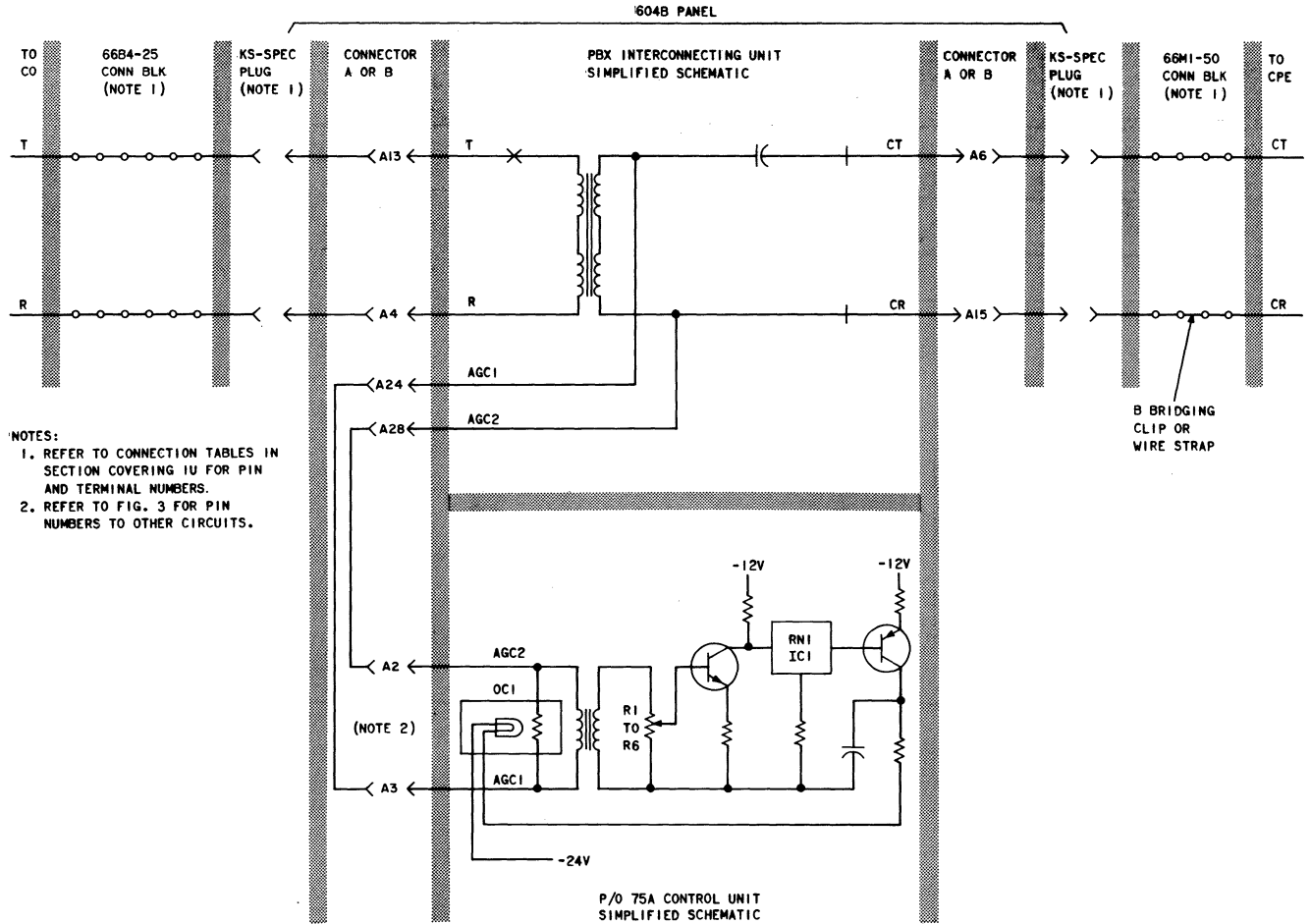
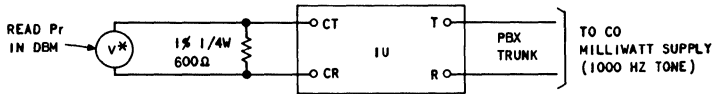
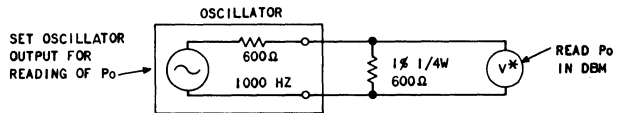


Fig. 5—Typical Connection of First ALC Circuit of 75A Control Unit to Interconnecting Unit in 604B Panel



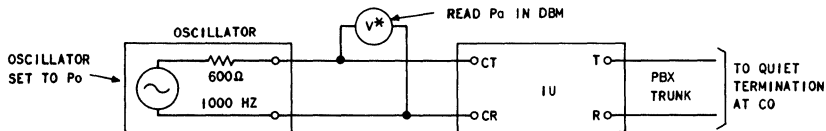
\* HIGH IMPEDANCE AC VOLTMETER (VOLTMETER WITH INTERNAL  $600\Omega$  INPUT TERMINATION) MAY BE USED IN PLACE OF RESISTOR AND HIGH IMPEDANCE VOLTMETER

A. MEASURE RECEIVED POWER



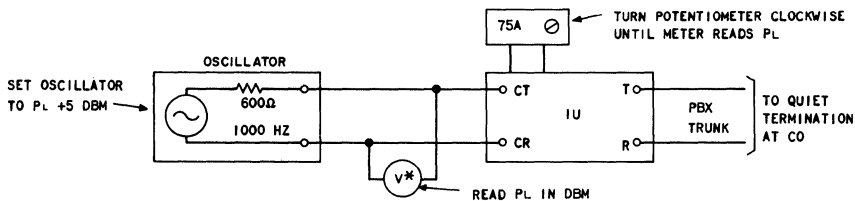
\* HIGH IMPEDANCE AC VOLTMETER (VOLTMETER WITH INTERNAL  $600\Omega$  INPUT TERMINATION) MAY BE USED IN PLACE OF RESISTOR AND HIGH IMPEDANCE VOLTMETER.

B. SET OSCILLATOR OUTPUT POWER



\* HIGH IMPEDANCE AC VOLTMETER (NO  $600\Omega$  TERMINATION)

C. MEASURE APPARENT POWER



\* HIGH IMPEDANCE AC VOLTMETER (NO  $600\Omega$  TERMINATION).

D. ADJUST LEVEL CONTROL ON 75A

Fig. 6—Typical 75A Set Up Procedure

**Note:** If several lines are being adjusted at the same time, use the reading from the line with the smallest loss (least -dBm received power).

**5.05** For purposes of illustration, assume the  $P_R$  reading was -3 dBm.

- (1) Using this reading, refer to Table A to find the test oscillator power ( $P_o$ ) and the maximum allowable power from the customer ( $P_c$ ). Using the assumed reading of -3 dBm,  $P_o$  is -8 dBm and  $P_c$  is -10 dBm.

TABLE A

RECEIVED POWER $P_R$	MAX CUSTOMER POWER $P_C$	OSCILLATOR POWER $P_O$
-1.5 to -2.4	-11	-8
-2.5 to -3.4	-10	-8
-3.5 to -4.4	-9	-8
-4.5 to -5.4	-8	-8
-5.5 to -6.4	-7	-7
-6.5 to -7.4	-6	-6
-7.5 to -8.4	-5	-5

All power readings in dBm referenced to 1 milliwatt, 600 ohms.

- (2)  $P_c$  is the maximum allowable power that the customer's signal source should deliver into a 600-ohm resistive load and must be posted at the interface block for the customer's use. (Attach a tag to interface connecting block on customer side and mark for customer use.)

**5.06** Set the oscillator output power as follows:

- (1) Connect test equipment as shown in Fig. 6B.
- (2) Set oscillator to supply 1000-Hz.
- (3) Adjust oscillator output to read  $P_o$  on voltmeter (-8 dBm in example given).

**5.07** Measure apparent power as follows:

- (1) Connect test equipment as shown in Fig. 6C except do not connect to CR and CT.

- (2) Place call to quiet termination at serving CO over test line.

- (3) Connect oscillator to CR and CT (output should still be set at  $P_o$ ) and read apparent power ( $P_A$ ) on voltmeter.

**Note:** The apparent power may be larger or smaller than the oscillator power into the 600 ohm resistor, depending on the line impedance characteristics.

**5.08** Using reading of  $P_A$  obtained above, refer to Table B to determine power level setting ( $P_L$ ). Again for purposes of illustration, assume  $P_A$  was found to be -11 dBm. Table B then indicates that  $P_L$  should be -10 dBm.

TABLE B

APPARENT POWER $P_A$	75A LEVEL SETTING $P_L$
-10.5 to -11.4	-10
-9.5 to -10.4	-9
-8.5 to -9.4	-8
-7.5 to -8.4	-7
-6.5 to -7.4	-6
-5.5 to -6.4	-5

All power readings in dBm referenced to 1 milliwatt, 600 ohms.

**5.09** Connect test equipment as shown in Fig. 6D, increase the oscillator output, measured on the voltmeter, several dBm above the level of  $P_L$  (-10 dBm is example) then turn potentiometer on 75A control unit clockwise until voltmeter again reads  $P_L$ .

**5.10** Adjust potentiometers for other circuits under test using the procedure outlined in 5.04 to 5.09.

#### OPERATIONAL TEST

**5.11** When trouble is suspected in the 75A control unit, a quick operational test may be performed by opening the suspected circuit at the interface connecting block. Connect an oscillator and voltmeter to the CT and CR terminals to the IU. Slowly increase oscillator output power from about -15 dBm to 0 dBm. The voltmeter reading

should slowly increase up to a point approximately equal to the  $P_c$  value and remain there as the oscillator output is increased to 0 dBm. This would indicate that the ALC circuit is working properly. Repeat this procedure for the other five ALC circuits in the 75A control unit.

**5.12** If trouble is suspected in the 75A control unit, replace it with a new unit and adjust the six level adjusting controls according to the set up procedures given in 5.03 to 5.10 above.

**5.13** If trouble is not indicated to be in the 75A control unit, refer to the section covering the IUs in use for further tests.

**5.14** If the tests are satisfactory, remove all test connections and replace the B bridging clips (or wire straps) on the 66M1-50 interface connecting block.



***Do not attempt any tests or repairs to the customer-provided equipment.***

**5.15** When in the repairman's judgment the trouble is located in the CPE, the Repair Service Bureau should be notified so that proper Maintenance of Service Charge billing can be initiated as outlined in Section 601-101-312 entitled Maintenance of Service Charge on Service With Customer-Provided Equipment (CPE).

## **6. CONNECTIONS**

**6.01** All necessary connections are provided by the internal wiring of the 604B panel when a 75A control unit is plugged into position 13 or 14.

## INTERCONNECTING DEVICES

### COMMON EQUIPMENT

### 142A TEST SET

#### 1. GENERAL

**1.01** This section provides identification, operation, and maintenance information for the 142A test set.

**1.02** This section is reissued to:

- Change title to delete reference to 242A adapter
- Remove Fig. 2 (242A adapter)
- Change Fig. 3 (142A Test Set, Connections) to Fig. 2 and revise wiring for CS-CG resistance switch
- Revise Fig. 1 to show new slide switch for CS-CG resistance switch
- Add Tables A and B
- Add new lead assemblies.

**1.03** This issue of the section is based on the following drawing:

SD-1E258-01, Issue 1—142A Test Set

If this section is to be used with equipment or apparatus reflecting later issue(s) of the drawing, reference should be made to the SDs to determine the extent of the changes and the manner in which the section may be affected.

#### 2. IDENTIFICATION

##### PURPOSE

**2.01** The 142A test set (Fig. 1) is designed to permit field testing of various multilead interconnecting units (IUs) by simulating the inputs

from the customer-provided equipment (CPE). The test set can be used for installation and maintenance tests of the 101-, 102-, 108-, and J53050J-type IUs.

##### ORDERING GUIDE

###### (a) *Basic Unit*

- Set, Test, 142A

###### (b) *Replaceable Components*

- 841122322 Lead Assembly—two conductor, for supplying power to test set
- 841224330 Lead Assembly—ten conductor, for access to IU. Furnished with alligator clips for connection to all 66-type blocks.
- Fuse, 70H (3/4 ampere)
- Lamp, A3—replacement for PWR, CS, CBS-, C-, CRV- lamps

###### (c) *Optional Components*

- 841720527 Lead Assembly—ten conductor, with 961A connector (200 mil spacing) for connection to 66M1-50 connecting block
- 841720535 Lead Assembly—ten conductor, with 961B or RS-16349 connector (250 mil spacing) for connection to 66-type connecting block (see Table A).

###### (d) *Associated Apparatus*

- Set, Test Hand, 1013A, or equivalent.

#### NOTICE

Not for use or disclosure outside the  
Bell System except under written agreement

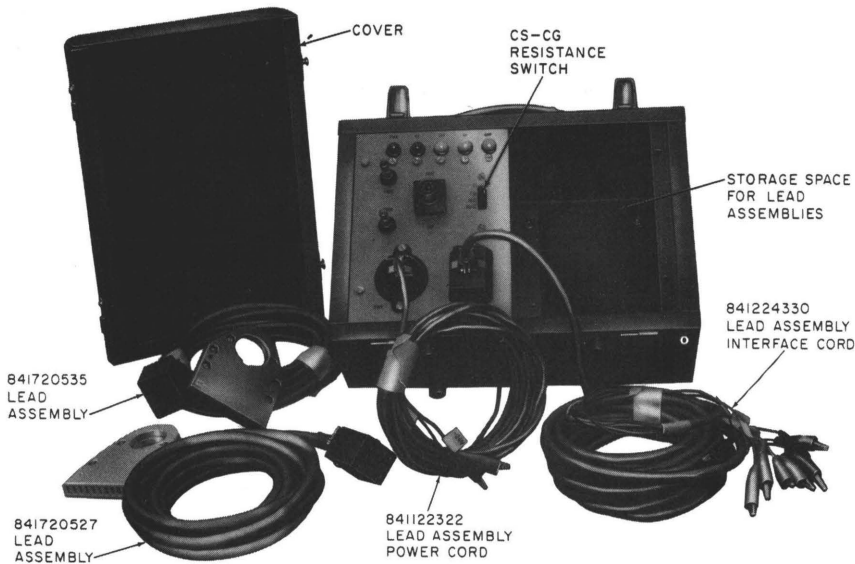


Fig. 1—142A Test Set Shown With Optional Lead Assemblies

**DESIGN FEATURES**

**2.02** Features of the 142A test set:

- Self-contained in portable metal case 10 inches wide, 6 inches high, and 7 inches deep, including lead assembly storage space. The cover is removable.
- Powered from same 24-volt power source as IU under test.
- Permits complete installation and maintenance testing on the customer's premises for the following IUs:

IU TYPE	USOC CODE
101	CDH, CED
102	CD7, CD8, CD9, C2ACP, C2AKS, CET
108	CD6, CDA
J53050J	TAS

- Visual indications of the status of the IU output leads.
- Terminals for 1013A hand test set, or equivalent, to permit monitoring or voice communication.
- Provision for varying resistance in CS-CG loop.

*Note:* This is a slide switch on current production; earlier models used a rotary switch.

- Self-indicating fuse in power supply lead and visual indication (PWR lamp) when power is applied to test set.
- Requires typically 200 mA (300 mA maximum) of testing current at 24 volts dc during testing.

**3. OPERATION**

**3.01** The 142A test set is designed to permit a quick field test of the J53053J IU and the 101-, 102-, and 108-type IUs, using visual signals as indications of operations. It may not detect

marginal operation, for instance, that caused by excessive loops effecting transmission or dial pulsing. No positive test set indication is provided regarding transmission. Results may be relative with variations due to minor differences in the 1013A hand test set and the user's judgment.

**3.02** Where marginal operation is suspected, more precise testing gear may be required.

**3.03** The test set should be connected to the IU on the telephone company side of the interface block, permitting testing of the unit, mounting arrangement, and all wiring up to the point of demarcation from customer responsibility. ***The CPE must be disconnected before the test set is attached.***

**3.04** For the specific method of connecting lead assemblies involved, refer to the section covering the connecting arrangement involved.

**3.05** The IU to be tested and the 142A test set should be set up as follows:

- (1) Disconnect the CPE by removing the B bridging clips or wire straps at the interface block.
- (2) Select the proper lead assembly (from the three available 10-conductor lead assemblies in Table A) and connect it to the telephone company side of the interface connecting block.

**Note:** Lead assemblies with 961-type connectors have the tip at the end of the connector opposite the cord entrance.

(3) Connect the leads from the 2-conductor power cord to -24 volts and ground. This voltage should be obtained from the same source used to power the IU under test. The PWR lamp should light at this time.

(4) Connect a 1013A hand test set to the HNDR and HNDT terminals of the test set with the MON-TALK switch in the MON position.

(5) Set the CS-CG slide switch in the 18-ohm position for a 101A or 102A, and in the 100-ohm position when testing the 101B, 101C, 102B, 108A, or J53053J IU.

**3.06** The test sequence following is general and may vary slightly, depending on the IU and connecting arrangement involved. For instance, the CBS1 and CBS2 leads are only used with the 101-type IUs (ground start trunks). The specific sequence will be covered in the section covering the arrangement involved.

**3.07** After circuit preparation, proceed as follows:

- (1) Operate switch on 1013A hand test set to the TALK position. The S relay in the 142A test set will operate, lighting the CS lamp and providing ground on the CS lead through the

◆ TABLE A ◆

SELECTION OF LEAD ASSEMBLIES

CONNECTING BLOCK	841720527 LEAD ASSEMBLY (WITH 961A CONNECTOR)	841720535 LEAD ASSEMBLY (WITH 961B CONNECTOR)*	841224330 LEAD ASSEMBLY (WITH CLIPS)
66M1-50	•		•
66A Type		•	•
66B Type		•	•
66C Type		•	•
66D Type		•	•
66E Type		•	•

\* Some units may be equipped with RS-16349 connectors.



selected resistance on the CS-CG switch. Ground on the CS lead causes the IU to seize the CO trunk as indicated by the CBS- lamp becoming lit (101-type IU only) and dial tone being heard in the hand test set. If the IU is a 101B used on a ground start trunk, a ground hum may be heard in the hand test set during trunk seizure. ***This is a normal condition caused by the ground start placed on the ring passing through the coupling transfer and will not be heard through the CPE.***

**Note:** If the IU fails to seize the CO trunk, move the CS-CG switch to a lower value. If the IU now operates properly, it should be considered marginal. ♦Circuits which operate only in the 0 position should be replaced.♦

- (2) Dial the local test desk using the 1013A hand test set. The S relay and the CS lamp should follow the dial pulses. Request the test desk to call back on the trunk under test.
- (3) Operate the hand test set to the MON position. The CS lamp should be extinguished indicating the S relay in the 142A test set has released, removing the ground from the CS lead. The CBS- lamp should also be extinguished in approximately 1/2 second indicating the IU has released the CO trunk and the CO has disconnected.
- (4) When the trunk is seized on the return call from the test desk, the CBS- lamp lights. When ringing is applied to the trunk, the C- lamp lights, following the ringing cycle.
- (5) Reoperate the hand test set switch to TALK. The C- lamp should extinguish and the CS lamp lights indicating ringing has been tripped and the call answered. The trunk should now be cut through the IU and transmission quality judged using the hand test set.
- (6) Instruct the test desk to reverse line polarity. The CRV- lamp should light and remain lit for the duration of the reversal.
- (7) Have the test desk release the trunk and return hand test set switch to MON. The CBS- and CS lamps should be extinguished and the IU should be in the idle condition.

**3.08** When all testing is complete, remove power and interface cords. Connect CPE by restoring B bridging clips or wire straps at interface connecting block.

#### 4. CONNECTIONS

**4.01** Figure 2 provides a schematic of the 142A test set and the setup required to test a typical IU. For a complete schematic of the IU and testing procedures, refer to the section for the specific connecting arrangement.

**4.02** ♦Table B shows the three positions of the CS-CG resistance slide switch, the resistance at each position, and the switch contact through which each position connects.♦

#### 5. MAINTENANCE

**5.01** Maintenance of the 142A test set is limited to replacement of the components listed in the ORDERING GUIDE.

**5.02** To replace the A3 lamps, remove the 2-type lamp caps using a 319B tool and the lamp using a 553A tool. When installing new lamp, ensure lamp contact surfaces mate with those in the socket.

**5.03** Removing the cap of the fuse block will provide access to the 70H fuse if replacement is required.

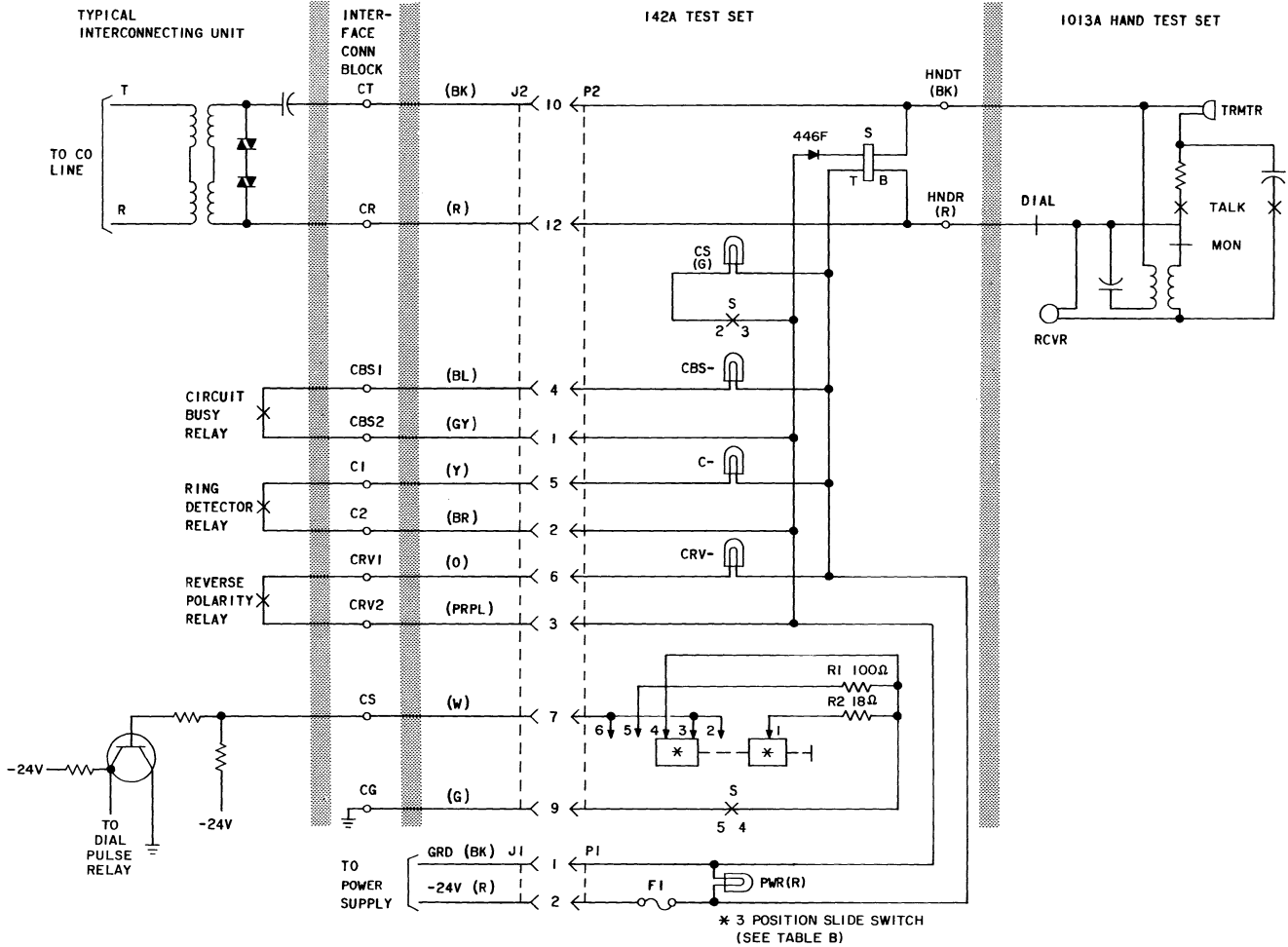


Fig. 2—142A Test Set, Connections

◆ TABLE B ◆

## CS-CG SWITCH POSITIONS

SWITCH POSITION	RESISTANCE IN OHMS	CIRCUIT PATH THROUGH SWITCH CONTACTS	INTERCONNECTING UNITS
1	0	3-4	To verify if marginal
2	18	1-2; 4-5	101A, 102A
3	100	2-3; 5-6	J53053J, 101B, 101C, 102B, 108A

## VOICE CONNECTING ARRANGEMENTS QKT AND QKTBT

### 30-TYPE VOICE COUPLER

#### 1. GENERAL

**1.01** This section provides identification, installation, operation, maintenance and connection information for the 30-type voice coupler when used to provide Voice Connecting Arrangements (VCA) QKT and QKTBT. Voice Connecting Arrangement QKT may use either the 30A (MD) or 30B coupler to permit voice transmission only from the customer-provided equipment (CPE). Voice Connecting Arrangement QKTBT uses the 30B voice coupler to permit voice transmission and tone address signaling from the CPE.

**1.02** This section is reissued to:

- Include connections for H1B and C4B ringers
- Revise drawings and tables.

**1.03** This section provides information on modification and connections to be made to telephone sets to permit their use with voice couplers.

**1.04** If the customer wants a copy of the Technical Reference which covers this interface specification, the customer should contact the local Telephone Company Business Office or the Marketing Representative.

#### 2. IDENTIFICATION

**2.01 Purpose:** To provide 2-wire connection of CPE (voice transmitting and/or receiving) to Bell System lines. These couplers must be associated with a Bell System set equipped with an exclusion key. The coupler provides dc isolation and limits excessive signals.

**2.02 Ordering Guide (Fig. 1 and 2):**

- Coupler, Voice, 30A\*
- Coupler, Voice, 30A\*, modified for radio frequency interference (RFI) (5.06)
- Coupler, Voice, 30B\*

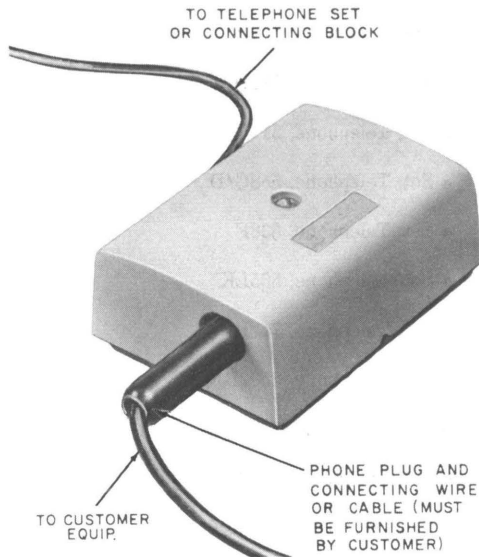


Fig. 1—30-Type Voice Coupler

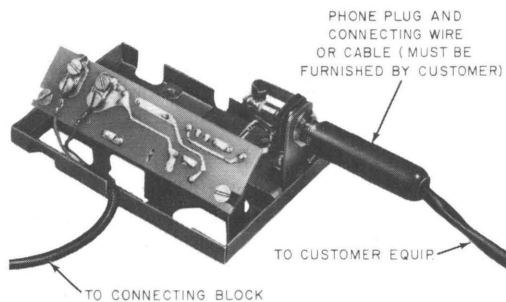


Fig. 2—30-Type Voice Coupler, Cover Removed

- Coupler, Voice, 30B\*, modified for RFI (5.06)
- \* -49 (Light olive gray).

#### Associated Apparatus (Order Separately, 3.02)

- Set, Telephone, 502B
- Set, Telephone, 511D
- Set, Telephone, 511F
- Set, Telephone, 558C/D
- Set, Telephone, 558F
- Set, Telephone, 565LK
- Set, Telephone, 712B
- Set, Telephone, 2502B
- Set, Telephone, 2511F/H
- Set, Telephone, 2558D
- Set, Telephone, 2565LK
- Set, Telephone, 2712B
- Kit of Parts, D-179935 (exclusion switch for 565- or 2565LK telephone set).

#### 2.03 Design Features:

- (a) Component parts are housed in a modified 74A connecting block. Approximate dimensions are 4 inches long by 2-3/4 inches wide by 1-5/8 inches deep.
- (b) A standard 0.25-inch tip-sleeve phone jack permits the electrical connection of customer-provided (CP) voice communication device.
- (c) Any power for customer equipment must be supplied by the customer. DC power is not available at the coupler and must not be applied to the coupler.
- (d) 30A and 30B couplers are electrically and mechanically the same except for the higher peak signal clipping level of the 30B to permit customer tone address signaling from CPE.

### 3. INSTALLATION

**3.01** Insofar as possible be guided by the customer's wishes in placing the apparatus. The coupler will mount to any flat surface. A backboard is not required unless mounting to a damp surface or when a backboard will facilitate mounting.

**3.02** Where the customer needs only a single bridge, a 502B or 2502B telephone set is recommended. If the customer requires the transmitter and/or receiver of the telephone set to be disabled, a 511- or 2511-type telephone set (or equivalent) is recommended. The 565LK or 2565LK telephone set allows the customer to bridge the coupler to any line picked up in the set and use the turnkey to disable the transmitter and/or receiver of the set. If tip party identification is required, the 511D or 511F telephone set is recommended.

**3.03** Other type telephone sets may be used provided the set is equipped with an exclusion key to connect the voice coupler to the central office (CO) line. Where no exclusion key is available, as with CALL DIRECTOR® sets, see Voice Connecting Arrangement CEBAW (Section 463-311-106).

**3.04** If the exclusion switch has spare contacts available, they may be used to automatically disable the transmitter and/or receiver (Fig. 4).

**3.05** The F-57948 (MD) voice coupler is equipped with a terminal strip for line and associated telephone set connections; the 30-type voice coupler requires these connections be made at an external connecting block.

### 4. OPERATION (Fig. 3)

**4.01 Incoming Call:** An incoming call is received in the usual way, and the coupler is connected to the line and short across coupler output removed by lifting the associated telephone set exclusion key.

**4.02 Outgoing Call:** An outgoing call is placed in the usual way, and the coupler is connected to the line by lifting the associated telephone set exclusion key. The coupler should be disconnected and shorted (exclusion key down) when dialing to prevent possible dial pulse distortion and transmission of dial pulses through the coupler to the CPE.

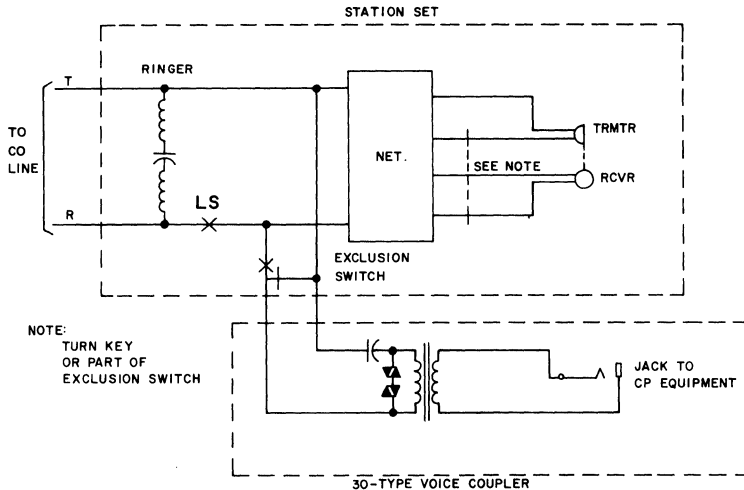


Fig. 3—Schematic—Voice Connecting Arrangements QKT and QKTBT

**4.03 Disconnect:** The voice coupler will be disconnected when the associated telephone set goes on-hook to terminate the call or when the exclusion key is pushed down to normal position.

**4.04** The telephone set remains connected to the line and is functional on both incoming and outgoing calls unless transmitter or receiver cutoff option is in effect.

**4.05** As a customer option, the transmitter and/or receiver of the associated telephone set may be disconnected when the CPE is in operation. The associated telephone set may be equipped with a cutoff turnkey or spare exclusion key contacts used for this purpose.

**4.06** When the turnkey is used to disconnect the transmitter and/or receiver, the turnkey must be in the "on" position to receive or make a call and turned "off" to disconnect transmitter or receiver or both when the coupler is used. The cutoff key must be manually restored when the call is terminated. When the exclusion switch contacts are used to disconnect the transmitter and/or receiver, lifting the exclusion switch will automatically disconnect the transmitter or receiver or both. When the call is terminated, the transmitter and/or receiver will be automatically restored.

## 5. MAINTENANCE

**5.01** Maintenance is limited to checking connections and determining if the coupler is working properly by monitoring reception at the tip and sleeve of the jack on the coupler with customer equipment disconnected.

**5.02** Go off-hook on the associated telephone set and verify normal dial tone in associated telephone set. Connect a 1013A (or equivalent) hand test set with MON-TALK switch in MON position to the tip and sleeve of the jack on the coupler; no dial tone should be heard. Dial digit "0" using the dial of the telephone set; no dial clicks or tones should be heard in the hand test set. Go on-hook and off-hook and lift exclusion key; dial tone should be heard in the hand test set at about the same volume as heard in the associated telephone set receiver prior to lifting the exclusion key.

**5.03** If the associated telephone set is equipped with a cutoff turnkey, operate to the "off" position and verify that the transmitter and/or receiver of the telephone handset are disconnected while dial tone at normal volume is heard on hand test set at coupler.

**5.04** If the associated telephone set is using spare contacts on the exclusion switch to disconnect the transmitter and/or receiver, verify that the transmitter and/or receiver of the telephone handset are disconnected while dial tone at normal volume is heard on the hand test set at the coupler. If all tests are satisfactory, the coupler is working properly.



***Do not attempt any tests or repairs to the CPE.***

**5.05** When in the repairman's judgment the trouble is located in the CPE, the Repair Service Bureau should be notified so that proper Maintenance of Service Charge billing can be initiated as outlined in Section 660-101-312 entitled Maintenance of Service Charge on Services With Customer-Provided Equipment (CPE).

**5.06** If RFI is encountered, the F-57948 (MD) or 30-type voice coupler should be replaced by a 30-type voice coupler stamped "Modified for RFI". In addition, install a 1542A inductor in series with tip and ring of the coupler at the coupler connecting block (Fig. 9). Refer to Section 500-150-100 entitled "Radio Signal Suppression for Telephone Sets" for complete modifications necessary when RFI is encountered.

## **6. CONNECTION INDEX**

Table A—Typical Telephone Set Modified for Use With 30-Type Voice Coupler

Table B—502B Telephone Set Modified for Use With F-57948 (MD) or 30-Type Voice Coupler

Table C—Modification of 511D Telephone Set for Use With F-57948 (MD) or 30-Type Voice Coupler

Table D—511D Telephone Set—Modified for Tip Party Identifying Ground and Use With F-57948 (MD) or 30-Type Voice Coupler

Table E—Modification of 511F Telephone Set for Use With F-57948 (MD) or 30-Type Voice Coupler

Table F—511F Telephone Set—Modified for Tip Party Identifying Ground and Use With F-57948 (MD) or 30-Type Voice Coupler

Table G—Modification of 558C/D Telephone Set for Use With 30-Type Voice Coupler

Table H—Modification of 558F Telephone Set for Use With 30-Type Voice Coupler

Table I—Modification of 565LK Telephone Set for Use With F-57948 (MD) or 30-Type Voice Coupler

Table J—Modification of 712B Telephone Set for Use With 30-Type Voice Coupler

Table K—2502B Telephone Set—Modified for Use With F-57948 (MD) or 30-Type Voice Coupler

Table L—2511F Telephone Set—Modified for Use With F-57948 (MD) or 30-Type Voice Coupler

Table M—Modification of 2558D Telephone Set for Use With 30-Type Voice Coupler

Table N—2565LK Telephone Set—Modified for Use With F-57948 (MD) or 30-Type Voice Coupler

Table O—Modification of 2712B Telephone Set for Use With 30-Type Voice Coupler

Table P—1542A Inductor Connections to Telephone Sets—Modified for RFI

Fig. 4—Typical Telephone Set Modified for Use With 30-Type Voice Coupler Using Exclusion Key to Automatically Disable Transmitter and Receiver

Fig. 5—502B Telephone Set—Modified for Use With F-57948 (MD) or 30-Type Voice Coupler

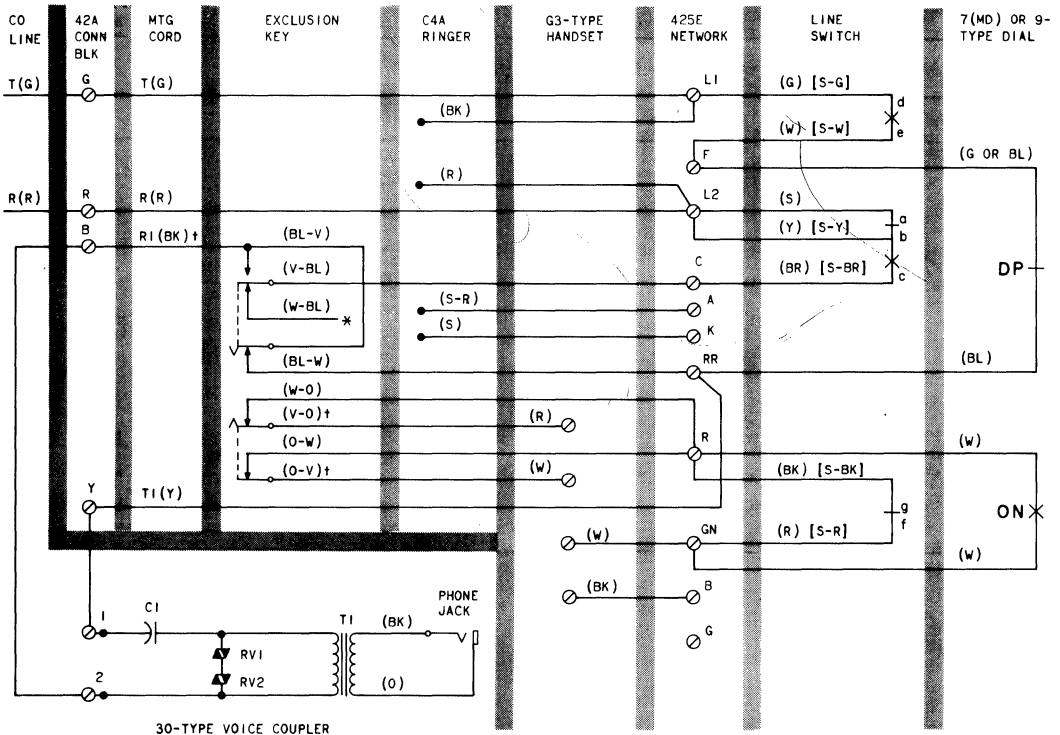
Fig. 6—511D Telephone Set—Modified for Use With F-57948 (MD) or 30-Type Voice Coupler Using Turnkey to Disable Transmitter and Receiver

Fig. 7—511F Telephone Set—Modified for Use With F-657948 (MD) or 30-Type Voice Coupler

Voice Coupler Using Cutoff Key to Disable Transmitter and Receiver

Fig. 8—565LK Telephone Set—Modified for Use With F-57948 (MD) or 30-Type

Fig. 9—1542A Inductor Used With 30-Type Voice Coupler



NOTE:  
 MODIFY SET WIRING PER  
 TABLE A.

( ) CURRENT COLOR CODE  
 [ ] MD COLOR CODE  
 \* INSULATE AND STORE  
 † SPLICE USE D161488 CONNECTOR

Fig. 4—Typical Telephone Set—Modified for Use With 30-Type Voice Coupler Using Exclusion Key to Automatically Disable Transmitter and Receiver



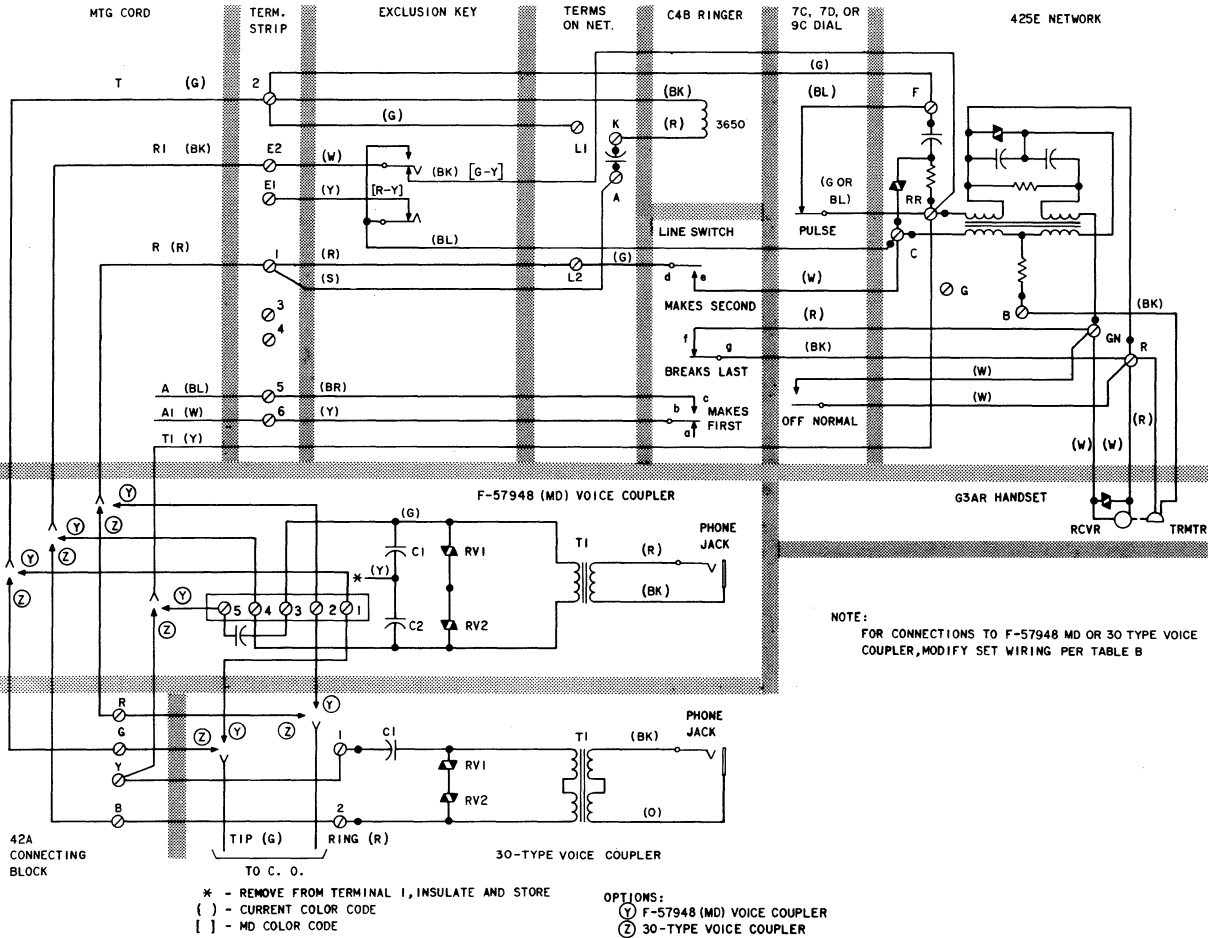


Fig. 5—502B Telephone Set—Modified for Use With F-57948 (MD) or 30-Type Voice Coupler

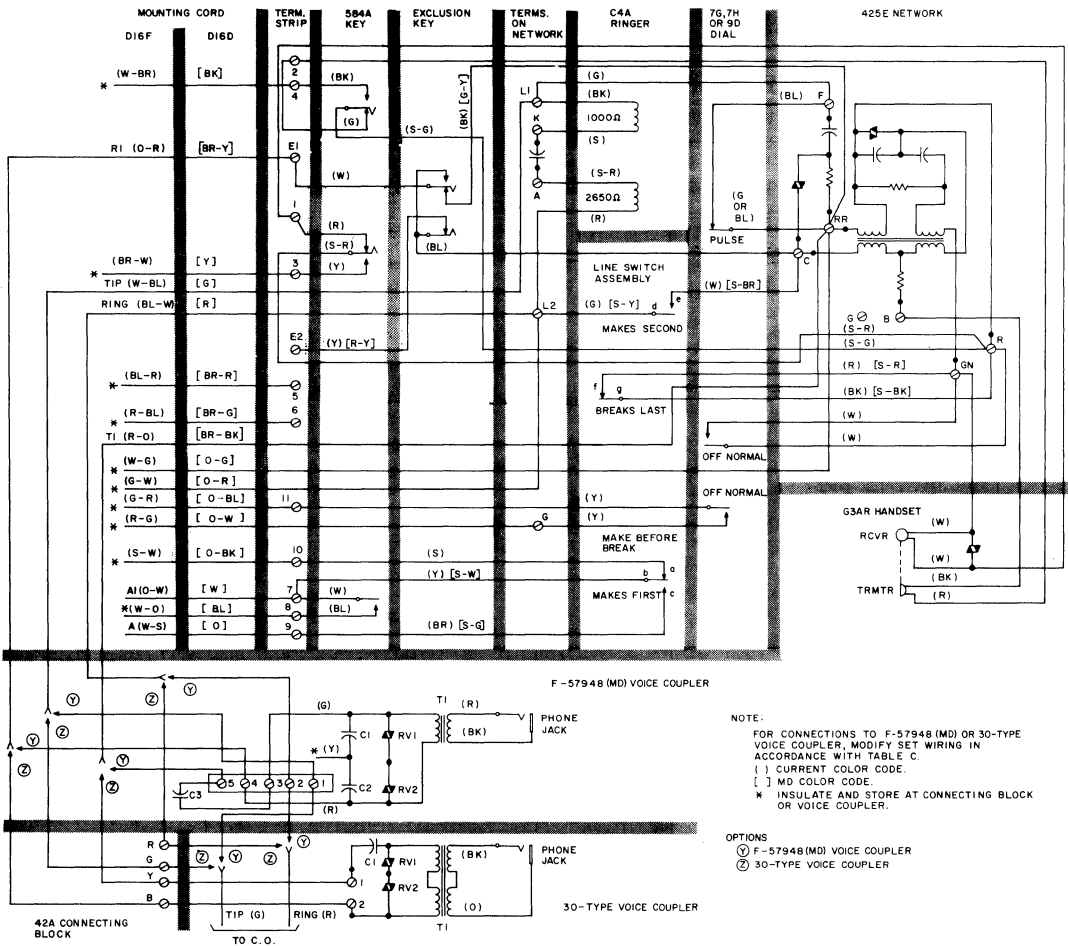


Fig. 6—511D Telephone Set—Modified for Use With F-57948 (MD) or 30-Type Voice Coupler Using Turnkey to Disable Transmitter and Receiver

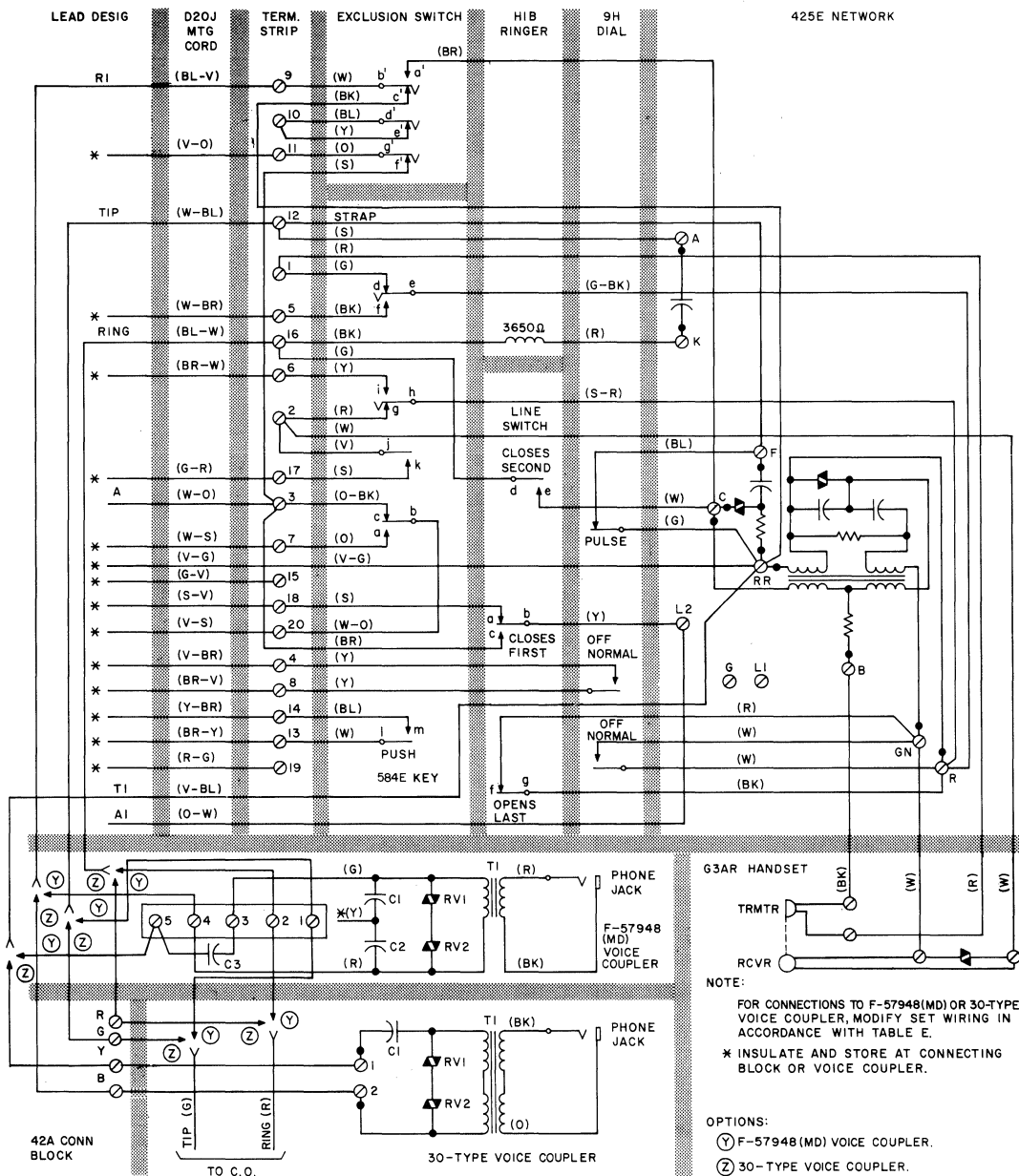


Fig. 7—511F Telephone Set—Modified for Use With F-57948 (MD) or 30-Type Voice Coupler Using Turnkey to Disable Transmitter and Receiver

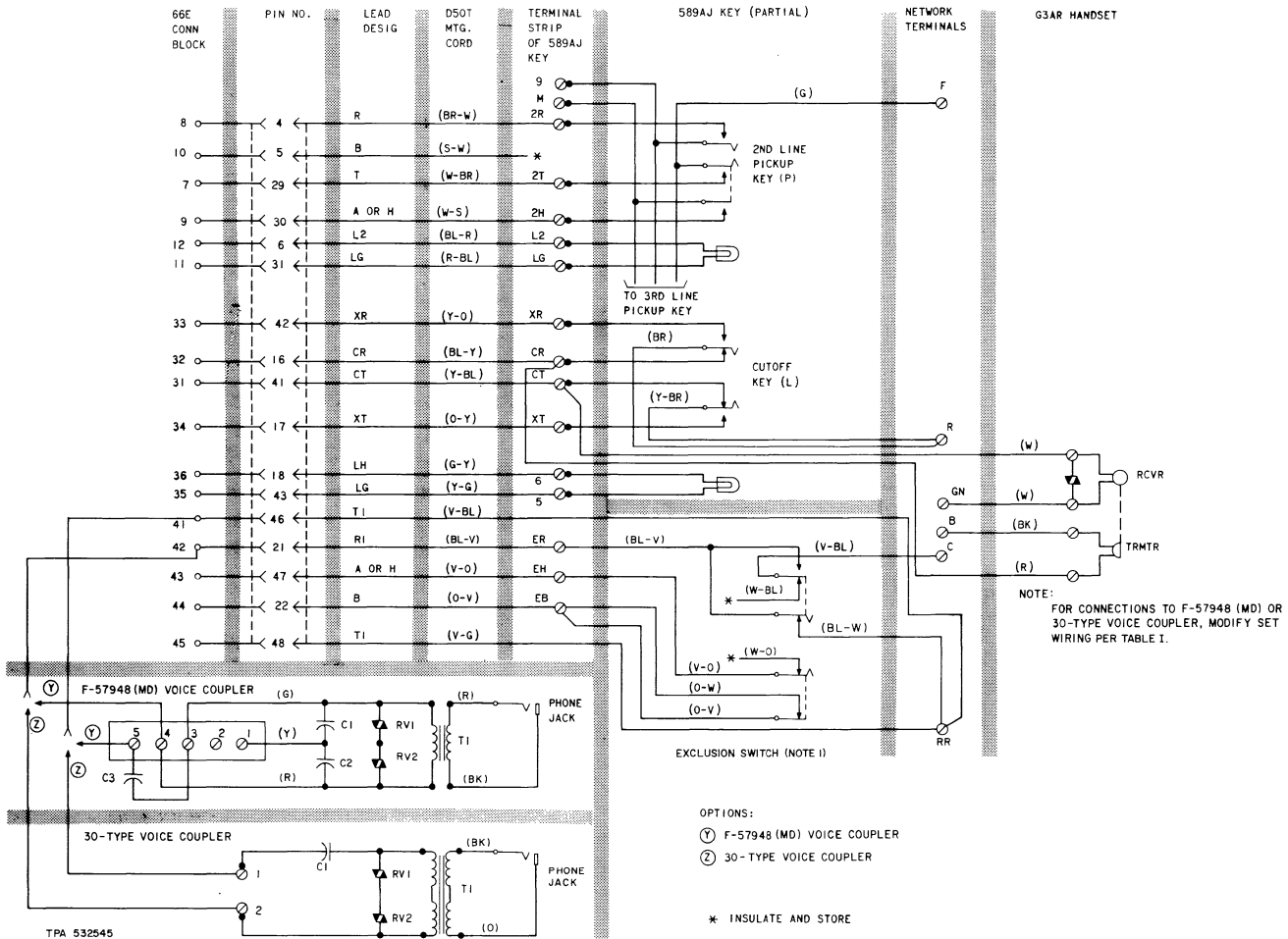
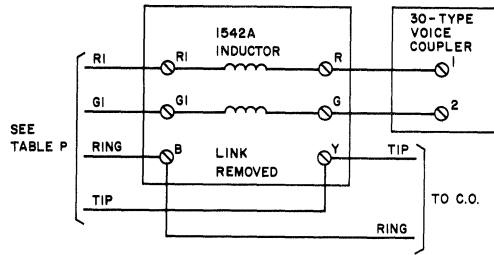


Fig. 8—565LK Telephone Set—Modified for Use With F-57948 (MD) or 30-Type Voice Coupler Using Cutoff Key to Disable Transmitter and Receiver



**Fig. 9—1542A Inductor Used With 30-Type Voice Coupler (When Modified for RFI)**

**TABLE A**  
**TYPICAL TELEPHONE SET – MODIFIED FOR USE WITH**  
**30-TYPE VOICE COUPLER**

	WIRE OR LEAD	REMOVE FROM NETWORK	CONNECT TO		
			MTG CORD	EXCLUSION KEY	NETWORK
Modification to connect voice coupler to CO line	Exclusion Key (Ordered Separately)	BL-V		BK†	
		V-BL			C
		BL-W			RR
		W-BL		*	
Operation of exclusion key disables RCVR	Exclusion Key	O-W			R
	RCVR	W	R	O-V†	
Operation of exclusion key disables TRMTR	Exclusion Key	W-O			R
	TRMTR	R	R	V-O†	

*Note:* See Figure 4 for example.

\* Insulate and store.

† Splice using D161488 connector.

TABLE B

502B TELEPHONE SET – MODIFIED FOR USE WITH  
F-57948 (MD) OR 30-TYPE VOICE COUPLER (See Note)

	WIRE OR LEAD		REMOVE FROM		CONNECT TO	
			TERM. STRIP	NETWORK	TERM. STRIP	NETWORK
Modification to connect voice coupler to line and telephone set	Mtg Cord*	Y	E1			RR
	Exclusion Key	BL	E1			C
		BK		L1		RR
		Y		L2	E1	

*Note:* Refer to Fig. 5 for connections to F-57948 (MD) or 30-type voice couplers.

\* Insulate and store (BL) and (W) mounting cord leads if not required for A lead control. Disconnect, insulate, and store (Y) lead of F-57948 (MD) voice coupler.

TABLE C

MODIFICATION OF 511D TELEPHONE SET FOR USE  
WITH F-57948 (MD) OR 30-TYPE VOICE COUPLER (See Note)

	WIRE OR LEAD		REMOVE FROM		CONNECT TO	
			TERM. STRIP	NETWORK	TERM. STRIP	NETWORK
Modification to connect voice coupler to line and telephone set	Mtg* Cord	W-BL	2			L1
		BL-W	2			L2
		R-O	E2			RR
	C4A Ringer	BK	6			L1
		R†	5			L2
	Exclusion Key	BL	E1			C
		BK	2			RR
		Y	1		E2	
W		E2		E1		
Operation of 584A key disables TRMTR	584A Key	S-G		L1		R
	TRMTR	R		R	2	
Operation of 584A key disables RCVR	584A Key	S-R		L2		R
	RCVR	W		R	1	

*Note:* Refer to Fig. 6 for CO, mounting cord, and interconnections to F-57948 (MD) or 30-type voice coupler. If needed, MD lead colors are shown in Fig. 6. If A lead control is required, use (W-S) and (O-W) mounting leads to extend A and A1 to line circuit. If 3-type speaker-phone is required, refer to appropriate connection section in Division 512.

\*Insulate and store unused mounting cord leads and (Y) lead of F-57948 (MD) voice coupler.

†If C4B ringer is used, (S) lead will be on terminal 5 on terminal strip; move to L2 of network.

TABLE D

511D TELEPHONE SET – MODIFIED FOR  
TIP PARTY IDENTIFYING GROUND AND USE WITH  
F-57948 (MD) OR 30-TYPE VOICE COUPLER (Note 1)

	WIRE OR LEAD		CONNECTIONS			SET MODIFICATIONS			
			42A CONN. BLK.	30-TYPE VOICE COUPLER	F-57948 (MD) TERM. STRIP	REMOVE FROM		CONNECT TO	
						TERM. STRIP	NET-WORK	TERM. STRIP	NET-WORK
Inside wire at conn blk or F-57948 (MD) term.	Ground		Y		1				
	Tip		G		5				
	Ring		R		2				
Mtg cord at conn blk or F-57948 (MD) term. strip (Note 2)	O-W		Y		1				
	W-BL		G		5				
	BL-W		R		2				
	R-O		B		4				
	All Other		*	*	*				
Inside wire from conn blk to 30A-type V/C			G	1					
			B	2					
Modifications to connect telephone set and voice coupler to line	Mtg Cord	W-BL				2			L1
		BL-W				1			L2
	† C4A Ringer Leads	R				5			K
		BK				6		7	
		S					K		B
	Exclusion Key	S-R					A		B
		Y				1		E1	
		BL				E1			RR
	Line Switch	BK				2		E2	
		S				10			A
		BR				9			C
		Y				7			L1
	Strap	W					C		F
	Operation of line key disables TRMTR	Key	S-R				L2		R
		TRMTR	R				R	1	
Operation of line key disables RCVR	Key	S-G				L1		R	
	RCVR	W				R	2		

**Notes:**

- Connections shown are for tip party with 1000Ω to ground. For 2650Ω, connect ringer leads as follows: (R) and (BK) to network terminal B, (S) to network terminal K and (S-R) to terminal strip 7.
  - Disconnect, insulate, and store (Y) lead of F-57948 (MD) voice coupler.
- \* Insulate and store.  
† C4A ringer must be used; TPI cannot be supplied with CAB ringer.

**TABLE E**  
**MODIFICATION OF 511F TELEPHONE SET FOR USE**  
**WITH F-57948 (MD) OR 30-TYPE VOICE COUPLER**  
 (See Note)

	WIRE OR LEAD		REMOVE FROM		CONNECT TO	
			TERM. STRIP	NETWORK	TERM. STRIP	NETWORK
Modification to connect voice coupler to line and telephone set	Mtg* Cord	W-BL	1		12	
		V-BL	9			RR
		BL-W	2		16	
		BL-V	10		9	
	HIB Ringer	S†	1		12	
		BK	2		16	
	Exclusion Key	BK	1			RR
		Y	2		10	
		BR	10			C
	Line Switch	G	15		16	
		BR	20		3	
	Add Strap				12	F
Operation of 584E key disables TRMTR	584E Key	G-BK		F		R
	TRMTR	R		R	1	
Operation of 584E key disables RCVR	584E Key	S-R	15			R
	RCVR	W		R	2	

*Note:* Refer to Fig. 7 for CO, mounting cord, and interconnections to F-57948 (MD) or 30-type voice couplers. If A lead control is required, use (W-O) and (O-W) mounting cord leads to extend A and A1 to line circuit. If 3-type speakerphone is required move (G-V) mounting cord lead to terminal strip 16 and (V-S) to 3; then connect per appropriate connection section in Division 512.

\* Insulate and store unused mounting cord leads and (Y) lead of F-57948 (MD) voice coupler.

† If HIA ringer is used, (R) lead will be on terminal 1. Move to terminal 12 on terminal strip.



TABLE F

**511F TELEPHONE SET – MODIFIED FOR TIP PARTY  
IDENTIFYING GROUND AND USE WITH F-57948 (MD) OR 30-TYPE  
VOICE COUPLER (Note 1)**

	WIRE OR LEAD	CONNECTIONS			SET MODIFICATIONS			
		42A CONN. BLK.	30-TYPE VOICE COUPLER	F-57948 (MD) TERM. STRIP	REMOVE FROM		CONNECT TO	
					TERM. STRIP	NET- WORK	TERM. STRIP	NET- WORK
Inside wire at conn blk or F-57948 (MD) term. strip	Ground	Y		1				
	Tip	G		5				
	Ring	R		2				
Mtg cord at conn blk or F-57948 (MD) term. strip (Note 2)	O-W	Y		1				
	W-BL	G		5				
	BL-W	R		2				
	BL-V	B		4				
	All Other	*	*	*				
Inside wire from conn blk to 30-type V/C		G	1					
		B	2					
Modifications to connect telephone set and voice coupler to line	Mtg Cord	W-BL			1		12	
		BL-W			2		16	
	† HIA Ringer Leads	R			1			K
		BK			2			L2
		S					K	B
		S-R					A	B
	Exclusion Key	W				9		RR
		BK				1		RR
	Line Switch	G				15		16
		W					C	F
		Y					L2	12
		BR				20		C
		S				18		A
Operation of line key disables TRMTR	Key	G-BK				F	R	
	TRMTR	R				R	1	
Operation of line key disables RCVR	Key	W-O			20		R	
	RCVR	W				R	3	

**Notes:**

1. Connections shown are for tip party with 1000Ω to ground. For 2650Ω, connect ringer leads as follows: (R) and (BK) to network terminal B, (S) to K, and (S-R) to L2.
2. Disconnect, insulate, and store (Y) lead of F-57948 (MD) voice coupler.

\* Insulate and store.

† HIA ringer must be used; TPI cannot be supplied with HIB ringer.

**TABLE G**  
**MODIFICATION OF 558C/D TELEPHONE SET FOR USE**  
**WITH 30-TYPE VOICE COUPLER (See Note)**

	WIRE OR LEAD	CONNECTIONS				SET MODIFICATIONS			
		TELSET		42A CONN BLK	30-TYPE COUPLER	REMOVE FROM		CONNECT TO	
		TERM STRIP	NET-WORK			TERM STRIP	NET-WORK	TERM STRIP	NET-WORK
Inside wire at conn blk	T			G					
	R			R					
	T1			B					
	R1			Y					
Inside wire at telephone set	T	2							
	R	1							
	T1		RR						
	R1	6							
Inside wire conn blk to voice coupler				B	1				
				Y	2				
Basic modifications to connect voice coupler to telephone set and line	584B/F Key	S-R				L2	E1		
		R			1		E1		
		G			2		E2		
	EXCN Key	Y			6			RR	
		W			5			C	
	Line Switch	G				L2	1		
Add Strap						2	F		
Disable TRMTR	584B/F Key	R			E1			R	
		S-R			E1			G	
	TRMTR	R				R		G	
Disable RCVR	584B/F Key	G			E2			R	
		G-BK				L1		L2	
	RCVR	W				R		L2	

*Note:* If A lead control is required, connect A1 to terminal 12 and A to terminal 9 on terminal strip in telephone set.

TABLE H  
 MODIFICATION OF 558F TELEPHONE SET FOR USE  
 WITH 30-TYPE VOICE COUPLER (See Note)

	WIRE OR LEAD	CONNECTIONS				SET MODIFICATIONS			
		TELSET		42A CONN BLK	30- TYPE COUPLER	REMOVE FROM		CONNECT TO	
		TERM STRIP	NET- WORK			TERM STRIP	NET- WORK	TERM STRIP	NET- WORK
Inside wire at conn blk	T			G					
	R			R					
	T1			B					
	R1			Y					
Inside wire at telephone set	T	1							
	R	2							
	T1		RR						
	R1	9							
Inside wire conn blk to voice coupler				B	1				
				Y	2				
Basic modifications to connect voice coupler to telephone set and line	584B/F Key	V				2		17	
		O-BK				3		7	
		R				2		15	
		G				1		5	
	EXCN Key	BK				1			RR
		BR				10			C
	Line Switch	BR				20		3	
		G				15		2	
Add Strap							1	F	
Disable TRMTR	584B/F Key	R				15			G
		S-R				15			R
	TRMTR	R					R		G
Disable RCVR	584B/F Key	G				5			R
		G-BK					F		L2
	RCVR	W					R		L2

*Note:* If A lead control is required, connect A1 to terminal 4 and A to terminal 3 on terminal strip in telephone set.

TABLE I

565LK TELEPHONE SET – MODIFIED FOR USE WITH  
F-57948 (MD) OR 30-TYPE VOICE COUPLER (See Note)

	WIRE OR LEAD	REMOVE FROM		CONNECT TO	
		589AJ KEY TERM. STRIP	NETWORK	589AJ KEY TERM. STRIP	NETWORK
Modifications to connect voice coupler to any line picked up in telephone set	D-179935 Exclusion Key (Ordered Separately)	BL-V		ER	
		V-BL			C
		BL-W			RR
		W-BL		*	
		O-W		EB	
		W-O		*	
		O-V		EB	
	V-O		EH		
	Mtg Cord	V-BL	ET		RR
Operation of cut-off key disables RCVR	589AJ Key	Y-BR	2T		R
	RCVR	W		R	CT
Operation of cut-off key disables TRMTR	589AJ Key	BR	2R		R
	TRMTR	R		R	CR

*Note:* Refer to Fig. 8 for connections to F-57948 (MD) or 30-type voice coupler. If a 3-type speakerphone is required, connect as shown in appropriate section in Division 512.

\*Insulate and store.

TABLE J  
 MODIFICATION OF 712B TELEPHONE SET FOR USE  
 WITH 30-TYPE VOICE COUPLER (See Note)

	LEAD DESIG	WIRE OR LEAD	CONNECTIONS		SET MODIFICATIONS			
			42A CONN BLK	30- TYPE COUPLER	REMOVE FROM		CONNECT TO	
					TERM STRIP	NET- WORK	TERM STRIP	NET- WORK
Mounting cord* at connecting block	T	W-BL	G					
	R	BL-W	R					
	T1	V-G	B					
	R1	G-V	Y					
Inside wire from conn blk to 30- type voice coupler			B	1				
			Y	2				
Basic modifications to connect telephone set and voice coupler to line	638A Key	S-R			L2		1	
		V			1		8	
	EXCN Key	BR				1		C
		W				3		L2
		BK				3		RR
	Line Switch	BR				E1		8
		G				L2		1
Add Strap							3 F	
Disable TRMTR	638A Key	S-R			1			G
		R			1			R
	TRMTR	R				R		G
Disable RCVR	638A Key	G-BK				F		L2
		G			3			R
	RCVR	W				R		L2

*Note:* If A lead control is required, connect A1 to terminal E1 and A to terminal 8 on terminal strip in telephone set.

\*Insulate and store unused leads.

TABLE K  
 2502B TELEPHONE SET – MODIFIED FOR USE WITH  
 F-57948 (MD) OR 30-TYPE VOICE COUPLER (See Note)

	WIRE OR LEAD		REMOVE FROM		CONNECT TO	
			TERM. STRIP	NETWORK	TERM. STRIP	NETWORK
Modification to connect voice coupler to line and telephone set	Mtg Cord*	Y	E1			RR
	Exclusion Key	BL	E1			C
		BK		L1		RR
		Y		L2	E1	

*Note:* Refer to Fig. 5 for connections to F-57948 (MD) or 30-type voice couplers.

\* Insulate and store (BL) and (W) mounting cord leads if not required for A lead control. Disconnect, insulate, and store (Y) lead of F-57948 (MD) voice coupler.

TABLE L

2511F TELEPHONE SET – MODIFIED FOR USE WITH  
F-57948 (MD) OR 30-TYPE VOICE COUPLER (See Note)

	WIRE OR LEAD		REMOVE FROM		CONNECT TO	
			TERM. STRIP	NETWORK	TERM. STRIP	NETWORK
Modification to connect voice coupler to line and telephone set	Mtg Cord*	W-BL	1		12	
		BL-W	2		16	
		V-BL	9			RR
		BL-V	10		9	
	HIB Ringer	S†	1		12	
		BK	2		16	
	Exclusion Key	BK	1			RR
		Y	2		10	
		BR	10			C
	Line Switch	G	15		16	
		BR	20		3	
	Dial	G		F	12	
	Operation of 631B (line) key disables TRMTR	631B Key	G-BK		F	
TRMTR		R		T	1	
Operation of 631B (line) key disables RCVR	631B Key	S-R	15			R
	RCVR	W		R	2	

*Note:* Refer to Fig. 7 for connections to F-57948 (MD) or 30-type voice coupler and 42A conn blk and to CO line. If A lead control is required, use (O-W) and W-O) mounting cord leads to extend A1 and A to line circuit. If 3-type speakerphone is required, move (G-V) mounting cord lead to terminal strip 16 and (V-S) to 3; move (V-G) mounting cord lead and (O) dial lead to an unused terminal; then connect per appropriate connection section in Division 512.

\*Insulate and store unused mounting cords leads. Disconnect, insulate and store (Y) lead of F-57948 (MD) voice coupler.

†If HIA ringer is used, (R) lead will be on terminal 1; move to terminal 12 of terminal strip.

TABLE M  
 MODIFICATION OF 2558D TELEPHONE SET FOR USE  
 WITH 30-TYPE COUPLER

	WIRE OR LEAD	CONNECTIONS				SET MODIFICATIONS			
		TELSET		42A CONN BLK	30- TYPE COUPLER	REMOVE FROM		CONNECT TO	
		TERM STRIP	NET- WORK			TERM STRIP	NET- WORK	TERM STRIP	NET- WORK
Inside wire at conn blk	T			G					
	R			R					
	T1			B					
	R1			Y					
Inside wire at telephone set	T	2							
	R	1							
	T1		RR						
	R1	3							
Inside wire conn blk to voice coupler				B	1				
				Y	2				
Basic modifications to connect voice coupler to telephone set and line	584H Key	R				1		12	
		Y				3		12	
	EXCN Key	BR					E1		C
		W					E2		3
		BK							
	Line Switch	G					12		1
Strap								2	F
Disable TRMTR	584H Key	S-R				12		11	
		R				12			L2
	TRMTR	R				11			L2
Disable RCVR	584H Key	G-BK					F		L1
		G				2			R
	RCVR	W					R		L1



TABLE N

2565LK TELEPHONE SET – MODIFIED FOR USE WITH  
F-57948 (MD) OR 30-TYPE VOICE COUPLER (See Note)

	WIRE OR LEAD	REMOVE FROM		CONNECT TO	
		589AJ KEY TERM. STRIP	NETWORK	589AJ KEY TERM. STRIP	NETWORK
Modifications to connect voice coupler to any line picked up in telephone set	D-179935 Exclusion Key (Ordered Separately)	BL-V		ER	
		V-BL			C
		BL-W			RR
		W-BL		*	
		O-W		EB	
		W-O		*	
		O-V		EB	
	V-O		EH		
Mtg Cord	V-BL	ET			RR
Operation of cut-off key disables RCVR	589AJ Key	Y-BR	2T		R
	RCVR	W		R	CT
Operation of cut-off key disables TRMTR	589AJ Key	BR	2R		R
	TRMTR	R		R	CR

*Note:* Refer to Fig. 8 for connections to F-57948 (MD) or 30-type voice coupler. If a 3-type speakerphone is required, connect as shown in appropriate section in Division 512.

\*Insulate and store.

TABLE O  
 MODIFICATION OF 2712B TELEPHONE SET FOR USE  
 WITH 30-TYPE VOICE COUPLER

	LEAD DESIG	WIRE OR LEAD	CONNECTIONS		SET MODIFICATIONS			
			42A CONN BLK	30- TYPE COUPLER	REMOVE FROM		CONNECT TO	
					TERM STRIP	NET- WORK	TERM STRIP	NET- WORK
Mounting cord at connecting block *	T	W-BL	G					
	R	BL-W	R					
	T1	V-G	B					
	R1	G-V	Y					
Inside wire conn blk to voice coupler			B	1				
			Y	2				
Basic modifications to connect voice coupler to telephone set and line	638B Key	S-R			L2		1	
		V			1		8	
	EXCN Key	BR			1			C
		W			3		L2	
	Line Switch	BK			3			RR
		BR			E1		8	
	Add Strap	G			L2		1	
Disable TRMTR	638B Key	S-R			1			G
		R			1			6
	TRMTR	R			6			G
Disable RCVR	638B Key	G			3			R
		G-BK				F		L2
	RCVR	W				R		L2

\*Insulate and store unused leads.

TABLE P  
1542A INDUCTOR CONNECTIONS TO TELEPHONE SETS  
MODIFIED FOR RFI

1542A INDUCTOR TERMINALS *	LEAD DESIG	TELEPHONE SETS									
		502B 2502B	511D	511F	558C/D	558F	565LK 2565LK	712B 2712B	2511F	2558D	
G1	T1	RR on NET	RR on NET	RR on NET	RR on NET	RR on NET	RR on NET	Clip 41 66E Conn Blk	RR on NET	RR on NET	RR on NET
R1	R1	E2 on TS	E1 on TS	9 on TS	6 on TS	9 on TS	Clip 42 66E Conn Blk	L2 on TS	9 on TS	3 on TS	
Y	T	2 on TS	L1 on NET	12 on TS	2 on TS	1 on TS		3 on TS	12 on TS	2 on TS	
B	R	1 on TS	L2 on NET	16 on TS	1 on TS	2 on TS		1 on TS	16 on TS	1 on TS	

\*Connect to appropriate mounting cord leads or terminals on 66E connecting block. See Fig. 9 and appropriate telephone set figure or table. Terminals R and G of 1542A inductor are connected to 1 and 2 of 30-type voice coupler, or 4 and 5 of F-57948(MD) voice coupler.

## VOICE CONNECTING ARRANGEMENTS CDN AND CD5

### 111A INTERCONNECTING UNIT, 69H APPARATUS MOUNTING AND 606A PANEL

#### 1. GENERAL

**1.01** This section provides identification, installation, operation, maintenance, and connection information on the 111A Interconnecting Unit (IU) and 69H apparatus mounting or 606A panel when used in Voice Connecting Arrangements CDN and CD5.

**1.02** This section is being reissued to show information for the 606A panel.

**1.03** The size of the job on initial installation and the expected growth should be the determining factor in selecting the proper equipment. It is recommended to use the 69H apparatus mounting for one to two circuits and the 606A panel for three to six circuits.

**1.04** If the customer wants a copy of the Technical Reference which covers this interface specification, the customer should contact the local Telephone Company Business Office or the Marketing Representative.

**1.05** This issue of the section is based on the following drawing:

SD-69614-01 Issue 3D —111A IU

If this section is to be used with equipment or apparatus reflecting later issue(s) of the drawing(s), reference should be made to the SDs and CDs to determine the extent of the changes and the manner in which the section may be affected.

#### 2. IDENTIFICATION

##### PURPOSE

- To provide a means for connecting a Bell System 1A2 Key Telephone System (KTS) line to a customer-provided (CP) intercommunicating (intercom) system. Supervision and the means to establish

connections are provided by a Bell System key telephone control station.

- To limit excessive levels from CP equipment and to provide protection for personnel against hazardous voltages.

##### APPLICATION

- 1A2 Key Telephone System

##### ORDERING GUIDE

- Unit, Interconnecting 111A (one per central office[CO] line, Fig. 1)

##### Associated Apparatus (Order Separately)

##### *For 69H Apparatus Mounting, Fig. 2.*

- Mounting, Apparatus, 69H (one per two 111A IUs installed on a 23-inch relay rack using 99-type brackets or in a 16-type apparatus mounting).
- Block, Connecting, 66M1-50 (as required, Fig. 3).
- Block, Connecting, 66B4-25 (as required).
- Cable, Connector, A25B (one per 69H apparatus mounting).
- Clip, Bridging, B (as required, Fig. 3).
- Wire, "D" inside, or equivalent (for cabling from 66B4-25 connecting block to 66M1-50 interface connecting block).
- Unit, Telephone, Key, 400D (one per CO line and one per CP intercom line). Installed in key service unit or panel. (The 584-type panel or 69-type apparatus mounting may be used to mount 400D.)

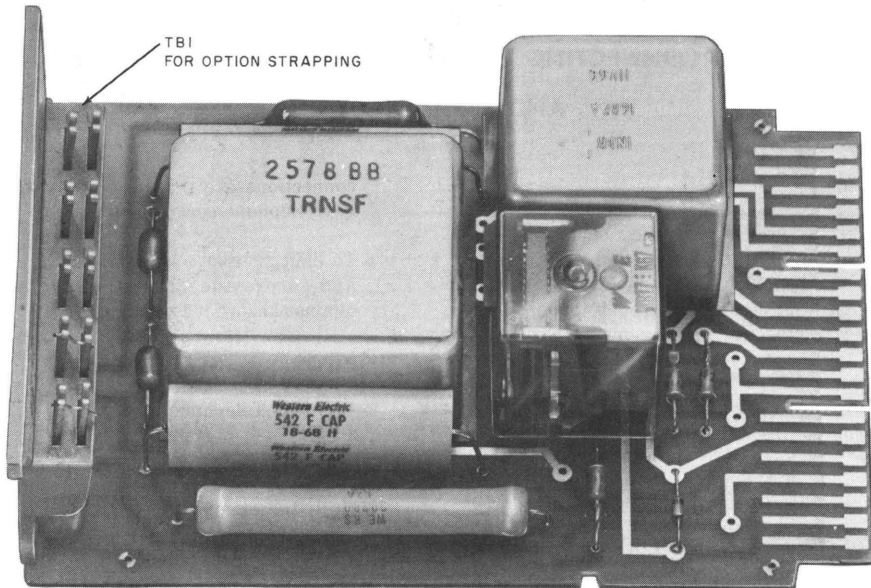


Fig. 1—111A Interconnecting Unit

- Diode, KS-15724, L1 or equivalent (one per each key telephone set used as a control station for Voice Connecting Arrangement CD5 or two per station if BL lead is multiplied).

◆ *For 606A Panel, Fig. 4 and 5*

- Panel, 606A (one per six 111A IUs).
- Brackets, 99-Type (one per three 606A panels).
- Fuse, 24E, 1/2 ampere (eight furnished per 606A panel).
- Block, Connecting, 66M1-50 (as required, Fig. 3).
- Clip, Bridging, B (as required, Fig. 3).
- Block, Connecting, 66B4-25 (as required).
- Cable, Connector, A25B (two per 606A panel).

- Wire, "D" inside, or equivalent (for cabling from 66B4-25 connecting block to 66M1-50 interface connecting block).

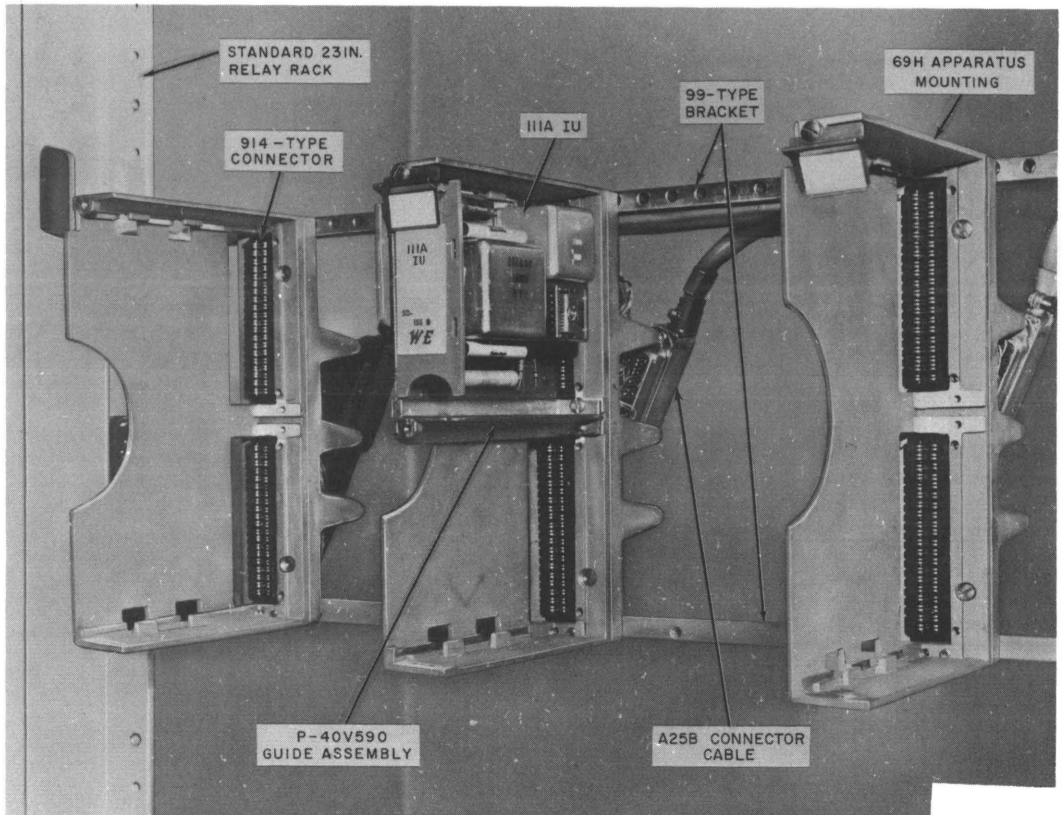
- Unit, Telephone, Key, 400D (one per CO line and one per CP intercom line). Installed in key service unit panel as required. (The 584-type panel or 69-type apparatus mounting may be used to mount 400D KTU.)

- Diode, KS-15724, L1 or equivalent (one per each key telephone set used as a control station for Voice Connecting Arrangement CD5, or two per station if BL lead is multiplied).◆

## DESIGN FEATURES

### 111A Interconnecting Unit

- Circuitry is provided on a 4-inch, 40-pin printed wiring board.
- Provides voice frequency coupling only.



**Fig. 2—69H Apparatus Mounting With 111A Interconnecting Unit**

- Option terminals.
  - Mounts in 69H apparatus mounting or 606A panel.
  - Prevents switchhook dialing from the CP equipment.
  - Requires 0.047 ampere at 26V dc.
  - Voice Connecting Arrangement CD5 (Y option) provides supervision and circuit release control at the Bell System control station.
  - Provides a holding bridge across the tip and ring of both associated 400D KTUs.
- 69H Apparatus Mounting**
- Equipped with two 914-type 40-pin connectors factory-wired to a 50-pin KS-type connector
  - Designed to mount two 111A IUs

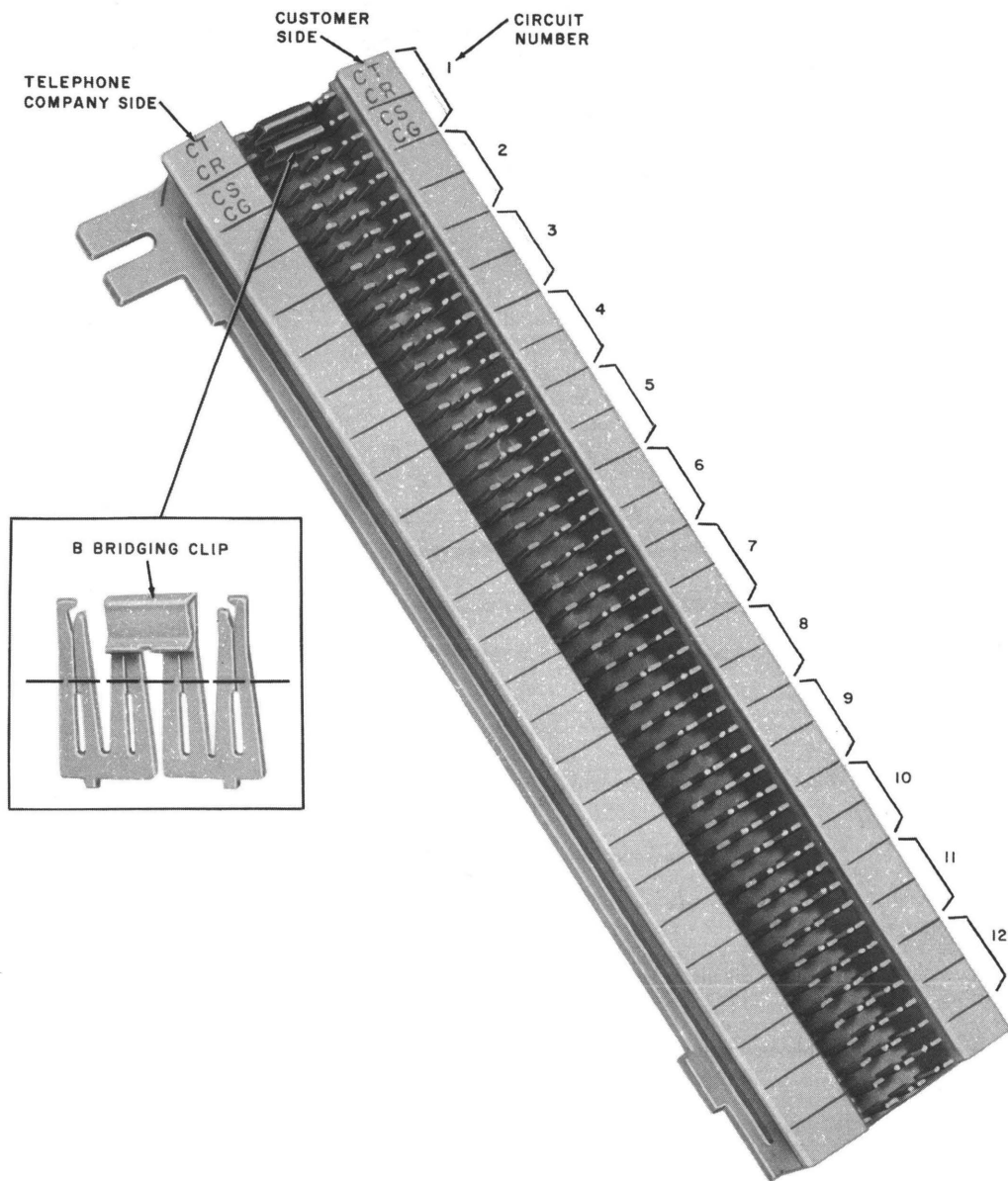


Fig. 3—66M1-50 Interface Connecting Block

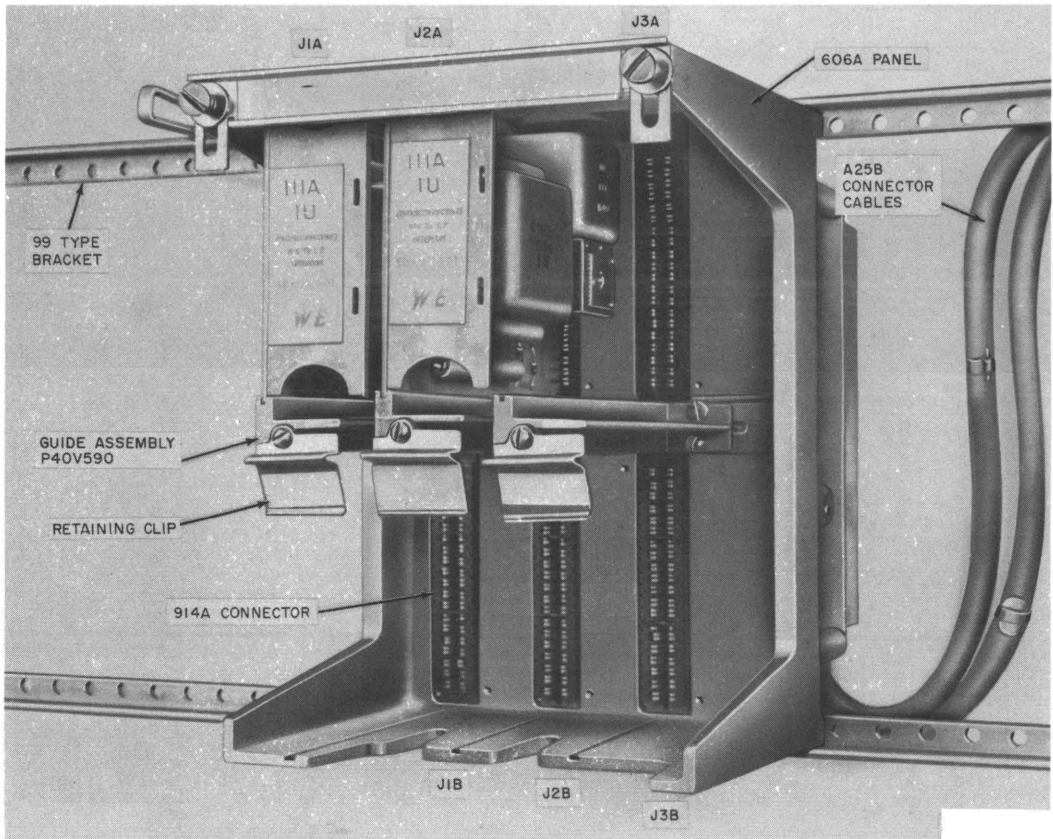


Fig. 4—606A Panel With 111A Interconnecting Unit

- For mounting on a standard relay rack using 99-type brackets or in a 16-type apparatus mounting.
- For mounting on a standard relay rack using 99-type brackets or in a 16-type apparatus mounting.

#### 606A Panel

- Equipped with six 914-type 40-pin connectors and two factory-wired 50-pin KS-16671 plugs
- Designed to mount six 111A IUs
- Fuse panel included
- Approximate size 6 by 8 by 9 inches

### 3. INSTALLATION

- 3.01** Locate Connecting Arrangement CDN or CD5 in an area free of dampness and excessive dust or dirt with adequate room for access to front and rear of equipment.
- 3.02** The CP equipment must be located so that the maximum loop resistance from the 111A IU does not exceed 50 ohms (Fig. 6).



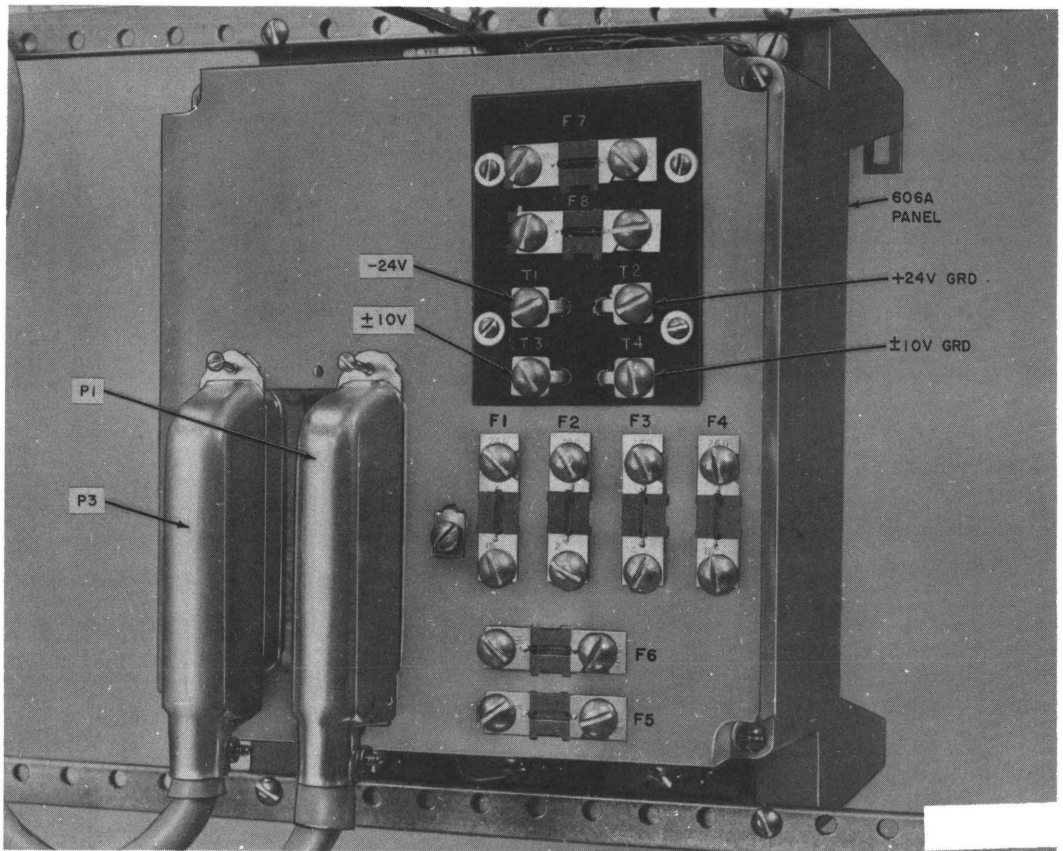


Fig. 5—606A Panel (Rear View)

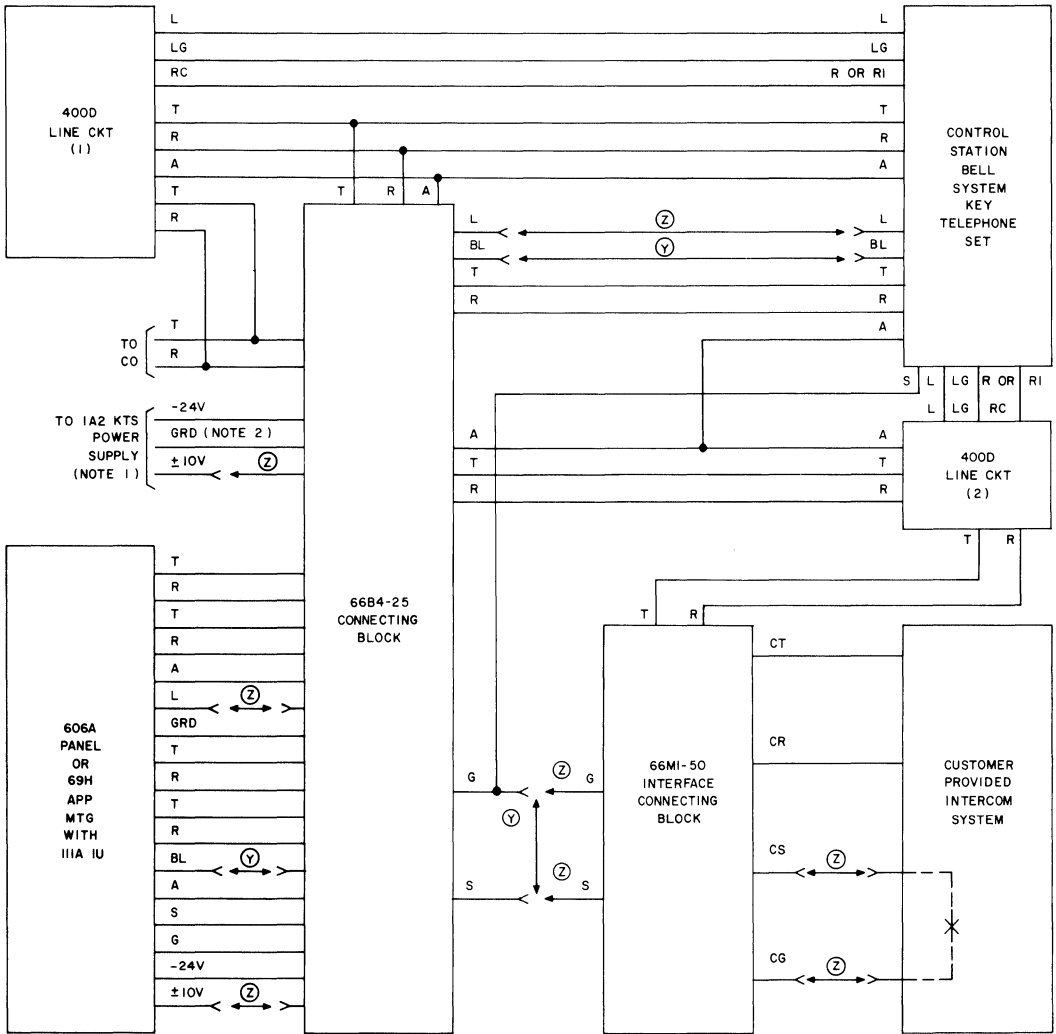
- 3.03** One 111A IU must be provided for each circuit between the CP intercom system and a Bell System CO line.
- 3.04** The connecting arrangement should be located as close as possible to the 1A2 KTS for convenience in wiring and strapping.
- 3.05** Leads associated with each circuit to a CP intercom line should be terminated on a 66M1-50 connecting block and lead designations should be stenciled (Fig. 3).
- 3.06 CD5 (Y Option):** Install station busy lamp circuit in Bell System control station key telephone set. A KS-15724, List 1 diode (or

equivalent) is required for each busy lamp circuit. When BL lead is multiplied, a KS-15724, List 1 diode or equivalent must be installed in series with each BL lead, using an available spare terminal. All associated stations must be on-hook to release the circuit.

- 3.07 CDN (Z Option):** Install a lamp ( $\pm 10V$  ac) in or associated with the nonlocking key in the control station.

#### 69H Apparatus Mounting

- 3.08** Mount the 69H apparatus mounting on either a standard relay rack using 99-type brackets



NOTES:

1. POWER SUPPLY CONNECTS TO REAR OF 606A PANEL (SEE FIG 5).
2. GROUND RETURN SHALL BE COMMON WITH KTS

Ⓩ OPTION, VCA-CDN

Ⓨ OPTION, VCA-CD5

Fig. 6—Block Diagram—Voice Connecting Arrangement CDN or CD5

or in a 16-type apparatus mounting. Connect a separate ground wire to frame of rack or mounting.

**3.09** Connect an A25B connector cable to the plug on the rear of the 69H apparatus mounting and terminate the raw end on the 66B4-25 connecting block following the wiring plan shown in Fig. 7 and 8.

**3.10** Connect leads to the two 400D KTUs, KTS power supply, and key telephone station as shown in Fig. 7 and 8.

**3.11** Extend leads to the CP equipment from the 66B4-25 connecting block and 400D KTU No. 2 to the 66M1-50 interface connecting block. Stencil lead designations on the fanning strip of the 66M1-50 interface connecting block, Fig. 3.

**3.12** The customer must terminate the CP equipment to the 66M1-50 interface connecting block using the four terminals stenciled on the customer side.

**606A Panel**

**3.13** Mount the 606A panel on either a standard relay rack using 99-type brackets or in a 16-type apparatus mounting. Connect a separate ground wire to rack or mounting

**3.14** Two A25B connector cables are connected to the P1 and P3 plugs on the rear of the 606A panel. P1 connects to the upper three 111A IUs and P3 connects to the three lower 111A IUs as shown in Fig. 4.

**3.15** Terminate the raw ends of the A25B connector cables to the 66B4-25 connecting block following the wiring plan shown in Fig. 9 and 10.

**3.16** Connect leads to the two 400D KTUs, KTS power supply, and key telephone station as shown in Fig. 5, 7, 9, and 10.

**3.17** Extend leads to the CP equipment from the 66B4-25 and 400D No. 2 to the 66M1-50 interface connecting block. Stencil lead designations on the fanning strip of the connecting block, Fig. 3.

**3.18** The customer must terminate the CP equipment to the 66M1-50 interface connecting block using the four terminals stenciled on the customer side.

**111A Interconnecting Unit**

**3.19** Strap terminals on TB1 of the 111A IU to obtain desired option (Fig. 1). Check for continuity after strapping.

**3.20** Loosen screw securing retaining clip to 69H apparatus mounting or 606A panel and raise clip to provide access to mounting or panel.

**3.21** Align 111A IU in mounting guides and properly seat connector fingers of printed wiring board in connector of 69H mounting or 606A panel.

**3.22** Position retaining clip and tighten screw.

**3.23** Stencil circuit and connection information, as required, onto designation strip of retaining clip.

**3.24** Perform tests in Part 5 after installation.

**4. OPERATIONS**

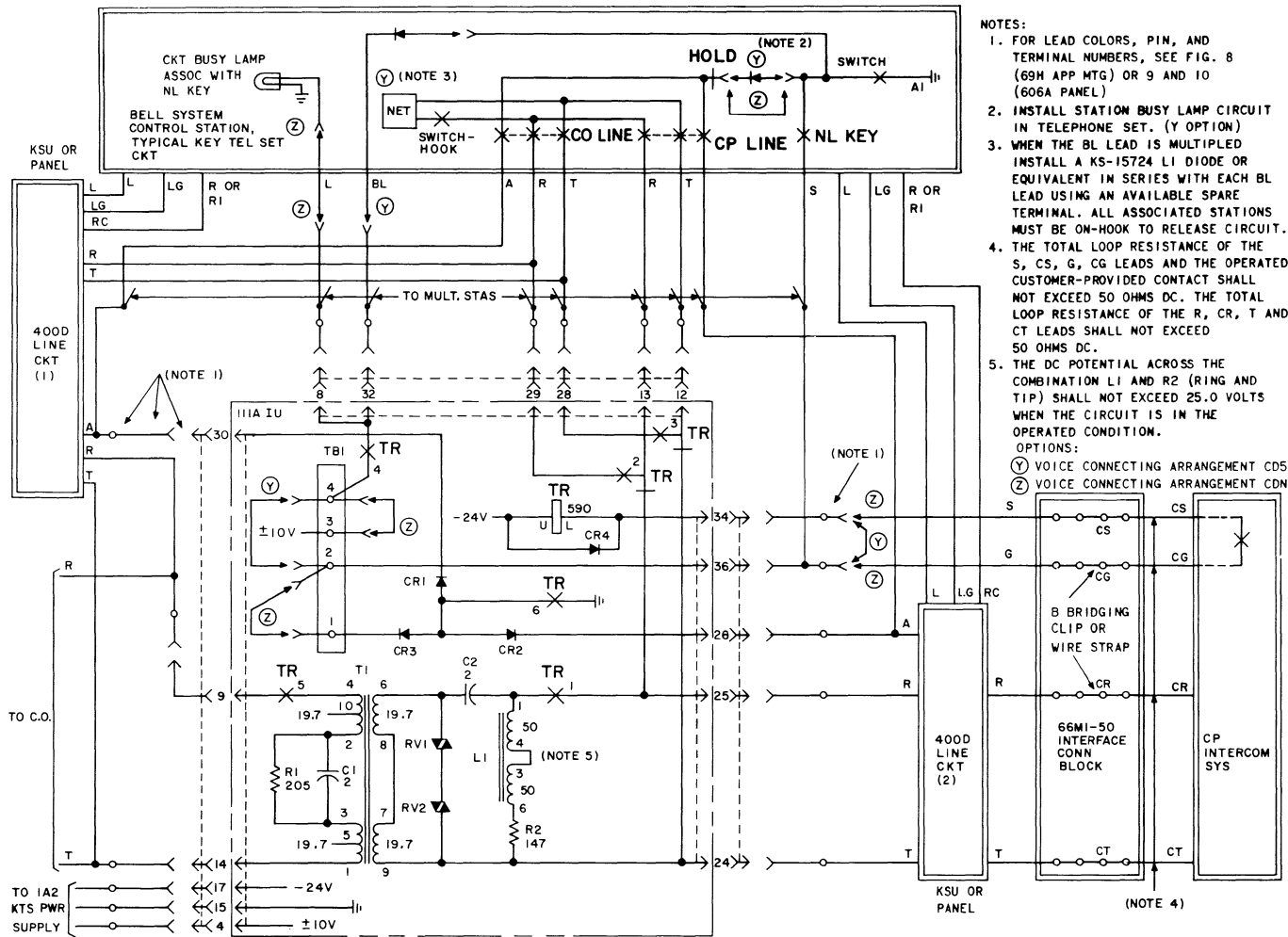
**4.01 Incoming Call to CP Intercom Station:**

- On an incoming call to be connected to a CP intercom station, the attendant:

- (1) Places the CO call on hold
- (2) Depresses a button associated with the CP intercom system
- (3) Establishes a connection to the requested intercom station
- (4) Depresses the nonlocking pushbutton to operate the TR relay of the associated 111A IU which completes a talking path between the CO line and the CP intercom station.

**CDN (Z Option)**

- (5) When step (4) is completed, the attendant may use other pickup buttons to answer incoming calls or establish outgoing calls or the attendant can go on-hook.
- (6) When the CP intercom station goes on-hook, the 111A IU and all associated line units are restored to normal.



NOTES:

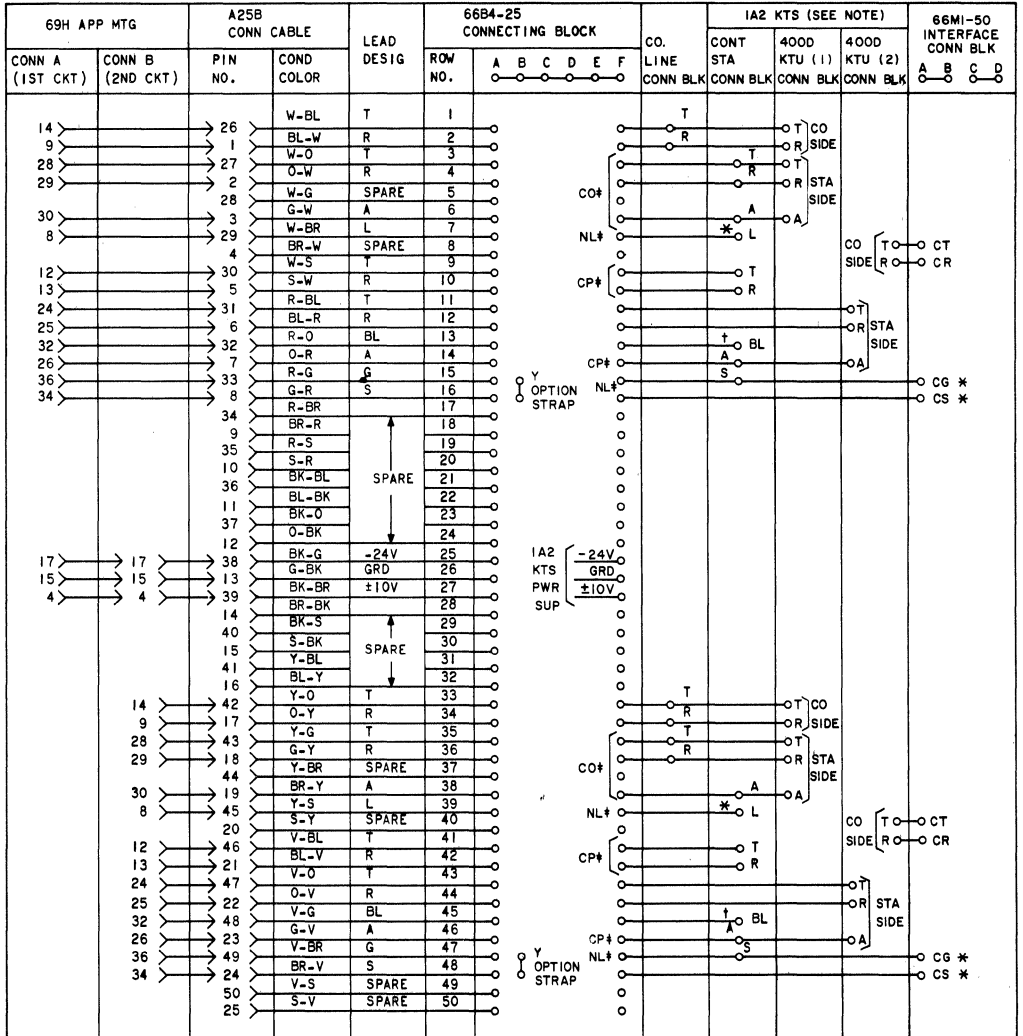
1. FOR LEAD COLORS, PIN, AND TERMINAL NUMBERS, SEE FIG. 8 (69H APP MTG) OR 9 AND 10 (606A PANEL)
2. INSTALL STATION BUSY LAMP CIRCUIT IN TELEPHONE SET. (Y OPTION)
3. WHEN THE BL LEAD IS MULTIPLIED INSTALL A KS-15724 LI DIODE OR EQUIVALENT IN SERIES WITH EACH BL LEAD USING AN AVAILABLE SPARE TERMINAL. ALL ASSOCIATED STATIONS MUST BE ON-HOOK TO RELEASE CIRCUIT.
4. THE TOTAL LOOP RESISTANCE OF THE S, CS, G, CG LEADS AND THE OPERATED CUSTOMER-PROVIDED CONTACT SHALL NOT EXCEED 50 OHMS DC. THE TOTAL LOOP RESISTANCE OF THE R, CR, T AND CT LEADS SHALL NOT EXCEED 50 OHMS DC.
5. THE DC POTENTIAL ACROSS THE COMBINATION LI AND R2 (RING AND TIP) SHALL NOT EXCEED 25.0 VOLTS WHEN THE CIRCUIT IS IN THE OPERATED CONDITION.

OPTIONS:

- (Y) VOICE CONNECTING ARRANGEMENT CD5
- (Z) VOICE CONNECTING ARRANGEMENT CDN

Fig. 7—Simplified Schematic Voice Connecting Arrangement CDN or CD5 Using 69H Apparatus Mounting

CONNECTIONS FOR VOICE CONNECTING ARRANGEMENT CDN OR CD5



\* Z OPTION (CONNECTING ARRANGEMENT CDN)  
 † Y OPTION (CONNECTING ARRANGEMENT CD5)

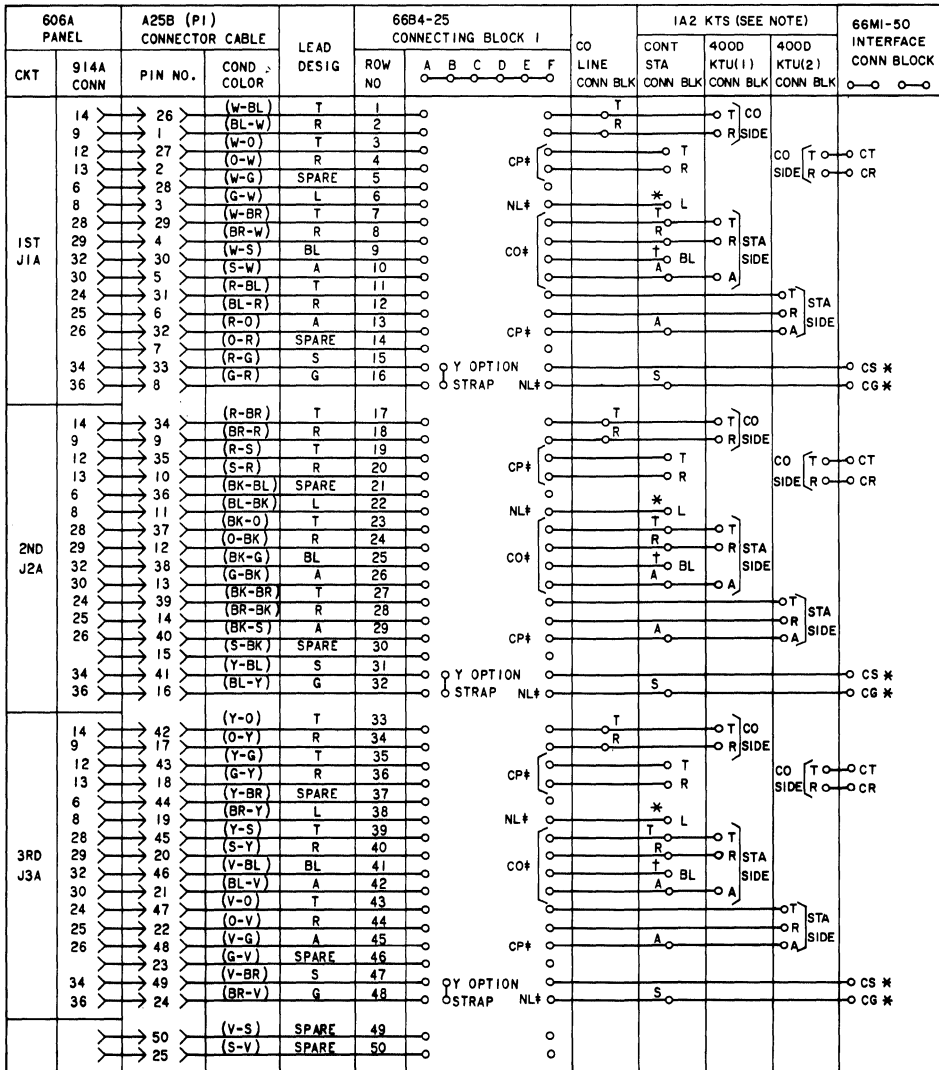
‡ ASSOCIATED WITH KEY APPEARANCE AT CONTROL STATION. SEE FIG. 7

NOTE:

REFER TO FIG. 7 FOR ADDITIONAL CONTROL STATION CONNECTIONS TO 400D KTUS.

Fig. 8—Connections for Voice Connecting Arrangement CDN or CD5 Using 69H Apparatus Mounting

CONNECTIONS FOR VOICE CONNECTING ARRANGEMENT CDN OR CD5

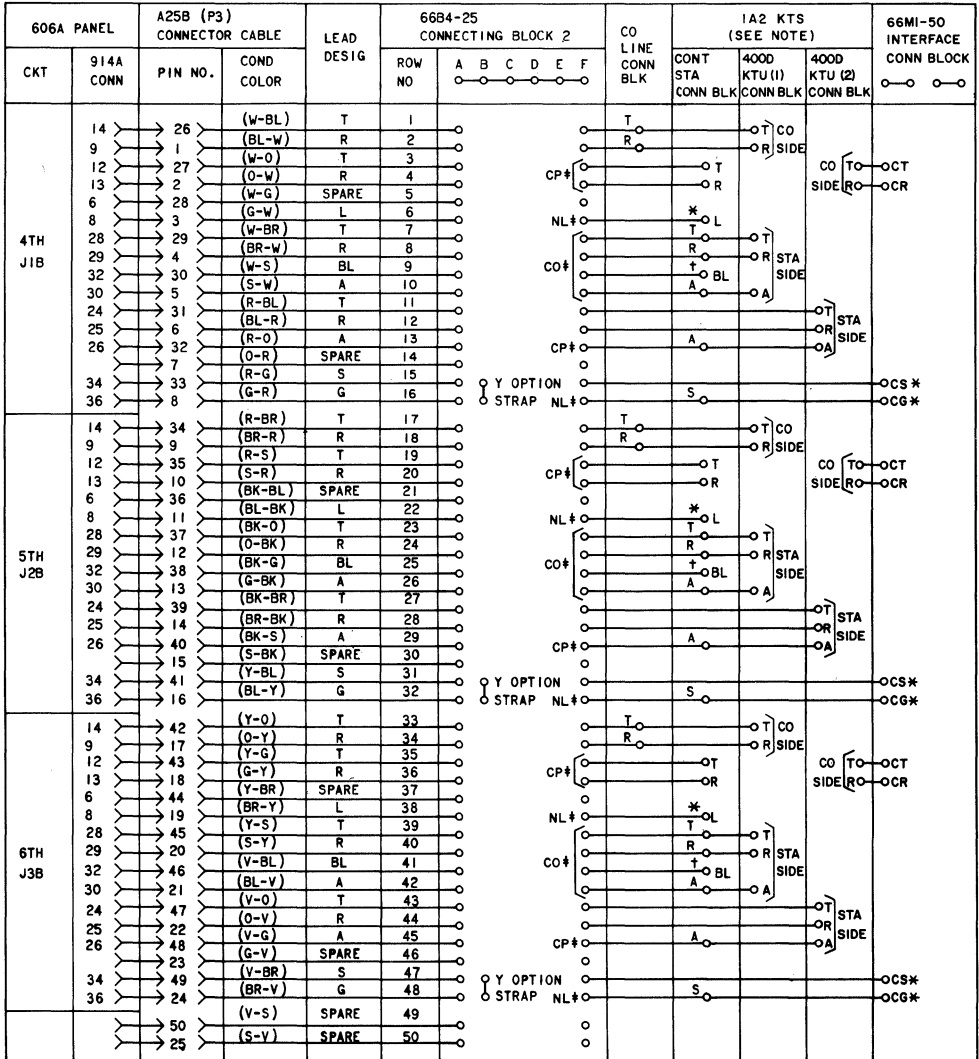


\* Z OPTION (CONNECTING ARRANGEMENT CDN) † ASSOCIATED WITH KEY APPEARANCE AT CONTROL STATION, SEE FIG. 7  
 † Y OPTION (CONNECTING ARRANGEMENT CD5)

NOTE:  
 CONNECT IA2 KTS POWER SUPPLY TO FUSE PANEL ON REAR OF 606A PANEL, REFER TO FIG. 7 FOR ADDITIONAL STATION CONNECTIONS TO 400D KTU'S.

Fig. 9—Connections for Voice Connecting Arrangement CDN or CD5 Using 606A Panel

CONNECTIONS FOR VOICE CONNECTING ARRANGEMENT CDN OR CD5



\* Z OPTION (CONNECTING ARRANGEMENT CDN)

‡ ASSOCIATED WITH KEY APPEARANCE AT CONTROL STATION. SEE FIG. 7

† Y OPTION (CONNECTING ARRANGEMENT CD5)

NOTE:

CONNECT 1A2 KTS POWER SUPPLY TO FUSE PANEL ON REAR OF 606A PANEL, REFER TO FIG. 7 FOR ADDITIONAL STATION CONNECTIONS TO 400D KTU'S

Fig. 10—Connections for Voice Connecting Arrangement CDN or CD5 Using 606A Panel

**CD5 (Y Option)**

(7) When step (4) is completed, the attendant may use other pickup buttons to answer incoming calls or establish outgoing calls or operate the HOLD key.



*The attendant cannot go on-hook until conversation is terminated because TR relay is held operated by a ground through the switchhook contacts.*

(8) By periodically monitoring the connection, the attendant determines when the conversation has been terminated and then goes on-hook to release the 111A IU and associated line units.

**4.02 Outgoing Call from CP Intercom Station:**

- On an outgoing call from a CP intercom station to be connected to a CO line, the attendant at the control station:

- (1) Places the intercom station on HOLD.
- (2) Depresses a button associated with a CO line.
- (3) Dials the requested CO number.
- (4) When connection is established between the Bell System control station and the CO line, the attendant depresses the nonlocking pushbutton to operate the TR relay of the associated 111A IU which completes a talking path between the CP intercom station and the CO line.

**CDN (Z Option)**

- (5) When step (4) is completed, the attendant may use other pickup buttons to answer incoming calls or establish outgoing calls or the attendant can go on-hook.
- (6) When the intercom station goes on-hook, the 111A IU and all associated line units are restored to normal.

**CD5 (Y Option)**

- (7) When step (4) is completed, the attendant may use other pickup buttons to answer

incoming calls or establish outgoing calls or operate HOLD key.



*The attendant cannot go on-hook until conversation is terminated because TR relay is held operated by a ground through the switchhook contacts.*

- (8) By periodically monitoring the connection, the attendant determines when conversation is terminated and then goes on-hook to release the 111A IU and associated line units.

**5. MAINTENANCE**

- 5.01** Check the CO line and check for blown fuses, loose or broken connections.
- 5.02** Open the four leads to the circuit under test at the interface connecting block by removing the B bridging clips (or wire straps) and perform the following tests:

**CD5 (Y Option)**

- (a) Using a 1013A (or equivalent) hand test set, clip to the tip and ring of the CO line associated with the 111A IU under test at the 66B4-25 connecting block.
- (b) Operate the switch on the hand test set to TALK; dial a CO number that will return 1000 Hz test tone.
- (c) Go off-hook and operate NL key on Bell System control key telephone set, momentarily. The TR relay should operate cutting through the transmission path.
- (d) Remove the hand test set from tip and ring of the CO line, operate switch to MON, and clip to terminals CT and CR at the 66M1-50 interface connecting block. 1000-Hz test tone should be heard.
- (e) Go on-hook at Bell System control key telephone set. The TR relay should release and 1000-Hz test tone will be removed.



**CDN (Z Option)**

- (a) Connect a strap between terminals CS and CG on the Telephone Company side of the 66M1-50 interface connecting block.
  - (b) Using a 1013A (or equivalent) hand test set, clip to the tip and ring of the CO line associated with the 111A IU under test, at the 66B4-25 connecting block.
  - (c) Operate the switch on the hand test set to TALK, dial a CO number that will return 1000-Hz test tone.
  - (d) Ground terminal CS on the 66M1-50 interface connecting block. TR relay should operate cutting through the transmission path.
  - (e) Remove the hand test set from tip and ring of CO line, operate switch to MON, and clip to terminals CT and CR at the 66M1-50 interface connecting block. 1000-Hz test tone should be heard.
  - (f) Remove ground from terminal CS and 1000-Hz test tone will still be heard.
  - (g) Remove the strap from terminals CS and CG; TR relay should release and the 1000-Hz test tone will be removed.
- 5.03** If the tests are not satisfactory, check wiring, battery and ground to unit. If battery and ground are present and wiring is correct, replace 111A IU and retest.

- 5.04** If the tests described are satisfactory, remove all test connections and replace the B bridging clips (or wire straps) on the interface connecting block.



***Do not attempt any tests or repairs to the customer-provided equipment.***

**6. CONNECTIONS**

- 6.01** For connecting information using the 69H apparatus mounting, refer to Fig. 6, 7, and 8.
- 6.02** For connecting information using the 606A panel, refer to Fig. 6, 9, and 10.
- 6.03** The same power supply used for the 1A2 KTS should be used for the voice connecting arrangement.
- 6.04** Refer to the appropriate section in Division 518 for 1A2 KTS information and connections.
- 6.05** The following are typical connecting circuits.
- (a) Key Telephone System No. 1A2, CO or PBX line circuits—SD-69513-01.
  - (b) Dial Intercom and Miscellaneous Panels—SD-69608-01
  - (c) Key Telephone System No. 1A2; 513-, 514-, and 515-Type Key Service Units—SD-69597-01.

**VOICE CONNECTING ARRANGEMENTS CEBAX AND CEBBX**  
**111A INTERCONNECTING UNIT**  
**69H APPARATUS MOUNTING**  
**606A PANEL**

**1. GENERAL**

**1.01** This section provides identification, installation, operation, maintenance, and connection information on the 111A interconnecting unit (IU), formerly designated 432A KTU, and 69H apparatus mounting or 606A panel.

**1.02** This section is reissued to include information on the 606A panel.

**1.03** Voice Connecting Arrangements CEBAX and CEBBX provide for voice frequency coupling between a Bell System central office (CO) line and the customer-provided (CP) equipment through a Bell System provided key telephone system (KTS). Supervision and network control signaling are provided by a Bell System key telephone station.

**1.04** The customer should be informed of the proper use and operation of Voice Connecting Arrangement CEBAX and/or CEBBX by the manufacturer or supplier of his equipment.

**1.05** If the customer wants a copy of the Technical Reference which covers this interface specification, the customer should contact the local Telephone Company Business Office or the Marketing Representative.

**1.06** This issue of the section is based on the following drawing:

SD-69614-01 Issue 3D (111A IU)

If this section is to be used with equipment or apparatus reflecting a later issue of the drawing, reference should be made to the SD and CD to determine the extent of the changes and the manner in which the section may be affected.

**2. IDENTIFICATION**

**PURPOSE**

- To provide a means of connecting CP equipment, typically conferencing devices, to KTS lines using a multibutton key telephone set as the controlling station
- To hold the CO line in a busy state
- To limit excessive levels from CP equipment and to provide protection for personnel against hazardous voltages.

**APPLICATION**

- 1A1 or 1A2 Key Telephone Systems.

**ORDERING GUIDE**

- Unit, Interconnecting, 111A (Fig. 1) formerly designated 432A KTU (one per voice connecting arrangement).

**Associated Apparatus (Order Separately)**

*Note:* If a 23-inch relay rack is not provided on customer premises, order a 16C apparatus mounting or equivalent.

- Mounting, Apparatus, 69H (one per two 111A IUs)
- or
- Panel, 606A (one per six 111A IUs)¶
- Bracket, 99B (Fig. 2)
- Block, Connecting, 66E3-25 (Fig. 3, as required)

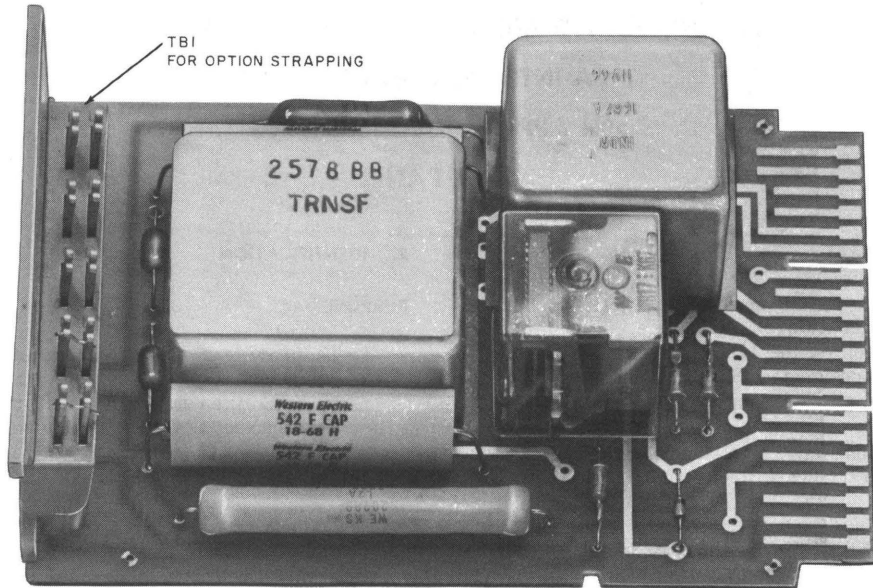


Fig. 1—111A Interconnecting Unit

- Block, Connecting, 66B4-25 (as required)

**Note:** Other connecting blocks can be used.

- Diode, KS-15724, List 1, or equivalent (one per each 111A IU, also one per each key telephone set used as a control station)
- Cable, Connector, A25B (one per 69H app mtg, two per 606A panel)
- Cable, Inside Wiring, D, or equivalent (for cabling from 66B4-25 connecting block to 66E3-25 interface connecting block)
- Fuse, 24E 1/2 ampere (eight per 606A panel)
- Unit, Power, 19C2, or equivalent (locally engineered and installed when existing KTS power supply is insufficient).

## DESIGN FEATURES

### 111A Interconnecting Unit

- Components mounted on 4-inch 40-pin double-sided printed wiring board
- Option terminals
- Provides voice frequency *only* access to the telecommunication network
- Provides a dry contact closure to signal CP equipment
- Provides for accepting supervisory signals from CP equipment
- Requires 0.047 ampere at 26V dc.

### 69H Apparatus Mounting

- Equipped with two 914-type 40-pin connectors factory-wired to one KS-16671 50-pin plug
- Designed to mount two 111A IUs
- For mounting on standard relay rack or on 16C apparatus mounting using 99B brackets.

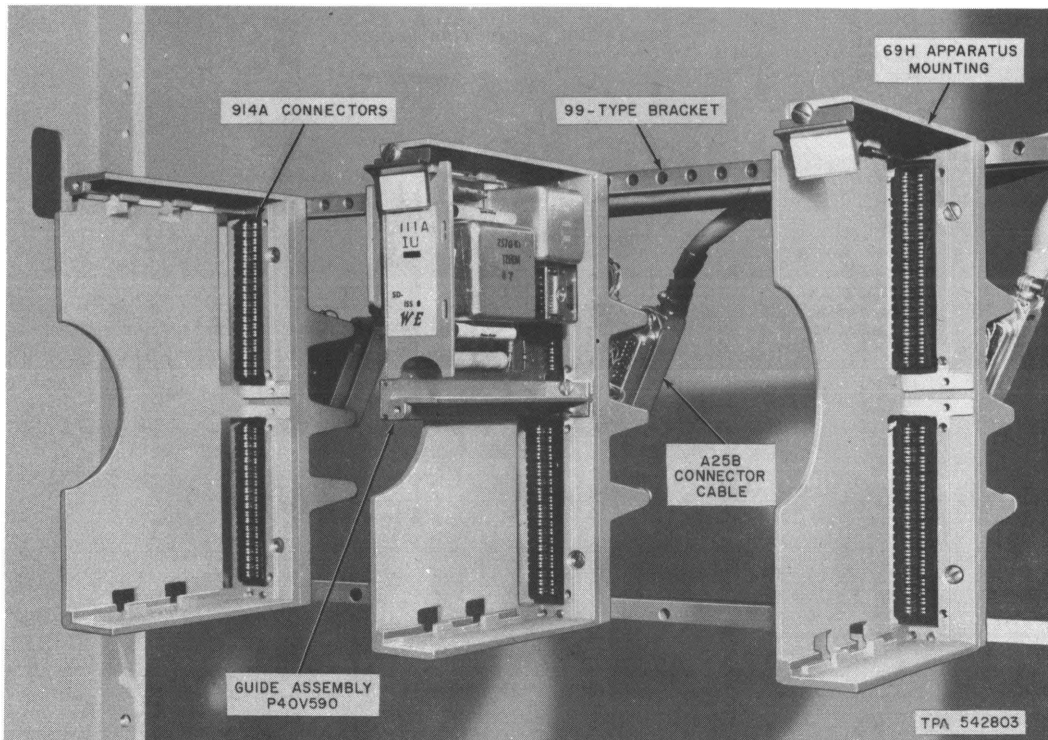


Fig. 2—69H Apparatus Mounting With 111A Interconnecting Unit

#### 606A Panel (Fig. 4 and 5)

- Equipped with six 914-type 40-pin connectors factory-wired to two KS-16671 50-pin plugs
- Designed to mount six 111A IUs
- For mounting on standard relay rack or on 16C apparatus mounting using 99B brackets
- Fuse panel included
- Approximate size 6 by 8 by 9 inches.

### 3. INSTALLATION

**Note 1:** A KS-15724, List 1 diode or equivalent must be strapped between terminals 2 and 4 on terminal board (TB1) of the 111A IU for

Voice Connecting Arrangements CEBAX and CEBBX (Fig. 6 and 7).

**Note 2:** A KS-15724, List 1 diode or equivalent must be installed as a station busy lamp circuit in each control station as shown in Service Section (Division 502) for the particular set involved.

**Note 3:** When Voice Connecting Arrangement CEBAX is used, a strap must be provided between G and BL leads (customer leads CG and CBL) at the interface connecting block on the Telephone Company side of the interface.

- 3.01** Locate voice connecting arrangements as close as possible to the KTS for convenience of wiring and in an area free of dampness and excessive dust or dirt, with adequate room for

## 66E3-25 CONNECTING BLOCK

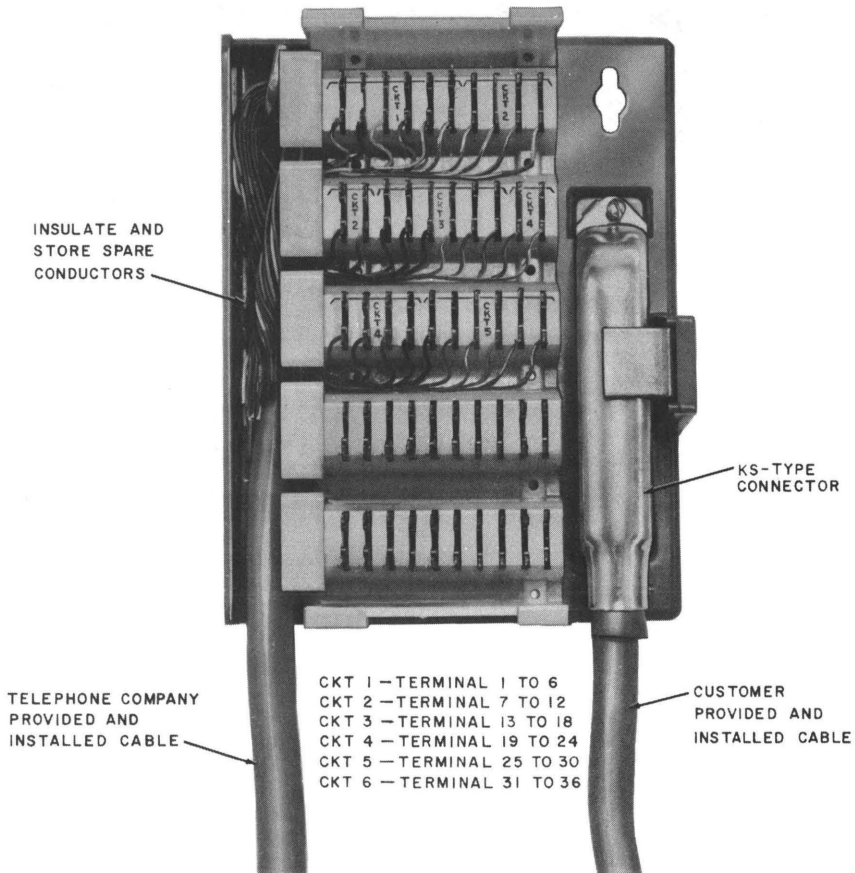


Fig. 3—66E3-25 Interface Connecting Block

access to front and rear of equipment and connecting blocks.

**3.02** ♦ The size of the initial installation and expected growth should be the determining factors in selecting the proper equipment. Use the 69H apparatus mounting for one or two 111A IUs and the 606A panel for three to six 111A IUs.♦

**3.03** One 111A IU must be provided per each CO line per control station to be connected

to the CP equipment for Voice Connecting Arrangement CEBAX (Fig. 6).

**3.04** One 111A IU must be provided per each CO line with any number of multiple control stations to be connected to the CP equipment for Voice Connecting Arrangement CEBBX (Fig. 7).

#### 69H Apparatus Mounting

**3.05** One A25B connector cable or equivalent must be provided for each 69H apparatus

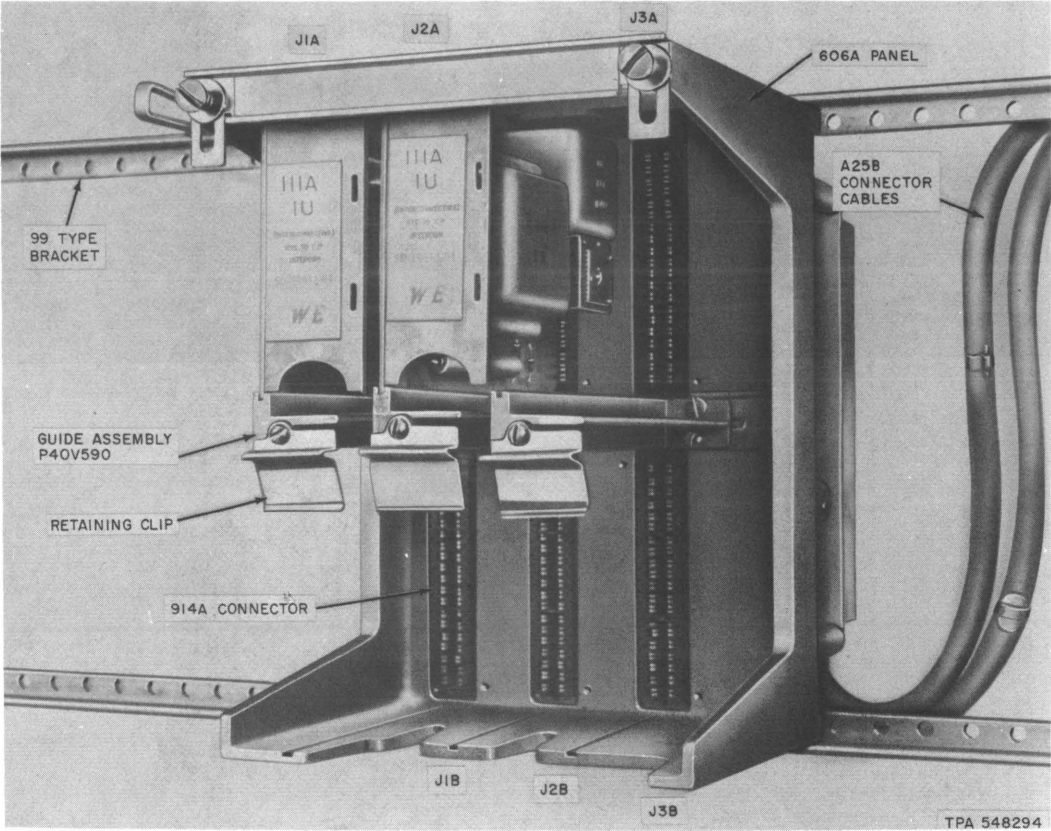


Fig. 4—606A Panel With 111A Interconnecting Unit

mounting installed. The A25B connector cable plugs into the 69H apparatus mounting.

**3.06** One 66B4-25 connecting block should be provided (one block will accommodate connections for six 111A IUs).

**3.07** The stub end of the A25B connector cable will be terminated on the 66B4-25 connecting block (see Tables A and B); unused leads should be insulated and stored.

**3.08** Leads associated with the CP equipment with access to the CO line will be terminated on an interface connecting block (66E3-25). Circuit

numbers or lead designations should be stenciled on the connecting block (see Fig. 3 and Table C). The CP equipment must be located so that maximum loop resistance of the CA, CS leads does not exceed 50 ohms measured at the interface connecting block.

**3.09** The interface connecting block may be located at the control station at customer request.



*This may require customer billing.*

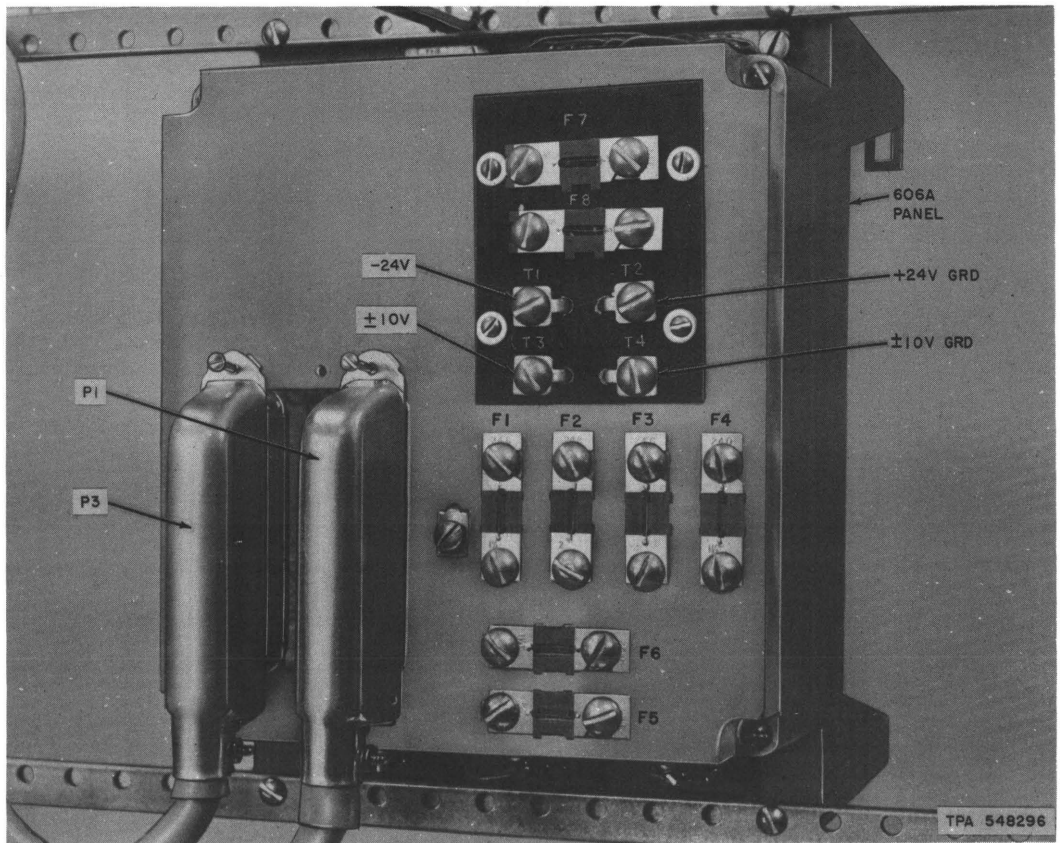


Fig. 5—606A Panel (Rear View)◆

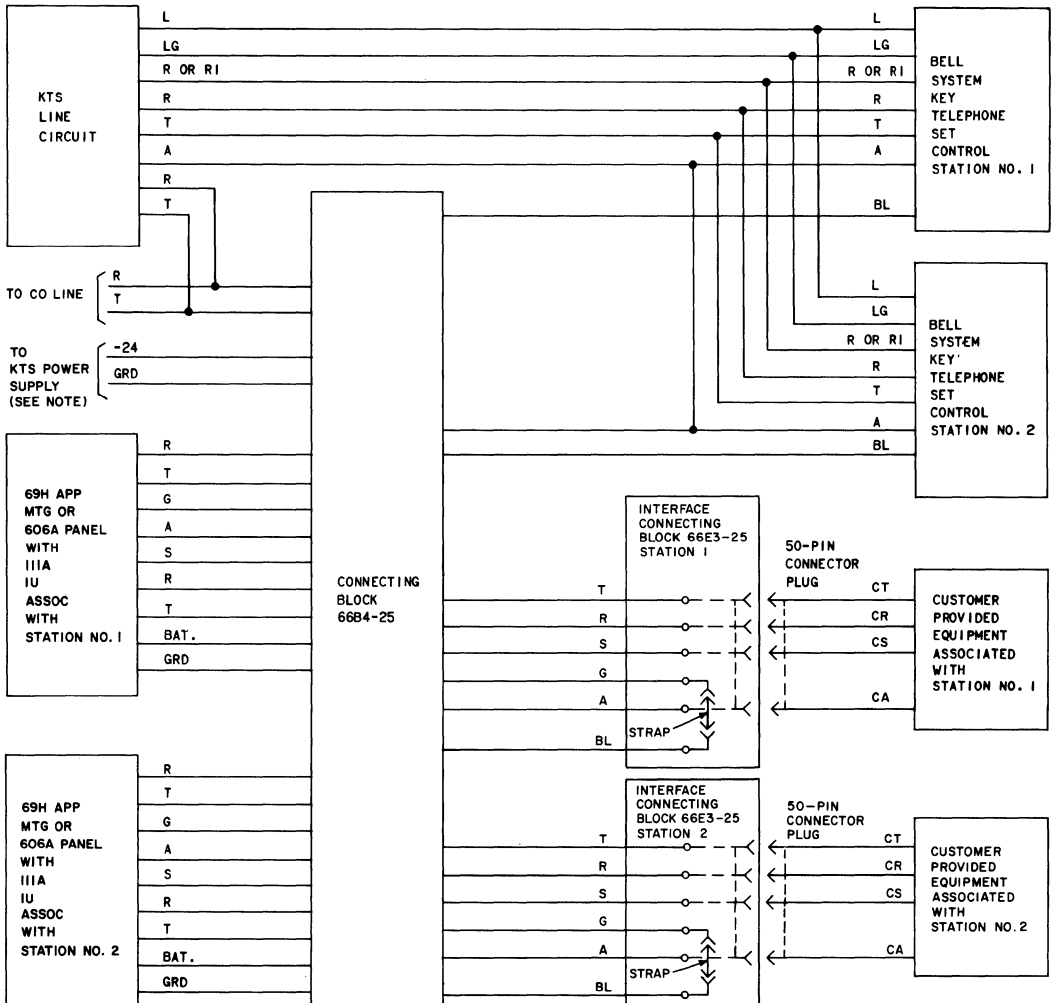
**3.10** The customer must terminate the CP equipment to the KS-16672, List 3 connector on the 66E3-25 connecting block (Fig. 3) using an Amphenol No. 57-10500-7 plug, Cinch No. 223-32-50-023 plug, or equivalent.

**3.11** Power supply (supplied locally if required) connects to the 66B4-25 connecting block as shown in Fig. 8 and 9. Fuses must be provided locally for the 69H apparatus mounting. Each 111A IU requires 0.047 ampere at 26V dc. Refer to the appropriate section in Division 518 for proper grounding of power plants.

#### ◆606A Panel

**3.12** Two A25B connector cables are used to connect the 606A panel to the 66B4-25 intermediate connecting block. The A25B connector cables plug into the back (P1 and P3) of the 606A panel (Fig. 5).

**3.13** The stub ends of the A25B connector cables will be terminated on the 66B4-25 intermediate connecting block (Fig. 6 or 7 and Table D or E). Unused leads should be insulated and stored.



NOTE:  
POWER SUPPLY CONNECTS TO REAR OF  
606A PANEL (SEE FIG. 5).

**Fig. 6—Block Diagram—Voice Connecting Arrangement CEBAX**

**3.14** Install 66B4-25 intermediate connecting blocks as required. One block provides connections for six 111A IUs.

**3.15** Leads associated with the CP equipment will be terminated on an interface connecting block (66E3-25). Circuit numbers or lead designations should be stenciled on the connecting block (See

Fig. 3 and Table D or E). The CP equipment must be located so that maximum loop resistance of the CA, CS leads does not exceed 50 ohms measured at the interface connecting block.

**3.16** The interface connecting block may be located at the control station at customer request.



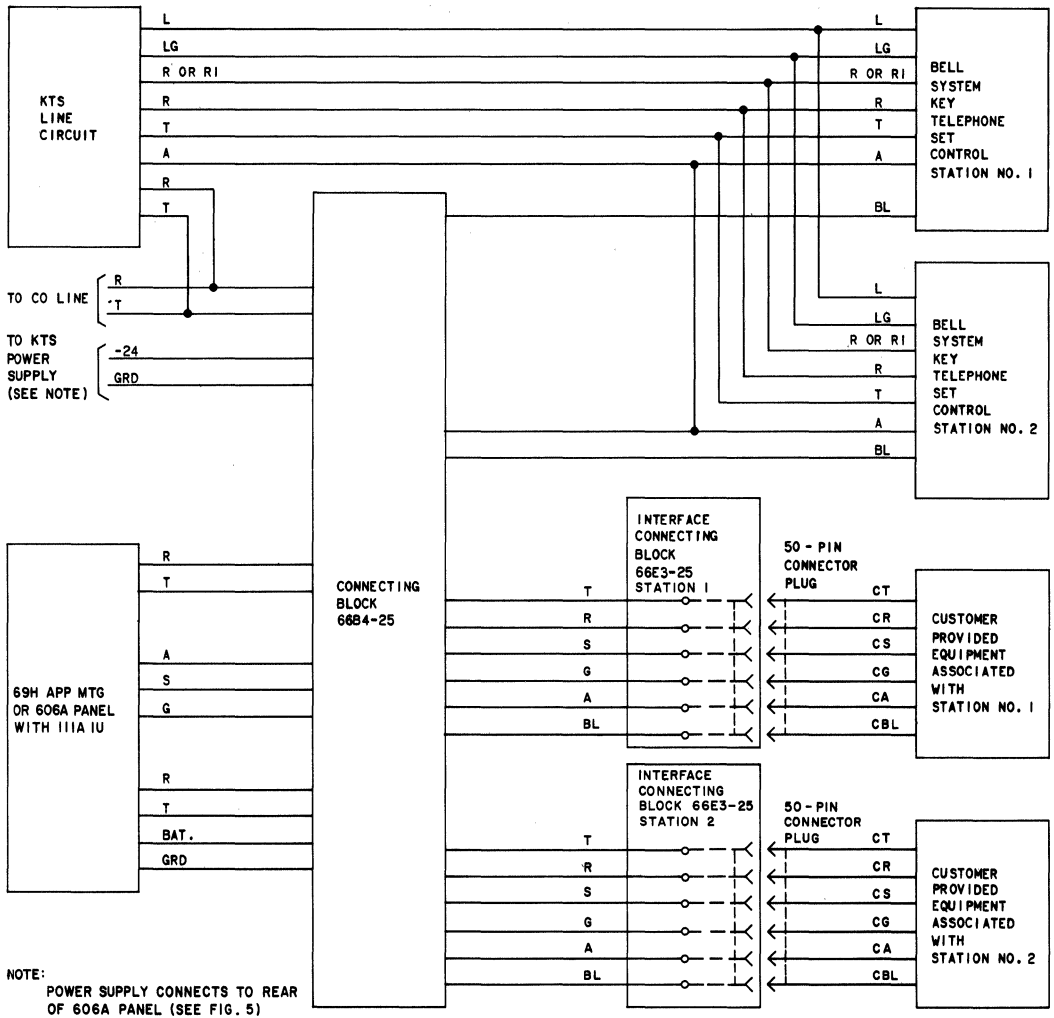


Fig. 7—Block Diagram—Voice Connecting Arrangement CEBBX

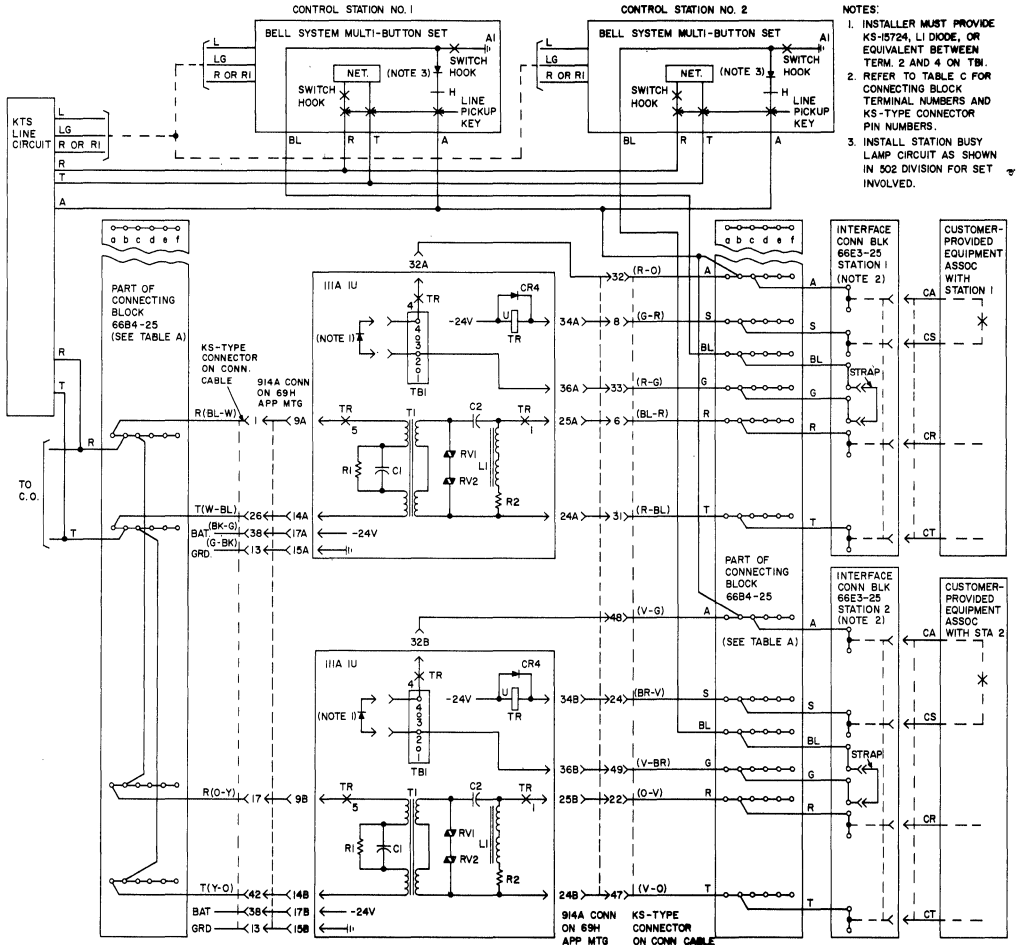


*This may require customer billing.*

**3.17** The customer must terminate the CP equipment to the KS-16672, List 3 connector on the 66E3-25 connecting block (Fig. 3) using an

Amphenol No. 57-10500-7 plug, Cinch No. 223-32-50-023 plug, or equivalent.

**3.18** Power supply (supplied locally, if required) connects to the rear of the 606A panel as shown in Fig. 5. Refer to the appropriate section in Division 518 for proper grounding of power plants.



- NOTES:
1. INSTALLER MUST PROVIDE KS-15724, LI DIODE, OR EQUIVALENT BETWEEN TERM. 2 AND 4 ON TB1.
  2. REFER TO TABLE C FOR CONNECTING BLOCK TERMINAL NUMBERS AND KS-TYPE CONNECTOR PIN NUMBERS.
  3. INSTALL STATION BUSH LAMP CIRCUIT AS SHOWN IN 502 DIVISION FOR SET INVOLVED.

Fig. 8—Simplified Schematic-Voice Connecting Arrangement CEBAX

**111A Interconnecting Unit**

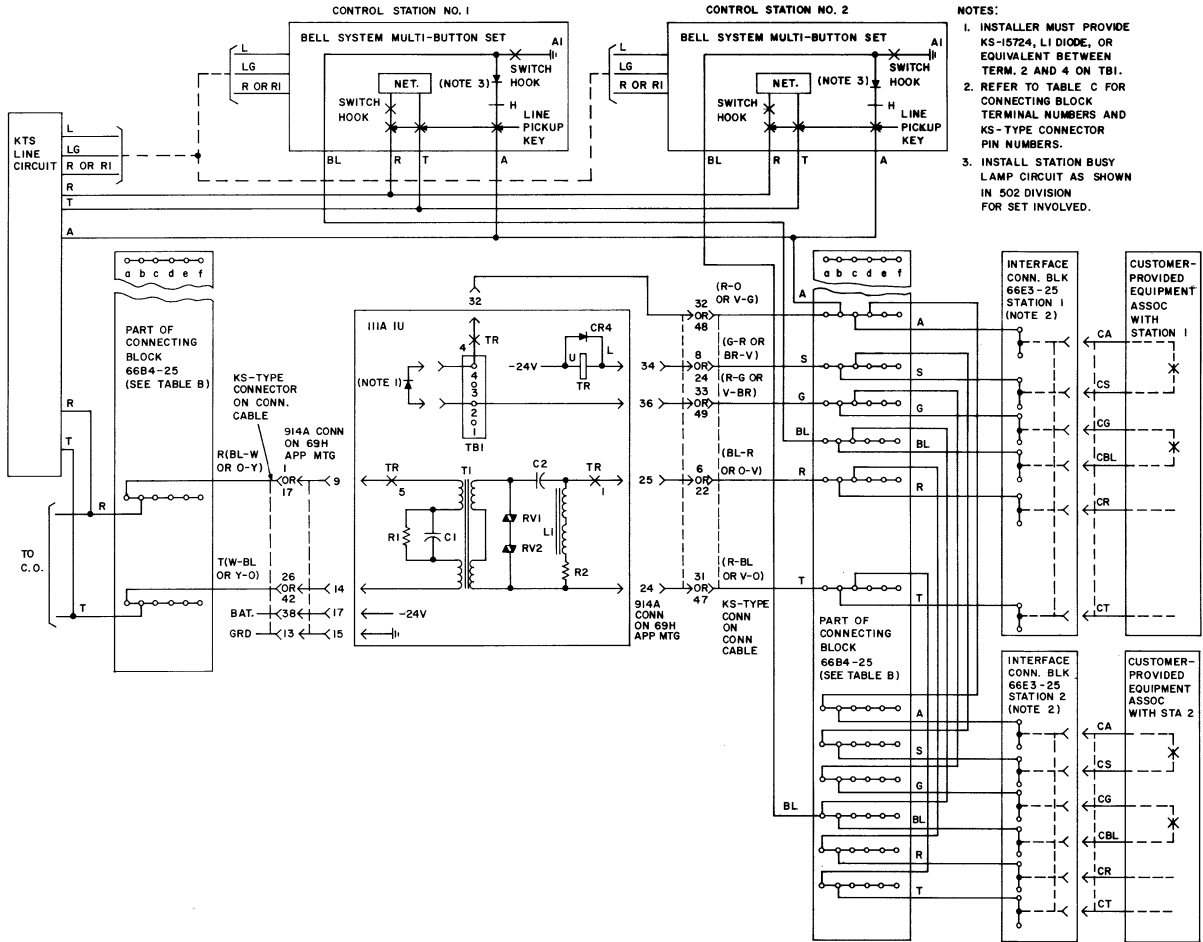
**3.19** Install diode between terminals 2 and 4 of TB1 as shown in Fig. 8 or 9 before installing 111A IU in apparatus mounting.

**3.20** Loosen screw securing retaining clip or designation bar to apparatus mounting or panel and raise clip or designation bar to provide access to mounting.

**3.21** Align 111A IU in mounting guides and properly seat connector of printed wiring board in connector of mounting.

**3.22** Position retaining clip or designation bar on rear of 111A IU and tighten screw.

**3.23** Stencil circuit and connection information as required to designation strip or retaining clip.



- NOTES:
1. INSTALLER MUST PROVIDE KS-15724, LI DIODE, OR EQUIVALENT BETWEEN TERM. 2 AND 4 ON TBI.
  2. REFER TO TABLE C FOR CONNECTING BLOCK TERMINAL NUMBERS AND KS-TYPE CONNECTOR PIN NUMBERS.
  3. INSTALL STATION BUSY LAMP CIRCUIT AS SHOWN IN 502 DIVISION FOR SET INVOLVED.

Fig. 9—Simplified Schematic—Voice Connecting Arrangement CEBBX

**3.24** Perform tests shown in Part 5 after installation.

#### 4. OPERATION

##### 4.01 *Connection—Voice Connecting Arrangement CEBAX* (Fig. 8)

- (a) An incoming or outgoing call is handled in the normal manner for a key telephone set. If a connection to the CP equipment is desired, the control station attendant operates the CP equipment to provide a locking closure on the CA and CS leads associated with the control station and the 111A IU for the connected line. The control station pickup key for the connected line must be operated.
- (b) The CP contact closure completes an operate path for TR relay over CS, CA, and A leads to A1 ground. Relay TR operated places a holding bridge across the line and couples it to the CP equipment. The line lamp (if provided) at the control station remains lighted steadily.
- (c) TR relay is held operated by the control station ground over the BL lead, through the Telephone Company provided strap between the G and BL leads at the interface connecting block and the CP contact closure between the CA, CS leads.
- (d) The control station must remain off-hook for the duration of the connection since the holding ground for the 111A IU is provided through the switchhook contact of the control station. If the control station attendant desires to leave the connection, the HOLD key at the control station may be depressed to release the pickup key, (this does not place the line on hold). The control station can originate and answer calls on other line pickup keys but must not go on-hook until the connection to the CP equipment is no longer required.

##### 4.02 *Connection—Voice Connecting Arrangement CEBBX* (Fig. 9)

- (a) An incoming or outgoing call is handled in the normal manner for a key telephone set. If a connection to the CP equipment is desired, the control station attendant operates the CP equipment to provide a locking closure on the CA and CS leads and a locking closure on the CG and CBL leads associated with the control

station and the 111A IU for the connected line. The control station pickup key for the connected line must be operated.

- (b) The first CP contact closure completes an operate path for TR relay over CS, CA, and A leads to A1 ground. The second CP contact closure provides a holding path for TR relay. Relay TR operated places a holding bridge across the line and couples it to the CP equipment. The line lamp (if provided) on the control station remains lighted steadily.
- (c) The TR relay is held operated by the control station ground over the BL lead, through the CP contact closures between the CA, CS and CG, CBL leads. This permits more than one control station to be provided per line using only one 111A IU.
- (d) The control station must remain off-hook for the duration of the connection since the holding ground for the 111A IU is provided through the switchhook contact of the control station. If the control station attendant desires to leave the connection, the HOLD key at the control station may be depressed to release the pickup key (this does not place the line on hold). The control station can originate and answer calls on other line pickup keys but must not go on-hook until the connection to the CP equipment is no longer required.

##### 4.03 *Disconnection—Voice Connecting Arrangements CEBAX and CEBBX*

- (a) To disconnect all connections at one time, the control station goes on-hook. This breaks the switchhook controlled holding ground to the interconnecting units, releasing all operated TR relays. Release of the TR relays opens the circuits to the CO and the control station going on-hook causes all lighted line lamps to extinguish. The control station attendant must release the CP contact closure(s) associated with each line to prevent accidental connection to the CP equipment on subsequent use of the line.
- (b) To disconnect a single connection from the network, the control station attendant opens the CP contact closure(s) associated with the line to be disconnected. Opening the CP contact closure(s) removes ground from the CS lead to the IU associated with the disconnected station

allowing the TR relay to release. Release of the TR relay opens the circuit to the CO permitting the line circuit associated with the disconnected line to release and the line lamp to extinguish.

## 5. MAINTENANCE

**5.01** Check the CO pair and for blown fuses, loose or broken connections.

**5.02** Open circuit at 66E3-25 interface connecting block by removing the customer plug from the KS-type connector (Fig. 3). Perform the following tests.

### CEBAX (Fig. 8)

(a) Place a strap across CS and CA terminals on the Telephone Company side of the 66E3-25 interface connecting block.

(b) Go off-hook and operate the line pickup key for the connected line. The TR relay should operate and cut through the transmission path to the CT and CR terminals.

(c) Dial a CO number from telset that will return a busy signal or 1000-Hz tone.

(d) With switch in MON position, clip hand test set to terminals CT and CR at 66E3-25 connecting block. Tone should be heard in hand test set receiver.

(e) Release the pickup key. Busy signal or 1000-Hz tone should still be heard.

(f) Go on-hook at the control key telephone set. TR relay will release, and busy signal or 1000-Hz tone will not be heard.

### CEBBX (Fig. 9)

(g) Strap terminals CS and CA and strap terminals CBL and CG on the Telephone Company side of the 66E3-25 interface connecting block.

(h) Go off-hook and operate the line pickup key for the connected line. The TR relay should operate and cut through the transmission path to the CT and CR terminals.

(i) Dial a CO number from telset that will return a busy signal or 1000-Hz tone.

(j) With switch on MON position, clip hand test set to terminals CT and CR at 66E3-25 connecting block. Tone should be heard in hand test set receiver.

(k) Release the pickup key; busy signal or 1000-Hz tone should still be heard.

(l) Go on-hook at the control key telephone set. TR relay will release and busy signal or 1000-Hz tone will not be heard.

**5.03** If the results described are not obtained, check wiring, battery, and ground to unit. If battery and ground are present and wiring is correct, replace 111A IU and retest.

**5.04** When trouble is suspected in the 111A IU, exchange it with another unit known to be functioning properly.

**5.05** If the tests described are satisfactory, restore circuit to normal by replacing the customer plug in the KS-16672, List 3 connector on the 66E3-25 interface connecting block.



***Do not attempt any tests or repairs to the CP equipment.***

**5.06** When in the repairman's judgment the trouble is located in the CP equipment, the Repair Service Bureau should be notified so that proper Maintenance of Service Charge billing can be initiated as outlined in Section 660-101-312 entitled Maintenance of Service Charge on Services with Customer-Provided Equipment (CPE).♦

## 6. CONNECTIONS

**6.01** For connecting information using the 69H apparatus mounting, refer to Fig. 8 or 9 and Table A or B.

**6.02** The 111A IU is shown schematically in Fig. 8 and 9. The 69H apparatus mounting has provisions for installing two 111A IUs. Terminal designations for the KS-type connector associated with the 66E3-25 interface connecting block are shown in Table C.

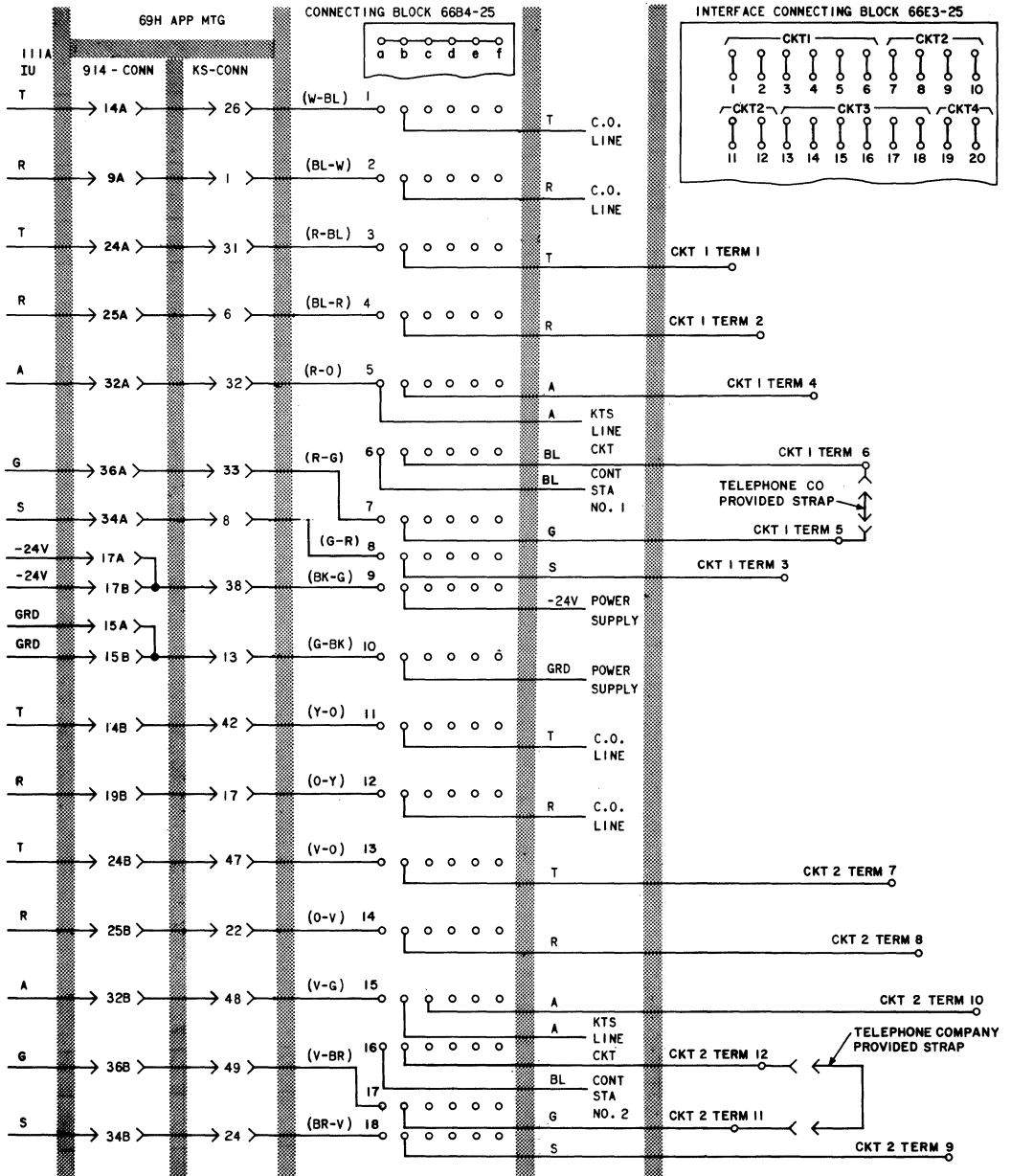
**6.03** For connecting information using the 606A panel, refer to Fig. 6 or 7 and Table D or E.

**6.04** Tables D and E show connections for six 111A IUs, circuit lead designations, connector cable color codes, and cross-connects from 66B4-25 intermediate connecting block to 66E3-25 interface connecting block. Lead BL from the key telephone set connects to terminal CBL on the 66B4-25

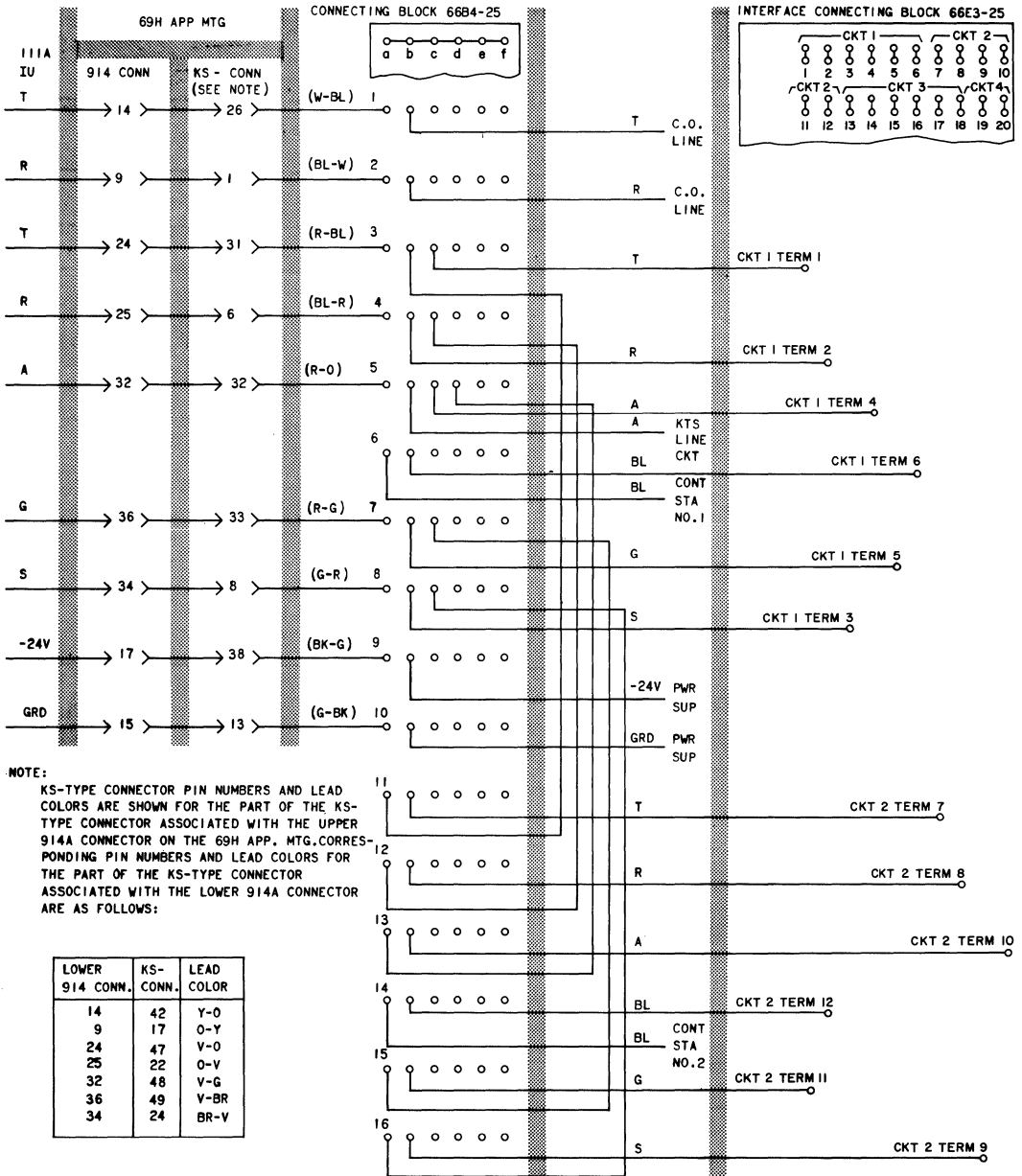
connecting block. Lead A from the KTS line circuit connects to terminal A on the 66B4-25 intermediate connecting block.

**6.05** Power supply (supplied locally) connects -24V to T1 and GRD to T2 (Fig. 5) on rear of 606A panel. Power supply (supplied locally with fusing) connects to rows 9 and 10 on the 66B4-25 connecting block for the 69H apparatus mountings.

**TABLE A**  
**CONNECTIONS FOR VOICE CONNECTING ARRANGEMENT CEBAX**  
**USING 69H APPARATUS MOUNTING**



**TABLE B**  
**CONNECTIONS FOR VOICE CONNECTING ARRANGEMENT CEBBX**  
**USING 69H APPARATUS MOUNTING**



**NOTE:**  
 KS-TYPE CONNECTOR PIN NUMBERS AND LEAD COLORS ARE SHOWN FOR THE PART OF THE KS-TYPE CONNECTOR ASSOCIATED WITH THE UPPER 914A CONNECTOR ON THE 69H APP. MTG. CORRESPONDING PIN NUMBERS AND LEAD COLORS FOR THE PART OF THE KS-TYPE CONNECTOR ASSOCIATED WITH THE LOWER 914A CONNECTOR ARE AS FOLLOWS:

LOWER 914 CONN.	KS- CONN.	LEAD COLOR
14	42	Y-O
9	17	O-Y
24	47	V-O
25	22	O-V
32	48	V-G
36	49	V-BR
34	24	BR-V



**TABLE C**  
**INTERFACE CONNECTING BLOCK (66E3-25) CONNECTIONS**

CIRCUIT NO.	BELL SYSTEM LEAD DESIG.	66E3-25 CONN. BLOCK TERM. NO.	66E3-25 KS-TYPE CONN. PIN NO.	CUSTOMER LEAD DESIG.
1	T	1	26	CT
	R	2	1	CR
	S	3	27	CS
	A	4	2	CA
	G	* 5	28	CG
STA 1	BL	* 6	3	CBL
2	T	7	29	CT
	R	8	4	CR
	S	9	30	CS
	A	10	5	CA
	G	*11	31	CG
STA 2	BL	*12	6	CBL
3	T	13	32	CT
	R	14	7	CR
	S	15	33	CS
	A	16	8	CA
	G	*17	34	CG
STA 3	BL	*18	9	CBL
4	T	19	35	CT
	R	20	10	CR
	S	21	36	CS
	A	22	11	CA
	G	*23	37	CG
STA 4	BL	*24	12	CBL
5	T	25	38	CT
	R	26	13	CR
	S	27	39	CS
	A	28	14	CA
	G	*29	40	CG
STA 5	BL	*30	15	CBL

\*For Voice Connecting Arrangement CEBAX, strap G and BL leads.

◆ TABLE D ◆  
 CONNECTIONS FOR VOICE CONNECTING ARRANGEMENT CEBAX  
 USING 606A PANEL

606A PANEL CIRCUIT NO.	LEAD* DESIG	A25B CONN PIN NO.	A25B CONN CABLE COLOR	CONNECT	
				FROM	TO
				66B4-25 CONN BLK ROW NO.	66E3-25 INTERFACE CONN BLK TERM. NO.
1 (P1 J1A)	T	26	W-BL	1†	—
	R	1	BL-W	2†	—
	CT	31	R-BL	3	1
	CR	6	BL-R	4	2
	CS	33	R-G	5	3
	CA	5	S-W	6	4
CG	8	G-R	7	5§	
STA 1	CBL	—	—	8††	6§
2 (P1 J2A)	T	34	R-BR	9†	—
	R	9	BR-R	10†	—
	CT	39	BK-BR	11	7
	CR	14	BR-BK	12	8
	CS	41	Y-BL	13	9
	CA	13	G-BK	14	10
CG	16	BL-Y	15	11§	
STA 2	CBL	—	—	16††	12§
3 (P1 J3A)	T	42	Y-O	17†	—
	R	17	O-Y	18†	—
	CT	47	V-O	19	13
	CR	22	O-V	20	14
	CS	49	V-BR	21	15
	CA	21	BL-V	22	16
CG	24	BR-V	23	17§	
STA 3	CBL	—	—	24††	18§
4 (P3 J1B)	T	26	W-BL	25†	—
	R	1	BL-W	26†	—
	CT	31	R-BL	27	19
	CR	6	BL-R	28	20
	CS	33	R-G	29	21
	CA	5	S-W	30	22
CG	8	G-R	31	23§	
STA 4	CBL	—	—	32††	24§

◆ TABLE D (Cont) ◆  
 CONNECTIONS FOR VOICE CONNECTING ARRANGEMENT CEBAX  
 USING 606A PANEL

606A PANEL CIRCUIT NO.	LEAD* DESIG	A25B CONN PIN NO.	A25B CONN CABLE COLOR	CONNECT	
				FROM	TO
				66B4-25 CONN BLK ROW NO.	66E3-25 INTERFACE CONN BLK TERM. NO.
5 (P3 J2B)	T	34	R-BR	33†	—
	R	9	BR-R	34†	—
	CT	39	BK-BR	35	25
	CR	14	BR-BK	36	26
	CS	41	Y-BL	37	27
	CA	13	G-BK	38	28
	CG	16	BL-Y	39	29§
STA 5	CBL	—	—	40††	30§
6 (P3 J3B)	T	42	Y-O	41†	—
	R	17	O-Y	42†	—
	CT	47	V-O	43	31
	CR	22	O-V	44	32
	CS	49	V-BR	45	33
	CA	21	BL-V	46	34
	CG	24	BR-V	47	35§
STA 6	CBL	—	—	48††	36§
	SPARE	—	—	49	—
	SPARE	—	—	50	—

\* Stencil Lead Designations on Fanning Strips.

† Connections to CO Lines.

†† Connect to BL Lead of Key Telephone Set.

§ Strap Leads CG and CB.

◆ TABLE E ◆

CONNECTIONS FOR VOICE CONNECTING ARRANGEMENT CEBBX  
USING 606A PANEL

606A PANEL CIRCUIT NO.	LEAD* DESIG	A25B CONN PIN NO.	A25B CONN CABLE COLOR	CONNECT	
				FROM	TO
				66B4-25 CONN BLK ROW NO.	66E3-25 INTERFACE CONN BLK TERM. NO.
1 (P1 J1A)	T	26	W-BL	1†	—
	R	1	BL-W	2†	—
	CT	31	R-BL	3	1
	CR	6	BL-R	4	2
	CS	33	R-G	5	3
	CA	5	S-W	6	4
	CG	8	G-R	7	5
STA 1	CBL	—	—	8††	6
2 (P1 J2A)	T	34	R-BR	9†	—
	R	9	BR-R	10†	—
	CT	39	BK-BR	11	7
	CR	14	BR-BK	12	8
	CS	41	Y-BL	13	9
	CA	13	G-BK	14	10
	CG	16	BL-Y	15	11
STA 2	CBL	—	—	16††	12
3 (P1 J3A)	T	42	Y-O	17†	—
	R	17	O-Y	18†	—
	CT	47	V-O	19	13
	CR	22	O-V	20	14
	CS	49	V-BR	21	15
	CA	21	BL-V	22	16
	CG	24	BR-V	23	17
STA 3	CBL	—	—	24††	18
4 (P3 J1B)	T	26	W-BL	25†	—
	R	1	BL-W	26†	—
	CT	31	R-BL	27	19
	CR	6	BL-R	28	20
	CS	33	R-G	29	21
	CA	5	S-W	30	22
	CG	8	G-R	31	23
STA 4	CBL	—	—	32††	24

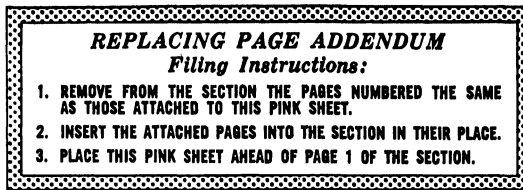
◆ TABLE E (Cont) ◆  
**CONNECTIONS FOR VOICE CONNECTING ARRANGEMENT CEBBX  
 USING 606A PANEL**

606A PANEL CIRCUIT NO.	LEAD* DESIG	A25B CONN PIN NO.	A25B CONN CABLE COLOR	CONNECT	
				FROM	TO
				66B4-25 CONN BLK ROW NO.	66E3-25 INTERFACE CONN BLK TERM. NO.
5 (P3 J2B)	T	34	R-BR	33†	—
	R	9	BR-R	34†	—
	CT	39	BK-BR	35	25
	CR	14	BR-BK	36	26
	CS	41	Y-BL	37	27
	CA	13	G-BK	38	28
	CG	16	BL-Y	39	29
STA 5	CBL	—	—	40††	30
6 (P3 J3B)	T	42	Y-O	41†	—
	R	17	O-Y	42†	—
	CT	47	V-O	43	31
	CR	22	O-V	44	32
	CS	49	V-BR	45	33
	CA	21	BL-V	46	34
	CG	24	BR-V	47	35
STA 6	CBL	—	—	48††	36
	SPARE	—	—	49	—
	SPARE	—	—	50	—

\* Stencil Lead Designations on Fanning Strips.

† Connections to CO Lines.

†† Connect to BL Lead of Key Telephone Set.



**VOICE CONNECTING ARRANGEMENT LVH  
109A AND 110A INTERCONNECTING UNIT  
69H APPARATUS MOUNTING  
606A PANEL**

**1. GENERAL**

**1.001** This addendum supplements Section 463-311-105, Issue 3. The attached pages must be inserted in the section in accordance with the filing instructions above.

**1.002** This addendum is issued to change the maintenance tests to use 1000-Hz test tone instead of dial tone.

**5. MAINTENANCE**

The following change applies to Part 5 of the section:

(a) 5.02—revised

**Attached:**

**Page 7 dated April 1974—revised**

**Page 8 dated April 1974—reissued**

SEE ADDENDUM

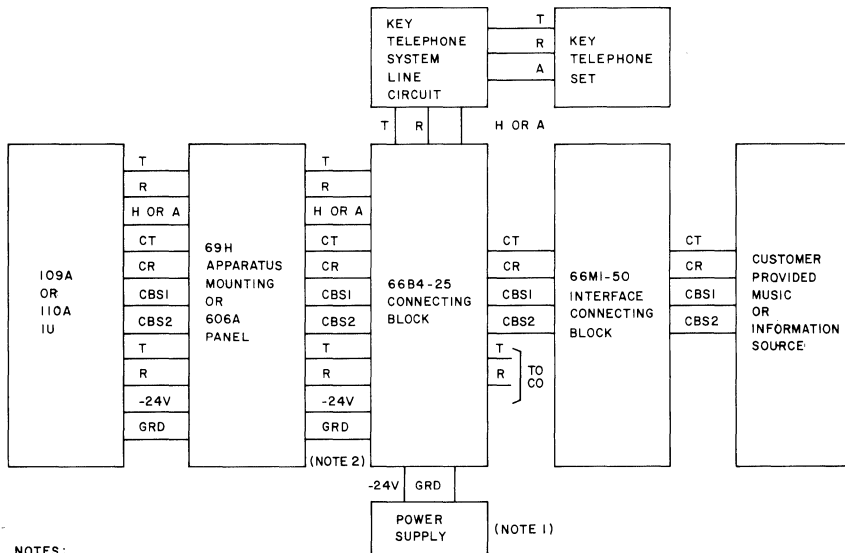
**VOICE CONNECTING ARRANGEMENT LVH  
109A AND 110A INTERCONNECTING UNITS  
69H APPARATUS MOUNTING  
606A PANEL**

**1. GENERAL**

**1.02** This section is reissued to:

**1.01** This section contains identification, installation, operation, maintenance, and connecting information for Voice Connecting Arrangement (VCA) LVH (Fig. 1). VCA LVH is equipped with 109A or 110A interconnecting unit(s) (IU) (Fig. 2) and 69H apparatus mounting(s) or 606A panel(s). This arrangement provides a voiceband connection between a customer-provided (CP) music or information source and a line or lines on hold in a key telephone system (KTS).

- Clarify the information concerning the termination of the CP music or information source with an 8-ohm resistor.
- Delete detailed information on the 606A panel formerly contained in this section which is currently contained in Section 463-300-103.
- Revise Fig. 7.



NOTES:  
1. POWER SUPPLY CONNECTS TO T1(-24V) AND T2 (GRD) ON BACK OF 606A PANEL.  
2. INSULATE AND STORE UNUSED LEADS.

**Fig. 1—Block Diagram—Voice Connecting Arrangement LVH**

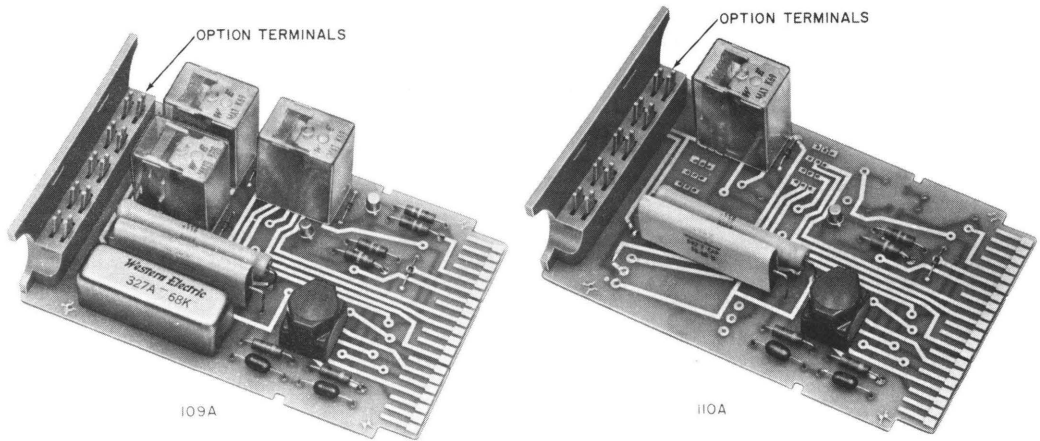


Fig. 2—109A and 110A Interconnecting Units

**1.03** The size of the job at initial installation and the expected growth should be the determining factors in selecting the proper equipment. The 69H apparatus mounting is recommended for use for one to two circuits and the 606A panel for three to six circuits.

**1.04** If the customer wants a copy of the Technical Reference which covers this interface specification, the customer should contact the local Telephone Company Business Office or the Marketing Representative.

**1.05** This issue of the section is based on the following drawing:

SD-69627-01 Issue 2B—109A and 110A IUs

If this section is to be used with equipment or apparatus reflecting later issue(s) of the drawing(s), reference should be made to the SDs and CDs to determine the extent of the changes and the manner in which the section may be affected.

## 2. IDENTIFICATION

### PURPOSE

- To adapt a CP source of recorded music or information to a line placed on hold in a KTS.

- To limit excessive levels from customer-provided equipment (CPE) and to provide protection for personnel against hazardous voltages.

### APPLICATION

- 1A, 1A1 Key Telephone System (110A IU)
- 1A2 Key Telephone System (109A IU).

◆ **Note:** The 109A IU can be used in 1A and 1A1 Key Telephone Systems instead of a 110A IU when a 110A IU is not available or when necessitated by local conditions. **However**, the connecting arrangement must be wired for use with 1A or 1A1 KTS as shown in Fig. 4 and a strap **must be provided** between option terminals 5 and 6 on the 109A IU. Before using a 109A IU in place of a 110A IU, the increased current drain (0.060 amps as opposed to 0.030 amps) and expense should be considered.◆

### ORDERING GUIDE

- Unit, Interconnecting, 109A (one per each 1A2 KTS line circuit to be connected to CP music or information source).



- Unit, Interconnecting, 110A (one per each 1A or 1A1 KTS line circuit to be connected to CP music or information source).

#### Associated Apparatus (Order Separately)

##### For 69H Apparatus Mounting

- Mounting, Apparatus, 69H (one per two 109A or 110A IUs)
- Supply, Power, 19C2 or equivalent (locally engineered and installed when existing KTS power supply is insufficient)
- Mounting, Apparatus, 16-Type (if required to mount 69H)
- Bracket, Mounting, 99B
- Cable, Connector, A25B, single-ended (one per 69H apparatus mounting)
- Block, Connecting, 66M1-50 (Fig. 3)
- Block, Connecting, 66B4-25 (one per 69H apparatus mounting)
- Resistor, KS-14603, L3A, 8.25-ohm (or equivalent 8-ohm, 1-watt resistor, one per CP music or information source)—leads no larger than 19-gauge for clip-type terminal



**Use only ONE resistor PER CP MUSIC OR INFORMATION SOURCE. The use of more than one resistor per source causes an impedance mismatch, resulting in the deterioration of voice frequency transmission.**

- Resistor, KS-14603, L3A, 511-ohm (or equivalent 500-ohm, 2-watt resistor)—for test purposes, if required (see 5.02).
- Clip, Bridging, B (Fig. 3, as required, shipped 25 per package)
- Wire, "D" inside or equivalent (for cabling from 66B4-25 connecting block to 66M1-50 interface connecting block).

##### For 606A Panel

- Panel, 606A (one per six 109A or 110A IUs)

- Supply, Power, 19C2 or equivalent (locally engineered and installed when existing KTS power supply is insufficient)
- Mounting, Apparatus, 16-Type (if required to mount 606A panel)
- Bracket, Mounting, 99B (as required)
- Cable, Connector, A25B, single-ended (one per three circuits—maximum, two per 606A panel)
- Fuse, 24E, 1/2 ampere (eight per 606A panel)
- Block, Connecting, 66M1-50 (Fig. 3)
- Block, Connecting, 66B4-25
- Resistor, KS-14603, L3A, 8.25-ohm (or equivalent 8-ohm, 1-watt resistor, one per CP music or information source)—leads no larger than 19-gauge for clip-type terminals



**Use only ONE resistor PER CP MUSIC OR INFORMATION SOURCE. The use of more than one resistor per source causes an impedance mismatch, resulting in the deterioration of voice frequency transmission.**

- Resistor, KS-14603, L3A, 511-ohm (or equivalent 500-ohm, 2-watt resistor)—for test purposes, if required
- Clip, Bridging, B (Fig. 3, as required, shipped 25 per package)
- Wire, "D" inside or equivalent (for cabling from 66B4-25 connecting block to 66MI-50 interface connecting block).

#### DESIGN FEATURES

##### 109A and 110A Interconnecting Units

- Components mounted on 4-inch 40-pin printed wiring board.
- Provides a dry contact closure to signal CPE.
- Provides voice frequency coupling to CPE.

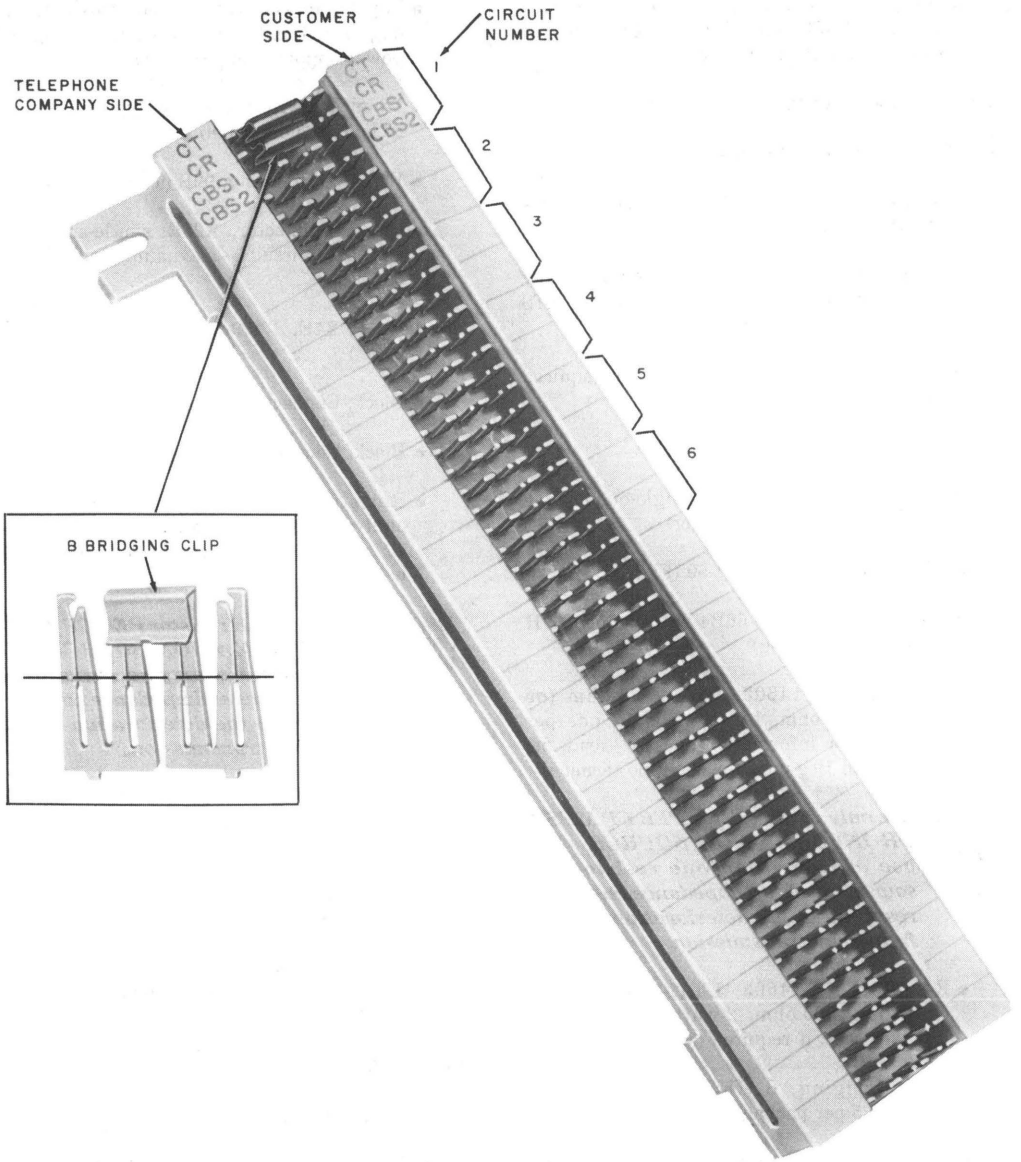


Fig. 3—Typical Interface Connecting Block

- Provides option strapping terminals.
- 109A IU designed for A-lead control (1A2 KTS) directly from the associated key telephone set.
- 109A IU requires 0.060 ampere 26V dc.
- 110A IU designed for H-lead ground from 1A1 KTS line circuit or from busy and supervisory relay circuit of 1A KTS.
- 110A IU requires 0.030 ampere at 26V dc.

### 69H Apparatus Mounting

- Provides facilities for mounting two 109A or 110A IUs.
- Equipped with two 40-pin connectors factory-wired to one 50-pin KS-type plug.
- Mounts on 99A or 99B brackets on standard relay rack or 16-type apparatus mounting.

## 3. INSTALLATION

### 69H Apparatus Mounting

- 3.01** Install the 69H apparatus mounting on a standard 23-inch relay rack or in a 16-type apparatus mounting. Connect a ground wire to rack or mounting.
- 3.02** Electrical connection is made to the 69H apparatus mounting through an A25B connector cable. Terminate the raw end of the cable to a 66B4-25 connecting block following the wiring plan shown in Fig. 1 and 6. Insulate and store all spare conductors. Refer to Part 6 for wire strap and resistor connections.
- 3.03** Extend CT, CR, CBS1, and CBS2 leads from the 66B4-25 connecting block to the 66M1-50 interface connecting block for access to the CPE. Stencil lead designations on the 66M1-50 connecting block as shown in Fig. 3.
- 3.04** The 66M1-50 interface connecting block should be located as close as possible to the 66B4-25 connecting block. Locate so that the maximum loop resistance between the CT and CR leads will not exceed approximately 1.25 ohms (less than 25 feet of No. 24 gauge) when measured at the 66B4-25

connecting block with the 8-ohm resistor disconnected and the CT and CR leads shorted at the CPE.

- 3.05** The customer must terminate the CPE to the 66M1-50 connecting block using the four terminals stenciled on the customer side.

### 606A Panel

- 3.06** Install the 606A panel as outlined in Section 463-300-103.
- 3.07** Terminate the raw end of the single-ended A25B connector cable(s), used with the 606A panel, to the 66B4-25 connecting block following the wiring plan shown in Fig. 1 and 7. (Refer to Part 6 for wire strap and resistor connection).
- 3.08** Extend CT, CR, CBS1, and CBS2 leads from the 66B4-25 connecting block to the 66M1-50 interface connecting block for access to the CPE. Stencil lead designations on 66M1-50 connecting block as shown in Fig. 3.
- 3.09** The interface connecting block should be located near the 66B4-25 connecting block. Locate so that maximum dc loop resistance of the CT and CR leads does not exceed 1.25 ohms (less than 25 feet of No. 24 gauge) when measured at the 66B4-25 connecting block with the 8-ohm resistor disconnected and the CT and CR leads strapped at the CPE.
- 3.10** The customer must terminate the CPE to the 66M1-50 connecting block using the four terminals stenciled on the customer side.
- ### 109A or 110A Interconnecting Unit
- 3.11** Loosen screw securing retaining clip to apparatus mounting or panel and raise clip or designation bar to provide access.
- 3.12** Align IU in mounting guides and properly seat printed wiring board in connector.
- 3.13** Position retaining clip or designation bar and tighten screw.
- 3.14** Stencil circuit designation and connection information, as required, on retaining clip or designation strip.
- 3.15** Perform tests shown in Part 5 after installation.

**4. OPERATION**

**1A or 1A1 Key Telephone System (110A IU, Fig. 4)**

**4.01 Incoming Call:**

An incoming central office (CO) call is answered and placed on hold in the normal manner.

**1A Key Telephone System**

- (a) Depressing the HOLD key of the telephone set causes the L relay in the 1A hold circuit to release which in turn causes H relay to operate and lock up on line current. Relay H operated causes the SR relay to operate in the busy and supervisory circuit which extends ground over the H lead of the 1A KTS to the H lead of the 110A IU.
- (b) Ground on the H lead of the 110A IU causes the H relay in the 110A IU to operate. Relay H operated provides a contact closure across leads CBS1, CBS2 toward the CP music or information source and completes a voice frequency transmission path from the CPE over leads CT, CR, through the voice coupler circuit, to tip and ring of the held party.

**1A1 Key Telephone System**

- (a) Depressing the HOLD key of the telephone set causes the A relay in the 1A1 line circuit to release which in turn causes the H relay to operate. Relay H operated extends ground over the HA lead of the 1A1 KTS to the H lead of the 110A IU.
- (b) Ground on the H lead of the 110A IU provides a contact closure and voice frequency transmission path in the same manner as the 1A KTS.

**4.02 Disconnection:**

- (a) Depressing a line pickup key associated with the incoming line placed on hold releases SR relay in the busy and supervisory relay circuit (1A KTS) or the H relay in the line circuit KTU (1A1 KTS) causing H relay of the 110A IU to release. H relay released transfers control of the connection to the KTS line circuit and removes the voice coupler from the line.

- (b) If the calling party goes on-hook while connected to the CP source, removal of control ground from the line releases H relay in the 110A IU causing the circuit to restore to normal.

**1A2 Key Telephone System (109A IU, Fig. 5)**

**4.03 Incoming Call:**

- (a) An incoming CO call is answered and placed on hold in the normal manner. Going off-hook places a ground on the A lead to the 109A IU operating the A relay which operates C relay. The A and C relays operated provide a voice frequency transmission path through the 109A IU by bypassing L relay in the tip side of the line. When the line is placed on hold, ground is removed from the A lead to the 109A IU, releasing the A relay. C relay is held operated momentarily by the diode across its winding. With C relay momentarily operated and the A relay released, L relay operates causing H relay to operate which supplies a holding ground for C relay, provides a contact closure across leads CBS1, CBS2 toward the CP music or information source, and completes a voice frequency transmission path from the CPE over leads CT, CR, through the voice coupler circuit, to tip and ring of the held party.

**4.04 Disconnection:**

- (a) Depressing the line pick-up button associated with the calling party placed on hold operates the A relay in the 109A IU, releasing L relay. Release of L relay releases H relay, opening the circuits to the CPE and restoring the talking path to the telephone set.

**5. MAINTENANCE**

- 5.01** Check the CO pair and check for loose or broken connections and blown fuses.
- 5.02** Open the circuit under test at the interface connecting block by removing B bridging clips (or wire straps). Perform the following tests:

**109A Interconnecting Unit (Fig. 5)**

- (a) Connect a 1013A (or equivalent) hand test set across CT and CR on the Telephone Company side of the 66M1-50 interface connecting

block. Operate switch on hand test set to MON position.

(b) Connect another hand test set across leads T and R of the 66B4-25 connecting block (W-S and S-W leads). Operate switch of hand test set to TALK. Central office dial tone should be heard. Dial number to return 1000-Hz tone on line.

(c) Connect an 81A or KS-16990, List 1 test set across CBS1 and CBS2. Set test set to continuity position.

(d) Ground the A lead on the 66B4-25 connecting block; the A relay should operate. Remove ground from the A lead. The A relay should release and the L and H relays should operate. The test set across CBS1 and CBS2 should indicate continuity, and 1000-Hz test tone should be heard on the 1013A hand test set connected to CT and CR.

(e) Reapply ground on the A lead. The A relay should operate and the L and H relay should release. An open circuit should appear across CBS1 and CBS2, and 1000-Hz test tone should not be heard at CT and CR. Switch the hand test set across the T and R to MON. 1000-Hz test tone should not be heard.

#### 110A Interconnecting Unit (Fig. 4)

(a) Connect a 1013A (or equivalent) hand test set across CT and CR on the Telephone Company side of the 66M1-50 interface connecting block. Operate switch on hand test set to MON position.

(b) Connect an 81A or KS-16990, List 1 test set across CBS1 and CBS2. Place test set in continuity position.

(c) Connect another hand test set across T and R of the 66B4-25 connecting block (to draw loop current). Operate switch of hand test set to TALK. Central office dial tone should be heard. Dial number to return 1000-Hz tone on line.

(d) Connect ground to H or HA lead on the 66B4-25 connecting block. Relay H should operate. Continuity should be indicated at CBS1

and CBS2, and 1000-Hz test tone heard in the hand test set connected to CT and CR.

(e) Remove ground from H or HA lead. The H relay should release, an open circuit should appear at CBS1 and CBS2, and 1000-Hz test tone will not be heard at CT and CR. Operate switch of hand test set across T and R to MON. 1000-Hz test tone should not be heard.

**5.03** When trouble is suspected in the IU, exchange it with another unit known to be functioning properly.

**Caution:** Remove fuse for particular circuit before replacing IU.

**5.04** Remove the test connections to restore circuit to normal and replace B bridging clip (or wire straps).



**Do not attempt any tests or repairs to the customer-provided equipment.**

#### 6. CONNECTIONS

◆ **Note:** Since the HA leads are multiplied between lines in the 1A1 KTS, isolation of the HA lead is necessary to prevent the H relays of all IUs from operating when any line of the KTS goes on hold. To provide isolation of the HA lead when a 202-type KTU is used, remove any existing HA lead from the KTU terminal shown in Table A and connect to a spare terminal. Connect the HA lead from the 110A IU to the vacated terminal. Connect a KS-15724, List 1 or equivalent diode between the two terminals, observing polarity as shown in Fig. 4. To provide isolation of the HA lead when a 230-, 238-, or 239-type KTU is used, use a 227B KTU as shown in Fig. 8 and Table A.◆

**6.01** ◆ Provide straps on the 66B4-25 connecting block(s) between terminals 40 and 41, 43 and 44, 46 and 47, and 49 and 50 as shown in Fig. 6 and 7.◆

**6.02** Place a KS-14603, L3A, 8-1/4 ohm resistor or 8-ohm 1-watt resistor (furnished locally) across CT and CR leads to CPE at the 66B4-25 connecting block (see Fig. 6 and 7). The resistor should have pigtailed no larger than 19 gauge to connect in the quick-connect clip-type terminals.

If wire size is larger than 19 gauge, pigtailed should be soldered to the terminals.



**Use only ONE resistor PER CP MUSIC OR INFORMATION SOURCE. The use of more than one resistor per source causes an impedance mismatch, resulting in the deterioration of voice frequency transmission.**

**6.03** For connection information when using the 69H apparatus mounting, refer to Fig. 6, 8, and Table A.

**6.04** For connection information when using the 606A panel, refer to Fig. 7, 8, and Table A.

**6.05** The same power supply used for the 1A, 1A1, or 1A2 KTS should be used for the voice connecting arrangement if capacity is sufficient.

**6.06** Refer to the appropriate section in Division 518 for 1A, 1A1, or 1A2 KTS information and connections.

TABLE A

1A1 KTS CONNECTIONS USING DIODE(FIG. 4)					1A1 KTS CONNECTIONS USING 227B KTU(FIG. 8)					
110A IU	202A	202B	202C 202D	TEL SET	110A IU	230A 230B	238A 239A	227B	TEL SET	KTS
T	1	31	7		T	7	7			
R	2	32	8		R	8	8			
HA	23	37	21		HA			12		
	9	1	1	T				11		GRD
	11	2	2	R				1		GRD
	13	3	3	A		18	21	2		
						1	1		T	
						2	2		R	
						3	3		A	

Notes:

1. For separately wired line circuits using a 202-type KTU, isolation of the HA lead to the 110A IU is provided by diodes. For multiple-wired line circuits using a 230-, 238-, or 239-type KTU, isolation of the HA lead to the 110A IU is provided by a 227B KTU.
2. Connections shown are for the first circuits of the 230-, 238-, or 239-type KTUs. For additional circuit connections refer to Section 518-114-425.

NOTES:

1. USE LOWER ROWS OF TERMINALS (ROW 40-50) AS COMMON BUSS.
2. MULTIPLE TO OTHER IU'S COMMON TO THIS MUSIC OR INFORMATION SOURCE.
3. PROVIDE ONE 8 OHM, 1 WATT RESISTOR PER CP MUSIC OR INFORMATION SOURCE.  
**DO NOT PROVIDE ONE FOR EACH IU OR CONNECTING BLOCK.**
4. GROUNDS SHOULD BE BONDED WITH SEPARATE POWER SUPPLIES.
5. MOVE EXISTING HA LEAD TO SPARE TERMINAL AND INSTALL DIODE.

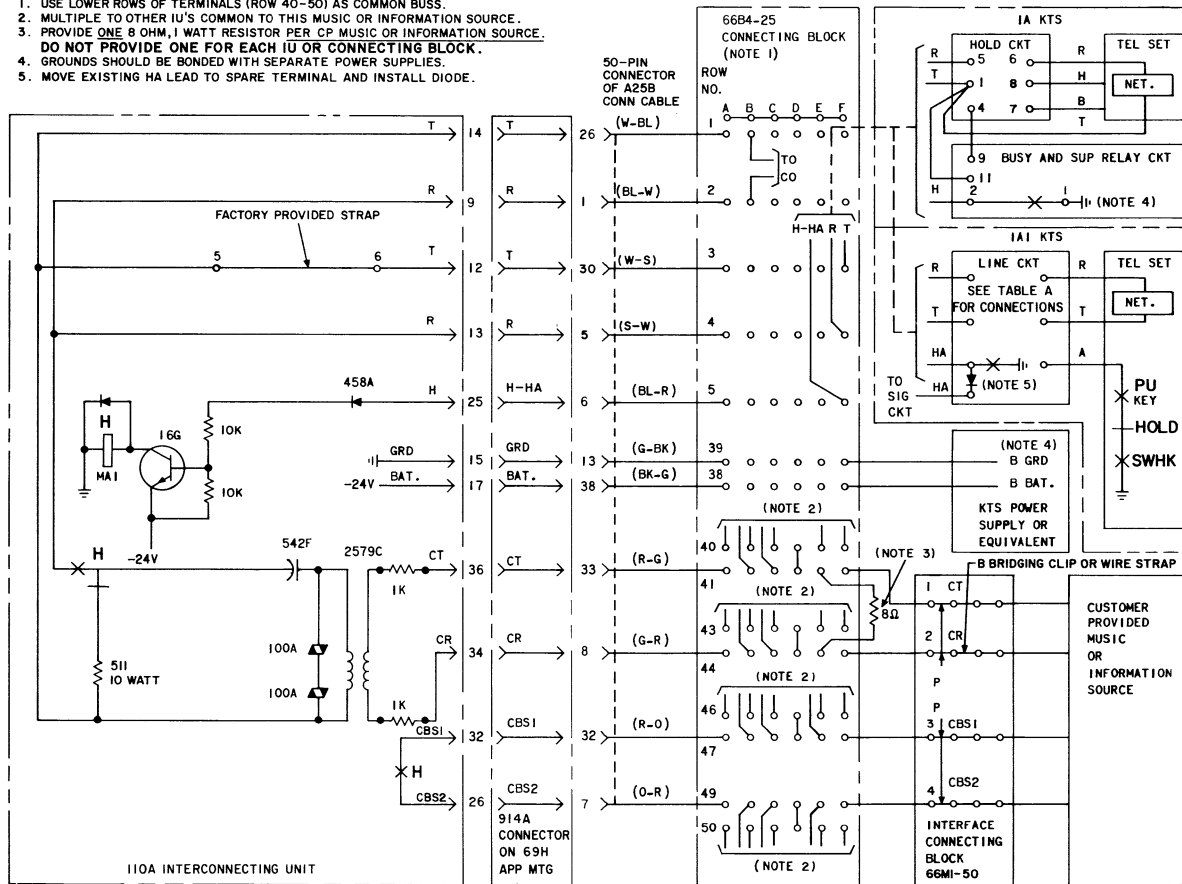


Fig. 4—Connections for Voice Connecting Arrangement LVH with 1A and 1A1 KTS

NOTES:

1. USE LOWER ROWS OF TERMINALS (ROW 40-50) AS COMMON BUSS.
2. MULTIPLE TO OTHER IU'S COMMON TO THIS MUSIC OR INFORMATION SOURCE.
3. PROVIDE ONE 8 OHM, 1 WATT RESISTOR PER CP MUSIC OR INFORMATION SOURCE. DO NOT PROVIDE ONE FOR EACH IU OR CONNECTING BLOCK.
4. GROUNDS SHOULD BE BONDED WITH SEPARATE POWER SUPPLIES.

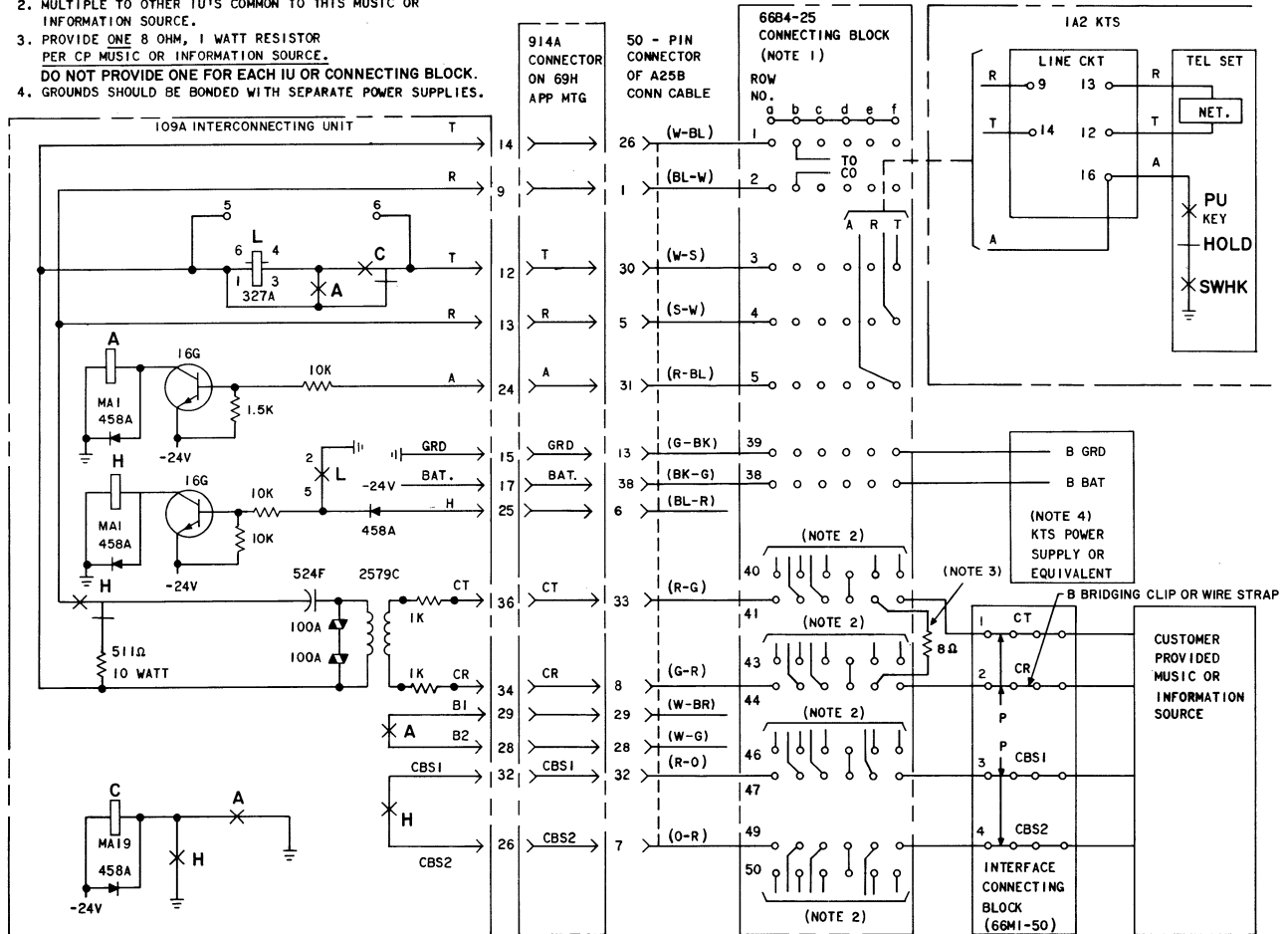


Fig. 5—Connections for Voice Connecting Arrangement LVH with 1A2 KTS



CONNECTIONS FOR CONNECTING ARRANGEMENT LVH

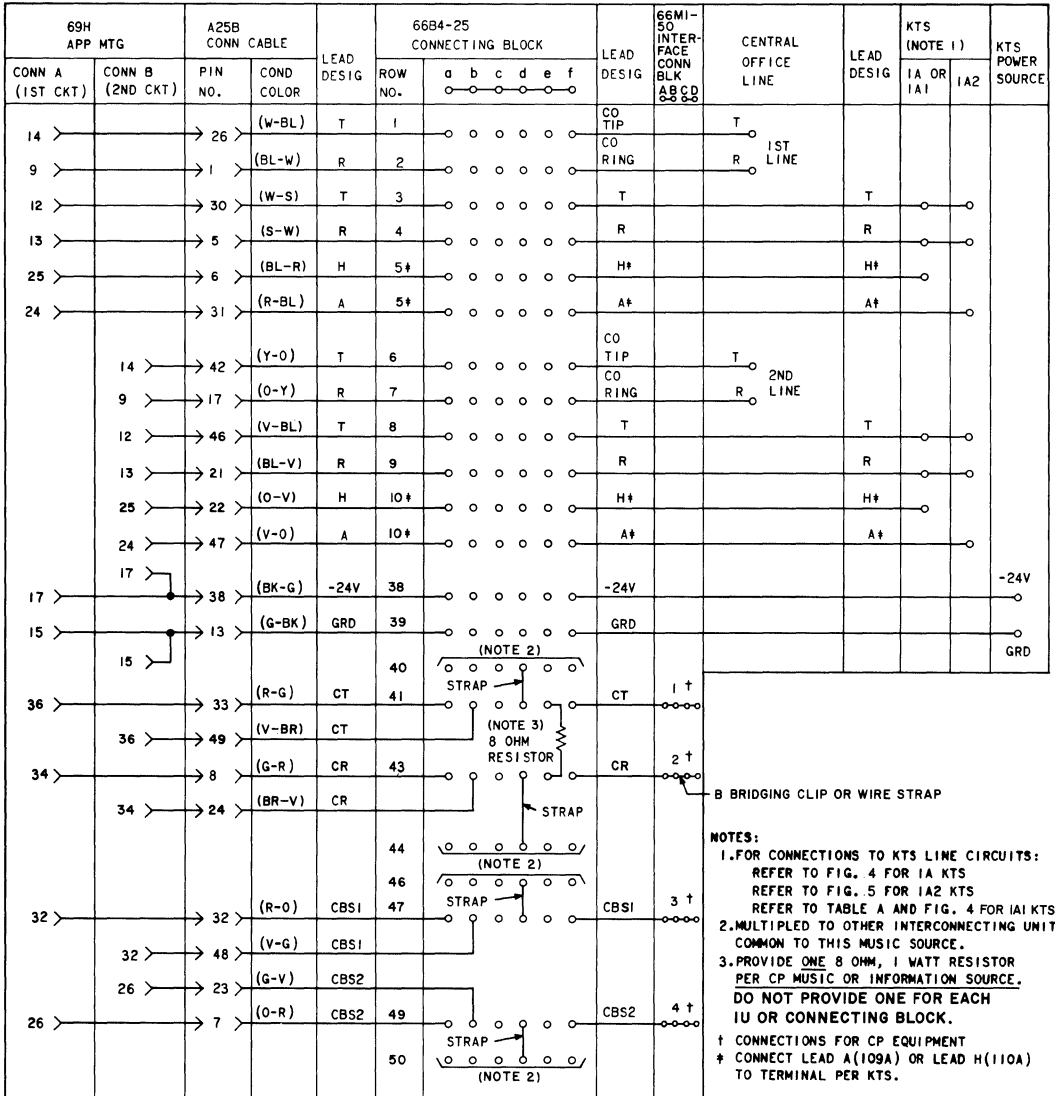


Fig. 6—Connections for Voice Connecting Arrangement LVH Using 69H Apparatus Mounting

TELEPHONE COMPANY LEADS

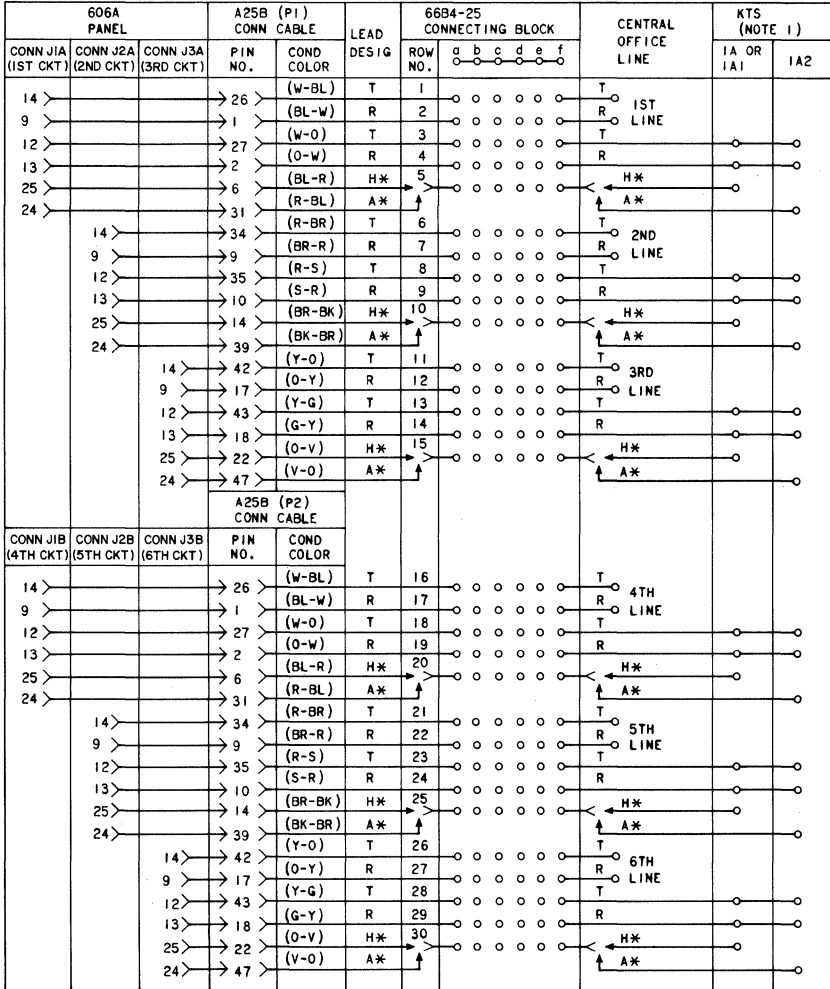
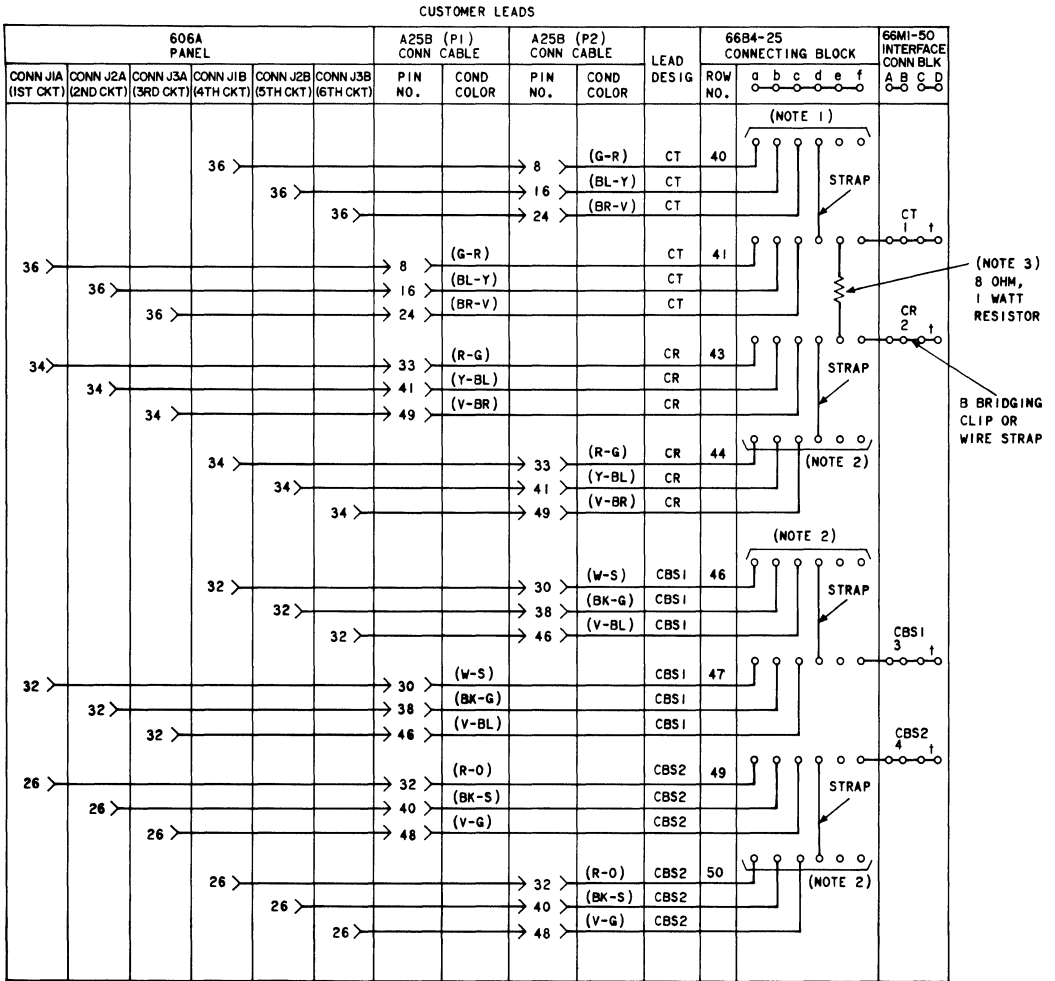


Fig. 7—Connections for Voice Connecting Arrangement LVH Using 606A Panel (Sheet 1)

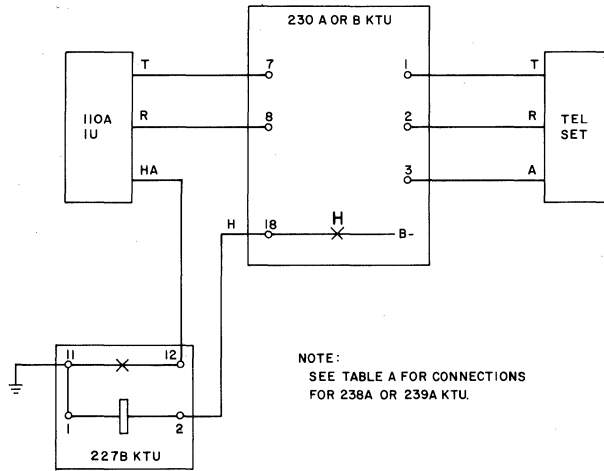


**NOTES:**

- 1. FOR CONNECTIONS TO KTS LINE CIRCUITS:  
REFER TO FIG. 4 FOR 1A KTS  
REFER TO FIG. 5 FOR 1A2 KTS  
REFER TO FIG. 4 AND TABLE A  
FOR 1A1 KTS
- 2. MULTIPLIED TO OTHER INTERCONNECTING  
UNITS COMMON TO THIS CP MUSIC OR  
INFORMATION SOURCE.

- 3. PROVIDE ONE 8 OHM, 1 WATT RESISTOR  
PER CP MUSIC OR INFORMATION SOURCE.  
DO NOT PROVIDE ONE FOR EACH IU OR  
CONNECTING BLOCK.
- \* CONNECT LEAD H TO TERMINAL WHEN  
110A IU IS USED; CONNECT LEAD A  
TO TERMINAL WHEN 109A IU IS USED.
- † CONNECTIONS FOR CP EQUIPMENT.

**Fig. 7—Connections for Voice Connecting Arrangement LVH Using 606A Panel (Sheet 2)**



**Fig. 8—Typical 1A1 Key Telephone System Connecting Diagram**

# VOICE CONNECTING ARRANGEMENTS CEBAV AND CEBAW

## 111A INTERCONNECTING UNIT

### 69H APPARATUS MOUNTING

#### 606A PANEL

#### 1. GENERAL

**1.01** This section provides identification, installation, operation, maintenance, and connection information on the 111A Interconnecting Unit (IU), formerly designated 432A KTU, and on the 69H apparatus mounting or 606A panel arranged to provide Voice Connecting Arrangements CEBAV and CEBAW which are used to couple Central Office (CO), Centrex, or PBX lines terminated on a key telephone set to customer-provided (CP) equipment.

**1.02** This section is being reissued to include information on the 606A panel.

**1.03** Voice Connecting Arrangements CEBAV and CEBAW provide for voice frequency coupling between a Bell System CO line and the CP equipment through a Bell System provided key telephone system (KTS). Supervision and network control signaling are provided by a Bell System key telephone station.

**1.04** The size of the initial installation and the expected growth should be the determining factor in selecting the proper equipment. It is recommended to use the 69H apparatus mounting for one or two 111A IUs and the 606A panel for three to six 111A IUs.

**1.05** If the customer wants a copy of the Technical Reference which covers this interface specification, the customer should contact the local Telephone Company Business Office or the Marketing Representative.

**1.06** This issue of the section is based on the following drawing:

SD-69614-01 Issue 3D (111A IU)

If this section is to be used with equipment or apparatus reflecting later issue(s) of the drawing(s),

reference should be made to the SDs and CDs to determine the extent of the changes and the manner in which the section may be affected.

#### 2. IDENTIFICATION

##### PURPOSE

- To provide a means of connecting CP equipment, typically, communications systems (CEBAW) or announcement service (CEBAV) to key telephone system lines using a multibutton key telephone set as the controlling station.
- To hold the CO line circuit in a busy state
- To limit excessive levels from CP equipment and to provide protection for personnel against hazardous voltages
- To trip CO ringing if present on the line (CEBAV).

##### APPLICATION

- 1A2 Key Telephone Systems

##### ORDERING GUIDE

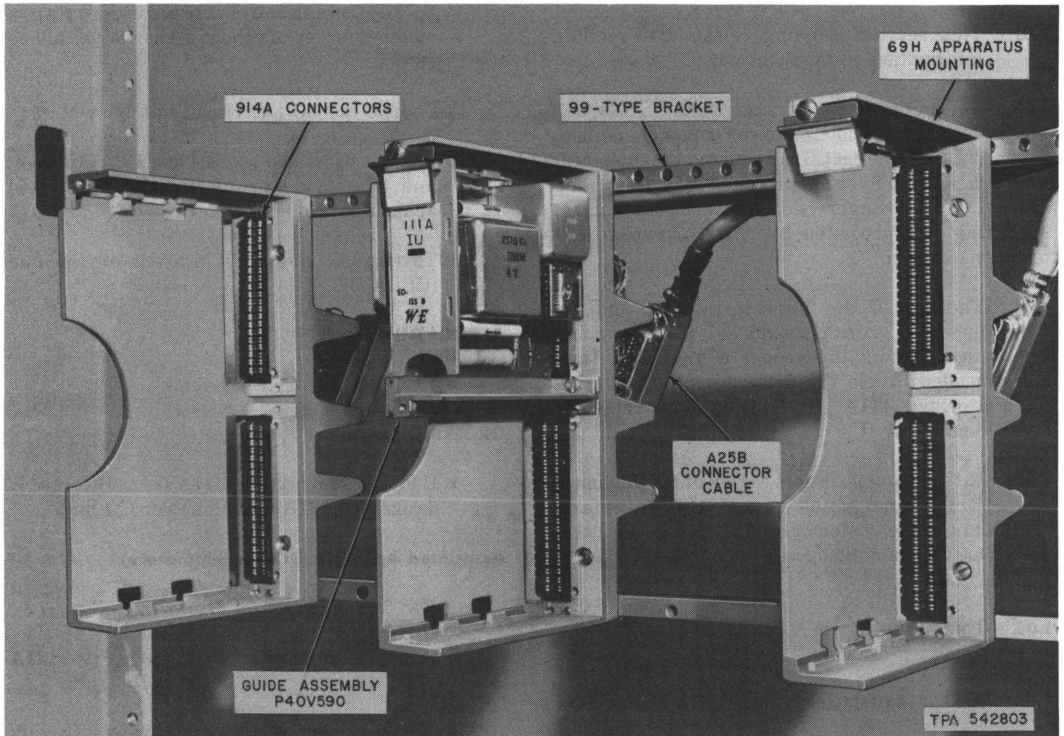
- Unit, Interconnecting, 111A (Fig. 1) formerly designated 432A KTU (one per CO line)

##### Associated Apparatus (Order Separately)

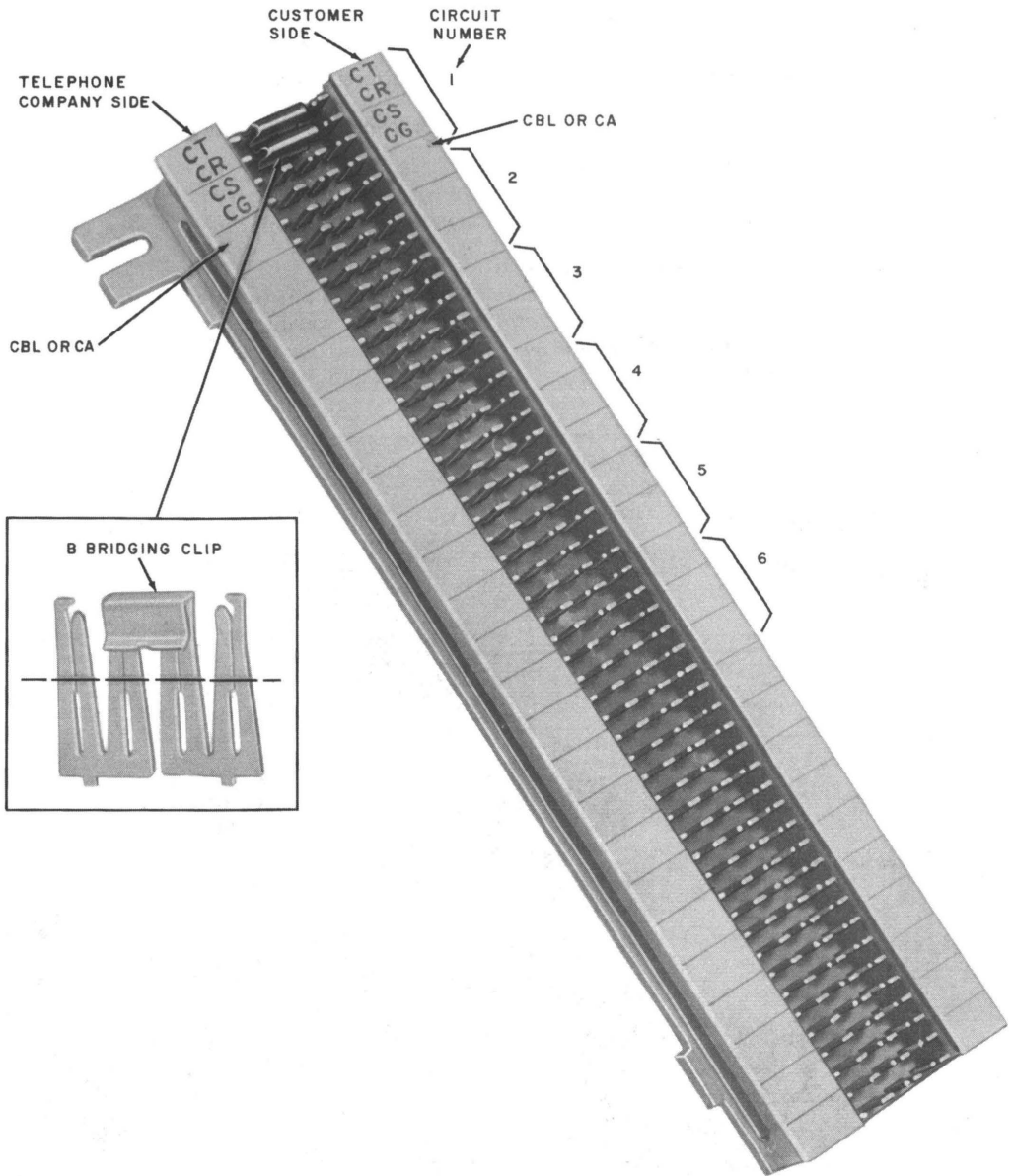
(a) *For 69H Apparatus Mounting (Fig. 1)*

- Mounting, Apparatus, 69H (one per two 111A IUs)
- Supply, Power, 19C2 or equivalent (locally engineered and installed when existing KTS power supply is insufficient)

- Block, Connecting, 66M1-50 (Fig. 2, as required)
  - Clip, Bridging, B (Fig. 2, as required)
  - Wire, "D" inside, or equivalent (for cabling from 66M1-50 intermediate connecting block to 66M1-50 interface connecting block)
  - Cable, Connector, A25B (one per 69H apparatus mounting)
  - Diode, KS-15724, List 1, or equivalent (one per each key telephone set used as a control station)
  - Bracket, 99-Type
- (b) ♦ For 606A Panel (Fig. 3 and 4)
- Panel, 606A (one per six 111A IUs)
  - Supply, Power, 19C2 or equivalent (locally engineered and installed when existing key telephone system power supply is insufficient)
  - Block, Connecting, 66M1-50 (as required)
  - Clip, Bridging, B (Fig. 2, as required)
  - Wire, "D" inside, or equivalent (for cabling from 66M1-50 intermediate connecting block to 66M1-50 interface connecting block)
  - Cable, Connector, A25B (2 per 606A panel)
  - Diode, KS-15724, List 1, or equivalent (one per each key telephone set used as a control station)



♦ Fig. 1—69H Apparatus Mounting With 111A Interconnecting Unit ♦



◆ Fig. 2—66M1-50 Interface Connecting Block ◆

- Bracket, 99-Type (1 per 606A panel)
- Fuse, 24E 1/2 ampere (8 per 606A panel)

**DESIGN FEATURES**

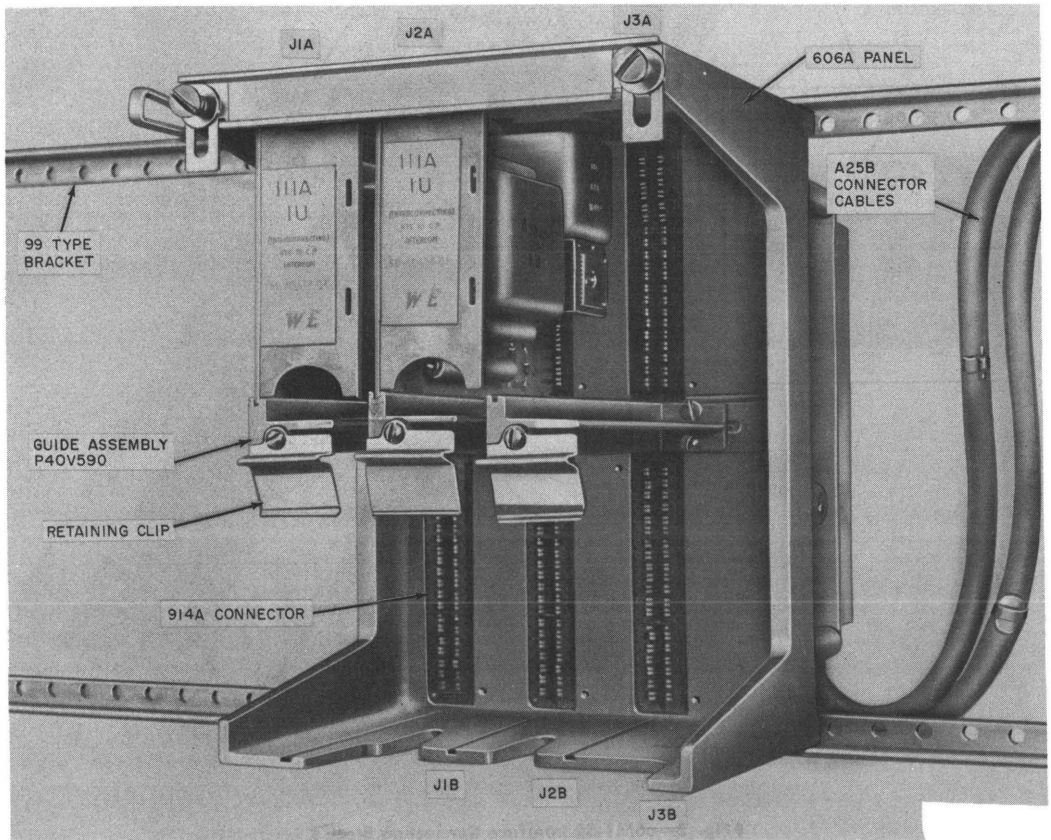
**111A Interconnecting Unit**

- Components mounted on 4-inch 40-pin board
- Provides a dry contact closure to signal CP equipment
- Provides voice frequency *only* access to the telecommunication network

- Option terminals
- Accepts supervisory signals from CP equipment
- Requires 0.047 ampere at 26V dc

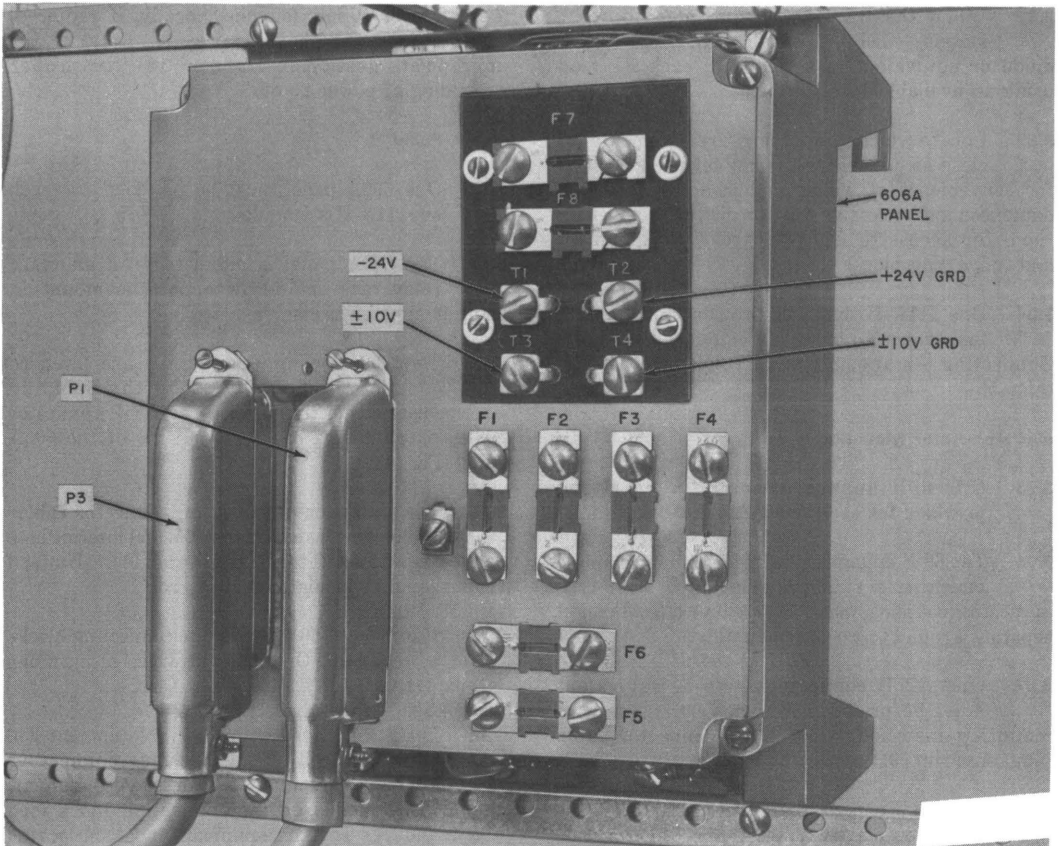
**69H Apparatus Mounting**

- Equipped with two 914-type 40-pin connectors factory wired to KS-type connector
- Designed to mount two 111A IUs



◆ Fig. 3—606A Panel With 111A Interconnecting Unit ◆





◆ Fig. 4—606A Panel (Rear View) ◆

- For mounting on standard relay rack or on 16-type apparatus mountings using 99A or 99B brackets.
- Fuse panel included
- Approximate size 6 by 8 by 9 inches ◆

#### ◆ 606A Panel

- Equipped with six 914-type 40-pin connectors factory wired to two KS-16671 50-pin plugs
- Designed to mount six 111A IUs
- For mounting on standard relay rack or on 16-type apparatus mountings using 99-type brackets

### 3. INSTALLATION

#### General

**3.01** A KS-15724, List 1 diode or equivalent must be installed as a station busy lamp circuit in each control station for Voice Connecting Arrangement CEBAV as shown in Division 502, Section entitled 2565HK Telephone Sets.

**3.02** When the BL lead is multiplied to other stations (CEBAV) install a KS-15724, List 1 diode or equivalent in series with each BL lead using an available spare terminal.

**3.03** Locate voice connecting arrangements as close as possible to the key telephone system for convenience of wiring and in an area free of dampness and excessive dust or dirt, with adequate room for access to front and rear of equipment and connecting blocks.

**3.04** One 111A IU must be provided for each CO line connected to the CP equipment for Voice Connecting Arrangements CEBAV and CEBAW (Fig. 5).

**69H Apparatus Mounting**

**3.05** One 69H apparatus mounting must be provided for each two 111A IUs installed.

**3.06** The 69 H apparatus mounting can be mounted on either a standard relay rack or 16-type apparatus mounting, using 99-type brackets. (Connect separate ground to rack or mounting.)

**3.07** One A25B connector cable or equivalent must be provided for each 69H apparatus mounting installed. The A25B connector cable plugs into the 69H apparatus mounting.

**3.08** The stub end of the A25B connector cable will be terminated on the 66M1-50 intermediate connecting block (see Fig. 6). Unused leads should be insulated and stored.

**3.09** Install 66M1-50 intermediate connecting blocks as required (one block will accommodate connections for six 111A IUs).

**3.10** Leads associated with the CP equipment will be terminated on an interface connecting block (66M1-50). Circuit numbers or lead designations should be stenciled on the connecting block (see Fig. 2 and 6). The CP equipment must be located so that maximum loop resistance of the CA, CS leads does not exceed 50 ohms measured at the interface connecting block.

**3.11** The customer must terminate the CP equipment to the 66M1-50 interface connecting block using the five terminals stenciled on the customer side.

**3.12** Power supply (supplied locally, if required) connects as shown in Fig. 6. Refer to the appropriate section in Division 167 for proper grounding of power plants.

**606A Panel**

**3.13** One 606A panel must be provided for each six 111A IUs installed.

**3.14** The 606A panel is mounted on a standard relay rack or 16-type apparatus mounting using 99-type brackets.

**3.15** Two A25B connector cables are used to connect the 606A panel to the 66M1-50 intermediate connecting block. The A25B connector cables plug into the back (P1 and P3) of the 606A panel (Fig. 4).

**3.16** The stub ends of the A25B connector cables will be terminated on the 66M1-50 intermediate connecting block (Fig. 7 and Table A). Unused leads should be insulated and stored.

**3.17** Install 66M1-50 intermediate connecting blocks as required. One block provides connections for six 111A IUs.

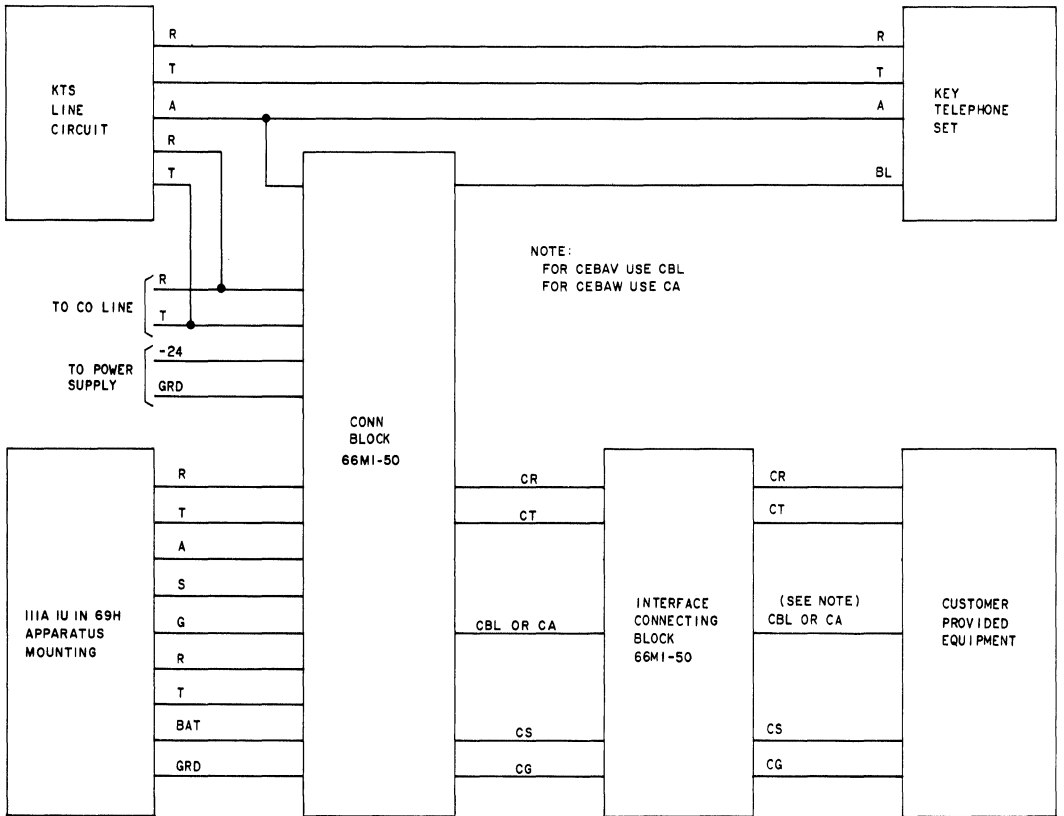
**3.18** Leads associated with the CP equipment will be terminated on an interface connecting block (66M1-50). Circuit numbers or lead designations should be stenciled on the connecting block (see Fig. 2 and 7). The CP equipment must be located so that maximum loop resistance of the CA, CS leads does not exceed 50 ohms measured at the interface connecting block.

**3.19** The customer must terminate the CP equipment to the 66M1-50 interface connecting block using the five terminals stenciled on the customer side.

**3.20** Power supply (supplied locally, if required) connects as shown in Fig. 4. Refer to the appropriate section in Division 167 for proper grounding of power plants.⚡

**111A Interconnecting Unit**

**3.21** Strap W option, when required, per Fig. 8 before installing IU in apparatus mounting. Check option strap for continuity.



◆ Fig. 5—Block Diagram—111A Interconnecting Unit With 69H Apparatus Mounting ◆

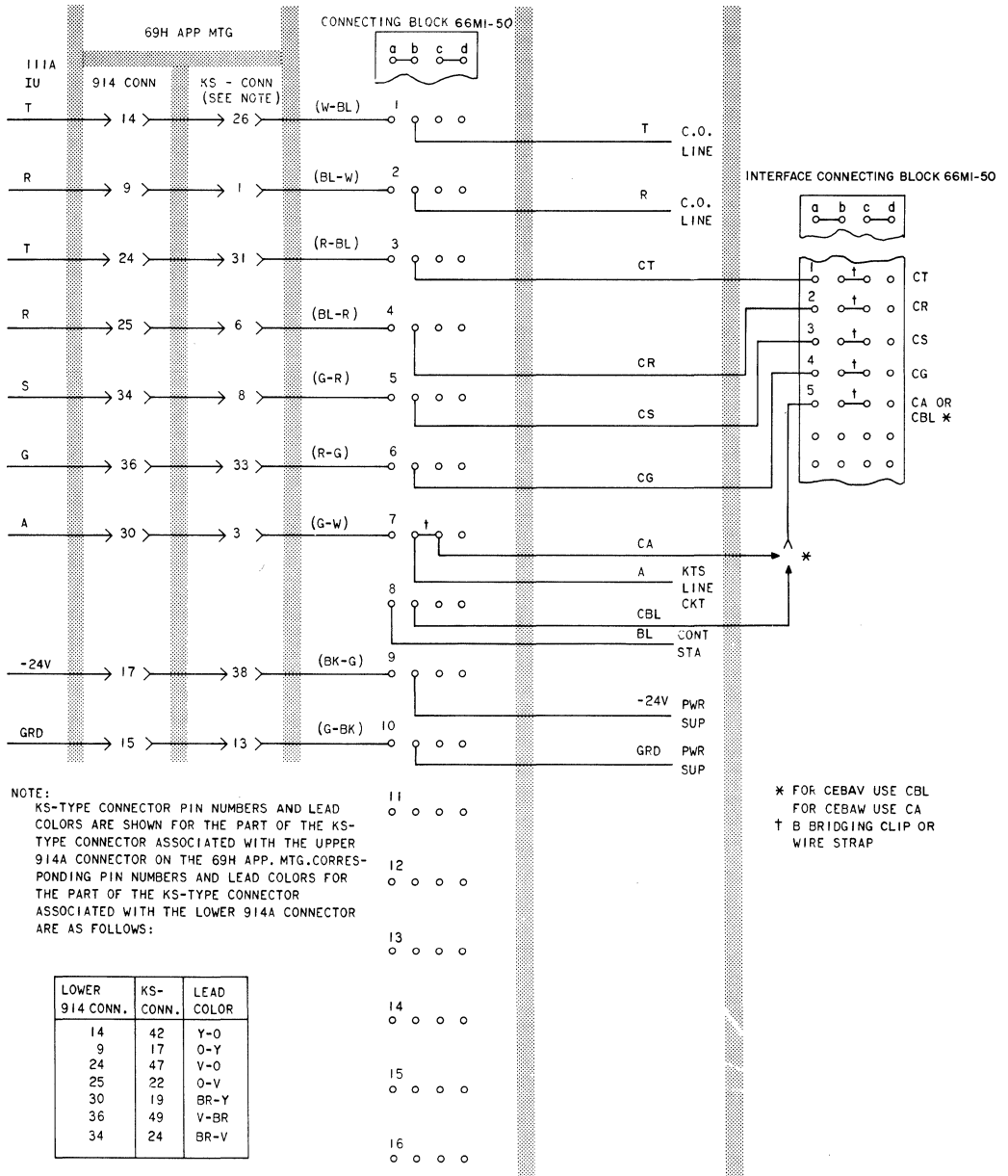
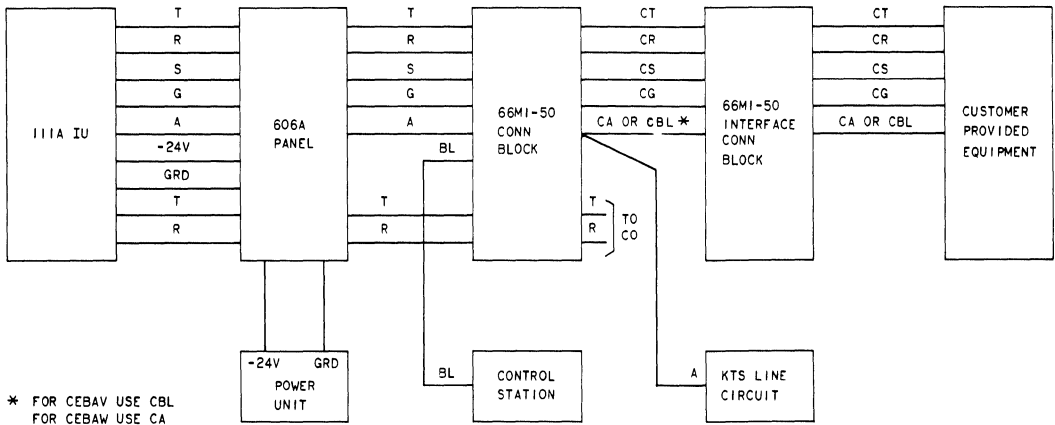


Fig. 6—Connections for 69H Apparatus Mounting



◆ Fig. 7—Block Diagram—111A Interconnecting Unit With 606A Panel ◆

**3.22** Loosen screw securing retaining clip or designation bar to apparatus mounting or panel and raise clip or designation bar to provide access to mounting.

**3.23** Align IU in mounting guides and properly seat connector of printed wiring board in connector of mounting.

**3.24** Position retaining clip or designation bar on rear of IU and tighten screw.

**3.25** Stencil circuit and connection information as required to designation strip or retaining clip.

**3.26** Perform tests shown in Part 5 after installation.

#### 4. OPERATION (Fig. 8)

##### Connection—Voice Connecting Arrangement CEBAV (V Option)

**4.01** When the Bell System control station is busy (off-hook) and receives an incoming call on another CO line, the CP announcement device can connect to this CO line through the IU by operating the CP locking key (make contact) associated with this line. This will complete an operate path for the TR relay over the CS, CA, and A lead to the A1 ground. The TR relay will remain operated under the control of the CP

equipment and the handset of the Bell System key telephone set.

TR relay operated:

(a) Connects ground potential to the associated A lead holding the CO line circuit in the busy state.

(b) Connects the transmission path from transformer T1 to the CP delayed announcement device via CR and CT leads.

(c) Connects T and R leads of transformer T1 to the CO line, which will trip the CO ringing and provide a dc holding path for the CO line, as well as a transmission path through the IU to the CP equipment.

**4.02** Capacitor C2 blocks dc from transformer T1 and the varistors. Varistors RV1 and RV2 serve as power limiting devices.

**4.03 Bell System Station Disconnect:** The control station handset must remain off-hook to maintain interconnection between the Bell System CO line and the CP announcement device. Disconnect can be achieved by placing the handset on-hook which in turn removes ground from the TR relay in the associated IU and disconnects the CP equipment restoring the circuit to normal. When there are multiple stations associated with this

**TABLE A**  
**◆ CONNECTIONS FOR 606A PANEL**

CIRCUIT NO.	LEAD* DESIG	CONN PIN NO.	CONN CABLE COLOR	CONNECT	
				FROM	TO
				66M1-50 CONN BLK ROW NO.	66M1-50 INTERFACE CONN BLK ROW NO.
P1 J1A	T	26	W-BL	1 †	—
	R	1	BL-W	2 †	—
	CT	31	R-BL	3	1
	CR	6	BL-R	4	2
	CS	33	R-G	5	3
	CG	8	G-R	6	4
	CA	5	S-W	7	5
	CBL	—	—	8††	5
P1 J2A	T	34	R-BR	9 †	—
	R	9	BR-R	10 †	—
	CT	39	BK-BR	11	6
	CR	14	BR-BK	12	7
	CS	41	Y-BL	13	8
	CG	16	BL-Y	14	9
	CA	13	G-BK	15	10
	CBL	—	—	16††	10
P1 J3A	T	42	Y-O	17 †	—
	R	17	O-Y	18 †	—
	CT	47	V-O	19	11
	CR	22	O-V	20	12
	CS	49	V-BR	21	13
	CG	24	BR-V	22	14
	CA	21	BL-V	23	15
	CBL	—	—	24††	15
P3 J1B	T	26	W-BL	25 †	—
	R	1	BL-W	26 †	—
	CT	31	R-BL	27	16
	CR	6	BL-R	28	17
	CS	33	R-G	29	18
	CG	8	G-R	30	19
	CA	5	S-W	31	20
	CBL	—	—	32††	20
P3 J2B	T	34	R-BR	33 †	—
	R	9	BR-R	34 †	—
	CT	39	BK-BR	35	21
	CR	14	BR-BK	36	22
	CS	41	Y-BL	37	23
	CG	16	BL-Y	38	24
	CA	13	G-BK	39	25
	CBL	—	—	40††	25
P3 J3B	T	42	Y-O	41 †	—
	R	17	O-Y	42 †	—
	CT	47	V-O	43	26
	CR	22	O-V	44	27
	CS	49	V-BR	45	28
	CG	24	BR-V	46	29
	CA	21	BL-V	47	30
	CBL	—	—	48††	30
	SPARE	—	—	49	—
	SPARE	—	—	50	—

\* Stencil Lead Designations on Fanning Strips.

† Connections to CO Lines.

†† Connect to BL Lead of Key Telephone Set.

arrangement, all stations must be on-hook to effect release of the 111A IU.

#### 4.04 *Customer-Provided Equipment Disconnect:*

Disconnect can be achieved by releasing the associated locking key to open its contact. This removes ground from the CS lead of the associated IU to release its TR relay which will disconnect the CP equipment and restore the circuit to normal.

#### Connection—Voice Connecting Arrangement CEBAW (W Option)

4.05 To connect the CP communication system to the CO line through the IU a call is first established on the associated CO line at the Bell System station. The normally open (make) contact which is furnished in the CP communication system is then operated. This will complete an operate path for TR relay over CS, CA, and A leads to A1 ground. Another CP normally open contact is operated to provide a lockup path for TR relay over CG and CS leads. TR relay operated:

- (a) Connects ground potential to the CG lead holding the TR relay operated under the control of the CP equipment.
- (b) Closes ground potential to the associated A lead holding the CO line circuit in the busy state.
- (c) Connects the transmission path from transformer T1 to the CP communications system via the CR and CT leads.
- (d) Connects the T and R path of the CO line to T1 via the T and R leads.

4.06 Transformer T1 serves as a dc holding path to the CO line when another pickup key at the Bell System control station is depressed to establish a call on another CO line, if desired. Once the interconnection is established, the Bell System station may go on-hook.

4.07 Capacitor C2 blocks dc from transformer T1 and the varistors. Varistors RV1 and RV2 serve as power limiting devices.

4.08 *Disconnect:* Disconnect can be accomplished by CP equipment only. When the CP contact closure in the lockup path opens, ground is removed from the CS lead of the associated IU to release

the TR relay which will disconnect the CP equipment and restore the circuit to normal.

## 5. MAINTENANCE (Fig. 8)

5.01 Check CO pair and for blown fuses, loose or broken connections.

5.02 Open circuit at 66M1-50 interface connecting block by removing B bridging clips (or wire straps) on all leads of circuit under test (Fig. 2). Perform the following tests.

### Option V

- (a) Using a 1013A or equivalent hand test set, clip to the tip and ring of the CO trunk associated with the IU under test at the 66M1-50 intermediate connecting block.
- (b) Operate the switch on the hand test set to TALK position; dial a CO number that will return a busy signal or 1000 Hz test tone.
- (c) Ground CS lead on the telephone company side of the 66M1-50 interface connecting block; TR relay should operate.
- (d) Remove the hand test set from tip and ring of CO line, operate switch to MON position, and clip to CT and CR at 66M1-50 interface connecting block. Busy signal or 1000 Hz tone should be heard.
- (e) Remove ground from CS lead; TR relay will release, and busy signal or 1000 Hz tone will not be heard.

### Option W

- (a) Place a strap (short) across CS and CG terminals on the telephone company side of the 66M1-50 interface connecting block.
- (b) Using a 1013A or equivalent hand test set, clip to the tip and ring of the CO trunk associated with the IU under test at the 66M1-50 intermediate connecting block.
- (c) Operate the switch on the hand test set to the TALK position; dial a CO number that will return a busy signal or 1000 Hz tone.

- (d) Ground CS lead on the 66M1-50 interface connecting block; TR relay should operate.
  - (e) Remove the hand test set from tip and ring of CO line, operate switch to MON position, and clip CT and CR at 66M1-50 interface connecting block. Busy signal or 1000 Hz tone should be heard.
  - (f) Remove ground from CS lead; busy signal or 1000 Hz tone should still be heard.
  - (g) Remove strap from CS and CG terminals; TR relay will release, and busy signal or 1000 Hz tone will not be heard.
- 5.03** If the results described are not obtained, check wiring, battery, and ground to unit. If battery and ground are present and wiring is correct, replace IU and retest.
- 5.04** When trouble is suspected in the 111A IU, exchange it with another unit known to be functioning properly.
- 5.05** If the tests described are satisfactory, restore circuit to normal by replacing B bridging clips ( or wire straps).

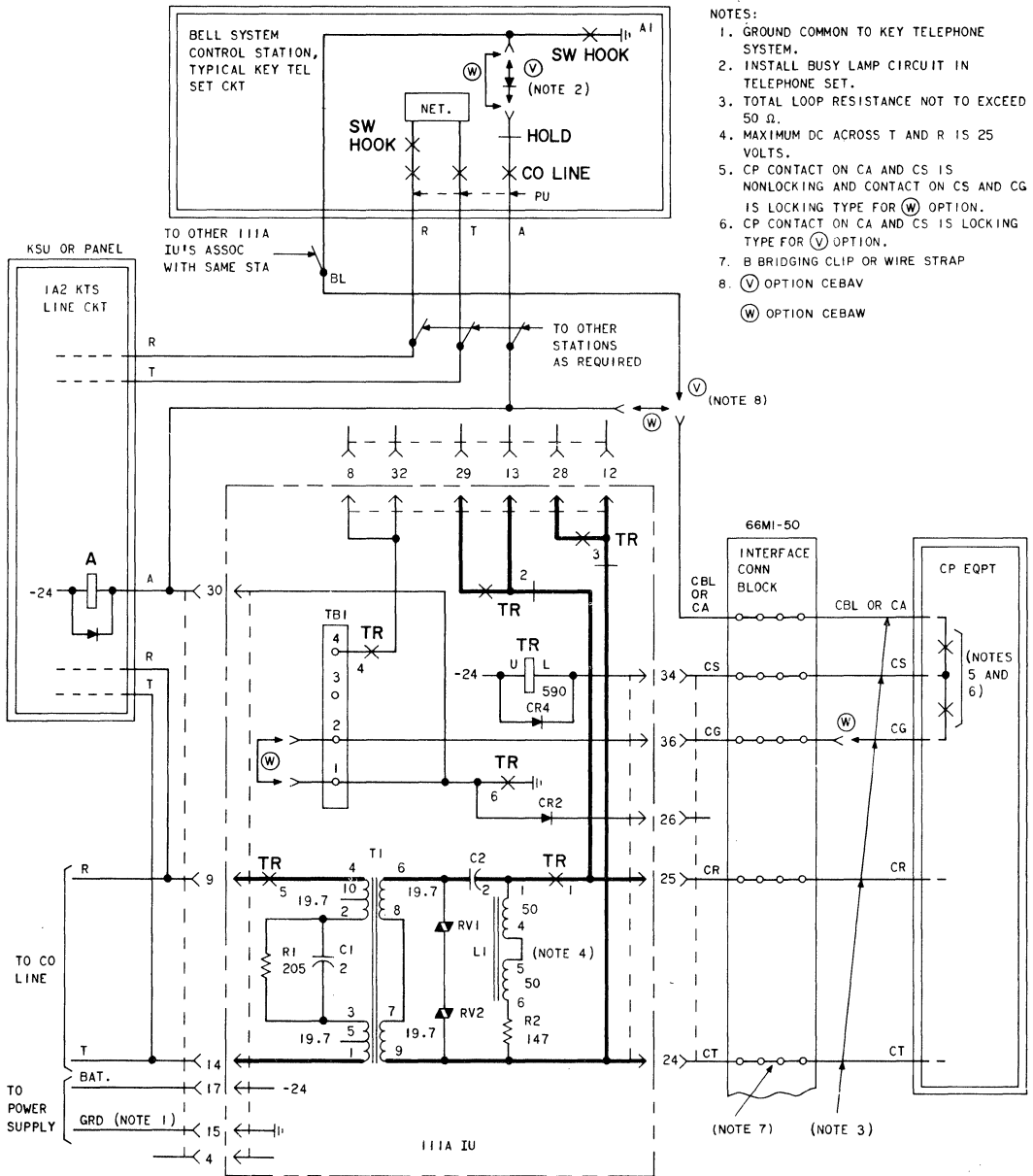


***Do not attempt any tests or repairs to the CP equipment.***

## 6. CONNECTIONS

- 6.01** For connecting information using the 69H apparatus mounting, refer to Fig. 6 and 8.
- 6.02** The 111A IU is shown schematically in Fig. 8. The 69H apparatus mounting has provisions for installing two 111A IUs. Terminal designations for the KS-type connector associated with the apparatus mountings in Fig. 6 provide for installing 111A IUs in both positions.
- 6.03** For connecting information using the 606A panel, refer to Fig. 8 and Table A.
- 6.04** Table A shows connections for six 111A IUs, circuit lead designations, connector cable color codes, and cross-connects from 66M1-50 intermediate connecting block to 66M1-50 interface connecting block. Lead BL from the key telephone set connects to terminal CBL on the 66M1-50 connecting block.
- Lead A from the key telephone system line circuit connects to terminal CA on the 66M1-50 intermediate connecting block. Power supply (supplied locally) connects -24V to T1 and GRD to T2 (Fig. 4) on rear of 606A panel.





- NOTES:
1. GROUND COMMON TO KEY TELEPHONE SYSTEM.
  2. INSTALL BUSY LAMP CIRCUIT IN TELEPHONE SET.
  3. TOTAL LOOP RESISTANCE NOT TO EXCEED 50 Ω.
  4. MAXIMUM DC ACROSS T AND R IS 25 VOLTS.
  5. CP CONTACT ON CA AND CS IS NONLOCKING AND CONTACT ON CS AND CG IS LOCKING TYPE FOR (W) OPTION.
  6. CP CONTACT ON CA AND CS IS LOCKING TYPE FOR (V) OPTION.
  7. B BRIDGING CLIP OR WIRE STRAP
  8. (V) OPTION CEBAV  
(W) OPTION CEBAW

◆ Fig. 8—Schematic—Voice Connecting Arrangements CEBAV & CEBAW ◆

## **VOICE CONNECTING ARRANGEMENT C2AKS**

### **1. GENERAL**

**1.01** This section provides identification, installation, operation, maintenance, and connection information on the 102-type interconnecting unit (IU) when used in Voice Connecting Arrangement (VCA) C2AKS.

**1.02** This section is reissued to:

- Include information on the 615A panel which replaces the 69G apparatus mounting
- Add use of 142A test set
- Include information on the KS-20944 protector
- Add information about W option on the 102B IU
- Add information on the 604C panel and 21A apparatus unit
- Add information on index clips of the 604B panel.

**1.03** The 102B IU (Fig. 1) is an improved version of the 102A IU (MD) providing option terminals for matching the impedance of the customer-provided equipment (CPE) to the central office (CO) line. The 102B IU does not require pulse correction. In existing installations using pulse correction, the 103A IU (MD) pulse correctors must be removed when replacing the 102A IUs with the 102B IUs. The 102B IU also increases the range limitation to the CPE from 18 ohms to 100 ohms maximum on the supervision leads (CS and CG).

**1.04** Refer to Sections 463-300-101 and 463-300-102 for information on the 604A (MD), 604B, and 604C panels. ♦Refer to Section 463-300-104 for information on the 615A panel, Section 463-300-113 for information on the 142A test set and Section 463-300-109 for information on the KS-20944 protector.♦

**1.05** The size of the job on initial installation and the expected growth should be the

determining factor in selecting the proper equipment. ♦For one to three circuits using the 102-type IU use the 615A panel. For four to fourteen circuits use the 604 type. Connections are provided for the 69G apparatus mounting, but it should be used on an Additions and Maintenance (A&M) basis only.♦

**1.06** If the customer wants a copy of the Technical Reference which covers this interface specification, the customer should contact the local Telephone Company Business Office or the Marketing Representative.

**1.07** This issue of the section is based on the following drawings:

SD-1E238-01, Issue 2A—102B IU

SD-1E202-01, Issue 3A—102A IU

SD-1E258-01, Issue 1—142A Test Set

SD-1E200-01, Issue 2D—604A Panel

SD-69599-01, Issue 2A—69G Apparatus Mounting

If this section is to be used with equipment or apparatus reflecting later issue(s) of the drawing(s), reference should be made to the SDs and CDs to determine the extent of the changes and the manner in which the section may be affected.

### **2. IDENTIFICATION**

#### **PURPOSE**

- To provide an interface between CPE and a CO, PBX, or 1A2 Key Telephone System station line terminating on a Bell System station set
- To provide network control signaling functions
- To busy out the line associated with a key telephone system station (if provided)

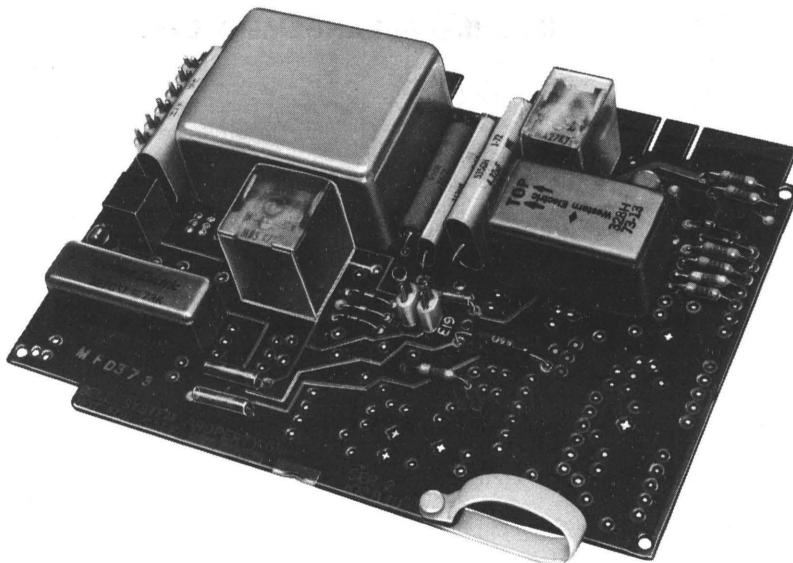


Fig. 1—102B Interconnecting Unit

- To limit excessive levels from the CPE and to provide protection for telephone company personnel against hazardous voltages.

**APPLICATION**

- Voice Connecting Arrangement C2AKS provides an automatic connection of customer-provided (CP) terminal equipment, typically call diversion of WATS line extension equipment, to a Bell System CO, PBX, or 1A2 Key Telephone System station line terminating on a Bell System station set.

**ORDERING GUIDE**

- Unit, Interconnecting, 102A or 102B (one per CO trunk, Fig. 1).

◆ **Note:** If 102A IUs are used in positions 13 or 14 of a 604B or 604C panel, 102A IUs must also be used in positions 1, 4, 7, and 10.◆

**Associated Apparatus (Order Separately)**

**Note:** If a 23-inch relay rack is not provided on customer premises, provide a 16C apparatus mounting, or equivalent, for the 69G or an ED-91180-72, Group 21 cabinet for the 604-type or 615A panels.

- Panel, 604A1, (fuse panel only—no power unit)  
or
- Panel, 604A2 (19C2 power unit and fuse panel)  
or
- Panel, 604B and 604C (fuse panel only—no power unit, will mount up to fourteen 102-type IUs)
- ◆ Unit, Apparatus, 21A (used with 604C panel when -48 voltage is supplied)

- Panel, 615A (fuse panel only—no power unit; will mount up to three 102-type IUs) (Fig. 2)◆
- Bracket, 99B (one per three 615A panels)
- Cable, A25B (four per 604-type panel [see Table A] or one per 615A-type panel)
- Block, Connecting, 66M1-50 (as required, Fig. 3)
- Block, Connecting, 66B4-25 (as required)
- Clip, Bridging, B (as required, shipped 25 per package, Fig. 3)
- Block, Connecting, 66E3-25 (optional, Fig. 4)

**Note:** ◆Other type blocks should not be used due to incompatibility with the 142A test set connections.◆

- Cable, "D" Inside Wiring, or equivalent (for cabling from 66B4-25 intermediate connecting block to the 66M1-50 interface connecting block)
- Unit, Power, 19C2 (or equivalent for 604A1, 604B, 604C, or 615A panel locally engineered and installed when existing KTS power supply is insufficient)
- Cord, Power (for 19C2 power unit or 604A2 panel)
  - P40J326 (1-1/2 ft)
  - P40J327 (2 ft)
  - P40J328 (4 ft)
  - P40J329 (6 ft)
  - P40J099 (12 ft)
- ◆Protector, KS-20944, List 1 or List 2 (Fig. 5)—for optional power protection.

**Note:** Must be provided when a CP dc power supply is used. Use List 1 protector for -4 volts and List 2 for -48 volts.◆

#### Replaceable Components (For 604-Type Panel)

- Unit, Power, 19C2 (604A2 only)
- Fuses, 70G (1/2 ampere, 18 per 604A-type panel)
- ◆Fuses, 70A (1-1/3 ampere, 3 per 604B and 604C panels)
- Fuses, 70F (1/4 ampere, 13 per 604B and 604C panels)
- Fuses, 70G (1/2 ampere, 2 per 604B and 604C panels)
- Indicator, 17C-49 (for optional fuse alarm, if required, for 604B and 604C panels only).◆

#### ◆Replaceable Components (For 615A-Type Panel)

- Fuse, 24E (1/2 ampere, 8 per panel)◆

### DESIGN FEATURES

#### 102-Type Interconnecting Unit

- Components mounted on epoxy-coated 8-inch 80-pin board
- Provides voice frequency coupling to CPE
- 2-way loop-start operation
- Option terminals
- Line impedance matching (102B only)
- Requires 0.090 ampere at 26 volts dc (102B) maximum
- Requires 0.110 ampere at 26 volts dc (102A) maximum
- Provides dc isolation to CPE
- Limits excessive signals
- Permits tone signaling from customer equipment.

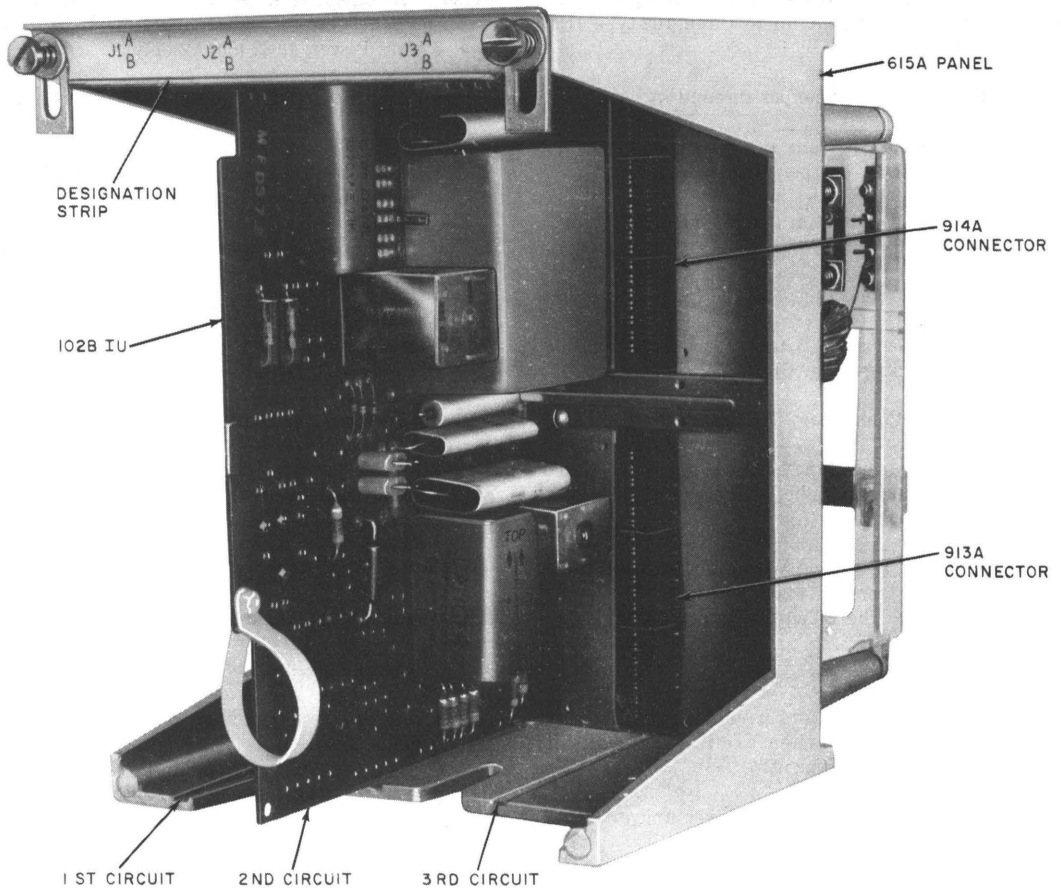


Fig. 2—102B Interconnecting Unit Mounted in 615A Panel

### 3. INSTALLATION

#### 69G Apparatus Mounting (Fig. 6)

◆**Note:** The 69G apparatus mounting is not recommended for new installations. It has been replaced by the 615A panel. The following paragraphs are intended for use on an A&M ONLY basis.◆

**3.01** Electrical connection is made to the 69G apparatus mounting through two A25B connector cables. Terminate the raw end of the cable to a 66B4-25 intermediate connecting block

following the wiring plan shown in Fig. 6. Insulate and store all spare conductors. The CO lines and power supply leads also connect to this block.

**3.02** Extend the CT, CR, CS, CG, C1, C2, and CA (if provided) leads from the 66B4-25 intermediate connecting block to the 66M1-50 interface connecting block for access to the CPE. Stencil lead designations on the interface connecting block as shown in Fig. 3.

**3.03** Separate fusing and -24 volt power are provided locally. ◆Connect the telephone company-provided power supply leads or CP dc

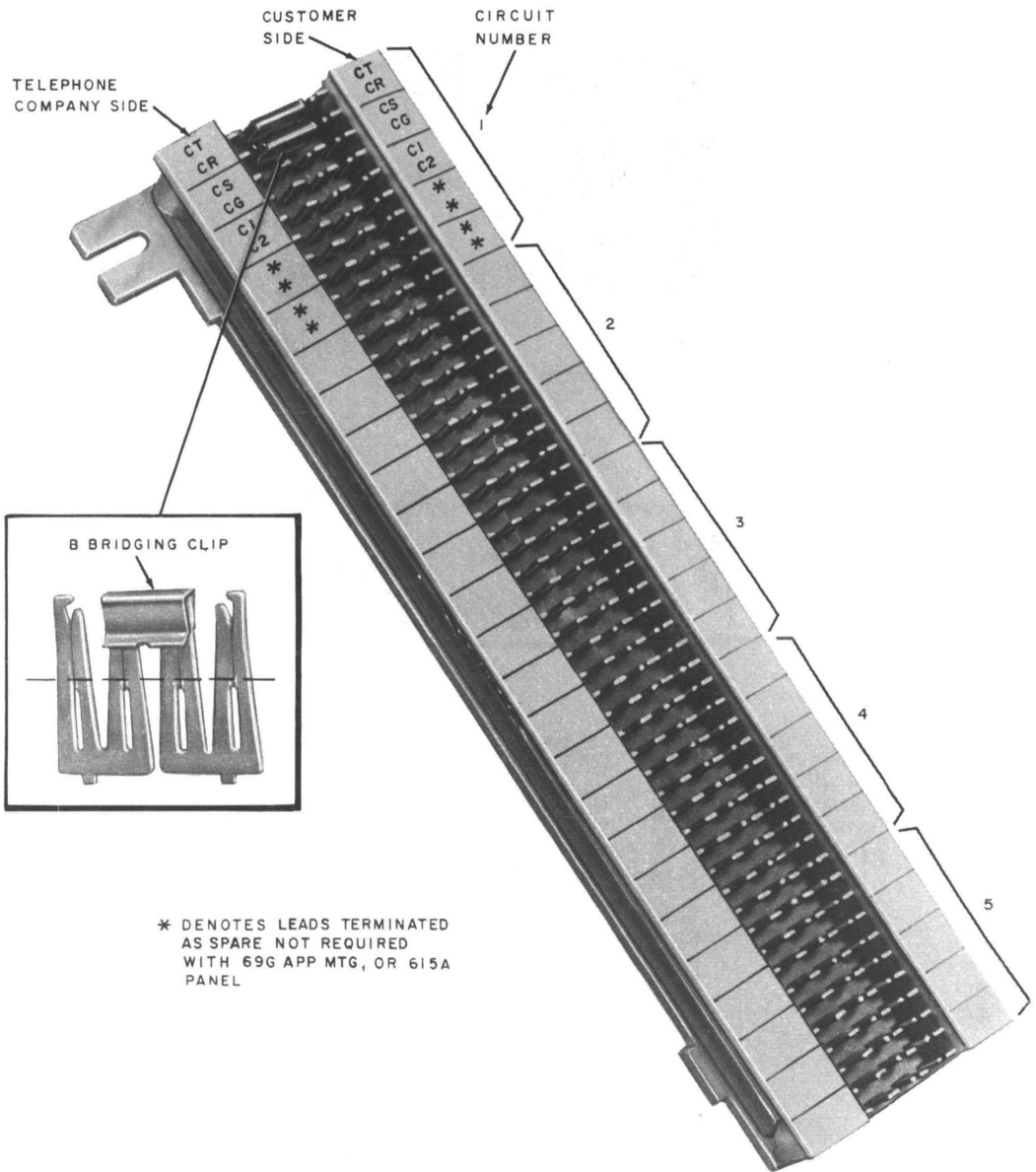


Fig. 3—66M1-50 Interface Connecting Block

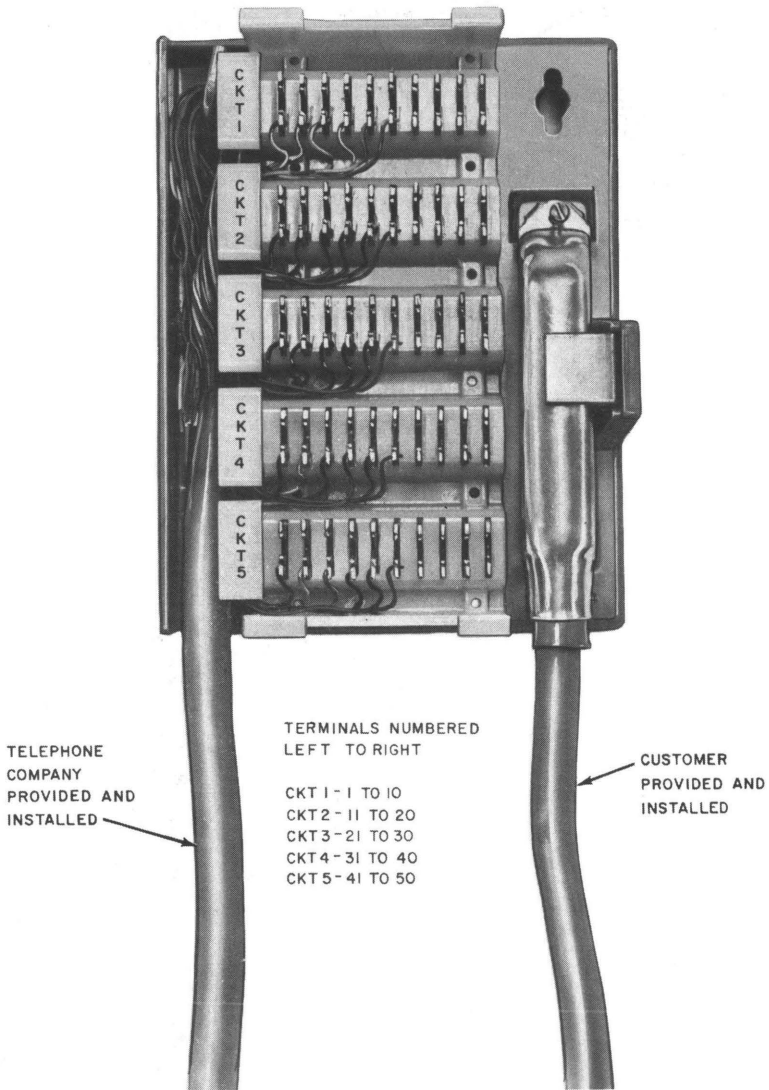


Fig. 4—66E3-25 Interface Connecting Block (Optional)

power supplied through the KS-20944, List 1 protector to the 66B4-25 connecting block as shown in Fig. 6 and Table K and multiple through separate fuses to each 102-type IU (201C KTU fuse unit with 24E, 1/2 ampere fuses or equivalent).

**3.04** The 66B4-25 intermediate connecting block and the 66M1-50 interface connecting block should be located within 25 feet of the 69G apparatus mounting. The customer must terminate the CPE on the 66M1-50 interface connecting block using



Fig. 5—KS-20944 Protector



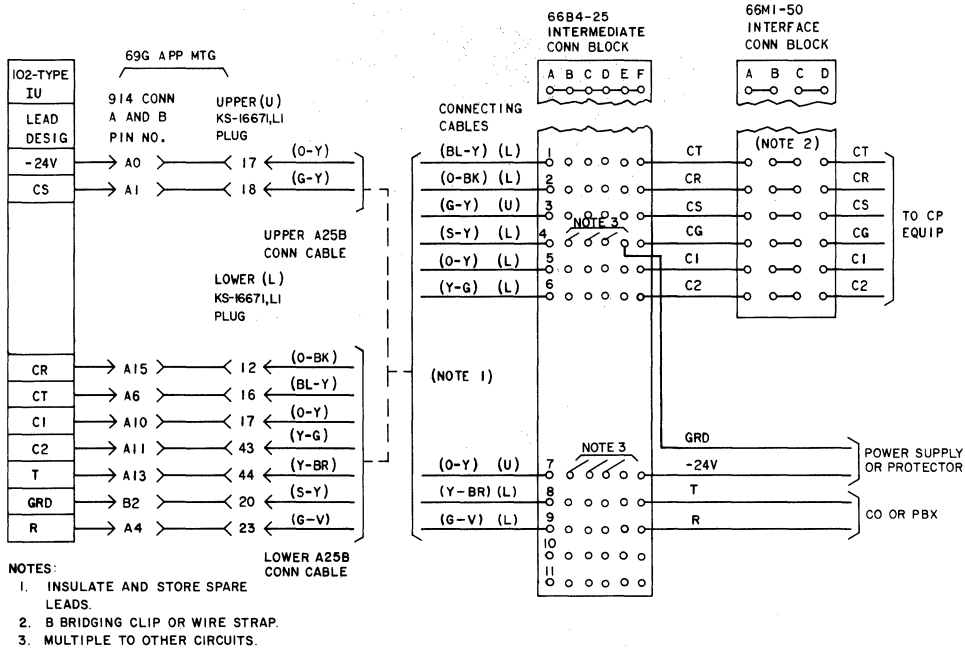


Fig. 6—Connection Diagram for 69G Apparatus Mounting

the seven terminals stenciled on the customer side of the 66M1-50 interface connecting block.

**604-Type Panel (Fig. 7, 8 and Tables B, C, D, E and G)**

**3.05** The 604-type panel will mount on a standard 23-inch relay rack or in an ED-91180-72, Group 21, 18-plate equipment cabinet which should be installed in a location specified by the customer. Connect a frame ground to rack or cabinet.



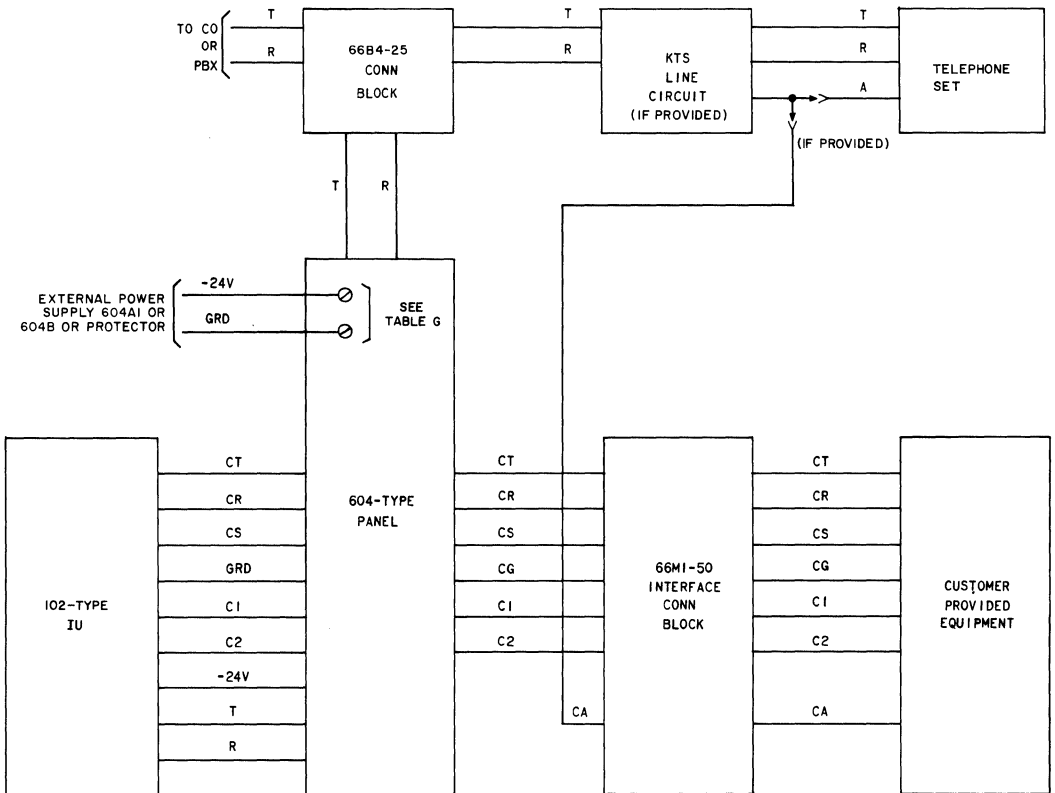
*The 18-plate cabinet will hold two 604A-type (MD), three 604B or 604C (with external power unit) panels, or two 604B or 604C panels with power unit, when the drawing holder on the lower half of the equipment cover is removed.*

**3.06** Telephone circuit connection is made to the 604-type panel through connector cables.

Arrangement of the KS-16671, List 1 plugs on the panel restricts the first plug (to CO lines) to an A25B connector cable. Plugs two through four (to CPE) are arranged to adapt to a choice of cable sizes (see Table A). Plug No. 5 (604A-type only) is dedicated to one-way incoming trunks only and is not used in this application.

**3.07** Terminate the raw end of connector cable No. 1 on a 66B4-25 connecting block for the CO lines. Terminate the raw ends of connector cables 2, 3 and 4 on 66M1-50 interface connecting blocks at the customer end following the wiring plan shown in Fig. 7 and Tables B, C, D, and E. Insulate and store all spare conductors. Stencil lead designations on the interface connecting block as shown in Fig. 3.

**3.08** The customer must provide a 105- to 130-volt 60-Hz outlet within reach of available power cords (see Ordering Guide for cord lengths). It is



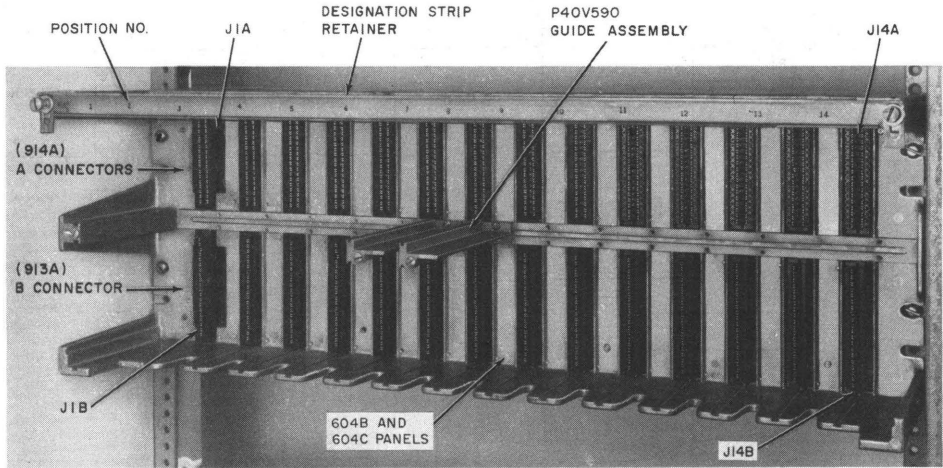
**Fig. 7—Block Diagram—102-Type Interconnecting Unit With 604-Type Panel**

recommended that this outlet be separately fused and not under the control of a wall switch.

**3.09** If an external telephone company-provided power supply is used (604A1, 604B, or 604C only), or CP dc power is supplied through the KS-20944 protector, connect to fuse panel on rear of 604A1, 604B, or 604C as shown in Fig. 7 and Table G (use 16-gauge, or equivalent, twisted pair). Refer to the appropriate section in Division 167 for proper grounding of power plants. Connect power supply (using 16 gauge or equivalent twisted pair) as shown in Fig. 7 and Table G. Proper grounding of equipment and power unit is important to prevent damage from power line surges.

**3.10** The 66M1-50 interface connecting block should be located within 25 feet of the panel. The customer must terminate the CPE on the interface connecting block using the seven terminals stenciled on the customer side.

**3.11** As a customer option, the 66E3-25 interface connecting block may be used and located not further than 200 feet from the panel. When using the 66E3-25 optional interface connecting block, refer to Fig. 4 and Table F for terminal and pin numbers. The 66E3-25 block provides an Amphenol connector for up to five circuits. The customer must terminate the CPE to the connector



INSTALLATION SEQUENCE OF INTERCONNECTING UNITS

TRUNK NO.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
POSITION NO.	1	2	4	5	7	8	10	11	13	3	6	9	12	14

Fig. 8—604B and 604C Panels (Front View)

TABLE A

OPTIONAL CABLE ARRANGEMENTS TO PROVIDE CONNECTIONS FOR FOUR PLUGS ON 604-TYPE PANEL

CABLE DESIGNATION (NOTE)	MAXIMUM NO. OF CABLES REQUIRED		
	ARRANGEMENTS (SEE 3.06)		
	Arrangement 1	Arrangement 2	Arrangement 3
A25B	1	4	2
A50B			1
A75A	1		

Note: Arrangement of interconnecting units and local requirements will determine the size and maximum length of cable required.

using an Amphenol No. 57-10500-7 plug, or Cinch No. 223-32-50-023 plug, or equivalent.

615A Panel (Fig. 2 and 11 and Tables G, J, K, and L)

3.12 The 615A panel is mounted on a standard relay rack or 16C apparatus mounting (or equivalent) using the 99-type bracket. The 99B bracket will hold three 615A panels. Remove the center mounting bar from the 16C apparatus mounting to avoid cover interference.

3.13 An A25B (or equivalent) connector cable is used to connect the 615A panel to the 66M1-50 interface connecting block. The A25B connector cable plugs into plug P1 on the rear of the 615A panel. The raw end of the A25B connector cable is terminated on the telephone company side of the 66M1-50 interface connecting block or optional 66E3-25 block (see 3.11) according to standard even

count color code. Lead designations are stenciled on the 66M1-50 interface connecting block as required.

**3.14** The customer must terminate the CPE on the 66M1-50 interface connecting block using the terminals on the customer side.

**3.15** D inside wiring cable is used to extend the T and R leads from the CO or PBX connecting block to the 66T1 connecting block on rear of the 615A panel as shown in Table L.

**3.16** The telephone company-provided power supply or CP — 24V dc power supplied through the KS-20944, List 1 protector is terminated on the 66T1 connecting block as shown in Table L. Use 20-gauge wire and remove insulation before placing in clip terminals.

**3.17** Refer to the appropriate section in Division 518 for proper grounding of power units. Proper grounding of equipment and power unit is important to prevent damage from power line surges.

#### 102-Type Interconnecting Unit (Fig. 9 and 10)



*To protect transistors and other electrical components of 102-type interconnecting units, remove fuses associated with that particular circuit before installing or replacing a unit. (See Tables H and I for 604-type panels.)*

**3.18** Select proper option straps for options Y, Z and W from Fig. 9 or 10 for local conditions. Always use option Z for the 102A IU. Use bare wire for strapping. Use option W for 102B when the external circuit resistance (including CO resistance) is greater than 800 ohms in the talking state.



*Check option strap for continuity after strapping.*

**3.19** Loosen retaining clip screw (69G) or designation strip (604-type or 615A) on apparatus mounting or panel and raise clip or strip to provide access.

**3.20** Position the board in the guide grooves, and slide the unit into the panel until it is properly seated in the connector. The 604B and 604C panels have a P13B354 index clip between contacts 9 and 10 in the lower position connector that must be removed when using the 102A IU. The 604A, 604B, and 604C panels are electrically equivalent for this VCA and are interchangeable if this clip is removed. The 102B IUs have a slot for this clip. For the 615A panel the code slots on the IUs match the index clips between contacts 5, 6, 12, and 13 in the connector.

**3.21** Position the retaining clip or designation strip holder to hold 102-type IUs securely.

**3.22** Stencil circuit designation information, as required, on retaining clip or designation strip. On 604C and current production of the 604B panels the designation strip is marked to show trunk numbering. Earlier production of the 604B showed position numbers.

**3.23** Install 102-type IUs in 604-type panels following the suggested sequence. This sequence is established to correspond to the plug arrangements. The installation sequence for the 615A panel is the same as the connector (J1A, J2A, J3A) from left to right. See Fig. 12.

**3.24** If 102A IUs are used in positions 13 or 14 of the 604B or 604C panel, 102A IUs must also be used in positions 1, 4, 7, and 10.

**3.25** When installing IUs in the 615A panel, position the boards in the grooves of the panel and slide the unit until it is properly seated in the connector. The code slots on the IUs match the index clips between contacts 5 and 6, and 12 and 13 in the connector. Lower the designation strip holder to hold the IUs securely in place. Refer to Fig. 12 for installation sequence of IUs in the panel to correspond to the plug wiring arrangement.

#### KS-20944 Protector (Fig. 13)

**3.26** When voltage protection is required, the KS-20944 protector must be mounted externally and wired to the power supply terminals of the 604-type and 615A panels.

**3.27** Connect as shown in Fig. 13 following local wiring instructions. The customer must

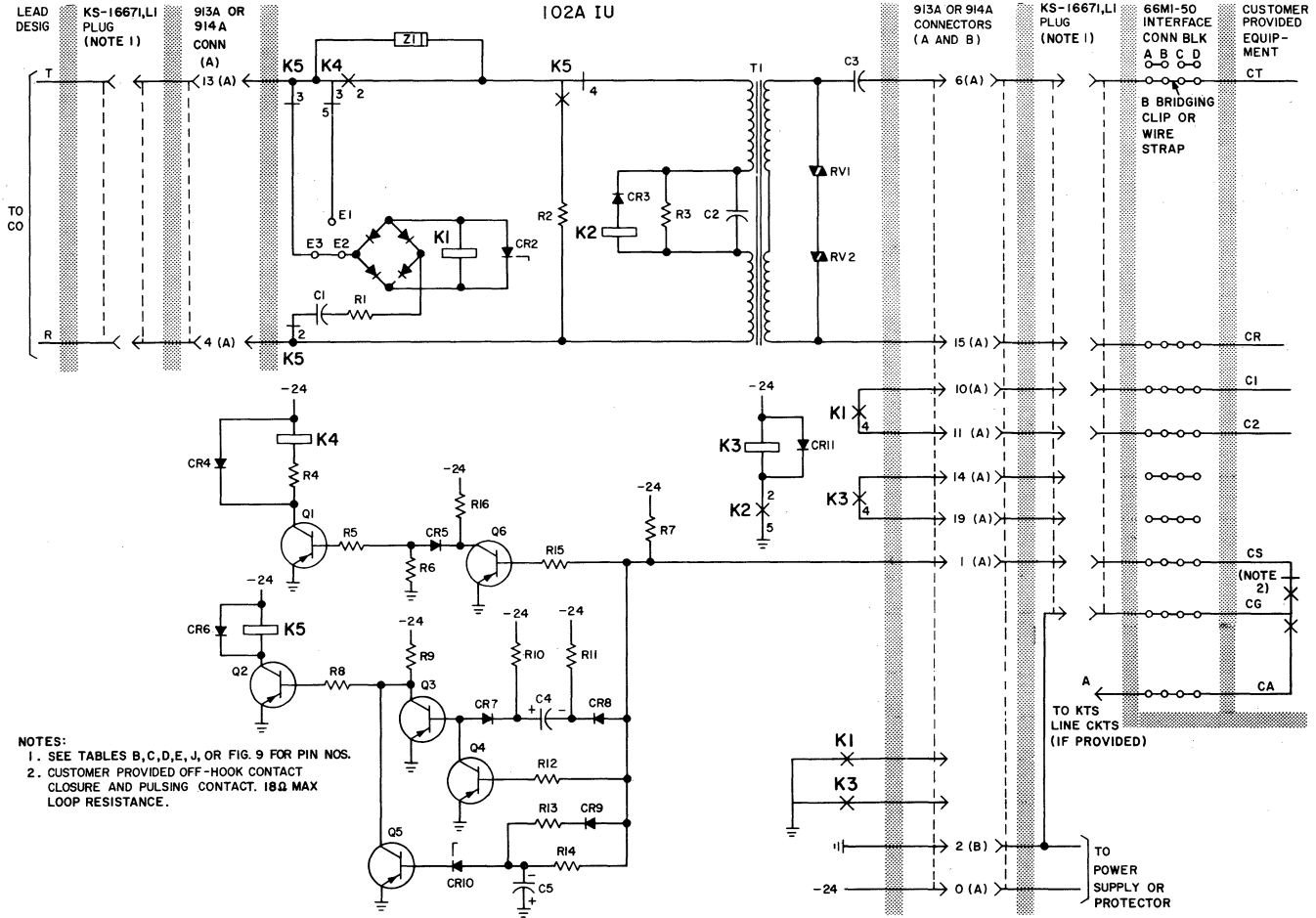
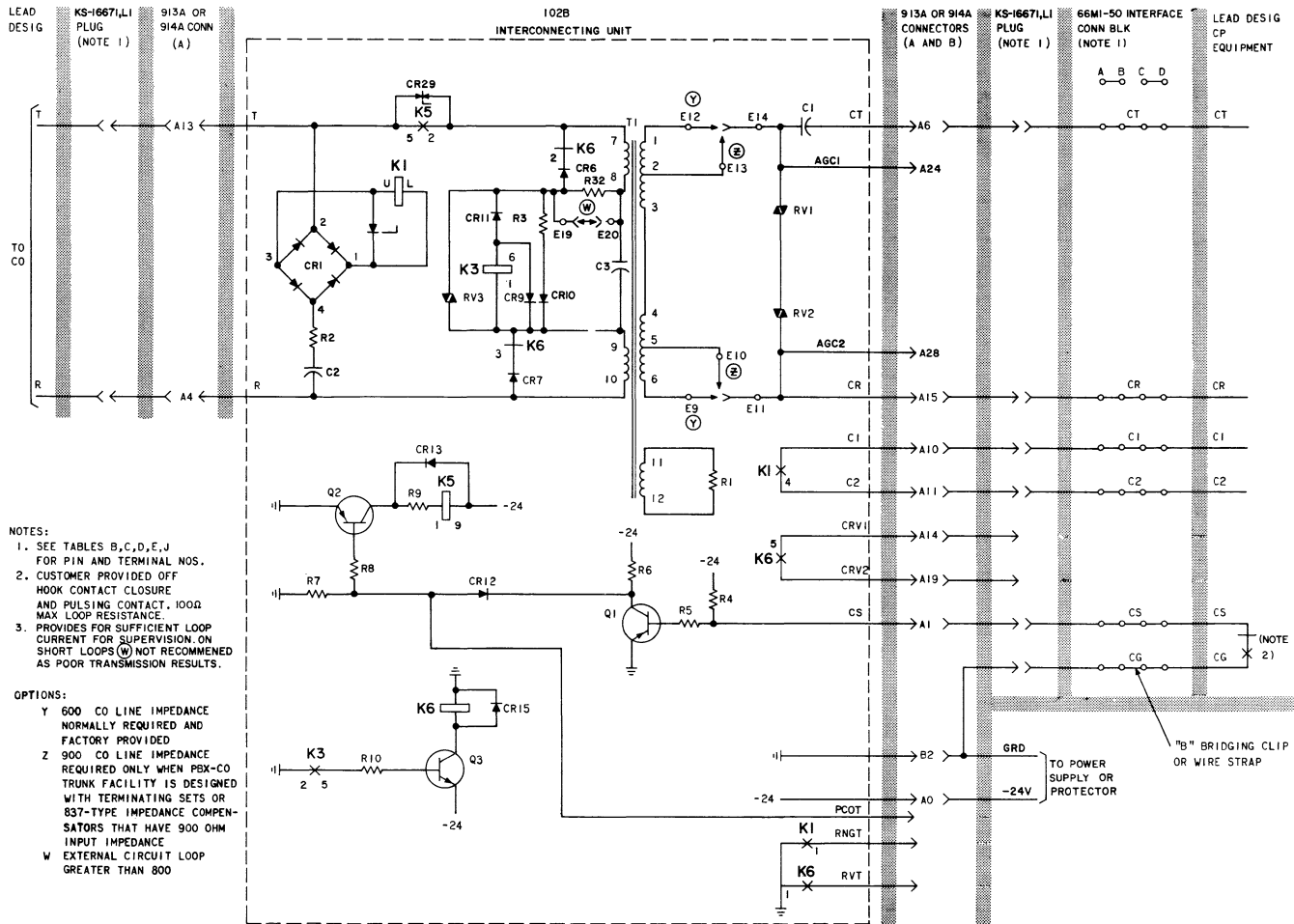


Fig. 9—Schematic Diagram—102A Interconnecting Unit (MD)



**Fig. 10—Schematic Diagram—102B Interconnecting Unit**

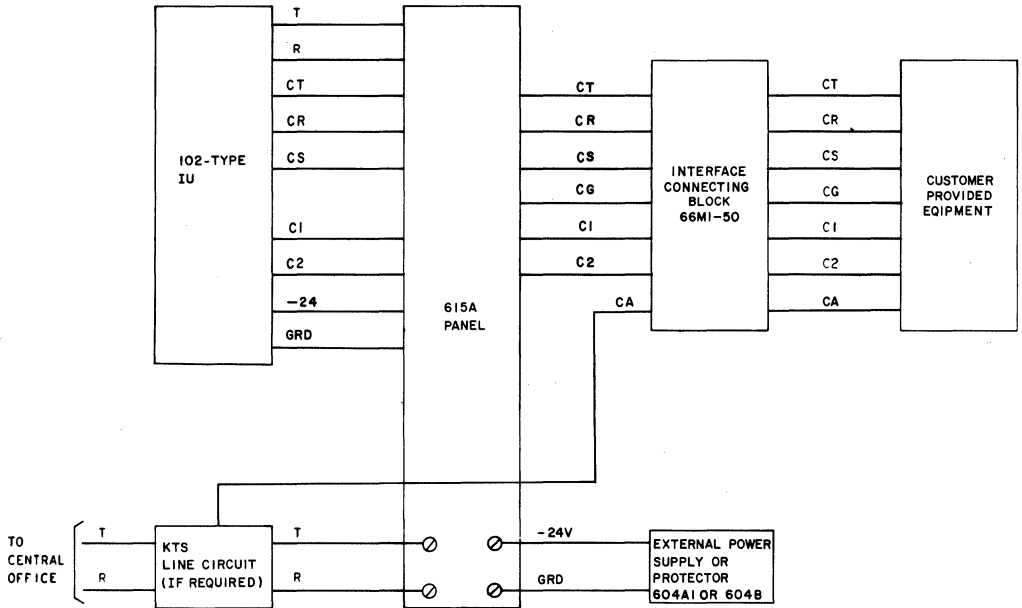


Fig. 11—Block Diagram—102-Type Interconnecting Unit with 615A Panel

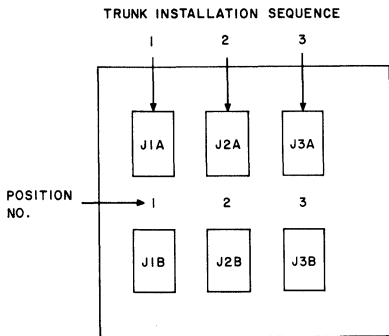


Fig. 12—Connector and Trunk Arrangement in 615A Panel

connect his power supply to the red (GRD) and black (-V) 14-gauge leads extending from the unit.

**Caution:** Voltage will be present on (upper) terminals 1 of circuit breakers.



Check for correct polarity and ground before closing switch.

**3.28** After installation is complete, apply power and perform tests shown in Part 5. To protect the electrical components of IUs, always remove the fuse associated with that particular circuit before removing or installing an IU. See Table K.

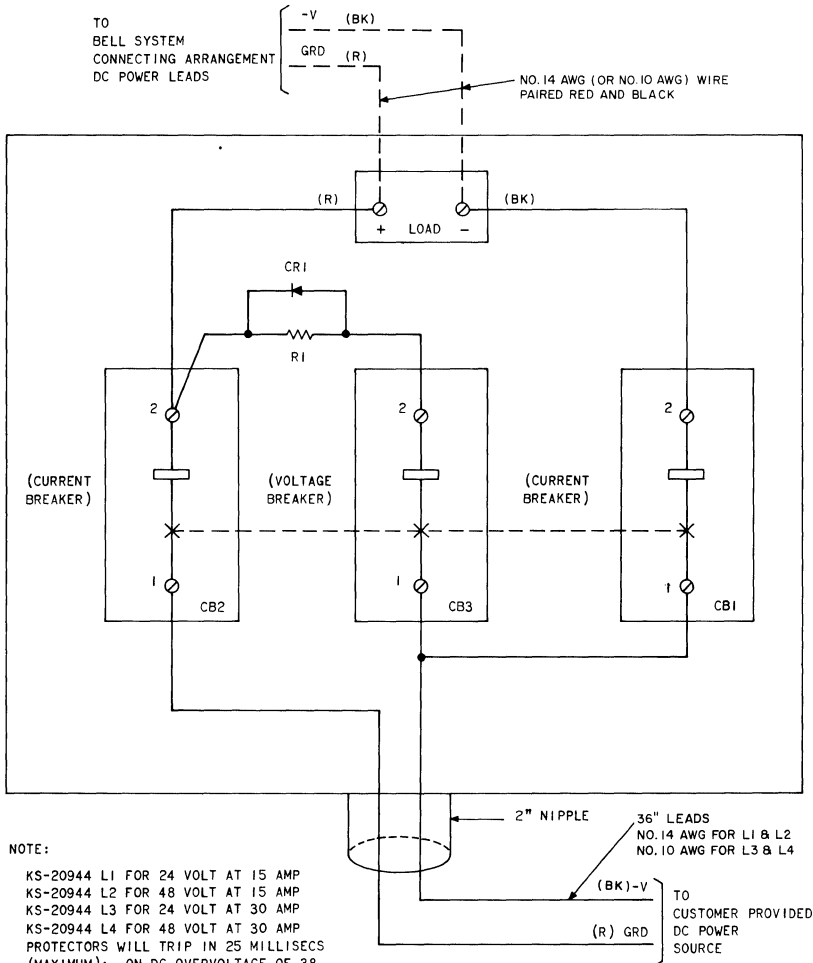


Fig. 13—Schematic—KS-20944 Protector

4. OPERATION

102B INTERCONNECTING UNIT (Fig. 10)

Incoming Call

4.01 When the CO seizes this circuit on an incoming call, ringing current is applied across the tip and ring. The K1 relay in the ringing bridge operates and provides a contact closure on the C1 and C2 leads to the CPE which open and close in unison with the ringing cycle. When the customer answers, the CPE provides a contact closure on



the CS and CG leads. An option closure on the CA and CG leads places a ground on the A lead to operate the line circuit and busy lamp when the line is associated with a Bell System 1A2 Key System. The closure on the CS and CG leads causes K5 relay to operate. The K5 relay operated closes the loop to the CO which trips the ringing, shunts the ringing bridge, releases K1 and closes the transmission path to the CT and CR leads through T1.

### Outgoing Call

**4.02** Before an outgoing call is placed, the customer must determine that the line is idle to avoid bridging to a call in progress. When the customer goes off-hook on an idle line, the CPE provides a contact closure on the CS and CG leads. An optional closure on the CA and CG leads places a ground on the A lead to operate the line circuit and busy lamp when the line is associated with a Bell System 1A2 Key System. The contact closure on the CS and CG leads causes K5 relay to operate. K5 relay operated shunts the ringing bridge, closes the loop to the CO, and closes the transmission path to the CT and CR leads. The CO recognizes the loop closure and returns dial tone over the CT and CR leads to the CPE. After receiving dial tone, the CPE dial contacts pulse the closure on the CS and CG leads, and K5 relay operates in unison with the CP dialing contacts to repeat the dial pulses to the CO. After completion of dialing the K5 relay restores the transmission path. When the customer is using tone address signaling and goes off-hook to dial out, the CPE provides a contact closure across CS and CG. This causes the K5 relay to operate cutting through the transmission path, and dial tone is returned to CT and CR. The customer may then dial over the CT and CR leads.

**4.03 *Disconnect:*** When the CPE goes on-hook removing the contact closure from the CS and CG and CA and CG leads, the K5 relay releases, and the line circuit and busy lamp are released. K5 relay released opens the loop to the CO, removes shunt from the ringing bridge and opens the transmission path.

**Note:** The 102A IU operates similarly to the 102B IU but uses different relays.

### KS-20944 Protector (Fig. 13)

**4.04** The KS-20944 protector is used to protect the Bell System personnel from hazardous voltages but may not protect equipment from component failures. The KS-20944 protector provides a switch to disconnect dc power when working on IUs.

**4.05** The KS-20944 protector consists of a dc voltage-operated circuit breaker in series with a parallel resistor-diode combination connected across the line and two dc current-operated circuit breakers connected in each side of the line. The contacts on the breakers are connected in series with their own coil and are mechanically coupled together. When any breaker is operated, the line will be opened. The circuit breakers must be manually reset by the customer after tripping. They cannot be reset if the fault persists.

**4.06** The KS-20944, List 1 and List 2 protectors are designed to trip in 25 milliseconds (maximum).

- 38 volts dc (List 1) or 68 volts dc (List 2)
- 18.75 amps dc (List 1) or 36 amps (List 2)
- Reversed polarity or ac greater than 18 volts
- Incorrect power supply ground.¶

### 5. MAINTENANCE

**5.01** When trouble is reported, check the CO pair and for blown fuses, loose or broken connections.

#### *Circuit Test Using 142A Test Set (Fig. 14)*

**5.02** The 142A test set should be set up as follows with the IU:

**Caution:** *Before removing or installing IUs in the mounting, remove the associated fuse to prevent damage to electrical components.*

- (1) Disconnect the CPE by removing the B bridging clips or wire straps at the interface block.

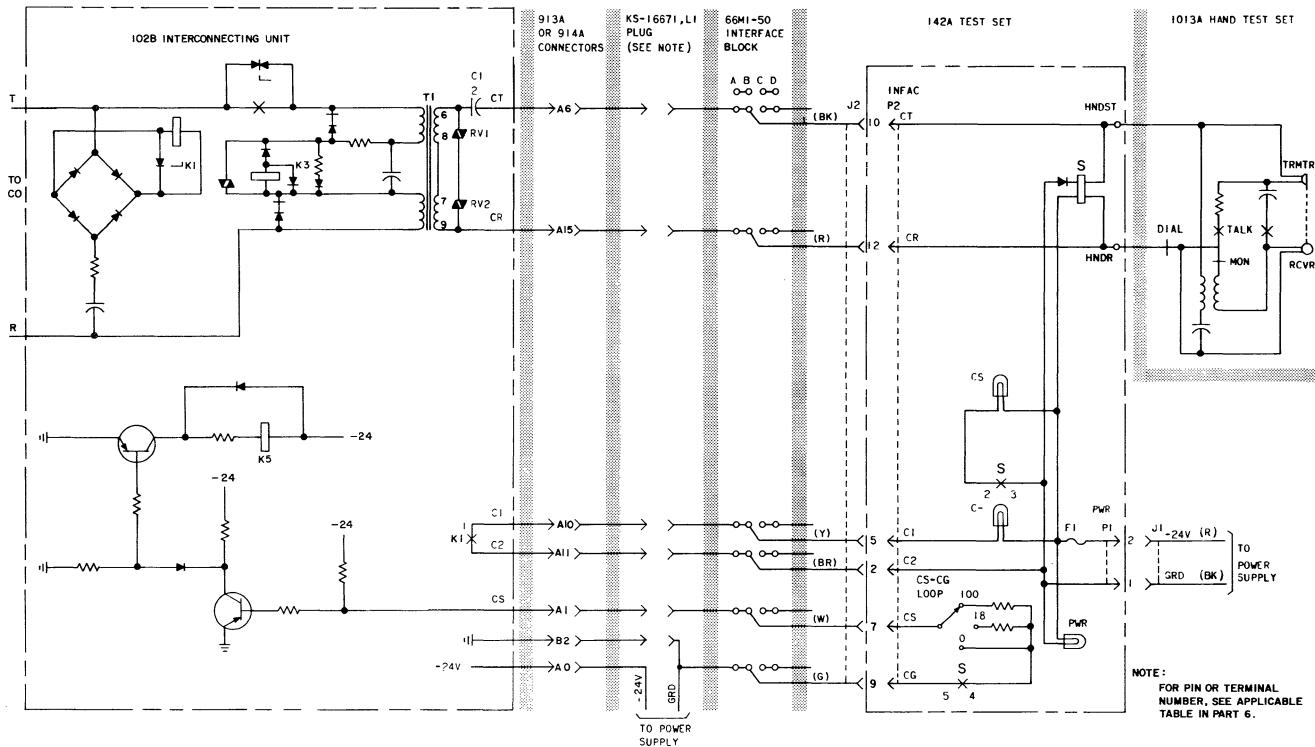


Fig. 14—Testing 102B Interconnecting Unit With 142A Test Set

- (2) Connect the leads from the 10-conductor interface cord as required to the proper terminals on the telephone company side of the block.
- (3) Connect the leads from the 2-conductor power cord to -24 volts and ground. This should be obtained from the same source used to power the IU under test. The PWR lamp on the test set should light at this time.
- (4) Connect a 1013A hand test set to the HNDR and HNDR terminals of the test set with the MON-TALK switch in the MON position.
- (5) Set the CS-CG RES loop switch in the 18-ohm position for a 102A IU or in the 100-ohm position for a 102B IU.

**5.03** After circuit preparation, proceed as follows:

- (1) Operate switch on 1013A hand test set to the TALK position. The CS lamp on the 142A test set should light and dial tone should be heard in the test set.

**Note:** If the IU fails to seize the CO trunk, move the CS-CG loop switch to a lower value. If the IU now operates properly, it is considered marginal. Circuits which only operate on the 0 position should be replaced.

- (2) Dial the local test desk using the 1013A hand test set. The S relay and the CS lamp should follow the dial pulses. Request the test desk to call back on the trunk under test.
- (3) Operate the hand test set to the MON position. The CS lamp should be extinguished indicating the S relay in the 142A test set has released, removing the ground from the CS lead.
- (4) When ringing is applied to the trunk, the C-lamp lights and follows the ringing pulses.
- (5) Reoperate the hand test set switch to TALK. The C-lamp should extinguish and the CS lamp lights indicating ringing has been tripped and the call answered. The trunk should now be cut through the IU and transmission quality judged using the hand test set.

- (6) Have the test desk release the trunk and return hand test set switch to MON. The CS lamp should be extinguished and the IU should be in the idle condition.

**5.04** When all testing is complete, remove power and interface cords. Connect CPE by restoring B bridging clips or wire straps at interface connecting block.

#### *Circuit Test Without 142A Test Set*

**5.05** Prepare the circuit under test as follows:

- (a) Open the seven leads to CPE by removing the B bridging clips (or wire straps) or connector at the 66B3-25 interface block.
- (b) Supply talk battery by connecting a 500-ohm resistor from the -24 volt supply to terminal CR and ground to terminal CT (make all connections on the telephone company side of the interface block. A 2A KTU or 31A KTU may be used for battery feed instead of the resistor. Refer to Section 518-112-421 for KTU connections.
- (c) Connect a 1013A hand test set (or equivalent) across terminals CT and CR.
- (d) Connect an 81A or KS-16990, List 1 test set across terminals C1 and C2.

**5.06** Perform the following tests:

#### *Transmission Path*

Operate switch on the hand test set to MON. Temporarily strap terminal CS to CG causing K5 relay to operate cutting through the transmission path, and dial tone will be heard on the hand test set. If a KTS line circuit is provided, strap CA to CG to operate the line circuit and busy lamp. Remove the straps from CA, CS and CG terminals and operate switch on the hand test set to TALK.

#### *Outgoing Call (Rotary Dial)*

Connect the blue leads (or blue and green) of a 9C dial across terminals CS and CG for dialing. Dial tone will be heard on the hand test set connected to terminals CT and CR. Dial the local test desk number using the 9C dial. Talk over the 1013A hand test set connected to CT and CR; arrange to have a call returned to the number

associated with the 102-type IU under test. Remove the 9C dial tone from terminals CS and CG.

### ***Outgoing Call (Tone Address Signaling)***

Connect the mounting cord leads of a 2500D (or equivalent) station set using 161A adapters as follows:

- (G) and (Y) cord leads to CT
- (R) cord lead to CR.

Strap terminal CS to CG; dial tone will now be heard on the 2500D (or equivalent) station set. Dial the test desk number using the 2500D and arrange to have a call returned to the number associated with the 102-type IU under test. Disconnect by removing the strap from terminals CS and CG.

### ***Incoming Call***

The 81A test set or KS-16990, List 1 test set across terminals C1 and C2 will indicate continuity (ringing) when the local test desk calls back. Answer the call by strapping terminal CS to CG and verify satisfactory transmission. Disconnect by removing the strap from terminals CS and CG.

**5.07** When trouble is suspected in the IU, exchange it with another unit known to be functioning properly. Pack the defective IU in a blister pack and return it for repair.



***Never replace a 102-type interconnecting unit without first removing the fuse or power for that particular circuit. (See Tables H, I, and K.)***

**5.08** If tests are satisfactory, remove all test connections to restore circuit to normal and replace B bridging clips (66M1-50) or Amphenol

connector (66E3-25) at the interface connecting block.

**5.09** When in the repairman's judgment the trouble is located in the CPE, the Repair Service Bureau should be notified so that proper maintenance of service charge billing can be initiated as outlined in BSP 660-101-312 entitled Maintenance of Service Charge on Services with Customer-Provided Equipment (CPE).



***Do not attempt any tests or repairs to the customer-provided equipment.***

## **6. CONNECTIONS**

**6.01** For connection information using the 69G apparatus mounting, refer to Fig. 6 and Table G.

**6.02** For connection information using the 604A-type panel, refer to Fig. 7, and Tables A, B, C, D, E, and G.

**6.03** For connection information using the 604B and 604C panels, refer to Fig. 7, and Tables A, B, C, D, E, and G.

**6.04** For connection information using the optional 66E3-25 connecting block, refer to Fig. 4 and Table F.

**6.05** The A and CA leads used to indicate a busy line condition are not required when a KTS line circuit is not provided.

**6.06** For connection information using the 615A panel refer to Fig. 2, 11, and 12, and Tables G, J, and L.

**6.07** For connection information using the KS-20944 protector, refer to Fig. 13.

**TABLE B**  
**CONNECTIONS FOR PLUG NO. 1 – 604-TYPE PANEL**

TRUNK NO.	LEAD DESIG*	A25B CONN PIN NO.	A25B CONN CABLE COLOR	66B4-25 CONN BLK ROW NO.	POS. IN 604-TYPE PANEL
1	T	26	W-BL	1	1A
	R	1	BL-W	2	
2	T	27	W-O	3	2A
	R	2	O-W	4	
3	T	28	W-G	5	4A
	R	3	G-W	6	
4	T	29	W-BR	7	5A
	R	4	BR-W	8	
5	T	30	W-S	9	7A
	R	5	S-W	10	
6	T	31	R-BL	11	8A
	R	6	BL-R	12	
7	T	32	R-O	13	10A
	R	7	O-R	14	
8	T	33	R-G	15	11A
	R	8	G-R	16	
9	T	34	R-BR	17	13A
	R	9	BR-R	18	
10	T	35	R-S	19	3A
	R	10	S-R	20	
11	T	36	BK-BL	21	6A
	R	11	BL-BK	22	
12	T	37	BK-O	23	9A
	R	12	O-BK	24	
13	T	38	BK-G	25	12A
	R	13	G-BK	26	
14	T	39	BK-BR	27	14A
	R	14	BR-BK	28	
SPARE	SPARE	40	BK-S	29	
		15	S-BK	30	
		41	Y-BL	31	
		16	BL-Y	32	
		42	Y-O	33	
		17	O-Y	34	
		43	Y-G	35	
		18	G-Y	36	
		44	Y-BR	37	
		19	BR-Y	38	
		45	Y-S	39	
		20	S-Y	40	
		46	V-BL	41	
		21	BL-V	42	
		47	V-O	43	
		22	O-V	44	
		48	V-G	45	
		23	G-V	46	
		49	V-BR	47	
		24	BR-V	48	
		50	V-S	49	
		25	S-V	50	

\* Stencil lead designations on fanning strip.

† Insulate and store spare leads.

TABLE C

## CONNECTIONS FOR PLUG NO. 2 – 604-TYPE PANEL

TRUNK NO.	LEAD DESIG*	CONN PIN NO.	CONN CABLE COLOR	66M1-50 INTERFACE CONN BLK 1 ROW NO.	POS. IN 604-TYPE PANEL
1	CT	26	W-BL	1	1
	CR	1	BL-W	2	
	CS	27	W-O	3	
	CG	2	O-W	4	
	C1	28	W-G	5	
	C2	3	G-W	6	
	SPARE	29	W-BR	7	
	SPARE	4	BR-W	8	
	CA	30	W-S	9†	
2	SPARE	5	S-W	10	2
	CT	31	R-BL	11	
	CR	6	BL-R	12	
	CS	32	R-O	13	
	CG	7	O-R	14	
	C1	33	R-G	15	
	C2	8	G-R	16	
	SPARE	34	R-BR	17	
	SPARE	9	BR-R	18	
3	CA	35	R-S	19†	4
	SPARE	10	S-R	20	
	CT	36	BK-BL	21	
	CR	11	BL-BK	22	
	CS	37	BK-O	23	
	CG	12	O-BK	24	
	C1	38	BK-G	25	
	C2	13	G-BK	26	
	SPARE	39	BK-BR	27	
4	SPARE	14	BR-BK	28	5
	CA	40	BK-S	29†	
	SPARE	15	S-BK	30	
	CT	41	Y-BL	31	
	CR	16	BL-Y	32	
	CS	42	Y-O	33	
	CG	17	O-Y	34	
	C1	43	Y-G	35	
	C2	18	G-Y	36	
5	SPARE	44	Y-BR	37	7
	SPARE	19	BR-Y	38	
	CA	45	Y-S	39†	
	SPARE	20	S-Y	40	
	CT	46	V-BL	41	
	CR	21	BL-V	42	
	CS	47	V-O	43	
	CG	22	O-V	44	
	C1	48	V-G	45	
5	C2	23	G-V	46	7
	SPARE	49	V-BR	47	
	SPARE	24	BR-V	48	
	CA	50	V-S	49†	
	SPARE	25	S-V	50	

\* Stencil lead designations on fanning strip.

† Terminal CA connects to A lead on KTS line circuit. Omit A and CA leads when KTS line circuit not provided.

♦TABLE D♦

## CONNECTIONS FOR PLUG NO. 3 – 604-TYPE PANEL

TRUNK NO.	LEAD DESIG*	CONN PIN NO.	CONN CABLE COLOR	66M1-50 INTERFACE CONN BLK 2 ROW NO.	POS. IN 604-TYPE PANEL
6	CT	26	W-BL	1	8
	CR	1	BL-W	2	
	CS	27	W-O	3	
	CG	2	O-W	4	
	C1	28	W-G	5	
	C2	3	G-W	6	
	SPARE	29	W-BR	7	
	SPARE	4	BR-W	8	
	CA	30	W-S	9†	
	SPARE	5	S-W	10	
7	CT	31	R-BL	11	10
	CR	6	BL-R	12	
	CS	32	R-O	13	
	CG	7	O-R	14	
	C1	33	R-G	15	
	C2	8	G-R	16	
	SPARE	34	R-BR	17	
	SPARE	9	BR-R	18	
	CA	35	R-S	19†	
	SPARE	10	S-R	20	
8	CT	36	BK-BL	21	11
	CR	11	BL-BK	22	
	CS	37	BK-O	23	
	CG	12	O-BK	24	
	C1	38	BK-G	25	
	C2	13	G-BK	26	
	SPARE	39	BK-BR	27	
	SPARE	14	BR-BK	28	
	CA	40	BK-S	29†	
	SPARE	15	S-BK	30	

♦TABLE D (Cont)♦

TRUNK NO.	LEAD DESIG*	CONN PIN NO.	CONN CABLE COLOR	66M1-50 INTERFACE CONN BLK 2 ROW NO.	POS. IN 604-TYPE PANEL
9	CT	41	Y-BL	31	13
	CR	16	BL-Y	32	
	CS	42	Y-O	33	
	CG	17	O-Y	34	
	C1	43	Y-G	35	
	C2	18	G-Y	36	
	SPARE	44	Y-BR	37	
	SPARE	19	BR-Y	38	
	CA	45	Y-S	39†	
	SPARE	46	V-BL	41	
		21	BL-V	42	
		47	V-O	43	
		22	O-V	44	
		48	V-G	45	
		23	G-V	46	
-24V	FAL1 ‡	49	V-BR	47	F2(FA)
GRD	G1 ‡	24	BR-V	48	
-48V	FAL2 ‡	50	V-S	49	F16(FA)
GRD	G2 ‡	25	S-V	50	

\* Stencil lead designations on fanning strip.

† Terminal CA connects to A lead on KTS line circuit. Omit A and CA leads when KTS line circuit is not provided.

‡ Optional attendant alarm indicator on 604B panel only.



**TABLE E**  
**CONNECTIONS FOR PLUG NO. 4 – 604-TYPE PANEL**

TRUNK NO.	LEAD DESIG*	CONN PIN NO.	CONN CABLE COLOR	66M1-50 INTERFACE CONN BLK 3 ROW NO.	POS. IN 604-TYPE PANEL
10	CT	26	W-BL	1	3
	CR	1	BL-W	2	
	CS	27	W-O	3	
	CG	2	O-W	4	
	C1	28	W-G	5	
	C2	3	G-W	6	
	SPARE	29	W-BR	7	
	SPARE	4	BR-W	8	
	CA	30	W-S	9†	
	SPARE	5	S-W	10	
11	CT	31	R-BL	11	6
	CR	6	BL-R	12	
	CS	32	R-O	13	
	CG	7	O-R	14	
	C1	33	R-G	15	
	C2	8	G-R	16	
	SPARE	34	R-BR	17	
	SPARE	9	BR-R	18	
	CA	35	R-S	19†	
	SPARE	10	S-R	20	
12	CT	36	BK-BL	21	9
	CR	11	BL-BK	22	
	CS	37	BK-O	23	
	CG	12	O-BK	24	
	C1	38	BK-G	25	
	C2	13	G-BK	26	
	SPARE	39	BK-BR	27	
	SPARE	14	BR-BK	28	
	CA	40	BK-S	29†	
	SPARE	15	S-BK	30	
13	CT	41	Y-BL	31	12
	CR	16	BL-Y	32	
	CS	42	Y-O	33	
	CG	17	O-Y	34	
	C1	43	Y-G	35	
	C2	18	G-Y	36	
	SPARE	44	Y-BR	37	
	SPARE	19	BR-Y	38	
	CA	45	Y-S	39†	
	SPARE	20	S-Y	40	
14	CT	46	V-BL	41	14
	CR	21	BL-V	42	
	CS	47	V-O	43	
	CG	22	O-V	44	
	C1	48	V-G	45	
	C2	23	G-V	46	
	SPARE	49	V-BR	47	
	SPARE	24	BR-V	48	
	CA	50	V-S	49†	
	SPARE	25	S-V	50	

\* Stencil lead designations on fanning strip.

† Terminal CA connects to A lead of KTS line circuit. Omit A and CA leads when KTS line circuit is not provided.

**TABLE F**  
**CONNECTIONS FOR 66E3-25 INTERFACE CONNECTING BLOCK**

CIRCUIT NO.	LEAD DESIG.	66E3-25 TERM NO.	66E3-25 PIN NO.
1	CT	1	26
	CR	2	1
	CS	3	27
	CG	4	2
	C1	5	28
	C2	6	3
	SPARE	7	29
	SPARE	8	4
	CA	9*	30
	SPARE	10	5
2	CT	11	31
	CR	12	6
	CS	13	32
	CG	14	7
	C1	15	33
	C2	16	8
	SPARE	17	34
	SPARE	18	9
	CA	19*	35
	SPARE	20	10
3	CT	21	36
	CR	22	11
	CS	23	37
	CG	24	12
	C1	25	38
	C2	26	13
	SPARE	27	39
	SPARE	28	14
	CA	29*	40
	SPARE	30	15
4	CT	31	41
	CR	32	16
	CS	33	42
	CG	34	17
	C1	35	43
	C2	36	18
	SPARE	37	44
	SPARE	38	19
	CA	39*	45
	SPARE	40	20
5	CT	41	46
	CR	42	21
	CS	43	47
	CG	44	22
	C1	45	48
	C2	46	23
	SPARE	47	49
	SPARE	48	24
	CA	49*	50
	SPARE	50	25

\* A lead of KTS line circuit connects to CA terminal. Omit if KTS line circuit is not provided.

♦TABLE G♦  
POWER CONNECTIONS

INPUT VOLTAGE	69G APP MTG (NOTE 1)	604A1 PANEL (NOTE 2)	604B PANEL (NOTE 3)	615A PANEL (NOTE 4)
-24V	8	T14	INPUT-24V	D2
-48V	—	—	INPUT-48V	—
GRD	4	T13	INPUT-GRD	D4

*Notes:*

1. Terminals on 66B4-25 connecting block, connect as shown in Fig. 7.
2. Terminals on terminal strip TSA on rear of 604A1 panel.
3. Terminals on rear of 604B panel are stamped as shown. Position option straps for -24V or -48V.
4. Terminals on 66T1 connecting block.

TABLE H  
604A-TYPE PANEL FUSE ASSIGNMENT

VOLTAGE	FUSE NO.*	PANEL POSITION
-24V	F1	J1A
	F2	J2A
	F3	J3A
	F4	J4A
	F5	J5A
	F6	J6A
	F7	J7A
	F8	J8A
	F9	J9A
	F10	J10A
	F11	J11A
	F12	J12A
	F13	J13A
	F14	J14A
	F15	J10B†
	F16	J11B†
	F17	J13B†
	F18	J14B†

\* Fuses are 70G 1/2-Ampere.

† Plug. No. 5 dedicated to one-way incoming trunks not used in this application.

TABLE I  
604B PANEL FUSE ASSIGNMENT

VOLTAGE	FUSE NO.	PANEL POSITION
±105V (Note)	F1*	J1A thru J14A
-24V	F2*	J1A
	F3*	J2A
	F4*	J3A
	F5*	J4A
	F6*	J5A
	F7*	J6A
	F8*	J7A
	F9*	J8A
	F10*	J9A
	F11*	J10A
	F12*	J11A
	F13*	J12A
	F14†	J13A
	F15†	J14A
-48V (Note)	F16‡	J1A thru J5A
	F17‡	J6A thru J10A
	F18‡	J11A thru J14A

*Note:* ±105V and -48V not used in this application.

\* 70F Fuse 1/4 Ampere.

† 70G Fuse 1/2 Ampere.

‡ 70A Fuse 1-1/3 Ampere.

♦TABLE J♦  
 CONNECTIONS FOR PLUG P1 – 615A PANEL

LEAD DESIG.	PLUG P1 PIN NO.	LEAD COLOR	615A PANEL		
			JACK	PIN	66T1 BLK
CT	26	W-BL	J1A	A6	C12
CR	1	BL-W		A15	
CS	27	W-O		A1	
CG	2	O-W			
C1	28	W-G		A10	
C2	3	G-W		A11	
SPARE	29	W-BR		A14	
SPARE	4	BR-W		A19	
CA	30	W-S		A7	
SPARE	5	S-W		A16	
CT	31	R-BL		J2A	
CR	6	BL-R	A15		
CS	32	R-O	A1		
CG	7	O-R			
C1	33	R-G	A10		
C2	8	G-R	A11		
SPARE	34	R-BR	A14		
SPARE	9	BR-R	A19		
CA	35	R-S	A7		
SPARE	10	S-R	A16		
CT	36	BK-BL	J3A	A6	C14
CR	11	BL-BK		A15	
CS	37	BK-O		A1	
CG	12	O-BK			
C1	38	BK-G		A10	
C2	13	G-BK		A11	
SPARE	39	BK-BR		A14	
SPARE	14	BR-BK		A19	
CA	40	BK-S		A7	
SPARE	15	S-BK		A16	

♦TABLE J (Cont)♦

LEAD DESIG.	PLUG P1 PIN NO.	LEAD COLOR	615A PANEL		
			JACK	PIN	66T1 BLK
SPARE	41	Y-BL	J1B	B6	D12
SPARE	16	BL-Y		B15	
SPARE	42	Y-O		B1	
SPARE	17	O-Y			
SPARE	43	Y-G		B10	
SPARE	18	G-Y		B11	
SPARE	44	Y-BR	J2B	B6	D13
SPARE	19	BR-Y		B15	
SPARE	45	Y-S		B1	
SPARE	20	S-Y			
SPARE	46	Y-BL		B10	
SPARE	21	BL-Y		B11	
SPARE	47	V-O	J3B	B6	D14
SPARE	22	O-V		B15	
SPARE	48	V-G		B1	
SPARE	23	G-V			
SPARE	49	V-BR		B10	
SPARE	24	BR-V		B11	
SPARE	50	V-S			
SPARE	25	S-V			

◆ TABLE K ◆

## 615A FUSE PANEL ASSIGNMENT

VOLTAGE	FUSE NO*	PANEL POSITION
-24V	F1	J1A, J1B
	F2	J2A, J2B
	F3	J3A, J3B
-48V	F4†	J1A
	F5†	J2B
	F6†	J3B
Row $\pm 105V$	F7†	J1A, J2A, J3A
Spare	F8	Spare

\* 24E fuse ½ ampere.

† Spare — not used in VCA C2AKS.

◆ TABLE L ◆

## TRUNK CONNECTIONS — 615A PANEL

LEAD DESIGNATION		66T1 CONN BLOCK TERMINAL
TRK 1	T	1A
	R	2A
TRK 2	T	3A
	R	4A
TRK 3	T	5A
	R	6A

**VOICE CONNECTING ARRANGEMENT CEZ**  
**KS-20893, LIST 10 INTERCONNECTING UNIT**  
**KS-20893, LIST 11 INTERCONNECTING SERVICE UNIT**

**1. GENERAL**

**1.01** This section provides identification, installation, operation, maintenance, and connecting information for Voice Connecting Arrangement (VCA) CEZ. Voice Connecting Arrangement CEZ provides a 2-wire voiceband only connection between customer-provided (CP) conferencing equipment and Bell System Key Telephone Systems. Each circuit of this connecting arrangement is seized by a loop closure from the CP equipment after a call has been established on the key telephone set. A disconnect signal causes the connecting arrangement to signal the CP equipment (momentary open) whenever the central office (CO) or PBX provides a momentary open or battery reversal. The CP equipment must recognize the momentary open and disconnect automatically. When the automatic disconnect feature is not desired, the interconnecting unit (IU) is strapped for manual disconnect and the disconnect signal is not provided to the CP equipment which must always be released manually.

**1.02** This section is reissued to:

- To delete reference to Uniform Service Order Code CEZAW for manual disconnect.
- Include information on wiring changes made on KS-20893, List 11 Interconnecting Service Unit (ISU) to permit use with CALL DIRECTOR® sets.
- Add Fig. 6 showing VCAs with CALL DIRECTOR sets.
- Revise Table A to show six key circuits and battery and ground terminal change.

**1.03** Voice Connecting Arrangement CEZ requires one KS-20893, List 11 ISU, Fig. 1 and 2, per five lines and one KS-20893, List 10 IU, Fig. 3, per line. A KS-20893, List 11 ISU equipped for five lines is shown in Fig. 4. Not all COs or PBXs provide an open or battery reversal on disconnect,

and some may provide an open for other reasons. The CP equipment may disconnect automatically or manually. The service provided is determined by the CP equipment and type of CO or PBX. Option terminals are provided on the KS-20893, List 10 IU (Fig. 3) which must be strapped to provide connecting arrangement CEZ with disconnect feature desired (option Z for automatic disconnect or option W for manual disconnect per SD-69952-01).

**1.04** The KS-20893, List 11 ISUs have been modified for application with CALL DIRECTOR sets by changing the local power leads from (O-Y) to (G-R) for battery and from (Y-O) to (S-W) for ground to permit the sixth pickup key to be used. Modified units are stamped with an A in a circle on the baseplate. All units manufactured after November 1972 have this change incorporated.

**1.05** This issue of the section is based on the following drawings:

CD-69952-01 Issue 1, App. 2D

SD-69952-01 Issue 3D

If this section is to be used with equipment or apparatus reflecting later issue(s) of the drawing(s), reference should be made to the SDs and CDs to determine the extent of the changes and the manner in which the section may be affected.

**2. IDENTIFICATION**

**PURPOSE**

- To provide a 2-wire voiceband only connection between CP conferencing equipment and Bell System Key Telephone System (KTS) lines terminated on a 6-button, plug-ended key telephone set or CALL DIRECTOR set.
- To extend line circuit supervision to the CP equipment



- To limit excessive levels from CP equipment and to provide protection for personnel against hazardous voltages.

**APPLICATION**

- 1A1 or 1A2 Key Telephone Systems.

**ORDERING GUIDE**

- Unit, Service, Interconnecting, KS-20893, L11 (one per five lines)
- Unit, Interconnecting, KS-20893, L10 (one per line terminated on key telephone set; maximum five per ISU)
- Cable, Connector, B25A (as required for CALL DIRECTOR sets. See Fig. 6.)

**Associated Apparatus (Order Separately)**

- Unit, Power, 19C2 or equivalent, if existing key system supply is inadequate. (Maximum current drain for each KS-20893, List 10 IU is 0.11 ampere at 26 volts.)

**Note:** This unit meets acceptable noise requirements as explained under Power Supplies

in Section 332-104-102. Other power units may be used when specified by local engineering.

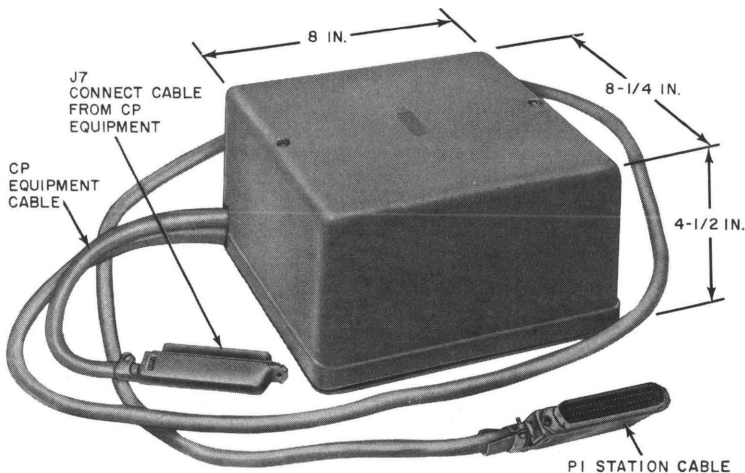
**Replaceable Components**

- Diode, Motorola, IN4001

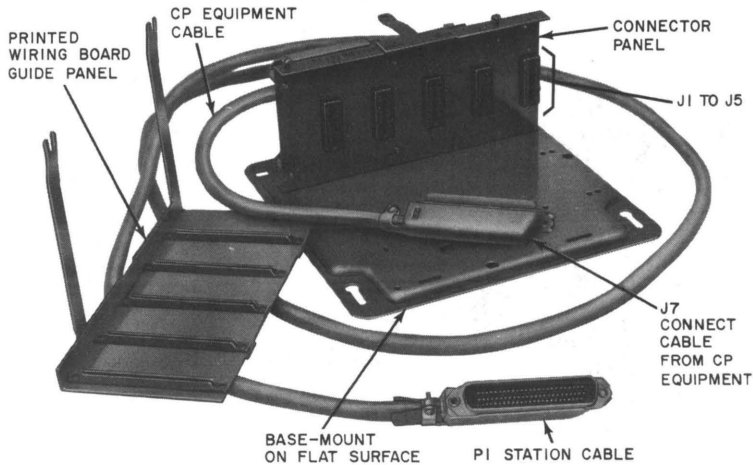
**DESIGN FEATURES**

**KS-20893, List 11 Interconnecting Service Unit (Fig. 1, 2, and 4)**

- Mounts on any flat surface, typically in knee well of desk.
- Size—approximately 4-1/2 by 8 by 8-1/4 inches; weight—approximately four pounds.
- Equipped with five 912A 14-pin connectors.
- Designed to mount five KS-20893, List 10 IUs.
- Current models stamped with (A) on the baseplate are wired for use with CALL DIRECTOR or 6-button sets. Models not so stamped are for use with 6-button sets only.



**Fig. 1—KS-20893, List 11 Interconnecting Service Unit**



**Fig. 2—KS-20893, List 11 Interconnecting Service Unit, Unequipped (Cover Removed)**

- Provides interface connector (J7) for connecting to CP equipment (customer provides mating connector and cabling).
- Equipped with a connector (J6) for connecting the telephone set and a plug-ended cable (P1) for connecting the existing station cable.
- Provides for accepting supervisory signals from Bell System equipment and CP equipment.
- Provides option strapping terminals.
- Requires 0.110 amperes (maximum) at 26 volts dc.

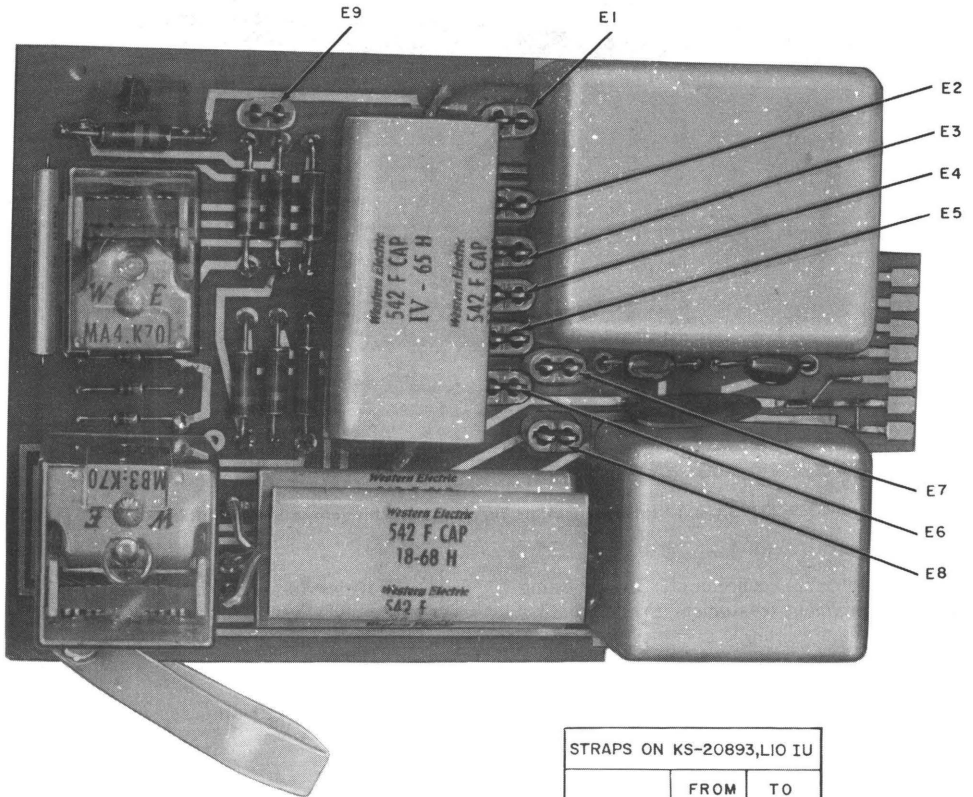
**KS-20893, List 10 Interconnecting Unit (Fig. 3)**

- Components are mounted on a 14-pin printed wiring board.
- Size—approximately 3-1/2 by 5-1/4 inches.
- Weight—approximately one pound.
- Provides voice frequency *only* access to key telephone line (requires one IU per line to be conferenced).
- Extends A and A1 lead supervision from the key telephone line circuit to CP equipment.
- Provides transformer isolation and hazardous voltage protection between CP equipment and Bell System equipment.

### 3. INSTALLATION

**3.01** Locate the voice connecting arrangement near the CP conferencing device and associated key telephone set, typically in the knee well of the desk on which the key telephone set and the CP equipment are located. The station cable on the ISU is approximately six feet long; therefore, the distance between the ISU and the connector on the existing station cable from the KTS equipment (Fig. 5) must not exceed 6 feet. Provide adequate room or cable slack for access to the ISU for testing and maintenance. When it is not possible to locate the ISU within 6 feet of the station cable connector, B25A connector cables may be used to extend length of P1 cable.

**3.02** One KS-20893, List 10 IU must be provided per line to be connected to the CP equipment for conferencing (minimum of two and maximum of five per KS-20893, List 11 ISU).



\* THIS STRAP REQUIRED FOR  
 MANUAL DISCONNECT ONLY.  
 INSULATED WIRE SHOULD BE USED  
 FOR STRAP FROM E6 TO E9 —  
 CHECK CONTINUITY AFTER STRAPPING.

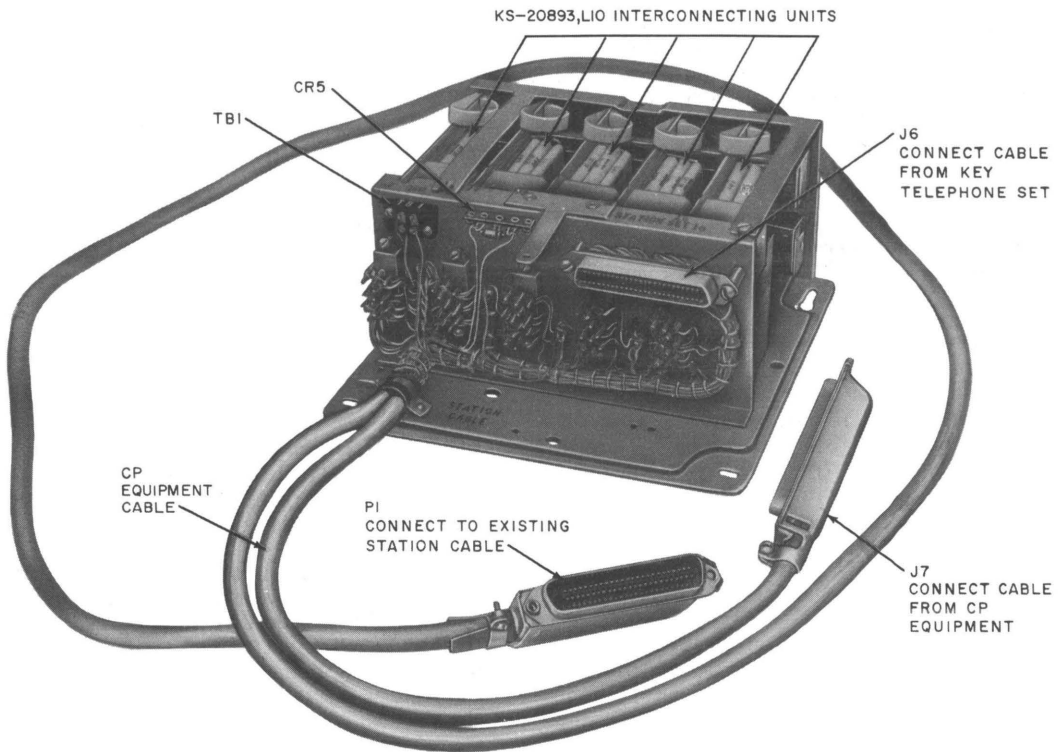
STRAPS ON KS-20893, LIO IU		
	FROM	TO
CEZ	E 1	E 2
	E 2	E 3
	E 3	E 4
	E 6 *	E 9 *
	E 7	E 8

Fig. 3—KS-20893, List 10 Interconnecting Unit

**3.03** Provide straps on KS-20893, List 10 IU for required disconnect feature as shown in Fig. 3. Use 24 gauge bare wire for strapping except where noted. Where an insulated wire is used for strapping, ends should be stripped before

inserting in option terminals. Check continuity after strapping.

**3.04** Provide power from the key telephone equipment talk battery by connecting battery



**Fig. 4—KS-20893, List 11 Interconnecting Service Unit, Equipped (Cover Removed)**

to the (G-R) lead, pin 8, and ground to the (S-W) lead, pin 5, of the existing station cable from the KTS line circuits. If these leads are not available, see 6.01.

**3.05** When the KS-20893, List 11 ISU is used with a multiple plug-ended CALL DIRECTOR set, a B25A connector cable is required as shown in Fig. 6. A separate B25A connector cable and KS-20893, List 11 ISU will be required for each plug (five circuits) used.

#### **4. OPERATION**

##### **4.01 Connection—Voice Connecting Arrangement CEZ (Fig. 7)**

(a) An incoming or outgoing call from the CO, PBX, or intercom is handled in the normal manner for a key telephone set. The station user may then activate two or more connecting arrangements to provide a conference connection between two or more lines on the key telephone set. When a call on a line on the key telephone set is to be conferenced, the station user operates the CP equipment to connect it to that line, then operates the line pickup key of another CO, PBX, or intercom line on the key telephone set and establishes a connection to the other party to be conferenced. The station user then operates the CP equipment to connect the second line for conferencing. The station user, in operating the CP equipment, has now provided a dc impedance through a contact closure across the CT and CR leads and a contact closure on the

CA and CA1 leads associated with the KS-20893, List 10 IU for each of the connected lines. This has established a 3-way conference connection between the station user and the parties on the two lines (maximum of five lines may be conferenced). The station user may leave the connection by going on-hook or by operating other line pickup keys to answer or originate calls.

(b) The closure which provides a dc impedance bridge across CT and CR leads completes a dc path which allows current to flow through R6 to ground via a closed contact on B relay. The IR drop across R6 causes transistor Q1 to turn on, and current through TR relay and Q1 to ground operates the TR relay. The TR relay operated places a holding bridge across the line (pins 1 and 7 on J1-J5) and couples the line to the CP equipment. The TR relay operated also provides an operate path to permit the L relay to operate from line current and causes the B relay to operate (L relay operates faster than B relay); this puts TR relay under control of L relay for Voice Connecting Arrangement CEZ.

(c) The contact closure on the CA and CA1 leads provides a ground to hold the line circuit operated to busy out the appearance of the line after the key telephone set leaves the connection.

#### **4.02 Disconnection—Voice Connecting Arrangement CEZ (Automatic)**

(a) If the CO or PBX provides a disconnect signal (momentary open or battery reversal on leads T and R) when a distant party on a conference line goes on hook, Voice Connecting Arrangement CEZ recognizes the disconnect, and the L relay releases the loop to the CO or PBX and causes TR relay to release. The release of TR relay opens the loop on leads CT and CR toward the CP equipment and causes B relay to release and reclose the loop to CT and CR. The release of TR and B relays provide a momentary open (approximately 25 milliseconds) to the CP equipment.

(b) The CP equipment recognizes the momentary interruption as a disconnect signal and removes the closure across leads CT, CR and leads CA, CA1, restoring the connecting

arrangement to the idle condition. Ground removed from CA releases the line circuit relay.

(c) Any conferenced line may be released manually by operating the CP equipment to remove the loop closure on leads CT and CR. This causes Q1 to turn off, releasing TR and opening the loop to the CO or PBX, which causes L relay to release, and also causes B relay to release restoring the connecting arrangement to the idle condition.

#### **4.03 Disconnection—Voice Connecting Arrangement CEZ (Manual)**

(a) Voice Connecting Arrangement CEZ, with terminals E6 and E9 strapped, *does not* provide a disconnect signal to the CP equipment when the distant party goes on-hook (TR relay does not release). The station user must monitor and manually operate the CP equipment to release each connection.

(b) When the station user operates the CP equipment to disconnect, the closure across leads CT, CR and CA, CA1 is removed, causing TR relay to release. TR relay released removes the connection to the line as in 4.02 (c) above and restores the connecting arrangement to the idle condition. Ground removed from CA releases the line circuit relay.

### **5. MAINTENANCE**

**5.01** Precautions should be taken when performing tests to avoid adversely affecting service to the customer. Local instructions should be followed with reference to notifying the customer before performing the tests.

**5.02** When there is an indication of trouble in the connecting arrangements, the circuit must be opened at the interface (J7 on the CP equipment cable on the KS-20893, List 11—see Fig. 4) to verify in which direction the trouble exists.

#### **5.03 Tests—Voice Connecting Arrangement CEZ**

(a) Check for faulty diode (CR5) on KS-20893, List 11 ISU.

- (b) Check for presence of battery and ground and proper polarity on TB1 (-24 volts) on KS-20893, List 11 ISU (see Fig. 4, 6, and 7).
- (c) Disconnect the key telephone set and the key telephone equipment from the KS-20893, List 11 ISU (see Fig. 5).
- (d) Connect the plug on the key telephone set mounting cord directly to the connector on the existing station cable from the key telephone equipment (Fig. 5).
- (e) Using existing practices, perform normal KTS tests to ascertain that the trouble is not in the key telephone set or the key telephone equipment.
- (f) If the key telephone set and the key telephone equipment are operating properly, reconnect the connecting arrangement equipment as shown in Fig. 5.
- (g) Set up conference calls and determine which circuit in the connecting arrangement is at fault. Replace the KS-20893, List 10 IU (Fig. 3) associated with the circuit under test with a KS-20893, List 10 IU known to be good.



***Always remove power at TB1 when replacing an interconnecting unit. Be sure that the KS-20893, List 10 IU is strapped in accordance with the information shown in Fig. 3.***

- (h) If it becomes necessary to test transmission on individual circuits, use a stub-ended A25D connector cable or a P90D259 wiring harness (part of D-180375 Kit of Parts) or equivalent, to provide access to leads CT and CR of the individual circuits (see Table A for pin numbers of CT and CR leads on J7 on the CP equipment cable on the KS-20893, List 11 ISU). Connect the A25D connector cable to J7 on the CP equipment cable on the KS-20893, List 11 ISU. Using the key telephone set, establish a call to a test center or test tone; using a 1013A hand test set or equivalent with switch operated to the TALK position, connect to CT and CR of circuit under test. Transmission levels heard at key telephone set and hand test set should be approximately the same.

- (i) If replacement of the KS-20893, List 10 IUs does not cure the trouble, replace the entire KS-20893, List 11 ISU.



***Do not attempt any tests or repairs to the CP equipment.***

**5.04** When in the repairman's judgment the trouble is located in the CP equipment, the Repair Service Bureau should be notified so that proper Maintenance of Service Charge billing can be initiated as outlined in BSP 660-101-312 entitled Maintenance of Service Charge on Service With Customer-Provided Equipment (CPE).

## 6. CONNECTIONS

**6.01** Connect plug P1 on the cable from the KS-20893, List 11 ISU to the connector on the existing station cable from the key telephone equipment (see Fig. 4 and 5). Connect the plug on the mounting cord from the key telephone set to connector J6 on the KS-20893, List 11 ISU. Connect the plug on the cable from the CP equipment to connector J7 on the CP equipment cable on the KS-20893, List 11 ISU. The plug on the cable from the CP equipment mates with connector J7 on the CP equipment cable on the KS-20893, List 11 ISU.



***The (S-W) (G-R) leads in the cable on the KS-20893, List 11 ISU are provided for battery and ground connection to the ISU from the key telephone equipment (see Fig. 6 and 7). If these leads are not available in the existing station cable from the key telephone equipment, separate wiring must be provided to connect battery and ground to the screw terminals on TB1 (Fig. 4) from the key telephone equipment or a separate -24 volt power supply. When battery and ground connections are made directly to screw terminals on TB1, disconnect the (G-R) wire from the screw terminal on TB1 and the (S-W) wire from terminal 6 (wire-wrap terminal) on connector J1; insulate and store.***

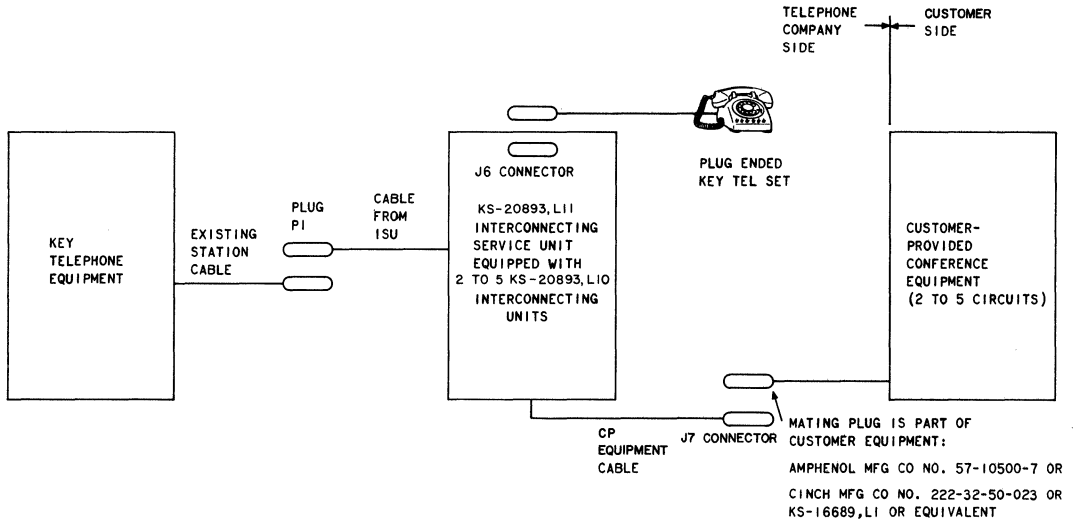
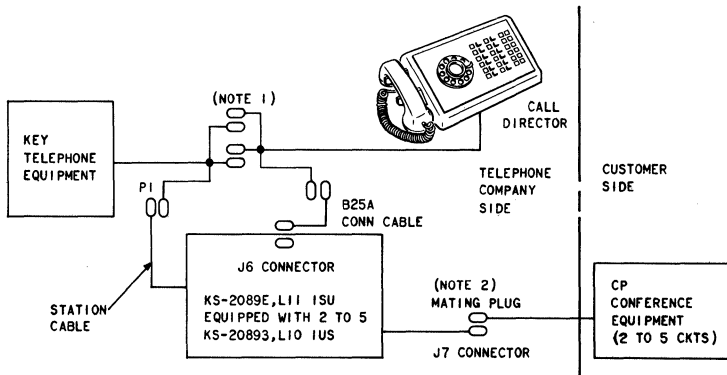
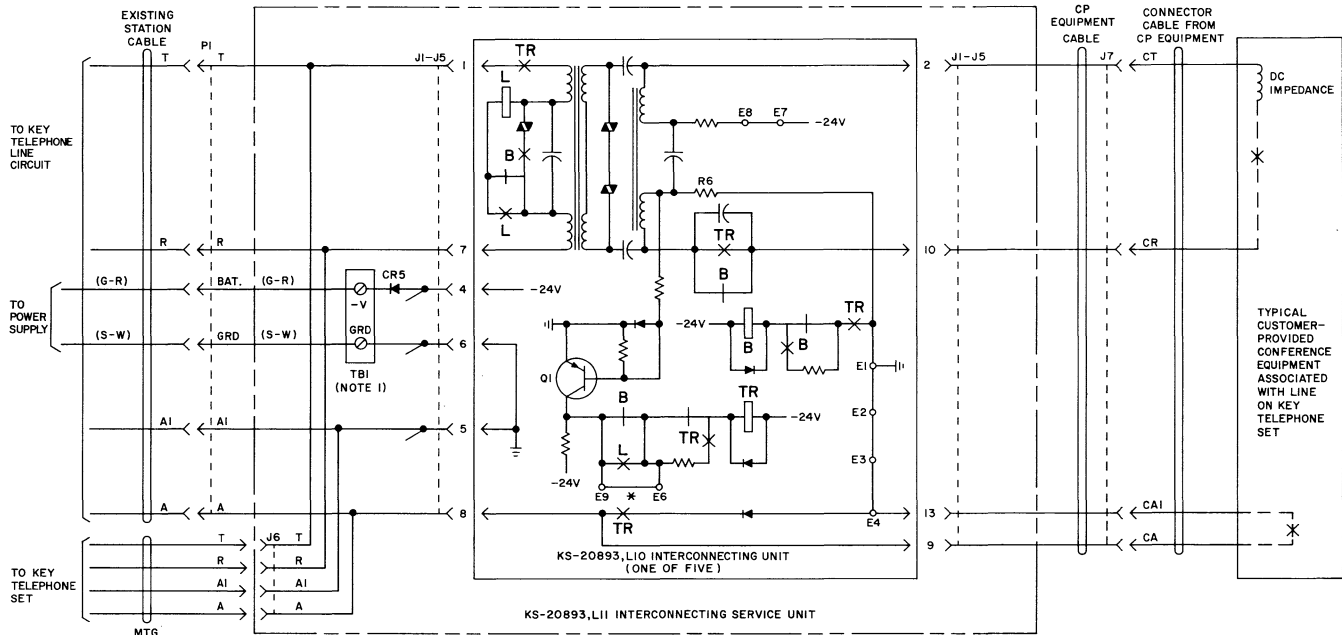


Fig. 5—Block Diagram—Voice Connecting Arrangement CEZ (With Key Telephone Set)



- NOTES:
1. FOR EACH FIVE CONFERENCE CKTS REQUIRED USE A KS-20893, L11 AND B25A CONN CABLE AS SHOWN.
  2. CUSTOMER-PROVIDED MATING PLUG IS AMPHENOL 57-10500-7 OR CINCH MFG CO NO. 222-32-50-023 OR EQUIVALENT.

Fig. 6—Block Diagram—Voice Connecting Arrangement CEZ (With CALL DIRECTOR® Set)



NOTES:

1. BATTERY AND GROUND MAY BE PROVIDED ON (G-R), (S-W) LEADS FROM KTS EQUIPMENT. IF THESE LEADS ARE NOT AVAILABLE FROM THE KTS EQUIPMENT, MAKE CONNECTIONS DIRECTLY TO SCREW TERMINALS ON TBI; WHEN BATTERY AND GROUND CONNECTIONS ARE MADE DIRECTLY TO SCREW TERMINALS ON TBI, DISCONNECT THE (G-R) WIRE FROM THE SCREW TERMINAL ON TBI AND THE (S-W) WIRE FROM TERMINAL 6 (WIREWRAPE TERMINAL) ON CONNECTOR J1.
  2. SEE TABLE A FOR PIN NUMBERS ON P1, J6, AND J7.
- \* TERMINALS E9 AND E6 ARE STRAPPED FOR MANUAL DISCONNECT ONLY

Fig. 7—Simplified Schematic—Voice Connecting Arrangement CEZ (One Circuit)



◆ TABLE A ◆

## PLUG CONNECTIONS FOR KS-20893, LIST 11 ISU

CONNECTOR J6 TO KEY TELEPHONE SET			PLUG P1 TO KEY TELEPHONE EQUIPMENT			CONNECTOR J7 TO CP EQUIPMENT		
CIRCUIT NO.	LEAD DESIG.	PIN NO.	CIRCUIT NO.	LEAD DESIG.	PIN NO.	CIRCUIT NO.	LEAD DESIG.	PIN NO.
1	T	26	1	T	26	1	CT	26
	R	1		R	1		CR	1
	A	27		A	27		CA	27
	A1	2		A1	2		CA1	2
2	T	29	2	T	29	2	CT	29
	R	4		R	4		CR	4
	A	30		A	30		CA	30
3	T	32	3	T	32	3	CA1	5
	R	7		R	7		CT	32
	A	33		A	33		CR	7
4	T	35	4	T	35	4	CA	33
	R	10		R	10		CA1	8
	A	36		A	36		CT	35
5	T	38	5	T	38	4	CR	10
	R	13		R	13		CA	36
	A	39		A	39		CA1	11
6	T	41	6	T	41	5	CT	38
	R	16		R	16		CR	13
	A	42		A	42		CA	39
				GRD	5			
				BAT	8			

## VOICE CONNECTING ARRANGEMENT QKP

### 32A VOICE COUPLER

#### 1. GENERAL

**1.01** This section provides identification, installation, operation, maintenance and connection information for the 32A voice coupler when used to provide Voice Connecting Arrangement (VCA) QKP. Voice Connecting Arrangement QKP uses the 32A voice coupler to permit voice transmission and tone address signaling from the customer-provided equipment (CPE).

**1.02** This section provides information on modification and connections to telephone sets to permit their use with the 32A voice coupler.

**1.03** The 32A voice coupler (Fig. 1) consists of a printed wiring board and components, phone jack, and a mounting bracket with mounting screw. The coupler is part of the "D" Kit of Parts ordered for the type of telephone set to be modified.

Telephone Company Business Office or the Marketing Representative.

#### 2. IDENTIFICATION

**2.01 Purpose:** The 32A coupler permits a customer to connect voice transmitting or receiving equipment to a Telephone Company central office (CO) line through a jack and plug arrangement. The coupler provides dc isolation and limits excessive signals.

**2.02 Application:** To Bell System central office lines terminated in a telephone set equipped with an exclusion key.

**2.03 Ordering Guide (Fig. 2 and 3):** Each kit contains a black telephone housing with a clearance hole for the plug and a 32A voice coupler. Fig. 2 shows a 32A voice coupler mounted on the telephone base pan, and Fig. 3 shows the modified housing installed. The kits are coded as follows:

- Kit of Parts, D180550 (for modifying a 502B telephone set)
- Kit of Parts, D180551 (for modifying a 511F/H telephone set)
- Kit of Parts, D180552 (for modifying a 2502B or 2511F/H telephone set)

#### Associated Apparatus (Order Separately)

- Coupler, Voice, 32A, Modified for radio frequently interference (RFI) (if required)
- Set, Telephone, 502B\*
- Set, Telephone, 511F/H\*
- Set, Telephone, 2502B\*
- Set, Telephone, 2511F/H\*

\*Telephone sets should be ordered modified for RFI if required.

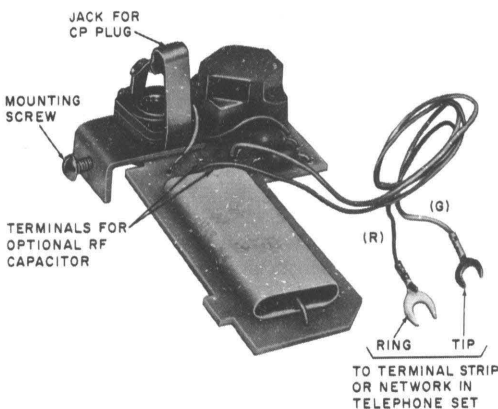


Fig. 1—32A Voice Coupler

**1.04** If the customer wants a copy of the Technical Reference which covers this interface specification, the customer should contact the local

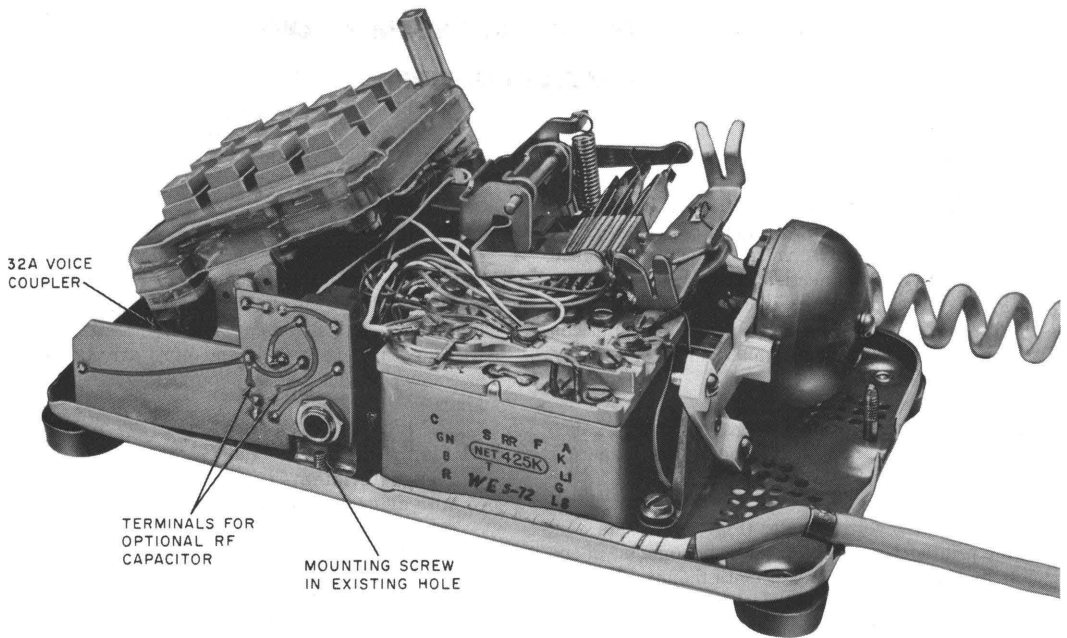


Fig. 2—32A Voice Coupler Mounted in 2511F Telephone Set (Cover Removed)

#### 2.04 Design Features:

- Component parts mounted on a printed circuit board. Approximate dimensions are 1-7/8 inches high by 3-1/4 inches long.
- A standard 1/4-inch tip-sleeve phone jack permits electrical connection of CPE.
- DC power is not available at the coupler and must not be applied to the coupler. Any power required for the CPE must be supplied by the customer.
- Permits customer tone address signaling from the CPE.
- Electrically equivalent to the 30B voice coupler.

### 3. INSTALLATION

**3.01** Modify telephone set by removing existing cover and installing 32A coupler in set as

shown in Fig. 2. Use existing spare hole in lower right side of base pan to fasten mounting bracket. Put the screw through the base pan from the bottom side into the threaded hole of the mounting bracket and tighten securely.

**3.02** Modify telephone set wiring as shown in the table and schematic diagram for the particular telephone set. Connect the red lead (ring) and green lead (tip) of the 32A coupler (see Fig. 4) to the tip and ring terminals shown on the schematic diagram of the modified telephone set. Install the modified black telephone housing. Test the modified set as shown in Part 5.

**3.03** When the customer only needs a single bridge, a 502B or 2502B telephone set is recommended. If the customer requires the transmitter and/or receiver to be disabled, a 511- or 2511-type telephone set is recommended.

**3.04** If the exclusion switch has spare contacts available, they may be used in place of the



Fig. 3—2511F Telephone Set With 32A Voice Coupler Installed (Cover on)

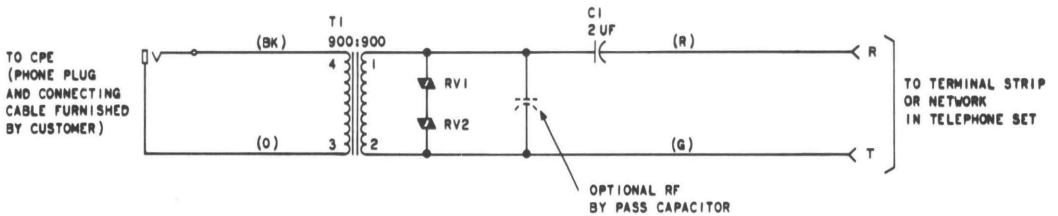


Fig. 4—Connections-32A Voice Coupler

line key to *automatically* disable transmitter and/or receiver.

**3.05** Voice Connecting Arrangement QKP was developed for portable telephone sets; when it is desirable to use a particular telephone set not suitable for the 32A coupler, refer to Section 463-311-100 (VCA QKT and VCA QKTBT). Where no exclusion key is available, as with CALL DIRECTOR® sets, refer to Section 463-311-106 (VCA CEBAV and CEBAW).

#### 4. OPERATION (Fig. 5)

**4.01 Incoming Call:** An incoming call is received in the normal manner. The exclusion key is lifted to remove the closure across the coupler output and to connect the coupler to the line.

**4.02 Outgoing Call:** The coupler should be disconnected and output shorted (exclusion

key down) when dialing to prevent possible dial pulse distortion and transmission of dial pulses through the coupler to the CPE. An outgoing call is placed in the normal manner, and the coupler is connected to the line by lifting the exclusion key.

**4.03 Disconnect:** The 32A voice coupler will be disconnected when the telephone set goes on-hook to terminate the call or when the exclusion key is pushed down to normal position.

**4.04** When the coupler is in use, the telephone set remains connected to the line and is functional on both incoming and outgoing calls.

**4.05** As a customer option, the transmitter and/or receiver of the telephone set may be disconnected when the CPE is in operation. The telephone set may be equipped with a 2-line key

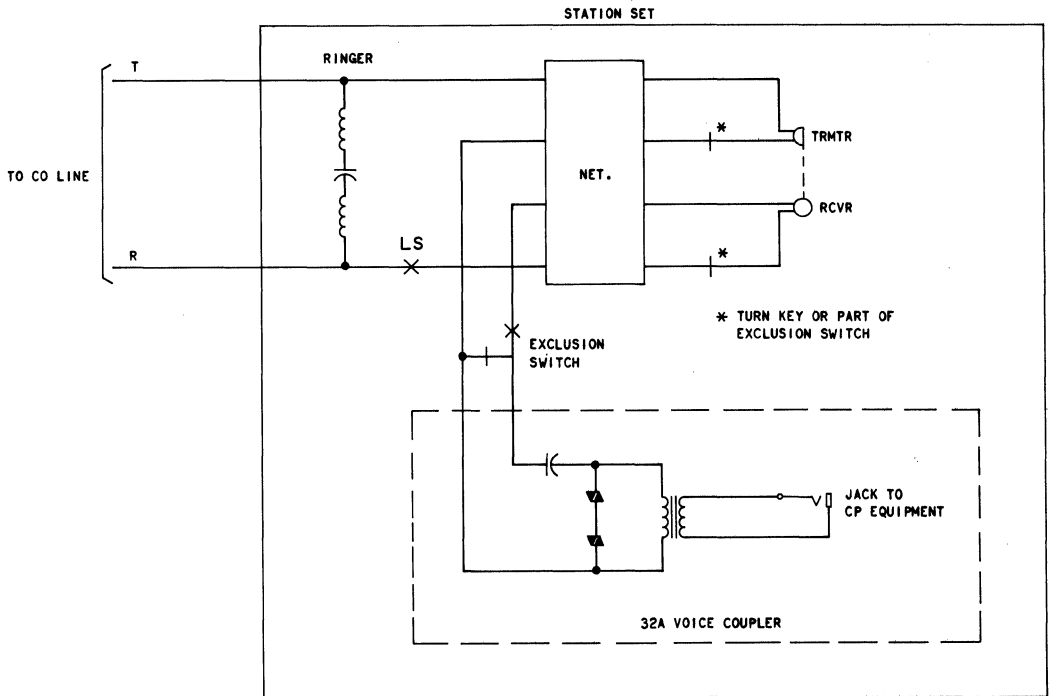


Fig. 5—Schematic-Voice Connecting Arrangement QKP

(511- or 2511-type) or spare exclusion key contacts used for this purpose.

**4.06** When the line key is used to disconnect the transmitter and/or the receiver, the line key must be in the "on" position to receive or make a call and turned "off" to disconnect transmitter and/or receiver when the coupler is used. The line key must be manually restored when the call is terminated. When spare exclusion switch contacts are used to disconnect the transmitter and/or receiver, lifting the exclusion switch will automatically disconnect the transmitter or receiver or both. When the telephone set goes on-hook to terminate the call, the transmitter and/or receiver will be automatically connected.

## 5. MAINTENANCE

**5.01** Maintenance is limited to checking connections and determining if the coupler is working properly by monitoring reception at the coupler with the CPE disconnected as follows:

- (1) Connect a 1013A (or equivalent) hand test set to the tip and sleeve of the jack on the 32A voice coupler with the hand test set MON-TALK switch in the MON position.
- (2) Go off-hook on the telephone set and verify normal dial tone through the handset. Dial tone should not be heard on the hand test set.
- (3) Dial digit "9" using the telephone set dial; no dial clicks or tones should be heard on the hand test set.
- (4) Go on-hook and off-hook; verify dial tone and lift the exclusion key. Dial tone at normal volume will now be heard on the hand test set.

**5.02** If the telephone set is equipped with a cutoff turnkey, operate the turnkey to the off position and verify that the transmitter and/or receiver of the telephone handset is disconnected while dial tone at normal volume is heard on hand test set at coupler.

**5.03** If the telephone set is using spare contacts on the exclusion switch to disconnect the transmitter and/or receiver, verify that the transmitter and/or receiver of the telephone handset is disconnected while dial tone at normal volume is heard on the hand test set at the coupler. If the

above tests are satisfactory, the coupler is working properly.



*Do not attempt any tests or repairs to the CPE.*

**5.04** When in the repairman's judgment the trouble is located in the CPE, the Repair Service Bureau should be notified so that proper Maintenance of Service Charge billing can be initiated as outlined in Section 660-101-312 entitled Maintenance of Service Charge on Services With Customer-Provided Equipment (CPE).

**5.05** If RFI is encountered, the 32A voice coupler should be replaced with a 32A coupler stamped modified for RFI. Install a 1542A inductor in series with the tip and ring of the CO line; use as a connecting block for the telephone set cord. A telephone set modified for RFI and a 40BA capacitor installed at the protector may also be required. Refer to Section 500-150-100 entitled "Radio Signal Suppression for Telephone Sets" for complete modifications necessary when RFI is encountered.

## 6. CONNECTION INDEX

Table A—502B or 2502B Telephone Set Modified for Use With 32A Voice Coupler

Table B—511F/H Telephone Set Modified for Use With 32A Voice Coupler

Table C—2511F/H Telephone Set Modified for Use With 32A Voice Coupler

Table D—1542A Inductor Connections to Telephone Sets Modified for RFI

Fig. 4—Connections—32A Voice Coupler

Fig. 6—502B Telephone Set Modified for Use With 32A Voice Coupler

Fig. 7—2502B Telephone Set Modified for Use With 32A Voice Coupler

Fig. 8—511F/H Telephone Set Modified for Use With 32A Voice Coupler

Fig. 9—2511F/H Telephone Set Modified for Use With 32A Voice Coupler.

TABLE A  
502B OR 2502B TELEPHONE SET  
MODIFIED FOR USE WITH 32A VOICE COUPLER

	WIRE OR LEAD		REMOVE FROM		CONNECT TO	
			TERM. STRIP	NETWORK	TERM. STRIP	NETWORK
Modification to connect voice coupler to line and telephone set.	Mtg. Cord*	Y	E1			Store
		BK	E2			Store
	Exclusion Key	BL	E1			C
		BK		L1		RR
		Y		L2	E1	
	32A Voice Coupler	R			E2	
		G				RR

\*Insulate and store (BL) and (W) mounting cord leads if not required for A lead control.

*Note:* Refer to Fig. 6 for CO, mounting cord, and interconnections to 32A voice coupler. If A lead control is required, use (BL) and (W) mounting cord leads to extend A and A1 to line circuit.

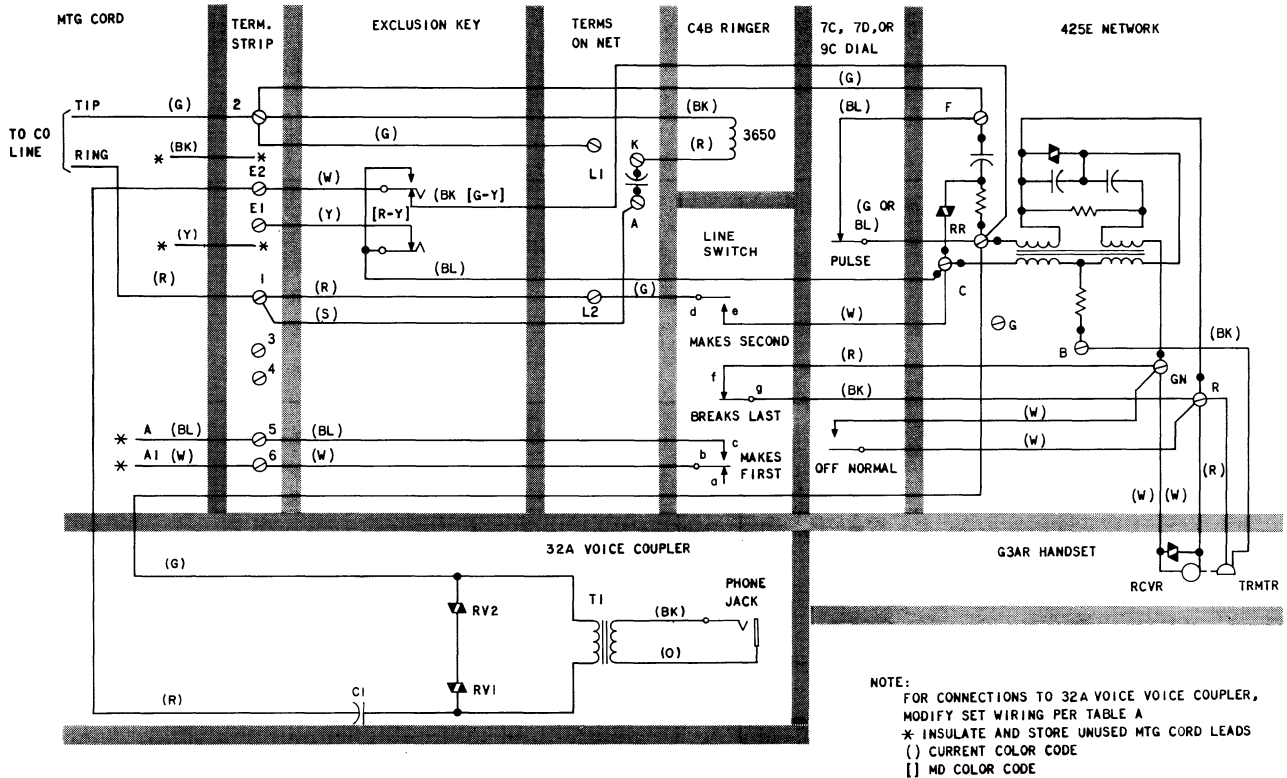


Fig. 6—502B Telephone Set—Modified for Use With 32A Voice Coupler





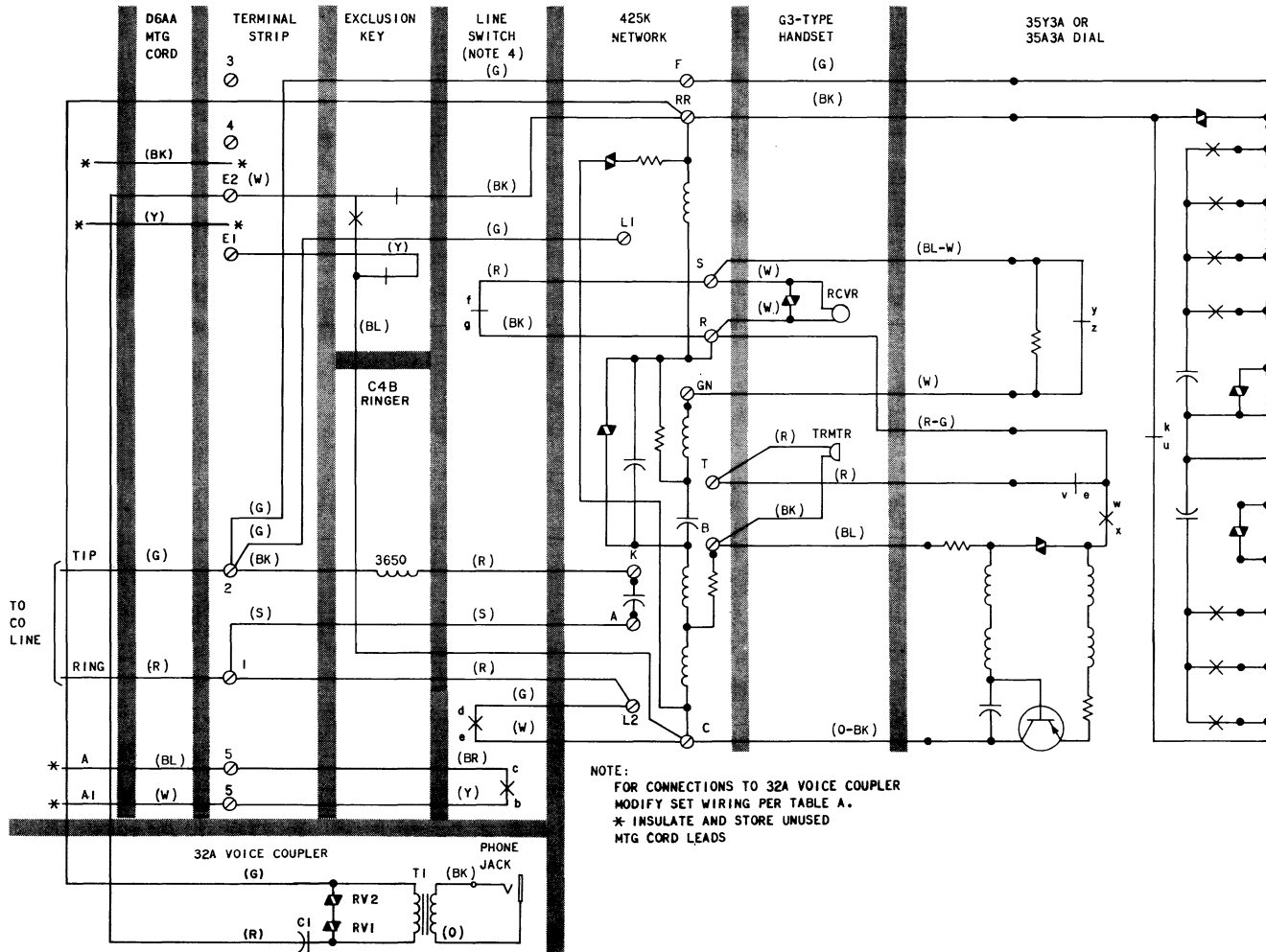


Fig. 7—2502B Telephone Set—Modified for Use With 32A Voice Coupler

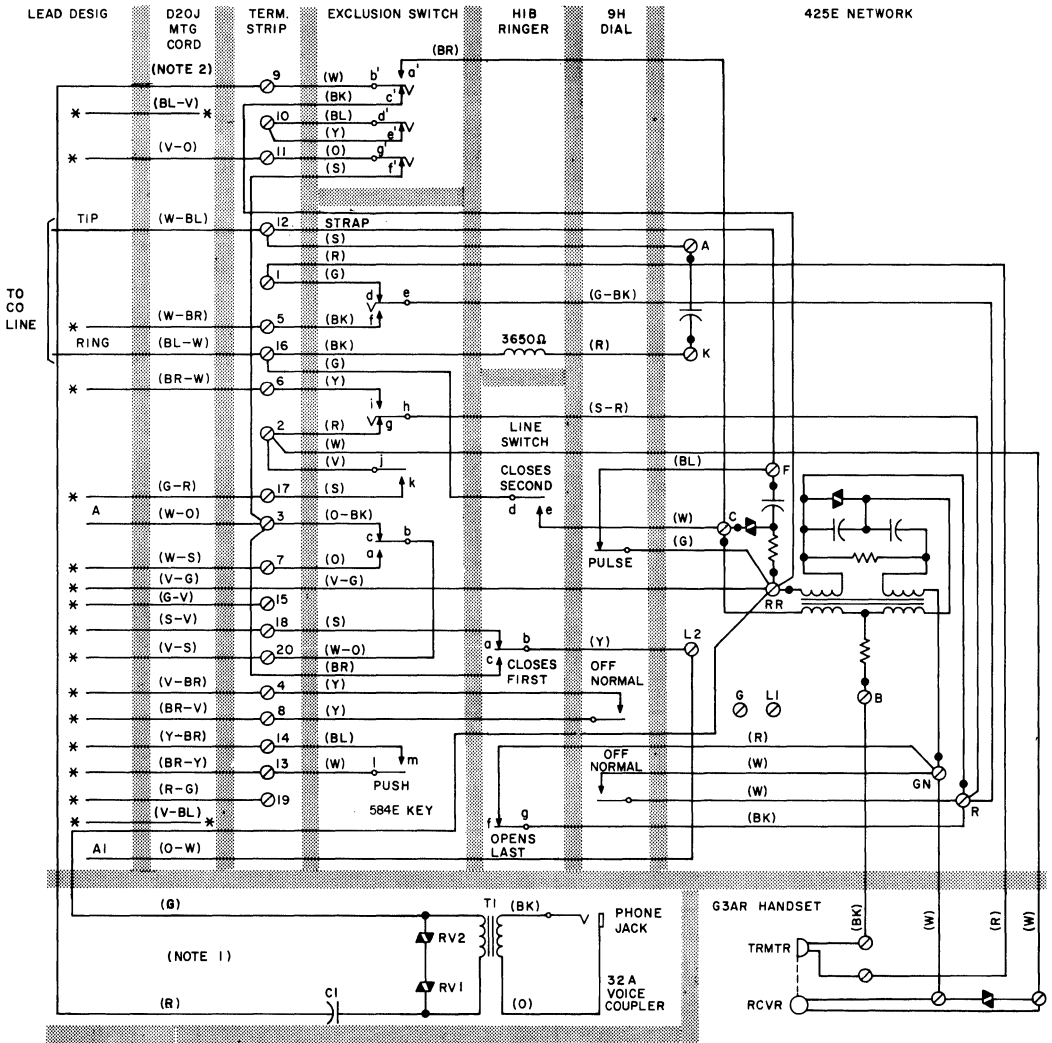
**TABLE B**  
**MODIFICATION OF 511F/H TELEPHONE SET FOR USE**  
**WITH 32A VOICE COUPLER**  
**(SEE NOTE)**

	WIRE OR LEAD		REMOVE FROM		CONNECT TO	
			TERM. STRIP	NETWORK	TERM. STRIP	NETWORK
Modification to connect voice coupler to line and telephone set	Mtg* Cord	W-BL	1		12	
		BL-W	2		16	
		V-BL	9		Store	
		BL-V	10		Store	
	H1B Ringer	S †	1		12	
		BK	2		16	
	Exclusion Key	BK	1			RR
		Y	2		10	
		BR	10			C
	Line Switch	G	15		16	
		BR	20		3	
	Add Strap				12	F
	32A Voice Coupler	G				RR
		R			9	
Operation of 584E (line) key disables TRMTR	584E Key	G-BK		F		R
	TRMTR	R		R	1	
Operation of 584E key disables RCVR	584E Key	S-R	15			R
	RCVR	W		R	2	

*Note:* Refer to Fig. 8 for CO, mounting cord, and interconnections to 32A voice coupler. If A control is required, use (W-O) and (O-W) mounting cord leads to extend A and A1 to line circuit. If 3-type speakerphone is required, move (G-V) mounting cord lead to terminal strip 16 and (V-S) to 3; then connect per appropriate connection section in Division 512.

\* Insulate and store unused mounting cord leads.

† If H1A ringer is used, (R) lead will be on terminal 1; move to terminal 12 on terminal strip.



- NOTES:
1. FOR CONNECTIONS TO 32A VOICE COUPLER, MODIFY SET WIRING PER TABLE B.
  2. D20J SPADE TIPPED MTG CORD FOR 511F TEL SET SHOWN. 511H IS IDENTICAL EXCEPT EQUIPPED WITH D20K PLUG ENDED MTG CORD.
- \* INSULATE AND STORE UNUSED MTG CORD LEADS.

Fig. 8—511F/H Telephone Set—Modified for Use With 32A Voice Coupler (Using Line Key to Disable Transmitter and Receiver)

**TABLE C**  
**2511F/H TELEPHONE SET—MODIFIED FOR USE WITH 32A**  
**VOICE COUPLER (SEE NOTE)**

	WIRE OR LEAD		REMOVE FROM		CONNECT TO		
			TERM. STRIP	NETWORK	TERM. STRIP	NETWORK	
Modification to connect voice coupler to line and telephone set	Mtg Cord*	W-BL	1		12		
		BL-W	2		16		
		V-BL	9		Store		
		BL-V	10		Store		
	H1B Ringer	S†	1		12		
		BK	2		16		
	Exclusion Key	BK	1			RR	
		Y	2		10		
		BR	10			C	
	Line Switch	G	15		16		
		BR	20		3		
	Dial	G		F	12		
	32A Voice Coupler	G				RR	
		R			9		
	Operation of 631B (line) key disables TRMTR	631B Key	G-BK		F		T
		TRMTR	R		T	1	
Operation of 631B (line) key disables RCVR	631B Key	S-R	15			R	
	RCVR	W		R	2		

**Note:**

Refer to Fig. 9 for connections to 32A voice coupler and to CO line. If A lead control is required, use (O-W) and (W-O) mounting cord leads to extend A1 and A to line circuit. If 3-type speakerphone is required, move (G-V) mounting cord lead to terminal strip 16 and (V-S) to 3; move (V-G) mounting cord lead and (O) dial lead to an unused terminal; then connect per appropriate connection section in Division 512.

\*Insulate and store unused mounting cord leads.

† If H1A ringer is used, (R) lead will be on terminal 1; move to terminal 12 of terminal strip.

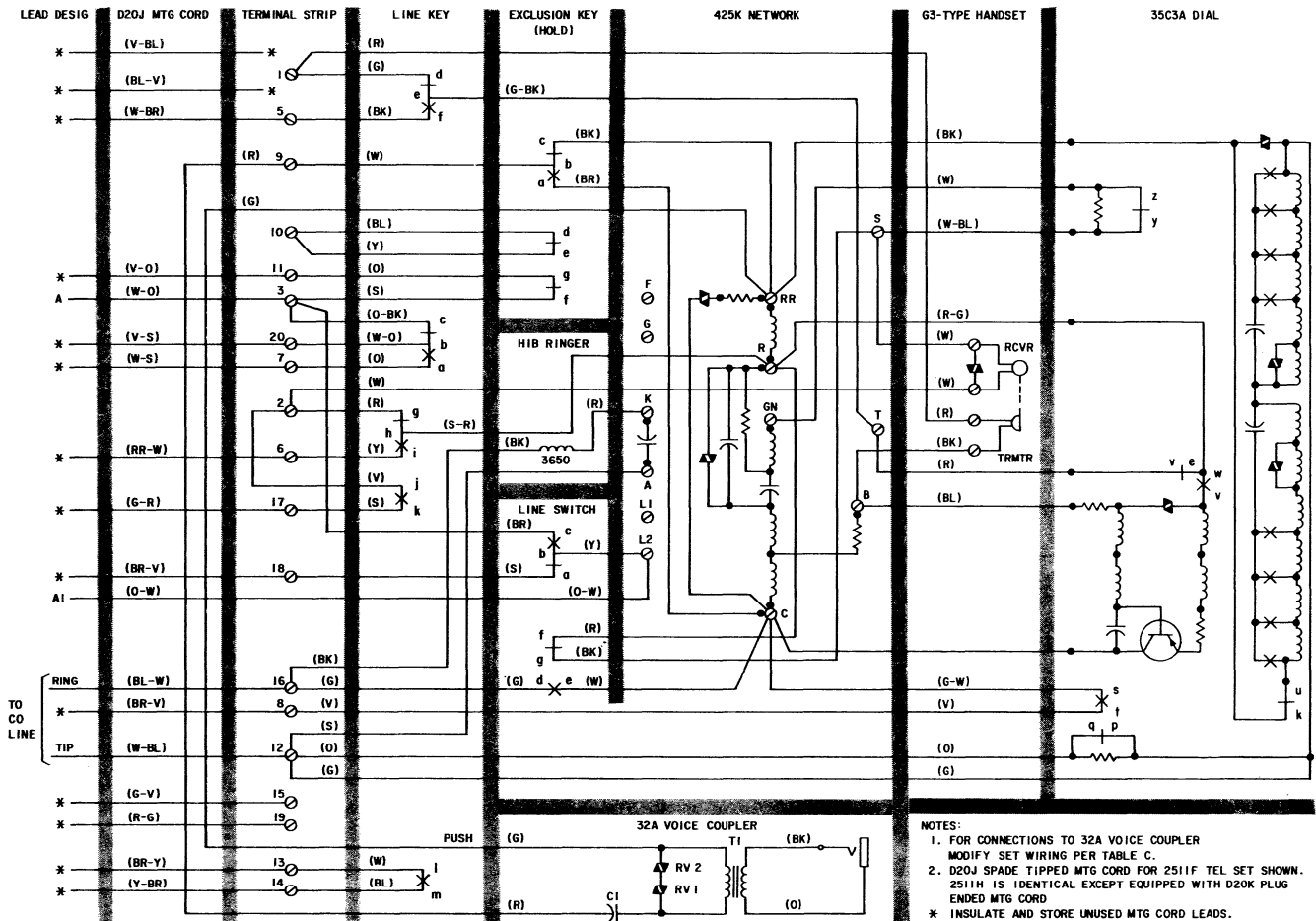


Fig. 9—2511F/H Telephone Set—Modified for Use With 32A Voice Coupler (Using Line Key to Disable Transmitter and Receiver)

- NOTES:
1. FOR CONNECTIONS TO 32A VOICE COUPLER MODIFY SET WIRING PER TABLE C.
  2. D20J SPADE TIPPED MTG CORD FOR 2511F TEL SET SHOWN. 2511H IS IDENTICAL EXCEPT EQUIPPED WITH D20K PLUG ENDED MTG CORD
- \* INSULATE AND STORE UNUSED MTG CORD LEADS.

**TABLE D**  
**1542A INDUCTOR CONNECTIONS**  
**FOR TELEPHONE SETS MODIFIED**  
**FOR RFI**

1542A INDUCTOR TERMINALS	LEAD DESIG	MTG CORD LEADS	
		502B 2502B	511F 2511F
R *	R	R(R)	R(BL-W)
G *	T	T(G)	T(W-BL)
R1 †	RING(R)	—	—
G1 †	TIP(G)	—	—

\* Connect to mounting cord leads.

† Connect to line.

## VOICE CONNECTING ARRANGEMENT CDY PICK-UP BUTTON, BELL SYSTEM TELEPHONE SET

### 1. GENERAL

**1.01** This section provides identification, operation, installation, maintenance, and connection information for Voice Connecting Arrangement CDY used to terminate a line from a customer-provided (CP) system (intercom or paging system) on a Telephone Company provided key telephone set.

**1.02** This section is reissued to show 66M1-50 connecting block and to revise Fig. 2.

**1.03** The customer should be informed by the supplier or manufacturer of the equipment, of the proper use and operation of Voice Connecting Arrangement CDY with his equipment.

**1.04** If the customer wants a copy of the Technical Reference which covers this interface specification, the customer should contact the local Telephone Company Business Office or the Marketing Representative.

### 2. IDENTIFICATION

(a) **Purpose:**

- To provide a termination, without connection to the telecommunications network, for a line from a CP system to a Bell System key telephone set.

(b) **Application:**

Key Telephone and PBX Systems

(c) **Ordering Guide:**

Block, Connecting, 66M1-50 (one per 25 CP line circuits)

**Note:** Other types of blocks may be used when specified by local engineering.

### *Optional Apparatus:*

- Unit, Telephone, Key (one per CP line if station set lamps and ringer are to be used for signaling)

((d) **Design Features:**

- Provides voice frequency coupling to and from the CP equipment
- Provides for dialing into the CP equipment
- Provides for accepting ringing signals from the CP equipment when optional KTU is provided
- Does not provide dc isolation to the CP equipment
- Does not provide voice signal limiting
- Talking battery must be furnished by the CP equipment
- Provides standard KTS services when optional line circuit KTU is provided.

### 3. METHOD OF OPERATION

#### 3.01 *With Optional Line Circuit:*

- (a) The CP equipment has access to the key telephone set by dialing the assigned code and applying ringing voltage over CT and CR leads to the key telephone line circuit. The set ringer is activated (audible signal) and the pick-up button lamp (when illumination is provided) associated with the CP equipment is energized.
- (b) The call can be answered at any appearance of this line in the key telephone system by depressing the flashing pick-up button and lifting the handset. This places the telephone set receiver and transmitter across the incoming



line. Talking battery is supplied by the CP equipment.

(c) If HOLD is provided and it is desired to hold the call from the CP equipment while originating or receiving a call on another line, the key telephone set HOLD button is depressed; this places a holding bridge across the leads from the CP equipment. To remove the hold, depress the line pickup button associated with the held line to transfer connection of the line from the hold circuit to the key telephone set network.

(d) Access to the CP equipment can be obtained at any appearance of this line by depressing the associated pick-up button, lifting the handset, and dialing the code assigned to the desired station.

**3.02 Without Optional Line Circuit KTU:**

(a) An external CP signaling arrangement is activated to signal the desired station of an incoming request. The incoming call can be answered at any appearance of this line in the key telephone system by depressing the associated pick-up button and lifting the handset. Talking battery is furnished by the CP equipment.

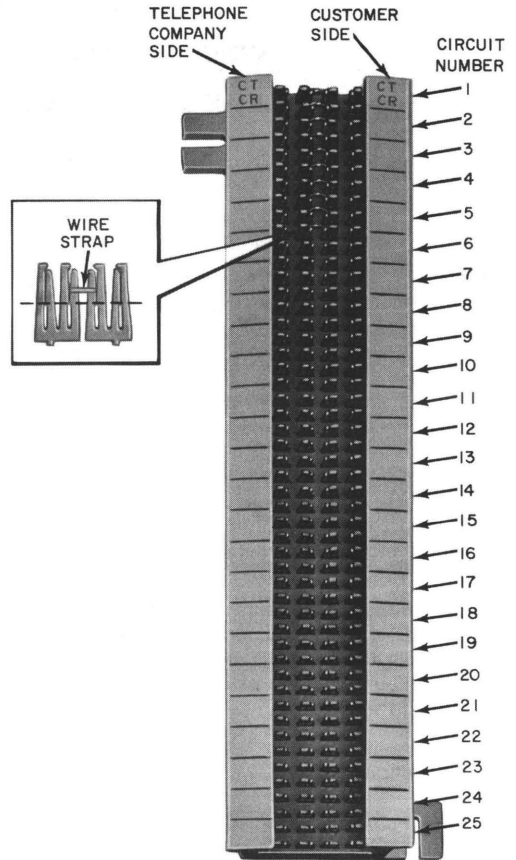
(b) Access to the CP equipment can be obtained at any appearance of this line by depressing the associated line pick-up button, lifting the handset, and dialing the assigned code.

**3.03 Disconnect:** The key telephone station set can be disconnected from the CP equipment either by going on-hook or by depressing another line pick-up button (to answer or originate a call on the telecommunications network).

**4. INSTALLATION**

**4.01** Install the 66M1-50 connecting block in a dry area free of excess dirt and dust within 25 feet of the key telephone equipment.

**4.02** Electrical connection is made to the key telephone system line circuit through a pair of wires terminated at the 66M1-50 connecting block for access to the CP equipment. Stencil lead designations on 66M1-50 connecting block as shown in Fig. 1.



◆ Fig. 1—66M1-50 Interface Connecting Block ◆

**4.03** See sections covering key telephone system installations for procedures for installing the optional line circuit KTU.

**5. MAINTENANCE**

**5.01** When trouble is reported, check for loose or broken connections.

**5.02** Open circuit at the Interface Connecting Block to verify in which direction the trouble exists. If the trouble is toward the CP equipment, inform the customer that the trouble tests towards his equipment.



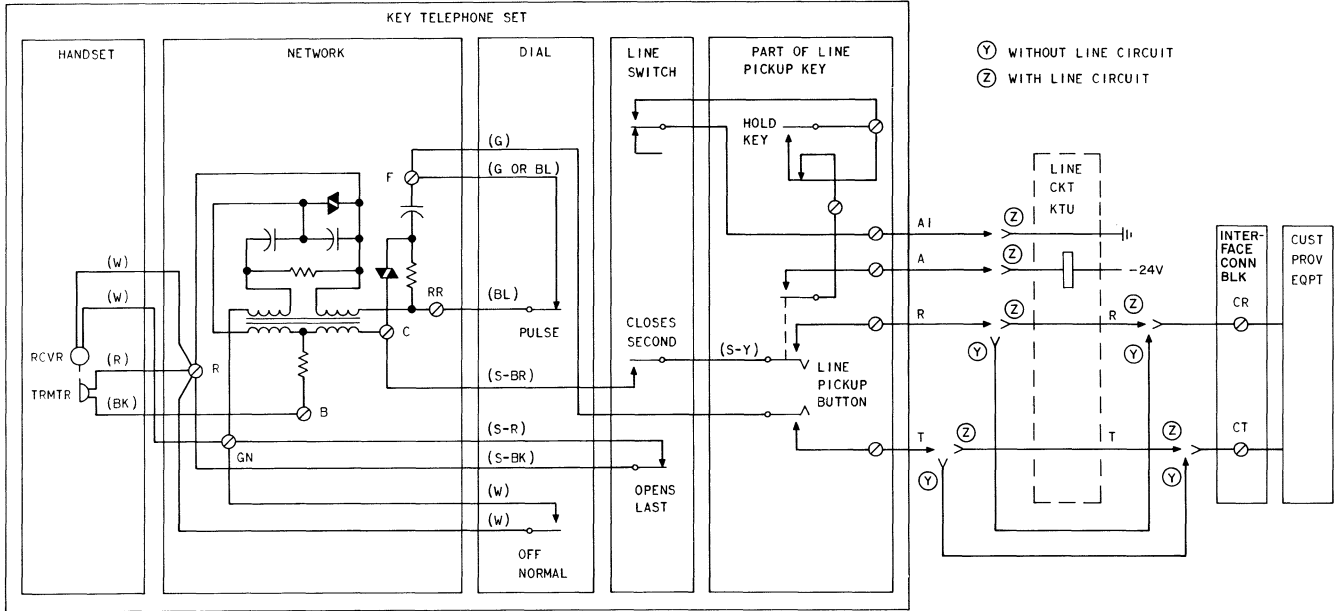
*Do not attempt any repairs to the customer-provided equipment.*

the key telephone set and optional line circuit KTU.

**5.03** See sections covering key telephone system maintenance for procedures on maintaining

## **6. CONNECTIONS**

**6.01** For connection information refer to Fig. 2.



◆ Fig. 2—Schematic-Voice Connecting Arrangement CDY Using 1A1 or 1A2 KTS ◆

## INTERFACE TERMINATION JTC USED WITH ATTESTED CUSTOMER-PROVIDED NON-POWERED CONFERENCING DEVICES

### 1. GENERAL

**1.01** This section provides information on the Bell System attestation program for customer-provided non-powered conferencing devices.

**1.02** If the customer requires a copy of the Technical Reference which covers this interface specification, he should contact the local Telephone Company Business Office or the Marketing Representative.

### 2. PURPOSE

To permit customer-provided non-powered conferencing devices attested under Interface Specification 2001 to be used with Bell System telephone equipment.

### 3. IDENTIFICATION

**3.01** This termination is designated as Interface Termination JTC and consists of a bridged connection to a 4-button or 6-button key telephone set (equipped with a HOLD button and illumination) associated with a key telephone system (KTS). A 50-pin Amphenol-type connector is provided as the interface with the customer-provided equipment.

**3.02** Conferencing devices included in this program are defined basically as transformer-coupled, switch-operated devices, intended to be bridged by means of a 50-pin Amphenol-type connection to a key telephone system station for the purpose of establishing a conferenced connection between two or more of the lines associated with the station.

**3.03** Conferencing devices excluded from this program are:

(a) Devices that have a provision for a ground path (ac or dc) other than through the interface leads.

(b) Devices that employ gain.

(c) Devices that perform network control signaling other than line holding and disconnect supervision.

(d) Devices that have provisions for being powered from sources other than Telephone Company talk battery on the lines.

(e) Devices that require or have provision for external wiring other than a plug-ended cord compatible with the interface termination.

**3.04** Interface Termination JTC is not offered for use with CALL DIRECTOR® sets, 6-, 10-, 20-line sets, or sets equipped with separately mounted keys.

**3.05** Conferencing devices which are acceptable for use will have an attestation number indelibly affixed on the device.

### 4. APPLICATION

**4.01** For use in connection with 4- or 6-button key telephone sets (equipped with HOLD button and illumination) associated with 1A, 1A1, or 1A2 Key Telephone Systems.



*Only lines providing voice communication service, i.e., local central office, PBX, WATS, local Centrex, foreign exchange, private and intercommunicating station line service may be conferenced by the device. Interface Termination*

*JTC is not offered for use with data service or with lines assigned as miscellaneous features (i.e., paging, pushbutton, and buzzer, etc).*

**5. INSTALLATION**

**5.01** The method of providing the interface termination will vary depending on whether the telephone set is equipped with a plug-ended or spade-tipped cord, whether a 66E3-25 connecting block is in place, etc (Fig. 1 through 4).

**5.02** In any arrangement, the customer should be provided with a connector-ended cable for his connections, to remove the necessity of connecting the customer-provided equipment (CPE) directly to Bell System apparatus.

**5.03** When the cable to the CPE is terminated on a 44-type or 66E3-25 connecting block, only the leads required need be extended. This would mean T and R of the lines involved in 1A KTS, or T, R, A and common A1 in 1A1 or 1A2 KTS (see Table A).

**5.04** After all connections have been made, verification of wiring can be made using a spare key telephone set plugged into the connector supplied for CPE.

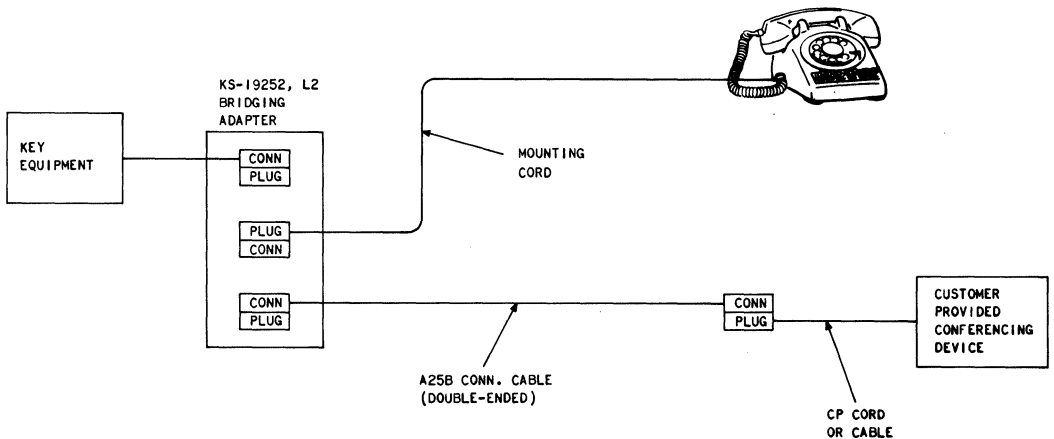
**6. MAINTENANCE**



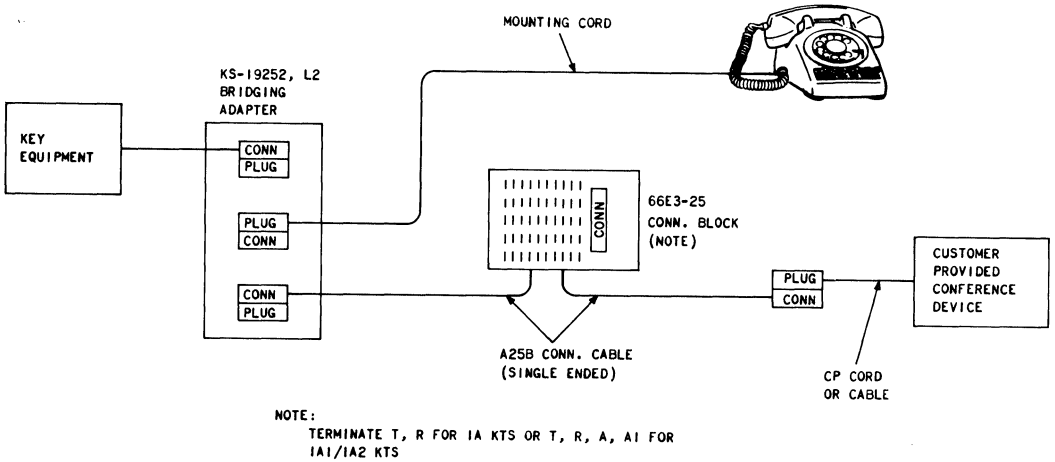
*Bell System personnel should not attempt to repair or modify CP conferencing devices.*

**6.01** When in the repairman's judgment the trouble is located in the CP device, the Repair Service Bureau should be notified so that proper Maintenance of Service Charge billing can be initiated as outlined in BSP 660-101-312 (Maintenance of Service Charge on Services With Customer-Provided Equipment).

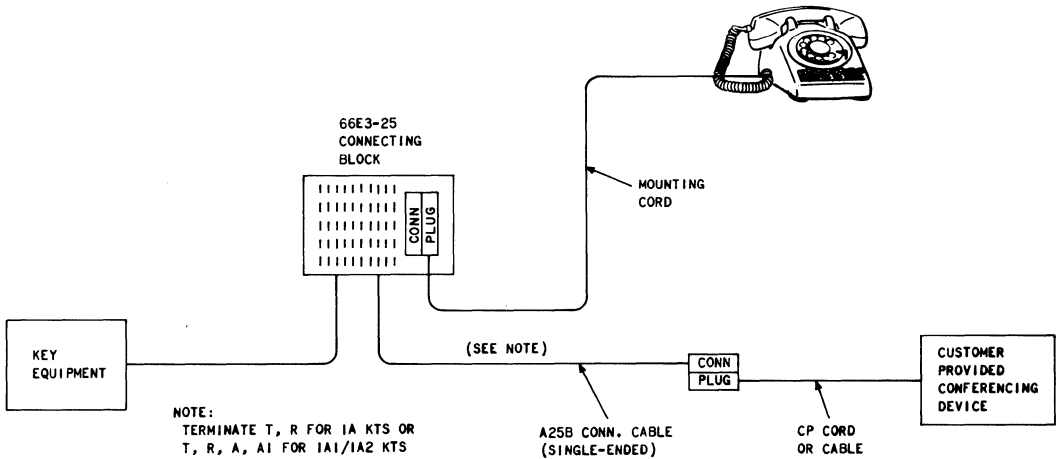
**6.02** The customer should be notified of trouble in his equipment in case removal for repair is required, or where CPE is interfering with proper operation of the associated Bell System equipment.



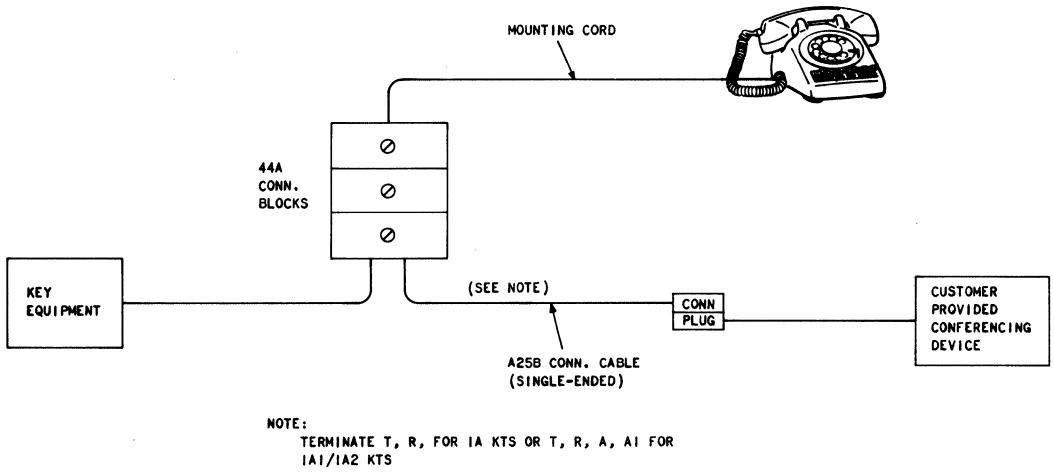
**Fig. 1—Arrangement for Key Telephone Set with Plug-Ended Mounting Cord and Bridging Adapter**



**Fig. 2—Arrangement for Key Telephone Set with Plug-Ended Mounting Cord, Bridging Adapter and Connecting Block**



**Fig. 3—Arrangement for Key Telephone Set with Plug-Ended Mounting Cord and Connecting Block**



**Fig. 4—Arrangement for Key Telephone Set with Spade-Tipped Mounting Cord and Connecting Blocks**

**TABLE A**  
**INTERFACE CONNECTOR CABLE CONNECTIONS**

LEAD DESIGNATION		CONNECTOR PIN NO.	COLOR	66E3-25 CONN. BLK. CLIP NO.	44A CONNECTING BLOCK TERMINAL	
Circuit 1	T	26	W-BL	1	2	Block 1
	R	1	BL-W	2	1	
	A	27	W-O	3	5	
	A1	2	O-W	4	4	
Circuit 2	T	29	W-BR	7	10	
	R	4	BR-W	8	9	
	A	30	W-S	9	8	
Circuit 3	T	32	R-O	13	5	
	R	7	O-R	14	4	
	A	33	R-G	15	7	
Circuit 4	T	35	R-S	19	8	
	R	10	S-R	20	3	
	A	36	BK-BL	21	2	
Circuit 5	T	38	BK-G	25	7	Block 3
	R	13	G-BK	26	6	
	A	39	BK-BR	27	10	

*Notes:*

1. All other leads are not required at the customers equipment and should not be terminated except when using a double-ended cable.
2. When used with 1A KTS, terminate T and R leads only.



## INTERFACE TERMINATION JTA USED WITH CONFORMING ANSWERING DEVICES INCORPORATING AUTHORIZED PROTECTIVE CONNECTING MODULES

### 1. GENERAL

**1.001** This addendum supplements Section 463-322-101, Issue 1.

**1.002** This addendum is issued to:

- Specify code of 400-type KTU used with Interface Termination JTA
- Add information on an alternate method of furnishing JTA.

### 2. CHANGES TO SECTION

**2.001** On page 1, after paragraph 4.01, add the following Note:

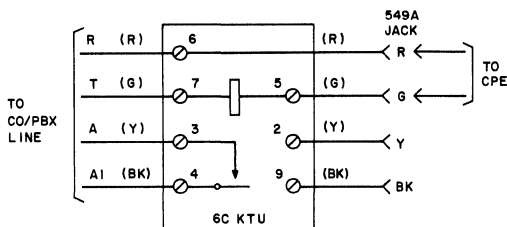
*Note:* When using a KS-21566 adapter in 1A2 KTS or 7A or 14A Communication System applications, the line unit must be a 400D or later design. Do not use a 400A, B, or C key telephone unit (KTU).

**2.002** Add paragraph 6.01.1 as follows:

**6.01.1** An alternate method of supplying Interface Termination JTA requires a 6C KTU and a 549A jack, or equivalent, wired as shown in Fig. 2. The KS-21566 adapter is not required in this configuration. The 6C KTU should be mounted in

a location providing access to the required leads from the key system line circuit. This can be at a distribution point, connecting block, or, in some cases, the telephone set. Use a 105C apparatus box to house the 6C KTU, where necessary. Use D inside wire between the access point and the KTU and between the KTU and the 549A jack. Locate the jack convenient to the CPE. Only the tip and ring leads are required at the CPE, so the other two leads of the IW are terminated on spare terminals at the KTU and jack.

**2.003** Add Fig. 2.



**Fig. 2—Alternate Method of Furnishing Interface Termination JTA**

## INTERFACE TERMINATION JTA USED WITH CONFORMING ANSWERING DEVICES INCORPORATING AUTHORIZED PROTECTIVE CONNECTING MODULES

### 1. GENERAL

**1.01** This section provides information on a customer-provided (CP) conforming answering device incorporating Authorized Protective Connecting Module (APCM) connected to a Key Telephone System (KTS) installation.

**1.02** Whenever this section is reissued, the reason for reissue will be listed in this paragraph.

### 2. PURPOSE

- To permit direct electrical connection of a CP conforming answering device incorporating APCM to any one line of a KTS installation by means of a telephone company-provided interface termination.

### 3. IDENTIFICATION

**3.01** Interface termination JTA consists of a supervisory relay to provide A-lead control for any one line of a KTS. A KS-21566 adapter (Fig. 1) provides the interface between the approved telephone answering devices and the KTS.

**3.02** Conforming answering devices included in this program are designed to answer incoming calls on the line, to transmit a prerecorded voice announcement or audible signal to the calling party, to record a voice message from the calling party, and to disconnect from the line. These devices may include provisions to retrieve recorded messages or change an announcement message. These provisions do not include devices which provide call origination. A dictation system, which meets the requirements, will be considered an automatic answering device.

**3.03** Conforming answering devices, which are acceptable for use, will have a Conformance Number permanently labeled on the external housing of the device.

**3.04** An APCM must be provided by an authorized manufacturer and connected to the telecommunications network by means of the interface termination provided by the telephone company. The interface termination is either a telephone company-provided 4-prong jack (single-line service) or interface termination JTA (Key Telephone Systems).

### 4. APPLICATION

**4.01** The KS-21566 adapter is furnished in two versions. The List 1 provides access to any of the first five lines in telephone sets using the standard wiring arrangement in 1A2 KTS. The List 2 provides access to any one of seven lines and is wired compatible with the 7A and 14A Communication Systems (COM-KEY\*). The 4-prong jack provides the line termination to the CPE. The line furnished to the jack is determined by the position of the wafer strip (Fig. 1).

\*Trademark of AT&T

### 5. ORDERING GUIDE

**5.01** The following items are required to provide interface termination JTA on a per-line basis:

- Adapter, KS-21566, List 1 (for 1A1 or 1A2 KTS lines not associated with COM-KEY)
- Adapter, KS-21566, List 2 (for lines associated with COM-KEY)
- Adapter, 225A (optional—required if answering device is equipped with a modular plug). Refer to Part 6.

### 6. INSTALLATION

**6.01** The method of providing the interface termination will vary depending on what type telephone set is used and whether access to the desired line is obtained using the plug and

connector on the KS-21566 adapter, at a distribution point, or at the KTS equipment. The adapter should be physically installed at a location which permits access to the line and connection to the CPE. If the CP conforming answering device is equipped with a modular plug, provide a 225A adapter.

**Six-Button Desk Set (565-, 2565-Type)**

**6.02** Use a List 1 adapter and connect by disconnecting set mounting cord from the connector cable and installing ends in the proper plug and connector on the adapter. Move wafer strip to screw terminals accessing desired line (Fig. 1).

**Six-Button Wall Set (851-, 2851-Type)**

**6.03** The List 1 adapter is also used for this application, but not the plug and connector. Using D inside wire, pick up T, R, and A of the desired line plus the A1 lead and run the IW to the adapter. At the adapter, terminate the IW in the proper order under the same screw terminals as the wafer strip plus the A1 terminal. If more accessible, the leads may be picked up at a distribution point.

**Ten-Button Desk Set (830-, 2830-Type)**

**6.04** Install a List 1 in the same way as for a six-button desk set. However, access is only to the first five lines on the key unless line appearance rearrangements are made at the set or equipment.

**Ten-Button COM-KEY (832-, 2832-Type)**

**6.05** Install the same as for a six-button wall set, except use a List 2 adapter. Any of the seven CO/PBX lines can be connected to the CPE.

*Note:* If the seventh line is used, the wafer strip must be reversed 180° to fit under the screw terminals to allow placement of the cover and to maintain proper polarity.

**Twenty-Button Desk Set (831-, 2831-Type)**

**6.06** Use a List 1 adapter with these sets. The mounting cords and connector cables have two arms each. Where physically possible, one arm of the cord and its mating connector can be connected directly to the adapter. If used this way, only the first five lines in the keys are available and line appearance rearrangement may be required. As an alternate arrangement, the necessary leads can be accessed to a distribution point on the equipment and terminated on the adapter. In this case, do not use the plug and connector on the adapter.

**Twenty-Button COM-KEY (832-, 2832-Type)**

**6.07** Use of the List 2 adapter is limited to the seven CO/PBX lines in either key depending on which arm of the cord and connector cable is used. The adapter is installed in the same manner as for the 20-button desk set.

**CALL DIRECTOR® (630-, 2630-Type)**

**6.08** Access to the desired line must be obtained at the equipment or distribution point using spare leads in the set connector cable and mounting cord. These leads should be terminated on spare terminals in the set and extended to the adapter using D inside wire or an auxiliary cord. The IW or cord is terminated on the screw terminals of a List 1 adapter with the wafer strip.

**Concentrator CALL DIRECTORS (634-, 2634-Type)**

**6.09** If spare leads are available, wire a List 1 adapter as in 6.08; otherwise, the desired leads will have to be accessed at the equipment or the concentrator KTU.

**6.10** Pockets are provided in the cover of the adapter for the inserts used when low profile plugs are encountered.

**7. MAINTENANCE**



*Bell System personnel should not attempt to repair or modify CP conforming answering devices.*

**7.01** When in the repairman's judgment the trouble is located in the CP device, the Repair Service Bureau should be notified so that proper maintenance of service charge billing can be initiated as outlined in BSP 660-101-312 entitled Maintenance of Service Charge on Services With Customer-Provided Equipment (CPE).

**7.02** The customer should be notified of trouble in his equipment in case removal for repair is required, or where CPE is interfering with proper operation of the associated Bell System equipment.

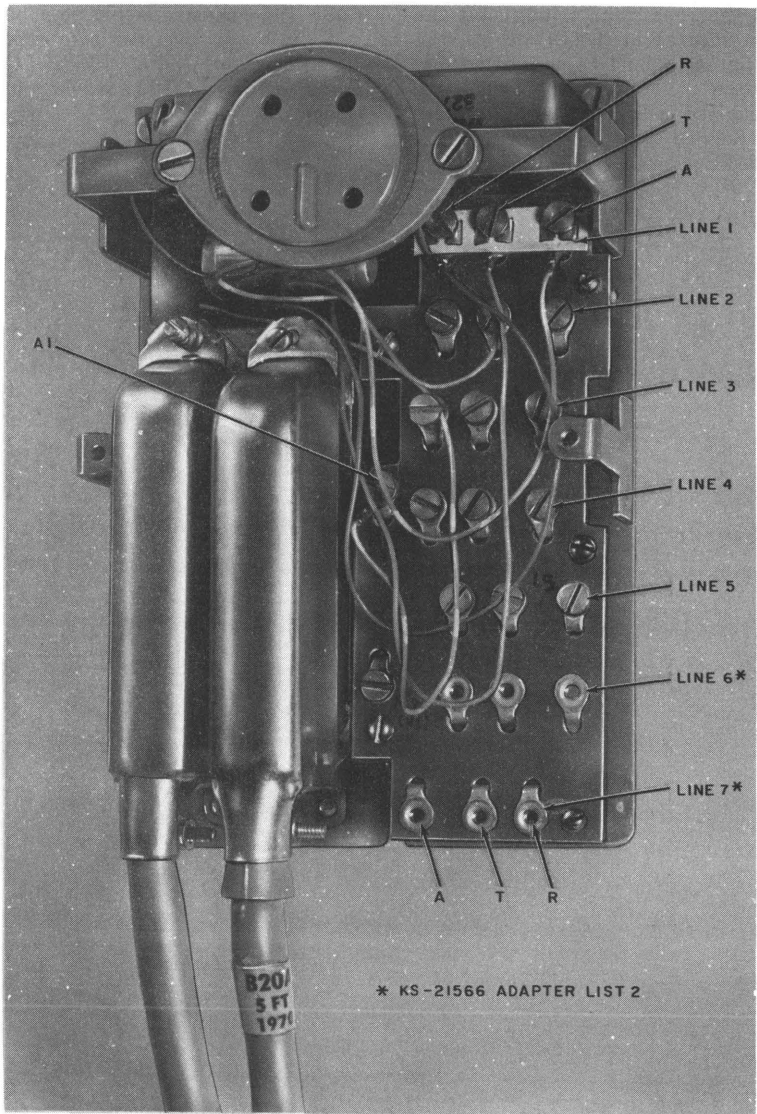


Fig. 1—KS-21566 Adapter

## **HEADSET INTERFACE TERMINATION**

### **USED WITH CUSTOMER-PROVIDED**

### **4-WIRE HEAD TELEPHONE SETS**

#### **1. GENERAL**

**1.01** This section provides information on the Bell System attestation program for customer-provided headsets.

**1.02** If the customer wants a copy of the Technical Reference which covers this interface specification, the customer should contact the local Telephone Company Business Office or the Marketing Representative.

#### **2. PURPOSE**

**2.01** To permit certain qualified customer-provided headsets to be used with Bell System telephone equipment.

#### **3. IDENTIFICATION**

**3.01** Attendant switchboard jack connection, attendant console jacks, and telephone set jacks are identified as Headset Interface Terminations when used by attested customer-provided headsets.

#### ***Headset Definition***

**3.02** Headsets included in this program are described as hands-free, 4-wire devices normally worn on the head of the user for close talking, containing acoustic-to-electric and electric-to-acoustic transducers that provide 2-way transmission of human speech.

#### ***Headset Marking***

**3.03** Headsets which are acceptable for use will have an attestation number indelibly affixed on the headset.

#### **4. APPLICATION**

**4.01** Headsets with the following features are specifically excluded for use at this time:

- (a) Headsets that have provision for a ground path (ac or dc)
- (b) Headsets that employ gain which is adjustable by the user
- (c) Headsets that perform network control signaling
- (d) Headsets that are powered from other than Telephone Company talk battery
- (e) Headsets that require permanent wiring between the headset and the Telephone Company headset jack appearances.

**4.02** Attested headsets may only be connected to 4-wire headset jacks normally provided as Bell System equipment.

**4.03** Table A describes the Bell System equipment which can be utilized in this program.

#### **5. MAINTENANCE**

**5.01** Bell System personnel should not attempt to repair or modify customer-provided headsets. Trouble proven to be in these headsets should be referred to the customer and the customer should remove the headset from service. A maintenance of Service Charge should be considered on such a repair visit.

TABLE A  
BELL SYSTEM APPARATUS AND EQUIPMENT  
COMPATIBLE WITH ATTESTED HEADSETS

ATTENDANT SWITCHBOARDS		ATTENDANT CONSOLES		TELEPHONE SETS					
ATTENDANT EQUIPMENT	OPERATOR'S POSITION	TELEPHONE CONSOLES	APPARATUS UNITS	CALL DIRECTORS	CARD DIALERS	TELEPHONE SETS	SUBSCRIBER SETS	KEYS	KEY MOUNTINGS
1A Telephone Answering System	506A	1-type*	12-type**	608C	663A1	514B	688A (MD)	6026A (MD) 6026B 6026C 6026D	400-type 1400-type 2400-type
	506B	2-type*	14-type**	617A	664A1	563HB	688B (MD)		
	552A	3-type		617B	664A2	1514B	688C		
	552B	4-type		618A (MD)	664A3	1563HB	690A (MD)		
	552D	5-type		618B	1663A1	2514B	690B (MD)		
	552E	6-type		636-type (MD)	1663B1 (MD)	2563HB	690C		
	555	8A-type		637-type (MD)	1664A1		1690C (MD)		
	556A	9A-type (MD)		638-type	1664A2		2690C		
	605A	10-type†		639-type	1664A3				
	606A	11-type†		682AA	1664B1 (MD)				
	606B	12-type†		683AA	1664B2 (MD)				
	607A	16-type		1636-type (MD)	1664B3 (MD)				
	607B	21-type		1637-type (MD)	2663A1				
	608A	23-type		1638-type (MD)	2664A1				
	608B	24-type		1639-type (MD)	2664A2				
	608D	28-type		2636-type	2664A3				
	608E	29-type		2637-type					
	608F	34-type		2638-type					
		41-type		2639-type					
		43-type		2682-type					
		48-type		2683-type					
		51-type							
		53-type							
	54-type								

\* Use 476A attendant jacks (See Section 504-211-401).

† Use M12L cord assembly (See Section 504-216-401).

\*\* Use M12L cord assembly (See Section 504-216-430).

## VOICE CONNECTING ARRANGEMENT CDB J53050A, LIST 1 INTERCONNECTING UNIT

### 1. GENERAL

**1.01** This section provides information on identification, installation, method of operation, maintenance, and connections on the J53050A, List 1 Interconnecting Unit.

**1.02** The customer must be informed of the proper use and operation of Voice Connecting Arrangement CDB.

**1.03** If the customer wants a copy of the Technical Reference which covers this interface specification, the customer should contact the local Telephone Company Business Office or the Marketing Representative.

### 2. IDENTIFICATION

#### (a) *Purpose*

- The J53050A, List 1 Interconnecting Unit (Fig. 1) is for use between Bell System manual PBXs and customer-provided (CP) dial intercommunicating systems which are arranged for supervision.
- To limit excessive levels from customer-provided equipment and to provide protection for personnel against hazardous voltages.

#### (b) *Application*

608A and 555A Bell System switchboards

#### (c) *Ordering Guide*

- Unit, Interconnecting, J53050A, List 1
- Block, Connecting, 30-Type (Fig. 2).

#### (d) *Design Features*

- Components are mounted on a 189A mounting plate (2 inches by 23 inches)

- Can be mounted in some switchboards, on relay racks, or apparatus mountings
- Slow release S relay prevents switch hook dialing by customer
- Designed to give cord supervision at the PBX
- Designed as a 2-way trunk to work in either direction
- When seized from either end gives busy lamp indication when multiple switchboard arrangement is provided
- Arranged to trip machine ringing from either end
- This circuit will operate over a voltage range of 20 to 52 volts dc.

**Note:** When this circuit is powered from other than the PBX power supply, the dc voltage of the supply shall be within  $\pm 4$  volts of the PBX power supply, but in no case less than 20 volts nor more than 52 volts.

### 3. METHOD OF OPERATION

#### (a) *Incoming Call to CP Intercom Station*

- Attendant at PBX switchboard receives incoming call signal and answers with the trunk cord
- Customer requests connection to a station on the CP intercom system



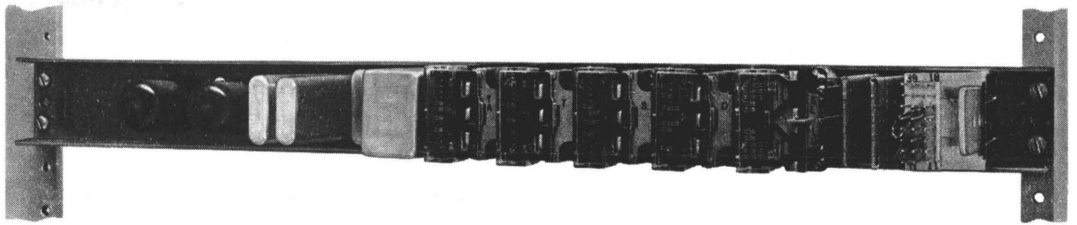


Fig. 1—J53050A, List 1 Interconnecting Unit

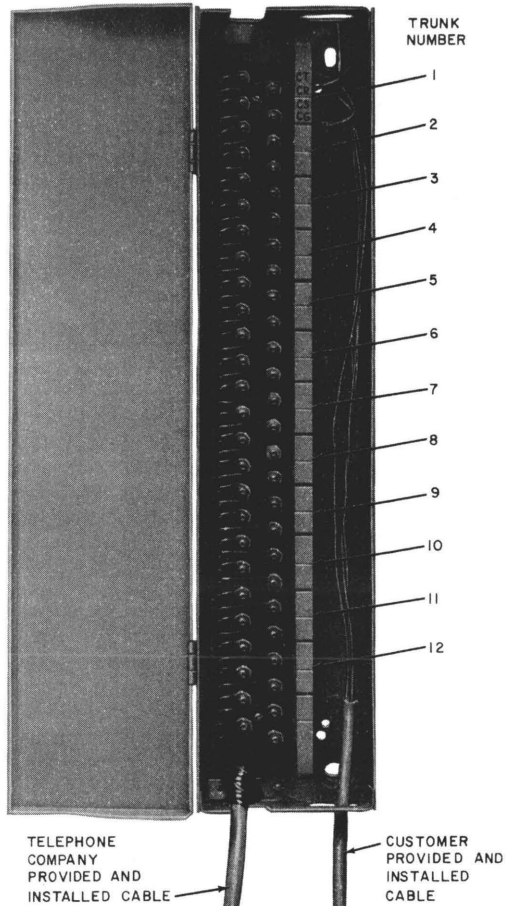


Fig. 2—Interface Connecting Block, 30-Type

- The attendant plugs station cord into the TALK jack associated with J53050A, List 1 Interconnecting Unit to seize CP dial intercom system and then plugs the station cord of another cord circuit into the DIAL jack associated with the J53050A, List 1 Interconnecting Unit to dial a station on the intercom system.

**Note:** IMMEDIATELY after completion of dialing, attendant removes cord from DIAL jack.

- When called station answers, cord supervision at the PBX goes dark
- The CP intercom station can recall PBX attendant by flashing switch hook

**Note:** Due to circuit design the switch hook flashes must be of at least 1/2-second duration.

- When attendant receives disconnect supervision, connection is released.

(b) **Outgoing Call From CP Intercom Station**

- Station dials code to reach Bell System PBX
- Upon completion of dialing and on establishing a connection to the PBX, a contact closure controlled by the CP equipment, operates S relay on the J53050A, List 1 Interconnecting Unit and a signal is received at the PBX.
- The attendant answers the call in a normal manner
- The station requests a telephone number and the attendant completes the call in a normal manner
- When attendant receives disconnect supervision, connection is released.

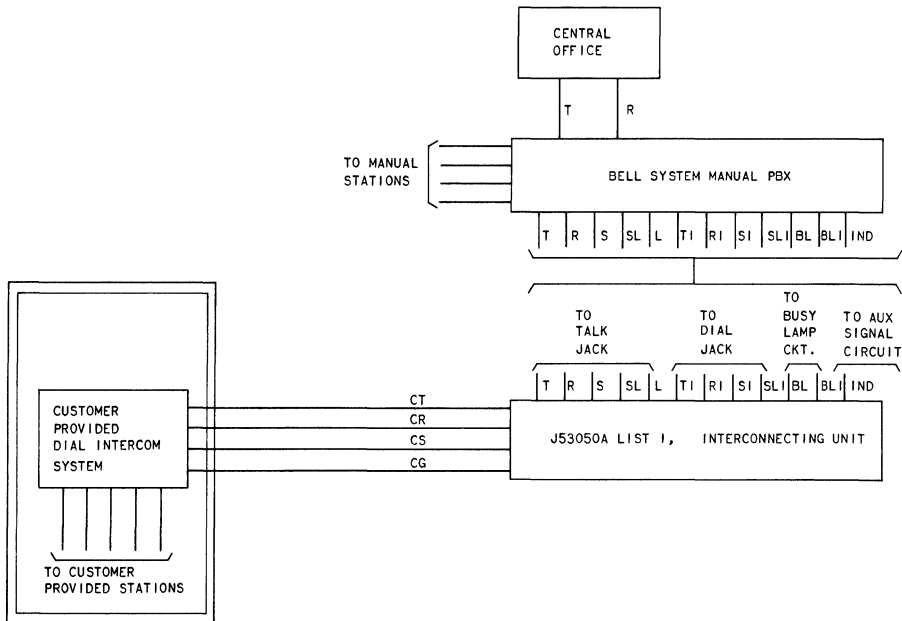


Fig. 3—Block Diagram, Typical Voice Connecting Arrangement CDB

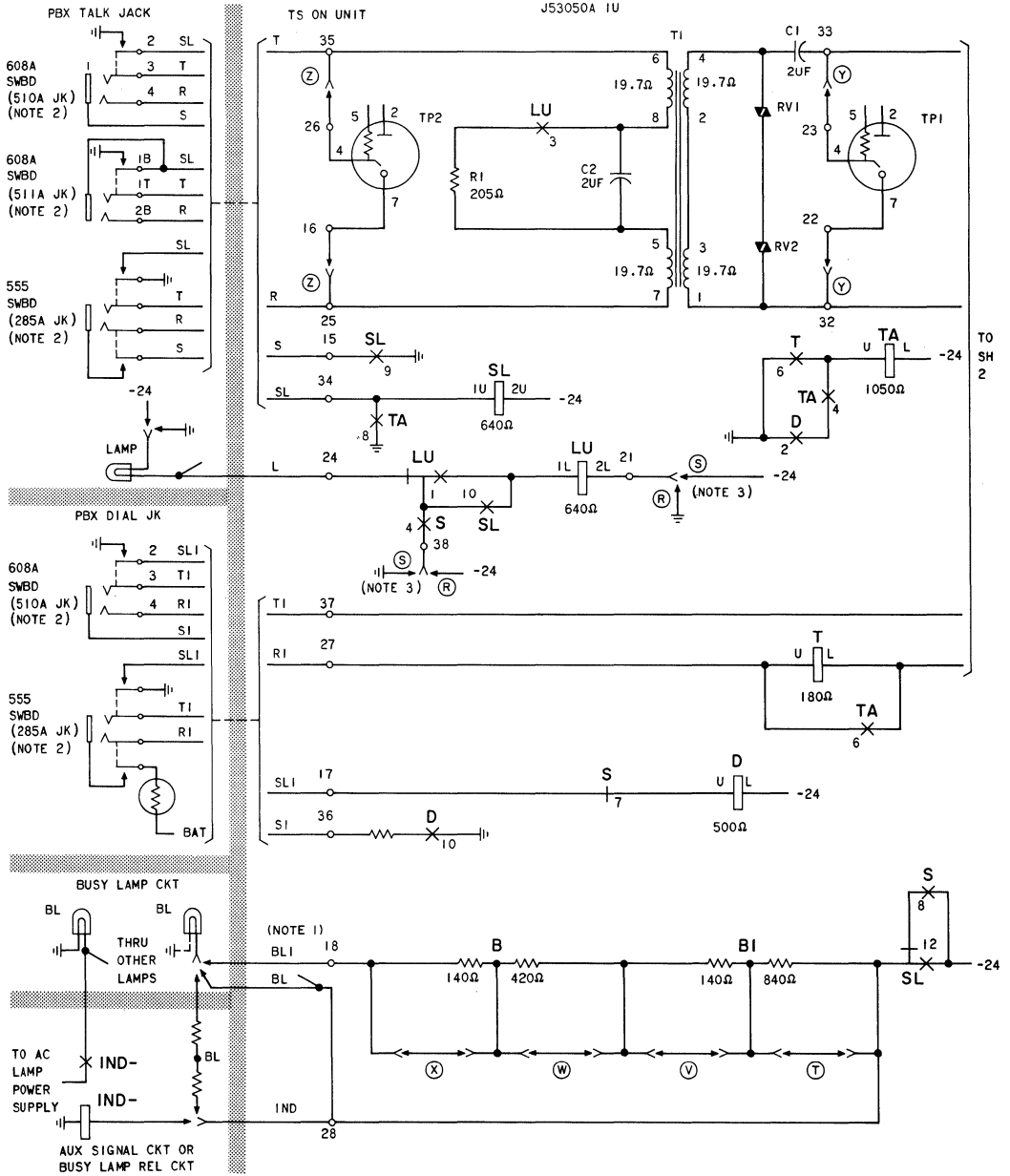
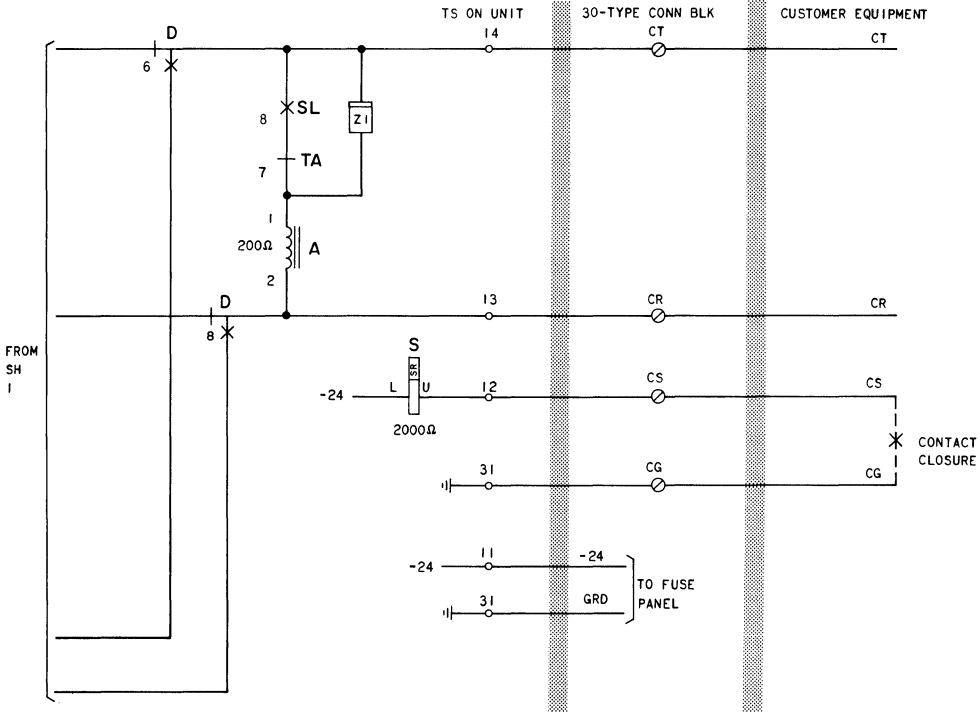


Fig. 4—Connections For. Voice Connecting Arrangement CDB (Sheet 1)



**WIRING OPTIONS**

OPTIONS-T,V,W,X,Y,Z ARE ALL FACTORY WIRED. THE INSTALLER SHALL REMOVE STRAPS AS NECESSARY TO PROVIDE THE REQUIRED CIRCUIT ARRANGEMENT.

- (T)
  - (V)
  - (W)
  - (X)
- SEE TABLE A

- (Y) RING TRIP CIRCUIT WHEN MACHINE RINGING IS SUPPLIED BY CUSTOMER PROVIDED EQUIPMENT
- (Z) RING TRIP CIRCUIT WHEN MACHINE RINGING IS SUPPLIED BY BELL SYSTEM PBX

**NOTES:**

1. BL AND BLI LEADS USED WHEN MULTIPLE SWITCHBOARD ARRANGEMENT PROVIDED.
2. IF THERE ARE NO SPARE JACKS ON THE SWITCHBOARD THAT CAN BE USED AS TALK AND DIAL JACKS, THEY MUST BE ORDERED SEPARATELY AND INSTALLED IN THE FIELD.
3. USE OPTION (S) IF LAMP ASSOCIATED WITH TALK JACK IS CONNECTED TO BATTERY AND OPTION (R) IF LAMP IS CONNECTED TO GROUND.

**Fig. 4—Connections For Voice Connecting Arrangement CDB (Sheet 2)**

**4. INSTALLATION**

**4.01** Locate the J53050A, List 1 Interconnecting Unit in an area free from dampness and excessive dust or dirt, with adequate room for access to front and rear of equipment.

**4.02** One J53050A, List 1 Interconnecting Unit must be provided for each circuit between the Bell System PBX and the CP intercom system.

**4.03** A 30-type connecting block should be mounted on a backboard in close proximity to the J53050A, List 1 Interconnecting Unit to serve as an interface connecting block.

**4.04** Leads associated with each circuit to CP intercom system should be wired from the J53050A, List 1 Interconnecting Unit to the interface connecting block.

**4.05** Refer to Section 463-140-100 for apparatus mountings.

**5. MAINTENANCE**

**5.01** When trouble is reported, check for loose or broken connections.

**5.02** Open circuit at interface connecting block to verify in which direction the trouble exists. If the trouble is toward the customer-provided equipment, inform the customer that the trouble tests toward his equipment.



*Do not attempt any repairs to the customer-provided equipment.*

**5.03** When detailed maintenance information is required, refer to the following:

SD-69612-01

CD-69612-01

**6. CONNECTIONS**

**6.01** A block diagram of a typical Voice Connecting Arrangement CDB installation is shown in Fig. 3.

**6.02** Refer to Fig. 4 and Table A for connections.

**TABLE A**

**BUSY LAMP CIRCUIT OPTIONS ON J53050A LIST 1 INTERCONNECTING UNIT**

NO. OF LAMPS	20-26 VOLTS REMOVE OPTION	26-32 VOLTS REMOVE OPTION	32-46 VOLTS REMOVE OPTION	44-52 VOLTS REMOVE OPTION
1	W, X	V, W, X	T, X	T, W, X
2	W	W, X	T	T, W
3	V, X	W	W, V, X	T, V, X
4	X	V, X	W, X	T, X
5		X	W	T
6			V, X	V, W, X
7			X	W, X
8				W
9				V, X
10				X
11				

## VOICE CONNECTING ARRANGEMENT CD4

### 1. GENERAL

**1.01** This section provides information on identification, installation, operation, maintenance and connections for the 31B or 31A (MD) voice coupler when used in Voice Connecting Arrangement CD4.

**1.02** This section is reissued to:

- Change note in Fig. 2 for connecting 608-type switchboard
- Revise 1.03
- Add 5.05 and 6.02.

**1.03** The 31B voice coupler is a direct replacement for the 31A (MD) voice coupler. The 31B voice coupler may be used in all CD4 arrangements; the 31A (MD) may not be used where tone signaling is required. The 31B is identical to the 31A coupler except for higher breakdown voltage rating of the transformer and varistors.

**1.04** If the customer wants a copy of the Technical Reference which covers this interface specification, the customer should contact the local Telephone Company Business Office or the Marketing Representative.

**1.05** This issue of the section is based on the following drawing:

SD-69618-01 Issue 2B—31B Voice Coupler

If this section is to be used with equipment or apparatus reflecting later issue(s) of the drawing(s), reference should be made to the SDs and CDs to determine the extent of the changes and the manner in which the section may be affected.

### 2. IDENTIFICATION

#### PURPOSE

- To provide a connection between a Telephone Company manual cord switchboard and a customer-provided (CP) communication system

(typically an intercom or radio system) not arranged for supervision.

- To limit excessive voice power levels from customer-provided equipment (CPE) and to provide protection for personnel against hazardous voltages.

### ORDERING GUIDE

- Coupler, Voice, 31B-49 (Fig. 1, one for each circuit between Telephone Company PBX and CPE) (31A-49 may be substituted if tone signaling is not used.)

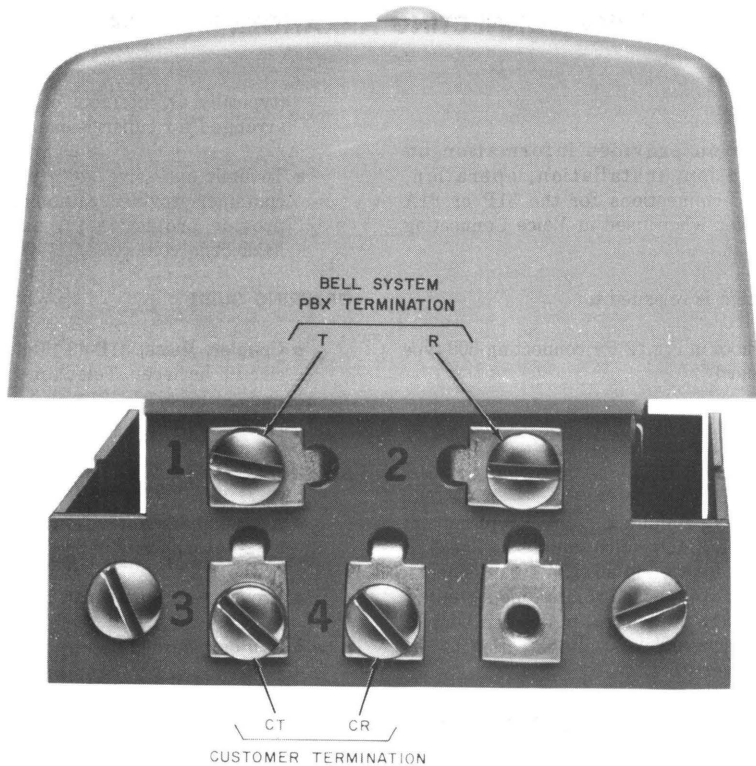
### DESIGN FEATURES

- Approximate dimensions are 4 inches long by 2-3/4 inches wide by 2 inches high.
- Provides dc isolation to CPE.
- Can be mounted on any flat surface.
- Voice transmission only.
- Permits tone signaling through coupler (31B only).
- Provides a means of holding the Telephone Company PBX circuit in the busy state.
- Maximum dc line current is 0.150 ampere.
- Operating temperature range is 0°C through 55°C.

### 3. INSTALLATION

**3.01** The voice coupler will mount on any surface. A backboard is not required unless mounting on a damp surface or when a backboard will facilitate mounting.

**3.02** One 31B voice coupler must be provided for each circuit between the Telephone Company PBX and the CP communication system.



**Fig. 1—31B (or 31A [MD]) Voice Coupler**

**3.03** Terminate the T and R leads to the 31B voice couplers on spare trunk jacks in the station jack area of the PBX switchboard. Refer to Division 536 for additional information covering the type of PBX in use.

**3.04** Refer to Section 463-130-100 entitled Backboards, Identification, and Installation for information on mounting backboards.

**3.05** CPE may be attached externally to the surface of the switchboard by means of a pressure sensitive adhesive or other means that will not damage the switchboard.

**3.06** Power for CPE must be provided by the customer. Transformer isolation prevents the central office (CO) dc from flowing through the

CPE and dc from the CPE is blocked by capacitor C1 within the coupler.

#### **4. OPERATION**

**4.01** The customer must provide a means of signaling between the attendant of the Telephone Company PBX and the CP communication system (ie, key telephone set, lamps, buzzers, etc).

#### **4.02 Incoming Call From CO**

- PBX attendant receives incoming call signal from CO on switchboard and answers with trunk cord.
- Customer requests connection to the CP intercom station.

- Attendant plugs station cord into the trunk jack associated with an idle coupler circuit. This connects the CO trunk to tip and ring of the Telephone Company side of the 31B voice coupler.
- Attendant uses CPE to signal the called station that a call is being connected via Voice Connecting Arrangement CD4 and to connect to the CT and CR leads of the 31B voice coupler.
- A talking connection is now established from the intercom station through the coupler to the calling station.
- Since Voice Connecting Arrangement CD4 provides no form of supervision, it will be necessary for the attendant to periodically monitor the circuit via the PBX attendant circuit or to receive a disconnect signal via the CPE and to remove the cords when conversation is terminated.

#### 4.03 *Outgoing Call to CO*

- Customer station user signals PBX attendant via CPE to request an outgoing connection and connects to CT and CR leads of coupler.
- Attendant answers the call by plugging station cord into trunk jack of associated coupler circuit and is connected to the T and R leads of coupler.
- Attendant plugs trunk cord into CO trunk jack and dials the requested number. A talking connection is then established from CO line, through coupler, to CP station.
- Since Voice Connecting Arrangement CD4 provides no form of supervision, it will be necessary for the attendant to periodically monitor the circuit via the PBX attendant circuit, or to receive a disconnect signal via the CPE, and to remove the cords when conversation is terminated.

### 5. MAINTENANCE

- 5.01** Check the CO pair and check for loose connections at 31B voice coupler and switchboard trunk jack.

- 5.02** Remove customer connections to terminals 3 and 4 of the 31B voice coupler and perform the following tests:

- (a) Connect a 1013A (or equivalent) hand test set to terminals 3 and 4 of the 31B voice coupler.
- (b) Place the hand test set in the MONITOR position.
- (c) Request the switchboard attendant to plug the station cord into trunk jack of associated 31B voice coupler and to plug the trunk cord into a vacant CO trunk jack and release TALK DIAL key.

Dial tone at normal volume should be heard on the 1013A (or equivalent) hand test set.

- 5.03** When trouble is suspected in the 31B voice coupler, exchange it with another unit known to be working properly.

- 5.04** If the reception is normal, the coupler is working. Replace customer connections to terminals 3 and 4 of the 31B voice coupler.

- 5.05** ♣When in the repairman's judgment the trouble is located in the CPE, the Repair Service Bureau should be notified so that proper Maintenance of Service Charge billing can be initiated as outlined in BSP 660-101-312 entitled Maintenance of Service Charge on Services With Customer-Provided Equipment.♣



*Do not attempt any tests or repairs to the CPE.*

### 6. CONNECTIONS

- 6.01** Refer to Fig. 2 and 3 for a typical connecting arrangement.

- 6.02** ♣The following are typical connecting circuits:

- (a) SD-67034-01—608D Cord Circuit
- (b) SD-66520-01—555 Station Line Circuit
- (c) SD-66198-01—552D Cord Circuit
- (d) SD-66198-01—605A Cord Circuit♣



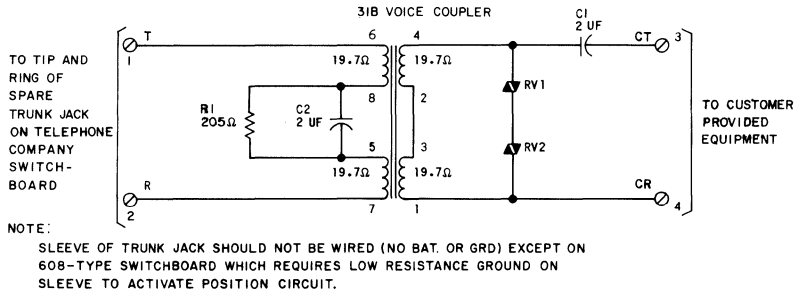


Fig. 2—Connections for 31B Voice Coupler

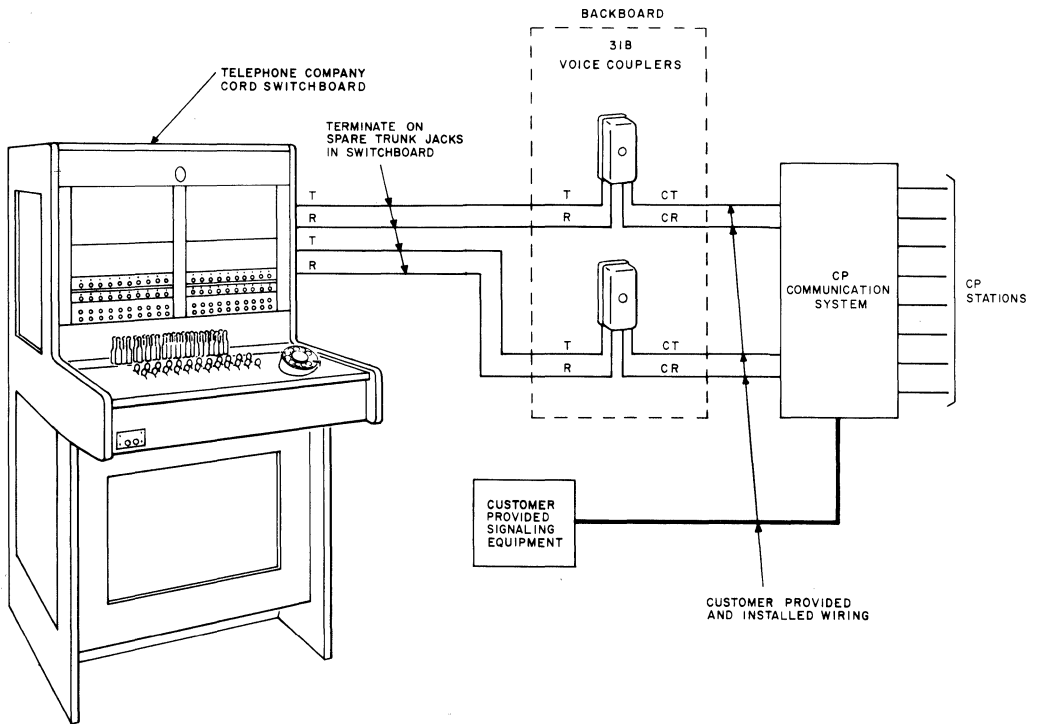


Fig. 3—Typical Arrangement for Two Voice Connecting Arrangements CD4

## VOICE CONNECTING ARRANGEMENT CDX USING 31B VOICE COUPLERS

### 1. GENERAL

**1.01** This section provides identification, installation, operation, maintenance, and connection information for Voice Connecting Arrangement CDX used to connect an incoming line through customer-provided (CP) equipment to an outgoing line.

**1.02** This section is reissued to show information for single cord switchboard (557B PBX).

**1.03** The 31B voice coupler is a direct replacement for the 31A (MD) voice coupler. The 31A (MD) voice coupler may still be used in areas where tone signaling is not required.

**1.04** If the customer wants a copy of the Technical Reference which covers this interface specification, the customer should contact the local Telephone Company Business Office or the Marketing Representative.

**1.05** This issue of the section is based on the following drawing:

SD-69613-01, Issue 2B—31B Voice Coupler

If this section is to be used with equipment or apparatus reflecting later issue(s) of the drawing(s), reference should be made to the SDs and CDs to determine the extent of the changes and the manner in which the section may be affected.

### 2. IDENTIFICATION

#### PURPOSE

- To connect a Bell System single or double cord manual switchboard to CP equipment and establish a through connection from an incoming line to an outgoing line (arranged for patching)
- To limit excessive levels from CP equipment and to provide protection for personnel against hazardous voltage.

### APPLICATION

- Used with secretarial lines, tie trunks, foreign exchange lines, central office (CO) lines, etc, for voice application only.

### ORDERING GUIDE

- Coupler, Voice, 31B-49 (Fig. 1, requires two per connecting arrangement).
- Jacks—(Table A, spare PBX jacks may be used when available.)
- Mounting, Jack—(Table A).
- Block, Connecting, 66M1-50 (Fig. 2).
- Cord, Patch—3P6A (557B PBX only).

**Note:** Other type blocks may be used when specified by local engineering.

### DESIGN FEATURES (31B Voice Coupler)

- Can be mounted on any flat surface.
- Approximate dimensions are 4 inches long by 2-3/4 inches wide by 2 inches high.
- Maximum dc line current is 0.150 ampere.
- Provides dc isolation to CP equipment.
- Provides a means of holding the PBX circuit in the busy state.
- Voice transmission only.
- Permits tone signaling through the coupler.

### 3. INSTALLATION

#### A. 2-Cord Switchboards

**3.01** The voice coupler will mount on any flat surface. A backboard is not required unless

mounting on a damp surface or when a backboard will facilitate mounting.

**3.02** Install the patching jacks in the station jack area of the PBX switchboard. Follow the wiring plan shown in Fig. 3 and Table B. Label the connecting arrangement jack "PATCHING" and the associated PBX jack "PATCH". Refer to Division 536 for additional information covering the type PBX required.

**3.03** Refer to Division 463 section entitled: "Backboards, Identification and Installation" for information on mounting backboards.

**3.04** Refer to Division 461 section entitled: "Connecting Blocks, Identification, Connection, and Wiring" for information on mounting 66M1-50 connecting blocks.

**3.05** Customer-provided equipment may be attached externally to the surface of the switchboard by means of a pressure-sensitive adhesive or other means that will not damage switchboard.

**3.06** Perform tests of Part 5 after installation.

**B. Single Cord Switchboard**

**3.07** The voice coupler will mount on any flat surface. A backboard is not required unless mounting on a damp surface or when a backboard will facilitate mounting.

**3.08** Install the patching jacks in the transfer jack area of the PBX switchboard. Follow the wiring plan shown in Fig. 4 and Table B. Label the connecting arrangement jack "PATCHING" and the associated PBX jack "PATCH". Refer to Division 536 for additional information covering the type PBX required.

**3.09** Refer to Division 463 section entitled: "Backboards, Identification and Installation" for information on mounting backboards.

**3.10** Refer to Division 461 section entitled: "Connecting Blocks, Identification, Connection, and Wiring" for information on mounting 66M1-50 connecting blocks.

**3.11** Customer-provided equipment may be attached externally to the surface of the switchboard

by means of a pressure-sensitive adhesive or other means that will not damage switchboard.

**3.12** Perform tests of Part 5 after installation.◀

**4. OPERATION**

**A. 2-Cord Switchboard (Fig. 3)**

**4.01** Standard operating procedures and functions of the PBX switchboard are not affected. Connecting Arrangement CDX is used only when an incoming line is to be connected to an outgoing line.

**4.02** When a call is received, an incoming signal appears at the switchboard, the attendant inserts the left or back (trunk) cord into the jack directly beneath the lighted lamp of the incoming signal, operates the DIAL or TALK key to the talk position, and answers the call.

**4.03** The attendant secures the necessary information to complete the call and then restores the DIAL or TALK key to its normal position to hold the incoming line. This cord may be used for monitoring when required.

**4.04** The attendant takes the left or back (trunk) cord of an adjacent cord pair, inserts it into a CO trunk jack (patch jack) associated with a patching jack, operates the DIAL or TALK key to dial position and dials the requested number. After completion of dialing, the attendant restores the DIAL or TALK key to its normal position to hold the dialed number.

**4.05** The attendant then takes the right or front (station) cord associated with the cord connected to the incoming line and inserts it into the connecting arrangement jack (patching jack) associated with the CO trunk jack used to dial the requested number. The left or back (trunk) cord should then be removed from the CO trunk jack. When a plug is inserted into the patching jack, the CS and CG leads are connected to provide a seizure signal to the CP equipment and VC2 is bridged across the CO trunk.

**Caution: Removing the cord removes busy lamp indication at all appearances of this CO trunk.**

The incoming line is now connected through the connecting arrangement and CP equipment to the outgoing line.

**4.06** Supervision is not provided by Connecting Arrangement CDX. The CP equipment may or may not provide supervision. If supervision is not provided, it will be necessary for the attendant to periodically monitor the circuit and remove the left or back (trunk) cord from the answer jack when the conversation is terminated.

#### **B. Single Cord Switchboard (Fig. 4)**

**4.07** Standard operating procedures and functions of the PBX switchboard are not affected. Connecting Arrangement CDX is used only when an incoming line is to be connected to an outgoing line.

**4.08** When a call is received, an incoming signal appears at the switchboard, the attendant inserts the intercept cord into the jack directly beneath the lighted lamp of the incoming signal, operates the DIAL or TALK key to the talk position, and answers the call.

**4.09** The attendant secures the necessary information to complete the call and then restores the DIAL or TALK key to its normal position to hold the incoming line. This intercept cord may be used for monitoring when required.

**4.10** The attendant takes another intercept cord and inserts it into a CO trunk jack (patch jack) associated with a patching jack, operates the DIAL or TALK key to the dial position and dials the requested number. After completion of dialing, the attendant restores the DIAL or TALK key to its normal position to hold the dialed number.

**4.11** The attendant then takes the 3P6A patch cord and inserts one end into the transfer jack connected to the incoming line and inserts the other end into the connecting arrangement jack (patching jack) associated with the CO trunk jack used to dial the requested number. The intercept cord should then be removed from the CO trunk jack. When a plug is inserted into a patching jack, the CS and CG leads are connected to provide a seizure signal to the CP equipment and VC2 is bridged across the CO trunk. The incoming line is now connected through the connecting arrangement and CP equipment to the outgoing line.

**4.12** Supervision is not provided by Connecting Arrangement CDX. The CP equipment may or may not provide supervision. If supervision is not provided, it will be necessary for the attendant to periodically monitor the circuit and remove the intercept cord from the calling line when the conversation is terminated.¶

#### **5. MAINTENANCE (Fig. 3 and 4)**

**5.01** When trouble is reported, check the CO pair and check for loose or broken connections at the PBX station jacks and 31B voice couplers.

**5.02** Open the six leads to the circuit under test by removing the B bridging clips (or wire straps) at the 66M1-50 interface connecting block to verify in which direction trouble exists by performing the following test.

- (a) Connect an 81A or KS-16990, List 1 test set across terminals 3 and 4 (CS and CG) of 66M1-50 interface connecting block. (Make all test connections on the Telephone Company side of the 66M1-50 interface connecting block.)
- (b) Place the test set in continuity position to indicate a contact closure across the CS and CG leads when the station cord is inserted into the connecting arrangement jack.
- (c) Strap terminal 1 (CT) to terminal 5 (CT1) and strap terminal 2 (CR) to terminal 6 (CR1).
- (d) Connect a 1013A (or equivalent) hand test set to terminals 1 and 2 of the incoming 31B voice coupler (VC1).
- (e) Set hand test set to MON position. Request the PBX attendant to plug the station cord into the connecting arrangement jack and set the TALK or DIAL key in the normal position to hold the line.

Continuity should be indicated at the test set connected to terminals 3 and 4 (CS and CG), and dial tone at normal volume should be heard on the 1013A (or equivalent) hand test set connected to terminals 1 and 2 of VC1.

**5.03** When trouble is suspected in the 31B voice coupler, exchange it with another unit known to be working properly.

5.04 If the tests are satisfactory, remove all test connections and replace the B bridging clips (or wire straps) at the 66M1-50 interface connecting block.

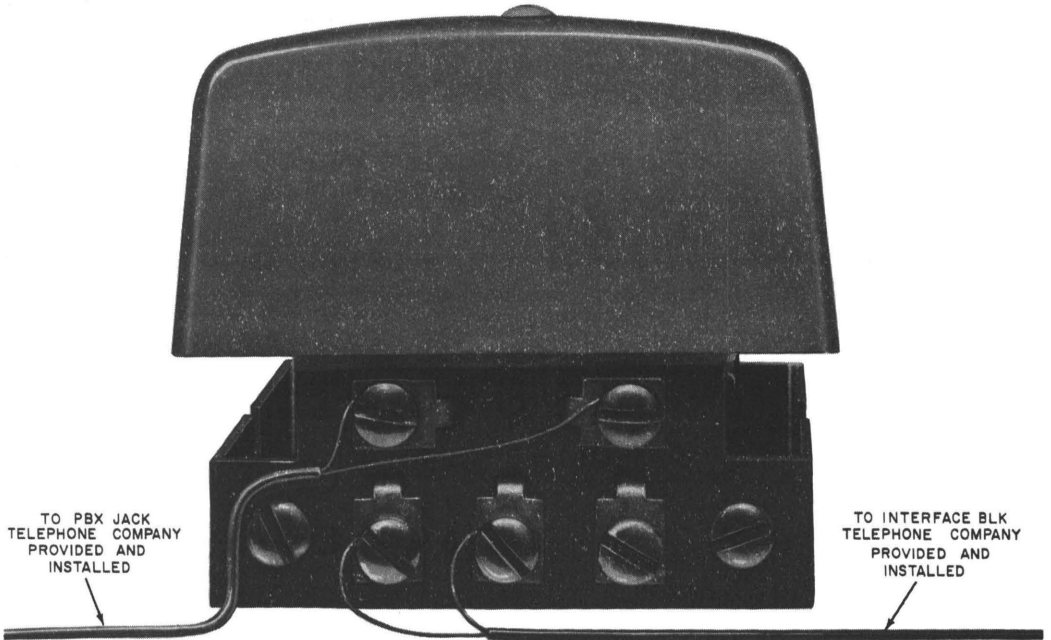


*Do not attempt any tests or repairs to the CP equipment.*

**6. CONNECTIONS**

6.01 Refer to Table B and Fig. 3 for 2-cord switchboards.

6.02 Refer to Table B and Fig. 4 for single cord switchboard (557B PBX).



**Fig. 1—31B Voice Coupler**

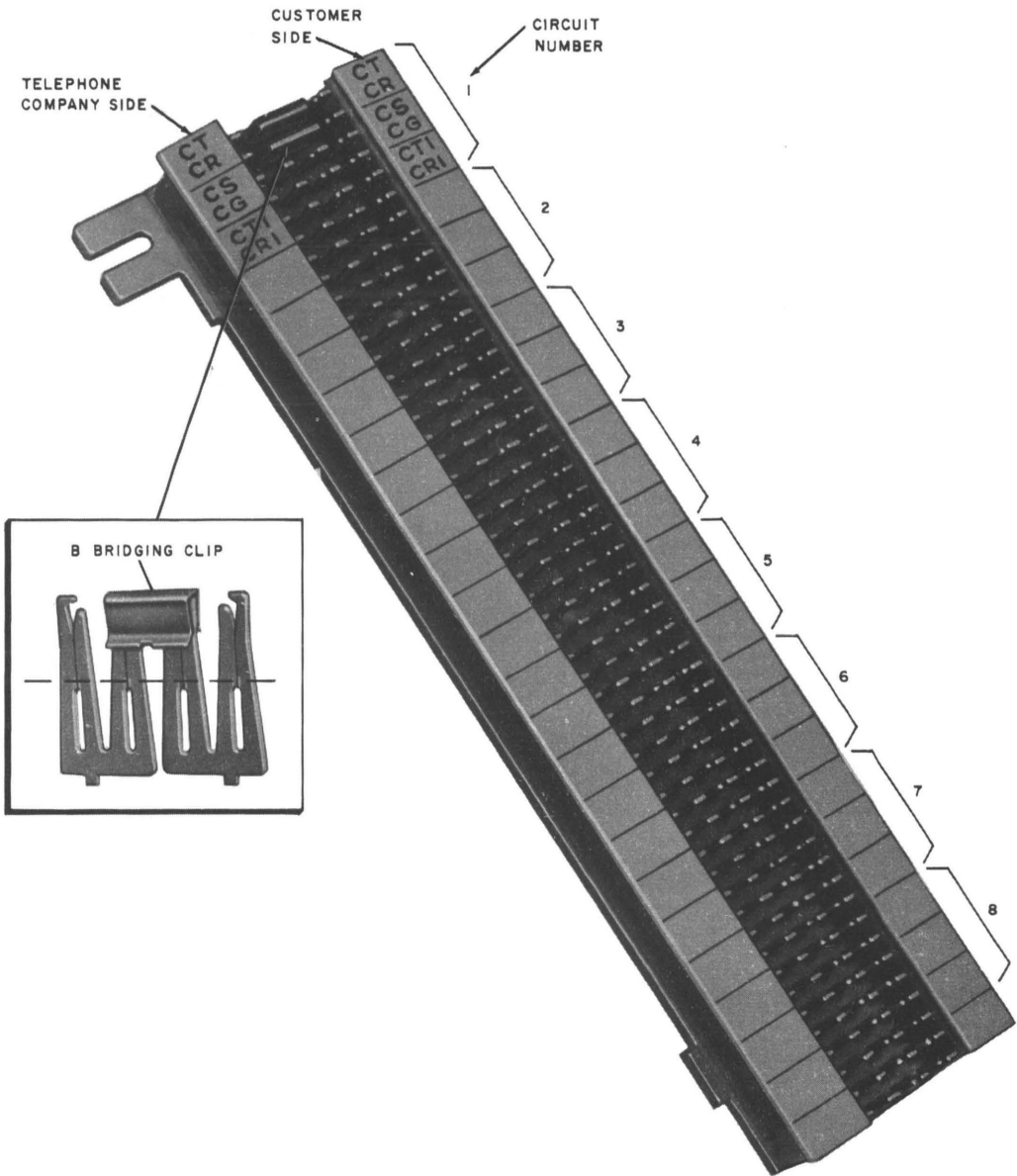
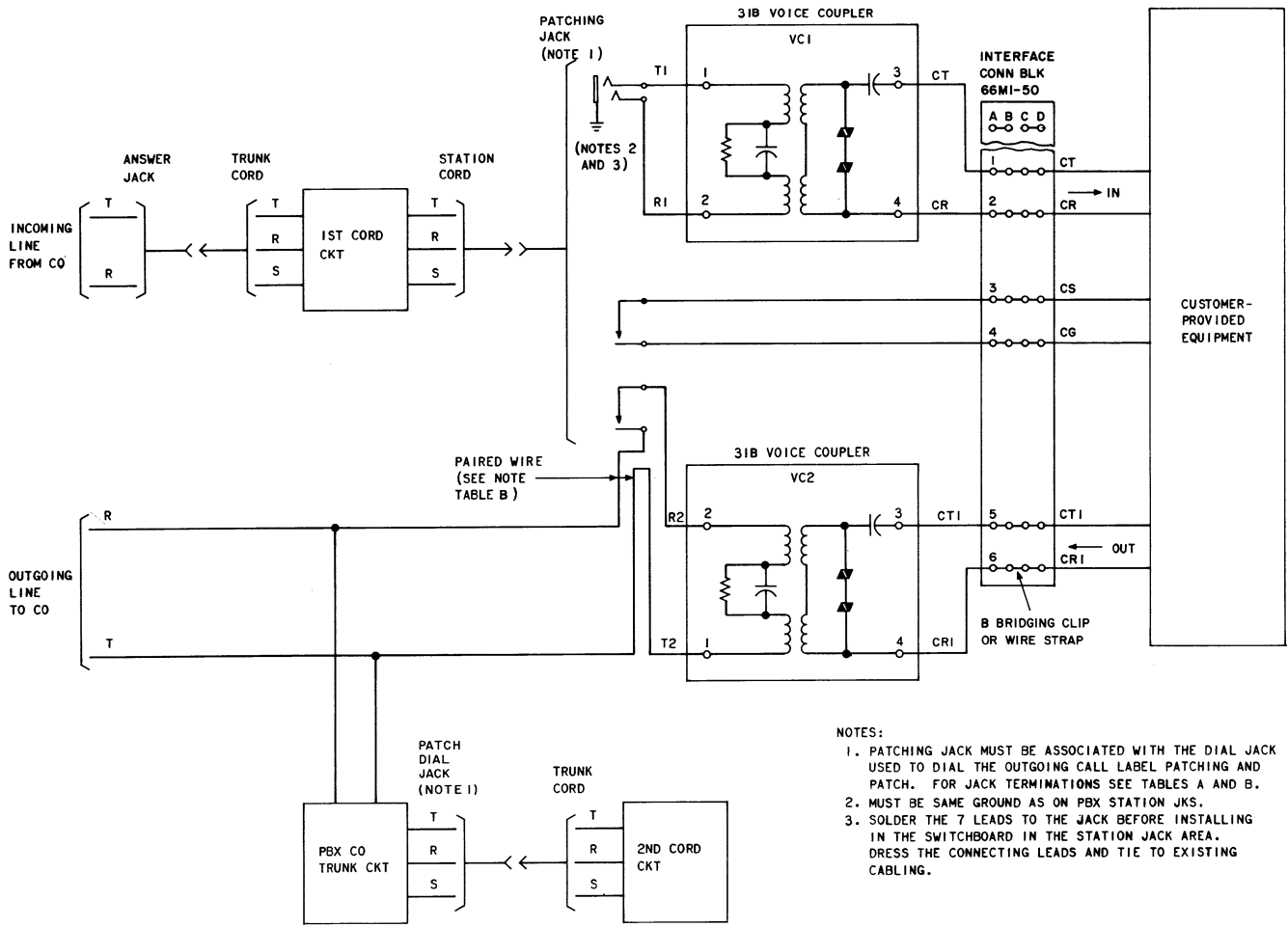
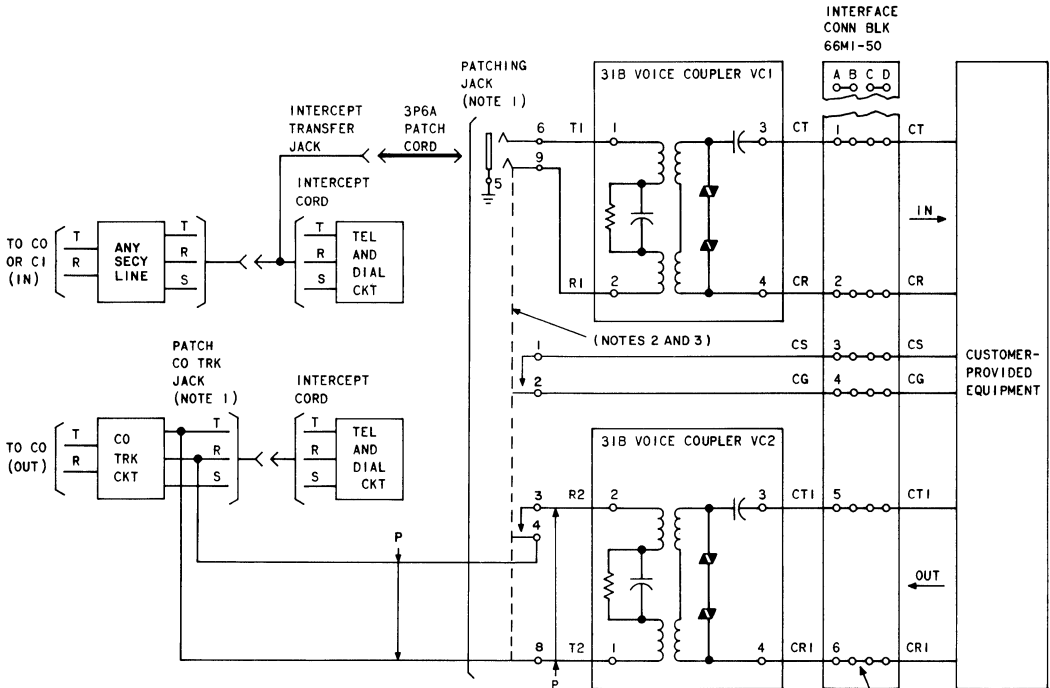


Fig. 2—66MI 50 Interface Connecting Block



- NOTES:
1. PATCHING JACK MUST BE ASSOCIATED WITH THE DIAL JACK USED TO DIAL THE OUTGOING CALL LABEL PATCHING AND PATCH. FOR JACK TERMINATIONS SEE TABLES A AND B.
  2. MUST BE SAME GROUND AS ON PBX STATION JKs.
  3. SOLDER THE 7 LEADS TO THE JACK BEFORE INSTALLING IN THE SWITCHBOARD IN THE STATION JACK AREA. DRESS THE CONNECTING LEADS AND TIE TO EXISTING CABLING.

Fig. 3—Voice Connecting Arrangement CDX (2-Cord Switchboard)



- NOTES:
1. PATCHING JACK MUST BE ASSOCIATED WITH THE CO TRK JACK USED TO DIAL THE OUTGOING CALL, LABEL PATCH AND PATCHING.
  2. MUST BE SAME GROUND AS ON PBX STATION JKS.
  3. SOLDER THE 9 LEADS TO THE JACK BEFORE INSTALLING IN THE SWITCHBOARD IN THE TRANSFER JACK AREA. DRESS THE CONNECTING LEADS AND TIE TO EXISTING CABLING.

Fig. 4—Voice Connecting Arrangement CDX (Single Cord Switchboard 557B PBX)



**TABLE A**  
**SWITCHBOARDS, JACKS, AND JACK MOUNTINGS**

SWITCHBOARD	JACK	JACK MOUNTING	MAX. NO. OF JACKS PER MOUNTING STRIP	REMARKS
551-, 552-, 556-, 605- Type, 555, 557A	494A	136 or 137	10	Factory assembled. Jack mounting equipped with number of jacks required (1-10).
557B	500A			
606- Type 607- Type	323C	190B	5	Field assembled. Order jack mountings and jacks as required.
608- Type	323C	197A	10	Field assembled. Order jack mountings and jacks as required.

*Note:* Spare PBX jacks may be used when available.

**TABLE B**  
**CONNECTIONS FOR 323C, 494A, 500A JACKS AND 31B VOICE COUPLERS**

FROM PATCHING JACK				TO
JACK NUMBER	JACK CONTACTS			
	*323C	*494A	*500A	
1, 2, 3, etc.	3	1	1	CS on 66M1-50 Conn. Blk. CG on 66M1-50 Conn. Blk. VC2 Term. 2 GRD (same as cord ckt.) VC1 Term. 2 VC1 Term. 1 RING (of outgoing line associated with Patch JK 1, 2, 3, etc.) VC2 Term. 1
	2	2	2	
	6	4	3	
	7	5	5	
	1	6	9	
	4	7	6	
	5	3	4	
FROM VOICE COUPLER				CT on 66M1-50 Conn. Blk. CR on 66M1-50 Conn. Blk. CT1 on 66M1-50 Conn. Blk. CR1 on 66M1-50 Conn. Blk.
VC1 Term. 3				
VC1 Term. 4				
VC2 Term. 3				
VC2 Term. 4				

\*From the rear of the jack the contacts count from top to bottom on the 323C jack and from left to right on the 494A and 500A jacks.

*Note:* For transmission reasons do not split the tip from the ring. Run both leads to the connecting arrangement jack although only the ring will be terminated for the 494A and 323C jacks (Fig. 3).

**VOICE CONNECTING ARRANGEMENT LOH**  
**110A INTERCONNECTING UNIT**  
**69H APPARATUS MOUNTING**  
**606A PANEL**

**1. GENERAL**

**1.01** This section provides identification, installation, operation, maintenance and connection information for the 110A interconnecting unit (IU) and the 69H apparatus mounting or 606A panel when used in Voice Connecting Arrangement (VCA) LOH.

**1.02** This section is reissued to:

- Revise illustrations
- Include information for multiplying HOLD jacks with busy indication
- Show 606A panel mounted in a 16C apparatus mounting.

**1.03** The size of the job on initial installation and the expected growth should be the determining factor in selecting the proper equipment. It is recommended that the 69H apparatus mounting should be used for one or two circuits and the 606A panel should be used for three to six circuits.

**1.04** If the customer wants a copy of the Technical Reference which covers this interface specification, the customer should contact the local Telephone Company Business Office or the Marketing Representative.

**1.05** This issue of the section is based on the following drawing:

- SD-69627-01, Issue 1—110A Interconnecting Unit

If this section is to be used with equipment or apparatus reflecting later issue(s) of the drawing(s), reference should be made to the SDs and CDs to determine the extent of the changes and the manner in which the section may be affected.

**2. IDENTIFICATION**

**PURPOSE**

- To adapt a customer-provided (CP) source of recorded music or information to a line (station or trunk) placed on hold at a Bell System cord-type switchboard
- To limit excessive signal levels from CP equipment and to provide protection for personnel against hazardous voltages.

**APPLICATION**

- 551, 552, 555, 556, 557, 605A, 606, 607, and 608 PBXs.

**ORDERING GUIDE**

- Unit, Interconnecting, 110A (Fig. 1 as required).

***Associated Apparatus (Order Separately)***

**For 69H Apparatus Mounting (Fig. 1)**

**Note:** If a 23-inch relay rack is not provided on customer premises, provide a 16C apparatus mounting or equivalent.

- Mounting, Apparatus, 69H (one per two 110A IUs).
- Bracket, 99B.
- Supply, Power, 19C2 or equivalent (locally engineered and installed), when existing PBX power supply is insufficient.
- Block, Connecting, 66M1-50 (Fig. 2).

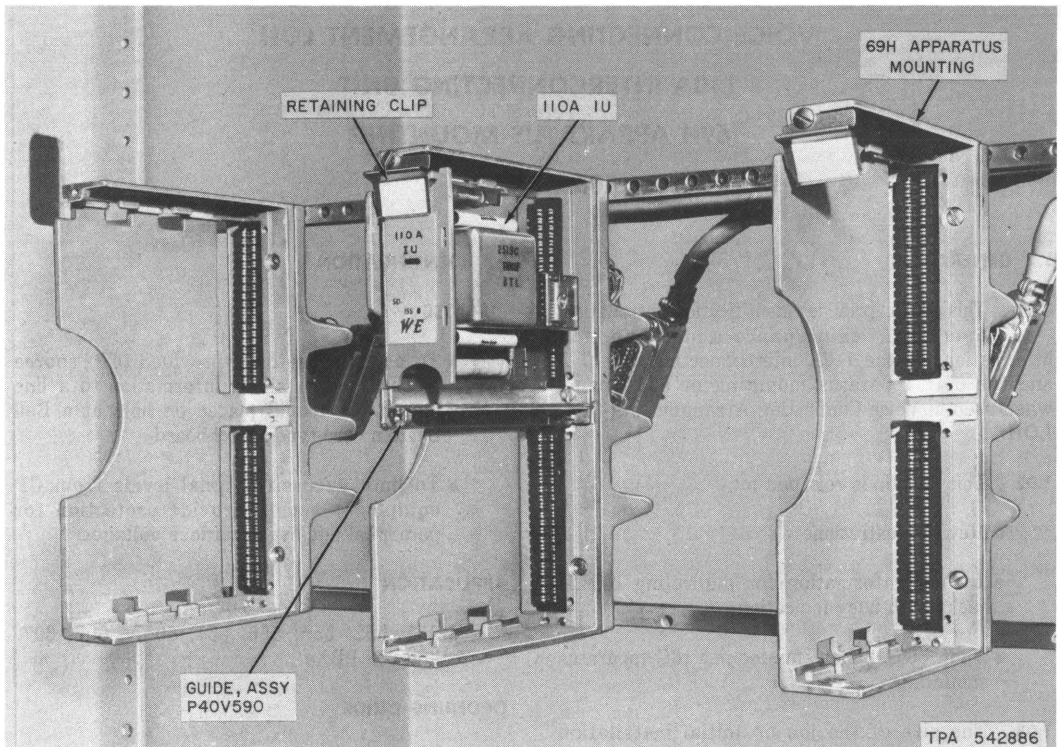


Fig. 1—69H Apparatus Mounting Mounted on Relay Rack

- Block, Connecting, 66B4-25 (common buss, one per two 69H apparatus mountings).
- Cable, Connector, A25B (one single-ended length per 69H apparatus mounting).
- Jack (See Table A for part number, as required.)
- Mounting, Jack (See Table A for part number, one per 10 jacks provided.)
- Mounting, Lamp (See Table A for part number, one per 10 lamps provided.)
- Resistor, 8-ohm, 1-watt (one per CP recorder music or information source). Resistor should have pigtailed no larger than 19 gauge to connect in quick-connect clip-type terminals.

If wire size is larger than 19 gauge, pigtailed should be soldered on the terminals.

- Clip, Bridging, B (25 per package).
- Wire, "D," inside or equivalent (for cabling from 66B4-25 connecting block to 66M1-50 interface connecting block).

**Note:** Other type blocks may be used when specified by local engineering.

**For 606A Panel (Fig. 3 and 4)**

**Note:** If a 23-inch relay rack is not provided on customer premises, provide a 16C apparatus mounting or equivalent.

- Panel, 606A (one per six 110A IUs).

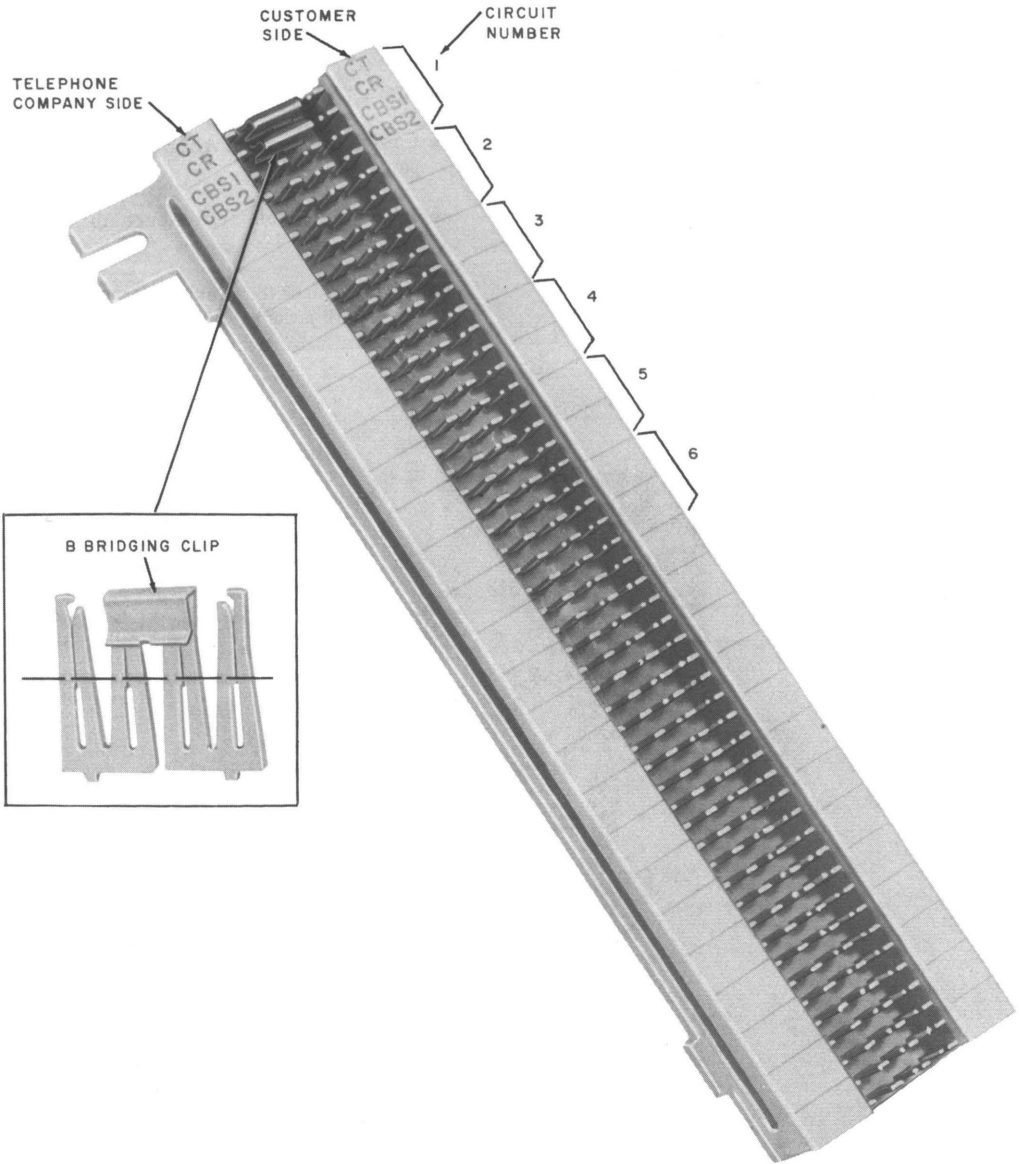


Fig. 2—66M1-50 Interface Connecting Block

TABLE A  
 JACKS, JACK AND LAMP MOUNTINGS

JACK	JACK MOUNTING	LAMP MOUNTING	USE WITH PBX
295	136 or 137	136C or 282B	551, 552, 555, 556, 557, 605A
408	145	294A	606, 607
510A	259A	282D	608

- Supply, Power, 19C2 or equivalent (locally engineered and installed when existing PBX power supply is insufficient).
- Bracket, 99B.
- Cable, Connector, A25B (two per 606A panel).
- Jack, (See Table A for part number, as required.)
- Mounting, Jack (See Table A for part number, one per 10 jacks.)

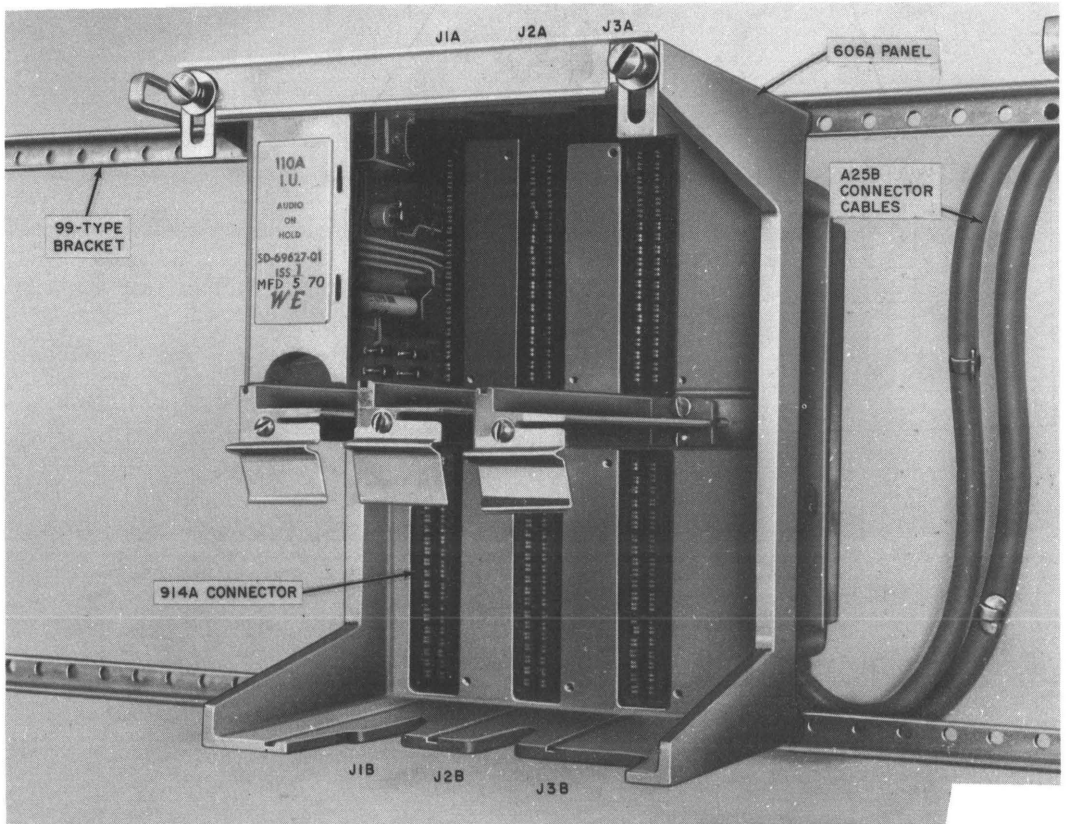


Fig. 3—606A Panel Mounted on Relay Rack

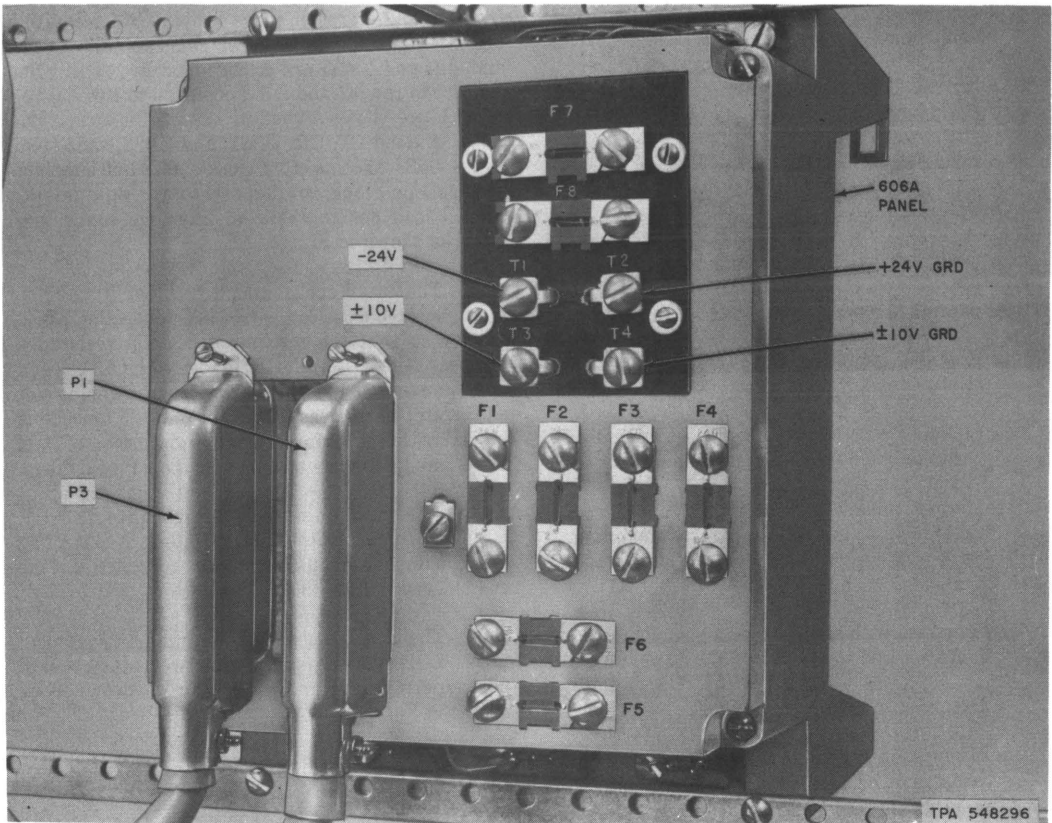


Fig. 4—606A Panel (Rear View)

- Mounting, Lamp (See Table A for part number, one per 10 lamps.)
- Fuse, 24E, 1/2 ampere (eight per 606A panel).
- Block, Connecting, 66M1-50 (Fig. 2).
- Block, Connecting, 66B4-25 (one per 606A panel).
- Resistor, 8-ohm, 1 watt (one per CP music or information source). Resistor should have pigtailed no larger than 19 gauge to connect in quick-connect terminals. If wire size is larger than 19 gauge, pigtailed should be soldered on terminals.

- Clip, Bridging, B (25 per package).

- Wire, "D", inside or equivalent (for cabling from 66B4-25 connecting block to 66M1-50 interface connecting block).

**Note:** Other type blocks may be used when specified by local engineering.

#### DESIGN FEATURES

##### 110A Interconnecting Unit

- Components mounted on 4-inch printed wiring board.

- Provides a dry contact closure to signal CP equipment.
- Provides voice frequency coupling to CP equipment.
- Requires 0.030 ampere at 26V dc.
- Option terminals.
- Designed for H lead ground control.

**69H Apparatus Mounting**

- Provides mounting facilities for two 110A IUs
- Equipped with two 40-pin connectors factory-wired to one 50-pin KS-type plug
- Mounts on a 99B bracket, on a standard relay rack, or in a 16C apparatus mounting.

**606A Panel**

- Equipped with six 914-type 40-pin connectors factory-wired to two KS-16671 50-pin plugs
- Designed to mount six 110A IUs
- Mounts on a 99B bracket, on a standard relay rack, or in a 16C apparatus mounting
- Fuse panel included
- Approximate size: 6 by 8 by 9 inches.

**3. INSTALLATION**

**69H Apparatus Mounting**

- 3.01** Install the 69H apparatus mounting on a standard 23-inch relay rack or in a 16C apparatus mounting using a 99B mounting bracket. The center mounting bar must be removed from the 16C apparatus mounting. Connect a separate ground to rack or mounting.
- 3.02** Electrical connection is made to the 69H apparatus mounting through a single-ended 25-pair connector cable equipped with a 50-pin connector (A25B connector cable). Terminate the raw end of the cable to a 66B4-25 connecting block. Follow the wiring plan shown in Fig. 6, 7, and 8.

Insulate and store all spare leads. (Refer to Part 6 for wire strap and resistor connections.) Fuses and -24 volt power are provided locally (-24 volts connect to row 37 and GRD connects to row 38).

**3.03** Extend CT, CR, CBS1, and CBS2 leads from 66B4-25 connecting block to 66M1-50 interface connecting block for access to CP equipment. Stencil lead designations on interface connecting block as shown in Fig. 2.

**3.04** The interface connecting block should be located close to the 66B4-25 connecting block. Locate so that the maximum dc loop resistance between the CT and CR leads will not exceed approximately 1-1/4 ohms (25 feet of 24 gauge or equivalent) when measured at the 66B4-25 connecting block, with the 8-ohm resistor disconnected and the CT and CR leads strapped at the CP equipment.

**3.05** The customer must terminate the CP equipment on the 66M1-50 interface connecting block using the four terminals stenciled on the customer side (Fig. 2).

**3.06** The HOLD jacks for connecting arrangement LOH may be multiplied between switchboard positions if busy lamp indication is provided as shown in Fig. 11.

**606A Panel**

**3.07** Install the 606A panel on a standard 23-inch relay rack or in a 16C apparatus mounting using a 99B mounting bracket (Fig. 5). The center mounting bar should be removed from the 16C apparatus mounting. Connect a separate ground to rack or mounting.

**3.08** Electrical connection is made to the 606A panel through two A25B connector cables. These cables connect to plugs P1 and P3 (Fig. 4) on the rear of the 606A panel. P1 connects to the upper row of 914A connectors J1A, J2A, and J3A (Fig. 3), and P3 connects to the lower row of 914A connectors J1B, J2B, and J3B. Terminate the raw end of the A25B connector cables on the 66B4-25 connecting block following the wiring plan shown in Fig. 6, 7, 9, and 10. (Refer to Part 6 for wire strap and resistor connections.) Connect -24 volt power to fuse panel on rear of 606A panel (-24 volts connect to T1 and GRD connects to T2).



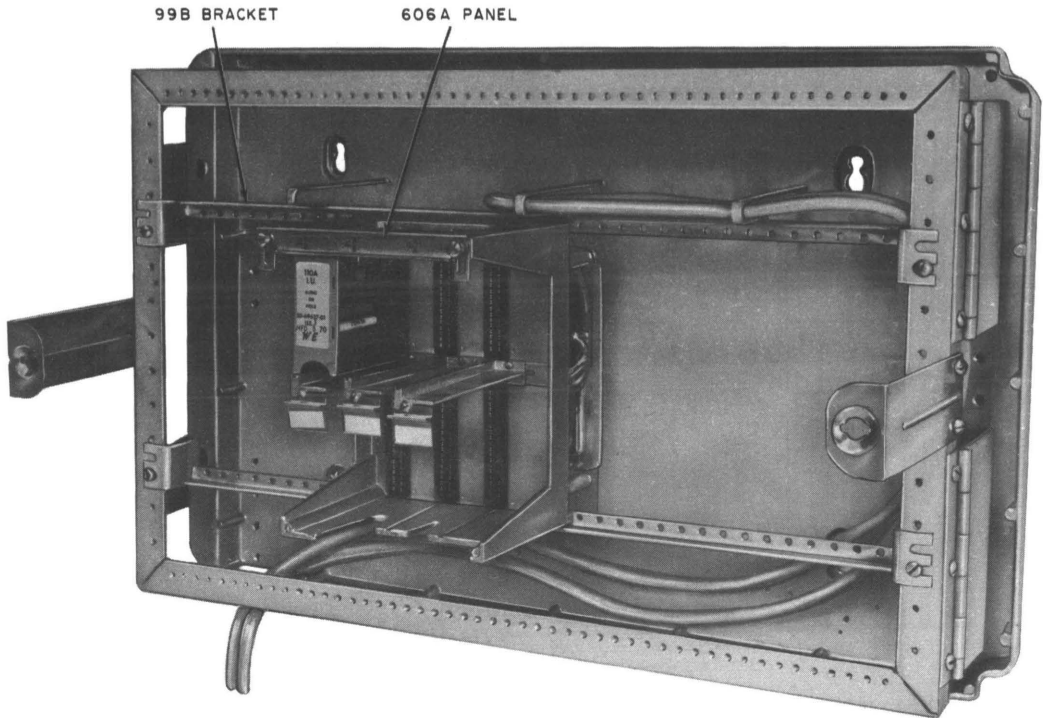


Fig. 5—606A Panel Mounted in 16C Apparatus Mounting

**3.09** Extend CT, CR, CBS1, and CBS2 leads from the 66B4-25 connecting block to the 66M1-50 interface connecting block for access to the CP equipment. Stencil lead designations on 66M1-50 connecting block as shown in Fig. 2.

**3.10** The interface connecting block should be located close to the 66B4-25 connecting block. Locate so that the maximum dc loop resistance of the CT and CR leads does not exceed approximately 1-1/4 ohms (25 feet of 24 gauge or equivalent) when measured at the 66B4-25 connecting block with the 8-ohm resistor disconnected and the CT and CR leads strapped at the CP equipment.

**3.11** The customer must terminate the CP equipment to the 66M1-50 connecting block using the four terminals stenciled on the customer side.

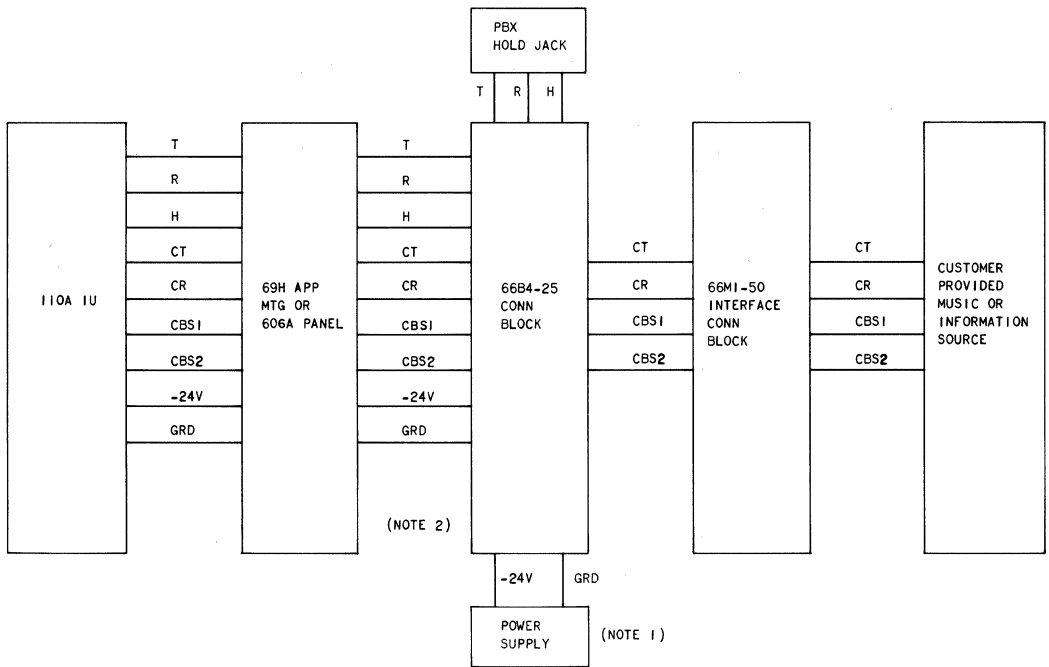
**3.12** The HOLD jacks for connecting arrangement LOH may be multiplied between switchboard positions if busy lamp indication is provided as shown in Fig. 11.

#### 110A Interconnecting Unit

**3.13** Strap Z option per Fig. 7 before installing IU in apparatus mounting or panel.

**Note:** The 109A IU is not recommended for this arrangement but can be used if a 110A IU is not available.

**3.14** Loosen screw securing retaining clip to apparatus mounting or panel and raise clip or designation bar to provide access to mounting.



NOTES:  
 1. POWER SUPPLY CONNECTS TO T1(-24V) AND T2(GRD) ON BACK OF 606A PANEL  
 2. INSULATE AND STORE UNUSED LEADS

Fig. 6—Block Diagram Voice Connecting Arrangement LOH

- 3.15 Align IU in mounting guides and properly seat connector of printed wiring board in connector of apparatus mounting or panel.
- 3.16 Position retaining clip or designation bar against the IU and tighten screw.
- 3.17 Stencil circuit and connection information as required on designation strip or retaining clip.
- 3.18 Perform tests shown in Part 5 after installation.

4. OPERATION (Fig. 7)

4.01 **Incoming Call:** A call from the central office (CO) trunk is answered in the normal manner by inserting the trunk answering cord of a cord pair in the incoming trunk jack and testing

the desired station for busy, using the station cord. If the station is busy and the calling party desires to hold, the station cord is inserted in a jack associated with the 110A IU and the TALK key is released. Inserting the station cord into the HOLD jack associated with the 110A IU causes the busy indication lamp to light (if multiple switchboard positions are provided) and applies ground to the H lead causing H relay to operate. The H relay operated provides a start signal to the CP recorded music or information source and couples this source to the tip and ring of the held party via the PBX HOLD jack and cord circuit.

4.02 **Monitoring and Talking to Party on Hold:**

To monitor the connection to the CP equipment, the PBX attendant operates the TALK-DIAL key of the cord pair to the TALK position and converses with the party on hold while the music is on the

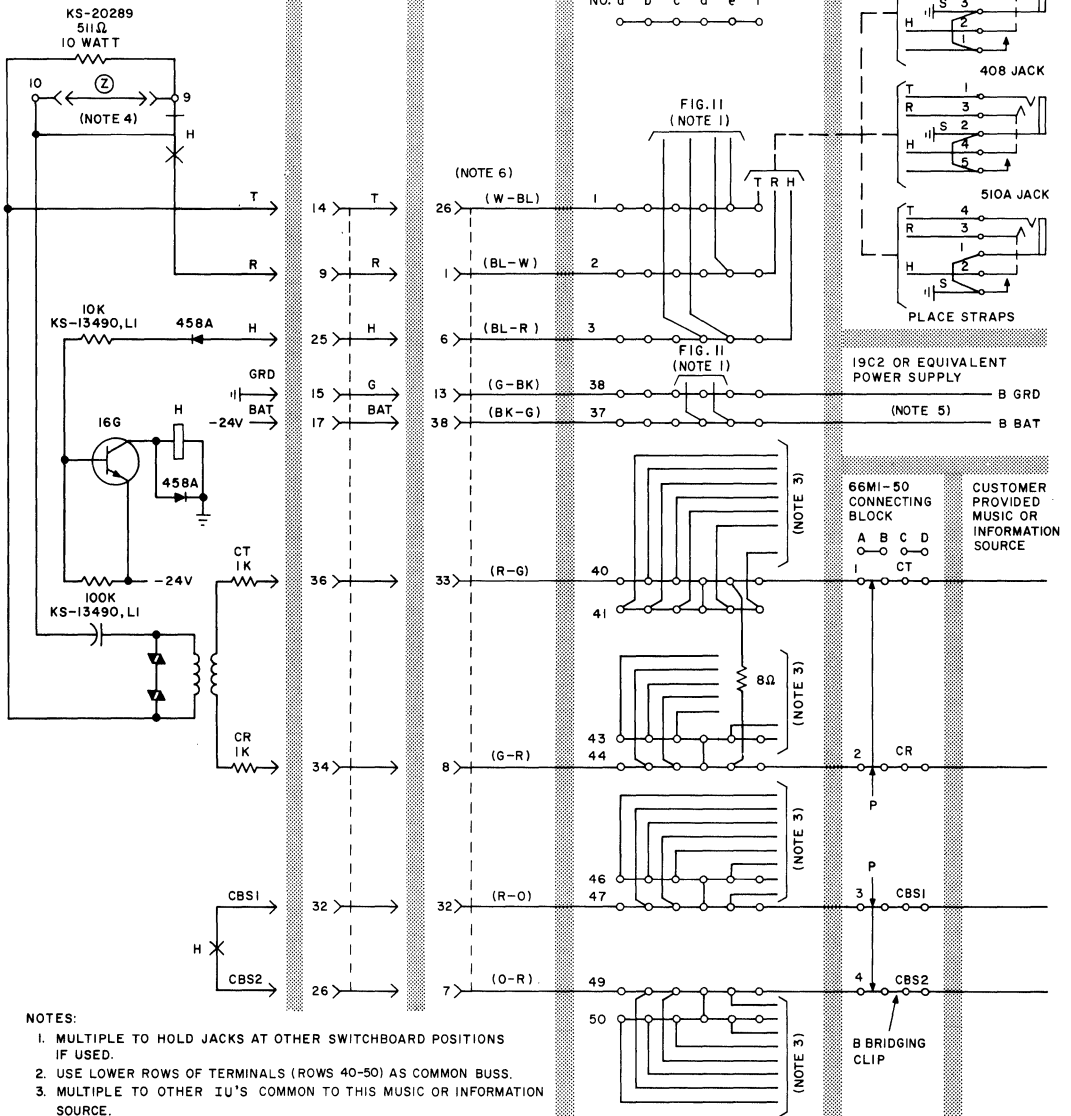
110A INTERCONNECTING UNIT

914A CONNECTOR ON 69H APP MTG

50-PIN CONNECTOR OF CONN CABLE

66B4-25 CONNECTING BLOCK (NOTE 2)

PBX SWITCHBOARD HOLD JACK (SEE TABLE A)



- NOTES:
1. MULTIPLE TO HOLD JACKS AT OTHER SWITCHBOARD POSITIONS IF USED.
  2. USE LOWER ROWS OF TERMINALS (ROWS 40-50) AS COMMON BUSS.
  3. MULTIPLE TO OTHER IU'S COMMON TO THIS MUSIC OR INFORMATION SOURCE.
  4. INSTALL (Z) OPTION.
  5. GRD SAME AS PBX GRD.
  6. INSULATE AND STORE SPARE LEADS.

Fig. 7—Schematic Diagram Voice Connecting Arrangement LOH Using 69H Apparatus Mounting

line. However, for better transmission, the attendant may remove the station cord from the HOLD jack associated with the 110A IU which will remove the music.

**4.03 Requested Station Becomes Idle:** When the requested station becomes available, the PBX attendant removes the station cord from the HOLD jack associated with the 110A IU and establishes the connection to the requested station. Removal of the cord causes H relay to release, restoring the IU to normal.

## 5. MAINTENANCE

**5.01** Check the CO pair and check for loose or broken connections or blown fuses.

**5.02** Open circuit at interface connecting block by removing the B bridging clips (or wire straps) and perform the following tests:

(a) Connect a 1013A (or equivalent) hand test set across terminals CT and CR on the Telephone Company side of the 66M1-50 interface connecting block. Set the hand test set to the MON position. Connect an 81A or KS-16990, List 1 test set across the CBS1 and CBS2 terminals. Set test set to continuity position. Request the PBX attendant to remove all cords from music-on-hold jacks and to place the rear cord in the HOLD jack associated with the 110A IU under test. Connect the front cord to an outside line, dial 1000-Hz test tone and release TALK key. The H lead will be grounded when the attendant plugs into the HOLD jack causing H relay in the 110A IU to operate. The H relay operated will complete the transmission path to terminals CT and CR and provide a contact closure across the CBS1 and CBS2 terminals.

**5.03** The test set across terminals CBS1 and CBS2 will indicate continuity and 1000-Hz test tone will be heard on the 1013A hand test set.

**5.04** When trouble is suspected in the 110A IU, exchange it with another unit known to be functioning properly.

**Caution: Remove fuse for particular circuit before replacing 110A IU.**

**5.05** Remove all test connections to restore the circuit to normal and replace the B bridging clips (or wire straps).



**Do not attempt any tests or repairs to the customer-provided equipment.**

**5.06** When in the repairman's judgment the trouble is located in the CP equipment, the Repair Service Bureau should be notified so that proper Maintenance of Service Charge billing can be initiated as outlined in BSP 660-101-312 entitled Maintenance of Service Charge on Services With Customer-Provided Equipment (CPE).

## 6. CONNECTIONS

**6.01** Place straps on the 66B4-25 connecting blocks between terminals 40 and 41, 43 and 44, 46 and 47, 49 and 50 as shown in Fig. 8.

**6.02** Place 8-ohm load resistor (furnished locally) across tip and ring leads to CP equipment at the common buss (66B4-25 connecting block, Fig. 8). The resistor should have pigtailed no larger than 19 gauge to connect in the quick connect clip-type terminals. If wire size is larger than 19 gauge, pigtailed should be soldered to terminals.

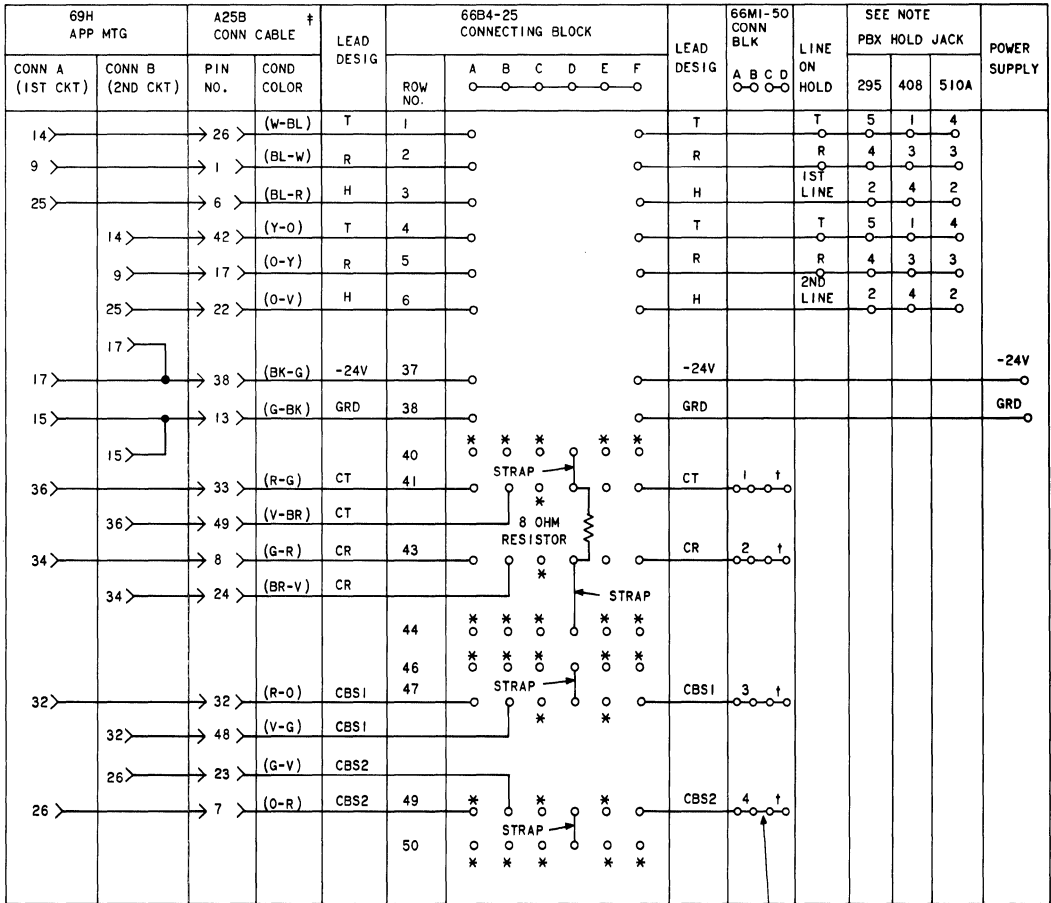
**6.03** For connection information using the 69H apparatus mounting, refer to Fig. 7 and 8.

**6.04** For connection information using the 606A panel, refer to Fig. 4, 9 and 10.

**6.05** If a separate power supply is used, connect to terminals T1 and T2 on rear fuse panel of 606A panel. Connect to terminals 37 and 38 on 66B4-25 for 69H apparatus mounting. Provide fuses locally for the 69H apparatus mounting. Bond the GRD lead to the PBX GRD.

**6.06** For connection information using multipled HOLD jacks with -24 volt lamp supply, refer to Fig. 11.

CONNECTIONS FOR CONNECTING ARRANGEMENT LOH

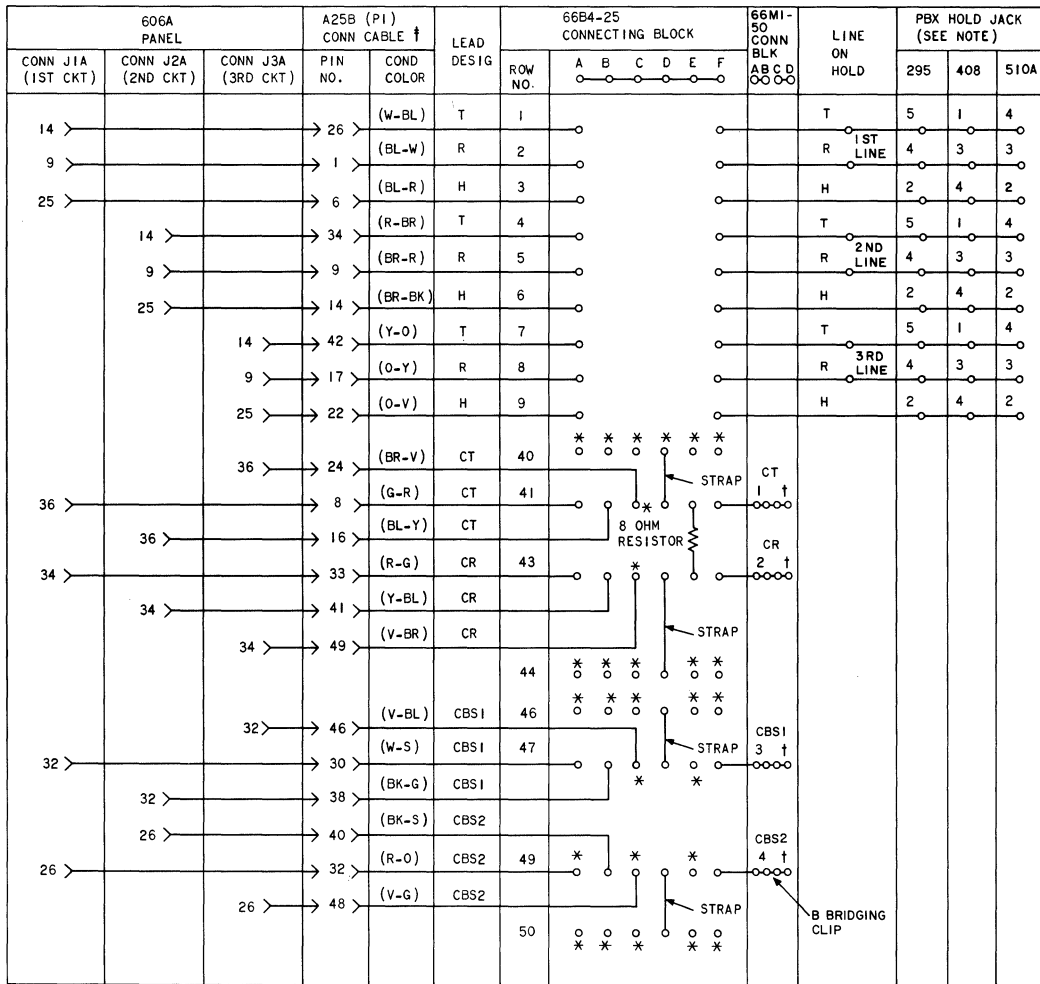


NOTE:  
 STRAP JACKS AS SHOWN IN FIG. 7.  
 \* MULTIPLIED TO OTHER INTERCONNECTING UNITS COMMON TO THIS MUSIC SOURCE.  
 † CONNECTIONS FOR CP EQUIPMENT.  
 ‡ INSULATE AND STORE UNUSED LEADS

B BRIDGING CLIP

Fig. 8—Connections Using 69H Apparatus Mounting

CONNECTIONS FOR CONNECTING ARRANGEMENT L0H



NOTE:

STRAP JACKS AS SHOWN IN FIG. 7.

\* MULTIPLIED TO OTHER INTERCONNECTING UNITS COMMON TO THIS MUSIC SOURCE.  
 † CONNECTIONS FOR CP EQUIPMENT.

‡ INSULATE AND STORE UNUSED LEADS.

Fig. 9—Connections Using 606A Panel (A-Connectors)



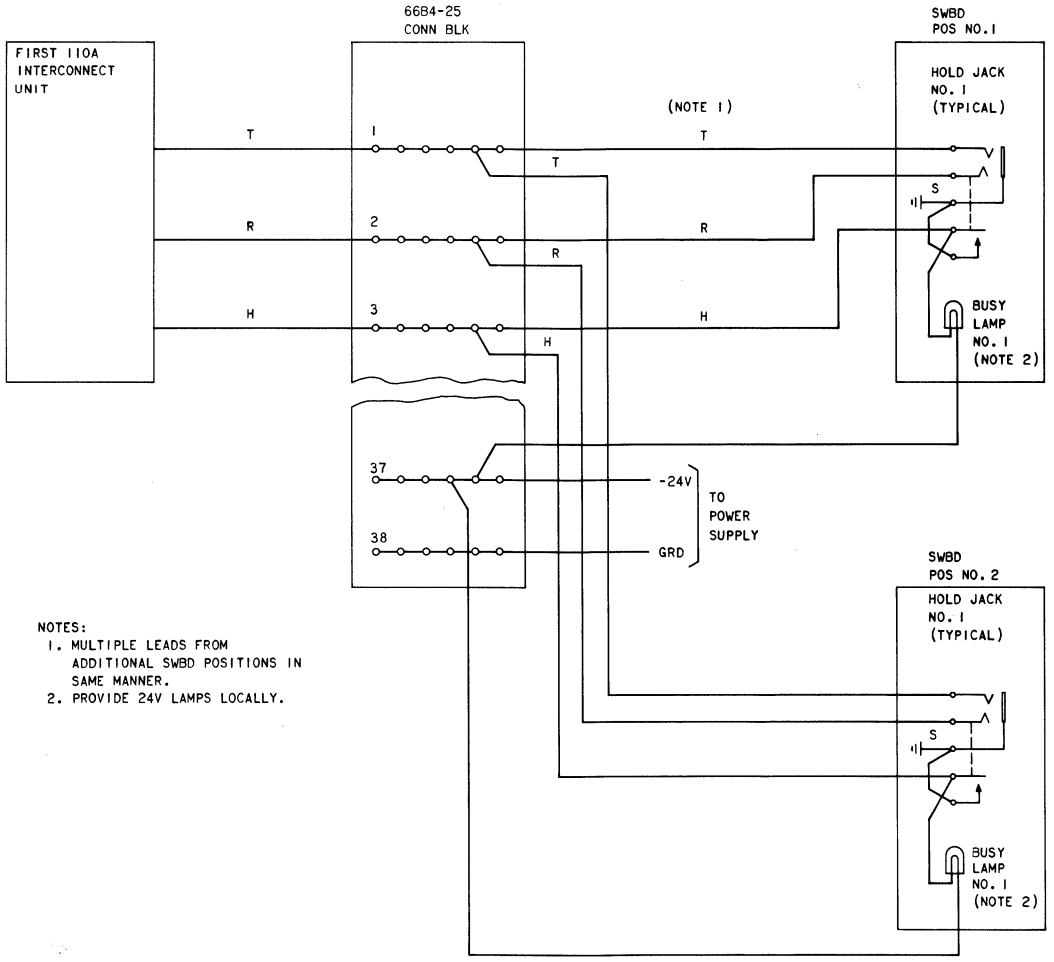


Fig. 11—Multiple HOLD Jacks With Busy Lamp Indication for Two or More Switchboard Positions



## VOICE CONNECTING ARRANGEMENT DCK J53050F INTERCONNECTING UNIT

### 1. GENERAL

**1.01** This section provides identification, installation, operation, maintenance, and connecting information for Voice Connecting Arrangement DCK, using J53050F, List 1A interconnecting unit (IU) (Fig. 1). Voice Connecting Arrangement DCK (Fig. 2) provides connection via trunk level access between customer-provided equipment (CPE) (typically, dictation equipment, radio paging system, or information retrieval system) and a Bell System private branch exchange (PBX), Centrex System or Switching System.

**1.02** This section is reissued to:

- Include wiring changes made on J53050F, List 1A
- Add connection information for 770A PBX, 812A PBX, and Switching System No. 400
- Revise drawings and illustrations
- Change SD reference in Fig. 5.

**1.03** The J53050F, List 1A is the same as the J53050F, List 1 with the IL resistor removed

and circuit changes made to improve operation as follows:

- Tip and ring battery feed was changed to improve current limiting on short loops.
- The idle circuit termination and dial pulsing termination has been improved.
- The test and make busy circuit has been changed to prevent interference with a call when the unit is in the busy state.

**1.04** If the customer wants a copy of the Technical Reference which covers this interface specification, the customer should contact the local Telephone Company Business Office or the Marketing Representative.

**1.05** This issue of the section is based on the following drawings:

CD-1E255-01, Issue 2B

SD-1E255-01, Issue 2B

If this section is to be used with equipment or apparatus reflecting later issue(s) of the drawing(s), reference should be made to the SDs and CDs to

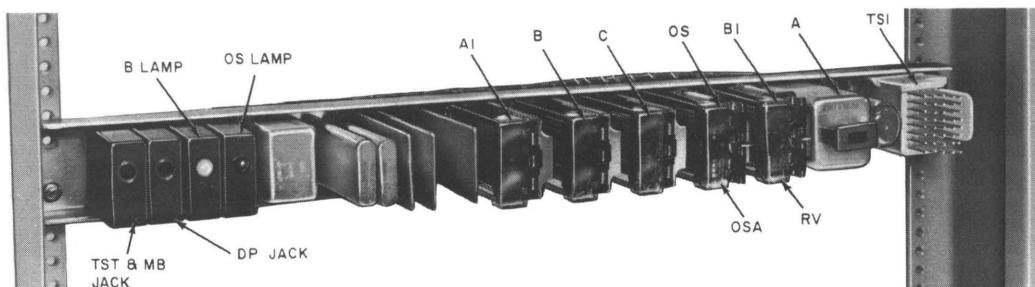


Fig. 1—J53050F, List 1A Interconnecting Unit

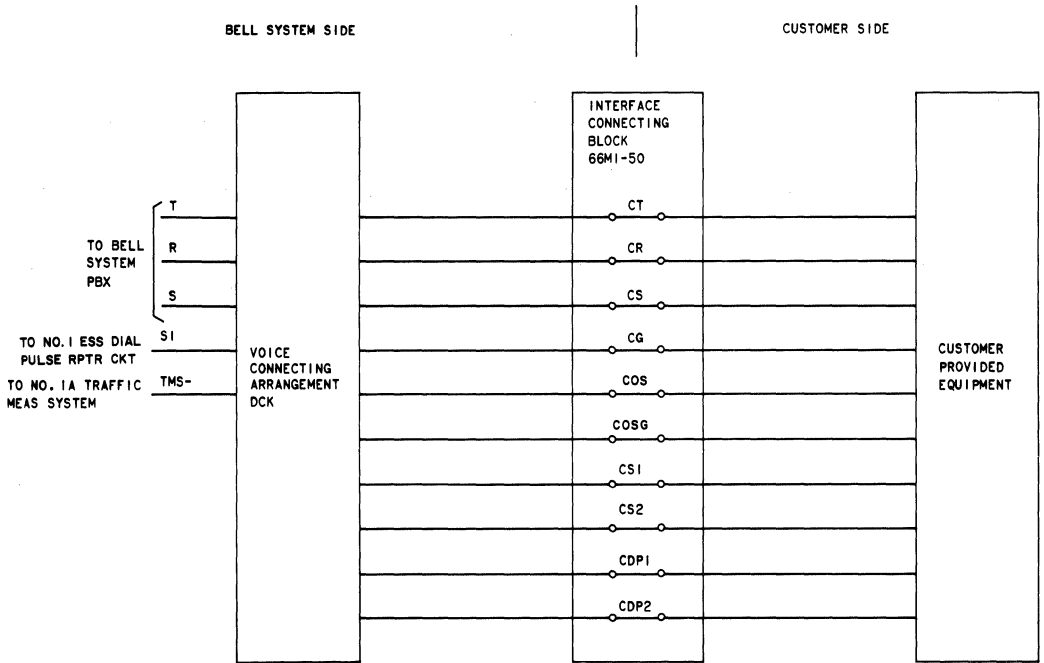


Fig. 2—Block Diagram—Voice Connecting Arrangement DCK

determine the extent of the changes and the manner in which the section may be affected.

**2. IDENTIFICATION**

**PURPOSE**

- To provide one-way outgoing access from the attendant or stations of a Bell System dial PBX Centrex or Switching System to CPE on a trunk level basis via a dial access code (e.g., dial "7")
- To provide 2-way voice transmission between the Bell System PBX and the CPE
- To pass control digits (rotary or TOUCH-TONE® dial), when required, to the CPE

- To provide for accepting supervisory control signals from CPE
- To limit excessive signal levels from CPE and to provide protection for personnel against hazardous voltages.

**APPLICATION**

- 701A, 701B, 711A, 711B, 740E, 756A, 757A, 770A, 800A, 801A, and 812A PBXs
- No. 1 ESS and No. 101 ESS
- No. 5 Crossbar Centrex
- 400-type Switching System

**ORDERING GUIDE**

- J53050F, ♦List 1A♦ Interconnecting Unit (one per voice connecting arrangement).

**Associated Apparatus (Order Separately)**

- KS-15620, List 22 Rectifier (required when PBX power supply is insufficient).

**Note:** This rectifier meets acceptable noise requirements as explained under Power Supplies in Section 332-104-102. Other rectifiers may be used when specified by local engineering.

- KS-14532 Power Cord (for use with KS-15620, List 22 Rectifier)

List 1—10 ft.

List 2—2 ft.

List 3—15 ft.

List 4—20 ft.

List 5—25 ft.

- Cable, Wiring, "D" inside, or equivalent (for cabling from connecting arrangement to interface connecting block)
- Block, Connecting, 66M1-50 (Fig. 3)

**Note:** Other types of blocks may be used when specified by local engineering.

- Clip, Bridging, B (25 per pkg.)

**Replaceable Components**

- Relay, 316J
- Lamp, Resistance, 14B

**DESIGN FEATURES****J53050F, ♦List 1A♦ Interconnecting Unit**

- Mounts on standard 23-inch relay rack
- Size—2 by 23 inches

- Provides transformer isolation and hazardous voltage protection between CPE and Bell System facilities.
- Accepts in service/out of service signal from CPE over leads COS and COSG
- Provides seizure signal to CPE over leads CS1 and CS2
- Repeats dial pulses to CPE over leads CDP1 and CDP2
- Passes TOUCH-TONE signals to CPE over leads CT and CR
- Provides a 2-wire voiceband transmission path (voice coupler) to and from CPE over leads CT and CR
- Accepts answer supervision from CPE over leads CS and CG (momentary contact closure)
- Provides option to permit voice transmission during dial pulsing.

**3. INSTALLATION**

**3.01** ♦The interconnecting unit is typically mounted on a 23-inch rack using existing space in the PBX. Follow installation and connection information given in the section for the PBX in use.

**3.02** Mount the 66M1-50 interface connecting block at a location mutually agreeable to the customer and where accessible for testing and ease of connection.♦

**3.03** Use "D" inside wiring cable or equivalent to terminate the leads associated with the CPE on the interface connecting block. Stencil trunk number and lead designations on interface connecting block designation strip (see Fig. 3).

**3.04** ♦Power will usually be supplied by the PBX.♦ When the KS-15620, List 22 rectifier is used, customer must provide a 117V 60-Hz power outlet within power cord length of the mounting location of the connecting arrangement (see Ordering Guide for cord lengths). Requires 0.6 ampere maximum current.

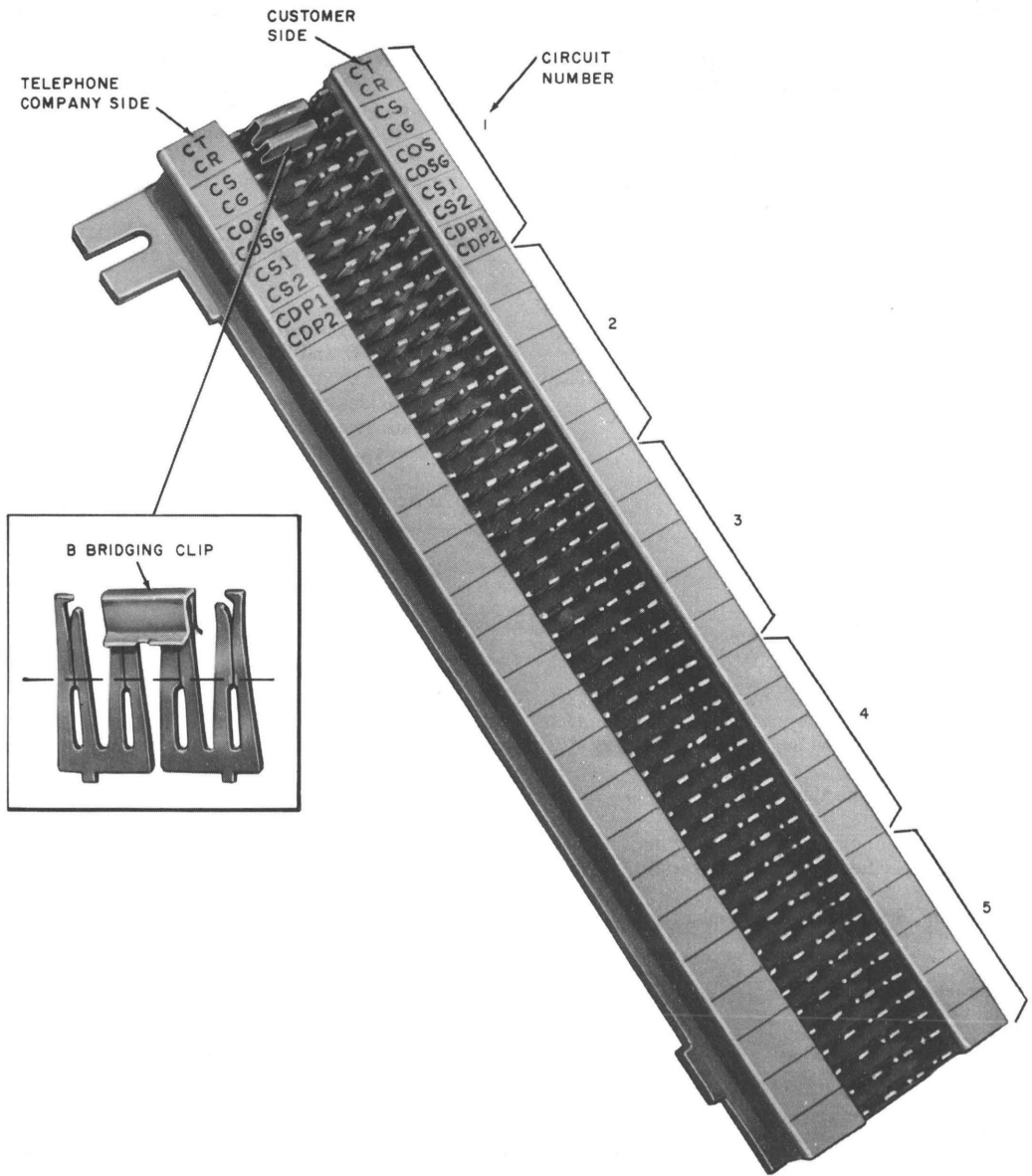


Fig. 3—66M1-50 Interface Connecting Block

- 3.05** The power outlet supplying connecting arrangement(s) must not be under control of a switch and should be on a separately fused power circuit to prevent accidental loss of ac line voltage. Where local instructions permit, secure the power cord to the outlet with a power cord plug retainer assembly.
- 3.06** Refer to appropriate sections in Division 518 for proper grounding of power plants.
- 3.07** Provide straps on the J53050F IU as shown in Table A and Fig. 4.

♦TABLE A♦  
FOR FIG. 4

SERVICE REQUIRED		OPTION	PROVIDE STRAP	
			FROM	TO
Selector Connector Access		Z, W	17	56
			51	57
Transmission Required During Dialing	YES	Y	37	27
	NO	X	47	27
CSBR No. 5, 400SS, 770A Selector Access- 801A, 756A, 757A, 800A, or No. 101 ESS 812A		W	51	57
No. 1 ESS Dial Pulse Repeater Circuit Provided		V	Make Connection Directly to Term. 57 (See Fig. 4.)	

#### 4. OPERATION

##### 4.01 Seizure (Fig. 4):

- (a) When the calling party dials the assigned trunk code (e.g., dial "7"), either by rotary or TOUCH-TONE dialing, the PBX will automatically connect the caller to an idle trunk associated with Voice Connecting Arrangement DCK. Seizure of the connecting arrangement by the PBX operates relay A in the IU through loop closure. Relay A operated causes relay A1 to operate which in turn operates relay B through the 2M contact of relay OS (relay OS is maintained in

the operated condition by the CPE over leads COS and COSG) and provides a closure across leads CDP1 and CDP2 toward the CPE. Relay B operated causes relay B1 to operate, prepares an operate path for relay C, and either places ground on lead S (option W) or closes lead S to lead S1 (option V) to make the trunk port busy to other calls. Relay B1 operated provides a closure across seizure leads CS1 and CS2 toward the CPE, lights lamp B to indicate circuit busy, grounds lead TMS- toward the Traffic Measuring System No. 1A, removes the 600 ohm idle line termination to the CPE, cuts through the transmission path to the CPE and opens the operate path to relay OSA.♦

- (b) When required, the CPE responds to the closure across seizure leads CS1 and CS2 by placing a momentary closure across leads CS and CG ( $300 \pm 100$  millisecond duration). This closure momentarily operates relay RV which returns answer supervision to the PBX by reversing the battery feed of relay A over leads T and R toward the PBX. This battery reversal signal is necessary only for a SXS PBX equipped with TOUCHTONE® to dial pulse conversion. The reversal is required to release the converter from the connection.

##### 4.02 Transmission of Control Information: If

the CPE requires an additional delay prior to receiving control digits, second dial tone will be provided over leads CT and CR from the CPE when the CPE is ready to receive control digits. The calling party may dial control information into the CPE by two methods, either TOUCH-TONE signals or dial pulses.

- (a) **TOUCH-TONE Signals:** These signals are passed directly to the CPE over leads CT and CR. No further circuit action will occur until the calling party disconnects.
- (b) **Dial Pulses:** These pulses are repeated to the CPE over leads CDP1 and CDP2 in the following manner: Relay A releases and reoperates following the open and closed interval of the calling party loop. Relay A1 follows relay A and subsequently repeats dial pulses to the CPE over leads CDP1 and CDP2. On the first dial pulse, relay A releases which in turn releases relay A1. Relay A1 released operates relay C through contact 8M of the B relay. Relay C operated opens the transmission path to the

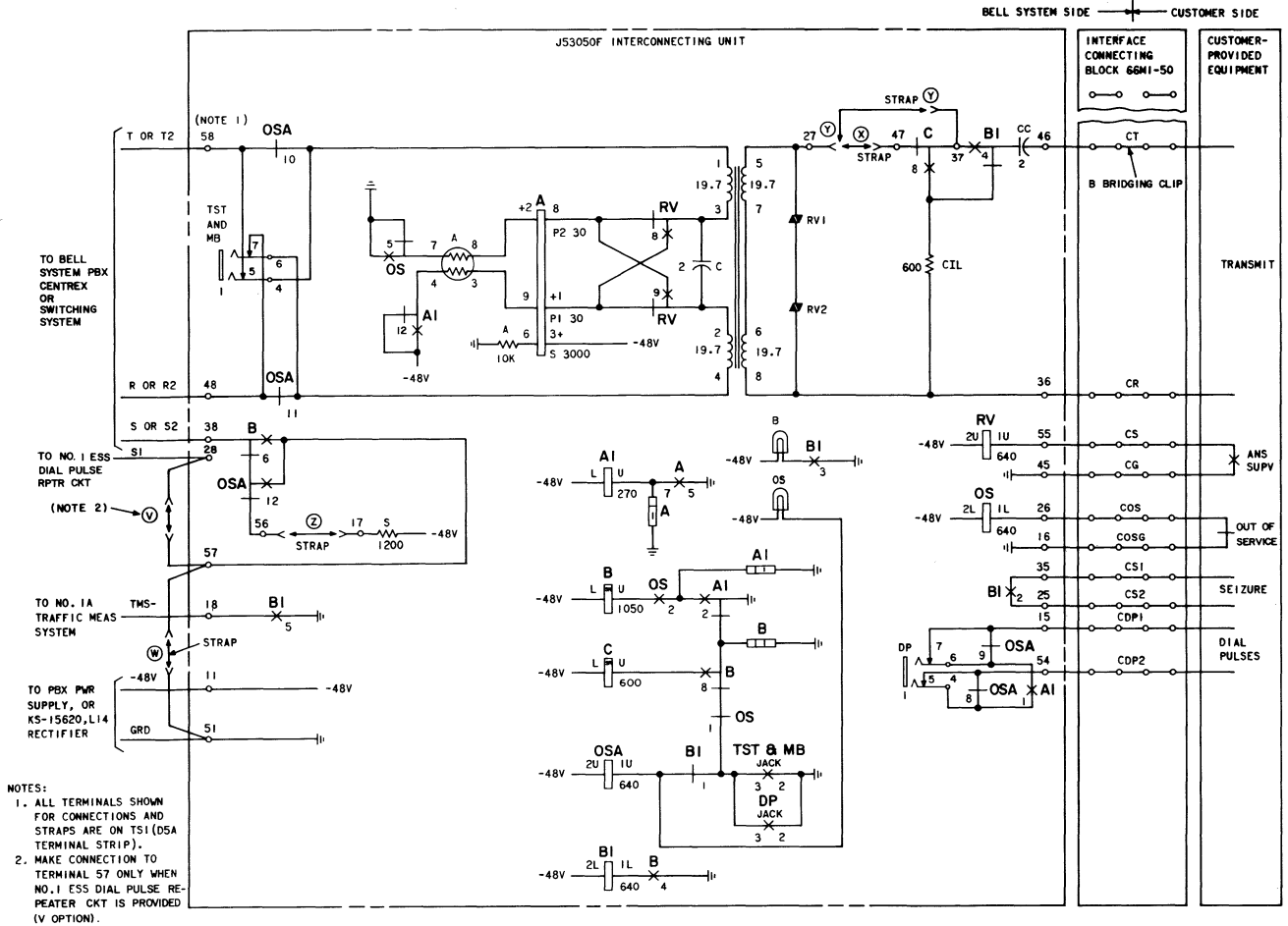


Fig. 4—Schematic and Connections—Voice Connecting Arrangement DCK

CPE when option X is provided (option Y must be provided when transmission during dialing is required—see Fig. 4 and Table A) and places a 600-ohm idle line termination across leads CT and CR through capacitor CC. At the end of the first pulse, relay A re-operates which subsequently operates relay A1. On successive pulses, relays A and A1 release and re-operate; after the last pulse with relay A1 operated, relay C releases. Relay C released removes the idle line termination across leads CT and CR and recloses the transmission path.

**4.03 Disconnect:** When the calling party disconnects or abandons the call, relay A releases, subsequently releasing relay A1. Relay A1 released opens leads CDP1 and CDP2 toward the CPE and releases relay B. Relay B released causes Relay B1 to release which removes ground from lead S (option W) or opens lead S from lead S1 (option V), opens leads CS1 and CS2 toward the CPE, and extinguishes lamp B. This returns the circuit to the idle condition.

**4.04 Out-of-Service:** The out-of-service feature is provided to allow the customer to make his equipment and the connecting arrangement busy to incoming calls. To initiate the action of this feature, the customer must remove the closure across leads COS and COSG toward the connecting arrangement. Leads COS and COSG opened releases relay OS; relay OS released causes relay B and relay C to release in sequence, if they are operated. Relay OSA operates and lamp OS lights through the normally closed contacts of relays A1, B, B1, and OS. Relay OSA operated grounds lead S (option W) or closes lead S to lead S1 to make the circuit busy to incoming calls.

## 5. MAINTENANCE

**5.01** Where there is an indication of trouble in the connecting arrangement(s), the circuit at fault must be opened at the interface connecting block to verify in which direction the trouble exists. The circuit can be opened at the connecting block by removing the B bridging clip associated with each lead.

**5.02** Precautions should be taken when performing tests to avoid adversely affecting service to the customer. Local instructions should be followed with reference to notifying the customer before performing the tests.

### 5.03 Apparatus Required to Perform Tests:

- (a) J34717A Pulsing Test Set or equivalent
- (b) J34720A Pulse Repeating Test Set or equivalent
- (c) 1013A Hand Test Set or equivalent
- (d) 81A Test Set or KS-16990, List 1 Test Set, or equivalent.

### 5.04 Test—Dial Pulses:

- (a) Observe that lamp B on J53050F, ♦List 1A♦ IU under test is extinguished; insert plug from J34717A pulsing test set into Test & MB jack of IU under test—the OS lamp on IU should light. (If lamp B is lighted initially, a call is in progress; the plug from the J34717A pulsing test set may be inserted in the Test & MB jack while the call is in progress without interfering with the call. After completion of the call, relay OSA will operate, lamp B is extinguished and OS will light and the circuit will be made busy to incoming calls).
- (b) Open all ten leads of the circuit under test at the interface connecting block. Provide a strap across leads COS and COSG at the interface connecting block; observe that relays A, A1, B, B1, and OS, are operated. Using the 81A or KS-16990, List 1 test set (set the test set to continuity position), check for closure across leads CS1 and CS2 at the interface connecting block; then check for presence of ground on lead TMS toward the PBX.
- (c) Provide a strap across leads CS and CG at the interface connecting block—observe that relay RV operates and check for battery reversal on leads T, R of the IU under test. Remove strap from leads CS and CG.
- (d) Insert the plug from J34720A pulse repeating test set into the DP jack on the IU under test. Initiate dial pulses with the J34717A pulsing test set and check for proper dial pulses as indicated by the J34720A pulse repeating test set.
- (e) Remove the J34717A pulsing test set and the J34720A pulse repeating test set from the IU under test.

**5.05 Tests—TOUCH-TONE Signals:**

- (a) Open all ten leads of the circuit under test at the interface connecting block. Provide a strap across leads COS and COSG at the interface connecting block. Verify that relay OS operates (OS lamp is extinguished).
- (b) Have the PBX attendant initiate a call to the trunk level code of the equipment under test. Observe that relays A, A1, B, and B1 are operated—check for closure across leads CS1 and CS2—check for presence of ground on lead TMS, toward the PBX.
- (c) Provide a strap across leads CS and CG at the interface connecting block; observe that relay RV operates; check for battery reversal on leads T and R of the IU under test.
- (d) Remove strap from leads CS and CG at the interface connecting block, then have the PBX attendant supply TOUCH-TONE dial signals. Using the 1013A dial hand test set, listen for presence of TOUCH-TONE signals across leads CT and CR at interface connecting block.

**5.06 Tests—Circuit Busy:**

- (a) Remove the strap from leads COS and COSG at the interface connecting block—observe that relay OS releases, relay OSA operates, and OS lamp lights. Have the PBX attendant dial the trunk level code of the equipment under test and check for return of equipment busy signal (120 IPM).

**5.07** On completion of tests, remove all straps and replace the B bridging clips at the interface connecting block.

**5.08** When in the repairman's judgment the trouble is located in the CPE, the Repair Service Bureau should be notified so that proper Maintenance of Service Charge billing can be initiated as outlined in Section 660-101-312 (Maintenance of Service Charge on services with CPE).



*Do not attempt any tests or repairs to the CPE.*

**6. CONNECTIONS**

**6.01** For connecting information refer to Fig. 4, 5, and Table A. Connections between Voice Connecting Arrangement DCK and the associated system (PBX or Centrex) switching equipment are shown in Fig. 5.

**6.02** Refer to the section covering the particular PBX in use for connection information as follows:

PBX	SECTION NO.
SS 400	518-710-200
756A	551-144-210
757A	551-234-210
770A	551-770-203
800A	553-105-201
801A	553-201-202
812A	553-212-203
101 ESS	240-248-201



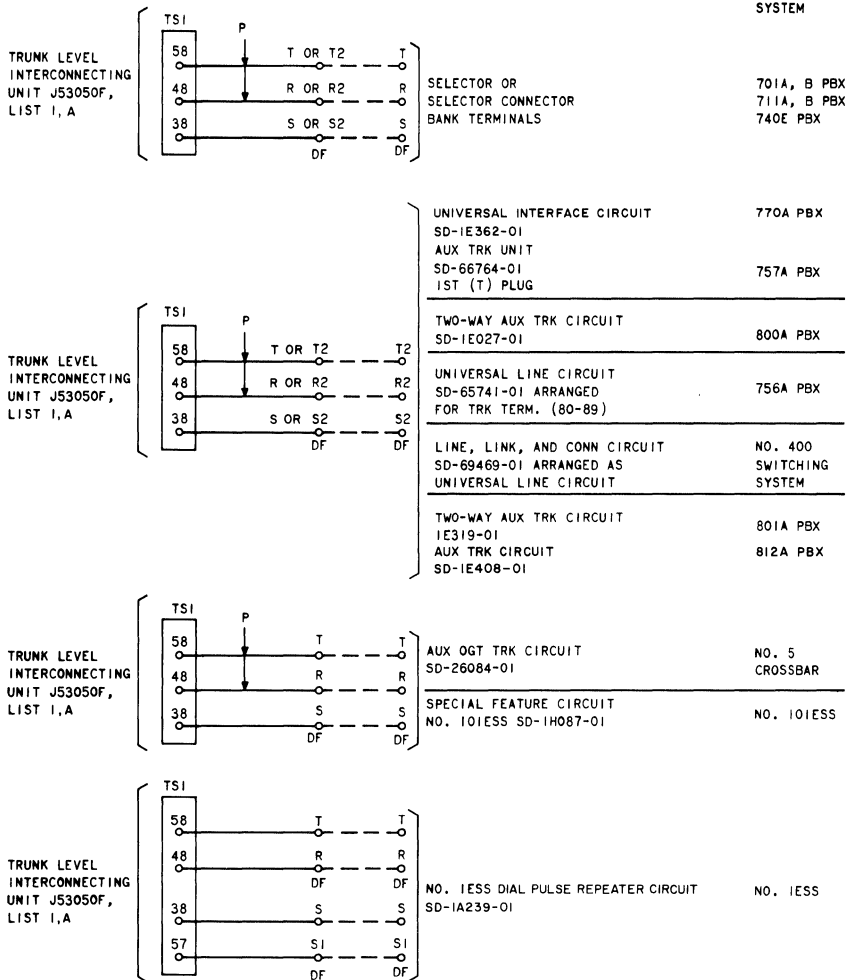


Fig. 5—Typical Connections for System Terminating Circuits with Trunk Level Interconnecting Unit J53050F, List 1, A

## VOICE CONNECTING ARRANGEMENT DCT

### J58827E RECORDED TELEPHONE DICTATION TRUNK UNIT

#### 1. GENERAL

**1.01** This section provides identification, installation, operation, maintenance, and connection information for Voice Connecting Arrangement DCT (Fig. 1 and 2) when used with the 701A, B; 711A, B; 740A, AX, B, C, E; 755A, 756A, 757A, 800A PBX Systems, No. 5 Crossbar CENTREX, No. 101 Electronic Switching System, and Electronic Switching System CENTREX, and the No. 400 Switching System, to provide interface connections between Bell System and customer-provided (CP) equipment. The equipment used to implement Voice Connecting Arrangement DCT is determined by the specific installation (See Table A and Part 2, ORDERING GUIDE).

**1.02** Voice Connecting Arrangement DCT is designed to function with a variety of CP dictation machines which have different operational and playback features. Table B shows the various Operational Features and Table C shows the various Playback Feature Groups. The various switching system options are shown in Table D.

**1.03** This section provides information formerly contained in Sections 473-131-201 and 473-131-501, which are hereby cancelled.

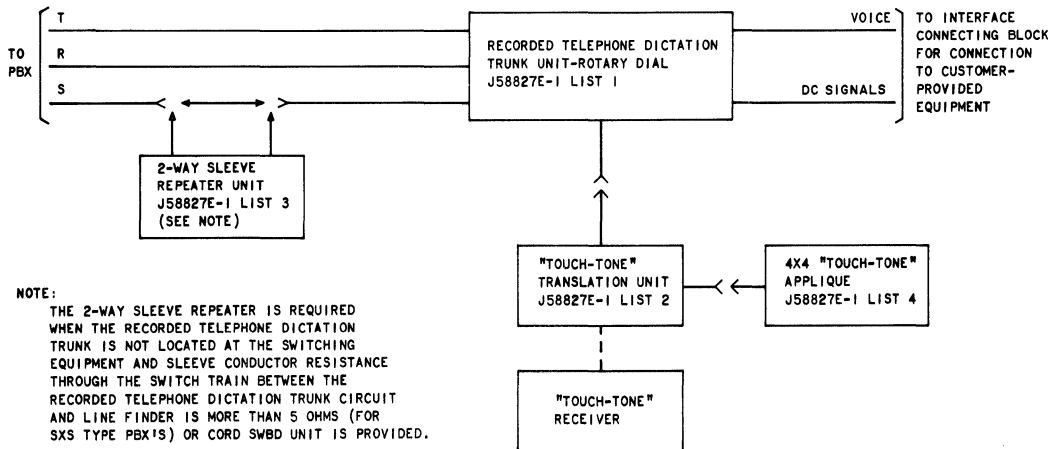
**1.04** This issue of the section is based on the following drawings:

CD-5E038-01 Issue 2B

SD-5E038-01 Issue 7B

If this section is to be used with equipment or apparatus reflecting later issue(s) of the drawing(s), reference should be made to the CDs and SDs to determine the extent of the changes and the manner in which the section may be affected.

**1.05** If the customer wants a copy of the Technical Reference which covers this interface specification, the customer should contact the local Telephone Company Business Office or the Marketing Representative.



**Fig. 1—Typical Equipment Configuration-Voice Connecting Arrangement DCT**

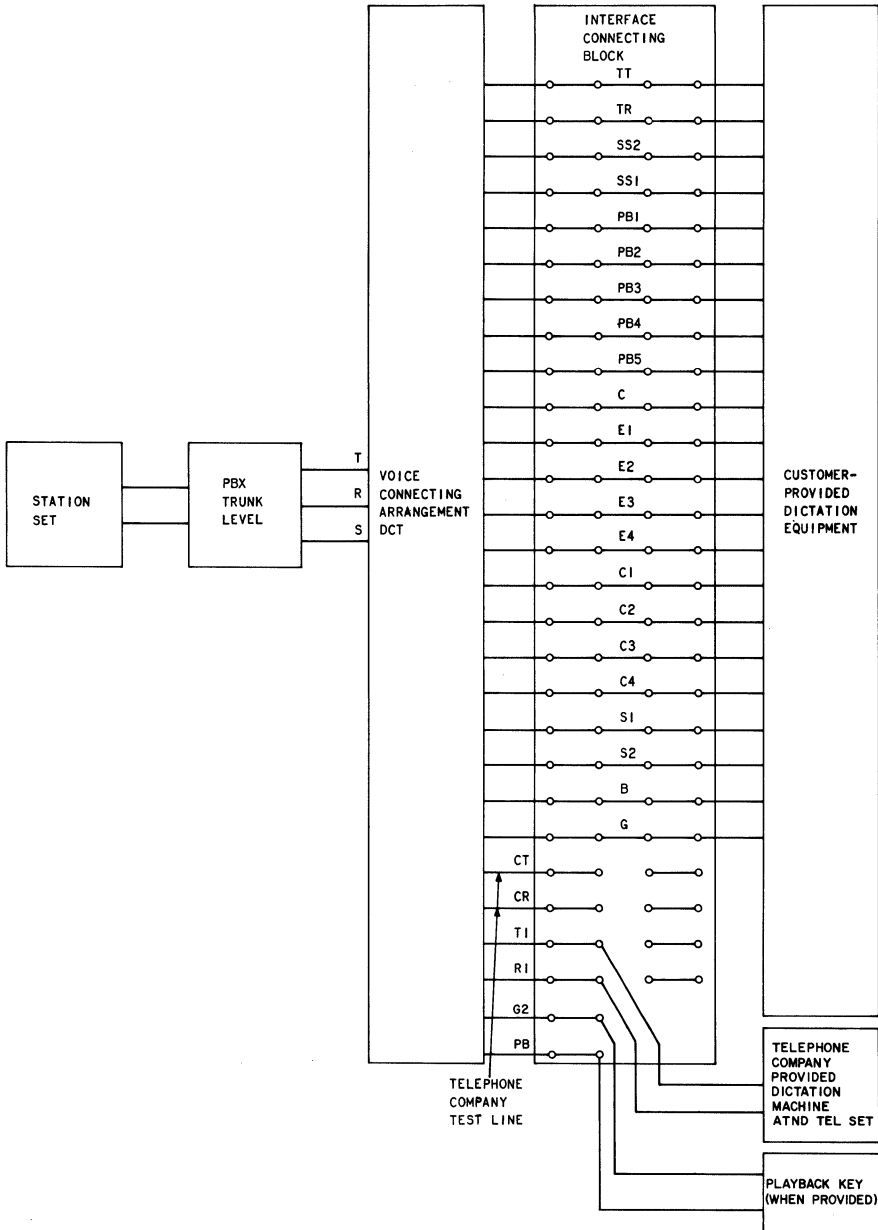


Fig. 2—Block Diagram—Voice Connecting Arrangement DCT

**TABLE A**  
**EQUIPMENT SUMMARY**

EQUIPMENT CODE	DESCRIPTION AND FUNCTION	SCHEMATIC
J58827E List 1	Basic dictation trunk unit to provide for connection between CP equipment and Bell System PBX	SD-5E038-01 Fig. 1
J58827E List 2	Equipment required in addition to List 1 to provide for TOUCH-TONE® operation.	SD-5E038-01 Fig. 4
J58827E List 3	Equipment required in addition to List 1 to provide for one 2-way sleeve repeater when the dictation trunk unit is not located at the switching equipment, or cord switch-board unit is provided.	SD-5E038-01 Fig. 3
J58827E List 4	Required in addition to List 2 to provide 4 x 4 TOUCH-TONE operation.	SD-5E038-01 Fig. 4
J58827E List 5	Required in addition to List 1 to provide a connector cable ED-1E073-10, Group 5 when dictation trunk is used with the 800A PBX and rotary dial operation is required.	SD-5E038-01 Fig. 5
J58827E List 6	Required in addition to List 1 to provide connector cables ED-1E073-10, Group 5 and Group 4, when dictation trunk is used with the 800A PBX and TOUCH-TONE operation is required.	SD-5E038-01 Fig. 6

## 2. IDENTIFICATION

### PURPOSE

- To provide access from a Bell System PBX to CP dictation equipment via a dial access code (e.g., dial "7")
- To provide voice-only transmission to and from the CP equipment
- To provide rotary dial or TOUCH-TONE® dial (optional) control signals to voice controlled or dial controlled CP equipment
- To provide a means of calling in the CP dictation equipment attendant for assistance (Telephone Company-provided telephone set)
- To limit abnormally high voice and supervisory tone levels to the Bell System PBX
- To provide longitudinal isolation
- To protect Telephone Company personnel and facilities from hazardous voltages.

### ORDERING GUIDE

- J58827E, List 1 Recorded Telephone Dictation Trunk Unit (Fig. 3)—basic dictation trunk

TABLE B

## OPERATIONAL FEATURES

OPERATION DESCRIPTION		FEATURE	SWITCHING SYSTEM		PROVIDE OPTION (See Note 1)
Dictation Machine Start-Stop Controlled By (Choose one)	Dial "1"	A	ESS 101-1A SW Unit		ZW, W
			ESS 101-2A 3A, 4A SW Unit		K, ZH
			All Others (See Note 2)	TOUCH-TONE DIAL	M, W, ZG
	Rotary Dial	G, W			
	Voice	B	ESS 101-1A SW Unit		ZW, V
			ESS 101-2A, 3A, 4A SW Unit		K, ZI
All Others			M, V		
Machine Attendant Playback Control Key		C	All Systems		Provide Key, 551A
Playback Reduced by Dialing 2 (Choose one)	Yes	D	All Systems		F
	No	E			E
When Dictation Machine Becomes Unavailable to Record (Choose one)	Makes Circuit Busy and Signals Attendant	F	All Systems		B
	Makes Circuit Busy	G			ZA

unit for connection between CP equipment and Bell System equipment

- J58827E, List 2 TOUCH-TONE Translation Unit (Fig. 4)—required in addition to List 1 for TOUCH-TONE operation
- J58827E, List 3 2-Way Sleeve Repeater Unit (Fig. 4)—required when the recorded telephone dictation trunk unit is not located at the switching equipment and sleeve conductor resistance through the switch train between the trunk circuit and line finder is greater than 5 ohms (for SXS type PBX) *or* a cord switchboard unit is provided
- J58827E, List 2, 4 TOUCH-TONE translation unit—wired and equipped to provide 4 X 4 (16-button) TOUCH-TONE operation (ZD option)
- J58827E, List 5 ED-1E073-10, Group 5 Connector Cable—required when dictation trunk (J58827E, L1) is used with 800A PBX
- J58827E, List 6 ED-1E073-10, Group 5 Connector Cable and ED-1E073-10, Group 6 Connector Cable—required when dictation trunk (J58827E, L1) is used with 800A PBX and TOUCH-TONE translation unit (J58827E, L2) is provided.

#### Associated Apparatus (Order Separately)

- J99289A TOUCH-TONE Receiver Cabinet (Fig. 4)—arranged to mount two receiver assemblies
- J99289B TOUCH-TONE Receiver Assembly (Fig. 4—A-Type TOUCH-TONE receiver unit; one required per dictation trunk when TOUCH-TONE operation is provided)
- J58866A Auxiliary Power Unit—required when the connecting arrangement is not located at the PBX and local power is required; must also be provided when the connecting arrangement is used with a 755A PBX

TABLE C  
PLAYBACK FEATURES

PLAYBACK DESCRIPTION		FEATURE GROUP (CHOOSE ONE)	SWITCHING SYSTEM	PROVIDE OPTION (SEE NOTE 1)
Machine Provides End-of-Playback Sig.	No	1	ALL	R
Dial 3 Extends Playback	No			
Dial 1 Ends Playback	Yes			
Machine Provides End-of-Playback Sig.	Yes	2	ALL	N
Dial 3 Extends Playback	Yes			
Dial 1 Ends Playback	No			
Machine Provides End-of-Playback Sig.	Yes	3	ALL	Q
Dial 3 Extends Playback	No			
Dial 1 Ends Playback	Yes			
Machine Provides End-of-Playback Sig.	Yes	4	ALL	A
Dial 3 Extends Playback	Yes			
Dial 1 Ends Playback	Yes			

- NOTES 1 — See Table G for installer provided straps required to implement options.  
2 — If both Rotary and TOUCH-TONE® dial stations access this circuit, use options specified for TOUCH-TONE operation.

**Note:** This power unit meets acceptable noise requirements as explained under Power Supplies in Section 332-104-102. Other power units may be used when specified by local engineering.

- Key, 551A or equivalent—Attendant Playback Key, provided when requested by the customer and installed as directed by the customer
- Cable, Wiring, "D" inside, or equivalent (for cabling from connecting arrangement to interface connecting block)
- Cable, Connector, A25B, or equivalent (for cabling from connecting arrangement to J58849C quick-connect field when dictation trunk is used with 800A PBX)
- Block, Connecting, 66M1-50 (Fig. 5)

**Note:** Other types of blocks may be used when specified by local engineering.

- Clip, Bridging, B (25 per pkg).

#### DESIGN FEATURES

##### J58827E, List 1 Recorded Telephone Dictation Trunk Unit

- Mounts on standard 23-inch relay rack
- Size—4 by 23 inches
- Provides basic circuit for connection between CP equipment and Bell System equipment
- Provides Test and MB jack for test purposes.

##### J58827E, List 2 TOUCH-TONE Translation Unit

- Mounts on standard 23-inch relay rack
- Size—2 by 23 inches
- Provides basic circuitry for use with dictation trunk unit when 4 X 3 (12-button) TOUCH-TONE operation is required

**TABLE D**  
**SWITCHING SYSTEM OPTIONS**

FEATURE OR OPTION (See Note 1)				PROVIDE	
				LIST	OPTION
TRK CKT	Trunk located at Switching System	With switchboards having station line jacks — using SWBD sleeve circuit (See Note 2.)	701 or 740 PBX's using SEL CONNS or 2-Digit Rotary Selectors	1 & 3	Z,ZF
			756A PBX		
			All other Switching Systems		ZF
		No switchboards or switchboards without station line jacks	701 or 740 PBX's using SEL CONNS or 2-Digit Rotary Selectors	1	Y,S
			All other Switching Systems		S
	For SXS PBX's only — Trunk not located at Switching Equipment — Using 2-Way Sleeve Repeater (See Note 3.)		SXS PBX's using SEL CONNS or 2-Digit Rotary Selectors	1 & 3	Z,ZF
			SXS PBX's using Regular Selectors		ZF
	ESS No. 1 CENTREX		Yes	1	ZK
			No		ZJ
	740E PBX (in addition to above options)				
800A PBX (in addition to above options)					ZQ
Loop resistance to attendant telephone set			Less than 300 OHMS		ZL
			More than 300 OHMS		ZM
TOUCH-TONE operation	Required with	4X3 TOUCH-TONE REC	2	ZC	
		4X4 TOUCH-TONE REC	2,4	ZC,ZD	
	Not required				ZB
Ringng machine not provided (740-Type PBX or 755A PBX)					J

*Notes* 1. See Table G for installer provided straps required to implement options.

2. List 3 is used as a sleeve circuit and is located with the dictation trunk.

3. List 3 is used as a two-way sleeve repeater and is located at the PBX.



Fig. 3—Voice Connecting Arrangement DCT-Basic Unit

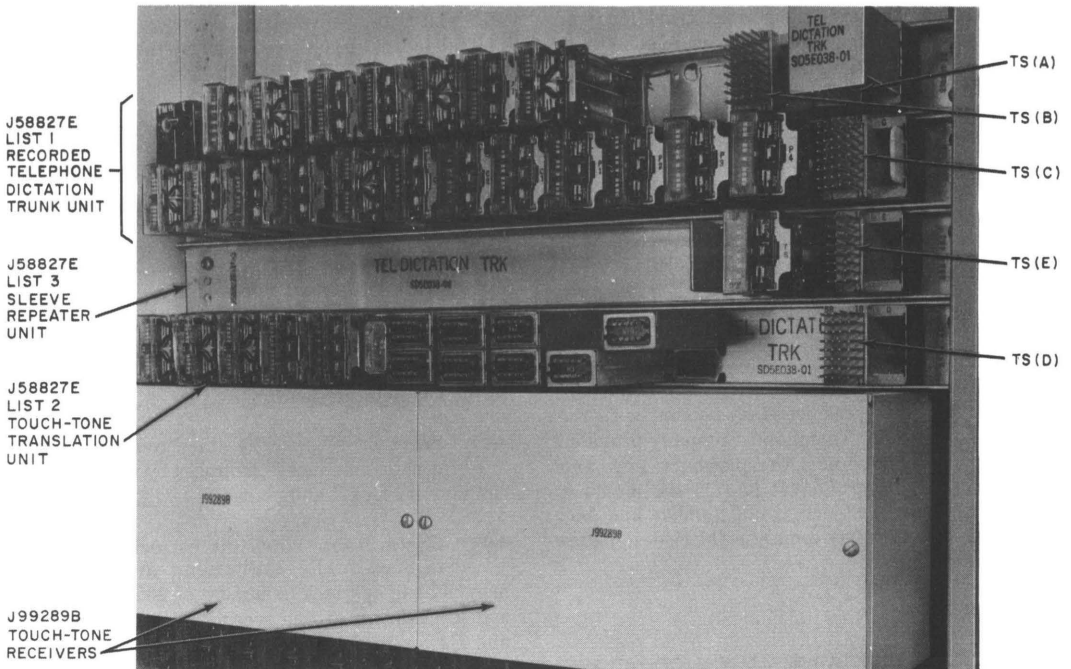


Fig. 4—Voice Connecting Arrangement DCT-Basic Unit with TOUCH-TONE® Translation Unit, TOUCH-TONE Receivers, and Sleeve Repeater Unit



- May be used for 4 X 4 (16-button) TOUCH-TONE operation when equipped with List 4.

### J58827E, List 3 2-Way Sleeve Repeater

- Mounts on standard 23-inch relay rack
- Size—2 by 23 inches
- Provides circuitry to extend sleeve lead function when the sleeve conductor resistance between the dictation trunk and line finder is greater than 5 ohms or when a cord switchboard unit is provided.

**Note:** When a cord switchboard is provided, lead "S" through the switch train must be continuous. Switches such as SD-66002-01, SD-66005-01 and SD-66142-01 do not provide continuous "S" lead.

## 3. INSTALLATION

**3.01** The recorded telephone dictation trunk units can be mounted on a 23-inch relay rack in the associated switching system cabinets when space is available or on a miscellaneous relay rack. Mounting screws are provided with each unit. Typical mounting arrangements are shown in Fig. 3 and 4.

**3.02** Use the "D" inside wiring cable or equivalent to terminate the leads associated with the CP equipment, the Telephone Company-provided attendant telephone set, the playback key, and the Telephone Company test line on the interface connecting block. Stencil trunk number and lead designations on interface connecting block designation strip (Fig. 5).

## 4. OPERATION

### VOICE CONTROLLED DICTATION MACHINE (OPERATIONAL FEATURE A)

**4.01 Idle Condition:** When the CP dictation machine is available for use (idle condition), a closure is provided by the CP dictation machine across leads B and G to hold up a supervisory relay (S relay) in Voice Connecting Arrangement DCT which provides an indication toward the associated PBX that the circuit is available for use (Fig. 6). When there is trouble in the CP dictation machine (machine unable to record), leads B and G are

opened by the CP dictation machine and the circuit is made busy toward the PBX (Operational Feature G). In addition, if Operational Feature F is provided, this open causes the connecting arrangement to pass ringing to the dictation machine attendant telephone set.

### 4.02 Seizure:

When Voice Connecting Arrangement DCT is seized by a PBX station user dialing the assigned circuit access or service code (e.g., dial "7"), a 600-ohm termination is removed from the TT and TR leads and the CP dictation machine is connected to the transmission path of the connecting arrangement. Leads S1 and S2 are closed toward the CP dictation machine and with Playback Feature Groups 2, 3, and 4, a closure is provided by the CP dictation machine across leads PB5 and C for end-of-playback control. A "ready" or "talk-down" tone is returned by the CP dictation equipment on the TT and TR leads.

### 4.03 Control Functions:

To perform the desired control functions, the dictator (PBX station user) must dial the digits listed in Table E. At the beginning of dialing, the connecting arrangement operates to open the transmission path and terminate the TT and TR leads in 600 ohms toward the CP dictation machine to minimize recording of dial pulses or tone signals. The CP "ready" tone is removed toward the dictator. At the end of dialing, the 600-ohm termination is removed and the transmission path (TT and TR leads) is connected to the CP dictating machine.

**4.04 Start or Stop:** The start and stop of the dictation machine is controlled by voice-operated circuitry in the CP equipment.

**4.05 Correction:** When the correction digit (2) is dialed, the connecting arrangement momentarily operates (minimum of 200 milliseconds and a maximum of one second) to (a) close the C1 and C2 leads, (b) close C3 and C4 leads, and (c) apply a burst of dial tone to the dictator as an acknowledgment. The connecting arrangement then returns to the dictate condition by the application of the CP "talk-down" tone on the TT and TR leads.

**4.06 Playback:** When the playback digit (3) is dialed, the connecting arrangement performs the following sequential operations:

- Feature Group 1:** Closes the PB1 and PB2 leads. After a minimum of 200 milliseconds,

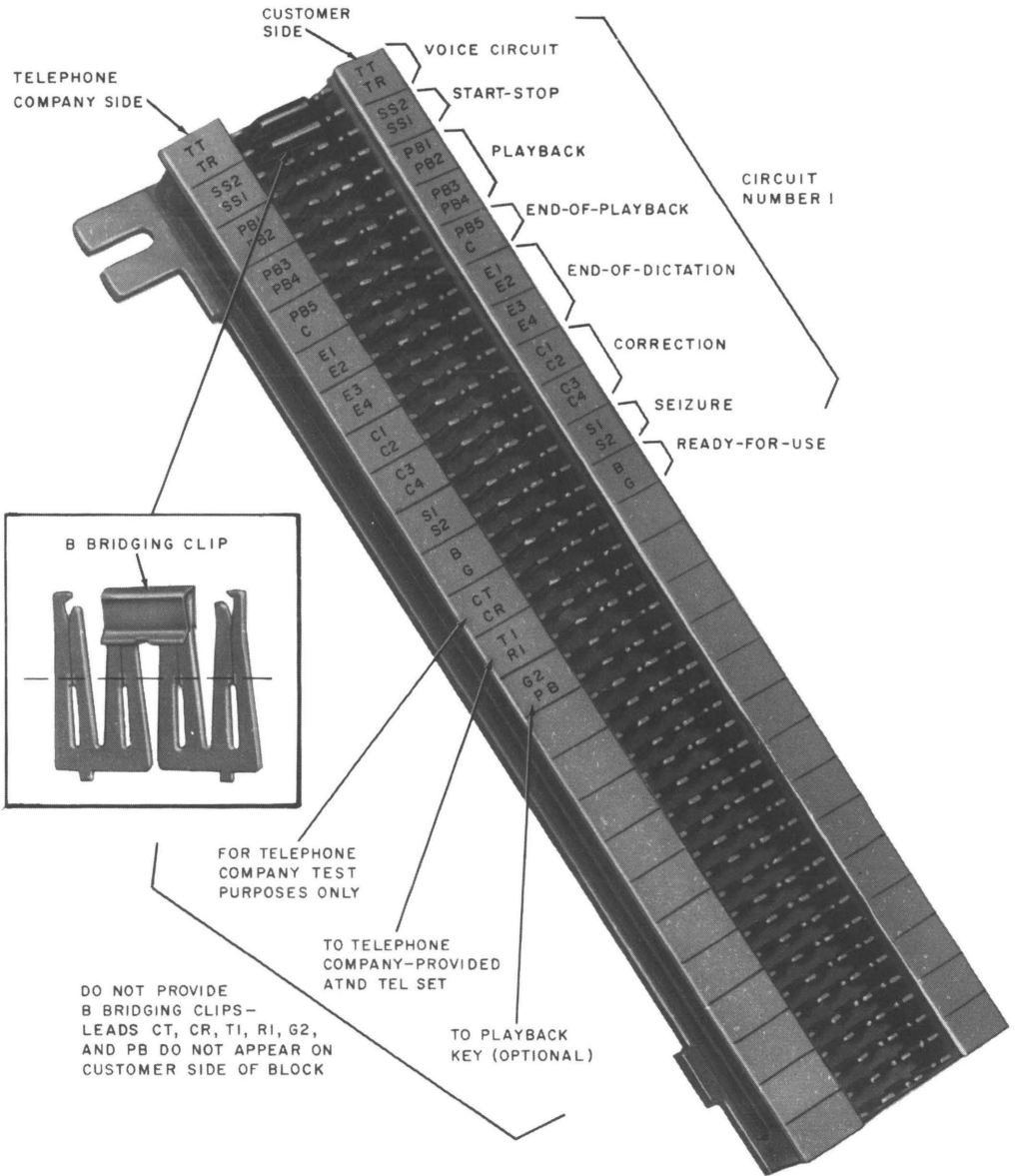


Fig. 5—Typical Interface Connecting Block

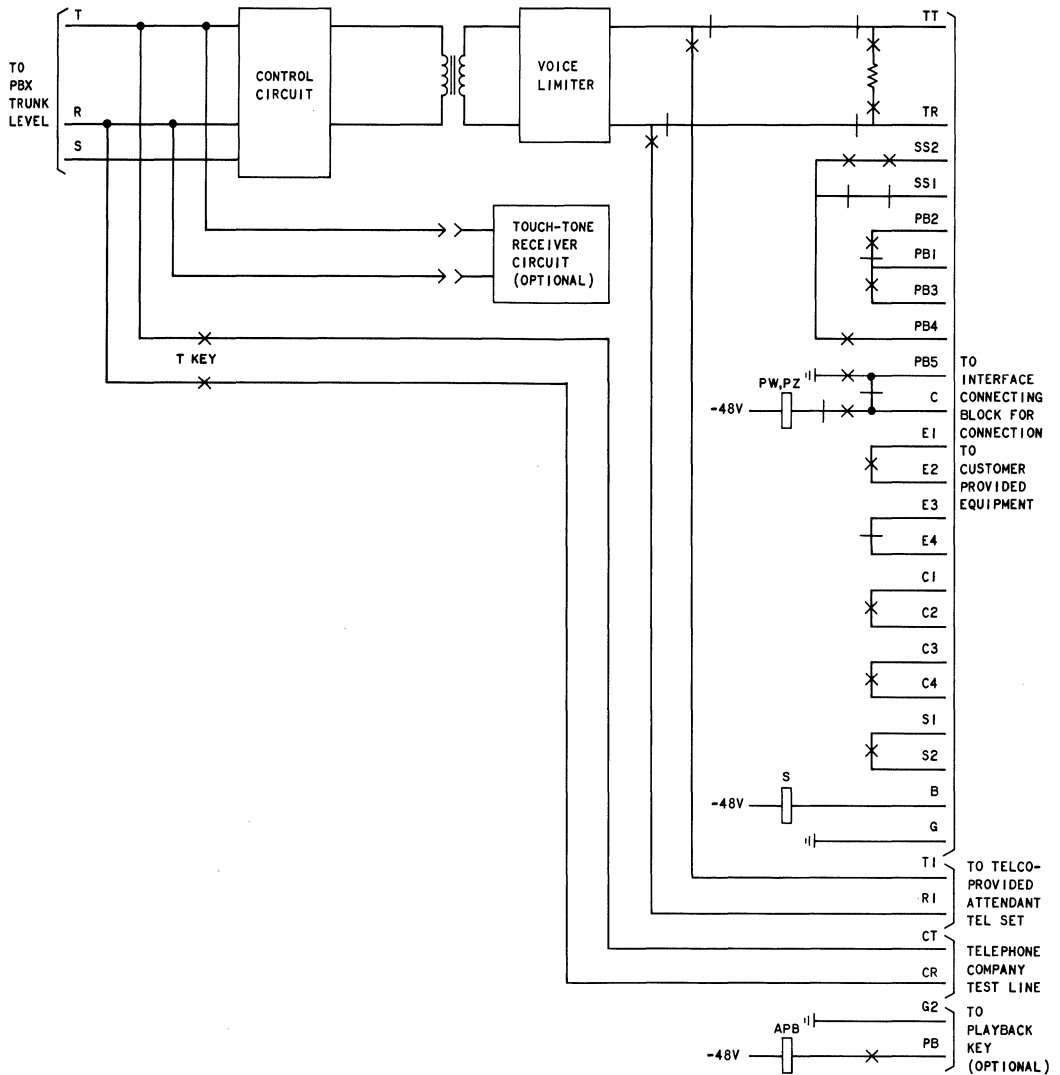


Fig. 6—Simplified Schematic—Voice Connecting Arrangement DCT

the connecting arrangement transfers lead PB1 from lead PB2 to lead PB3 and closes the PB4 lead to the SS1 lead.

(b) **Feature Group 2:** Closes the PB1 and PB2 leads. After a minimum of 200 milliseconds,

the connecting arrangement transfers lead PB1 from lead PB2 to lead PB3, closes the PB4 lead to the SS1 lead, and locks in the playback mode over the C and PB5 leads under control of the CP dictation machine. The playback digit (3) may be dialed repeatedly to reclose the PB1

TABLE E  
DICTATION TRUNK CONTROL FUNCTIONS

DIGIT DIALED	DIAL CONTROLLED MACHINE	VOICE CONTROLLED MACHINE
1	Start-Stop	Cancel remainder of playback
	Stop ringing of attendant telephone set when attendant does not answer.	Stop ringing of attendant telephone set when attendant does not answer.
	End or cancel of playback	
2	Correction	Correction
		Reduce extended playback
3	Playback	Playback
4	End of dictation	End of dictation
0	Dictation machine attendant	Dictation machine attendant

and PB2 leads, each time for a minimum of 200 milliseconds, to allow the CP dictation machine to extend playback time.

(c) **Feature Group 3:** Closes the PB1 and PB2 leads. After a minimum of 200 milliseconds, the connecting arrangement transfers lead PB1 from lead PB2 to lead PB3, closes the PB4 and SS1 leads, and locks in the playback mode over the C and PB5 leads under control of the CP dictation machine.

(d) **Feature Group 4:** Closes the PB1 and PB2 leads. After a minimum of 200 milliseconds, the connecting arrangement transfers lead PB1 from lead PB2 to lead PB3, closes the PB4 to the SS1 lead, and locks in the playback mode over the C and PB5 leads under control of the CP dictation machine. The playback digit (3) may be dialed repeatedly to reclose the PB1 and PB2 leads, each time for a minimum of 200 milliseconds, to allow the CP dictation machine to extend playback time.

**4.07 End of Playback or Cancel Remainder of Playback:**

The digit (1) may be dialed at the end of playback or to cancel playback, according to the provided playback feature group as follows:

(a) **Feature Group 1:** The dictation machine does not indicate that playback is in progress

within feature group. The dictator must dial (1) to end the playback. This action opens the PB1 and PB3 leads and opens the PB4 and SS1 leads. The connecting arrangement returns to the dictate condition indicated by the return of CP "talk-down" tone to the dictator.

(b) **Feature Group 2:** At the end of playback, the CP dictation machine automatically removes ground from the C lead for a minimum of 25 milliseconds. Subsequently, the connecting arrangement returns to the dictate condition, indicated by the return of CP "talk-down" tone to the dictator.

(c) **Feature Groups 3 and 4:** The dictator may cancel playback by dialing the digit (1). Alternately, at the normal end of playback, the dictation machine automatically removes ground from the C lead for a minimum of 25 milliseconds. In either case, the circuit opens the PB1 and PB3 leads and opens the PB4 and SS1 leads. The connecting arrangement returns to the dictate condition, indicated by the return of CP "talk-down" tone to the dictator.

**4.08 End of Dictation:** At the end of dictation, digit (4) is dialed. When digit (4) is dialed, the connecting arrangement opens the E3 and E4 leads, closes the E1 and E2 leads, and returns dial tone as an acknowledgment tone. After a short

duration, the connecting arrangement closes the E3 and E4 leads, opens the E1 and E2 leads, and returns to the dictate condition, indicated by a return of CP "talk-down" tone to the dictator.

#### 4.09 *Attendant Assistance*

(a) ***Assistance Before Playback:*** When the dictator dials the digit (0), the connecting arrangement operates to terminate leads TT and TR in 600 ohms and rings the attendant station. When the attendant answers, the connecting arrangement connects the dictator to the attendant and disconnects the TT and TR leads from the CP dictation machine.

(b) ***Assistance During Playback:*** If the dictator dials the attendant after playback has been initiated, the connecting arrangement operates as in (a) "Assistance Before Playback" with the exception that the TT and TR leads are reconnected to the CP dictation machine so that both the dictator and the attendant may hear the playback. Any playback in progress is cancelled by the connecting arrangement as described for Playback Feature Groups 1 and 3.

(c) ***Attendant Controlled Playback (Operational Feature C):*** If playback is desired while attendant and dictator are connected, the attendant momentarily operates the optional playback key. With the connecting arrangement in manual playback, the TT and TR leads are cut through to connect the dictator and attendant to the CP dictation machine and the connecting arrangement functions as described in 4.06 (Playback). The attendant may cancel playback with Feature Groups 1 or 3 by momentarily operating the optional playback key which causes the arrangement to function as described in 4.07 (End of Playback or Cancel Remainder of Playback).

(d) ***Attendant Does Not Answer:*** If the access digit (0) is dialed and the attendant does not answer, the dictator may stop ringing of the attendant line by dialing (1) during the silent interval of the ringing signal. This causes a closure on the TT and TR leads which connects the dictator to the transmission path, stops ringing on the attendant line, and restores the connecting arrangement to the dictate condition, indicated by the return of CP "talk-down" to the dictator.

#### 4.10 *Disconnect*

(a) ***Dictator Only:*** When the dictator hangs up, the TT and TR leads are terminated in 600 ohms toward the CP dictation machine; the E1 and E2 leads close momentarily (200 milliseconds minimum); the E3 and E4 leads open momentarily (200 milliseconds minimum); the S1 and S2 leads open; and the connecting arrangement is released toward the PBX.

(b) ***Dictator Connected to Attendant:*** When the attendant hangs up after a call for assistance, the dictator is disconnected from the attendant line and reconnected to the transmission path; the 600-ohm termination is removed from the TT and TR leads; and the TT and TR leads are reconnected to the CP dictation machine. The arrangement returns to the dictate condition, indicated by a return of CP "talk-down" tone to the dictator. If the dictator disconnects first, the procedure is the same as in (a) "Dictator Only" except that the connecting arrangement is not released until the attendant hangs up.

#### DIAL CONTROLLED DICTATION MACHINE (OPERATIONAL FEATURE B)

4.11 ***Idle Condition:*** When the CP dictation machine is available for use (idle condition), a closure is provided by the CP dictation machine across leads B and G to hold up a supervisory relay (S relay) in Voice Connecting Arrangement DCT, which provides an indication toward the associated PBX that the circuit is available for use (Fig. 6). When there is trouble in the CP dictation machine (machine unable to record), leads B and G are opened by the CP dictation machine and the circuit is made busy toward the PBX (Operational Feature G). In addition, if Operation Feature F is provided, this open causes the connecting arrangement to pass ringing to the CP dictation machine attendant telephone set.

4.12 ***Seizure:*** When Voice Connecting Arrangement DCT is seized by a PBX station user dialing the assigned circuit access or service code (e.g., dial "7"), a 600-ohm termination is removed from the TT and TR leads and the CP dictation machine is connected to the transmission path of the connecting arrangement. Leads S1 and S2 are closed toward the CP dictation machine; and with Playback Feature Groups 2, 3, and 4, a closure is provided by the CP dictation machine across leads

PB5 and C for end-of-playback control. A "ready" tone consisting of continuous audible ringing or dial tone (according to type of PBX) is returned to the calling station.

**4.13 Control Functions:** To perform the desired control functions, the dictator (PBX station user) must dial the digits listed in Table E. At the beginning of dialing, the circuit operates to open the transmission path and terminate the TT and TR leads in 600 ohms toward the CP dictation machine to minimize recording of dial pulses or tone signals. "Ready" tone is removed toward the dictator. At the end of dialing, the 600-ohm termination is removed and the transmission path (TT and TR leads) is connected to the CP dictation machine.

**4.14 Start or Stop:** When the first start-stop digit (1) is dialed, with the connecting arrangement in the "ready" or stop condition, the SS1 and SS2 leads are closed and the connecting arrangement is conditioned for the dictate or start mode. The next time digit (1) is dialed for stop, the SS1 and SS2 leads are opened and dial tone or ringing is returned to the dictator as a ready signal.

**4.15 Correction:** When the correction digit (2) is dialed, the connecting arrangement momentarily operates (minimum of 200 milliseconds and a maximum of one second) to (a) close the C1 and C2 leads, (b) close the C3 and C4 leads, (c) open the SS1 and SS2 leads, and (d) apply a burst of dial tone to the dictator as an acknowledgment. The connecting arrangement then returns to the dictate condition.

**4.16 Playback:** When the playback digit (3) is dialed, the connecting arrangement performs the following sequential operations:

- (a) **Feature Group 1:** Opens the SS1 and SS2 leads and closes the PB1 and the PB2 leads. After a minimum of 200 milliseconds, the connecting arrangement transfers lead PB1 from lead PB2 to lead PB3 and closes the PB4 lead to the SS1 lead.
- (b) **Feature Group 2:** Closes the PB1 and PB2 leads and within 150 milliseconds opens the SS1 and SS2 leads. After a minimum of 200 milliseconds, the connecting arrangement transfers lead PB1 from lead PB2 to lead PB3, closes the

PB4 lead to the SS1 lead, and locks in the playback mode over the C and PB5 leads under control of the CP dictation machine. The playback digit (3) may be dialed repeatedly to reclose the PB1 and PB2 leads, each time for a minimum of 200 milliseconds, to allow the CP dictation machine to extend playback time.

- (c) **Feature Group 3:** Opens the SS1 and SS2 leads and closes the PB1 and PB2 leads. After a minimum of 200 milliseconds, the connecting arrangement transfers lead PB1 from lead PB2 to lead PB3, closes the PB4 and SS1 leads, and locks in the playback mode over the C and PB5 leads under control of the CP dictation machine.

- (d) **Feature Group 4:** Closes the PB1 and PB2 leads and within 150 milliseconds opens the SS1 and SS2 leads. After a minimum of 200 milliseconds, the connecting arrangement transfers lead PB1 from lead PB2 to lead PB3, closes the PB4 to the SS1 lead, and locks in the playback mode over the C and PB5 leads under control of the CP dictation machine. The playback digit (3) may be dialed repeatedly to reclose the PB1 and PB2 leads, each time for a minimum of 200 milliseconds, to allow the CP dictation machine to extend playback time.

**4.17 End of Playback or Cancel Remainder of Playback:** The digit (1) may be dialed at the end of playback or to cancel playback, according to the provided playback feature group as follows:

- (a) **Feature Group 1:** The CP dictation machine does not indicate that playback is in progress with this feature group. The dictator must dial (1) to end playback. This action closes the SS1 and SS2 leads, opens the PB1 and PB3 leads, opens the PB4 and SS1 leads, and returns the connecting arrangement to the dictate condition.
- (b) **Feature Group 2:** At the end of playback, the CP dictation machine automatically removes ground from the C lead for a minimum of 25 milliseconds. Subsequently, the connecting arrangement opens the PB1 and PB3 leads, opens the PB4 and SS1 leads, and sends a "ready" tone to the dictator. Digit (1) must be dialed to restore the connecting arrangement to the dictate condition which provides a closure on the SS1 and SS2 leads toward the CP dictation machine.

(c) **Feature Groups 3 and 4:** The dictator may cancel playback by dialing digit (1). In this case, the connecting arrangement closes the SS1 and SS2 leads, opens the PB1 and PB3 leads, opens the PB4 and SS1 leads, and returns the connecting arrangement to the dictate condition. Alternately, at the normal end of playback, the CP dictation machine automatically removes ground from the C lead for a minimum of 25 milliseconds. In this case the arrangement opens the PB1 and PB3 leads, opens the PB4 and SS1 leads, and sends a "ready" tone to the dictator. The digit (1) must be dialed again to provide a closure on the SS1 and SS2 leads to restore the connecting arrangement to the dictate condition.

**4.18 End of Dictation:** At the end of dictation, digit (4) is dialed. The connecting arrangement opens the SS1 and SS2 leads, opens the E3 and E4 leads, closes the E1 and E2 leads, and returns dial tone as an acknowledgment tone. After a short duration the connecting arrangement closes the E3 and E4 leads, opens the E1 and E2 leads, and sends the "ready" tone to the dictator indicating that the dictator should now hang-up (see 4.10—Disconnect).

#### 4.19 Attendant Assistance

(a) **Assistance Before Playback:** When the dictator dials the digit (0), the connecting arrangement operates to terminate the TT and TR leads in 600 ohms, opens the SS1 and SS2 leads, and rings the attendant station. When the attendant answers, the connecting arrangement connects the dictator to the attendant and disconnects the TT and TR leads from the CP dictation machine.

(b) **Assistance During Playback:** If the dictator dials the attendant after playback has been initiated, the connecting arrangement operates as in (a) "Assistance Before Playback" with the exception that the TT and TR leads are reconnected to the CP dictation machine so that both the dictator and attendant may hear the playback. Any playback in progress is cancelled by the connecting arrangement as described for Playback Feature Groups 1 and 3.

(c) **Attendant Controlled Playback (Operational Feature C):** If playback is desired while attendant and dictator are connected, the attendant momentarily operates the optional playback key.

With the connecting arrangement in this manual playback condition, the TT and TR leads are cut through to connect the dictator and attendant to the CP dictation machine and the connecting arrangement functions as described in 4.16 (Playback). The attendant may cancel playback in progress with Feature Groups 1 and 3 by momentarily operating the optional playback key which causes the circuit to open the PB1 and PB3 leads, open the PB4 and SS1 leads, and terminates the TT and TR leads in 600 ohms. The dictator must dial (1) to resume dictation.

(d) **Attendant Does Not Answer:** If the access digit (0) is dialed and the attendant does not answer, the dictator may stop ringing of the attendant line by dialing a digit (1) during the silent interval of the ringing signal. This causes a closure on the TT and TR leads to connect the dictator to the transmission path, disconnects the attendant, and closes the SS1 and SS2 leads, restoring the connecting arrangement to the dictate condition.

#### 4.20 Disconnect

(a) **Dictator Only:** When the dictator hangs up, the TT and TR leads are connected to 600 ohms toward the CP dictation machine; the E1 and E2 leads close momentarily (200 milliseconds minimum); the E3 and E4 leads open momentarily (200 milliseconds minimum); the S1 and S2 leads open; the SS1 and SS2 leads open; and the connecting arrangement is released toward the PBX.

(b) **Dictator Connected to Attendant:** When the attendant hangs up after a call for assistance, the dictator is disconnected from the attendant line and reconnected to the transmission path; the 600-ohm termination is removed from the TT and TR leads; the TT and TR leads are reconnected to the CP dictation machine; and "ready" tone is sent to the dictator. If the dictator disconnects first, the procedure is the same as in (a) (Dictator Only) except that the circuit is not released until the attendant hangs up.

### 5. MAINTENANCE

**5.01** Where there is an indication of trouble in the connecting arrangement(s), the circuit at fault must be opened at the interface connecting

block to verify in which direction the trouble exists. The circuit can be opened at the connecting block by removing the B bridging clip associated with each lead.

**5.02** Precautions should be taken when performing tests to avoid adversely affecting service to the customer. Local instructions should be followed with reference to notifying the customer before performing the test.

**5.03** This part describes a method of testing the operating features of recorded telephone dictation trunk circuit SD-5E038-01 when connected to dial controlled or voice controlled dictation machines using either rotary dial or TOUCH-TONE calling stations.

**5.04** The tests covered are:

**A. Dial Controlled Dictation Machine Using Either Rotary Dial or TOUCH-TONE**

**Stations:** This test checks the operating features of the dictation trunk when connected to a dial controlled dictation machine using rotary dial or TOUCH-TONE station sets.

**B. Voice Controlled Dictation Machine Using Either Rotary Dial or TOUCH-TONE**

**Stations:** This test checks the operating features of the dictation trunk when connected to a voice controlled dictation machine using rotary dial or TOUCH-TONE station sets.

**C. Continuity Check of Trunk Operation at Telephone Company Connecting Block:**

This test verifies the relay contact operations associated with dialed or keyed digits independent of the customer-owned dictation equipment and wiring.

**5.05** The digits dialed or keyed by the dictator (station user) and functions performed at the dictation machine are shown in Table E.

**5.06** The dictation trunk lead designations and functions are shown in Table F.

**5.07 Lettered Steps:** A letter a, b, c, etc, added to a step number in Part 5 of this section indicates an action which may or may not be required depending on local conditions. The condition under which a lettered step or a series

TABLE F

DICTIONATION TRUNK LEAD DESIGNATION AND FUNCTION

LEAD DESIGNATION	FUNCTION
T1, R1	Attendant telephone
CT, CR	Telephone Company Test Line
TT, TR	Two Way Voice Circuit
S1, S2	Seizure
SS1, SS2	Start-Stop
C1, C2, C3, C4	Correction
PB1, PB2, PB3, PB4	Playback
PB5, C	End-of-playback from machine
E1, E2, E3, E4	End of message
B, G	Ready-for-use
PB, G2	Playback Key

of lettered steps should be made is given in the ACTION column, and all steps governed by the same condition are designated by the same letter within a test. Where a condition does not apply, all steps designated by that letter should be omitted.

**APPARATUS REQUIRED TO PERFORM TESTS**

**All Tests**

**5.08** 1011G handset (dial hand test set) equipped with a 2W38A cord assembly consisting of one W2CK cord, one 471A jack and one 310 plug.

**5.09** 2500-Type TOUCH-TONE telephone set, or equivalent, equipped with one 310 plug.



**SECTION 463-332-110**

**5.10** Blocking and insulating tools, as required.  
Use tools and apply, as covered in Section  
069-020-801.

No. 30 cord tips, and two P360690 fiber sliding  
sleeves.

**Test C**

**5.11** 81A test set equipped with a W2BA cord,  
two No. 2 test clips per Spec AT6928, two

**METHOD**

**STEP**

**ACTION**

**VERIFICATION**

**A. Dial Controlled Dictation Machine Using Either  
Rotary Dial or TOUCH-TONE Stations**

- |    |   |   |
|----|---|---|
| 1  | At dictation machine associated with dictation trunk selected for test—<br>Request dictation machine attendant to prepare the machine for operation. This should include the provision of a new recording medium. |   |
| 2  | At dictation trunk unit selected for test—<br>Observe B1 relay.   | If B1 relay nonoperated—<br>Trunk unit idle.<br>If B1 relay operated—<br>Trunk unit busy.   |
| 3a | If dictation trunk is equipped for rotary dial operation—<br>At idle dictation trunk unit selected for test—<br>Insert plug of handset into TEST & MB jack.   |   |
| 4a | At handset—<br>Operate switch to TALK.  | If option G provided—<br>Continuous audible ringing tone heard in handset receiver.<br>If option J, ZW, or ZG provided—<br>Dial tone heard in handset receiver. |
| 5b | If dictation trunk is equipped for TOUCH-TONE dial operation—<br>At idle dictation trunk unit selected for test—<br>Connect TOUCH-TONE station set to TEST & MB jack.   |   |
| 6b | At TOUCH-TONE station set—<br>Remove handset from switchhook.   | If option G provided—<br>Continuous audible ringing tone heard in handset receiver.<br>If option J, ZW, or ZG provided—<br>Dial tone heard in handset receiver. |
| 7  | Dial or key START digit 1.  | If option G provided—<br>Continuous audible ringing tone silenced.<br>If option J, ZW, or ZG provided—<br>Dial tone silenced.                                   |

STEP	ACTION	VERIFICATION
		At dictation machine associated with dictation trunk under test— Machine starts.
8	At handset— Speaking plainly into handset transmitter, count from 1 to 10 at a rate of about one number per second.	
9	Dial or key PLAYBACK digit 3.	Recorded numbers from about 6 to 10 should be heard, depending upon playback adjustment of the dictation machine.
10	Dial or key digit 1.	Playback terminated. Dictation machine now ready to record.
11	Speaking plainly into handset transmitter, count from 1 to 10 at a rate of about one number per second.	
12	Dial or key PLAYBACK digit 3 three times.	If options Q and R are provided— Recorded numbers from about 6 to 10 should be heard, depending upon playback adjustment of dictation machine. If options A and N are provided— Recorded numbers from about 1 to 10 should be heard depending upon playback adjustment of the dictation machine.
13	Dial or key digit 1.	Playback terminated. Machine now ready to record.
14	Dial or key CORRECTION digit 2.	At dictation machine— Correction indication marked on recording medium by machine. At handset— Momentarily burst of dial tone heard as an acknowledgment indicating that correction mark has been made.
15	Dial or key dictation machine attendant assistance digit 0.	At handset— Audible ringing tone heard. At dictation machine attendant telephone set— Ringer sounds.
16	At dictation machine attendant telephone set— Answer call.	Ringer tripped. At handset— Audible ringing tone silenced. Conversation satisfactory.
17	Repeat Steps 15 and 16 for digit 5.	

STEP	ACTION	VERIFICATION
18	Repeat Steps 15 and 16 for digit 6.	
19	Repeat Steps 15 and 16 for digit 7.	
20	Repeat Steps 15 and 16 for digit 8.	
21	Repeat Steps 15 and 16 for digit 9.	
22b	If dictation trunk is equipped for TOUCH-TONE dial operation— Repeat Steps 15 and 16 for digit #.	
23b	Repeat Steps 15 and 16 for digit *.	
24c	If attendant PLAYBACK (PB) key is provided— At dictation machine attendant telephone set— Operate (PB) key.	Approximately last 30 seconds of recording heard at handset and dictation machine attendant telephone set.
25	At dictation machine attendant telephone set— Disconnect.	
26	Dial or key digit 1.	Machine now ready to record.
27	At dictation trunk unit under test— Insulate contact 3B of F relay.	
28	Dial or key dictation machine attendant assistance digit 0.	At handset— Audible ringing tone heard.
29	Dial or key digit 1.	Audible ringing tone silenced, machine now ready to record.
30	At dictation trunk unit under test— Remove insulating tool from F relay.	
31	At interface connecting block— Remove B bridging clip from B lead.	At dictation trunk under test— S relay released. If trunk is arranged to call in dictation machine attendant and make trunk busy when dictation machine becomes unavailable to record (option B)— At handset— Audible ringing tone heard. At dictation machine attendant telephone set— Ringer sounds.
32d	If option B is provided— Dial or key digit 1.	Audible ringing tone still heard.
33	At interface connecting block— Replace B bridging clip on B lead.	At dictation trunk unit under test— S relay operated. At handset—

STEP	ACTION	VERIFICATION
		Audible ringing tone silenced. At dictation machine attendant telephone set— Ringer silenced.
34	Dial or key END OF DICTATION digit 4.	Reduced level dial tone is heard. At dictation machine— End of dictation indication marked on recording medium by dictation machine.
35	Dial or key STOP digit 1.	Reduced level dial tone is removed.
36a	If dictation trunk is equipped for rotary dial operation— Remove plug of handset for TEST & MB jack.	
37b	If dictation trunk is equipped for TOUCH-TONE dial operation— At dictation trunk— Remove TOUCH-TONE station set from TEST & MB jack.	
38	Advise dictation machine attendant that testing has been completed.	
<b>B. Voice Controlled Dictation Machine Using Either Rotary Dial or TOUCH-TONE Stations</b>		
1	At voice controlled dictation machine associated with dictation trunk selected for test— Request dictation machine attendant to prepare the machine for operation. This should include the provision of a new recording medium.	
2	At dictation trunk unit selected for test— Observe B1 relay.	If B1 relay nonoperated— Trunk unit idle. If B1 relay operated— Trunk unit busy.
3a	If dictation trunk is equipped for rotary dial operation— At idle dictation trunk unit selected for test— Insert plug of handset into TEST & MB jack.	
4a	At handset— Operate switch to TALK.	“Ready” tone heard in handset as indication machine is ready to record.
5b	If dictation trunk is equipped for TOUCH-TONE dial operation— At idle dictation trunk unit selected for test— Connect TOUCH-TONE station set to TEST & MB jack.	

STEP	ACTION	VERIFICATION
6b	At TOUCH-TONE station set— Remove handset from switchhook.	"Ready" tone heard in handset as indication machine is ready to record.
7	At handset— Speaking plainly into handset transmitter, count from 1 to 10 at a rate of about one number per second.	"Ready" tone removed during counting. At end of counting— "Ready" tone heard in handset receiver.
8	Dial or key PLAYBACK digit 3.	"Ready" tone removed. Recorded numbers from about 6 to 10 should be heard, depending upon playback adjustment of the dictation machine. "Ready" tone heard.
9	Speaking plainly into handset transmitter, count from 1 to 10 at a rate of about one number per second.	"Ready" tone removed during counting. At end of counting— "Ready" tone heard in handset receiver.
10	Dial or key PLAYBACK digit 3 three times.	If options Q and R are provided— Recorded numbers from about 6 to 10 should be heard, depending upon playback adjustment of the dictation machine. If options A and N are provided— Recorded numbers from about 1 to 10 should be heard depending upon playback adjustment of the dictation machine. At end of playback— "Ready" tone heard in handset receiver.
11	Dial or key CORRECTION digit 2.	At dictation machine— Correction indication marked on recording medium by machine. At handset— Momentary burst of dial tone heard as acknowledgment indicating that correction mark has been made. After acknowledgment tone is heard— Uninterrupted "ready" tone heard in handset receiver.
12	Dial or key dictation machine attendant assistance digit 0.	At handset— "Ready" tone removed. Audible ringing tone heard. At dictation machine attendant telephone set— Ringer sounds.
13	At dictation machine attendant telephone set— Answer call.	Ringer tripped. At handset— Audible ringing tone silenced. Conversation satisfactory.

STEP	ACTION	VERIFICATION
14c	If attendant PLAYBACK (PB) key is provided— At dictation machine attendant telephone set— Operate (PB) key.	Approximately last 30 seconds of recording heard at handset and dictation machine attendant telephone set.
15	At dictation machine attendant telephone set— Disconnect.	At handset— "Ready" tone heard in handset receiver.
16	At dictation trunk unit under test— Insulate contact 3B of F relay.	At handset— "Ready" tone removed. Audible ringing tone heard.
17	Dial or key dictation machine attendant assistance digit 0.	At handset— "Ready" tone removed. Audible ringing tone silenced. "Ready" tone heard in handset receiver.
18	Dial or key digit 1.	At dictation trunk unit under test— Remove insulating tool from F relay.
19	At dictation trunk unit under test— Remove B bridging clip from B lead.	At dictation trunk unit under test— S relay released. If trunk is arranged to call in dictation machine attendant and make trunk busy when dictation machine becomes unavailable to record (option B)— At handset— "Ready" tone removed. Audible ringing tone heard. At dictation machine attendant telephone set— Ringer sounds.
20	If option B is provided— Dial or key digit 1.	Audible ringing tone still heard.
21d	At interface connecting block— Replace B bridging clip on B lead.	At dictation trunk unit under test— S relay operated. At handset— Audible ringing tone silenced. "Ready" tone heard in handset receiver. At dictation machine attendant telephone set— Ringer silenced.
22	Dial or key END OF DICTATION digit 4.	Momentary burst of dial tone heard in handset receiver as an acknowledgment tone. At dictation machine— End of dictation marked on recording medium by dictation machine. "Ready" tone heard in handset receiver.

STEP	ACTION	VERIFICATION
24a	If dictation trunk is equipped for rotary dial operation— Remove handset plug from TEST & MB jack.	
25b	If dictation trunk is equipped for TOUCH-TONE dial operation— At dictation trunk— Remove TOUCH-TONE station set from TEST & MB jack.	
26	Advise dictation machine attendant that testing has been completed.	
<b>C. Continuity Check of Trunk Operation At Telephone Company Connecting Block</b>		
1	At dictation trunk unit selected for test— Observe B1 relay.	If B1 relay nonoperated— Trunk unit idle. If B1 relay operated— Trunk unit busy.
2a	If dictation trunk unit selected for test is equipped for rotary dial operation— At interface connecting block— Remove B bridging clips from B and G leads. Provide strap across B and G leads at B and G terminals on Telephone Company side of interface connecting block. Connect handset to CT, CR terminals.	At dictation trunk unit selected for test— S relay operated.
3b	If dictation trunk unit selected for test is equipped for TOUCH-TONE dial operation— At interface connecting block— Remove B bridging clips from B and G leads. Provide strap across B and G leads at B and G terminals on Telephone Company side of interface connecting block. Connect TOUCH-TONE station set to CT, CR terminals.	
4	At dictation trunk unit under test— Operate T key.	
5	At dictation machine associated with dictation trunk unit under test— Disconnect dictation machine from ac power source.	
6a	If dictation trunk unit selected for test is equipped for rotary dial operation— Operate switch to TALK.	

STEP	ACTION	VERIFICATION
7b	If dictation trunk unit selected for test is equipped for TOUCH-TONE dial operation— Remove handset from switchhook.	

**Seizure**

8	At interface connecting block— Remove B bridging clips from leads S1 and S2.	
9	At 81A test set— Operate switch to position C.	
10	Connect 81A set across S1 and S2 leads.	At 81A test set— Buzzer sounds.
11	Disconnect 81A test set from S1 and S2 leads.	81A test set— Buzzer silenced.
12	At interface connecting block— Replace B bridging clips on S1 and S2 leads.	

**Start—Stop (dial control provided only)**

13	Remove B bridging clips from SS1 and SS2 leads at interface connecting block.	
14	Connect 81A test set across SS1 and SS2 leads.	
15	Dial or key START digit 1.	At 81A test set— Buzzer sounds.
16	Dial or key STOP digit 1.	At 81A test set— Buzzer silenced.
17	Disconnect 81A test set from SS1 and SS2 leads.	
18	Replace B bridging clips on SS1 and SS2 leads at interface connecting block.	

**Correction or Dial 2 to Reduce Playback**

19	Remove B bridging clips from C1 and C2 leads at interface connecting block.	
20	Remove B bridging clips from C3 and C4 leads at interface connecting block.	
21	Connect 81A test set across C1 and C2 leads.	



<b>STEP</b>	<b>ACTION</b>	<b>VERIFICATION</b>
22	Dial or key digit 2.	At 81A test set— Buzzer sounds momentarily.
23	Disconnect 81A test set from C1 and C2 leads.	
24	Replace B bridging clips on C1 and C2 leads at interface connecting block.	
25	Connect 81A test set across C3 and C4 leads.	
26	Dial or key digit 2.	At 81A test set— Buzzer sounds momentarily.
27	Disconnect 81A test set from C3 and C4 leads.	
28	Replace B bridging clips on C3 and C4 leads at interface connecting block.	

**End of Dictation**

29	Remove B bridging clips from E1 and E2 leads at interface connecting block.	
30	Remove B bridging clips from E3 and E4 leads at interface connecting block.	
31	Connect 81A test set across E1 and E2 leads.	
32	Dial or key END OF DICTATION digit 4.	At 81A test set— Buzzer sounds momentarily.
33	Disconnect 81A test set from E1 and E2 leads.	
34	Replace B bridging clips on E1 and E2 leads at interface connecting block.	
35	Connect 81A test set across E3 and E4 leads.	At 81A test set— Buzzer sounds.
36	Dial or key END OF DICTATION digit 4.	At 81A test set— Buzzer silenced momentarily.
37	Disconnect 81A test set from E3 and E4 leads.	
38	Replace B bridging clips on E3 and E4 leads at interface connecting block.	

**Playback**

39	Remove B bridging clips from C lead at interface connecting block.	
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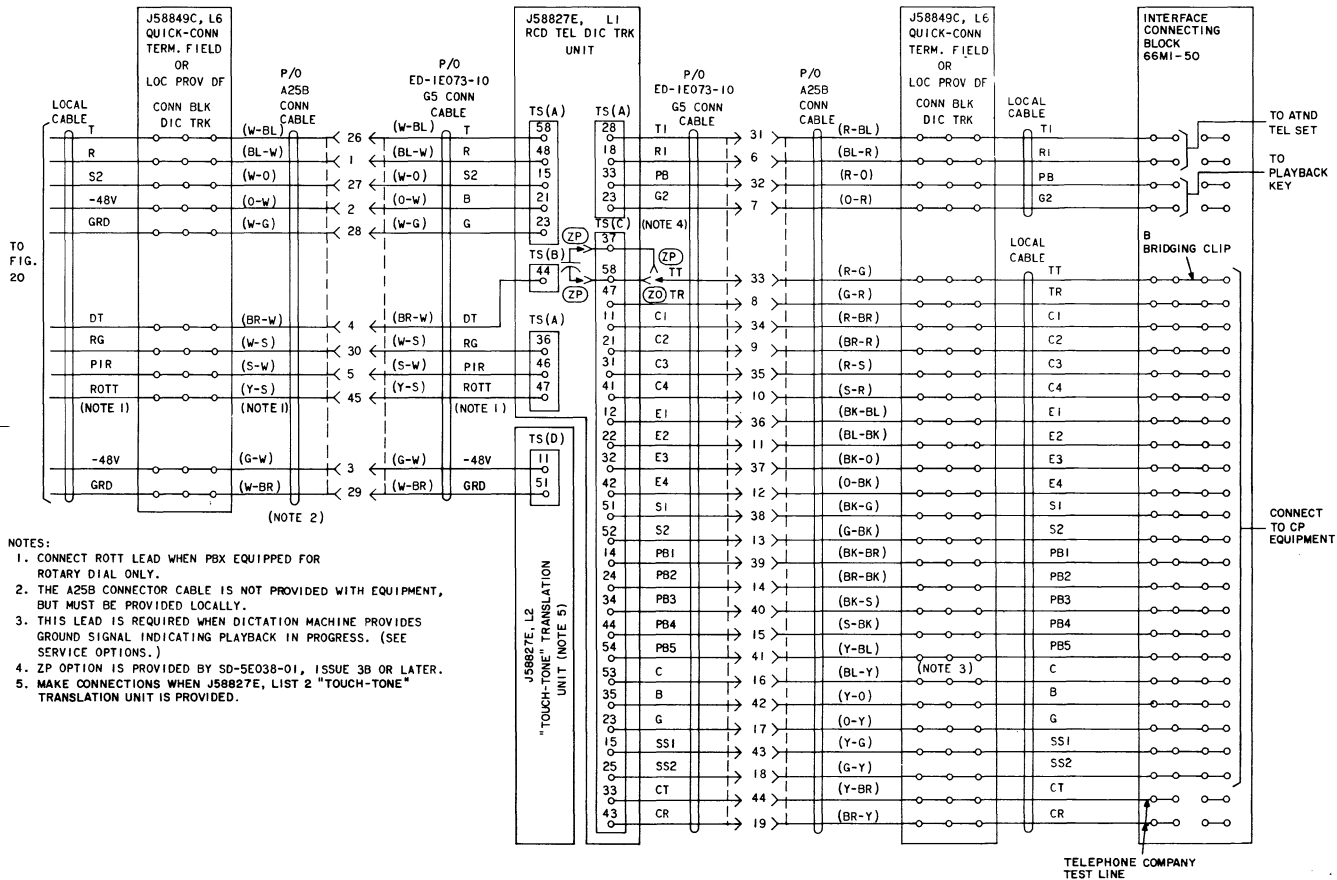
STEP	ACTION	VERIFICATION
40	Provide strap across C and G leads at interface connecting block.	
41	Remove B bridging clips from PB1 and PB2 leads at interface connecting block.	
42	Connect 81A test set across PB1 and PB2 leads.	
43	Dial or key PLAYBACK digit 3.	At 81A test set— Buzzer sounds momentarily.
44	Disconnect 81A test set from PB1 and PB2 leads.	
45	Replace B bridging clips on PB1 and PB2 leads at interface connecting block.	
46c	If dial control is provided— Remove B bridging clips from SS1 and SS2 leads at interface connecting block.	
47	Connect 81A test set across SS1 and SS2 leads.	
48	Dial or key START-STOP digit 1.	At 81A test set— Buzzer sounds.
49	Dial or key PLAYBACK digit 3.	At 81A test set— Buzzer silenced.
50	Disconnect 81A test set from SS1 and SS2 leads.	
51	Replace B bridging clips on SS1 and SS2 leads at interface connecting block.	
52d	If option A, Q, or R is provided— Dial or key digit 1.	
53e	If option N is provided— Momentarily remove strap across leads C and G at interface connecting block.	
54	Remove B bridging clips from PB1 and PB3 leads at interface connecting block.	
55	Connect 81A test set across PB1 and PB3 leads.	
56	Dial or key PLAYBACK digit 3.	At 81A test set— Buzzer sounds.

STEP	ACTION	VERIFICATION
57	Disconnect 81A test set from PB1 and PB3 leads.	At 81A test set— Buzzer silenced.
58	Replace B bridging clips on PB1 and PB3 leads at interface connecting block.	
59d	If option A, Q, or R is provided— Dial or key digit 1.	
60e	If option N is provided— Momentarily remove strap across leads C and G at interface connecting block.	
61	Remove B bridging clips from SS1 and PB4 leads at interface connecting block.	
62	Connect 81A test set across SS1 and PB4 leads.	
63	Dial or key PLAYBACK digit 3.	At 81A test set— Buzzer sounds.
64	Disconnect 81A test set from SS1 and PB4 leads.	At 81A test set— Buzzer silenced.
65	Replace B bridging clips on SS1 and PB4 leads at interface connecting block.	
66	Remove strap across C and G leads at interface connecting block.	
67	Replace B bridging clips on C lead at interface connecting block.	
<b>Idle Condition</b>		
68	Remove strap across G and B leads at interface connecting block.	At dictation trunk unit— S relay released.
69	Replace B bridging clips on G and B leads at interface connecting block.	
70a	If dictation trunk unit selected for test is equipped for rotary dial operation— Disconnect handset from CT, CR terminals.	
71b	If dictation trunk unit selected for test is equipped for TOUCH-TONE dial operation— Disconnect TOUCH-TONE station set from CT, CR terminals.	

STEP	ACTION	VERIFICATION
72	At dictation trunk unit— Restore T key.	
<b>6. CONNECTIONS</b>		
<b>6.01</b>	Operational Features are shown in Table B, Playback Feature Groups are shown in Table C, and switching system options are shown in Table D.	<b>6.04</b> Connections between the Recorded Telephone Dictation Trunk Units and all other switching systems are shown in Fig. 8 through 19.
<b>6.02</b>	Table G shows the installer provided straps required to implement the features and options.	<b>6.05</b> Connections between the Recorded Telephone Dictation Trunk Unit and the interface connecting block are shown in Fig. 21.
<b>6.03</b>	Connections for Recorded Telephone Dictation Trunk Units when used with an 800A PBX are shown in Fig. 7 and 20.	<b>6.06</b> Connections between the TOUCH-TONE Translation Unit and the TOUCH-TONE receiver are shown in Fig. 22.
		<b>6.07</b> Interconnections between the Recorded Telephone Dictation Trunk Unit and the TOUCH-TONE Translation Unit are shown in Fig. 23.

**TABLE G  
STRAPS REQUIRED TO PROVIDE OPTIONS**

TO PROVIDE OPTION	ADD STRAPS ON J58827E				TO PROVIDE OPTION	ADD STRAPS ON J58827E			
	LIST 1			LIST 3		LIST 1			LIST 3
	TS(A)	TS(B)	TS(C)	TS(E)		TS(A)	TS(B)	TS(C)	TS(E)
A		46-56	13-14		W	11-21	18-57		
B	13-23	26-36					37-47		
E & ZB		45-55 35-55	48-58 28-38 18-57 47-57				17-27		
E & ZC		45-55 35-55	18-28		Y	21-31			
F & ZB		42-52 35-55 45-55	48-58 28-38 18-57 47-57		Z				11-21
					ZA	13-23			
					ZD	NO STRAP REQUIRED			
					ZE	21-41			
F & ZC		42-52 35-55 45-55	18-28		ZF				16-26
					ZG	45-57			
G	46-56				ZH	11-21	37-47		
J	47-57						18-57		
K	NO STRAP REQUIRED						17-27		
M	46-56				ZI		47-57		
N		38-28 46-56	13-14				15-25		
Q		48-58			ZJ	24-34		17-27	
R		48-58			ZK	15-54 34-44			
S	35-45						ZL	NO STRAP REQUIRED	
V		15-54 47-57 34-44 24-34 23-33			ZM	25-55 14-24			
					ZQ	STRAPS SHOP INSTALLED			
					ZW	57-47			



- NOTES:
1. CONNECT ROTT LEAD WHEN PBX EQUIPPED FOR ROTARY DIAL ONLY.
  2. THE A25B CONNECTOR CABLE IS NOT PROVIDED WITH EQUIPMENT, BUT MUST BE PROVIDED LOCALLY.
  3. THIS LEAD IS REQUIRED WHEN DICTATION MACHINE PROVIDES GROUND SIGNAL INDICATING PLAYBACK IN PROGRESS. (SEE SERVICE OPTIONS.)
  4. ZP OPTION IS PROVIDED BY SD-5E038-01, ISSUE 3B OR LATER.
  5. MAKE CONNECTIONS WHEN J58827E, LIST 2 "TOUCH-TONE" TRANSLATION UNIT IS PROVIDED.

Fig. 7—Connections for Recorded Telephone Dictation Trunk Circuit When Used With 800A PBX

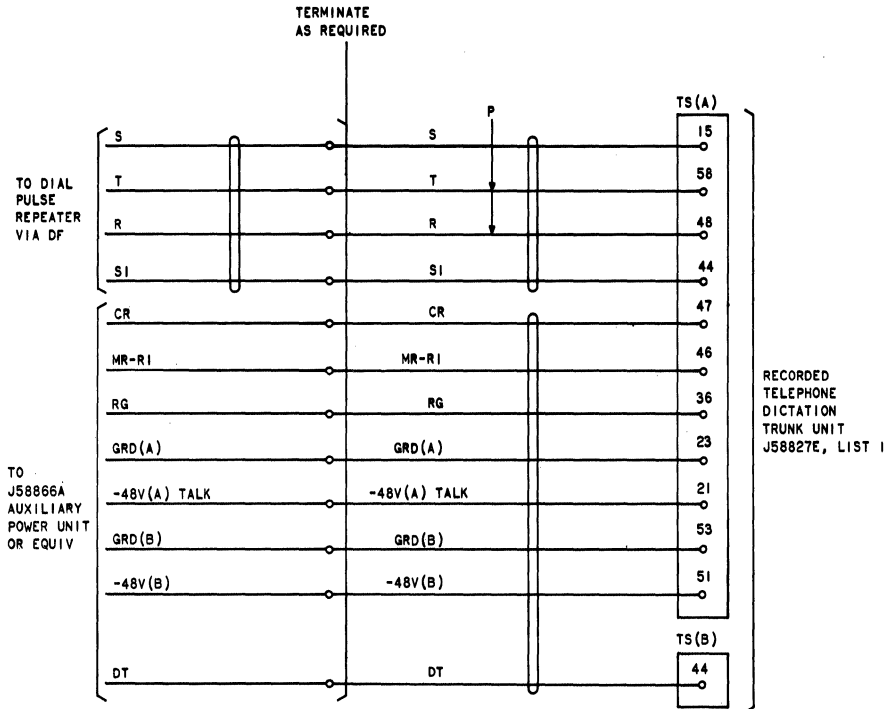
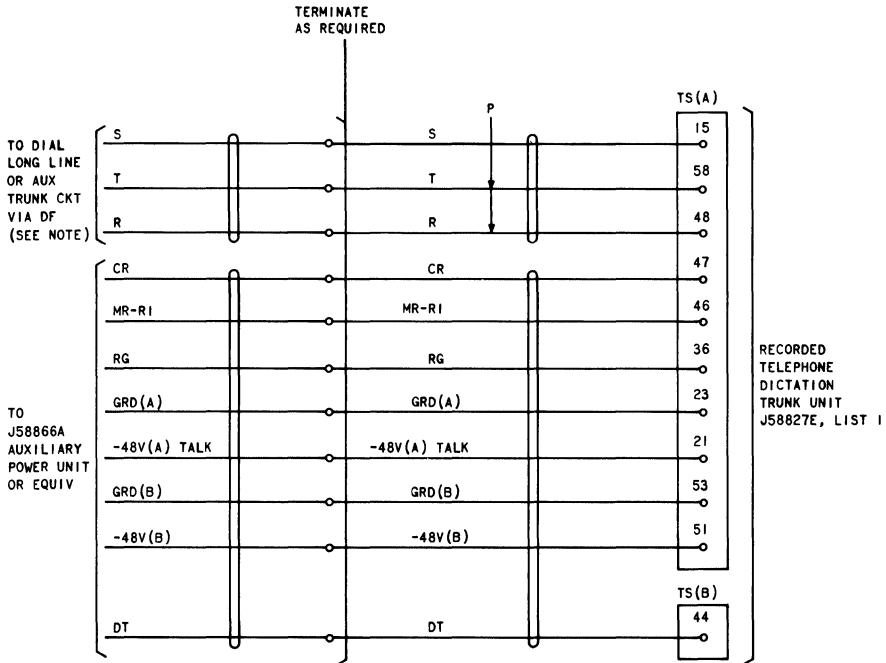


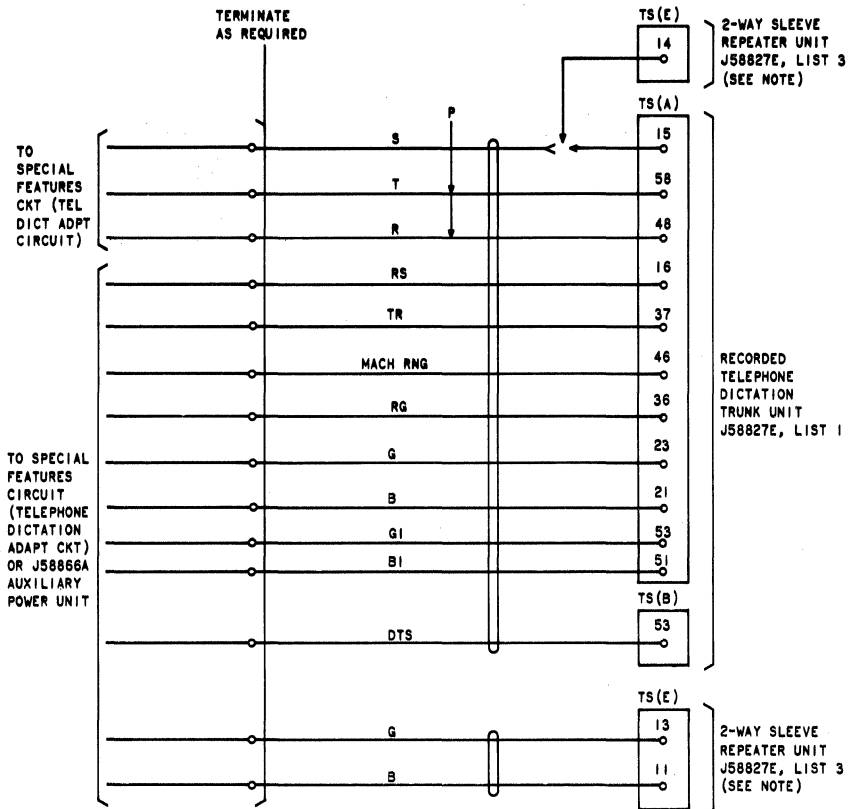
Fig. 8—Connections for Recorded Telephone Dictation Trunk Unit When Used With No. 1 ESS CENTREX



NOTE:  
 WHEN THIS CIRCUIT CONNECTS TO A NO. 5 CROSSBAR CENTREX AND THE EXTERNAL CIRCUIT LOOP EXCEEDS 1500Ω, A DIAL LONG LINE CIRCUIT SD-96234-01 (TYPICAL) MUST BE PROVIDED AT THE NO. 5 CROSSBAR CENTREX.

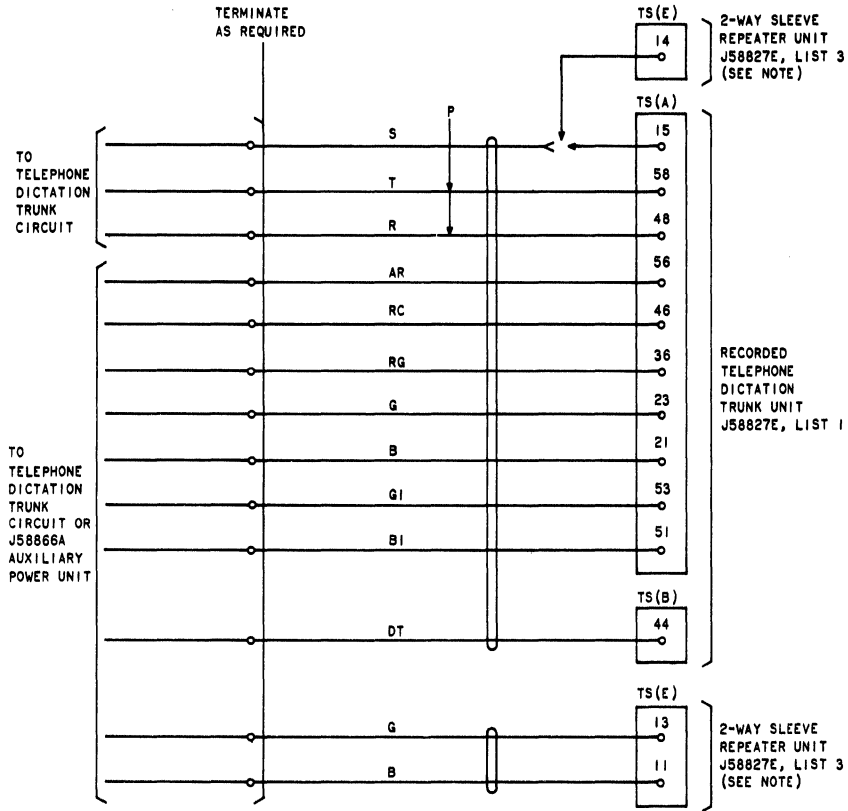
**Fig. 9—Connections for Recorded Telephone Dictation Trunk Unit When Used With No. 5 Crossbar CENTREX**





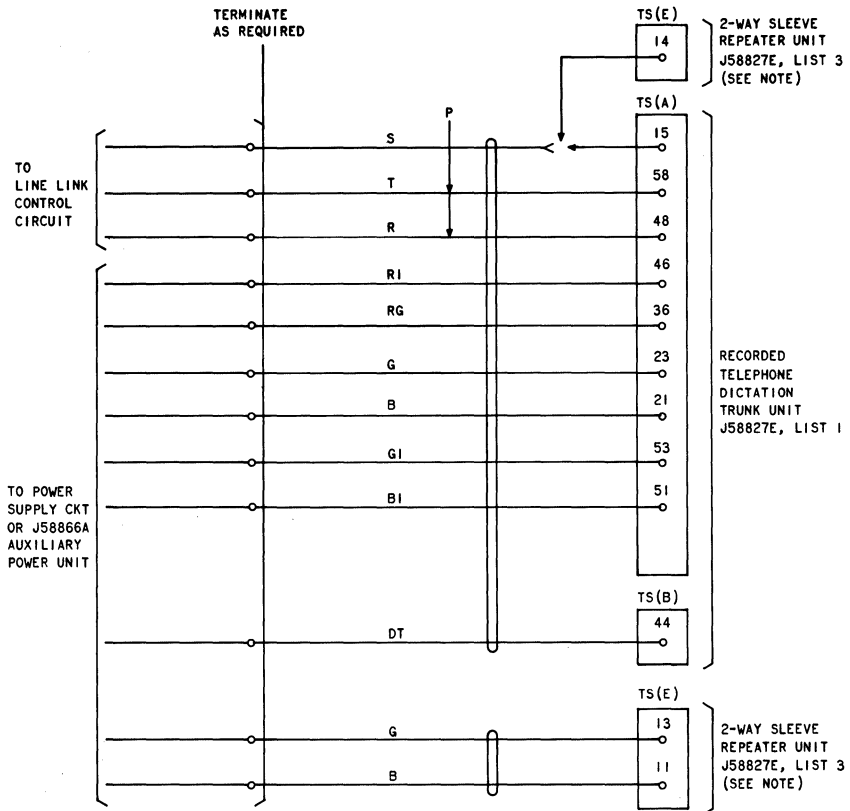
NOTE:  
 CONNECTION TO THE J58827E, LIST 3 2-WAY SLEEVE REPEATER IS REQUIRED WHEN THE RECORDED TELEPHONE DICTATION TRUNK IS NOT LOCATED AT THE SWITCHING EQUIPMENT AND SLEEVE CONDUCTOR RESISTANCE THROUGH THE SWITCH TRAIN BETWEEN THE RECORDED TELEPHONE DICTATION TRUNK CIRCUIT AND LINE FINDER IS MORE THAN 5 OHMS (FOR SXS TYPE PBX'S) OR CORD SWBD UNIT IS PROVIDED (SEE FIG. 19).

Fig. 10—Connections Between Recorded Telephone Dictation Trunk Circuit and No. 101, 2A, 3A, 4A Electronic Switching System



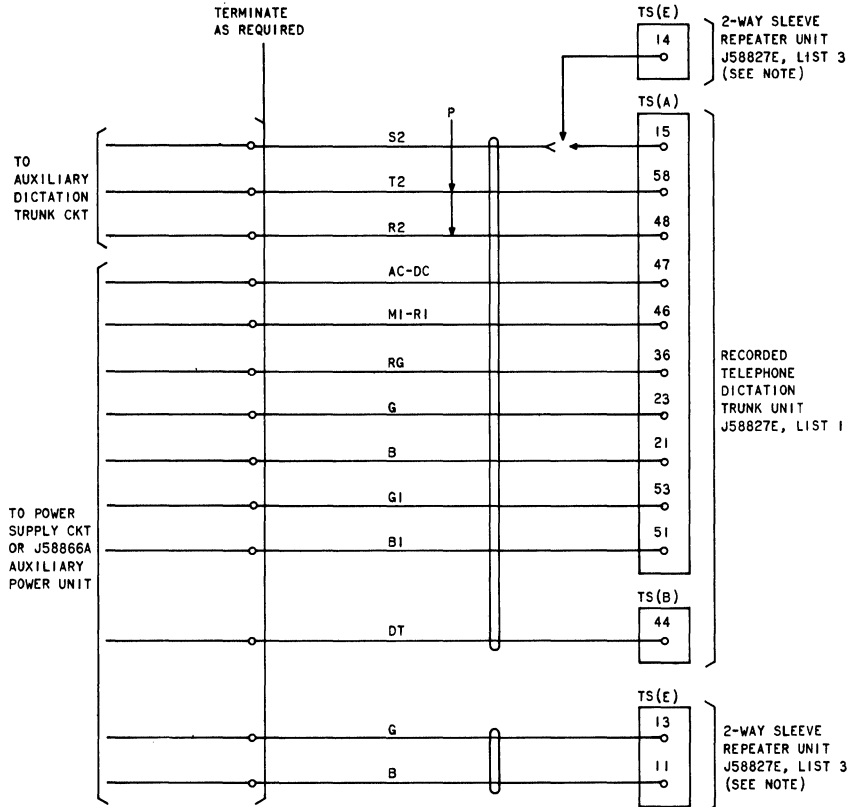
NOTE:  
 CONNECTION TO THE J58827E, LIST 3 2-WAY SLEEVE REPEATER IS REQUIRED WHEN THE RECORDED TELEPHONE DICTATION TRUNK IS NOT LOCATED AT THE SWITCHING EQUIPMENT AND SLEEVE CONDUCTOR RESISTANCE THROUGH THE SWITCH TRAIN BETWEEN THE RECORDED TELEPHONE DICTATION TRUNK CIRCUIT AND LINE FINDER IS MORE THAN 5 OHMS (FOR SXS TYPE PBX'S) OR CORD SWBD UNIT IS PROVIDED (SEE FIG. 19).

Fig. 11—Connections Between Recorded Telephone Dictation Trunk Circuit and No. 101, 1A Electronic Switching System



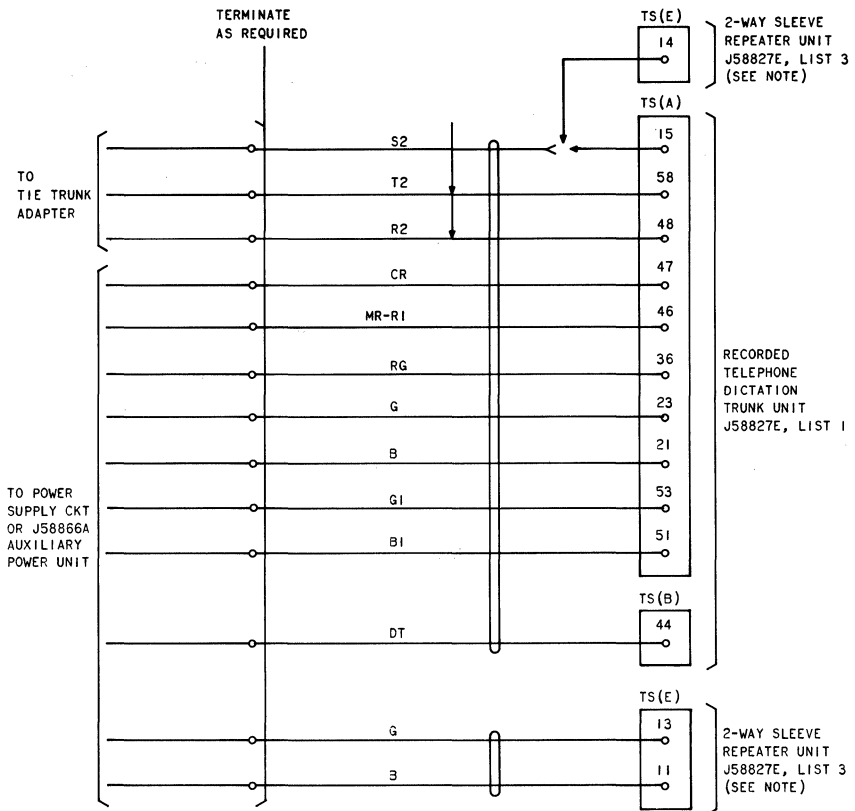
NOTE:  
 CONNECTION TO THE J58827E, LIST 3 2-WAY SLEEVE REPEATER IS REQUIRED WHEN THE RECORDED TELEPHONE DICTATION TRUNK IS NOT LOCATED AT THE SWITCHING EQUIPMENT AND SLEEVE CONDUCTOR RESISTANCE THROUGH THE SWITCH TRAIN BETWEEN THE RECORDED TELEPHONE DICTATION TRUNK CIRCUIT AND LINE FINDER IS MORE THAN 5 OHMS (FOR SXS TYPE PBX'S) OR CORD SWBD UNIT IS PROVIDED (SEE FIG. 19).

Fig. 12—Connections Between Recorded Telephone Dictation Trunk Circuit and No. 400 Switching System



NOTE:  
 CONNECTION TO THE J58827E, LIST 3 2-WAY SLEEVE REPEATER IS REQUIRED WHEN THE RECORDED TELEPHONE DICTATION TRUNK IS NOT LOCATED AT THE SWITCHING EQUIPMENT AND SLEEVE CONDUCTOR RESISTANCE THROUGH THE SWITCH TRAIN BETWEEN THE RECORDED TELEPHONE DICTATION TRUNK CIRCUIT AND LINE FINDER IS MORE THAN 5 OHMS (FOR SXS TYPE PBX'S) OR CORD SWBD UNIT IS PROVIDED (SEE FIG. 19).

Fig. 13—Connections Between Recorded Telephone Dictation Trunk Circuit and 757A PBX



NOTE:  
CONNECTION TO THE J58827E, LIST 3 2-WAY SLEEVE REPEATER IS REQUIRED WHEN THE RECORDED TELEPHONE DICTATION TRUNK IS NOT LOCATED AT THE SWITCHING EQUIPMENT AND SLEEVE CONDUCTOR RESISTANCE THROUGH THE SWITCH TRAIN BETWEEN THE RECORDED TELEPHONE DICTATION TRUNK CIRCUIT AND LINE FINDER IS MORE THAN 5 OHMS (FOR SXS TYPE PBX'S) OR CORD SWBD UNIT IS PROVIDED (SEE FIG. 19).

**Fig. 14—Connections Between Recorded Telephone Dictation Trunk Circuit and 756A PBX**

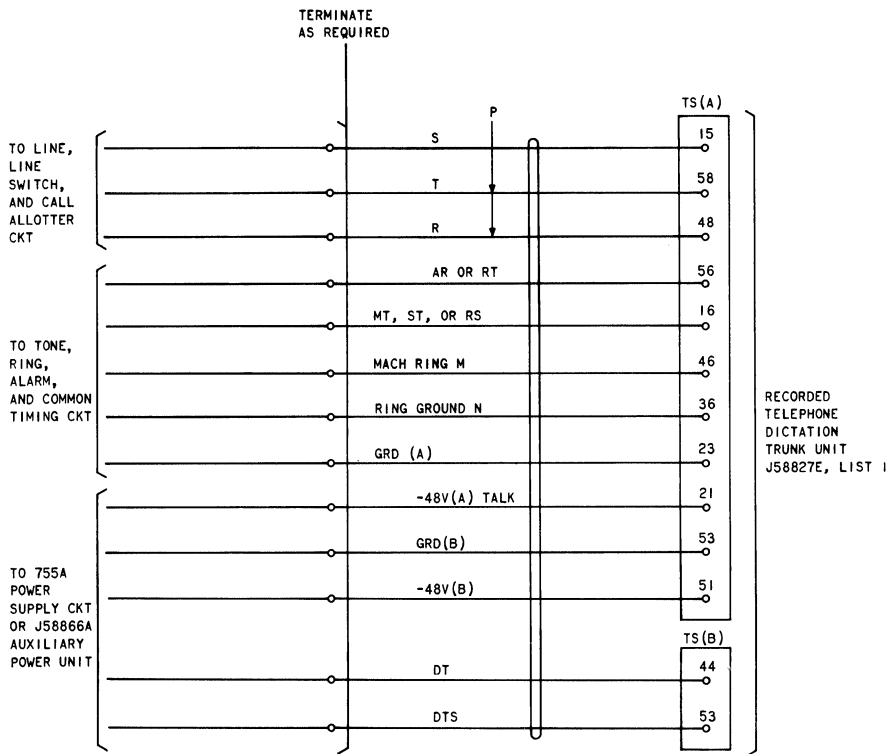
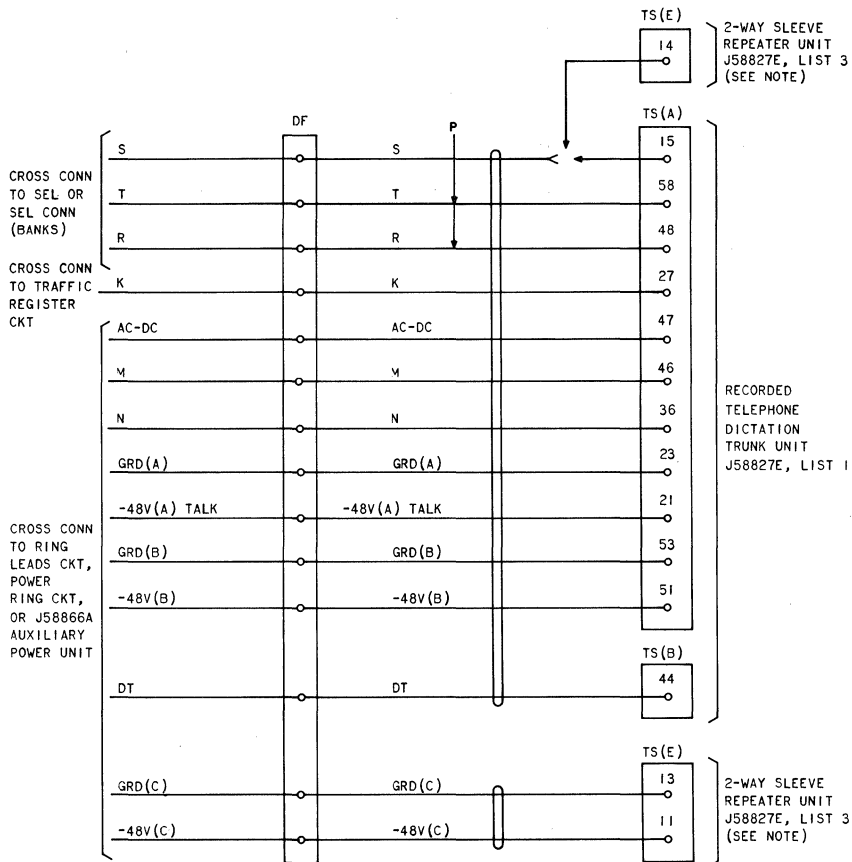
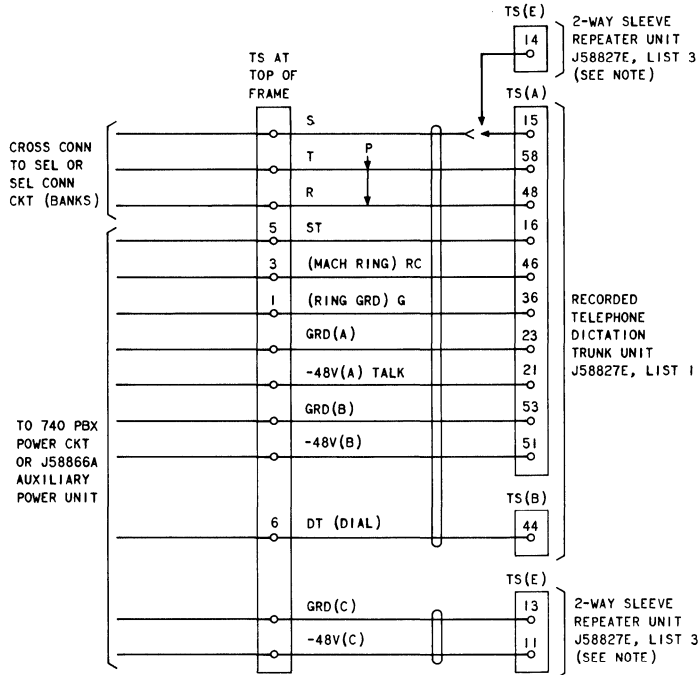


Fig. 15—Connections Between Recorded Telephone Dictation Trunk Circuit and 755A PBX



NOTE:  
 CONNECTION TO THE J58827E, LIST 3 2-WAY SLEEVE REPEATER IS REQUIRED WHEN THE RECORDED TELEPHONE DICTATION TRUNK IS NOT LOCATED AT THE SWITCHING EQUIPMENT AND SLEEVE CONDUCTOR RESISTANCE THROUGH THE SWITCH TRAIN BETWEEN THE RECORDED TELEPHONE DICTATION TRUNK CIRCUIT AND LINE FINDER IS MORE THAN 5 OHMS (FOR SXS TYPE PBX'S) OR CORD SWBD UNIT IS PROVIDED (SEE FIG. 19).

Fig. 16—Connections Between Recorded Telephone Dictation Trunk Circuit and 701A, 701B, 711A, and 711B PBXs

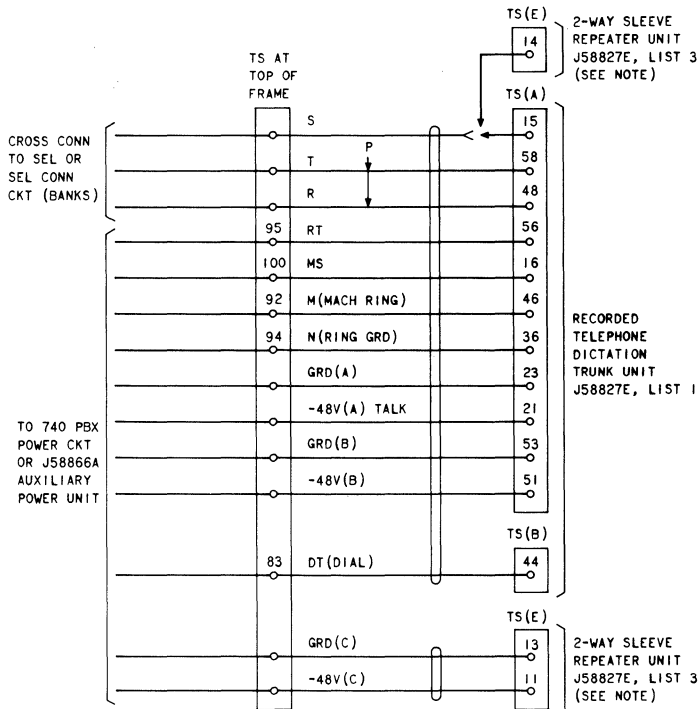


NOTE:

CONNECTION TO THE J58827E, LIST 3 2-WAY SLEEVE REPEATER IS REQUIRED WHEN THE RECORDED TELEPHONE DICTATION TRUNK IS NOT LOCATED AT THE SWITCHING EQUIPMENT AND SLEEVE CONDUCTOR RESISTANCE THROUGH THE SWITCH TRAIN BETWEEN THE RECORDED TELEPHONE DICTATION TRUNK CIRCUIT AND LINE FINDER IS MORE THAN 5 OHMS (FOR SXS TYPE PBX'S) OR CORD SWBD UNIT IS PROVIDED (SEE FIG. 19).

Fig. 17—Connections Between Recorded Telephone Dictation Trunk Circuit and 740A, 740B, and 740C PBXs

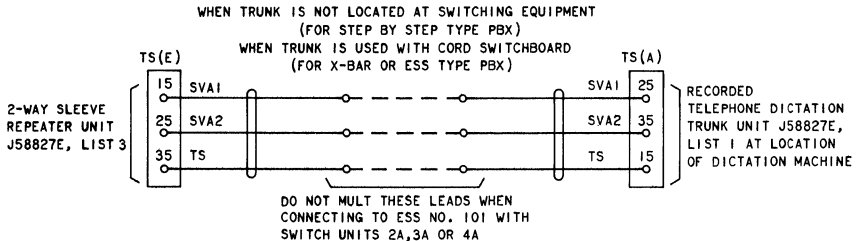
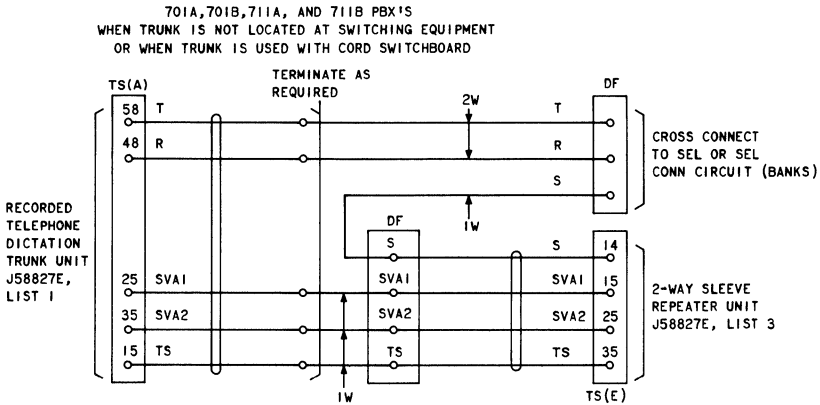
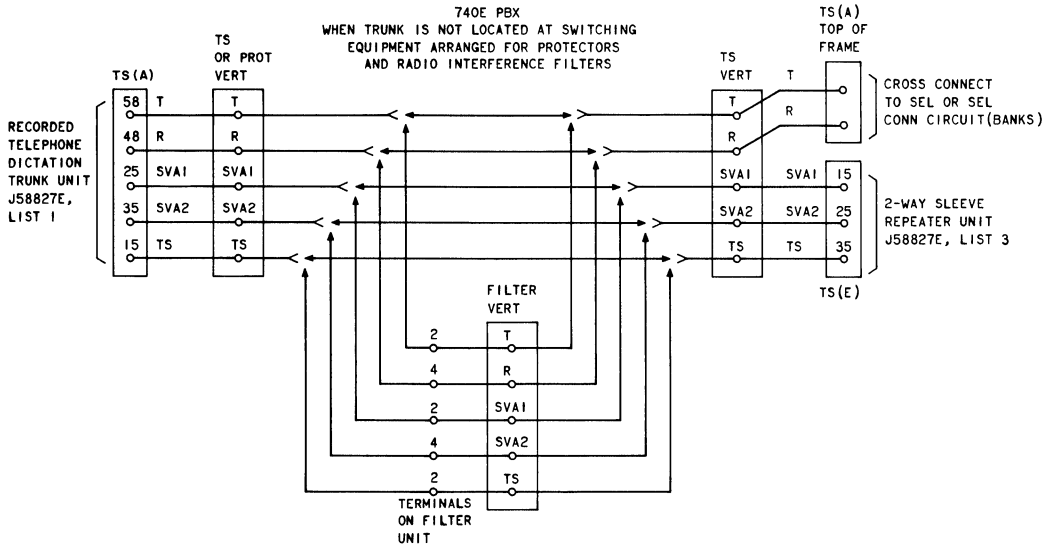




NOTE:

CONNECTION TO THE J58827E, LIST 3 2-WAY SLEEVE REPEATER IS REQUIRED WHEN THE RECORDED TELEPHONE DICTATION TRUNK IS NOT LOCATED AT THE SWITCHING EQUIPMENT AND SLEEVE CONDUCTOR RESISTANCE THROUGH THE SWITCH TRAIN BETWEEN THE RECORDED TELEPHONE DICTATION TRUNK CIRCUIT AND LINE FINDER IS MORE THAN 5 OHMS (FOR SXS TYPE PBX'S) OR CORD SWBD UNIT IS PROVIDED (SEE FIG. 19).

Fig. 18—Connections Between Recorded Telephone Dictation Trunk Circuit and 740E PBX



**Fig. 19—Connection of SVA1, SVA2, and TS Leads When J58827E, List 3 2-Way Sleeve Repeater Unit is Provided**

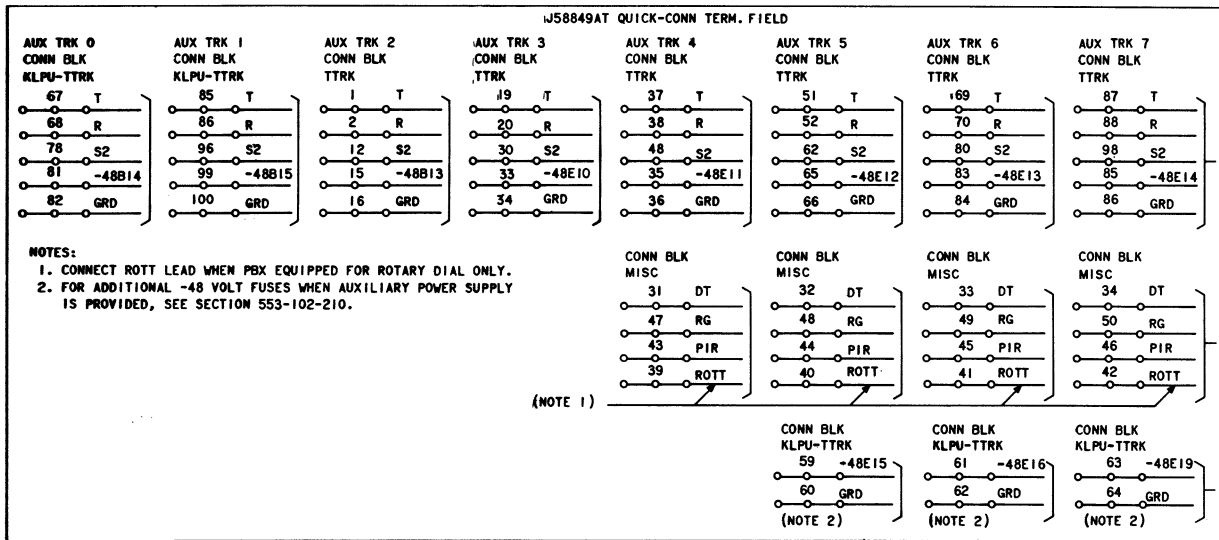


Fig. 20—Connections from Recorded Telephone Dictation Trunk Circuit to 800A PBX Quick-Connect Field

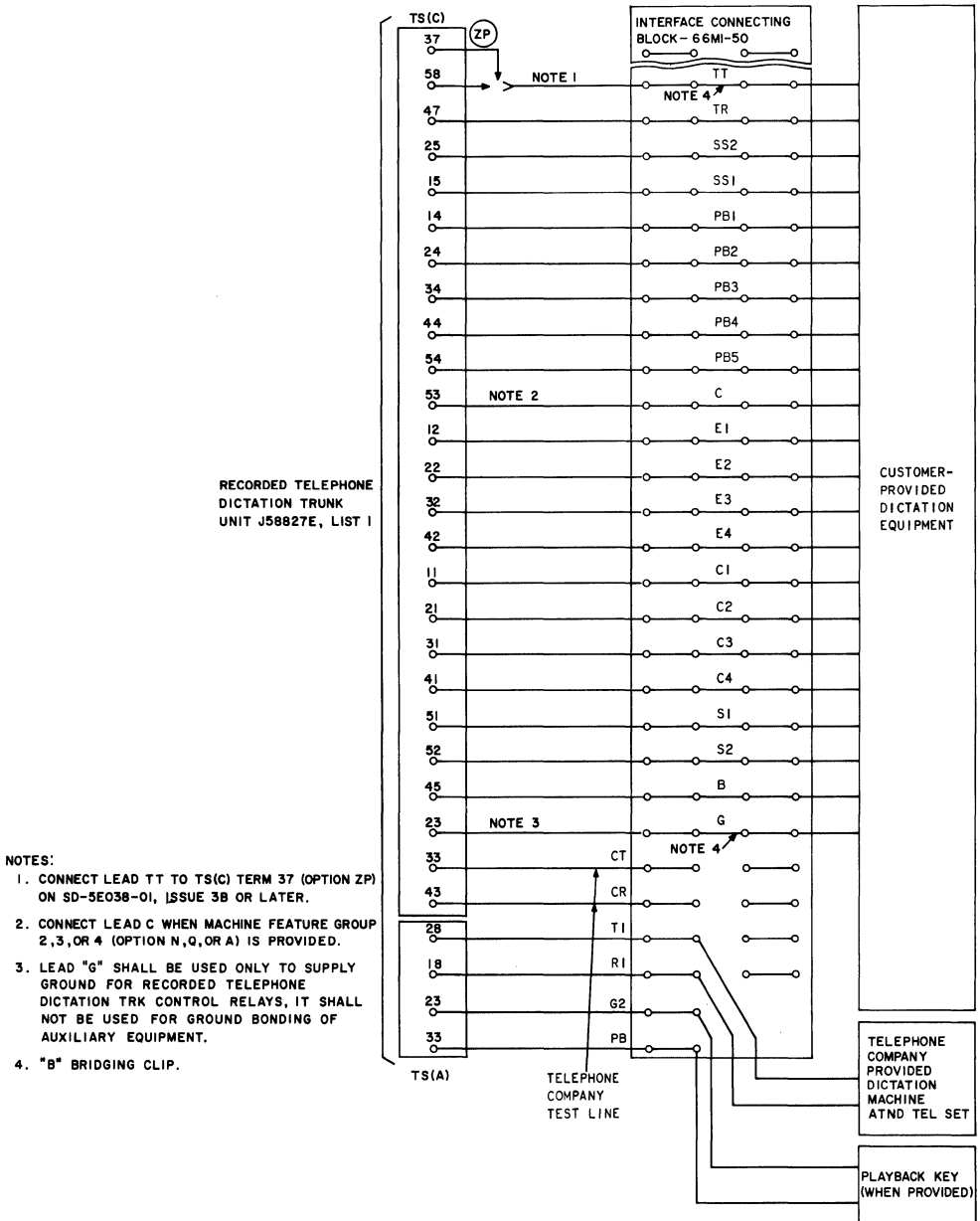
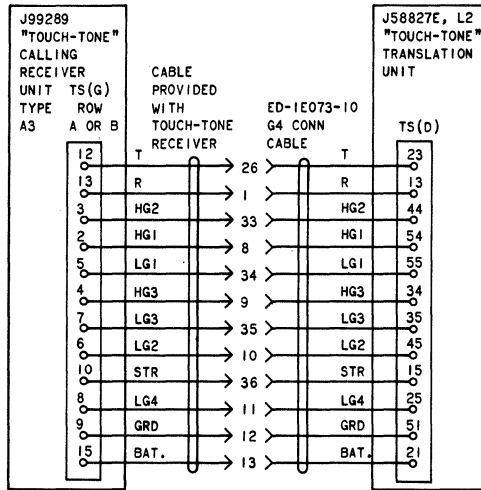
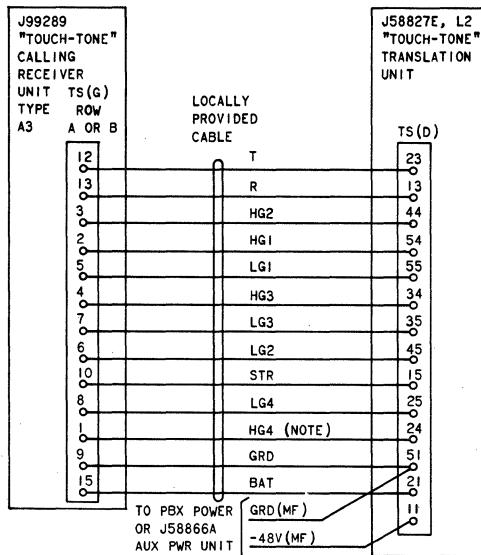


Fig. 21—Connections from Recorded Telephone Dictation Trunk Unit to Interface Connecting Block for Connection to CP Equipment, Telephone Company-Provided Atnd Tel Set, and Playback Key



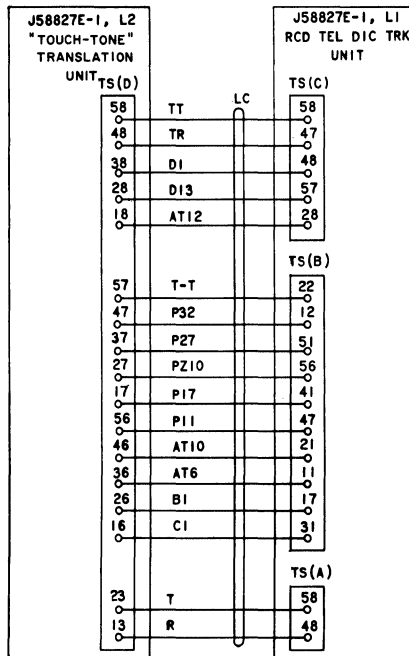
WHEN USED WITH 800A PBX



WHEN USED WITH OTHER PBX'S

NOTE:  
WHEN 4 X 4 "TOUCH-TONE" OPERATION IS PROVIDED, LEAD HG4 MUST ALSO BE CONNECTED.

Fig. 22—Connections Between TOUCH-TONE Translation Unit and TOUCH-TONE Receiver when TOUCH-TONE Operation is Provided



**Fig. 23—Interconnections Between Recorded Telephone Dictation Trunk Unit and TOUCH-TONE Translation Unit when TOUCH-TONE Operation is Provided**

## **VOICE CONNECTING ARRANGEMENT DCW**

### **J58824CD INTERFACE TRUNK UNIT**

#### **1. GENERAL**

**1.01** This section provides identification, installation, operation, connecting, and maintenance information for Voice Connecting Arrangement DCW (see Fig. 1) when used with the 701A, B, 711A, B, 740E, 756A, 757A, 800A PBX Systems, No. 5 crossbar, No. 1 and No. 101 Electronic Switching Systems, and the No. 400 Switching System to provide interface connections between Bell System and customer-provided (CP) equipment. The equipment used to implement Voice Connecting Arrangement DCW is determined by the requirements of the specific installation (see Table A and Part 2, ORDERING GUIDE). A general description of the SD-66926-01 interface trunk circuit used for this connecting arrangement is covered in Section 981-261-100.

**1.02** This section provides information formerly provided in Sections 473-135-201 and 473-135-501, which are hereby cancelled.

**1.03** This issue of the section is based on the following:

CD-66926-01, Issue 4B

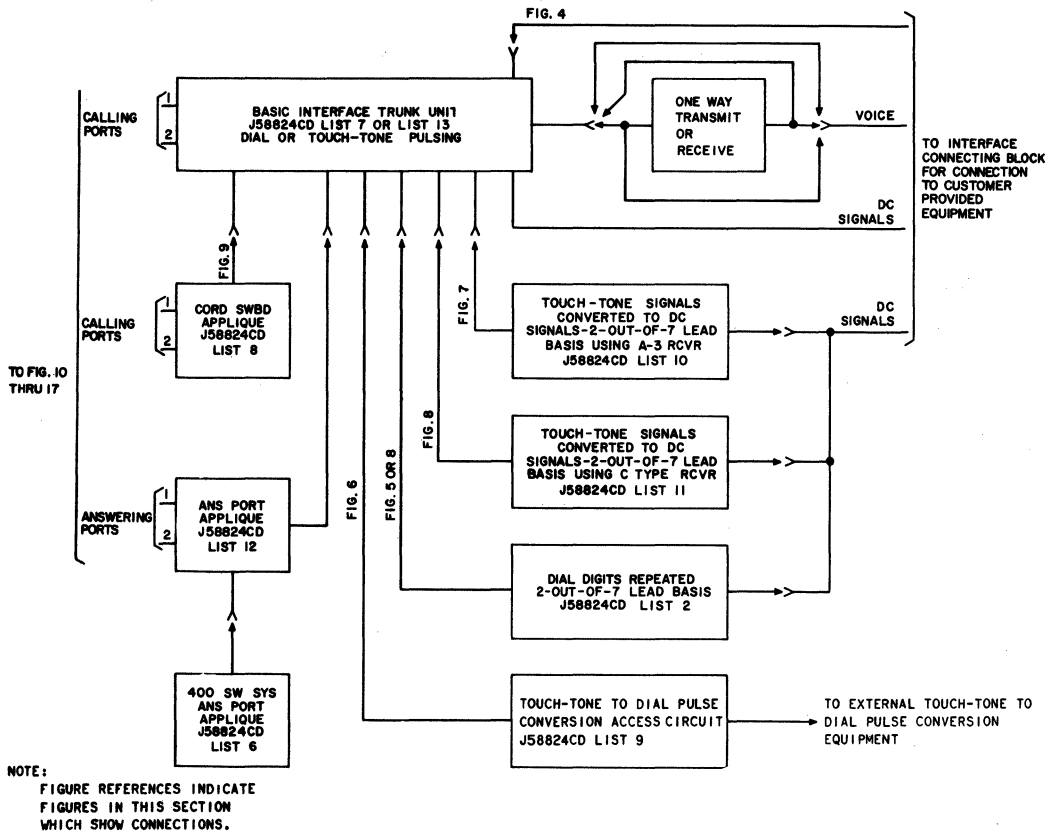
SD-66926-01, Issue 11B

If this section is to be used with equipment or apparatus reflecting a later issue of the drawing, reference should be made to the CD and SD to determine the extent of the changes and the manner in which the section may be affected.

#### **2. IDENTIFICATION**

##### **PURPOSE**

- To provide for accepting supervisory control signals from CP equipment.
  - To provide a second dial tone to the calling party.
  - To permit stations to dial additional dial pulse digits or TOUCH-TONE® after access for control of the CP equipment.
  - To provide 2-way voice transmission between the Bell System PBX and CP equipment.
  - To provide two calling ports for dual operation (not available when more than one circuit is required).
  - To protect Telephone Company personnel and facilities from hazardous voltages.
  - To limit abnormally high voice and supervisory signal levels from the CP equipment.
  - To provide direct access by the attendant via a cord switchboard termination (optional). If the PBX is equipped with a console, the attendant must dial the access code.
  - To provide called (paged) party access or "meet me" feature which provides direct telephone access by the called party to the calling party through the arrangement (optional). With certain PBX equipment this feature is provided within the PBX and is not a function of the arrangement.
  - To provide for the conversion of dc dial pulse or TOUCH-TONE® signals into special control signals for use by the CP equipment (optional). These signals are available at the interface connecting block and consist of contact closures on a 2- out of 7-lead basis.
- To provide dial access from rotary dial private branch exchange (PBX) stations to the CP equipment.



**Fig. 1—Block Diagram-Voice Connecting Arrangement DCW (Interface Trunk Circuit SD-66926-01)**

- To provide for the conversion of TOUCH-TONE signals to dial pulse signals for use by the CP equipment where PBX equipment configuration permits (optional).

#### ORDERING GUIDE

- J58824CD, List 7 Interface Trunk Unit—basic interface trunk for connection between CP equipment and Bell System equipment (except 800A PBX)
- J58824CD, List 13 Interface Trunk Unit—basic interface trunk for connection between CP equipment and Bell System 800A PBX
- J58824CD, List 2 Unit—required to convert dial pulse digits to dc signals on a 2- out of 7- lead basis
- J58824CD, List 8 Applique Unit—required for use with 552A, 552B, 552C, 552D, 605A, 608A switchboard
- J58824CD, List 9 Applique Unit—required to convert TOUCH-TONE signals to dial pulses (can be used with J58847N trunk converter or J58847T and J58847U common group TOUCH-TONE unit)
- J58824CD, List 10 Applique Unit—required to convert TOUCH-TONE signals to dc signals on a 2- out of 7-lead basis using an A3-type receiver
- J58824CD, List 11 Applique Unit—required to convert TOUCH-TONE signals to dc signals on a 2- out of 7-lead basis using a C-type receiver



**TABLE A**  
**EQUIPMENT SUMMARIZATION**

EQPT CODE	TYPE	SCHEMATIC	REMARKS
J58824CD-1, List 1 (Mfr Disc.)	Assembly, wiring, and equipment for one interface trunk unit		Replaced by List 7
J58824CD-1, List 2	Assembly, wiring, and equipment required in addition to List 1, 7, or 13 to convert dial pulse digits to dc signals on a 2- out of 7- lead basis	SD-66926-01 Fig. 2	
J58824CD-1, List 3 (Mfr Disc.)	Assembly, wiring, and equipment for one applique unit when using 552A, 552B, 552C, 552D, 605A, and 608A swbd		Replaced by List 8
J58824CD-1, List 4 (Mfr Disc.)	Wiring and equipment required in addition to List 1 or 7 to provide called party access		Replaced by List 12
J58824CD-1, List 5 (MD)*	Wiring and equipment required in addition to List 1 or 7 to provide an isolation amplifier		Added to List 7 and List 13
J58824CD-1, List 6	Equipment required in addition to List 4 or 12 when interface trunk is used with No. 400 Switching System	SD-66926-01 Fig. 4	Apparatus option K
J58824CD-1, List 7	Assembly, wiring, and equipment for one interface trunk unit for dial pulse or TOUCH-TONE signaling	SD-66926-01 Fig. 1, 2B	Wiring options A, J, ZB, ZE, ZF, ZK, ZL, ZO, HB Apparatus options A, ZL, ZF, HB
J58824CD-1, List 8	Assembly, wiring, and equipment required in addition to List 7 or 13 for one applique unit for use with 552A, 552B, 552C, 552D, 605A, or 608A swbd	SD-66926-01 Fig. 3	Wiring options ZI, ZG, HB Apparatus option ZI
J58824CD-1, List 9	Assembly, wiring, and equipment required in addition to List 7 for one applique unit when TOUCH-TONE signals are converted to dial pulses.	SD-66926-01 Fig. 6	A local trunk converter (J58847N) or common group TOUCH-TONE units (J58847T) and J58847U) is required.
J58824CD-1, List 10	Assembly, wiring, and equipment required in addition to List 7 or 13 for one applique unit when TOUCH-TONE signals are converted to dc signals on a 2- out of 7- lead basis using an A3-type receiver	SD-66926-01 Fig. 7	Requires mounting space of three 2-inch mounting plates because of 275D mercury relay
J58824CD-1, List 11	Assembly, wiring, and equipment required in addition to List 7 for one applique unit when TOUCH-TONE signals are converted to dc signals on a 2- out of 7- lead basis using a C1-type receiver	SD-66926-01 Fig. 8	
J58824CD-1, List 12	Wiring and equipment required in addition to List 7 to provide called party access	SD-66926-01 Fig. 4	Apparatus and wiring option F
J58824CD-1, List 13	Assembly, wiring and equipment for one interface unit for dial or TOUCH-TONE pulsing with additional wiring and equipment required to provide connections to 800A PBX.		Wiring options X and ZS per SD-66926-01

\* Circuitry formerly contained in List 5 is now part of the basic List 7 and basic List 13 unit.

- J58824CD, List 7, 12 Interface Trunk Unit—basic interface trunk unit arranged to provide called party access
- J58824CD, List 7, 12, 6 Interface Trunk Unit—basic interface trunk unit arranged to provide called party access when used with No. 400 Switching System.

**Associated Apparatus (Order Separately)**

- J58866A Auxiliary Power Unit (required when the connecting arrangement is not located in a CENTREX-type central office or when trunk is not located at PBX)

*Note:* This power unit meets acceptable noise requirements as explained under Power Supplies in Section 332-104-102. Other power units may be used when specified by local engineering.

- J58847N Trunk Converter or J58847T and J58847U Common Group TOUCH-TONE Units (required only when J58824CD, List 9 is provided)
- Cable, Wiring, "D" Inside, 16-Pair, or equivalent (for cabling from connecting arrangement to interface connecting block)
- Block, Connecting, 66M1-50 (Fig. 2)

*Note:* Other types of blocks may be used when specified by local engineering.

- Clip, Bridging, B (25 per pkg.).

**DESIGN FEATURES**

**J58824CD, List 7 Interface Trunk Unit**

- Mounts on standard 23-inch relay rack
- Size—8 by 23 inches
- Provides basic circuit for connection between CP equipment and Bell System equipment on a PBX trunk level basis
- Provides called party access when equipped with List 12
- May be used with No. 400 Switching System when equipped with List 6.

**J58824CD, List 13 Interface Trunk Unit**

- Mounts on standard 23-inch relay rack
- Size—8 by 23 inches
- Provides basic circuit for connection between CP equipment and Bell System 800A PBX.

**J58824CD, List 2 Unit**

- Mounts on standard 23-inch relay rack
- Size—2 by 23 inches
- Provides circuit to convert dial pulse digits to dc signals on a 2- out of 7-lead basis.

**J58824CD, List 8 Applique Unit**

- Mounts on standard 23-inch relay rack
- Size—2 by 23 inches
- Provides circuit for use with basic unit when used with 552A, 552B, 552C, 552D, 605A, or 608A switchboard.

**J58824CD, List 9 Applique Unit**

- Mounts on standard 23-inch relay rack
- Size—2 by 23 inches
- Provides circuit to convert TOUCH-TONE signals to dial pulses (must be used with a local trunk converter or common group TOUCH-TONE unit).

**J58824CD, List 10 Applique Unit**

- Mounts on standard 23-inch relay rack
- Size—2 by 23 inches (requires space of three 2-inch mounting plates for mounting to clear the 275D mercury relay)
- Provides circuit to convert TOUCH-TONE signals to dc signals on a 2- out of 7-lead basis when an A3-type receiver is provided.

**J58824CD, List 11 Applique Unit**

- Mounts on standard 23-inch relay rack

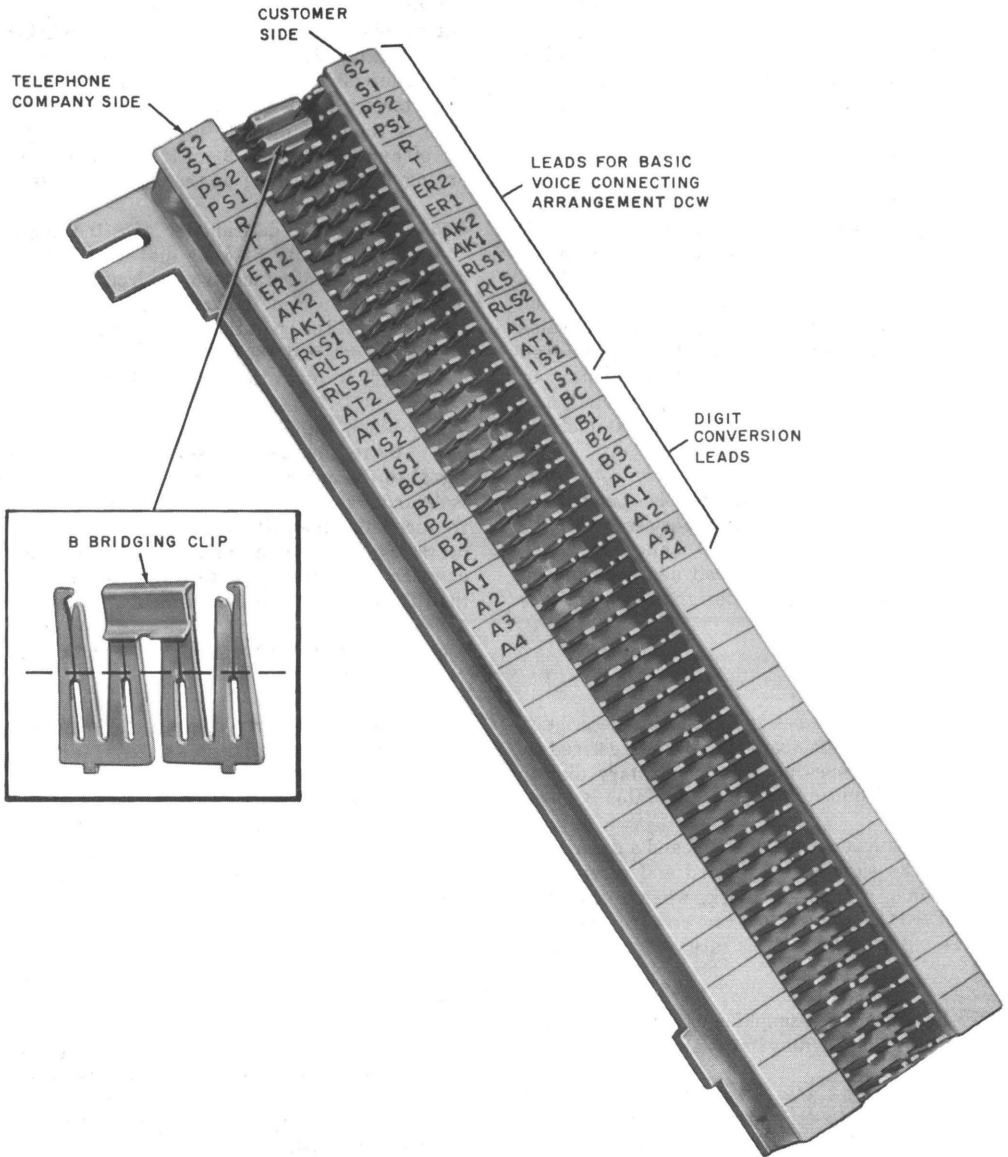


Fig. 2—Typical Interface Connecting Block

- Size—2 by 23 inches
- Provides circuit to convert TOUCH-TONE signals to dc signals on a 2- out of 7-lead basis when a C-type receiver is provided.

### 3. INSTALLATION

**3.01** The interface trunk has been designed on a building block basis which makes the basic trunk unit and its optional applique units adaptable to a wide variety of PBX installation configurations. It is recommended that the basic trunk unit and required applique units be mounted on the same frame or bay, and be adjacent to associated connecting circuits, whenever possible. However, if space conditions do not allow this, the units may be mounted on another frame or bay as dictated by local job installation requirements.

**3.02** Use the "D" inside wiring cable or equivalent to terminate the leads associated with the CP equipment on the interface connecting block. Stencil trunk number and lead designations on interface connecting block designation strip (see Fig. 2).

### 4. OPERATION

**4.01** The functional designations and a description of the signals transmitted and received at the interface connecting block for rotary dial or TOUCH-TONE pulsing are shown in Table B.

**4.02** The functional designations and a description of the signals transmitted and received at the interface connecting block, when rotary dial or TOUCH-TONE signals are converted to dc signals on a 2- out of 7-lead basis, are shown in Table C.

**4.03** Fig. 3 shows a simplified schematic of Voice Connecting Arrangement DCW.

**4.04 *Incoming Call:*** By dialing an assigned code from a calling station, the caller will be automatically connected to an idle interface trunk circuit. The interface trunk circuit completes the connection to the CP equipment. A second dial tone may be returned to the caller either under control of the CP equipment or immediately upon seizure if no warmup time is required or other reasons for delay exist. In the case of step-by-step PBXs associated with CP equipment which does

not require a warmup or equipment ready signal not supplied, second dial tone may be eliminated. After hearing this second dial tone, when provided, the caller dials the appropriate digital code into the interface trunk circuit. The digital information then is repeated directly into the CP equipment on either a DP or a 2- out of 7-lead closure arrangement depending on the option provided.

**4.05** Where it is desirable to give the attendant at a manual PBX or dial auxiliary board access to the interface trunk circuit, there is a direct appearance of the trunk circuit on the PBX switchboard. The operation is the same as described in 4.04 except that the attendant need not dial an access code to reach the interface trunk.

**4.06** When the CP equipment has received all the required digits, it returns an acknowledgment signal to the interface trunk. Audible ringing tone is heard by the calling party during the time required for the CP equipment to perform the necessary functions in preparation for transmitting or receiving a message. Ringing tone ceases when the CP equipment signals it is ready.

**4.07** The interface trunk circuit remains in this state until:

- (a) The calling party disconnects, restoring the circuit to normal.
- (b) An allotted time signal is received from the CP equipment, causing the circuit to disconnect the calling party from the CP equipment return enabling the other port to receive incoming calls; or
- (c) The called party answers the incoming call when the answer port answer feature is provided.

**4.08** If the CP equipment has some particular allotted work time which is exceeded by a party on calling port 1, the interface trunk circuit transfers the telephone equipment end of the interface from calling port 1 to calling port 2 and returns busy tone to the party holding on calling port 1. This frees the CP equipment to handle additional calls. If allotted time is exceeded on calling port 2 and calling port 1 is still held busy, the interface circuit transfers the telephone equipment end of the interface to the first busy port that becomes idle.

**TABLE B**  
**INTERFACE CONNECTING BLOCK DESIGNATIONS**

TERMINALS	FUNCTION	CIRCUIT OPERATION
ER1, ER2	Equipment Ready	Closed by CP equipment when ready. If customer equipment is always ready, option R should be used in trunk circuit.
RLS, RLS1	Release	Momentarily opened by trunk during transfer from one entry port to another upon disconnect by calling party, an answer-back connection, or a time-out signal from CP equipment.
AK1, AK2	Acknowledgement	Closed by the CP equipment when last digit necessary has been received. Opened by customer equipment when ready to transmit or receive message.
RLS2, RLS	Release	Momentarily closed by trunk during a transfer from one entry port to another on disconnect by calling party, an answer-back connection, or a time-out signal from CP equipment.
AT1, AT2	Time Out	Closed by CP equipment when calling party attempts to exceed allowed time of equipment.
S1, S2	Seizure	Closed by trunk when seized by station. Open on disconnect.
IS1, IS2	In Service	Closed by CP equipment to indicate equipment in service. This is required at all times.
PS1, PS2	Pulsing	Closed by trunk when seized and opened approximately 60 msec for each dial pulse.
T, R	Talking Path	600-ohm termination for either transmitting to customer equipment option Y, or receiving from customer equipment option Z, or 2-way transmission option ZZ.

**4.09 Seizure:** Seizure of the interface trunk circuit is accomplished by closing the calling party loop to the tip and ring leads of one of the calling ports. Port 1 is always selected when both ports are idle. Closure of the tip and ring leads provides a seizure signal to the CP equipment by the operation of a relay. The sleeve lead is grounded to hold the switching train and make the interface trunk circuit busy to other incoming calls. A busy indication is sent to the attendant when a manual switchboard is associated with the interface circuit. Dial tone, if provided, is sent to the calling party when the CP equipment is ready to receive dial pulses.

**4.10** Port 2 is available for seizure when the calling party on port 1 has exceeded the allotted time of the CP equipment or is talking to the called party via an answer connection. When calling port 2 is seized, the interface trunk circuit functions in the same manner as for port 1.

**4.11 Seizure by Attendant at Manual Switchboard:**

When the interface circuit is idle, an attendant may seize it by inserting a cord plug into the talk or dial jack. A cord plugged into the dial jack causes the operation of a relay which closes through the dialing loop and disconnects the tip (T) and ring (R) leads toward the talk jack.

**4.12** A cord plugged into the talk jack will close the T and R leads to the circuit and light a busy lamp when a 552-, 605A-, or 608A-type switchboard is provided.

**4.13 Seizure by Step-by-Step PBX:** When a station dials the code assigned to the calling end of the interface trunk circuit, the selector or selector connector steps to the assigned level and connects the station to an idle calling port of the interface trunk circuit.

**4.14 Seizure by 756A PBX:** The 756A PBX may be connected to the originating end of the

TABLE C

INTERFACE CONNECTING BLOCK DESIGNATIONS  
WHEN ROTARY DIAL OR TOUCH-TONE SIGNALS  
ARE CONVERTED TO DC SIGNALS ON A  
2- OUT OF 7- LEAD BASIS

TERMINALS	CLOSURE FOR DIGIT
A1, AC	1
B1, BC	1
A1, AC	2
B2, BC	2
A1, AC	3
B3, BC	3
A2, AC	4
B1, BC	4
A2, AC	5
B2, BC	5
A2, AC	6
B3, BC	6
A3, AC	7
B1, BC	7
A3, AC	8
B2, BC	8
A3, AC	9
B3, BC	9
A4, AC	0
B2, BC	0

interface trunk circuit by using a universal line circuit (20 through 29) modified as a trunk circuit (80 through 89). To seize the interface trunk circuit, the attendant or station dials the trunk code (80 through 89) assigned to the circuit. The marker will make the connections through a link to the modified station circuit.

**4.15 Seizure by 757A PBX:** The 757A PBX may be connected to the originating end of the interface trunk circuit by using an auxiliary trunk circuit. The interface trunk circuit is seized through the auxiliary trunk circuit when the attendant or station dials two digits (70 through 79 or 80 through 89) assigned to the originating end.

**4.16 Seizure by Switching System No. 400:** The No. 400 Switching System may be connected to the originating end of the interface trunk circuit by using a universal line circuit (6 through 8). To seize the interface trunk circuit, a station dials the code assigned to the calling end. The marker will complete the connection through a link circuit.

**4.17 Seizure by the 800A PBX, No. 5 Crossbar, and No. 1 and No. 101 Electronic Switching**

**Systems:** These systems have auxiliary circuits that seize the interface trunk circuit by closing a loop across the T and R leads at the originating end of the interface trunk circuit.

**4.18 Release of Interface Trunk Circuit:** If the calling party goes on-hook from a station or the attendant removes the cord plug from the talk jack, a release indication is provided to the CP equipment and the interface trunk circuit returns to normal. A release signal is also given each time the trunk shifts from port 1 to port 2 and each time an answer is received.

**CALLED PARTY ANSWERING FEATURE ASSOCIATED WITH INTERFACE TRUNK CIRCUIT**

**4.19** A called party answer feature is available in some systems when the interface trunk circuit is used for radio paging. This option allows the called party to dial a predetermined number and be connected directly to the calling party. When the two parties are connected together, the interface trunk transfers the CP equipment from entry port 1 to entry port 2 so that another paging call can be handled while the two parties are talking.

**4.20 Called Party Answer in a Step-by-Step PBX:** When the called party is required to answer a page, the called party dials a predetermined number from any telephone in the PBX. This causes a connector or selector connector to select the idle answering terminal of the interface trunk circuit.

**4.21 Called Party Answer in a 756A PBX:** The station circuit of the 756A PBX assigned to the answering end of the interface trunk circuit must be in the group 20 through 29. When the called party answers the incoming call, the called party dials the code assigned for answering the call. This code then causes the marker in the 756A PBX to set up a junctor-class call, which connects the called party with a junctor and two links through the station circuit to the answering end of the interface trunk circuit.

**4.22 Called Party Answer in a 757A or 800A PBX:** When the called party dials the code assigned to the answering end, the interface circuit is seized through the auxiliary trunk circuit. After

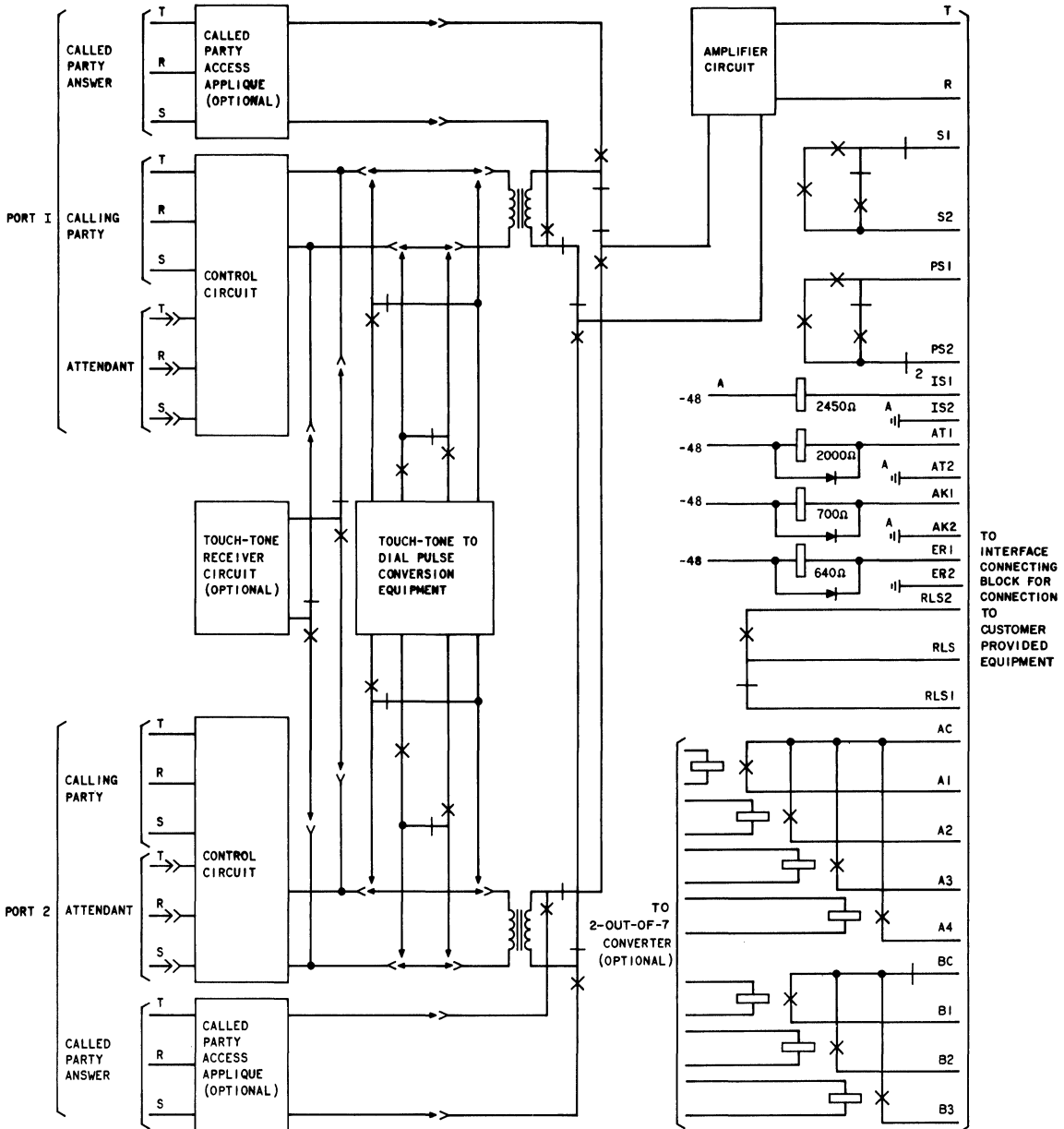


Fig. 3—Simplified Schematic—Voice Connecting Arrangement DCW

seizure, the operation is basically the same as described for the 756A PBX.

**4.23 Called Party Answer in a No. 400 Switching System:** When the called party dials the code assigned to the answering end, the marker connects the called party through a junctor, two links, and the line circuit to the answering end of the interface trunk circuit. The circuit then functions as described for the 756A PBX with the exception of S and S1A leads being connected to allow the marker to seize the line circuit assigned for answering.

**4.24 Called Party Answer in a No. 1 Electronic Switching System (ESS):** When the interface trunk circuit is used in the No. 1 ESS, the called party answering feature is not required since the answer connection is completed within the ESS.

#### **CALLED PARTY ANSWERING LINE—ATTEMPTED SEIZURE WITH CALLING LINE IDLE**

**4.25 Seizure Attempt in a Step-by-Step PBX or No. 400 Switching System:** Should the answering end line circuit code be dialed when the calling end line circuit is idle, the answering end line sleeve lead is grounded, causing busy tone to be sent to the party attempting to seize the answering end line. This prevents the answering end from being seized unless a call is connected to the calling end of the interface trunk circuit.

**4.26 Seizure Attempt in a 756A, 757A, or 800A PBX:** When the interface trunk circuit is associated with these systems, the called party answering line cannot be seized unless S and S1A leads are connected. S and S1A leads are not connected unless a calling party has seized the calling end of the interface trunk circuit. This prevents the answering end from being seized unless a call is connected to the calling end of the interface trunk circuit.

#### **TOUCH-TONE CALLING EQUIPMENT OPERATION**

##### **TOUCH-TONE Signals Converted to Dial Pulses**

**4.27** When the interface trunk circuit is used with the TOUCH-TONE-to-dial-pulse conversion feature, connections are made to external TOUCH-TONE conversion equipment through an associated access circuit.

**4.28** When the trunk finder or crossbar linkage circuit completes the connection between the interface trunk circuit and its associated TOUCH-TONE conversion equipment, the T and R leads are split by the operation of a CV relay, thereby connecting them to the TOUCH-TONE receiver and converter. Dial tone is transmitted to the calling party by the TOUCH-TONE conversion equipment. If the CP equipment is always ready (ie, no second dial tone), the converter used to set up the PBX connection can, on a timeout basis, continue to convert TOUCH-TONE to DP and thereby eliminate the need for TOUCH-TONE to DP conversion in the interface trunk.

**4.29** If the calling party is using a TOUCH-TONE telephone set, the TOUCH-TONE signals are received and converted to dial pulses by the associated TOUCH-TONE conversion equipment. Relays in the interface trunk circuit will react to the converted dial pulses and the circuit will function in the same manner as for rotary dial pulses. The TOUCH-TONE converter will remain connected to the circuit until one of the following occurs:

- (a) The allotted interdigital converter time is exceeded.
- (b) The converter receives reverse battery and ground on the FT and FR leads.
- (c) The T and R leads are opened on an abandoned call.
- (d) It releases due to pretranslation cross connections within the conversion equipment.

**4.30** Before the TOUCH-TONE converter releases, CV relay releases, disconnecting the T and R leads from the TOUCH-TONE converter equipment and reconnects them directly through the interface trunk circuit.

**4.31** If the calling party is using a dial telephone set, the TOUCH-TONE conversion equipment will repeat the dial pulses of the first digit and release before the start of the second digit.

##### **TOUCH-TONE Signals Converted to DC Signals Using A3-Type Receiver**

**4.32** The input of the TOUCH-TONE receiver is connected across the T and R leads of the



two incoming ports through contacts of TRA, TPB1, and TPB2 relays. TRA relay, when released, connects the TOUCH-TONE receiver to port 1 and, when operated, connects the receiver to port 2. TPB1 or TPB2 relay, when operated, disconnects the receiver from the T and R leads of its respective port.

**4.33** After receiving dial tone, the customer starts keying the desired number. On the first digit and on each succeeding digit, one LF- relay and one HF- relay operate. LF- and HF- relays, when operated, repeat the TOUCH-TONE digit to the CP equipment on a 2- out of 7-lead basis by connecting the AC lead to one of the A1 through A4 leads and the BC lead to one of the B1 through B3 leads. These relays will remain operated for a period approximately equal to the length of time that the button of the telephone is depressed. When the CP equipment receives the required digits, it disconnects the T and R leads from the TOUCH-TONE receiver.

**4.34** If the interface trunk circuit is seized by a customer using a rotary dial telephone set, the TOUCH-TONE receiver will not respond to the rotary dial pulses. The rotary dial pulses will be converted to dc signals on a 2- out of 7-lead basis by an applique unit provided for this purpose.

#### **TOUCH-TONE Signals Converted to DC Signals Using C-Type Receiver**

**4.35** Connections to the T and R leads for the C-type and A3 receivers are the same. After receiving dial tone, the calling party starts keying the desired number. On the first and each succeeding digit, one of the corresponding D(0-9) digit relays is operated. D(0-9) digit relay, when operated, repeats the digit to the CP equipment on a 2- out of 7-lead basis by connecting the AC lead to one of the A1 through A4 leads and the BC lead to one of the B1 through B3 leads. The operated D(0-9) relay will remain operated for a period approximately equal to the length of time that the TOUCH-TONE button on the telephone set is depressed. When the calling party is using a rotary dial telephone set, the TOUCH-TONE receiver will not respond to the rotary dial pulses which are converted to dc signals on a 2- out of 7-lead basis by an applique unit provided for this purpose.

## **5. CONNECTIONS**

**5.01** Features and options are shown in Table D.

**5.02** Table E shows the method of connecting the DT lead. Read the table horizontally; for instance, if step-by-step PBX equipment ready signal is supplied by the CP equipment, use regular dial tone.

**5.03** Connections between the basic interface trunk unit, the interface connecting block, and the applique units required to provide the desired operating features are shown in Fig. 4 through 9.

**5.04** Connections between the interface trunk equipment and the associated PBX switching equipment are shown in Fig. 10 through 17.

## **6. MAINTENANCE**

**6.01** Where there is an indication of trouble in the connecting arrangement(s), the circuit at fault must be opened at the interface connecting block to verify in which direction the trouble exists. The circuit can be opened at the connecting block by removing the B bridging clip associated with each lead.

**6.02** Precautions should be taken when performing tests to avoid adversely affecting service to the customer. Local instructions should be followed with reference to notifying the customer before performing the test.

**6.03** The tests covered are:

**A. Operational Test:** This test consists of three subtests which determine the ability of calling ports 1 and 2 to be seized; test the reaction of these ports to dial pulse, acknowledgement, and allotted time signals; and test for proper operation of the pulse counting chain.

**B. TOUCH-TONE Calling Test:** This test checks the proper response of the calling ports to TOUCH-TONE signals and checks the response of the following components when provided:

(a) A3-type receiver

(b) C-type receiver.

TABLE D

FEATURE			OPTION	
Interface trk ckt	when TOUCH-TONE signals are converted to:	Dial Pulses		ZD, ZX
		dc signals on a 2- out of 7- lead basis	Type A3 rcvr	ZC
			Type C1 or C2 rcvr	ZC
	DIAL PULSING			ZC
Number of busy lamps connected to leads	BL	1	V	
		2	V, S	
		3	T	
		4	V, T	
		5	V, T, S	
		6	Q	
		7	S, Q	
		8	V, S, Q	
		9	T, Q	
		10	T, S, Q	
		BL1	11	V, T, S, Q
Isolation amplifier for:	Transmitting		Y	
	Receiving		Z	
	Two-way Transmission		ZZ	
Called port access *	SXS PBX		W	
	756A, 757A CSBR		X	
	800A PBX		X, ZS	
	No. 400 Sw Sys		K, X	
Equipment ready signal not supplied by customer			R	
Repeat dial digits to customer on a 2- out of 7- lead basis				
608A Switchboard			M	
552 (A, B, D, E) or 605A Switchboard			N	
Without Swbd			ZV	
Busy Condition	No. 1 ESS Centrex	With Swbd	E, ZG	
		Without Swbd	B	
	Other		E	

\* Called port access is provided on internal basis (No. 1 ESS and No. 101 ESS).

**TABLE E**  
**CONNECTION OF DT LEAD**  
**READ PARAGRAPH 5.02 BEFORE USING TABLE E**

	EQUIPMENT READY SIGNAL SUPPLIED BY CP EQUIPMENT		TYPE OF DIAL TONE REQUIRED		DIAL TONE CONNECTION NOT REQUIRED
	YES	NO	TOUCH-TONE	REG	
STEP BY STEP PBX	X			X	
		X			X
CSBR PBX, 800A PBX, or CENTREX	X			X	
		X		X	
SXS PBX with TOUCH-TONE Signaling	X		X		
		X			X
TOUCH-TONE CONVR IN CSBR PBX, 800A PBX, or CENTREX	X				X *
		X			X *
TOUCH-TONE RCVR in CSBR PBX, 800A PBX, or CENTREX	X		X		
		X	X		

\* Precision dial tone provided by local trunk converter.

**6.04 Lettered Steps:** A letter a, b, c, etc, added to a step number in Part 7 of this section indicates an action which may or may not be required depending on local conditions. The condition under which a lettered step or a series of lettered steps should be made is given in the ACTION column and all steps governed by the same condition are designated by the same letter within a test. Where a condition does not apply, all steps designated by that letter should be omitted.

#### APPARATUS

##### Test A

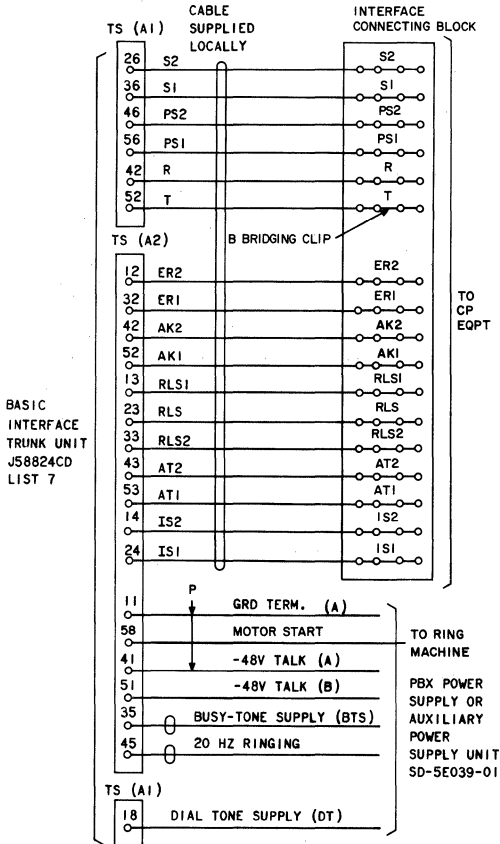
**6.05** Handset (dial hand test set) equipped with 310 plug.

##### Test B

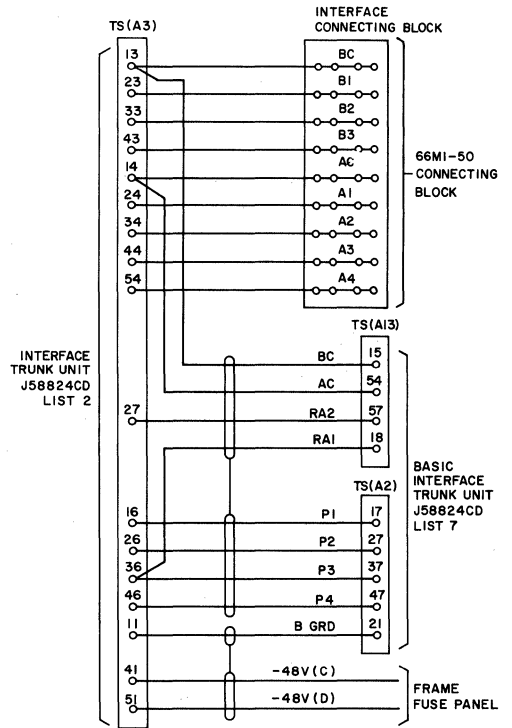
- 6.06** TOUCH-TONE station set equipped with 310 plug.
- 6.07** KS-14510, List 1 volt-ohm-milliammeter (volt-ohmmeter).

##### All Tests

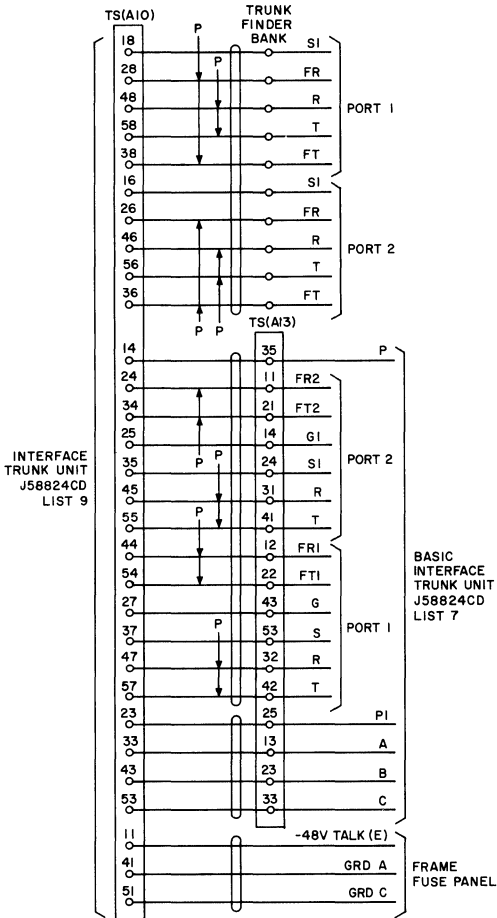
**6.08** Blocking and insulating tools as required. Use tools and apply as covered in Section 069-020-801.



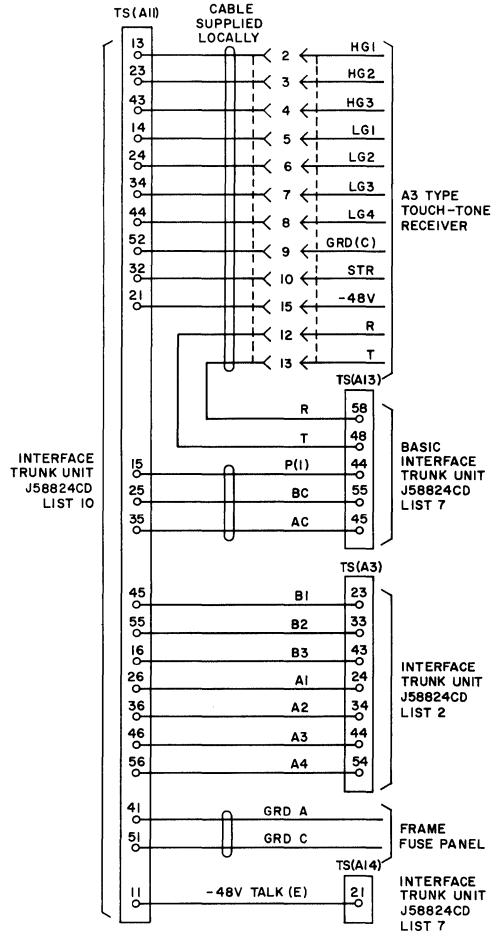
**Fig. 4—Connections Between Basic Interface Trunk Unit, Interface Connecting Block, Frame Fuse Panel, Busy-Tone Supply and 20-Cycle Ringing Supply for Rotary Dial Pulsing or TOUCH-TONE Signaling**



**Fig. 5—Connections Between Applique Unit, Interface Connecting Block, Basic Interface Trunk Unit, and Frame Fuse Panel to Convert Dial Pulse Digits to CP Equipment for 2- out of 7-Lead dc Signals**



**Fig. 6—Connections Between Applique Unit, Trunk Finder Bank Circuit, Basic Interface Unit, and Frame Fuse Panel to Convert TOUCH-TONE Signals to Dial Pulses**



NOTE:  
CABLE SUPPLIED LOCALLY.

**Fig. 7—Connections Between Applique Units, A3-Type TOUCH-TONE Receiver, Basic Interface Trunk Unit, Frame Fuse Panel to Convert TOUCH-TONE Signals to dc Signals on a 2- out of 7-Lead Basis**

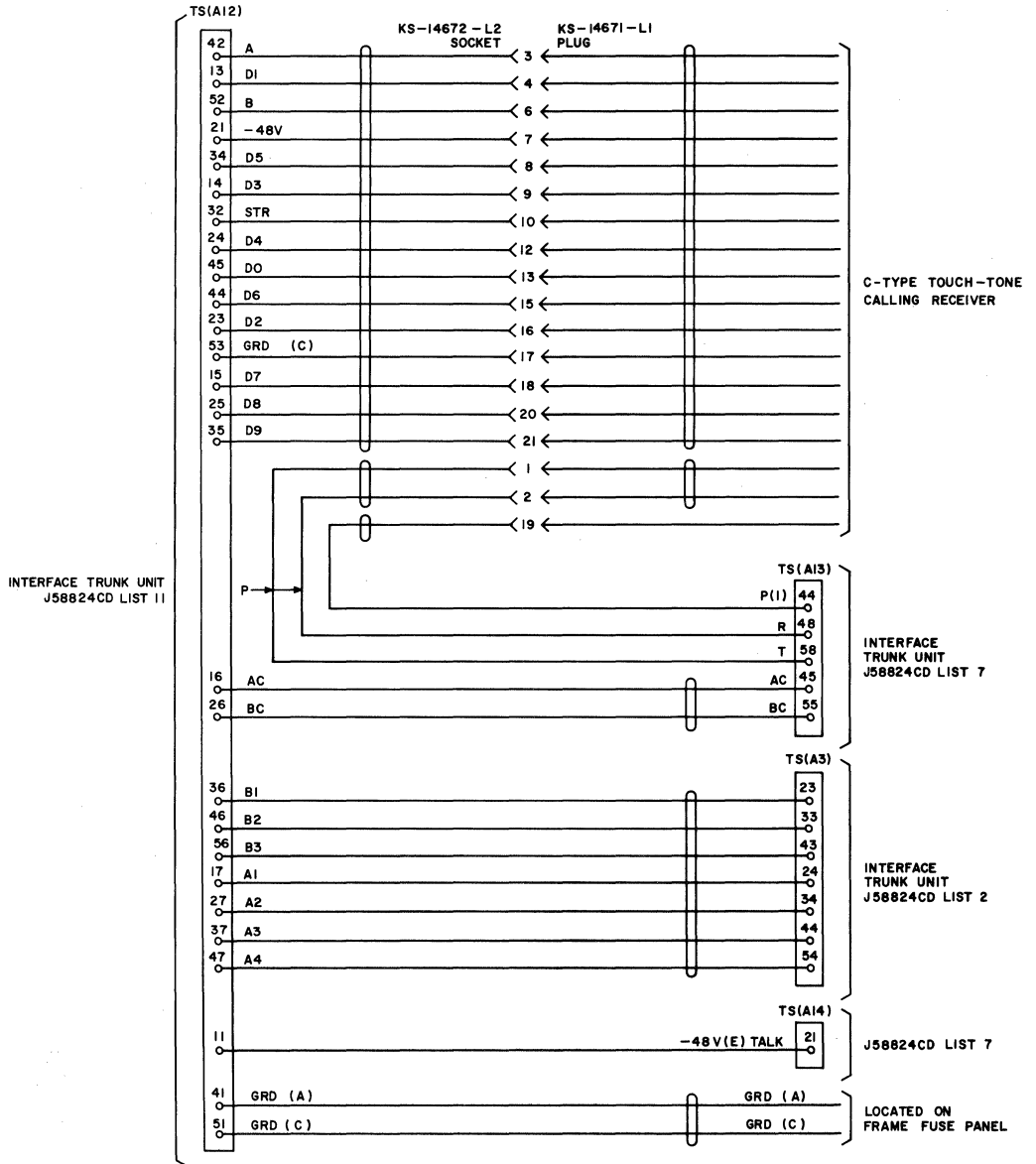


Fig. 8—Connections Between Applique Units, C-Type TOUCH-TONE Receiver, Basic Interface Trunk Unit, and Frame Fuse Panel to Convert TOUCH-TONE Signals to dc Signals on a 2-out of 7-Lead Basis

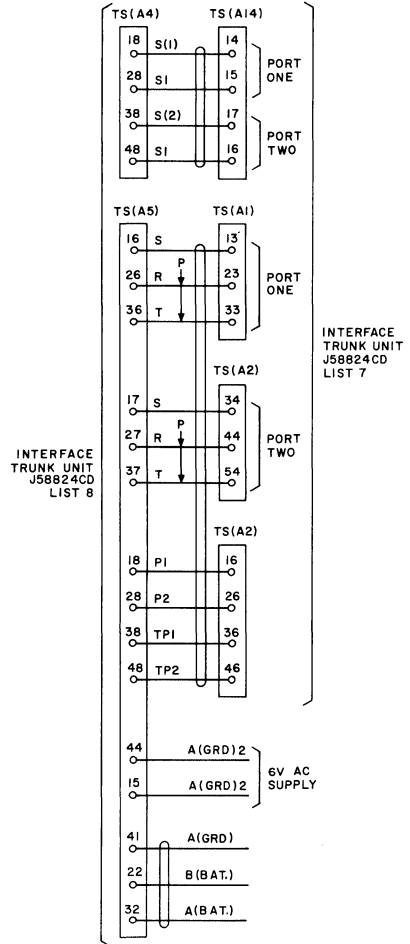
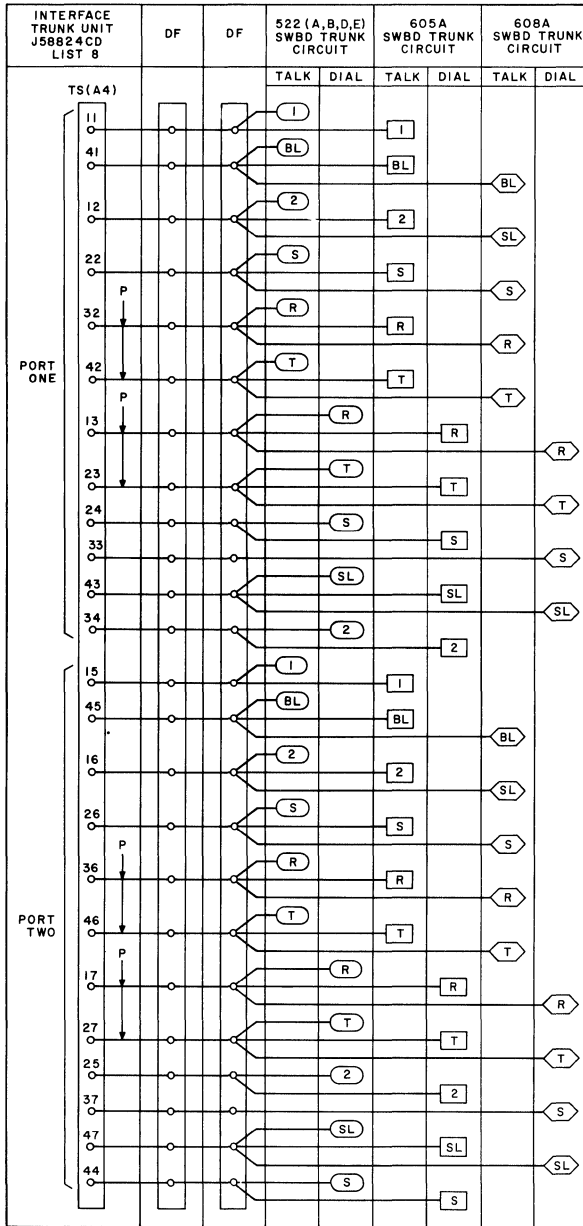
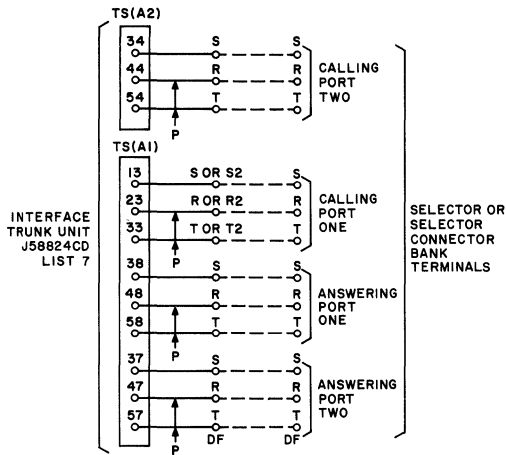
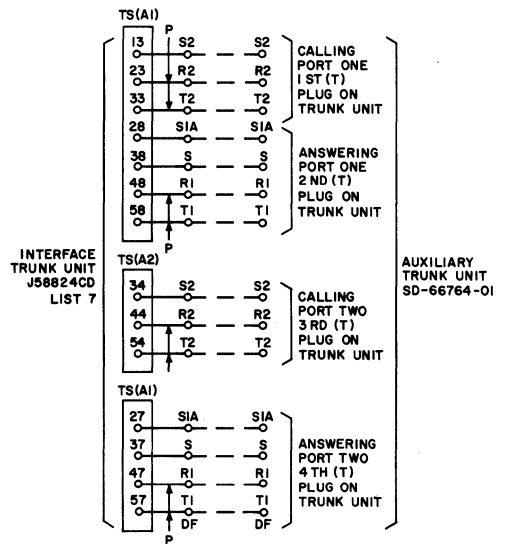


Fig. 9—Connections Between 552A, B, D, E, 605A, 608A Switchboard Talk and Dial Jack Circuits, Applique Unit, Basic Interface Trunk Unit, Frame Fuse Panel, and 6-Volt Supply to Provide Calling Party Access From Switchboard



**Fig. 10—Connections for Selector or Selector Connector Bank Terminals Assigned to Calling and Answering Ports—Interface Trunk Circuit—701A, B, 711A, B, or 740E PBX**



**Fig. 11—Connections for Auxiliary Trunk Circuit SD-66764-01 Assigned to Calling and Answering Ports—Interface Trunk—757A PBX**



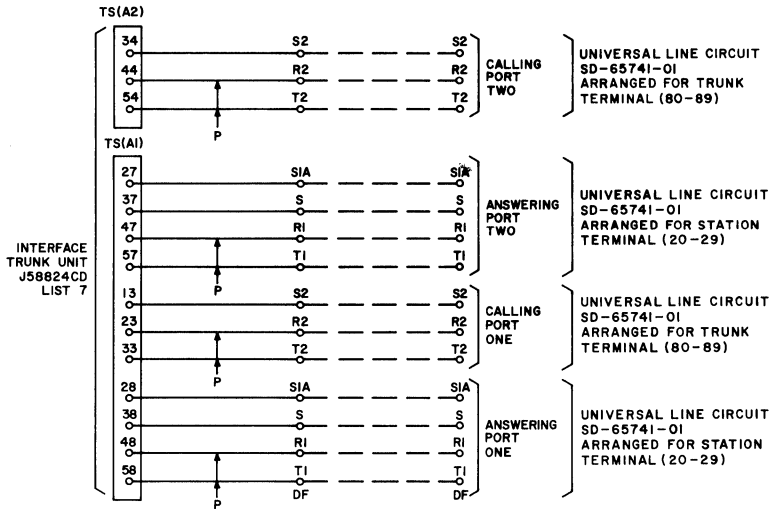


Fig. 12—Connections for Line, Link, and Marker Circuit Assigned to Calling and Answering Ports—Interface Trunk—756A PBX

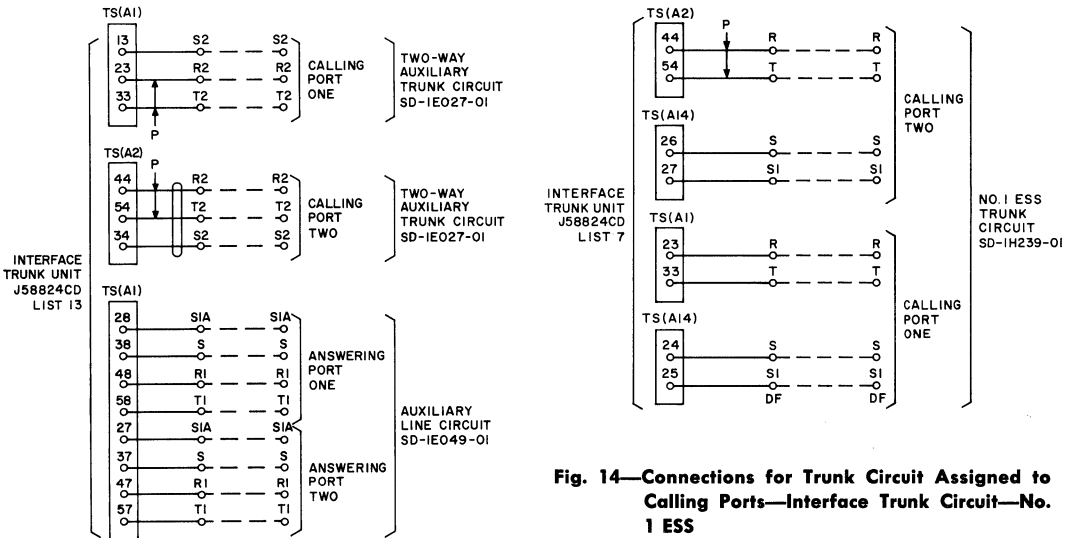


Fig. 13—Connections for 2-Way Auxiliary Trunks and Auxiliary Line Circuit Assigned to Calling and Answering Ports—Interface Trunk Circuit—800A PBX

Fig. 14—Connections for Trunk Circuit Assigned to Calling Ports—Interface Trunk Circuit—No. 1 ESS

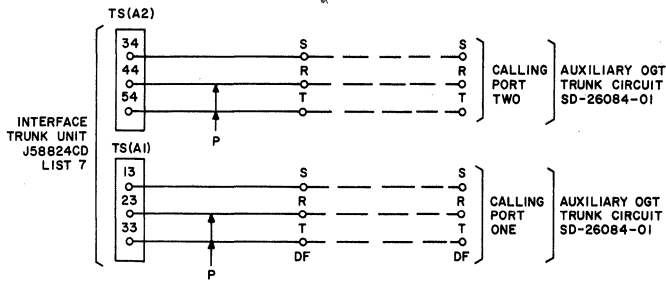
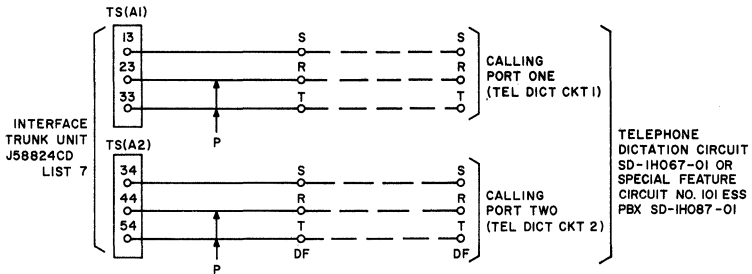


Fig. 15—Connections for No. 5 Crossbar Auxiliary Outgoing Trunk Assigned to Calling Ports—Interface Trunk Circuit



NOTES:

1. ANSWER CONNECTION COMPLETED WITHIN THE IOI SWITCHING SYSTEM.
2. THREE TRUNK CIRCUIT PORTS ARE PROVIDED IN ONE SD-IH067-01 TELEPHONE DICTATION CIRCUIT.

Fig. 16—Connections for Telephone Dictation Circuit or Special Feature Circuit Assigned to Calling Ports of Interface Trunk Circuit—No. 101 ESS

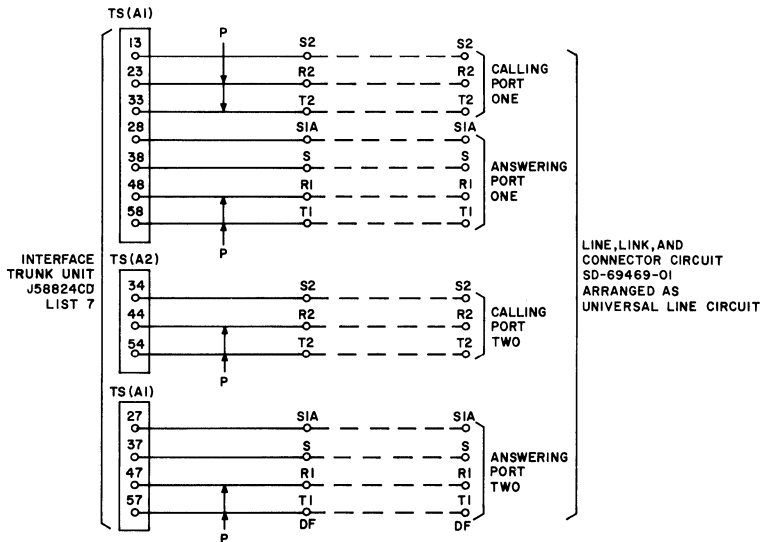


Fig. 17—Connections for Universal Line Circuits Assigned to Calling and Answering Ports of Interface Trunk Circuit—No. 400 Switching System

## 7. METHOD

STEP	ACTION	VERIFICATION
<b>A. Operational Test</b>		
<b>Calling Port 1 Test</b>		
1	Operate TALK-MON switch on handset to MON.	
2	Connect handset to TST1 jack.	
3	Operate TALK-MON switch on handset to TALK.  <i>Note:</i> If TOUCH-TONE to dial pulse conversion equipment is provided, dial tone, if required, will be furnished by TOUCH-TONE converter.	SLA1 and AA1 relays operated. If option R is provided— ER relay operated. Dial tone heard if provided.
4a	If option R is not provided— Manually operate ER relay.	ER relay remains operated. Dial tone heard if provided.
5	Dial any one digit.	Dial tone removed if provided. ER relay released.
6	Manually operate AK relay.	Ringing induction heard.
7	Release AK relay.	Ringing induction removed. TPA1 relay operated.
8	Momentarily operate handset TALK-MON switch to MON.	If option R and dial tone are provided— Dial tone heard.
9a	If option R is not provided— Repeat Step 4a.	
10	Block nonoperated TR1 relay.	
11	Block operated AT relay.	RLS relay operated. Busy tone heard.
12	Remove blocking tools from AT, TR1 relays.	
<b>Calling Port 2 Test</b>		
13	Repeat Steps 1 through 9a using TST2 jack and correspondingly designated relays in port 2.	
14	Block operated AT relay.	RLS relay operated. Busy tone heard.
15	Remove blocking tool from AT relay.	RLS relay released.

STEP	ACTION	VERIFICATION
<b>Pulse Counting Circuit Test</b>		
16	Repeat Steps 1 through 3.	Dial tone heard if provided.
17a	If option R is not provided— Repeat Step 4a.	
18	Insulate contacts 2 and 4 of RA1 relay.	
19	Successively dial digits 1 through 0.	After each digit dialed— P- and PA-relays operated in accordance with Table F.

TABLE F

DIGIT	P- RELAYS OPERATED
1	P1, P2
2	P3
3	P1, P2, P3, P4, P4A
4	P3, P4, P4A
5	P1, P2, P4, P4A
6	P4, P4A, P5, P5A
7	P1, P2, P4, P5, P4A, P5A
8	P3, P4, P5, P4A, P5A
9	P1, P2, P3, P5, P5A
0	P3, P5, P5A

- 20 Remove insulating tools from contacts 2 and 4 of RA1 relay.

## B. TOUCH-TONE Calling

### Calling Port 1 Test

- 1 Connect TOUCH-TONE station set to TST1 jack.
- 2 Remove handset from switchhook.
- Note:** If TOUCH-TONE to dial pulse conversion equipment is provided, dial tone, if required, will be furnished by TOUCH-TONE converter.
- SLA1 and AA1 relays operated.  
If option R is provided—  
ER relay operated.  
Dial tone heard if provided.

STEP	ACTION	VERIFICATION
3a	If option R is not provided— Manually operate ER relay.	ER relay remains operated. Dial tone heard if provided.
4	Dial any one digit.	Dial tone removed. ER relay released.
5	Manually operate AK relay.	Ringinduction heard.
6	Release AK relay.	Ringinduction removed. TPA1 relay operated.
7	Replace handset on hook.	SLA1 and AA1 relays released.

**Calling Port 2 Test**

- 8 Repeat Steps 1 through 7 using TST2 jack and correspondingly designated relays in port 2.

**Test of TOUCH-TONE to DC Signal Conversion Using A3-Type Receiver Circuit**

- 9 Repeat Steps 1 and 2.
- 10a If option R is not provided—  
Repeat Step 3a.
- 11 At TS A11—  
Connect BLK lead of volt-ohmmeter to terminal 21.
- 12 Insulate contacts 11 and 12 of AK relay.
- 13 At TOUCH-TONE station set—  
Dial digit 1.
- 14 At TS A11—  
Connect RED lead of volt-ohmmeter in turn to terminals 13 and 14.
- 15 Repeat Steps 13 and 14 substituting digits and terminals shown in Table G.
- 16 Remove insulating tools from contacts 11 and 12 of AK relay.
- 17 Replace receiver on hook.
- While TOUCH-TONE key is depressed—  
—48 volts present at each terminal.

STEP	ACTION	VERIFICATION
<b>Test of TOUCH-TONE to DC Signal Conversion Using C-Type Receiver Circuit</b>		
18	Repeat Steps 1 and 2.	
19a	If option R is not provided— Manually operate ER relay.	ER relay remains operated. Dial tone heard if provided.
20	At TS A12— Connect BLK lead of volt-ohmmeter to terminal 21.	
21	Insulate contacts 11 and 12 of AK relay.	
22	At TOUCH-TONE station set— Dial digit 1.	
23	At TS A12— Connect RED lead of volt-ohmmeter to terminal 13.	While TOUCH-TONE key is depressed— —48 volts present at terminal.
24	Repeat Steps 22 and 23, substituting digits and terminals as listed in Table H.	
25	Remove insulating tools from contacts 11 and 12 of AK relay.	
26	Replace receiver on hook.	

TABLE G

DIGIT DIALED	-48 VOLTS PRESENT AT TS A11 TERMINALS
2	14, 23
3	14, 43
4	24, 13
5	24, 23
6	24, 43
7	34, 13
8	34, 23
9	34, 43
0	44, 23

TABLE H

DIGIT DIALED	-48 VOLTS PRESENT AT TS A12 TERMINALS
2	23
3	14
4	24
5	34
6	44
7	15
8	25
9	35
0	45

## VOICE CONNECTING ARRANGEMENTS CAU, SU3, SU4, SU6, AND SU7

### 1. GENERAL

**1.01** This section contains information on identification, installation, operation, maintenance, and connections for the KS-20445, List 1; KS-20445, List 2; KS-20445, List 1 (2W); KS-20445, List 2 (2W); and KS-20445, List 1 (RD) control units, when used in Voice Connecting Arrangements (VCA), CAU, SU3, SU4, SU6, and SU7. (SU7 was an interim arrangement and has been replaced by SU7QW.)

**1.02** This section is reissued to:

- Add ordering information for VCA SU4
- Revise Fig. 3, 5, and 6
- Revise 3.03(b) to clarify connections.

**1.03** The customer must be informed by the supplier or manufacturer of the equipment of the proper use and operation of that equipment with Voice Connecting Arrangements CAU, SU3, SU4, SU6, and SU7.

**1.04** If the customer wants a copy of the Technical Reference which covers these interface specifications, the customer should contact the local Telephone Company Business Office or the Marketing Representative.

**1.05** The KS-20445, List 1 control unit is an exact replacement for the KS-20008 alarm coupler.

**1.06** This issue of the section is based on the following drawing:

SD-69600-01 Issue 3D—KS-20445 Control Unit

If this section is to be used with equipment or apparatus reflecting a later issue(s) of the drawing, reference should be made to the SD to determine the extent of the changes and the manner in which the section may be affected.

### 2. IDENTIFICATION

#### 2.01 Purpose:

- Voice Connecting Arrangement CAU provides for one-way voice transmission when customer-provided (CP) alarm systems are connected to the telecommunications network. This arrangement can be provided by the KS-20445, List 1 control unit. If KS-20445, List 2 control unit only is available, it may be used if List 3 circuit board is removed.
- Voice Connecting Arrangement SU3 provides for control and testing by the customer of the customer-provided equipment (CPE) from a remote telephone set equipped with an appropriate tone signaling device. SU3 cannot be used alone; it is only used with CAU or SU6.
- Voice Connecting Arrangement SU4 (CAU plus SU3) provides the remote testing feature for CP alarm systems.
- Voice Connecting Arrangement SU6 provides for the use of the control unit with CPE where 2-way voice transmission is required. In this arrangement, the CPE requires automatic originating or automatic receiving capabilities. This arrangement requires a Distributing House modification. This arrangement is *not* intended for recording a 2-way conversation. Voice Connecting Arrangement SU3 may be used in this application as an option.
- Voice Connecting Arrangement SU7 provides for the use of the control unit with a CP repertory dialer (dial pulse) that requires no voice transmission path to the network. This arrangement requires a Distributing House modification of the control unit. Voice Connecting Arrangement SU3 is not used in this application (SU7 has been replaced by SU7QW).



**2.02 Application:** For use on individual lines (not semipublic or coin lines) as an adjunct to a main or extension telephone set.

**2.03 Ordering Guide:**

- Unit, Control, KS-20445, List 1 (for one-way transmission, CAU)
- Unit, Control, KS-20445, List 2 (for one-way transmission, SU4) consists of CAU and SU3 signal unit
- Unit, Signaling, KS-20445, List 3 (signal unit SU3), used only with CAU or SU6
- Unit, Control, KS-20445, L1 "2W" (modified for 2-way transmission, SU6 without List 3 signal unit SU3)
- Unit, Control, KS-20445, List 2 "2W" (modified for 2-way transmission SU6 with SU3 signal unit)
- Unit, Control, KS-20445, List 1 "RD" (modified for repertory [dial pulse] dialers, SU7). SU7 was an interim arrangement. It has been replaced by SU7QW—KS-20721, List 1 station coupler.

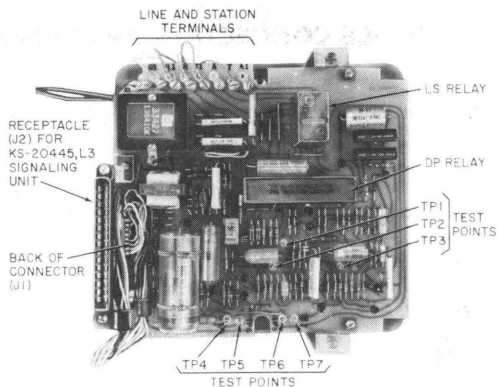
**Note:** The combination CAU plus SU3 is identified by USOC SU4. The combination SU6 plus SU3 is not identified by a single USOC code.

**2.04 Color:** Light olive-gray.

**2.05 Design Features:**

**KS-20445, List 1 Control Unit, CAU, (Fig. 1)**

- Provides a means of connecting the speech, pulsing, and power supply leads from CPE.
- Has screw terminals for terminating telephone line, associated telephone set, and A and A1 leads.
- Enables the customer to *monitor* the progress of an alarm call.
- Equipped with test leads packaged with the unit for operation test of the KS-20445 unit.

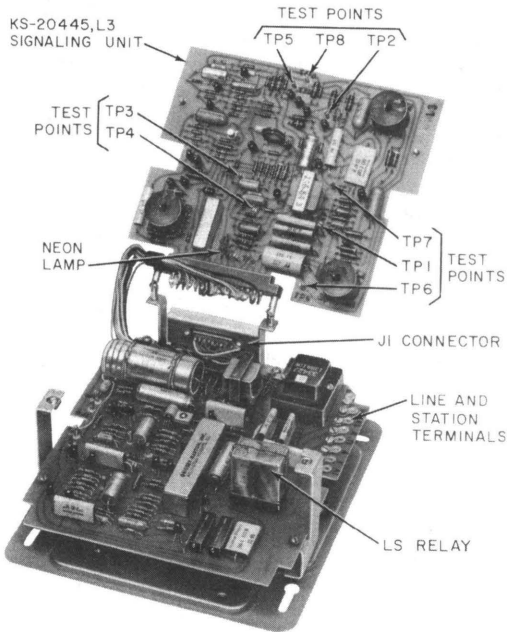


**Fig. 1—KS-20445, List 1 Control Unit, CAU, Cover Removed, Test Points**

- Provides a plug-in arrangement for converting to List 2 unit.
- Designed for wall mounting.
- Unit is 6-7/8 inches wide, 7-3/8 inches high, and 3-3/8 inches deep.
- Unit weighs 4 pounds.

**KS-20445, List 2 Control Unit, SU4 (CAU and SU3, Fig. 2)**

- Consists of a KS-20445, List 1 control unit and a KS-20445, List 3 signaling unit.
- Permits the customer *to test* and *control* the operation of his alarm system from a remote telephone set when the remote telephone set has a TOUCH-TONE® dial, or is equipped with a 62A control unit or a J1A handset, to provide a 1475-Hz control tone.
- Provides a means for resetting the customer's alarm system.
- Has a 20-second time-out circuit causing the control unit to disconnect after ring-up, if a 1475-Hz tone is not received from distant party.



**Fig. 2—KS-20445, List 2 Control Unit, Test Points on List 3 Signaling Unit**

- Provides a continuous 2125-Hz acknowledgment tone to distant party.
- Unit weighs 4-1/2 pounds.

**KS-20445, List 1 (2W) Control Unit, SU6**

- Same as KS-20445, List 1 except modified to provide 2-way transmission.

**KS-20445, List 2 (2W), Control Unit SU6 and SU3**

- Same as KS-20445, List 2 except modified for 2-way transmission.

**KS-20445, List 1 (RD) Control Unit, SU7**

- Provides a means of connecting pulsing, power supply, and off-normal muting leads from CP repertory dialer.

- Has screw terminals for terminating telephone line, associated telephone set, ON1 and ON2 leads.
- Enables dialing from CPE.
- Designed for wall mounting.
- Unit is 6-7/8 inches wide, 7-3/8 inches high, and 3-3/8 inches deep.
- Unit weighs approximately 4 pounds.

**3. INSTALLATION**

**PLANNING**

**3.01** The customer must provide a Cinch Mfg. Co. or ITT Cannon Electric Co. DA-19603-403 plug with DA-51225-1 hood (or equivalent) and a connecting cable as a part of the customer's device.

**3.02** The customer must provide dc power for normal operation. Power requirements are:

- Voltage:  $18 \pm 3$  volts dc, peak voltage (including ripple) shall **not exceed** 25 volts.
- Current requirements for the KS-20445 unit are shown in Table A.

**TABLE A**



KS-20445 UNIT CURRENT REQUIREMENTS		mA DC (APPROX.)	
		LIST 1	LIST 2
18-Volt Supply	Standby	2.5	10.
	Initial Surge	(1000 max)	(1000 max)
	Operating	50	70

**INSTALLING**



**Do not install in hazardous locations, near excessive heat, moisture, or cold temperatures.**

**3.03** Sufficient wall space should be available. Install as follows:

- (a) Remove cover and secure unit to wall with appropriate fasteners. Use backboard only where required.
- (b)  Connect the telephone line, associated telephone sets and key equipment, where required, to the screw terminals on the printed wiring board according to the arrangement desired (Fig. 3 through 6). All Telephone Company-provided telephone sets must be connected to the T1 and R1 terminals. Do not bridge directly to the line. 



***Make certain that the dc power from the customer's device is of proper polarity. Improper polarity will not damage unit because it contains a polarity guard. However, the unit will not operate if the polarity is reversed.***

- (c) Perform operating tests to determine if the KS-20445 unit is operating properly (Part 5).
- (d) Replace cover.
- (e) Attach plug from customer's device into receptacle (J1) at the bottom of the unit (Fig. 2).

#### 4. OPERATION

**4.01 *Outgoing Call:*** When the CP alarm unit goes off-hook and provides a contact closure between leads OH1 and OH2, the control unit will seize the line and dial tone is returned to the CP alarm unit. The CP alarm unit outpulses by opening and closing the contact between leads OH1 and OH2. After dialing is completed, the control unit provides a transmission path from leads TT and TR (CP alarm unit) to the telephone line. When the signaling unit is not provided, the CP alarm unit must provide an announcement or other means of delaying the main message to permit the called party to respond to ringing and answer the call. If the signaling unit is provided, the CP alarm unit may close lead SRU to lead COM to transmit a 2125-Hz tone to the called party. During operation of the control unit, the associated telephone set is placed in a monitor condition (by opening the dc path). The customer may check the progress of an alarm call by monitoring on the associated

telephone set without interfering with dialing or transmission. If alarm device is programmed to transmit more than one calling cycle, the monitoring telephone must go on-hook at completion of each call to prevent interference with the alarm sending device.

**Note:** If the associated telephone set uses a G6-type amplifier handset, it will be inoperative when the coupler operates and removes TALK battery.

**4.02 *Disconnect:*** The automatic call cycle is terminated when the CP alarm unit goes on-hook removing the closure between leads OH1 and OH2. When the signaling unit is provided, the called party may terminate the alarm cycle by transmitting a 1475-Hz tone to the control unit.

**4.03 *Incoming Call (KS-20445, List 2 Only):***

The List 3 signaling unit enables the control unit to receive incoming calls from a remote telephone set for test purposes. When the customer dials the number assigned to the telephone set associated with the control unit, the control unit detects the 20-Hz ringing and seizes the telephone line. The control unit answers the calling party by transmitting a pulsed 2125-Hz tone while waiting for a 1475-Hz control tone from the calling party. A 20-second timeout circuit will cause the control unit to disconnect automatically if the 1475-Hz control tone is not received. After the 1475-Hz tone is detected, a continuous 2125-Hz tone is transmitted to the calling party to acknowledge receipt of the 1475-Hz tone; and a contact closure is provided between leads TD1 and TD2 to start the CP alarm unit. The CP alarm unit closes leads OH1 to OH2 to start the alarm reporting cycle and closes lead RTD to COM to stop the 2125-Hz tone. The control unit removes the closure between leads TD1 and TD2. If the CPE opens lead ETD from COM during the announcement, the calling party may signal the control unit with a second 1475-Hz tone. This second tone will cause the control unit to close leads TD1 and TD2 to reset the CP alarm unit. After the announcement is completed, the CP alarm unit may open lead RTD from COM to start the 2125-Hz pulsing tone and the 20-second disconnect. The calling party may signal with a 1475-Hz tone to reset the CP alarm unit. If the 1475-Hz tone is not received, the control unit will disconnect in approximately 20 seconds.

**5. MAINTENANCE**

**5.01** When trouble is reported verify that:

- Customer connector plug is secure in control unit.
- Power of correct polarity is present at control unit.
- CO pair is good.
- Leads to CO line and associated telephone set are secure.

If trouble still exists, perform the following tests.

**5.02 *Lettered Steps:*** The letter "a" added to a step number in 5.05 indicates an action required when the List 3 signaling unit is provided. Where the List 3 signaling is not provided, all steps designated by the letter "a" should be omitted.

**5.03 *Apparatus Required:*****Tests A and B**

- One KS-7105 battery (22-1/2 volts), or equivalent.
- Test leads for connecting battery to pins 9 and 11 on J1 (supplied with unit).
- On 1013A or equivalent hand test set. (If the associated telephone set has a G6-type

amplifier handset, use a second 1013A hand test set connected across T1 and R1 for monitoring.)

- A separate test lead consisting of a piece of insulated wire approximately 6 to 8 inches long with ends stripped and tinned approximately 1/4 inch.
- One KS-14510, volt-ohm-milliammeter (VOM) equipped with KS-14510, List 2 leads with test prods, or equivalent (used to make tests on the KS-20445, List 3 signaling unit, when provided).

**5.04 *Preparation:*****Tests A and B**

***Make all tests with CPE disconnected.***

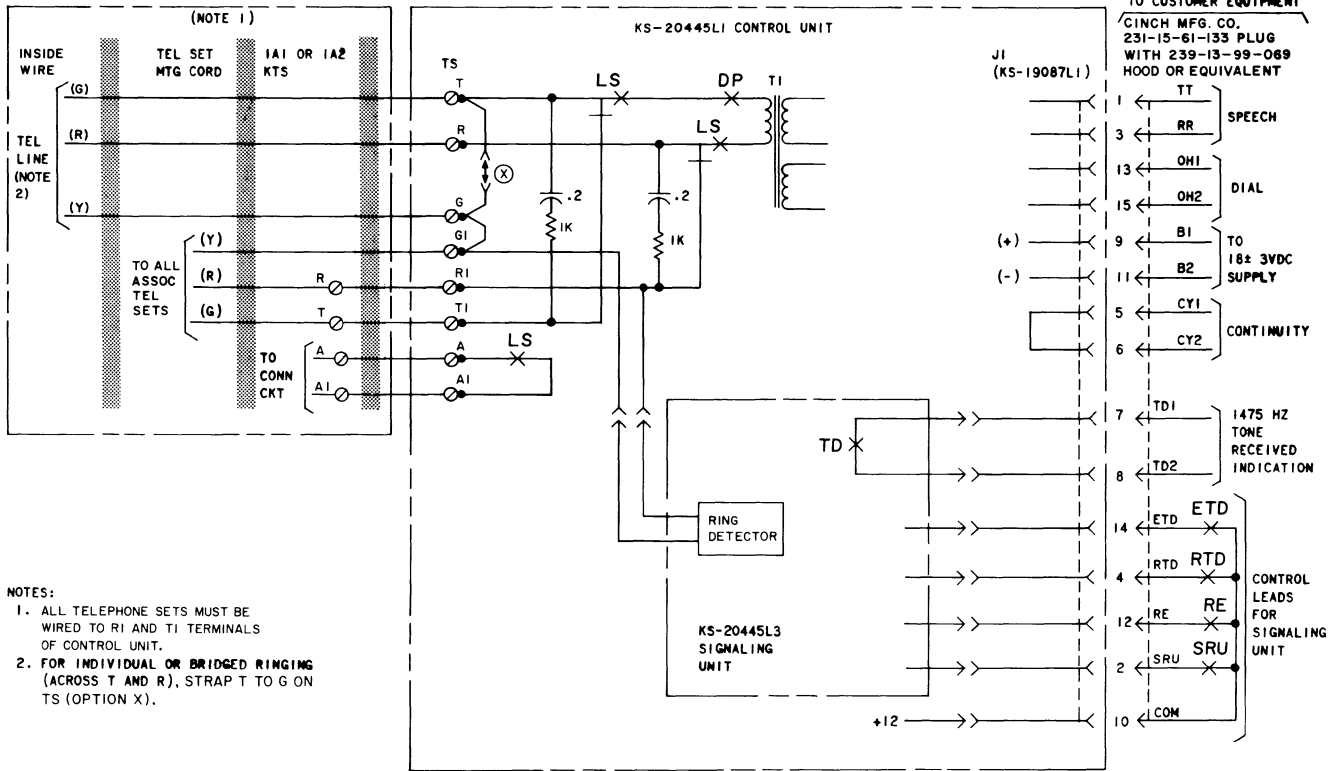
***Note:*** To perform operating test on the List 3 signaling unit, have a test call placed to the control unit from the local test desk. A TOUCH-TONE® dial, a 62A control unit, or a J1A handset, or equivalent, may be employed at the test desk to provide 1475-Hz control tone. Where the List 3 signaling unit is not provided, all steps designated by the letter "a" should be omitted.

**SECTION 463-340-100**

<b>STEP</b>	<b>ACTION</b>	<b>VERIFICATION</b>
1	Disconnect customer plug (see Fig. 2).	
2	Remove unit cover.	
3	Connect power supply to pins 9 (+) and 11(-) on unit using test leads provided. Connect red lead to pin 9(+) and black lead to pin 11(-).	
4a	If List 3 signaling unit is provided— Loosen the two retaining screws and swing signaling unit on its hinge in order to view LS relay (Fig. 2).	
5	Connect one 1013A hand test set, or equivalent (with switch in MON position), cord clip across TP4 and TP5, and the other clip across TP6 and TP7 (Fig. 1).	
	<b>Caution: High room noise may cause transmission of dial pulses in TALK position.</b>	
6	Operate hand test set switch to TALK position.	LS relay operated. (Relay operation can be seen through clear plastic cover of LS relay, Fig. 1. Also, the momentary "click" of the relay when operating is audible.)

**5.05 Test A—CAU, SU3, SU4, and SU6:**

<b>STEP</b>	<b>ACTION</b>	<b>VERIFICATION</b>
7	Listen for dial tone on associated telephone set (connected to terminals T1 and R1—Fig. 3).	Dial tone is heard. (Since dc is blocked by the control unit, the associated telephone set can be used only for monitoring when LS relay is operated—Fig. 3).



**NOTES:**

1. ALL TELEPHONE SETS MUST BE WIRED TO R1 AND T1 TERMINALS OF CONTROL UNIT.
2. FOR INDIVIDUAL OR BRIDGED RINGING (ACROSS T AND R), STRAP T TO G ON TS (OPTION X).

**Fig. 3—Typical Connections for KS-20445, List 1 or List 2 Control Unit and Single Line Telephone Set**

STEP	ACTION	VERIFICATION
8	While listening on associated telephone set— Dial a test number using the 1013A, or equivalent, hand test set.	LS relay remains operated (due to slow release feature). Dial pulses transmitted to line can be verified by listening to clicks on associated telephone set.
9	Monitor on associated telephone set. When test number answers, talk over 1013A, or equivalent, hand test set and listen for reply on associated telephone set.	Conversation (on both ends) heard satisfactorily.
10	With associated telephone set still off-hook— Operate 1013A, or equivalent, hand test set switch to MON position.	LS relay in control unit released (control unit is unoperated). Telephone line transferred from the control unit to the associated telephone set.
11	Talk and listen to distant end (of test number called) using associated telephone set.	Conversation normal.
12	With control unit unoperated (as a result of Step 10)— Test associated telephone set for normal service.	Service is normal. (This completes dialing and speech transmission tests. Have distant end disconnect.)
13	Place the associated telephone set on-hook.	
14a	If List 3 signaling unit is provided— Leave one 1013A, or equivalent, hand test set clip across TP4 and TP5 on List 1 unit (Fig. 1). The other clip will be used to test the control unit functions by probing test points on List 3 signaling unit (Fig. 2).	
	<b>Note:</b> Read Steps 15a and 16a before proceeding with Step 15a.	
15a	Have a test call placed to the control unit from the local test desk and have the test call remain off-hook for duration of tests.	When 20-Hz ringing is received at the control unit, the neon lamp (Fig. 2) will flash momentarily and then LS relay will operate to seize the line.
16a	After LS relay operated— Monitor the call on the associated telephone	A pulsed tone will be heard for approximately 20 seconds after LS relay operated; then LS

STEP	ACTION	VERIFICATION
	set.	relay will release to disconnect the control unit.
17a	Leave the associated telephone set off-hook for remaining tests. Operate 1013A, or equivalent, hand test set switch to TALK position.	
18a	On the List 3 signaling unit— Momentarily <i>touch</i> the free 1013A, or equivalent, hand test set clip (mentioned in 14a), to TP3 and then <i>connect</i> to TP5 on List 3 signaling unit.	LS relay should operate and remain operated as long as the clip is connected to TP5.
19a	Leave the hand test set clip connected to TP5 on List 3 signaling unit.	
20a	While monitoring on associated telephone set— Use a separate test lead to connect TP7 to TP2 on List 3 signaling unit (Fig. 2) for approximately 1 second. Remove test lead.	A continuous 2125-Hz tone should be heard in associated telephone set receiver.
21a	Use KS-14510 VOM, or equivalent, with test prods to check for continuity between pins 7 and 8 on J1 on unit (verify that TD relay operated).	Continuity present.
22a	Continue to leave hand test set clip connected to TP5 on List 3 signaling unit.	
23a	Listen, using associated telephone set receiver. Use test lead to connect TP5 to TP6 on List 3 signaling unit (Fig. 2) for approximately 1 second. Remove test lead.	2125-Hz tone will stop.
24a	Use KS-14510 VOM, or equivalent, with test prods to check for open circuit between pins 7 and 8 on connector J1 to verify that relay TD released (Fig. 3).	Open circuit.
<b>Note:</b> Read <i>all</i> of Step 25a before proceeding.		
25a	Listen, using associated telephone set receiver. Disconnect 1013A, or equivalent, hand test set clip from TP5 on List 3 signaling unit for 5 to 10 seconds and then momentarily touch clip to TP4.	A pulsed tone will be heard until TP4 is touched; then the control unit will disconnect.
26a	Instruct the party at the test location to send a tone signal by pressing the "3" button on	After TP3 is touched, relay LS operates and the 2125-Hz beep tone is heard. When the



STEP	ACTION	VERIFICATION
	TOUCH-TONE dial, or equivalent, for approximately 1 second after the 2125-Hz beep tone from the control unit is heard. Then, touch the 1013A, or equivalent, hand test set clip to TP3 on List 3 signaling unit.	test party sends the TOUCH-TONE signal, the control unit stops pulsing and sends back a continuous tone in reply. Control unit disconnects automatically after 20 seconds.
27	Disconnect 1013A, or equivalent, hand test set from test points.	
28a	Have test location telephone set placed on-hook.	
29a	Place associated telephone set on-hook.	
30a	Swing List 3 signaling unit back into position and fasten by turning the retaining screws.	
31	Replace outer cover and connect customer J1 plug to control unit.	
32	The customer may now proceed to test his alarm device.	
	<b>Note:</b> All Telephone Company-provided telephone sets associated with the line connected to the KS-20445 control unit must be connected to the T1 and R1 terminals. This is to prevent an off-hook extension on the line disabling an alarm call.	

**5.06 Test B—SU7:**

STEP	ACTION	VERIFICATION
7	Listen for dial tone on associated telephone set (connected to terminals T1 and R, Fig. 4).	Dial tone is heard.
8	While monitoring on associated telephone set, dial a test number using 1013A, or equivalent, hand test set.	LS relay remains operated. Since muting contacts of repertory dialer are not being used, clicks will be heard in associated telephone set.
9	Talk to called party on associated telephone set.	
10	Place the associated telephone set on-hook.	
11	Disconnect 1013A, or equivalent, hand test set from test points.	
12	Replace outer cover and connect customer J1 plug to control unit.	

STEP	ACTION	VERIFICATION
13	Test associated telephone set for manual service.	
5.07	Maintenance of the KS-20445 control unit is limited to checking connections and performing the operating tests described. If a failure is indicated in the KS-20445 control unit, replace the unit.	Maintenance of Service Charge billing can be initiated as outlined in Section 660-101-312 entitled Maintenance of Service Charge on Services With Customer-Provided Equipment (CPE).
5.08	If the tests are satisfactory, remove all test connections to restore circuit to normal and follow local reporting procedures for CP trouble.	



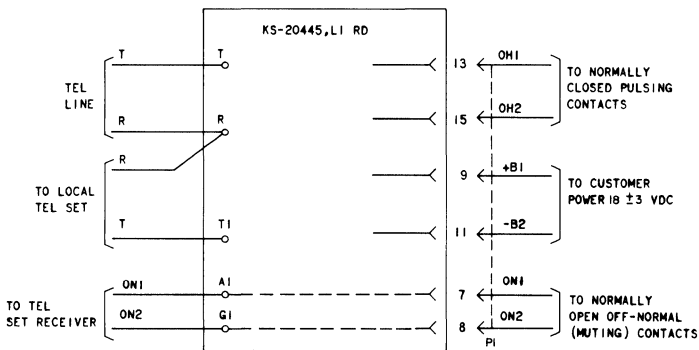
*Do not attempt any test or repair to the CPE.*

5.09 When in the repairman's judgment the trouble is located in the CPE, the Repair Service Bureau should be notified so that proper

**6. CONNECTIONS**

6.01 Fig. 3, 4, 5, 6, and Table B provide connection information for the KS-20455 type control units.

6.02 A receptacle (J1) is provided at the bottom of the unit to permit connection of the speech, pulsing, power supply, and control leads from the customer equipment by means of a (Cinch) plug to be furnished with the connecting cable as part of the customer device (see 3.01).



- NOTES:
1. PLUG PI, PART OF CABLE FROM CUSTOMER CIRCUIT.
  2. PULSING CONTACTS CONNECTED TO LEADS OH1 AND OH2 MUST BE CLOSED BEFORE LOCAL TEL SET GOES OFF HOOK.
  3. CONNECT ON1 AND ON2 LEADS FROM SCREW TERMINALS AI AND GI ACROSS RECEIVER OF LOCAL TEL SET AS SHOWN IN TABLE B.

**Fig. 4—Typical Connections for KS-20445, List 1 (RD) Control Unit, SU7 and Single Line Telephone Set**

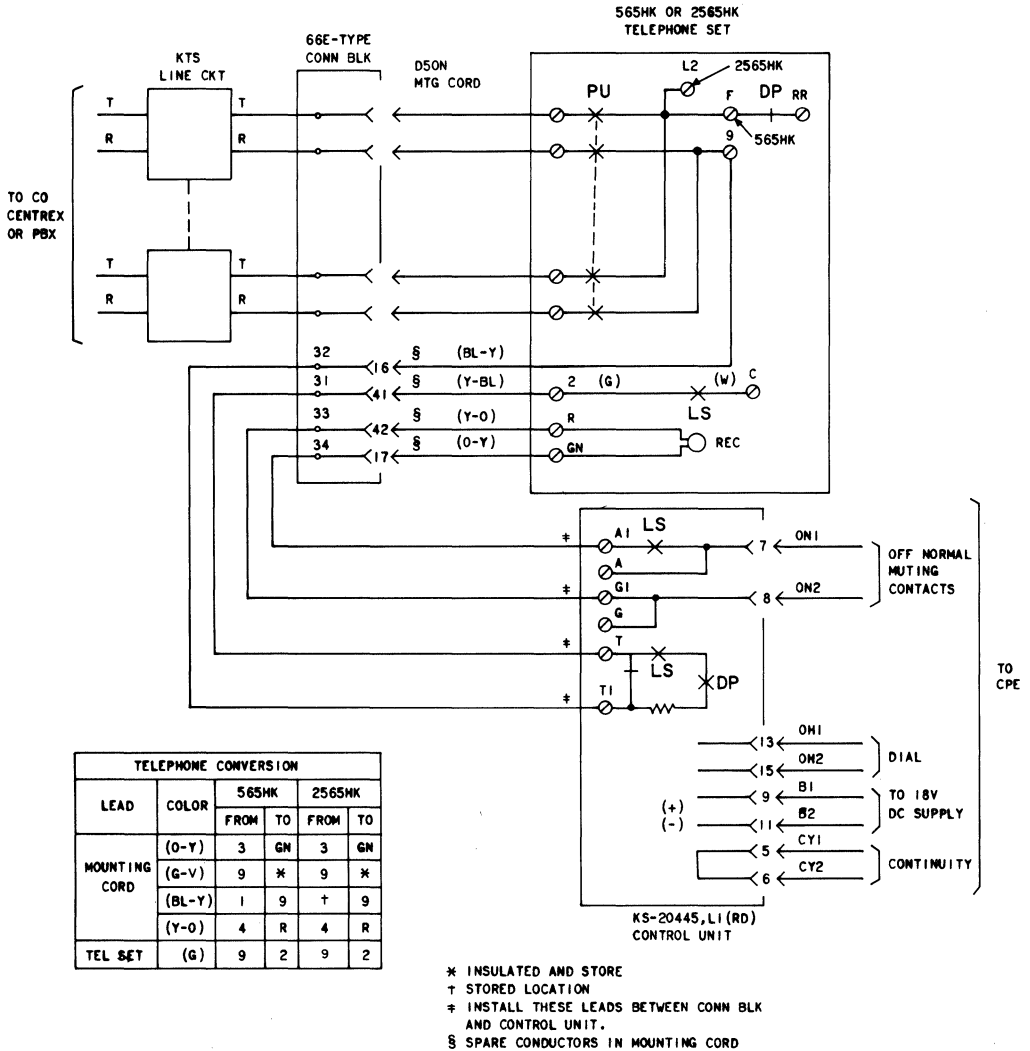


Fig. 5—Typical Connections for KS-20445, List 1 (RD) Control Unit, SU7 and Multiline Key Telephone Sets 565HK and 2565HK

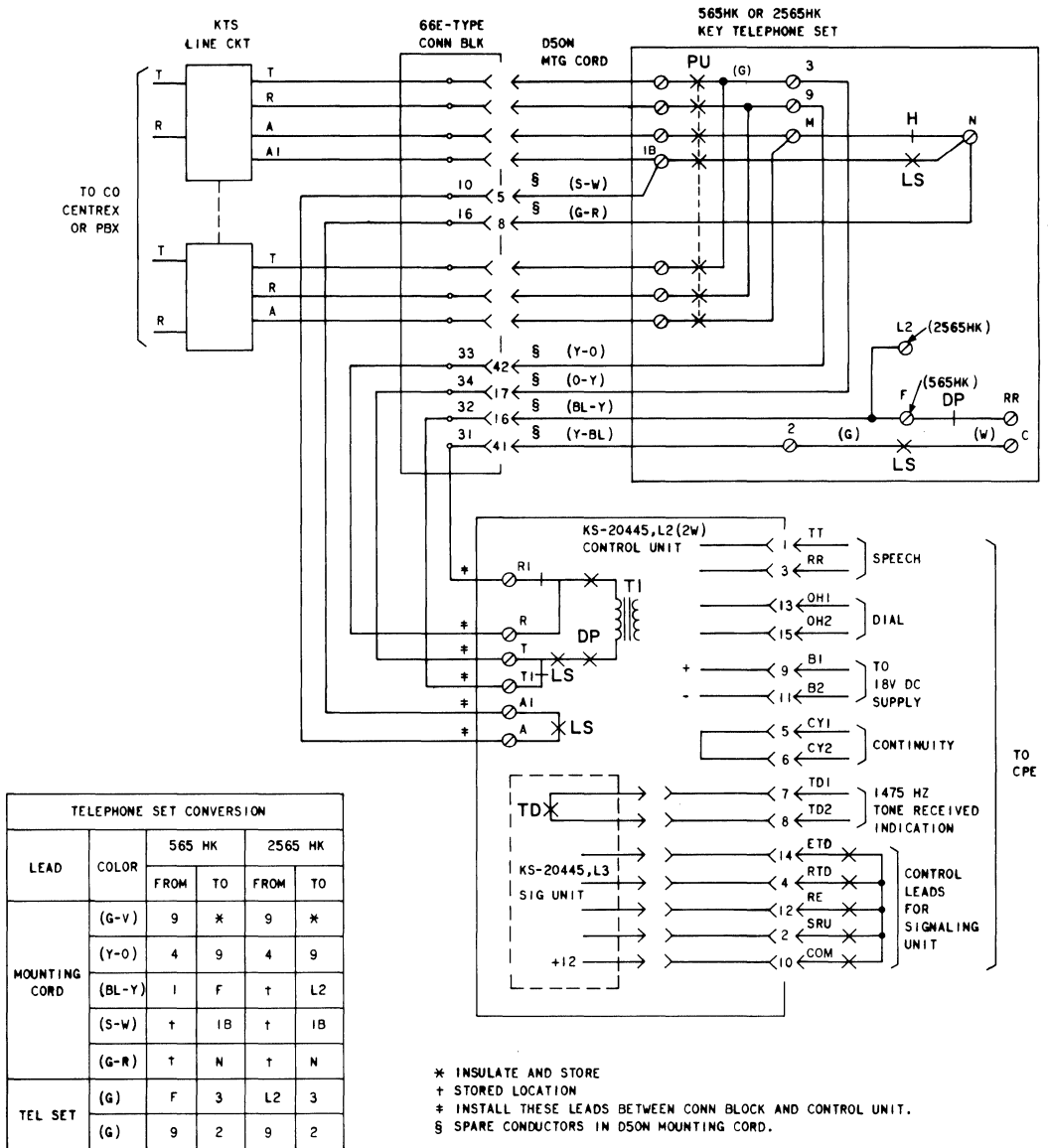


Fig. 6—Typical Connections for KS-20445, List 1 (2W), SU6 or List 2 (2W) SU6 and SU3, Control Unit and Multiline Key Telephone Set 565HK and 2565HK

TABLE B

## TELEPHONE SET RECEIVER MUTING CONNECTIONS (VCA SU7)

TEL SET TYPE	ON1 LEAD	ON2 LEAD
All 200 series except: 200 series using 685A sets	GN (Ind Coil)	R (Ind Coil)
	GN (Network)	B (Network)
All 300 series except: 332C	GN (Ind Coil)	R (Ind Coil)
	E (Ring Term. Strip)	R (Ind Coil)
All 400 series except: 462AC, 466AC	GN (Ind Coil)	R (Ind Coil)
	W (Dial)	R (Ind Coil)
All 500, 1500 and 2500 series	GN (Network)	R (Network)
All 600 series except: 610A	GN (Network)	R (Network)
	Term. 1 of TS2	Term. 2 of TS2

## PROTECTIVE CONNECTING ARRANGEMENTS

### RDMZR AND RDY

#### 1. GENERAL

**1.01** This section provides identification, installation, operation, maintenance and connection information for the KS-20721, List 1 and List 2 general purpose station couplers when used in Protective Connecting Arrangements (PCA) RDMZR and RDY.

**1.02** This section is reissued to:

- Change test procedure
- Revise Ordering Guide
- Remove extra circuit packs from Fig. 5
- Add note to Table B
- Clarify use of KS-20721, List 12 voice control—see 4.03(c)
- Replace the term Voice Connecting Arrangement (VCA) with Protective Connecting Arrangement (PCA).

**1.03** The KS-20721 station coupler (Fig. 1) is used to provide services similar to those provided by the KS-19522 recorder coupler for answering sets and recorders. However, the plug and wiring connections may be different and substitution should not be made without customer approval.

**1.04** The customer should be informed by the manufacturer or supplier of the equipment as to the proper PCA to be used with his equipment.

**1.05** If the customer wants a copy of the Technical Reference which covers any of the above PCAs, the customer should contact the local Telephone Company Business Office or the Marketing Representative.

**1.06 *Lettered Steps:*** A letter a, b, c, etc, added to a step number in Part 5 of this section indicates an action which may or may not be required depending on local conditions. The condition under which a lettered step or a series of lettered steps should be made is given in the ACTION column, and all steps governed by the same condition are designated by the same letter within a test. Where a condition does not apply, all steps designated by that letter should be omitted.

**1.07** The KS-20721 station coupler is a general purpose station coupler used with several different PCAs. Only features and options used with the arrangements in Table A are covered. Avoid alteration of the PCAs to provide services other than their design intent.

**1.08 *Protective Connecting Arrangements RDMZR and RDY:*** These connecting arrangements provide the means for automatically connecting customer-provided (CP) answer-only terminal equipment; typically, answering sets, recorded dictation equipment, and loudspeaker paging systems, to the telecommunications network. PCA RDY has all the features of RDMZR and, by means of the List 12 voice control, provides automatic volume limiting on incoming calls and voice controlled disconnect for customer-provided equipment (CPE) that are not equipped with that feature.◆

**1.09** An associated telephone company telephone set may make a normal outgoing call with either of the arrangements when the station coupler is not in operation.

**1.10** The KS-20721, List 15 test set is used to test the station coupler.

**1.11** This issue of the section is based on the following drawing:

SD-69903-01, Issue 5B—KS-20721 Station Coupler

#### NOTICE

Not for use or disclosure outside the  
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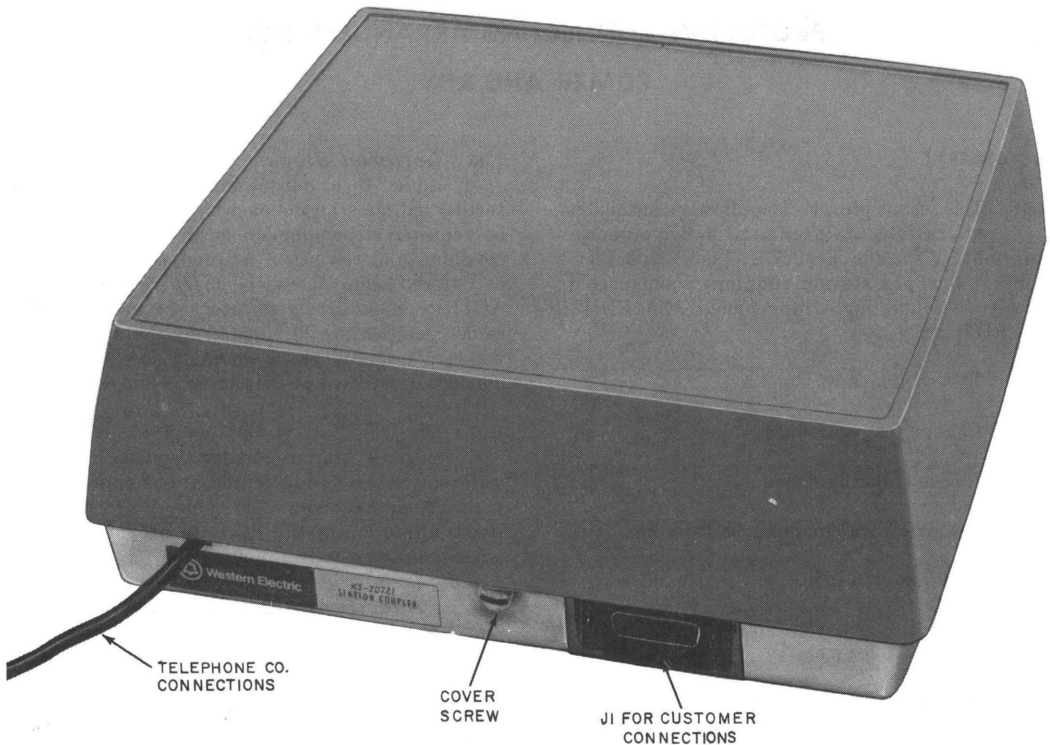


Fig. 1—KS-20721, List 1 and List 2 Station Coupler

If this section is to be used with equipment or apparatus reflecting later issue(s) of the drawing(s), reference should be made to the SDs and CDs to determine the extent of the changes and the manner in which the section may be affected.

## 2. IDENTIFICATION

### PURPOSE

- To provide facilities for connecting various types of CPE to the telephone line
- To limit excessive signal levels from CPE and to provide protection for telephone company personnel and facilities against hazardous voltages to insure longitudinal balance and to repeat network control signaling.

### APPLICATION

- Used to connect a CP recorder and/or announcement set to an exchange line for 2-way transmission.

### ORDERING GUIDE

#### ◆ Basic Units

- Coupler, Station, KS-20721, L1 (Fig. 1 and 2)—used for PCA RDMZR
- Coupler, Station, KS-20721, L2 (Fig. 1 and 3)—used for PCA RDY

The List 2 comes factory equipped with the KS-20721 L1 station coupler, KS-20721 L12 voice control, and KS-20721 L10 hinge

assembly. The three units may also be ordered separately and assembled in the field (see 2.02 and 2.03).

### Optional Units

When coupler is to be powered by telephone company, provide:

- Transformer, 2012B (one per coupler)

or

- Unit, Power, 19-Type (or equivalent dc supply) for multiple installations (see 3.09).

### Associated Apparatus

- Battery, KS-6571 (or equivalent)—required for testing if coupler is powered by CPE
- Set, Test, KS-20721, List 15 (Fig. 5)—see 2.05
- Set, Test, Hand, 1013A (or equivalent)
- Tool, KS-19192, List 1 (not required on later model units which have slotted cover screws).⚡

### DESIGN FEATURES

**2.01** The KS-20721 station coupler provides the following features:

- DC isolation and high-voltage surge protection
- 20-Hz ringing detection
- Network control signaling (off-hook and disconnect)
- 2-way voice transmission
- Voice-controlled disconnect (RDY only)
- AC or DC powered.

**2.02** The KS-20721, List 1 station coupler (Fig. 2) is the basic unit designed to be field equipped with a KS-20721, List 10 hinge assembly for mounting the optional circuit pack. The circuit pack is equipped with quick connect connectors for easy installation.

**2.03** The KS-20721, List 2 station coupler (Fig. 3) consists of a KS-20721, List 1 station coupler with a KS-20721, List 10 hinge assembly and KS-20721, List 12 voice control, factory installed.

**2.04** The List 12 voice control (Fig. 4) consists of a speech detector and a 13-second timer that is kept reset by pulses from the speech detector when voice signals are present on the telephone line. In the absence of speech signals, the timer will time out in approximately 13 seconds disconnecting the coupler from the line. However, the CO receiver off-hook tone generator, if applied to the line, will prevent operation of the List 12 voice control. An automatic volume limited (AVL) amplifier is part of the speech detector and provides a relatively constant  $-5$  dBm speech level at 600 ohms to leads AVL and ground. The customer may use this AVL amplifier to drive a tape recorder, paging system, or other equipment. ⚡The List 12 voice control is provided only with PCA RDY to provide the features of the Y option (see Tables A and C).⚡

**2.05** The KS-20721, List 15 test set plugs into the connector on the station coupler and is used with a 1013A hand test set (or equivalent) to test the operation of the coupler independent from the CPE (Fig. 5).

### 3. INSTALLATION—KS-20721, LISTS 1 AND 2 STATION COUPLERS (Refer to Tables A and B.)

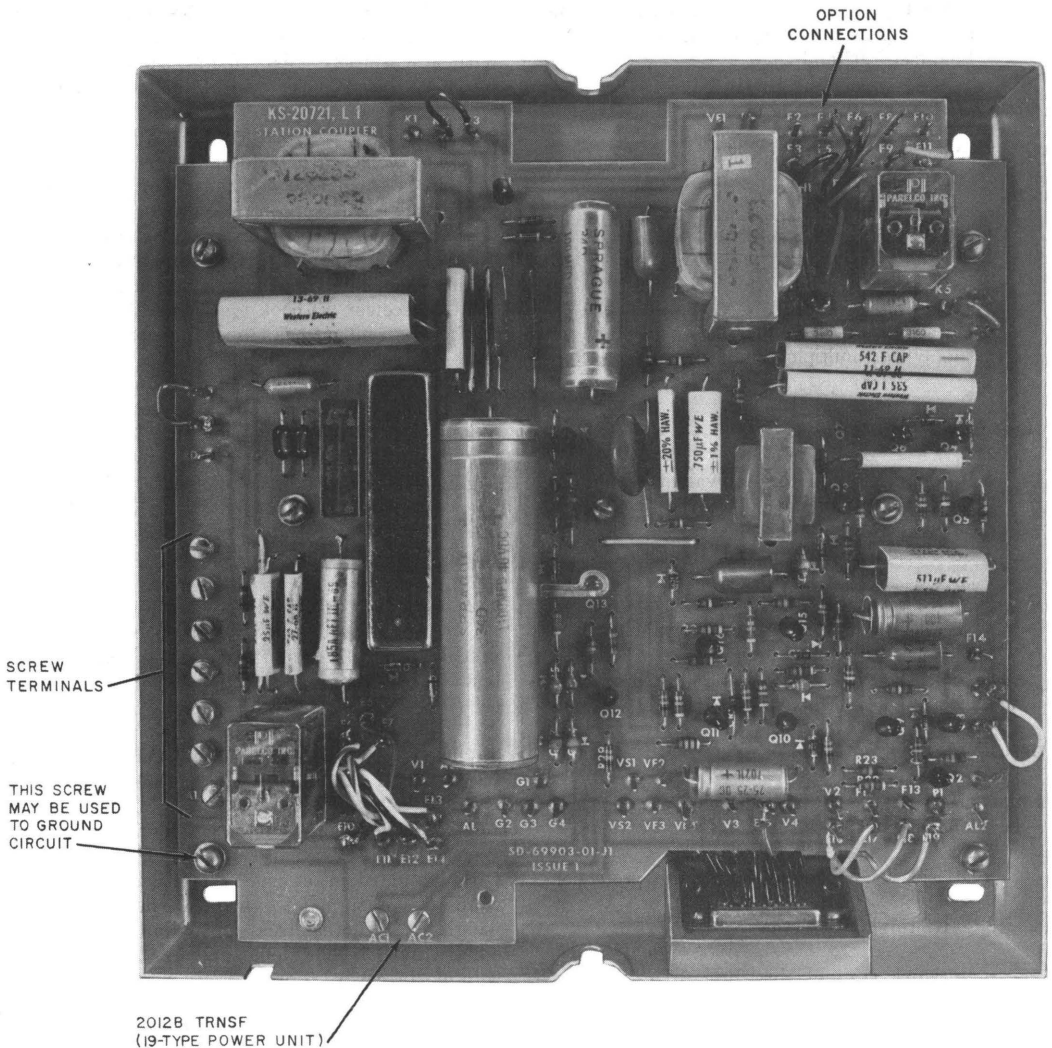
**3.01** The location and method of installing the KS-20721 station coupler shall be consistent with standard practices. The KS-20721 station coupler is designed for wall or shelf mounting, weighs 4 lbs, measures approximately 9 inches square by 3 inches deep, and has a metal base with plastic cover. (Cover screws require KS-19192, List 1 tool for early models, screwdriver for later models, and may be changed by the installer.)



*Early models had special quarter turn fasteners; current models have conventional captive screws which fasten clockwise and release when turned counterclockwise. On the early models, turn fasteners clockwise only to open or close. (Fastener may break if turned counterclockwise.)*

**3.02** A 15-pin connector (J1, Fig. 1) is located on the base of the unit to connect the transmission





**Fig. 2—KS-20721, List 1 Station Coupler, Cover Removed**

path and control leads to the CPE by means of a CP cable equipped with an ITT-Cannon Electric or Cinch Mfg. Co. No. DA-19603-403 plug with Hood No. DA-51225-1. Screw terminals on the left side of the printed circuit board (Fig. 2) provide connections to the CO line, telephone set, and 2012B power transformer (or power supply). Flexible

jumper leads with connectors provide for installation options.

**3.03** The station coupler should be located in a place mutually agreeable to the customer and telephone company, readily accessible for maintenance, and convenient for customer connection.

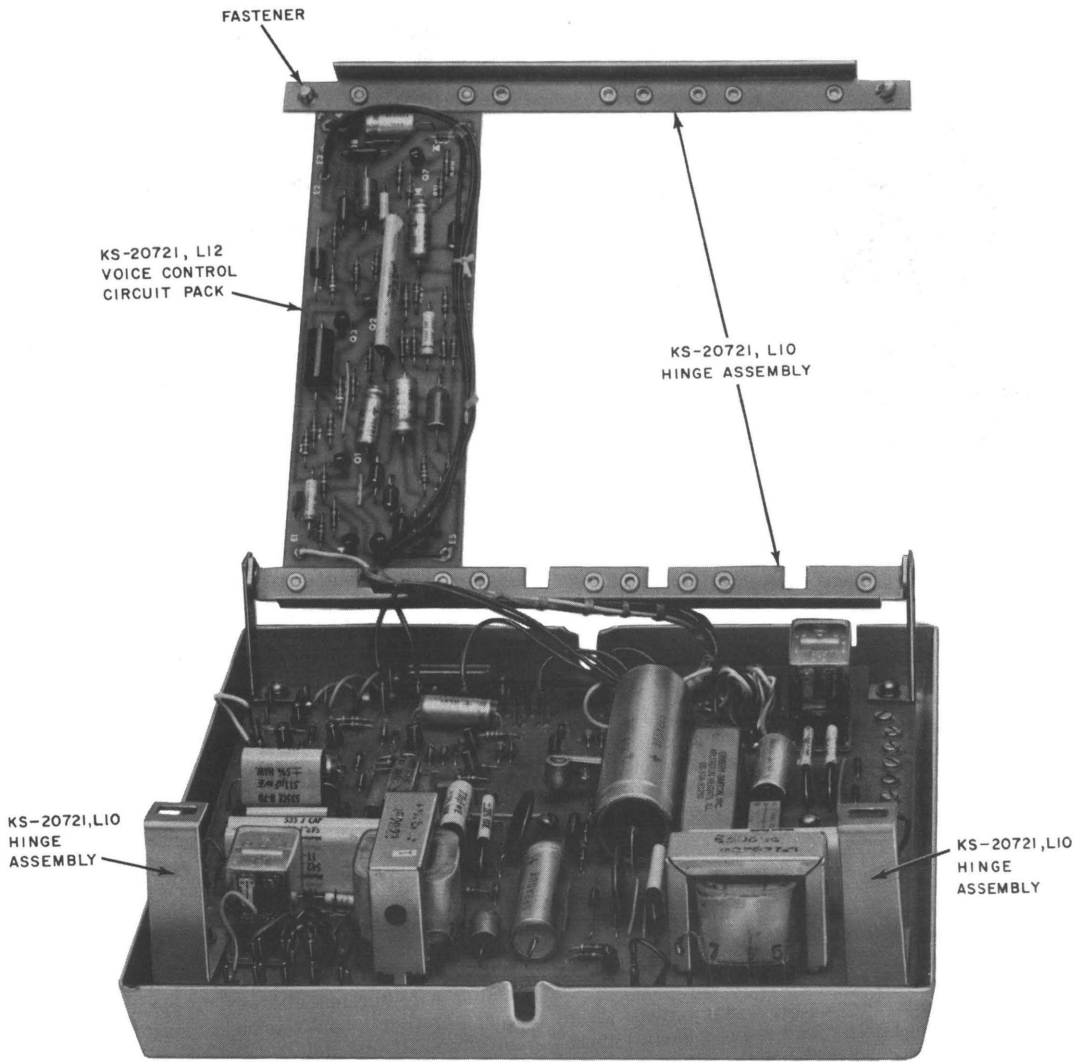


Fig. 3—KS-20721, List 2 Station Coupler

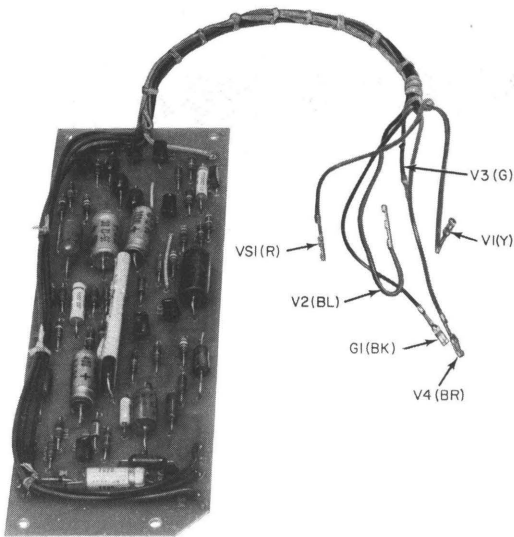


Fig. 4—KS-20721, List 12 Voice Control

◆ When a telephone set is associated with the coupler, locate coupler within 5 feet of telephone set, if practicable. ◆ When mounting coupler with screws, do not overtighten and bend base. Mount the unit close to a 115V ac convenience outlet not under control of a wall switch when power is provided by a 2012B transformer or 19-type power unit.



**Complete all installation work before connecting the power supply or connecting the CPE.**

**3.04** ◆ **Options:** Provide the wiring options given in Table A. The features provided by these options are explained in Table C. **These are the only options that are to be provided.** Wire the options by moving the flexible jumpers with connectors to the terminals in Table B. Unused leads should be stored on the terminals given in Table B. For PCA RDY, if the KS-20721 List 12 is to be field installed, proceed with the circuit pack installation given below. ◆

**3.05** **Circuit Pack Installation:** For PCA RDY installations where the KS-20721, List 2 is

not used, the List 12 must be added to the List 1 as follows:

- (1) Remove the cover from the station coupler using the KS-19192, List 1 tool or screwdriver.
- (2) Attach KS-20721, List 10 hinge assembly to the four corner screws mounting the List 1 board. Refer to Fig. 3.
- (3) The installer can mount the circuit pack on the internal mounting frame formed by the hinge assembly. Place board in correct position on frame (refer to Fig. 3 or cover label) and secure with four corner mounting screws furnished with circuit pack.
- (4) Connect the flexible jumper leads on List 1 board to provide the required options called for in Table A by using the connecting information given in Table B (see 3.04).
- (5) Provide option Y by plugging the connecting leads from the List 12 board into corresponding terminals on List 1 board per Table B and Fig. 4. Dress leads to avoid interference with boards and cover and secure leads with cable clamp provided.
- (6) Close hinge assembly and fasten the two top corner fasteners; replace cover.

### Connections

**3.06** ◆ If an associated telephone company telephone set(s) is supplied, connect the telephone set mounting cord directly to station coupler; otherwise, interconnect set and station coupler using D station wire. Secure telephone set mounting cord or D station wire to clamp at lower left corner of station coupler. All telephone sets on line must be connected to T1 and R1 of coupler.



**If there is no telephone set on the line, use a ringer simulator (to prevent line testing open). Use an AA-1A ringer simulator. If not available, an EIC ringer installed and silenced as described in Section 501-251-100 may be used.**

**3.07** Connect the CO line to screw terminals T and R. Finger-tighten all unused terminal screws. ◆

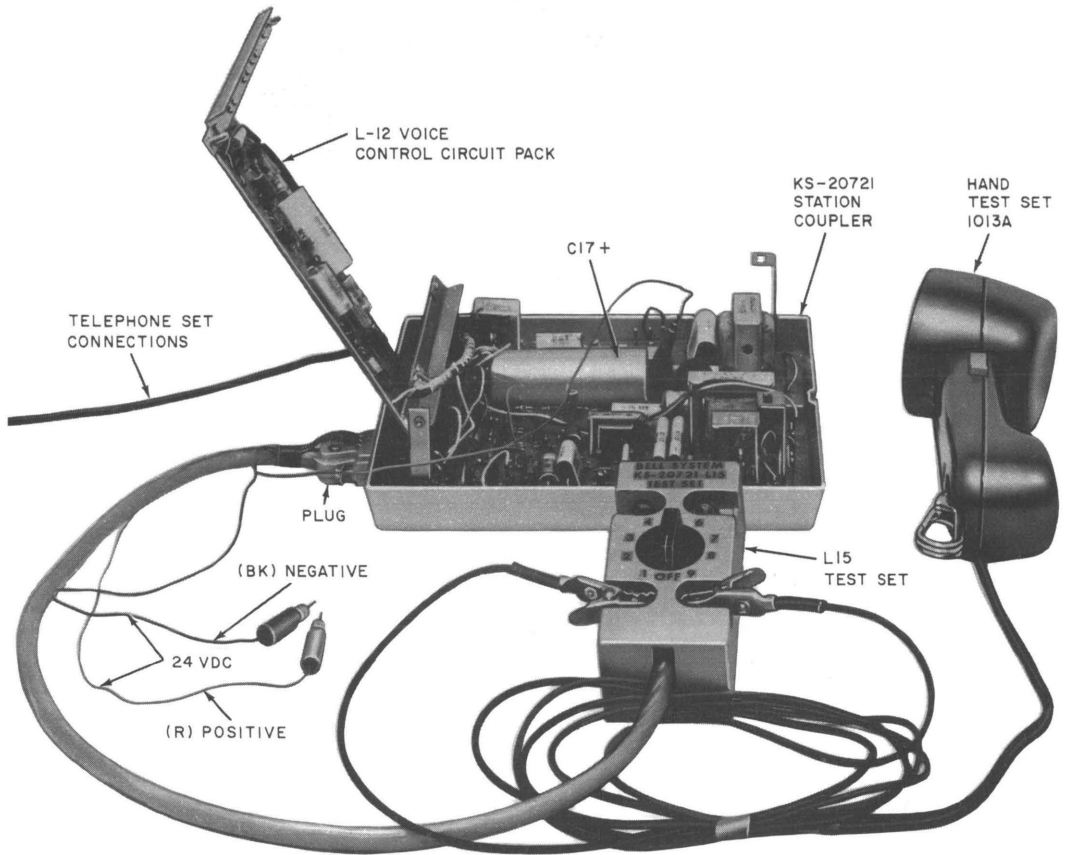


Fig. 5—KS-20721, List 2 Station Coupler With KS-20721, List 15 Test Set and 1013A Hand Test Set

TABLE A

OPTION TABLE  
(SEE NOTE)

PROTECTIVE CONNECTING ARRANGEMENT	TYPICAL CUSTOMER PROVIDED EQUIPMENT	KS-20721 STATION COUPLER LIST NUMBERS	REQUIRED WIRING OPTIONS*
RDMZR	Answering Set	List 1	Q,R,Z
RDY	Answering Set	List 2†	Q,R,Y,Z

Note: Do not provide options other than those shown required.

\* Features described in Table C.

† List 2 consists of Lists 1, 10, and 12.

♦ TABLE B ♦

## WIRING OPTIONS FOR FIELD INSTALLATION

	OPTION LEADS COLOR	FROM TERMINAL ON L1†	TO TERMINAL ON L1 BOARD			
			OPTIONS			
			Q‡	R	Z‡	Y
LEADS ON L1	G	N			N	
	BL	K1				
	S	K4				
	O	F10				
	BR	F6				
	V	F4				
	BK	F5		F1		
	Y	P2	P2			
	S*	F8			F8	
	BL*	F7			F7	
	W	M				
LEADS ON L12	R					VS1
	BK					G1
	Y					V1
	BL					V2
	G					V3
	BR					V4

\* These leads originate from J1 connector.

† Verify that leads are stored on these terminals when not in use.

‡ Options Q and Z are factory-wired.

**Power**

**3.08** Power for the coupler may be supplied either by the telephone company or the customer. If power is supplied by the telephone company, either a 2012B transformer or suitable dc supply (19-type or equivalent) may be used.

**3.09** A 2012B transformer must not be used to supply more than one coupler. A suitable dc supply (19-type or equivalent) can supply a maximum of 25 PCA RDMZR or 21 RDY connected to the dc signal output. The dc power supply should be of the current limiting type, or it should be connected through a 20-ohm, 1-watt resistor to provide current limiting. The power supply may be connected with either polarity to the AC1 and

AC2 terminals. ♦ The internal, full-wave bridge rectifier will apply the correct voltage polarity to the station coupler. **Do not ground either terminal of the power supply.** (Due to noise considerations, a power supply used in this application is an exception to the grounding instructions in Section 167-440-201.) Power supply current drain of the KS-20721, List 1 station coupler in the PCA RDMZR is .060 ampere operating current, .012 ampere standby current, and 1 ampere initial surge current. Adding the List 12 voice control to the List 1 coupler increases the operating current to .070 ampere total.♦

**3.10** Line noise pickup, cross-talk, etc, may occur between units connected to a common power supply. When this occurs, it may be cleared by

**TABLE C**  
**WIRING OPTION FEATURES**

OPTION	FEATURE
Q	Provides for direct control of line relay PR for DC pulse repeating.
R	Connects RU relay to ring detector.
Z	Connects transmission circuit to tip side of telephone line. Used with option R to provide an isolated contact closure to customer over leads RU1 and RU2.
Y	Adds List 12 circuit to provide voice controlled disconnect supervision and volume limited output to CP equipment.

grounding the housing of each station coupler. The circuit board mounting screw *below* terminal A1 may be used for grounding the circuit.

**3.11** When power is supplied by a 2012B transformer (or 19-type power unit), a current limited, positive dc voltage source is provided to the customer on lead B1 (ground return on lead B2) furnishing a charging current of 2.5 milliamperes which may be used to keep a CP rechargeable battery (18V, 150 to 500mA) charged during normal operation to provide power when commercial power fails. If the customer furnishes power, 21  $\pm$ 5 volts dc must be connected to leads B1 and B2 through plug (P1).

**3.12** After installation is completed, perform tests given in Part 5 to check for proper operation before CPE is connected.

#### **4. OPERATION**

##### **General**

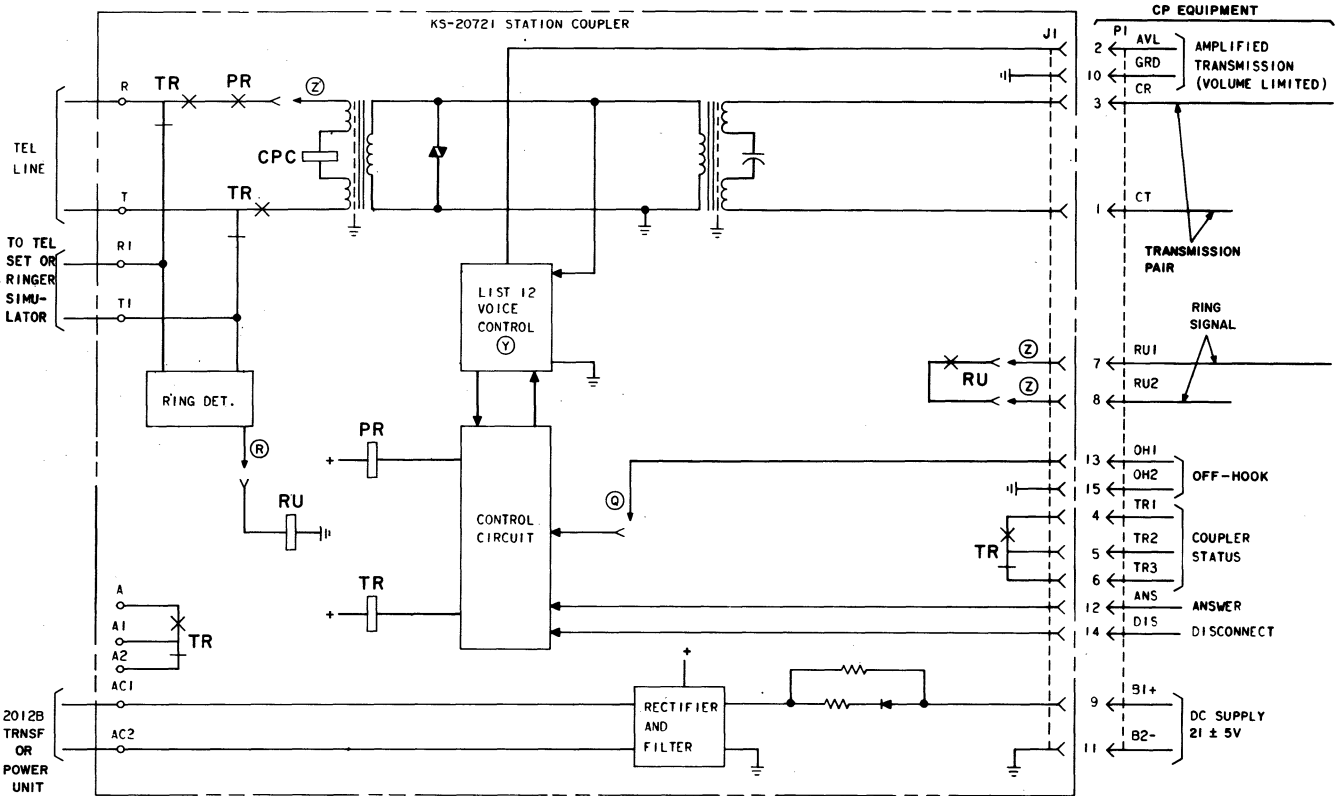
**4.01** The KS-20721, List 1 station coupler (Fig. 6) consists of a 20-Hz ringing signal detector operating ringup (RU) relay, a supervisory control circuit operating line transfer (TR) relay, dial pulsing (PR) relay, CPC relay, a transmission circuit consisting of two transformers in tandem, a peak voltage limiter, and a power supply rectifier and filter circuit.

**4.02** When 20-Hz ringing is detected by the ring detector circuit, relay RU will operate for

approximately 1 second during each 2-second ringing cycle closing leads RU1 and RU2 to indicate ringing to the CPE. The ring detector circuit also causes PR relay to operate and hold for about 4 seconds. The CPE may answer the call by:

- (a) Closing leads OH1 and OH2, or
- (b) Closing lead ANS to lead B1+ momentarily (at least 1 second).

Performing (a) causes TR relay to operate, seizing the line, since PR relay was already operated by the ring detector. Performing (b) causes PR relay to stay operated and causes TR relay to operate. Telephone line current operates CPC relay which causes PR and TR relays to stay operated after lead ANS is disconnected from lead B1+. Either of the two actions listed above will cause the coupler to terminate the telephone line and answer the incoming call. Two-way transmission is provided immediately upon line seizure; leads TR2 and TR3 are opened, and leads TR1 and TR2 are closed indicating line seizure. When the ANS lead is closed to B1+ to answer the call, leads OH1 and OH2 must not be connected. Line current must be present at all times for operation of the connecting arrangement. If line current is interrupted momentarily, inadvertently or otherwise, after using the ANS and B1+ leads to establish line seizure, a disconnect signal will be given to the CPE via the status leads (TR1, TR2, TR3).



- NOTES:
1. CIRCLED LETTERS (Z), (R), ETC DENOTE WIRING OPTIONS
  2. PI IS CUSTOMER PROVIDED PLUG.

Fig. 6 → KS-20721 Station Coupler, Internal Wiring Options ←

**Disconnect Incoming Call**

- 4.03** The coupler will remain connected to the telephone line until:
- (a) The CPE opens the closure between leads OH1 and OH2.
  - (b) The CPE closes lead DIS to lead B2—
  - (c) List 12 voice control causes disconnect when speech is absent for approximately 13 seconds.
  - (d) The CO times out following calling party disconnect and momentarily opens the line toward the coupler (the CPE must have answered using ANS and B1+ and there must be no closure between OH1 and OH2).

Any of the actions described cause TR and PR relays to release, disconnecting the coupler from the line.



*The open signal described in (d) above is not given by every CO. If the customer requires disconnect, he must order PCA RDY.*

**List 15 Test Set**

- 4.04** The List 15 test set (Fig. 5 and 7) used with the 1013A hand test set (or equivalent) and a connecting cable terminated in a plug for connection to the station coupler permits checking of the coupler independent of the CPE.

- 4.05** When detailed circuit description and operation information is required, refer to CD- and SD-69903-01.

**5. MAINTENANCE**

- 5.01** When trouble is reported, verify that:

- Customer connector plug is secure in coupler.
- Power is being supplied to station coupler either by telephone company or CPE.
- Leads to CO line and telephone set are secure.
- CO pair and telephone set are good.
- Wiring options and coupler connections are correct. (Refer to Table B and Fig. 8.)

- 5.02** After performing steps in 5.01, if trouble still exists, perform the following test.

**5.03 Apparatus Required:**

- List 15 test set
- 1013A (or equivalent) hand test set
- KS-6571 (or equivalent) battery (if coupler is powered by CPE).





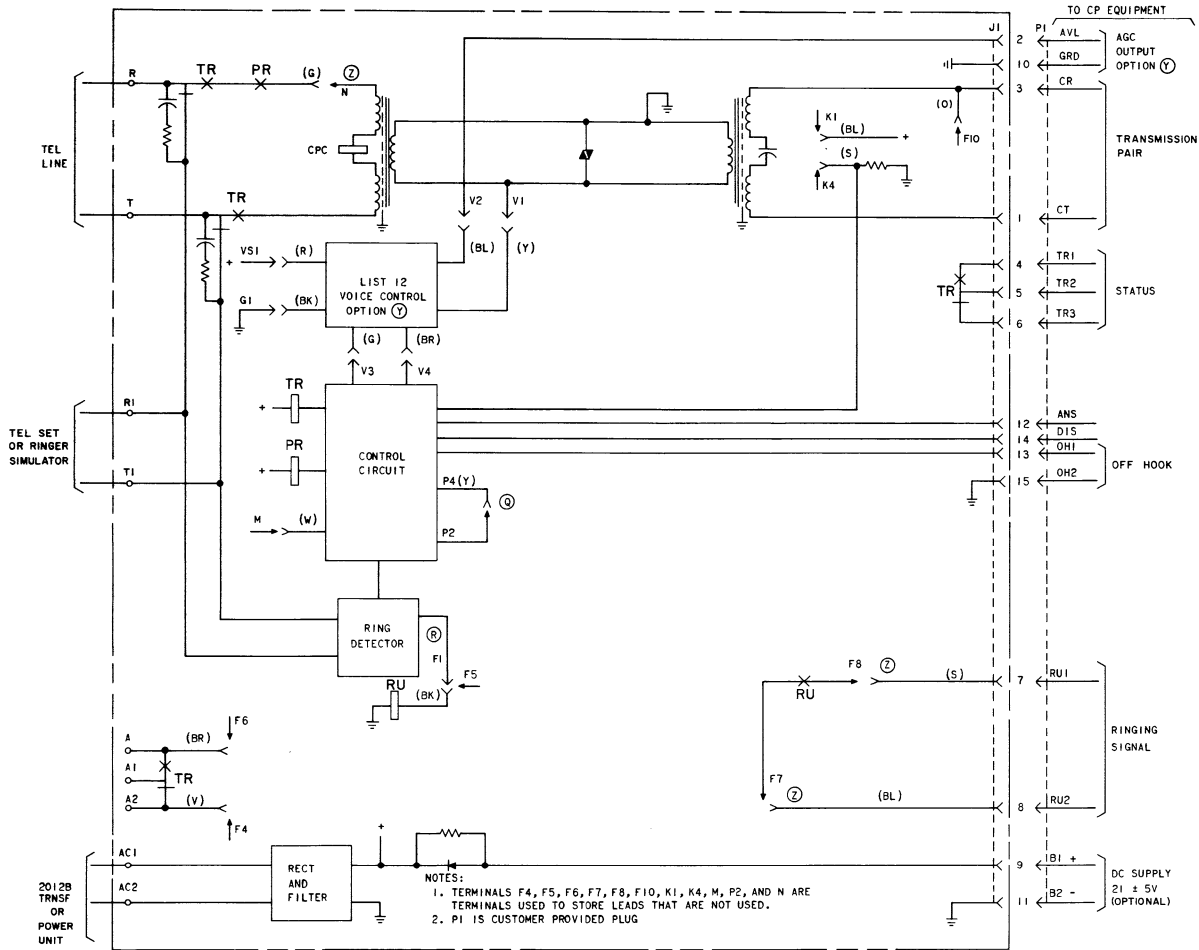


Fig. 8—KS-20721 Station Coupler, Simplified Schematic


5.04 *Preparation:*

*Make all tests with CPE disconnected.*

STEP	ACTION	VERIFICATION
1	Remove cover of station coupler using KS-19192, List 1 tool or screwdriver.	
2	Rotate selector switch on List 15 test set to OFF.	
3	Connect a 1013A (or equivalent) hand test set to terminals provided on test set (Fig. 5).	
4a	If coupler is normally powered by CPE— Use a 24V (KS-6571 or equivalent) battery and connect the pin-tipped red lead from the test set to +24V and black lead to -24V.	
5	Connect test set plug to receptacle on station coupler.	White lamp extinguished. Red lamp extinguished.

5.05 *Tests—RDMZR and RDY*

STEP	ACTION	VERIFICATION
6	Connect alligator clip on wire coming from the test set plug to the positive (+) terminal of capacitor C17 in the station coupler (Fig. 5).	
7	Operate switch on hand test set to MON.	
8	Rotate selector switch of test set to position 2.	
9	Operate switch on hand test set to TALK.	White lamp lighted. Dial tone heard in hand test set receiver in approximately one second.
10	Using the hand test set, dial the local test desk and request the testman to call back; proceed with Step 11 immediately.	
11	Operate switch on hand test set to MON.	White lamp extinguished.
12	Rotate selector switch of test set to position 3.	

STEP	ACTION	VERIFICATION
13	Testman returns call.	White lamp flashes in unison with ringing cycle.
14	Rotate selector switch of test set to position 5 to answer call.	White lamp lighted.
15	Operate test set switch to TALK position.	
16b	If testing PCA RDMZR— Rotate selector switch of test set to position 6.	
17b	Request testman to release the line and immediately operate switch on hand test set to MON.	
18b	Wait for disconnect.	White lamp extinguished within 1 minute (indicates disconnect).
	<p><b><i>When the coupler is connected to a SXS office, a loop current interruption may occur almost immediately after the calling party disconnects. The hand test set must be set to MON very quickly to catch the open indication and extinguish the white lamp. Not all central offices give an open indication upon disconnect. This should be considered before a coupler is replaced as defective.</i></b></p>	
19c	If testing PCA RDY— Request the testman to disable his transmitter while retaining talk battery on the line.	
20c	Operate switch on hand test set to MON, wait 20 seconds, then operate switch to TALK.	White lamp remains lighted.
21c	Rotate selector switch of test set to position 6 and talk for at least 10 seconds and request testman to remain silent for 20 seconds, then disconnect by operating hand test set switch to MON.	
22c	After talking, immediately operate switch on hand test set to MON and wait for disconnect.	White lamp extinguished in approximately 13 seconds after talking ends.
23	Rotate selector switch of test set to position 7.	White lamp remains extinguished. (If white lamp lights, verify that switch on hand test set is in MON position. Rotate selector switch of test set back to position 6, wait for lamp to extinguish, then rotate back to position 7 and proceed with test.)

STEP	ACTION	VERIFICATION
24	Rotate selector switch of test set to position 8.	White lamp lighted. Dial tone heard in hand test set receiver. (If there is an abnormal delay before proceeding to the next step, some offices may return a dial tone time-out indication. If this happens, rotate selector switch to OFF, then back to position 8; dial tone will return; proceed with test.)
25c	If testing PCA RDY— Rotate selector switch of test set to position 9. (The 13-second time-out starts at this time and may cause disconnect. If this happens, rotate selector switch to position 8, then back to 9, and proceed with test.)	White lamp remains lighted. Dial tone level is increased.
26b	If testing PCA RDMZR— Rotate selector switch of test set to position 9.	White lamp remains lighted. Dial tone silenced.
27	Rotate selector switch of test set back to position 8.	White lamp remains lighted.
28	Rotate selector switch of test set to OFF.	White lamp extinguished.
29	Disconnect test set from station connector and reconnect CPE.	
<b>5.06</b>	If coupler does not meet the above tests, replace coupler and/or circuit pack.	
<b>5.07</b>	If the tests are satisfactory, remove all test connections, restore circuit to normal, and follow local reporting procedures for CP trouble.	

**PROTECTIVE CONNECTING ARRANGEMENTS**  
**SU6AQ AND STS**  
**KS-20721 STATION COUPLER**

**1. GENERAL**

**1.001** This addendum supplements Section 463-340-102, Issue 3. Place this pink sheet ahead of Page 1 of the section.

**1.002** This addendum is issued to combine step 8 with step 7 and to renumber steps 9 through 14 in paragraph 5.05.

**5.05 Tests—SU6AQ and STS**

**2. CHANGES TO SECTION**

**2.001** On Page 13, change paragraph 5.05 to read as follows:

<b>STEP</b>	<b>ACTION</b>	<b>VERIFICATION</b>
4	Connect test set plug to receptacle on station coupler and connect alligator clip on wire coming from test set plug to terminal VF4 in the station coupler (Fig. 5).	White lamp extinguished.
5	Rotate selector switch of test set to position 8.	White lamp lighted.
6	Rotate selector switch to OFF.	White lamp extinguished.
7	Operate switch on 1013A hand test set to TALK and connect its leads to the terminals provided on the List 15 (Fig. 5). Rotate selector switch to position 1.	White lamp lighted. Dial tone heard in hand test set receiver.
8	Using the hand test set, dial the local test desk and request the testman to call back. Proceed immediately to step 9.	
9	Rotate test set switch to position 3.	White lamp extinguished.
10	Testman returns call.	White lamp flashes in unison with ringing cycle.
11	Rotate test set switch to position 1 and answer call on 1013A.	White lamp lighted.
12	Rotate test set switch to OFF.	White lamp extinguished.
13	Disconnect test set from station coupler, replace cover, and reconnect CPE.	

**NOTICE**

Not for use or disclosure outside the  
Bell System except under written agreement

## PROTECTIVE CONNECTING ARRANGEMENTS

### SU6AQ AND STS

#### KS-20721 STATION COUPLER

##### 1. GENERAL

**1.01** This section provides identification, installation, operation, maintenance and connection information for the KS-20721, List 1 and List 3 general purpose station couplers which are used to connect customer-provided (CP) alarm systems in Protective Connecting Arrangements (PCA) SU6AQ and STS. (Suffixes AV, QT, and VT have been deleted.)

**1.02** This section is reissued to:

- Rate KS-20721, List 11 pulse corrector MD and remove references to its use
- Revise Tables A, B, and C
- Change Fig. 3, 5, 6, 7, and 8
- Replace the term Voice Connecting Arrangement (VCA) with Protective Connecting Arrangement (PCA)
- Add current drain requirements to 3.09.

**1.03** The KS-20721 station coupler (Fig. 1) is used to provide services similar to those provided by the KS-20008 control unit (MD) and the KS-20445, List 1 control unit for alarm systems. However, the plug and wiring connections may be different and substitution should not be made without customer approval.

**1.04** The customer should be informed by the manufacturer or supplier of the equipment of the proper PCA to be used with his equipment.

**1.05** If the customer wants a copy of the Technical Reference which covers any of the above PCAs, the customer should contact the local Telephone Company Business Office or the Marketing Representative.

**1.06 *Lettered Steps:*** A letter a, b, c, etc, added to a step number in Part 5 of this section indicates an action which may or may not be required depending on local conditions. The condition under which a lettered step or a series of lettered steps should be made is given in the ACTION column, and all steps governed by the same condition are designated by the same letter within a test. Where a condition does not apply, all steps designated by that letter should be omitted.

**1.07** The KS-20721 station coupler is a general purpose station coupler used with several PCAs. Only the features and options applying to the arrangements shown in Table A are covered. Avoid alteration of the PCA to provide services other than design intent.

##### **1.08 *Protective Connecting Arrangement SU6AQ:***

This connecting arrangement is intended to connect customer-provided equipment (CPE) capable of either originating or receiving calls, or both, and typically providing alarm systems to the telecommunication network.

##### **1.09 *Protective Connecting Arrangement STS:***

This connecting arrangement is typically used with CP alarm systems that transmit supervisory tones.

**1.10** An associated telephone company telephone set may make a normal outgoing call with any of the arrangements if the station coupler is not in operation.

**1.11** The KS-20721, List 15 test set may be used to test the station coupler.

**1.12** This issue of the section is based on the following drawing:

SD-69903-01, Issue 5B—KS-20721 Station Coupler

If this section is to be used with equipment or apparatus reflecting later issue(s) of the drawing,

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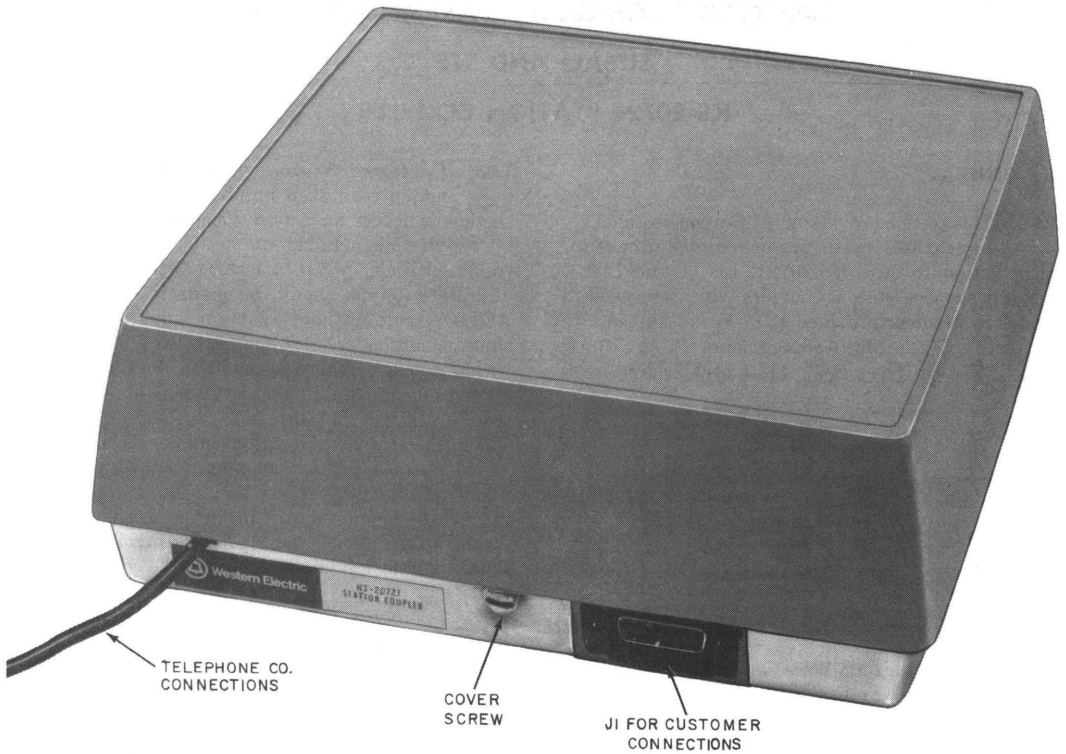


Fig. 1—KS-20721, List 1 or List 3 Station Coupler

◆ TABLE A ◆

OPTION TABLE §

PROTECTIVE CONNECTING ARRANGEMENT	TYPICAL CUSTOMER PROVIDED EQUIPMENT	KS-20721 STATION COUPLER LIST NO.	REQUIRED WIRING OPTIONS*
SU6AQ	Alarm Systems	List 1	Q‡, R, Z‡
STS	Alarm System With Tone Signaling	List 3†	Q‡, R, T, Z‡

\* Features described in Table C.

† List 3 consists of Lists 1, 10, and 13.

‡ Options Q and Z are factory-wired.

§ Never provide more than required wiring options.



reference should be made to the SDs to determine the extent of the changes and the manner in which the section may be affected.

## 2. IDENTIFICATION

### PURPOSE

- To provide facilities for connecting various types of CPE to the telephone line
- To limit excessive levels from CPE, to provide protection for telephone company personnel and facilities against hazardous voltages, to insure longitudinal balance, and to provide for network control signaling.

### APPLICATION

- Used to connect a CP alarm system to a central office (CO) exchange line or PBX station line.

### ORDERING GUIDE

#### *Basic Units*

- Coupler, Station, KS-20721, L1 (Fig. 1 and 2). Used for PCA SU6AQ.
- Coupler, Station, KS-20721, L3 (Fig. 3). Used for PCA STS. The L3 comes factory-wired with the three units listed below. These three units may also be ordered separately and assembled in the field. (See 2.03 and 2.04.)

Coupler, Station, KS-20721, L1

Assembly, Hinge, KS-20721, L10 (Fig. 3)

Limiters, KS-20721, L13 (Fig. 4)

**2.01** If coupler is to be powered by telephone company, provide:

- Transformer, 2012B (one per coupler)
- or
- Unit, Power, 19-type (or equivalent dc supply) when required for multiple coupler installations—see 3.09.

### *Associated Apparatus*

- Set, Test, KS-20721, L15 (Fig. 5)—see 2.06.
- Set, Test, Hand, 1013A (or equivalent).
- Battery, KS-6571 (or equivalent)—required for testing if coupler is powered by CPE.
- Tool, KS-19192, L1 (not required on later model units which have slotted screws).

### DESIGN FEATURES

**2.02** Protective Connecting Arrangements SU6AQ and STS provide the following features:

- DC isolation and high-voltage surge protection
- 20-Hz ringing detection
- Network control signaling (off-hook, dial pulse, tone address signaling, and disconnect)
- 2-way voice transmission
- AC or DC powered
- Can be powered by either telephone company or CP power supply.

**2.03** The KS-20721, List 1 station coupler (Fig. 2) is the basic unit which can be field equipped with a KS-20721, List 10 hinge assembly for mounting the optional circuit pack (Fig. 3). The circuit pack is equipped with quick connectors for easy installation.

**2.04** The KS-20721, List 3 station coupler consists of a KS-20721, List 1 station coupler with a KS-20721, List 10 hinge assembly and KS-20721, List 13 limiter (Fig. 4), factory-installed.

**2.05** The KS-20721, List 13 limiter circuit protects the telephone facilities from excessive tone signal levels from the CPE. Average power limiting is achieved by a photoresistor shunting the transmission path. A level detector drives current through the lamp controlling the photoresistor when the signal amplitude goes above  $-10$  dBm. The List 13 limiter is added to the List 1 coupler by providing option T as shown in Table B.

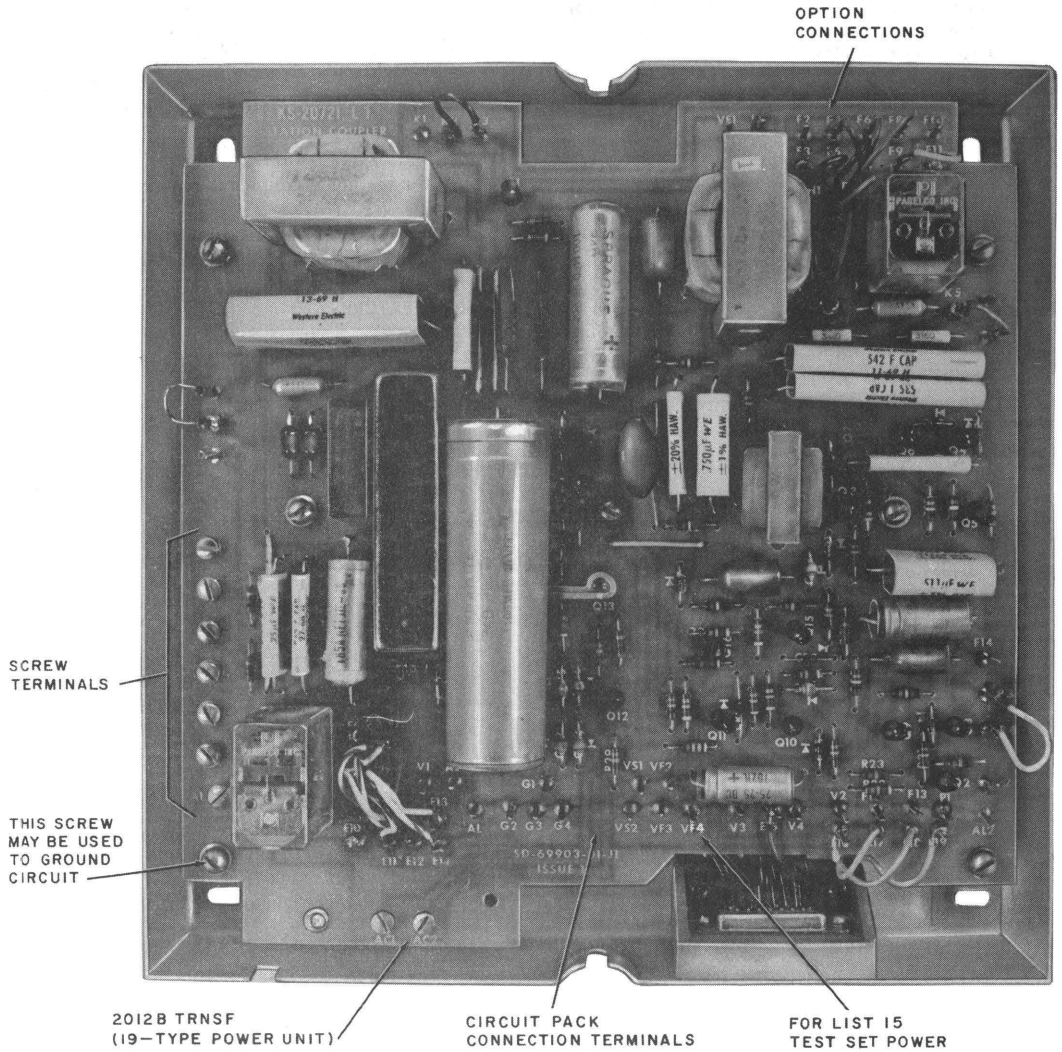


Fig. 2—KS-20721, List 1 Station Coupler, Cover Removed, Used With PCA SU6AQ

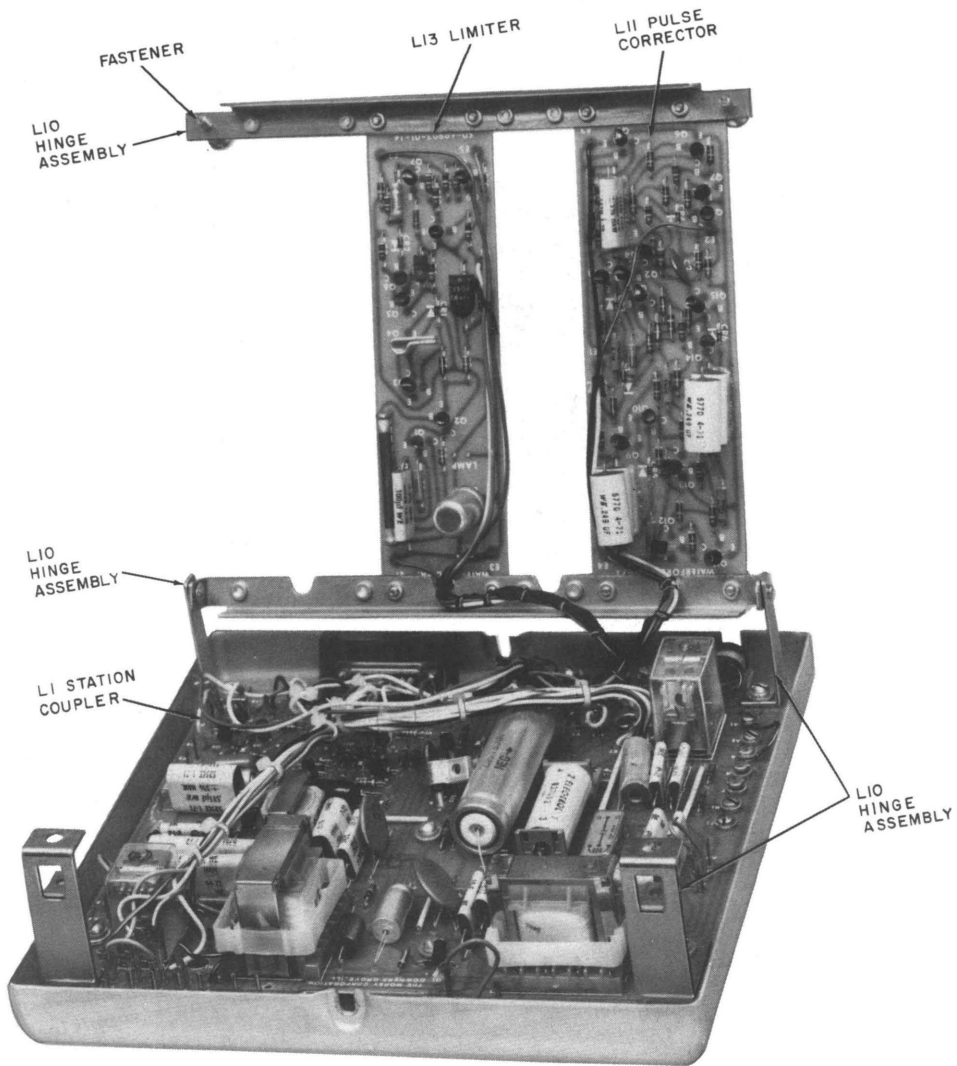


Fig. 3 - KS-20721, List 3 Station Coupler Used With PCA STS

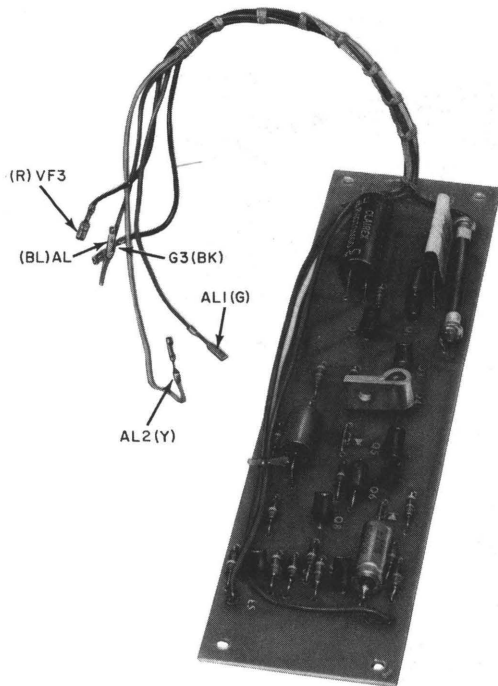


Fig. 4—KS-20721, List 13 Limiter

**2.06** The KS-20721, List 15 test set plugs into the connector on the station coupler and is used with a 1013A hand test set (or equivalent) to test the operation of the coupler independent of the CPE (Fig. 5).

**3. INSTALLATION—KS-20721, LISTS 1 and 3 STATION COUPLERS** (Refer to wiring options shown in Table A and connections in Table B)

**3.01** The location and method of installing the KS-20721 station coupler shall be consistent with standard practices. The station coupler is designed for wall or shelf mounting, weighs 4 lbs, measures approximately 9 inches square by 3 inches deep, and has a metal base with plastic cover. (Cover screws require KS-19192, List 1 tool for early models, screwdriver for later models, and may be changed by the installer.)



*Early models had special quarter-turn fasteners, current models have conventional captive screws which fasten clockwise and release when turned counterclockwise. On early models, turn fasteners clockwise only to open or close. Fasteners may break if turned counterclockwise.*

**3.02** A 15-pin connector (J1, Fig. 1) is located on the base of the unit to connect the transmission path and control leads to the CPE by means of a CP cable equipped with an ITT-Cannon Electric or Cinch Manufacturing Company plug No. DA-19603-403 (P1) with hood No. DA-51225-1. Screw terminals on the left side of the printed circuit board (Fig. 2) provide connections to the CO line, telephone set, and 2012B power transformer (or power supply). Flexible jumper leads with connectors provide for installation options.

**3.03** The station coupler should be located in a place mutually agreeable to the customer and telephone company, readily accessible for maintenance, and convenient for customer connection. When associated with a telephone company telephone set, the coupler should be within 5 feet of the telephone set, if practical. When mounting coupler with screws, do not overtighten and bend the base. Mount the unit close to a 115V ac convenience outlet not under control of a wall switch when power is provided by a 2012B transformer or 19-type power unit.



*Complete all installation work before connecting the power supply or the CPE.*

**3.04** **Options:** Provide the wiring options given in Table A. The features provided by these options are explained in Table C. These are the only options which are to be provided. Wire the options by moving the flexible jumper leads with connectors to the terminals given in Table B. Verify that the unused leads are stored on the proper terminals given in Table B. For PCA STS, if the KS-20721 List 13 is to be field-installed, proceed with the circuit pack installation procedures given below. ⚡

◆TABLE B◆

## WIRING OPTIONS FOR FIELD INSTALLATIONS

OPTION LEAD		FROM TERMINAL ON L1†	TO TERMINAL ON L1 BOARD			
LOC	COLOR		OPTIONS			
			Q‡	R	T	Z‡
LEADS ON L1 BOARD	G	N				N
	BL	K1				
	S	K4				
	O	F10				
	BR	F6				
	V	F4				
	BK	F5		F1		
	Y	P2	P2			
	S*	F8				F8
	BL*	F7				F7
	W	M				
LIST 13 LIMITER	R				VF3	
	BK				G3	
	Y				AL2	
	BL				AL	
	G				AL1	

\* These leads originate from J-1 connector.

† Verify that leads are stored on these terminals when not in use.

‡ Options Q and Z are factory-wired.

**CIRCUIT PACK INSTALLATION (PCA STS)**

**3.05** For those installations for PCA STS where the KS-20721 List 3 with the factory-installed KS-20721 List 13 circuit pack is not used, the KS-20721 List 13 must be added to a KS-20721

List 1. To add this circuit pack, perform the following steps:

- (1) Remove the cover from the station coupler using the KS-19192, List 1 tool or screwdriver.

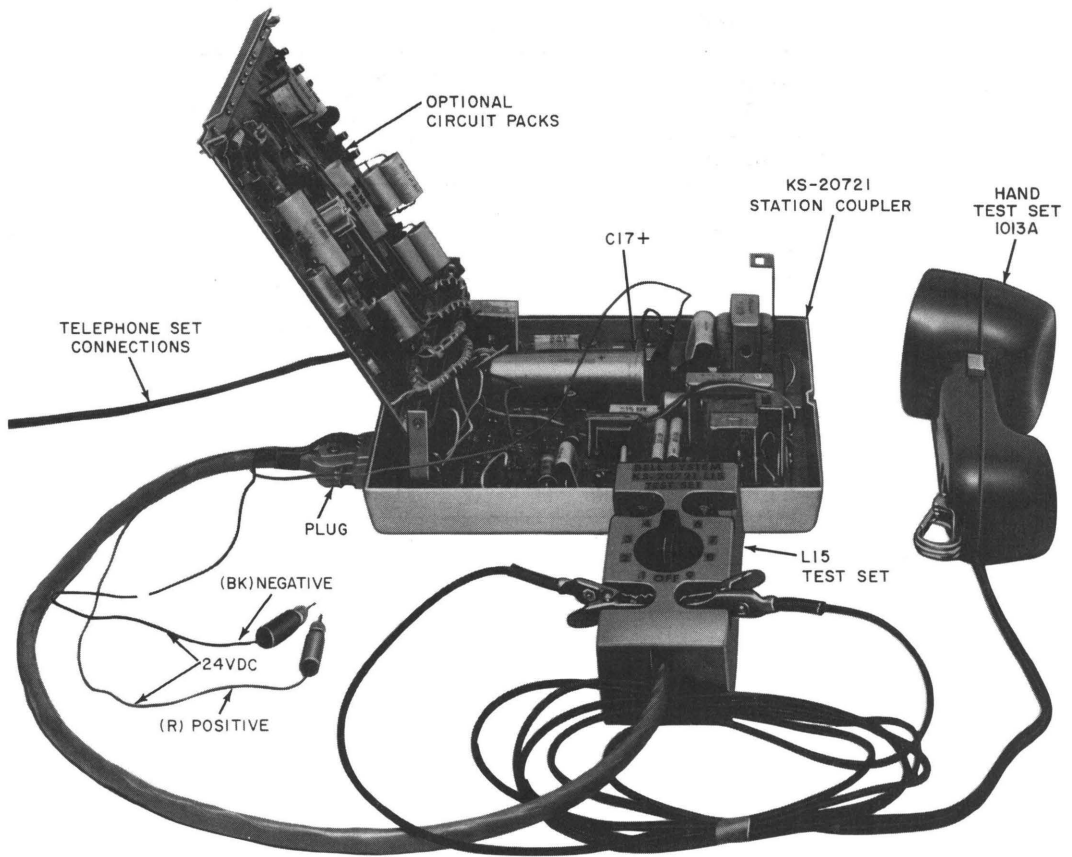


Fig. 5—KS-20721, List 3 Station Coupler With KS-20721, List 15 Test Set and 1013A Hand Test Set

- (2) Attach KS-20721, List 10 hinge assembly to the four corner screws mounting the List 1 board. Refer to Fig. 3.
- (3) Mount the circuit pack on the internal mounting frame formed by the hinge assembly. Place board in correct position on frame (refer to Fig. 3 or cover label) and secure with four corner mounting screws furnished with circuit pack.
- (4) Connect the flexible jumper leads on List 1 board to provide the required options called for in Table A by using the connecting information given in Table B. (See 3.04.)
- (5) Provide option T by plugging the connecting leads from circuit pack into corresponding terminals on List 1 board per Table B and Fig. 4. Dress leads to avoid interference with boards and cover and secure leads with cable clamp provided.
- (6) Close hinge assembly and fasten the two top corner fasteners.

◆ TABLE C ◆

## WIRING OPTION FEATURES

OPTION	FEATURE
Q	Provides for direct control of line relay PR for dc pulse repeating.
R	Connects RU relay to ring detector.
Z	Connects transmission circuit to tip side of telephone line. Used with option R to provide an isolated contact closure to customer over leads RU1 and RU2.
T	Adds list 13 circuit to provide AGC limiting when customer transmits end-to-end nonvoice signals.

## CONNECTIONS

**3.06** If an associated telephone company telephone is used, connect telephone set mounting cord directly to station coupler; otherwise, interconnect set and station coupler using D station wire (see Fig. 8). Secure telephone set mounting cord or D station wire to clamp at lower left corner of station coupler. All station sets on the line must be connected to terminals R1 and T1 of coupler.



*If there is no telephone set on the line, use a ringer simulator to prevent line testing open. Use an AA-1A ringer simulator. If not available, an E1C ringer installed and silenced as described in Section 501-251-100 may be used.*

**3.07** Connect the CO line to screw terminals T and R. Lightly tighten all unused terminal screws.

## POWER

**3.08** Power for the coupler may be supplied by either the telephone company or the customer. If power is supplied by the telephone company, either a 2012B transformer or suitable dc supply (19-type or equivalent) may be used.

**3.09** ◆A 2012B power transformer must not be used to supply more than one coupler. A

suitable dc power supply (19C2 or equivalent) may be used to supply multiple couplers (a maximum of ten couplers per 19C2 power unit connected to the dc signal [20-26V dc] terminals). The dc power supply should be of the current limiting type, or it should be connected through a 20-ohm, 1-watt resistor to provide current limiting. The input power terminals, AC1 and AC2, may be connected to either the ac output of a single 2012B power transformer or to the dc signal terminals of a 19-type power unit, with either polarity. The internal bridge rectifier will apply the correct polarity to the station coupler. Do not ground either terminal of the power supply. The power supply current drain of the basic coupler (List 1), used with the PCA SU6AQ, is .060 ampere operating current, .012 ampere standby current, and 1 ampere initial surge. The current drain of the coupler (List 3) with the List 13 limiter, used with the PCA STS, is .150 ampere operating current, .015 ampere standby current, and 1 ampere initial surge.◆

**3.10** Line noise pickup, cross-talk, etc, may occur between units connected to a common power supply. When this occurs, it may be cleared by grounding the housing of each station coupler. The circuit board mounting screw below terminal A1 may be used for grounding the circuit.

**3.11** When power is supplied by a 2012B transformer (or 19-type power unit), a current limited, positive dc voltage source is provided to the customer on lead B1+ (ground return on lead B2-) furnishing a charging current of approximately 2.5 milliamperes which may be used to keep a CP rechargeable battery (18V, 150 to 500 ma) charged during normal operation to provide power when commercial power fails. If the customer furnishes power, 21 ±5 volts dc is connected to leads B1+ and B2- through plug (P1).

**3.12** After installation is completed, perform operational tests given in Part 5 to check for proper operation before CPE is connected.

## 4. OPERATION

## GENERAL

**4.01** The KS-20721, List 1 station coupler (Fig. 6) consists of a 20-Hz ringing signal detector operating ringup (RU) relay, a supervisory control circuit operating line transfer (TR) relay, dial pulsing (PR) relay, CPC relay, a transmission circuit

consisting of two transformers in tandem, a peak voltage limiter, and a power supply rectifier and filter circuit.

### OUTGOING CALL

**4.02** When the customer goes off-hook, the CPE provides a contact closure to the off-hook leads OH1 and OH2. After a 1-second delay, during which time the coupler will terminate a call originated from a phone connected to T1 and R1, the coupler will seize the telephone line and complete the 2-way transmission path. The closure between leads OH1 and OH2 must be maintained for the duration of the call except during dial pulsing. The CPE maintains the closure until dial tone is returned before transmitting dial pulses. The List 1 coupler repeats dial pulses through PR relay to the CO line. Two-way transmission is provided during line seizure; dial tone and call progress tones are returned to the CPE. The transfer leads are operated by the TR relay to indicate coupler status to the CPE. During line seizure leads TR1 and TR2 are closed; leads TR2 and TR3 are opened. When the line is released, leads TR1 and TR2 are open and leads TR2 and TR3 are closed.

### Disconnect Outgoing Call

**4.03** When the CPE goes on-hook by opening leads OH1 and OH2, relays PR and TR release to terminate the call.

### INCOMING CALL

**4.04** When 20-Hz ringing is detected by the ring detector circuit, relay RU will operate for approximately 1 second during each 2-second ringing cycle closing leads RU1 and RU2 to indicate ringing to the CPE. The ring detector circuit also causes PR relay to operate and hold for about 4 seconds. The CPE may answer the call by closing (and maintaining a closure) between leads OH1 and OH2.

This causes TR relay to operate causing line seizure, since PR relay was already operated by the ring detector. Two-way transmission is provided immediately on line seizure; leads TR2 and TR3 are opened, and leads TR1 and TR2 are closed indicating line seizure.

### Disconnect Incoming Call

**4.05** The coupler will remain connected to the telephone line until it is caused to disconnect by removing the closure between leads OH1 and OH2. This causes TR and PR relays to release, disconnecting the coupler from the line.

### LIST 15 TEST SET

**4.06** The List 15 test set (Fig. 5 and 7), used with the 1013A hand test set (or equivalent) and a connecting cable terminated in a plug for connection to the station coupler, permits checkout of the coupler independent of the CPE.

**4.07** When detailed circuit description and operation information is required, refer to CD- and SD-69903-01.

### 5. MAINTENANCE

**5.01** When trouble is reported verify that:

- Customer connector plug is secure in coupler.
- Power is supplied to station coupler with correct polarity, if supplied from CPE.
- Leads to CO line and telephone set are secure.
- CO pair and telephone set are good.
- Wiring options and coupler connections are correct. (Refer to Table B and Fig. 8.)

**5.02** After performing steps in 5.01, if trouble still exists, perform test described in 5.05.

#### **5.03** *Apparatus Required:*

- List 15 test set
- 1013A (or equivalent) hand test set
- KS-6571 (or equivalent) battery (if coupler is powered by CPE).

#### **5.04** *Preparation:*



***Make all tests with CPE disconnected.***



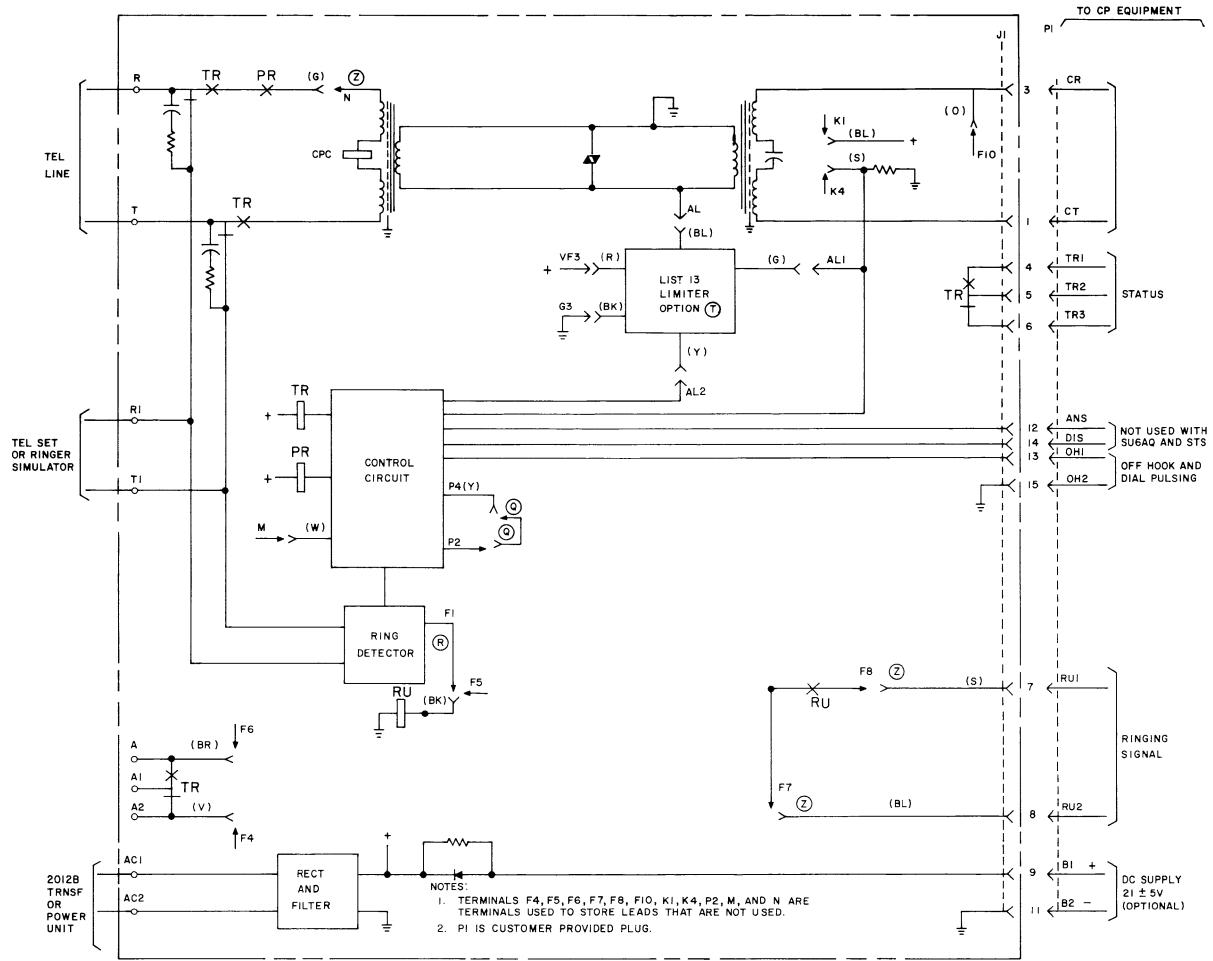


Fig. 6—KS-20721 Station Coupler, Internal Wiring Options

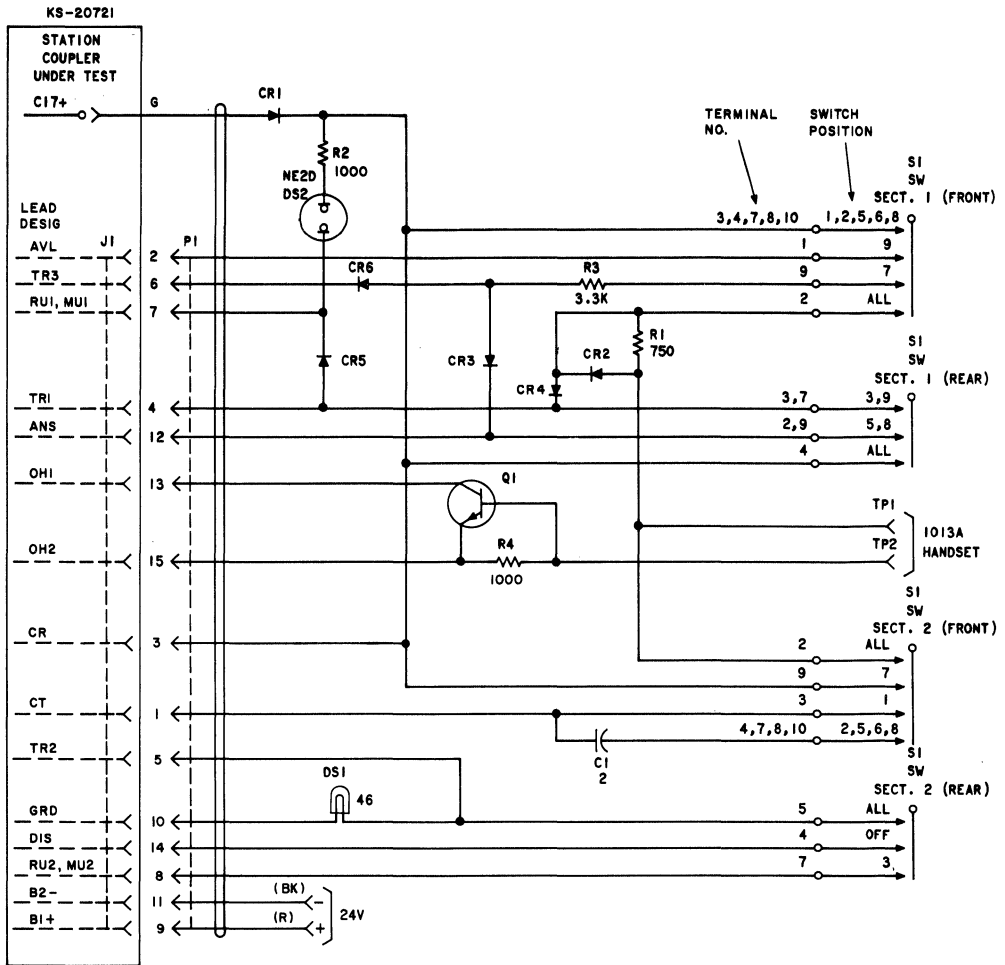


Fig. 7—KS-20721, List 15 Test Set Schematic

STEP	ACTION	VERIFICATION
1	Remove cover of station coupler using KS-19192, List 1 tool or screwdriver.	
2	Rotate selector switch on List 15 test set to position 7.	
3a	If coupler is normally powered by CPE— Use a 24V (KS-6571 or equivalent) battery	White lamp extinguished. Red lamp extinguished.

STEP	ACTION	VERIFICATION
	and connect the pin-tipped red lead from the test set to +24V and black lead to -24V.	

#### 5.05 Tests—SU6AQ and STS

STEP	ACTION	VERIFICATION
4	Connect test set plug to receptacle on station coupler and connect alligator clip on wire coming from test set plug to terminal VF4 in the station coupler (Fig. 5).	White lamp extinguished.
5	Rotate selector switch of test set to position 8.	White lamp lighted.
6	Rotate selector switch to OFF.	White lamp extinguished.
7	Operate switch on 1013A hand test set to TALK and connect its leads to the terminals provided on the List 15 (Fig. 5).	White lamp lighted.
8	Rotate selector switch to position 1.	Dial tone heard in hand test set receiver.
9	Using the hand test set, dial the local test desk and request the testman to call back. Proceed immediately to step 10.	
10	Rotate test set switch to position 3.	White lamp extinguished.
11	Testman returns call.	White lamp flashes in unison with ringing cycle.
12	Rotate test set switch to position 1 and answer call on 1013A.	White lamp lighted.
13	Rotate test set switch to OFF.	White lamp extinguished.
14	Disconnect test set from station coupler, replace cover, and reconnect CPE.	

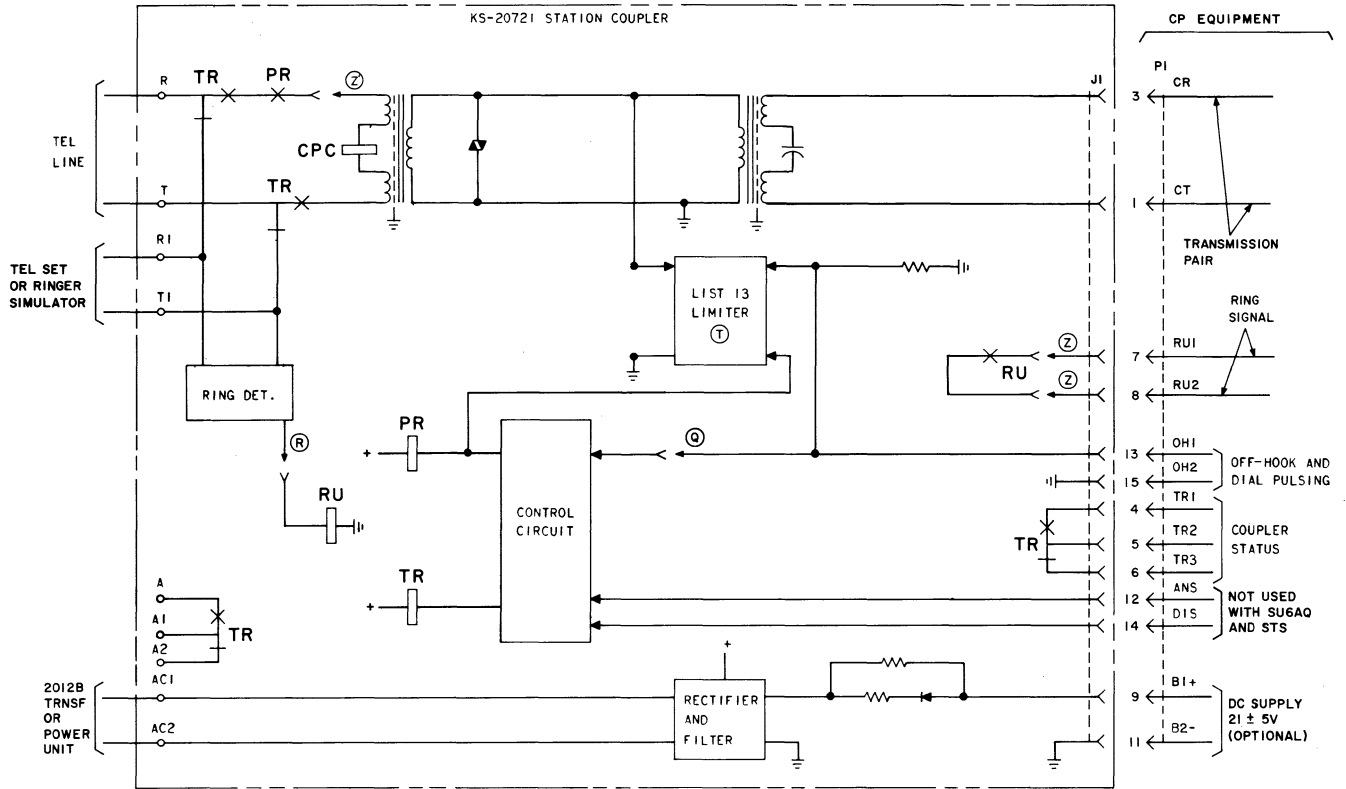
**5.06** If coupler does not meet the above tests, replace coupler and/or circuit pack.

**5.07** If the tests are satisfactory, remove all test connections to restore circuit to normal and follow local reporting procedures for CP trouble.

**5.08** When in the repairman's judgment the trouble is located in the CPE, the Repair Service Bureau should be notified so that proper Maintenance of Service Charge billing can be initiated as outlined in Section 660-101-312 entitled Maintenance of Service Charge on Services With Customer-Provided Equipment (CPE).



***Do not attempt any test or repair to the CPE.***



NOTES:

1. CIRCLED LETTERS (Z), (T), ETC DENOTE WIRING OPTIONS
2. PI IS CUSTOMER PROVIDED PLUG.

Fig. 8—KS-20721 Station Coupler, Simplified Schematic

**VOICE CONNECTING ARRANGEMENT STC**  
**KS-20721 STATION COUPLER**

**1. GENERAL**

**1.001** This addendum supplements Section 463-340-103, Issue 2.

**1.002** This addendum is issued to revise paragraph 2.04, rate the KS-20721, List 11 pulse corrector MD, and remove all references to the List 11 and option (V).

**2. CHANGES TO SECTION**

**2.001** On page 2, revise paragraph 2.04 to read as follows:

Under present percent break requirements, the List 11 pulse corrector is not required. The pulse corrector has therefore been rated Manufacture Discontinued (MD) and should not be installed with VCA STC.

**NOTICE**

Not for use or disclosure outside the  
Bell System except under written agreement

## VOICE CONNECTING ARRANGEMENT STC KS-20721 STATION COUPLER

### 1. GENERAL

**1.01** This section provides identification, installation, operation, maintenance and connection information for the KS-20721, List 1 and KS-20721, List 4 general purpose station couplers when used in Voice Connecting Arrangement (VCA) STC. (Suffixes QX and VX have been deleted.)

**1.02** This section is reissued to:

- Revise conditions for use of List 11 pulse corrector
- Add information on noise pickup (6.04)
- Remove key system leads from Fig. 7 and 9; delete key system reference from note under Table A.
- Add lead designations to Fig. 8.

**1.03** The customer should be informed by the manufacturer or supplier of the equipment of the proper VCA to be used with his equipment.

**1.04** If the customer wants a copy of the Technical Reference which covers the above VCA, the customer should contact the local Telephone Company Business Office or the Marketing Representative.

**1.05 *Lettered Steps:*** A letter a, b, c, etc, added to a step number in Part 5 of this section indicates an action which may or may not be required depending on local conditions. The condition under which a lettered step or a series of lettered steps should be made is given in the ACTION column, and all steps governed by the same condition are designated by the same letter within a test. Where a condition does not apply, all steps designated by that letter should be omitted.

**1.06** The KS-20721 station coupler is a general purpose station coupler used with several voice connecting arrangements. All features and options are not shown; only those applying to STC are shown.

**1.07 *Voice Connecting Arrangement STC:*** This connecting arrangement is intended to be used to connect customer-provided equipment (CPE), typically telephone sets to Bell System central office (CO) lines. The arrangement provides 20-Hz ringing and talk battery over a 3-wire interface. This VCA does not provide bridged ringing and may not be directly compatible with customer-provided (CP) line circuits which are similar in design to the 400D key telephone units. Modifications, if required, should be made to CPE by the customer.

**1.08** The KS-20721, List 15 test set may be used to test the station coupler, or apparatus shown in Fig. 10 may be used.

**1.09** This issue of the section is based on the following drawing:

SD-69903-01, Issue 5B—KS-20721 Station Coupler

If this section is to be used with equipment or apparatus reflecting later issue(s) of the drawing(s), reference should be made to the SDs and CDs to determine the extent of the changes and the manner in which the section may be affected.

### 2. IDENTIFICATION

#### PURPOSE

- To provide facilities for connecting various types of CPE to the telephone line
- To limit excessive levels from CPE and to provide protection for personnel and facilities against hazardous voltages.

#### APPLICATION

- Provides for the connection of CP main or extension telephones to a CO.

#### ORDERING GUIDE

- Coupler, Station, KS-20721, L4 (Fig. 1)

The List 4 consists of the following items which may be ordered separately and assembled in the field:

- Coupler, Station, KS-20721, L1 (Fig. 1 and 2)
- Assembly, Hinge, KS-20721, L10 (Fig. 3)
- Supply, Ring, KS-20721, L14 (Fig. 5)
- Corrector, Pulse, KS-20721, L11 (Fig. 4)
- Set, Test, KS-20721, L15 (Fig. 6)
- Tool, KS-19192, L1 (not required on later model units which have slotted screws)
- Transformer, 2012B (One per coupler)
- Unit, Power, 19-type (or equivalent when required for multiple couplers, see 6.03).

#### DESIGN FEATURES

**2.01** The VCA STC provides the following features:

- DC isolation and high-voltage surge protection
- 20-Hz ringing detection
- 20-Hz ringing signal to customer equipment
- Network control signaling (off-hook, dial pulse, tone address signaling, and disconnect)
- Talk battery to customer equipment
- 2-way voice transmission
- AC or DC powered.

**2.02** The KS-20721, List 4 station coupler (Fig. 1) consists of a KS-20721, List 1 station coupler with a KS-20721, List 10 hinge assembly and a KS-20721, List 14 ring supply, factory installed.

**2.03** The KS-20721, List 1 station coupler (Fig. 2) is the basic unit, designed to be field equipped with a KS-20721, List 10 hinge assembly for mounting any combination of the optional circuit packs (Fig. 3). The circuit packs are equipped with lead connectors for easy installation.

**2.04** The KS-20721, List 11 pulse corrector is not required for initial installations. It shall be used only after it has been determined that the dial pulses received from the CPE meet all requirements specified in the Technical Reference and pulsing problems still exist. It should not be used to correct poor customer pulses. When adding the List 11 pulse corrector (Fig. 4) to the List 1 coupler, remove wiring option Q and provide option V as shown in Table A.

**2.05** The List 14 ring supply (Fig. 5) provides a high voltage 20-Hz ringing signal to leads RU1 and CR to operate up to three CP ringers (C4 type or equivalent). The circuit consists of a dc to dc inverter supply and a relay driver. The inverter changes the 21V dc input to approximately 120V dc output. When ringing is present, the RU relay operates at a 20-Hz rate to alternate the polarity of the 120V dc output to provide the ringing signal. The List 14 ring supply is added to the List 1 coupler by providing option X as shown in Table A.

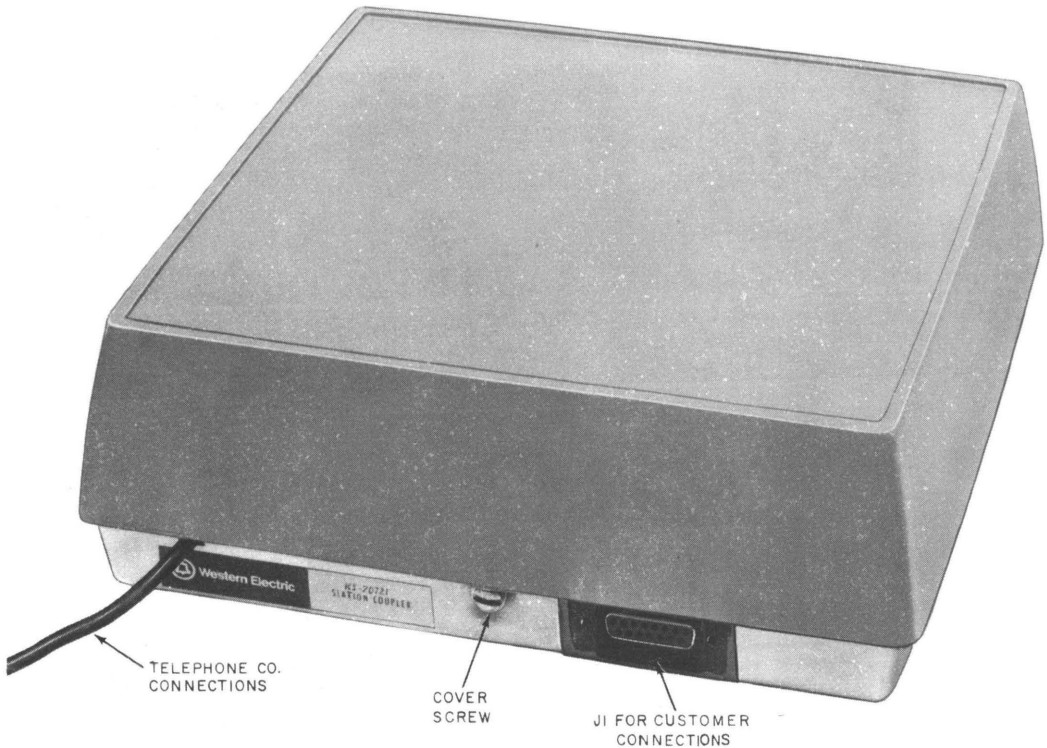
**2.06** The KS-20721, List 15 test set plugs into the connector on the station coupler and is used with a 1013A hand test set (or equivalent) to check the operation of the coupler with the CPE disconnected (Fig. 6).

### 3. INSTALLATION—KS-20721, LISTS 1 AND 4 STATION COUPLERS (Refer to Tables A and B)

**3.01** The installer should provide the necessary internal wiring options that are specified for VCA STC using Table A. The features provided by the various options are explained in Table B. The KS-20721 station coupler is designed for wall or shelf mounting, weighs 4 lbs, measures approximately 9 inches square by 3 inches deep, and has a metal base with plastic cover. (Cover screws require KS-19192, List 1 tool for early models, screwdriver for later models, and may be changed by the installer.)



*If there is no telephone set on the line, use a ringer simulator (to prevent line testing open). Use an AA-1A ringer simulator. If not available, an E1C ringer installed and silenced as described in Section 501-251-100, 3.05, may be used.*



**Fig. 1—KS-20721, List 1 or List 4 Station Coupler**

**3.02** A 15-pin connector (J1, Fig. 1) is located on the base of the unit to connect the transmission path and control leads to the CPE. The mating Cinch Manufacturing Co. or ITT-Cannon Electric Plug No. DA-19603-403 with Hood No. DA-51225-1 is customer-provided. Screw terminals on the left side of the printed circuit board provide connections to the CO line, Telephone Company-provided telephone set, and 2012B power transformer (or power supply). Flexible jumper leads with connectors provide for installation options.

**3.03** When using an associated Telephone Company telephone set, locate station coupler within 5 feet of the telephone set, if practical, and connect telephone set mounting cord directly to station coupler; otherwise, interconnect set and station coupler using D station wire. Secure telephone set mounting cord or D station wire to clamp at lower left corner of station coupler. All Telephone

Company-provided station sets on the line must be connected to the T and R terminal on the coupler.

**3.04** The location and method of installing the station coupler shall be consistent with standard practices. The station coupler should be located in a place mutually agreeable to the customer and Telephone Company and readily accessible for maintenance and convenient for customer connection. When mounting the coupler with screws do not overtighten and bend the base. Mount the unit close to a 115V ac convenience outlet not under control of a wall switch when power is provided by a 2012B transformer or 19-type power unit.



**Complete all installation work before applying power or connecting the CPE.**



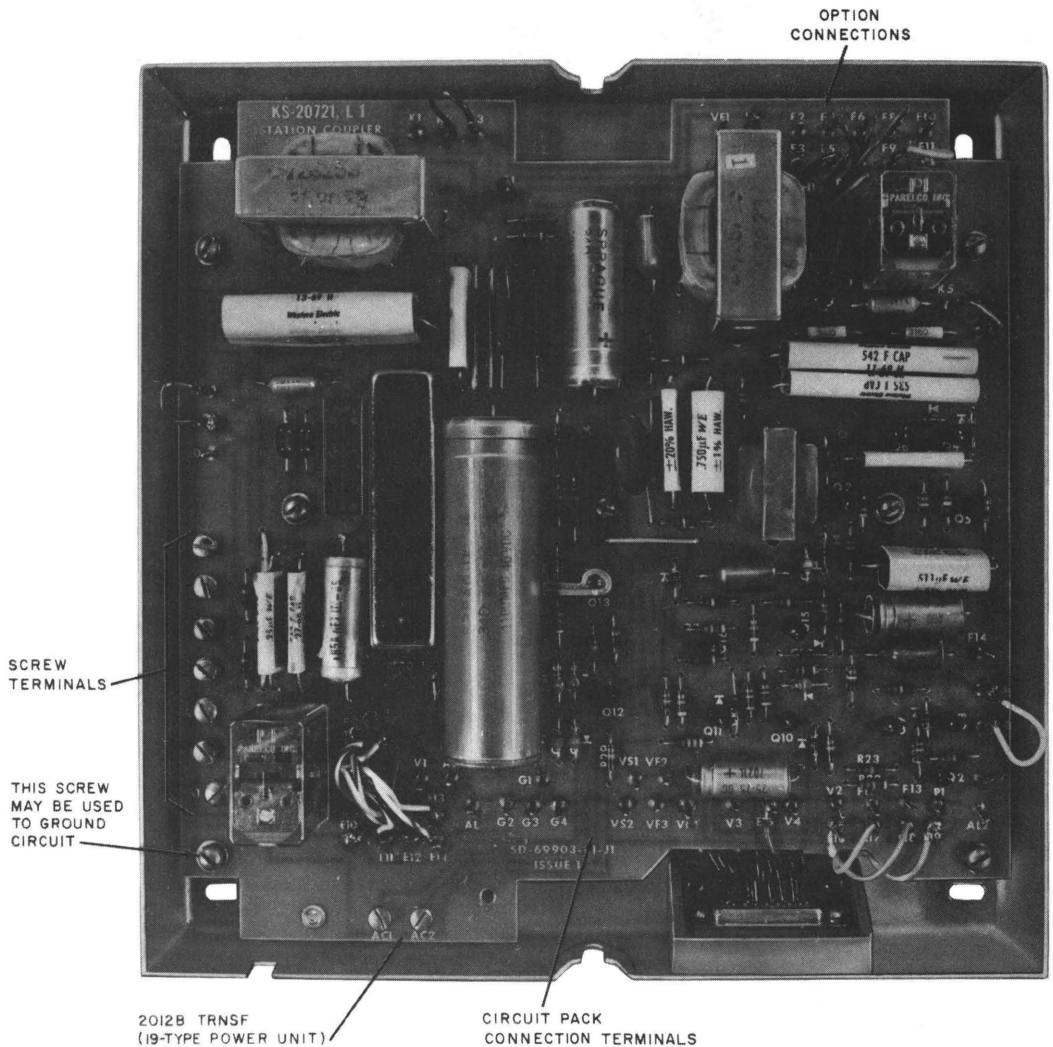


Fig. 2—KS-20721, List 1 Station Coupler, Cover Removed

### CIRCUIT PACK INSTALLATION

**3.05** The KS-20721, Lists 11 and 14 circuit packs (if not provided) may be added initially or to an existing installation by providing the wiring options shown in Table A.

**3.06** To install optional circuit packs, perform the following steps:

- (1) Remove the cover from the station coupler using the KS-19192, List 1 tool or screwdriver.

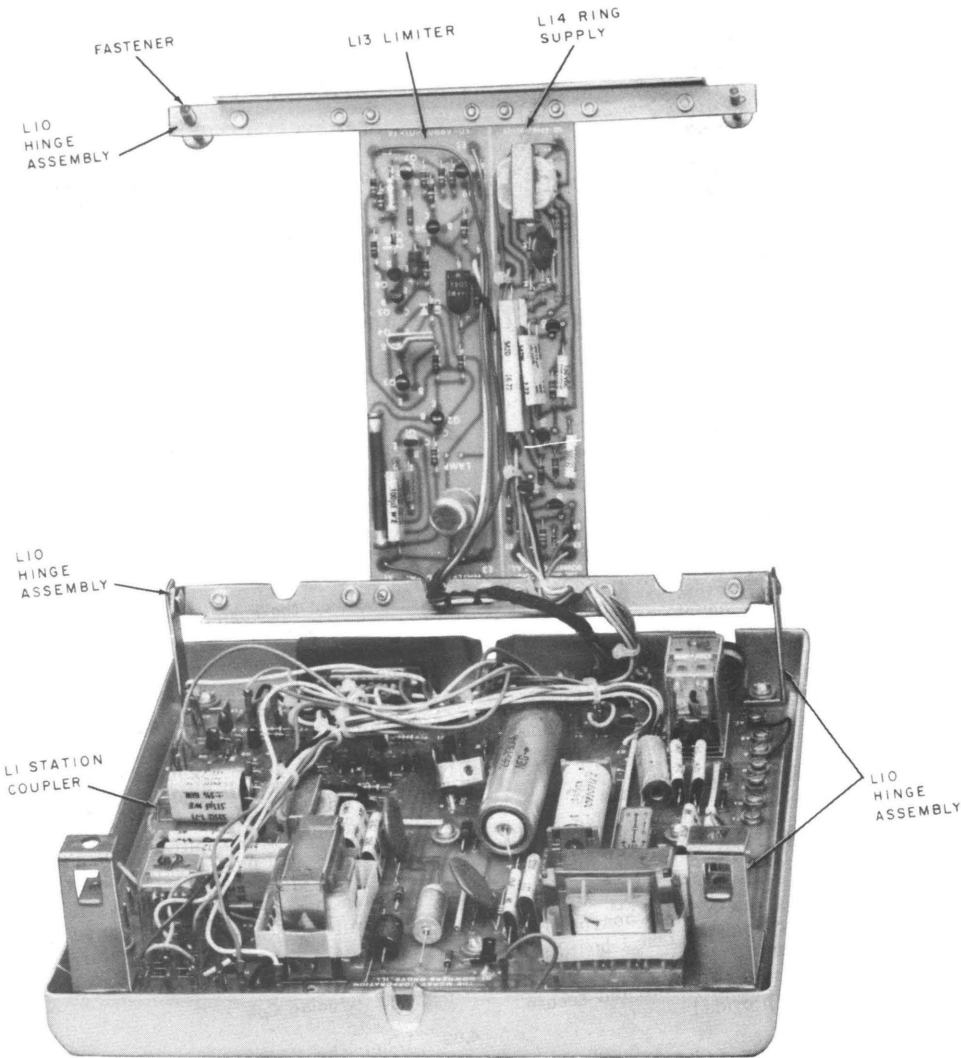
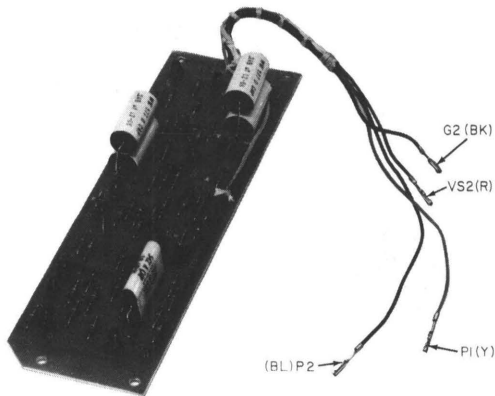


Fig. 3 → KS-20721 Station Coupler Showing Optional Circuit Packs ←



**Fig. 4—KS-20721, List 11 Pulse Corrector**

- (2) Attach KS-20721, List 10 hinge assembly to the four corner screws mounting the List 1 board. Refer to Fig. 3.
- (3) The installer can mount any combination of circuit packs on the internal mounting frame formed by the hinge assembly. Place board in correct position on frame (refer to Fig. 3 or cover label) and secure with four corner mounting screws furnished with circuit pack.
- (4) Connect the flexible jumper leads on List 1 board to provide the options called for in Table A by using the connecting information given in the table.
- (5) Plug connecting leads from boards into corresponding terminals on List 1 board per Table A and Fig. 4 and 5. Dress leads to avoid interference with boards and cover and secure leads with cable clamp provided.
- (6) Close hinge assembly and fasten the two top corner fasteners.



**Early models had special quarter-turn fasteners. Current models have conventional captive screws which fasten clockwise and release when turned counterclockwise. On early models, turn fasteners clockwise only**

**to open or close. (Fastener may break if turned counterclockwise.)**

- (7) Replace cover and fasten cover screws.

**3.07** After installation is completed, perform operational tests given in Part 5 to check for proper operation before CPE is connected.

#### **4. OPERATION**

##### **GENERAL**

**4.01** The KS-20721, List 1 station coupler (Fig. 7) consists of a 20-Hz ringing signal detector operating ringup (RU) relay; a supervisory control circuit operating line transfer (TR) relay, dial pulsing (PR) relay, and CPC relay; a transmission circuit consisting of two transformers in tandem, a peak voltage limiter, and a power supply rectifier and filter circuit.

##### **OUTGOING CALL**

**4.02** When the customer goes off-hook, the CPE provides a dc termination (option S) across leads CT and CR to permit network control signaling (off-hook and dialing). The coupler will immediately seize the telephone line (P option) and complete the 2-way transmission path. The termination between leads CT and CR must be maintained for the duration of the call except during dial pulsing. The CPE maintains the termination until dial tone is returned before transmitting dial pulses. The coupler repeats dial pulses or tone address signals through PR relay to the CO line. Two-way transmission is provided during line seizure; dial tone and call progress tones are returned to the CPE.

##### **Disconnect Outgoing Call**

**4.03** When the CPE goes on-hook by opening leads CT and CR, relays PR and TR release and terminate the call.

##### **INCOMING CALL**

**4.04** When 20-Hz ringing is detected by the ring detector circuit, relay RU will pulse (following ringing signal) to apply ringing voltage to the CPE. The List 14 ring supply is used with option X to apply a high voltage 20-Hz ringing signal between leads CR and RU1 to the CPE to operate up to

TABLE A  
WIRING OPTIONS FOR FIELD INSTALLATION

OPTION LEADS		FROM† TERMINALS ON L1	TO TERMINALS ON L1					
LOC	COLOR		OPTIONS					
			P	Q‡	S	V‡	X§	Z¶
LEADS ON L1 BOARD	G	N						N
	BL	K1			K3			
	S	K4			K6			
	O	F10					F6	
	BR	F6					F9	
	V	F4					F10	
	BK	F5					F5	
	Y	P2		P2		P3		
	S*	F8					F8	F8
	BL*	F7					F4	
	W	M	G5					
CIRCUIT PACKS	R					VS2	VF4	
	BK					G2	G4	
	Y					P1	F1	
	BL					P2	F2	
	G						F14	
	S						F12	
	O						F13	

\*These leads originate from J1 connector.

†Leads stored on these terminals when not in use.

‡Remove Q option before installing V option (Telephone Company option).

§Strap screw terminals A and A1.

¶Option Z is factory wired.

three CP ringers (C4-type or equivalent, bridged ringing is not provided). The ring detector circuit requires approximately 0.6 second to detect ringing so a shorter ring burst is applied to CPE. The CPE answers the call by closing leads CT and CR through a resistive termination. This closure causes TR relay to operate causing line seizure, since PR relay was already operated by the ring detector. This causes the coupler to terminate the telephone

line and answer the incoming call. Two-way transmission is provided immediately on line seizure.

#### Disconnect Incoming Call

**4.05** The coupler will remain connected to the telephone line until it is caused to disconnect by the CPE removing the termination from leads

CT and CR. Relays TR and PR release disconnecting the coupler from the line.

**LIST 15 TEST SET**

**4.06** The List 15 test set (Fig. 6 and 8) used with the 1013A hand test set (or equivalent) and a connecting cable terminated in a plug for connection to the station coupler permits checkout of the coupler independent of the CPE.

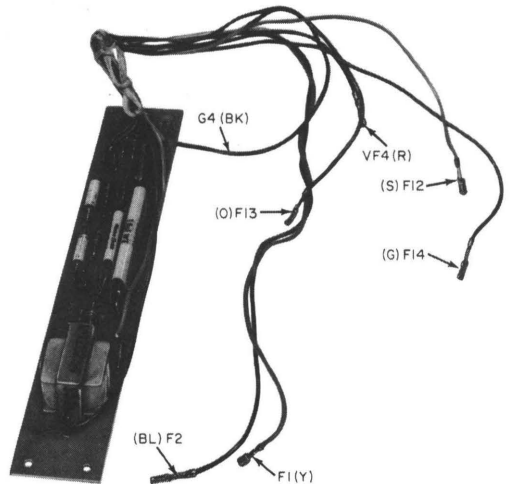
**4.07** When detailed circuit description and operation information is required, refer to CD- and SD-69903-01.

**5. MAINTENANCE**

**5.01** When trouble is reported verify that:

- Customer connector plug is secure in coupler.
- Power is supplied to station coupler with correct polarity.
- CO pair is good.

- Leads to CO line and telephone set are secure.
- Wiring options and coupler connections are correct. (Refer to Table A and Fig. 9.)



**Fig. 5—KS-20721, List 14 Ring Supply**

**TABLE B**  
**WIRING OPTION FEATURES**

OPTION	FEATURE
Q	Provides for direct control of line relay PR for dc pulse repeating without pulse correction.
Z	Connects transmission circuit to tip side of telephone line.
S	Provides talk battery to customer over transmission leads CT and CR.
P	Removes line seizure delay feature.
V	Adds List 11 circuit to provide dc pulse correction.
X	Adds List 14 circuit to provide 20-Hz ringing signal to customer over leads CR and RU1. (Does not provide bridged ringing.)

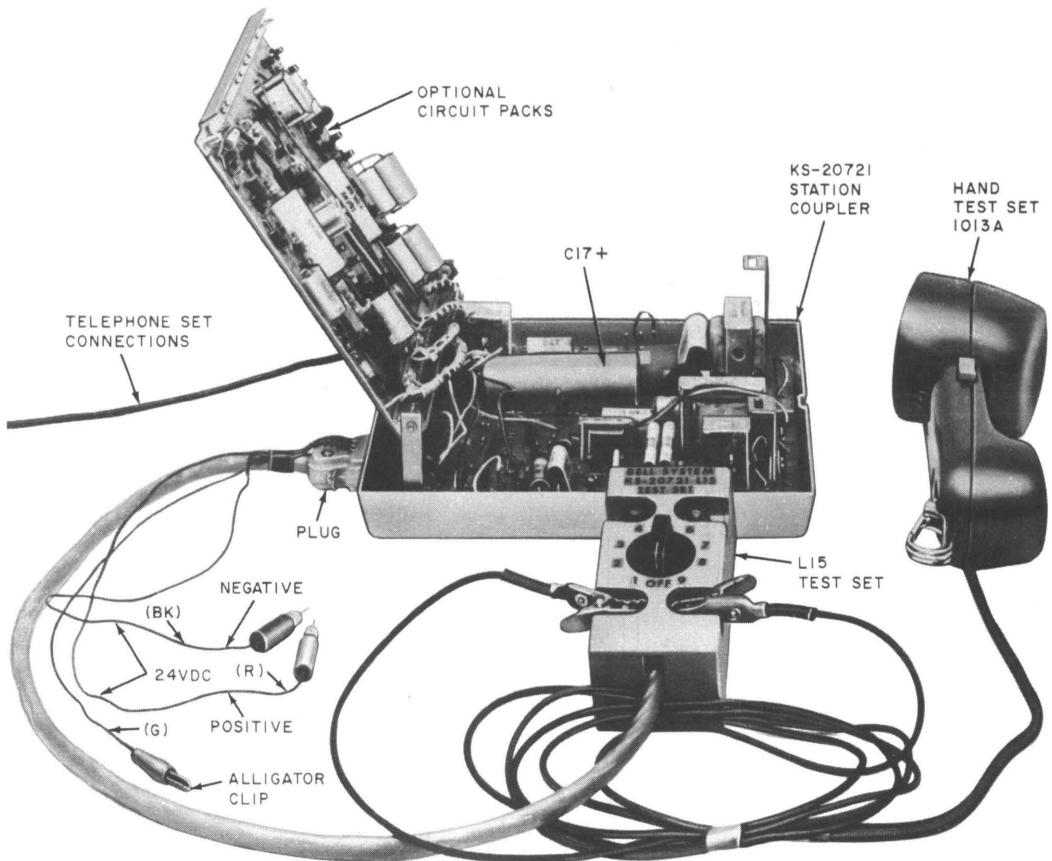


Fig. 6—KS-20721 Station Coupler with KS-20721, List 15 Test Set and 1013A Hand Test Set

**5.02** After performing steps in 5.01, if trouble still exists, perform the following test using the List 15 test set, or perform tests (place and receive calls) using the apparatus shown in Fig. 10).

**5.03 Apparatus Required:**

- List 15 test set
- 1013A (or equivalent) hand test set
- KS-6571 (or equivalent) battery (if coupler is powered by CPE).

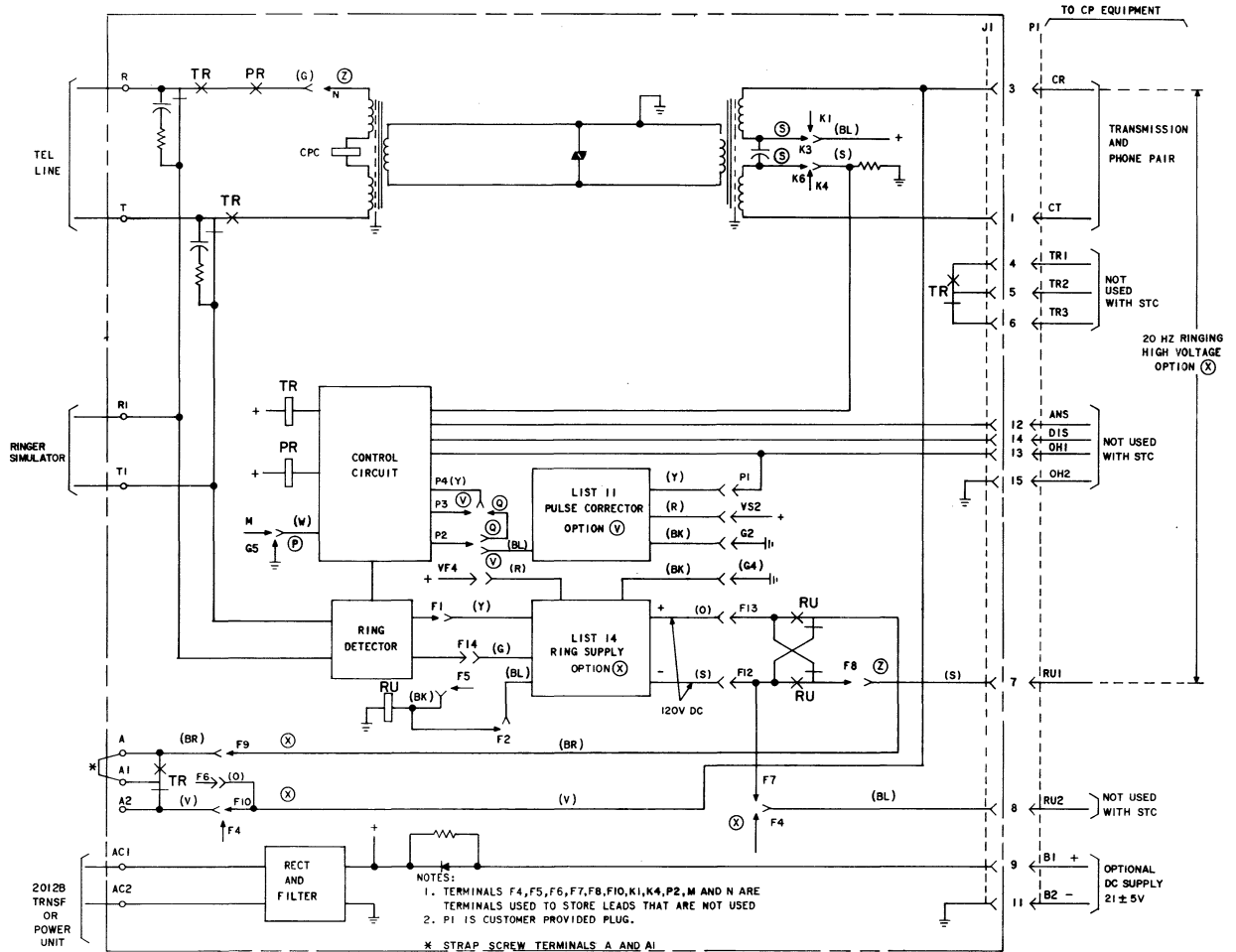


Fig. 7—KS-20721 Station Coupler Internal Wiring Options

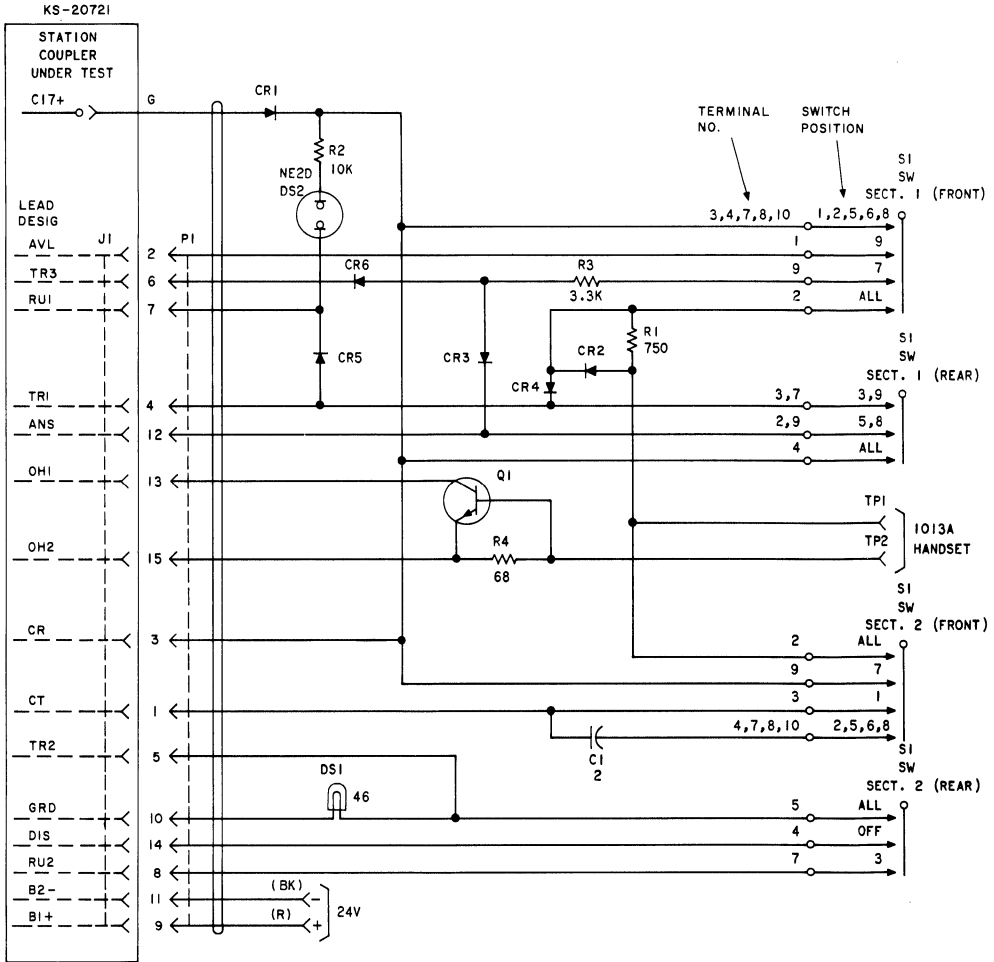
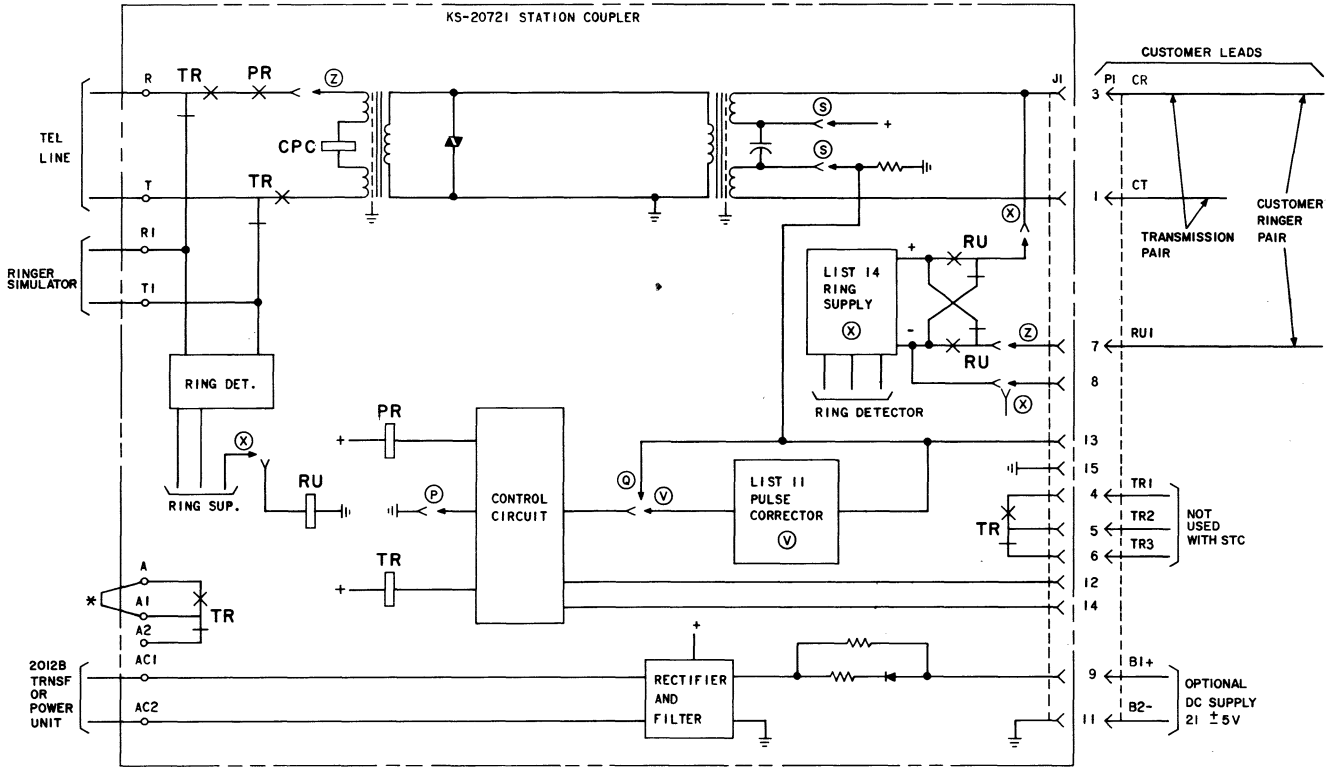


Fig. 8—KS-20721, List 15 Test Set, Schematic





NOTES:

1. CIRCLED LETTERS (Z), (X), ETC DENOTE WIRING OPTIONS.
2. PI IS CUSTOMER PROVIDED PLUG.

\* STRAP SCREW TERMINALS A AND A1.

Fig. 9—KS-20721 Station Coupler, Simplified Schematic

**5.04 Preparation:**

*Make all tests with CPE disconnected.*

STEP	ACTION	VERIFICATION
1	Rotate selector switch on List 15 test set to OFF.	
2	Remove cover of station coupler using KS-19192, List 1 tool or screwdriver.	
3	Connect a 1013A (or equivalent) hand test set to terminals provided on test set (Fig. 6).	
4a	If coupler is normally powered by CPE— Use a 24V (KS-6571 or equivalent) battery and connect the pin-tipped red lead from the test set to +24V and black lead to -24V.	
5	Connect test set plug to receptacle on station coupler. Do not connect alligator clip to C17.	White lamp extinguished. Red lamp extinguished.

**5.05 Tests**

STEP	ACTION	VERIFICATION
6	Operate switch on hand test set to MON. Rotate selector switch of test set to position 1.	White lamp lighted. Dial tone heard in hand test set receiver at <i>low</i> level.
7	Operate switch on hand test set to TALK. Rotate selector switch of test set to position 2.	White lamp remains lighted. Dial tone level increases. (Note presence of sidetone.)
8	Using the hand test set, dial the local test desk and request the testman to call back; proceed to next step immediately.	<b>Note:</b> If dial tone should time out before dialing, rotate selector switch back to OFF then proceed directly to position 2 for dialing.
9	Rotate selector switch of test set to position 4. Operate switch on hand test set to MON.	White lamp extinguished.
10	Testman returns call.	RU relay pulses and red lamp flashes (both elements) in unison with ring cycle.

STEP	ACTION	VERIFICATION
11	Rotate selector switch of test set to position 5 and operate switch on hand test set to TALK.	White lamp lighted. Red lamp stops flashing.
12	Request testman to release the line.	
13	Rotate selector switch of test set to OFF position.	White lamp extinguished.
14	Disconnect test set from station coupler and reconnect CPE.	



*An alternate method for testing the coupler may be used by placing a test call to check dialing, transmission and disconnect and receiving a test call to check ringing using the testing arrangement shown in Fig. 10. This test setup may be used when the List 15 test set is not available.*

**5.06** If coupler does not meet the above tests, replace coupler and/or circuit packs.

**5.07** If the tests are satisfactory, remove all test connections to restore circuit to normal and follow local reporting procedures for CP trouble.



*Do not attempt any test or repair to the CPE.*

**5.08** When in the repairman's judgment the trouble is located in the CPE, the Repair Service Bureau should be notified so that proper Maintenance of Service Charge billing can be initiated as outlined in Section 660-101-312 entitled Maintenance of Service Charge on Services With Customer-Provided Equipment (CPE).

## 6. CONNECTIONS

**6.01** Connections to the CPE are made through the 15-pin KS-19087, List 1 female connector on the coupler. The customer must furnish a suitable connecting cable equipped with a Cinch Manufacturing Co. or ITT-Cannon Electric No.

DA-19603-403 plug with a No. DA-51225-1 hood (or equivalent).

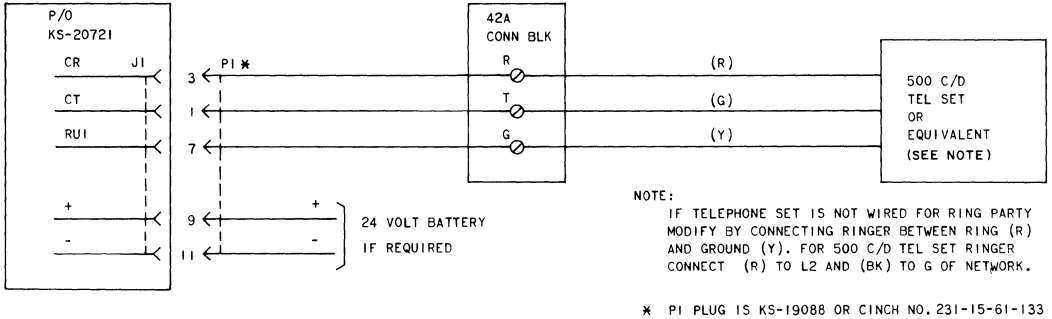
**6.02** Provide the correct wiring options from Table A, connect the CO line and all associated Telephone Company-provided station sets to screw terminals T and R, and the 2012B power transformer (or 19-type power unit) leads to screw terminals AC1 and AC2. If an associated telephone set is not used (and no telephone set is on line), connect a ringer simulator (see 3.01) to terminals T1 and R1. Lightly tighten all unused terminal screws.

**6.03** A 2012B transformer must not be used to supply more than one coupler. A suitable dc power supply (19-type or equivalent) may be used to supply multiple couplers (a maximum of ten couplers per 19-type power unit connected to the dc signal output). The dc power supply should be of the current limiting type, or it should be connected through a 20-ohm, 1-watt resistor to each coupler to provide current limiting. The power supply may be connected with either polarity to the AC1 and AC2 terminals. Do not ground either terminal of the power supply. Power supply current drain is 0.140 ampere maximum with all circuit packs in use. Initial surge current is 1 ampere and standby current is 0.012 ampere.

**6.04** Line noise pickup, cross-talk, etc, may occur between units connected to a common power supply. When this occurs, it may be cleared by grounding the housing of each station coupler. The circuit board mounting screw below terminal A1 may be used for grounding the circuit.

**6.05** When power is supplied by a 2012B transformer (or 19-type power unit), an optional current limited, positive dc voltage source is provided to the customer on lead B1 (ground return on lead B2) furnishing a charging current of 2.5 milliamperes which may be used to keep a CP rechargeable

battery (18V 150 to 500 ma) charged during normal operation to provide power when commercial power fails. If the customer furnishes power,  $21 \pm 5$  volts dc is connected to leads B1 and B2 through plug (P1).



**Fig. 10—STC Test Circuit (Fabricate Locally)**

## PROTECTIVE CONNECTING ARRANGEMENT SU7QW

### KS-20721 STATION COUPLER

#### 1. GENERAL

**1.01** This section provides identification, installation, operation, maintenance and connection information for the KS-20721, List 1 general purpose station coupler which is used to connect customer-provided (CP) dc pulse dialers in Protective Connecting Arrangement (PCA) SU7QW.

**1.02** This section is reissued to:

- Remove information on the KS-20721, List 11 pulse corrector which has been rated MD
- Revise Tables A, B, and C
- Add Tables E and F to show connections for installation of PCA SU7QW with most commonly used telephone sets
- Rearrange Ordering Guide
- Change the term Voice Connecting Arrangement (VCA) to Protective Connecting Arrangement (PCA)
- Change figures to show only items used with SU7QW arrangement.

**1.03** The customer should be informed by the manufacturer or supplier of the equipment of the proper PCA to be used with his equipment.

**1.04** If the customer wants a copy of the Technical Reference which covers the above PCA, the customer should contact the local Telephone Company Business Office or the Marketing Representative.

**1.05 *Lettered Steps:*** A letter a, b, c, etc, added to a step number in Part 5 of this section indicates an action which may or may not be required depending on local conditions. The condition under which a lettered step or a series of lettered steps should be made is given in the ACTION column, and all steps governed by the same condition are designated by the same letter

within a test. Where a condition does not apply, all steps designated by that letter should be omitted.

**1.06** The KS-20721 station coupler is a general purpose station coupler used with several protective connecting arrangements. All features and options are not shown; only those applying to SU7QW are shown. Avoid alteration of the PCA to provide services other than design intent.

**1.07** Information on dialer connections to switchboards and miscellaneous key equipment will be found in Section 512-125-430.

**1.08 *Protective Connecting Arrangement SU7QW:***

This connecting arrangement is intended to connect CP dial pulse dialers that require no transmission paths to the telecommunications network. It replaces PCA SU7 which used a modified KS-20445 control unit (repertory dialer) and was an interim PCA.

**1.09** An associated telephone company telephone set may make a normal outgoing call with this connecting arrangement.

**1.10** The KS-20721, List 15 test set may be used to test the station coupler.

**1.11** This issue of the section is based on the following drawing:

SD-69903-01, Issue 5B—KS-20721 Station Coupler

If this section is to be used with equipment or apparatus reflecting later issue(s) of the drawing(s), reference should be made to the SDs and CDs to determine the extent of the changes and the manner in which the section may be affected.

#### 2. IDENTIFICATION

##### PURPOSE

- To provide for the connection of CP dc dial pulse repertory dialers which require no

voice transmission path to the telecommunications network

- To provide protection for telephone company personnel against hazardous voltages.

#### APPLICATION

- Associated with telephone company-provided telephone sets equipped with rotary or TOUCH-TONE® dials, telephone company switchboards, and miscellaneous key equipment.

#### ORDERING GUIDE

##### *Basic Unit*

- Coupler, Station, KS-20721, L1 (Fig. 1 and 2).

##### *Optional Equipment*

**2.01** If coupler is to be powered by telephone company, provide:

- Transformer, 2012B (one per coupler)

or

- Unit, Power, 19-type (or equivalent dc supply) when required for multiple coupler installations; see 3.11.

##### *Associated Apparatus*

- Set, Test, KS-20721, L15 (Fig. 3)—see 2.03
- Set, Test, Hand, 1013A (or equivalent)
- Battery, KS-6571 (or equivalent) if coupler is powered by CP equipment (CPE)
- Tool, KS-19192, L1 (not required on later model units which have slotted screws).

#### DESIGN FEATURES

**2.02** Protective Connecting Arrangement SU7QW provides the following features:

- DC isolation and high-voltage surge protection
- Provides leads for the connector to the muting contacts in CPE

- Network control signaling (off-hook, dial pulse, and disconnect)
- AC or DC powered
- Can be powered by either telephone company or CP power supply.

**2.03** The KS-20721, List 15 test set plugs into the connector on the station coupler and is used with a 1013A hand test set (or equivalent) to check the operation of the coupler with the CPE disconnected (Fig. 3 and 4).

#### **3. INSTALLATION—KS-20721, LIST 1 STATION COUPLER (Refer to Tables A and B)**

**3.01** The location and method of installing the KS-20721 station coupler shall be consistent with standard practices. The station coupler is designed for wall or shelf mounting, weighs 4 lbs, measures approximately 9 inches square by 3 inches deep, and has a metal base with plastic cover. (Cover screws require KS-19192, List 1 tool for early models, screwdriver for later models, and may be changed by the installer.)



*Early models had special quarter turn fasteners; current models have conventional captive screws which fasten clockwise and release when turned counterclockwise. On early models, turn fasteners clockwise only to open or close. (Fastener may break if turned counterclockwise.)*

**3.02** A 15-pin connector (J1, Fig. 1) is located on the base of the unit to connect the pulsing and muting leads to the CPE by means of a CP cable equipped with an ITT-Cannon Electric or Cinch Manufacturing Company plug No. DA-19603-403 with hood No. DA-51225-1. Screw terminals on the left side of the printed circuit board (Fig. 2) provide connections to the dial and receiver of the telephone set and 2012B power transformer (or power supply). Flexible jumper leads with connectors provide for installation options.

**3.03** The station coupler should be located in a place mutually agreeable to the customer and telephone company, readily accessible for maintenance, and convenient for customer connection. When associated with a telephone company telephone set, the coupler should be within 5 feet of the

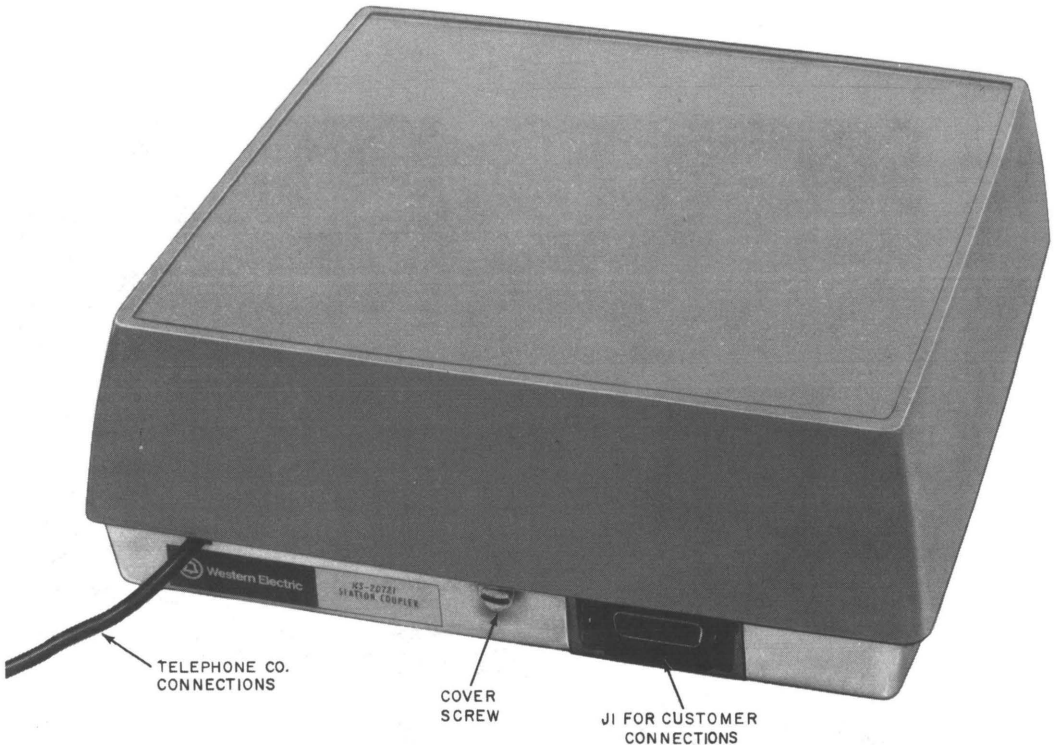


Fig. 1—KS-20721, List 1 Station Coupler

telephone set, if practical. When mounting coupler with screws, do not overtighten and bend base. Mount the unit close to a 115V ac convenience outlet not under control of a wall switch when power is provided by a 2012B transformer or 19-type power unit.



**Complete all installation work before connecting the 2012B transformer, 19-type power unit, or the CPE.**

**3.04 Options:** Provide the wiring options given in Table A. (The features provided by these options are explained in Table C.) These are the only options which are to be provided. Wire the options by moving the flexible jumper leads with connectors to the terminals given in Table B.

Verify that the unused leads are stored on the proper terminals given in Table B.⚡

### CONNECTIONS

**3.05** The connections to be made between the coupler and the associated telephone company equipment are similar to those made when installing a Magical\* KS-19594 repertory dialer.

\* Registered trademark of DASA Corporation

**3.06** When using an associated telephone company telephone set, locate station coupler within 5 feet of the telephone set, if practical, and connect telephone set to station coupler using a D4BN mounting cord or D station wire. (See Fig. 6 and Table E or F.) Secure D4BN mounting cord or D station wire to clamp at lower left corner of

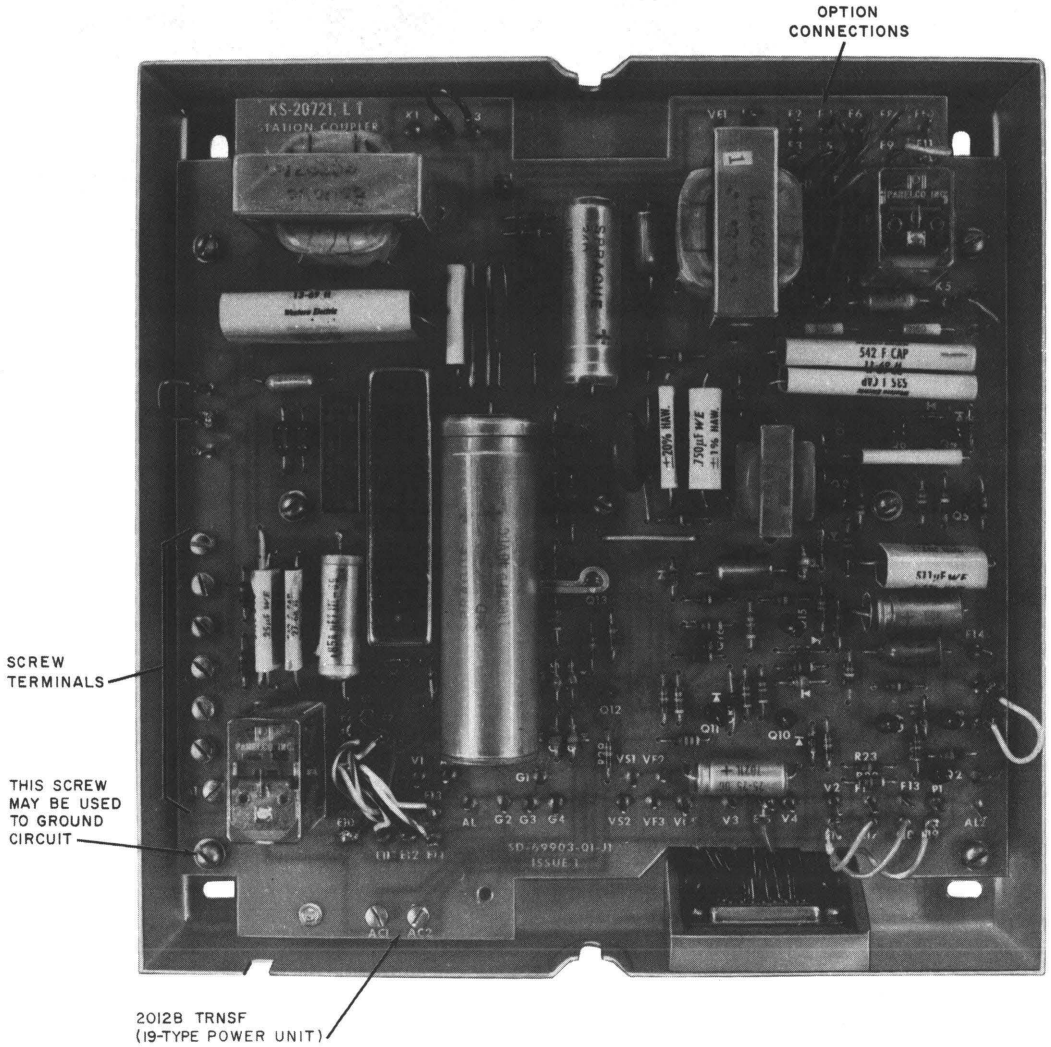


Fig. 2—KS-20721, List 1 Station Coupler, Cover Removed

station coupler. The coupler pulsing contacts are connected in series with the telephone set dial by using screw terminals R and R1 in the coupler. Leads from screw terminals A and A2 connect across the telephone set receiver to provide muting

during outpulsing. Refer to Table E or F and Fig. 6 for connections to be made with the most commonly used telephone sets. For those sets not covered in Table E or F, refer to Section 512-125-400 for telephone sets equipped with rotary dials and



◆ TABLE A ◆

OPTION TABLE ‡

PROTECTIVE CONNECTING ARRANGEMENT	TYPICAL CUSTOMER-PROVIDED EQUIPMENT	KS-20721 STATION COUPLER LIST NUMBERS	WIRING OPTIONS †
SU7QW	Dialers	List 1	P*, Q*, W

\* Options P and Q are factory-wired.

† Features described in Table C.

‡ Never provide more than required wiring options.

◆ TABLE B ◆

WIRING OPTIONS FOR FIELD INSTALLATION

OPTION LEAD		FROM TERMINAL ON L1 †	TO TERMINAL ON L1 OPTIONS		
LOC	COLOR		P‡	Q‡	W
L1 BOARD	G	N			RD
	BL	K1			
	S	K4			
	O	F10			
	BR	F6			F8
	V	F4			F7
	BK	F5			F5
	Y	P2		P2	
	S*	F8			F2
	BL*	F7			VF1
	W	M	G5		

\* These leads originate from J1 connector.

† Verify that leads are stored on these terminals when not in use.

‡ Options P and Q are factory-wired.

◆ TABLE C ◆

WIRING OPTION FEATURES

OPTION	FEATURE
Q *	Provides for direct control of line relay PR for DC pulse repeating.
P †	Removes line seizure delay feature.
W	Used for repertory dialer connections.

\* Option Q is factory-wired.

† Option P is required and is factory-wired.

**3.08** Mount the 10-141 terminal strip under the key shelf adjacent to the wire entrance hole for the dial. Rewire the 6044B dial mounting as shown in Fig. 7 or Table D. Lift wires and dial and use D-161488 connectors to extend wiring from the KS-16323 connector to the 10-141 terminal strip. Use strap wire to connect the 10-141 terminals to the 6044B dial mounting. If station coupler is disconnected, leave 10-141 terminal strip in place and strap terminals 3 and 5.

**3.09** For dialer connection to other switchboards and miscellaneous key equipment, refer to Section 512-125-430.

**POWER**

**3.10** Power for the coupler may be supplied by either the telephone company or the customer. If power is supplied by the telephone company,

Section 512-125-410 for telephone sets equipped with TOUCH-TONE dials.

**3.07** Typical connections to a 608-type PBX are shown in Fig. 7 and Table D.

**TABLE D**  
**CONNECTIONS FOR 608-TYPE PBX**

ROTARY OR ROTARY AND TOUCH-TONE® DIALS (FIG. 7)				
LEAD FROM KS-16323 CONN PIN NUMBER	REMOVE FROM 6044B	CONNECT TO 10-141	CONNECT STRAPS	
			FROM 10-141	TO 6044B
1	B	3		
2	Y	4	4	Y
3	R	1	1	R
21	GN	2	2	GN
			5	B

♦TABLE E♦

**CONNECTIONS FOR INSTALLATION OF PCA SU7QW  
WITH MOST COMMONLY USED TELEPHONE SETS**

CORD FROM KS-20721 COUPLER		TELEPHONE SETS, SERIES (NOTE)					
		500D 554B	511D 558D	565GK 565HK 565LK	630-TYPE 632-TYPE	702D	830-TYPE 831-TYPE 851-TYPE
P U L S I N G	R	Remove BL dial lead from F terminal of network and connect to R of coupler telephone cord using D-161488 connector or spare terminal.					
	R1	Connect to F terminal of network.					
O F F N O R M A L	A	Connect to GN terminal of network.					
	A2	Connect to R terminal of network.					

*Note:* For connections to sets not covered in table, refer to Section 512-125-400.

either a 2012B transformer or suitable dc supply (19-type or equivalent) may be used.

**3.11** ♦The 2012B transformer must not be used to supply more than one coupler. A suitable dc power supply (19-type or equivalent) must be used to supply multiple couplers (a maximum of

ten couplers per 19-type power unit connected to the dc signal output [20-26V dc]). The dc power supply should be of the current limiting type, or it should be connected through a 20-ohm, 1-watt resistor to each coupler to provide current limiting. The power supply may be connected with either polarity to the AC1 and AC2 terminals. Do not

◆TABLE F◆

CONNECTIONS FOR INSTALLATION OF PCA SU7QW  
WITH MOST COMMONLY USED TELEPHONE SETS

CORD FROM KS-20721 COUPLER		TELEPHONE SETS, SERIES (NOTE)							
		2500D 2554B	2511D 2558D	2565GK	2565HK 2565LK	2630-TYPE 2632-TYPE	2702D	2830-TYPE 2831-TYPE	2851-TYPE
P U L S I N G	R	Remove G dial lead from F on the network and connect to R of dialer tel cord with D-161488 connector.	Remove G dial lead from G on the network  <i>and</i>	Remove G dial lead from L2 on the network  <i>and</i>	Remove G dial lead from 4 on the terminal block  <i>and</i>	Remove G dial lead from F on the network  <i>and</i>	Remove G dial lead from 8 on the terminal board  <i>and</i>	Remove G dial lead from 20 on the terminal board  <i>and</i>	Connect to R of dialer telephone cord with D-161488 connector.
	G	Connect to F terminal on network.	Connect to G terminal on the network.	Connect to L2 on the network.	Connect to terminal 4 on the terminal block.	Connect to F terminal on the network.	Connect to terminal 8 of the terminal block.	Connect to terminal 20 of the terminal block.	
O F F N O R M A L	W	Connect to R terminal on the network.							
	BL	Connect to S terminal on the network.	Connect to S terminal on the network.		For 2630-type, connect to R terminal. For the 2632-type, connect to GN terminal on the network.	Connect to terminal 5 of the terminal block.	Connect to S terminal on the network.		

Note: For connections to sets not covered in table, refer to Section 512-125-400 for rotary dials and Section 512-125-410 for TOUCH-TONE® dial.

ground either terminal of the power supply used for the PCA SU7QW. Due to noise considerations, a power supply used in this application is an exception to the grounding instructions stated in Section 167-440-201. Power supply current drain during normal operation is 0.060 ampere. Initial surge current is 1 ampere. Standby current is .012 ampere.⚡

**3.12** Line noise pickup, cross-talk, etc, may occur between units connected to a common power supply. When this occurs, it may be cleared by grounding the housing of each station coupler. The circuit board mounting screw below terminal A1 may be used for grounding the coupler.

**3.13** When power is supplied by a 2012B transformer (or by the dc signal terminals of a 19-type power unit), an optional current-limited, positive dc voltage source is provided to the customer on lead B1 (ground return on lead B2) furnishing a charging current of 2.5 milliamperes which may be used to keep a CP rechargeable battery (18V, 150 to 500 ma) charged during normal operation to provide power when commercial power fails. If the customer furnishes power,  $21 \pm 5$  volts dc is connected to leads B1 and B2 through plug (P1).

**3.14** After installation is completed, perform operational test given in Part 5 to check for proper operation before CPE is connected.

#### 4. OPERATION

##### DIAL PULSE REPERTORY DIALER (PCA SU7QW With no Transmission Path)

**4.01** With PCA SU7QW (Fig. 5), the customer goes off-hook with the associated telephone company telephone set and, after receiving dial tone, operates his dialer to output the desired station code. The dial pulsing contacts open and close leads OH1 and OH2 causing PR relay to repeat the pulses over leads R and R1 to the telephone line. The muting (off-normal) contacts from the CP dialer, if provided, open and close the muting leads MU1 and MU2 causing RU relay to repeat closures on leads A and A2 to mute the telephone set receiver during outpulsing. To prevent a false dial pulse, power must be applied to the coupler, and leads OH1 and OH2 must be closed before the associated telephone handset goes

off-hook. If a power failure occurs, the coupler automatically connects the telephone set across the line so the customer can dial manually.

#### LIST 15 TEST SET

**4.02** The List 15 test set (Fig. 3 and 4), used with the 1013A hand test set (or equivalent) and a connecting cable terminated in a plug for connection to the station coupler, permits checkout of the coupler independent of the CPE.

**4.03** When detailed circuit description and operation information is required, refer to CD- and SD-69903-01.

#### 5. MAINTENANCE

**5.01** When trouble is reported, verify that:

- Customer connector plug is secure in coupler.
- Power is supplied to station coupler with correct polarity.
- Leads to CO line and telephone set are secure.
- CO pair and telephone set are good.
- Wiring options and coupler connections are correct. (Refer to Table B and Fig. 6.)

**5.02** After performing steps in 5.01, if trouble still exists, perform the test described in 5.05.

##### 5.03 *Apparatus Required:*

- List 15 test set
- 1013A (or equivalent) hand test set
- KS-6571 (or equivalent) battery (if coupler is powered by CPE).

##### 5.04 *Preparation:*



***Make all tests with CPE disconnected.***

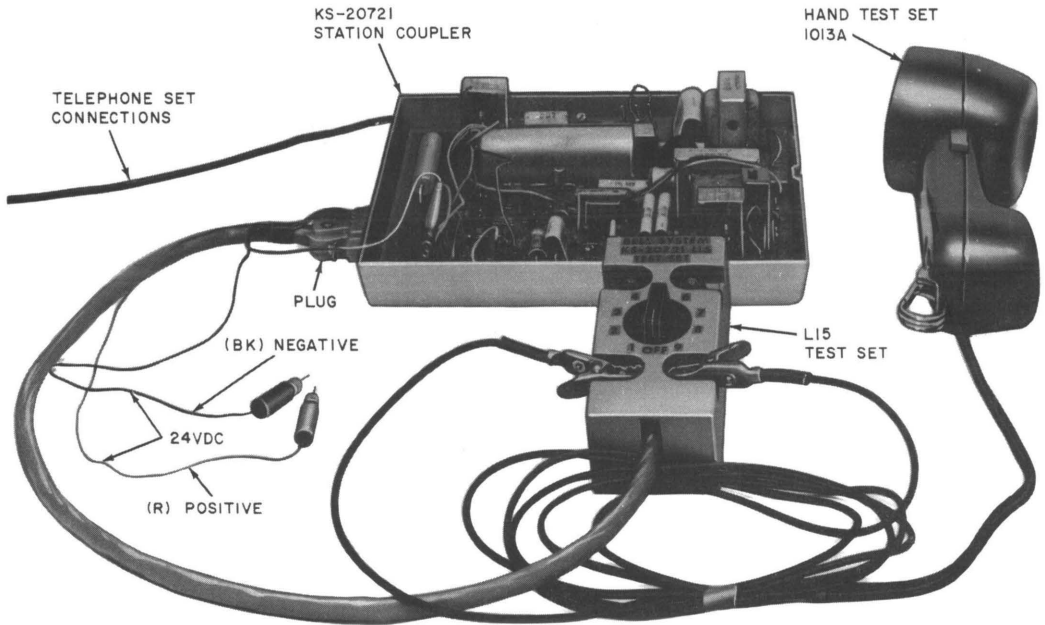


Fig. 3—KS-20721 Station Coupler With KS-20721, List 15 Test Set and 1013A Hand Test Set

STEP	ACTION	VERIFICATION
1	Rotate selector switch on List 15 test set to OFF.	
2	Remove cover of station coupler using KS-19192, List 1 tool or screwdriver.	
3	Connect a 1013A (or equivalent) hand test set to terminals provided on test set (Fig. 3).	
4a	If coupler is normally powered by CPE— Use a 24V (KS-6571 or equivalent) battery and connect the pin-tipped red lead from the test set to +24V and black lead to -24V.	White lamp extinguished. Red lamp extinguished.
5	Connect test set plug to receptacle on station coupler.	
6	Connect alligator clip on wire coming from the test set plug to the positive (+) terminal of capacitor C17 in the station coupler (Fig. 3).	

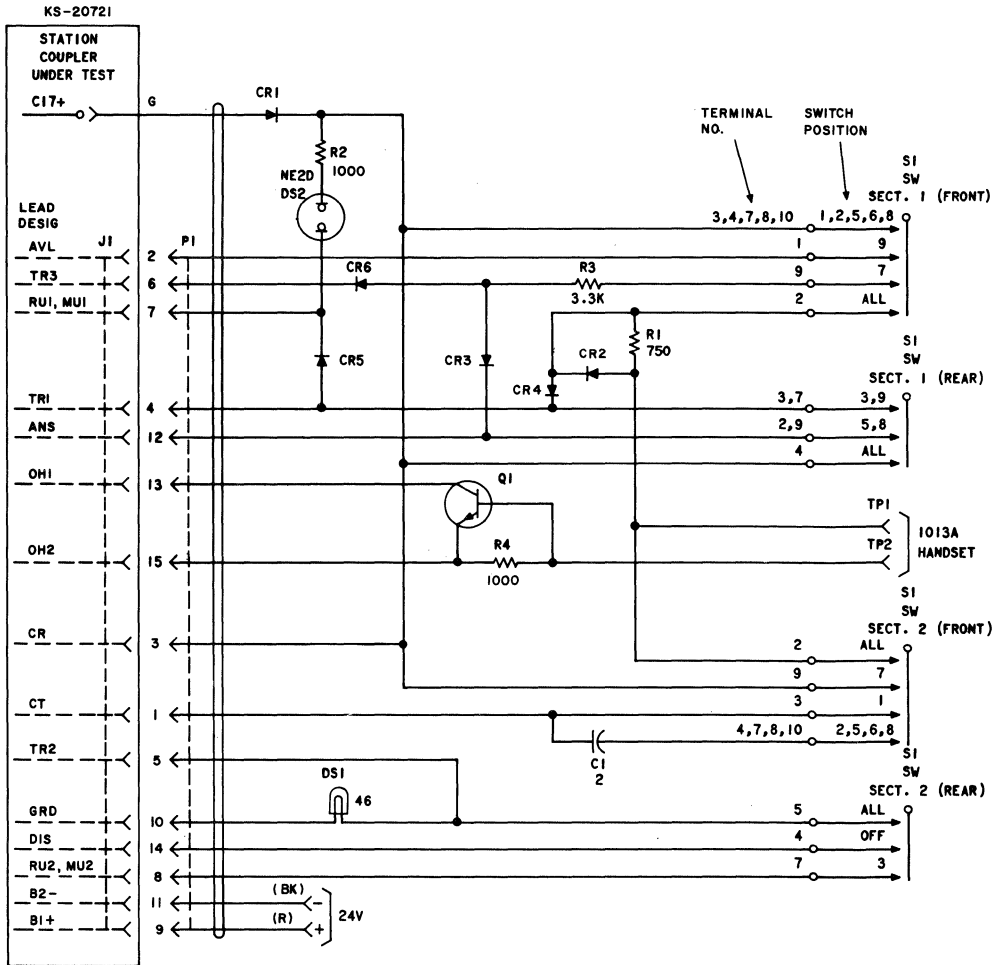

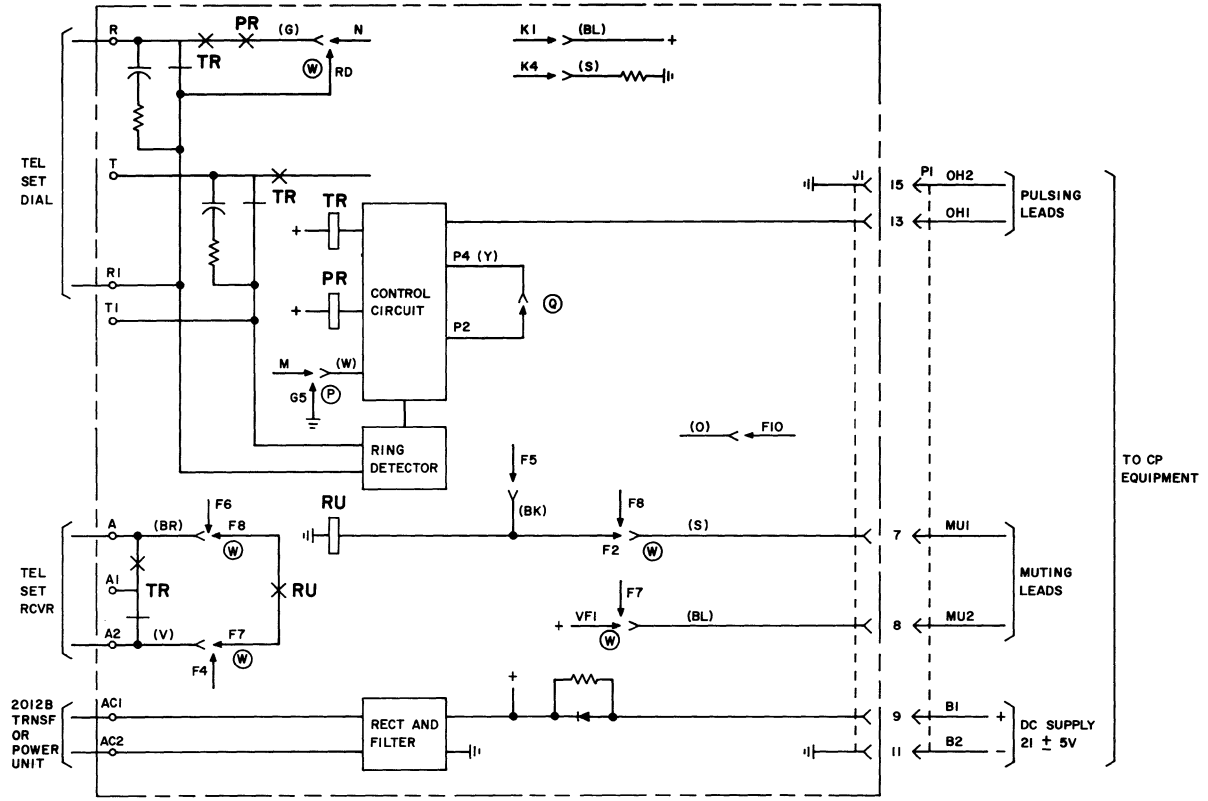


Fig. 4—KS-20721, List 15 Test Set, Schematic

5.05 Test—SU7QW

STEP	ACTION	VERIFICATION
7	Operate switch on hand test set to MON.	
8	Rotate selector switch to position 1.	Relay RU operated.
9	Rotate selector switch to position 3.	White lamp lighted.

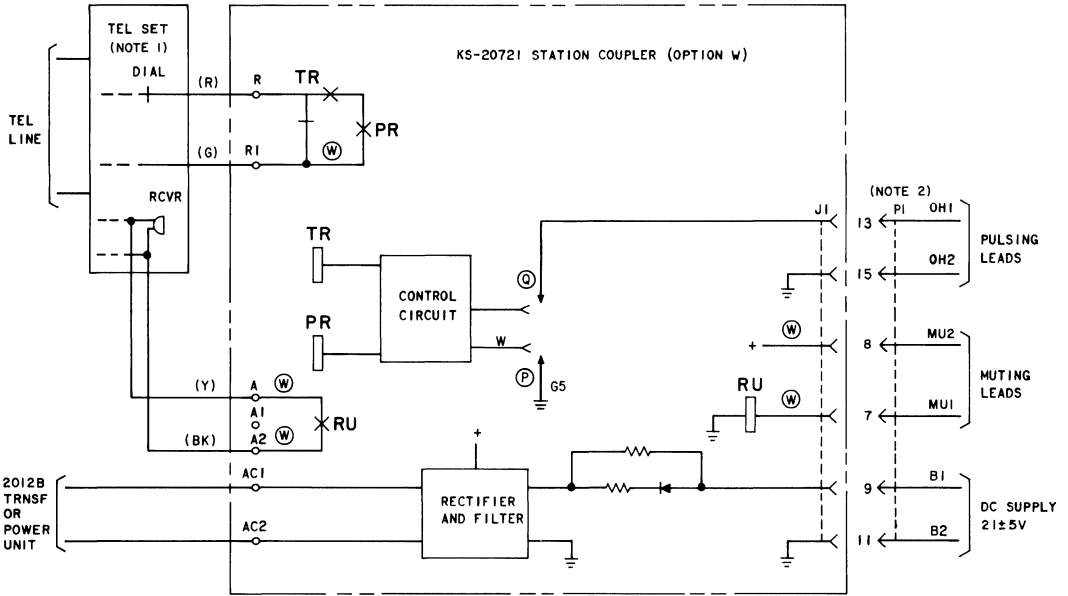
STEP	ACTION	VERIFICATION
10	Rotate selector switch back to position 1.	White lamp extinguished.
11	Operate switch on hand test set to TALK.	Relay TR operated. White lamp lighted.
12	Dial a test number using the hand test set while listening at the associated telephone.	Dial pulses should be muted to a low level.
13	Rotate selector switch of test set to OFF and check for normal performance of associated telephone.	White lamp extinguished. Associated telephone performs normally.
14	Disconnect test set from station coupler and reconnect CPE.	
5.06	If coupler does not meet the above test, replace coupler.	of Service Charge on Services with Customer-Provided Equipment (CPE).
5.07	If the test is satisfactory, remove all test connections to restore circuit to normal and follow local reporting procedures for CP trouble.	
	<b><i>Do not attempt any test or repair to the CPE.</i></b>	
5.08	When in the repairman's judgment the trouble is located in the CPE, the Repair Service Bureau should be notified so that proper Maintenance of Service Charge billing can be initiated as outlined in Section 660-101-312 entitled Maintenance	
<b>6. CONNECTIONS</b>		
6.01	Refer to Fig. 6 and Table E or F for connections to a repertory dialer.	
6.02	Refer to Fig. 7 and Table D for typical connections to a 608-type PBX.	
6.03	Refer to Fig. 7 and Table D for connections to 6044B dial mounting.	
6.04	Refer to Section 512-125-430 for dialer connections to other switchboards and key equipment.	



- NOTES:
1. TERMINALS F4, F5, F6, F7, F8, F10, K1, K4, M, N, AND P2 ARE TERMINALS USED TO STORE LEADS THAT ARE NOT USED
  2. P1 IS CUSTOMER PROVIDED PLUG.
  3. OPTION Q IS FACTORY WIRED.

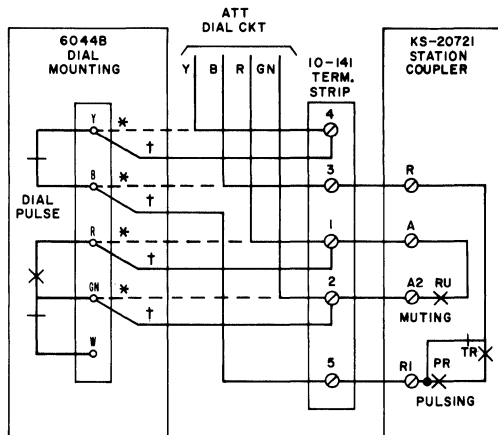
Fig. 5—KS-20721 Station Coupler, Repertory Dialer, Internal Wiring Options





- NOTES:
1. REFER TO TABLE E AND F FOR INTERNAL TEL SET CONNECTIONS.
  2. PI IS CUSTOMER-PROVIDED PLUG.
  3. CIRCLED LETTERS (W) AND (Q) DENOTE WIRING OPTIONS.
  4. OPTION Q IS FACTORY WIRED.

Fig. 6—KS-20721 Station Coupler, Repertory Dial, Simplified Schematic



- \* REMOVE EXISTING WIRE AND CONNECT TO TERM STRIP  
 † ADD WIRE STRAPS

Fig. 7—Connections for 608-Type PBX

## PROTECTIVE CONNECTING ARRANGEMENT AD1

### 23A COUPLER

#### 1. GENERAL

**1.01** This section provides identification, installation, operation, maintenance, and connection information for the 23A coupler when used in Protective Connecting Arrangement (PCA) AD1.

**1.02** This section is reissued to:

- Add Table A to show connections for installation of PCA AD1 with commonly used multiline rotary dial telephone sets
- Add Table B to show connections for installation of PCA AD1 with most commonly used multiline TOUCH-TONE® dial telephone sets
- Change Fig. 3 to a simplified schematic diagram.

**1.03** PCA AD1 uses the 23A coupler to provide an interface between customer-provided (CP) dc dial pulse dialers which require no transmission path and the central office (CO) or PBX station line. PCA AD1 cannot be used with CP tone dialers.

**1.04** PCA AD1 does not provide for receiver muting during dialing; if this feature is provided, PCA SU7QW may be used. For installation of PCA SU7QW with multiline sets, refer to Section 463-340-104.

**1.05** An associated telephone set may make a normal outgoing call with this PCA.

**1.06** If the customer wants a copy of the Technical Reference which covers PCA AD1, the customer should contact the local Telephone Company Business Office or Marketing Representative.

**1.07** The customer should be informed by the manufacturer or supplier of his equipment of the proper PCA to be used with the equipment.

**1.08** This issue of the section is based on the following drawing: CD- and SD-69912-01, Issue 2A—23A Coupler Circuit. If this section is to be used with equipment or apparatus reflecting later issues of the drawing, reference should be made to the CD and SD to determine the extent of the changes and the manner in which the section may be affected.

#### 2. IDENTIFICATION

##### PURPOSE

- To provide facilities for connecting CP dial pulse repertory dialers to the telephone line
- To provide dc isolation and hazardous voltage protection to telephone company personnel
- To provide network control by dc dial pulse repeating
- To provide fail-safe operation if dialer is disconnected or power fails.

##### APPLICATION

- Provides for the connection of CP dial pulse dialers that do not require a transmission path or associated telephone set receiver muting during dialing.

##### ORDERING GUIDE

###### *Basic Units*

- Coupler, 23A
- Transformer, 2012B (one per coupler).

##### DESIGN FEATURES

- Approximate dimensions are 4 inches long by 2-3/4 inches wide and 1-7/8 inches deep.
- Contains a mercury relay for long life.

- Provides covered screw terminals for line and power connections.
- Provides exposed screw terminals on top of coupler for customer connections.
- Must be mounted in vertical position.
- AC power requirements are 15 to 25 volts at 20 milliamps RMS maximum. DC power requirements are 18 to 26 volts at 22 milliamps maximum.
- Repeats dial pulses without pulse correction.
- Replaces a 42A connecting block.

### **3. INSTALLATION**

**3.01** The location and method of installing the 23A coupler shall be consistent with standard practices. Locate the 23A coupler within 5 feet of associated telephone set. Remove cover and mount coupler on wall or baseboard in a vertical position with terminal board at top. The coupler must be mounted vertically to insure that the sealed contacts of the D relay will be in the enclosed mercury pool.

**3.02** Connect telephone line and telephone set mounting cord to screw terminals on terminal board at top end of coupler as shown in Fig. 2 and 3.

**3.03** Single line sets are wired to the coupler as shown in Fig. 3. For multiline sets, connect the coupler as shown in Tables A and B. These connections permit the coupler to be used on all lines in the set by putting the pulsing contacts of the dialer in series with those in the telephone set.

**3.04** At single installations, a 2012B transformer can be used to power the 23A coupler. For multiple coupler installations use a KS-5714, List 4 or List 5 signal transformer or a 19B2 power unit (dc signal supply).

**3.05** The 2012B transformer, when used, should be plugged into a 115-volt, 60-Hz ac outlet not under control of a wall switch. Use only one coupler per transformer. Run "D" inside wire leads and terminate on screw terminals 1 and 2 located on the printed circuit board. (See Fig. 1.)

When a dc power unit is used, connect the positive lead to screw terminal 1 and the negative lead to screw terminal 2.

**3.06** Replace cover and fasten cover-attaching screw. After installation is complete, apply power and perform operational tests given in Part 5 of this section.

**3.07** The customer will provide the leads to his dialer pulsing contact and connect to screw terminals A and B located on the terminal board on the top end of the coupler. These terminals are not covered when cover is in place and are clearly marked on the terminal board. Make sure there is clear access to these terminals for the customer.

### **4. OPERATION**

#### **Outgoing Call**

**4.01** To originate an outgoing call, the customer sets the dialer selector to the desired number and goes off-hook on the associated telephone company-provided telephone set. (The telephone set must remain off-hook for duration of call.) After receiving dial tone, the customer presses the start button on his dialer to initiate the call. The pulsing contact in the CP dialer opens and closes the A and B leads, causing the D relay in the 23A coupler to open and close the tip side of the telephone line to repeat dial pulses to the CO or PBX. If power failure should occur or CP dialer becomes defective, the D relay releases after a short delay to close the tip side of the telephone line to provide normal operation of the associated telephone set. An incoming call is received in the normal manner.

### **5. MAINTENANCE**

**5.01** When trouble is reported verify that:

- Customer dial pulse interface leads are secure on coupler.
- Power is supplied to coupler with correct polarity.
- Leads to line and station set are secure.
- CO or PBX line and telephone set are operative.

**5.02** After performing steps in 5.01, if trouble still exists, perform the following tests.

**5.03** Disconnect the customer dialer leads from screw terminals A and B. Connect a 1013A (or equivalent) hand test set to screw terminals A and B. Place hand test set in "TALK" position. Go off-hook on associated telephone set; after receiving dial tone, dial the test number for 1000-Hz test tone using the 1013A hand test set for dialing. Verify satisfactory reception and place the 1013A hand test set in "MON" position to open the line and 1000-Hz test tone will no longer be heard. In a few seconds, dial tone should be heard as the coupler closes the tip side of line.

**5.04** If the tests are satisfactory, remove all test connections to restore circuit to normal and reconnect customer dialer leads to screw terminals A and B. If coupler does not meet above tests, replace coupler.

**Note:** Do not attempt any test or make repairs to the CP equipment.

**5.05** When in the repairman's judgment the trouble is located in the CPE, the Repair Service Bureau should be notified so that proper maintenance of service charge billing can be initiated as outlined in Section 600-101-312 entitled Maintenance of Service Charge on Services with Customer-Provided Equipment (CPE).

## 6. CONNECTIONS

**6.01** Refer to Fig. 1, 2, and 3 for power and line connections.

**6.02** Refer to Fig. 3 for connections to single line sets.

**6.03** Refer to Table A for connections to typical, multiline sets equipped with rotary dials.

**6.04** Refer to Table B for connections to typical, multiline sets equipped with TOUCH-TONE dials.

**6.05** Terminals Y and BK are spare terminals, not internally connected, that can be used for the termination of other leads in the station mounting cord.

**6.06** Pair the ring lead with the tip lead to the coupler and to the telephone set, where possible, to maintain line balance.

**6.07** The customer must provide leads and connect the pulsing contact of the CP dialer to terminals A and B.

**6.08** Screw terminals C and 7 are spare terminals provided for future applications and are not used.

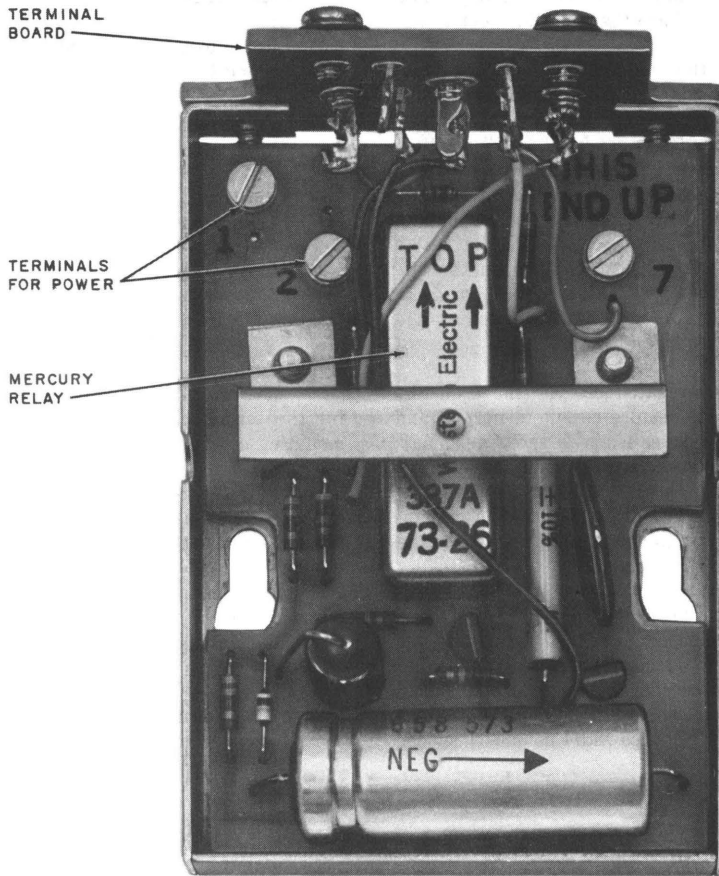


Fig. 1—23A Coupler, Front View (Cover Removed)

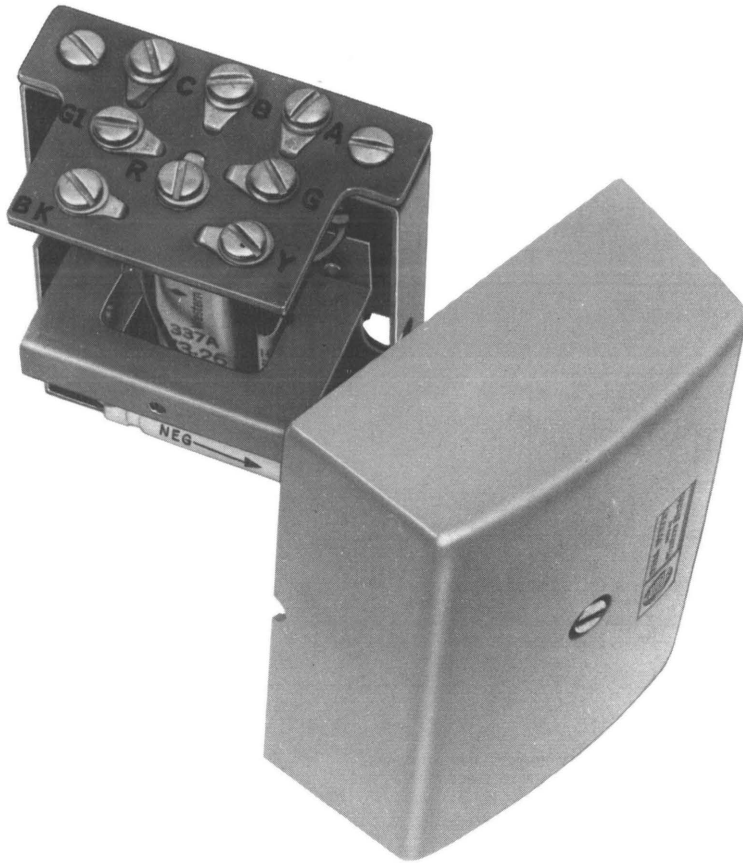
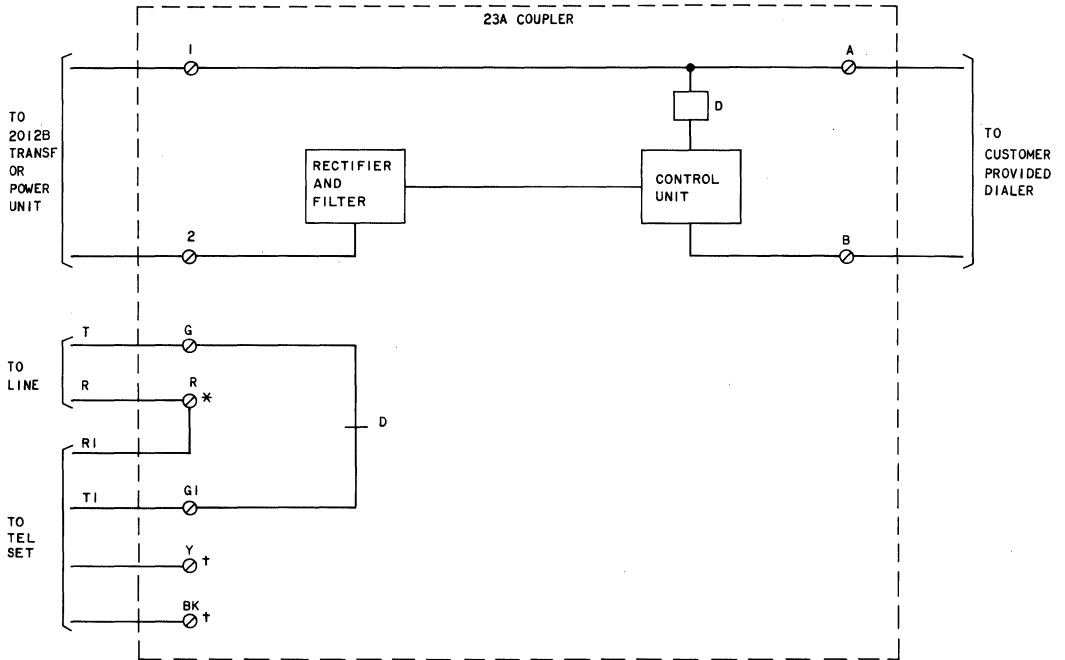


Fig. 2—23A Coupler, Top View (Cover Removed)



NOTE:  
 LINE AND TELEPHONE SET CONNECTIONS SHOWN ARE FOR SINGLE LINE SETS. REFER TO TABLE A FOR MULTILINE SETS.

\* R TERMINAL NOT INTERNALLY CONNECTED USE TO CONNECT R OF LINE TO RI OF TEL SET.

† TERMINALS Y AND BK NOT INTERNALLY CONNECTED. USE FOR TERMINATION OF OTHER LEADS IN STATION MOUNTING CORD WHEN REQUIRED.

Fig. 3—23A Coupler, Simplified Schematic Diagram

→TABLE A←

**TYPICAL MULTILINE  
ROTARY DIAL TELEPHONE SET CONNECTIONS**

23A COUPLER		511D/558D	565GK 565HK 565LK	630-, 632-TYPE	830-, 831-TYPE
P U L S I N G C O N T A C T S	G	Remove (BL) dial lead from F terminal of network. Connect to lead from G of coupler using D-161488 connector or spare terminal.			
	G1	Connect lead from G1 of coupler to F terminal of network.			
T E R M I N A L S S P A R E	Y	Connect a spare lead of cord to terminal for termination. Not internally connected.			
	BK	Connect a spare lead of cord to terminal for termination. Not internally connected.			

*Note:* For multiline telephone sets that are equipped with rotary dials and not included in this table, refer to Section 512-125-400. Refer to Fig. 3 for single line telephone set connections.



→TABLE B←

## TYPICAL MULTILINE TOUCH-TONE TELEPHONE SET CONNECTIONS

23A COUPLER		2511F 2558D	2565GK	2565HK 2565LK	2630-, 2632- TYPE	2830-, 2831- TYPE
P U L S I N G	G	Remove G dial lead from F on network  AND	Remove G dial lead from G on network  AND	Remove G dial lead from L2 on network  AND	Remove G dial lead from 4 on term. block  AND	Remove G dial lead from 8 on term. board  AND
	Connect to R of dialer telephone cord with D-161488 connector					
	G1	To F on network	To G on network	To L2 on network	To term. 4 on term. block	To term. 8 on term. board
T E R M I N A L S	Y	Connect spare lead of cord to screw terminal for termination. Not internally connected.				
	BK	Connect spare lead of cord to screw terminal for termination. Not internally connected.				

*Note:* For multiline telephone sets that are equipped with TOUCH-TONE dials and not included in this table, refer to Section 512-125-410. Refer to Fig. 3 for single line telephone set connections.

## **VOICE CONNECTING ARRANGEMENTS RDL AND RDM**

### **1. GENERAL**

**1.01** This section provides identification, installation, operation, maintenance, and connection information for the KS-19522 recorder coupler when used in Voice Connecting Arrangements (VCA) RDL and RDM.

**1.02** This section is reissued to:

- Change title
- Add information on the KS-19522, List 21 and List 22 replacing the List 1 and List 2 which are rated MD.

**1.03** The customer must be informed by the manufacturer or supplier of the equipment of the proper use and operation of his equipment with VCA RDL and RDM.

**1.04** If the customer wants a copy of the Technical Reference (AT&T Publication 42204) which covers these interface specifications, the customer should contact the local Telephone Company Business Office or the Marketing Representative.

**1.05** With either arrangement, an associated telephone set may make a normal outgoing call when the coupler is not in use and may be used to monitor the line when the coupler is in use.

**1.06** The KS-19522, List 12 test set is used to test the recorder coupler independent of the customer-provided equipment (CPE).

**1.07** This issue of the section is based on the following drawing:

SD-99356-01, Issue 13B—KS-19522 Recorder Coupler

If this section is to be used with equipment or apparatus reflecting later issue(s) of the drawing(s), reference should be made to the SDs and CDs to determine the extent of the changes and the manner in which the section may be affected.

### **2. IDENTIFICATION**

#### **PURPOSE**

- VCA RDL provides for one-way voice transmission in each direction (but not simultaneously) between customer-provided (CP) announcement/recorder equipment and a telephone line on incoming calls. Transmitters of any telephone sets associated with the line are disabled during incoming calls to prevent recording of 2-way conversations. This arrangement is provided by KS-19522, List 1 or List 21 or List 2 or List 22 recorder coupler. The KS-19522, List 2 or List 22 consists of a KS-19522, List 11 voice control added to a KS-19522, List 1 or List 21 recorder coupler.
- VCA RDM provides for 2-way voice transmission between the CPE and telephone line, permitting distant party control of the CPE during incoming calls. Recording of 2-way conversations is prevented as before. This arrangement is provided by a modified KS-19522, List 21 or List 22 recorder coupler stamped "2W".
- The KS-19522, List 21 and List 22 recorder couplers are identical to the List 1 and List 2 recorder couplers with one exception. The List 21 and List 22 are provided with three extra screw terminals (S, C, and L) for installing options for disconnect time delay. The KS-19522, List 1 and List 2 will be rated MD with the availability of the List 21 and List 22.

#### **APPLICATION**

For use with central office (CO) or PBX lines.

#### **ORDERING GUIDE**

- Coupler, Recorder, KS-19522,L21
- Coupler, Recorder, KS-19522,L22

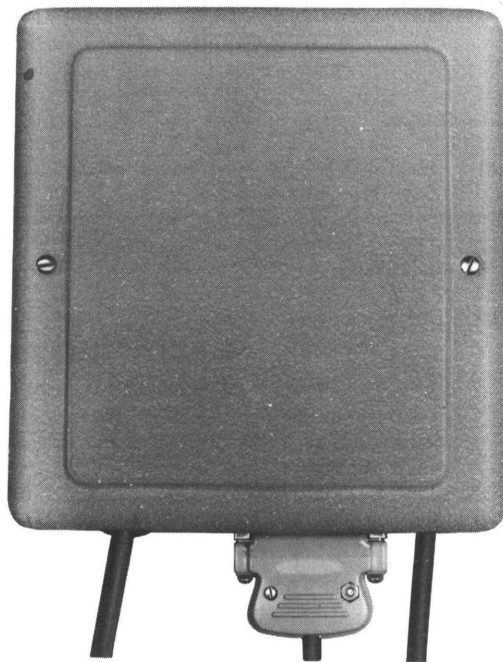
- Coupler, Recorder, KS-19522,L21 (2W) modified for 2-way transmission per BSRs 455.204
- Coupler, Recorder, KS-19522,L22 (2W) modified for 2-way transmission per BSRs 455.204
- Control, Voice, KS-19522, L11 (provides automatic disconnect—see 2.03)
- Set, Test, KS-19522, L12 (required for testing recorder couplers)
- Relay, Plug-in (if required for maintenance, see Table A).

**TABLE A  
ORDERING INFORMATION**

RELAY	ORDERING INFORMATION
ENA	T163X-23 or T163X-23A, 2C, 700 ohms, 24VDC, Allied Control Company
LS, TR	T163X-21 or T163X-126, 6C, 430 ohms, 24VDC, Allied Control Company

## DESIGN FEATURES

- 2.01** The KS-19522, List 1 and List 21 or List 2 and List 22 recorder coupler (Fig. 1):
- Detects ringing and supplies a signal to the CPE
  - Upon command by CPE, couples prerecorded announcements to telephone line from CP unit
  - Upon command by CPE, couples incoming messages from telephone line to recording equipment
  - Transmits a single short beep tone to telephone line at the time of mode transfer (start and end of recording period)
  - Transmits low level tone to telephone line as required by customer unit (not recommended when List 11 voice control is used)



**Fig. 1—KS-19522 Recorder Coupler**

- Disconnects from telephone line on signal from customer unit (opening of ready leads), battery reversal, or momentary open from the CO.
  - KS-19522, List 21 and List 22 also provide three installer selectable disconnect time delay intervals to prevent false disconnects.
- 2.02** The KS-19522, List 11 voice control provides automatic disconnect from the telephone line in the absence of speech for 12 seconds. CO receiver off-hook tone generator will prevent operation of the voice control.
- 2.03** The KS-19522, List 11 voice control is required when the local CO or PBX does not provide a suitable disconnect signal (momentary interruption in line current) when the calling party goes on-hook or when CPE does not provide disconnect. The List 11 voice control is factory-installed in the List 2 and List 22 recorder coupler. It may be ordered separately for field installation in the List 1 or List 21 recorder couplers.

**2.04** The KS-19522, List 1 and List 21 recorder couplers are constructed on a printed wiring board mounted in a metal apparatus box measuring 6-7/8 inches wide, 7-3/8 inches high, and 3-3/8 inches deep. The complete assembly weighs approximately five pounds and is designed for wall mounting.

**2.05** Screw terminals for termination of the telephone line and telephone set mounting cord, or inside wiring cable, are located on the right side of the printed wiring board (Fig. 2 for List 1 and Fig. 3 for List 21). Entrance is provided at the bottom of the recorder coupler.

**Note:** Terminal locations on late production circuit boards of KS-19522, List 1 differ from early production boards.

**2.06** The recorder coupler is equipped with a 6-foot, 3-conductor power cord with a 3-wire,

parallel blade grounding cap for connection to a 3-wire, grounded 115-volt ac convenience outlet.

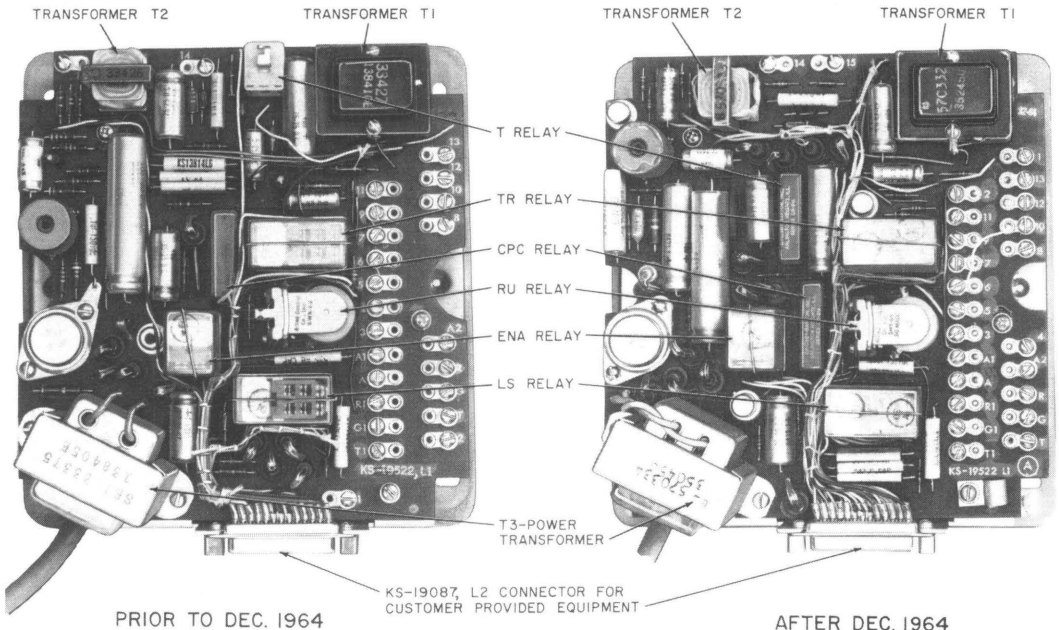
**2.07** The power cord and customer equipment connector are located at the bottom of the recorder coupler (Fig. 2 and 3).

**2.08** The power supply input is 105 to 125 volts, 50 to 60 Hz. The power supply output is 22 volts dc.



*If only dc power is available, the KS-15662 dc-ac inverter must be used.*

**2.09** The KS-19522, List 2 recorder coupler consists of the List 1 recorder coupler with the List 11 voice control factory-installed (Fig. 4). The KS-19522, List 22 recorder coupler consists of the List 21 recorder coupler with the List 11 voice control factory-installed (Fig. 4). The List 11



**Fig. 2—KS-19522, List 1 (MD) Recorder Coupler, Cover Removed**

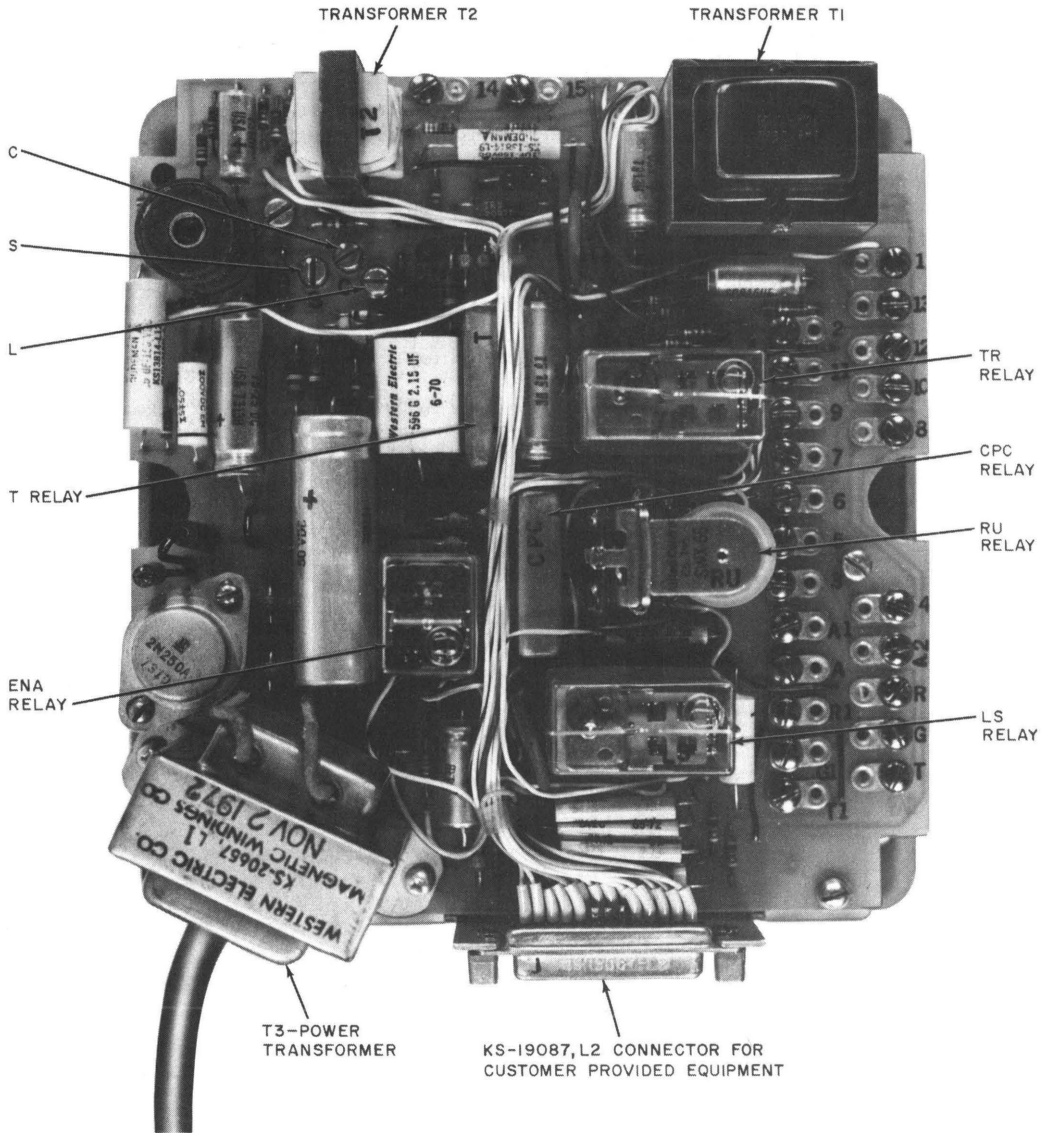


Fig. 3—KS-19522, List 21 Recorder Coupler, Cover Removed

(Fig. 5) may be ordered separately for field installation in List 1 or List 21 recorder couplers.⚡

**2.10** The KS-19522, List 11 voice control is constructed on a printed wiring board and is equipped with spade-tipped leads for connecting to screw terminals on the recorder coupler (Fig. 5).

**2.11** The KS-19522, List 12 test set (Fig. 6) provides a means for testing the operation of the recorder coupler following installation. It also permits testing the recorder coupler independently of the CPE, as an aid in trouble clearance. The test circuit is housed in a small plastic case and consists of a 12-position rotary switch and associated circuitry arranged to test each function of the recorder coupler by providing contact closures in sequence. A schematic of the test set is shown in Fig. 7.

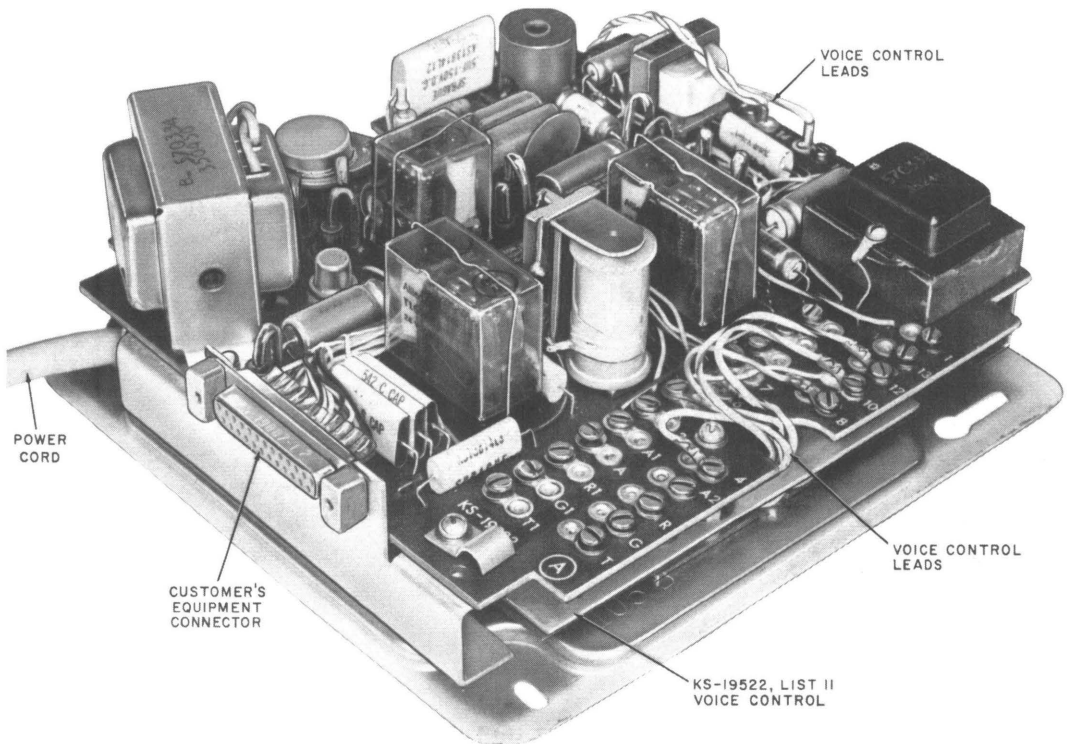
### 3. INSTALLATION

**3.01** The location and method of installing the recorder coupler shall be consistent with standard practices. The KS-19522 recorder couplers are designed for vertical wall mounting only. If a backboard is required, the 165A backboard is recommended.



**Connect KS-19522 recorder couplers to commercial power after all other installation work has been completed. The power cord shall not be passed through holes in walls or fastened to walls.**

**3.02** The installation of the KS-19522, List 21 recorder coupler is identical to the installation of List 1.



**Fig. 4—KS-19522, List 2 or List 22 Recorder Coupler, Cover Removed**

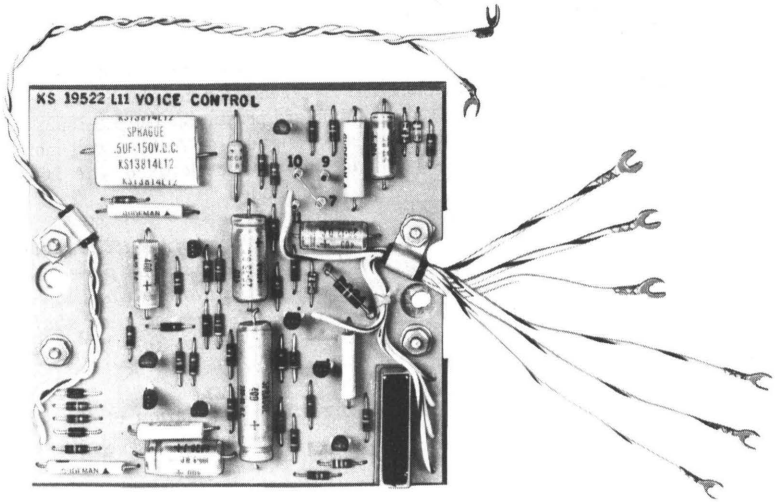


Fig. 5—KS-19522, List 11 Voice Control, Unmounted

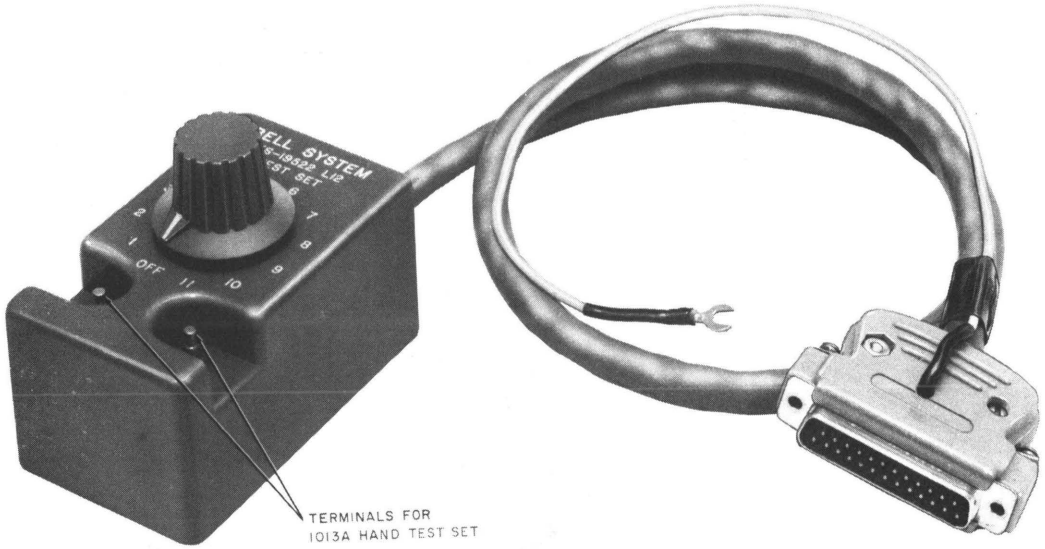
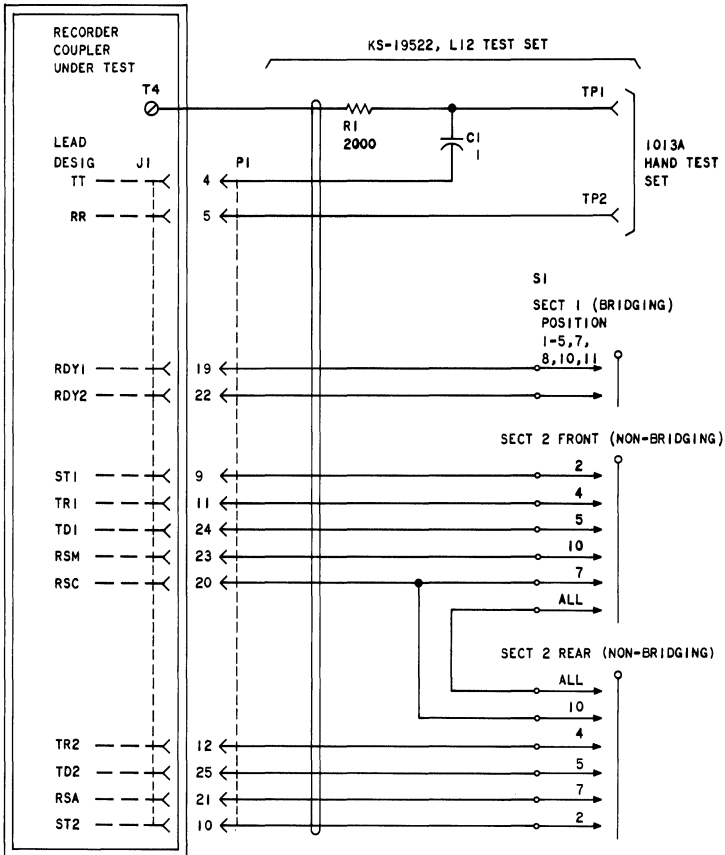


Fig. 6—KS-19522, List 12 Test Set



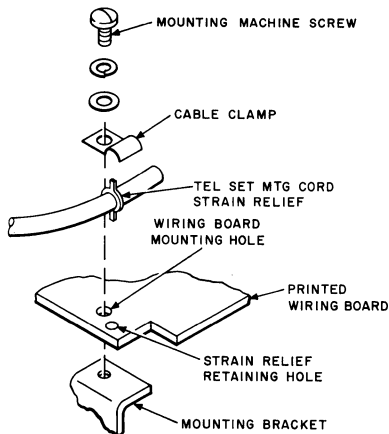
POSITION	SIGNAL PROVIDED	LEADS CLOSED
1	READY	RDY1 TO RDY2
2	START	RDY1 TO RDY2, ST1 TO ST2
3	READY	RDY1 TO RDY2
4	TRANSFER	RDY1 TO RDY2, TR1 TO TR2
5	TONE APPLIED	RDY1 TO RDY2, TDI TO TD2
6	TONE REMOVED	NONE
7	REMOTE START ANNOUNCE	RDY1 TO RDY2, RSC TO RSA
8	READY	RDY1 TO RDY2
9	READY REMOVED	NONE
10	REMOTE START MESSAGE	RDY1 TO RDY2, RSC TO RSM
11	READY	RDY1 TO RDY2
12	OFF	NONE

Fig. 7—Schematic—KS-19522, List 12 Test Set



**Note:** When the voice control feature of the List 2 or List 22 recorder coupler is not desired it can be replaced by the List 1 or List 21 unit, or the voice control may be permanently disabled by strapping terminal 5 to terminal 6 (screw terminals on recorder coupler circuit board).

**3.03** For non-key system use, where practical, locate recorder coupler within 5 feet of the associated set. The telephone mounting cord is secured to the recorder coupler as shown in Fig. 8. Dress leads before closing cover. In key system use, where possible, wire recorder coupler between CO or PBX line and the key equipment (Fig. 11). In all cases the tip and ring to all telephone sets must be terminated on the T1 and R1 terminals of the recorder coupler to prevent interference with operation of announcement/recorder equipment.



**Fig. 8—Securing Telephone Set Mounting Cord in Recorder Coupler**

**3.04** A 25-pin connector (Fig. 1) is located on the base of the unit to connect the transmission path and control leads to the CPE. The mating ITT Cannon Electric or Cinch Plug No. DB-19604-432 with Hood No. DB-51226-1, or equivalent, is customer-provided and prewired to his equipment.

**3.05** The recorder coupler shall be readily accessible for maintenance and within 6 feet of a

3-wire ground convenience outlet not under control of a wall-switch.



**Do not install near hazardous locations, moisture, or excessive heat.**

**3.06** Where local instructions permit, fasten power cord plug of recorder coupler to convenience outlet. Use a 5A or 6A Tinnerman clamp and an ES-528772 bracket, or equivalent.

#### KS-19522, LIST 11 VOICE CONTROL INSTALLATION

**3.07** The KS-19522, List 11 voice control can be installed in List 1 or List 21 recorder couplers in the field. To add the voice control to an existing installation:

- (1) Disconnect customer equipment cable and commercial power from the recorder coupler.
- (2) Remove cover from recorder coupler and disconnect all external leads from terminal board. Remove recorder coupler assembly from wall and move to a suitable work area.

**Note:** Connections should be suitably noted as terminations may not be in standard sequence.

- (3) Remove recorder coupler wiring board assembly from baseplate by removing eight mounting screws (accessible from back of baseplate). Remove standoff (located on back of board between terminal 3 and edge of board). Retain screws and washers for reassembly.
- (4) Mount voice control on baseplate using screws, lockwashers, and standoff supplied as loose parts with unit (Fig. 9).
- (5) Reassemble recorder coupler wiring board assembly to baseplate using screws and washers retained in step (3).
- (6) Connect voice control leads in accordance with Table B. Dress leads to avoid interference with circuit components and cover.
- (7) Affix adhesive circuit label, supplied as loose part with voice control, inside cover on upper side panel. Change nameplate designation from

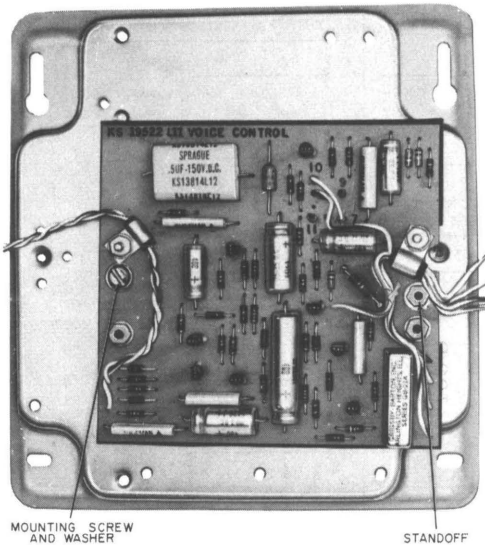


Fig. 9—KS-19522, List 11 Voice Control, Mounted on Baseplate

TABLE B  
CONNECTIONS FOR KS-19522, LIST 11  
VOICE CONTROL

VOICE CONTROL LEAD	CONNECT TO TERMINAL
W-Y	4
W-G	5*
W-BL	6*†
W-S	8
W-O	10†
W-BK	12
W-R	14
W-BR	15

\* Remove existing strap between terminals 5 and 6.

† Add strap between terminals 6 and 10.

KS-19522, List 1 to KS-19522, List 2 or KS-19522, List 21 to KS-19522, List 22 in accordance with locally established procedure.

(8) Reinstall voice recorder and connect leads disconnected in step (2).

#### KS-19522, LIST 21 AND LIST 22 RECORDER COUPLER

**3.08** The installation of the KS-19522, List 21 and List 22 is identical to that of List 1 and List 2 except that List 21 and List 22 are provided with three extra screw terminals designated S, C, and L located on the upper left quadrant of the recorder coupler circuit board (Fig. 3).

**3.09** The three screw terminals, S, C, and L, are provided to overcome false disconnects caused by the momentary loss of battery during reswitching or transferring of calls in certain types of associated equipments.

**3.10** The recorder coupler provides an 8-millisecond (MS) time delay as a standard feature. If the recorder coupler is connected to a No. 5 crossbar centrex, 800-type PBX, or manual switchboard, refer to 3.11. If the recorder coupler is connected to a No. 1 Electronic Switching System (ESS), refer to 3.12.

**3.11** A strap shall be placed between terminals S, C, and L (E option) when the recorder coupler is connected to a line served by a No. 5 crossbar centrex, 800-type PBX or a manual switchboard. This option will provide a delay of approximately 100 MS to prevent false disconnects caused by the momentary loss of battery during reswitching or transferring of calls.

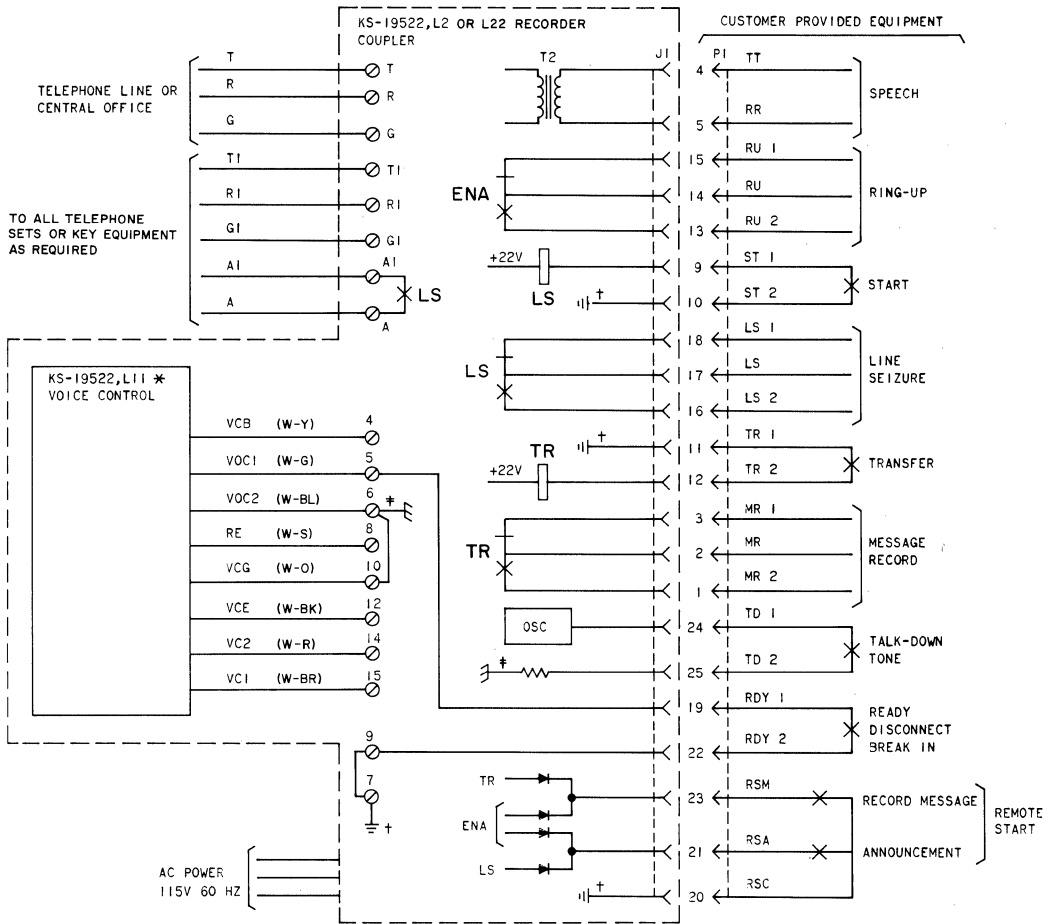
**3.12** When a recorder coupler is connected to a CO line served by a No. 1 ESS, a strap shall be placed between screw terminals C and L (D option). Option D will provide a disconnect time delay of approximately 450 MS, to prevent premature disconnects caused by the momentary loss of battery during reswitching or transferring of calls.

#### TESTS AT TIME OF INSTALLATION

**3.13** Perform the operational tests of Part 5.

#### 4. OPERATION (Fig. 10)

**4.01** Refer to CD- and SD-99356-01 for detailed circuit description and operation.



\* KS-19522, L1 OR L21 RECORDER COUPLER IS WITHOUT L11 VOICE CONTROL.  
 † DENOTES CONTROL GROUND  
 \* DENOTES CHASSIS GROUND

**Fig. 10—Simplified Schematic-Voice Connecting Arrangements RDL-RDM**

**4.02** The recorder coupler signals the progress of the automatic cycle to the CPE by dry contact closures. The CPE provides signals by means of dry contact closures to control the automatic cycle of the recorder.

**4.03** The telephone set associated with the recorder coupler may be operated in the conventional

manner when the recorder coupler is not answering a call. During the automatic cycle, the telephone set may be used to monitor the call in progress; however, the transmitter is disabled by removal of talk battery preventing its use for a 2-way telephone conversation. The G6-type amplifier handset, required by a handicapped person for conventional calling, requires line current to operate

and will become inoperative when used to monitor a call during the automatic cycle of a KS-19522 recorder coupler (during which it is capacitively coupled to the line).

**4.04** The recorder coupler under control of the customer equipment will automatically function as follows:

- (1) Ready signal (closure between RDY1 and RDY2) is present from customer unit.
- (2) Ringing current on telephone line provides ring-up signal (lead RU opened from lead RU1 and closed to RU2) to CP unit.
- (3) Customer unit provides start signal (closure between leads ST1 and ST2) when ready to start automatic cycle.
- (4) Coupler seizes line and trips ringing; line seizure signal (lead LS opened from LS1 and closed to LS2) is provided to customer unit.
- (5) Announcement on speech leads (TT and RR) is transmitted from customer unit to telephone line.
- (6) At end of announcement, transfer signal (closure between leads TR1 and TR2) from customer unit causes the following:
  - (a) Direction of transmission through the recorder coupler is reversed so that speech on the telephone line appears on speech leads (TT and RR).
  - (b) A 1/2-second beep tone is transmitted from coupler to telephone line.
  - (c) Message record signal (lead MR opened from MR1 and closed to MR2) is provided to CP unit.
- (7) Ready signal (lead RDY1 opened from lead RDY2) is removed by the customer unit at the end of message record cycle. This indicates a request to the coupler for disconnect and causes:
  - (a) A 1/2-second beep tone transmitted to the telephone line from the coupler and then disconnect.

- (b) Removal of line seizure signal (lead LS opened from lead LS2 and closed to LS1), removal of message record signal (lead MR opened from lead MR2 and closed to lead MR1).

- (c) Ready signal (closure between leads RDY1 and RDY2) reestablished by customer unit.

**4.05** The automatic cycle can be interrupted by a BREAK-IN signal (momentary open between leads RDY1 and RDY2) from the customer unit. This will allow normal transmit and receive operation of the associated telephone set.

**4.06** When an automatically answered call has been interrupted by a BREAK-IN signal, the automatic cycle can be reinstated by use of the REMOTE START switch (closure of lead RSC to lead RSA and RSM) located on the customer unit.

**4.07** Low level tone is under control of the customer unit and may be transmitted by closure of the TD1 and TD2 leads as many times as required, for any desired interval during the cycle. This may be used, for example, as talk-down tone associated with a recording control circuit located in the customer unit. This feature is not recommended when the List 11 voice control is provided as the tone signal may mask the calling party's voice, and the voice control would time out causing disconnect.

## 5. MAINTENANCE

**5.01** When trouble is reported, verify that:

- CO pair and telephone set are good.
- Power plug of recorder is secure in outlet.
- Plug-in relays are secure in sockets.
- Leads from telephone line and telephone set are secure on screw-type terminals.
- Connections for type of service are correct.
- Customer connector plug is secure in recorder coupler.

- Proper option straps have been placed between screw terminals S, C, and L.

**5.02** Test for proper operation of the recorder coupler using the KS-19522, List 12 test set (Fig. 6). The test set permits testing of the recorder coupler independent of the customer unit.

**NOTES FOR TEST:**

- (1) When the KS-19522, List 11 voice control unit is provided (List 2 or List 22 recorder coupler), the voice control feature may be disabled by strapping terminal 5 to terminal 6 as an aid in trouble clearance.
- (2) When the TR relay is operated, the installer will not be able to talk to the local test desk operator since talking battery is removed

from the associated telephone set and the recorder coupler is conditioned for one-way transmission from the telephone line to the 1013A or equivalent hand test set [except KS-19522 (2W) Voice Connecting Arrangement RDM].

- (3) If the associated telephone set uses a G6-type amplifier handset, it will be necessary to use a second 1013A (or equivalent) hand test set connected to screw terminals T1 and R1 for monitoring.

**5.03 Apparatus Required:**



- KS-19522, List 12 test set (Fig. 6)
- 1013A (or equivalent) hand test set.

**5.04 Preparation:**

STEP	ACTION	VERIFICATION
1	Disconnect connector to customer equipment.	
2	Remove cover of recorder coupler.	
3	Plug the recorder coupler power cord into 115-volt 60-Hz power outlet.	
4	Set rotary switch on the test set to the OFF position.	
5	Connect test set plug to the receptacle on the recorder coupler.	
6	Connect the spade-tipped lead from the test set plug to terminal 4 on the recorder coupler.	
7	Connect a 1013A (or equivalent) hand test set to terminals provided on the test set.	

**5.05 Operational Tests:**

STEP	ACTION	VERIFICATION
8	Rotate test set switch to position 1. Have a call placed to the recorder coupler from the local test desk. (If the recorder coupler is connected to a CO centrex station line, place test call via attendant to verify that coupler does not disconnect when attendant releases from connection.) [Associated telephone set on-hook.]	Relay RU buzzes in presence of ringing current. Relay ENA operates.

STEP	ACTION	VERIFICATION
9	Rotate test set switch to position 2.	Relay LS operates and trips ringing. Relay RU stops buzzing. After 1-1/2 seconds, relay ENA releases. Battery removed from local telephone set.
	<b><i>Two-way conversation specified in Steps 10, 11, and 12 apply to VCA RDM only. VCA RDL will accept conversation for recording purposes only in these steps.</i></b>	
10	Rotate test set switch to position 3. Talk into transmitter of the 1013A (or equivalent) hand test set and listen to receiver of local telephone handset. (Leave local telephone handset off-hook through remaining steps to maintain line connection.)	Speech is transmitted to calling party (may be heard in telephone handset receiver).
11	Ask tester to speak for approximately 30 seconds after hearing the beep tone, then cut off test desk transmitter but hold talking battery on the line.	Speech from the local test desk operator may be monitored on the local telephone handset receiver.
12	Rotate test set switch to position 4. Listen to receiver of 1013A (or equivalent) hand test set.	Relay TR operated. Beep tone is transmitted to telephone line. Beep tone and speech from calling party should be heard in 1013A (or equivalent) hand test set and telephone handset receivers.
	<b><i>Steps 13 and 14 apply to the List 11 voice control. If List 11 is not provided, proceed to Step 15.</i></b>	
13	The List 11 voice control will cause automatic disconnect approximately 12 seconds after the calling party stops talking. Listen to receiver of telephone handset.	Relay TR releases. Short beep tone from recorder coupler should be heard in telephone handset receiver. Relay LS releases. Battery connected to telephone set.
14	After voice control disconnect— Connect strap between terminals 5 and 6 to prevent time-out in following steps. Proceed to Step 16.	
15	Rotate test set switch to position 5. Listen to receiver of telephone handset.	Low level 1400-Hz tone from recorder coupler should be heard in telephone handset receiver.
16	Rotate test set switch to position 6. Listen to receiver of telephone handset.	Relay TR releases. Short beep tone from recorder coupler should be heard in telephone handset receiver. Relay LS releases. Battery connected to telephone set.

STEP	ACTION	VERIFICATION
17	Rotate test set switch to position 7.	Relays LS and ENA operate. Battery removed from telephone set.
18	Rotate test set switch to position 8.	After approximately 1-1/2 seconds relay ENA releases.
19	Rotate test set switch to position 9.	Relay LS releases. Battery connected to telephone set.
20	Rotate test set switch to position 10. Listen to receiver of telephone handset.	Relays ENA, LS, and TR operate. Short beep tone from recorder coupler should be heard in telephone handset receiver. Battery removed from telephone set.
21	Rotate test set switch to position 11.	After approximately 1-1/2 seconds relay ENA releases.



***When List 11 voice control is provided, proceed to Step 23.***

22	Talk into 1013A hand test set; ask local test desk operator to release the line from test. Observe relays in coupler.	Relays TR and LS should release within one minute after test desk disconnects. (If relays TR and LS do not release within 1 minute, see 5.06.)
23	Rotate test set switch to OFF. Remove strap between terminals 5 and 6 if voice control is provided.	

**5.06** If trouble is identified as failure to disconnect from CO, check disconnect delay options 3.11 through 3.13. A List 11 voice control may be required to correct trouble. When trouble develops that cannot be cleared by plug-in relay substitution, replace the recorder coupler.

**5.07** If the tests are satisfactory, remove all test connections to restore circuit to normal and follow local reporting procedures for CPE trouble.



***Do not attempt any test or repair to the CPE.***

**5.08** When in the repairman's judgment the trouble is located in the CPE, the Repair Service Bureau should be notified so that proper maintenance of service charge billing can be initiated as outlined in Section 600-101-312 entitled Maintenance of Service Charge on Services With Customer-Provided Equipment (CPE).



***When the recorder coupler is served by a CO line of a No. 1 ESS and the customer continues to complain of false disconnects after option D of KS-19522, List 21 or List 22 has been provided, line applique circuit SD-1A297 should be installed at the CO.***

## 6. CONNECTIONS

**6.01** Connections to the customer's equipment are made through the 25-pin KS-19087, List 2 connector. The customer must furnish a suitable connecting cable equipped with a Cinch or ITT Cannon Electric DB-19604-432 plug with a DB-51226-1 hood (or equivalent).

**6.02** Fig. 11 shows the connections for the recorder coupler for various telephone set applications. Fig. 10 shows connections for customer's equipment.

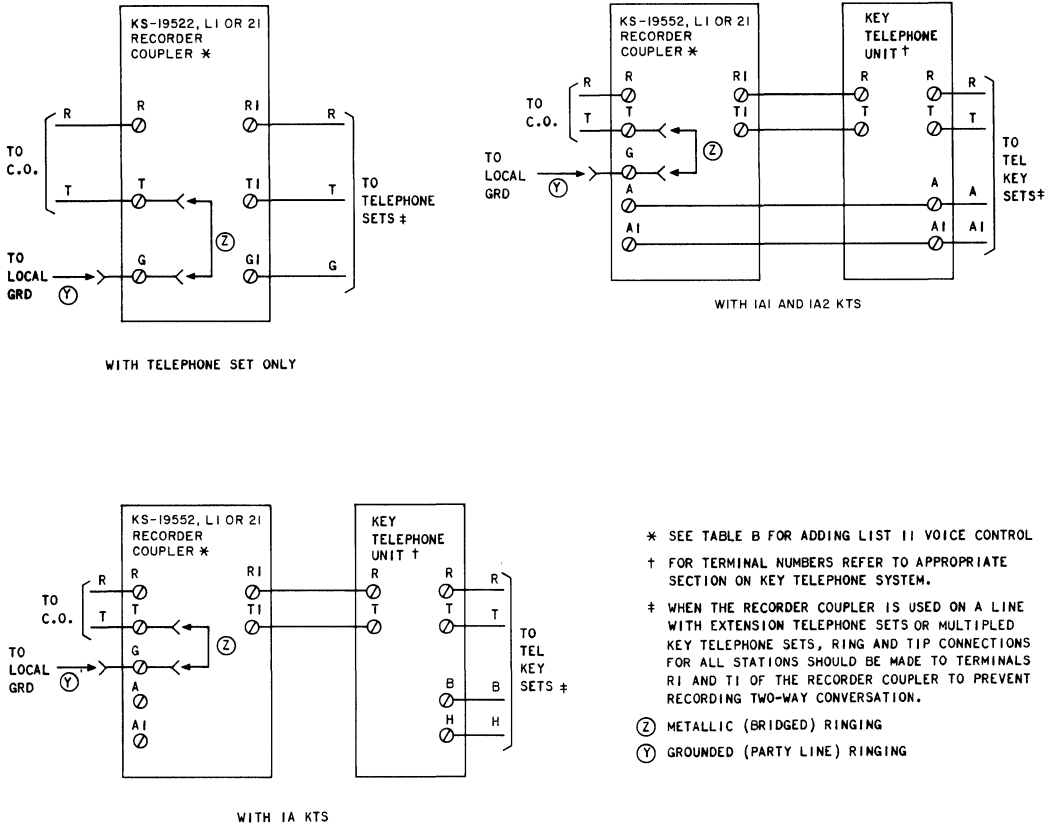


Fig. 11—KS-19522 Recorder Coupler Connections



*When the recorder coupler is used on a line with extension telephone sets or multiplied key telephone sets, ring and tip connections for all stations should be made to terminals R1 and T1 of the recorder coupler to prevent*

*recording of 2-way conversations. When the recorder coupler is used on a busy out line where sleeve control is required, this contact may be provided using A and AI leads when not connected to a key system line.*



**VOICE CONNECTING ARRANGEMENT RDL AND RDM**  
**KS-19522, LIST 1 OR LIST 2 RECORDER COUPLER USED WITH**  
**KS-16765, LIST 1 ANNOUNCEMENT SET**

**1. GENERAL**

**1.001** This addendum supplements Section 463-340-111, Issue 2.

**1.002** This addendum is issued for the following reasons:

(a) To change Fig. 10 to correct a condition shunting the VOC contacts to ground when the KS-19522, List 2 is used.

(b) Add information on disabling lamp power supply in KS-16765, List 1 announcement set.

**2. CHANGES TO SECTION**

**2.001** On Fig. 10 (Sheet 2), remove the connection shown between terminal 10 of Block 3 and

terminal 1 of TB1 on the KS-16765, List 1 announcement set. Add a connection between terminal 1 of TB1 on the KS-16765, List 1 announcement set and terminal 6 of the KS-19522, List 2 recorder coupler.

**2.002** Add the following as Note 5 to Fig. 10 (Sheet 3):

Remove, insulate and store green leads from terminals 3 and 4 of TB2 (option X) on KS-16765, List 1. Add strap between terminals 3 and 6 of TB2 (option Y).

On Fig. 10 (Sheet 2) add terminals 3 and 6 on TB2 of KS-16765, List 1 announcement set and a strap between them with the notation—See Note 5.

## VOICE CONNECTING ARRANGEMENTS RDL AND RDM

### KS-19522, LIST 1 OR LIST 2 RECORDER COUPLER USED WITH KS-16765, LIST 1 ANNOUNCEMENT SET

#### 1. GENERAL

**1.01** This section provides identification, installation, operation, maintenance and connection information for the KS-19522, List 1 or List 2 recorder coupler when used in Voice Connecting Arrangements (VCA) RDL or RDM and in association with the KS-16765, List 1 announcement set and a customer-provided (CP) message recorder.

**1.02** This section is reissued to:

- Add test information on the use of a 1013A (or equivalent) hand test set when the associated telephone set requires a G6-type amplifier handset
- Add Fig. 11—Recorder Coupler Connections to CP equipment
- Revise test section format in Part 5.

**1.03** Voice Connecting Arrangement RDL provides for one-way voice transmission in each direction (but not simultaneously) between CP recorder equipment and a telephone line on incoming calls. Transmitters of any telephone set associated with the line are disabled during incoming calls to prevent recording of 2-way conversations. This arrangement is provided by KS-19522, List 1 or List 2 recorder coupler. The KS-19522, List 2 consists of a KS-19522, List 1 with a KS-19522, List 11 voice control added.

**1.04** Voice Connecting Arrangement RDM provides for 2-way voice transmission between the CP equipment and telephone line, permitting distant party control of CP equipment during incoming calls. Recording of 2-way conversations is prevented as before. This arrangement requires a modified KS-19522, List 2 recorder coupler stamped "2W".

**1.05** When used with RDL or RDM the KS-16765, List 1 announcement set:

- Answers incoming calls automatically
- Transmits prerecorded announcements to telephone line
- Signals the KS-19522 recorder coupler at the end of the announcement period.

**1.06** With either arrangement (RDL or RDM), an associated key telephone set may make a normal outgoing call when the coupler is not in use.

**1.07** The KS-19522, List 12 test set is used for testing the recorder coupler.

**1.08** *Lettered Steps:* A letter a, b, c, etc, added to a step number in Part 5 of this section indicates an action which may or may not be required depending on local conditions. The condition under which a lettered step or a series of lettered steps should be made is given in the ACTION column, and all steps governed by the same condition are designated by the same letter within a test. Where a condition does not apply, all steps designated by that letter should be omitted.

**1.09** Refer to Section 463-340-110 for detailed information on the circuit description and operation of the KS-19522 recorder coupler.

**1.10** Refer to Sections 514-210-100 and 514-210-200 for detailed information on the circuit description and operation of the KS-16765 announcement set.

**1.11** If the customer wants a copy of the Technical Reference which covers this interface specification, the customer should contact the local Telephone Company Business Office or the Marketing Representative.

1.12 This issue of the section is based on the following drawings:

SD-99356-01, Issue 10D—KS-19522 Recorder Coupler

SD-95286-01, Issue 7B—KS-16765, L1 Announcement Set

If this section is to be used with equipment or apparatus reflecting later issue(s) of the drawing(s), reference should be made to the SDs and CDs to determine the extent of the changes and the manner in which the section may be affected.

## 2. IDENTIFICATION

### PURPOSE

- To provide the means of coupling CP equipment to the telecommunications network
- To limit excessive levels from CP equipment and to provide protection for personnel against hazardous voltages.

### APPLICATION

- For use with a key telephone set to connect a CP recorder to the telecommunications network for transmitting prerecorded messages to the telephone line and recording messages from the line. Not to be used for the recording of 2-way conversations.

### ORDERING GUIDE

- Coupler, Recorder, KS-19522, L1 (one-way transmission, Fig. 1 and 2)
- Coupler, Recorder, KS-19522, L2 (one-way transmission, automatic disconnect, Fig. 3)
- Coupler, Recorder, KS-19522, L1 (2W modified for 2-way transmission per BSRS 455.204)
- Coupler, Recorder, KS-19522, L2 (2W modified for 2-way transmission, per BSRS 455.204 with automatic disconnect)
- Control, Voice, KS-19522, L11, Fig. 4 (provides automatic disconnect—see 2.03) required for No. 1 Crossbar

- Set, Test, KS-19522, L12 (required for testing recorder-couplers, Fig. 5)
- Set, Announcement, KS-16765, L1 (Fig. 6, 7, and 8).

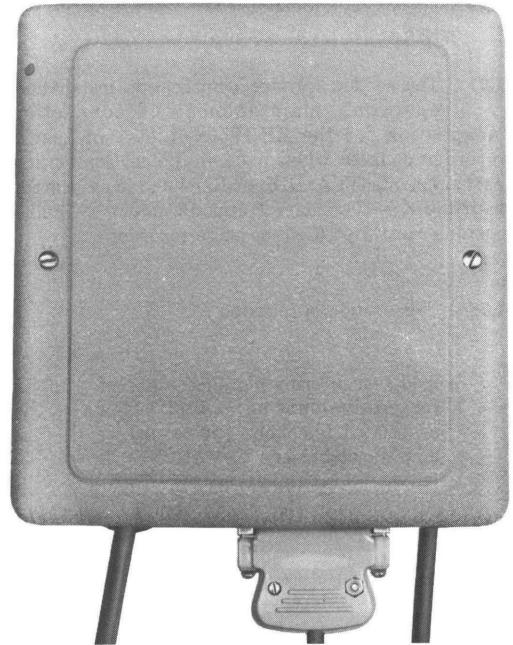


Fig. 1—KS-19522 Recorder Coupler

### Associated Equipment (Order Separately)

- Set, Telephone, 565GK or
- Set, Telephone, 2565GK
- Capacitor, 596G- 1.0 MFD (one required, 2565GK only)
- \*Capacitor, 542C- .25 MFD (one required)
- \*Resistor, KS-14603, L3C-450 ohms (one required)
- \*Diodes, 420G (nine required)

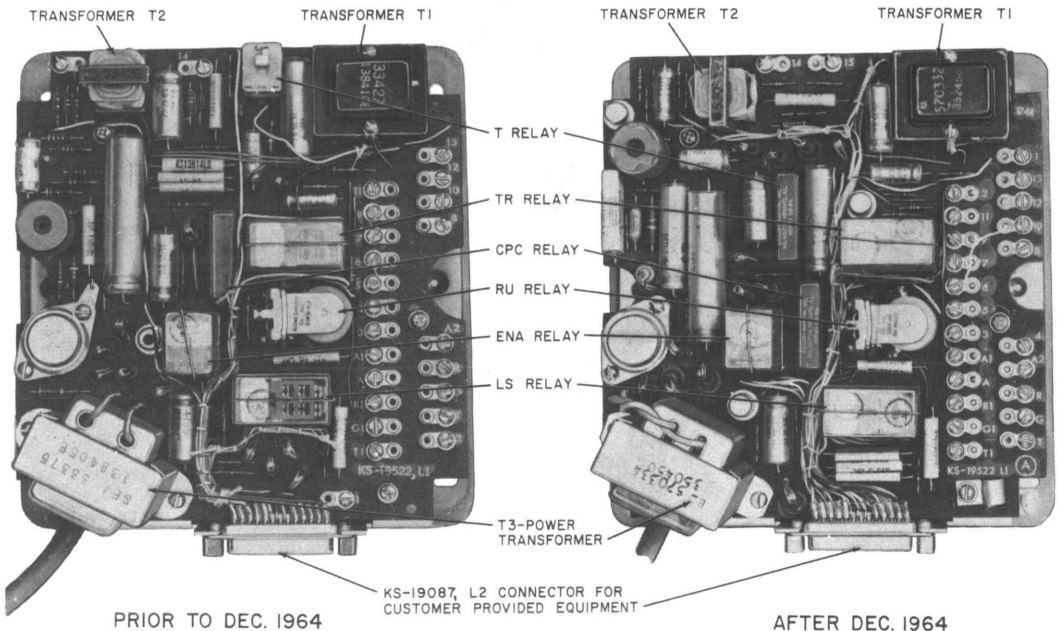


Fig. 2—KS-19522, List 1 Recorder Coupler (Cover Removed)

- \*Unit, Telephone, Key 17B (one required)
- \*Block, Connecting, 44A (four required).

\* These components are required for interunit connections (Fig. 9 and 10).

## DESIGN FEATURES

**2.01** The KS-19522, List 1 or List 2 recorder coupler:

- Couples incoming messages from telephone line to CP recording equipment (upon receipt of transfer signal from the KS-16765, List 1 announcement set)
- Transmits a single short beep tone to telephone line at start and end of recording period

- Transmits low-level tone to telephone line as required by customer unit (not recommended when List 11 voice control is used)

- Disconnects from telephone line on signal from customer unit (opening of ready leads), battery reversal or momentary open from CO, or, at the end of a predetermined timing interval in the absence of speech when the KS-19522, List 11 voice control (Fig. 4) is provided.

**2.02** The KS-19522, List 11 voice control provides automatic disconnect from the telephone line in the absence of speech after a 12-second interval. CO receiver off-hook tone generator will prevent operation of the voice control.

**2.03** The KS-19522, List 11 voice control is required when the local CO does not provide a suitable disconnect signal (momentary interruption in line current) when the calling party goes on-hook.

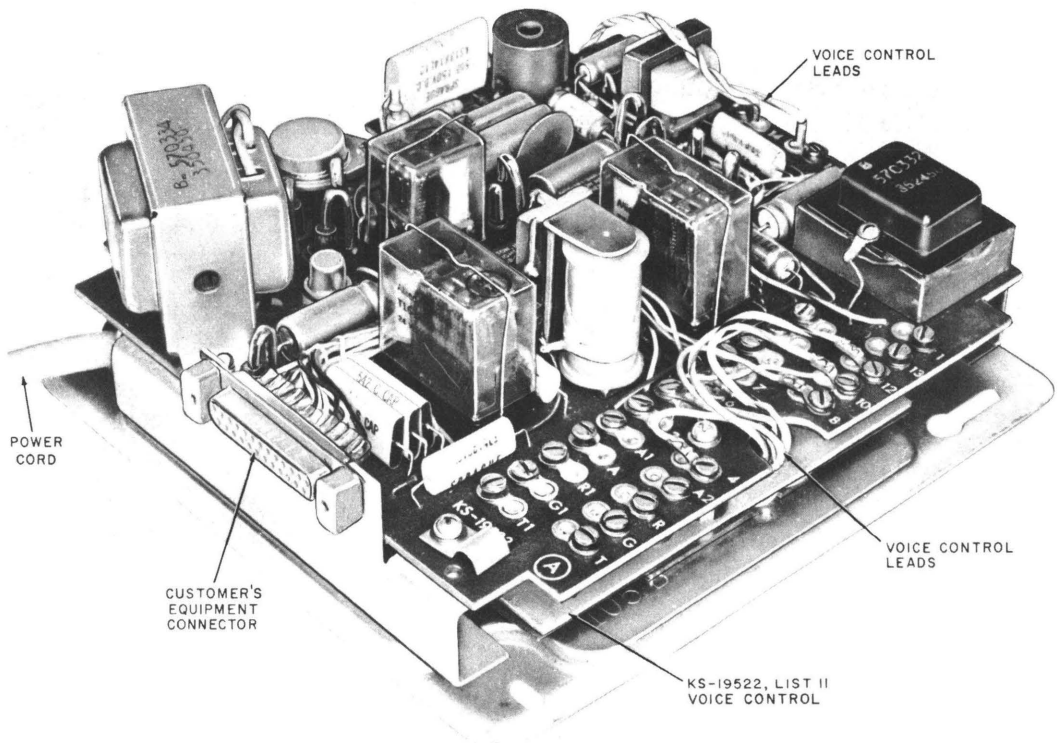


Fig. 3—KS-19522, List 2 Recorder Coupler (Cover Removed)

The List 11 voice control is factory-installed in the List 2 recorder coupler or may be ordered separately for field installation in the List 1 recorder couplers. See Fig. 10 for connections. †

**2.04** The KS-16765, List 1 announcement set features:

- Recording and reproducing of announcements on a magnetic recording band
- Announcement recording capacity of 2 minutes with provision for increasing to 3 minutes
- Adjustment for limiting announcement recording interval to less than maximum capacity
- Variable cycle that automatically adjusts reproduce cycle to length of recorded announcement.

### 3. INSTALLATION

**3.01** Install and test the recorder coupler as described in Section 463-340-110.

**Warning:** *Disconnect recorder coupler power cord before proceeding with interconnections to announcement set.*

**3.02** Install the KS-16765, List 1 announcement set as described in Section 514-210-200.

**3.03** Install telephone set, cable, drop, block, and inside wiring in the standard manner as outlined in the appropriate sections.

**3.04** Fig. 10 shows the interconnecting circuits for the KS-19522, List 1 or List 2 recorder coupler; KS-16765, List 1 announcement set; 17B KTU; and 565GK or 2565GK key telephone sets.

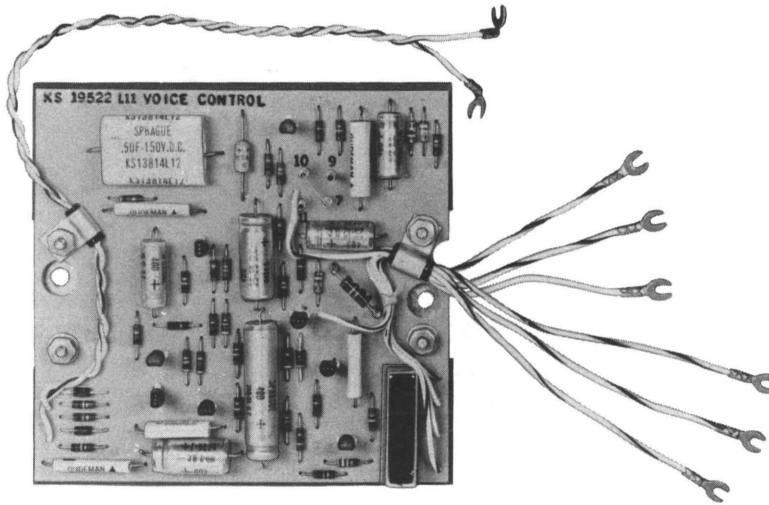


Fig. 4—KS-19522, List 11 Voice Control, Unmounted

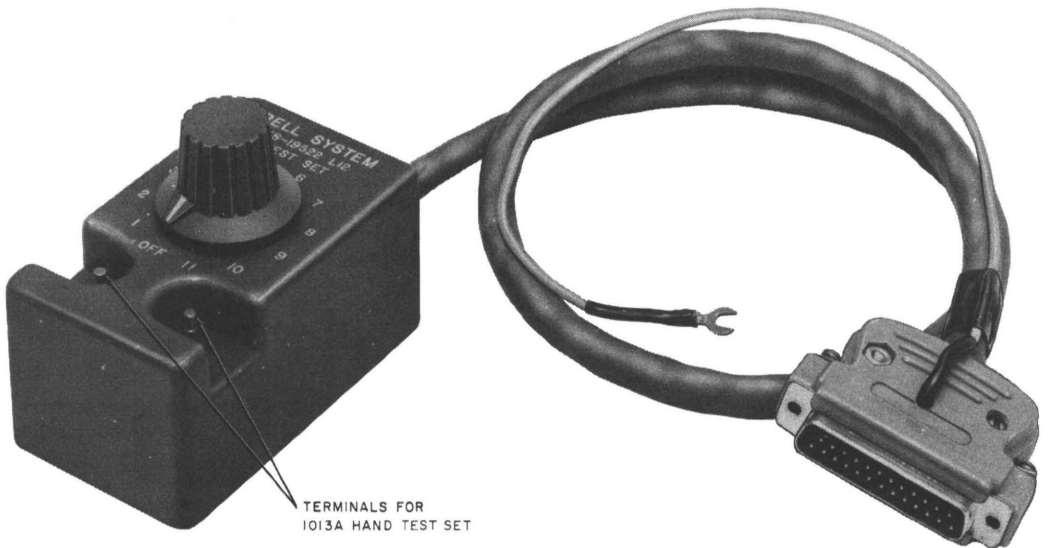


Fig. 5—KS-19522, List 12 Test Set

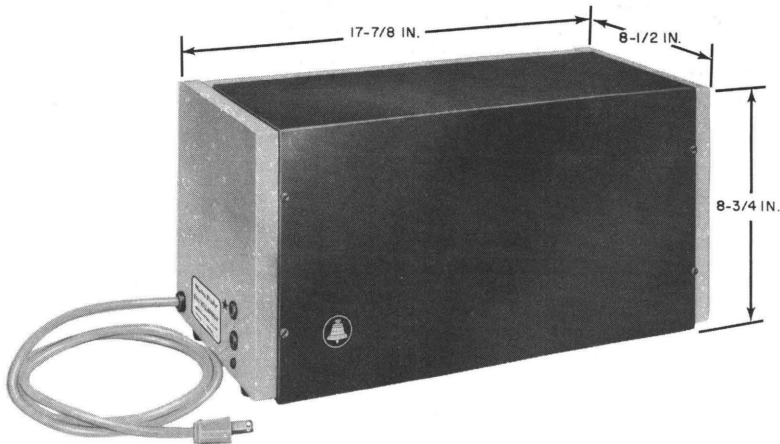


Fig. 6—KS-16765, List 1 Announcement Set

The key telephone set provides for functional control of the announcement set and recorder coupler.

**3.05** Interconnection of the recorder coupler and announcement set requires the use of nine diodes, a capacitor, a resistor, and a 17B key telephone unit (KTU). Fig. 9 shows eight diodes, the capacitor, and resistor mounted on the 44A connecting blocks associated with the key telephone set. One diode is installed between terminals 1 and 3 of the 17B KTU. Polarity of the diodes must be observed.

**3.06** Connect diodes, capacitor, and resistor as shown in Fig. 9 and extend connections to key telephone set through an A25B, single-ended connector cable (Fig. 10).

**3.07** Table A and Fig. 10 with associated notes explain the necessary modifications to, and interconnection of, apparatus.

**3.08** Table B and Fig. 10 provide ringer connection information.

**3.09** Prepare key designation strip in accordance with strip shown in Fig. 10.

TABLE A

MODIFICATION TO 565GK OR 2565GK TELEPHONE SET\*

565GK, 2565GK† INTERNAL LEAD	TERMINAL STRIP	
	REMOVE FROM	CONNECT TO
BR-BK	M	5H
STRAP (M1W cord or equivalent)	—	2R to 3R
	—	4R to 5R
	—	4T to 5T
	—	LG2 to LG3
	—	LG3 to LG4
	—	LG4 to LG5

\*Convert No. 6 pick-up key to nonlocking.

†Add a 596G, 1.0 mf capacitor between network terminals L2 and RR on the 2565GK telephone set.

#### 4. OPERATION (Fig. 11)

**4.01** The key telephone set associated with this equipment may be operated in the conventional manner when an incoming call is not being answered and LINE key is depressed. During the automatic cycle, the telephone set may be used to monitor the call in progress; however, the transmitter is disabled by removal of talking battery preventing its use for 2-way telephone conversation. ▶The

**TABLE B**  
**RINGER CONNECTION OPTIONS WITH**  
**KS-16765, LIST 1 ANNOUNCEMENT SET**

STATION RINGER COMBINATIONS	OPTION
Normal ringer connection	A
Ringer silenced during DICTATE*	B
Tip Party (no identification)	M
Ring Party	N
Bridged	V

\*With B option the telephone line (ringer) will be open as long as the DICTATE key is operated.

G6-type amplifier handset, required by a handicapped person for conventional calling, requires line current to operate and will become inoperative when used to monitor a call during the automatic cycle of a KS-19522 recorder coupler (because it is then inductively coupled to the line).♦

**4.02** The automatic cycle can be interrupted by a BREAK-IN signal from the customer unit (a momentary opening of the ready signal leads RDY 1 and RDY 2, if provided), or by operating the LINE key on the associated key telephone set. This will allow normal transmit and receive operation of the associated key telephone set.

**4.03** Low-level tone is under control of the customer unit and may be transmitted by closing the TD1 and TD2 leads, as many times as required, for any desired interval during the cycle. This may be used, for example, as talk-down tone associated with a recording control circuit located in the customer unit. This feature is not recommended when the List 11 voice control is provided, as the tone signal may mask the calling party's voice and the voice control would cause disconnect after 12-seconds.

**4.04** To record announcement: (CP recorder may be disconnected if desired)

- (1) Remove handset and operate locking DICTATE READY key.

- (2) Press down nonlocking DICTATE key and wait for DICTATE READY lamp to light. DICTATE READY lamp indicates that any previously recorded announcement has been erased and the recorder is ready to record new announcement.

- (3) Continue to hold DICTATE key operated and dictate announcement in normal voice to the transmitter of the telephone set.

- (4) Release DICTATE key immediately after dictating announcement. When necessary, station ringer can be disabled throughout dictate procedure to prevent sound of bell being recorded by using wiring option **B**, Fig. 10.



*When wiring option B is used, telephone line will be open as long as DICTATE key is operated.*

**4.05** To check recorded announcement: (CP recorder may be disconnected if desired)

- (1) With handset off-hook, operate locking CHECK key. Recorded announcement will be heard over receiver of telephone set but will be isolated from telephone line.

- (2) After checking announcement, release CHECK key by operating either locking LINE key or locking AUTO ANSWER key depending upon which condition of the system is desired.

**4.06** To place answering and recording system in automatic answer and record condition, operate locking ANS-REC key. System will operate as follows: (Ready signal, closure of leads RDY 1 and RDY 2 must be present from CP recorder.)

- (1) ANS-REC lamp will light.

- (2) Incoming 20-Hz ringing will be tripped by ringing bridge in announcement set.

- (3) ANS-REC lamp will go off.

- (4) Prerecorded announcement will then be automatically transmitted to telephone line.

- (5) After announcement has been transmitted once, the announcement set sends a transfer



signal to the recorder coupler (grounds lead RSM to operate transfer relay TR).

- (6) The recorder coupler transmits a short beep tone to the telephone line and conditions its amplifier to couple incoming speech from the telephone line to the CP message recorder.
- (7) Incoming message is recorded by CP equipment.
- (8) Low-level tone is transmitted by recorder coupler to telephone line as required by customer unit (when List 11 voice control is not provided).
- (9) The recorder coupler transmits a short beep tone to the telephone line and disconnects on signal from the customer unit (opening of ready leads), CO battery reversal or momentary open, or, after approximately 12 seconds in the absence of speech, when the List 11 voice control is provided.
- (10) ANS-REC lamp will light.

**4.07** To place answering system in automatic answer only condition, operate locking ANS-ONLY key. System will operate as follows:

- (1) ANS-ONLY lamp will light.
- (2) Incoming 20-Hz ringing will be tripped by ringing bridge in announcement set.
- (3) ANS-ONLY lamp will go off.
- (4) Prerecorded announcement will then be automatically transmitted.
- (5) After announcement has been transmitted once, announcement set automatically disconnects from telephone line and prepares to accept another call.
- (6) ANS-ONLY lamp will light.

**4.08** To use the telephone set as a regular station, operate locking LINE key. This disassociates telephone set from announcement set.

**4.09** Fig. 11 shows the connections to the CP equipment. These leads are designated and function as follows:

- (a) Speech pair (leads TT and RR) provides unilateral transmission from the telephone line to the CP recorder during the message record interval. Not used in this application for the announcement interval.
- (b) Ready (leads RDY 1 and RDY 2)—isolated circuit closure is provided by CP equipment at all times except when the CP recorder is not ready to accept a call or when signaling the recorder coupler for disconnect.
- (c) Ring-up (leads RU, RU1, and RU2)—isolated contact closures provided by the recorder coupler to the CP recorder to indicate that a call is being received.
- (d) Start (leads ST1 and ST2)—isolated contact closure provided by the CP recorder to the recorder coupler to cause line seizure.
- (e) Line seizure (leads LS, LS1 and LS2)—isolated contact closures provided by the recorder coupler to indicate line seizure to the CP recorder.
- (f) Transfer (leads TR1 and TR2)—isolated contact closure provided by the CP recorder to the recorder coupler at the end of the announcement cycle to cause the recorder coupler to change from announcement to record. Not used in this application.
- (g) Message record (leads MR, MR1 and MR2)—isolated contact closures provided by the recorder coupler to the CP recorder at the time of transfer from announcement to message record.
- (h) Remote start (leads RSA, RSM and RSC)—isolated contact closures provided by the CP recorder to the recorder coupler to start an announcement or message record cycle. Used only for the message record cycle in this application.
- (i) Talk down tone (leads TD1 and TD2)—isolated contact closure provided by the CP recorder to the recorder coupler to cause the recorder coupler to transmit a low level 1400-Hz tone to the telephone line. This feature is not

recommended when the List 11 voice control is used.

**5. MAINTENANCE**

**5.01** When trouble is reported verify that:

- CO pair is good.
- All wiring is correct and secure and proper wiring options installed.
- Power is supplied to station coupler and announcement set.
- Customer connection plug is secure.

**5.02** Using the KS-19522, List 12 test set (Fig. 5), test for proper operation of the recorder coupler and announcement set (Test A). If the KS-19522, List 12 test set is not available, proceed to (Test B) tests without test set.

*Notes:* Tests A and B

(1) When LS relay is operated, the installer will not be able to talk to the local test desk operator since talking battery is removed from

the associated telephone set (except KS-19522 [2W] Voice Connecting Arrangement RDM), and the recorder coupler is conditioned for one-way transmission from the telephone line to the 1013A (or equivalent) hand test set.

(2) When the KS-19522, List 11 voice control unit is provided (List 2 recorder coupler), the voice control feature may be disabled by strapping terminal 5 to terminal 6 as an aid in trouble clearance.

(3) If the associated telephone set uses a G6-type amplifier handset, it will be necessary to use a 1013A (or equivalent) hand test set connected across T and R of the telephone line for monitoring.

**5.03 Apparatus Required:**

**Test A**

- KS-19522, List 12 test set (Fig. 5)
- 1013A (or equivalent) hand test set.

**5.04 Preparation:**

**Tests A and B**

STEP	ACTION	VERIFICATION
1	Disconnect connector to customer equipment.	
2	Remove cover of recorder coupler.	
3	Plug the recorder coupler and announcement set power cords into 115-volt, 60-Hz power outlet.	


**Test A**

4	Set rotary switch on the test set to the OFF position.	
5	Connect test set plug to the connector on the recorder coupler.	
6	Connect a 1013A (or equivalent) hand test set to the terminals provided on the List 12 test set.	

5.05 *Test A:* (using List 12 test set)

STEP	ACTION	VERIFICATION
7	Record desired announcement as described in 4.04.	Check recorded announcement as described in 4.05.
8	Depress LINE key on associated key telephone set and call local test desk. Ask test desk operator to call back and speak for approximately 30 seconds after hearing the beep tone (following the recorded announcement), then cut off test desk transmitter but hold talking battery on the line. Restore handset on-hook.	
9	Depress ANS-REC key on telephone set. Rotate test set switch to position 1.	ANS-REC key lamp lights.
10	Ringing current on telephone line.	Announcement set relays RU and ST operate, motor starts, relays A, B, and CPC operate. ANS-REC lamp goes off. Recorder coupler relays ENA and LS operate. Battery removed from associated key telephone set.
11	Monitor outgoing announcement on key telephone handset.	Announcement transmitted to telephone line and heard in key telephone handset.
12	Announcement is concluded.	Announcement set relay STP operates— Set mechanism stops. Recorder coupler relay TR operates— After approximately 1-1/2 seconds, relay ENA releases.
13	Listen to receiver of 1013A hand test set.	Short beep tone is transmitted to telephone line. Beep tone and speech from calling party should be heard in 1013A hand test set receiver.
14a	If List 11 voice control is provided— It will cause automatic disconnect approximately 12 seconds after the calling party stops talking. Listen to receiver of telephone handset.	Relay TR releases. Short beep transmitted to telephone line should be heard in telephone handset receiver. Relay LS releases. Battery connected to telephone set.
15b	If voice control is not provided— Rotate test set switch to position 5. Listen to receiver of telephone handset.	Low level tone from recorder coupler should be heard in telephone handset receiver.
16b	Rotate test set switch to position 6. Listen to receiver of telephone handset.	Relay TR releases. Short beep tone transmitted to telephone line should be heard in telephone handset receiver.

STEP	ACTION	VERIFICATION
17	Ask local test desk operator to release the line from test.	Relay LS releases. Battery connected to telephone set.
<b>5.06 Test B:</b> (without test set)		
STEP	ACTION	VERIFICATION
4	Record desired announcement as described in 4.04.	Check recorded announcement as described in 4.05.
5	Depress LINE key on associated key telephone set and call local test desk. Ask test desk operator to call back and speak for approximately 30 seconds after hearing the beep tone (following the recorded announcement), then cut off test desk transmitter but hold talking battery on the line. Restore handset on-hook.	
6	Depress ANS-REC key on telephone set.	ANS-REC key lamp lights.
7	Ringing current on telephone line.	Announcement set relays RU and ST operate, motor starts, relays A, B, and CPC operate. ANS-REC lamp goes off. Recorder coupler relays ENA and LS operate. Battery removed from associated key telephone set.
8	Monitor outgoing announcements on key telephone handset. (Leave handset off-hook through remaining steps to maintain line connection.)	Announcement transmitted to telephone line and heard in key telephone handset receiver.
9	Announcement is concluded.	Announcement set relay STP operates— Set mechanism stops. Recorder coupler relay TR operates— Short beep tone is transmitted to telephone line— After approximately 1-1/2 seconds relay ENA releases. Beep tone should be heard in telephone set handset.
10	Test desk operator should speak for approximately 30 seconds.	Incoming message should be heard in telephone set handset.
11a	If List 11 voice control is provided— It will cause automatic disconnect approximately 12 seconds after the calling party stops talking.	Relay TR releases. Short beep tone transmitted to telephone line should be heard in telephone handset receiver.

STEP	ACTION	VERIFICATION
		Relay LS releases. Battery connected to telephone set.
12a	After voice control disconnect— Connect a strap between terminals 5 and 6 of the recorder coupler to prevent time-out in following steps. Proceed to Step 15.	
13b	If the List 11 voice control is <i>not</i> provided and customer unit provides for control of the talk-down tone circuit— Momentarily connect pins 24 and 25 at J1.	A low level 1400-Hz tone should be heard in telephone handset receiver.
14b	Depress LINE key on the associated key telephone set.	Relay TR releases. Short beep tone transmitted to telephone line should be heard in telephone handset receiver. Relay LS releases. Battery connected to telephone set.
15c	If the customer equipment provides REMOTE-START MESSAGE feature— ANS-REC key must be depressed to enable REMOTE-START operation. Momentarily connect terminal 7 to terminal 2 on the recorder coupler to simulate remote start.	Relays ENA, LS, and TR operate. Short beep tone transmitted to telephone line should be heard in telephone handset receiver. Battery removed from telephone set. After approximately 1-1/2 seconds, relay ENA releases. Incoming speech from telephone line can be recorded.
16c	Depress LINE key on associated key telephone set.	Relay TR releases. Short beep tone transmitted to telephone line should be heard in telephone handset receiver. Relay LS releases. Battery connected to telephone set.
17	End of tests. Ask local test desk operator to release the line from test.	
5.07	When trouble develops that cannot be cleared with plug-in relay substitution, replace the recorder coupler. If trouble is identified as failure to disconnect from CO, List 11 voice control may be required to correct trouble.	 <p><i>Do not attempt any test or repair to the customer-provided equipment.</i></p>
5.08	If the tests are satisfactory, remove all test connections to restore circuit to normal and follow local reporting procedures for CP trouble.	
		5.09 Maintenance of the KS-19522 recorder coupler is covered in Section 463-340-110. Maintenance of the KS-16765, List 1 announcement set is covered in Section 514-210-100.

**5.10** When in the repairman's judgment the trouble is located in the CP equipment, the Repair Service Bureau should be notified so that proper Maintenance of Service Charge billing can be initiated as outlined in Section 660-101-312 entitled Maintenance of Service Charge on Services With Customer-Provided Equipment (CPE).

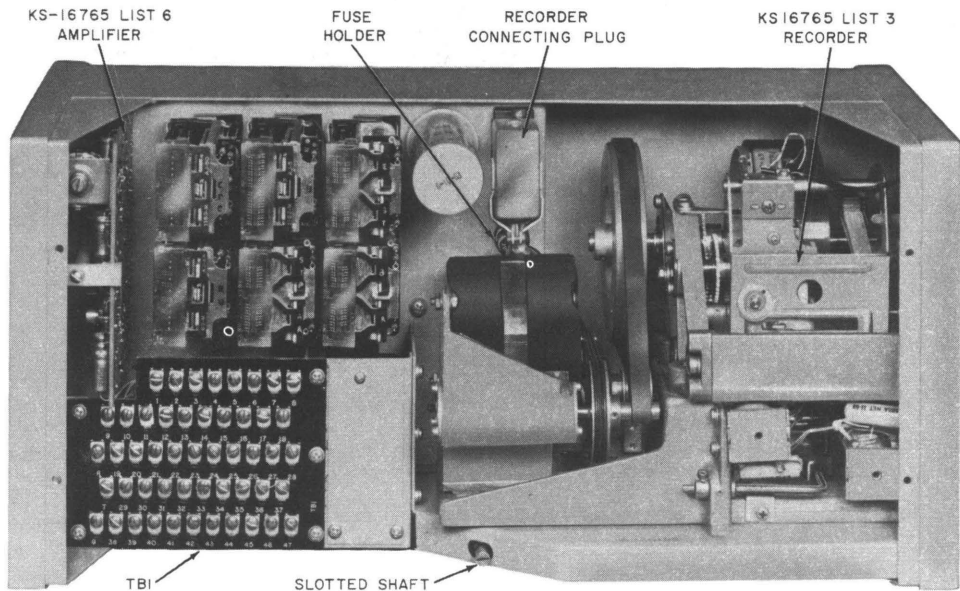
## 6. CONNECTIONS

**6.01** For connection information using the KS-19522 recorder coupler, refer to Fig. 3 and 10.

**6.02** For connection information using the KS-16765, List 1 announcement set, refer to Fig. 7, 8, 9, and 10.

**6.03** For connection information for the key telephone set, refer to Fig. 9 and 10 and Tables A and B.

**6.04** Connections to the customer equipment shown in Fig. 11 are made through the 25-pin KS-19087, List 2 connector. The customer must furnish a suitable connecting cable equipped with a Cinch DB-19604-432 (231-25-61-125) Plug with a DB-51226-1 (239-13-99-070) Hood, or equivalent.



**Fig. 7—KS-16765, List 1 Announcement Set (Front Cover Removed)**

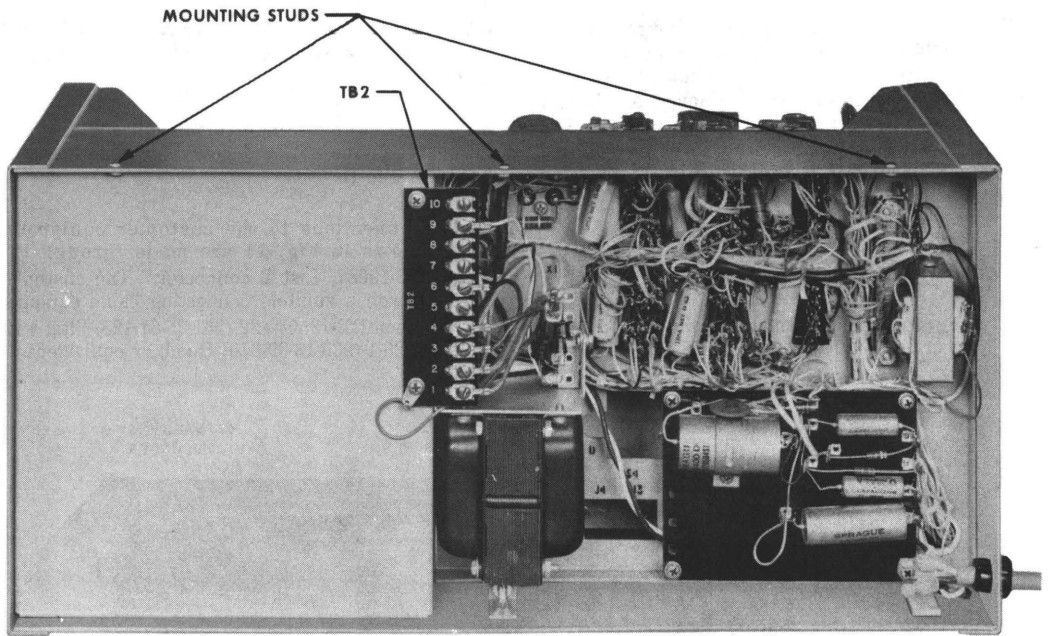


Fig. 8—KS-16765, List 1 Announcement Set (Rear Cover Removed)

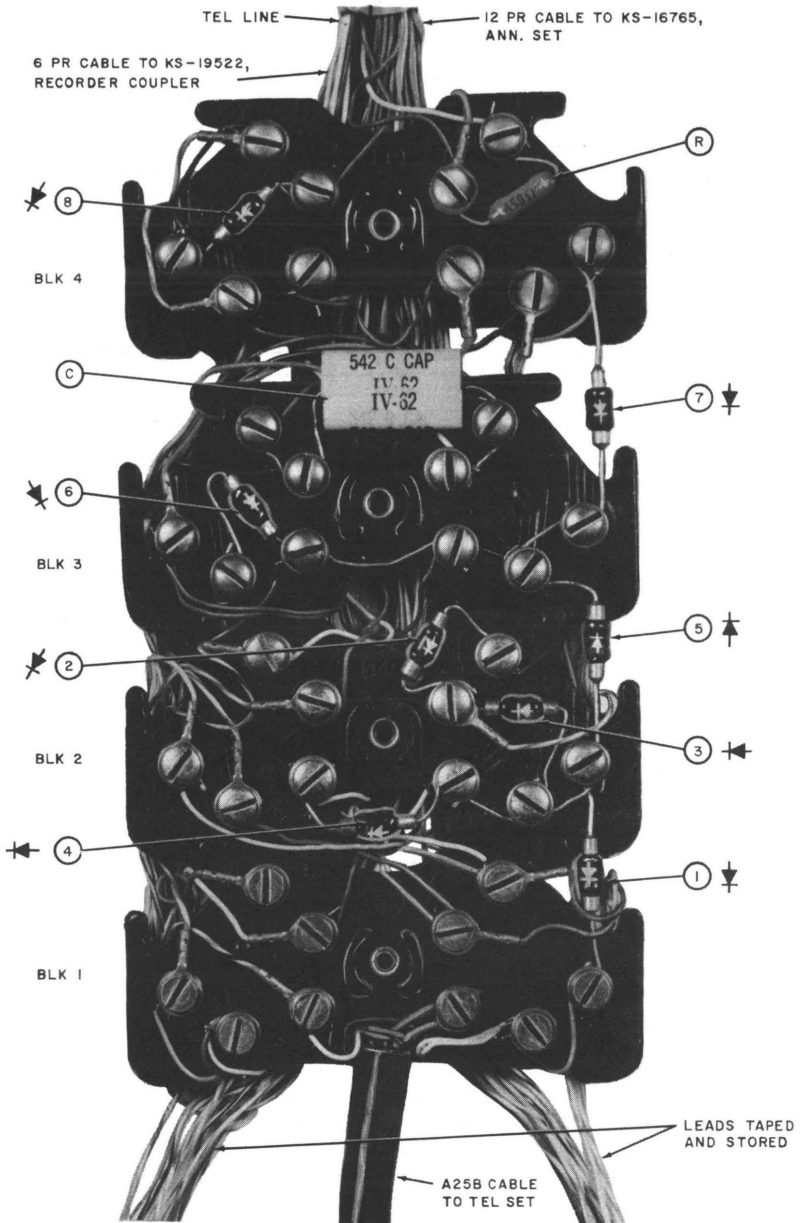


Fig. 9—44A Connecting Blocks With Components Mounted



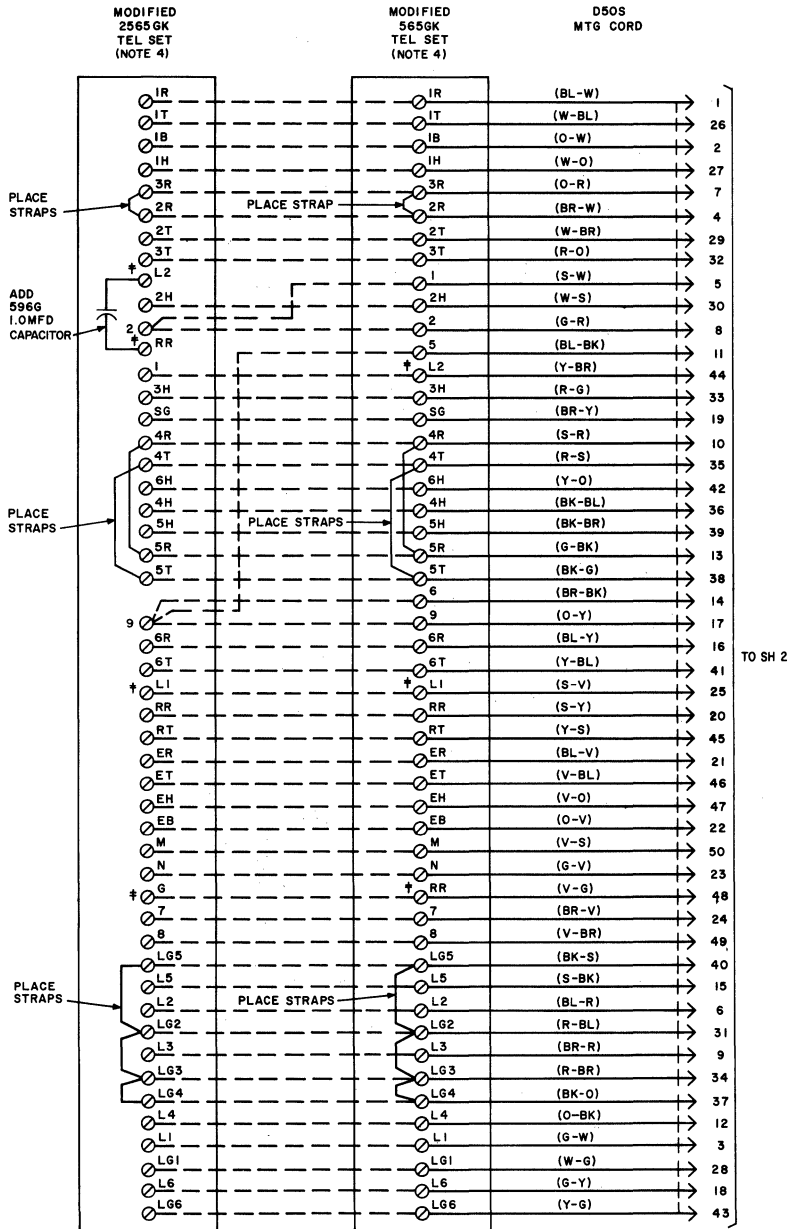


Fig. 10—Connections Using KS-16765, List 1 Announcement Set, KS-19522 Recorder Coupler and 565GK or 2565GK Telephone Set With Customer-Provided Message Recorder (Sheet 1)



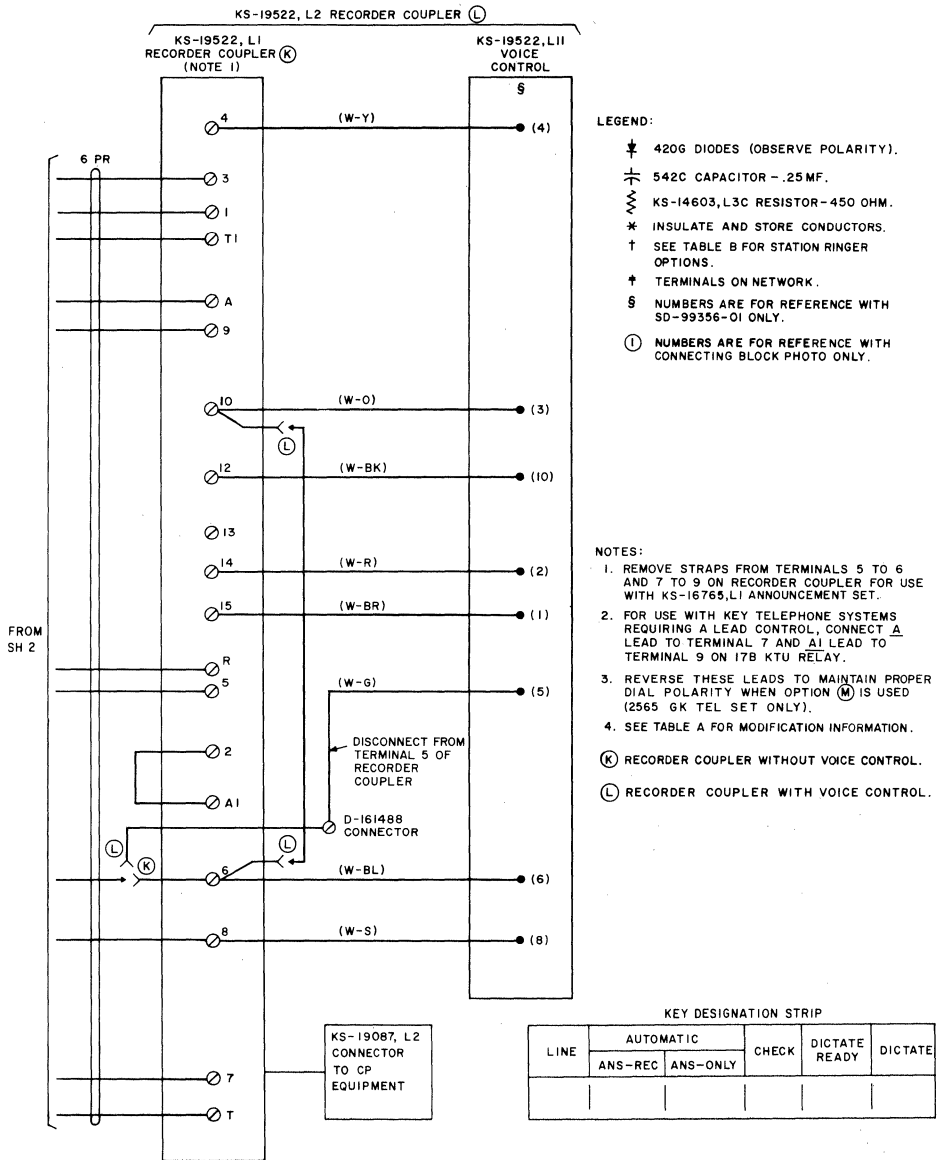
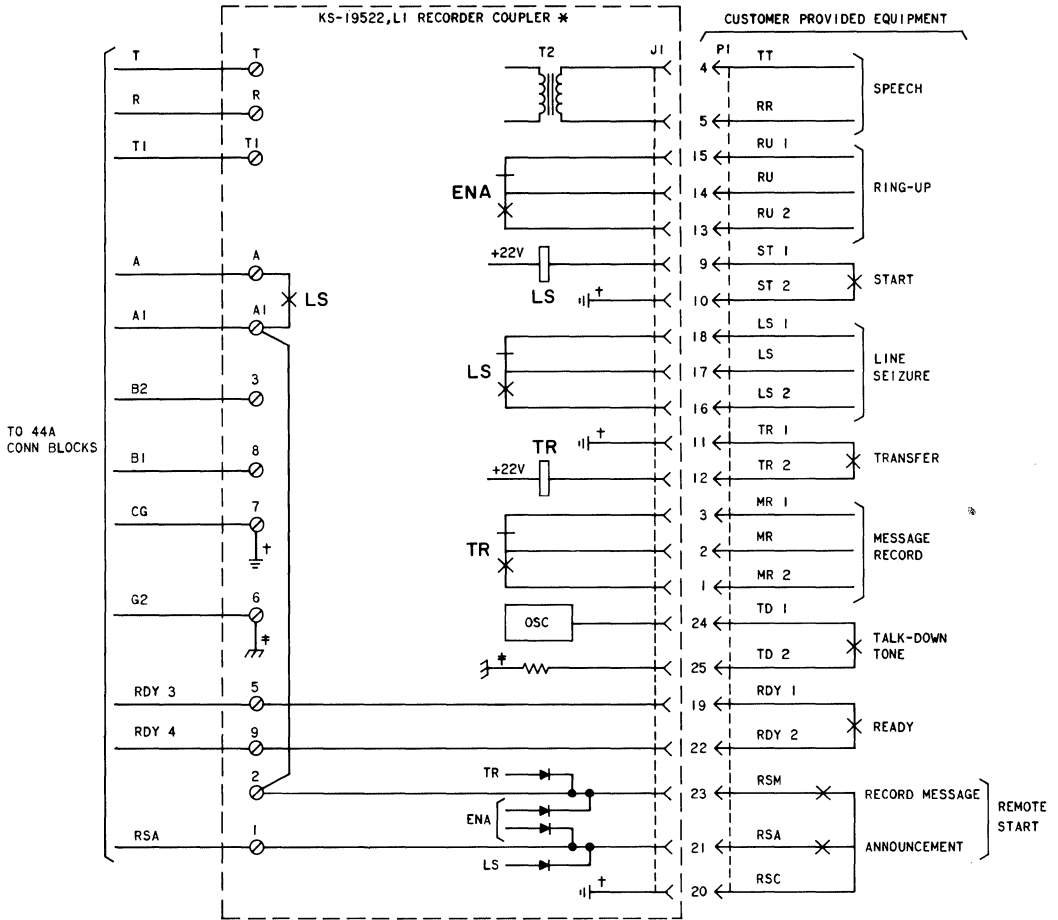


Fig. 10—Connections Using KS-16765, List 1 Announcement Set, KS-19522 Recorder Coupler and 565GK or 2565GK Telephone Set With Customer-Provided Message Recorder (Sheet 3)



\* KS-19522, L2 RECORDER CONNECTIONS ARE AS SHOWN WITH VOICE CONTROL ADDED PER FIG. 10.  
 † DENOTES CONTROL GROUND  
 ‡ DENOTES CHASSIS GROUND

Fig. 11—KS-19522 List 1 Recorder Coupler-Connections to Customer-Provided Equipment

## VOICE CONNECTING ARRANGEMENT GTS

### 1. GENERAL

**1.01** This section provides information on the KS-21440, List 1 coupler when used in Voice Connecting Arrangement (VCA) GTS.

**1.02** VCA GTS provides a protective interface for customer-provided (CP) answer-only station equipment.

**1.03** The customer may obtain a copy of the Technical Reference covering this VCA by contacting the local Telephone Company Business Office or Marketing Representative.

**1.04** This issue of the section is based on the following drawing:

SD-69918-01, Issue 3—KS-21440, List 1 Coupler

If this section is to be used with equipment or apparatus reflecting later issue(s) of the drawing, reference should be made to the CD and SD to determine the extent of the changes and the manner in which the section may be affected.

### 2. IDENTIFICATION

#### *Purpose*

- To provide a 2-wire interface between a telephone line and customer-provided equipment (CPE) such as answering sets, message recorders, dictation machines, etc.
- To protect the telephone line from hazardous voltages generated in the CPE.

#### *Application*

- 2-wire CO/PBX lines with or without 1A1 or 1A2 Key Telephone System (KTS).

#### *Ordering Guide*

Order basic unit as:

- Coupler, KS-21440, List 1

Order replaceable components as:

- Fuse, Buss, AGX 1/16A (2 required) **do not substitute.**

#### *Design Features*

**2.01** The KS-21440, List 1 coupler provides the following features:

- Standard 4-prong telephone jack on bottom for customer connections.
- Can be powered either by ac or dc supplied by the telephone company. Requires a maximum of 32 milliamperes in the off-hook mode when powered from a 28V dc supply.
- Activated by CO ringing to transmit ac ringing signal to CPE over CT and CR leads. Reacts to a CPE dc termination across CT and CR to trip ringing and establish a transmission path between telephone line and CPE.
- Permits 2-way voice transmission in the off-hook mode allowing for a prerecorded announcement to a calling party and recording of incoming transmission.
- Protects the telephone line from hazardous voltages generated by CPE by means of F1 and F2, isolation transformer T1 and diode CR6.
- Provides a balanced telephone line termination.
- Prevents line seizure except after ring detection by inhibiting dc pulsing and limiting the amplitude of voice-frequency signals.

### 3. INSTALLATION

**3.01** Where possible, the coupler should be mounted in a location that permits access to the telephone line, CPE and an electrical outlet when transformer powered. The coupler is housed similar

to a 105-type apparatus unit and is mounted in the same manner.

**3.02** Connection to the CPE is made through the jack on the bottom of the coupler (Fig. 1). A 4-prong plug such as a 505A is required on the end of the customer wiring.

**3.03** Line connections are made to terminals T and R and when required behind 1A1 or 1A2 KTS, to terminals A and A1. Any telephone sets or audible signals associated with the line should also be connected to these terminals.

*Note:* To insure proper operation of the ring detector circuit, no more than two ringers may be connected to the T and R terminals.

**3.04** Additional terminals are provided for power connections. Use a 2012B transformer for single installations or a KS-5714, List 4 or List 5 transformer or 19-type power unit for multiple installations and connect to terminals 1 and 2. The power supply should be connected to a 60-hertz circuit where possible and not under control of a switch.

**3.05** When all installation work is complete perform the tests shown in 6.02.

#### **4. OPERATION**

##### ***Incoming Call***

**4.01** An interrupted ac ringing signal applied to the telephone line causes relay RD to operate. The operation of RD disconnects the voltage limiting circuit and causes ringing to be supplied through T1 to the CPE over CT and CR.

**4.02** If the ring detector circuit in the CPE reacts and applies a dc termination across CT and CR, relay OH will operate to:

- Trip CO ringing and seize the line
- Release the RD relay
- Apply A1 ground to the A lead if required.

The RD relay released connects the voltage limiting circuit diode CR6 across T1.

**4.03** In this state, 2-way transmission is established through the coupler between the telephone line and the CPE. The CPE can transmit a prerecorded message and record incoming messages. Rotary dialing from the CPE is inhibited by the slow release of the OH relay.

**4.04** Release of the coupler is dependent on the CPE disconnecting the dc termination on CT and CR. If the termination is not removed, the CO line will be resealed initiating the CO permanent signal circuitry. Removal of the dc termination releases the OH relay allowing the circuit to return to normal.

#### **5. PROTECTION**

##### ***Telephone Line Protection***

**5.01** Longitudinal voltages induced on leads CT and CR are prevented from reaching the telephone line by the isolation transformer and normally open contacts on relay OH. Metallic voltages applied to CT and CR, if sufficiently large, cause relay OH to operate whether normal power is applied to terminals 1 and 2 or not. Operation of OH prevents RD from operating so that voltages on the line are limited to safe levels. Currents in excess of 1/16 ampere will cause fuses F1 and F2 to operate to protect coupler components.

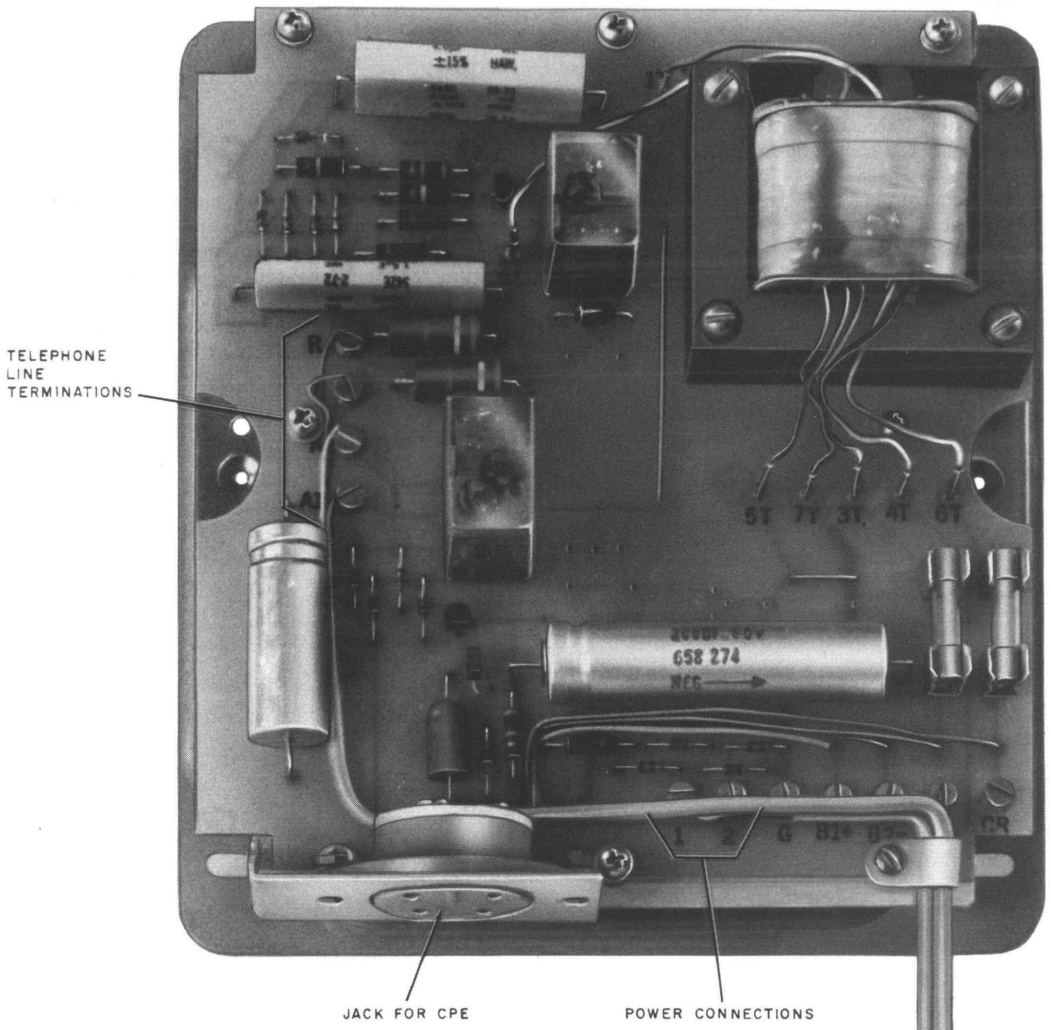
#### **6. MAINTENANCE**

**6.01** Maintenance of VCA GTS is limited to the following:

- Wiring of telephone line and A and A1 leads
- Customer plug securely in place
- Proper power source and connections
- Replacement of fuses F1 and F2.

**6.02** If a check of the items above does not clear the trouble, test the KS-21440, List 1 coupler as follows:

- (1) Disconnect plug to CPE.
- (2) If line is associated with 1A1 or 1A2 KTS, connect an 81A test set to terminals A and A1 with switch in C position.



**Fig. 1—KS-21440, List 1 Coupler, Cover Removed**

- (3) Plug a 500-type telephone set equipped with a 505A plug and wired for bridged ringing into the CPE jack on the coupler.
- (4) Using another line, call the local test desk and ask that a call be returned on the line under test.
- (5) When the call is returned, the RD relay will operate and the test telephone should ring (may require placing biasing spring in low notch).
- (6) Go off-hook—Relay OH should operate. The 81A test set should operate indicating continuity on A and A1. Check for normal

conversation by conversing with test desk using test telephone.

- (7) Go on-hook—Relay OH should release.
- (8) After 30 seconds go off-hook on test telephone. Relay OH should not operate.
- (9) Remove plug from jack and disconnect 81A test set.

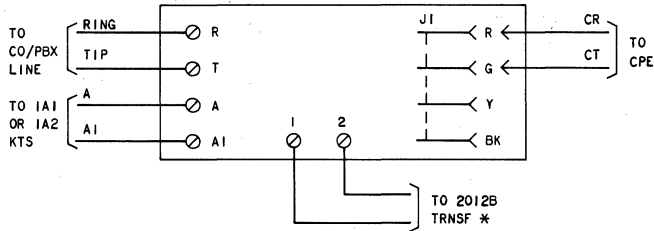
**6.03** If trouble is indicated in coupler, replace coupler. If all tests are satisfactory, remove

all test equipment and restore circuit to normal by connecting CPE plug.



**Do not attempt any tests or repairs to the CPE.**

**6.04** When in the repairman's judgment the trouble is located in the CPE, the Repair Service Bureau should be notified so that proper billing can be initiated as outlined in Section 660-101-312 entitled Maintenance of Service Charge on Services with Customer-Provided Equipment.



\* AT MULTIPLE INSTALLATIONS USE A KS-5714, LIST 4 OR LIST 5 TRANSFORMER OR A 19-TYPE POWER UNIT. ONLY ONE KS-21440, LIST 1 COUPLER MAY BE POWERED FROM A 2012B TRANSFORMER

**Fig. 2—KS-21440, List 1 Coupler, Connections**



## PROTECTIVE CONNECTING ARRANGEMENTS RCZ, RTT, AND RT1, AND 4-WIRE SERVICE

### 1. GENERAL

1.001 This addendum supplements Section 463-340-120, Issue 5. Place this pink sheet ahead of page 1 of the section.

1.002 This addendum is issued to:

- Clarify information on option Z—used with KS-19645 recorder connectors modified for 4-wire service
- Revise Table C.

(g) All units modified per BSRS 455.205 for 4-wire service have option Z installed which is required when the recorder connector is associated with a line where there is no dc line current. If the unit is to be used on a line where dc line current is present, the telephone company installer can remove option Z by cutting the two red straps located near the OH relay. The OH relay is located just above and to the right of screw terminals C2 and C7. Position the cut ends so there will be no interference with circuit board components.

### 2. CHANGES TO SECTION

2.001 On page 9 after subparagraph (f), add subparagraph (g) as follows:

2.002 On page 15, Table C is obsolete. A new Table C is shown in this addendum.

#### NOTICE

Not for use or disclosure outside the  
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## PROTECTIVE CONNECTING ARRANGEMENTS RCZ, RTT AND RC1, AND 4-WIRE SERVICE

### 1. GENERAL

**1.01** This section provides information on the identification, installation, operation, maintenance, and connections of the KS-19645 type recorder connectors used for Protective Connecting Arrangements (PCA) RCZ, RTT and RC1, and 4-Wire Service.

**1.02** This section is reissued to:

- Change rating of KS-19645, List 2 and List 6 recorder connectors from AT&T Standard to Manufacture Discontinue (MD)
- Add KS-19645, List 4 recorder connector
- Change customer interface to 44A connecting block
- Add new Fig. 18 to show connections for 832-, 2832-, 833-, and 2833-type key telephone sets
- Add new Fig. 31
- Revise Fig. 1, 2, 3, 8, 9, 10, 11, and 30
- Revise Tables A, B, C, and D, and add new Table E
- Replace the term Voice Connecting Arrangement (VCA) with Protective Connecting Arrangement (PCA).

**1.03** The customer should be informed by the manufacturer or supplier of the proper use of his equipment with the recorder connector.

**1.04** The customer can obtain a copy of the Technical Reference covering interface specifications PCA RCZ, RTT and RC1 by contacting the local Telephone Company Business Office or the Marketing Representative.

**1.05** This issue of the section is based on the following drawing:

SD-99414-01, Issue 8—KS-19645, L4 Recorder Connector

If this section is to be used with equipment or apparatus reflecting later issue(s) of the drawing, reference should be made to the SDs to determine the extent of the changes and the manner in which the section may be affected.

### 2. IDENTIFICATION

#### PURPOSE

- To provide facilities for connecting customer-provided equipment (CPE) to the telecommunications network
- To provide protection for telephone company personnel against hazardous voltages and to insure longitudinal balance
- To provide facilities for complying with the rules of the Federal Communications Commission for recording of 2-way telephone conversations (RCZ only).

**2.01** *PCA RCZ (Fig. 1 and 2):* KS-19645, List 1 (MD), List 2 (MD), List 6 (MD), or List 4 recorder connectors provide 1400-Hz warning beeps on 2-wire station lines only when 2-way conversations are being recorded by customer-provided (CP) voice recorders.

**2.02** *PCA RTT (Fig. 1 and 2):* KS-19645, List 4 recorder connector modified to provide 440-Hz warning beeps in both directions on 2-wire station or PBX trunk lines to signal conversing parties that their call is exceeding a time limit predetermined by a CP call duration timer. Not to be used for the recording of 2-way conversations.

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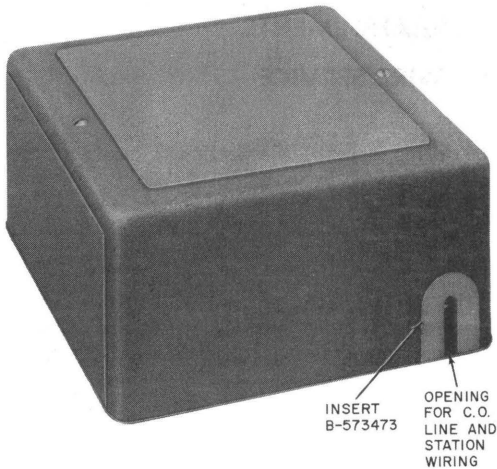


Fig. 1—KS-19645, List 4 Recorder Connector

**2.03 PCA RCI (Fig. 1 and 2):** KS-19645, List 4 recorder connector modified to provide 1400-Hz warning beeps to the local party and reduce the level of the beep tone being transmitted to the distant party by approximately 60 dB. It is used to connect CP call duration timers to 2-wire station or PBX trunk lines to signal the local party that their call is exceeding a time limit predetermined by a CP call duration timer. Not to be used for the recording of 2-way conversations.

**2.04 4-Wire Service (Fig. 3):** KS-19645, List 4 recorder connector, modified for 4-wire use (4W), provides 1400-Hz warning beeps on 4-wire telephone lines when 2-way conversations are being recorded by CP voice recorders.

**APPLICATION**

- Central Office (CO), Centrex, or PBX station lines

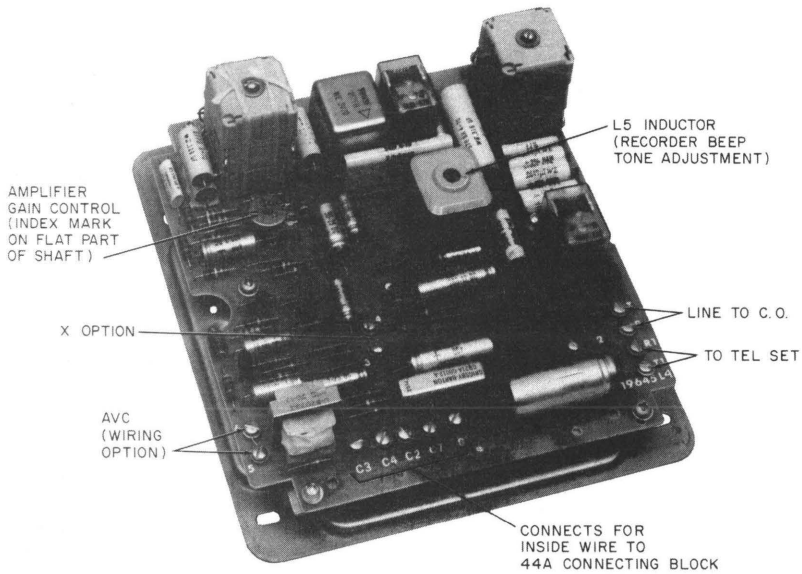


Fig. 2—KS-19645, List 4 Recorder Connector, Cover Removed

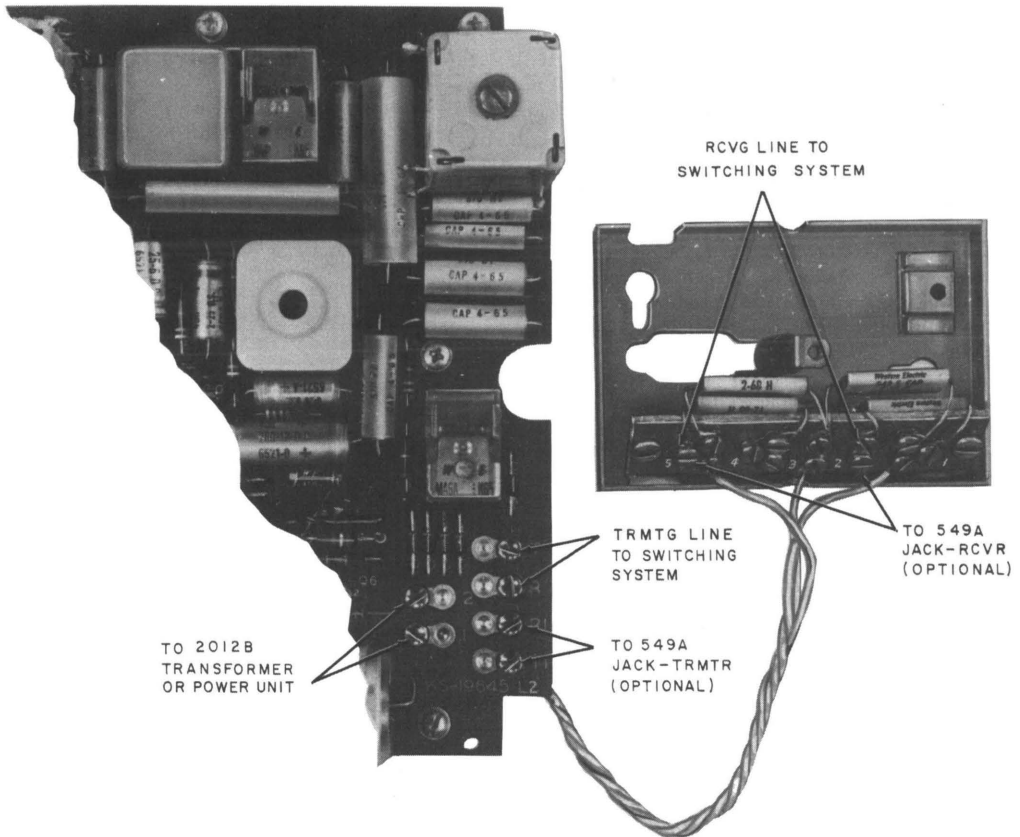


Fig. 3—KS-19645, List 4 Recorder Connector Modified For 4-Wire Use

- 1A, 1A1, or 1A2 Key Telephone System lines
- PBX switchboard attendant circuits (RCZ only)
- 100- and 101-type key equipment (RCZ only)
- PBX trunks (RTT and RC1 only)
- 4-wire circuits.



**Recording on 4-wire circuits is on the receive side only. Transmit speech is recorded only when a sidetone circuit is provided as part of the 4-wire telephone circuit. This should be kept in mind when answering trouble reports and before replacing the recorder connector as being defective.**

**2.05** All new installations must use a 44A connecting block for the customer interface. For KS-19645, List 2 (MD) recorder connectors

currently in stock, the addition of the 44A connecting block can be accomplished by ordering a KS-19645, List 12 interconnecting cable. The KS-19645, List 6 (MD) recorder connector consists of a KS-19645, List 2 recorder connector factory-equipped with a KS-19645, List 12 interconnecting cable.⚡

#### RESTRICTIONS FOR PCA RCZ

**2.06** When a voice recorder is used on a telephone line, adequate notice must be given to both parties that their conversation is being recorded. This notice is provided by a recorder connector (PCA RCZ) which automatically produces a warning tone (beep) repeated at approximately 15-second intervals.

**2.07** ⚡The FCC has made two exceptions to the requirement for a tone warning: (1) for FCC licensed broadcasters when recording 2-way conversations for broadcast purposes; (2) for the U.S. Secret Service when involved with the President of the United States, his immediate family, or the White House grounds.

Where telephone service is used only in intrastate applications, other exceptions may be available for other emergency agencies such as municipal police or fire departments. When a service order is issued to disconnect the "beep-tone" on connecting arrangements, a service order remarks notation will be sufficient (eg, disconnect "beep tone" or reinstall RCZ without "beep tone").⚡



*Obtain approval from your supervisor before installing any recorder connector without warning tone (beep) unless specified on service order.*

#### ORDERING GUIDE



*All new installations must use a 44A connecting block for the customer interface.*

##### (a) *Basic Units:*

#### RCZ

- Connector, Recorder, KS-19645, List 4

or

- Connector, Recorder, KS-19645, List 6 (MD) (see 2.05)

#### RTT

- Connector, Recorder, KS-19645, List 4 "DR" modified tone per BSRS 455.205

or

- Connector, Recorder, KS-19645, List 6 (MD) "DR" modified tone per BSRS 455.205 (see 2.05)

#### RC1

- Connector, Recorder, KS-19645, List 4 (or List 6 MD) "RC1" modified tone per BSRS 455.205 (see 2.03 for List 4 and 2.05 for List 6)

#### 4-Wire Service

- Connector, Recorder, KS-19645, List 4 "4-W" modified for 4-wire per BSRS 455.205

or

- Connector, Recorder, KS-19645, List 6 (MD) "4-W" modified for 4-wire per BSRS 455.205 (see 2.05)

#### (b) *Associated Apparatus or Equipment (order separately)*

- Block, Connecting, 44A
- Transformer, 2012B-49 (Light Olive Gray or -50 Ivory), or
- Unit, Power, 19-Type (or equivalent, if required for multiple recorders—see 6.04)

#### (c) *Optional Apparatus or Equipment (order separately if needed)*

- Adjuster, KS-19355, List 1 (used for adjusting inductor List 5)
- Backboard, KS-5796, List 7 (used to mount recorder connector on irregular wall surfaces)
- Capacitor, KS-13814, List 7 (three required—used to reduce radio interference)

**Note:** Additional apparatus may be required as a special assembly depending upon the specific use of recorder connector as shown in Table A. This apparatus may be determined from the figure references shown in Table A and from the following information:

- Multistation Circuit\*, consisting of:

Mounting, Apparatus, 15A (one each) Typical

Cover, 116A (one per two 15A) Typical

Unit, Telephone Key, 229B (one each per station)

Unit, Telephone Key, 227B (one per three 229B KTUs)

Unit, Telephone Key, 241B (one each)

Diode, 400A (or equivalent—one per 227B KTU)

- Recorder Start Circuit, consisting of:

Relay, KS-16626, List 12

- Inductor, 1542A (two required—used to reduce radio interference)
- Jack, 549A (used to connect modified 4-wire recorder connector to optional telephone or customer equipment)
- Network, KS-19645, List 11 (used to reduce line and background noise, Fig. 4).

\* Components must be ordered separately and field-installed as required. Refer to Section 463-140-100 for apparatus mountings and covers.

(d) **Replaceable Components**

- Cable, Interconnecting, KS-19645, List 12

**DESIGN FEATURES**

◆KS-19645, List 4 Recorder Connector, Unmodified (Fig. 1 and 2), and KS-19645, List 6 (MD) Recorder Connector, Unmodified◆

- Provide a high-impedance bridging connection to the station line. Not applicable for trunk service.
- Amplify audio transmission from the telephone line to the CP recorder with an option of automatic volume control (AVC) (wiring option Y).
- Generate a beep tone (wiring option X) at approximately 15-second intervals.
- Operate from 18 volts ac supplied from a separate 2012B transformer or from 24 volts dc when power is provided by a 19-type power unit (or equivalent).
- Have screw terminals for connecting the telephone line, the associated telephone set or line circuit, and the 2012B transformer.
- Provide 22 volts dc potential across interface leads ST1 and ST2 which may be used for start signal, if desired.
- Are designed for vertical mounting.
- Weigh approximately 4 pounds each.
- Measure 6-7/8 inches wide by 7-3/8 inches high and 3-3/8 inches deep.
- Suitable for stations equipped for TOUCH-TONE® dialing.
- Generate beep tone at a reduced level of -15 dBm to eliminate interference with TOUCH-TONE receivers.
- Delay the start of beep tone by 15 seconds to allow TOUCH-TONE calling without beep tone interference.
- Five screw terminals replace the SK-M7/5-32S jack of the List 2 (MD) and are designated C3, C4, C2, C7, and G for ground. The screw terminals are connected to a 44A interface connecting block using inside wire (List 4 only).
- Consist of KS-19645, List 2 plus KS-19645, List 12 interconnecting cable. The cable is connected to a 44A interface connecting block (List 6 only).◆

→TABLE A←

## SELECTION OF APPARATUS

TYPE OF SERVICE	SPECIFIC USE OF RECORDER CONNECTOR	TYPE TELEPHONE EQUIPMENT	FIG. NO. PER INSTALLATION	FIG. NO. PER STATION
RCZ	With voice recorder on individual CO or PBX line	500- or 2500-series telephone set	8, 27*	12
	With voice recorder to record on all lines terminated in <i>two or more</i> key set of 1A, 1A1, or 1A2 Key Telephone System	560-, 1560-, or 2600-series telephone set	8, 27*	13
		830-, 831-, 2830-, 2831-type telephone sets	8, 27*	17
		832-, 833-, 2832-, 2833-type telephone sets	8, 27*	18
		6040G key	8, 27*	23
	With voice recorder to record on all lines terminated in <i>two or more</i> key sets of 1A, 1A1, or 1A2 Key Telephone System	560-, 1560, 2500-series telephone set	8, 25†, 26, 27*	13, 24
		830-, 831-, 2830-, 2831-type telephone sets	8, 25†, 26, 27*	17, 24
		832-, 833-, 2832-, 2833-type telephone sets	8, 25†, 26, 27*	18, 24
	With voice recorder to record on all lines terminated in <i>one</i> attendant position	100- or 101-type key equipment position	8, 27*	19
		630- or 2630-type telephone set	8, 27*	14, 15, 16
	With voice recorder to record on all lines terminated in <i>two or more</i> attendant positions	100- or 101-type key equipment position	8, 25†, 26, 27*	18, 24
		630- or 2630-type telephone set		14, 15, 16
	With voice recorder on cord-type PBX (permanent installation)	Cord-type PBX attendant position	8, 25†, 27*	20, 21, 22‡
With voice recorder on attendant position circuit, manual start provided	Cord-type PBX attendant position	8, 27*	21, 22‡	
With voice recorder on 4-wire line	Customer operated attendant consoles	11		
RTT	With CP timer as tone generator on telephone lines	300-, 500-, or 2500 series telephone sets or PBX	9	
RC1			10	

\* Use Fig. 27 only when KS-19645, List 11 network is required for noise suppression.

† Use Fig. 25 when automatic start and stop of recorder is required.

‡ Fig. 22 provides connections for the 608-type PBX, but is typical of other PBXs.

**KS-19645, List 4 and List 6 (MD) Recorder Connectors Modified for 440-Hz and for Use With a CP Call Duration Timer (PCA RTT, Fig. 1 and 2)**

- Identified by "DR" stamped on the upper right-hand corner of the nameplate.
- Used as a customer-controlled tone generator—*not* as a voice recorder connector.
- Indicates telephone off-hook by contact closure between interface leads OH1 and OH2.
- Begins generating beep tone on the line shortly after receiving start signal from CP timer.
- Generates one 440-Hz beep tone lasting 1/2-second every 15 seconds as long as signal is provided by CP timer.
- Tone is transmitted to both local and distant parties.
- Modified at the Distributing House per BSRS 455.205.

**KS-19645, List 4 and List 6 (MD) Recorder Connectors Modified for "RC1" and for Use With a CP Call Duration Timer (PCA RC1, Fig. 1 and 2)**

- Identified by "RC1" stamped on the upper right-hand corner of the nameplate and the lower right-hand corner of the printed circuit board.
- Used as a customer-controlled tone generator—*not* as a voice recorder connector.
- Indicates telephone off-hook by voltage change across interface leads ST1 and ST2.
- Begins generating beep tone on the line shortly after receiving signal from CP timer.
- Generates a single 1400-Hz beep tone lasting approximately 1/2-second every 15 seconds as long as signal is provided by CP timer.
- Generates tone to be heard by local party only.
- Modified at the Distributing House per BSRS 455.205. Recorder connectors, modified prior

to April 1972, delay tone 15 seconds after signal by CP timer.

**KS-19645, List 4 and List 6 (MD) Recorder Connectors Modified for 4-Wire Use (Fig. 3)**

- Identified by "4-W" stamped on the upper right-hand corner of the nameplate.
- Provide an externally mounted unit which contains the connector terminals required for 4-Wire Switching System use.
- Delay the start of beep tone approximately 15 seconds after ST1 and ST2 leads are closed at CP recorder; associated telephone set may be off hook.
- Modified at the Distributing House per BSRS 455.205.

**KS-19645, List 11 Network (Fig. 4)**

- Used if the telephone set associated with the recorder connector is in an acoustically noisy location so that the background noise being recorded does not reach an objectionable level during lulls in conversation. Under normal noise conditions, the hybrid-coil effect of the network is not needed. Also, the network is not intended to be used to correct noisy telephone lines.
- Reduces the near-end level and effect of room noise by approximately 15 dB at a sacrifice of approximately 3.5 dB insertion loss for the far-end talker.
- Provides an improvement of approximately 11.5 dB in signal-to-noise ratio of voice transmission from the far end.

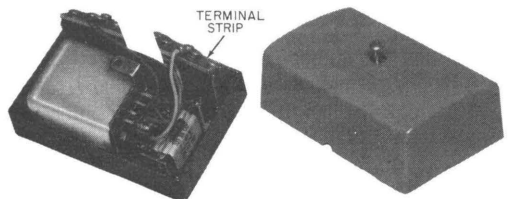


Fig. 4—KS-19645, List 11 Network



## 3. INSTALLATION



◆ **All new installations must use a 44A connecting block for the customer interface (see 2.05).**◆

**3.01** The location and method of installing the recorder connector shall be consistent with standard practices.



◆ **Connect KS-19645 recorder couplers to commercial power after all other installation work has been completed. The power cord shall not be passed through holes in walls or fastened to walls.**◆

**3.02** Determine that a solid vertical surface is available for the recorder connector and the 44A connecting block as close to the customer's equipment as possible.◆ A solid surface is essential to prevent false relay operation.

**3.03** Make certain the customer has an unused 115-volt ac outlet *not* under control of a wall switch for the power supply. When using standard inside wire, the distance between the transformer (or power unit) and recorder connector should not exceed 100 feet.

**3.04** Install the KS-19645 type recorder connectors as follows:

- (1) Remove cover.
- (2) When installing a KS-19645, L1 (MD) or L2 (MD) recorder connector, position the recorder connector vertically so that the SK-M7/5-32S jack is at the bottom of the unit. ◆When installing a List 4, position the recorder connector so the screw terminals are at the bottom of the unit (see Fig. 2).◆
- (3) Secure unit to wall using appropriate fasteners for the type of wall surface. If necessary, use a KS-5796, List 7 backboard (see Ordering Guide). For installation of backboards, refer to Section 463-130-100 entitled Backboards, Identification and Installation.
- (4) If installing a recorder connector modified for 4-wire use, mount the separate connector

enclosure on the wall within the limits of the wiring furnished with the two units (Fig. 3).

- (5) Run inside wiring for 2012B transformer (or 19-type power unit, or equivalent) to recorder connector.
- (6) Connect CO lines (Fig. 2) or switching system lines (Fig. 3), and transformer leads. Terminate the mounting cord of the telephone set, if used, at the recorder connector or run additional wire to desired location. If needed, wire four leads to the 549A jack (Fig. 3). See Part 6.
- (7) If the KS-19645, List 11 network (Fig. 4) is required, place it on a desk or fasten it to the wall. Wire the terminal strip as described in Part 6. Inside wire or cord may enter from the top or bottom.
- (8) ◆When installing KS-19645, L4 recorder connector, use approximately 20 inches of inside wire to connect recorder connector to 44A connecting block. Terminate inside wire on terminal strip as shown in Fig. 8 for RCZ, Fig. 9 for RTT, or Fig. 10 for RC1.
- (9) After terminating inside wire on 44A connecting block, install straps (furnished with the unit) on the 44A connecting block as shown in Fig. 30.
- (10) When installing a KS-19645, List 6 (MD) recorder connector, connect the KS-19645, List 12 interconnecting cable to the Cannon plug on the bottom of the recorder connector.
- (11) When installing the KS-19645, List 6 (MD) recorder connector, terminate the other end of the List 12 cable and install straps on 44A connecting block as shown in Fig. 31.
- (12) Select options as listed below.

**RC1, RTT**

No options required.

**RCZ and 4-Wire Service**

- (a) All units are manufactured with option Y, AVC, installed (Fig. 2). AVC equalizes the level of speech between the recording station

and the distant station but does not affect the level on line. If the customer does not desire this feature or in 4-wire service, AVC may be disabled.

- (b) To disable AVC, remove wire strap from terminals 5 and 6 (option Y) and turn the amplifier gain potentiometer R9 (Fig. 2) fully counterclockwise.
- (c) To reactivate AVC, install wire strap between terminals 5 and 6 (option Y) and turn the amplifier gain potentiometer R9 (Fig. 2) clockwise to a point midway between numbers 2 and 3.
- (d) The index for the potentiometer is the flat black part of the shaft end (Fig. 2).
- (e) All units are manufactured with option X (terminals 3 and 4 strapped) beep tone installed (Fig. 2). Since the removal of this option disables the warning beep tone, **do not remove it without permission from your supervisor**, or unless it is specified on service order.
- (f) If the customer desires beep tone to be recorded on his tape, turn the tuning slug of inductor L5 (Fig. 2) with a KS-19355, List 1 adjuster until a suitable beep tone level is produced across pins 3 and 4 of connector (Fig. 5).

**Caution:** To prevent damaging the tuning slug, do not use a screwdriver to adjust inductor L5.

- (13) Make adjustments and checks as outlined in Part 5.
- (14) Replace cover.
- (15) The customer's wiring terminates on screw terminals 1, 4, 6, and 9 of the 44A connecting block as shown in Fig. 30.

#### 4. OPERATION

**4.01 KS-19645, List 1 (MD), List 2 (MD), List 6 (MD), and List 4 Recorder Connectors (RCZ):** Indicate off-hook condition of associated telephone set by a voltage change from 0 volts to 22 volts dc on leads ST1 and ST2. Generate 1400-Hz beep tone after approximately 15 seconds

and bridge leads TT and TR to the line when ST1 and ST2 leads are closed at the customer's recorder.

**4.02 KS-19645 DR Recorder Connector Modified for 440-Hz (RTT) and for Use With CP**

**Call Duration Timer:** Indicates off-hook condition of associated telephone equipment by a contact closure between (screw terminals C2 and C3) leads OH1 and OH2. Generates 440-Hz beep tone shortly after associated telephone equipment is off-hook and the ST1 and ST2 leads are closed at the customer's timer.

**4.03 KS-19645 RC1 Recorder Connector Modified Tone and for Use With CP Call Duration**

**Timer:** Indicates off-hook condition of associated telephone equipment by a voltage change from 0 volts dc to 22 volts on leads ST1 and ST2. Generates 1400-Hz beep tone immediately and every 15 seconds thereafter when associated telephone set is off-hook and the ST1 and ST2 leads are closed at the customer's timer.

**4.04 KS-19645, List 2 (MD), List 6 (MD), and List 4 (4-W) Recorder Connectors**

**Modified for 4-Wire Use:** Generate 1400-Hz beep tone approximately 15 seconds after the ST1 and ST2 leads are closed at the CP recorder even if the customer's associated telephone equipment is not off-hook.

**4.05** In the event of a commercial power failure, KS-19645 type recorder connector will not operate.

**4.06** When the recorder connector is used to connect more than one station to the CP voice recorder, a multistation circuit is required. The basic circuit is shown in Fig. 26. The 229B and 227B KTUs function as a line circuit to connect the station to the recorder connector, and the 241B KTU functions as a lockout circuit by removing -24 volts from lead A to prevent other line circuits from operating. The pushbutton at each station is pushed to operate and pushed to release the recorder. When the pushbutton is first closed, the 227B relay operates and provides ground to operate relay AW which locks. The 227B relay and AW operated provide ground to operate relay A which locks under control of AW. The A relay operated removes battery from the 227B KTU which slowly releases. Release of the pushbutton removes shunt from the AZ relay which operates under control of AW and removes battery from

→TABLE C←

LINE, STATION, AND WIRING CONNECTION—KS-19645, LIST 2 (MD), LIST 6 (MD), OR LIST 4 RECORDER CONNECTOR MODIFIED FOR 4-WIRE USE (RCZ)

FUNCTION	DESIGNATION	TERMINALS ON:	
		PRINTED CIRCUIT BOARD	EXTERNAL TERMINAL STRIP
Line to 4-Wire Switching System (transmit)	TT	T	
	TR	R	
Line to 4-Wire Switching System (receive)	RT		2
	RR		4
To Telephone Set or Customer Equipment — TRMTR (optional)	T1	T1	
	R1	R1	
To Telephone Set or Customer Equipment — RCVR (optional)	T		2
	R		4
To 2012B Transformer or Power Unit	1	1	
	2	2	
Disable AVC	Remove wiring Option Y	Remove strap from 5 to 6	
Disable Beep Tone*	Remove wiring Option X	Remove strap from 3 to 4	
Line to 4-Wire Switching System (provides dc current)	Remove wiring Option Z	Cut two red jumpers adjacent to OH relay	

\* Obtain supervisory permission before disabling beep tone unless specified on service order.

other circuits. The telephone set is now connected to the recorder through the A relay. The second operation of the pushbutton shunts relay AW which releases, and relay AZ stays operated through pushbutton ground; when the pushbutton is released, it releases AZ relay. AZ relay released removes ground from the A relay which releases and disconnects the recorder connector, removes lamp voltage, and stops the CP recorder.

**4.07** For information on suppression of radio frequency interference (RFI) and noise, see 5.08 and 5.09.

**4.08** Refer to CD- and SD-99414-01 for additional information on operation of KS-19645 type recorder connectors.

## 5. MAINTENANCE

### KS-19645, List 1 (MD), List 2 (MD), List 6 (MD) or List 4 Recorder Connectors

**5.01** The primary difference between KS-19645, List 2 (MD) and KS-19645, List 4 or List 6 (MD) is the customer interface. For the List 2 the customer must have a Cannon SK-M7-21C-1/2 plug; while for the Lists 4 and 6, the customer must connect to a 44A connecting block.

**5.02** Before checking operation, make certain that:

- **For List 2 Only**—the customer's plug is wired as shown in Fig. 5, 6, or 7 (wiring the plug is the customer's responsibility).
- **For Lists 4 and 6 Only**—The customer's wiring is properly terminated on the 44A connecting block as shown in Fig. 30 or 31.
- Connections and options are as required and as shown in Table B, C, D, or E.
- AC voltage (or dc voltage if powered by power unit) is present on screw terminals 1 and 2 of recorder connector.
- Telephone line is good.

**5.03** To determine whether the recorder connector operates properly, perform the steps outlined below.

### 5.04 Unmodified and 4-Wire Modified Units (RCZ):

- (1) Disconnect plug from customer's equipment (List 2 only).
  - (2) Disconnect customer's leads from 44A connecting block (Lists 4 and 6).
  - (3) Connect a voltmeter across pins 2 and 7 in connector on unit (List 2 only). Zero volts should be indicated for unmodified units. (A nominal 22 volts should be indicated for 4-wire modified units.)
  - (4) Connect a voltmeter across screws 2 and 8 on 44A connecting block (Lists 4 and 6). Zero volts should be indicated for unmodified units. (A nominal 22 volts should be indicated for 4-wire modified units.)
  - (5) Go off-hook on the telephone associated with the recorder connector. (A nominal 22 volts should be indicated on the voltmeter.) If no voltage is present, recorder connector is defective and should be replaced.
  - (6) Establish a call to the local test desk or a nearby station.
  - (7) Remove voltmeter and strap pins 2 and 7 in connector on unit (List 2 only).
  - (8) Remove voltmeter and strap screws 2 and 8 on 44A connecting block (Lists 4 and 6).
  - (9) One 1400-Hz beep tone should be heard about every 15 seconds (except when X option is removed).
- Note:** On TOUCH-TONE service installations, to avoid interference, make certain that the first beep tone from a List 2, 4, or 6 unit occurs no earlier than 15 seconds after the associated set goes off-hook. If no beep tone is heard (except when X option is removed), recorder connector is defective and should be replaced.
- (10) Connect 1013A hand test (or equivalent) set across pins 3 and 4 of connector on unit (List 2 only).

- (11) Connect 1013A hand test set (or equivalent) across screws 3 and 7 of 44A connecting block (Lists 4 and 6).
- (12) Voice transmission from local test desk or nearby station should be heard in hand test set. Beep tone should be heard at very low level but should not be noticeable when normal speech signals are present (see 3.04[12] [f]). If beep and voice transmission are not heard in hand test set receiver, recorder connector is defective and should be replaced.
- (13) If tests are satisfactory, remove all test connections and reconnect customer's plug (List 2) or leads (List 4 or 6).
- (4) Connect an ohmmeter or buzzer across screws 7 and 8 on 44A connecting block (Lists 4 and 6). Open circuit should be indicated.
- (5) Go off-hook with associated telephone set or seize WATS line. Continuity should be indicated by ohmmeter or buzzer. If no continuity is indicated, recorder connector is defective and should be replaced.
- (6) Establish a call to nearby station, if possible, or to local test desk.
- (7) Strap pins 5 and 7 in connector on unit (List 2 only).



***Recording on 4-wire is on the receive side only. Transmit speech is recorded only when a sidetone circuit is provided as a part of the 4-wire telephone circuit. This should be kept in mind when answering trouble reports and before replacing the recorder connector as being defective.***

- (14) When, in the judgment of repair personnel, the trouble is located in the CPE, the Repair Service Bureau should be notified so that proper Maintenance of Service Charge billing can be initiated as outlined in BSP 660-101-312 entitled Maintenance of Service Charge on Services With Customer-Provided Equipment (CPE).
- (8) Strap screws 2 and 3 on 44A connecting block (Lists 4 and 6).
- (9) 440-Hz beep tone should be heard by test desk and in local telephone set about every 15 seconds. If beep tone is not heard, recorder connector is defective and should be replaced.
- (10) If tests are satisfactory, remove all test connections and reconnect customer's plug (List 2) or leads (List 4 or 6).



***Do not attempt any tests or repairs on the CPE.***



***Do not attempt any tests or repairs on the CPE.***

#### **5.05 Modified 440-Hz (DR) Units (RTT):**

- (1) Disconnect plug from customer's equipment (List 2 only).
- (2) Disconnect customer's leads from 44A connecting blocks (Lists 4 and 6).
- (3) Connect an ohmmeter or buzzer across pins 2 and 3 of connector on unit (List 2 only). Open circuit should be indicated.

#### **5.06 Modified Tone Units (RC1):**

- (1) Disconnect plug from customer's equipment (List 2 only).
- (2) Disconnect customer's leads from 44A connecting block (Lists 4 and 6).
- (3) Connect a voltmeter across pins 2 and 7 of the connector on the unit (List 2 only). Zero volts should be indicated.

- (4) Connect a voltmeter across screws 2 and 8 of the 44A connecting block (Lists 4 and 6). Zero volts should be indicated.
- (5) Go off-hook with the associated telephone set or seize the WATS line. (A nominal 22 volts should be indicated on the voltmeter.) If no voltage is present, recorder connector is defective and should be replaced.
- (6) Establish a call to the local test desk or a nearby station.
- (7) Strap pins 2 and 7 of the connector (List 2 only). One 1400-Hz beep tone should be heard about every 15 seconds on the associated telephone set.
- (8) Strap screws 2 and 8 on the 44A connecting block. One 1400-Hz beep tone should be heard about every 15 seconds on the associated telephone set.
- (9) If beep tone is not heard, recorder connector is defective and should be replaced.
- (10) At the test desk or nearby station, the 1400-Hz beep tone should not be noticeable.
- (11) If tests are satisfactory, remove all test connections and reconnect customer's plug (List 2) or leads (List 4 or 6).
- (12) When in the judgment of repair personnel the trouble is located in the CPE, the Repair Service Bureau should be notified so that proper Maintenance of Service Charge billing can be initiated as outlined in BSP 660-101-312 entitled Maintenance of Service Charge on Services With Customer-Provided Equipment (CPE).



***Do not attempt any tests or repairs on the CPE.***

- 5.07** To prevent trouble reports of constant beep tone on older models of List 1 recorder connector, disconnect, insulate, and store the lead on pin 5 on J1 (Cannon connector).⚡
- 5.08 *Radio Frequency Interference:*** RFI may occur at locations near radio transmitters.

Because the normal gain of the unit is 25 dB, radio signals demodulated in associated telephone equipment or cables, or in the unit itself, may be amplified to objectionable levels. Should this occur, proceed with following steps until RFI ceases or reduces to a tolerable level.

- (1) Connect three KS-13814, List 7 capacitors across the terminals of the unit as shown in Fig. 28.
- (2) Connect two 1542A inductors as shown in Fig. 29.
- (3) Add suppression devices to associated telephone sets.

### **Noise Suppression**

**5.09** Background noise at the local station may rise to objectionable levels on the line during lulls in conversation. When this occurs, install a KS-19645, List 11 network as shown in Fig. 27. If line noise pickup due to RFI common power supply, crosstalk, etc, is objectionable, ground the chassis of the recorder connector. Connect the ground wire to the cable clamp screw ⚡ for Lists 2 and 6 and to screw labeled G for List 4 (see Fig. 2, 27, and 28).⚡

**5.10** Noise in the output of the recorder connector, which occurs during the periods that relay BT is operated, may be caused by high-level longitudinal signals on the telephone line. This type of longitudinal induced noise is caused by the capacitance between ground and the transmission leads connecting terminals T1 and R1 (on the KS-19645) to the associated telephone set. Capacitance to ground can be minimized by locating the KS-19645 as close as possible to the telephone set. In the case of key telephones where capacitance between the transmission pair and ground is increased by the presence of other leads in the same cable which connect to grounded control circuits or lamp supplies, a separate cable may be used for the transmission pair to reduce capacitance to ground. When these suggested rearrangements of station wiring cannot be provided or do not provide sufficient noise reduction, a 285A inductor or 101-type protector should be installed between the telephone line and terminals T and R on the KS-19645 to suppress the longitudinal signals.

## 6. CONNECTIONS

- 6.01** Tables B, C, D, and E show line and station connections made on terminals of the unit.
- 6.02** Table A shows the selection of apparatus. Refer to Ordering Guide and figures as indicated in the table.



**Protective Connecting Arrangements RTT (RTS) and RC1 (RC2) are not permitted on Centrex CO trunk applications.**

- 6.03** For a functional schematic and circuit description of KS-19645 recorder connectors, see CD- and SD-99414-01.
- 6.04** A suitable dc power supply such as the 19-type may be used to supply multiple recorder connectors. **Do not use a 2012B transformer for more than one KS-19645 recorder connector installation.** The dc power supply should be of the current limiting type, or it should be connected through a 20-ohm, 1-watt resistor (a separate resistor for each coupler) to provide current limiting. The power supply may be connected with either polarity to terminals 1 and 2 of the recorder connector. Do not ground either terminal of the power supply. Power supply current drain is 0.070 ampere per recorder connector in operation and 0.010 ampere in the standby condition. The initial surge current is 1.0 ampere.
- 6.05** A multistation application of PCA RCZ is shown in Fig. 26. In this arrangement, one modified 241B KTU is required per arrangement and one 229B and 1/3 227B KTUs are required per station. A protective connecting arrangement for three stations would require one each 241B and 227B KTUs and three 229B KTUs. Additional stations would require one 229B KTU per station and one 227B KTU for each three or less stations. Provide a nonlocking pushbutton for each station and a lamp indicator per station with all lamps connected in multiple (Fig. 24). Automatic start-stop of the CP recorder may be direct or by control relay (Fig. 25) as required.
- 6.06 Connection Index:**

Table B—▶ Line, Station, and Wiring Connections—KS-19645, List 1 (MD), List 2 (MD), List 6 (MD), or List 4,

and Modified 440-Hz Recorder Connectors (RTT)

Table C—Line, Station, and Wiring Connections—KS-19645, List 2 (MD), List 6 (MD), or List 4 (4-W) Recorder Connector Modified for 4-Wire Use (RCZ)

Table D—Line, Station, and Wiring Connections—KS-19645, List 2 (MD), List 6 (MD), or List 4 Modified Tone Recorder Connector (RC1)

Table E—Line, Station, and Wiring Option Connections—KS-19645, List 2 (MD), List 6 (MD), or List 4 Recorder Connector Unmodified for RCZ▶

Fig. 5—Connections for Customer's SK-M7-21C-1/2 Plug from Voice Recorder (RCZ and 4-Wire Circuits) to KS-19645, List 2 Recorder Connector

Fig. 6—Connections for Customer's SK-M7-21C-1/2 Plug from Timer (RTT) to KS-19645, List 2 Recorder Connector

Fig. 7—Connections for Customer's SK-M7-21C-1/2 Plug from Timer (RC1) to KS-19645, List 2 Recorder Connector

Fig. 8—▶ Connections for KS-19645, List 4 Recorder Connector and CP Recorder (RCZ)

Fig. 9—Connections for KS-19645, List 4 "DR" Recorder Connector (RTT)

Fig. 10—Connections for KS-19645, List 4 Recorder Connector (RC1)

Fig. 11—Connections for KS-19645, List 4 "4W" Recorder Connector (RCZ)▶

Fig. 12—Connections Using 500- or 2500-Series Telephone Sets (RCZ)

Fig. 13—Record on All Lines Terminated in 560-, 1560-, or 2560-Series Key Telephone Sets (RCZ Application)

Fig. 14—Record on All Lines Terminated in 630-, 631-, 636-, 637-, 2636-, and

- 2637-Type Key Telephone Sets (RCZ Application)
- Fig. 15—Record on All Lines Terminated in 634-, 635-, 2634-, and 2635-Type Key Telephone Sets (RCZ Application)
- Fig. 16—Record on All Lines Terminated in 630DA-, 631DA-, 2630DA-, and 2631DA-Type Key Telephone Sets (RCZ Application)
- Fig. 17—Record on All Lines Terminated in 830-, 831-, 2830-, and 2831-Type Key Telephone Sets (RCZ Application)
- Fig. 18—Record on all Lines Terminated in 832-, 2832-, 833-, and 2833-Type Key Telephone Sets (RCZ Application)
- Fig. 19—Connections and Modifications Using 100- or 101-Type Key Units (RCZ Application)
- Fig. 20—Connections to Attendant Telephone Circuit for Cord-Type PBX (RCZ Application)
- Fig. 21—Connections to Attendant Telephone Circuit for 552- or 605-Type PBX (RCZ)
- Fig. 22—Connections to Attendant Telephone Circuit for 608-Type PBX (RCZ Application)
- Fig. 23—Connections Using 6040G Key (RCZ Application)
- Fig. 24—Key and Lamp Circuit (RCZ Multistation Application)
- Fig. 25—Recorder Start Circuit\* (RCZ Multistation Application)
- Fig. 26—Multistation Circuit\* (RCZ Application)

Fig. 27—Connections Using KS-19645, List 11 Network (RCZ Application)

Fig. 28—Connections Using KS-19645, List 7 Capacitors (RCZ Application)

Fig. 29—Connections Using 1542A Inductors (RCZ Application)

Fig. 30—Connection of Inside Wire from KS-19645, List 4 Recorder Connector to 44A Connecting Block

Fig. 31—Connections for KS-19645, List 6 Recorder Connector to 44A Connecting Block

\*Circuits must be field assembled, installed and connected. See Ordering Guide.

→TABLE B←

**LINE, STATION, AND WIRING CONNECTIONS  
KS-19645, LIST 1 (MD), LIST 2 (MD),  
LIST 6 (MD), OR LIST 4, AND MODIFIED  
440-HZ RECORDER CONNECTORS (RTT)**

FUNCTION	DESIGNATION	TERMINALS ON PRINTED CIRCUIT BOARD
Line to CO	T	T
	R	R
2012B Transformer or Power Unit	1	1
	2	2
To Telephone Set, PBX, and/or Key System	T	T1
	R	R1



→TABLE C←

LINE, STATION, AND WIRING CONNECTION—KS-19645, LIST 2 (MD),  
LIST 6 (MD), OR LIST 4 RECORDER CONNECTOR MODIFIED FOR 4-WIRE USED (RCZ)

FUNCTION	DESIGNATION	TERMINALS ON:	
		PRINTED CIRCUIT BOARD	EXTERNAL TERMINAL STRIP
Line to 4-Wire Switching System (Transmit)	TT	T	
	TR	R	
Line to 4-Wire Switching System (Receive)	RT		2
	RR		4
To Telephone Set or Customer Equipment-- TRMTR (Optional)	T1	T1	
	R1	R1	
To Telephone Set or Customer Equipment-- RCVR (Optional)	T		2
	R		4
To 2012B Transformer or Power Unit	1	1	
	2	2	

→TABLE D←

LINE, STATION, AND WIRING CONNECTIONS  
KS-19645, LIST 2 (MD), LIST 6 (MD), OR  
LIST 4 MODIFIED TONE RECORDER  
CONNECTOR (RC1)

FUNCTION	DESIGNATION	TERMINALS ON PRINTED CIRCUIT BOARD
Line to CO	T	T1
	R	R1
2012B Transformer or Power Unit	1	1
	2	2
To Telephone Set, PBX, and/ or Key System	T	T
	R	R

◆ TABLE E ◆

LINE, STATION, AND WIRING OPTION  
 CONNECTIONS KS-19645, LIST 2 (MD), LIST 6 (MD),  
 OR LIST 4 RECORDER CONNECTOR  
 UNMODIFIED FOR RCZ

FUNCTION	DESIGNATION	TERMINALS ON PRINTED CIRCUIT BOARD
Line to CO	T	T
	R	R
2012B Transformer or Power Unit	1	1
	2	2
To Telephone Set, PBX, and/or Key System	T	T1
	R	R1
Disable AVC	Remove wiring option Y	Remove strap from 5 to 6
Disable Beep Tone*	Remove wiring option X	Remove strap from 3 to 4

\* Obtain supervisory permission before disabling beep tone or see service order.

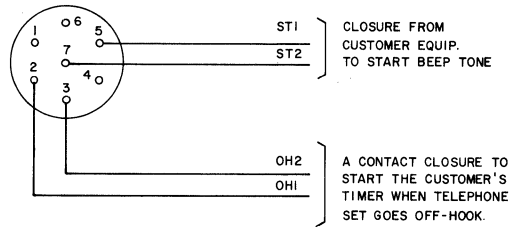


Fig. 6—Connections for Customer's SK-M7-21C-1/2 Plug From Timer (RTT) to KS-19645, List 2 (MD) Recorder Connector

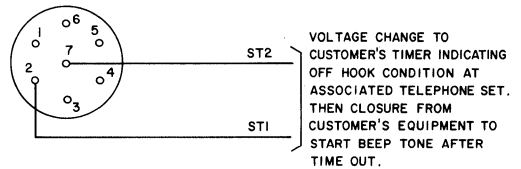
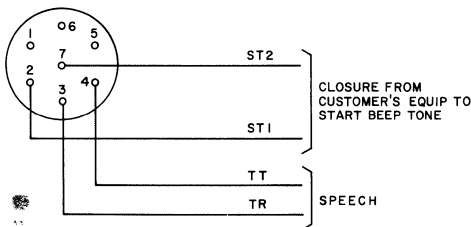


Fig. 7—Connections for Customer's SK-M7-21C-1/2 Plug From Timer (RC1) to KS-19645, List 2 (MD) Recorder Connector



NOTE:

22 VOLTS IS PRESENT BETWEEN LEADS ST1 AND ST2 WHEN ASSOCIATED TELEPHONE SET GOES OFF HOOK.

Fig. 5—Connections for Customer's SK-M7-21C-1/2 Plug From Voice Recorder (RCZ and 4-Wire Circuits) to KS-19645, List 2 (MD) Recorder Connector

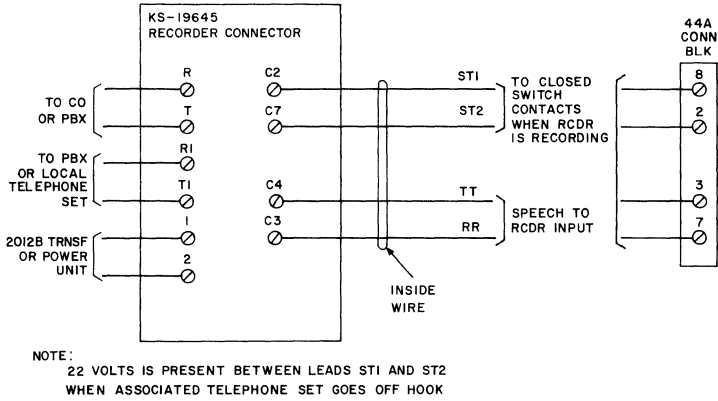


Fig. 8—Connections for KS-19645, List 4 Recorder Connector and CP Recorder (RCZ)

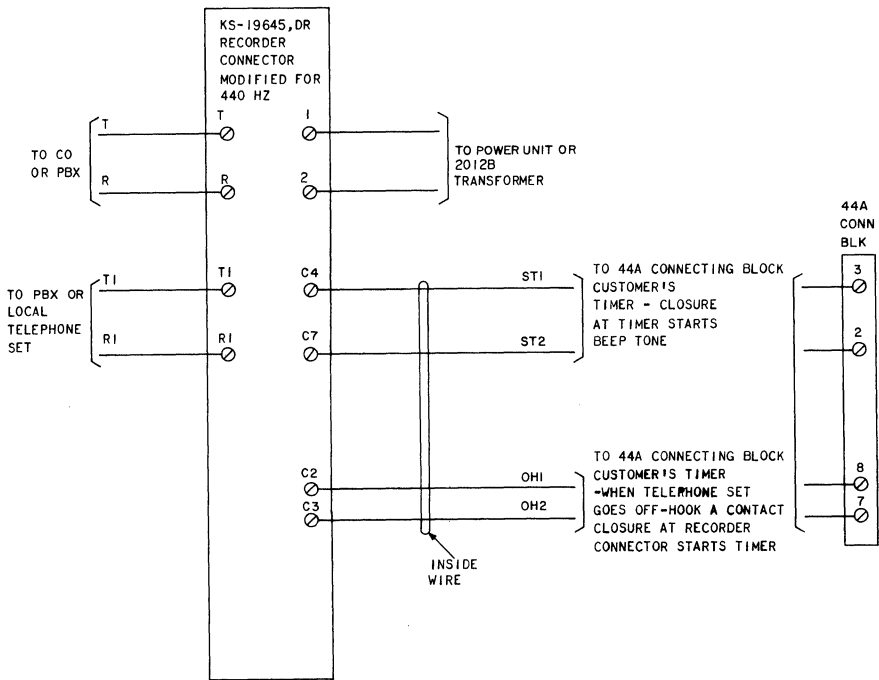


Fig. 9—Connections for KS-19645, List 4 "DR" Recorder Connector (RTT)

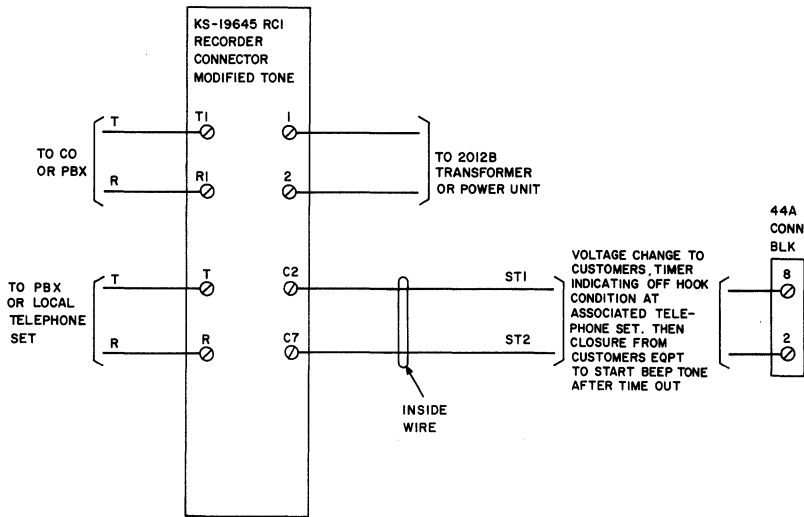


Fig. 10—Connections for KS-19645, List 4 "RC1" Recorder Connector (RC1)

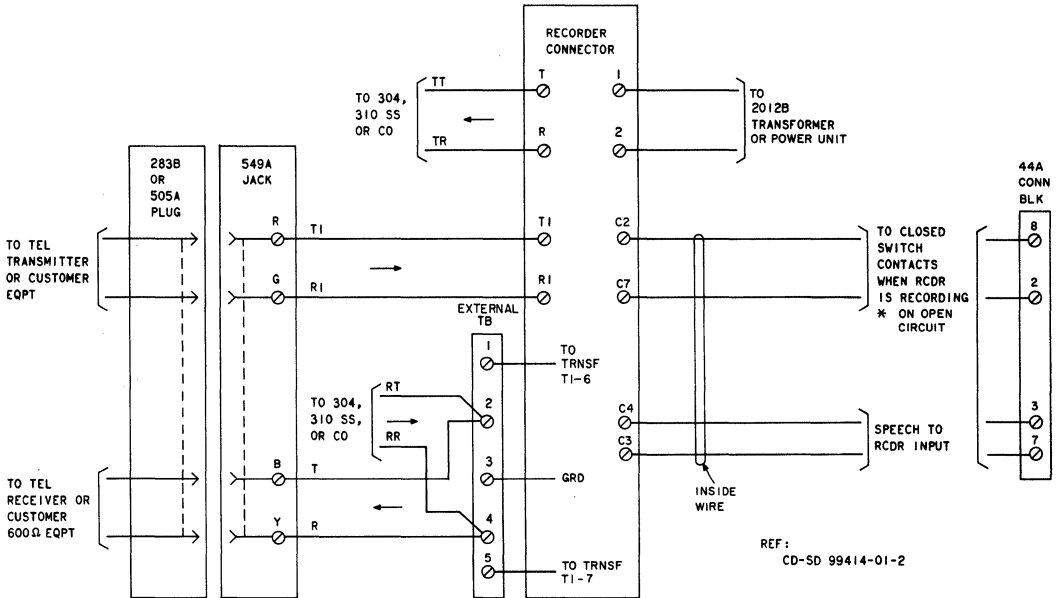
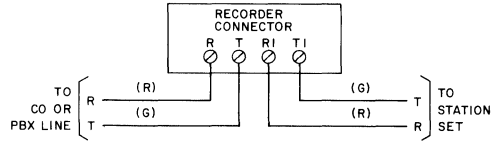


Fig. 11—Connections for KS-19645, List 4 "4W" Recorder Connector (RCZ)



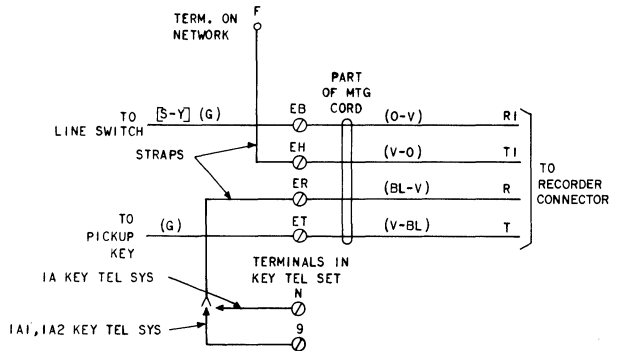
**Fig. 12—Connections Using 500- or 2500-Series Telephone Sets (RCZ)**

WIRE OR LEAD	565GK		1565GK, 2565GK		565HK		1565HK, 2565HK		565LK		1565LK, 2565LK	
	REMOVE FROM	CONN TO	REMOVE FROM	CONN TO	REMOVE FROM	CONN TO	REMOVE FROM	CONN TO	REMOVE FROM	CONN TO	REMOVE FROM	CONN TO
(G) KEY LEAD	F	ET	L2	ET	F	ET	L2	ET	F	ET	L2	ET
(G) [S-Y] LINE SWITCH	N	EB	9*	EB	9*	EB	9*	EB	9*	EB	9*	EB
ADD STRAPS		F TO EH * 9 TO ER		F TO EH * 9 TO ER		F TO EH * 9 TO ER		F TO EH * 9 TO ER		F TO EH * 9 TO ER		F TO EH * 9 TO ER

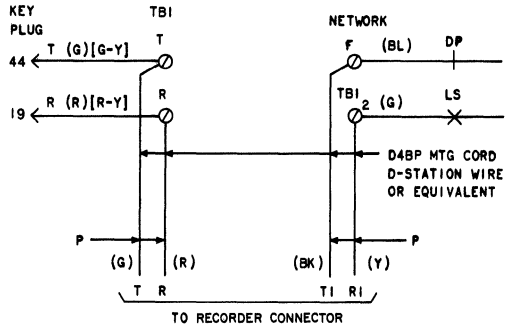
\* TERMINAL N IF SET IS MODIFIED FOR IA KTS

**NOTE:**

THIS IS A TYPICAL EXAMPLE USING 565 HK KEY TELEPHONE SET. REFER TO PARTICULAR TELEPHONE SET CONNECTIONS TO DETERMINE EQUIVALENT TERMINALS. USE EXCLUSION TYPE SETS TO PROVIDE SUFFICIENT CORD CONDUCTORS AND CONNECTION POINTS. EXCLUSION FEATURE CANNOT BE USED WITH THIS ARRANGEMENT IF 3-TYPE SPEAKERPHONE IS PROVIDED, MOVE (G-V) MTG CORD LEAD TO TERM. EB ALSO.



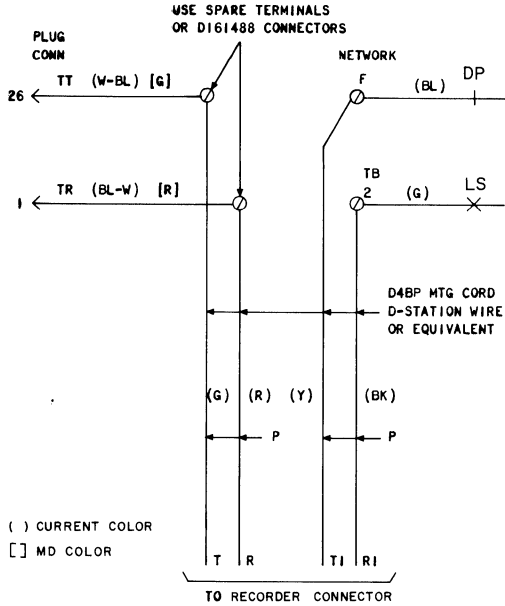
**Fig. 13—Record on All Lines Terminated in 560-, 1560-, or 2560-Series Key Telephone Sets (RCZ Application)**



NOTE:  
 CONNECTIONS SHOWN ARE FOR 630 OR 631 TYPE TELEPHONE SET.  
 REFER TO PARTICULAR TELEPHONE SET CONNECTIONS TO  
 DETERMINE EQUIVALENT TERMINALS.

WIRE OR LEAD	630, 631, 636, 637		2636 2637	
	REMOVE FROM	CONNECT TO	REMOVE FROM	CONNECT TO
(V-BL)	F AND T	STORE	4 AND T	STORE
(BL-V)	2 AND R	STORE	2 AND R	STORE
(G) MTG CORD LEAD	---	T ON TBI	---	T ON TBI
(R) MTG CORD LEAD	---	R ON TBI	---	R ON TBI
(BK) MTG CORD LEAD	---	F ON NET	---	4 ON TBI
(Y) MTG CORD LEAD	---	2 ON TBI	---	2 ON TBI

Fig. 14—Record on All Lines Terminated in 630-, 631-, 636-, 637-, 2636-, and 2637-Type Key Telephone Sets (RCZ Application)

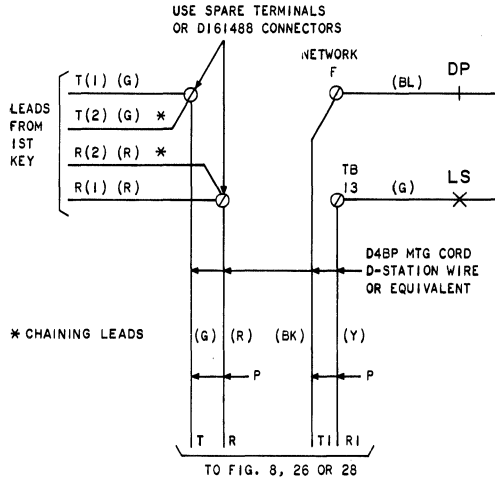


NOTE:  
CONNECTIONS SHOWN ARE FOR 634 OR 635 TYPE TELEPHONE SET. REFER TO PARTICULAR TELEPHONE SET CONNECTIONS TO DETERMINE EQUIVALENT TERMINALS.

WIRE OR LEAD	634D, 635D 2634, 2635		634DA, 635DA		2634DA, 2635DA	
	REMOVE FROM	CONNECT TO	REMOVE FROM	CONNECT TO	REMOVE FROM	CONNECT TO
(W-BL) TT	F ON NET	* (G) MTG CORD	F ON NET	* (G) MTG CORD	L2 ON NET	* (G) MTG CORD
(BL-W) TR	2 ON TB	* (R) MTG CORD	13 ON TB	* (R) MTG CORD	13 ON TB	* (R) MTG CORD
(Y) MTG CORD LEAD	—	F ON NET	—	F ON NET	—	L2 ON NET
(BK) MTG CORD LEAD	—	2 ON TB	—	13 ON TB	—	13 ON TB

\* USE D161488 CONNECTORS OR SPARE TERMINALS.

Fig. 15—Record on All Lines Terminated in 634-, 635-, 2634-, and 2635-Type Key Telephone Sets (RCZ Application)



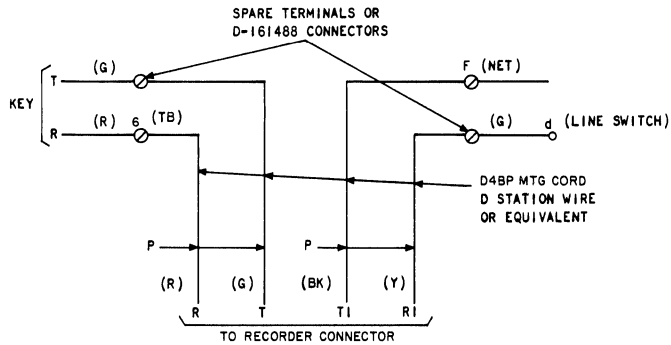
NOTE:  
 CONNECTIONS SHOWN ARE FOR 630DA OR 631DA TYPE TELEPHONE SET. REFER TO PARTICULAR TELEPHONE SET CONNECTIONS TO DETERMINE EQUIVALENT TERMINALS. CHAINING T AND R LEADS FROM FIRST KEY MUST BE MOVED TO SAME POINT AS T(1) AND R(1) LEADS.

WIRE OR LEAD	630DA, 631DA		2630DA, 2631DA	
	REMOVE FROM	CONNECT TO	REMOVE FROM	CONNECT TO
(G) T(1) T(2)	F ON NET	(G)* MTG CORD	12 ON TB	(G)* MTG CORD
(R) R(1) R(2)	13 ON TB	(R)* MTG CORD	13 ON TB	(R)* MTG CORD
(BK) MTG CORD LEAD	—	F ON NET	—	12 ON TB
(Y) MTG CORD LEAD	—	13 ON TB	—	13 ON TB

\* USE D161488 CONNECTORS OR SPARE TERMINALS

**Fig. 16—Record on All Lines Terminated in 630DA-, 631DA-, 2630DA-, and 2631DA-Type Key Telephone Sets (RCZ Application)**



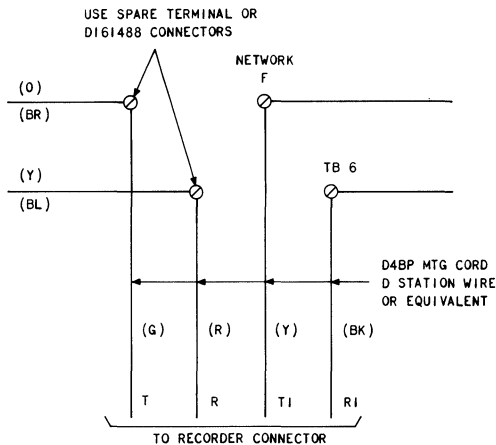


NOTE:  
CONNECTIONS SHOWN ARE FOR 830-TYPE KEY TELEPHONE SET, REFER TO PARTICULAR TELEPHONE SET CONNECTIONS FOR EQUIVALENT TERMINALS.

WIRE OR LEAD	830		831		2830, 2831	
	REMOVE FROM	CONNECT TO	REMOVE FROM	CONNECT TO	REMOVE FROM	CONNECT TO
(G) KEY LEAD	F (NET)	(G) * MTG CORD	—	—	—	—
(G) LINE SWITCH	6 (TB)	(Y) * MTG CORD	6 (TB)	(Y) * MTG CORD	6 (TB)	(Y) X MTG CORD
(G) 353CA DIAL	—	—	—	—	8 (TB)	(BK) X MTG CORD
(R) MTG CORD	—	6 (TB)	—	6 (TB)	—	6 (TB)
(BK) MTG CORD	—	F (NET)	—	F (NET)	—	—
(G) MTG CORD	—	—	—	8 (TB)	—	8 (TB)
(G) WIRE	—	—	F AND 8	STORE	—	—

\* USE SPARE TERMINAL OR D-161488 CONNECTOR

Fig. 17—Record on All Lines Terminated in 830-, 831-, 2830-, and 2831-Type Key Telephone Sets (RCZ Application)



WIRE	832, 2832 833, 2833		REMARKS
	REMOVE FROM	CONNECT TO	
O	F OF NET	* (G) MTG CORD	MOVE (O) TEL SET LEAD WHEN TEL SET <u>NOT</u> EQUIPPED WITH PRIVACY FEATURE
BR	F OF NET	* (G) MTG CORD	MOVE (BR) LEAD OF PRIVACY BOARD WHEN TEL SET <u>IS</u> EQUIPPED WITH PRIVACY FEATURE
Y	6 ON TB	* (R) MTG CORD	MOVE (Y) TEL SET LEAD WHEN TEL SET <u>NOT</u> EQUIPPED WITH PRIVACY FEATURE
BL	6 ON TB	* (R) MTG CORD	MOVE (BL) LEAD OF PRIVACY BOARD WHEN TEL SET <u>IS</u> EQUIPPED WITH PRIVACY FEATURE

\* USE D161488 CONNECTORS OR SPARE TERMINAL

Fig. 18—Record on All Lines Terminated in 832-, 2832-, 833-, and 2833-Type Key Telephone Sets (RCZ Application)

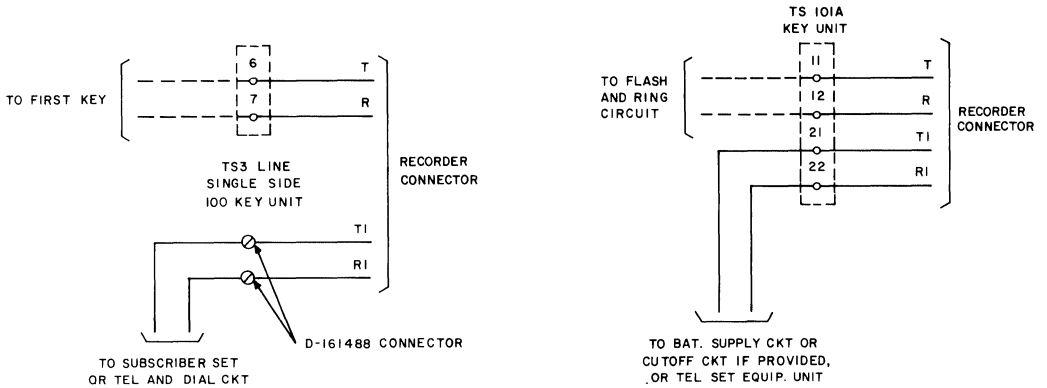
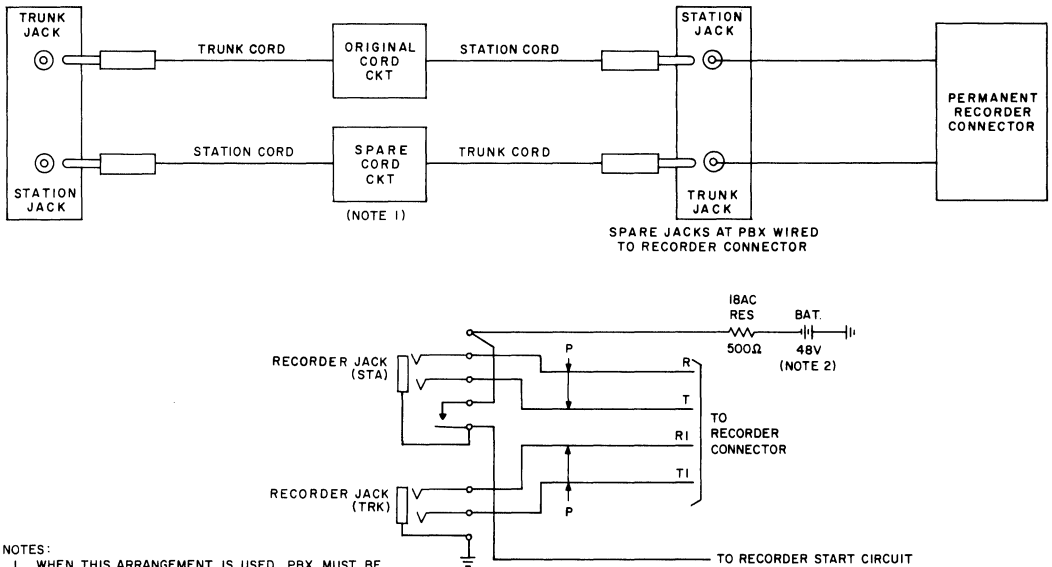


Fig. 19—Connections and Modifications Using 100- or 101-Type Key Units (RCZ Application)



- NOTES:
1. WHEN THIS ARRANGEMENT IS USED, PBX MUST BE WIRED FOR NONTHROUGH SUPERVISION.
  2. REQUIRED WHEN RECORDER CONNECTOR IS USED WITH 552A, 552B, 552D, 552E, 605A OR 701A PBX USING CORD CIRCUIT DRAWING SD-66198-01.

Fig. 20—Connections to Attendant Telephone Circuit for Cord-Type PBX (RCZ Application)

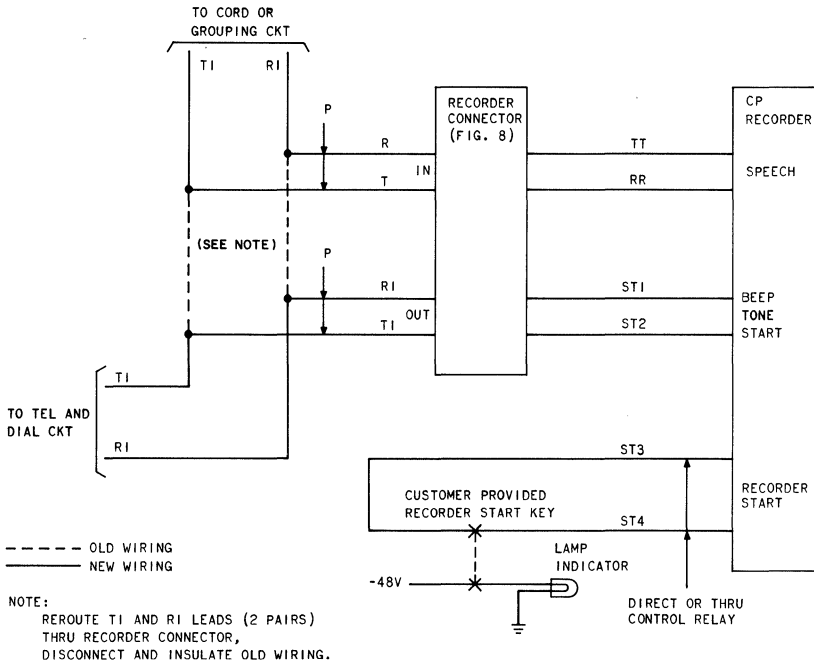
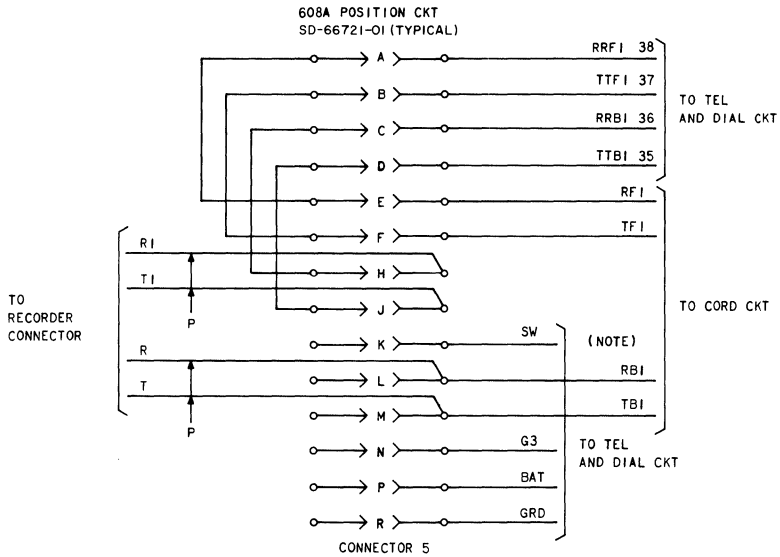
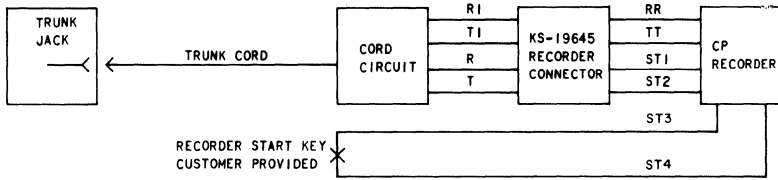


Fig. 21—Connections to Attendant Telephone Circuit for 552- or 605-Type PBX (RCZ Application)



NOTE:  
RELOCATE LEADS RB1 AND TB1 FROM CONNECTOR PINS  
H AND J TO PINS L AND M. RUN TWO PAIRS FROM  
CONNECTOR 5 TO RECORDER CONNECTOR

Fig. 22—Connections to Attendant Telephone Circuit for 608-Type PBX (RCZ Application)

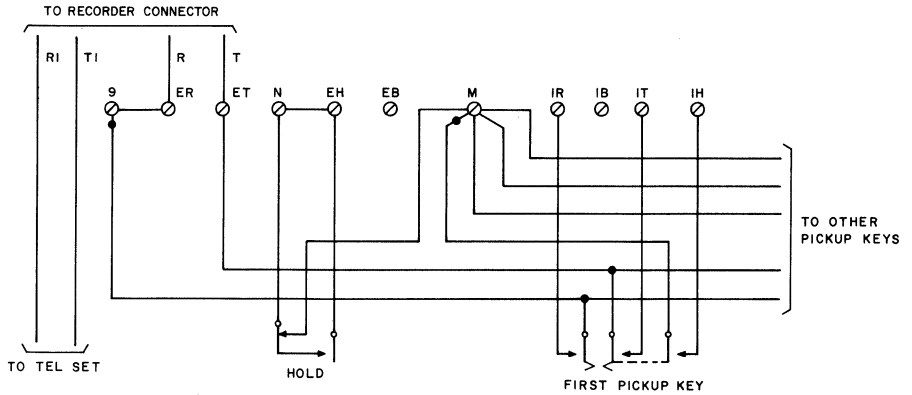


Fig. 23—Connections Using 6040G Key (RCZ Application)

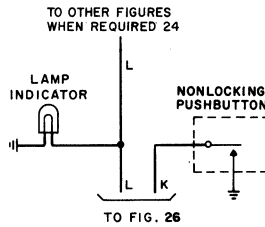


Fig. 24—Key and Lamp Circuit (RCZ Multistation Application)

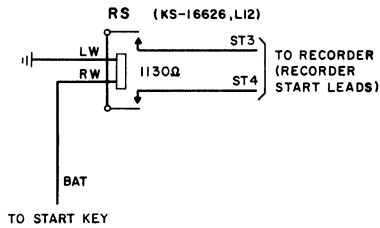
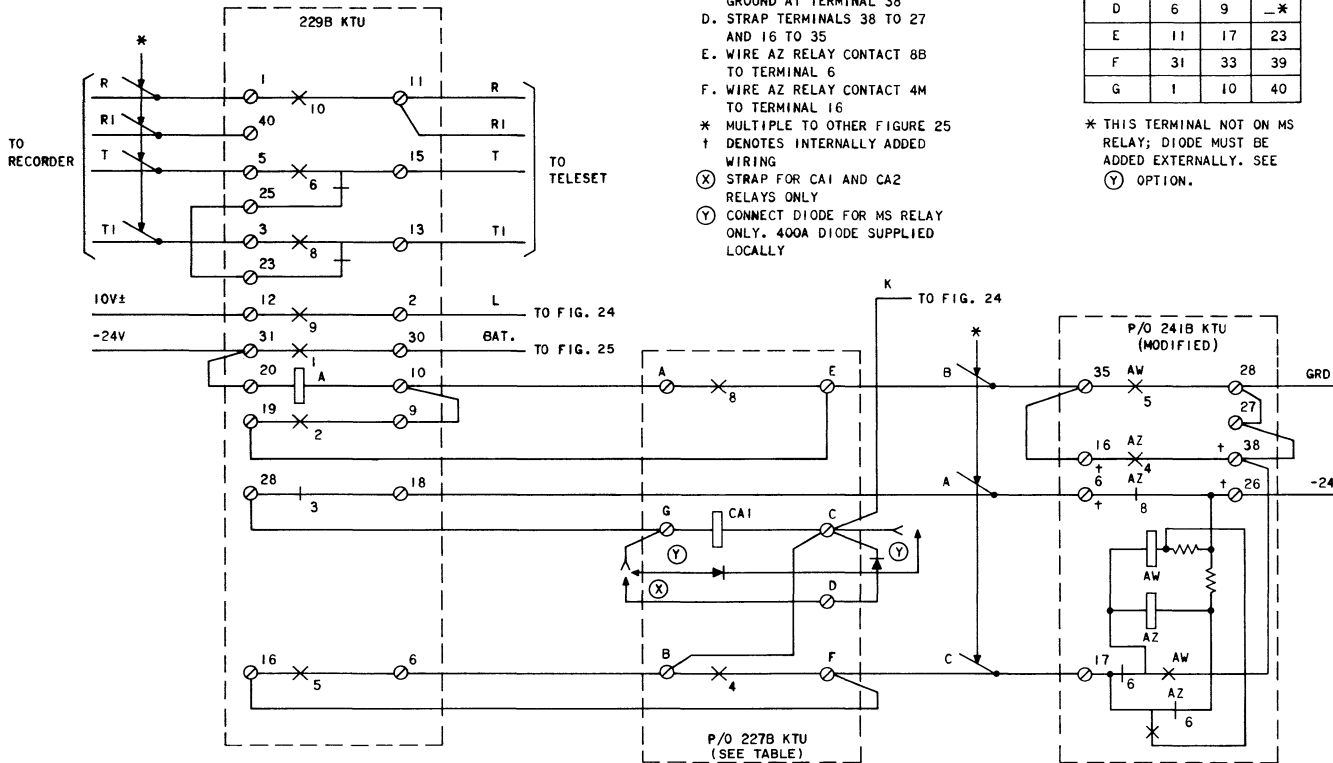
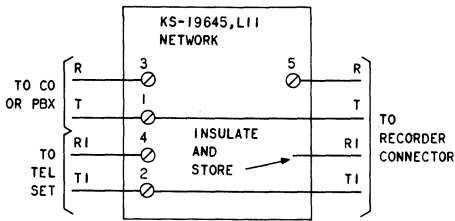


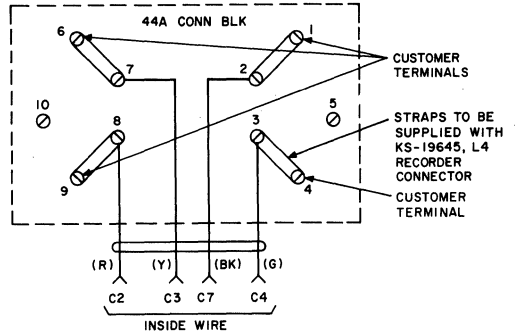
Fig. 25—Recorder Start Circuit (RCZ Application)



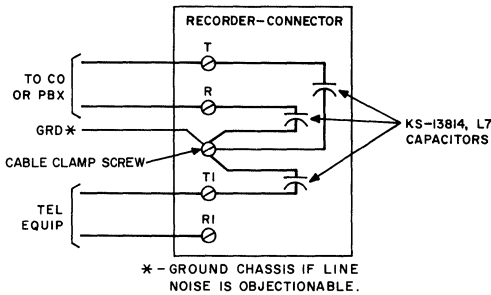
**Fig. 26—Multistation Circuit (RCZ Application)**



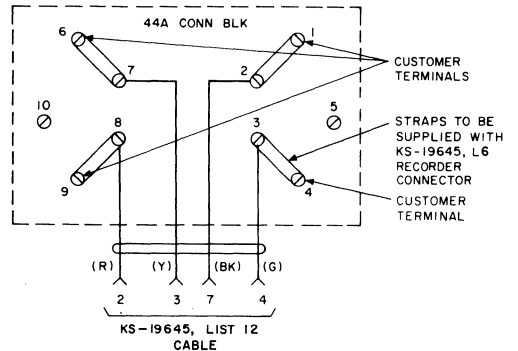
**Fig. 27—Connections Using KS-19645, List 11 Network (RCZ Application)**



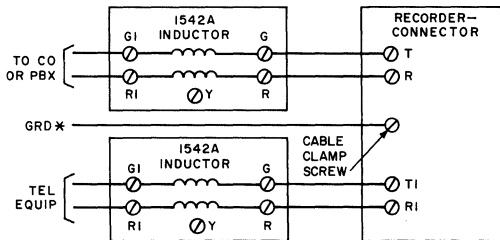
**Fig. 30—Connection of Inside Wire From KS-19645, List 4 Recorder Connector to 44A Connecting Block**



**Fig. 28—Connections Using KS-13814, List 7 Capacitors (RCZ Application)**



**Fig. 31—Connection of KS-19645, List 12 Cable From the KS-19645, List 6 Recorder Connector to the 44A Connecting Block**



**NOTE:**  
CAPACITORS MAY ALSO BE ADDED IN SAME MANNER AS SHOWN IN FIG. 28 TO OBTAIN ADDITIONAL SUPPRESSION.  
\* - GROUND CHASSIS IF LINE NOISE IS OBJECTIONABLE.

**Fig. 29—Connections Using 1542A Inductors (RCZ Application)**



## VOICE CONNECTING ARRANGEMENT C2ACP

### 1. GENERAL

**1.01** This section provides identification, installation, operation, maintenance and connection information on the 102-type interconnecting unit (IU), 604-type panel, or 615A panel when used in Voice Connecting Arrangement (VCA) C2ACP.

**1.02** This section is reissued to:

- Include information on the 615A panel
- Include information on the 604C panel
- Include information on the KS-20944 protector
- Add use of 142A test set
- Remove information on use of 69G apparatus mounting in new installations.

**1.03** The 102B IU (Fig. 1) is an improved version of the 102A IU with option terminals for line impedance matching. No pulse correction is required. In existing installations using pulse correction, the 103A pulse correctors must be removed when replacing the 102A IUs with 102B IUs. The 102B IU also increases the range limitation to the customer-provided equipment (CPE) from 18 ohms to 100 ohms maximum on the supervision leads (CS and CG).

**1.04** Refer to Sections 463-300-101 and 463-300-102 for information on the 604A, 604B, and 604C panels. Refer to Section 463-300-104 for information on the 615A panel, Section 463-300-113 for information on the 142A test set, and Section 463-300-109 for information on the KS-20944 protector.

**1.05** The size of the initial installation and the expected growth should be the determining factor in selecting the proper equipment. For one to six circuits using the 102-type IU, use 615A panel. For seven to fourteen circuits use the 604-type panel. Connections are provided for the 69G apparatus mounting, but it should be used on an Additions and Maintenance (A&M) only basis.

**1.06** If the customer wants a copy of the Technical Reference which covers this specification, the customer should contact the local Telephone Company Business Office or the Marketing Representative.

**1.07** This issue of the section is based on the following drawings:

SD-1E238-01, Issue 5B—102B IU

SD-1E202-01, Issue 5D—102A IU

SD-1E200-01, Issue 2D—604A Panel

SD-1E258-01, Issue 1—142A Test Set

SD-69599-01, Issue 2A—69G Apparatus Mounting.

If this section is to be used with equipment or apparatus reflecting later issue(s) of the drawing(s), reference should be made to the SDs and CDs to determine the extent of the changes and the manner in which the section may be affected.

### 2. IDENTIFICATION

#### PURPOSE

##### VCA C2ACP

- To provide an interface between CPE and a *loop-start* central office (CO) line
- To provide network control signaling function
- To limit excessive signal levels from CPE and to provide protection for telephone company personnel against hazardous voltages.

##### CA VCP

- To provide an interface between CP power supply and VCA C2ACP
- To provide protection for personnel against hazardous voltages.

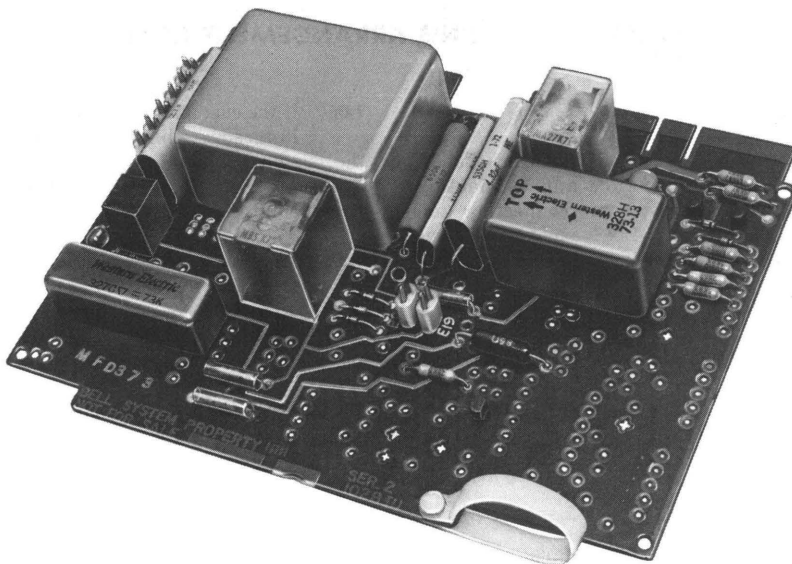


Fig. 1—102B Interconnecting Unit

#### APPLICATION

- Voice Connecting Arrangement C2ACP provides an automatic connection of customer-provided (CP) terminal equipment, typically key systems, to an exchange line or WATS access line.

#### ORDERING GUIDE

##### VCA C2ACP

- Unit, Interconnecting, 102A or 102B (one per CO line, Fig. 1).

**Note:** If 102A IUs are used in position 13 or 14 (trunk 9 or 14) of a 604B or 604C panel, 102A IUs must also be used in positions 1, 4, 7 or 10 (trunks 1, 3, 5 or 7).

##### Associated Apparatus (Order Separately)

**Note:** If a 23-inch relay rack is not provided on customer premises, provide a 16C apparatus mounting (or equivalent) for the 69G or 615A

panel, or an ED-91180-72, Group 21 cabinet (or equivalent) for the 604-type panel.

- Panel, 604A1, (fuse panel only—no power unit; mounts fourteen 102-type IUs)
- or
- Panel, 604A2 (19C2 power unit and fuse panel, mounts fourteen 102-type IUs)
- or
- Panel, 604B or 604C (fuse panel only—no power unit; mounts fourteen 102-type IUs)—Use 604B panel if supply voltage is  $-48V$ ; use 604C if supply voltage is  $-24V$ .
- Panel, 615A (fuse panel only—no power unit; will mount up to three 102-type IUs, Fig. 4)
- Unit, Apparatus, 21A (one required to convert 604C to  $-48V$  operation)
- Bracket, 99B (one per three 615A panel)

- Cable, A25B (two per 69G, one per 615A-type panel or up to four per 604-type panel) (See Table A.)
- Cable, A50B (one per 604-type panel) (See Table A.)
- Cable, A75B (one per 604-type panel) (See Table A.)
- Block, Connecting, 66M1-50 (as required, Fig. 2)
- Block, Connecting, 66B4-25 (as required)
- Clip, Bridging, B (as required, Fig. 2)
- Block, Connecting, 66E3-25 (optional, Fig. 3)

◆ **Note:** Other type blocks should not be used due to incompatibility with the 142A test set connections.

- Cable, D Inside Wiring, or equivalent (for cabling from 66B4-25 intermediate connecting block to the 66M1-50 interface connecting block and for making trunk connections to 615A panel)
- Unit, Power, 19C2, or equivalent (for 604A1, 604B, 604C or 615A panels when existing KTS power supply is insufficient)
- Unit, Key Telephone, 201C (if required, for fusing 69G; see 3.03)
- Cord, Power (for 19C2 power unit or 604A2 panel)
  - P40J326 (1-1/2 ft)
  - P40J327 (2 ft)
  - P40J328 (4 ft)
  - P40J329 (6 ft)
  - P40J099 (12 ft)
- KS-20944, L1 or KS-20944, L2 Protector (for optional power protection).

**Note:** Must be provided when the customer supplies power. Use L1 protector for -24 volts dc; L2, -48 volts dc.

#### Replaceable Components (For 604-Type Panel)

- Fuses, 70G (1/2 ampere, 18 per 604A-type panel)
- Fuses, 70A (1-1/3 ampere, 3 per 604B and 604C panels)
- Fuses, 70F (1/4 ampere, 13 per 604B and 604C panels)
- Fuses, 70G (1/2 ampere, 2 per 604B and 604C panels)
- Lamps for Indicator, 17C-49 (for optional fuse alarm if required; for 604B and 604C panels only).

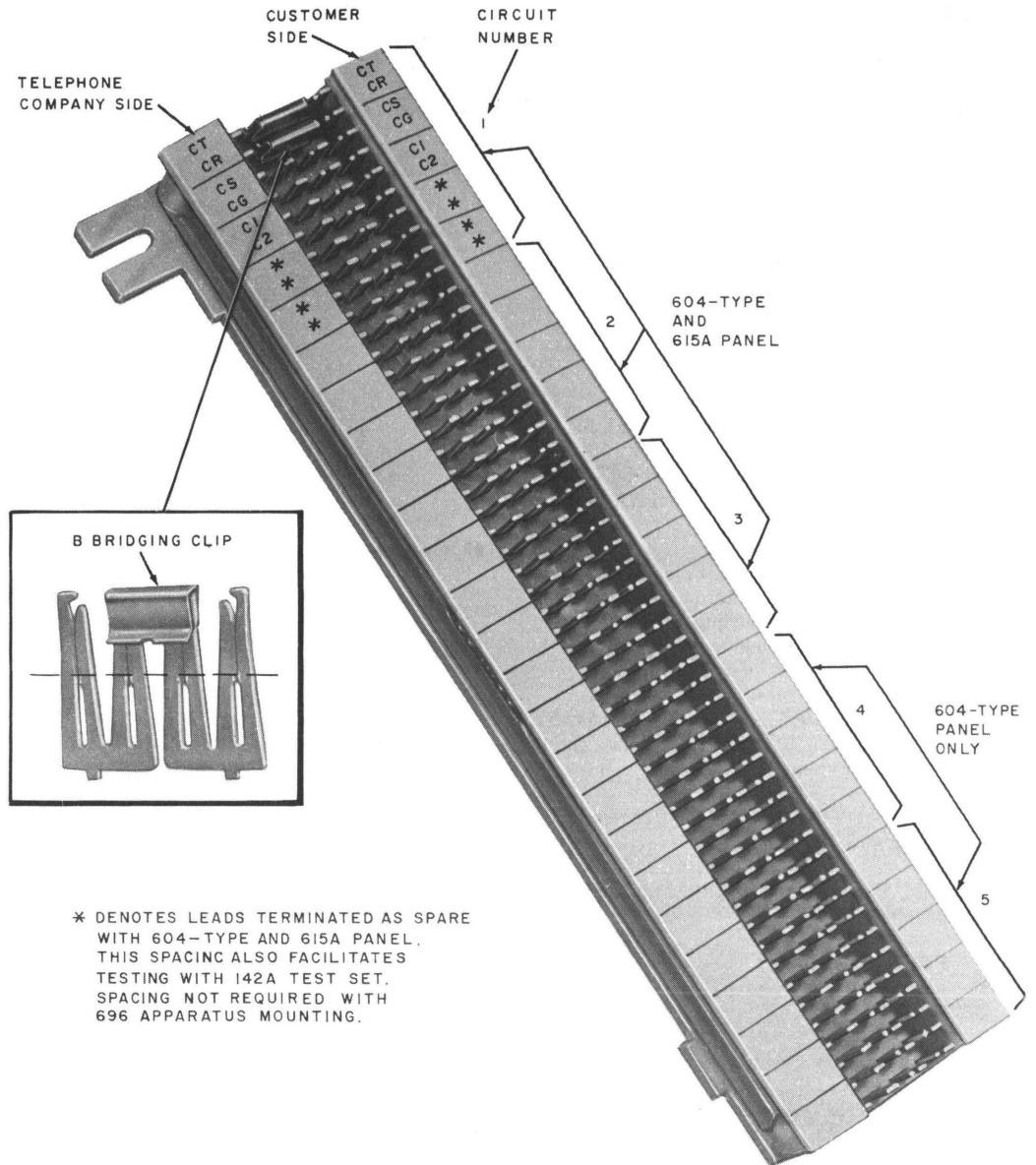
#### ◆ Replacement Component (615A Panel)

- Fuse, 24E (1/2 ampere, 8 per panel)

#### DESIGN FEATURES

##### 102-Type Interconnecting Unit (Fig. 4)

- Components mounted on epoxy coated 8-inch 80-pin board
- Provides voice frequency coupling to CPE
- 2-way loop-start operation
- Option terminals (Fig. 1)
- Features line impedance matching options (102B only)
- Requires 0.090 ampere maximum at 26 volts dc for 102B IU
- Requires 0.110 ampere maximum at 26 volts dc for 102A IU
- Provides dc isolation to CPE
- Limits excessive signals
- Permits tone address signaling from behind CPE.



\* DENOTES LEADS TERMINATED AS SPARE WITH 604-TYPE AND 615A PANEL. THIS SPACING ALSO FACILITATES TESTING WITH 142A TEST SET. SPACING NOT REQUIRED WITH 696 APPARATUS MOUNTING.

Fig. 2—66M1-50 Interface Connecting Block

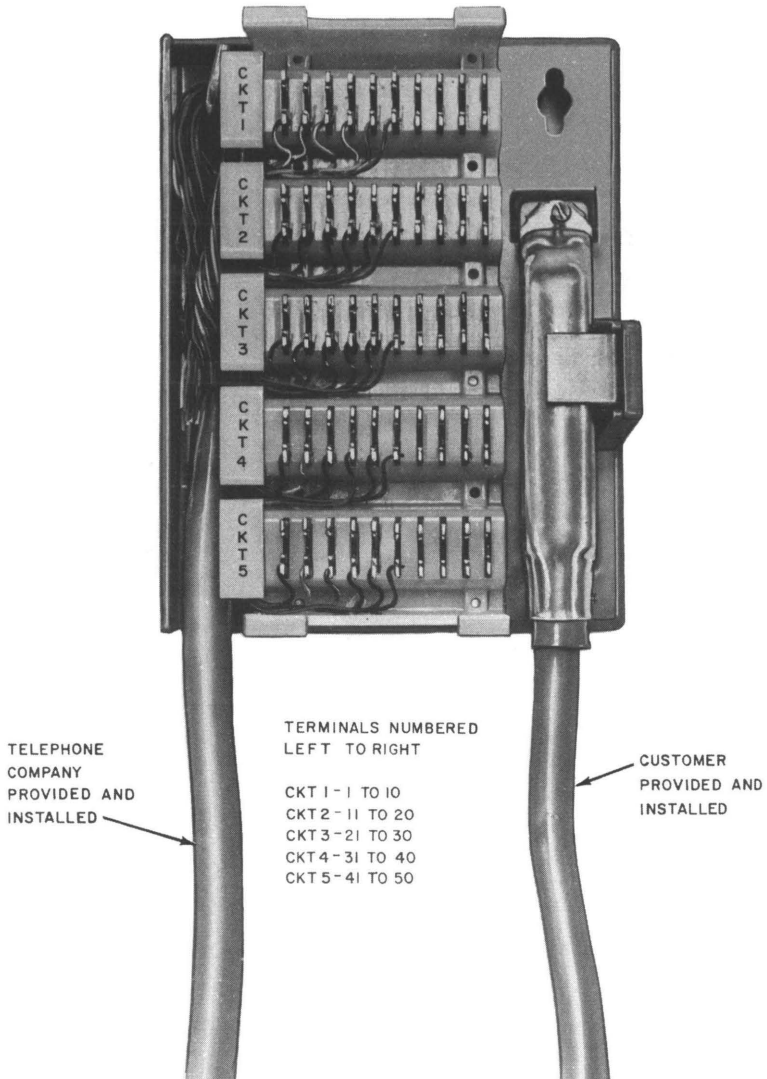


Fig. 3—66E3-25 Interface Connecting Block (Optional)

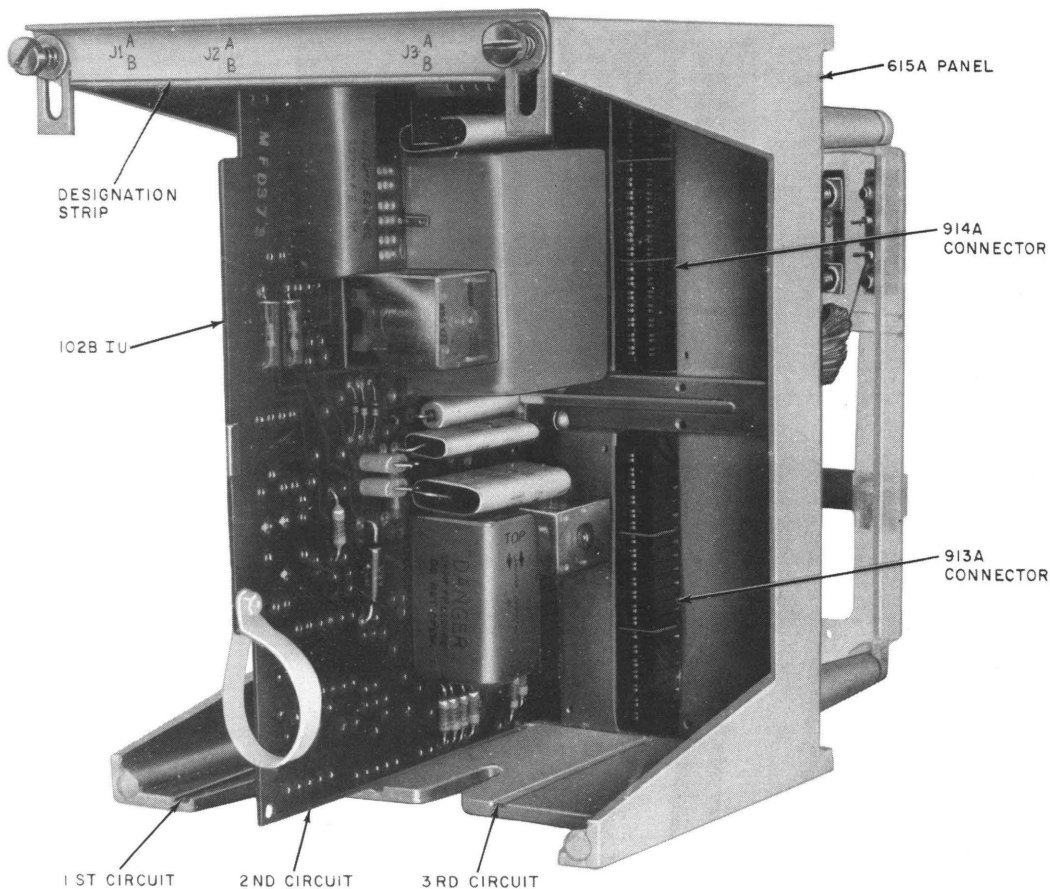


Fig. 4—102B Interconnecting Unit Mounted in 615A Panel

### 3. INSTALLATION

#### 69G Apparatus Mounting (Fig. 5)

3.01 The 69G apparatus mounting should not be used for new installations of VCA C2ACP. Refer to Fig. 5 for connections used in existing installations.

#### 604-Type Panel (Fig. 6)

3.02 The 604-type panel will mount on a standard relay rack, or in an ED-91180-72, Group 21,

18-plate equipment cabinet or equivalent. Connect frame ground to rack or cabinet.



*The 18-plate equipment cabinet will house two 604A-type, three 604B and 604C with external power unit, two 604B and 604C panels with power unit when the drawing holder on the lower half of the equipment cabinet cover is removed.*

3.03 Telephone circuit connection is made to the 604-type panel through connector cables.

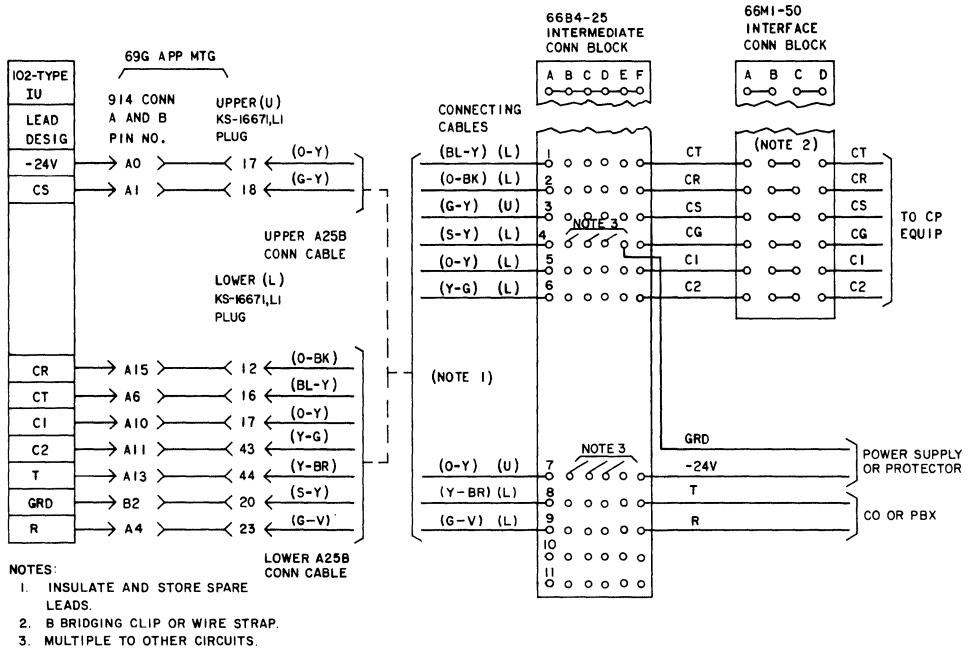
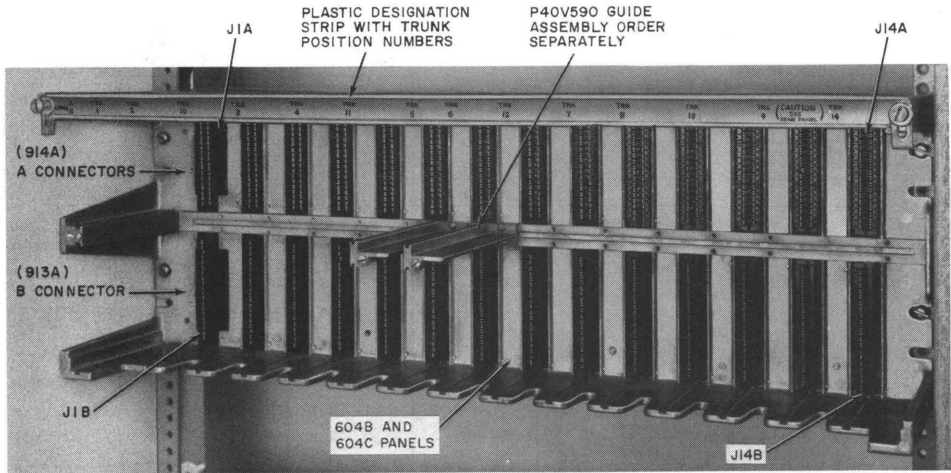


Fig. 5—Connection Diagram for 69G Apparatus Mounting



INSTALLATION SEQUENCE OF INTERCONNECTING UNITS

TRUNK NO.	1	2	10	3	4	11	5	6	12	7	8	13	9	14
POSITION NO.	1	2	3	4	5	6	7	8	9	10	11	12	13	14

Fig. 6—604B and 604C Panels (Front View)

Arrangement of the KS-16671, L1 plugs on the panel restricts the first plug (for CO lines) to an A25B connector cable. Plugs 2 through 4 (for CPE) are arranged to adapt to a choice of cable

sizes (see Table A). Plug 5 (604A-type only) is dedicated to one-way incoming trunks only and is not used in this application.



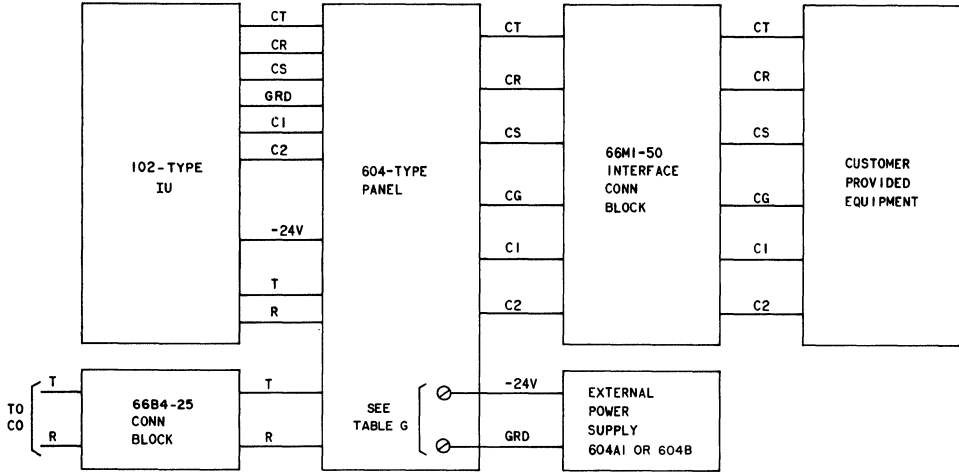


Fig. 7—Block Diagram—102-Type Interconnecting Unit With 604-Type Panel

**3.04** Terminate the raw end of connector cable 1 on a 66B4-25 connecting block for the CO lines (Table B). Terminate the raw end of connector cables 2, 3, and 4 on the 66M1-50 interface connecting block following the wiring plan shown in Tables C, D, and E. Stencil lead designations on the 66M1-50 interface connecting block as shown in Fig. 2).

**3.05** The customer must provide a 105- to 130-volt, separately fused, 60-Hz outlet within reach of available power cords (see Ordering Guide for cord lengths). This outlet should *not* be under the control of a wall switch.

**3.06** If an external telephone company-provided power supply is used (604A1, 604B or 604C only), or CP dc power supplied through the KS-20944 protector, connect to fuse panel on rear of 604A1, 604B, and 604C as shown in Fig. 7 and Table G (use 16-gauge or equivalent twisted pair). The 604A, 604B, and 604C panels operate on externally supplied -24 volts. The 604B can be adapted to -48 volt operation by putting the option straps in the down position. The 604C can be adapted to -48 volt operation by adding a 21A apparatus unit and putting the option straps in

the down position. Refer to the appropriate section in Division 167 for proper grounding of power plants. Proper grounding of equipment and power unit is important to prevent damage from power line surges.

**TABLE A**  
**OPTIONAL CABLE ARRANGEMENTS TO PROVIDE CONNECTIONS FOR FOUR PLUGS ON 604-TYPE PANEL**

CABLE DESIGNATION (NOTE)	MAXIMUM NO. OF CABLES REQUIRED ARRANGEMENTS (SEE 3.03)		
	ARGT 1	ARGT 2	ARGT 3
A25B	4	2	1
A50B		1	
A75A			1

**Note:** Arrangement of interconnecting units and local requirements will determine the size and maximum length of cable required.

**3.07** The 66M1-50 interface connecting block should be located near the connecting arrangement. The customer must terminate the CPE on the 66M1-50 interface connecting block using the six terminals stenciled on the customer side.

**3.08** As a customer option, the 66E3-25 interface connecting block may be used and located not further than 200 feet from the equipment. The 66E3-25 block provides an Amphenol connector for up to five lines. The customer must terminate the CPE using an Amphenol No. 57-10500-7 plug, Cinch No. 223-32-50-023 plug, or equivalent. When using the 66E3-25 optional interface connecting block, refer to Fig. 3 and Table F for terminal and pin numbers.

**3.09** The 21A apparatus unit is attached to the rear of the 604C panel using four 8-32 by 3/16-inch screws supplied with the apparatus unit as a loose item. Electrical connection to the 604C panel is made by attaching any of the red lead wires to the 48-volt option terminals and any of the red-black lead wires to the 24-volt option terminals, one lead per terminal (total 6 leads).

#### 615A Panel (Fig. 8)

**3.10** The 615A panel is mounted on a standard relay rack or 16C apparatus mounting (or equivalent) using the 99B bracket. The 99B bracket will hold three 615A panels. Remove the center mounting bar from the 16C apparatus mounting to avoid cover interference.

**3.11** An A25B (or equivalent) connector cable is used to connect the 615A panel to the 66M1-50 interface connecting block. The A25B connector cable plugs into plug P1 on the rear of the 615A panel. The raw end of the A25B connector cable is terminated on the telephone company side of the 66M1-50 interface connecting block according to standard even-count color code (Table J). Lead designations are stenciled on the 66M1-50 interface connecting block as required.

**3.12** The customer must terminate the CPE on the 66M1-50 interface connecting block using the terminals on the customer side.

**3.13** D inside wiring cable is used to extend the T and R leads from the CO or PBX connecting

block to the 66T1 connecting block on rear of the 615A panel. (See Table L.)

**3.14** The telephone company-provided power supply or CP 24V dc power supplied through the KS-20944, List 1 protector is terminated on the 66T1 connecting block as shown in Table G. Use 20-gauge wire and remove insulation before placing in clip terminals.

**3.15** Refer to the appropriate section in Division 518 for proper grounding of power units. Proper grounding of equipment and power unit is important to prevent damage from power line surges.

#### 102-Type Interconnecting Unit (Fig. 1, 9, or 10)



*To protect transistors and other electrical components of 102-type IUs, remove fuse associated with that particular circuit before installing or replacing a unit. (See Tables H and I for 604-type panels and Table K for 615A panel.)*

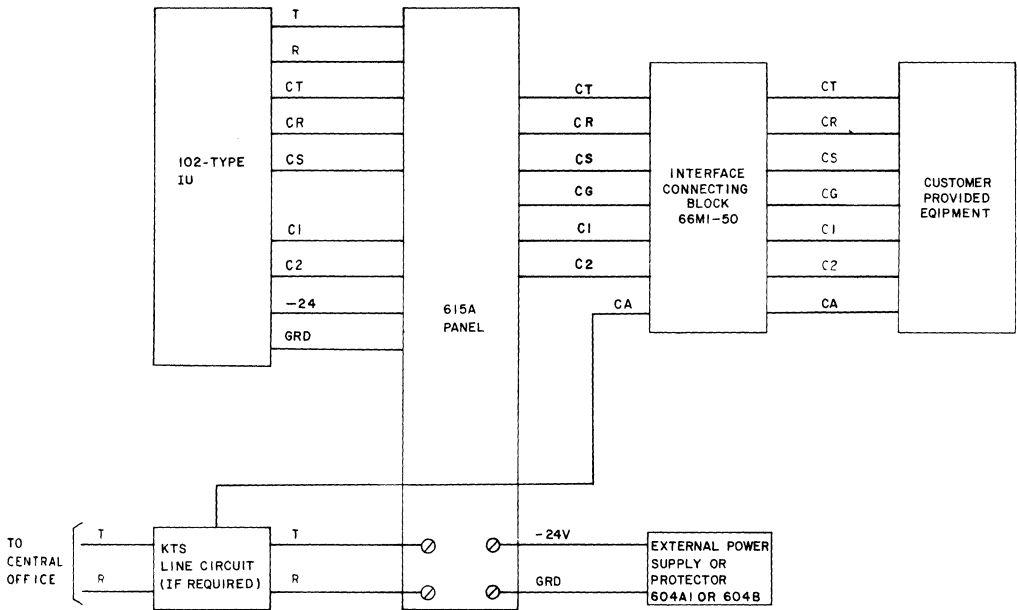
**3.16** Select proper option straps for options W, Y, and Z from Fig. 9 or 10 for local conditions. Always use option Z for the 102A IU and use bare wire for strapping. Option Z is required only when PBX-CO trunk facility is designed with terminating sets or 837-type impedance compensators that have 900 ohms input impedance. Use option W for 102B IUs when the external circuit resistance (including CO resistance) is greater than 800 ohms in the talking state.



*Be sure all option straps have been installed and check for continuity after strapping.*

**3.17** Loosen screw securing retaining clip (69G) or designation strip holder (604-type or 615A) to apparatus mounting or panel and raise clip or holder to provide access.

**3.18** Position the board in the guide grooves and slide the unit in until it is properly seated in the connector. The 604B and 604C panels have a P13B354 clip between contacts 9 and 10 in the lower position connector that must be removed when using the 102A IU. The 604-type panels are electrically equivalent for this VCA and are



**Fig. 8—Block Diagram—102-Type Interconnecting Unit With 615A-Type Panel**

interchangeable if this clip is removed. The 102B IUs have a slot for this clip.⚡

**3.19** Position retaining clip or designation strip holder to hold 102-type IU securely.

**3.20** Stencil circuit designation information as required on retaining clip or designation strip. ⚡On 604C and current production of the 604B panels the designation strip is marked to show trunk numbering. Earlier production of the 604B showed position numbers.⚡

**3.21** For the 604-type panel, refer to Fig. 6 for installation sequence of 102-type IUs. This suggested sequence is established to correspond to the plug arrangement.

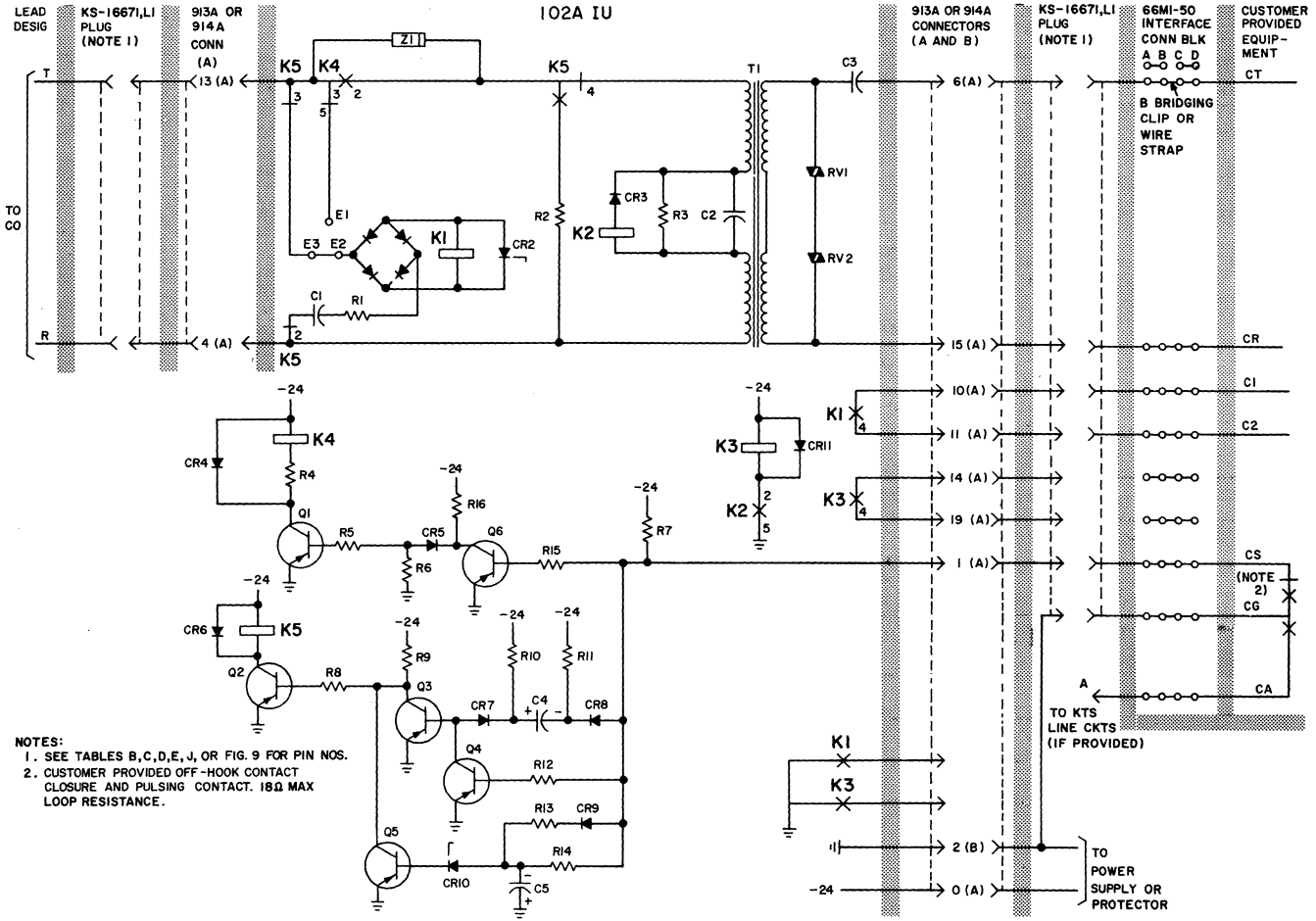
**3.22** If 102A IUs are used in position 13 or 14 (trunk 9 or 10) of the 604B or 604C panel, 102A IUs must also be used in positions 1, 4, 7 or 10 (trunks 1, 3, 5 or 7).

**3.23** ⚡When installing IUs in the 615A panel, position the boards in the grooves of the panel and slide the unit in until it is properly seated in the connector. The code slots on the IUs match the index clips between contacts 5 and 6, and 12 and 13 in the connector. Lower the designation strip holder and lock down to hold the IUs securely in place. Refer to Fig. 11 for installation sequence of IUs in the panel to correspond to the plug wiring arrangement.

**3.24** After installation is completed, apply power and perform tests shown in Part 5. To protect the electrical components of IUs, always remove the fuse associated with that particular circuit before removing or installing an IU. See Tables H, I, and K.⚡

#### **KS-20944 Protector (Fig. 12 and 13)**

**3.25** ⚡When voltage protection is required, the KS-20944 protector must be mounted externally and wired to the power supply terminals of the 604-type and 615A panel. (See Fig. 7 and 8.)



**Fig. 9—Schematic Diagram—102A Interconnecting Unit (MD)**

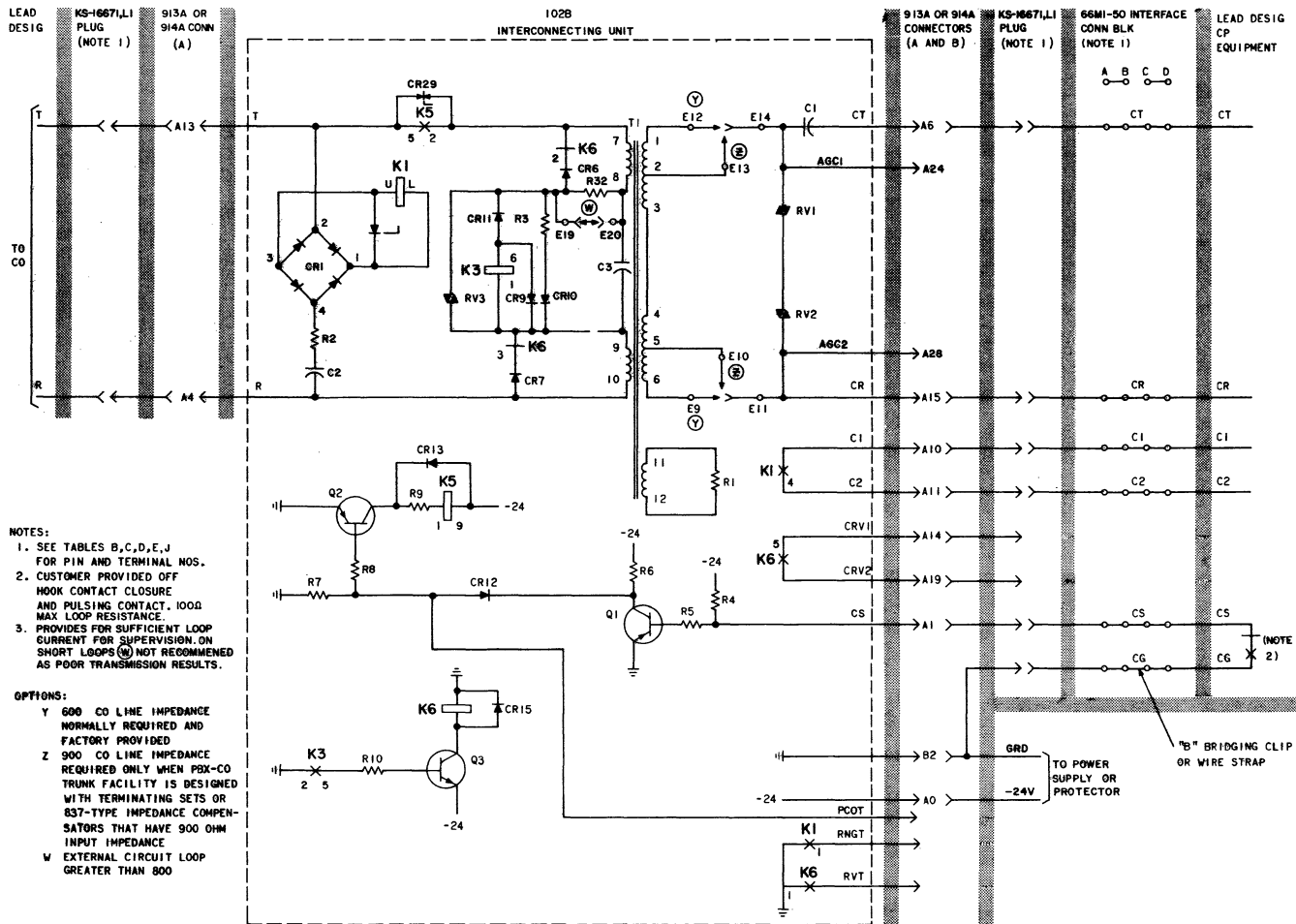
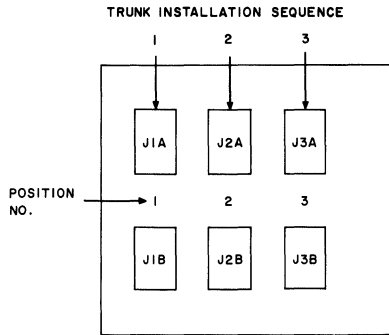


Fig. 10—Schematic Diagram—102B Interconnecting Unit



**Fig. 11—Connector and Trunk Arrangement in 615A Panel**

**3.26** Set circuit breaker lever to OFF and connect as shown in Fig. 13 following local wiring instructions. The customer must connect his power supply to the red (GRD) and black (-V) 14-gauge leads extending from the unit.

**Caution:** *Voltage will be present on (upper) terminals 1 of circuit breakers as soon as customer power is connected.*



*Check for correct polarity and ground before closing switch.*

#### 4. OPERATION

##### 102B Interconnecting Unit (Fig. 10)

**4.01 Incoming Call:** When the CO seizes this circuit on an incoming call, ringing current is applied across the tip and ring. K1 relay in the ringing bridge operates and provides a contact closure to the C1 and C2 leads to the CPE which opens and closes in unison with the ringing cycle. When the customer answers, the CPE provides a contact closure to the CS and CG leads causing K5 relay to operate. The K5 relay operated closes the loop to the CO which trips the ringing, shunts the ringing bridge releasing K1, and closes the transmission path to the CT and CR terminals through T1.

**4.02 Outgoing Call:** When the customer goes off-hook, the CPE provides a contact closure to the CS and CG leads causing K5 relay to operate. The K5 relay operated closes the loop to the CO and closes the transmission path to the CT and CR terminals. The CO recognizes the loop closure and returns dial tone over the CT and CR leads to the CPE. After receiving dial tone, the dialing contacts in the CPE pulse the closure on the CS and CG leads. The K5 relay operates in unison with the CP dialing contacts to repeat the dial pulses to the CO. After completion of dialing the K5 relay restores the transmission path to the CT and CR leads. When the customer is using tone address signaling and goes off-hook to dial out, the CPE provides a contact closure across CS and CG leads. This causes K5 relay to operate closing the loop to the CO and cutting through the transmission path. Dial tone is then returned to CT and CR leads. The customer may then dial over the CT and CR leads.

**4.03 Disconnect:** When the CPE goes on-hook removing the contact closure from the CS and CG leads, K5 relay releases. The K5 relay released opens the loop to the CO, removes the shunt from the ringing bridge connected to the tip and ring, and opens the transmission path.

**Note:** The 102A IU operates similarly to the 102B IU but uses different relay designations.

##### KS-20944 Protector (Fig. 12)

**4.04** The KS-20944 protector is used to protect the Bell System personnel from hazardous voltages but may not protect equipment from component failures. The KS-20944 protector provides a switch to disconnect ac and dc power when working on IUs.

**4.05** The KS-20944 protector consists of a dc voltage-operated circuit breaker in series with a parallel resistor-diode combination connected across the line and two dc current-operated circuit breakers connected in each side of the line. The contacts on the breakers are connected in series with their own coil and mechanically coupled together. When any breaker is operated, the line will be opened. The circuit breakers must be manually reset by the customer after tripping. They cannot be reset if the fault persists.

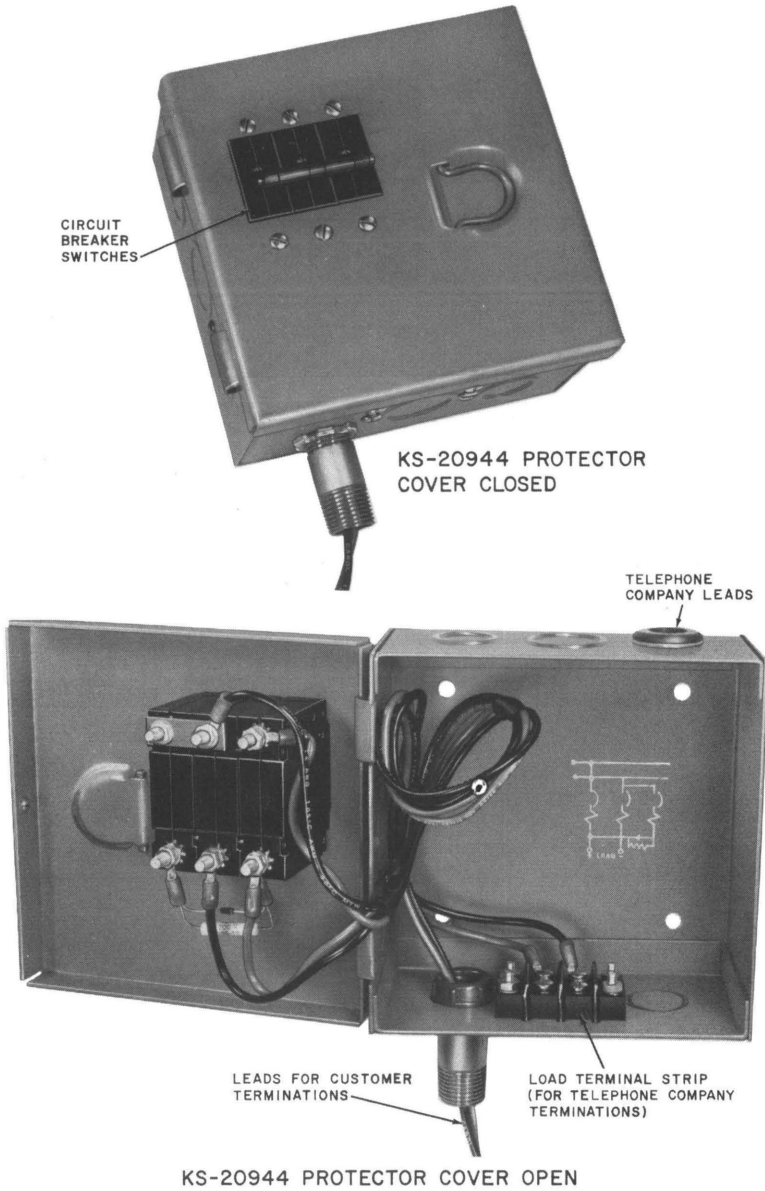


Fig. 12—KS-20944 Protector

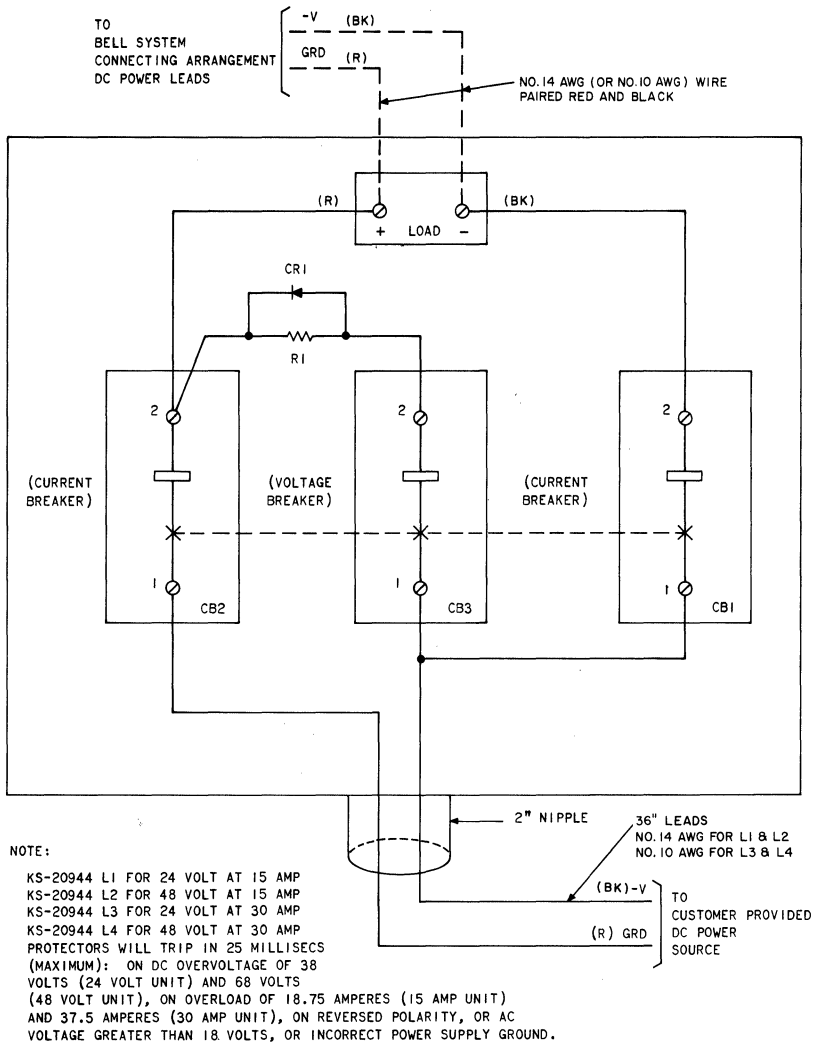


Fig. 13—Schematic—KS-20944 Protector



**4.06** The KS-20944, List 1 and List 2 protectors are designed to trip in 25 milliseconds (maximum) on:

- 38 volts dc (List 1) or 68 volts dc (List 2)
- 18.75 amps dc (List 1) or 36 amps (List 2)
- Reversed polarity or ac greater than 18 volts
- Incorrect power supply ground.⚡

## 5. MAINTENANCE

**5.01** When trouble is reported, check the CO pair and check for blown fuses and loose or broken connections.

### ⚡Circuit Test Using 142A Test Set

**5.02** The 142A test set (see Fig. 14 and 15) should be set up as follows with the IU:

**Caution:** *Before removing or installing IUs in the mounting, remove the associated fuse to prevent damage to electrical components.*

- (1) Disconnect the CPE by removing the B bridging clips or wire straps at the interface block.
- (2) Connect the leads from the 10-conductor interface cord, as required, to the proper terminals on the telephone company side of the block.
- (3) Connect the leads from the 2-conductor power cord to -24 volts (red lead) and ground (black lead). This should be obtained from the same source used to power the IU under test. The PWR lamp should light at this time.
- (4) Connect a 1013A hand test set to the HNDR and HNDT terminals of the test set with the MON-TALK switch in the MON position.
- (5) Set the CS-CG LOOP switch in the 18-ohm position for a 102A IU or in the 100-ohm position for the 102B IU.

**5.03** After circuit preparation, proceed as follows:

- (1) Operate switch on 1013A hand test set to the TALK position. The CS lamp on the 142A test set should light and the dial tone should be heard in the test set.

**Note:** If the IU fails to seize the CO trunk, move the CS-CG LOOP switch to a lower value. If the IU now operates properly, it is considered marginal. Circuits which only operate on the 0 position should be replaced.

- (2) Dial the local test desk using the 1013A hand test set. The S relay and the CS lamp should follow the dial pulses. Request the test desk to call back on the trunk under test.

- (3) Operate the hand test set to the MON position. The CS lamp should be extinguished indicating the S relay in the 142A test set has released, removing the ground from the CS lead.

- (4) When ringing is applied to the trunk, the C- lamp lights and follows the ringing cycle.

- (5) Reoperate the hand test set switch to TALK. The C- lamp should extinguish and the CS lamp lights indicating ringing has been tripped and the call answered. The trunk should now be cut through the IU and transmission quality judged using the hand test set.

- (6) Have the test desk release the trunk and return hand test set switch to MON. The CS lamp should be extinguished and the IU should be in the idle condition.

**5.04** When all testing is complete, remove power and interface cords. Connect CPE by restoring B bridging clips or wire straps at interface connecting block.

### Circuit Testing Without 142A Test Set

**5.05** Prepare the circuit under test as follows:

- (a) Open the six leads to CPE by removing the B bridging clips (or wire straps) or connector at the 66B4-25 interface block.
- (b) Supply talk battery by connecting a 500-ohm resistor from the -24 volt supply to

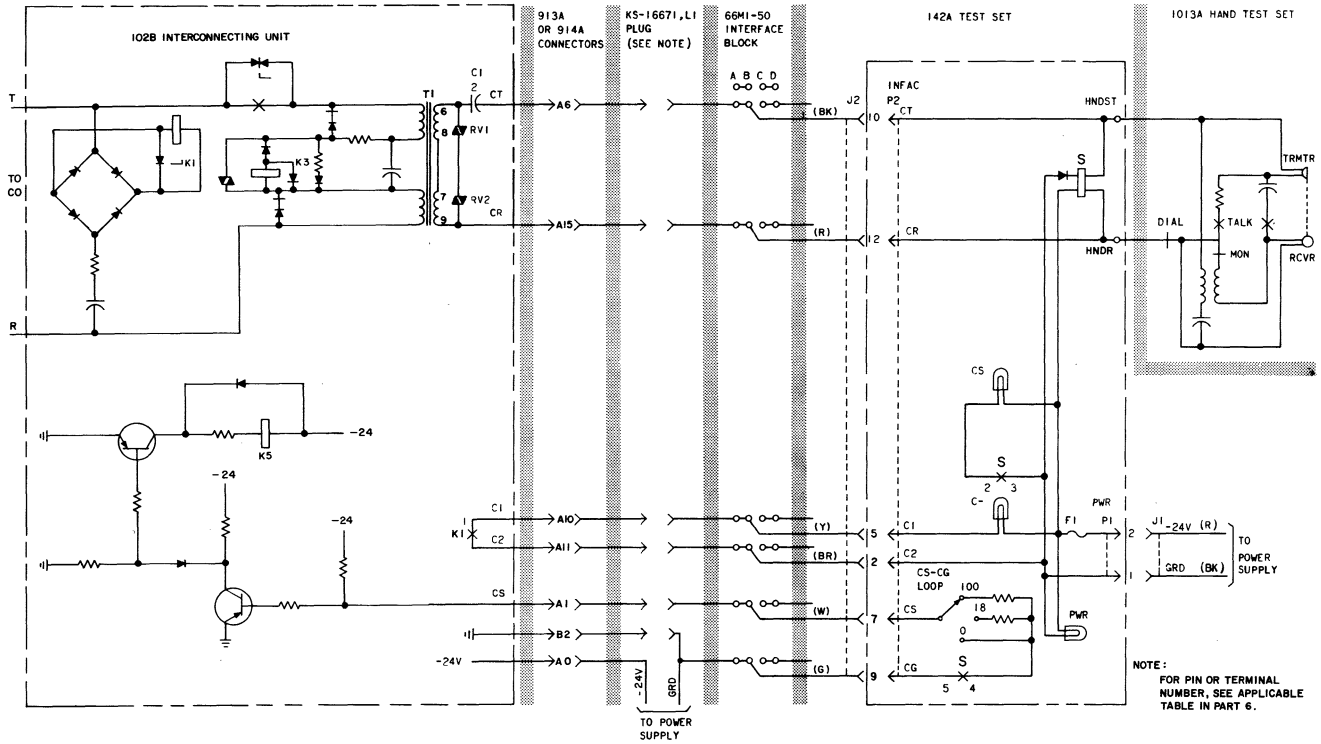


Fig. 14—Testing 102B Interconnecting Unit With 142A Test Set

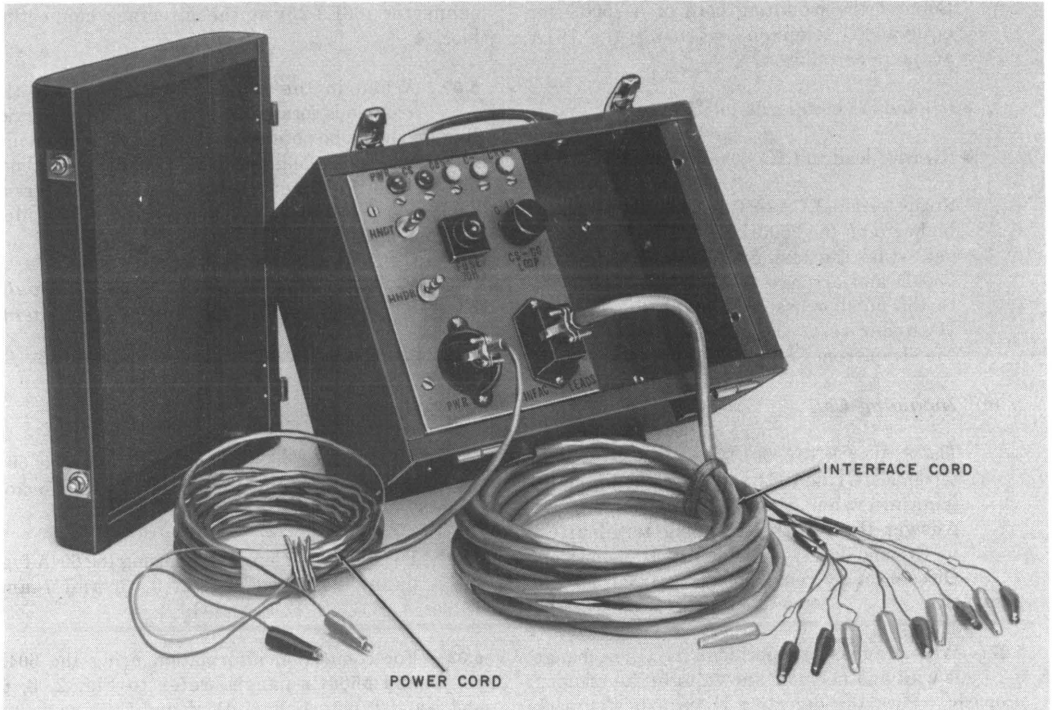


Fig. 15—142A Test Set

terminal CR and connect ground to terminal CT. A 2A KTU or 31A KTU may be used for battery feed instead of the resistor. Refer to Section 518-112-421 for KTU connections. (Make all test connections on the telephone company side of the interface block.)

- (c) Connect a 1013A hand test set (or equivalent) across terminals CR and CT.
- (d) Connect an 81A or KS-16990, List 1 test set across terminals C1 and C2.

**5.06** Perform the following tests.

(a) **Transmission Path**

Operate the switch of the hand test set to MON. Temporarily strap terminal CS to CG causing K5 relay to operate cutting

through the transmission path. Dial tone will be heard on the hand test set across CT and CR. Remove strap from terminals CS and CG and operate the switch on the hand test set to TALK.

(b) **Outgoing Call (Rotary Dial)**

Connect the blue leads (or blue and green) of a 9C dial across terminals CS and CG for dialing. Dial tone will be heard on the hand test set connected to CT and CR. Dial the test desk using the 9C dial and talk over the hand test set and arrange to have a call returned to the number associated with the 102-type IU under test. Disconnect by removing 9C dial from terminals CS and CG.

(c) **Outgoing Call (Tone Address Signaling)**

Connect the mounting cord of a 2500D (or equivalent) telephone set using the 161A adapters as follows:

- (G) and (Y) cord leads to CT
- (R) cord lead to CR.

Strap terminal CS to CG; dial tone will now be heard on the 2500D (or equivalent) station set. Dial the test desk number using the 2500D and arrange to have a call returned to the number associated with the 102-type IU under test. Disconnect by removing the strap from CS and CG.

(d) ***Incoming Call***

The 81A or KS-16990, List 1 test set across terminals C1 and C2 will indicate continuity (ringing) when the test desk calls back. Answer the call by strapping terminal CS to CG and verify satisfactory transmission. Disconnect by removing strap from CS and CG.

- 5.07** When trouble is suspected in the IU, exchange it with another unit known to be functioning properly. Pack the defective IU in a blister pack and return it for repair.



***Never replace a 102-type IU in the 604-type or 615A panel or 69G apparatus mounting without first removing the fuse for that particular circuit. (See Tables H and K.)***

- 5.08** If tests are satisfactory, remove all test connections to restore circuit to normal and replace B bridging clips (66M1-50) or Amphenol

connector (66E3-25) at the interface connecting block.◆

- 5.09** When in the repairman's judgment the trouble is located in CPE, the Repair Service Bureau should be notified so that proper maintenance of service charge billing can be initiated as outlined in BSP 660-101-312 entitled Maintenance of Service Charge on Services with Customer-Provided Equipment (CPE).



***Do not attempt any tests or repairs to the customer-provided equipment.***

**6. CONNECTIONS**

- 6.01** For connection information using the 69G apparatus mounting, refer to Fig. 5 and Table G.

- 6.02** For connection information using the 604A-type panel, refer to Fig. 2, 3, 6, and 7 and Tables A, B, C, D, E, F, and G.

- 6.03** For connection information using the 604B and ◆604C◆ panels, refer to Fig. 2, 3, 6, and 7 and Tables A, B, C, D, F, and G.

- 6.04** For connection information using the optional 66E3-25 connecting block, refer to Fig. 3 and Table F.

- 6.05** ◆For connection information using the 615A panel, refer to Fig. 2, 3, 4, 8, 11 and Tables F, G, J and L.◆

- 6.06** ◆For connection information using the KS-20944 Protector, refer to Fig. 13.◆

**TABLE B**  
**CONNECTIONS FOR PLUG NO. 1—604-TYPE PANEL**

TRUNK NO.	LEAD DESIG*	A25B CONN PIN NO.	A25B CONN CABLE COLOR	66B4-25 CONN BLK ROW NO.	POS. IN 604-TYPE PANEL
1	T	26	W-BL	1	1A
	R	1	BL-W	2	
2	T	27	W-O	3	2A
	R	2	O-W	4	
3	T	28	W-G	5	4A
	R	3	G-W	6	
4	T	29	W-BR	7	5A
	R	4	BR-W	8	
5	T	30	W-S	9	7A
	R	5	S-W	10	
6	T	31	R-BL	11	8A
	R	6	BL-R	12	
7	T	32	R-O	13	10A
	R	7	O-R	14	
8	T	33	R-G	15	11A
	R	8	G-R	16	
9	T	34	R-BR	17	13A
	R	9	BR-R	18	
10	T	35	R-S	19	3A
	R	10	S-R	20	
11	T	36	BK-BL	21	6A
	R	11	BL-BK	22	
12	T	37	BK-O	23	9A
	R	12	O-BK	24	
13	T	38	BK-G	25	12A
	R	13	G-BK	26	
14	T	39	BK-BR	27	14A
	R	14	BR-BK	28	
† SPARE	† SPARE	40	BK-S	29	
		15	S-BK	30	
		41	Y-BL	31	
		16	BL-Y	32	
		42	Y-O	33	
		17	O-Y	34	
		43	Y-G	35	
		18	G-Y	36	
		44	Y-BR	37	
		19	BR-Y	38	
		45	Y-S	39	
		20	S-Y	40	
		46	V-BL	41	
		21	BL-V	42	
		47	V-O	43	
		22	O-V	44	
		48	V-G	45	
		23	G-V	46	
		49	V-BR	47	
		24	BR-V	48	
		50	V-S	49	
		25	S-V	50	

\* Stencil lead designations on fanning strip.

† Insulate and store spare leads.

**TABLE C**  
**CONNECTIONS FOR PLUG NO. 2—604-TYPE PANEL**

TRUNK NO.	LEAD DESIG*	CONN PIN NO.	CONN CABLE COLOR	66MI-50 INTERFACE CONN BLK 1 ROW NO.	POS. IN 604-TYPE PANEL
1	CT	26	W-BL	1	1
	CR	1	BL-W	2	
	CS	27	W-O	3	
	CG	2	O-W	4	
	C1	28	W-G	5	
	C2	3	G-W	6	
	SPARE	29	W-BR	7	
	SPARE	4	BR-W	8	
	SPARE	30	W-S	9	
	SPARE	5	S-W	10	
2	CT	31	R-BL	11	2
	CR	6	BL-R	12	
	CS	32	R-O	13	
	CG	7	O-R	14	
	C1	33	R-G	15	
	C2	8	G-R	16	
	SPARE	34	R-BR	17	
	SPARE	9	BR-R	18	
	SPARE	35	R-S	19	
	SPARE	10	S-R	20	
3	CT	36	BK-BL	21	4
	CR	11	BL-BK	22	
	CS	37	BK-O	23	
	CG	12	O-BK	24	
	C1	38	BK-G	25	
	C2	13	G-BK	26	
	SPARE	39	BK-BR	27	
	SPARE	14	BR-BK	28	
	SPARE	40	BK-S	29	
	SPARE	15	S-BK	30	
4	CT	41	Y-BL	31	5
	CR	16	BL-Y	32	
	CS	42	Y-O	33	
	CG	17	O-Y	34	
	C1	43	Y-G	35	
	C2	18	G-Y	36	
	SPARE	44	Y-BR	37	
	SPARE	19	BR-Y	38	
	SPARE	45	Y-S	39	
	SPARE	20	S-Y	40	
5	CT	46	V-BL	41	7
	CR	21	BL-V	42	
	CS	47	V-O	43	
	CG	22	O-V	44	
	C1	48	V-G	45	
	C2	23	G-V	46	
	SPARE	49	V-BR	47	
	SPARE	24	BR-V	48	
	SPARE	50	V-S	49	
	SPARE	25	S-V	50	

\* Stencil lead designations on fanning strip.

**TABLE D**  
**CONNECTIONS FOR PLUG NO. 3—604-TYPE PANEL**

TRUNK NO.	LEAD DESIG*	CONN PIN NO.	CONN CABLE COLOR	66MI-50 INTERFACE CONN BLK 2 ROW NO.	POS. IN 604-TYPE PANEL
6	CT	26	W-BL	1	8
	CR	1	BL-W	2	
	CS	27	W-O	3	
	CG	2	O-W	4	
	C1	28	W-G	5	
	C2	3	G-W	6	
	SPARE	29	W-BR	7	
	SPARE	4	BR-W	8	
	SPARE	30	W-S	9	
	SPARE	5	S-W	10	
7	CT	31	R-BL	11	10
	CR	6	BL-R	12	
	CS	32	R-O	13	
	CG	7	O-R	14	
	C1	33	R-G	15	
	C2	8	G-R	16	
	SPARE	34	R-BR	17	
	SPARE	9	BR-R	18	
	SPARE	35	R-S	19	
	SPARE	10	S-R	20	
8	CT	36	BK-BL	21	11
	CR	11	BL-BK	22	
	CS	37	BK-O	23	
	CG	12	O-BK	24	
	C1	38	BK-G	25	
	C2	13	G-BK	26	
	SPARE	39	BK-BR	27	
	SPARE	14	BR-BK	28	
	SPARE	40	BK-S	29	
	SPARE	15	S-BK	30	
9	CT	41	Y-BL	31	13
	CR	16	BL-Y	32	
	CS	42	Y-O	33	
	CG	17	O-Y	34	
	C1	43	Y-G	35	
	C2	18	G-Y	36	
	SPARE	44	Y-BR	37	
	SPARE	19	BR-Y	38	
	SPARE	45	Y-S	39	
	SPARE	20	S-Y	40	
SPARE		46	V-BL	41	
		21	BL-V	42	
		47	V-O	43	
		22	O-V	44	
		48	V-G	45	
		23	G-V	46	
-24V †	FAL1 †	49 †	V-BR †	47 †	F2(FA) †
GRD †	G1 †	24 †	BR-V †	48 †	TS1(15) † ‡
-48V †	FAL2 †	50 †	V-S †	49 †	F16(FA) †
GRD †	G2 †	25 †	S-V †	50 †	TS1(16) † ‡

\* Stencil lead designations on fanning strip.

† Optional attendant alarm indicator on 604B and 604C panels only.

‡ TS1 was in early 604B panels. Now incorporated in cable form with metal clamp.

**TABLE E**  
**CONNECTIONS FOR PLUG NO. 4—604-TYPE PANEL**

TRUNK NO.	LEAD DESIG*	CONN PIN NO.	CONN CABLE COLOR	66MI-50 INTERFACE CONN BLK 3 ROW NO.	POS. IN 604-TYPE PANEL
10	CT	26	W-BL	1	3
	CR	1	BL-W	2	
	CS	27	W-O	3	
	CG	2	O-W	4	
	C1	28	W-G	5	
	C2	3	G-W	6	
	SPARE	29	W-BR	7	
	SPARE	4	BR-W	8	
	SPARE	30	W-S	9	
11	CT	31	R-BL	11	6
	CR	6	BL-R	12	
	CS	32	R-O	13	
	CG	7	O-R	14	
	C1	33	R-G	15	
	C2	8	G-R	16	
	SPARE	34	R-BR	17	
	SPARE	9	BR-R	18	
	SPARE	35	R-S	19	
12	CT	36	BK-BL	21	9
	CR	11	BL-BK	22	
	CS	37	BK-O	23	
	CG	12	O-BK	24	
	C1	38	BK-G	25	
	C2	13	G-BK	26	
	SPARE	39	BK-BR	27	
	SPARE	14	BR-BK	28	
	SPARE	40	BK-S	29	
13	CT	41	Y-BL	31	12
	CR	16	BL-Y	32	
	CS	42	Y-O	33	
	CG	17	O-Y	34	
	C1	43	Y-G	35	
	C2	18	G-Y	36	
	SPARE	44	Y-BR	37	
	SPARE	19	BR-Y	38	
	SPARE	45	Y-S	39	
14	CT	46	V-BL	41	14
	CR	21	BL-V	42	
	CS	47	V-O	43	
	CG	22	O-V	44	
	C1	48	V-G	45	
	C2	23	G-V	46	
	SPARE	49	V-BR	47	
	SPARE	24	BR-V	48	
	SPARE	50	V-S	49	
SPARE	25	S-V	50		

\* Stencil lead designations on fanning strip.



**TABLE F**  
**CONNECTIONS FOR 66E3-25 CONNECTING BLOCK**

CIRCUIT NO.	LEAD DESIG.	66E3-25 TERM NO.	66E3-25 PIN NO.
1	CT	1	26
	CR	2	1
	CS	3	27
	CG	4	2
	C1	5	28
	C2	6	3
	SPARE	7	29
	SPARE	8	4
	SPARE	9	30
	SPARE	10	5
2	CT	11	31
	CR	12	6
	CS	13	32
	CG	14	7
	C1	15	33
	C2	16	8
	SPARE	17	34
	SPARE	18	9
	SPARE	19	35
	SPARE	20	10
3	CT	21	36
	CR	22	11
	CS	23	37
	CG	24	12
	C1	25	38
	C2	26	13
	SPARE	27	39
	SPARE	28	14
	SPARE	29	40
	SPARE	30	15
4	CT	31	41
	CR	32	16
	CS	33	42
	CG	34	17
	C1	35	43
	C2	36	18
	SPARE	37	44
	SPARE	38	19
	SPARE	39	45
	SPARE	40	20
5	CT	41	46
	CR	42	21
	CS	43	47
	CG	44	22
	C1	45	48
	C2	46	23
	SPARE	47	49
	SPARE	48	24
	SPARE	49	50
	SPARE	50	25

◆TABLE G◆

## POWER CONNECTIONS

INPUT* VOLTAGE	69G APP MTG (NOTE 1)	604A1 PANEL (NOTE 2)	604B PANEL (NOTE 3)	615A PANEL (NOTE 4)
-24V	7	T14	INPUT -24V	D2
-48V	—	—	INPUT -48V	—
GRD	4	T13	INPUT -GRD	D4

*Notes:*

1. Terminals on 66B4-25 connecting block, connect as shown in Fig. 5.
2. Terminals on terminal strip TSA on rear of 604A1 panel.
3. Terminals on rear of 604B panel are stamped as shown. Position option straps for -24V or -48V.
4. Terminals on 66T1 connecting block.

\* 48 volts not used with 102 IUs.

TABLE H

## 604A-TYPE PANEL FUSE ASSIGNMENT

VOLTAGE	FUSE NO.*	PANEL POSITION
-24V	F1	J1A
	F2	J2A
	F3	J3A
	F4	J4A
	F5	J5A
	F6	J6A
	F7	J7A
	F8	J8A
	F9	J9A
	F10	J10A
	F11	J11A
	F12	J12A
	F13	J13A
	F14	J14A
	F15	J10B†
	F16	J11B†
	F17	J13B†
	F18	J14B†

\* Fuses are 70G 1/2-ampere.

† Plug. No. 5 dedicated to one-way incoming trunks not used in this application.

TABLE I

## 604B/C PANEL FUSE ASSIGNMENT

VOLTAGE	FUSE NO.	PANEL POSITION
$\pm 105V$ (Note)	F1*	J1A thru J14A
-24V	F2*	J1A
	F3*	J2A
	F4*	J3A
	F5*	J4A
	F6*	J5A
	F7*	J6A
	F8*	J7A
	F9*	J8A
	F10*	J9A
	F11*	J10A
	F12*	J11A
	F13*	J12A
	F14†	J13A
	F15‡	J14A
	-48V (Note)	F16‡
F17‡		J6A thru J10A
F18‡		J11A thru J14A

**Note:**  $\pm 105V$  and  $-48V$  not used in this application.

\* 70F Fuse 1/4 Ampere.

† 70G Fuse 1/2 Ampere.

‡ 70A Fuse 1-1/3 Ampere.

TABLE J

## CONNECTIONS FOR PLUG P1 - 615A PANEL

LEAD DESIG	PLUG P1 PIN NO.	LEAD COLOR	615A PANEL		
			JACK	PIN	66T1 BLK
CT	26	W-BL	J1A	A6	C12
CR	1	BL-W		A15	
CS	27	W-O		A1	
CG	2	O-W		—	
C1	28	W-G		A10	
C2	3	G-W		A11	
SPARE	29	W-BR		A14	
SPARE	4	BR-W		A19	
SPARE	30	W-S		A7	
SPARE	5	S-W		A16	
CT	31	R-BL	J2A	A6	C13
CR	6	BL-R		A15	
CS	32	R-O		A1	
CG	7	O-R		—	
C1	33	R-G		A10	
C2	8	G-R		A11	
SPARE	34	R-BR		A14	
SPARE	9	BR-R		A19	
SPARE	35	R-S		A7	
SPARE	10	S-R		A16	
CT	36	BK-BL	J3A	A6	C14
CR	11	BL-BK		A15	
CS	37	BK-O		A1	
CG	12	O-BK		—	
C1	38	BK-G		A10	
C2	13	G-BK		A11	
SPARE	39	BK-BR		A14	
SPARE	14	BR-BK		A19	
SPARE	40	BK-S		A7	
SPARE	15	S-BK		A16	
SPARE	41	Y-BL	J1B	B6	D12
SPARE	16	BL-Y		B15	
SPARE	42	Y-O		B1	
SPARE	17	O-Y		—	
SPARE	43	Y-G		B10	
SPARE	18	G-Y	B11		
SPARE	44	Y-BR	J2B	B6	D13
SPARE	19	BR-Y		B15	
SPARE	45	Y-S		B1	
SPARE	20	S-Y		—	
SPARE	46	V-BL		B10	
SPARE	21	BL-V	B11		
SPARE	47	V-O	J3B	B6	D14
SPARE	22	O-V		B15	
SPARE	48	V-G		B1	
SPARE	23	G-V		—	
SPARE	49	V-BR		B10	
SPARE	24	BR-V	B11		
SPARE	50	V-S			
SPARE	25	S-V			

♦TABLE K♦

## 615A PANEL FUSE ASSIGNMENT

VOLTAGE	FUSE NO.*	PANEL POSITION
-24V	F1	J1A,B
	F2	J2A,B
	F3	J3A,B
-48V†	F4†	J1A
	F5†	J2A
	F6†	J3A
±105V	F7†	J1A,J2A,J3A
SPARE	F8†	SPARE

\* 24E Fuse, 1/2 ampere.

† Unused in this application.

♦TABLE L♦

CO OR PBX TRUNK  
CONNECTIONS - 615A PANEL

LEAD DESIGNATION		66T1 CONNECTING BLOCK TERMINAL
TRK 1	T	1A
	R	2A
TRK 2	T	3A
	R	4A
TRK 3	T	5A
	R	6A

## PROTECTIVE CONNECTING ARRANGEMENTS

### STP AND C2F

#### 1. GENERAL

**1.01** This section contains identification, installation, connection, operation, and maintenance information for Protective Connecting Arrangements (PCAs) STP and C2F using the 120-type interconnecting unit (IU).

**1.02** This section is reissued to:

- Rate the 120B IU MD, now replaced by the 120C (Fig. 1)
- Change Fig. 7 and 8 to include circuitry for improved lightning protection
- Add Fig. 9 (schematic of 120C)
- Show that dc power for the 120-type IU must always be talk battery
- Rate the 604B panel MD. (Information required for servicing existing installations of the 604B is retained.)

**1.03** The size of the initial installation and the expected growth should be the determining factors in selecting the mounting arrangement.

- Use a 615A panel for one to three circuits. If it appears growth will not exceed six circuits, a second 615A panel can be added.
- Use a 604C panel if it appears the growth will be greater than six circuits. ♦(If the 604C is to be used with a -48V supply instead of -24V, a 21A apparatus unit must be attached and wired to it.)♦
- The 69G apparatus mounting is recommended only where mountings are already in place and an additional circuit is required, or as a direct replacement for maintenance reasons. Information on the 69G apparatus mounting

is limited to that required for additions and maintenance.

**1.04** A copy of the Technical Reference covering this interface specification can be obtained from the local Telephone Company Business Office or the Marketing Representative.

**1.05** This issue of the section is based on the following drawings:

♦CD- and SD-69646-01, Issue 10B—120A(MD), 120B(MD), and 120C IU♦

CD- and SD-69599-01, Issue 2A—69G Apparatus Mounting.

If this section is to be used with equipment or apparatus reflecting later issues of the drawings, reference should be made to the CDs and SDs to determine the extent of the changes and the manner in which the section may be affected.

#### 2. IDENTIFICATION

##### PURPOSE

**2.01** *PCA STP* provides a means for automatically connecting CP voice terminal equipment to a telephone company CO/PBX line. PCA STP provides a 2-wire interface, locally generated ringing signal, and 24-volt talking battery to the CPE. In addition, it permits CP dial pulse or tone address signaling. It is typically used for CP key telephone systems.

**2.02** *PCA C2F* provides a means for automatically connecting CP voice terminal equipment to the telecommunications network. PCA C2F provides a 2-wire interface, locally generated ringing signal, and 48-volt talking battery to the CPE. In addition, it permits dial service using CP dial pulse or tone address signaling. It is typically used for connecting

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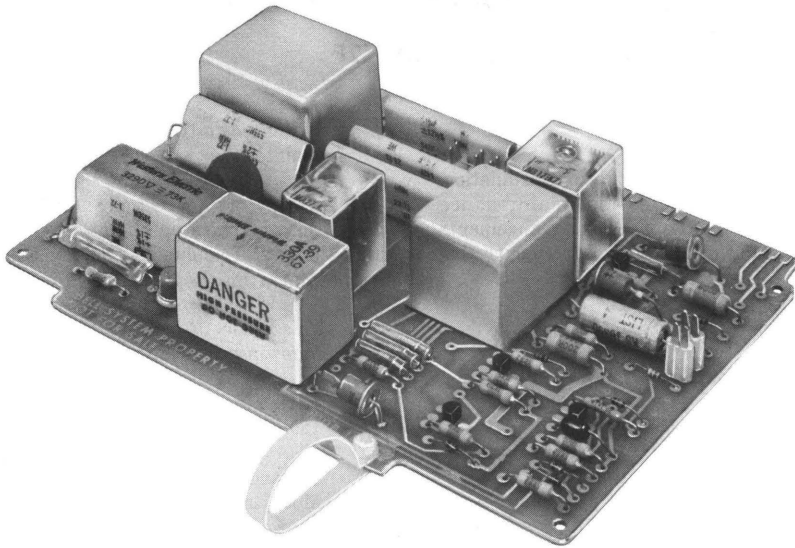


Fig. 1—120C Interconnecting Unit

a telephone company PBX to an off-premise extension using CP facilities and telephone.

#### ORDERING GUIDE

##### (a) *Basic Unit*

- Unit, Interconnecting, ♦120C♦ —one per PCA STP or C2F (Fig. 1).

**Note:** Any 120-type IU can be used with PCA STP, but a ♦120B(MD) or 120C♦ is always required with PCA C2F.

##### (b) *Associated Apparatus (Order Separately)*

**Note 1:** If a 23-inch rack is not available on customer premises, provide a 16C apparatus mounting (for 615A panel) or an ED-91180-72, Group 21 apparatus cabinet (for 604C panel).

**Note 2:** Order the following apparatus as required on the basis that PCA STP will require -24 ♦talk battery♦ volts only and PCA C2F will require -48 ♦talk battery♦ volts only.

- Panel, 604C—one per fourteen IUs, -24V supply
- Unit, Apparatus, 21A—one per 604C panel to convert panel to -48V supply
- Panel, 615A—one per three IUs (-24V or -48V supply)
- Bracket, 99B—one per three 615A panels
- Cable, Connecting, A25B—one per 615A panel; one to four per 604C panel (see Fig. 3)
- Block, Connecting, 66M1-50—as required
- Block, Connecting, 66B4-25—as required

**Note:** Other blocks may be used when specified by local engineering.

- Clip, Bridging, B—as required, 25 per package

- Power source(s) with talk battery and  $\pm 105V$  ringing supply—locally engineered and installed when existing PBX power supply is insufficient:

STP—A 20- or 30-type power unit (-24V talk battery and ringing supply)

C2F—A KS-15620,L22 rectifier (-48V talk battery) and a 20C2 power unit (ringing only)•

- Protector, KS-20944, List 1 (-24V) for STP or List 2 (-48V) for C2F—one required when CP dc power supply is used.

### (c) *Replaceable Components*

#### *For 604B (MD) and 604C Panels:*

- Fuse, 70F, 1/4 ampere—13 per panel
- Fuse, 70A, 1-1/3 amperes—3 per panel
- Fuse, 70G, 1/2 ampere—2 per panel
- Indicator, 17C-49, or equivalent—for optional fuse alarm.

#### *For 615A Panel:*

- Fuse, 24E, 1/2 ampere—8 per panel.

### DESIGN FEATURES

**2.03** The 120-type IU provides voice frequency coupling between Bell System telecommunications network and CPE and off-hook supervision and rotary dial pulsing or tone address signaling from CPE.

Other features are listed below:

- Limits excessive signal levels on the transmission leads from the CPE.
- Provides dc talk battery to the CPE.
- Current drains are as follows:

Maximum—0.046 ampere at 20 volts dc, or  
0.093 ampere at 45 volts dc

Typical—0.045 ampere at 24 volts dc, or  
0.055 ampere at 48 volts dc.

- Maximum external CP conductor loop when connected to CT and CR is 200 ohms for STP or 1300 ohms for C2F.

- Maximum of two CP high impedance ringers or ringing bridges• can be connected to CT and CR.

- 120B(MD) or 120C IU is immune to a maximum 60-Hz induced longitudinal voltage of 35 volts RMS. The 120A (MD) does not have this capability and should not be used for PCA C2F.

**2.04** Refer to the following sections for design features and detailed information on associated apparatus:

- 463-300-102—604B and 604C Panel
- 463-300-104—615A Panel
- 463-300-109—KS-20944 Protector.

### 3. INSTALLATION AND CONNECTIONS

**Note:** All wiring should be completed and IUs installed in panels before applying power to panel to prevent damage to IU components.

#### **69G Apparatus Mounting**

**3.01** The 69G apparatus mounting should only be used to add a circuit at installations where mountings are already in place. Refer to Fig. 2 for connections. For new installations, the 615A panel is recommended.

**3.02** Separate fuses must be provided locally for each mounting. Use a 24E, 1/2-ampere fuse in a 201A KTU, or equivalent, and connect power as shown in Table F. Typical current drain for a 120-type IU is 0.045 ampere at 24 volts and 0.055 ampere at 48 volts dc.

#### **604C Panel**

**3.03** Mount the 604C panel on a 23-inch relay rack or in an ED-91180-72, Group 21 equipment cabinet. Up to three panels may be mounted in the cabinet if the power supply is externally mounted and the drawing holder clips on the lower half of the cover are removed. The cabinet will also accommodate two panels and a 30-type power

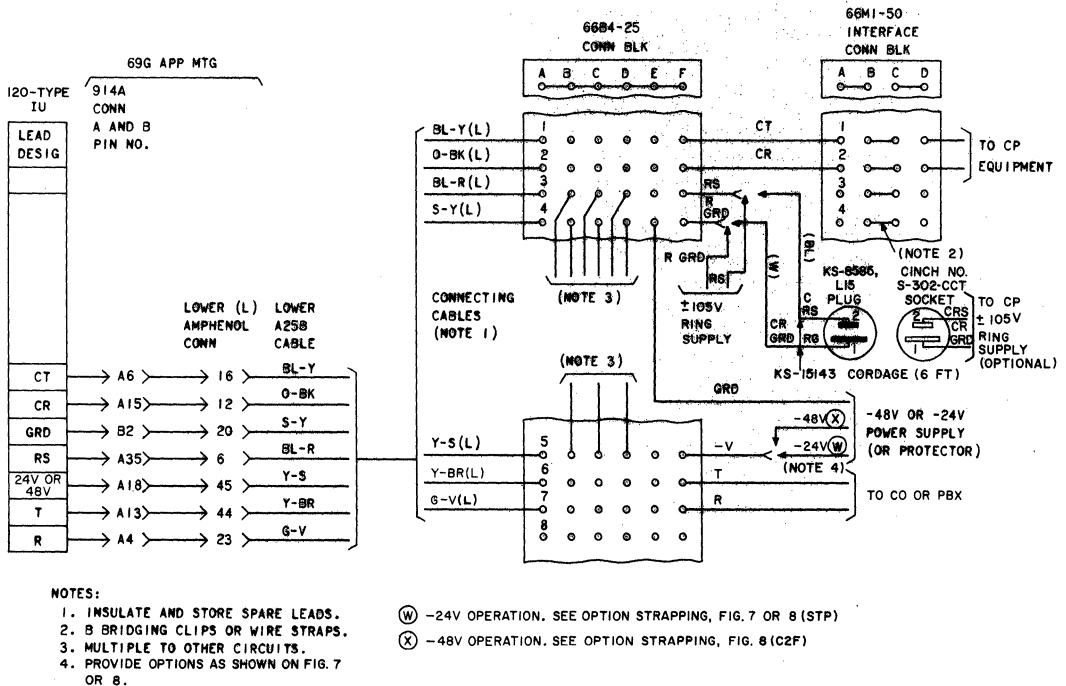


Fig. 2—Connection Diagram, 120-Type IU in 69G Apparatus Mounting

supply internally. Ground the relay rack or equipment cabinet separately.

**3.04** All connections, except power supply, are made to the panels through the four plugs on the rear of the panel. The wiring arrangement requires that an A25B connector cable be used in P1 (top plug). Any of the cable combinations shown on Fig. 3 can be used to connect P2, P3, and P4.

**3.05** Wire the panel as follows:

- (a) Connect the connector end of an A25B connector cable to P1. Route to terminating point for incoming CO/PBX lines and terminate T and R leads per Table A.
- (b) Plug desired connector cables to P2, P3, and P4, and terminate raw ends on 66M1-50 interface block (Fig. 5). Only the CT and CR

leads are terminated as shown in Table B unless the optional fuse alarm is also provided. Insulate and store all spare leads.

**Note:** Each circuit should be tagged or otherwise identified at the interface block for subsequent trouble testing and reporting.

- (c) All power supply leads are connected to the terminal board on the rear of the panel per Table G. Position the power option straps for the proper voltage being supplied. Refer to 4.06 for information on power options.

**615A Panel**

**3.06** Mount the 615A panel on a 23-inch relay rack or in a 16C apparatus mounting. When a 16C mounting is used, a 99B bracket is required and the center mounting bar must be removed before the panel can be mounted.



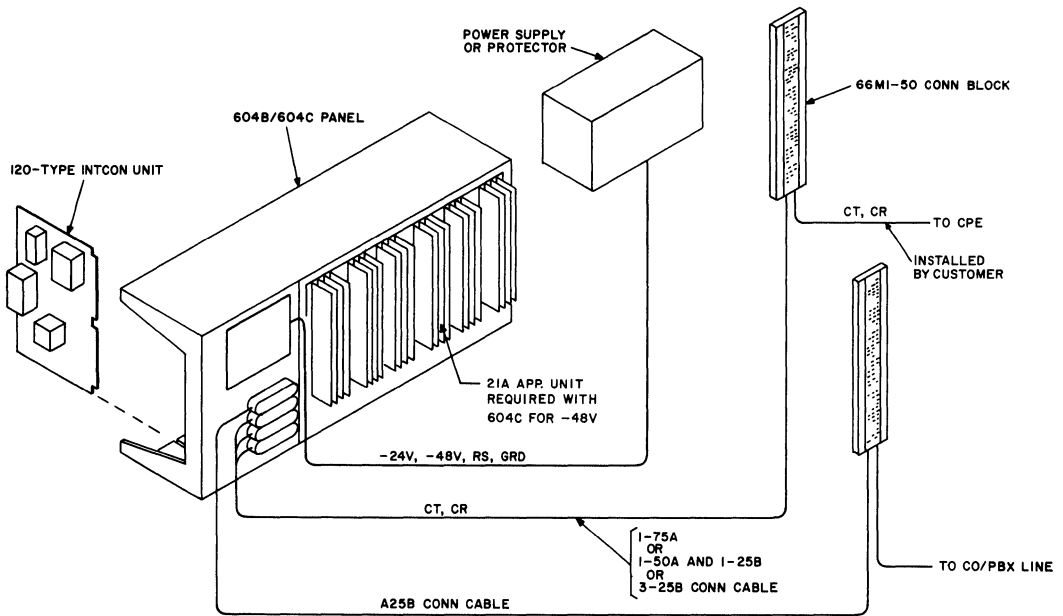


Fig. 3—Block Diagram, PCA STP or C2F Using 604-Type Panel

**3.07** Leads CT and CR are multiplied, both in plug P1 and in the 66T1 connecting block, so connections can be made by either of the following methods (Fig. 4):

- (a) Connect the connector end of an A25B connector cable to P1 and terminate the raw end on the 66M1-50 interface block (Fig. 5). Only leads CT and CR need be terminated (Table D). Insulate and store all spare leads.

or

- (b) Terminate one end of a 6-pair IW cable on the 66T1 connecting block on rear of panel, terminating only CT and CR (Table D). Insulate and store all spare leads. The other end of the cable is terminated on the interface block.

**Note:** Each circuit should be tagged or otherwise identified at the interface block for subsequent trouble testing and reporting.

**3.08** The T and R leads of the CO/PBX lines are supplied to the panel through a separate IW cable or jumpers between the incoming termination point and the 66T1 connecting block. Connect as shown in Table C.

**3.09** All power supply leads are brought to the 66T1 block and terminated per Table G. Provision is made for either -24V or -48V operation of the 615A panel. With either type operation,  $\pm 105V$  must be supplied on the RS lead. Refer to 4.06 for information on power options.

#### 120-Type Interconnecting Unit

**3.10** Before installing a 120-type IU in a panel or apparatus mounting, install the proper straps as shown on Fig. 7, 8, or 9. Use bare wire for strapping and check continuity after placing.

**3.11** The IUs should be installed in the panels in the proper sequence. For the 615A panel, this sequence is from left to right. For the 604B

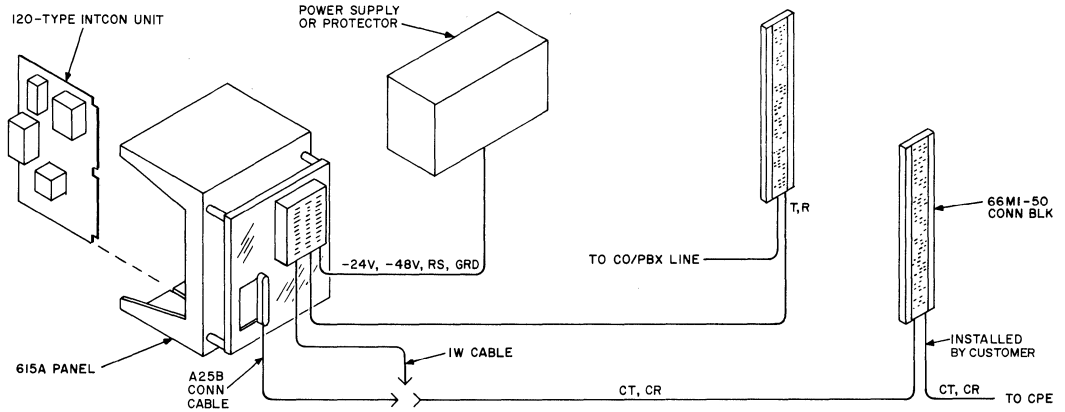


Fig. 4—Block Diagram, PCA STP or C2F Using 615A Panel

(MD) and 604C panels, install trunks in the order shown in Table A.

**Note:** On earlier production of the 604B panels, the **position** number was stamped on the designation strip locking bar. On current production of the 604B and the 604C panels, the **trunk** number is stamped on the bar.

**3.12** When installing the 120-type IU, position the IU in the guide grooves of the panel and slide the unit in until it is properly seated in the mating connectors. When units are installed, lower the designation strip locking bar to hold the IUs in place.

**3.13** When installation work is complete, perform the tests outlined in Part 5.

#### KS-20944 Protector

**3.14** When CP equipment provides the dc power for the 120-type IU, the KS-20944 protector must be mounted externally and wired to the power supply terminals of the 604C or 615A panel.

**3.15** Connect as shown in Fig. 6 following local wiring instructions. The customer must connect his power supply to the red (+) and black (-) 14-gauge leads extending from the unit.

**Warning:** Voltage will be present on terminal 1 of circuit breakers. Check for correct polarity and ground before closing switch.

#### Fuse Alarm Indicator (Optional)

**3.16** Install a 17C lamp indicator at a location agreeable with the customer and connect to leads specified in Table B. Install an M1 lamp (48V) under the red lens and an A3 lamp (24V) under the green lens.

## 4. OPERATION

### PCA STP (120A, B, OR C IU)

#### Incoming Call

**4.01** Ringing from the CO or PBX line on the T and R leads will operate the R relay which in turn operates the R1 relay. Operation of these relays connects local ringing from the RS lead to the CR lead and short-circuits the windings of talk battery inductor L1. Relays R and R1 follow the CO/PBX ringing cycle.

**4.02** When the CP station goes off-hook, relay DP operates, which connects transformer T1 to the T and R leads to trip ringing on the CO/PBX line and operates the L relay from battery and ground. If the CP station went off-hook

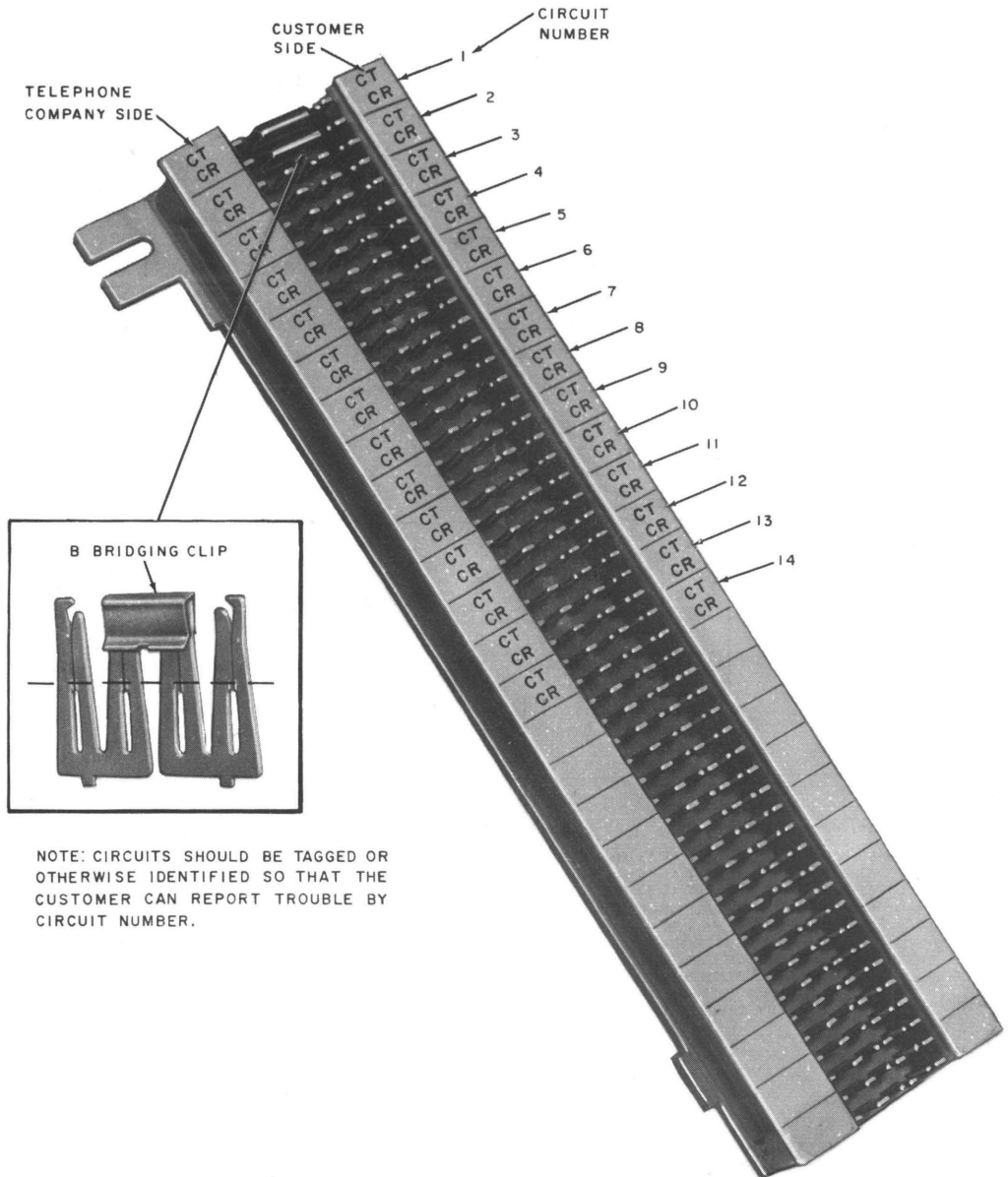


Fig. 5—66M1-50 Interface Connecting Block

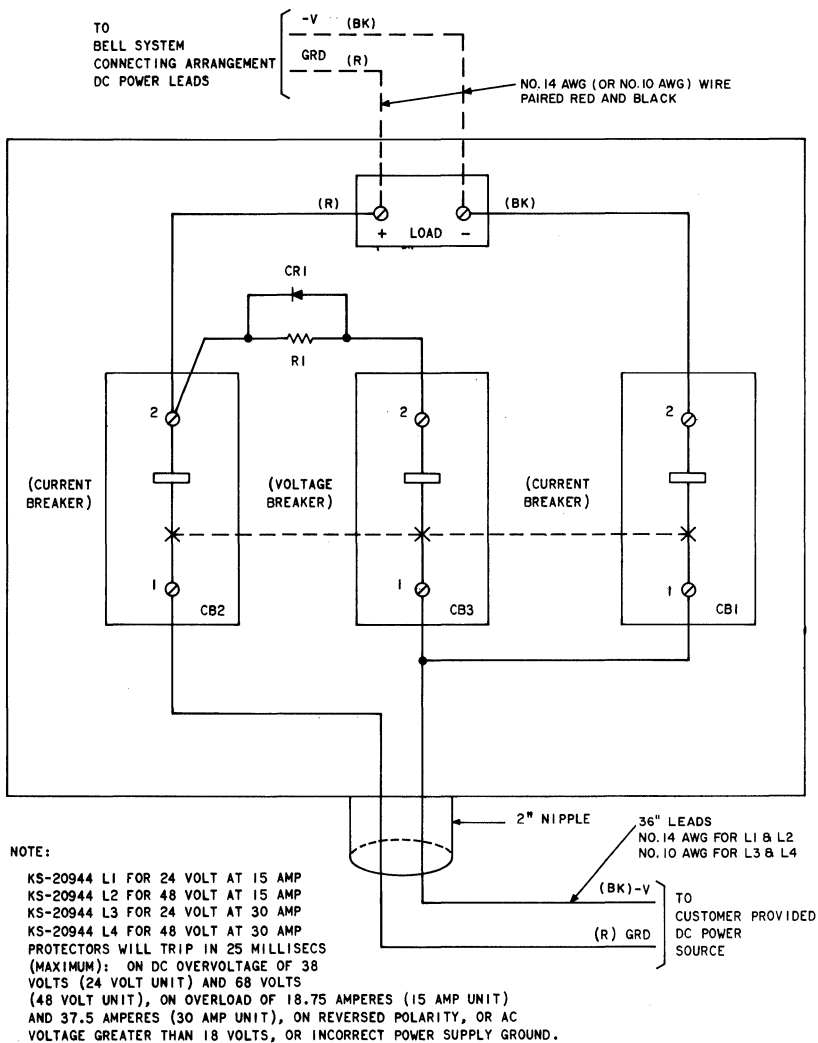


Fig. 6—Schematic Diagram—KS-20944 Protector

during a ringing interval, operation of relay DP removes the ringing detector from the line, releasing the R and R1 relays. This in turn removes the local ringing supplied on the RS lead and removes the shunt from the L1 windings, establishing a transmission path between the CPE and the line through T1. The local dc talk path, furnished on

the CT and CR leads, is under control of the L relay so that any momentary open on the T and R leads will be passed on to CT and CR via the L relay contact. If the CPE goes off-hook during a silent-ringing interval, the DP relay operates to provide the dc termination to trip ringing and establishes the transmission path.

**Outgoing Call**

**4.03** When the CP station goes off-hook, the DP relay operates which closes the transmission path to the CO/PBX line through the T1 transformer. Relay L operates from CO/PBX battery and ground. A make contact on the L relay controls the local battery and ground supply (24V) on the CT and CR leads. If the CPE rotary pulses, the DP relay follows the pulses which are transmitted to the line. At the end of pulsing, relay DP remains operated. Thermistor RT1 prevents false operation of the ring detector from dial pulse transients on the line when the DP relay releases during dialing. If the CPE uses tone address signaling, the signals are transmitted through T1 to the T and R, and relay DP remains operated. Once established, the call is under control of the CPE via the CT and CR leads.

**Release**

**4.04** When the CPE goes on-hook, relay DP releases which disconnects T1 and connects the ring detector. The CO/PBX line releases and the circuit is now restored to normal.

**PCA C2F (120B OR C IU)**

**4.05** Circuit operation of PCA C2F is the same as STP except ringing and battery and ground (48V) on the T and R leads are supplied by a telephone company PBX, and an off-premises station is connected to the CT and CR leads through CP facilities.

**POWER OPTIONS**

**4.06** The 120-type IU is designed to operate on either -24 or -48V talk battery dc supply. For STP the supply must be -24V and is used for both circuit operation and talk battery. For C2F the supply must be -48V (120B or C IU only). A diode on the 120B or C IU is used to reduce the voltage to -24V for circuit operation in the 615A panel and 69G apparatus mounting while the -48V is used for talk battery.

**4.07** Provide power wiring and options depending on supply voltage and mounting as follows:

**(a) 69G Apparatus Mounting**

- (1) If supply voltage is -24V, add option W to 120A, B, or C IU (STP only).
- (2) If supply voltage is -48V, add option X to 120B or C IU (C2F only).
- (3) Connect supply voltage to 66B4-25 connecting block (Fig. 2).

**(b) 604B (MD) Panel**

- (1) If supply voltage is -24V, place option straps on rear of panel in upper positions and add option Z to 120A, B, or C IU (STP only).
- (2) If supply voltage is -48V, place option straps in lower positions and add option Y to 120B or C IU (C2F only).
- (3) Connect supply voltage to proper terminals on rear of panel.

**(c) 604C Panel, -24V Supply (STP only)**

- (1) Place option straps in upper positions and add option Z to 120A, B, or C IU.
- (2) Connect supply voltage to -24V terminals on rear of panel.

**(d) 604C Panel, -48V Supply (C2F only)**

- (1) Add 21A apparatus unit to 604C panel.
- (2) Connect the R-BK leads to the -24 terminals in any order and the R leads to the -48V terminals in any order.
- (3) Position option straps in lower positions and add option Y to 120B or C IU.
- (4) Connect supply voltage to -48V terminals on rear of panel.

**(e) 615A Panel**

- (1) If supply voltage is -24V, add option Q to 120A, B, or C IU (STP only).
- (2) If supply voltage is -48V, add option R to 120B or C IU (C2F only).

(3) Connect supply voltage to terminals of connecting block on rear of panel per Table G.

**4.08** Refer to Fig. 7, 8, or 9 for placement of options on the 120-type IU. **Options should be added before plugging IU into mounting and before connecting power.** Use bare wire for strapping and check continuity after placing.

#### KS-20944 PROTECTOR

**4.09** The KS-20944 protector is used to protect telephone company personnel from hazardous voltages when CP power is used but will not protect equipment from component failures (separate fuses are required for the 120-type IUs). The KS-20944 circuit breaker provides a switch to disconnect dc power when working on interconnecting circuits.

**4.10** The KS-20944 protector consists of a dc voltage-operated circuit breaker in series with a parallel resistor-diode combination connected across the line and two dc current-operated circuit breakers connected in each side of the line. The contacts on the breakers are connected in series with their own coil, and their toggles are mechanically coupled together. When any breaker is operated, all breakers will trip. The circuit breakers must be manually reset after tripping. If the fault is still on the line, the breakers cannot be reset.

**4.11** The KS-20944, List 1 (use for STP) and List 2 (use for C2F) protectors are designed to trip in 25 milliseconds (maximum) on:

- 38 volts dc (List 1) or 68 volts dc (List 2)
- 18.75 amperes dc (List 1 or 2)
- Reversed dc voltage or ac voltage greater than 18 volts
- Incorrect ground.

The diode and resistor combination is selected to adjust the tripping voltage of the voltage-operated circuit breaker. Refer to Section 463-300-109 for additional information on operation of the KS-20944 protector.

#### CP RINGING SUPPLY

**4.12** If the customer supplies the  $\pm 105V$  ringing voltage, furnish a 6-foot length of KS-15143 cordage terminated in a KS-8585, List 15 plug. The other end of the cordage is terminated per Table G. If terminated on a clip-type terminal, the connection must be soldered. The customer must furnish a Cinch No. S-302-CCT socket and extend the wiring to his ringing voltage power supply.

#### FUSE ALARM INDICATOR CIRCUIT

**4.13** Leads have been provided on plug P3 of the 604C panel to provide voltage for operating an optional attendant alarm indicator. The red lamp will light when a 48-volt fuse blows, and the green lamp will light when a 24-volt fuse blows. The attendant may be instructed to call Repair Service.

#### 5. MAINTENANCE

**5.01** When trouble is reported, check for blown fuses, loose or broken connections, and verify that the CO pair is good.

**5.02** Open the CT and CR leads to circuit under test by removing B bridging clips or wire straps at the 66M1-50 connecting block. To verify in which direction the trouble exists, perform the following tests:

(a) **Transmission Path:** Connect a 1013A (or equivalent) hand test set to the CT and CR lead on the telephone company side of the 66M1-50 connecting block (avoid shorting CT and CR). Operate the TALK-MON switch of the test set to the TALK position. This will cause the 120-type IU to operate cutting through the transmission path, and dial tone will be heard on the hand test set.

(b) **Outgoing Call (Rotary Dial):** After receiving dial tone, dial the local test desk number using the 1013A hand test set and arrange to have a call returned to the number associated with the 120-type IU under test. Operate the TALK-MON switch of the test set to the MON position and wait for the return call.



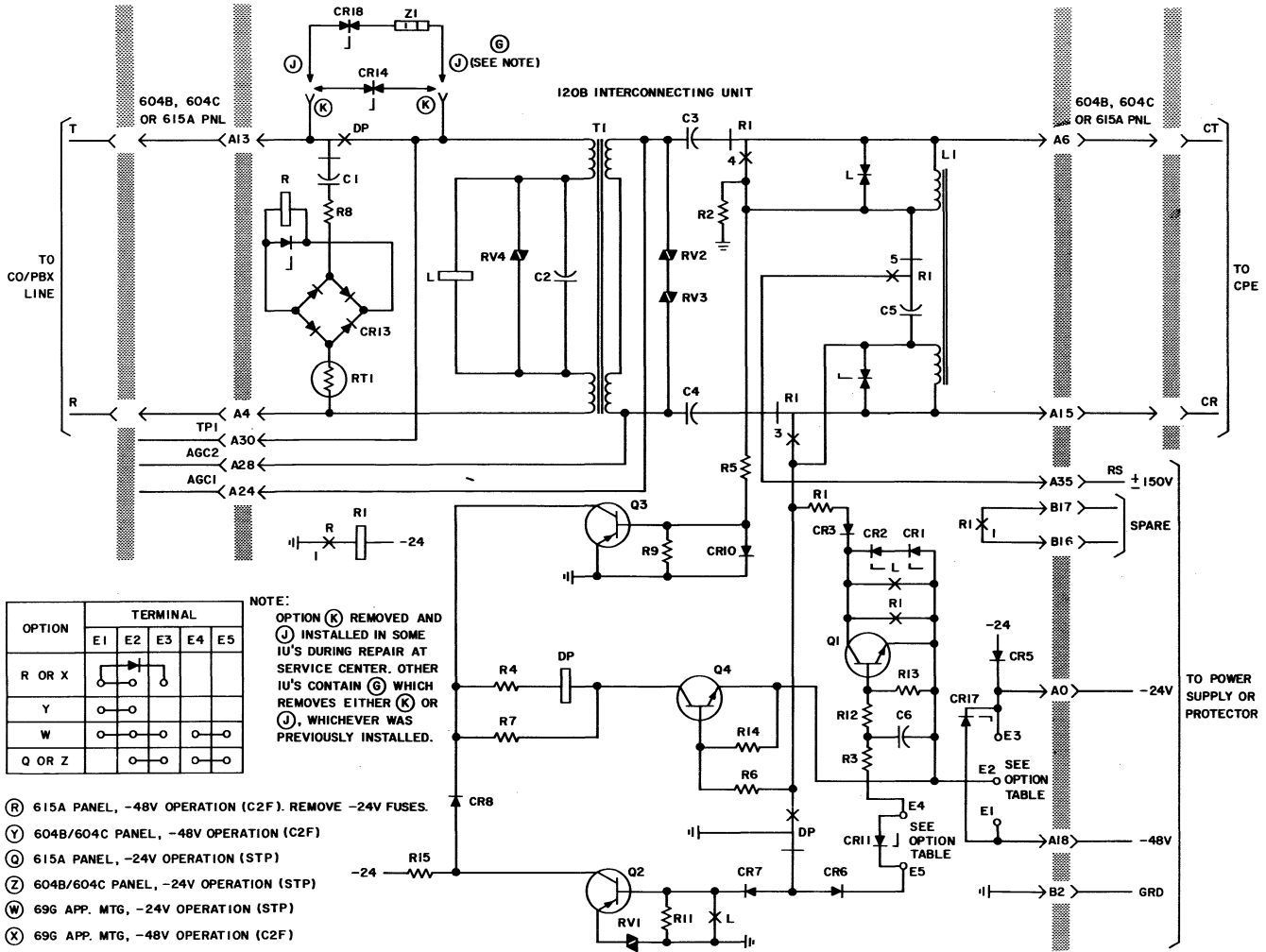


Fig. 8—Schematic Diagram—120B (MD) IU



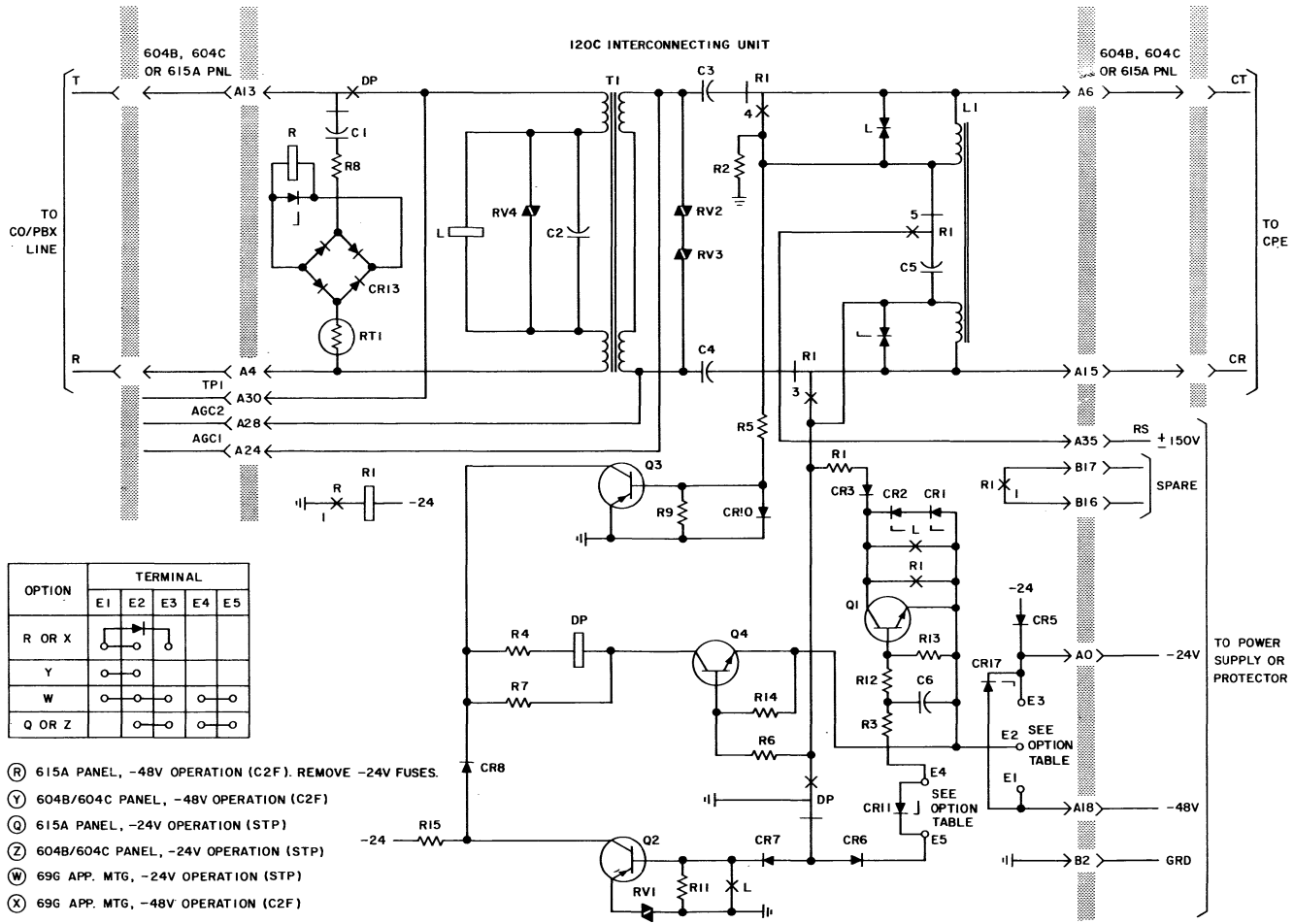


Fig. 9—Schematic Diagram—120C IU

(c) **Incoming Call (Rotary Dial):** When the local test desk calls back, ringing will be heard on the hand test set. Answer the call by operating the TALK-MON switch to the TALK position and verify that ringing has been tripped and transmission is satisfactory. Disconnect by removing the hand test set from the CT and CR terminals.

(d) **Outgoing Call (Tone Address Signaling):**  
Connect the mounting cord of a 2500D (or equivalent) telephone set using 161A adapters as follows:

- (G) and (Y) cord leads to CT
- (R) cord lead to CR.

Go off-hook. This will cause the 120-type IU to operate cutting through the transmission path and dial tone should be heard on the 2500D station set. Dial the test desk number using the 2500D and arrange to have a call returned to the number associated with the 120-type IU under test. Go on-hook and wait for the return call.

(e) **Incoming Call (Tone Address Signaling):**  
When the local test desk calls back, ringing

will be heard on the station set. Answer the call and verify that ringing has been tripped and transmission is satisfactory. Disconnect by going on-hook and remove the station set from the CT and CR terminals.

**5.03** When trouble is suspected in the 120-type IU, exchange it with another unit known to be functioning properly.

**5.04** If tests are satisfactory, remove all test connections and restore circuit to normal by replacing B bridging clips on the 66M1-50 interface connecting block. Follow local reporting procedures for trouble in CPE.



***Do not attempt any tests or repairs to the customer-provided equipment.***

**5.05** When in the judgment of repair personnel the trouble is located in the CPE, the Repair Service Bureau should be notified so that proper Maintenance of Service Charge billing can be initiated as outlined in Section 660-101-312 entitled Maintenance of Service Charge on Services with Customer-Provided Equipment (CPE).

TABLE A  
CONNECTIONS FOR PLUG 1-604B OR 604C PANEL

TRUNK NO.	POS. IN 604B/C PANEL	LEAD DESIG*	CONN PIN NO.	A25B CONN CABLE COLOR	66B4-25 CONN BLK ROW NO.
1	1	T R	26	W-BL	1
			1	BL-W	2
2	2	T R	27	W-O	3
			2	O-W	4
3	4	T R	28	W-G	5
			3	G-W	6
4	5	T R	29	W-BR	7
			4	BR-W	8
5	7	T R	30	W-S	9
			5	S-W	10
6	8	T R	31	R-BL	11
			6	BL-R	12
7	10	T R	32	R-O	13
			7	O-R	14
8	11	T R	33	R-G	15
			8	G-R	16
9	13	T R	34	R-BR	17
			9	BR-R	18
10	3	T R	35	R-S	19
			10	S-R	20
11	6	T R	36	BK-BL	21
			11	BL-BK	22
12	9	T R	37	BK-O	23
			12	O-BK	24
13	12	T R	38	BK-G	25
			13	G-BK	26
14	14	T R	39	BK-BR	27
			14	BR-BK	28
		SPARE	40	BK-S	29
			15	S-BK	30
			41	Y-BL	31
			16	BL-Y	32
			42	Y-O	33
			17	O-Y	34
			43	Y-G	35
			18	G-Y	36
			44	Y-BR	37
			19	BR-Y	38
			45	Y-S	39
			20	S-Y	40
			46	V-BL	41
			21	BL-V	42
			47	V-O	43
			22	O-V	44
			48	V-G	45
			23	G-V	46
			49	V-BR	47
			24	BR-V	48
			50	V-S	49
			25	S-V	50

\* Stencil lead designations on fanning strip.

TABLE B  
 CONNECTIONS FOR PLUGS 2, 3, AND 4—604B OR 604C PANEL

TRUNK NO.	POS. IN 604B/C PANEL	LEAD* DESIG	CONN PIN NO.	CONN CABLE COLOR	66M1-50† CONN BLK ROW NO.
<b>CONNECTIONS FOR PLUG 2</b>					
1	J1	CT	26	W-BL	1
		CR	1	BL-W	2
2	J2	CT	31	R-BL	3
		CR	6	BL-R	4
3	J4	CT	36	BK-BL	5
		CR	11	BL-BK	6
4	J5	CT	41	Y-BL	7
		CR	16	BL-Y	8
5	J7	CT	46	V-BL	9
		CR	21	BL-V	10
<b>CONNECTIONS FOR PLUG 3</b>					
6	J8	CT	26	W-BL	11
		CR	1	BL-W	12
7	J10	CT	31	R-BL	13
		CR	6	BL-R	14
8	J11	CT	36	BK-BL	15
		CR	11	BL-BK	16
9	J13	CT	41	Y-BL	17
		CR	16	BL-Y	18
24V	F2(FA)	FAL1	49	V-BR	‡
24V	GRD	G1	24	BR-V	‡
48V	F16(FA)	FAL2	50	V-S	‡
48V	GRD	G2	25	S-V	‡
<b>CONNECTIONS FOR PLUG 4</b>					
10	J3	CT	26	W-BL	19
		CR	1	BL-W	20
11	J6	CT	31	R-BL	21
		CR	6	BL-R	22
12	J9	CT	36	BK-BL	23
		CR	11	BL-BK	24
13	J12	CT	41	Y-BL	25
		CR	16	BL-Y	26
14	J14	CT	46	V-BL	27
		CR	21	BL-V	28

\* Stencil lead designations on fanning strip.

† Insulate and store spare leads.

‡ Optional attendant alarm No. 17 Indicator.

**TABLE C**  
**LINE CONNECTIONS TO 615A PANEL**

LEAD DESIGNATION		COLOR	615A PANEL	
			66T1 CONN. BLOCK	POSITION
Trunk 1	T	W-BL	1A	J1A/J1B
	R	BL-W	2A	
Trunk 2	T	W-O	3A	J2A/J2B
	R	O-W	4A	
Trunk 3	T	W-G	5A	J3A/J3B
	R	G-W	6A	

**TABLE D**  
**LEADS TO CPE-615A PANEL**

LEAD DESIGNATION		A25B CONN. CABLE	6 PAIR IW CABLE	615A PANEL	
				66T1 CONN. BLOCK	POSITION
Trunk 1	CT	W-BL	W-BL	1B	J1A/J1B
	CR	BL-W	BL-W	2B	
Trunk 2	CT	R-BL	W-O	3B	J2A/J2B
	CR	BL-R	O-W	4B	
Trunk 3	CT	BK-BL	W-G	5B	J3A/J3B
	CR	BL-BK	G-W	6B	

*Note:* Connections to the CPE can be made either through an A25B connector cable in P1 or by terminating a 6-pair IW cable on the 66T1 connecting block. See Fig. 4.

TABLE E

## 604B OR 604C PANEL FUSE ASSIGNMENT

VOLTAGE	FUSE NO.	PANEL POSITION
±105V	F1†	J1A thru J14A
Talk Battery -24V (STP Only)	F2†	J1A
	F3†	J2A
	F4†	J3A
	F5†	J4A
	F6†	J5A
	F7†	J6A
	F8†	J7A
	F9†	J8A
	F10†	J9A
	F11†	J10A
	F12†	J11A
	F13†	J12A
	F14§	J13A
	F15§	J14A
Talk Battery -48V* (C2F Only)	F16‡	J1A thru J5A
	F17‡	J6A thru J10A
	F18‡	J11A thru J14A

\*-48V used for talk battery to CP equipment only

† 70F fuses 1/4 Ampere

‡ 70A fuses 1-1/3 Ampere

§ 70G fuses 1/2 Ampere

TABLE F

## 615A PANEL FUSE ASSIGNMENT

VOLTAGE	FUSE NO.*	PANEL POSITION
Talk Bat. -24V (STP Only)	F1	J1A
	F2	J2A
	F3	J3A
Talk Bat. -48V (C2F Only)	F4	J1A
	F5	J2A
	F6	J3A
±105V	F7	J1A, J2A, J3A
Spare	F8	

\* 24E fuse, 1/2 ampere

♦TABLE G♦

## POWER CONNECTIONS

INPUT VOLTAGE	69G APP MTG (NOTE 1)	604B PANEL (NOTE 2)	615A PANEL (NOTE 3)
-24V Talk Bat.	5	Input -24V	D2
-48V Talk Bat.*	5	Input -48V	D10 (Note 4)
GRD	4	Input GRD	D4 (24V) D12 (48V)
±105V	3	RING SIG ±	D6
±GRD	4	RNG SIG GRD	D8

*Note 1:* Terminals on 66B4-25 connecting block.

*Note 2:* Terminals on rear of panel stamped as shown.  
Position option straps for -24V or -48V.

*Note 3:* Terminals on 66T1 connecting block.

*Note 4:* Remove 24V fuses on 615A panel when powering 120B IU from -48V.

\* KS-15620, L22 rectifier is suitable for talk battery supply.

## VOICE CONNECTING ARRANGEMENT FTP

### 1. GENERAL

**1.01** This section provides identification, installation, operation, maintenance, and connecting information for Voice Connecting Arrangement FTP. The 33A voice coupler (Fig. 1) is used to implement Voice Connecting Arrangement FTP. This arrangement provides a "high-fidelity" connection (see note) between a customer-provided (CP) music or information source and the music-on-hold circuit and/or the paging amplifier circuit in a Bell System 7A or 14A Communication System.

**Note:** The 3 dB bandwidth of the 33A voice coupler is from 100 Hz to 20 kHz.

**1.02** This issue of the section is based on the following drawing:

SD-69911-01 Issue 1—33A Voice Coupler

If this section is to be used with equipment or apparatus reflecting later issue(s) of the drawing, reference should be made to the SD to determine the extent of the changes and the manner in which the section may be affected.

### 2. IDENTIFICATION

#### PURPOSE

- To provide a "high-fidelity" connection between a CP music or information source and the music-on-hold circuit(s) and/or the paging amplifier circuit in the 7A or 14A Communication System for the music-on-hold feature and/or background music over the paging speakers when the paging circuit is not in use.
- To limit excessive levels from customer-provided equipment (CPE) and to provide protection for personnel against hazardous voltages.

**Note:** The output of the CP music source must provide AC coupling only—thus blocking all direct current to the input terminals of the 33A voice coupler.

#### APPLICATION

- 7A and 14A Communication System

### ORDERING GUIDE

- Coupler, Voice, 33A (order as required—see note)

**Note:** *One* 33A voice coupler will accommodate a maximum of *two* 451A music-on-hold circuits and *three* 457C paging amplifier circuits. The 7A Communication System may be equipped with either *zero* or *one* music-on-hold circuit and either *zero* or *one* paging amplifier circuit; the 14A Communication System may be equipped with from *zero* to *two* music-on-hold circuits and from *zero* to *three* paging amplifier circuits.

- Wire, "G" station, or equivalent (for cabling from the 33A voice coupler to the 7A or 14A Communication System)

### Replaceable Components

- Fuse, 35P (3/4 ampere—two per 33A voice coupler)
- Assembly, Cover, 841224751
- Guard, 841223696

### DESIGN FEATURES

- Approximate dimensions—4 by 2-3/4 by 2 inches
- Provides dc isolation between 457C paging amplifier circuit and CPE
- Mounts on any flat surface
- Provides 8-ohm nominal input impedance to CP music or information source
- Limits input level from CP music or information source to one watt
- Provides level adjust control between CP music or information source and 457C paging amplifier circuit



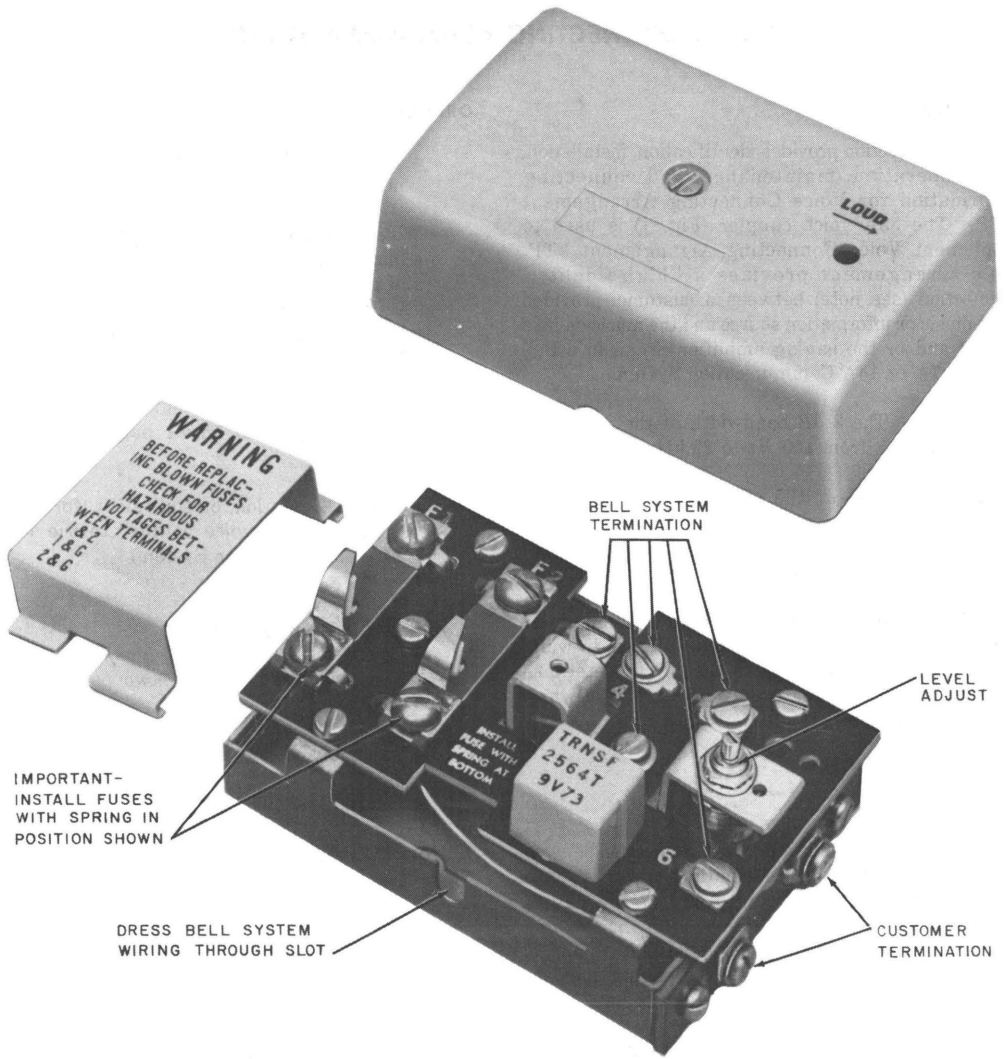


Fig. 1—33A Voice Coupler, with Cover and Fuse Guard Removed

- Has a passband extending from 100 Hz to 20 kHz at the half-power points
- Provides fused protection (3/4 ampere) between CPE and Telephone Company equipment
- Shorts primary winding of T1 to ground when fuses blow, to protect Telephone Company equipment—see Fig. 2
- Provides screw terminals for connections to the CP music or information source and Telephone Company equipment.

### 3. INSTALLATION AND CONNECTIONS

**3.01** The 33A voice coupler will mount on any flat surface. A backboard is not required unless mounting on a damp surface or when a backboard will facilitate mounting.

**3.02** The voice coupler should be mounted as near as possible to the KSU in the 7A or 14A Communication System. If the installation is such that the distance between the CPE and the KSU is excessive, the longer leads should be the CP wiring between the CPE and the voice coupler (see Fig. 2). The length of these leads should be determined by the customer; the loop resistance of these leads should not exceed 50 ohms.

**3.03** Install and connect the voice coupler as follows:

- (1) Remove the cover from the coupler.
- (2) Using two locally provided screws, mount the coupler on the designated surface. Two keyhole slots are provided in the base for mounting the coupler.
- (3) Make connections from the screw terminals on the coupler, using "G" station wiring or equivalent, to the 7A or 14A Communication System, as shown in Fig. 2. Dress the wiring through the slot in the side of the coupler—see Fig. 1.
- (4) Ascertain that the fuses are installed with the spring in the position shown in Fig. 1.
- (5) Replace cover.
- (6) Have the customer make connections from his music or information source to the screw terminals provided on the coupler.

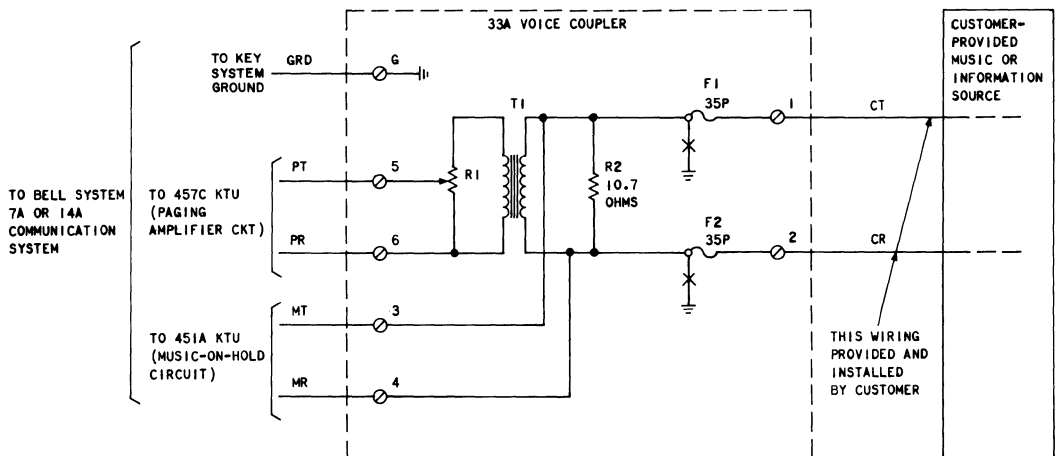


Fig. 2—Connections—Voice Connecting Arrangement FTP

**Adjustment at Time of Installation**

**3.04** When the 33A voice coupler has been installed and connected and customer connections have been made, adjust the coupler as follows:

- (1) Rotate the level adjust potentiometer to the full CCW position.
- (2) Place a call to a 7A or 14A station which is associated with the coupler being adjusted.
- (3) Answer the call and place it on hold.
- (4) Have the customer adjust his music or information source for a comfortable listening level at the held station.
- (5) Disconnect call.
- (6) Dial paging code and adjust potentiometer on each paging speaker for desired volume while paging in a normal voice.
- (7) Disconnect
- (8) Have the customer rotate the level adjust potentiometer on the coupler to the setting which provides the desired level of background music.

**3.05** When paging and music-on-hold is provided and background music is not required, the level adjust potentiometer should remain in the extreme CCW position.

**4. OPERATION**

**Music-on-Hold**

**4.01** When an incoming call to a 7A or 14A Communication System, equipped with the music-on-hold feature, is answered and placed on hold, the 33A voice coupler provides a transmission path between the CP music or information source and the key telephone equipment associated with the station on hold.

**Paging Feature with Background Music**

**4.02** In a 7A or 14A Communication System equipped with the paging feature, background music can be applied over the paging speakers when the system is not being used for paging.

The paging feature takes precedence over the CP source and temporarily cuts it off; it is reconnected automatically when paging is completed. When background music is provided, the 33A voice coupler provides a transmission path between the CP music or information source and the key telephone equipment associated with the paging zones.

**4.03** If the CPE presents excessive signal levels or foreign voltages to the connecting arrangement, the fuse circuit is arranged in such a manner that when one fuse operates it will apply ground to the other fuse causing it to operate and remove the applied voltage from the connecting arrangement.

**5. MAINTENANCE**



*Before replacing blown fuses or attempting any maintenance on the 33A voice coupler, check for hazardous voltages between terminals 1 and 2, 1 and G, and 2 and G.*

**5.01** When trouble is reported, check for blown fuses and loose or broken connections at the 33A voice coupler.

**5.02** Remove customer connections to terminals 1 and 2 and Telephone Company connections to terminals 3, 4, 5, and 6 of the voice coupler. Make the following resistance measurements:

BETWEEN TERMINALS	RESISTANCE
1 and 2	approx. 1 ohm
1 and 3	0
2 and 4	0
1 and 5	open
2 and 6	open
any terminal and G	open
5 and 6	variable between 0 and 46 ohms with level adjust pot.

**5.03** When trouble is indicated in the 33A voice coupler, exchange it with a coupler known to be working properly.

**5.04** When in the repairman's judgment the trouble is located in the CPE, the Repair Service Bureau should be notified so that proper Maintenance of Service Charge billing can be initiated as outlined in Section 660-101-312 entitled Maintenance of Service Charge on Services With Customer-Provided Equipment (CPE).



*Do not attempt any tests or repairs to the CPE.*

## PROTECTIVE CONNECTING ARRANGEMENT FTM

### 1. GENERAL

**1.01** This section provides identification, installation, operation, maintenance, and connection information for the 451B key telephone unit (KTU) (Fig. 1) and Protective Connecting Arrangement (PCA) FTM. The 34A voice coupler is used to implement PCA FTM. This PCA provides a connection between a customer-provided (CP) music or information source and the music-on-hold circuit (451B KTU) in a telephone company 1A2 Key Telephone System (KTS).

**1.02** Whenever this section is reissued, the reason for reissue will be listed in this paragraph.

**1.03** If a copy of the Technical Reference which covers this Interface Specification is needed,

the customer can obtain a copy from the local Telephone Company Business Office or the Marketing Representative.

**1.04** This issue of the section is based on the following drawings:

SD-69922-01, Issue 1—Audio Features

SD-69911-01, Issue 2—33- and 34-Type Voice Couplers.

If this section is to be used with equipment or apparatus reflecting later issue(s) of these drawings, reference should be made to the SDs to determine the extent of the changes and the manner in which the section may be affected.

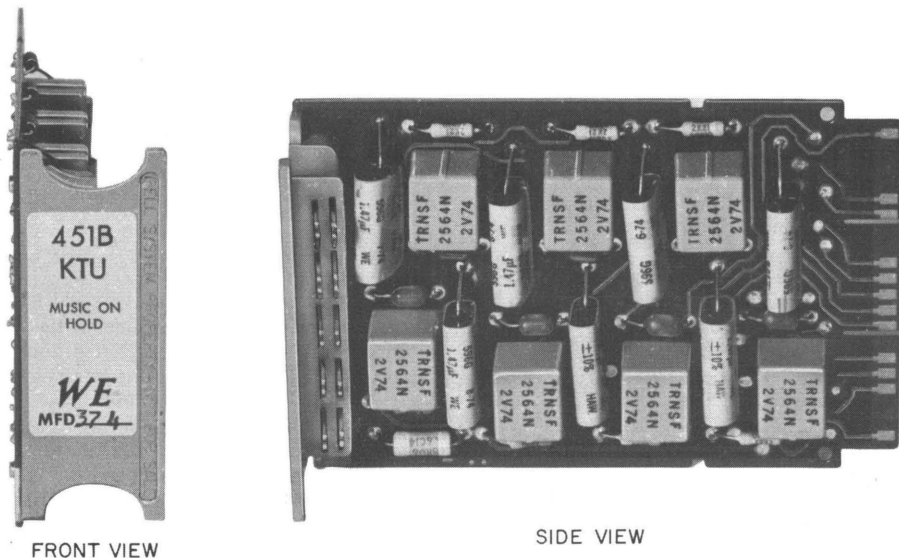


Fig. 1—451B KTU

### NOTICE

Not for use or disclosure outside the  
Bell System except under written agreement

**2. IDENTIFICATION****2.01 Purpose**

- To provide a connection for music-on-hold between CO/PBX lines and a CP music or information source which does not require a start signal
- To limit excessive levels from customer-provided equipment (CPE) and to provide protection for telephone company personnel from hazardous voltage.

**2.02 Application**

- 1A2 Key Telephone System
- 7A and 14A Communication Systems

**Note:** When music is to be applied to both the music-on-hold and paging amplifier circuits in the 7A (570A KSU) or 14A (580A KSU) Communication System, refer to PCA FTP (Section 463-341-102). For application with 1A and 1A1 KTS or if start signal is required, refer to PCA LVH (Section 463-311-105).

**2.03 Ordering Guide****(a) Basic Units:**

- Unit, Telephone, Key, 451B (one per up to 7 CO/PBX lines)
- Coupler, Voice, 34A (one per system).

**(b) Replaceable Components:**

- Fuse, 35P (3/4 ampere—2 required per 34A voice coupler)
- 818659492 (P86E949) Cover (34A voice coupler)
- 841223696 Guard (fuse guard—34A voice coupler).

**(c) Associated Equipment:**

See Table A.

**2.04 Design Features****(a) 451B KTU**

- Provides a connection for music to be impressed on a CO/PBX line when the line is placed on hold
- One 451B KTU provides a music source for up to 7 CO/PBX lines
- Requires mounting arrangement for a 4-inch, 40-pin KTU.

**(b) 34A Voice Coupler**

- Approximate dimensions: 4 inches high by 2-3/4 inches deep by 2 inches wide
- Mounts on any flat surface
- Provides 8-ohm nominal input impedance to CP music or information source
- Limits excessive input level from CP music or information source
- Provides fused protection (3/4 ampere) between CPE and telephone company equipment
- Provides screw terminals for connection to CP music or information source and telephone company equipment.

**3. INSTALLATION**

**3.01** Select a location close to the CP music or information source and mount the 34A voice coupler (Fig. 2). One 34A voice coupler will accommodate all the 451B KTUs in a system.

**3.02** Select the proper mounting for the 451B KTU from Table A and install at easily accessible location close to the key telephone equipment. The 451B KTU does not require any battery supply to operate.

**4. CONNECTIONS**

**4.01** Cable the leads T1(CO), R1(CO), T1(STA), R1(STA), etc, of the 451B KTU as pairs to the appropriate connecting block associated with the CO-STa connections of the 400D KTU.

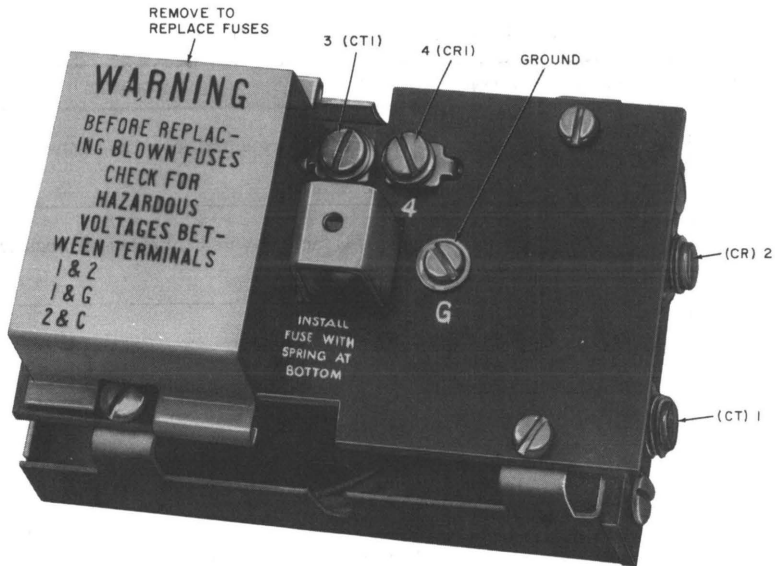


Fig. 2—34A Voice Coupler

**4.02** Considering the first circuit as typical of all seven circuits of the 451B, install the music-on-hold circuit as follows:

- (1) At the designated connecting block, connect the T1(CO) and R1(CO) leads of the 451B KTU to the T(CO) and R(CO) leads of the first 400D KTU.
- (2) Connect the T1(STA) and R1(STA) leads of the 451B to the T(STA) and R(STA) leads of the first 400D KTU.
- (3) Proceed to T2(CO), R2(CO), T2(STA), R2(STA) and continue until desired CO/PBX lines have been terminated through the 451B KTU.
- (4) Wire leads associated with pins 35 and 36 (Fig. 3) of the jack(s) containing 451B KTUs to spare terminals in cross-connect field and label CT1 and CR1.

**Note:** This wiring arrangement, in conjunction with the 451B KTU circuitry, connects the music-on-hold input across the R(CO) to R(STA) side of the 400-type KTU. The tip side of

the line is run with the ring and connected together on the 451B to maintain circuit balance.

**4.03** Cross-connect terminals 3 and 4 of the 34A voice coupler to the CT1 (pin 35) and CR1 (pin 36) of the 451B KTU. Cross-connect terminal G of 34A voice coupler to an approved circuit ground connection.

**4.04** When all wiring is complete, insert 451B KTU(s) in proper jack and lock in place, depending on mounting arrangement.

**4.05** The customer is required to provide the wiring (CT and CR) between screw terminals 1 and 2 of the 34A voice coupler and the CP music or information source.

**Caution:** The output of the CP music source must furnish ac coupling only, thus blocking all direct current to the input terminals of the 34A voice coupler.

TABLE A

## MOUNTING INFORMATION FOR 451B KTU

400D MOUNTED IN	451B* MOUNTED IN	REMARKS
570A KSU† (7A COM KEY)	570A KSU† (7A COM KEY) (Fig. 13)	KSU is factory-wired for cross-connecting to 34A voice coupler.
580A KSU† (14A COM KEY)	580A KSU† (14A COM KEY) (Fig. 14)	KSU is factory-wired for cross-connecting to 34A voice coupler.
584-Type Panel	69D Apparatus Mounting (Fig. 4)	Cross-connects made at 66-type connecting blocks used to terminate panels.
	272A KTU (Fig. 5)	
	598-Type Panel‡ (Fig. 6)	
620A Mod Panel	642 Mod Panel (Fig. 7)	Direct panel-to-panel cross-connects.
513 KSU	513 KSU (Fig. 8 & 9)	The 451B can be mounted only in connectors 7 and 8.
515 KSU	515 KSU (Fig. 8, 9, 10, 11, 12)	The 451B can be mounted only in connectors 7, 8, 11, and 13 or with 69E or F apparatus mounting.

\* Not recommended with 550/551 KSU or any arrangement using 69B mounting with 400-type CO/PBX line circuits.

† When music is to be applied to both music-on-hold and paging amplifier circuits in the 7A and 14A Communication Systems, use PCA FTP (Section 463-341-102). PCA FTM should be used if only music-on-hold is required.

‡ 598-type panel should not be used unless customer orders 15 or more CO/PBX lines with music-on-hold (3 or more 451B KTUs) or unless it can be shared with other circuits.



***The maximum permissible power from CP 8-ohm source, when averaged over any 3-second interval, should not exceed 1 dB below 1 watt (+ 29 dBm).***

the hold resistor, and the 451B KTU is in parallel with the L relay in the ring side of the line. Music is impressed on the ring side of the line from the CP music source through the 451B KTU to the 400D KTU, and is heard by the held party.

## 5. OPERATION

**5.01** When an incoming CO/PBX line is placed on hold, the L relay of the 400D KTU appears across the tip and ring leads in series with

**5.02** When the line hold is terminated, the A relay operates to shunt the L relay of the 400D KTU, causing it to release. This removes the music from the line.



**6. MAINTENANCE**



*Before replacing blown fuses or attempting any maintenance on the 34A voice coupler, check for hazardous voltages between terminals 1 and 2, 1 and G, and 2 and G.*

**6.01** When trouble is reported, check for blown fuses and loose or broken connections at 34A voice coupler. If fuses are blown, replace with 35P (3/4 amp) fuse.

**6.02** Remove customer connections to terminals 1 and 2 and telephone company connections from terminals 3 and 4 of the voice coupler. Make the following resistance measurements:

<u>Between Terminals</u>	<u>Resistance</u>
1 and 2	8 ohms
1 and 3	0
2 and 4	0
Any term. and G	4 ohms

**6.03** When trouble is indicated in the 451B KTU, replace it with another 451B KTU known to be working properly.

**6.04** When trouble is suspected in the CPE, notify the Repair Service Bureau so that proper Maintenance of Service Charge billing can be initiated as outlined in Section 660-101-312, entitled Maintenance of Service Charge on Services with Customer-Provided Equipment (CPE).



*Do not attempt any tests or repairs to the CPE.*

**6.05 Connection Index**

Fig. 3—Schematic of 451B KTU With 34A Voice Coupler

Fig. 4—Connections for 451B KTU Mounted in 69D Apparatus Mounting (400D KTUs Mounted in a 584-Type Panel)

Fig. 5—Connections for 451B KTU Mounted in 272A KTU (400D KTUs Mounted in a 584-Type Panel)

Fig. 6—Connections for 451B KTU Mounted in 598-Type Panel (400D KTUs Mounted in a 584-Type Panel)

Fig. 7—Connections for 451B KTU Mounted in 642A Modular Panel (400D KTUs Mounted in a 620A Modular Panel)

Fig. 8—Connections for 451B KTU Mounted in Jack 7 of 513- or 515-Type KSU (400D KTUs Mounted in 513- or 515-Type KSU)

Fig. 9—Connections for 451B KTU Mounted in Jack 8 of 513- or 515-Type KSU (400D KTUs Mounted in 513- or 515-Type KSU)

Fig. 10—Connections for 451B KTU Mounted in Jack 11 of 515-Type KSU (400D KTUs Mounted in 515-Type KSU)

Fig. 11—Connections for 451B KTU Mounted in Jack 13 of 515-Type KSU (400D KTUs Mounted in 515-Type KSU)

Fig. 12—Connections for 451B KTU Mounted in 69E or F Apparatus Mounting and Connections From Externally Mounted Connecting Blocks to (CO) and (STA) Lines of 515-Type KSU

Fig. 13—Connections of 34A Voice Coupler When 451B KTU is Mounted in 570A KSU

Fig. 14—Connections of 34A Voice Coupler When 451B KTU is Mounted in 580A KSU.

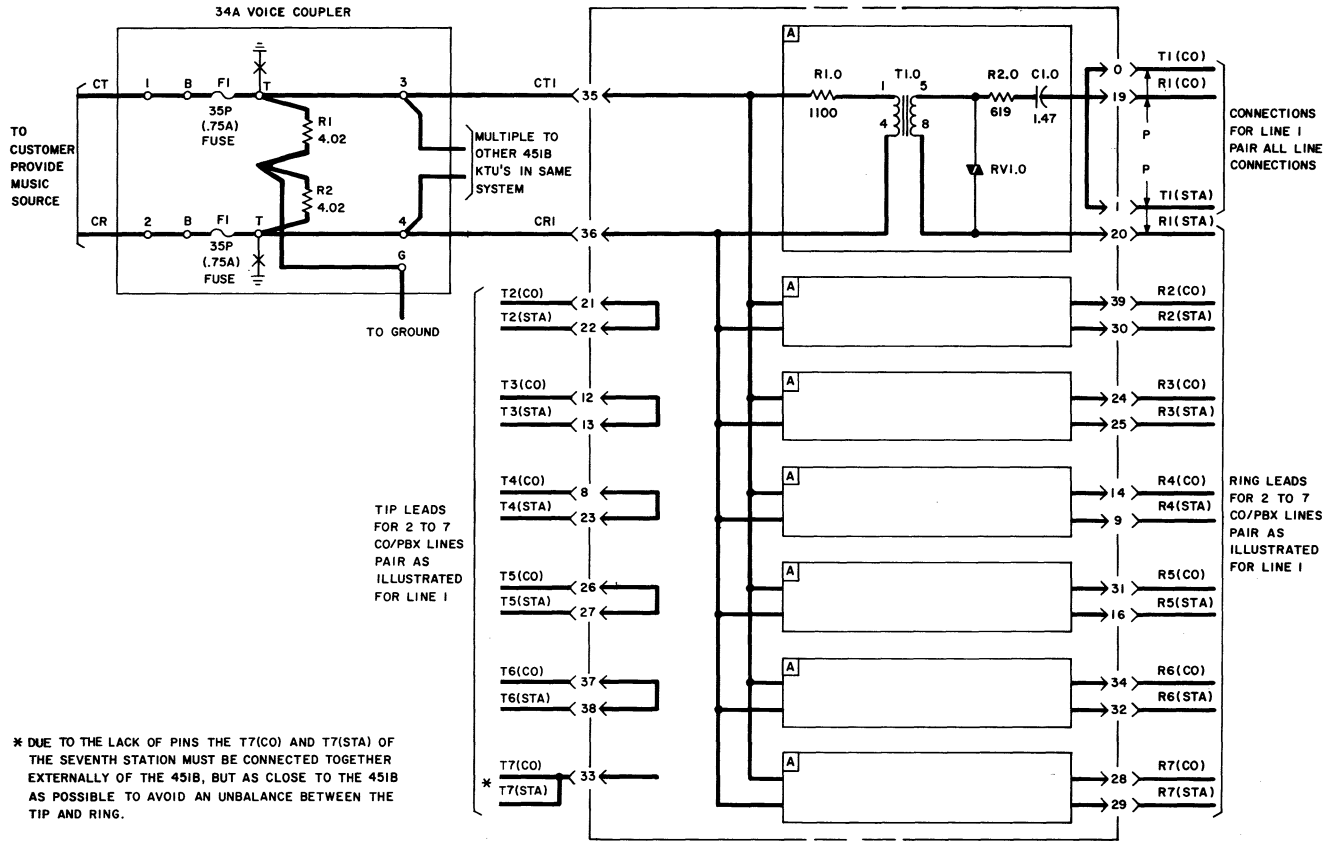


Fig. 3—Schematic of 451B KTU With 34A Voice Coupler

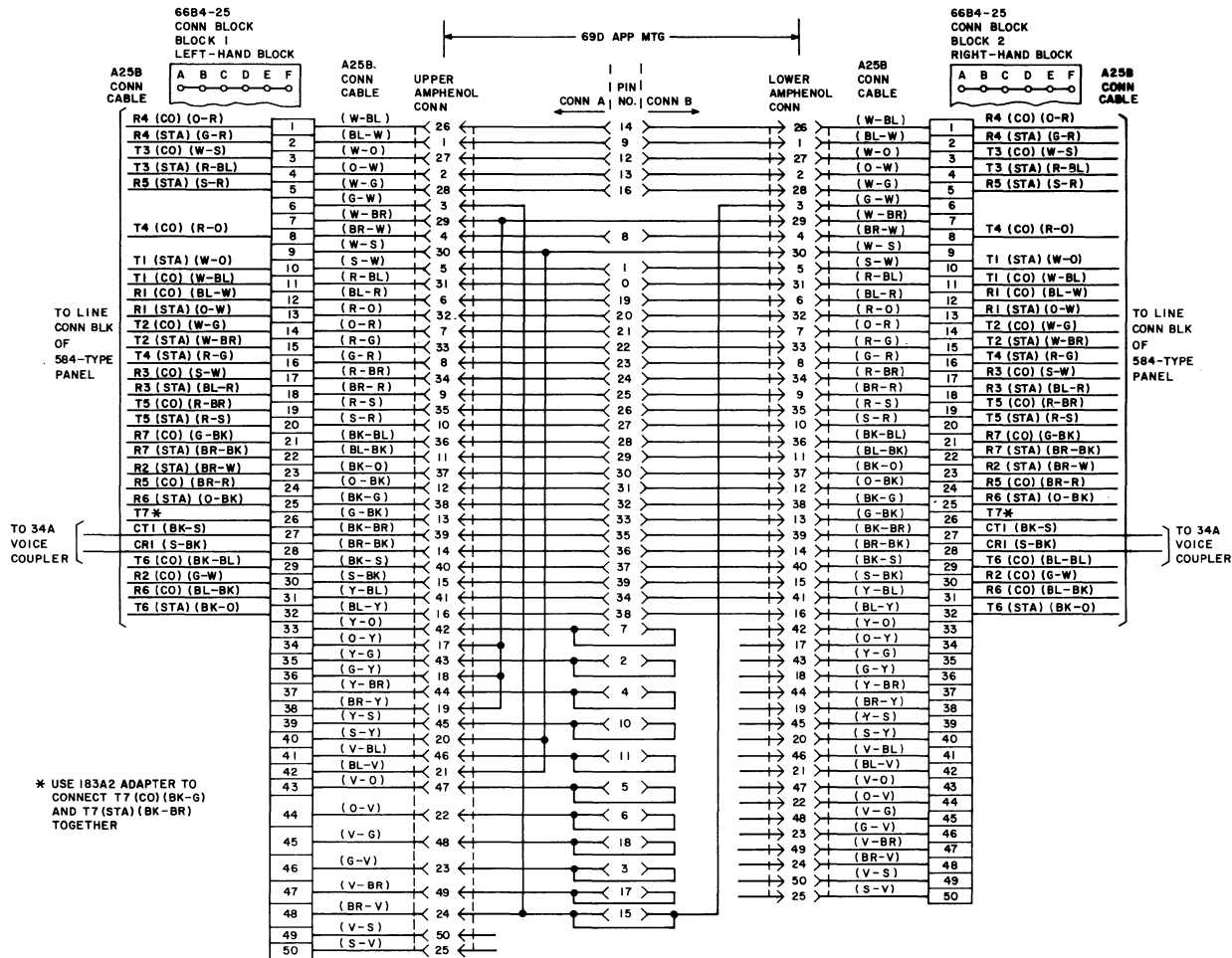
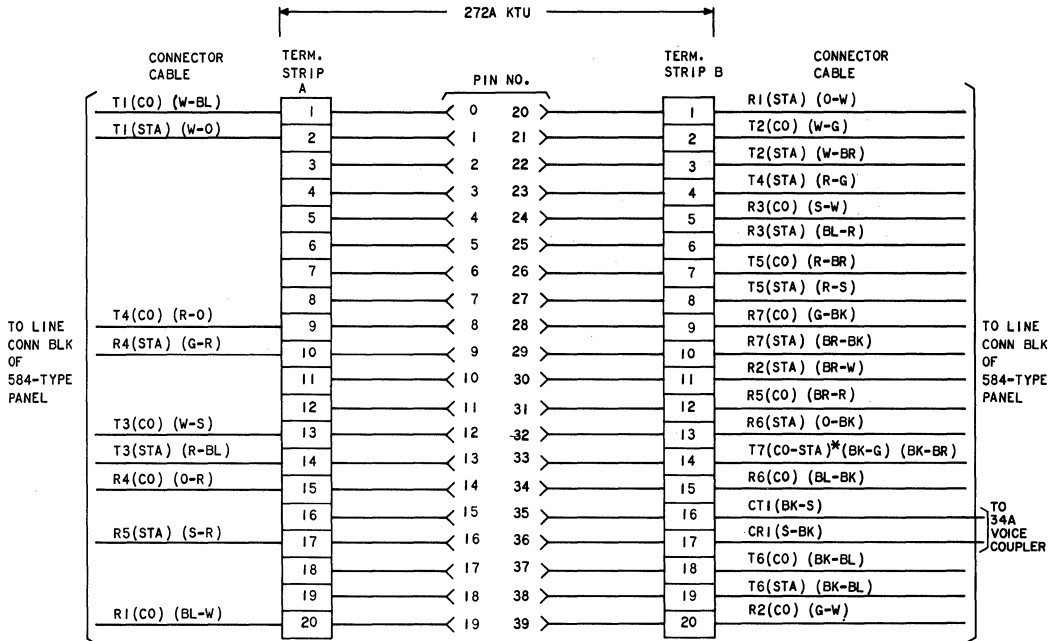


Fig. 4—Schematic of 451B KTU Mounted in 69D Apparatus Mounting (400D KTUs Mounted in a 584-Type Panel)



\* USE 182A2 ADAPTER TO CONNECT T7(CO) AND T7(STA) TOGETHER

Fig. 5—Schematic of 451B KTU Mounted in 272A KTU (400D KTUs Mounted in a 584-Type Panel)

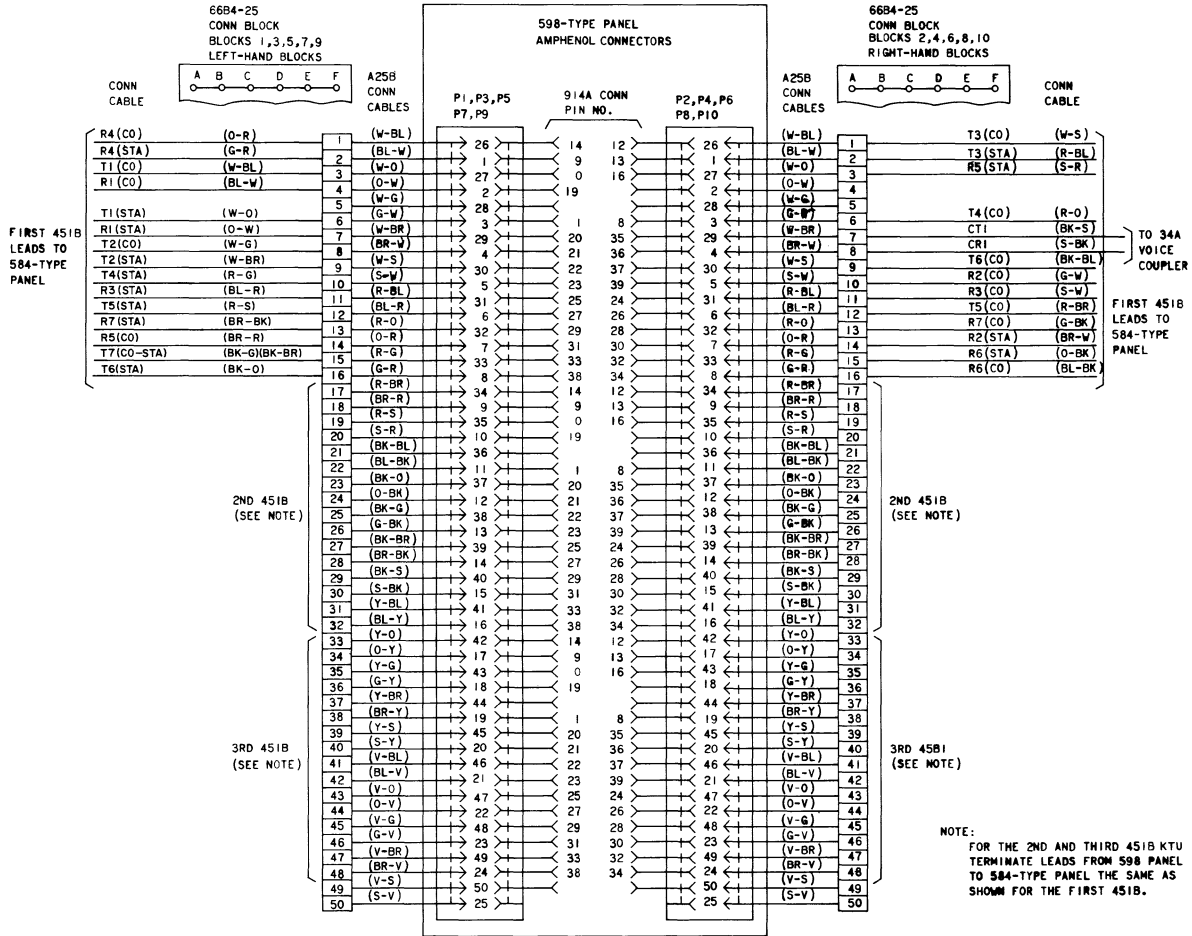


Fig. 6—Schematic of 451B KTU Mounted in 598-Type Panel (400D KTUs Mounted in a 584-Type Panel)

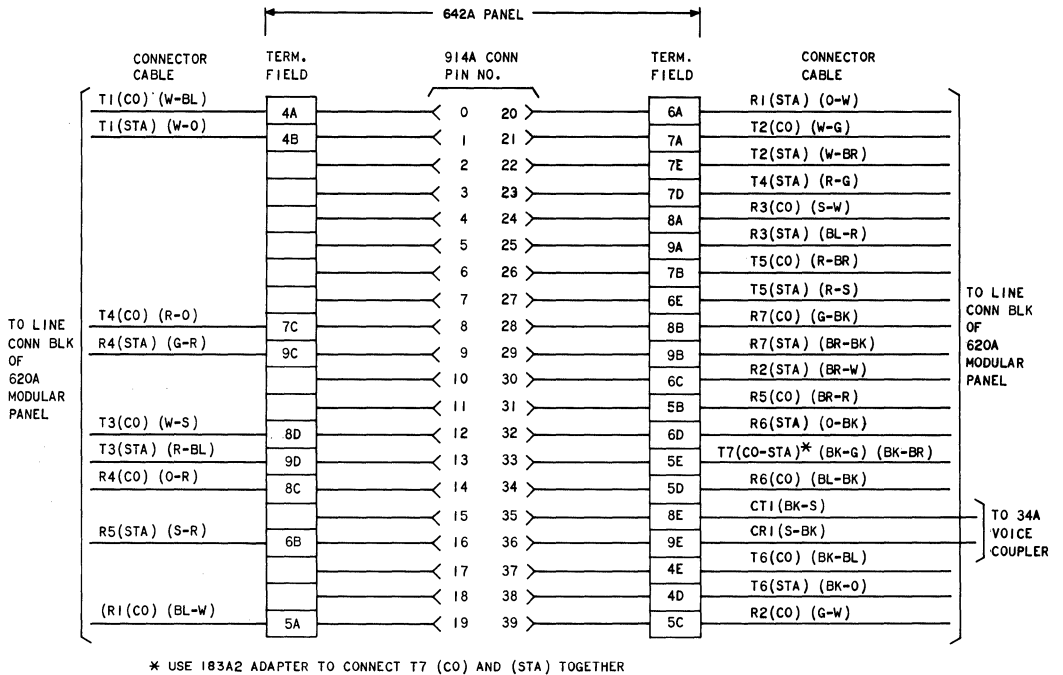


Fig. 7—Schematic of 451B KTU Mounted in 642A Modular Panel (400D KTUs Mounted in a 620A Modular Panel)

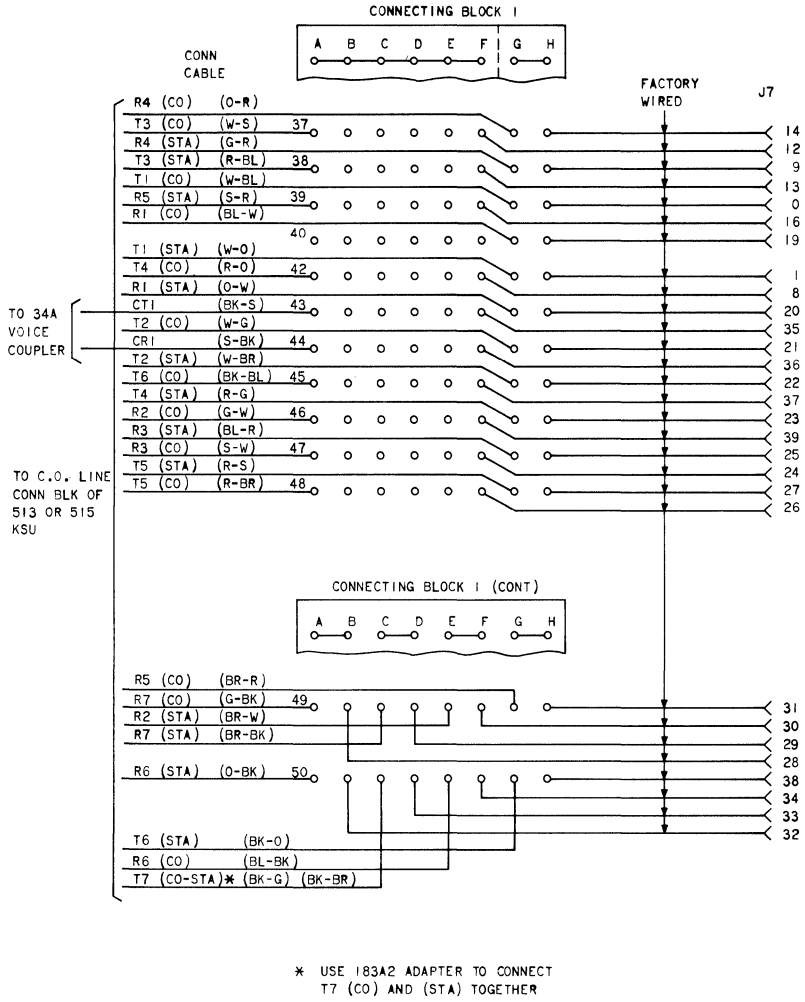


Fig. 8—Schematic of 451B KTU Mounted in Jack 7 of 513- or 515-Type KSU (400D KTUs Mounted in 513- or 515-Type KSU)





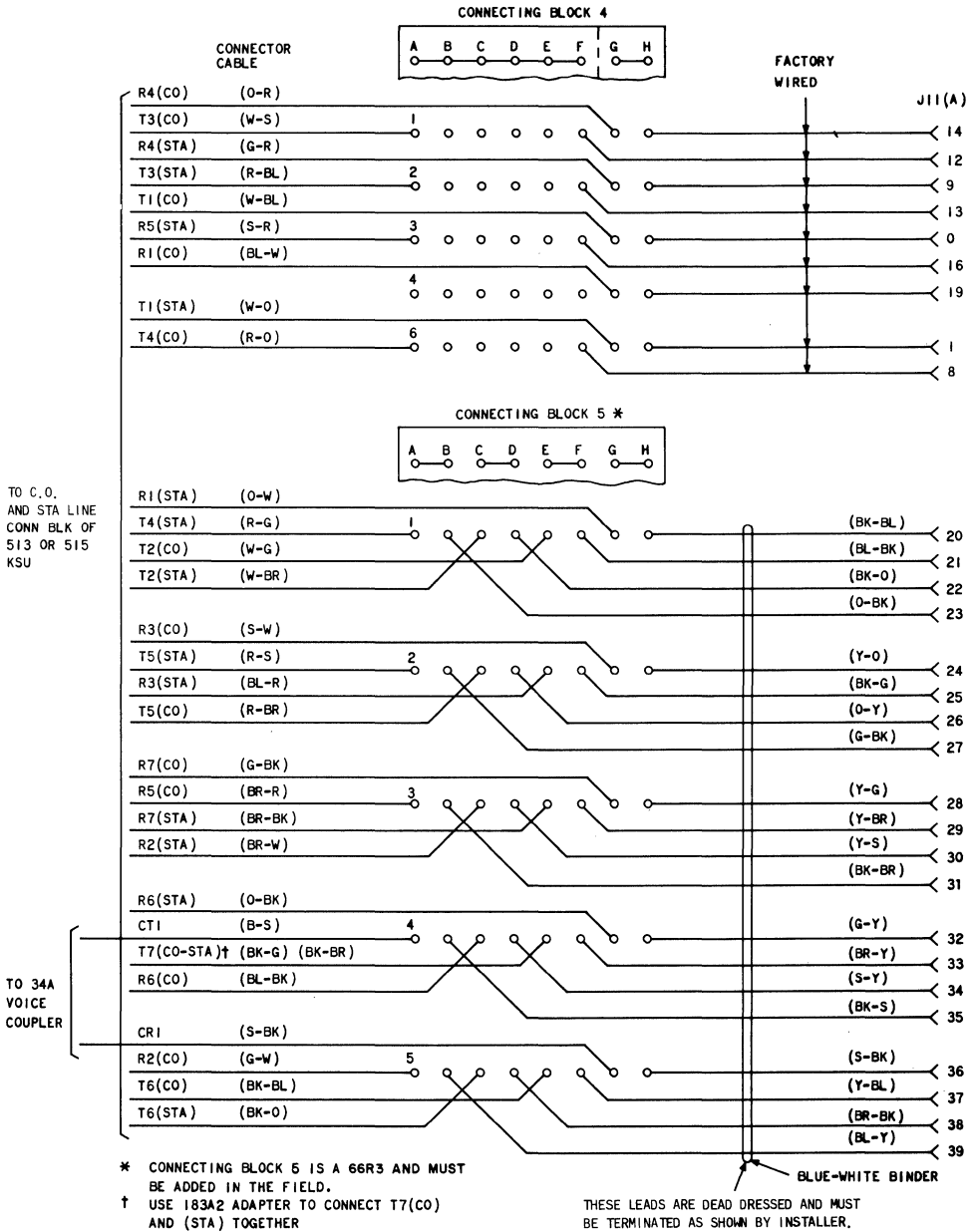


Fig. 10—Schematic of 451B KTU Mounted in Jack 11 of 515-Type KSU (400D KTUs Mounted in 515-Type KSU)

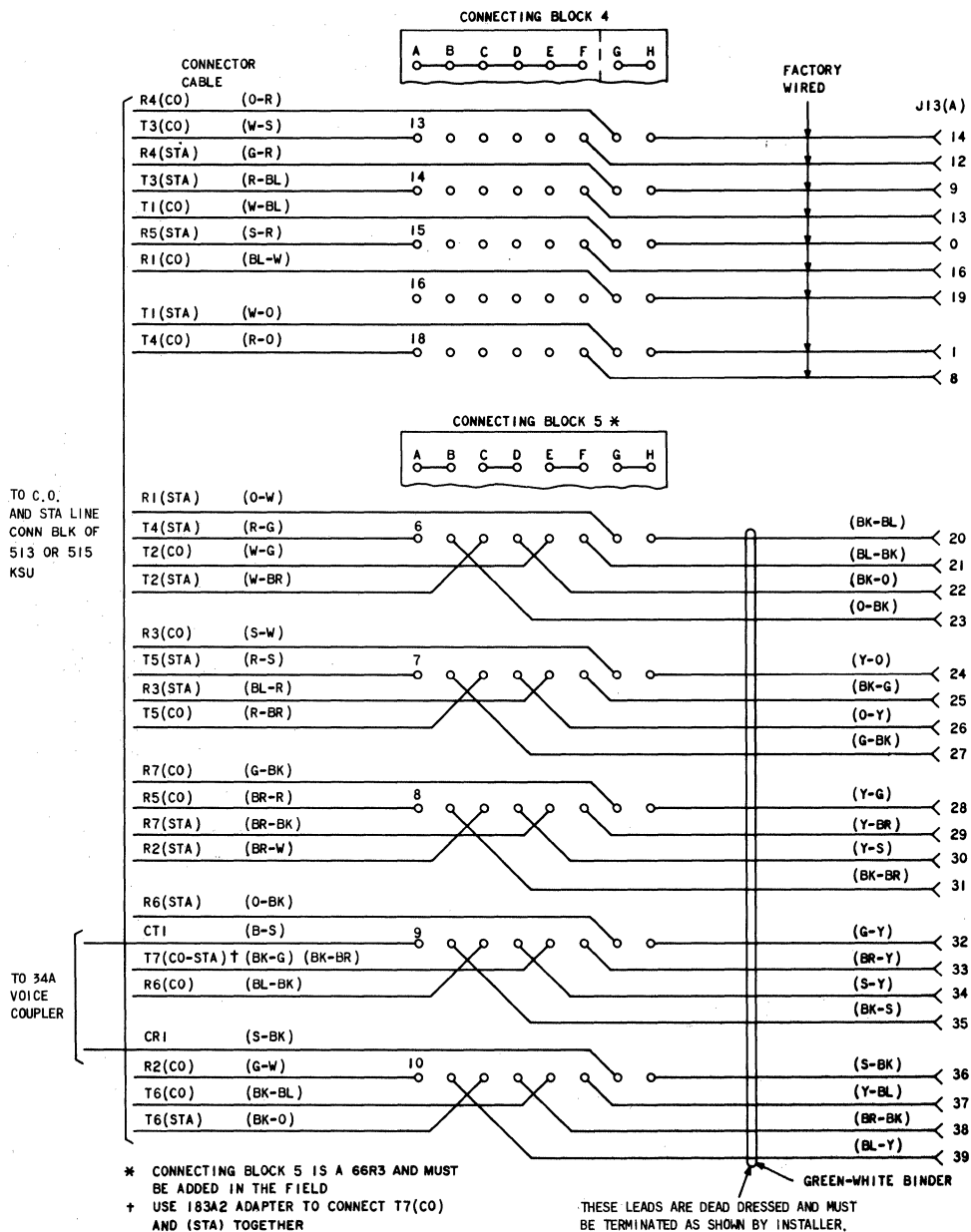


Fig. 11—Schematic of 451B KTU Mounted in Jack 13 of 515-Type KSU (400D KTUs Mounted in 515-Type KSU)

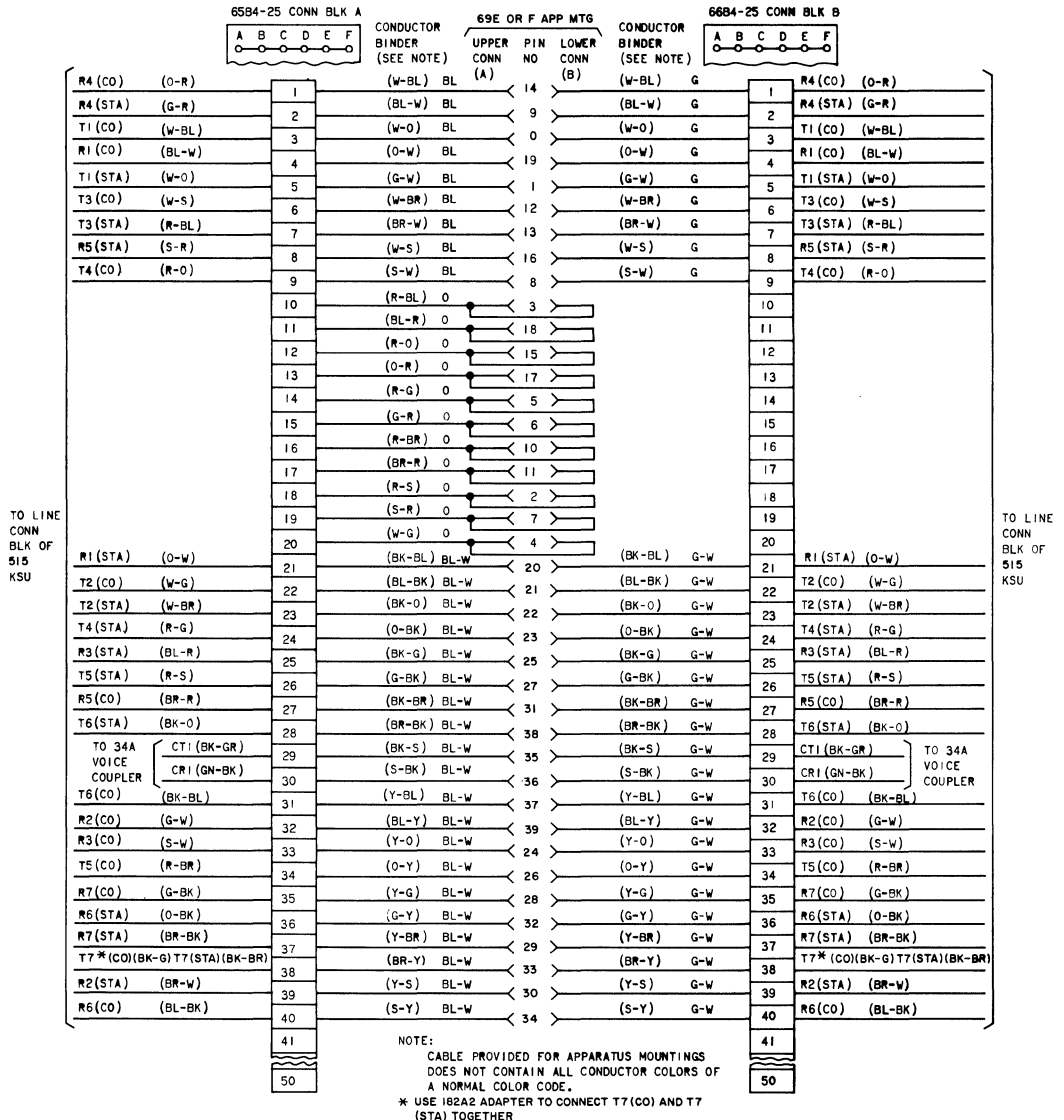


Fig. 12—Schematic of 451B KTU Mounted in 69E or F Apparatus Mounting and Connections From Externally Mounted Connecting Blocks to (CO) and (STA) Lines of 515-Type KSU

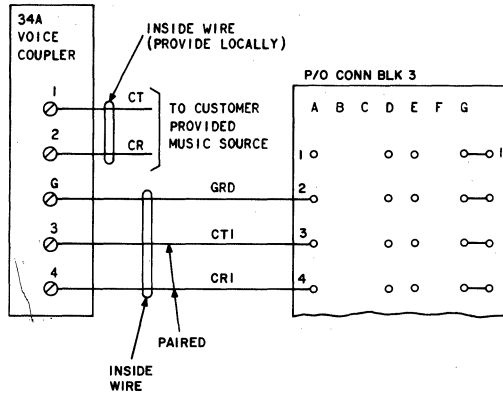


Fig. 13—Connections of 34A Voice Coupler When 451B KTU is Mounted in 570A KSU

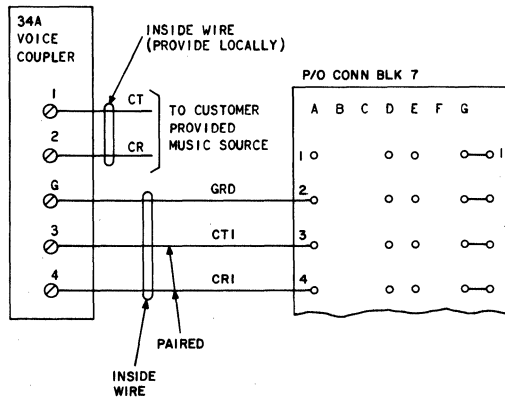


Fig. 14—Connections of 34A Voice Coupler When 451B KTU is Mounted in 580A KSU

