

V.A.2M

CUSTOMER ENGINEERING DIVISION

03-0075

# **FIELD LEVEL MAINTENANCE GUIDE NO.3**

## **928 Word Processing Systems**

**WANG**

**REORDER NUMBER**

**741-0653**

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**CHAPTER**

**1**

**INTRO-  
DUCTION**

CHAPTER 1  
INTRODUCTION

1.1 SCOPE

This is a Field Level Maintenance Guide (FLMG) for the 928 Wang Word Processing Systems (WWPS). It is intended that this FLMG will provide the Customer Field Engineers with a concise simplified reference for the preventive and corrective maintenance of all Wang Word Processing Systems and their associated options. The material in this FLMG has been drawn from oral and written recommendations of ATS personnel in the field, 928 Preliminary Maintenance Manuals, and other internal documents, with additional help from Customer Engineering. The on-site maintenance prescribed in this manual is restricted to LEVEL 1 and LEVEL 2. In instances requiring corrective maintenance at LEVEL 3, the decision to perform these repairs is based on the capability and availability of personnel and equipment by the area office concerned.

LEVEL 1-- Includes replacement of filters, ribbon cartridges, print wheels, cleaning and lubrication, adjustment of built-in controls etc.

LEVEL 2-- Includes LEVEL 1 items, plus unit replacement, PCB removal and replacement, minor adjustments and alignments.

LEVEL 3-- LEVEL 1 and 2 items, plus major disassembly and repair of subassemblies.

1.2 GENERAL

Wang Word Processing Systems are presently manufactured and packaged in five major configurations.

- 1) Editing Station
- 2) WP System 10A
- 3) WP System 20

### 1.3 SYSTEM CONFIGURATIONS AND GENERAL DIFFERENCES

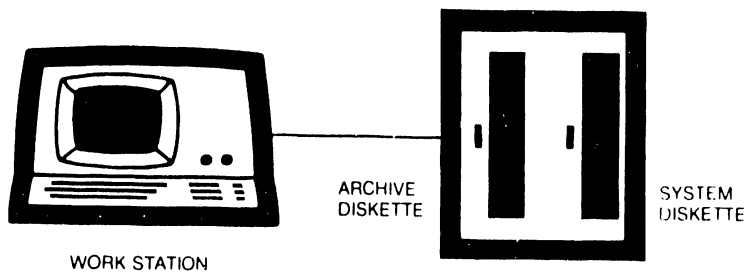
The Printed Circuit Board (PCB) complement of 928 Master and Slave units are included in each of the designated chapters. This provides for quick reference when servicing any one of the four systems. It is necessary that the Customer Engineer become familiar with the board complement of each unit because of the added options. The fact that the PCB part number changes with the added option could jeopardize the operation of a unit. For example, the 7225 is the 80x24 CRT CONTROL board for the workstation. The 7425 is the CRT CONTROL board with the TC option. The 7235/7335 is the 80x24 CRT CONTROL with the WIDE PLATEN OPTION. The substitution of the wrong board could cause many hours of frustration. Block diagrams are included to illustrate the basic configuration of each system and the additional units that can be added to expand each system. Included also are the accessories available with each system.

### 1.4 ORGANIZATION AND DESCRIPTION OF MANUAL

The Master units for each of the WP systems are contained in Chapter 2 with the maintenance and troubleshooting procedures that pertain to each system or group of systems. Chapters 3 and 4 will contain the Workstation and Printer maintenance data respectively with the options available for each unit. A separate troubleshooting flow chart has been included for each of these two units with detailed explanations.

Chapter 5 contains the maintenance procedures for each of three different disk drive models used with the Word Processing Systems. A new STEVE NORRIS (WP 928 MAINTENANCE UTILITY DISKETTE) is included for use in troubleshooting the disk drives in Section 5.13.7. Chapter 6 contains the system options. Each basic WP System is assigned two disk drives as an integral part of each Master. However, it was decided that the disk drives should be separated from the Master and discussed separately. Supporting documentation for each of the chapters is included with troubleshooting flow diagrams. Specifications, PCB complements, minor unit differences and other pertinent support data will be included to assist in expediting the return of a defective system to an operating condition.

## EDITING SYSTEM (WPS-ES)



### Basic Configuration

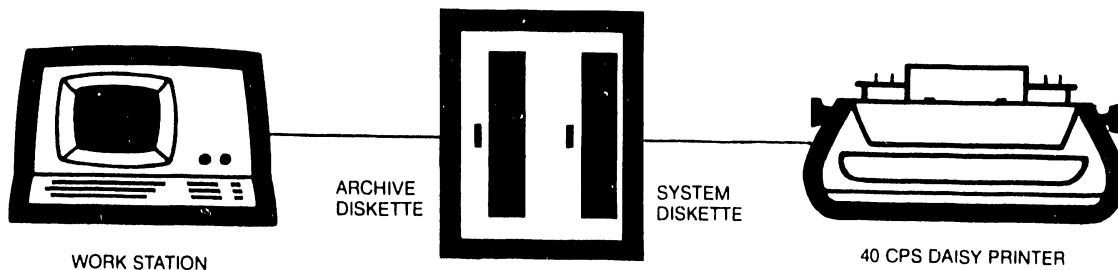
- 1 Work Station
  - 1 System Diskette
  - 1 Archive Diskette
- Cable Length: 25' Standard

### Accessories

- Work Station Table
- General Work Table

FIGURE 1-1

## SYSTEM 10A



### Basic Configuration

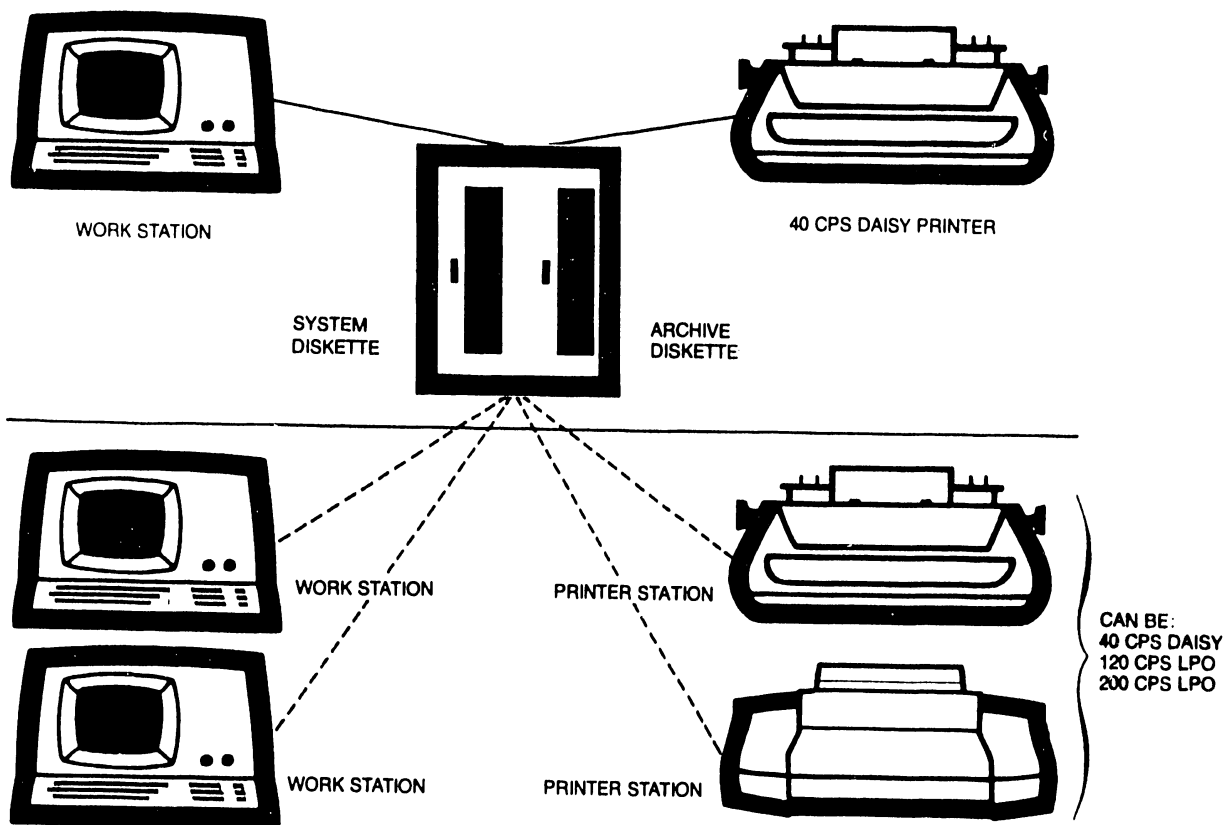
- 1 Work Station
  - 1 System Diskette
  - 1 Archive Diskette
  - 1 40 CPS Daisy Printer
- Cable Length: 25' Standard

### Accessories

- Work Station Table
- General Work Table
- Printer Table

FIGURE 1-2

# SYSTEM 20



## Basic Configuration

- 1 Work Station
- 1 System Diskette
- 1 Archive Diskette
- 1 40 CPS Daisy Printer
- Cable Length: 25' Standard

## Additional Stations

- 2 Work Stations
- 2 Printers:
  - 40 CPS Daisy
  - 120 CPS LPO
  - 200 CPS LPO

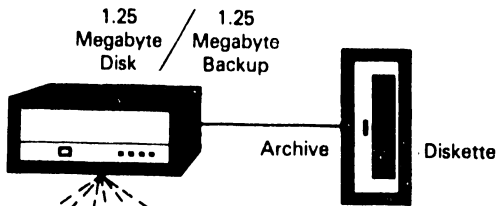
## Accessories

- Work Station Table
- General Work Table
- Daisy Printer Table
- LPO Printer Stand

FIGURE 1-3

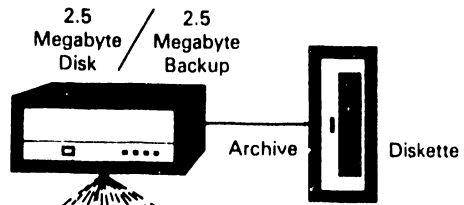
# Wang Word Processor System 25

**Model 1**



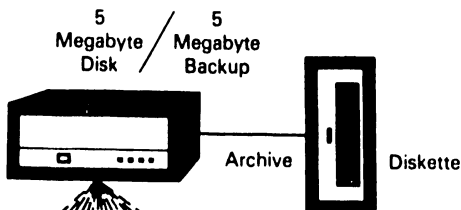
Can support a total of 6 work stations, printers, or other peripherals in any combination.

**Model 2**



Can support a total of 14 work stations, printers, or other peripherals in any combination.

**Model 3**



Can support a total of 14 work stations, printers, or other peripherals in any combination.

**Printers can be:**

- 40 CPS Daisy
- 120 CPS Line Printer
- 200 CPS Line Printer
- 5571 Chain Printer

**Optional Peripherals can be:**

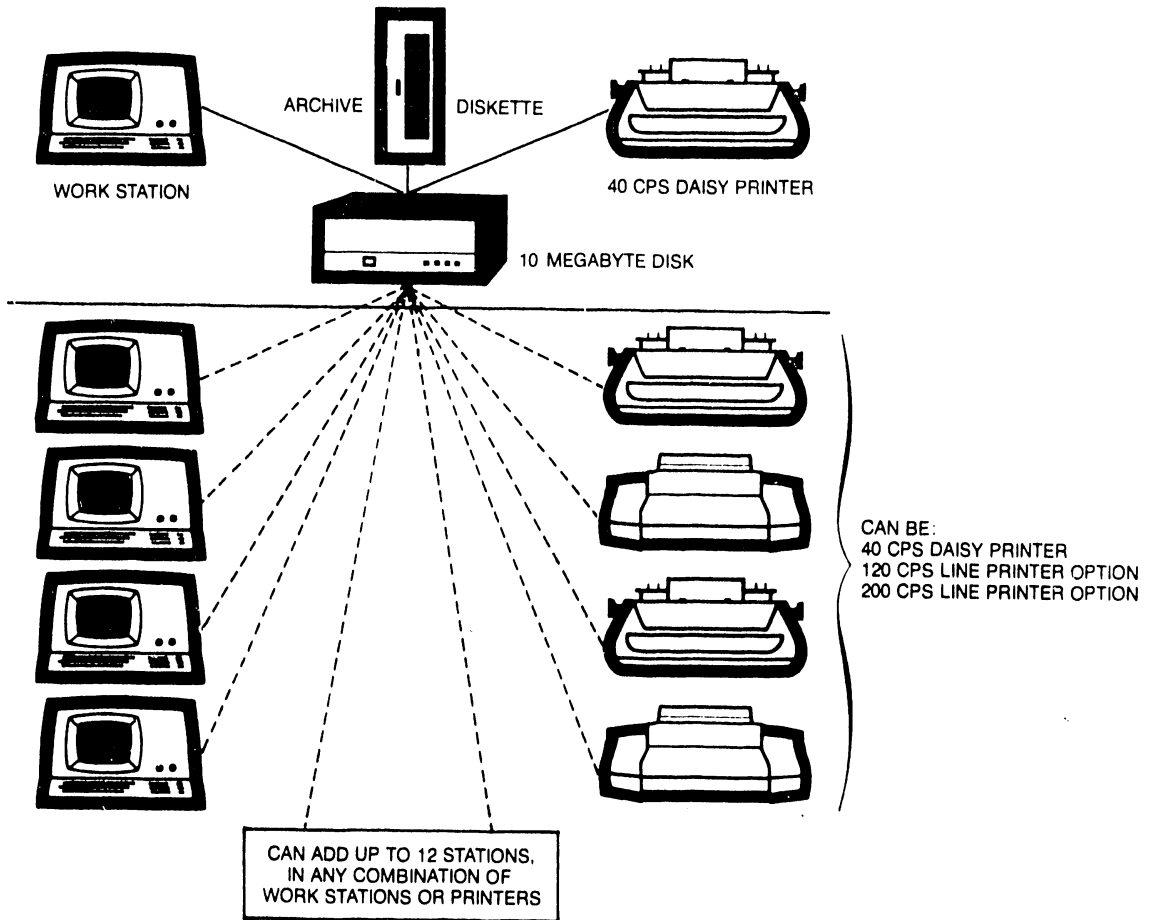
- Photocomposition
- Telecommunications

**Accessories:**

- Work Station Table
- General Work Table
- Daisy Printer Table
- Line Printer Stand
- Additional Cable Lengths (2000' max.)

**FIGURE 1-4**

# SYSTEM 30



## Basic Configuration

- 1 Work Station
- 1 10-Megabyte Disk
- 1 Archive Diskette
- 1 40 CPS Daisy Printer
- Cable length: 2000' max.

## Additional Stations

- 12 — Any Combination
- Work Stations
- Printers:
- 40 CPS Daisy
- 120 CPS LPO
- 200 CPS LPO
- 5571 Chain Printer

## Accessories

- Work Station Table
- 10-Megabyte Disk Stand
- General Work Table
- Daisy Printer Table
- LPO Printer Stand

Figure 1-5

## 1.5 PURPOSE

Several troubleshooting guides have been submitted for servicing 928 WP Systems. The previous methods suggested to isolate malfunctions to a single major unit (Master, Disk, Workstation or Printer) have been short cuts resulting in visual/audio techniques utilizing the workstation and/or printer. This method is in no way discouraged. The method of troubleshooting suggested in this FLMG is based more on the premise that the Master/Disk is the central control unit and must be an operational/servicing focal point. The assumed condition for all systems is POWER OFF. When power is turned ON, the main trouble shooting flow is to a successful "STEADY STATE" condition.

## 1.6 RECOMMENDED TEST EQUIPMENT AND TOOLS

1. Digital voltmeter
2. Standard Wang tool kit
3. Special tools which are listed in the Customer Engineering Division tool listing pamphlet 03-0064.
4. Oscilloscope (Used only if the maintenance problem can be solved more conveniently at the site).

## 1.7 LIST OF INFORMATION PUBLICATIONS AND REFERENCES

1. Volume I,II and III of the MODEL 928 PRELIMINARY WP SYSTEMS FIELD LEVEL MAINTENANCE MANUALS.
2. Preliminary Field-Level Maintenance Manual for the CDC HAWK Cartridge Disk Drive #03-0072.
3. CDC Hardware Maintenance Manual for the Cartridge Disk Drive Model 9427H (# 77834675)
4. Field Level Maintenance Guide for DIABLO SERIES 40 DISK DRIVES.
5. DIABLO Series 40 Disk Drive Maintenance Manual 81601
6. Diablo Series 1300 Hy-Type II Printer Maintenance Manual



**CHAPTER**

**2**

**MASTER**

**CPU**

CHAPTER 2  
MASTER CPU

2.1 GENERAL DESCRIPTION

Master CPU Models, WPS-ES (Editing Station), 5510A, 5520, 5525 and 5530 are delivered to the customer with the assigned disk drives listed in section 5.2. The disk drives are an integral part of each Master model and are delivered to the customer as a unit. Chapter 5 has been assigned for maintenance of hardware and operational features of the disk drives delivered with each Wang Word Processing System. The circuit board complement of each Master CPU for Wang Word Processing Systems is included with LEVEL 1 and 2 maintenance procedures and operational requirements.

2.2 MASTER CPU CIRCUIT BOARD COMPLEMENT

The printed circuit board complement for the Master units is as listed. The only major difference in the Master Units is the number of slave units that each can accommodate via the connector plate and cable assembly that is mounted on the rear of the cabinet. The Connector Plate and Cable assembly comes in a single channel configuration for the EDITING STATION with a maximum of 14 channels for the System 30.

2.2.1 MASTER CPU (EDITING STATION) (928M4)

PCB	REV#	NAME	COMMENT
210-7214	R2	Master Data Link	Supplies 1 I/O channel
210-7201	R3	16K Master Memory#1	
210-7202	R2	Master CPU	
210-7203	R9	Master Disk Controller	
210-7206	R2	Master Pwr. Supply Reg.	
210-7205	R2	Motherboard	

## 2.2.2 MASTER CPU (5510A) (928M3)

(Same board complement as the Editing Station)

Differences:

210-7214	Master Data Link	Supplies 2 I/O channels
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## 2.2.3 MASTER CPU (5520) (928M1)

(Same board complement as Editing Station)

Differences:

210- 7214	Master Data Link	Supplies 6 I/O channels
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## 2.2.4 MASTER CPU (5525/5530) (928M2)

(Same board complement as Editing Station)

Differences:

210- 7214-1	Master Data Link	5525 supplies 6 and 14 I/O channels 5530 supplies 14 channels only
-------------	------------------	---

## 2.3 MASTER MAINTENANCE PROCEDURES

### 2.3.1 REPLACEMENT FUSES FOR MASTER UNITS

The same size line fuse is used for each of the four Master units. See Interconnection Diagram D6840-999 in Appendix A.

1. PRIMARY SOURCE 115VAC 60HZ  
Fuse 3.0 Amperes 250V SLO-BLO (PART #360-1031-SB)
2. PRIMARY SOURCE 220-240VAC 50HZ  
Fuse 1.5 Amperes 250V SLO-BLO (PART #360-1016-SB)

### 2.3.2 MEASUREMENT OF MASTER OPERATING VOLTAGES

To measure the Master operating voltages requires removing the cover. Turn Master power OFF. Remove the three screws on each side

of the cover that attaches to the base chassis and lift the cover straight up until it is clear of the disk drive(s) and the electrical circuit boards. Set the cover aside and turn Master power ON. (The power voltage regulator board 7206 employs a power-off circuit which will shut down the Master and produce signal\*AUTO RESET if any one of the operating voltages drop below its regulated tolerance limits listed below.) See schematic D6840-999(Interconnection Diagram for the Master power supply).

+24 Volts Regulated is produced by the power supply for use with the system disks. When this voltage is shut down by the power-off circuit, it inhibits any READ/WRITE operations from taking place on the system disk. The test points for checking and adjusting the operating voltages are listed below. Figure 2-1 indicates the location for adjusting the voltages on the 7206 board.

LOCATION	ADJ	VOLTAGE	TOLERANCE	BOARD	TP
7206 PCB		+or-0v		7201	TP#3
7206	R11	+5 VR	+4.90 to +5.10	7201	TP#2
7206	R19	-5 VR	-5.10 to -4.90	7201	TP#4
7206	R15	+12 VR	+11.80to +12.20	7201	TP#1
7206	R6	+24 VR	+23.50to +24.50	(**)	

\*\* This voltage can be monitored at the Shugart Disk Drive and on the top right corner of the 7203 PCB.(Master Disk Controller)

Each Shugart disk drive is connected by a ribbon cable to the Master Motherboard. The +24V is routed via the cable to the disk drive and can be checked at pin 2 of the 6767 connector. (See Figure 2-2)

Test points (TP)for the operating voltages are labeled at the top center(component side) of the 7201 memory board. (See Figure 2-3) Voltage readings can be taken at the top of the four isolation resistors or at the TP eyelets adjacent to the resistors. Replace the Power Regulator board 7206 if voltages cannot be adjusted.

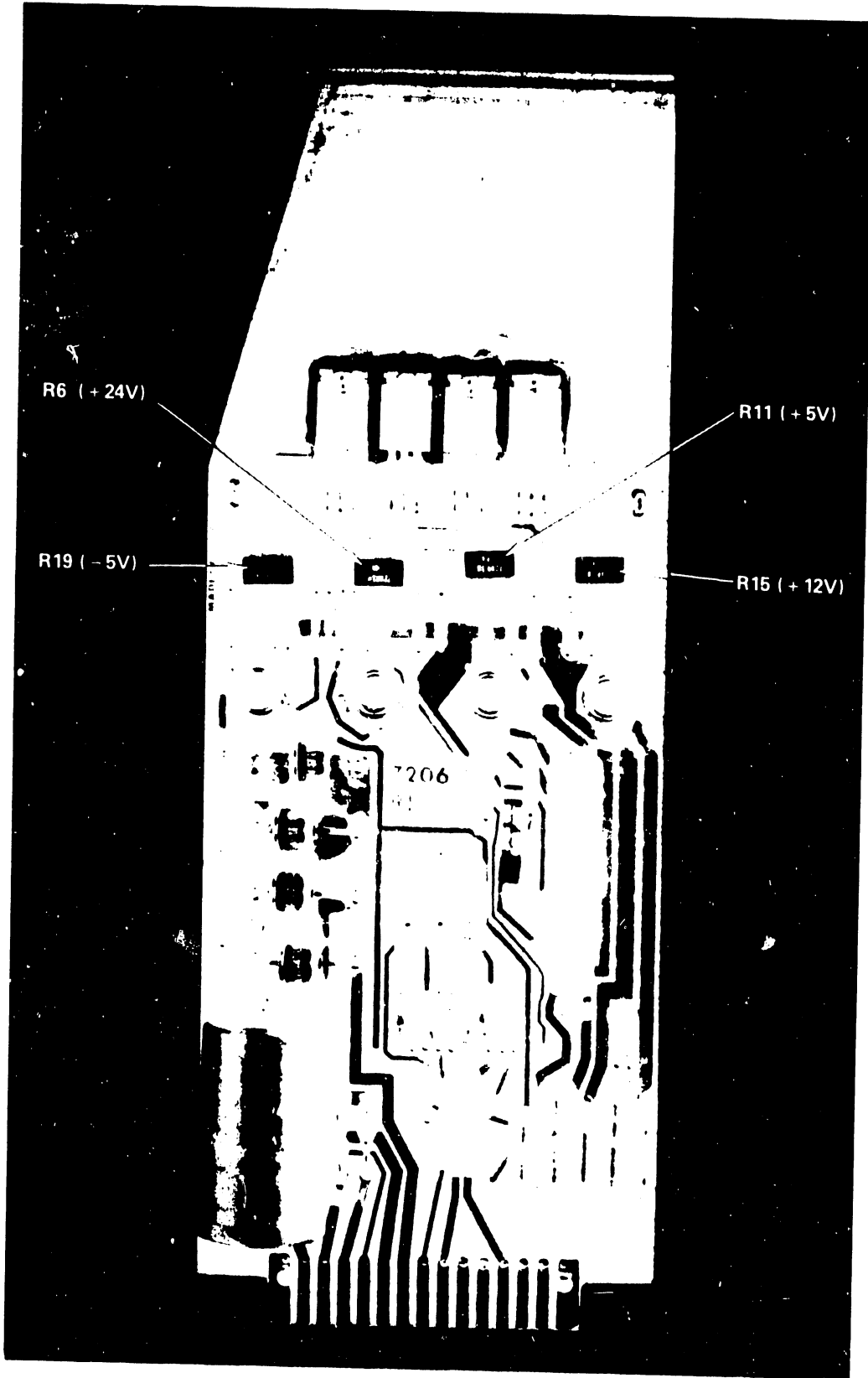


FIGURE 2-1 7206-MASTER CPU POWER REG PCB

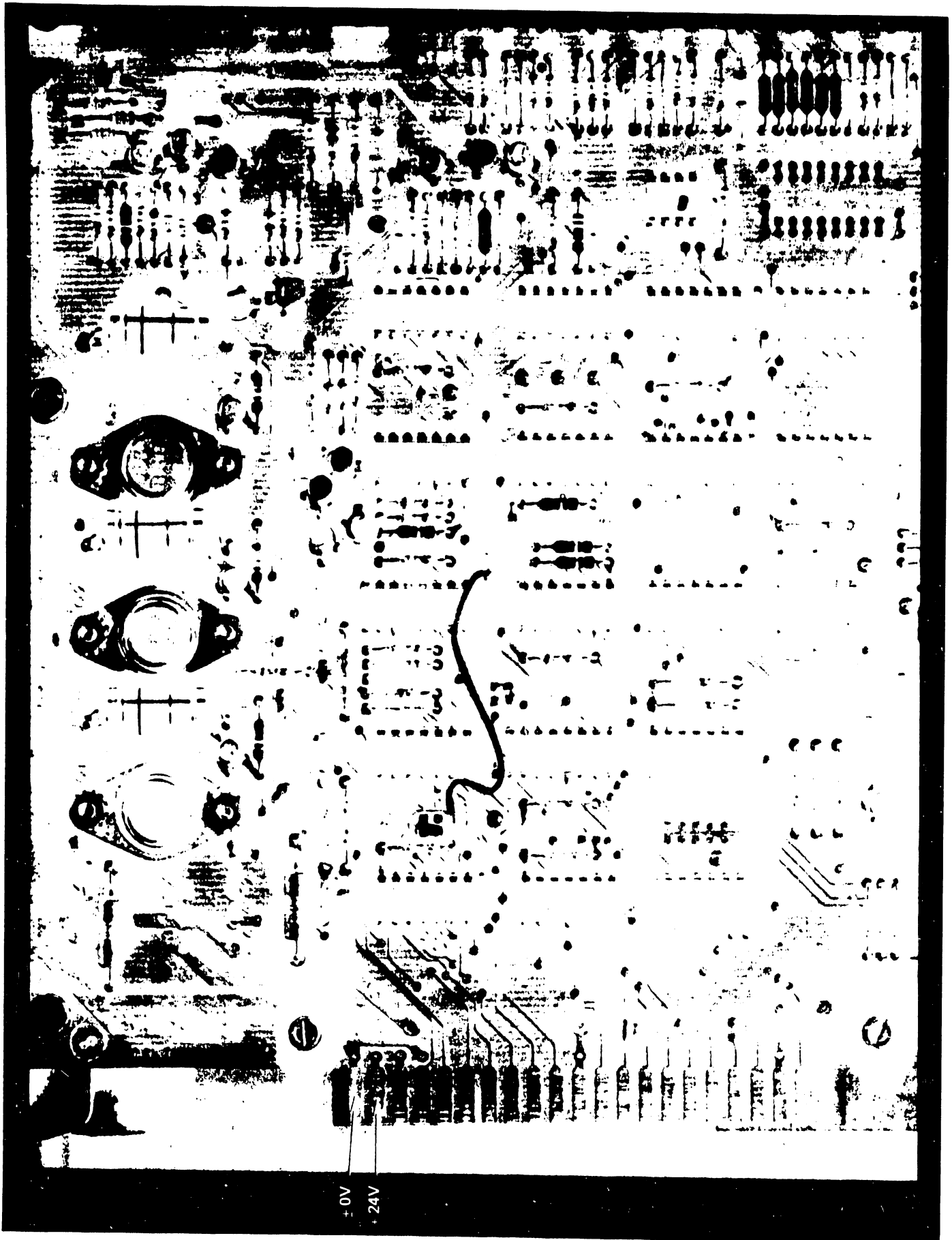


FIGURE 2-2 MODEL SA901 SHUGART ELECTRICAL PCB

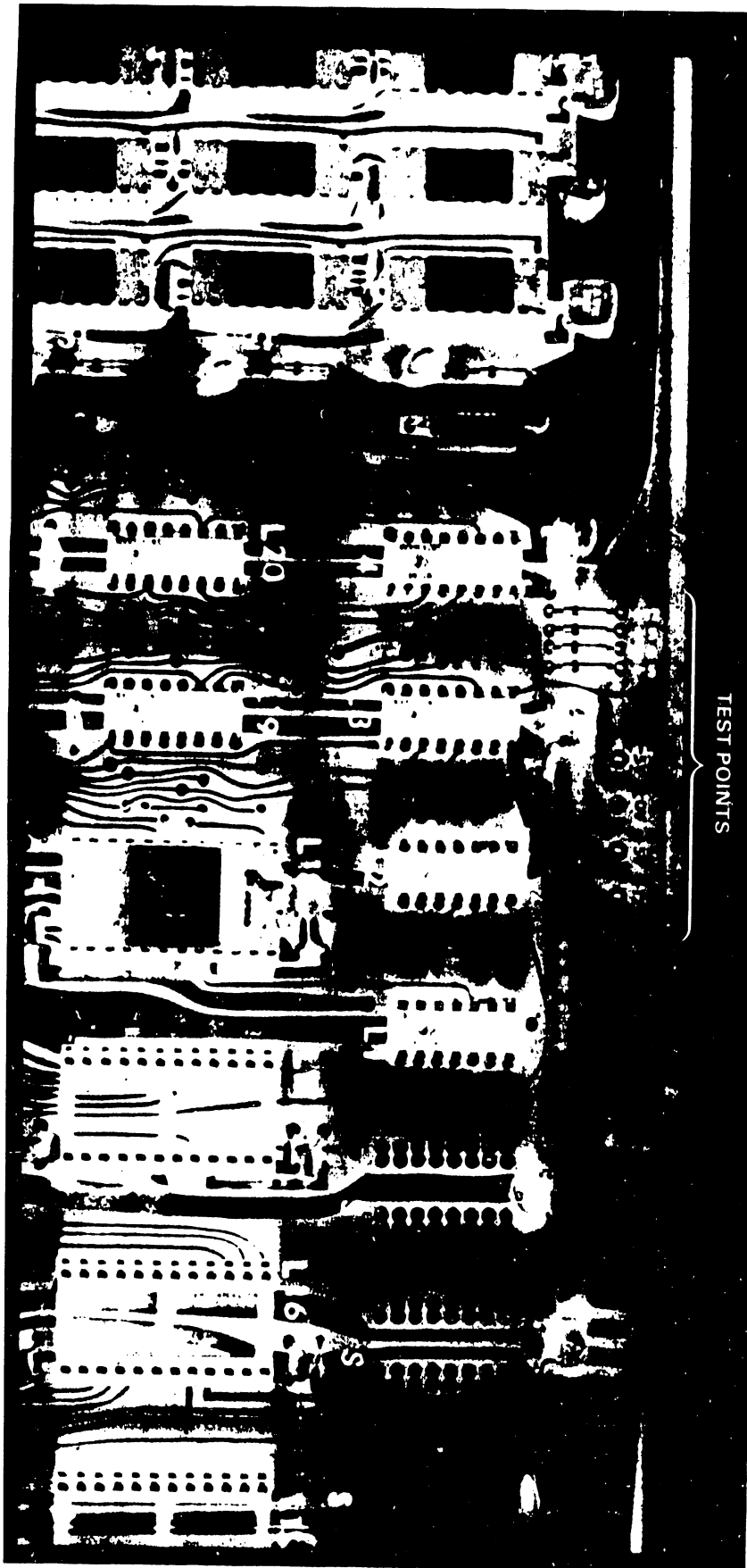


FIGURE 2-3 PCB 7201 TEST POINTS FOR MASTER OPERATING VOLTAGES

### 2.3.3 R & R OF MASTER PRINTED CIRCUIT BOARDS

Turn Master power OFF. Remove the cover as described in PARAGRAPH 2.3.2. Set cover aside. Remove the hardware screws that separate and support the boards (See Figure 2-4) and carefully remove the suspected board. Try removing the boards by lifting on one end and then on the other to overcome the pin contact pressure from the motherboard connectors. Replace the faulty board and insure that the replacement is properly inserted. Turn power on and test for proper operation as indicated in the troubleshooting flow diagrams prior to replacing the support hardware.

### 2.4 MASTER OPERATING CONTROLS AND INDICATORS

1. PROGRAM LEVEL SWITCHES - This mini-switch assembly contains a bank of eight switches and is located on the Master CPU board 7202. These switches must be set to correspond with certain values depending on the software options currently installed in each of the systems. If the switches are not set properly, the system will not operate. Refer to Appendix B for switch settings on all systems and system options.

NOTE: The wrong switch setting indication will be a flashing 2 in the lower right hand corner of the CRT screen.

#### 2. RESET and POWER ON INDICATOR

The RESET button is located inside of the Master front louvered panel and is only used when the system requires a reset. This action causes the system to return to the start up address 0000 and it reloads (IPLs) the Master and Slaves when the system is locked up because of an error or other problem. All system logic, registers and 8080 flip-Flops are cleared for a fresh start when reset.

The POWER ON indicator is a red LED lamp (for operator use) that glows when power is applied to the Master (Located inside the front grill). The lamp is extinguished during periods when System and



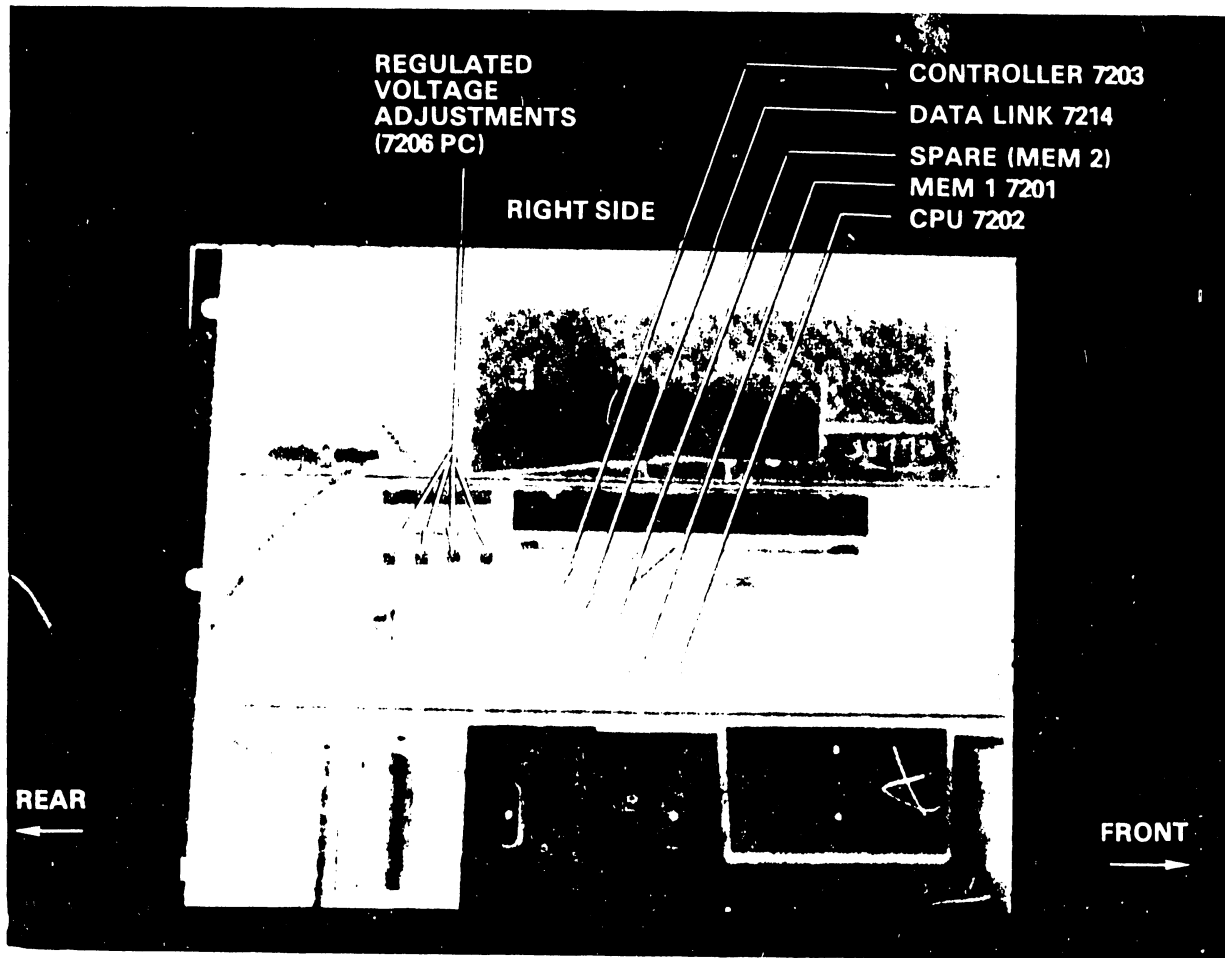


FIGURE 2-4 MASTER CPU PCB LAYOUT

Archive disks are in use on WP Systems equipped with dual diskettes. Refer to figure 2-5.

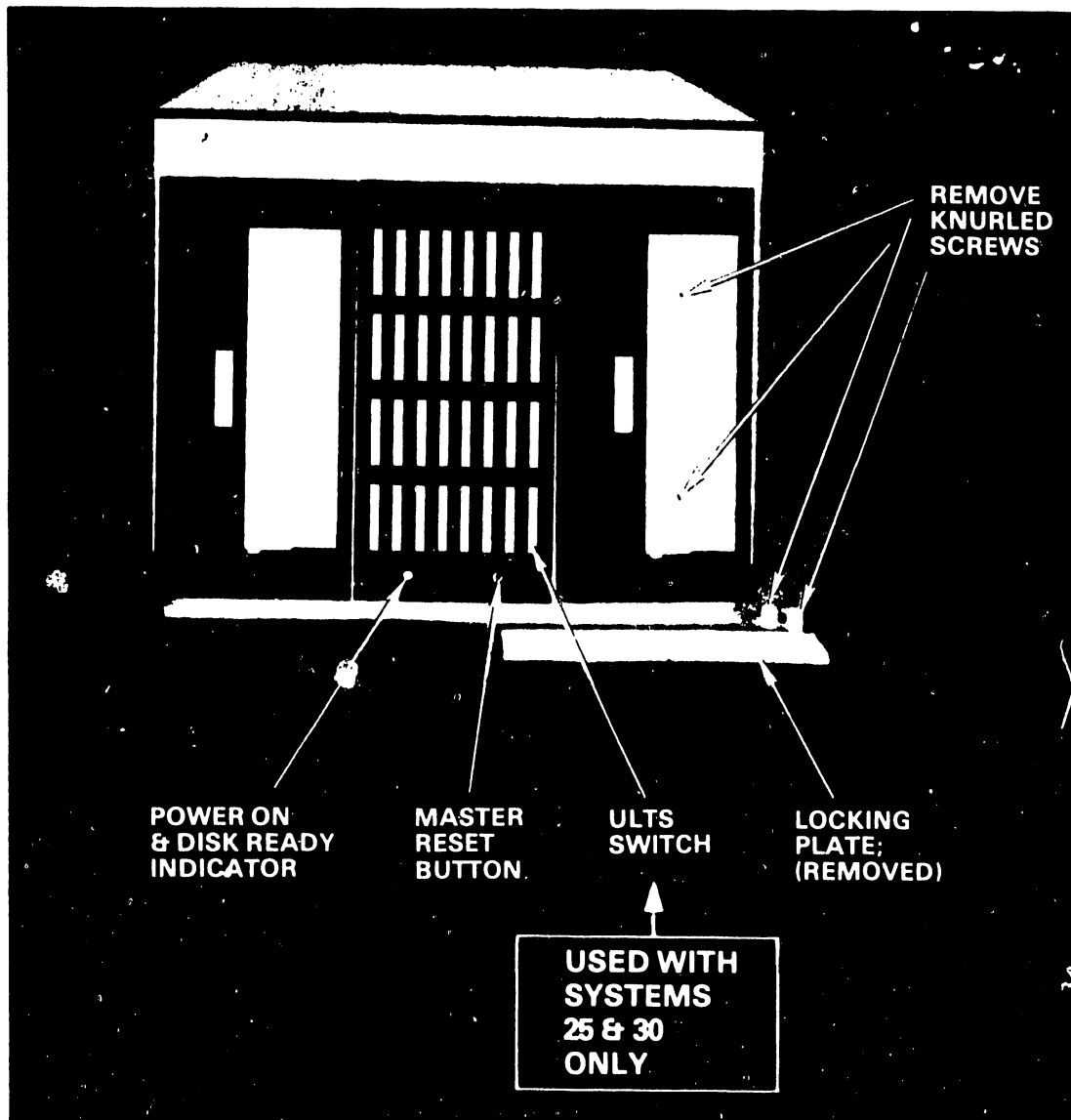
### 3. UTILITY LOAD TRANSFER SWITCH

The Utility Load Transfer Switch (ULTS) is only installed on the WP System 25 and 30 Master CPU. System 25 is delivered in three different models determined by the storage capacity of its hard disk drive (1.25, 2.5 and 5 megabytes.) System 30 is equipped with a 10 megabyte SYSTEM hard disk. Both systems have a Shugart floppy disk drive that is used as an ARCHIVE. This requires that the ARCHIVE drive be utilized for updating SYSTEM software with the convenient Utility Diskettes. The ULTS switch is recessed in a slot behind the front grill of the Master. (See figure 2-5). The switch is normally positioned DOWN for hard disk operation. When the switch is positioned UP, the archive floppy becomes the system drive. To perform a utility operation, install the utility disk in the ARCHIVE drive, set ULTS switch to the up position and press the RESET button through the recessed hole in the bottom of the grill.

#### 2.4.1 DISKETTE LOADING AND HANDLING

The diskette is a flexible disk enclosed in a plastic jacket. The interior of the jacket is lined with a wiping material to clean the disk of any foreign material. To load the diskette, depress the locking latch (opens the slot for inserting diskette), insert the diskette slowly with the label facing out. (See Figure 2-6). If the diskette is loaded properly, it should snap into place. The latch can then be moved slowly to the left, locking the diskette on the drive spindle. If the diskette persists in popping out each time it is inserted, refer to Chapter 5 for adjustments and handling procedures.

NOTE: The locking plate and knurled screws are used on the system disk drive (right side) for protection against inadvertently releasing the diskette and causing a catastrophe. THIS PLATE SHOULD BE LOCKED SECURELY DURING ALL OPERATING PERIODS. The diskette can be loaded or unloaded with the power ON and the drive spindle rotating. Observe LED front panel lamp (LIT) when changing diskettes (NO PROCESSING IN PROGRESS).



**FIGURE 2-5 MASTER CPU — LOCKING PLATE FOR SYSTEM DISKETTE AND OPERATING CONTROLS/INDICATORS**

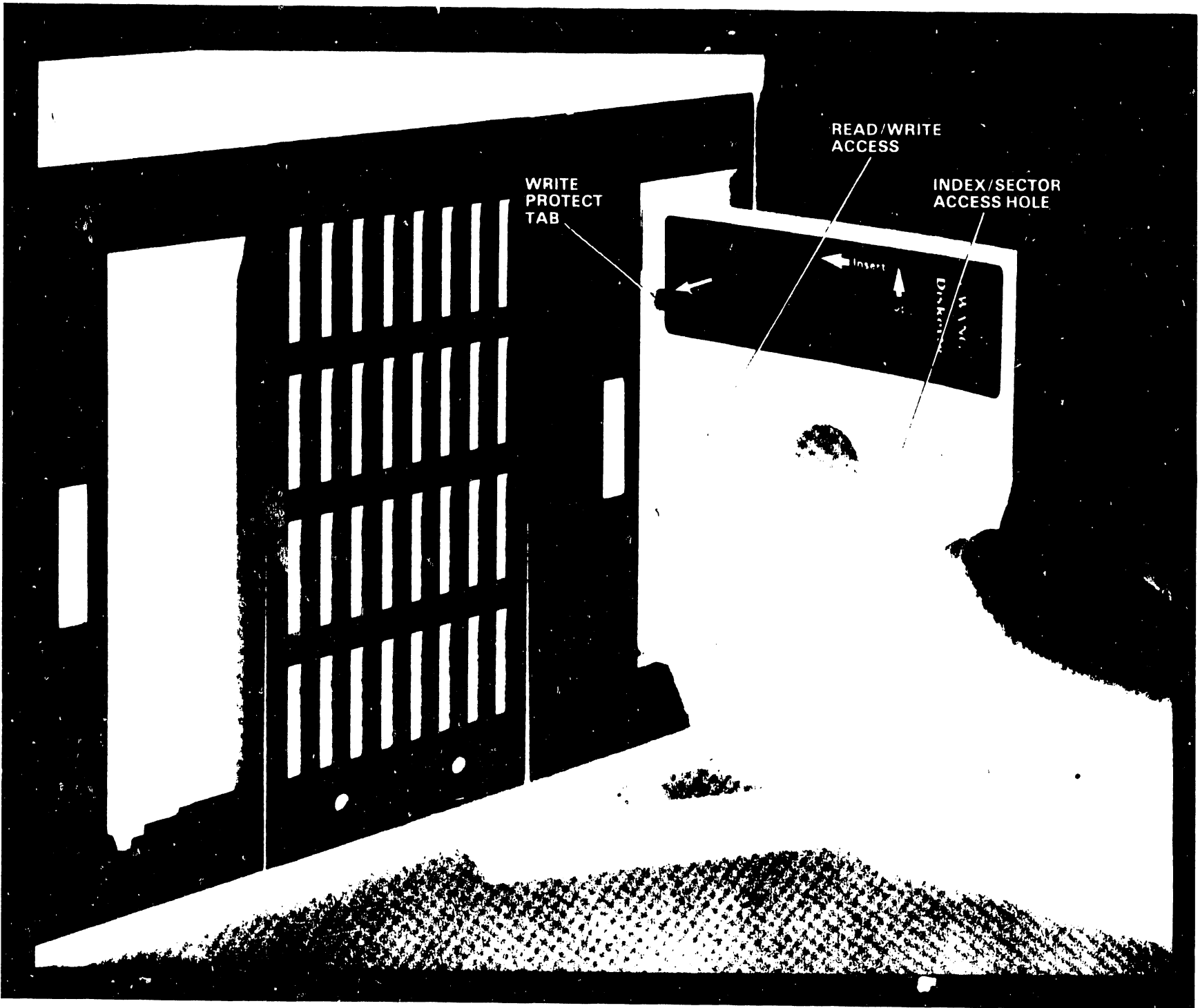


FIGURE 2-6 DISKETTE LOADING

## 2.4.2 MASTER CABLE ASSEMBLIES (MODELS 5510A, 5520, 5525, 5530 AND WPS-ES)

Master cable assembly drawings and part numbers are listed below for those cables most likely to be damaged or lost during maintenance periods. Harnesses are not included.

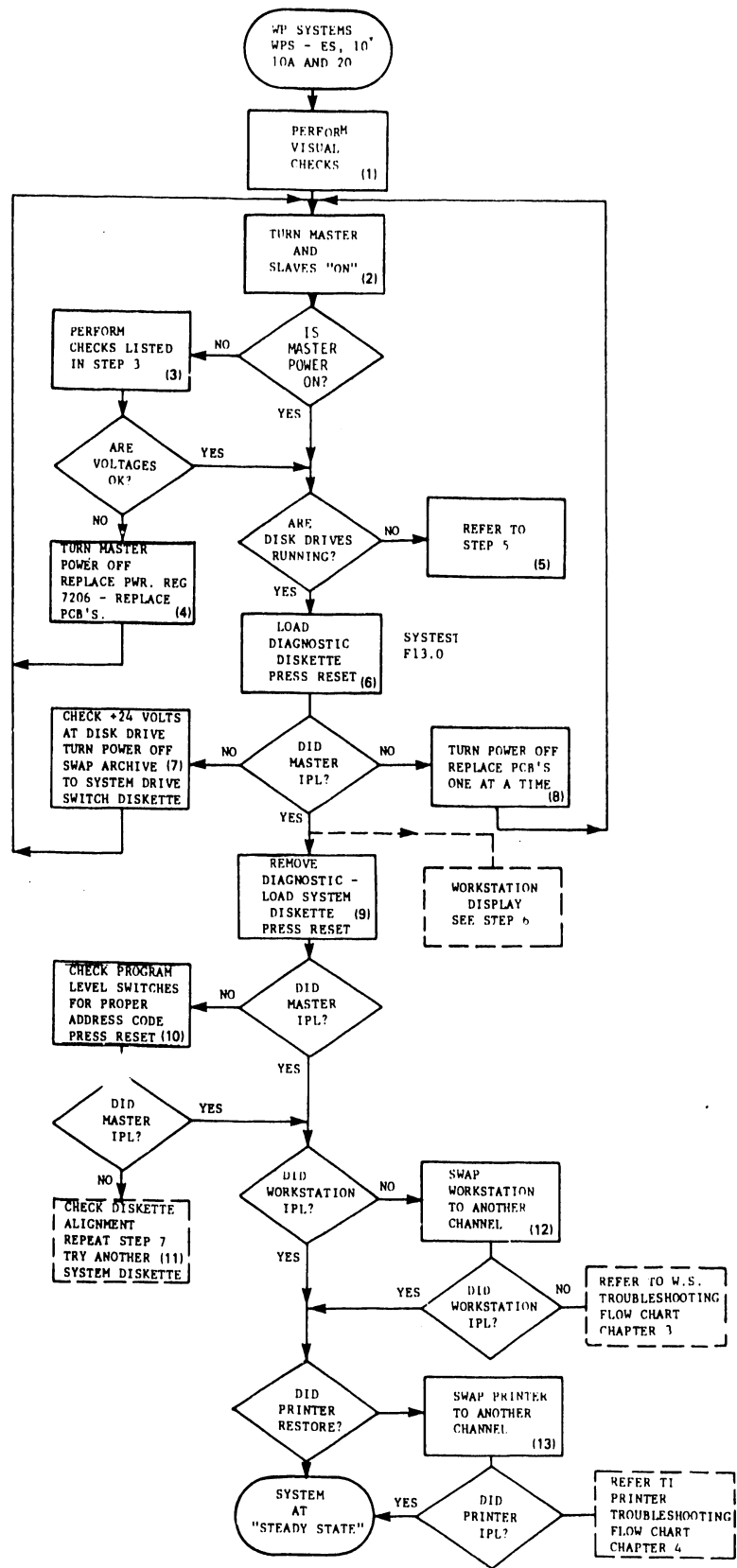
<u>DESCRIPTION</u>	<u>DRAWING #</u>	<u>PART #</u>
FLOPPY DISK CABLES(RIBBON)	C6482-62	220-3011
HARD DISK 44 CABLE(RIBBON)	D6482-138	220-0108-3
1 PR CONN PLATE & CABLE ASSY	D6840-14	270-0338
2 PR " " " "	D6840-15	270-0339
6 PR " " " "	D6840-11	270-0336
14 PR " " " "	D6840-25	270-0366

## 2.4.3 OPERATIONAL DOs AND DONTs

1. Do not swap floppy drive ribbon cable connectors on J1 and J2 inadvertently on Dual Diskette systems without replacing them in the proper jacks on the motherboard. See Section 5.13.7. SYSTEM floppy is plugged into J1 which is the front connector and the Archive floppy into J2. (Systems 10, 10A, 20 and WPS-ES). The Archive floppy is connected into J1 on Systems 25 and 30.
2. After performing a utility operation do not forget to place the ULTS switch in the down position.
3. Insure that each diskette inserted into the system or archive floppy drive is not jammed or binding because of improper adjustments. See chapter 5 for adjustments.

## 2.5 TROUBLE-SHOOTING FLOW CHART FOR WP SYSTEMS 10, 10A, 20 AND EDITING STATION

The operational flow chart, Figure 2-7, for trouble-shooting the dual diskette Word Processing Systems includes the Editing System, and Systems 10, 10A and 20. The Editing Station is not equipped with a printer and has only one channel output port for a single Workstation. If the Workstation is defective, the use of a visual display screen is not available and the maintenance does pose a



**FIGURE 2-7 DUAL DISKETTE WP SYSTEMS  
WPS-ES, 10, 10A AND 20 OPERATIONAL FLOW CHART**

problem. The Editing Station would normally be an adjunct to another system and therefore a display would necessarily be available. The following procedures will suffice for the above mentioned Dual Diskette systems.

2.5.1 WP SYSTEMS WPS-ES, 10, 10A AND 20 MASTERS (DUAL DISKETTE)  
(Trouble-shooting flow chart and narrative)

1. Visual checks of a faulty system will be helpful if the operating staff(personnel)can shed some light on the possible cause and effect of the existing malfunction.
  
2. Turn Master power on and listen for noises such as a fan blade banging, a noisy diskette drive or other noises that could cause damage. Shut the Master down immediately if any noises persist. If not, proceed to power up at least two slaves (workstation and printer -the exception is the Editing Station- No Printer). If the power does not appear to be on, perform the following steps:
  - a) Check red power indicator lamp inside the front grill.(This red indicator light also indicates a disk operation in progress when it is extinguished).
  - b) Check the Master cooling fan that exhausts air out of the rear louver.
  - c) Check that Diskette drives are running by viewing through the open diskette doors. If power is not on proceed to step 3.
  
3. If Master does not have power, perform the following steps:
  - a) Check site power--panel switch or circuit breaker.
  - b) Check Master fuse and replace if blown. See section 2.3.1 for proper size fuse. If Master is installed in Wang furniture insure that power plug is inserted properly and the power switch on the Master and furniture unit is ON.
  - c) Remove Master cover and check voltages as described in Section 2.3.2. If voltages are OK, go to step 6 but do not replace cover.

- d) If voltages are out of tolerance, adjust voltages within limits indicated in section 2.3.2.
  - e) If voltages cannot be adjusted or are nonexistent go to step 4.
4. Turn power OFF and replace the PWR.REG. board 7206. Monitor the +5 volts closely when the power is restored. If the +5 volt supply is low and can not be adjusted, turn the power OFF. Remove and replace one board at a time and turn the power ON. Repeat this operation until the defective circuit board is found. Replace defective board. Check the +12 volts that supply the Master Memory board. (Memory chips are prone to short circuit B+ to 0 volts bus). Test the +24 volts on the diskette drives as shown in figure 2-2. Insure that both drives are running. If the drives are not running, go to step 5.

WARNING : AFTER REMOVING AND REPLACING BOARDS INTERNALLY AND CERTIFYING PROPER OPERATION -- REPLACE ALL PLASTIC SEPARATORS AND EXISTING HARDWARE TO MAINTAIN THE RIGIDITY THEREBY PREVENTING SHORT CIRCUITS AND VIBRATION DAMAGE TO ADJACENT PRINTED CIRCUIT BOARDS.

5. Check AC power to the drive motor of each drive (System and Archive). MOLEX connectors are used to supply AC power to each drive. Insure good connections to the AC terminal strip internally. Remove and replace diskette drive if motor is defective.
6. Load the Diagnostic System Checkout diskette SYSTEST F13.0 into the system diskette drive and press RESET. Observe the head load on the system disk. (The process that should be taking place is a 256 byte transfer from the diagnostic disk into Master Memory accompanied with the following display). DO NOT go any further with the Diagnostic test!

928 SYSTEST REV F13.0 12/29/77



WARNING: EXECUTION OF THE DIAGNOSTIC WILL DESTROY  
ALL DOCUMENTS LEFT ON THE SYSTEM

The single sector transfer indicates that memory can be loaded, the Master Data Link is operational and all indications are that the system disk can be used to IPL the Master. If the above display does not appear on the workstation screen, the most likely problem would be a defective workstation or the inability of the diskette drive to read the diagnostic. Both cases should be pursued. Try another workstation on another channel prior to checking the master. If the master does not IPL, go to step 7. If the master IPLs, go to step 9.

7. Turn Master power off--Remove the ribbon cables from J1 and J2 on the motherboard. Plug the archive drive ribbon into J1. (Archive is now the System drive). Do not plug in the system drive. (Use only one Drive at a time). Switch the diagnostic from the old system drive to the new system drive. Turn power on and reset. If master does not IPL, check +24 volts at the disk as illustrated in Figure 2-2. As a last resort, try another diagnostic diskette and if a third disk drive is available, try it. Replace diskette drives to their original connectors on the Motherboard. If this fails go to step 8.
8. Turn power OFF. Replace master circuit boards one at a time and turn power ON after each board is replaced. Replace defective board.
9. Remove diagnostic diskette and replace the system diskette into the now SYSTEM drive. Press RESET. If the master doesn't IPL, go to step 10. If the master IPLs, go to step 12.
10. With system disk inserted, check program level switches for proper address code. If the bank of eight switches are not arranged for the proper software code, the system will not operate. Error code (2) will appear on the CRT screen. See Appendix B for proper switch settings. If switch settings are correct, go to step 11.

11. A check of the disk alignment can be performed by using the alignment diskette listed in section (f) of WPNL #21. This alignment is only for dual diskette systems. A repeat of step 7 can also be performed if the problem persists. As a last resort, try another system diskette and replace the system drive with one that is known to be good. Use only one disk drive at a time.
12. If the master IPLs then the slaves connected to the master channels should IPL when power is turned on. If the workstation does not display the START-UP menu, refer to chapter 3 for the troubleshooting flow chart. (Make sure the brightness control is working properly).
13. The printer should IPL when powered up. The indication is a RESTORE which causes the carriage to travel to the extreme left and the print wheel to rotate to the home position. Refer to the printer discussion in chapter 4 if printer fails to RESTORE.

## 2.6 TROUBLESHOOTING FLOW CHART FOR SYSTEMS 25 AND 30

Troubleshooting Word Processing Systems 25 and 30 can be approached in several ways. A systematic approach is recommended until the Customer Engineer is familiar with the equipment. The operational flow chart, Figure 2-8, for the Word Processing Systems 25 and 30 has each active block numbered to correspond with each detailed step. Proceed as follows:

1. Perform a visual check for cables, switches, covers and common faults that occur most often. (However, consultation with an operator or the person in charge of the processing area can assist in determining the problem area, a faulty printer or workstation etc.)
2. Power up the master and at least two slaves; preferably a printer and workstation. Indications that the master unit is powered up are as follows:
  - a) Red LED indicator lamp is lighted (Observe through front grill)

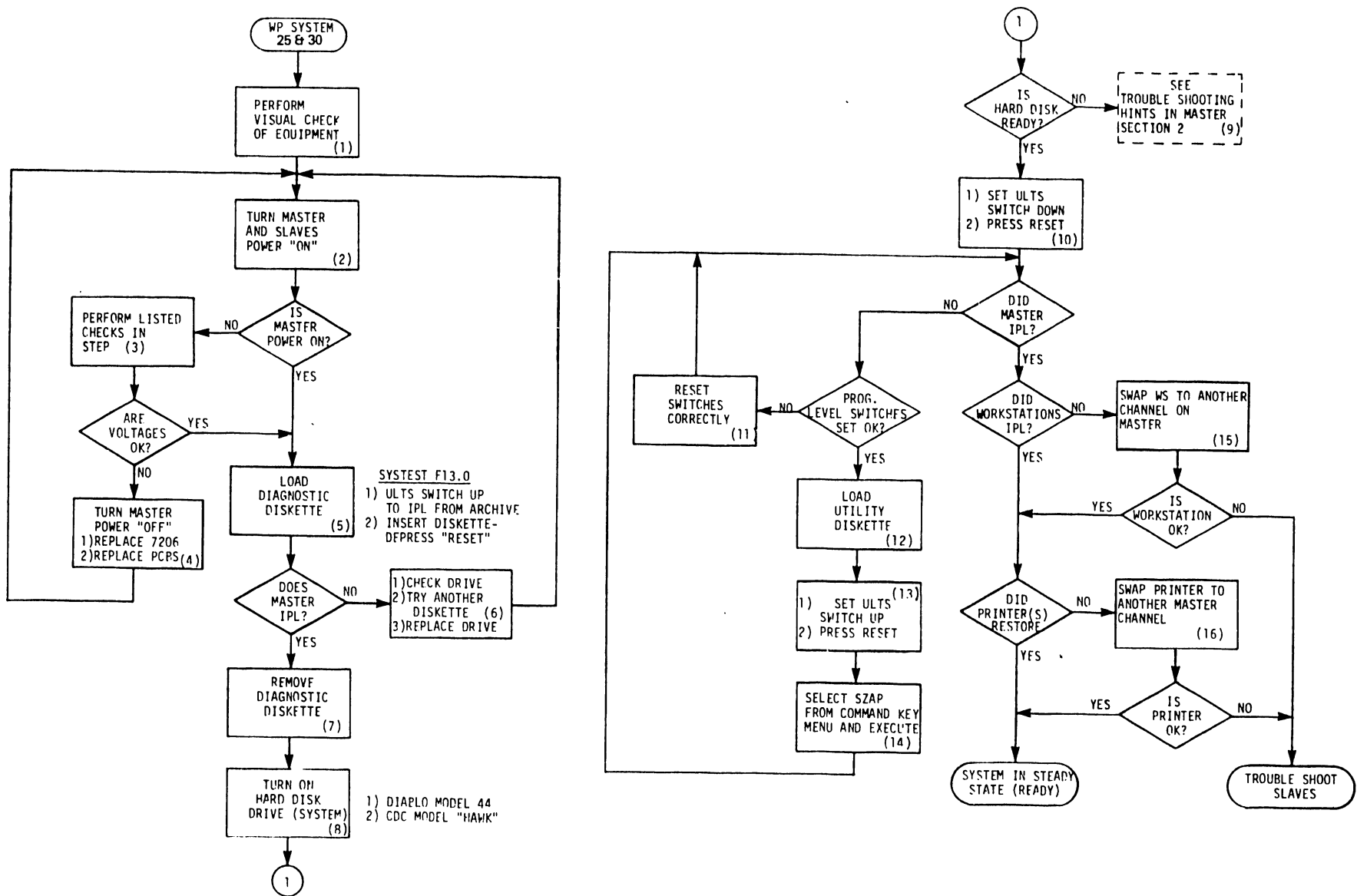


FIGURE 2-8 SINGLE DISKETTE, HARD DISK WP SYSTEM 30 OPERATIONAL FLOWCHART

- b) Air is flowing from internal cooling fan exhaust at rear of master unit.
  - c) Check that archive disk drive is running (View through open diskette door.)
3. If Master power does not turn on, perform the following:
- a) Check the power source for the Master. Circuit breaker or panel power switch may have tripped or been inadvertently turned off.
  - b) Check master fuse and replace if blown. (Is the fuse rating correct?) If the fuse rating is correct, do not replace fuse and power up until an investigation is done to determine why the fuse was blown. If the fuse is not blown proceed as follows. (See Section 2.3.1 for proper size fuse and part number.)
  - c) Remove Master cover. Check voltages as shown in Figure 2-1.
  - d) If +12 volt supply is missing or low, look for a possible short on the memory board. Remove and replace the memory board 7201 and check +12V.

If voltages are not within tolerance, adjust voltages to meet the specified values shown in section 2.3.2. If voltages are missing or low and can not be adjusted, go to step no.4. If voltages check OK, go to step 5

4. Turn power off and replace the PWR REG board 7206. Observe closely by monitoring +5 volts when power is turned on. Do not continue until it is determined that the possibility of damage to the new 7206 board has been removed. If the power problem is not resolved, turn power off and remove all PCBs.
- a) Replace PCBs one at a time with the power off and then power on until the defective board is found. Replace defective board.
  - b) Do not replace master cover until step 16 has completed successfully

5. Load the Diagnostic System Checkout Disk SYSTEST F13.0 into the archive drive. Throw the Utility Load Transfer Switch (ULTS) in the UP position and then press RESET. Check that the head loads on the archive drive. The archive head loading can be seen and heard.

a) The first test of the diagnostic is a 256 byte transfer from the diagnostic diskette to Master Memory. The first and ONLY phase of the test requires a 256 byte Initial Program Load into Master Memory with the following display on the workstation screen prior to the execution of the diagnostic. If the following display is not present on the workstation screen, swap the workstation to another channel or observe another powered up workstation. No display will cause a return to step 4 for a check of the master data link or to step 6 for checking the diskette drive.

928 SYSTEST REV F13.0 12/29/77

WARNING: EXECUTION OF THE DIAGNOSTIC WILL  
DESTROY ALL DOCUMENTS LEFT ON THE SYSTEM

This single sector transfer is all that is required to indicate that memory can be loaded, the data link is operating and the master appears ready for an IPL from the system hard disk.

WARNING: DO NOT CONTINUE FURTHER WITH THE DIAGNOSTIC.

6. If a read of the Archive diskette was unsuccessful, another diskette (diagnostic) should be tried before checking the drive or replacing it with a known good drive.
7. If test is successful, remove the utility diskette.
8. Make sure the removable cartridge is loaded and seated into the hard disk drive before turning it ON. Press the LOAD/RUN switch

to the RUN position if the system is equipped with the Model 44.(The START/STOP switch is used with the CDC "HAWK"). In approximately 60 seconds the READY light should go on for either drive.

9. If the disk drive does not come to the Ready state, refer to Section 5 of the FLMG.
10. Return the Utility Load Transfer Switch (ULTS) to the down position and press reset. The Master memory should IPL and the workstation will display the START-UP MENU. If Master does not IPL, go to step 11. If the IPL is successful, the determination of slave operation is simplified. Go to step 15.
11. Check Program Level switches for system software. Set switches as indicated in APPENDIX B. Insure that the system code is correct. If the Master still doesn't IPL, go to step 12.
12. Load the UTILITY diskette into the Archive drive.
13. Set ULTS switch to the up position and press RESET. The Utility menu should appear on the workstation display screen. Press the command key to select the second page of the menu which contains SZAP.
14. Select SZAP and EXECUTE. Executing SZAP allows the operator to view any track and sector from the temporary system diskette on the workstation. This indicates that an IPL should be possible from the Hard disk. Return to step 10.
15. If workstation failed to IPL, swap to another output channel on the Master. If failure persists refer to chapter 3 for detailed trouble shooting diagram.
16. A printer IPL failure after a channel swap will refer the Customer Engineer to Chapter 4 for the trouble shooting diagram.

**CHAPTER**

**3**

**WORK-  
STATION**

## CHAPTER 3 WORKSTATION

### 3.1 GENERAL DESCRIPTION

The Workstation CRT/KEYBOARD unit used with all 928 systems consists of two Models, 5526 and 5526H. The latter model is equipped with the Wide Platen Option (Horizontal Scroll).

Field maintenance LEVEL 1 and 2 for the Workstation includes all variable adjustments required to maintain the workstation in an operating condition. Other maintenance requirements include the replacement of internal plug-in logic PCBs, a power supply module and the keyboard.

The Wang manufactured 12" video display unit has replaced the original Motorola 12" (XM-351) chassis. (Refer to Service Bulletin #73.)

The display adjustments are located on the 12" monitor electronics removable plug-in PCB 7256/7456 with the exception of the front panel controls--BRIGHTNESS and CONTRAST. A separate power supply module furnishes the power for the Wang manufactured video display unit and is easily replaceable. The controls for the display alignment do not require adjustments normally, however the procedure is included for required maintenance.

A troubleshooting flow chart for the workstation is accompanied with detailed explanations and instructions to systematically assist the Customer Engineer in solving a unit fault or failure.

### 3.2 12" WANG VIDEO DISPLAY CHASSIS ADJUSTMENTS (PART # 270-0360)

The original 7256 (12" Monitor electronics board) was modified by ECN to incorporate a small piggyback electrical board 7258 for an improved blanking circuit. The installation of the blanking circuit was a temporary measure until a new board was designed. The new 7456



board has incorporated the added blanking circuit. The installation of this change is detailed in SERVICE BULLETIN #79. This brief history is included to make the Customer Engineer aware that two separate boards are available for replacement.

NOTE:

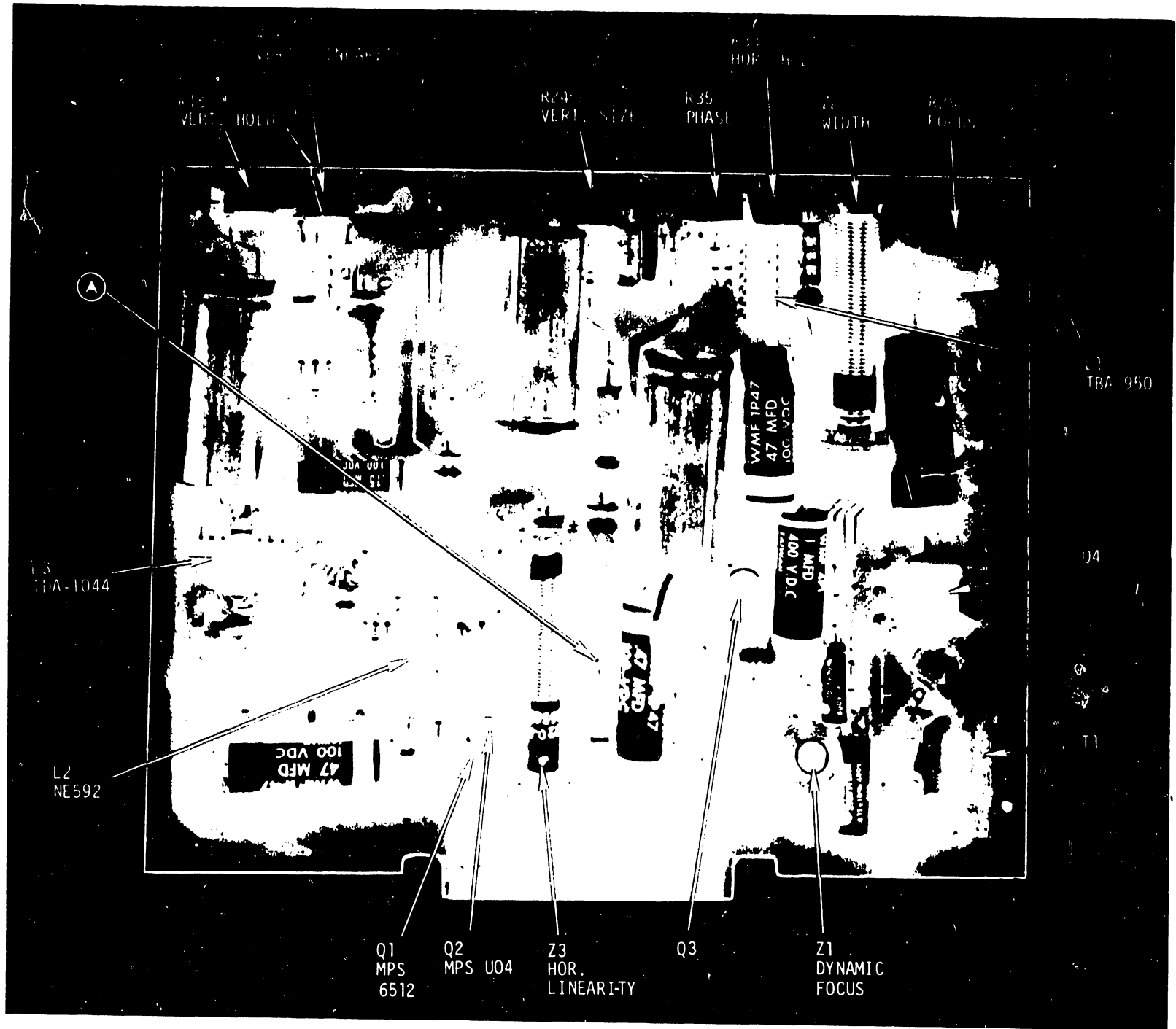
It is not necessary to remove the Monitor chassis to replace the 7256/7456 board. See procedure for removing this board. Refer to section 3.5.2.1.

The alignment procedure for both boards is as follows:

(See schematics for 7256/7456 boards)

1. Connect a digital voltmeter to the +12V test point A in Figure 3-1. Use pins D,E, F on the board and L1-1 for +or-0VDC ground reference.
2. The 928 Workstations equipped with WANG displays have a power supply module PART # 270-0361 for the 12" video display as shown in Figure 3-2. Adjust the +12vdc regulated voltage on the 7255 board that is mounted on the Power Supply module. The adjustment must be +12.00vdc +or-.10vdc. (See Paragraph 3.5.3.1 for details.)
3. Connect an oscilloscope to pin M,(Figure 3-1) 5th pin from the left). Adjust the Dynamic Focus coil(Z1) for an amplitude of 300V P-P as observed on the oscilloscope. Disconnect the oscilloscope.
4. Create a document to display a full screen (80 by 24) filled with alternating characters "HO". (See Figure 3-3.)
5. Set both Horizontal hold(R33) and Vertical hold (R15) to middle of stable display range.
6. Adjust the vertical size (R24) for a vertical height of 8.5 inches (21.6 cm) on the 12" display.(Use standard or metric scale).
7. Adjust the vertical linearity (R18) for character rows of equal height.
8. Repeat 5 and 6 until both requirements are met.

FIGURE 3-1 12" DISPLAY MONITOR ELECTRONICS BOARD (7256)



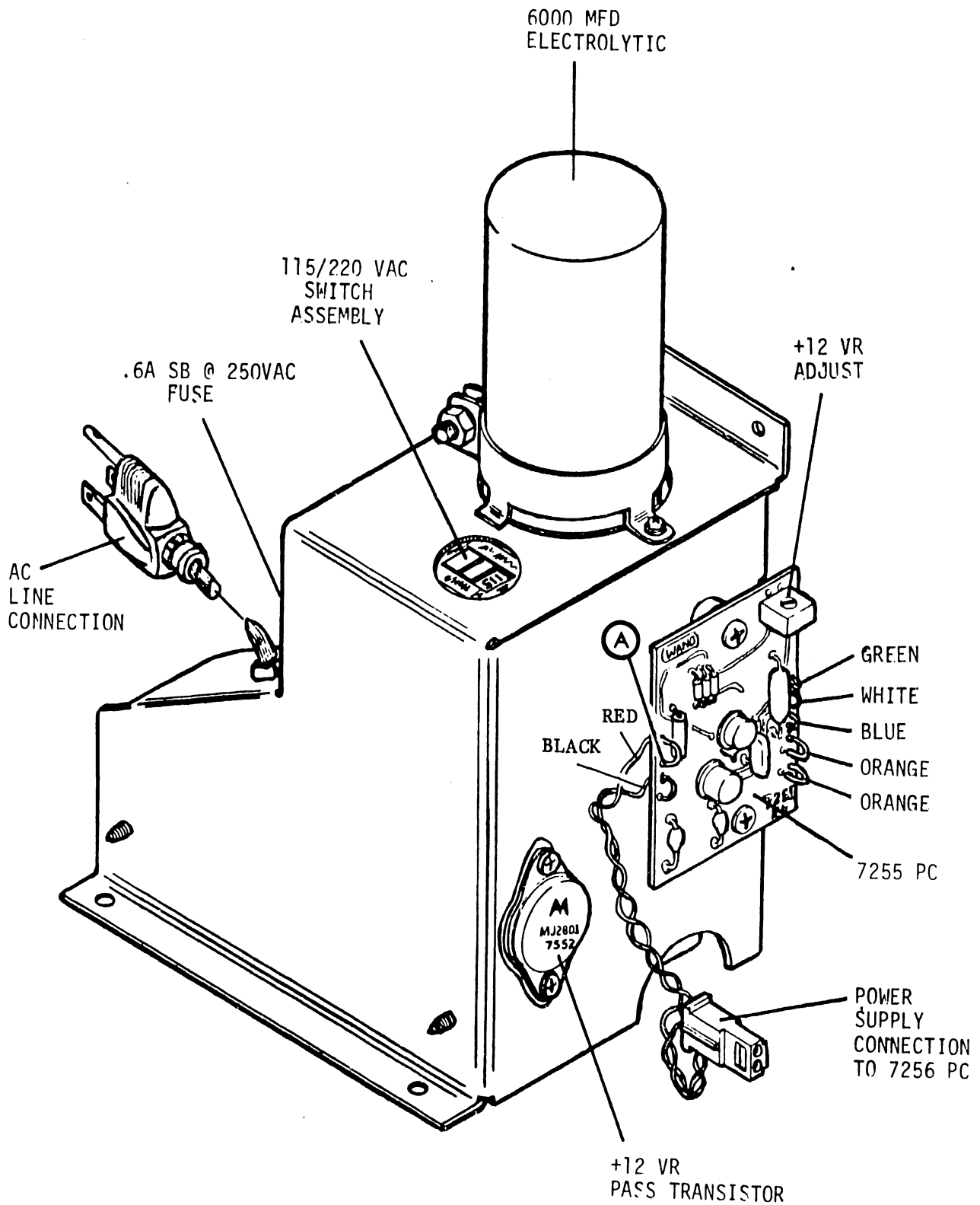


FIGURE 3-2 POWER SUPPLY MODULE FOR WANG DISPLAYS

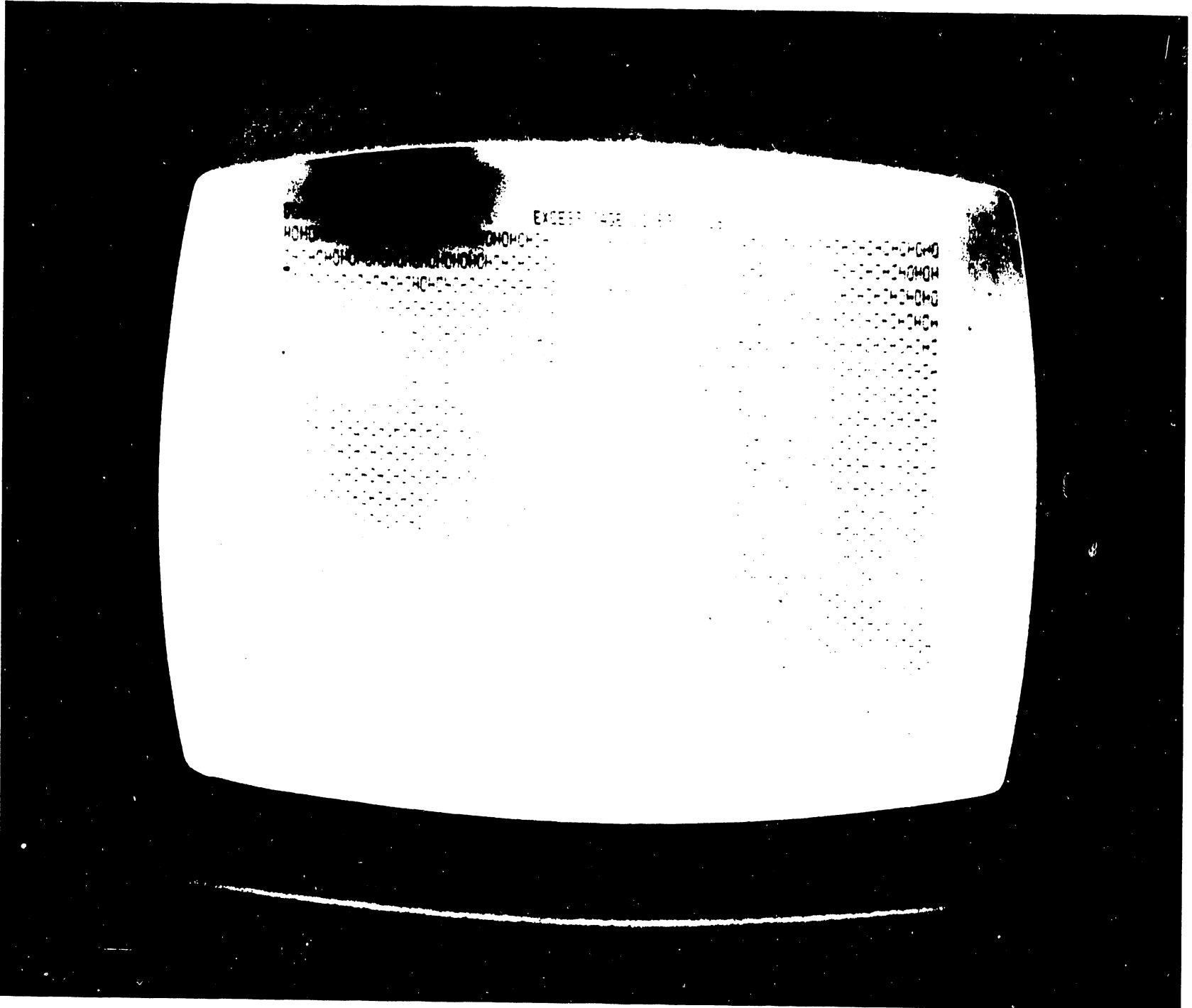


FIGURE 3-3 FULL SCREEN OF HO'S

9. Adjust the width coil (Z2) for 10 inches (25.4 cm) of horizontal deflection on the 12" display.(Use standard or metric scale)
10. Adjust the horizontal phasing (R35) for characters centered horizontally on the raster. (Turn the brightness up sufficiently to observe the raster frame.)
11. Adjust the focus (R28) for the best overall screen display.

Reference S.B #73 for additional information on WANG CRT video display monitors.

### 3.3 WORKSTATION PRINTED CIRCUIT BOARD COMPLEMENT

The PCB complement for the Workstation Models 5526 and 5526H are included below with present options and new boards. The options available include Horizontal Scroll(Wide Platen Option) and Telecommunications (TC). See Chapter 6 for Options.

PCB	NAME	COMMENT
210-7425**	WS CRT CNTL W/TC	7425 includes TC OPT,Sub 7225,7235.
210-7225	WS CRT CNTL	Old type board
-7235**	WS CRT CNTL W/WPO	Horizontal Scroll
7335**	WS CRT CNTL W/WPO	Supercedes 7235
-7229	WS Keyboard	
-7156*	P.S. REG. W/Cur Fld Bk	Replaces 7067 REG.
-7226	WS 16K Memory	
-7227	WS Data Link	
-7228	WS Motherboard	

\*7156 board has current fold back preventing component "burn up" when a short circuit occurs such as a faulty IC. (+5vdc short to 0vdc). The 7156 output will drop to 0 volts. This will prevent the power supply components from overheating and eventually destroying the regulator board. The 7156 will soon replace all existing 7067 boards. See WPNL#41.

\*\* 7235/7335 and 7425 --CRT CONTROL W/Options.

### 3.3.1 MAIN POWER FUSE FOR WORKSTATION

The power fuse used on 928 workstations is located on the rear of the main chassis.

Fuse 2 1/2 ampere 250V slo-blo ceramic 3AG (Part # 360-1025-SB3)

### 3.4 MAINTENANCE PRECAUTIONS

1. When removing and replacing the workstation cover, insure that power is turned OFF to prevent damage to the cooling fan. Fan can be damaged by its own power cord as well as the cable for the front panel controls (Brightness and Contrast). Arrange and crimp fan cord properly before replacing cover. Be extremely careful not to damage internal shielding and beryllium fingers designed to eliminate static problems.
2. When removing and replacing PCBs internally, DO NOT forget to replace plastic sleeve separators and retaining hardware. (See Figure 3-4.)
3. When removing the 7226 memory board, be careful not to disturb the phenolic laminate secured to the CRT socket. The IC socket pins on the board can penetrate the wiring on the socket. It is also recommended that if the IC pins are too long on the 7226 board, trim the pins short in the vicinity of the socket to prevent shorting between adjacent pins caused by vibration against the CRT socket. (See Fig. 3-5.)

### 3.5 WORKSTATION MAINTENANCE PROCEDURES

All adjustments on the workstation are internal except for front panel controls, BRIGHTNESS and CONTRAST. To replace a defective part or perform an adjustment requires the removal of the workstation cover and the keyboard cover.



7226 PCB

7225, 7235  
PCB (SEE  
TC OPTION)

7227 PCB

PLASTIC  
SEPARATORS  
AND 6-32' X 3'  
HARDWARE

ROUTE VIDEO  
CABLE AS  
SHOWN

COVER TO  
CHASSIS  
BERYLLIUM  
ANTI STATIC  
FINGERS

FIGURE 3-4 WORK STATION PCB LAYOUT

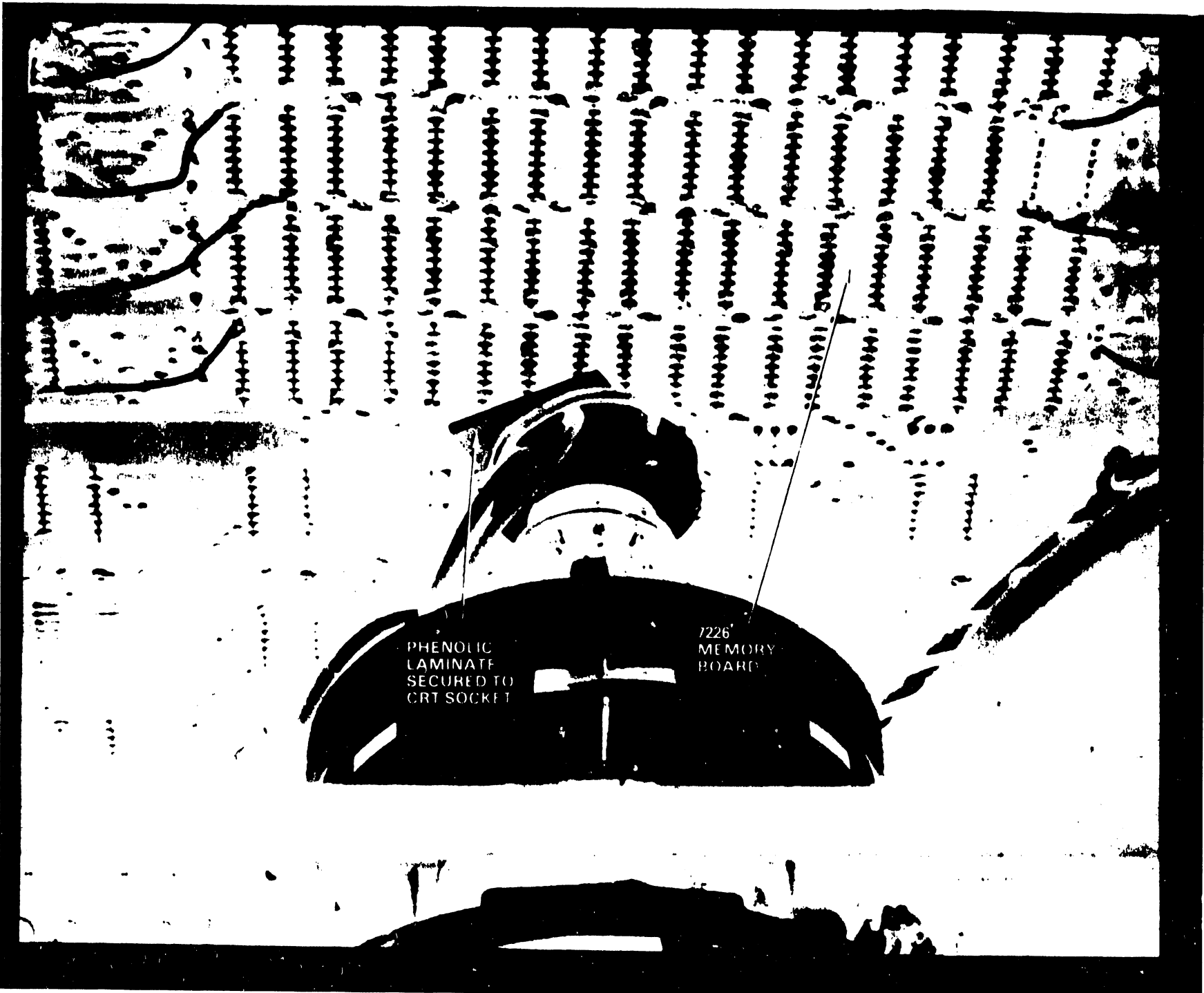


FIGURE 35 CRT CONNECTOR PROTECTED BY PHENOLIC LAMINATE



### 3.5.1 REMOVE WORKSTATION COVERS

1. There are only five Phillips head screws to be removed for internal access to the workstation. Three of the screws are used to secure the keyboard cover. Three screws on the keyboard cover are exposed when the white plastic strip between the main keyboard and the back row of special function keys is removed. **TURN WORKSTATION POWER OFF.** Loosen the knurled black knobs on either end of the cover and remove the plastic strip. Remove the three screws on the keyboard cover and the two screws on either side of the main cover as shown in Figure 3-6. Lightly pry up the rear of the keyboard cover (Next to to the Bezel plate) and move it back slightly to free the two clips under the front of the cover. Set the cover aside.
2. **WITH THE POWER TURNED OFF--** Make sure the internal cooling fan has stopped spinning before removing cover. Fan blades are easily broken if fan is rotating!
3. Prior to removing the main cover prepare adequate space to the right of the workstation for storing the cover. Place your hands on both sides of the main cover and lift the cover straight up carefully, several inches to clear the electronics inside before tilting the cover to the right. Set the cover down on its right edge. Disconnect the connector to the fan. Push the front Bezel plate out of the cover and set the cover aside where it can not be dropped or damaged. Place the Bezel plate in its original position. If the Brightness and Contrast controls are disconnected by removing the Bezel Plate (MOLEX CONNECTOR), the display screen will be disabled. Make sure the connector is mated properly and the controls are working.

With the covers removed, all LEVEL 1 and 2 maintenance functions can be performed. Certify all adjustments and replacement of subunits prior to replacing the covers.

**WARNING: DO NOT OPERATE THE WORKSTATION FOR EXTENDED PERIODS WITHOUT THE COVER AND COOLING FAN.**

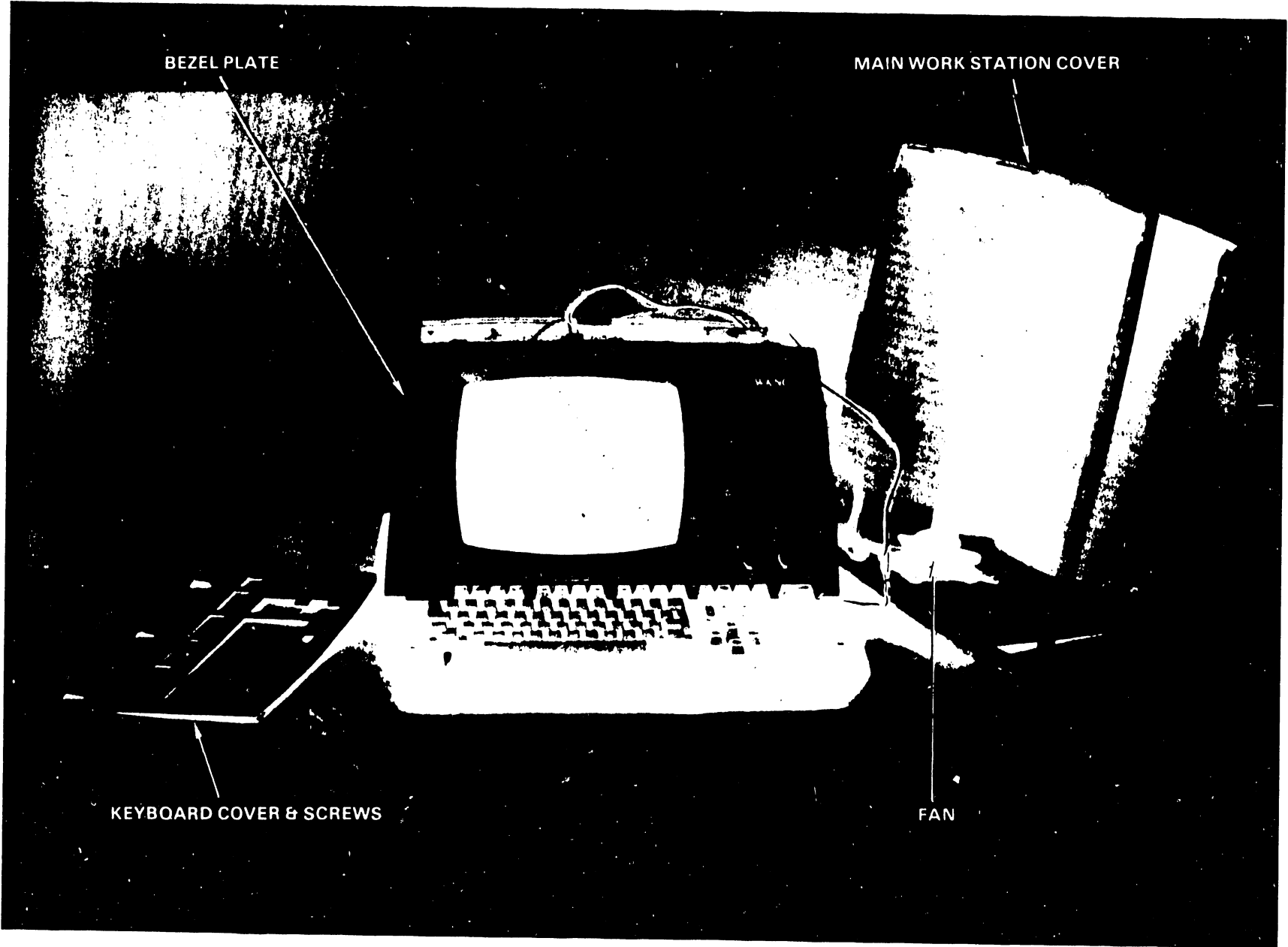
BEZEL PLATE

MAIN WORK STATION COVER

KEYBOARD COVER & SCREWS

FAN

FIGURE 3-6 WORK STATION WITH COVERS REMOVED



### 3.5.2 R & R KEYBOARD AND/OR 12" MONITOR ELECTRONICS BOARD 7256/7456

The procedure for removing the keyboard is combined with the removal and replacement of the 12" Monitor electronics board 7256.

#### 3.5.2.1 R & R 12" MONITOR ELECTRONICS BOARD

Once the keyboard is removed, it is a simple matter to extract the 7256 board by pulling and sliding it out toward the front of the station. In addition, the screwdriver alignment control potentiometers (5) for the monitor electronics are more accessible with the keyboard out of the way. (See figure 3-7.)

#### 3.5.2.2 R & R KEYBOARD ASSEMBLY

Replacing the keyboard assembly during a service call requires the following procedures:

1. Remove four phillips screws that secure the keyboard base plate to the cabinet mounts (one on each corner). The keyboard base plate has been factory shimmed with a washer on each of the two rear mounts. (Note that the rear screws are not fully tightened.- This permits slight position adjustments of the keyboard during assembly with respect to the keyboard cover.) Look for these washers when removing the screws. (DO NOT FORGET to replace the washers when replacing the keyboard assembly.) Lift keyboard free of the workstation which is restricted by the ribbon cable length.
2. To disconnect the keyboard from the workstation perform the following steps: (See figure 3-8)
  - a. Peel back the heavy adhesive treated tin foil on the ribbon cable from the scraped metal surface at the rear of the base plate. The foil acts as a static shield. Peeling back the adhesive tin foil requires patience to prevent tearing the foil. Insert a sharp blade under the corners of the tin foil and gradually work it

SHIM WASHER FOR KEYBOARD

7256 BOARD PARTIALLY REMOVED

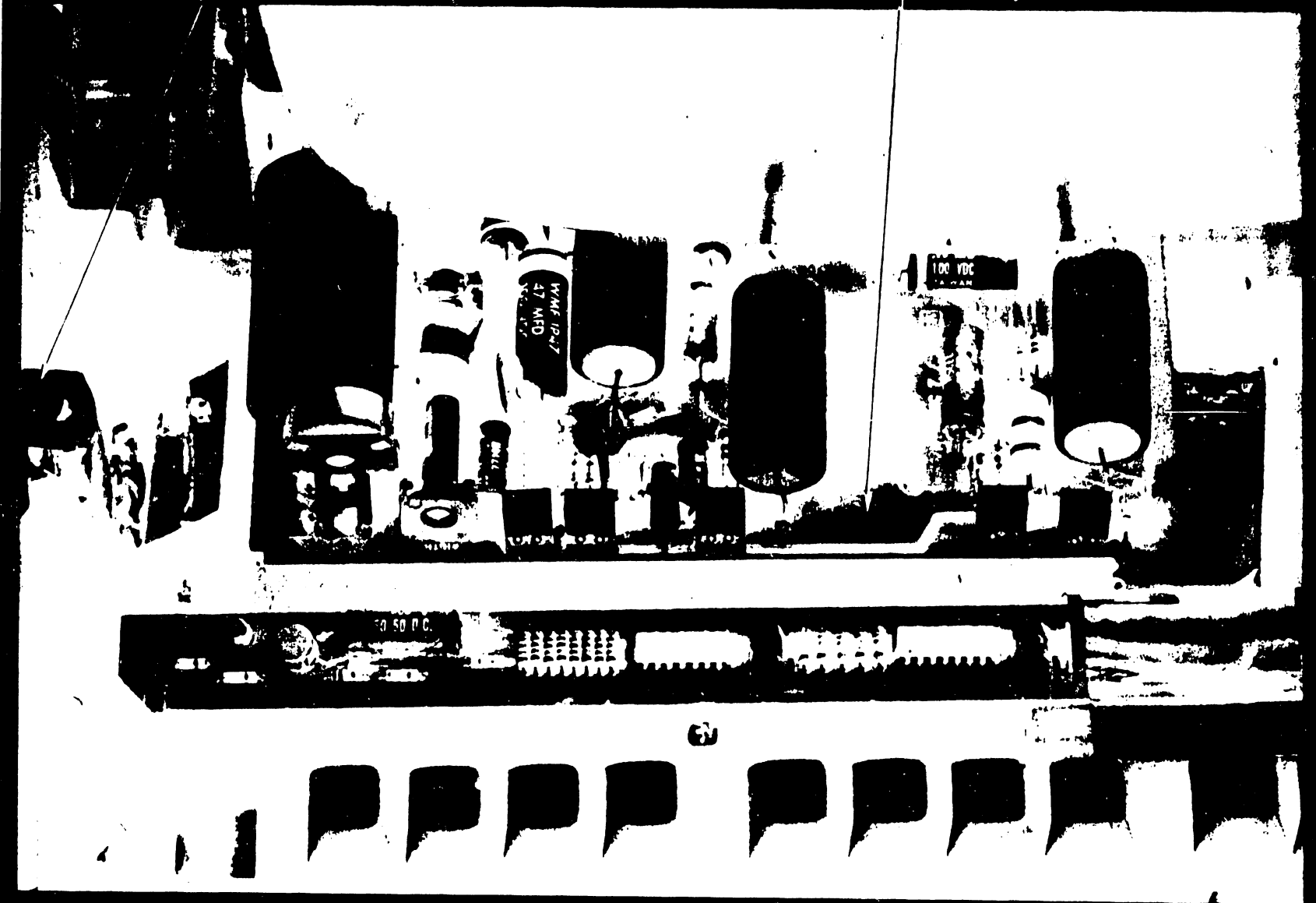


FIGURE 3-7 KEYBOARD REMOVED FOR ACCESS TO ELECTRONICS BOARD 7256

REMOVE ADHESIVE FOIL FROM  
KEYBOARD BASE PLATE

RIBBON CABLE  
COVERED WITH FOIL

FISH PAPER

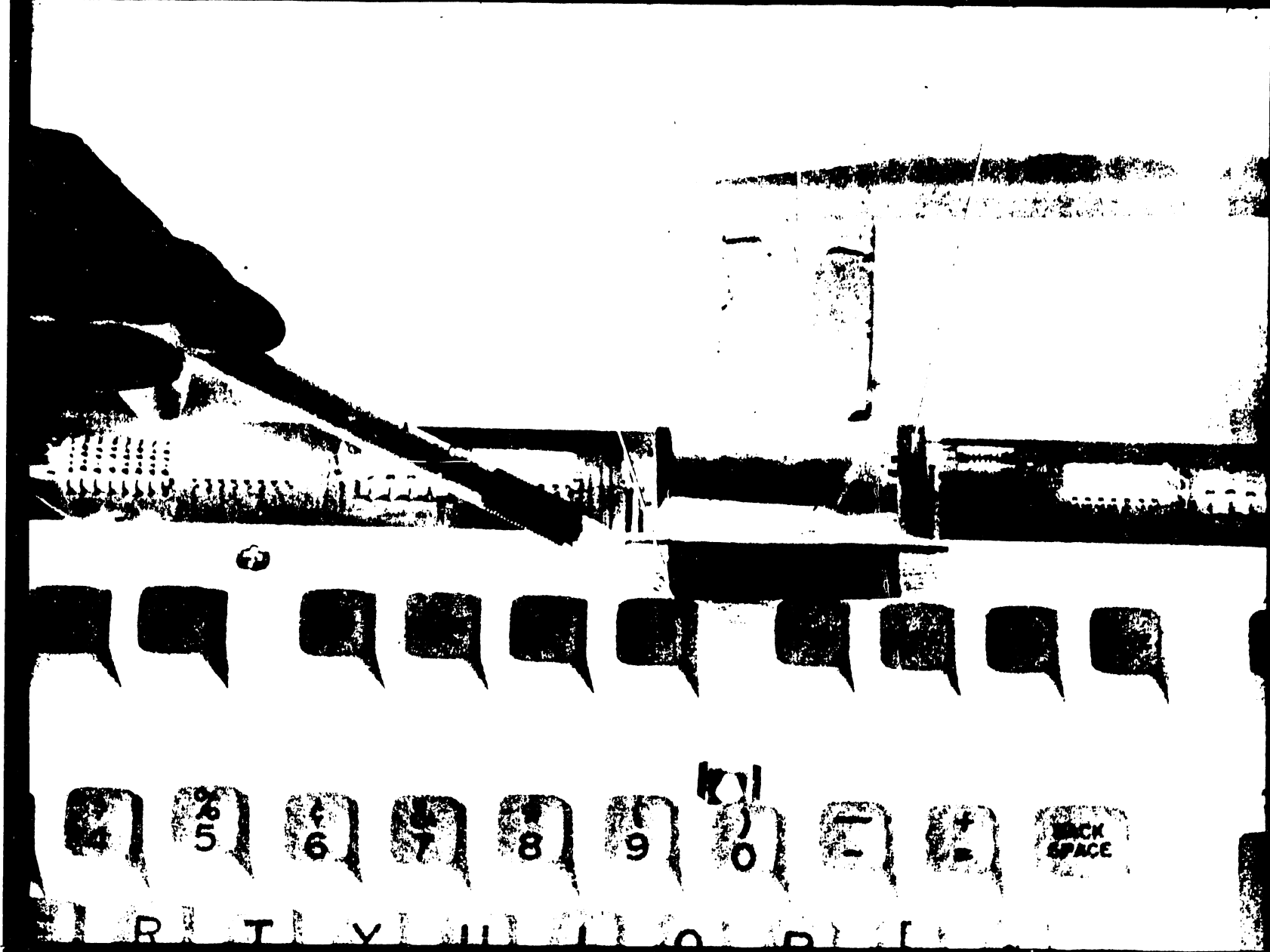


FIGURE 3-8 REMOVAL AND REPLACEMENT OF KEYBOARD

away from the base plate. A piece of fish paper is installed under the foil for insulation and protection of the ribbon cable. (Save the fish paper).

- b) Once the foil is removed from the metal surface, the keyboard can be tilted up and the ribbon cable connector on the bottom can be disconnected from the keyboard freeing the assembly. (See Figure 3-9.)
3. When installing the replacement keyboard, proceed by plugging in the ribbon connector. Place the base plate in a convenient position to replace the fish paper and the foil. The remaining adhesive on the foil is sufficient to reinstall the ribbon connector. Burnish the foil to insure a metal to metal contact. Make every effort to replace it as it was originally.

NOTE: If it is desired to check the operation of the keyboard prior to replacing the workstation covers, use particular care to isolate (insulate) the keyboard from the chassis and static foil before turning the power ON.

4. Replace the keyboard assembly with the same four screws (DO NOT forget to replace the washer shims on the rear mounts under the base plate). Tighten the rear screws to the point that the assembly can still be moved slightly for keyboard key alignment with cutout holes on the keyboard cover.

NOTE:

The reason for not tightening the screws on the keyboard assembly was to certify that none of the keys were sticking or binding after installing the keyboard cover. Once the main cover is installed in place, the rear screws are not accessible. Adjust the keyboard position with the cover in place. When properly aligned, tighten the two front screws on the keyboard assembly prior to installing the keyboard cover with three screws.

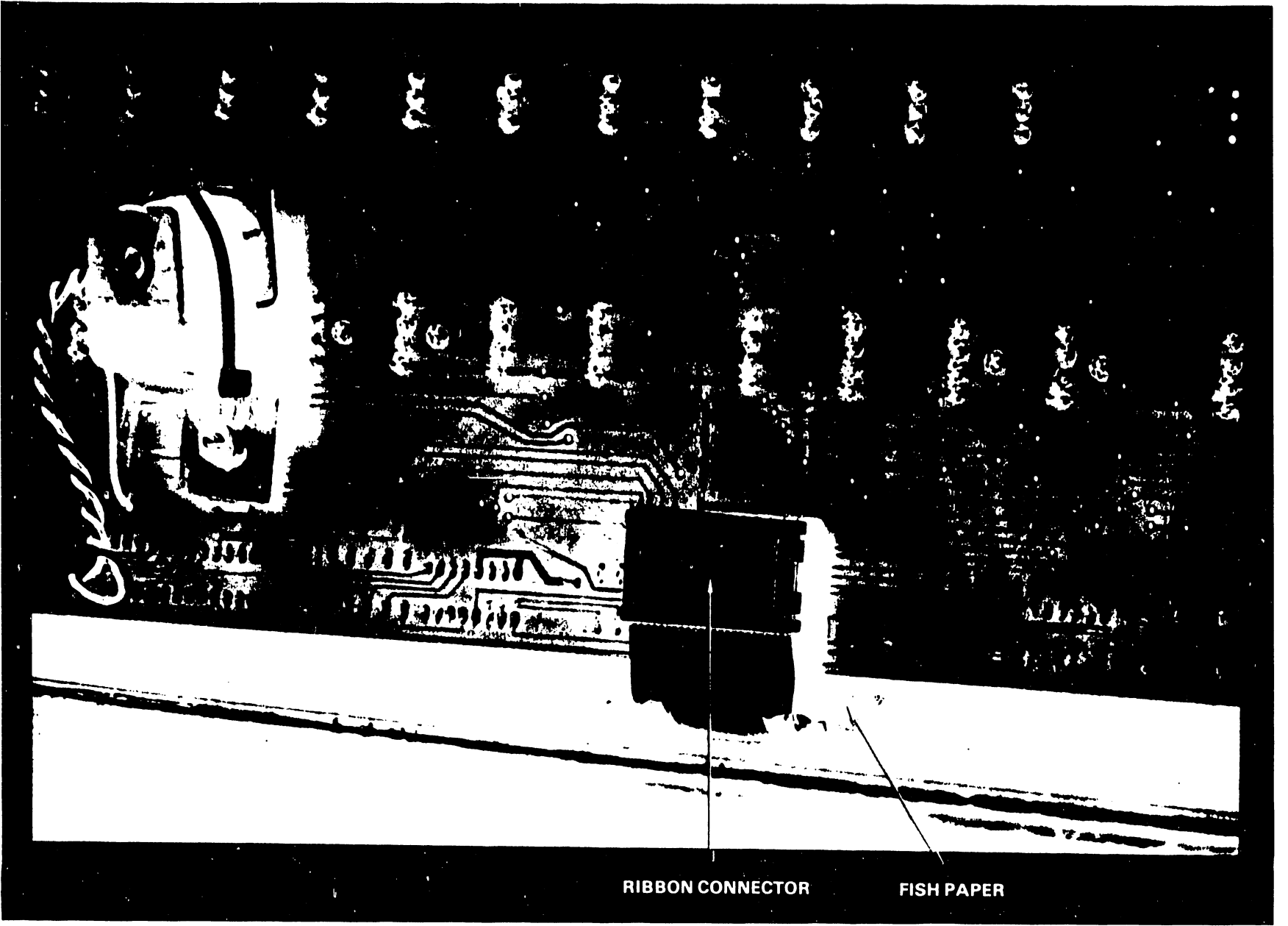


FIGURE 3-9 RIBBON CONNECTOR UNDER THE KEYBOARD

### 3.5.3 R & R POWER SUPPLY MODULE UNIT (12" DISPLAY)

1. Remove the AC plug on the module from the receptacle. (See figure 3-2.)
2. Disconnect the Molex connector that furnishes the +12 volts to the 7256/7456 monitor electronics board.
3. Remove the two screws on the left side of the monitor chassis close to the bottom when observed from the rear. Remove two other screws from the bottom right side of the power supply module that are screwed in from the top. The module can now be removed and replaced.
4. To replace module follow the steps above in reverse.

#### 3.5.3.1 POWER SUPPLY MODULE VOLTAGE ADJUST

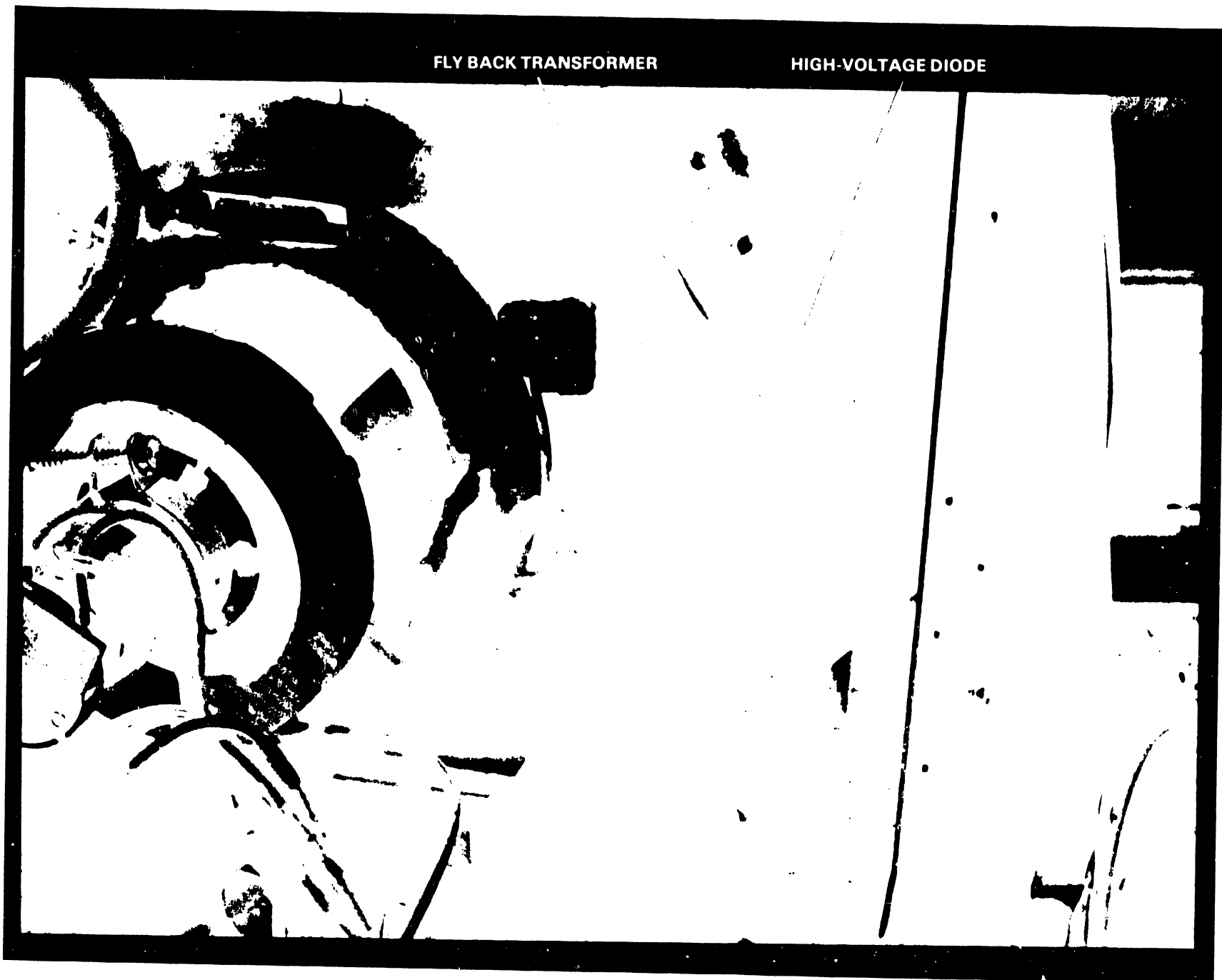
The power supply module for the 12" monitor display chassis produces a single voltage which is adjustable on the rear of the module. This +12 volt source is wired via a molex connector to the 7256/7456 electronic board. (See Figure 3-2.) The potentiometer adjust is mounted on the miniature monitor regulator board 7255/7455 attached to the rear of the power supply module. Adjust the +12VR voltage to +12vdc +or-.10vdc using point (A) for voltage check.

#### 3.5.3.2 POWER SUPPLY MODULE FAULT INDICATIONS

A rather common fault is the failure of the high voltage diode which is located in the high voltage lead to the anode of the CRT tube. (Refer to Figure 3-10.) If the raster is absent on the screen turn power off and investigate. The part number for the HI VOLTAGE DIODE is #380-3011. Install the diode with the single band closest to the tube anode.

When checking the output voltage (+12V) of the module, if the measurement is low (around 9 volts), the indication could be either the flyback circuit or the high voltage diode. Also check the single glass fuse inside the module if the raster is missing. See figure 3-11. The fuse is rated at .6 AMPERES 250V SB GLASS 3AG- Part #360-1006-SB.





FLY BACK TRANSFORMER

HIGH-VOLTAGE DIODE

FIGURE 3-10 WANG MONITOR 12" DISPLAY



115VAC  
POWER CORD  
FOR MODULE

POWER MODULE  
FUSE FOR 12"  
DISPLAY MONITOR

FIGURE 3-11 12" DISPLAY POWER SUPPLY MODULE

### 3.5.4 R & R WANG PRINTED CIRCUIT BOARDS AND POWER REGULATOR.

With workstation covers removed, access to the Wang circuit boards present no problem. Before any boards are removed and replaced, turn power OFF and remove power plug to eliminate any casualties. To remove the power regulator board 7067/7156 only one screw must be removed as illustrated in figure 3-12. To remove circuit boards 7227, 7225, and 7226 the hardware screws at the top of the boards on either side, that maintain the spacing between boards and provide the required mechanical stability, must be removed prior to removing and replacing a defective board. Always insure that the video cable from the 7225/7235 control board is routed between the control board and the 7226 board under the plastic spacer when removing and replacing boards to prevent contact with the rotating fan. (See Figure 3-4.)

### 3.5.5 CHECK AND ADJUSTMENT OF WORKSTATION VOLTAGES

Using a DVM, monitor the following voltages on the component side (rear) of the 7227 board as illustrated in figure 3-13. From top to bottom the voltages read +12v, -5v, +5v and the reference +and- 0volts. The adjustment potentiometers are located on the 7067/7156 regulator board. See figure 3-12 for selecting the proper adjustment.

#### NOTE:

The -12vdc is not used in the 928 workstations.  
Ignore the R16 adjustment.

The tolerances for the 7067 regulator voltages are:

VOLTAGE	ADJ	LIMITS
+5VR	R4	+4.90 to +5.10
+12VR	R10	+11.80 to +12.20
-5VR	R19	-5.10 to -4.90

LOOSEN AND REMOVE SCREW  
TO REPLACE REGULATOR BOARD

7067/7156 POWER  
SUPPLY REGULATOR

HEAT SINK

H4 (-5V)

R10 (-12V)

H19 (-5V)

R16 (-12V)  
NOT USED

COOLING  
FAN LUG

FIGURE 3-12 WORK STATION POWER SUPPLY REGULATOR BOARD

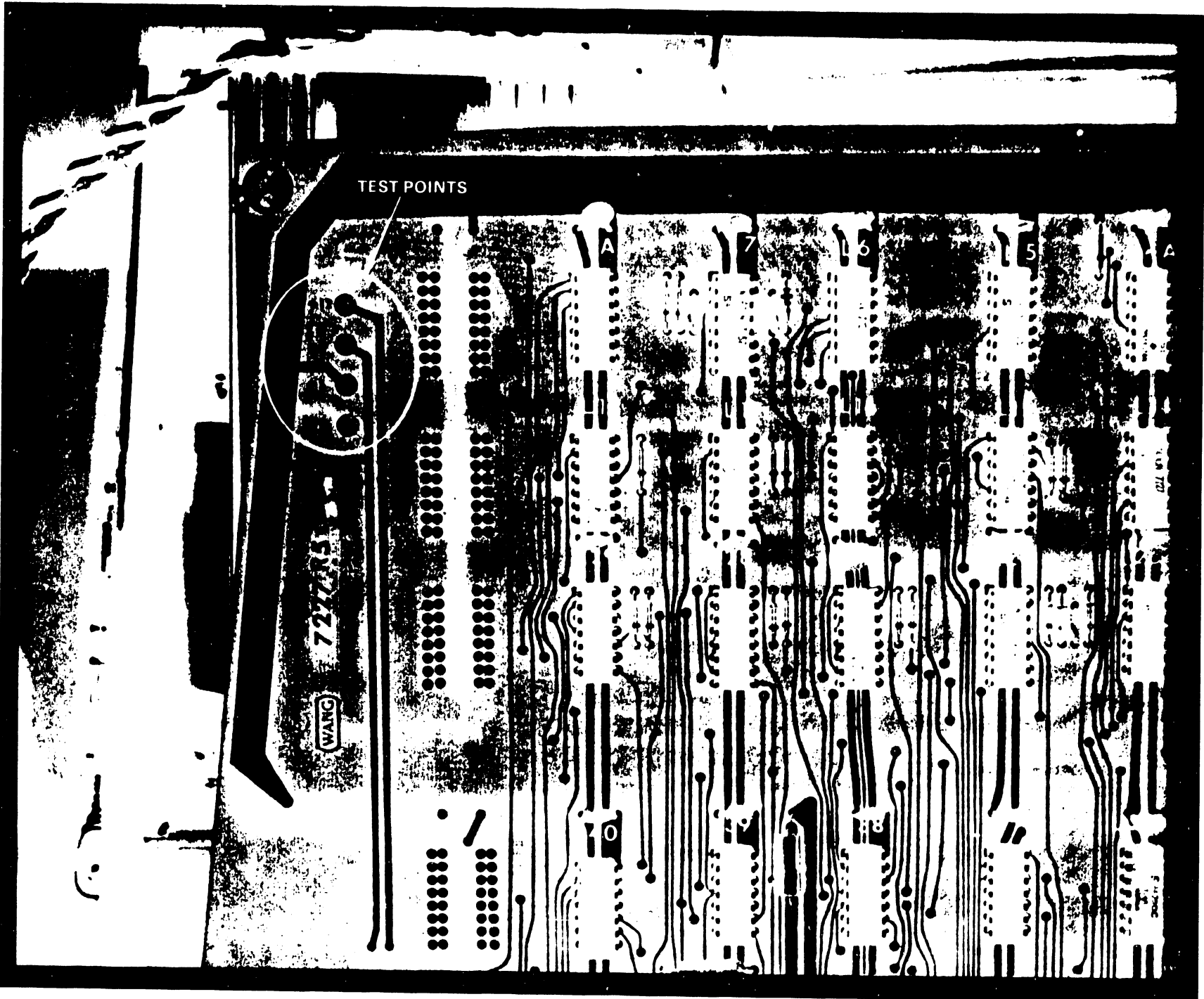


FIGURE 3-13 WORK STATION TEST POINTS FOR OPERATING VOLTAGES

### 3.5.6 REPLACE WORKSTATION COVERS

To replace the Workstation covers, perform all removal steps in reverse. Tilt the main cover on its right side edge close to the right side of the chassis and reconnect the molex connector on the fan cable. Crimp the fan cable so it will fall in between the circuit boards when the cover is installed. Lift the cover up to clear the frame and internal electronics. Guide the cover squarely and slowly in both hands down over the chassis. Do not bend or damage the beryllium fingers in the rear. Arrange the fan and external control cable so that the fan is not restricted from rotating. Once the main cover is set in place make sure the Bezel plate is snapped into its proper slot prior to replacing the two side screws. Check cooling fan operation. Replace the keyboard cover by sliding it forward to latch the front clips underneath. (The back of the keyboard cover must be under the brightness and contrast controls.) Adjust keyboard position for free operation of all keys before tightening the cover with the three screws.

### 3.6 WORKSTATION TROUBLESHOOTING FLOW CHART

The Workstation is to be used during the checkout of the MASTER. A workstation video display is necessary to certify the proper operation of the master and the printer. The operational flow chart for troubleshooting the workstation is separate; however a trouble free Master is necessary for testing the Workstation.

The following steps for troubleshooting are numbered per the action blocks on the flow chart. See Figure 3-14.

1. The visual checks for the workstation are only to certify that power is available and that the coaxial cable is connected to a master channel and to itself. A check of the coax cable is a good place to start.
2. Turn power ON. Check the internal cooling fan operation. The exhaust louver is on the right side. This indicates that power is available. If the screen displays the

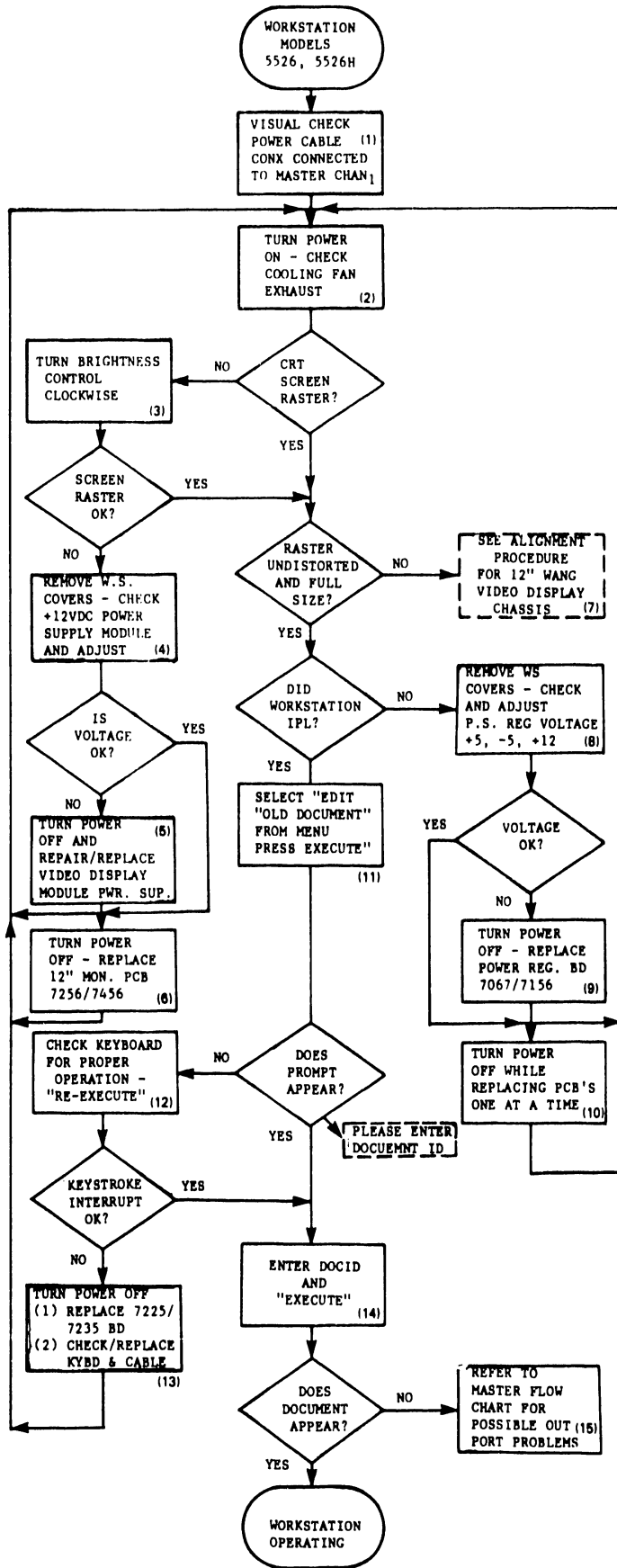


FIGURE 3-14 WORK STATION OPERATIONAL FLOW CHART

START-UP menu, the workstation has received its Initial Program Load (IPL). Proceed to step 11. If only the Raster is present on the screen, proceed to step 8. If the screen is blank, go to step 3.

3. Turn the brightness control clockwise. If the raster appears, adjust brightness and contrast for the proper intensity of light. If the raster is missing, go to step 4. If the raster is distorted and requires adjustment, go to step 7.
4. Remove the keyboard and top cover per section 3.5.1. Check contrast and brightness cable connections to the Bezel plate. (The workstation display can not operate if the cable is disconnected). Check filament on CRT tube (should be glowing). Check power connector on CRT neck. Test for +12V at TP A shown in figure 3-2. Adjust voltage if necessary. If power supply module appears defective, check the power plug on the module prior to going to step 5.
5. Turn power OFF. Repair or replace power supply module as explained in sections 3.5.3, 3.5.3.1 and 3.5.3.2. Turn power ON. If the raster still does not appear on the screen, go to step 6.
6. Remove and replace the 12" Monitor electronics board as explained in section 3.5.2.1. Remember to move keyboard as described in section 3.5.2.2 prior to removing and replacing the 7256/7456 board.
7. The alignment procedure for the 12" Monitor electronics board is detailed in section 3.2. If the alignment procedure fails, replace the 7256/7456 board as explained in step 6.
8. Remove workstation covers as explained in 3.5.1. Check and adjust voltages if required as detailed in section 3.5.5. If the voltages are missing or can not be adjusted, go to



step 9. If the voltages are adjusted within the tolerances listed, proceed to step 10.

9. Turn the workstation power OFF. Remove and replace the power supply regulator board 7067/7156. Turn power ON and check voltages. Adjust voltages to the tolerances listed in 3.5.5. If workstation does not IPL, go to step 10.
10. Remove and replace the workstation PCBs one at a time. Turn power off while replacing each board and then turn power on. If the workstation IPLs, go to step 11.
11. Select "EDIT OLD DOCUMENT" from the start-up menu and press EXECUTE key. A prompt, "PLEASE ENTER DOCUMENT ID" should appear. If the prompt appears, go to step 14. If the prompt does not appear, go to step 12.
12. Check keyboard for clicks and beeps using the menu. Use space bar and select each operation from the top to the bottom of the menu. Adjust the loudness of the clicks from the control on the rear of the chassis.

Offset the cursor one space from the Acceptance Block and use the space bar to produce beeps. Adjust the rear control for the desired loudness. If the key click is not heard, the possibility exists that the keyboard interrupt circuit is faulty. Proceed to step 13.

13. Turn power OFF. Remove and replace the CRT control board 7225/7235. If the prompt still does not appear, check the keyboard ribbon connector for possible damage. Replace keyboard per instructions listed in section 3.5.2.2. If DOCID prompt appears on the screen, go to step 14.
14. Enter DOCID and press EXECUTE. If the first page of the document appears on the screen, then the workstation is operational. If the document does not appear, proceed to step 15.

15. At this juncture, the problem could be in the Master or Workstation. Swap the workstation for another if available. If not, try a printer on the same master channel and see if it restores. If the printer restores, the problem remains in the workstation. There is the possibility that an error on the workstation IPL sector of the system disk could be the problem. Try another system diskette or reload the hard disk.

# **CHAPTER**

## **4**

### **DAISY PRINTER**

**MODELS 5511, 5581**

CHAPTER 4  
DAISY PRINTER MODELS 5511, 5581

4.1 GENERAL

The Model 5581 Daisy Printer is normally furnished with WP Systems 20, 25 and 30. WP System 10A is usually equipped with a Model 5511 Daisy Printer but a 5581 can be substituted. The Editing Station is not equipped with a printer. The only difference between the two printers is the size of memory. The 5511 has 8K of memory whereas the 5581 has 12K.

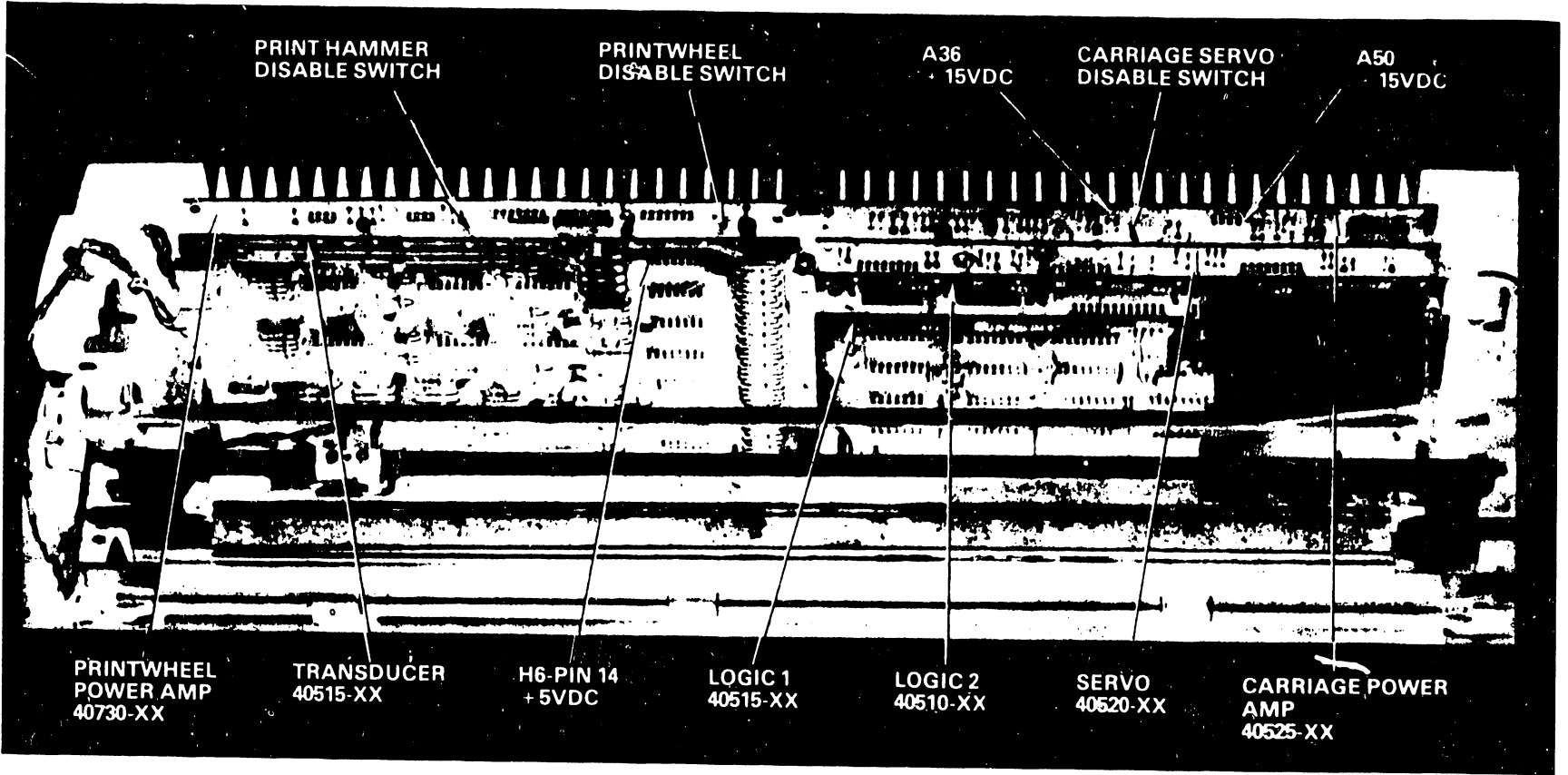
The 5511 and 5581 are modified DIABLO 1355WP printers with WANG microprocessor logic installed internally to interface with the 928 Word Processing Systems. This logic is mounted on a Wang manufactured base assembly that contains the power supply, the power supply regulator and the Wang electronics motherboard which houses three plug-in PCBs. DIABLO logic boards, six (6) in number, are mounted on the rear of the printer (HY-TYPE II standard equipment) as shown in Figure 4-1.

4.1.1 DIABLO PRINTER CIRCUIT BOARD COMPLEMENT

<u>NAME</u>	<u>DIABLO PART #</u>	<u>WANG PART #</u>	<u>CONN. SLOT</u>
LOGIC #1	40505-XX	726-0448	A
LOGIC #2	40510-XX	726-0447	B
SERVO	40520-XX	726-0446	C
CARRIAGE POWER AMPLIFIER	40525-XX	726-0445	D
TRANSDUCER	40515-XX	726-0449	G
PRINT WHEEL POWER AMPLIFIER	40730-XX	726-0444	H

It is important to note that DIABLO has included ADDENDA (Rev B) to the SERIES 1300 Hy-Type II Printer Models Maintenance Manual 82403-02 dated July 1977. Several adjustments were revised to improve the printing operation. This addenda was dated January 1978. Figure 4-15 (HAMMER ADJUSTMENTS) was revised and the clearances for the 1355WP are correct as illustrated.

FIGURE 4-1 DIABLO LOGIC BOARDS AND VOLTAGE CHECK POINTS



#### 4.1.2 WANG PRINTER CIRCUIT BOARD COMPLEMENT

PCB	NAME	COMMENTS
210-7247	PRINTER MEMORY 8K	REPLACEABLE WITH 7347 (12K)
210-7347	PRINTER MEMORY 12K	NOT REPLACEABLE
-7245	PRINTER KEYBOARD	
-7249 R2	PNTR. P.S. REGULATOR	
-7348 R3	CPU FOR MAT.& DAISY PNTRS. and PIO	
210-7446	I/O BD. FOR MAT.& DAISY PNTRS and PIO	
210-7243	MOTHERBOARD FOR DAISY PRINTER	
210-7343	MOTHERBOARD FOR 928 MATRIX & DAISY PTR's & PIO	

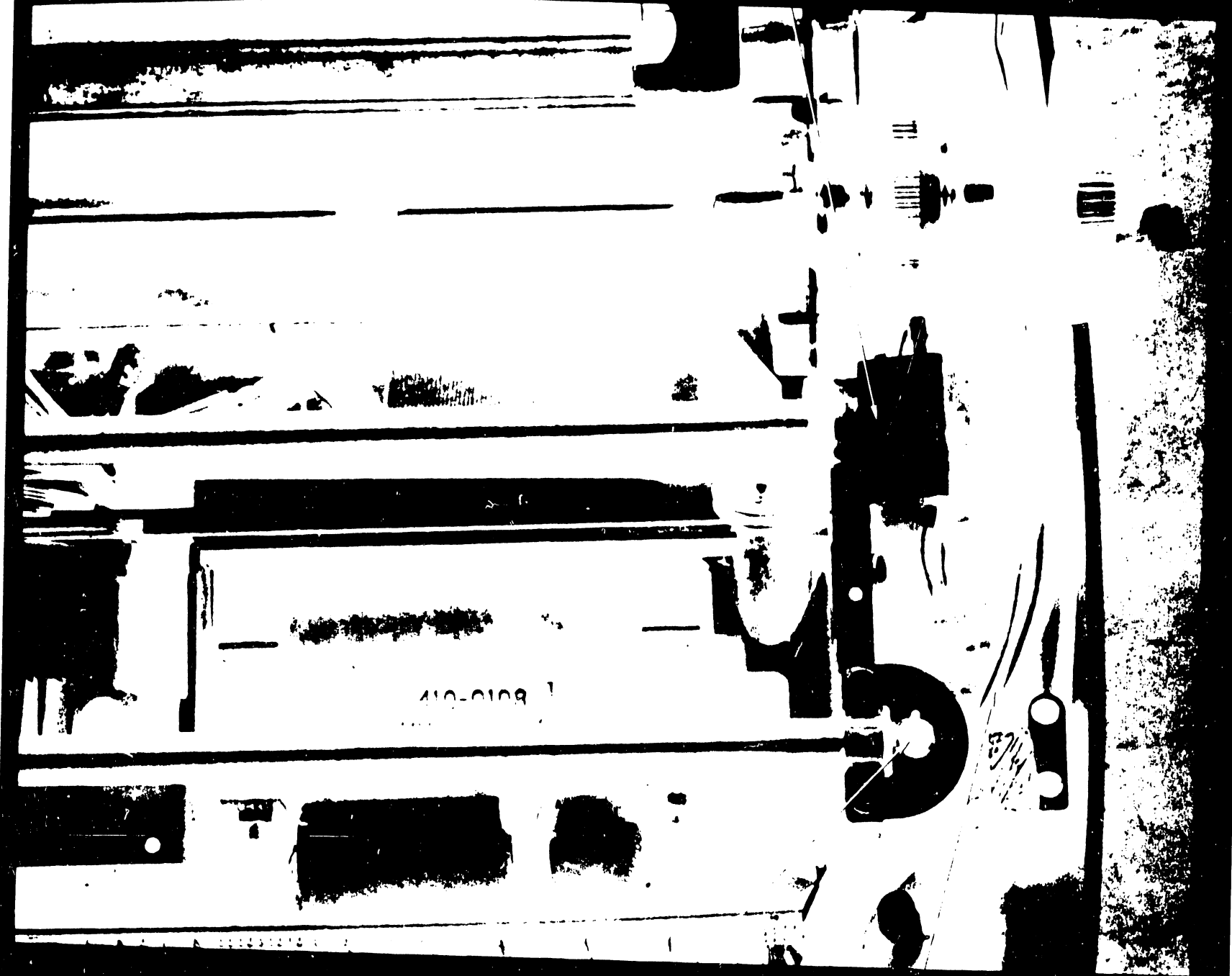
#### 4.2 PRINTER POWER REQUIREMENTS

The power supply furnishes unregulated voltages +15vdc, -15vdc and +5VR to the DIABLO printer boards. The +5VR required for the DIABLO boards is derived on the WANG power regulator board 7249 and should be regulated to within 2% RMS, 3% P/P, at the printer. These voltages are routed to the Diablo boards via the Power Supply Cable Assy B6482-118. A Winchester Connector P1 on the cable plugs into J1 located on the right side of the Diablo Motherboard when viewed from the front. See Figure 4-2. Measurement of these voltages can be made at the test points indicated. See Figure 4-1.

<u>VOLTAGE</u>	<u>ZONE</u>	<u>DIABLO BD</u>
+15vdc	A36	40525
-15vdc	A50	40525
+5VR	H6 Pin 14	40515

The voltages for the WANG logic boards are +5VR, -5VR and +12VR and are wired from the regulator board 7249 to the Wang Motherboard and accessible for measurement as shown in Figure 4-3.

COVER INTERLOCK SWITCH

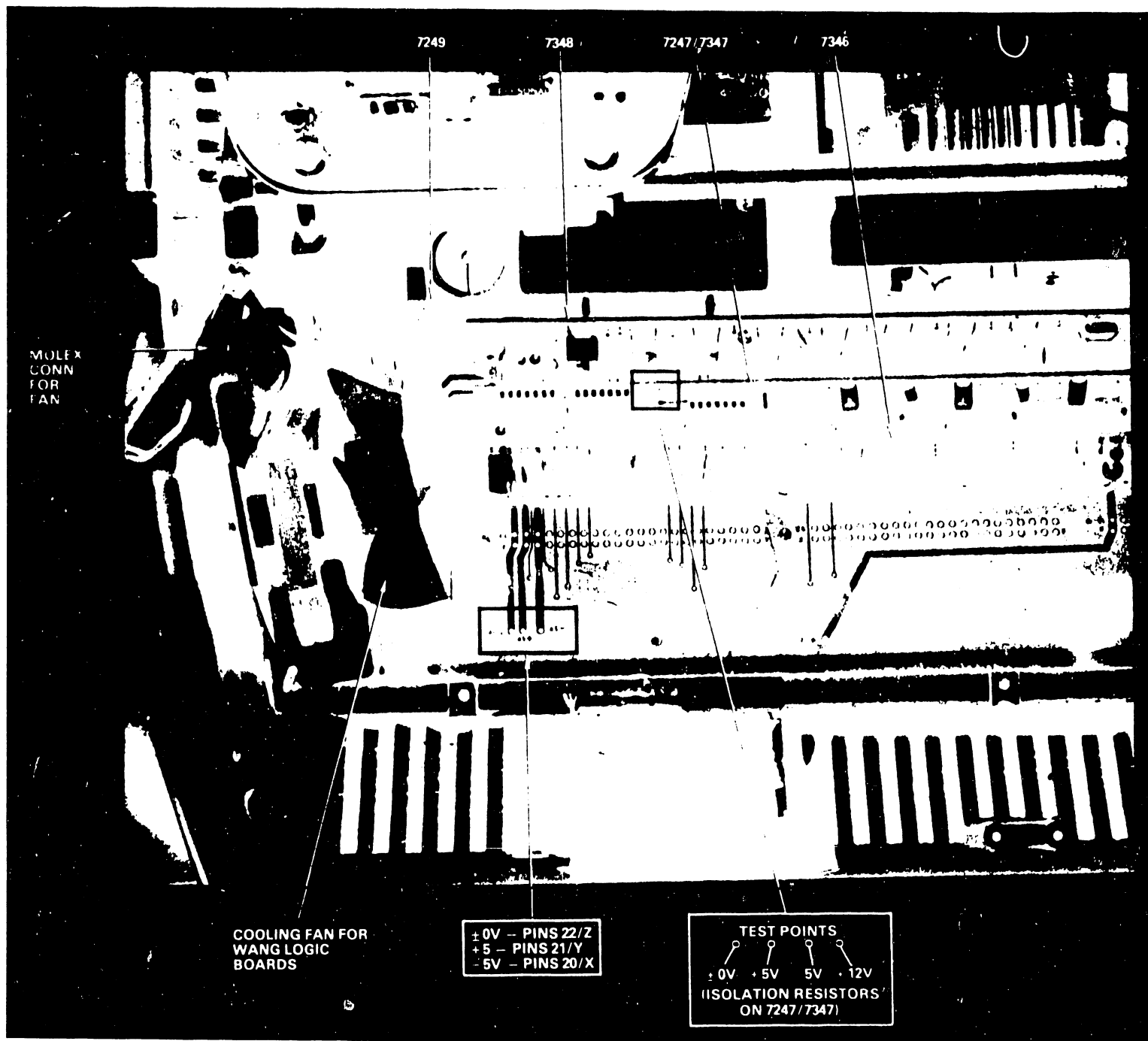


PRINT INTENSITY  
CONTROL SWITCH

POWER SUPPLY CABLE FOR  
DIABLO LOGIC BOARDS

FIGURE 4-2 PRINTER CONTROLS (PARTIAL)

FIGURE 4-3 WANG PRINTER LOGIC BOARDS AND VOLTAGE TEST POINTS

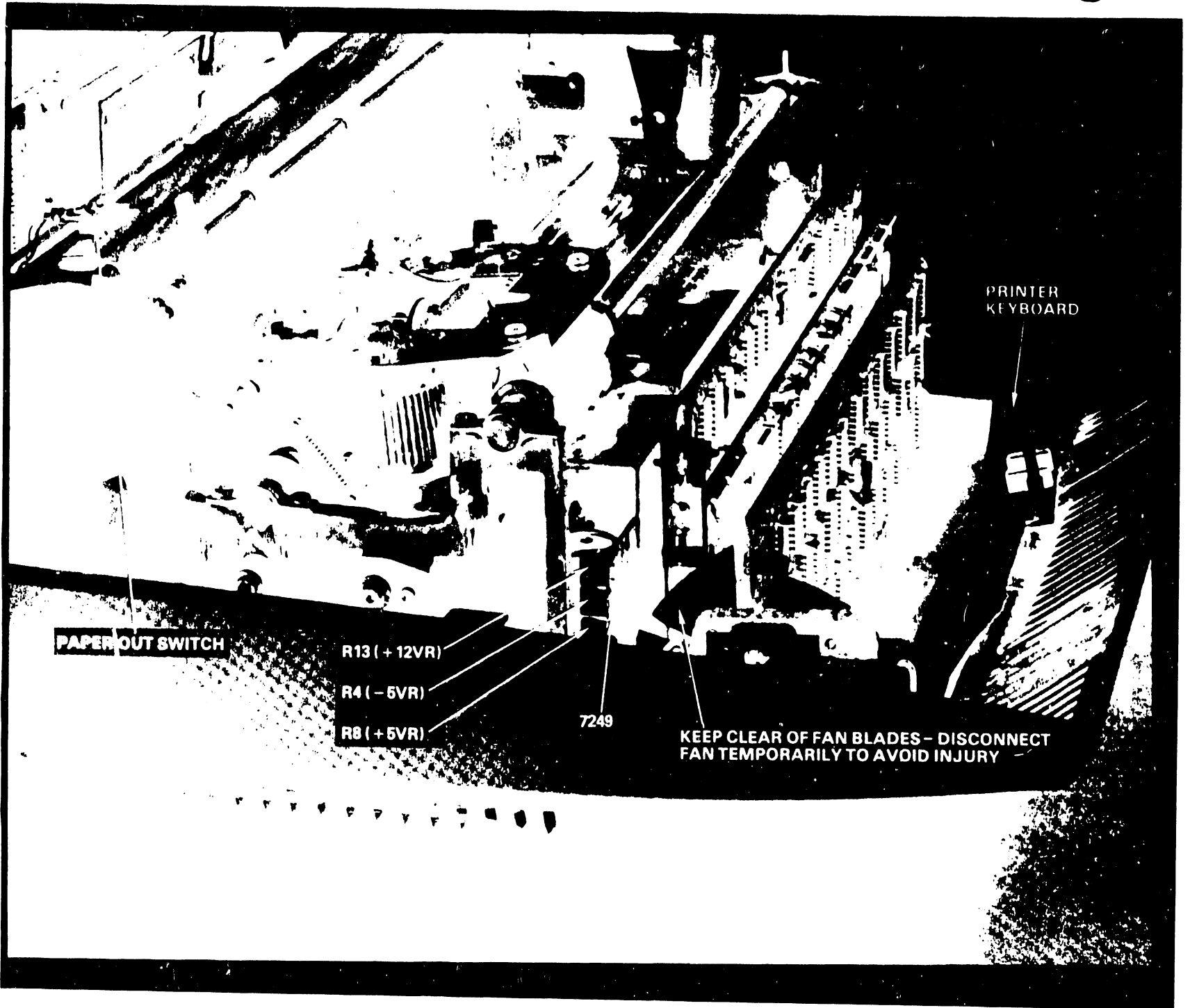




The voltage adjust controls are mounted on the 7249 board and arranged as shown in figure 4-4. Figures 4-5 and 4-6 are included to illustrate the disabling switches mounted on the Diablo Carriage Power Amplifier board (40525-XX) and Print Wheel Power Amplifier board (40730-XX). These switches should be used to prevent damage to the printer and injury to the customer engineer when replacing print wheels etc. These two boards are equipped with cooling fins in the rear and the printer should never be tilted up or rested on these boards.

#### 4.2.1 KEYBOARD-- CONTROLS AND INDICATORS

Control/Indicator	Function/Purpose
1. Power Indicator Lamp -	Illuminates when power is ON
2. Fault Indicator Lamp -	Indicates a system malfunction. A RESTORE command is required to continue. A printer CHECK condition will cause this lamp to light.
3. Cover open -	Indicates that the cover interlock switch is open, cover is removed or not properly seated.
4. Ribbon out -	Illuminates when ribbon cartridge is exhausted. Replace cartridge and depress select switch to restart.
5. Paper out -	Indicates paper supply is out on tractor feed units. Reload paper. Depress select to print additional lines on the last form of the previous paper supply, or to restart the printer.
6. Top of Form -	Advances paper to the top of the next form. the switch is disabled while the unit is printing. Printing will continue when printer is selected. See step 7.



PRINTER  
KEYBOARD

PAPER OUT SWITCH

R13 (+ 12VR)

R4 (- 5VR)

R8 (+ 5VR)

7249

KEEP CLEAR OF FAN BLADES - DISCONNECT  
FAN TEMPORARILY TO AVOID INJURY

FIGURE 4-4 DAISY PRINTER POWER REGULATOR ADJUSTMENTS

TP - A38  
+15VDC

CARRIAGE SERVO  
DISABLE SWITCH

TP - A50  
-15VDC

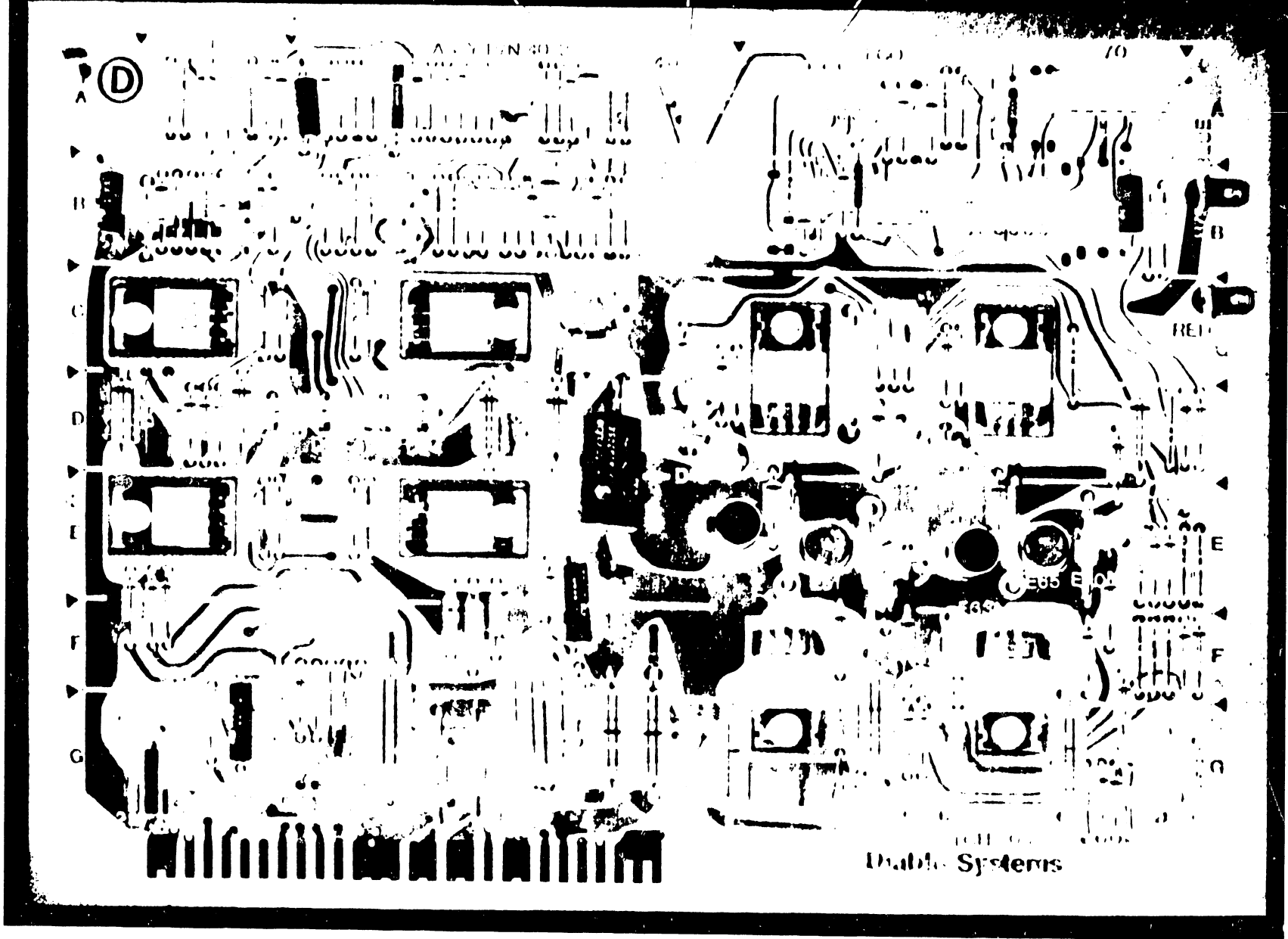


FIGURE 4-5 DIABLO LOGIC BOARD 40525-XX

PRINT HAMMER  
DISABLE SWITCH

PRINT WHEEL  
DISABLE SWITCH

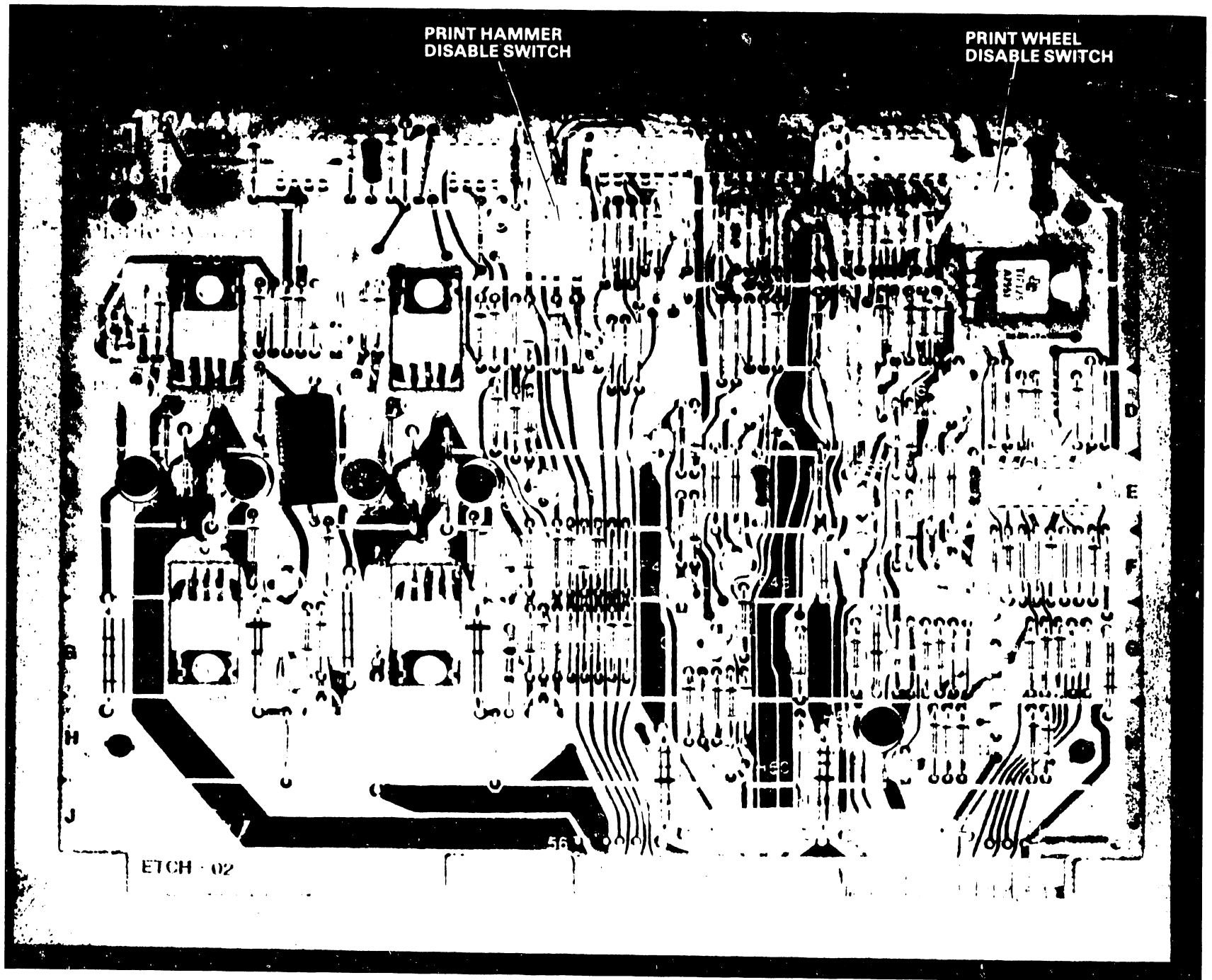


FIGURE 4-6 DIABLO LOGIC BOARD 40730-XX

7. Select Indicator/Switch Illuminates and allows input to the unit when selected. The operator can interrupt programmed control by manually deselecting. When select is initiated again, the printer will continue where it left off.

#### 4.3 MAINTENANCE PRECAUTIONS

1. To prevent injury never make or break internal connections to the Diablo printer boards while power is ON.
2. Applying power to the printer initiates a RESTORE sequence causing movement of the carriage to the left. Insure that the carriage is free to move with no obstructions.
3. DO NOT stand the printer on its rear heat sink panels. The finned heat sinks are mounted on plug-in circuit boards which are easily damaged.
4. DO NOT use alcohol to clean the platen or the paper feed rollers. Alcohol dries and hardens rubber and results in paper feed problems. Use an accepted platen cleaner. (IBM cleaning fluid--Wang Part # 660-0159.)
5. Use alcohol for cleaning plastic. DO NOT use platen cleaner on plastic.
6. Print wheels do not require cleaning under normal operating conditions. If cleaning is required use alcohol.
7. Discourage the customer from using reinked cloth ribbon cartridges. Serious problems have resulted from excessive ink that collects and builds up dirt deposits. CARBON RIBBONS ARE RECOMMENDED FOR ALL DAISY PRINTERS.
8. DO NOT ATTEMPT TO REPAIR THE CARRIAGE ASSEMBLY -- If all alignment and adjustment procedures have been tried and resulted in failure, procure a replacement carriage and make the necessary arrangements to replace the defective carriage assembly. Return the defective carriage to the home office for disposition.

WARNING:

PLATEN CLEANER AND ALCOHOL ARE FLAMMABLE  
AND THE CLEANER HAS A LOW FLASH POINT.

4.4 MAINTENANCE OF DAISY PRINTERS

The LEVEL 1 and 2 maintenance schedule for the printer includes the following items:

1. Paper loading, ribbon cartridge and print wheel replacement, surface cleaning and lubrication, and print quality (adjustment of print impression and platen adjustment controls).
2. The unit replacements will include six Diablo PCBs listed in paragraph 4.1.1 above and the WANG Microprocessor PCBs that are listed in 4.1.2
3. Check correct Model printer when substituting boards.

4.5 PAPER LOADING

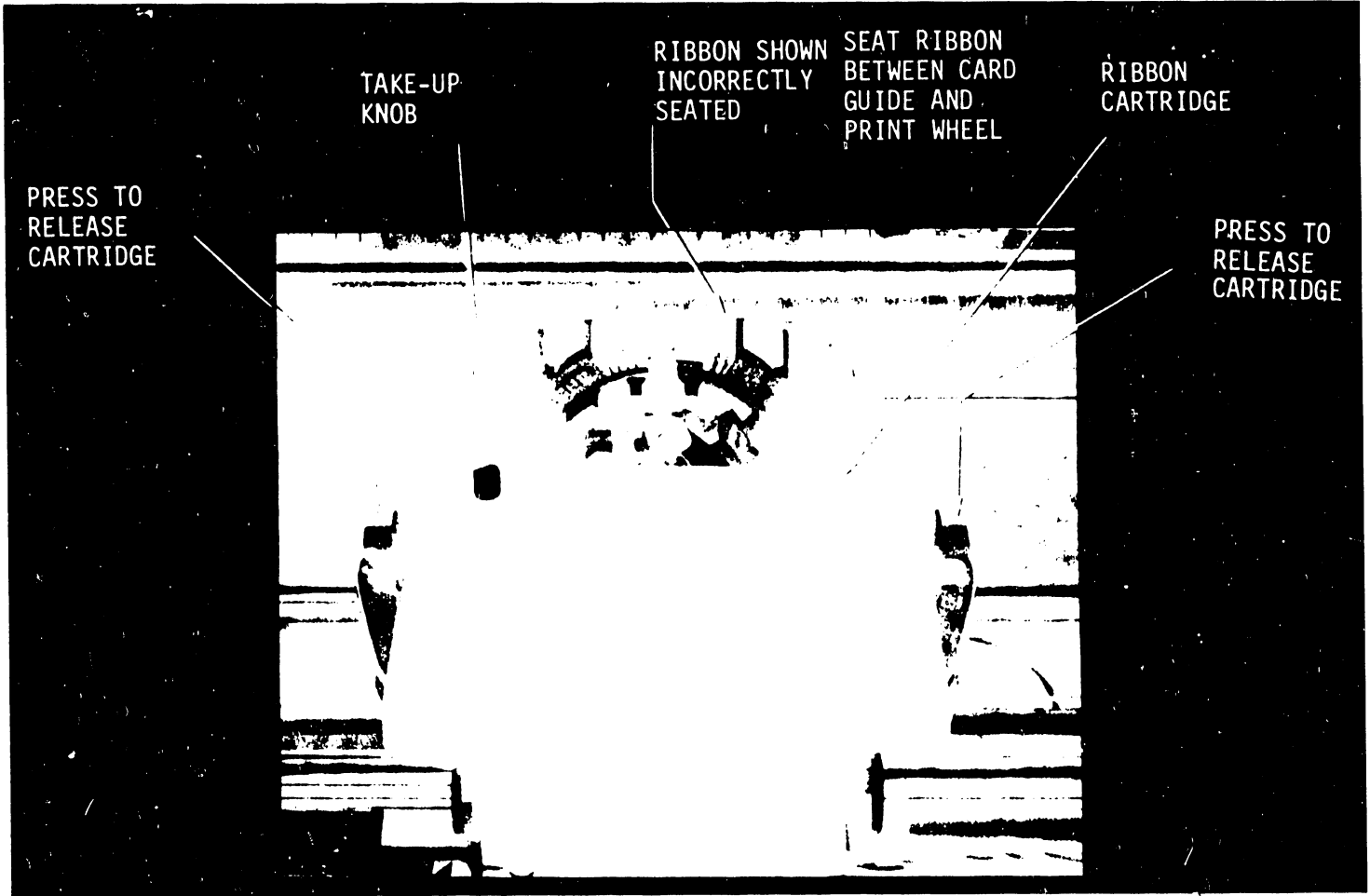
Paper loading for the standard HY-TYPE II (friction platen) is accomplished in the following manner. Paper is inserted down behind the platen and the platen rolled by hand to bring the paper around and up in front. The paper bail, when pulled forward, aids in directing the paper over the top of the platen to the rear. The right-hand paper release lever may be pulled forward to aid in proper paper alignment. After paper is positioned, the bail and paper release levers are returned to their operating positions. The operator can then adjust the platen adjust lever for the printing to be performed. THIS LEVER MUST BE FULLY FORWARD FOR PRINTING ON SINGLE SHEETS OF PAPER. Move the lever back for increased paper thickness. If carbon ribbons are breaking, the platen adjust lever should be checked. (See PLATEN to PRINT WHEEL adjustments).

#### 4.6 RIBBON CARTRIDGE REPLACEMENT

1. Snap the top access cover off by gently lifting up on the left side using the chrome trim bar. With cover removed the printer is disabled for personnel safety. By pulling up switch (cover interlock), printing can continue without cover. (See Figure 4-2.)
2. The cartridge is mounted and held on its platform by two latches. Pushing down on these latches releases the cartridge for removal. (See Figure 4-7.)
3. Installing a new cartridge requires engaging the exposed part of the ribbon behind the two ribbon guide posts located in front of the print wheel, and then snapping the cartridge into place on the platform. Before snapping it into place, turn the small white take up knob until it engages in the slot for the ribbon drive. The take-up also keeps the ribbon taut for easier insertion behind the guide.
4. Perform a print operation to insure operation before replacing access cover. Replace cover by inserting it properly into the right side and then pushing it down on the left.

#### 4.7 PRINT WHEEL REPLACEMENT

1. Remove access cover and Ribbon Cartridge as explained in section 4.6.
2. The inner carriage assembly can be tilted forward away from the platen, to expose the print wheel, by gently pulling the hammer guide.
3. Grasp the rubber hub and pull away the print wheel. The print wheel has a friction fit on the shaft of the print wheel drive. (See Figure 4-8.)
4. To install the new print wheel, turn printer power ON. (This holds the print wheel servo drive shaft electrically at its restore (Detent) position.)



**FIGURE 4-7 RIBBON CARTRIDGE REPLACEMENT**



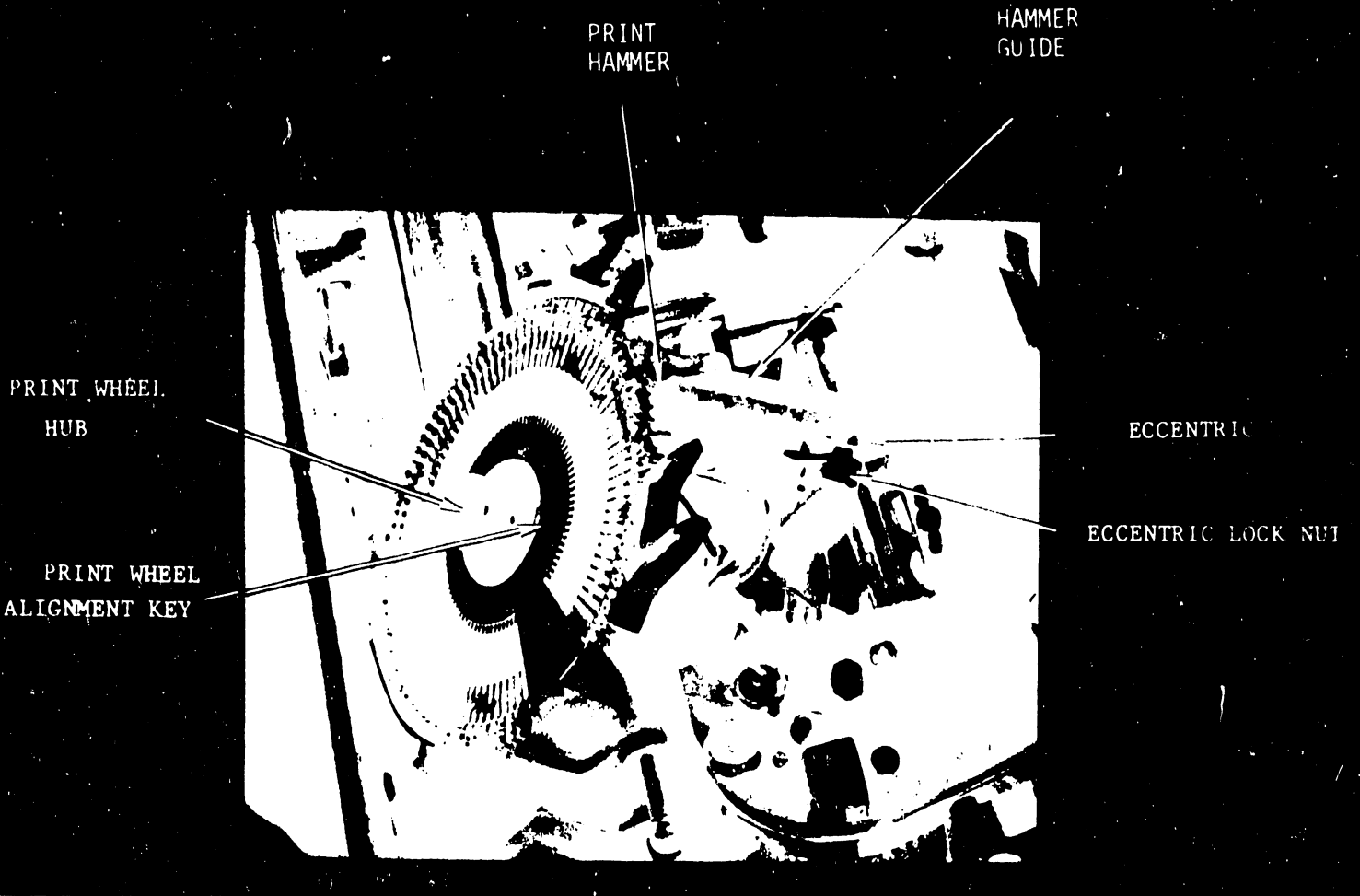


FIGURE 4-8 PRINT WHEEL REPLACEMENT

NOTE:

A PRINT WHEEL DISABLING SWITCH IS AVAILABLE ON THE DIABLO LOGIC BOARD #40525 WHICH CAN BE USED WHEN INSTALLING OR CHANGING PRINT WHEELS.

SEE FIGURE 4-5.

Push the print wheel solidly onto the end of the drive shaft. Insure that the key slot on the print wheel lines up with the alignment key on the shaft. (See figures 4-9 and 4-10.)

5. Tilt the inner carriage assembly back into the operating position and replace the ribbon cartridge as explained in section 4.6.
6. Replace access cover after checking for proper print action.

#### 4.8 INSPECTION, CLEANING AND LUBRICATION

- 1) Remove power from printer. Remove access cover as explained in paragraph 4.6. The top cover has two release latches, one on either side, that permit removal.
- 2) Thoroughly inspect the printer for signs of wear and loose or broken hardware. Check the carriage system for tautness and possible drag along the entire length of the rails. Check for dirt accumulation along the rails.
- 3) Remove the platen, paper cradle, ribbon cartridge and print wheel. Inspect each unit for signs of wear, such as damage to the platen surface and damaged print wheel characters or bent character petals. Check the hammer face for unusual wear due to misalignment. The hammer face should be perfectly square and not worn or rounded on the edges. A preliminary check of print impressions should alert the Customer Engineer to impending problems.
4. Clean the printer thoroughly, using alcohol saturated cleaning pads and wipers. (Part # 660-0130). Remove accumulations of paper residue, ink, dust, etc. Give special attention to carriage rails and pulley grooves.

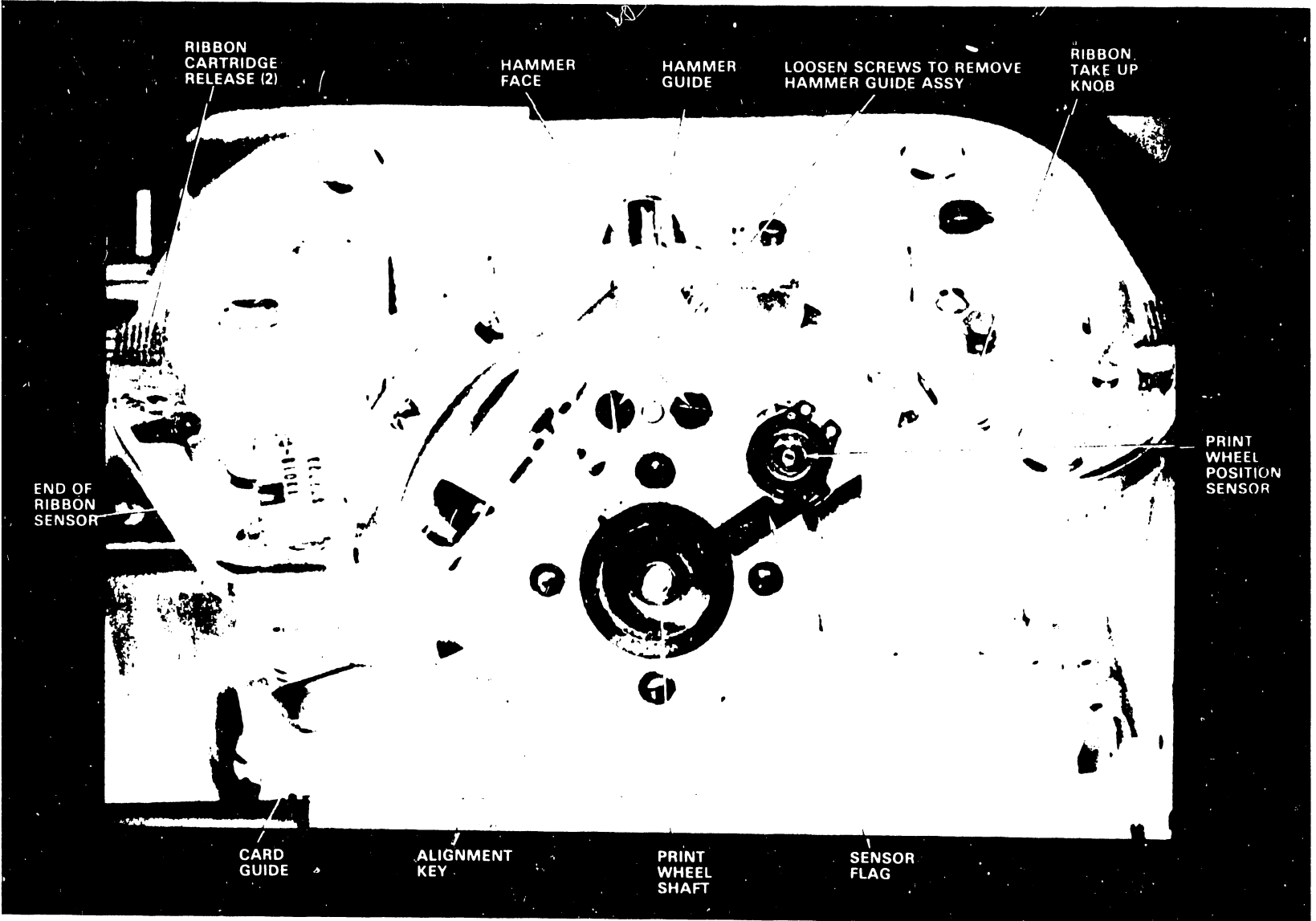
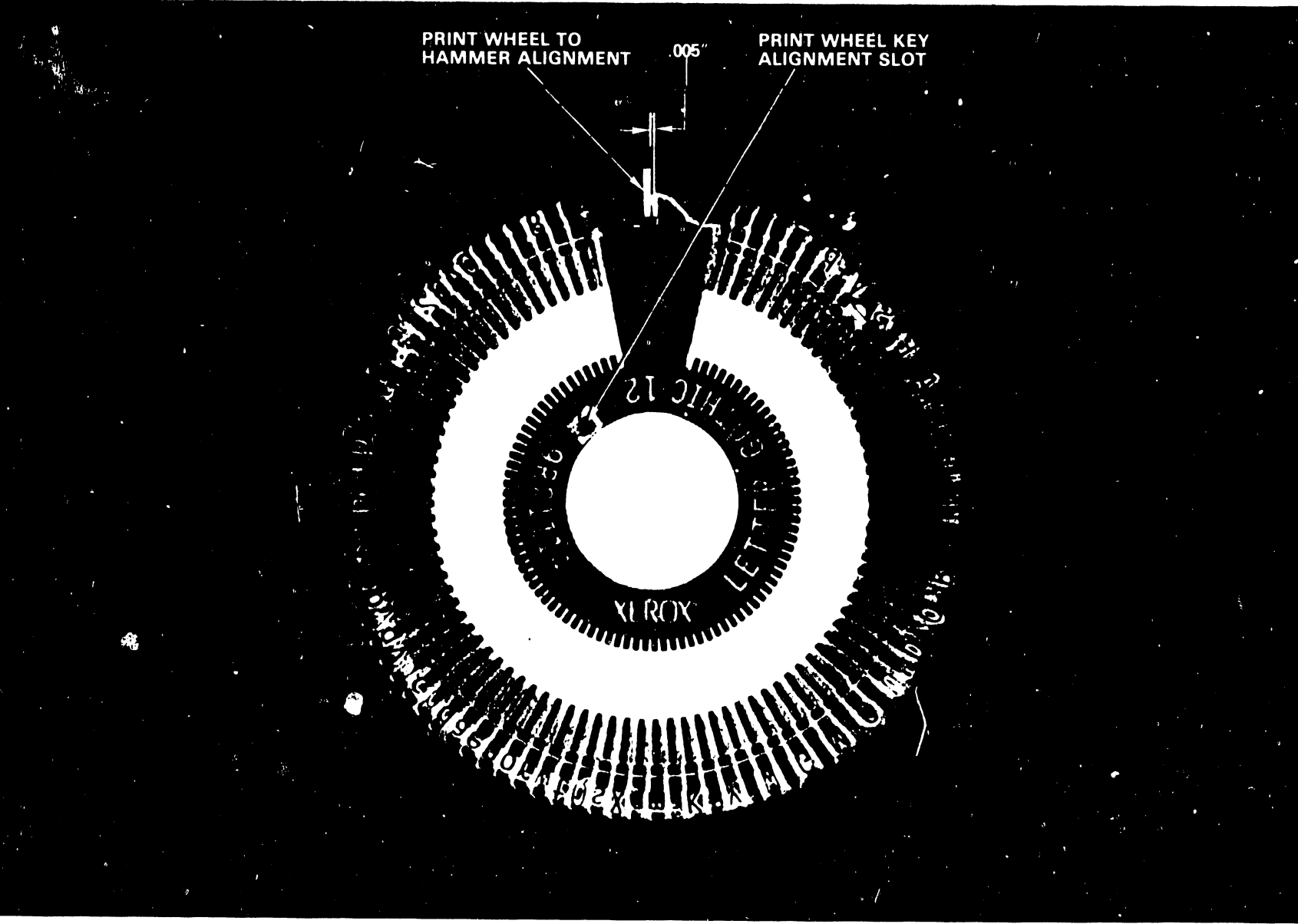


FIGURE 4-9 PRINT WHEEL SERVO MOTOR AND BRACKET ASSY WITH RIBBON CARTRIDGE MOUNTING PLATE



PRINT WHEEL TO  
HAMMER ALIGNMENT

.005"

PRINT WHEEL KEY  
ALIGNMENT SLOT

FIGURE 4-10 WANG PRINT WHEEL

5. Clean the platen, platen pressure rollers, and paper bail rollers with a good quality platen cleaner which is not injurious to rubber products. (IBM cleaning fluid--IBM # 280017 - WANG PART #660-0159).
6. LUBRICATION-- Follow the lubrication procedures as described in the Maintenance Section 5 (Para. 5.3.4) of the Diablo Maintenance Manual. Pay special attention to the carriage rails, carriage pivots and hammer armature.
  - a) Carriage Rail Bearings - Put 4 or 5 drops of light oil on each rail on both sides of the carriage. Move the carriage back and forth slowly by hand allowing the oil to saturate the lubrication felts inside each carriage bearing.

WARNING: Too much lubrication is worse than none at all.

#### 4.9 PRINT QUALITY ADJUSTMENTS

The proper assessment of print quality requires that the print samples used for evaluation are obtained under standardized conditions. Print quality tests therefore should be made with a new print wheel (one that the customer uses all the time and gives good service) and a carbon ribbon, on a good grade of standard bond paper with the impression control switch set on medium (M). See Print Intensity Adjustments-Paragraph 4.9.1

1. Print a full line of "H's"

H	H	H	H	H
(a)	(b)	(c)	(d)	(e)

2. Compare the test results with the above illustration. Item (a) Impressions similar to this having uniform density and good edge definition indicate proper adjustment. A gradual change in density (lighter or darker) from one end of the line to the other indicates a PLATEN to PRINT WHEEL adjustment.

Item (b) Impressions similar to this indicate PLATEN HEIGHT adjustment. Platen is too low.

Item (c) Impressions similar to this indicate PLATEN HEIGHT adjustment. Platen is too high.

Items (d) and (e) Impressions similar to these indicate that a PRINT WHEEL to HAMMER adjustment is required. Check the hammer face for possible wear and indentations.

In the event print quality has deteriorated as indicated above, the following adjustments should be checked in the order listed below. The alignment procedures listed are not always the solution to print quality, however, the procedures could eventually lead to a cause that can be remedied.

Every adjustment is performed with respect to the carriage assembly because of its permanent mount on rails. The rails are rigidly clamped to the printer main frame

1. Card Guide Height and Position Adjustment
2. Platen to Print Wheel Adjustment-(Platen Height and Depth)
3. Hammer/Print Wheel Adjustment
4. Ribbon Height
5. Carriage Home
6. Print Wheel to Hammer Alignment.

#### 4.9.1 PRINT INTENSITY ADJUSTMENT

The Hy-Type II Daisy Printers' impression control (print intensity or hammer energy) switch shown in figure 4-2 provides three levels of print intensity to compensate for print wheel font variations as well as multiple ply copy requirements. The settings recommended for use are as follows:

"H" for high (used for printing multiple forms).

"M" for medium (used for most normal printing work)

"L" for low (used for light printing with the delicate type fonts).

#### 4.10 CONDITIONS OF TEST AND ALIGNMENT

##### 1. POWER

Power is to be applied to the Printer while making these adjustments. Power is used to electrically detent the print wheel and carriage servo motors, and for cycling the printer through a RESTORE sequence when required.

##### 2. PLATEN

Platen carrier adjustments are to be made with a platen installed whose surface is in good condition and free from wear or defects.

##### 3. RIBBON

Ribbon adjustments are to be made with a CARBON ribbon cartridge installed.

##### 4. CONTROLS

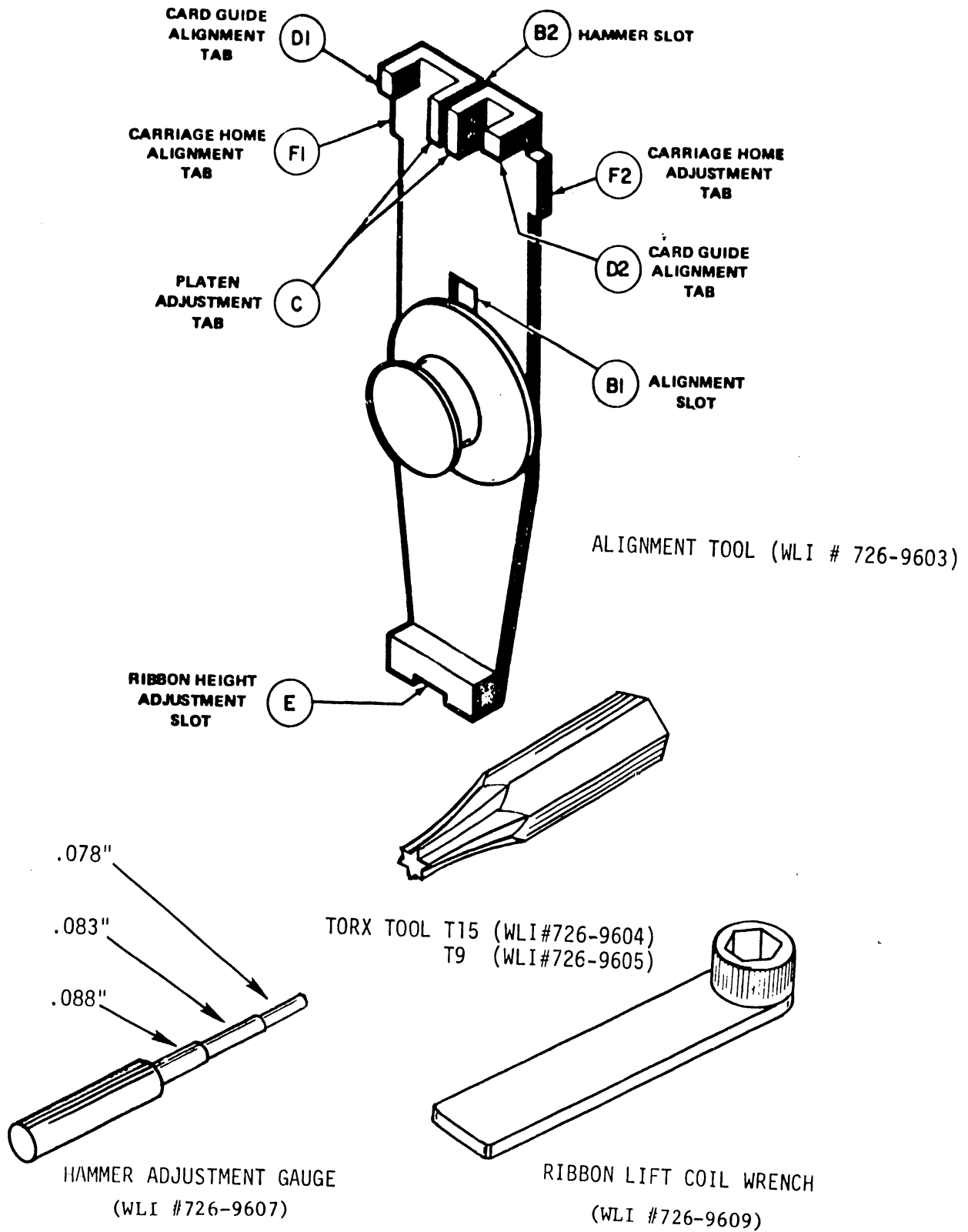
The Platen Position (manifold) lever is to be positioned fully forward for these tests and adjustments.(POSITION A)

##### 5. PRINT INTENSITY ADJUSTMENT

The Hy-Type II Daisy Printer print intensity switch should be set to the MEDIUM intensity position for all print quality adjustments and tests.

#### 4.11 ALIGNMENT TOOLS

The alignment tools required for the printer adjustments are illustrated in figure 4-11. The Alignment Tool (WLI #726-9603) performs several alignment checks when mounted on the print wheel shaft. The CAUTION written below must be heeded whenever the alignment tool is mounted. These tools should be a part of all servicing tool kits.



PRINTER ALIGNMENT TOOLS

FIGURE 4-11



#### CAUTION:

Always remove the ALIGNMENT TOOL from the print wheel servo motor shaft before initiating a RESTORE sequence, to prevent damage to the printer. The tool is not mechanically secured and could damage the printer and injure service personnel. Make sure that the tool is properly seated prior to making any adjustments or measurements. Use the PRINT WHEEL DISABLE switch mounted on the #40730 Power Amp. board when necessary. (See figure 4-6.)

#### 4.12 CARD GUIDE HEIGHT and POSITION ADJUSTMENT

The Card Guide is an integral part of the carriage assembly, and once adjusted should not require any further attention other than a slight forming for proper ribbon and paper clearance.

1. Loosen the two (2) 3/16" Hex Head card guide mounting screws (slotted screws on older models) and move the card guide down. (Refer to Figure 4-12.)
2. Mount the alignment tool on the print wheel shaft. Insure it is firmly seated. Push the print hammer into the hammer slot (B2) on the tool and hold it there. Raise the card guide gently, until its top edge contacts the underside of the tool tabs labeled D1 and D2. Release the hammer while holding the card guide in contact with the tool. Tighten the Card Guide mounting screws.
3. Using a .005" plastic shim, check for no-drag shim clearance between the card guide and the ribbon guide posts on the die-cast bracket assembly. If there is shim drag, gently reform the card guide support arms. Check for no drag clearance along the full length of the platen.

# Card Guide Height and Position Adjustment

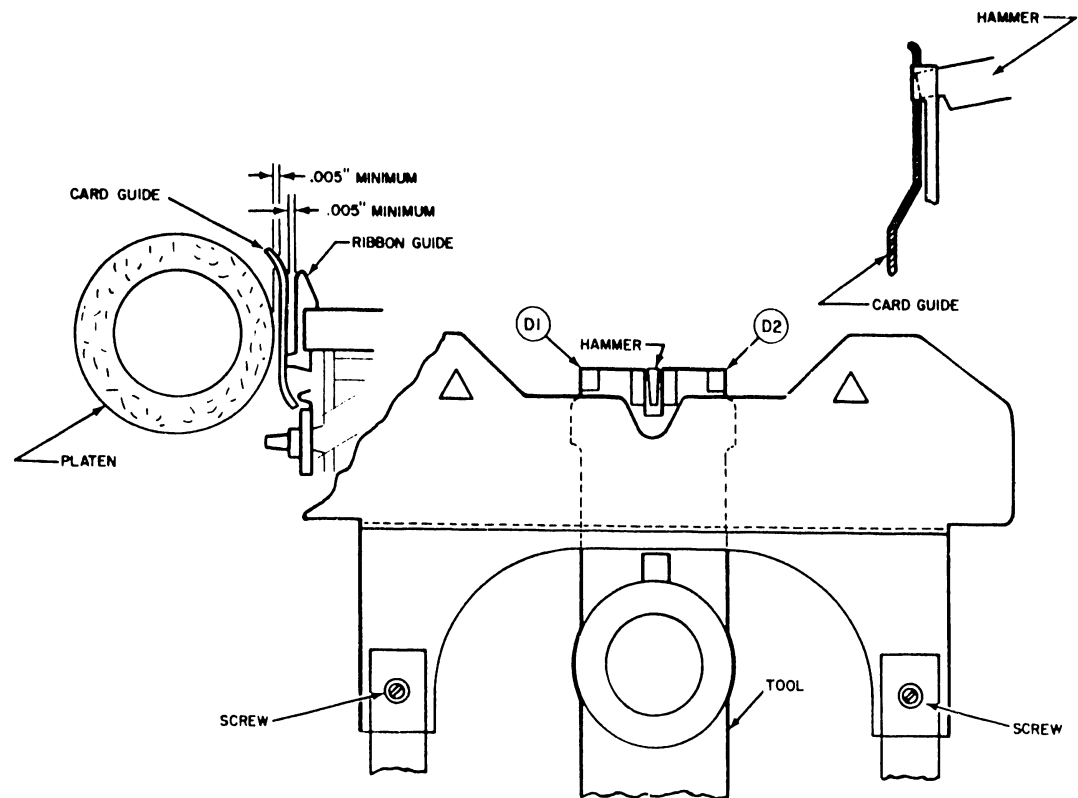


FIGURE 4-12 CARD GUIDE ADJUSTMENTS

#### 4.12.1 DIE CAST BRACKET ASSEMBLIES

The Diablo bracket assembly castings that support the print wheel servo in the carriage assembly are die cast brackets. See figure 4-13.

The bracket casting is a grayish black color that has ribbon guides that are part of the casting. The card guide must be adjusted to the bracket. However, it has come to our attention that there have been several attempts to form the ribbon guide portion of the casting to the card guides. These attempts have resulted in ruptured castings. Please do not damage these castings! ADJUST THE CARD GUIDE.

#### 4.13 PLATEN-TO- PRINT WHEEL ADJUSTMENTS (Platen Height and Depth)

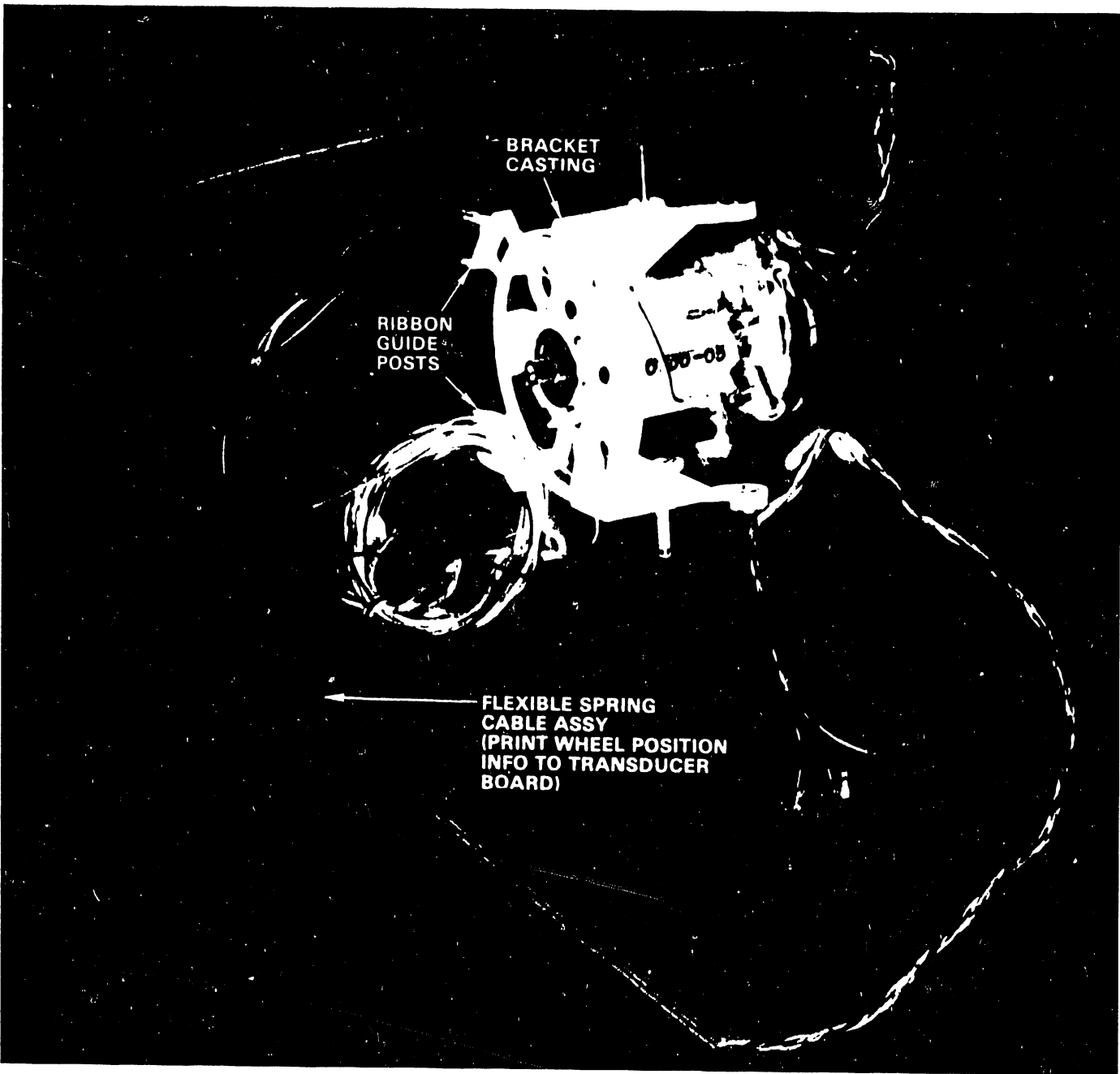
##### A. Zeroing or Mid Height Adjustment

1. Loosen the front eccentric on each end of the carriage assembly and set each to its mid-range (lobe facing to the rear) using a 1/4" with a 7/16" open end wrench. Tighten in this position. Remove idler gear on right side for access if necessary. (See Figure 4-14.)

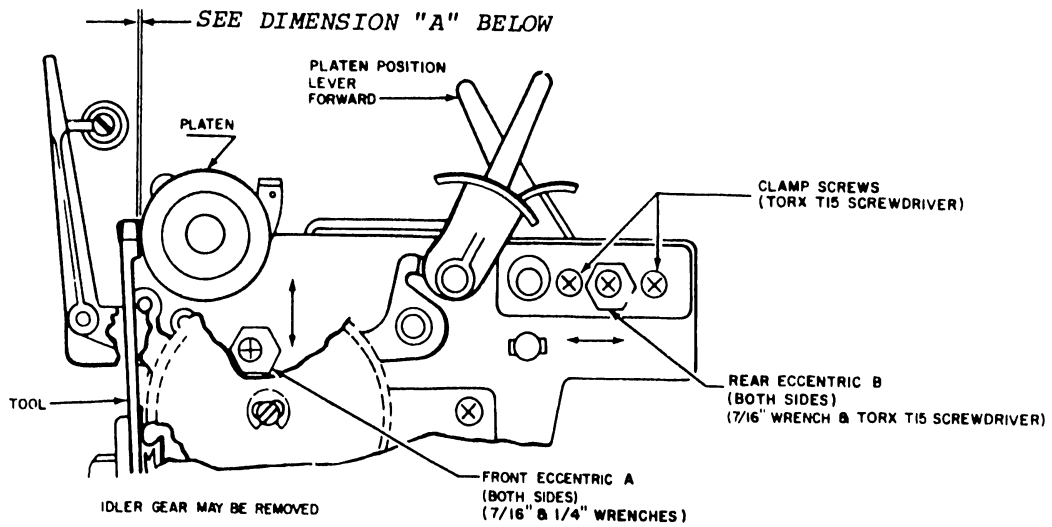
#### 4.13.1 PLATEN DEPTH PREPARATION

The following procedures must be completed prior to the Platen-to- Print Wheel Adjustment:

1. Move the Platen Adjust Lever to the fully forward position (A) with the print wheel motor tilted back and the alignment tool installed.
2. Tilt the print wheel motor forward and verify that the alignment tool clears the card guide completely. Tilt it back again.
3. Disable the Carriage Servo motor by placing the servo switch in the OFF position. This switch is located on the top of the #40525 Carriage Power Amplifier Board which is installed in slot D (Right rear of the Diablo Logic). (See Figure 4-5.)



**FIGURE 4-13 PRINT WHEEL SERVO MOTOR MOUNTED ON BRACKET ASSY**



MODEL	1355WP
DIMENSION "A"	.005 / .010

PLATEN TO PRINT WHEEL CLEARANCES

FIGURE 4-14 PLATEN-TO-PRINT WHEEL ADJUSTMENT POINTS

#### 4.13.2 ADJUSTMENT SETTINGS -(Refer to Figure 4-14.)

1. Move the carriage by hand as far left as it will go. Tilt the print wheel motor forward and verify the following relationship between the platen and the tool. The platen setting is correct when a clearance of .003" to .005" can be measured between Tabs C (see figure 4-11) of the tool and the platen surface.
2. Tilt the print wheel motor back and move the carriage as far right as it will go. Tilt the print wheel motor forward again and check the platen-to-tool relationship.

#### NOTE

GAP SHOULD BE MEASURED ON THE HIGH POINT OF THE PLATEN SLOWLY ROTATE THE PLATEN TO FIND ITS HIGH POINT.

#### 4.13.3 PLATEN DEPTH ADJUSTMENT--(Repeat for both ends of the platen).

1. Loosen the two rear eccentric clamp screws on each side of the printer, using a TORX T15 screwdriver and the screw for the rear eccentric, item (B).
2. Adjust the rear eccentric using a 7/16" wrench to bring the platen clearance to within the limits specified. Tighten the slide clamp screws. Move the carriage to the opposite end of the platen and check for proper clearance. Repeat the steps until the clearances are within tolerance. Tighten clamp and eccentric screws.

#### 4.13.4 PLATEN HEIGHT ADJUSTMENT

1. Remove the alignment tool. Install the print wheel and a carbon ribbon cartridge. Load a good quality sheet of bond paper into the printer. Apply power to the printer and observe a RESTORE. (If a RESTORE does not occur, go to paragraph 4.16 - Perform CARRIAGE HOME ADJUSTMENT)

2. CREATE A DOCUMENT containing a row of H's. Set up a PRINT operation and execute a one line printout of the H's. Compare the print quality of the H's with the illustration in paragraph 4.9.
3. Make the necessary adjustments to the platen height eccentrics (A), one end at a time, by repeating the print test to achieve an even printout top and bottom on each character.

#### 4.14 HAMMER/PRINT WHEEL ADJUSTMENTS

Turn power off. With the Platen Adjust Lever fully forward, remove the alignment tool and install a print wheel. DO NOT INSTALL A RIBBON CARTRIDGE. Remove all print paper. Align one of the print wheel petals with the print hammer. (Refer to Figure 4-15.)

##### NOTE:

INSPECT THE END OF THE HAMMER FOR WEAR - IF EXCESSIVE WEAR IS INDICATED ON THE HAMMER EDGES, REPLACE WITH A NEW HAMMER (PART #726-5088) AND THE HAMMER SPRING (726-5089). THIS CONDITION INDICATES MISALIGNMENT. (SEE HAMMER REPLACEMENT-PARAGRAPH 4.14.5)

##### 4.14.1 HAMMER ADJUSTMENT

1. Hold the hammer armature, Item (A) against the hammer coils, Item (F) and check for no gap between Items (A) and (F). Insert hammer adjustment guage #726-9607 (Figure 4-11) between the armature (A) and the armature stop eccentric (B). Use the .088 Dia. of the guage. Adjust the eccentric (B) for a very light resistance when sliding the guage in and out of the gap.
2. Rotate the print wheel manually to an upper case letter (M,W,E etc) in front of the hammer. Insert guage .088" between the armature (A) and the anvil end of the hammer (C). With the guage in place, lightly press in on the armature (A) until it stops against the hammer coils (F).

This will drive the print hammer (C) in to nest the selected upper case letter (Petal) lightly against the platen (E). Gently rock the print wheel back and forth, and verify the petal can move with a very light drag against the platen.

3. Repeat this process by checking points all across the platen by moving the carriage. Adjust the print hammer armature assembly (J) to achieve the desired hammer to platen dimensions by loosening screws (I) and moving the assembly. Retighten screws to secure the assembly (J).

#### 4.14.2 PRINT WHEEL-TO- HAMMER ALIGNMENT

1. Apply power to the printer, and verify the completion of a RESTORE sequence. (See section 4-17.) Remove paper, ribbon cartridge and the print wheel. Install the Alignment Tool #726-9603 firmly on the print wheel servo motor shaft, making sure that it is properly seated with its alignment slot (B1) engaged with the hub alignment tab.
2. Rotate the tool to bring its hammer slot (B2) in front of the print hammer, and block the carriage home sensor (by inserting a piece of dark paper into its slot) to detent the print wheel motor. See figure 4-16.
3. Manually push the print hammer in toward the platen lightly, until its face enters the adjustment tool's hammer slot (B2). If the hammer slides easily into the tool slot without contacting the sides, the print wheel-to-hammer alignment is correct. If the hammer contacts the sides of the tool slot, or the hammer will not enter the slot at all, continue with this procedure.
4. Place a 1/4" open end wrench on the print wheel motor shaft nut, and prevent the shaft from turning. Move the Adjustment Tool as necessary to achieve proper alignment with the print hammer.



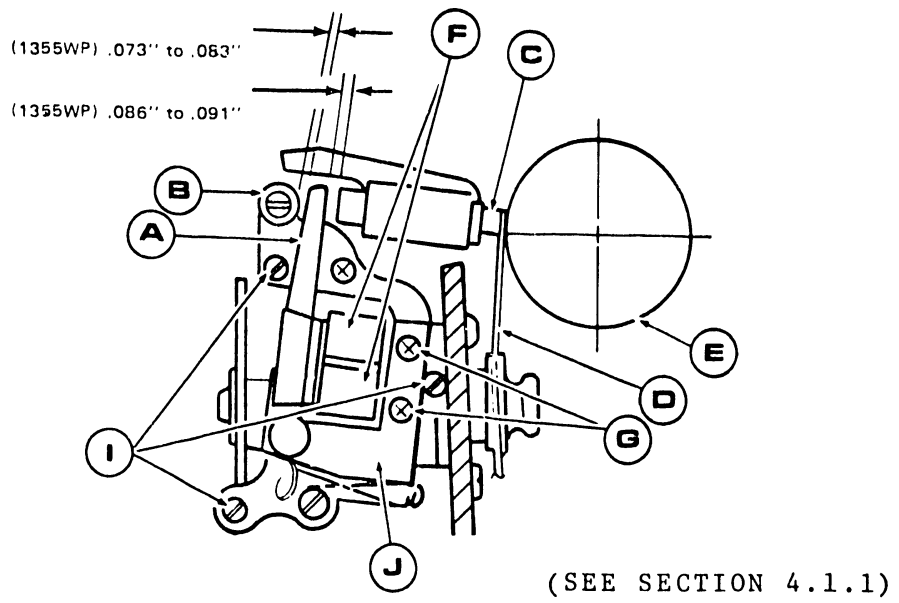


FIGURE 4-15 HAMMER ADJUSTMENTS

**Print Wheel-To-Hammer Alignment**

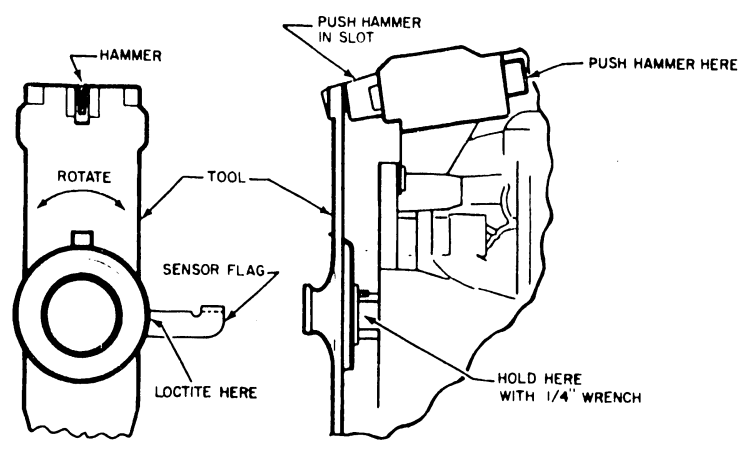


FIGURE 4-16 PRINT WHEEL-TO-HAMMER ALIGNMENT

CAUTION:

In this step, the tool is moving the print wheel locator tab/sensor flag on the motor shaft. (Refer to figure 4-9.) The flag has been bonded to the shaft with a LOCTITE adhesive cement (PART # 660-0106).

If this adjustment is necessary, be extremely careful not to deform the sensor flag. Rebond with adhesive when alignment is completed.

NOTE:

If the repositioning of the sensor flag is required, then a PRINT WHEEL HOME ADJUSTMENT check must be performed.

4.14.3 PRINT WHEEL HOME ADJUSTMENT

The print wheel logic has a special feature that ensures that the microprocessor on the LOGIC 2 board has the right count in its absolute counter for print wheel position. The print wheel is only allowed to stop at each petal position if adjusted properly. If the print wheel fails to stop at a petal position, then the microprocessor will issue a RESTORE command. The print wheel will RETRY for the proper condition to stop at a petal position but after 8 retries will go into CHECK to stop the printer. This situation normally indicates that a PRINT WHEEL HOME adjustment is required. Perform the following steps:

1. Remove the ribbon cartridge and tilt the print wheel forward away from the platen.
2. Initiate a RESTORE sequence. (Turn power OFF and ON). Verify that the home position (90 degree notch in the print wheel flag) is positioned squarely in front of the print hammer. (See Figure 4-10.)
  - a. If the flag is displaced less than one character width, perform 4.14.1
  - b. If the flag is displaced one full character, perform the following adjustment in 4.14.4.

- c. If the flag is displaced more than one full character, perform both a and b.

#### 4.14.4 PRINT WHEEL "HOME" ALIGNMENT (REFER TO FIGURE 4-17)

Use a 7/16" open end wrench to adjust the home sensor eccentric (A) as follows:

1. Move the eccentric slightly, in either direction, and RESTORE the printer. Continue adjusting the eccentric in that direction, a little at a time, until the print wheel spins (8 revolutions) and the printer goes into the CHECK mode. Note the eccentric position. Move the eccentric in the opposite direction in the same manner until the printer goes into check again. NOTE THIS POSITION.
2. The two extremes noted above may be as much as 180 degrees apart. Adjust the eccentric to the approximated midpoint between these two extremes.
3. If the print wheel spins continuously (8 revolutions), the sensor (B) may be located too far from the print wheel home sensor flag (C). Loosen nut (D) and rotate the sensor clockwise until the print wheel stops. Use a plastic shim to verify .003" to .007" clearance between the surface of the sensor and the edge of the flag. Retighten nut (D).

#### 4.14.5 HAMMER REPLACEMENT

The replacement of a worn print hammer is a simple operation requiring only the removal of two slotted or Phillips head screws. (Refer to figure 4-9.) The two screws are accessible when the print wheel assembly is tilted forward away from the platen and the print wheel is removed from the shaft. The two screws at the top of the bracket casting secure the Hammer Guide. Remove the hammer guide and be careful when removing the hammer that the internal hammer spring is not lost. Insert the hammer and spring into the hammer guide and secure the guide with the two screws. Insure that the hammer is free to slide easily within the guide.



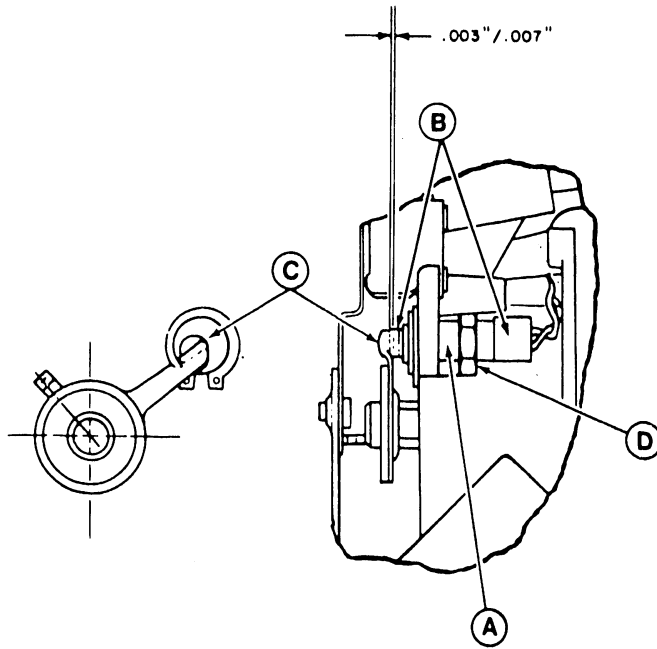


FIGURE 4-17 PRINT WHEEL "HOME" ALIGNMENT

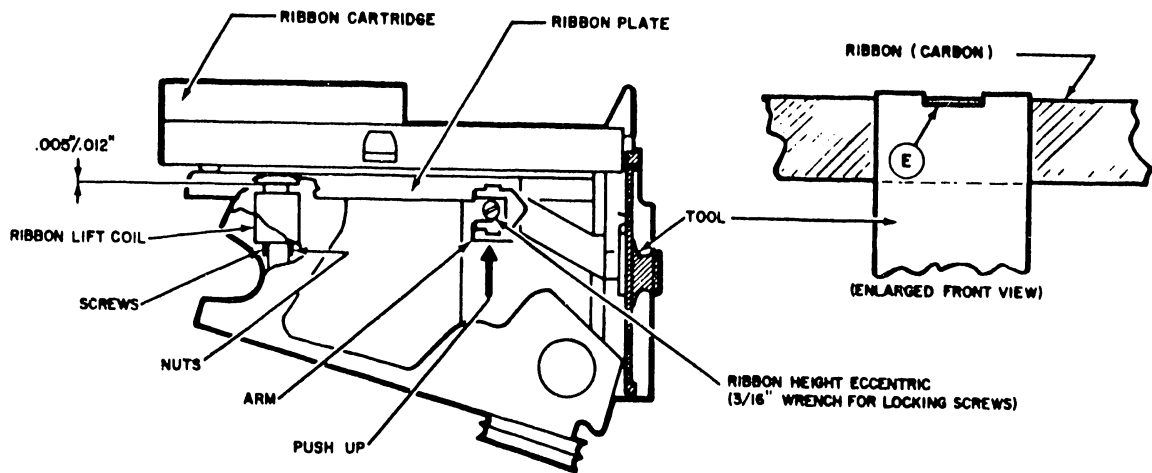


FIGURE 4-18 RIBBON HEIGHT ADJUSTMENT

## Carriage Home Adjustment

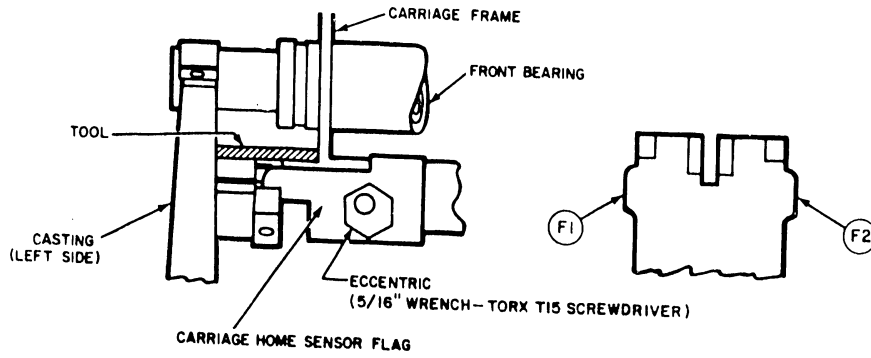


FIGURE 4-19 CARRIAGE HOME ADJUSTMENT

2. If the carriage home position is out of tolerance following a RESTORE, adjust the carriage home sensor flag eccentric, located on the bottom left front of the carriage frame, using a 5/16" wrench and a TORX T15 screwdriver.

The eccentric is adjusted to move the sensor flag LEFT if clearance is not sufficient. An adjust to the RIGHT is for too much clearance. Perform a restore to check results. Tighten the eccentric clamp after adjustment is completed.

#### 4.17 TROUBLE-SHOOTING HINTS FOR HY-TYPE II DAISY PRINTERS

The operational trouble-shooting flow diagram, Figure 4-20, for Daisy Printers (Models 5511 and 5581) can be used to determine whether the problem is within the printer logic (DIABLO), the printer interface logic (WANG) or a possible mechanical or adjustment failure.

##### NOTE:

It is necessary that the Customer Engineer first determine that power is available at the printer source.

It is also necessary that the BNC/TNC coaxial cable is verified and that the Master Channel port used by the printer is active.

1. With the printer power turned off, remove access cover by gently lifting the chrome strip at the extreme left corner. Remove the printer top cover by releasing the inside latches on both sides of the cover. Be extremely careful when removing the cover not to damage the cooling fan blade or the short ribbon cable that connects the keyboard to the printer. Allow adequate space to set the cover aside and permit use of the keyboard.
2. Check the following items:
  - a) Inspect the AC power plug and cable for damage.
  - b) Check the Diablo power cable with the Winchester connector on the right side of the Diablo motherboard.
  - c) Check the cooling fan plug.

5581 PRINTER

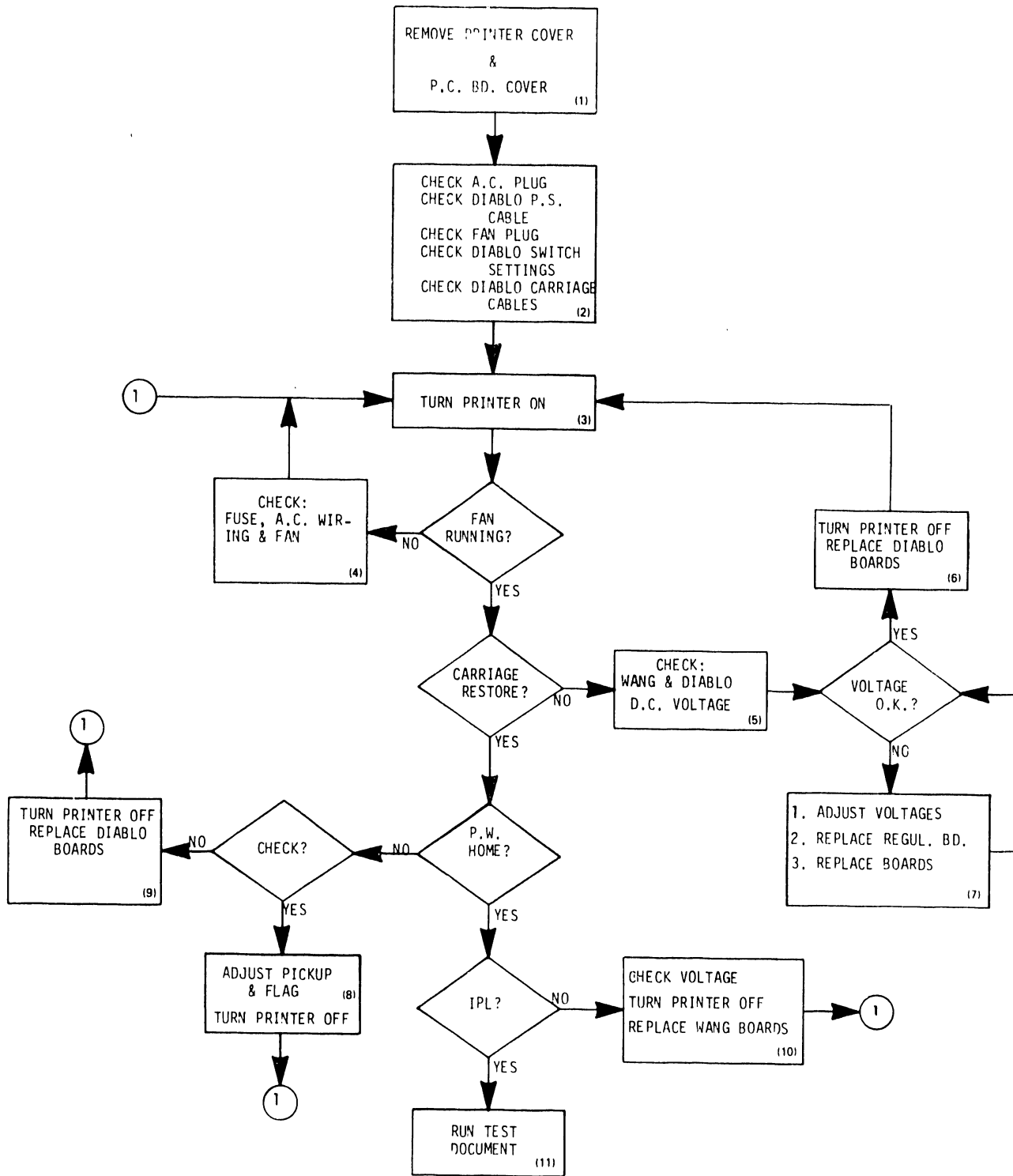


FIGURE 4-20 DAISY PRINTER MODELS 5511, 5581 OPERATIONAL FLOW CHART



- d) Check the Diablo board #40525 for the carriage servo disable switch. Check the #40730 board for the Print Wheel and Hammer disable switches. (On position- All three switches set to the left.)
  - e) Check Diablo carriage cables. The carriage assembly is equipped with two flexible spring covered electrical cables with connectors. The cables are arranged and clamped in the line of travel under the carriage. A portion of the two cables are clamped to prevent contact with the moving carriage. If the cables were to come loose, it could possibly restrict carriage travel and cause damage. One of these two cables provide the electrical information shown in Figure 4-13.
3. TURN THE PRINTER ON (Pull up the safety interlock switch normally activated by access cover).

The cooling fan in the lower left corner for the WANG boards should be running. If fan is not running, go to step 4. If fan is operating, observe the carriage RESTORE by turning the power OFF and displacing the carriage to the RIGHT side of the rail. Turn power ON and observe the restore as described below.

4. Check the printer power fuse on the rear of the base assembly. If blown, replace with 3 Ampere 250V SLO BLO ceramic 3AG fuse, Part #360-1031-SB. Inspect the AC wiring and fan.

#### RESTORE

The RESTORE sequence is used to initialize the printer, where the carriage and print wheel are moved to their home positions while logic circuits are reset and program counters are zeroed. (THIS PROCEDURE IS TO BE OBSERVED). (The restore or initialization of the carriage is performed first; if successful, the print wheel restore follows)

The carriage is commanded to move to the left at a slow rate. When the home position is detected, (by a sensor that detects the flag on the carriage), the carriage servo stops. After .1 seconds, the carriage is commanded to move to the right (forward).

The internal printer microprocessor (LOGIC 2 board) detects the absence of HOME and allows the carriage to move two more position increments to the right and then stops the carriage. This forward motion is 1/60 of an inch (.423mm) which is hardly detectable. This is designated as the carriage HOME position.

If the carriage does not RESTORE, go to step 5.

5. Turn the power OFF. Move the carriage to the right side and turn power ON. If the printer carriage was in CHECK, (Malfunction light ON), this should clear the error.
  - a) Check all DC voltages at the points specified in section 4.2. If the voltages check O.K. proceed to step 6. If not proceed to step 7
6. Replace the Diablo boards one at a time commencing with the LOGIC 1 board (SLOT A) and proceeding to slots B, C, and D. Turn the power OFF. Replace the board. Turn the power ON after each replaced board and observe for the carriage RESTORE.
7. Measure and adjust voltages that are out of tolerance.
  - a) If unable to adjust voltages, replace the POWER REGULATOR board 7249.
  - b) Replace WANG boards one at a time. Turn the power OFF. Replace the suspected bad board. Turn power ON.

If the carriage restore completes, the print wheel restore should occur. If the print wheel does not restore, again the possibility exists that the printer is in CHECK indicating an error. This condition warrants another try to clear the error by turning the power OFF and ON. If the print wheel is still in check, proceed to step 8. If the print wheel is not in check, proceed to step 9.

8. A CHECK condition exists when the print wheel fails to stop in the HOME position, which is when the 90 degree notch in the Word Processor print wheel flag is immediately adjacent to the print hammer with the hammer pushed into the notch. (Refer to the Print Wheel Home Adjustment paragraph 5.4.4.6 of Diablo Systems Maintenance Manual 82403-02 for the degree of misalignment and the method to correct it.) After the print wheel is properly aligned the printer should IPL.
9. If the print wheel is not in check, proceed to remove the Diablo boards, one by one, commencing with the LOGIC 1 board in slot A. Turn the power OFF when removing and replacing boards. Turn power ON after each board and observe the RESTORE sequence. If the RESTORE succeeds then the printer will IPL. If the printer does not IPL, go to step 10.
10. Recheck the voltages for WANG logic boards on the front etches of the MOTHERBOARD 7343. Remove and replace the WANG logic boards, one at a time, with power OFF. Turn power ON and observe the RESTORE on the printer.
11. Go to the workstation and power up. Select PRINT DOCUMENT from the menu and execute. SELECT printer and observe print quality. Make the required adjustments listed in this chapter.

**CHAPTER**

**5**

**DISK**

**DRIVES**

CHAPTER 5  
DISK DRIVES

5.1 GENERAL

This chapter contains the maintenance and operating procedures for the disk drives used with Wang Word Processing Systems. LEVEL 1 and 2 maintenance for the disk drives includes adjustments, cleaning and removal/replacement of defective circuit boards and filters. Disk verification, alignments and diagnostic checks can be performed on all disk drives. Alignment adjustments will be required when specific boards are replaced in the CDC "HAWK" Disk Drive utilized on the 928 WP Systems 25 and 30.

A revised Steve Norris (ATS) Maintenance Utility disk has been designed to run on any WANG 928 WP System (Systems 10, 10A, 20, 25 and 30). It is intended to be used in the field to assist the Customer Engineer repair and maintain disk drives. Refer to Section 5.3 of this Manual for the details on this new utility.

5.2 DISK DRIVE COMPLEMENT PER SYSTEM

The System storage and Archive storage disk drives for each of the Word Processing Systems are listed below.

1. Editing Station (EDS)	1 System Diskette Drive 1 Archive Diskette Drive
2. WP System 5510A	1 System Diskette Drive 1 Archive Diskette Drive
3. WP System 5520	1 System Diskette Drive 1 Archive Diskette Drive
4. WP System 5525	1 System Hard Disk Drive (Choice of three storage capacities) 1 Archive Diskette Drive

5. WP System 5530

1 System Hard Disk Drive (Model 44 or CDC Hawk). This system is expandable to an additional 10 Megabyte disk drive.

1 Archive Diskette Drive

### 5.3 THE 928 WP SYSTEM MAINTENANCE UTILITY DISK

The WP Maintenance Utility Disk will perform the following functions:

1. Disk Verification tests
2. Disk Alignment checks
3. Disk Diagnostic tests

All of the above functions can be performed on floppy's and sealed/hard disk drives

The Maintenance Utility Diskette is intended for use in the field for repairing and maintaining disk drives. There are two types of Maintenance Utilities, one is for the single PROM systems and the other is for the newer dual PROM systems with the software EVENT HANDLER.

SINGLE PROM SYSTEMS REV 5.1

DUAL PROM SYSTEMS REV 6.1

(Use the Utility that corresponds to the above systems)

NOTE: The Maintenance Utility determines the type system by the presence or absence of a SEALED/HARD disk in the READY condition. If the WP System being maintained is a 25 or 30, insure that the disk is in the READY state.

#### 5.3.1 OPERATIONS -MAINTENANCE UTILITY DISKETTE

1. Operation for Systems 10, 10A and 20

Place Maintenance Utility Disk in system drive and press reset.

2. Operation of Systems 25 and 30

Position the ULTS switch inside the front grill to the UP position

Insert Utility disk in Archive drive and press reset.

3. The following display should appear on all workstations:

WP DISK MAINTENANCE UTILITY

Please select next activity:

Verify a Floppy Disk

Verify Fixed Disk/Lower Head

Verify Fixed Disk/Upper Head

Verify Removable Disk/Lower Head

Verify Removable Disk/Upper Head

Disk Read/Write Diagnostics

Disk Alignment Procedures

4. Select desired activity and EXECUTE. To exit from an activity, press CANCEL. With no selection an arrow will slowly scan the Menu.

MAINTENANCE UTILITY FUNCTIONS

1. VERIFY A FLOPPY DISK - This function will verify a floppy disk.

2. VERIFY FIXED DISK/LOWER HEAD - This function will verify the fixed disk lower surface. All 24 sectors are verified on dual PROM (Event Handler) systems. Only 16 sectors are utilized and verified on single PROM systems.

3. VERIFY FIXED DISK/UPPER HEAD - Same as above for upper surface.

4. VERIFY REMOVABLE DISK/UPPER AND LOWER HEADS - Same as above for fixed disk.

5. DISK READ/WRITE DIAGNOSTICS - Selecting this function will access the following menu:

Disk Read/Write Diagnostics

Please select next activity:

Sealed Disk R/W Diagnostics

Floppy Disk R/W Diagnostics

Select the disk desired and press EXECUTE.

(If Floppy Disk R/W Diagnostics is selected, the following MENU is displayed.)

Floppy Disk R/W Diagnostics

Please select next activity:

Floppy Drive #1 R/W Test

Floppy Drive #2 R/W Test

Select the floppy drive to be tested. Floppy Drive #1 is either the System Drive on Models 10, 10A and 20 or the Archive Drive on Models 25 and 30. Floppy Drive #2 is always the Archive on the Dual Floppy systems.

If Sealed/Hard Disk R/W Diagnostics was selected the following MENU would be displayed.

Sealed Disk R/W Diagnostics

Please select next activity:

Random Read/Write Test

Random Read only Test



Random Read/Write Test will alternately Write and Read one of two different patterns at random sectors. The first pattern is 5AA5's. This pattern is used to test the electronics for the drives. The second is a pattern of E38's. This is used to test the Read/Write heads and the surface of the disk. This test "WILL" destroy all data on the disk.

Random Read Only Test will only randomly read from the disk. This is useful in troubleshooting disks which have intermittent read errors (ERROR 3). This test will "NOT" destroy any data that may be on the disk.

#### DISK ALIGNMENT PROCEDURES

Selecting this function will access the following menu:

#### Disk Alignment Procedures

Please select next activity:

Sealed Disk Alignment

Floppy Disk Alignment

Position the arrow next to the selected disk and EXECUTE. If floppy disk alignment is selected the following MENU will be displayed:

#### Shugart Floppy Disk Alignment

Please select next activity:

Track 0 (Track zero adjust)

Track 1 (Track zero adjust/Index)

Track 2 (Track zero adjust)

Track 38 (Radial Head adjust)

Track 76 (PCB adjust/Index check)

This menu is used to align Shugart floppy drives. Select the desired track and EXECUTE. Repeat for other track selections. On

Systems 10, 10A and 20 the Archive drive #2 will be selected for the alignment. If the System drive is desired, reverse the floppy ribbon cables on the MASTER motherboard.

If the Sealed/Hard disk Alignment is selected the following Menu is displayed.

#### CDC HAWK/DIABLO 44 Alignment

Please select next activity:

- Alternate Seek 0/1
- Alternate Seek 0/2
- Alternate Seek 200/201
- Alternate Seek 293/405
- Alternate Seek 400/401
- Alternate Seek 400/402
- F.E.O.T. (Seek 410/408)
- Index to Burst (Seek 10)
- Radial Head (Seek 146)
- Azimuth (Seek 402)
- Locate Data Burst

The above functions are used to align the CDC "HAWK" and the DIABLO 44 disk drive. By pressing the COMMAND key during a function, the sealed disk will execute a Restore. Then by pressing EXECUTE the function will be resumed. The Locate Data Burst function is used to sequentially step the heads forward or backward to locate the data burst. When first accessed, it will default to track 10.

#### ERROR DETECTION AND DISPLAY

The disk verification and diagnostics use the same method to detect and display errors. Listed below are some typical errors that may occur.

#### ERRORS

There are disk errors at:

01:00 CRC    02:00 HDR    03:00 CRC (5)    04:00 HDR (9)  
05:00 CRC  
0A:05 CRC    0B:0F HDR    10:03 CRC            0F:0E HDR (4)

All error callouts are broken down into the following:

TT:SS ERR (r)  
TT= Track  
SS= Sector  
ERR= Error type (CRC or HDR)  
(r)= Retry count

When a bad sector is encountered, the system will retry 9 times to read it. If it succeeds in reading the sector within 9 retries, the error will be displayed with the total number of retries. The retry count is displayed in ( ) and considered as a SOFT error. If the read retries exceed 9, no retry count is displayed. This is considered a HARD error.

#### 5.4 SHUGART DISKETTE DRIVES (MODEL SA901)

Shugart Diskette drives (Model SA901) are an integral part of all the Wang Word Processing Systems. The maintenance specified in this manual for the diskette drives is outlined below. The site adjustments and checks are minimized for the reason that the SA901 is easily replaceable and portable. The drives can also be repaired or aligned at the respective area or regional office. The distribution of system, diagnostic and utility diskette copies from an area office would tend to be more compatible with the alignment procedures performed at the same activity.

##### 5.4.1 MAINTENANCE CHECK LIST FOR SHUGART (SA901)DISKETTE DRIVES

- 1) Check and/or replace worn R/W head load pad buttons to prevent excessive wear on the diskette.

#### OLD STYLE

- a) To remove the old style button(attached with a clip and washer), grasp the button with pliers and rock the button back and forth while pulling.
- b) To install old style button, place button in the head load arm and press rubber washer onto button stem. Press clip onto stem and insure button does not move. (See Figure 5-1)

#### NEW STYLE

- a) To remove the new style button, hold the load arm out away from the head, squeeze the locking tabs together with a pair of needle nose pliers and press forward.
- b) To install the new style button, press the button into the head load arm and it will snap into place. (See Figure 5-2.)

#### 5.4.2 HEAD CLEANING PROCEDURE

Inspect the head load pad and head for dirt and/or damage. The head should be cleaned if it has an oxide build-up that is visible to the naked eye. Cleaning methods and materials other than those listed can permanently damage the head and should be avoided.

- a) Lightly dampen a piece of clean lintless tissue with isopropyl alcohol (Use sparingly)
- b) Lift the load arm off the head, being careful not to touch the load button. (Refer to figures 5-1 and 5-2)
- c) Gently wipe the head with the moistened portion of the tissue.
- d) After the alcohol has evaporated, gently polish the head with a clean dry piece of lintless tissue.
- e) Lower the load arm onto the head. DO NOT let it snap back.

#### 5.4.3 CARTRIDGE GUIDE ADJUSTMENT

- a) Insert the adjustment tool (PART #726-9612) through the hole in the cartridge guide and screw completely into the casting (hand tight). (See figures 5-3 and 5-4.)



FIGURE 5-1 QLD STYLE HEAD LOAD PAD BUTTONS



READ/WRITE  
HEAD

PAD

LOCKING  
TABS

FIGURE 5-2 NEW STYLE HEAD LOAD PAD BUTTONS

LOOSEN SCREWS FOR ADJUSTMENT  
TIGHTEN AFTER ADJUSTMENT

ADJUSTMENT TOOL

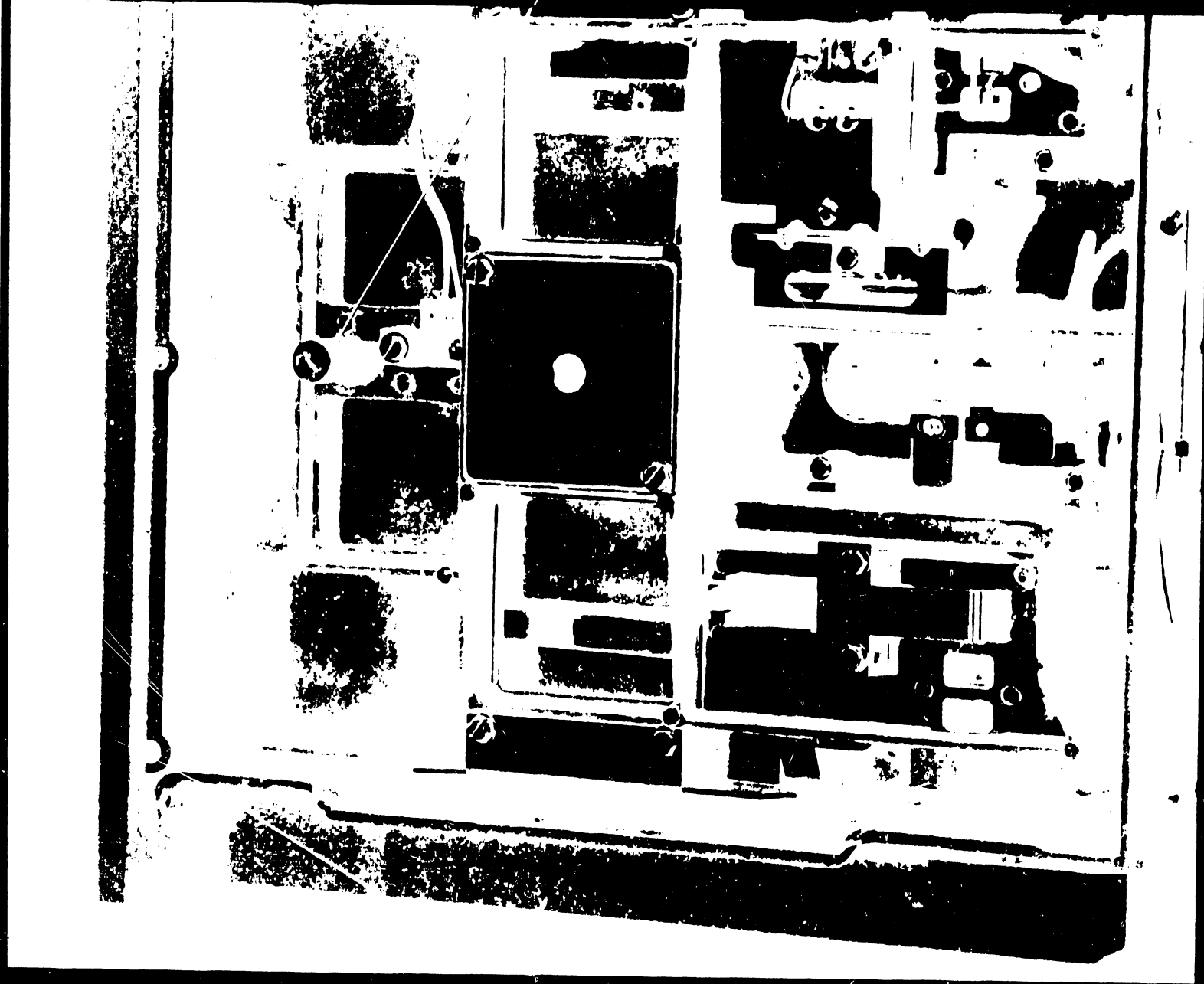


FIGURE 5-4 CARTRIDGE GUIDE ADJUSTMENT

- b) Loosen 2 screws holding the cartridge guide to the latch plate.
- c) Move the handle into the latched position and hold it lightly against the latch fingers.
- d) Tighten 2 screws, holding the cartridge guide to the latch plate.
- e) Depress push bar on front panel and check that door stays in the latched position. If the door latch was released, repeat adjustment.
- f) Insert diskette, close and open door, checking for proper operation.

NOTE:

After cartridge guide adjustment, insure the WRITE PROTECT detector assembly does not interfere with inserting the diskette. (This adjustment is not generally required). If it does, the ejector will not catch and the diskette will pop out each time that one attempts to close the door. (See S.B. #46.3 for adjustment of WRITE PROTECT detector.)

#### 5.4.4 HEAD LOAD BAIL (ACTUATOR) ADJUSTMENT

- a) Turn the stepping motor lead screw until head carriage is approximately at track 00.
- b) Place the bail adjustment tool (726-9613) on R/W head and place load button in the cup of the tool.
- c) Adjust the UP stop on the actuator so that the bail just touches the headload arm. (See Figure 5-5.)
- d) Remove the adjustment tool.
- e) Energize the head load coil by grounding TP11.
- f) Adjust the DOWN stop on the actuator so there is .020" + or - .010" clearance between head load bail and head load arm. (See Figure 5-6.)
- g) Turn the stepping motor lead screw until the head carriage is approximately at track 76. Insure .020" clearance is still maintained. If not, readjust down stop.



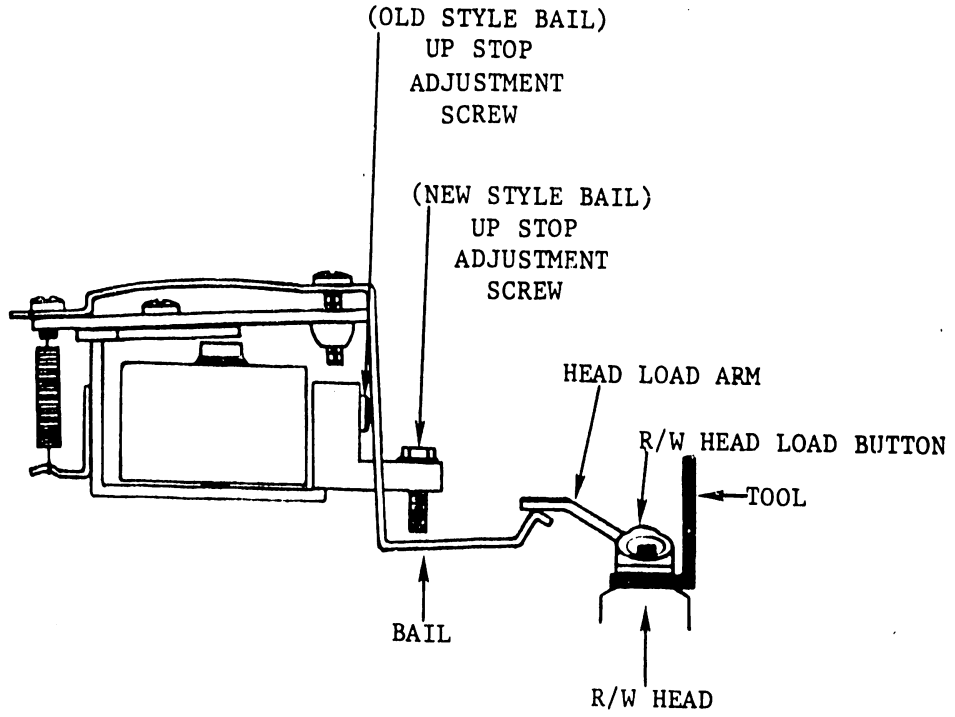


FIGURE 5-5  
HEAD LOAD ACTUATOR UP STOP ADJUSTMENT

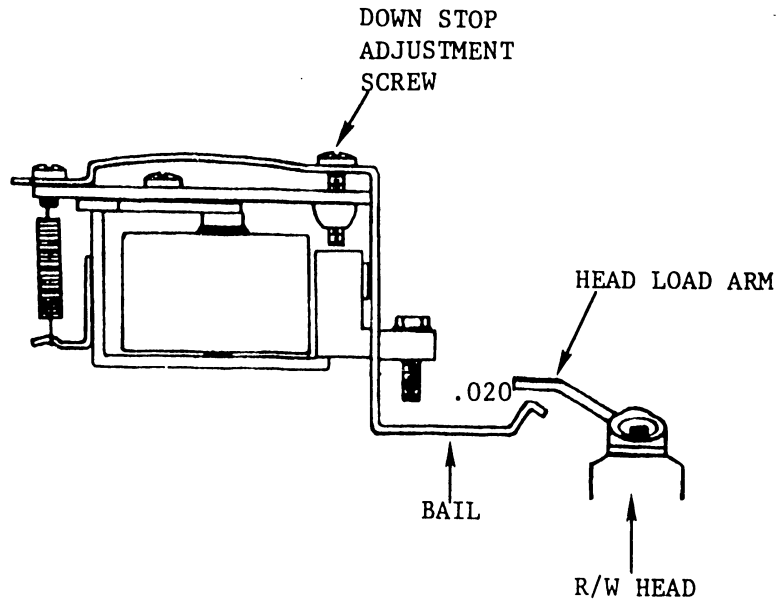


FIGURE 5-6  
HEAD LOAD ACTUATOR DOWN STOP ADJUSTMENT

#### NOTE

Alignment of the MODEL SA901 should not be attempted at a customer site. Replace defective disk drive with a known good drive. DO NOT LEAVE A SITE WITHOUT CERTIFYING THE COMPATIBILITY OF THE NEWLY INSTALLED DISKETTE DRIVE WITH THE CUSTOMER SYSTEM DISKETTE(S).

#### 5.4.5 OPERATING PRECAUTIONS

The following precautionary procedures are recommended to maintain a properly operating system. The theme in this manual is cleanliness and will be stressed as a means of keeping service personnel from making unnecessary trouble calls.

- a) Return the diskette to its storage envelope whenever it is removed from file.
- b) Keep diskettes clean. Insure cleanliness in handling, store in a clean place , dont expose diskettes to cigarette ashes and spilled coffee.
- c) Use felt tip pens for diskette notations to prevent distortions to the diskette.
- d) Do not expose diskette to heat and sunlight.
- e) Do not touch or attempt to clean the diskette surface. (Any abrasions can cause loss of stored data.)
- f) Keep diskettes away from magnetic fields or any ferromagnetic material that might be magnetized.
- g) Verify any and all replaced SHUGART disk drives that each is operational and compatible with customer system diskette or have the alignment checked to the Steve Norris Maintenance Utility Diskette as described in Section 5.3.

## 5.5 DIABLO SERIES 40 DISK DRIVE--MODEL 44

The Model 44 Disk Drive has a total storage capacity of 10 megabytes on one fixed disk and one removable disk platter. The MODEL 44 is used only with the 928 WP SYSTEMS and referred to as the HARD disk in the following discussions. The successor to this hard disk is the CDC HAWK which is also included in this section.

### 5.5.1 OPERATING INSTRUCTIONS

### 5.5.2 OPERATING PRECAUTIONS

#### Disk Drive Operation

1. Do not connect or disconnect power or I/O cables while the disk is powered up and running.
2. Do not at any time leave the bowl without a dust cover or a removable disk to prevent airborne dust contamination. (The Model 44 can operate without the REMOVABLE disk.)
3. The disk drive should be left in the RUN mode when possible so clean filtered air will be supplied to the interior of the machine.
4. Any sustained audible "tinging" or "scratching" sound may be caused by head-to-disk contact. If the noise persists, shut the machine down and investigate cause. (The head should never touch the disk). (See "HEAD CRASH".)
5. Do not force or attempt to override any interlock. Interlocks are safety devices , included to prevent injury, equipment damage, and loss of data. (See "DEFEAT OF INTERLOCKS".)
6. If the disk drive assembly must be moved for any reason, insure that it is completely shut down. A releveling of the assembly should be done to eliminate possible stresses and positioning errors.

#### -----WARNING-----

DO NOT ATTEMPT TO MOVE THE DISK DRIVE ASSEMBLY  
AT ANY TIME WHILE IT IS POWERED UP AND RUNNING.

### 5.5.3 OPERATING CONTROLS AND INDICATORS

CONTROL/INDICATOR	FUNCTION
1. LOAD/RUN switch	A two position rocker switch that provides a means for starting and stopping the disk drive. Cartridges may be removed and inserted when the switch is in the LOAD position and the LOAD light is on. With a cartridge inserted, switching to the RUN position starts the disk drive and brings the disk up to its normal operating speed in about 60 seconds. When the switch is moved to the LOAD position, the disk decelerates to a stop in about 15 seconds, after which the LOAD light turns on.
NOTE: Does not control power to the drive.	
2. LOAD	A white indicator light which shows that the removable disk can be loaded or unloaded. The light is on when in the LOAD position, the disk is not rotating, the brushes are retracted, the heads are retracted and power is on.
3. READY	A yellow indicator light which shows that the drive has completed its start-up sequence. The light indicates that the disk is rotating at the correct speed, heads are in position and the conditions are right for a SEEK/READ or WRITE operation. This light is extinguished when the LOAD/RUN switch is in the LOAD position.

4. CHECK An orange indicator light, that shows some abnormal condition, such as not being able to write. When the abnormal condition is corrected or no longer exists, the Model 44 can be reset by switching the LOAD/RUN switch to LOAD and then back to RUN.
5. POWER A red indicator light that is on when operating power is present.

#### 5.5.4 CARTRIDGE HANDLING AND STORAGE

1. Keep the magnetically recorded cartridges away from strong magnetic fields such as rotating machines, high current buss bars or cables, welding equipment, etc.
2. Keep the cartridge dust cover on when cartridge is removed from the machine.
3. Hard disk cartridges can be stored on edge or stacked flat. Limit flat stacking to five cartridges. Do not store cartridges in direct sunlight or in dusty or dirty areas.
4. Any disk cartridge that has been dropped should be inspected by the manufacturer or other qualified personnel prior to attempting to use it.
5. Refer to the manufacturer's instructions for maintenance and cleaning procedures.
6. DO NOT attempt to move the cartridge assembly while the machine is in operation (RUNNING).

#### 5.5.5 HEAD CRASH

If a "head crash" (head touches disk surface) occurs, it can usually be detected audibly. This will require both the disk and the head to be replaced and the cause of the crash to be corrected.

#### WARNING:

A head crash can be caused by contamination and careless handling of the disk drive and failing to observe operating precautions above.

### 5.5.6 DEFEAT OF INTERLOCKS

The disk drive equipment drawer is locked shut while power is off or while the spindle is rotating. Personnel will not attempt to force the equipment drawer open or defeat any interlock because of potential damage to the equipment. The drawer unlock solenoid cannot be energized unless all of the requirements are met as listed in the SERIES 40 DISK DRIVE MAINTENANCE MANUAL.

### 5.5.7 DIABLO DISK DRIVE (MODEL44)-(ELECTRONIC ASSEMBLIES)

The MODEL 44 DISK DRIVE contains two separate electronic assemblies called card cages. The assemblies consist of an I/O card cage and a Main card cage. The layout of each cage is shown below with identifiable Mfr. part numbers and corresponding Wang part numbers. The I/O card cage contains six slots for plug-in type PCBs. Only four of the slots are utilized for the Model 44. (See Figure 5-7 for location and identification of PCBs.) WANG and DIABLO part numbers are included. The removal and replacement of the following boards for the I/O Cage and Main cage will not require any adjustments or alignment procedures for proper operation of the Model 44 Disk Drive.

#### 5.5.7.1 I/O CARD CAGE

	<u>WANG P/N</u>	<u>DIABLO P/N</u>	<u>LOC</u>	<u>NAME</u>
RDR1	726-0468	11643-01	I/01	Receiver Driver #1
SC	726-0461	11459	I/03	Sector Counter
D/CS	726-0481	11637-01	I/05	Data/Clock Separator
RDR2	726-0470	11647-00	I/02	Receiver Driver #2

#### 5.5.7.2 MAIN CARD CAGE

The main card cage is mounted above the I/O cage and contains the following boards with listed WANG and DIABLO part numbers. See Figure 5-7 for board identification.

01	02	03	04	05	06	07	08	09
SD (11416) (11613)	OR (11414)	(SPARE)	TC (11537) (MOD 44 ONLY)	SL (11409) (11471)	SR (11411)	SO (11402) (11633)	AL2 (11407)	ALI (11404)

**MAIN CARD CAGE**  
(AS VIEWED FROM THE FRONT)

I/O-1	I/O-3	I/O-4	I/O-5	I/O-6	I/O-2
I/O-1 (11430) RDR1 (11643)	SC (11459)	VFI (11511)	VFS (11627)	D/CS (11429) VFC (11519)	VFO (11675 1500 RPM);(11517 2400 RPM)
					I/O-2 (11504) RDR2 (11647)

**I/O CARD CAGE**  
(AS VIEWED FROM THE FRONT)

FIGURE 5-7 PCB LOCATIONS

SD	726-0464	11613-01	M/01	Spindle Drive
OR	726-0497	11873-01	M/02	Oscillator
	(SPARE)		M/03	
TC	726-0482	11537	M/04	Temperature Compensator
SL	726-0492	11471-03	M/05	Sequence Logic
SR	726-0454	11411-01	M/06	Sensor
SO	726-0473	11633-20	M/07	Servo
AL2	726-0472	11407-20	M/08	Address Logic 2
AL1	726-0471	11404-20	M/09	Address Logic 1

The remaining PCBs contained in the Model 44 are:

R/W	726-0476	11486-20	R/W Amplifier
MB (Main Cage)		11635	Motherboard
MB (I/O)		11400-01	Motherboard
HS	726-0483	11890	Heatsink (This board supersedes 726-0465-(11631-01))
PD	726-0388	11499-00	Panel Distributor board
AW	726-0477	11435-20	Actuator Wiring diagram.

A description of functions performed by each board is detailed in the DIABLO Series 40 Disk Drive Maintenance Manual 81601--Section 5.

#### 5.5.8 POWER SUPPLY VOLTAGES FOR MODEL 44

Power supply voltages for the Model 40 series are furnished by a separate power supply. This power supply is a Model 429 power supply built by DIABLO specifically for the Series 40 disk drives. The combined static and dynamic output voltage variation does not exceed + or - 8% for the 24 volt outputs, and + or - 3% for the +5 volt output. The voltages must be checked/adjusted within the following tolerances:

- 24 volts + or - 1.92 volts (unregulated)
- + 24 volts + or - 1.92 volts (unregulated)
- + 5 volts + or - .15 volts (regulated and adjustable).



The power supply is mounted in a black metal multilouvered case installed under the disk drive when installed in 5590 furniture. Otherwise it will be mounted on a bench in the close proximity of the disk drive. (See figure 5-8.) The +5V adjustment control and fuses are located on the regulator board which is located at the rear of the power supply unit. Loosen the two screws holding the hinged end of the cover to the chassis and open. (See Figure 5-9.) The power supply has no power switch and will operate by connecting the power plug into one of the power outlets on the rear of the Master. If the MASTER is mounted in a 5590 table then outlets are available on the table.

#### 5.5.8.1 VOLTAGE ADJUSTMENT AND OUTPUT CONNECTIONS

To facilitate use and handling, the DC power cable assembly furnished with the MODEL 429 power supply has been made very thin and flexible. As a result, the voltage drop in the cable under nominal load is larger than it would be under normal conditions. 24 volt outputs are not affected. In the case of the +5 volt output, however, the drop is 0.3 volts. The power supply is factory adjusted so that the voltage present at the output connector is five volts if under nominal load. If the cable assembly is changed in any manner, the 5 volts may have to be adjusted. This is done by means of a 500 ohm potentiometer B62 on the regulator board. Make the adjustment under load conditions. The voltages can also be checked easily at the terminal posts on the R/W Amplifier PCB. Access to the R/W amplifier is performed by removing the cover to the Data Channel box shown in figure 5-10. This is accomplished by removing the hex nuts from the rear corners of the cover and two screws from the front corners.

#### 5.5.9 GENERAL TROUBLESHOOTING

The first step for trouble shooting the 928 Word Processing System 30 is to identify which of the two units has a malfunction.

1. Model 44 disk drive (Part of 5530 Master), or
2. 5530 Master CPU

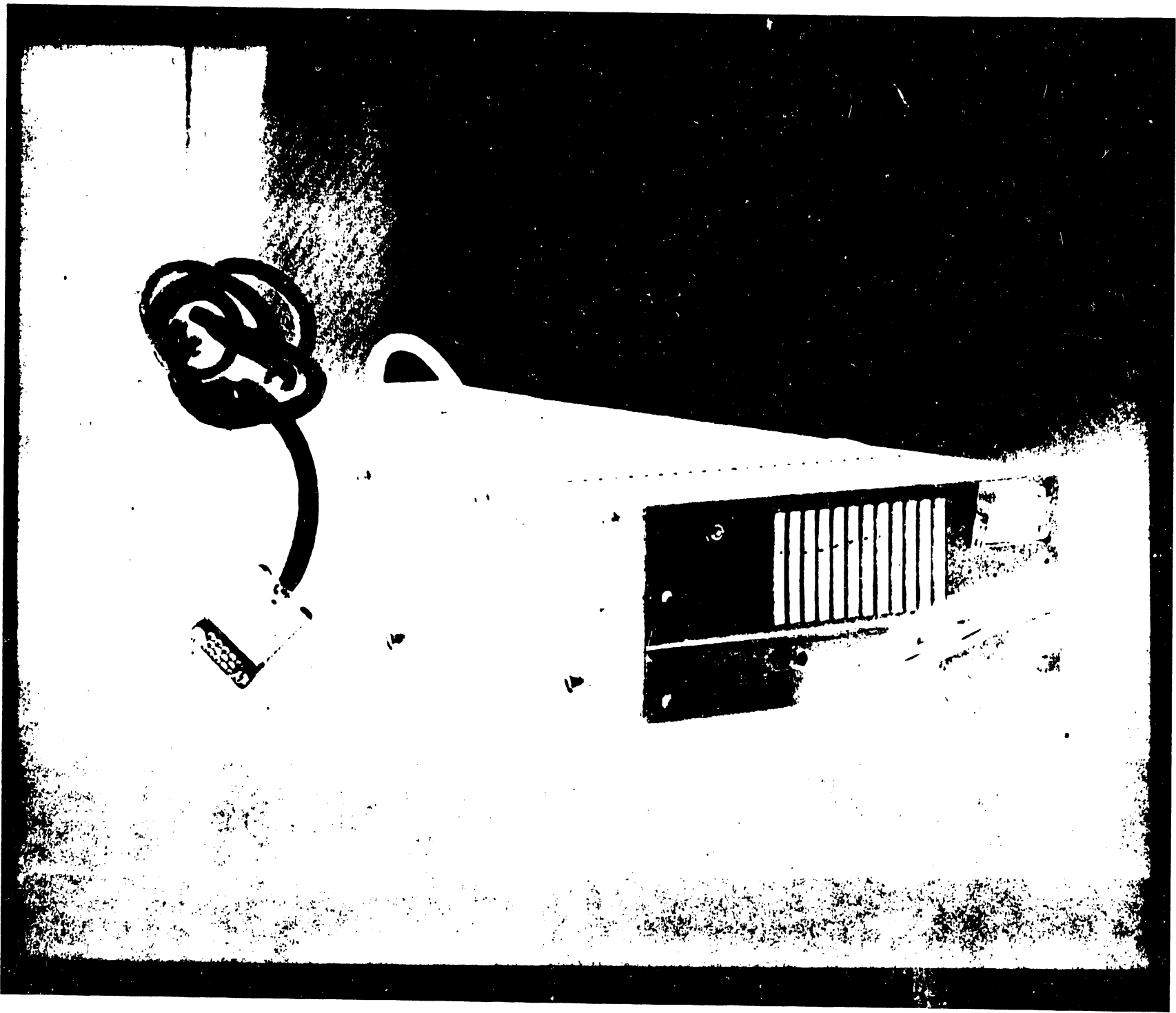


FIGURE 5-8 MODEL 429 POWER SUPPLY

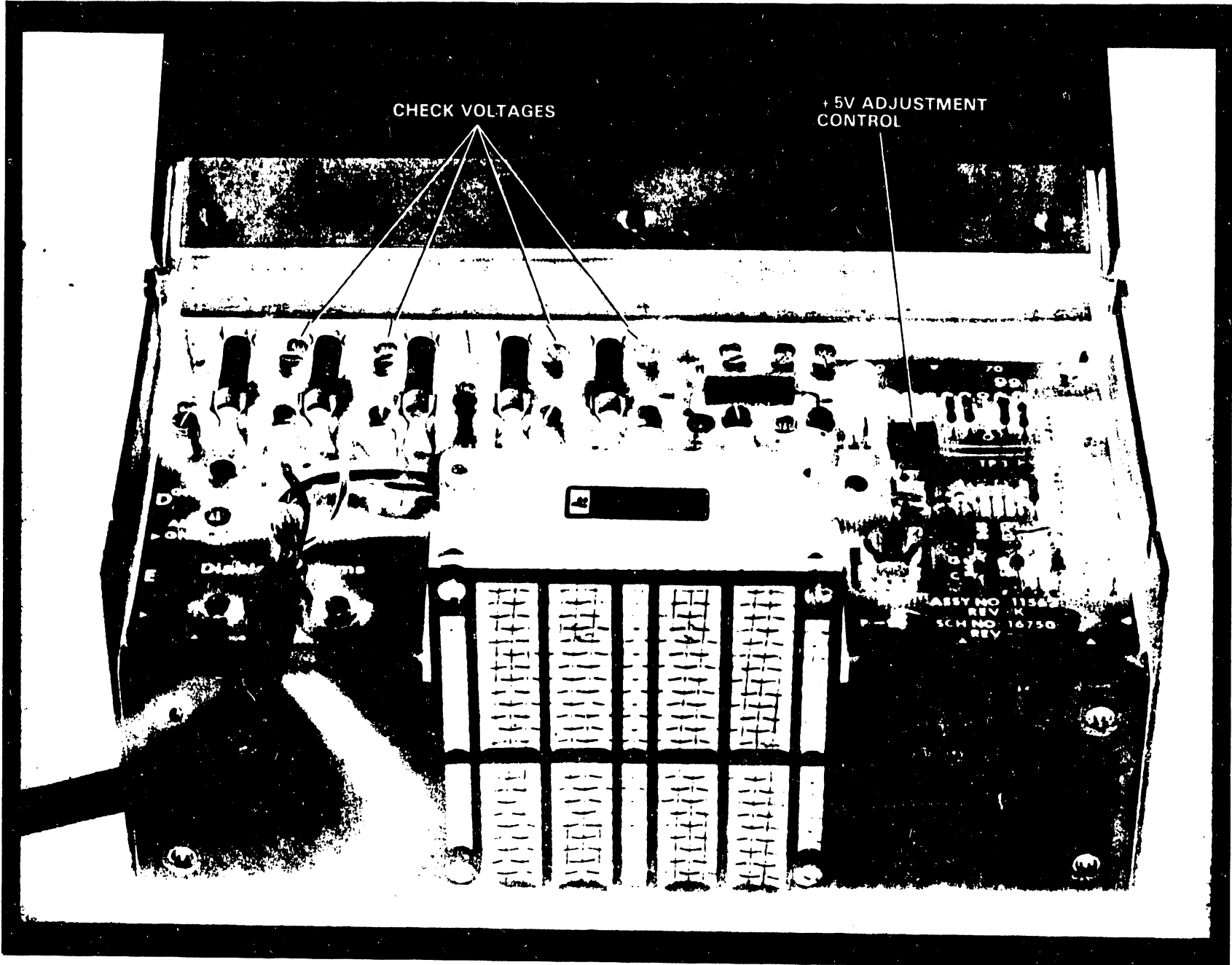


FIGURE 5-9 MODEL 429 POWER SUPPLY (REAR COVER OPEN)

The flow chart for troubleshooting the 5530 Master is directly associated with the system/operating 44 disk. (See paragraph 2.6 of Chapter 2.) If all operating indications are normal except for the IPL of the Master, then it becomes a problem to determine whether the Disk drive or Master CPU is at fault.

A diagnostic diskette is used to IPL the Master (SYSTEM 30) which bypasses the HARD disk to determine whether the Master or the Model 44 has a malfunction. The flow chart indicates the loading of the DIAGNOSTIC diskette which is the simplest method of checking the Master. Once the Master is certified, the checks for the disk can commence.

Check the cartridge seating. Verify that all cable connections (including the terminator) are properly made, and that correct signals are being presented to the interface. If the malfunction persists, put the drive into the LOAD position and turn the main power switch off after the LOAD light comes ON. Disconnect the I/O cable, and turn power on and verify DC power. A CHECK light "ON" in the LOAD mode indicates low voltage or trouble in the "write" circuitry. In the RUN mode if the spindle does not spin, the problem is with the disk drive. If the READY light comes "ON" it indicates that the cartridge is properly seated, the spindle speed is correct and heads are loaded.

#### 5.5.10 REMOVAL AND REPLACEMENT OF SUBASSEMBLIES

##### 5.5.10.1 Main Card Cage Printed Circuit Boards

To remove card-cage boards, remove screw (B) releasing cage from spring latch as shown in Figure 5-11. Lower the card cage to the maintenance position shown in Figure 5-12. Location of the circuit boards is shown in Figure 5-7. Each PCB is clearly marked in the upper front corner of the board. Figure 5-13 shows the method of removal.

##### 5.5.10.2 I/O Printed Circuit Boards

After removal of the slotted plate at the bottom rear of the I/O box, the pluggable I/O boards are removed by sliding each board out of

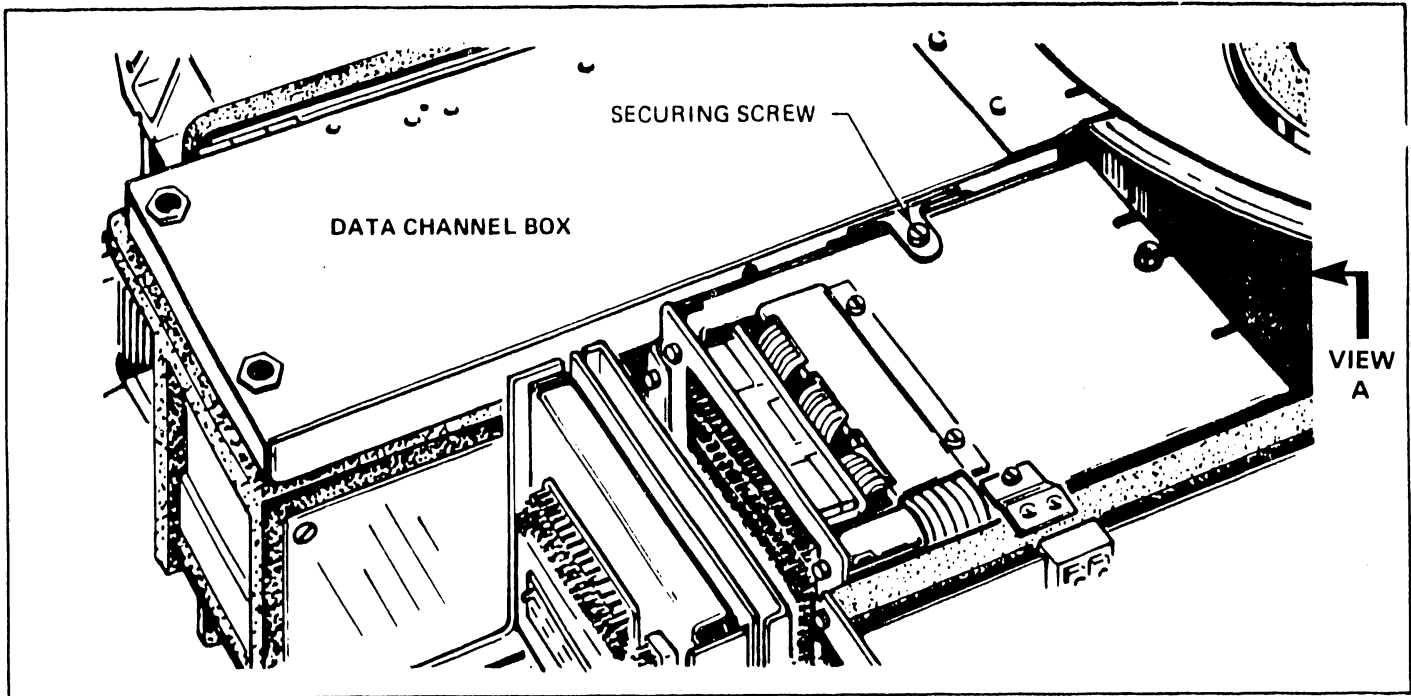


FIGURE 5-10 DATA CHANNEL BOX HOUSES R/W AMPLIFIER BOARDS

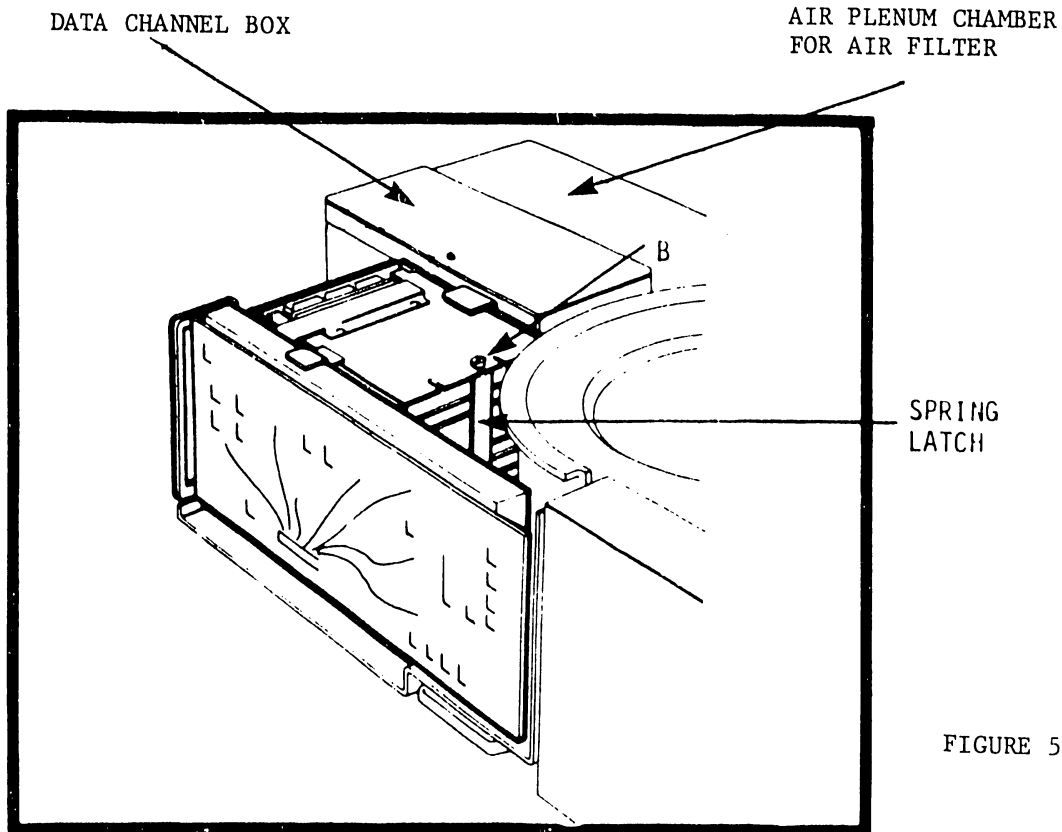


FIGURE 5-11

FIGURE 5-11 VIEW A

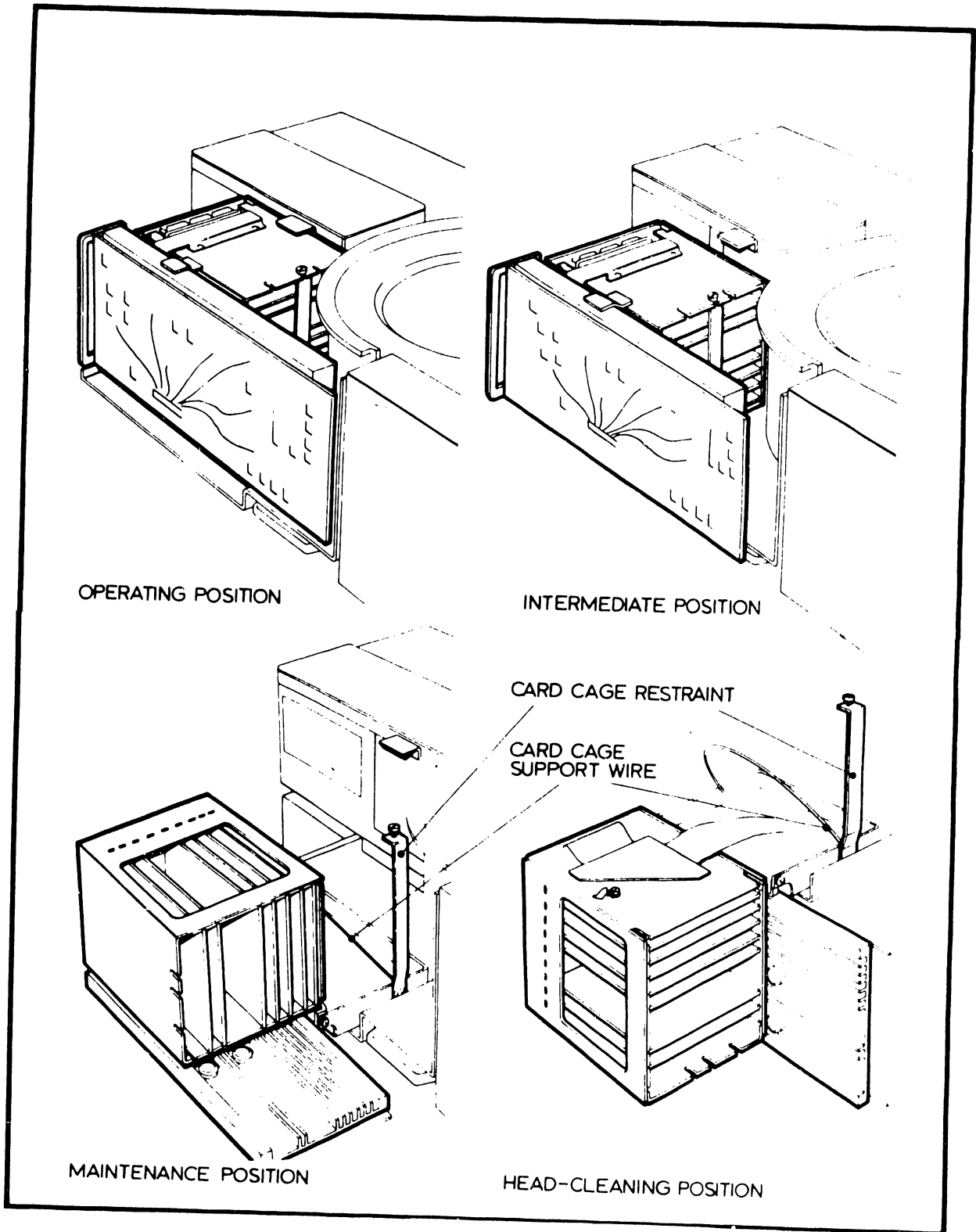


FIGURE 5-12 MAIN CARD CAGE POSITIONS

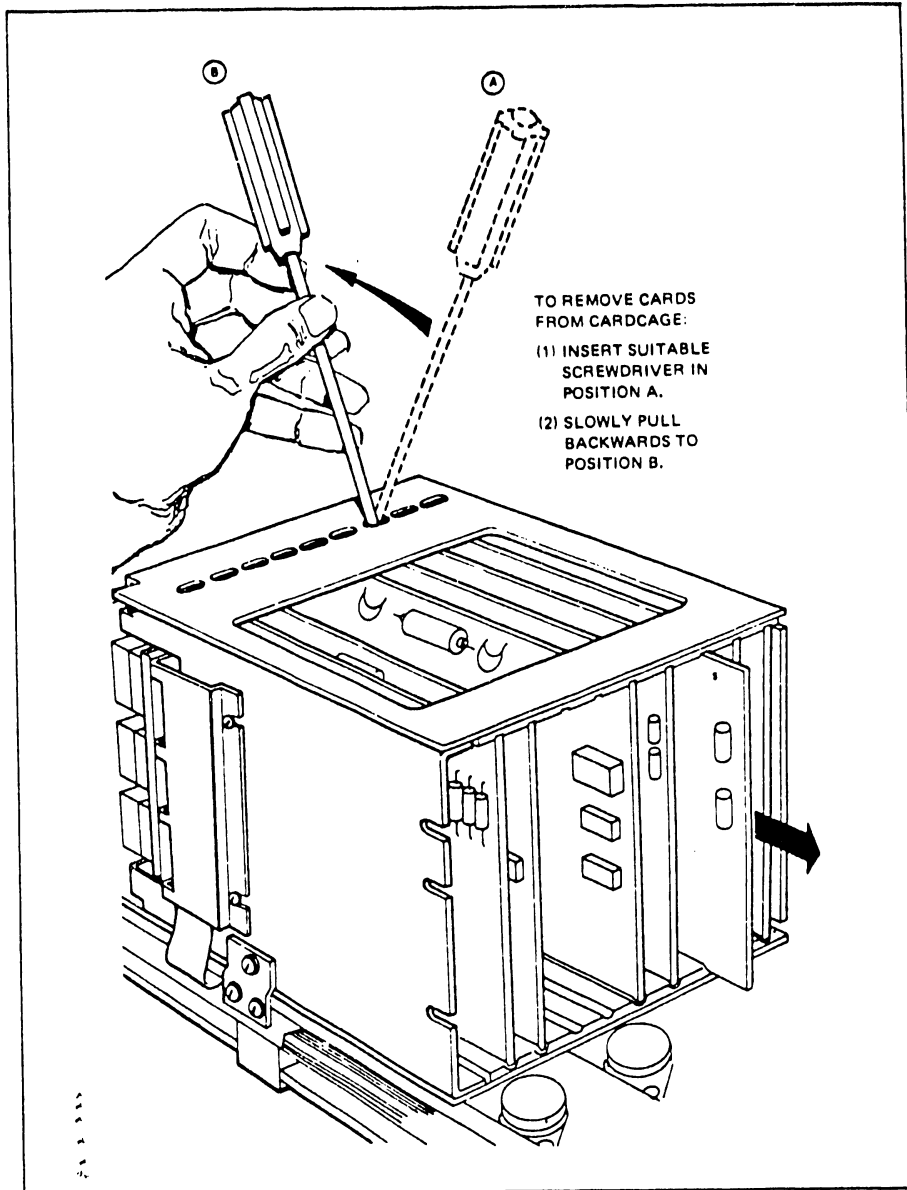


FIGURE 5-13 REMOVAL OF PLUGGABLE PCBs

its slot. (See Figure 5-14. For PCB identification in the I/O cage refer to Figure 5-7.)

#### 5.5.11 CLEANING OF R/W HEADS---(Power completely turned off)

In order to clean the R/W heads, the main card cage must be lowered to provide access to the lower heads. (Refer to figures 5-11 and 5-12.)

- 1) Loosen the securing screw at the left edge, middle, of the data channel box, as shown in Figure 5-11 (Point B). Lift the data channel box and move the card cage to the intermediate position.
- 2) Loosen the card cage restraint screw, move the restraint slightly forward until the restraint screw is clear of the slot.
- 3) Swing the main card cage down into the maintenance position, unhook the card cage support wire and lower the card cage into the head cleaning position.

Access to the lower heads is now possible by manually moving the head carriage all the way out of the bowl.

- a) Clean both lower heads by rubbing lightly with a pad soaked with 91% isopropyl alcohol (Texpad or equivalent). The pad should be wrapped around a tongue depressor so that light to moderate pressure can be exerted.
- b) Use a lint free wiper to remove alcohol residue.

Clean the upper heads in the same manner. Move the head carriage to the most convenient position possible. (Inside the bowl)

#### 5.5.12 CLEANING AND INSPECTION OF THE MAGNETIC RING

Use adhesive tape to remove any particles from the magnetic ring at the top of the spindle assembly. If there is any sign of corrosion on the magnetic clutch surface, remove the corrosion as follows:

- 1) Remove the lower disk cover by removing the four screws which hold it to the inside of the bowl.



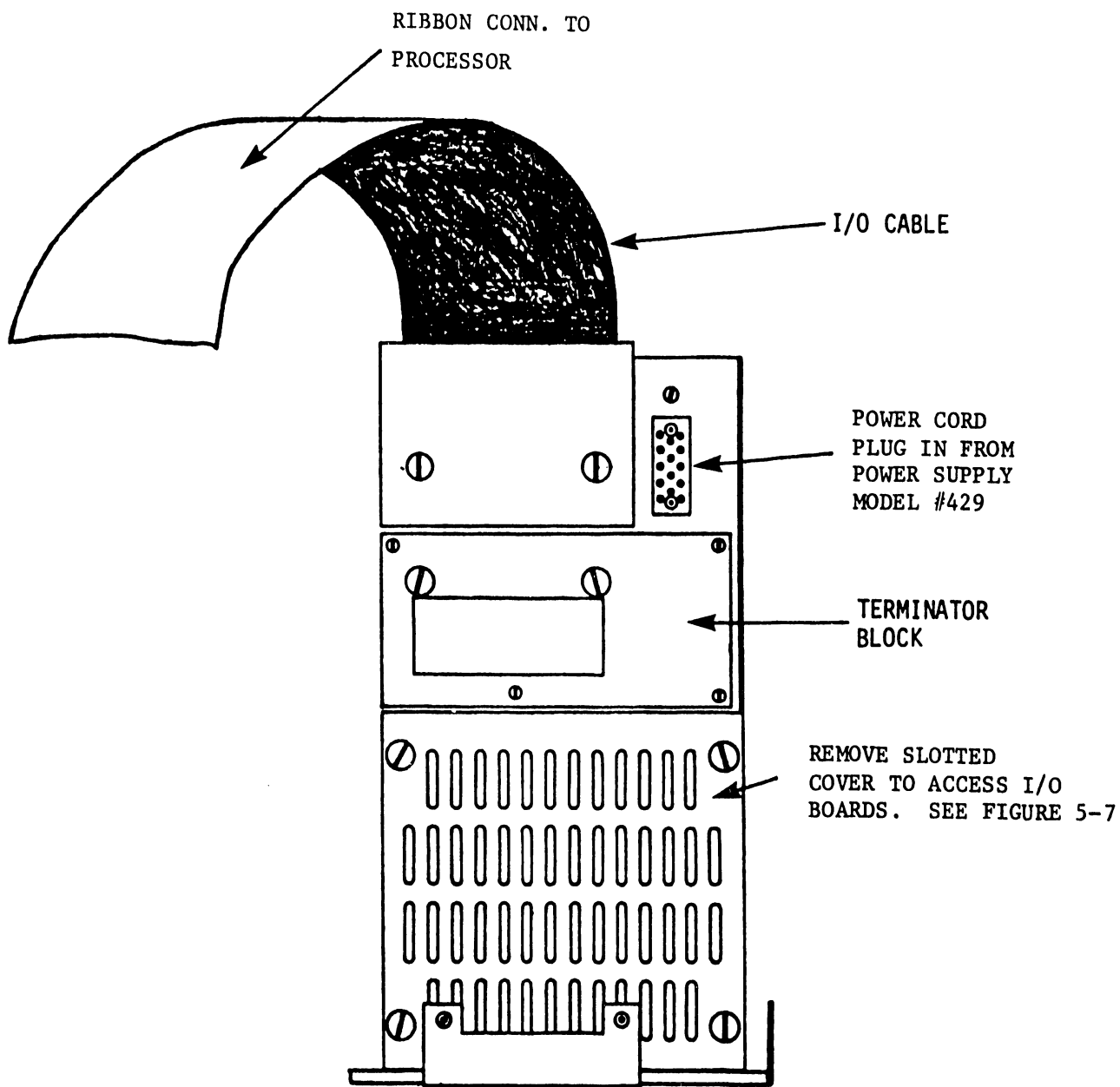


FIGURE 5-14 I/O CONNECTIONS

- 2) Using a very small quantity of metal cleaner (oxide remover) on the end of a Q-tip, rub the clutch surface until the corrosion is removed. DO NOT permit the fluid to run between the magnet and the clutch. (See Figure 5-15.)

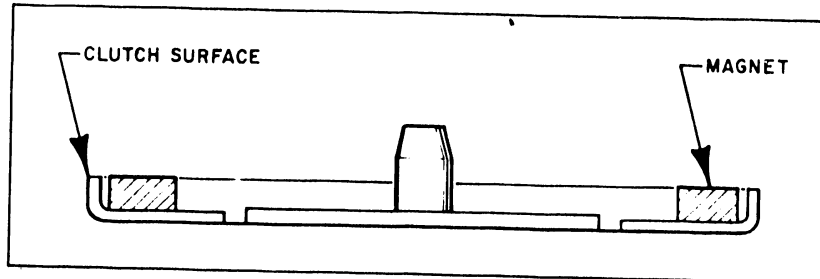


FIGURE 5-15 CLUTCH SURFACE AND MAGNET

#### 5.5.13 REPLACING THE AIR FILTER

To replace the air filter, PART #725-0560, first remove the plenum chamber cover. The top cover for the drive is not normally installed when rack mounted. The air filter plenum is on the right rear of the chassis when viewed from the front. (See Figure 5-11.) Remove the two screws that secure the plenum cover and remove it carefully to prevent damage to the gasket around the sealing edges. The air filter and pad can now be lifted straight up. Install the new filter and pad, observing the air-flow direction printed on the filter label (arrow up) and replace the plenum chamber cover. Insure the gasket integrity all around the cover. A DIRTY FILTER CAN CAUSE A HEAD CRASH.

#### LEVEL 1 ADJUSTMENTS

None

## 5.6 CDC CARTRIDGE DISK DRIVE --CDC (HAWK)MODEL 9427H

The Model 9427H disk drive is a voice coil actuated cartridge disk drive that directs the R/W heads to a desired location on a spinning disk surface. Data is written or retrieved by selection of the appropriate head and activating the R/W circuitry.

In addition to a removable cartridge, the standard 9427H disk drive also employs a fixed disk providing for storage capacities up to 10 megabytes with formatted disks while providing a total of four recording surfaces.

### 5.6.1 OPERATING INSTRUCTIONS

#### 5.6.1.1 OPERATING PRECAUTIONS--

- 1) Keep the access door closed to prevent unnecessary entry of atmospheric dust.
- 2) If a pinging or scratching sound (caused by head-to-disk contact) is heard and persists, stop the unit by using the Stop and Power Down procedure.
  - a) An analysis should be made to determine what safeguards can be taken to salvage valuable data if a HEAD-TO-DISK contact occurs
  - b) Such steps may include leaving the unit powered down, replacing the data cartridge with a scratch cartridge and/or immediate transfer of the data that is on the fixed disk.
  - c) A Head Crash is almost always a disaster which destroys the data and results in little or no recovery.

#### ATTENTION:

ARCHIVE YOUR DOCUMENTS AT THE END OF EACH DAY TO  
PREVENT ANY SUCH ACCIDENT FROM HAPPENING TO YOU

#### 5.6.1.2 CARTRIDGE HANDLING AND STORAGE

- 1) The cartridge dust cover should be on the cartridge while it is out of the disk receiver.

- 2) Cartridges can be stored flat or on edge. Several cartridges can be stacked on one another, however over-loading should be avoided.

#### 5.6.1.3 CDC HAWK DISK CARTRIDGE INSTALLATION

The disk cartridge must be stored in the same environment as the disk drive for at least 60 minutes before loading for use. Check disk for cleanliness (Installation of a dirty disk can create a major problem.) See procedure for cleaning disks in Section 6.5.4 of the CDC HARDWARE MAINTENANCE MANUAL #77834675.

#### NOTE:

The power must be ON and START/STOP lamp must be off to release PACK LOCK on disk hold-down arms.

1. Turn AC Circuit Breaker #1(CB1) ON. The DC Circuit Breaker #2 (CB2) should always be ON unless maintenance is being performed. CB1 will trip out (DISENGAGE) if CB2 (DC) is not in the ON position. The START/STOP switch must be off to release Pack Locks on hold-down arms. (See Figure 5-16.)
2. Raise cartridge access door on cabinet.
3. Pull back hold-down arms and remove dust cover from the cartridge bowl. Set cover aside. (See Figure 5-17.)
4. To separate dust cover from the disk cartridge, hold cover release button to left while lifting cartridge handle.
5. Disengage dust cover from disk cartridge. Set cover aside.

#### CAUTION:

Be careful while loading cartridge (Dont drop or slam disk onto the spindle).

Make sure that READ/WRITE heads are fully retracted and that disk cleaning brushes are completely out of the cartridge bowl area.

Clean dust and dirt from magnetic chuck ring and load the cartridge.

6. Place disk cartridge onto spindle hub (Head opening toward the rear of the disk drive).

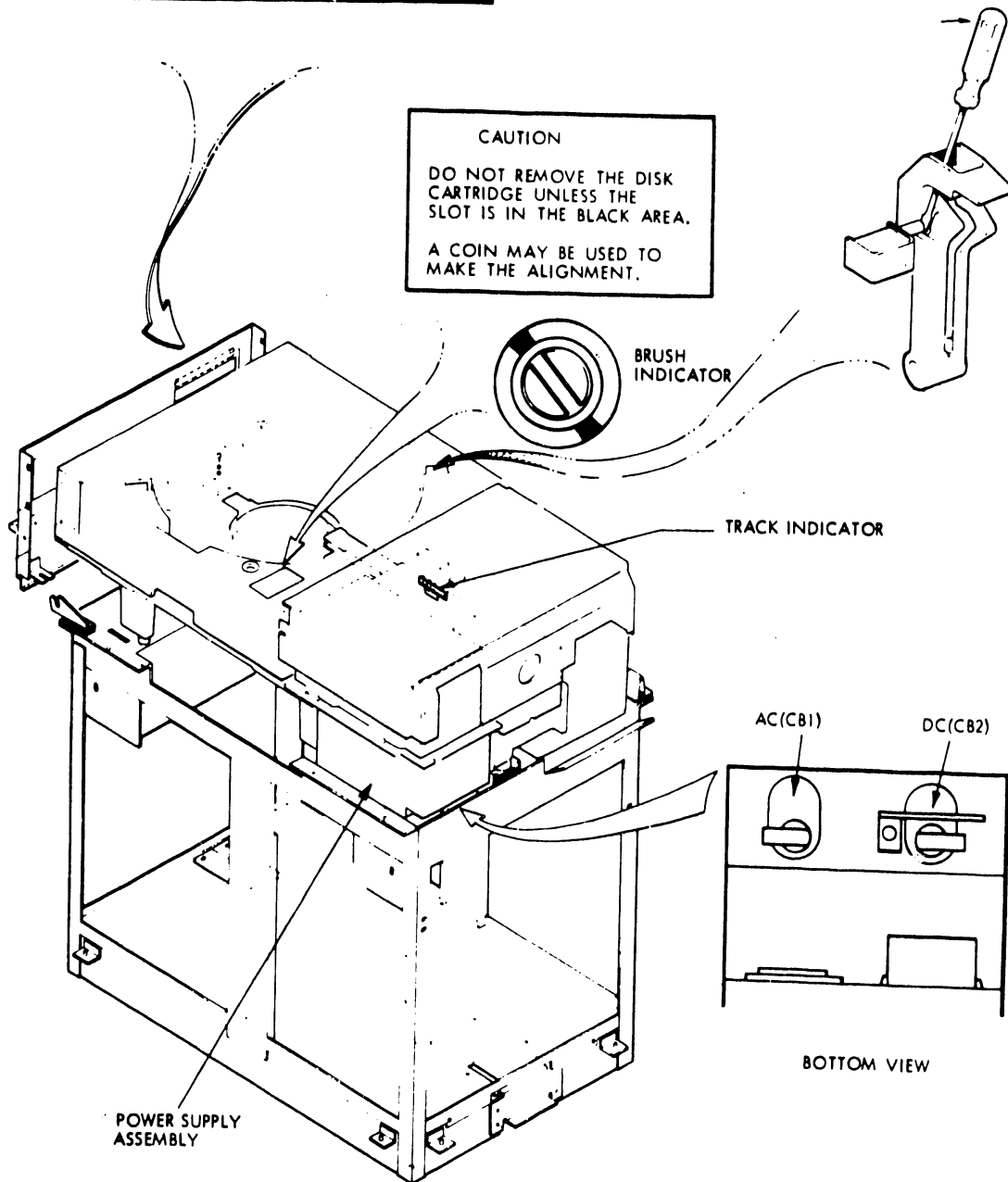
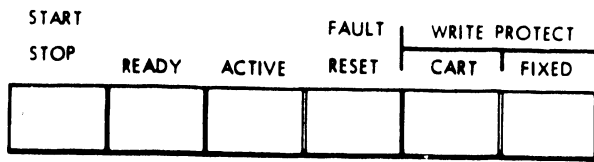
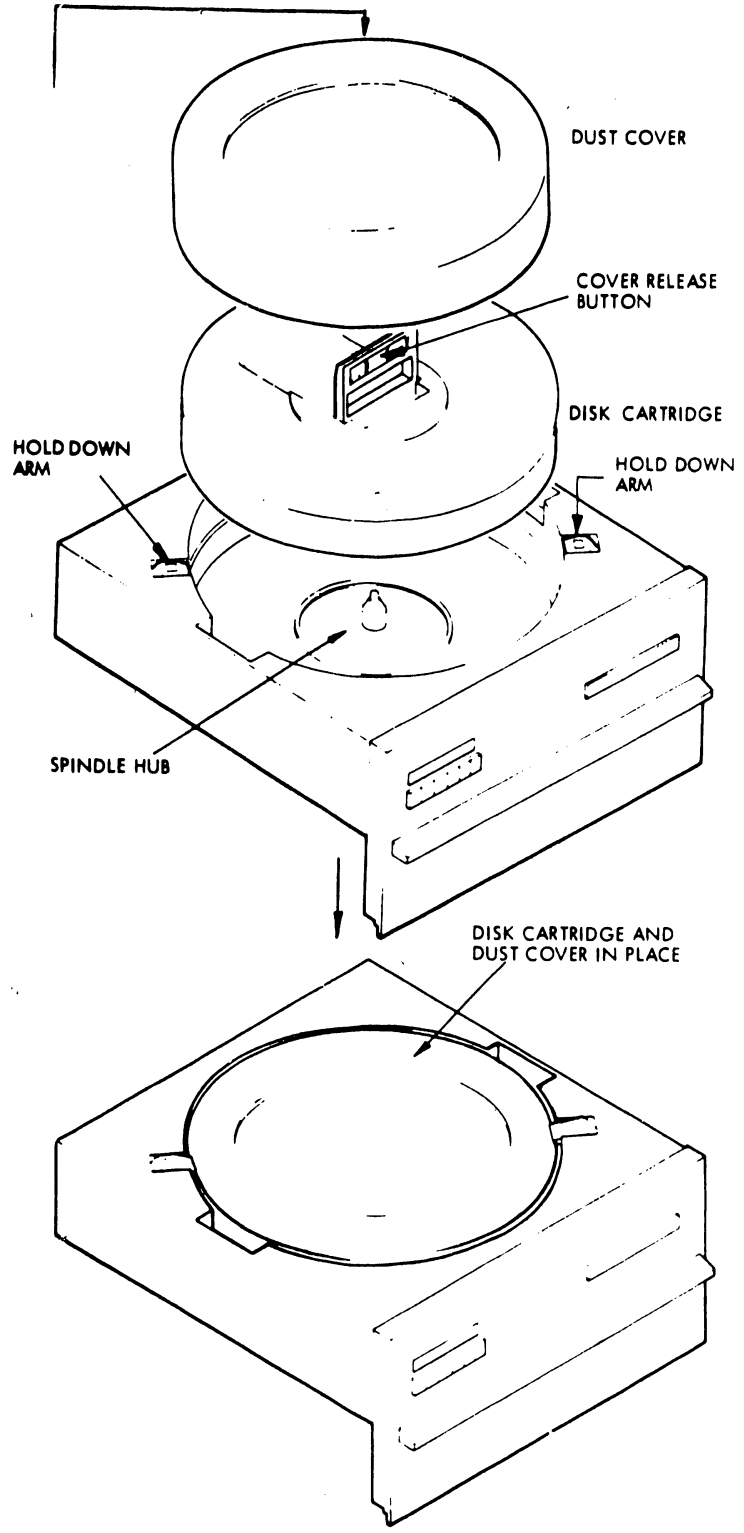
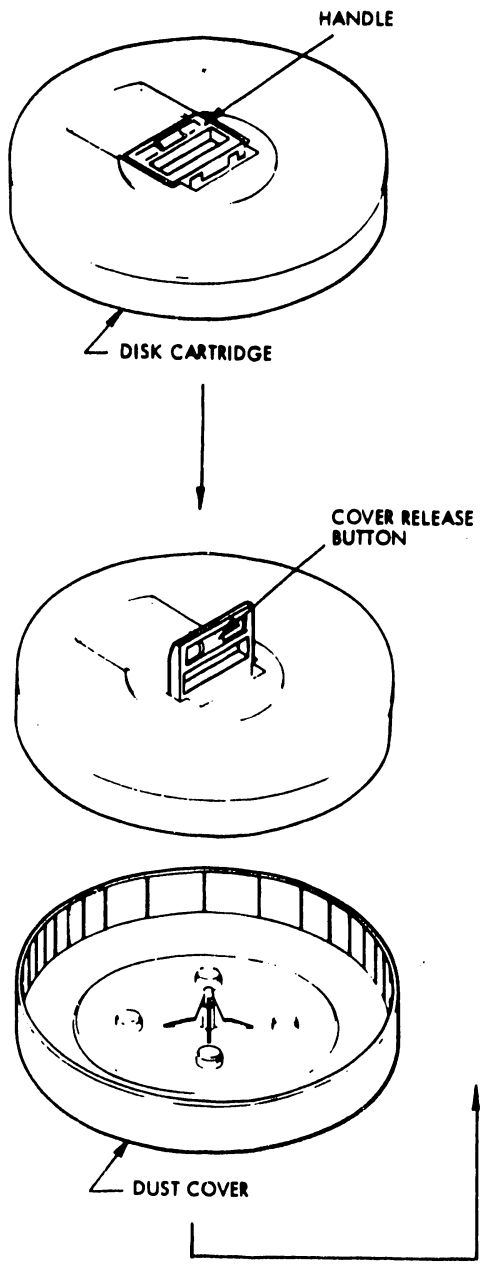


FIGURE 5-16 CONTROLS AND INDICATORS



AA124a

FIGURE 5-17 DISK CARTRIDGE INSTALLATION

7. Rotate cartridge slowly back and forth until cartridge detents.
8. Push handle down to seat cartridge.
9. Replace dust cover open end down over cartridge.
10. Position hold-down arms over the cartridge and dust cover.
11. Close cartridge access door.
12. Press START/STOP switch to apply power to spindle motor.

#### 5.6.1.4 CDC/DISK CARTRIDGE REMOVAL (UNDER NORMAL CONDITIONS)

Refer to Figure 5-16 for the following procedure.

1. Depress START/STOP switch to STOP.

**CAUTION:**

If START/STOP lamp is still illuminated after three minutes, check brush indicator for not being fully retracted. (See Figure 5-16.)

2. Raise cartridge access door after START/STOP indicator goes out.
3. Remove cartridge dust cover.
4. Pull back hold-down arms ( arms will not pull back until cartridge is stopped.)
5. Push and hold cover release button to left with thumb and lift cartridge handle.
6. Lift cartridge clear of spindle.
7. Place dust cover in position on cartridge and fold over top handle.

**NOTE:**

The handle may be swung out to carry the cartridge, but do not push the cover release button.

8. Close access door if another cartridge is not to be installed.

#### 5.6.1.5 POWER FAILURE OR EMERGENCY STOP REMOVAL

1. Wait approximately 3 minutes for cartridge to stop spinning.
2. Raise cartridge access cover.

#### CAUTION:

If START/STOP lamp is not extinguished after waiting 3 minutes and brushes are not fully retracted, open top cover, and manually retract heads and brushes.

3. Release pack locks by inserting a flat head screwdriver into hole on top of pack lock. Press solenoid plunger into solenoid and tilt pack lock. See Figure 5-16.
4. Remove cartridge dust cover.
5. Push and hold cover release button with thumb and lift cartridge handle.
6. Lift cartridge clear of spindle.
7. Place dust cover in position in cartridge bowl and fold over top handle.

#### 5.6.2 CONTROLS AND INDICATORS

Figure 5-16 illustrates the locations of the controls and indicators on the disk drive. The operating front panel switches and indicators are assembled on a PCB and mounted behind the control panel assembly. The panel contains separate write protect switches and indicators for both the fixed and removable disks. ACTIVE (seeking, reading or writing) and READY indicators are also mounted on the panel. A functional description of each control and indicator is included in Section 5.6.3.

##### 5.6.2.1 FAULT DETECTION

The fault indicator lamp on the control panel indicates a fault when illuminated. Fault conditions are divided into two classes: 1) Damaging and 2) Non-damaging.



### 5.6.2.2 DAMAGING FAULTS

Damaging faults are those that cause damage to the READ/WRITE heads and/or to the disk surfaces. These faults will occur as a result of subnormal spindle speed or supply voltage failure on the servo or inductosyn pre-amp boards in the main cage. The main concern is the Emergency Retract of the heads that cause damage to the recording surface and damage to the R/W heads and the resultant loss of important data.

### 5.6.2.3 NON-DAMAGING FAULTS

Non-damaging faults are not dangerous from the point of causing damage to the disk drive unit or the recording media. Non-damaging faults are the data exchanges that result in READ and/or WRITE errors. The non-damaging faults can be divided into three groups:

1. Read/Write head current faults.
2. Command faults.
3. Logic voltage failures.

### 5.6.3 TABLE OF CONTROLS AND INDICATORS

CONTROL OR INDICATOR	FUNCTION
POWER ASSEMBLY	
AC CIRCUIT BREAKER (CB1)	Provides AC power circuit protection, and main power switching.
DC CIRCUIT BREAKER (CB2)	Provides protection to the DC powered logic circuits.(This circuit breaker must be on at all times otherwise the AC circuit breaker CB1 will trip out.)

VOLTAGE ADJUST PLUG, P12

Provides a means of adjusting to a range of input voltages (100V to 250V) by using jumpers on the multitap inputs of the power transformer.

CONTROL PANEL

START/STOP indicator/switch

Start switch energizes spindle drive motor and initiates the first seek mode, provided the following conditions are met:

1. Circuit breakers CB1 and CB2 are ON.
2. Disk cartridge cover properly installed.
3. Cartridge hold-down switches are closed.
4. Depressing the alternate action START/STOP switch at any time after the start cycle is initiated will cause the machine to stop.
5. When the switch is depressed to stop machine, the indicator light remains illuminated until the disk rotation has stopped.
6. The interlock solenoids energize at this time to permit access to the cartridge.

NOTE:

The first seek mode is completely automatic and requires approximately 65 seconds to complete. The unit can be reset at any time after initiation of the start sequencing. In the event of a potentially damaging fault during this mode, the heads will automatically go into emergency retract and the machine will stop.

**READY indicator**

Illuminates when the unit is up to speed, the heads are loaded and the unit is ready for use. The READY lamp is extinguished during any fault, emergency retract, or stop operation.

**ACTIVE indicator**

Illuminates when the unit is actively engaged in any mode, i.e., direct (forward or reverse) seek, Return To Zero Seek (RTZS) or Read/Write/Erase (R/W/E).

**Fault indicator/switch**

Indicator illuminates when any fault exists with the exception of a line power failure. In the event of a momentary line power drop, the unit heads will go into an emergency retract and the disk drive will stop. However, the unit will restart automatically when the power returns to normal. In the event of a non-damaging fault, i.e. more than one head is selected, simultaneous read and write etc., the fault indicator will be illuminated and the unit will report the condition to the controller.

A RTZS command will reset the fault latch and extinguishes the fault indicator. The unit can be reset by the FAULT switch if a momentary non-damaging fault has occurred. Pressing the FAULT switch clears the fault logic and extinguishes the indicator. A persistent fault, however, will not permit a reset.

W/PROT CART indicator/switch      This alternate-action switch remains slightly depressed, and is lit when on. When ON, writing and erasing of data on the cartridge disk is inhibited.

W/PROT FIXED indicator/switch      This alternate-action switch remains slightly depressed and is lit when ON. When on, writing and erasing of data on the fixed disk is inhibited.

#### CARTRIDGE RECEIVER

Brush Indicator      Indicates the position of the brush motor.

#### CAUTION:

Do not remove the disk cartridge unless the slot is in the black area. A coin may be used to make the alignment.

#### CARRIAGE ASSEMBLY

Track Indicator      Vernier scale located on the side of the carriage over read/write heads (See Figure 5-16). Readable only when electronics cover is removed. Movable zero mark identifies hundreds and tens digits of track number. The coincident movable vernier identifies the units digit of the track number.

#### 5.6.4 HARDWARE CONFIGURATOR-(DEVICE SPECIFICATIONS AND SWITCH SELECTIONS)

Selected modes of operation are made possible by option selection switches mounted on various circuit boards used with the CDC HAWK Disk Drive unit. These switches are factory set to customer requirements. When replacing defective boards the switch settings must be set to the

options required for system compatibility. The boards affected are as listed in section 6 of WANG/CDC HAWK DISK DRIVE Preliminary Field Level maintenance manual 03-0072. In section 5.6.6 the switch settings on the Winchester I/O board will be used for alignment purposes. This will help familiarize the Customer Engineer on site, when confronted with replacing other boards that will have switch settings to be positioned.

#### 5.6.5 PCB COMPLEMENT

Main Cage -- Location of main cage is shown in Figure 5-18 with PCB locations.

TITLE	BOARD IDENT.NO.	WANG PART NO.
1) Control Board Assy	75297508	726-5614
2) Sector Board Assy	75881111	726-5694
3) Servo Board Assy	77831400	726-5617
4) Data Recovery BD ASM	75886537	726-5613
5) Read/Write/Erase(2400RPM)	75296311	726-5612

Access to the Main Cage for PCB replacement requires the removal of the electronic rear cover that is secured by three Phillips head screws. The Main Cage is mounted at the left rear corner when viewed from the front control panel. Remove the top perforated cover by releasing the metal strap that is held by a screw on the side of the cage.

The remaining PCBs are fixed and not easily removed. Maintenance will include board replacement in the main cage and also boards that are defective and not easily replaced .

The remaining complement of PCBs are as follows:

AGC Servo Preamp Board Asm.	77831200	726-5616
Power Supply Board No.1(Bottom)		(Piggyback Assy-
Power Supply Board No.2(Top)		726-5618)
Switch Board Assembly (Front Panel)	75299103	726-5619

## 5.6.6 COMPATIBILITY ALIGNMENT OF THE CDC HAWK DISK DRIVE

Compatibility alignment with the 928 WP Systems will be required when the actuator assembly or the Servo Amp/Servo PCBs are replaced. This section contains procedures necessary to complete the alignment using the 928 system as a substitute for the disk exerciser.

The following items are necessary to complete the adjustments:

Tri-bit Alignment Pack  
465 Oscilloscope (or equivalent)  
An oscilloscope probe (X1)  
928 Maintenance Utility Disk (See section 5.3)  
Hawk Head Alignment Tool  
Hawk PCB Extender

NOTE: The adjustments listed below will be performed in the order shown

AVERAGE SEEK	5.6.6.1
SERVO BALANCE	5.6.6.2
FORWARD END OF TRAVEL (FEOT)	5.6.6.3
READ/WRITE/ERASE HEAD ALIGNMENT	5.6.6.4
INDEX--TO--DATA BURST	5.6.6.5

SPECIAL NOTICE: Illustrations used for CDC Disk alignment are located in Section 5.6.6.6 and referenced by figure number throughout the adjustments.

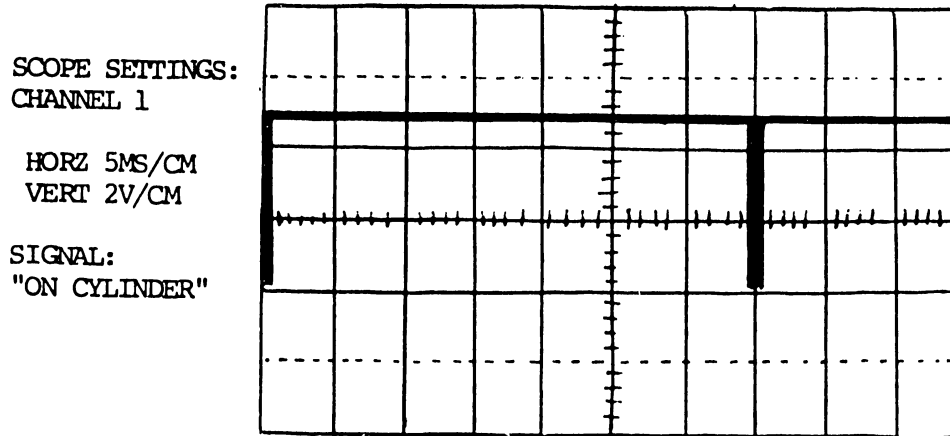
### 5.6.6.1 AVERAGE SEEK

NOTE: This adjustment must be performed if the SERVO PRE-AMP or SERVO PCB's have been changed/adjusted or the ACTUATOR has been replaced.

Perform the following steps.

1. Power down the disk drive, turn AC power OFF and remove the card cage covers. Refer to section 5.6.5
2. Bring the disk drive to the "LOAD" position by applying AC power.

3. Depress Start/Stop switch to start (In)
4. Perform temperature stabilization procedure.
5. Set channel 1 volts per division at 2 volts, DC coupling.
6. Set time base at 5 milliseconds per division.
7. Set scope trigger to internal channel 1, negative slope.
8. Connect channel 1 to P1 pin B9 of Winchester I/O board (On Cylinder). P1 is where I/O card plugs into motherboard. Pin B9 is ninth pin from from left on outside row. See Figure (Winchester I/O Board Test Point Locations) in Section 5.6.6.6
9. Using the 928 disk Maintenance Utility, select the alternate seek cylinders 293 and 405. Refer to section 5.3 for details.
10. Adjust trigger level and observe waveform on channel 1.
11. Adjust vertical/horizontal position controls to obtain waveform depicted below.



"ON CYLINDER SIGNAL WHILE ALTERNATELY SEEKING CYLINDERS 293 & 405"

12. Adjust potentiometer R73 shown in section 5.6.6.6 (Fig.#1-SERVO PREAMP BOARD) to produce 35 +or-1 milliseconds between the ON CYLINDER pulses as shown above.
13. This establishes the proper speed of the actuator during all seek commands.

#### 5.6.6.2 SERVO BALANCE

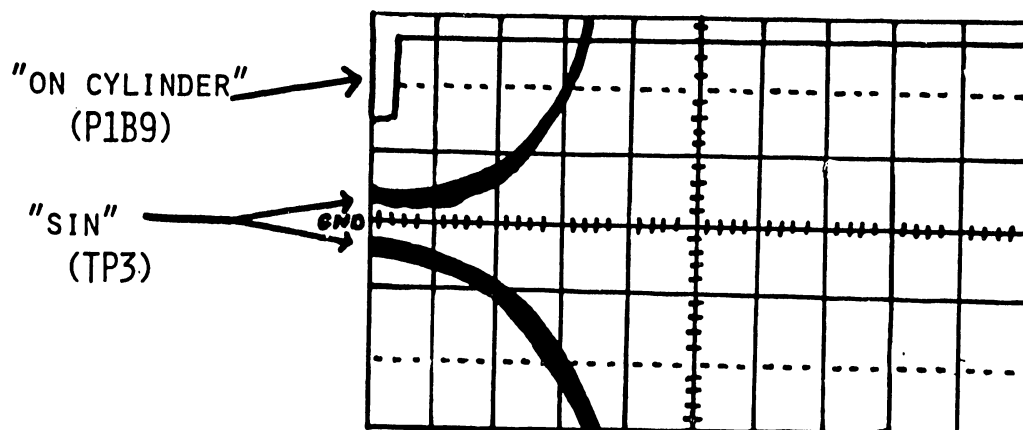
NOTE: This adjustment must be performed if the SERVO PRE-AMP/SERVO PCB's are changed/adjusted or the ACTUATOR is replaced.

**\*\*CAUTION\*\*** If the servo balance adjustment is altered, the following adjustments must be checked:

READ/WRITE/ERASE HEAD  
INDEX-TO-BURST ALIGNMENT  
F.E.O.T ADJUSTMENT

Perform the following steps:

1. Power down if necessary, turn AC power OFF and remove electronics/card cage covers.
2. Bring the disk drive to the "LOAD" position by applying AC power.
3. Depress Start/Stop switch to START (in)
4. Perform temperature stabilization procedure
5. Set time base at .2 milliseconds per division.
6. Set channel 1 volts per division at 5 volts, DC coupling
7. Set channel 2 volts per division at .1 volts, DC coupling.
8. Set for CHOPPED sweep, (alternate if using T932 scope).
9. Set trigger to internal channel 1, negative slope.
10. Connect channel 1 to P1 pin B9 of Winchester I/O Board (On Cylinder). See Section 5.6.6.6 (Figure #2).
11. Connect channel 2 to TP3 of SERVO PRE-AMP board. See Section 5.6.6.6 (Figure #1).
12. Using the 928 disk alignment utility, select the alternate seek cylinders 0/2.
13. Adjust vertical/horizontal position, trigger level and trigger slope controls to obtain waveform similar to the figure shown below.
14. Establish ground reference for channel 2 on center line of scope.





15. Adjust potentiometer R74 on SERVO PRE-AMP board so that the channel 2 waveform cross over points are on the ground reference point as shown by the waveform.
16. Using the 928 disk alignment utility, select the alternate seek, cylinders 400/402.
17. If channel 2 waveform cross over points are not on the ground reference point, alternate adjustments at 0/2 and 400/402 will be necessary to bring both as close to the ground reference point as possible.

SPECIAL NOTE: If the servo balance adjustment was altered, proceed directly to the F.E.O.T. adjustment, STEP 1.

#### 5.6.6.3 FORWARD END OF TRAVEL (F.E.O.T)

NOTE: The following adjustments must be correct before proceeding:

SERVO BALANCE  
AVERAGE SEEK

Perform the following steps:

1. Power down if necessary, turn AC power OFF and remove electronics/card cage covers.
2. Loosen the two screws on the power supply cover and tilt cover back.

**\*\*CAUTION\*\*** In the following step, relay K1 is removed because its physical location hampers the adjustment process. K1 must not be removed with power ON. With K1 removed, and ALP2 reversed, an emergency retract is not possible. Consequently, the heads must be manually unloaded should loss of spindle motion occur.

3. Remove Relay K1 (large relay on forward end of power supply board #1. See figure 5-20.
4. Unplug ALP2 noting orientation according to label on casting. See figure 5-20.

5. Remove SERVO PCB, place board on extender and insert extender into SERVO connector slot in card cage.

**\*\*CAUTION\*\*** Insure that all switches on the extender are in the ON position.

6. Bring the disk drive to the "LOAD" position by applying AC power.
7. Remove disk platter.
8. Install tri-bit alignment cartridge.
9. Depress Start/Stop switch to start (in).
10. Immediately upon the completion of the brush cycle, connect ALP2, but reverse orientation according to label on casting.
11. Verify head load and ready light illumination. Install the following jumpers on the SERVO board. Section 5.6.6.6-Fig.#3.
  - a) TP 20 to +or- 0 volts.(card cage chassis).
  - b) TP 21 to +or- 0 volts (card cage chassis).

These jumpers prevent the occurrence of a SEEK ERROR when the F.E.O.T is contacted during this adjustment.

**\*\*CAUTION\*\*** These jumpers must be removed if it becomes necessary to retract the heads. The jumpers must not be installed unless the heads are loaded and the READY light is ON.

12. Perform temperature stabilization procedure.
13. Set time base at 2 milliseconds per division
14. Set channel 1 and channel 2 at 1 volt per division, DC coupling.
15. Set trigger to internal channel 1 normal, negative slope.
16. Set for alternate sweep.
17. Connect channel 1 of oscilloscope to TP19 of SERVO PCB. See Section 5.6.6.6-Fig.#3. (Test point is not labeled on the board).
18. Connect channel 2 of oscilloscope to TP 3 of SERVO PRE-AMP. See Section 5.6.6.6-Figure #1.
19. Using the 928 disk alignment utility, select an alternate seek, cylinders 408/410.

NOTE: If a square wave is not present on channel 1, the scope does not have a trigger and the pictured waveform will not be attainable. If this is the case, adjust the F.E.O.T assembly as in step 25 and 26 to obtain a square wave on channel 1. Then proceed with the adjustment step 20.

20. Uncalibrate channel 2 volts per division to bring the sine wave to a full 5 divisions. See (A) F.E.O.T WAVEFORM below.

21. Uncalibrate channel 1 volts per division, if necessary, to insure that it is a full 5 divisions.

22. Use vertical position controls (both channels) to place waveforms on top of each other. (See (A) F.E.O.T WAVEFORM.

23. Expand time base until a waveform similar to (B) F.E.O.T WAVEFORM is obtained.

24. Loosen the Allen head screws that secure the EOT assembly (Figure 5-20) and place a wide blade screwdriver in the slot.

25. Using the screwdriver, move the assembly forward and reverse until the F.E.O.T signal, channel 1, goes low in the center of the "SIN" signal, channel 2. (The limits are illustrated in Figure (B) F.E.O.T WAVEFORM.

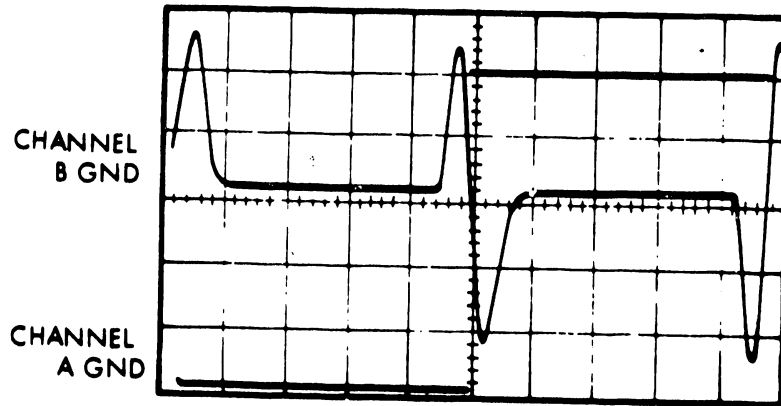
26. Tighten the E.O.T. assembly securing Allen screws and verify that the adjustment does not change.

27. When this adjustment is correct and the screws are tight, proceed directly to the Read/Write head alignment step #12.

**\*\*CAUTION\*\*** If F.E.O.T. adjustment was altered, the Head Alignment Pattern may not appear at cylinder 146. It may be off several tracks. Only when the heads are properly aligned with the pattern at cylinder 146, are both F.E.O.T. and head alignment correct.

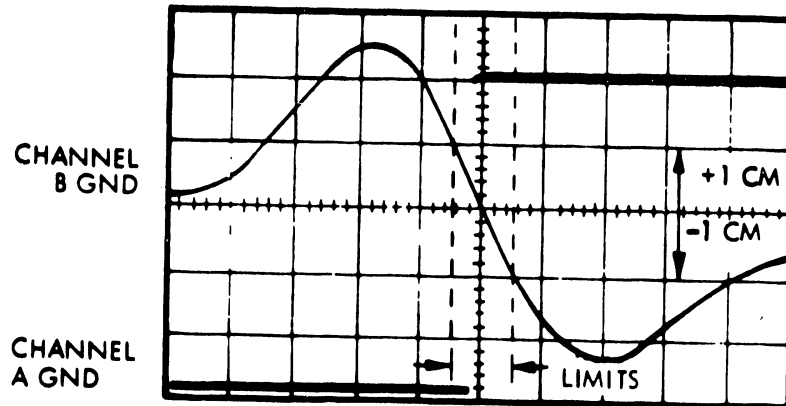
#### 5.6.6.4 READ/WRITE/ERASE HEAD ALIGNMENT

NOTE: This alignment must be checked if SERVO or SERVO PRE-AMP PCB's are exchanged.



SCOPE SETTINGS  
 HORIZ 5MS/CM  
 VERT "B" UNCAL  
 ADJUST FOR  
 5 CM HIGH  
 VERT "A" 1V/CM

(A) TYPICAL F.E.O.T. WAVEFORM



SCOPE SETTINGS:  
 HORIZ 5MS/CM  
 X10  
 VERT "B" UNCAL  
 VERT "A" 1V/CM

(B) TYPICAL F.E.O.T. WAVEFORM

The following adjustments must be correct before proceeding:

Servo Balance  
Average SEEK  
Forward End Of Travel (track zero)

Perform the following steps:

1. Power down if necessary, turn AC power OFF and remove electronics/card cage covers.
2. Loosen the two screws on the power supply cover and tilt cover back.

**\*\*CAUTION\*\*** In the following step, relay K1 is removed because it's physical location hampers the adjustment process. K1 must not be removed with power on. With K1 removed, and ALP2 reversed, an emergency retract is not possible. Consequently, the heads must be manually unloaded should loss of spindle motion occur.

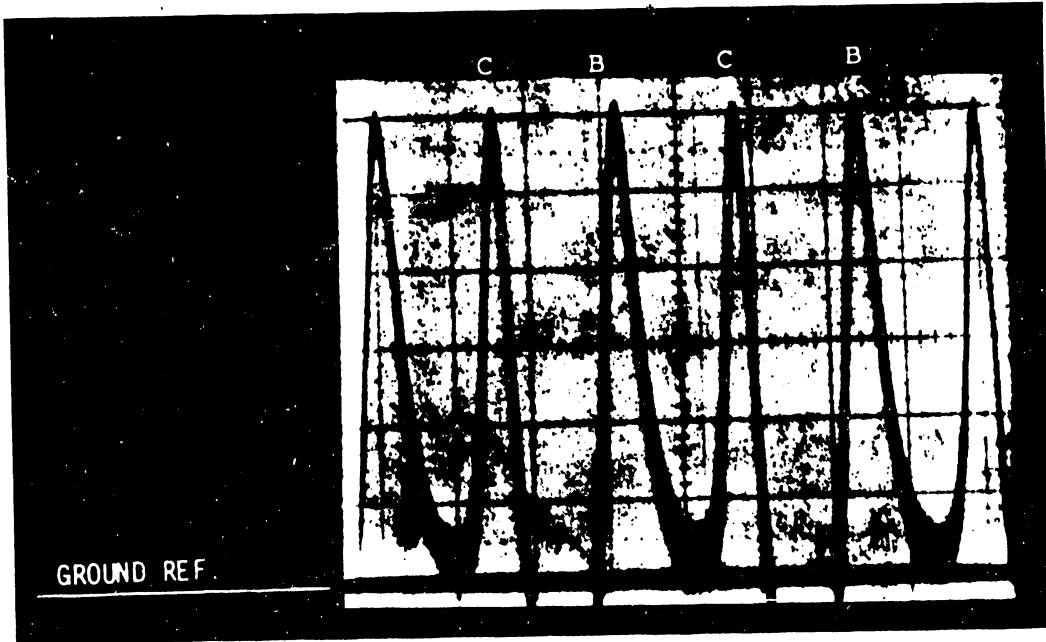
3. Remove Relay K1 (large relay on forward end of power supply board 1).
4. Unplug ALP2 noting orientation according to label on casting. (See Figure 5-20.)
5. Remove the R/W/E board and solder a wire to TP 2. Replace R/W/E board with wire draped so that it will not contact any metal substance. Assure that R/W heads are connected to board in proper order.
6. Bring the disk drive to the "LOAD" position by applying AC power.
7. Remove disk platter.
8. Install tri-bit alignment cartridge.
9. Depress Start/Stop switch to start (in).
10. Immediately upon completion of brush cycle reconnect ALP2 but reverse orientation as described on label. This bypasses the now removed K1 and allows the servo system to operate properly.

**\*\*CAUTION\*\*** If AC power were applied with ALP2 reversed, the servo system will not have settled and a head load and crash could result. Therefore, never reverse ALP2 until the brush cycle has been completed.

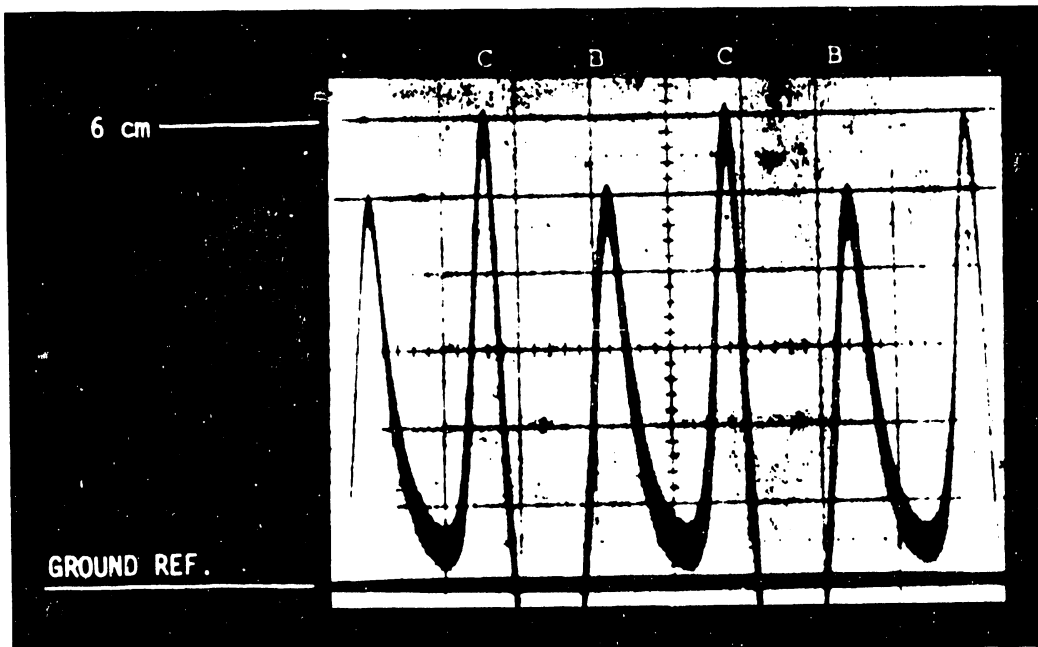
11. Perform temperature stabilization procedure.
12. On the Winchester I/O card, turn switch S3-3 ON and switch S3-2 OFF. (See Section 5.6.6.6-Figure #4.) This assures upper head selection.
13. Set scope time base to 2 usec per division.
14. Set volts per division channel 1 at 10 millivolts, AC coupling.
15. Trigger scope internally on channel 1 with a negative slope.
16. Place channel 1 (using a X1 probe only) on the wire from TP 2 of R/W/E board. If this wire has not been previously installed, it will be necessary to power down and do so at this time.

**\*\*CAUTION\*\*** Do not use a X1 probe at any point other than TP 2 of the R/W/E board.

17. Using the 928 disk alignment utility, command the unit to seek to cylinder 146, top head.
18. Actuator should position heads at cylinder 146. Check track indicator on actuator assembly.
19. Adjust trigger level and observe waveform on channel 1. Compare with HEAD ALIGNMENT Figures (A) and (B) below.
20. If the head is within one track of proper alignment, a waveform similar to HEAD ALIGNMENT (B) will be obtained. (Top peaks 1.9 usec apart).
21. If this is not the case, adjust the upper head as follows:
  - a) Loosen the proper head clamp. (See Section 5.6.6.6-Figure #5) for HEAD CLAMP locations).
  - b) Insert Hawk alignment tool with the pin in the proper head slot.
  - c) Using this tool, move head forward and reverse very slowly until a waveform similar to HEAD ALIGNMENT (B) is obtained (top peaks 1.9 usec apart). At this point you are within one track.



**FIGURE A HEAD ALIGNMENT WAVEFORM — (Head Aligned)**



**FIGURE B HEAD ALIGNMENT WAVEFORM — (Head Within One Track)**

**\*\*CAUTION\*\*** If the end of head adjustment travel is reached in either direction, the F.E.O.T. adjustment is incorrect. Alternate adjustments of both may be necessary to obtain the proper adjustment.

22. Set a ground reference line at the bottom of the scope.  
(See (A) HEAD ALIGNMENT WAVEFORM)
23. Adjust the volts per division, and the variable control, for a vertical deflection of six divisions (three divisions if using T932 scope) from the ground reference line to the highest peak.
24. If the difference between the two peaks is more than 1/2 of a division, adjust the head as described in step 20.
25. When the proper adjustment is obtained, tighten the head clamp while observing the waveform. Alternating adjustments may be necessary.
26. On the Winchester I/O card, select the lower cartridge disk R/W head by turning switch S3-3 OFF and S3-2 ON. (See Section 5.6.6.6-Figure #4).
27. Return to step 14 and align the lower head.

**SPECIAL NOTE:** When both heads are in proper alignment, proceed directly to INDEX-TO-DATA BURST alignment step #7.

#### 5.6.6.5 INDEX TO DATA BURST

The following adjustments must be correct before proceeding:

Servo Balance  
Average Seek  
Forward End Of Travel (track zero)  
Read/Write/Erase Head Alignment

Perform the following steps:

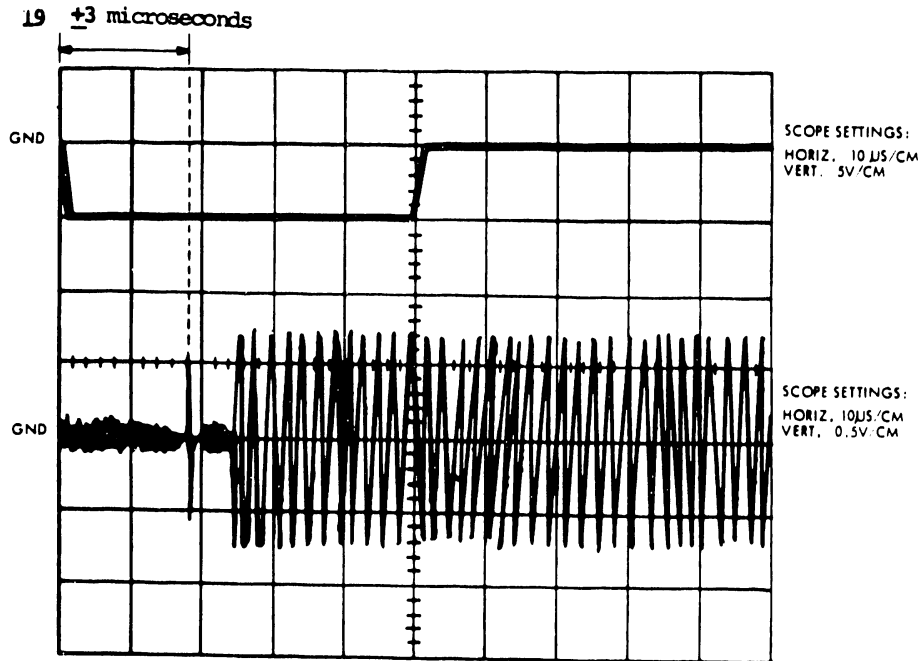
1. Power down if necessary, turn AC power OFF and remove electronics/card cage covers.
- 2 Bring the disk drive to the "LOAD" position by applying AC power.



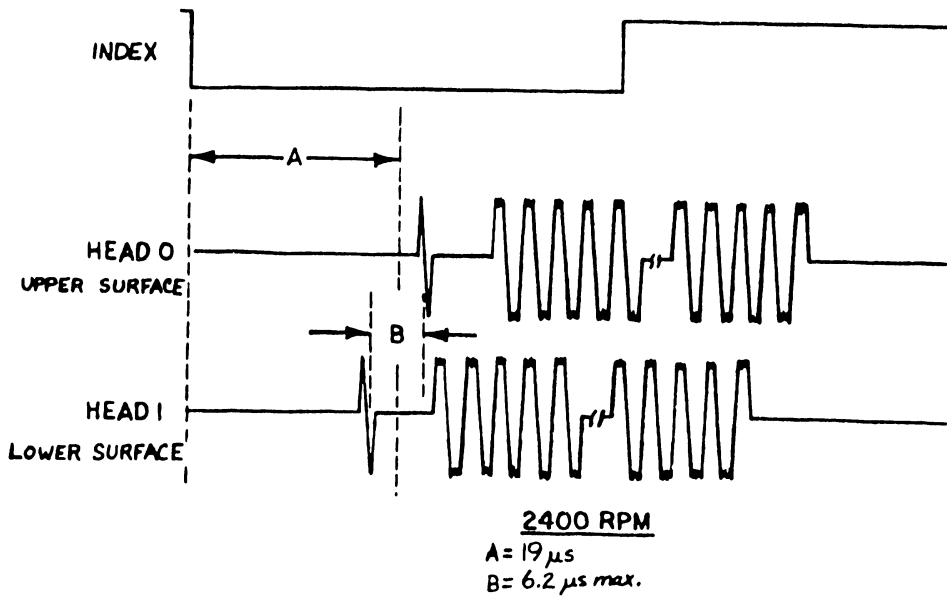
3. Remove disk platter.
4. Install tri-bit alignment cartridge.
5. Depress Start/Stop switch to start. (in)
6. Perform temperature stabilization procedure.
7. On the Winchester I/O card, turn switch S3-3 ON and switch S3-2 OFF. (See Section 5.6.6.6-Figure #4).
8. Using the 928 disk alignment utility, command unit t. seek to cylinder 10.
9. Actuator should position heads at cylinder 10. Check track indicator on actuator assembly.
10. Place oscilloscope channel 1 on pin P1-B10, sector. (See Section 5.6.6.6-Figure #6)-Winchester I/O Board TP locations).
11. Set time base to 10 usec per division.
12. Set volts per division channel 1 at 2 volts, DC coupling.
13. Set volts per division channel 2 at .5 volts, DC coupling.
14. Trigger scope internally on channel 1, negative slope.
15. Adjust trigger level and observe waveform on channel 1.
16. The INDEX waveform now on channel 1 should be a 40 usec pulse (+or- 3 usec).
17. Place oscilloscope channel 2 on TP 1 of Winchester I/O board TP locations. (See Section 5.6.6.6- Figure #6).

NOTE: The "Tri-bit" R/W head alignment pattern (cylinder 146) cannot be observed at TP 1 because of amplifier distortion. However, the INDEX-TO-BURST pattern is not distorted.

18. Set oscilloscope for alternate sweep.
19. By adjusting horizontal and vertical position controls, obtain the waveforms depicted by Figure below.
20. Verify INDEX-TO-BURST period is 19 usec +or- 3 usec.
21. If waveform is out of stated tolerance, adjust potentiometer on sector board to obtain proper adjustment.
22. Select the lower cartridge disk R/W head by turning switch S3-3 OFF and S3-2 ON. (Refer to Winchester I/O board switch settings in section 5.6.6.6- Figure #4.)
23. Check the INDEX-TO-BURST period.



24. Alternate adjustments, using both heads, may be necessary to bring both within the stated tolerance. (19 usec should split the difference between both heads). (See Figure below)



**\*\*CAUTION\*\*** Total pulse separation between the two heads shall not exceed 6.25 usec. If this tolerance is exceeded the heads must be reseatd in their mounts and realigned.

25. If alignment is correct, perform the following:

- a) Remove jumpers from SERVO board if F.E.O.T. alignment was performed.
- b) Depress Start/Stop switch (out).

**\*\*CAUTION\*\*** DO NOT unplug AlP2 until heads are retracted.

- c) Unplug AlP2 and return to normal position as indicated by label on casting.
- d) Remove Tri-Bit alignment cartridge.
- e) Remove AC power.
- f) Replace K1.
- g) Replace power supply cover.
- h) Remove SERVO board from extender if used and replace board into card cage.
- i) Return all switches on Winchester I/O board to the positions indicated in Section 5.13.6.1-Figure #4

**\*\*CAUTION\*\*** Failure to return all switches to their normal positions will result in improper operation of the drive.

j) Inspect the unit for the following:

1. All screws tight.
2. All connectors secure.
3. All cables routed so as not to obstruct moving parts.

k) Replace all covers.

l) Refer to section 5.3 for Diagnostic Checks.

• 5.6.6.6 CDC "HAWK" ALIGNMENT ILLUSTRATIONS.

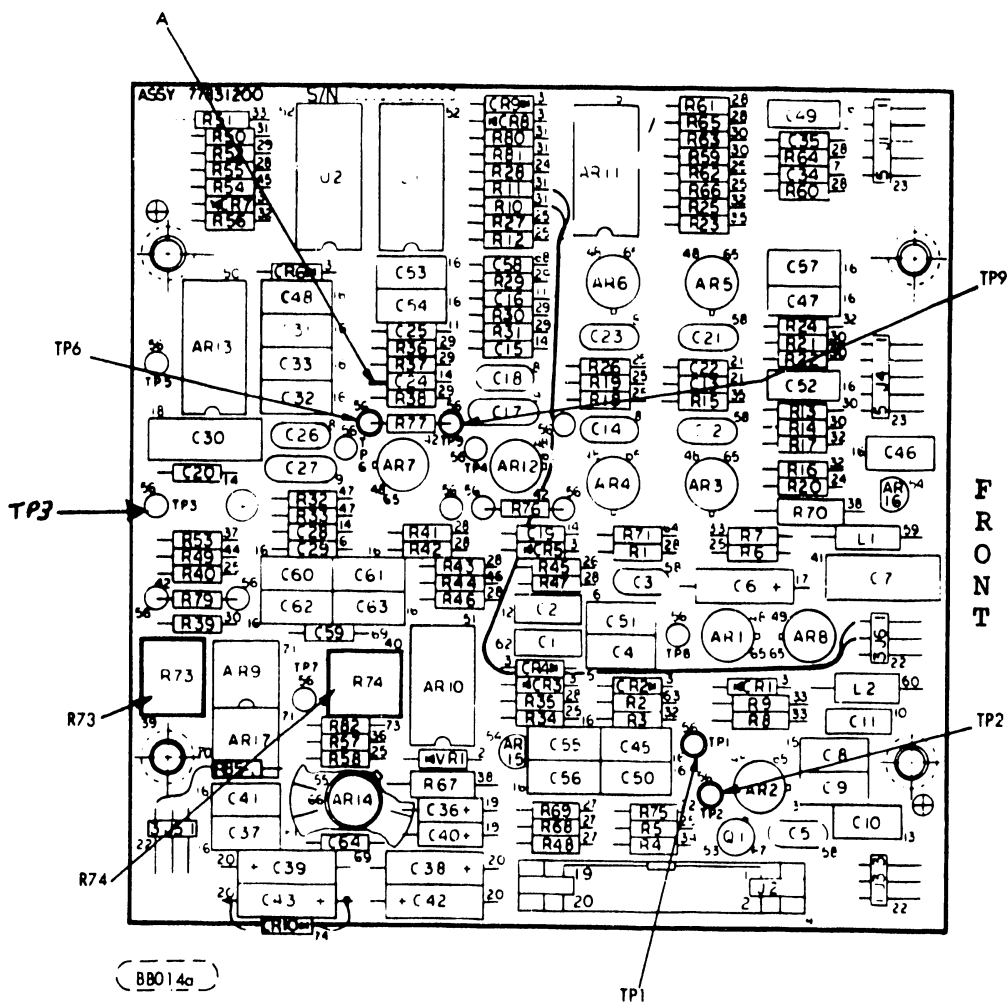


FIGURE 1 SERVO PREAMP TEST POINT LOCATIONS

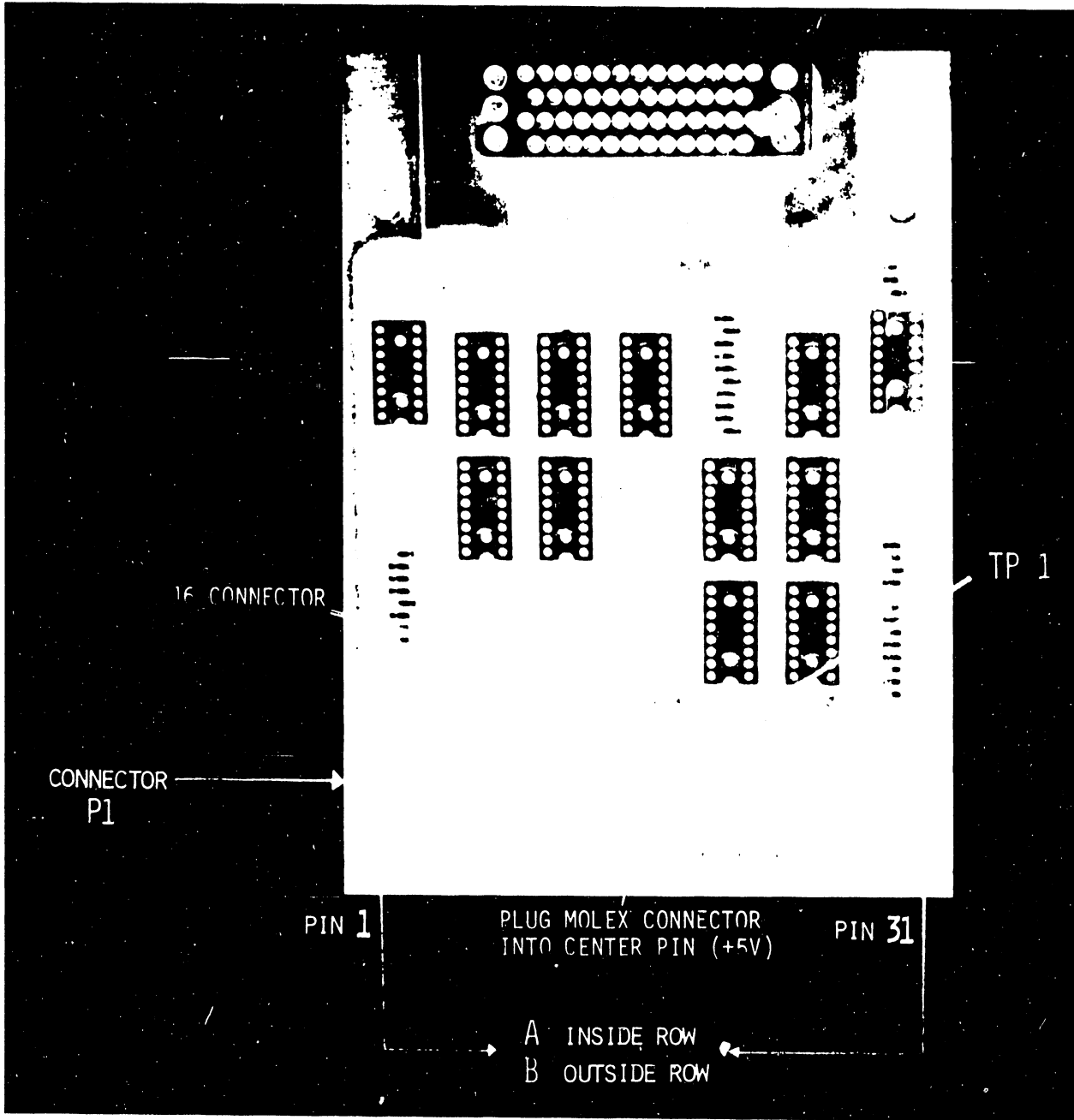


FIGURE 2 WINCHESTER I/O BOARD TEST POINT LOCATIONS

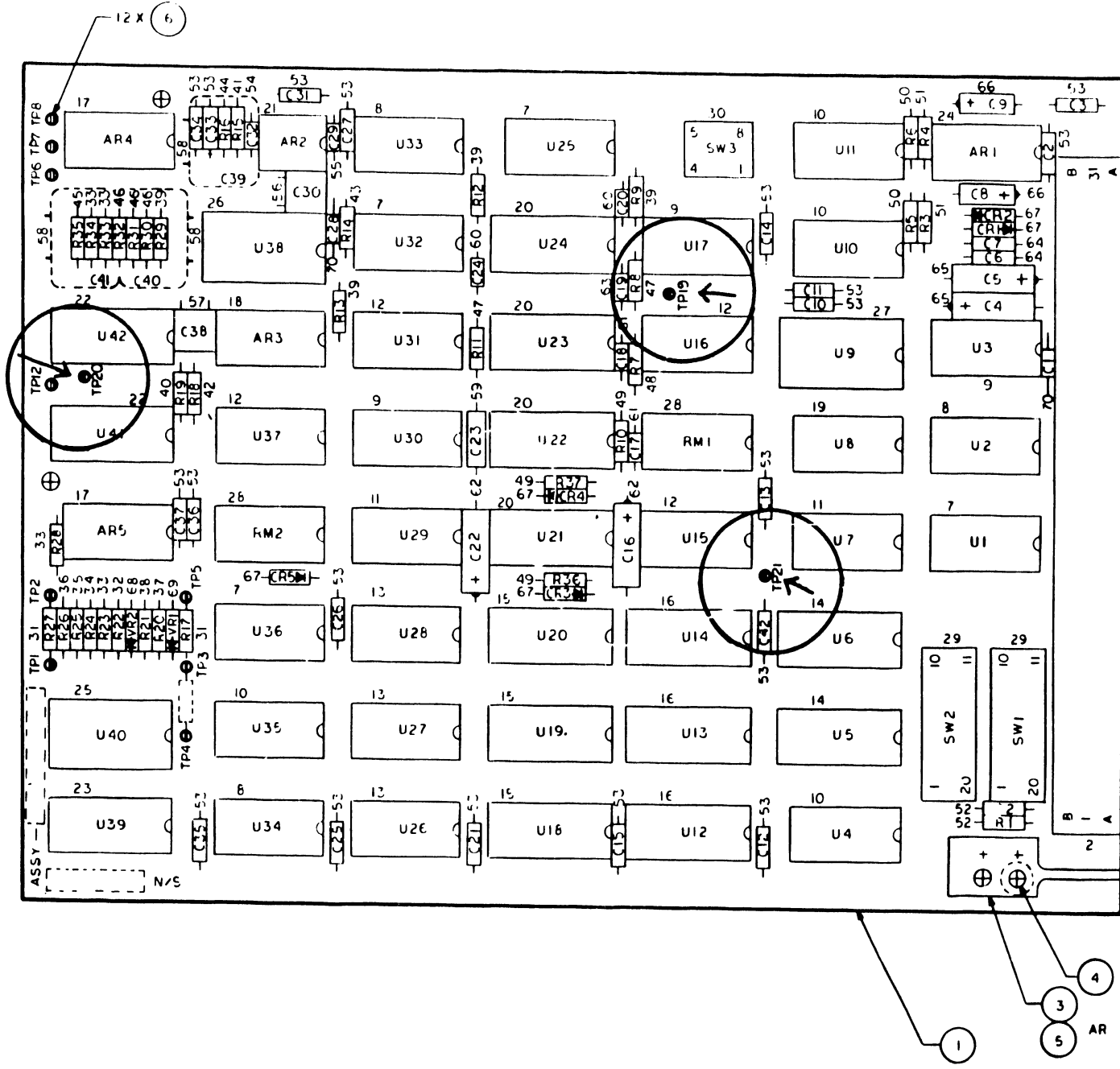


FIGURE 3 SERVO BOARD TEST POINT LOCATIONS

# WINCHESTER I/O BOARD

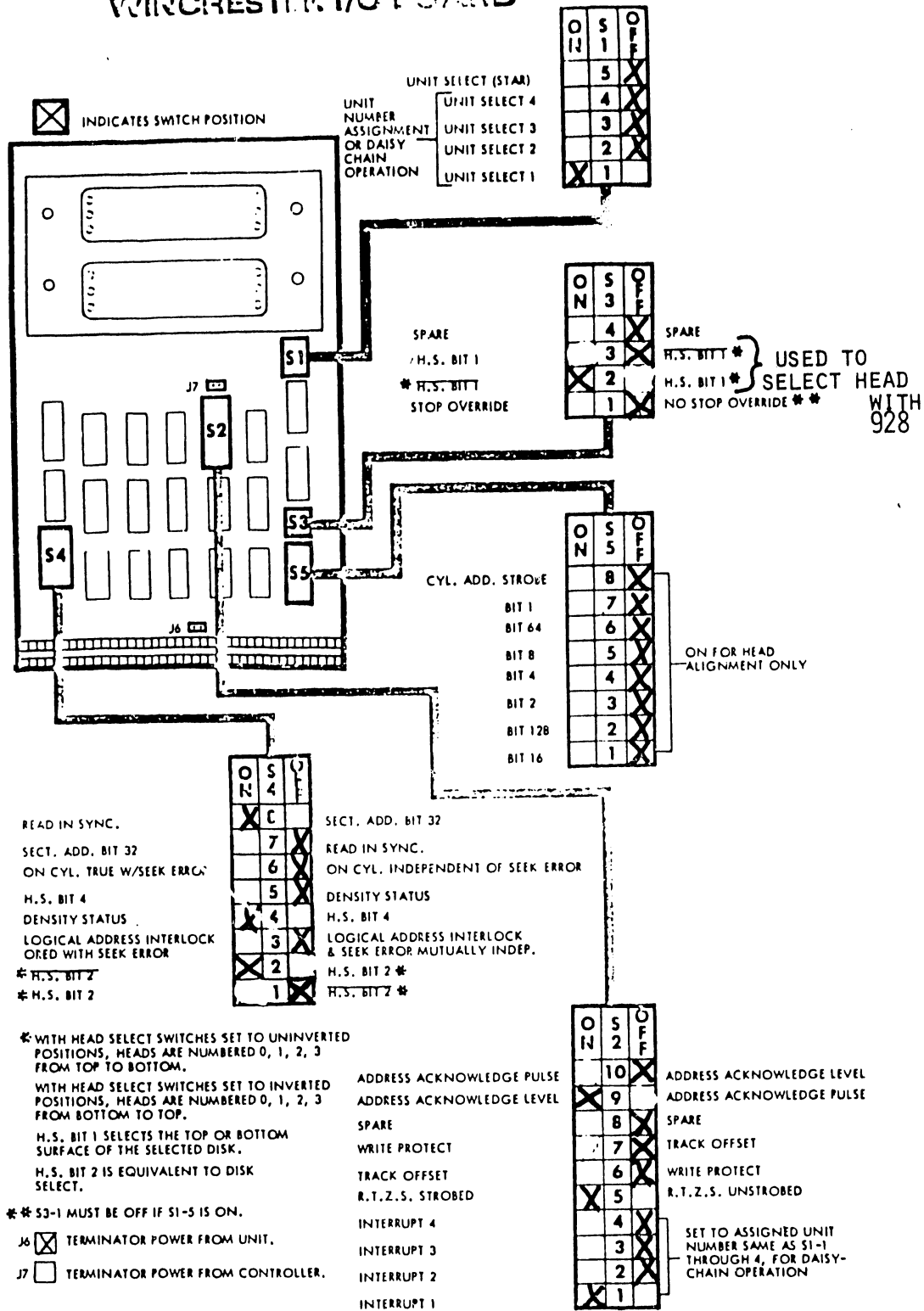


FIGURE 4 WINCHESTER I/O BOARD SWITCH SETTINGS

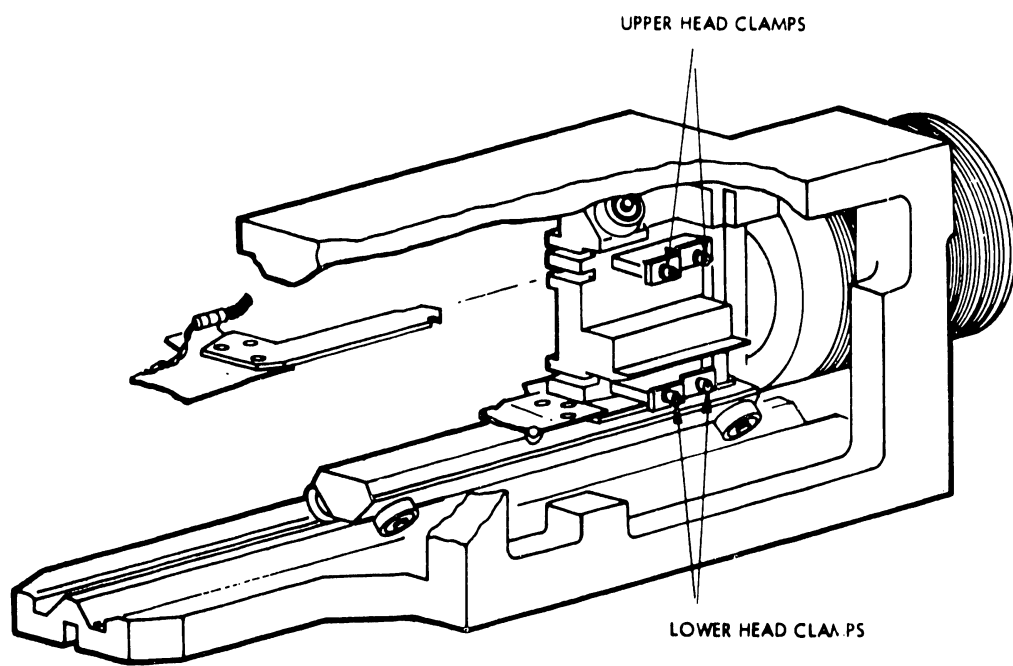


FIGURE 5 HEAD CLAMP LOCATIONS



## 5.6.7 CDC"HAWK" POWER DISTRIBUTION

### 5.6.7.1 INPUT POWER REQUIREMENTS

Input Voltage 120 volts - 4.6 Amps

The power supply chassis for the disk drive is enclosed in a covered unit located as shown in Figure 5-18.

The power supply provides the voltages used in the main card cage and the power amplifier. AC power is distributed to the synchronous Spindle Motor, Blower Motor and the Brush Motor. The input AC line feeds through a line filter to the AC circuit breaker CB1. (Refer to Figure 5-19.) The power from the circuit breaker is then routed to J12-pins 14 and 15. A multiple pin plug P12 is inserted into J12 which is used to select various taps on the input winding of the power supply transformer. The removable plug can be programmed by means of jumpers in accordance with the JUMPER TABLE on Figure 5-19. This adjustment is made during installation and should not be tampered with under normal conditions. The Table on Figure 5-19 is included for checking the plug arrangement in the case of an inadvertant error or power source change. Use the table to check the present jumper arrangement illustrated.

The secondary windings of the power transformer supply voltages to two rectifier circuits for providing the following DC voltages: +35, -35 and +11. Normally the DC circuit breaker should not be operated as an ON-OFF switch; it should be left ON except during a maintenance period, then it should be turned OFF. The above DC voltages are fed to Power Supply board #1. It is important to note that filter capacitors are stored in the top cover of the power supply used to filter the DC voltages at the output of Power Supply board #1. These large capacitors could be a source of trouble and should not be overlooked when having power problems.

Power Supply boards #1 and #2 (See PCB listing) are joined together and represent the PIGGYBACK POWER BOARD. The piggyback is mounted on top of the power supply chassis as shown in Figure 5-20 and accessible when the previously discussed top cover is hinged open.

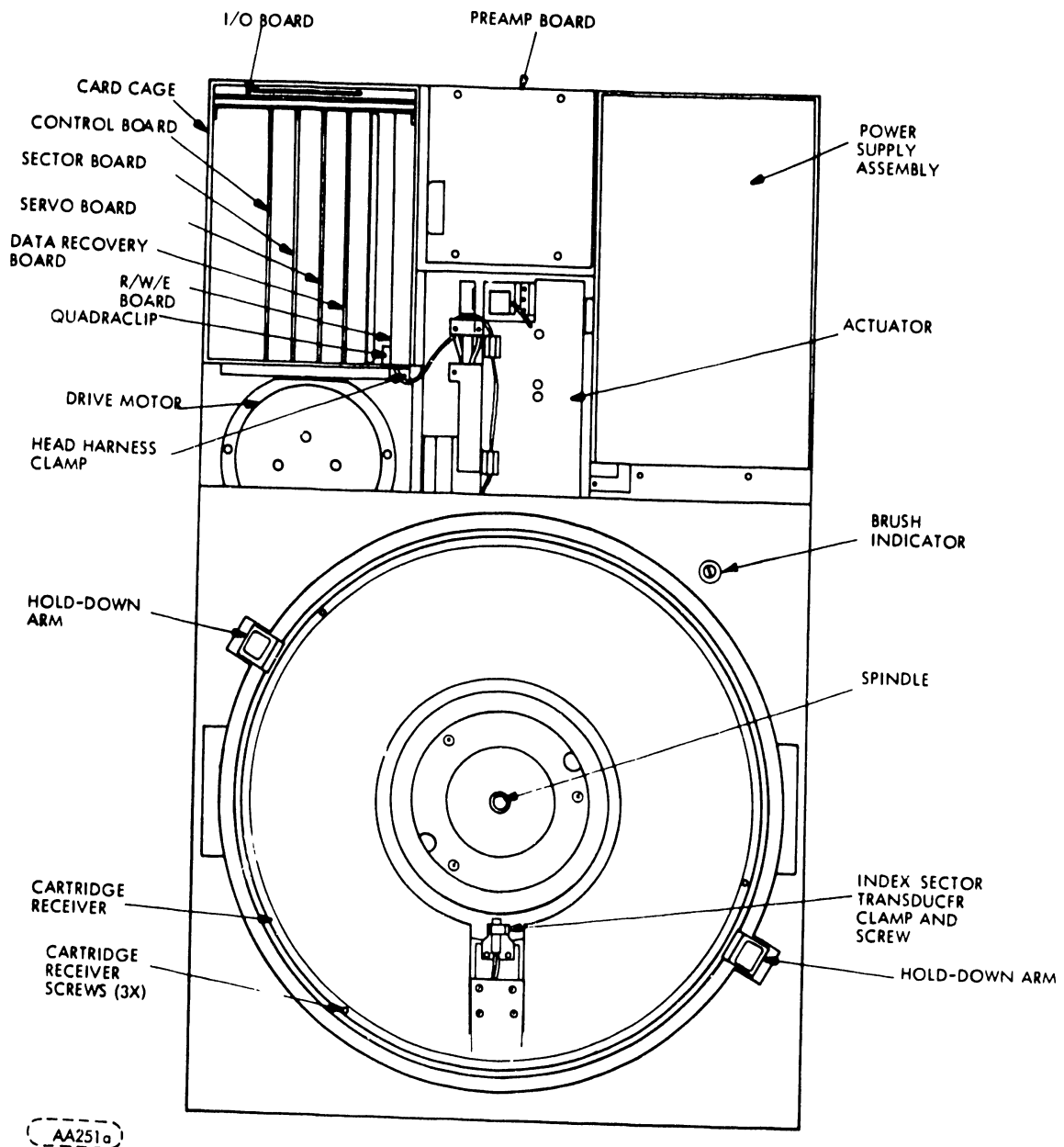
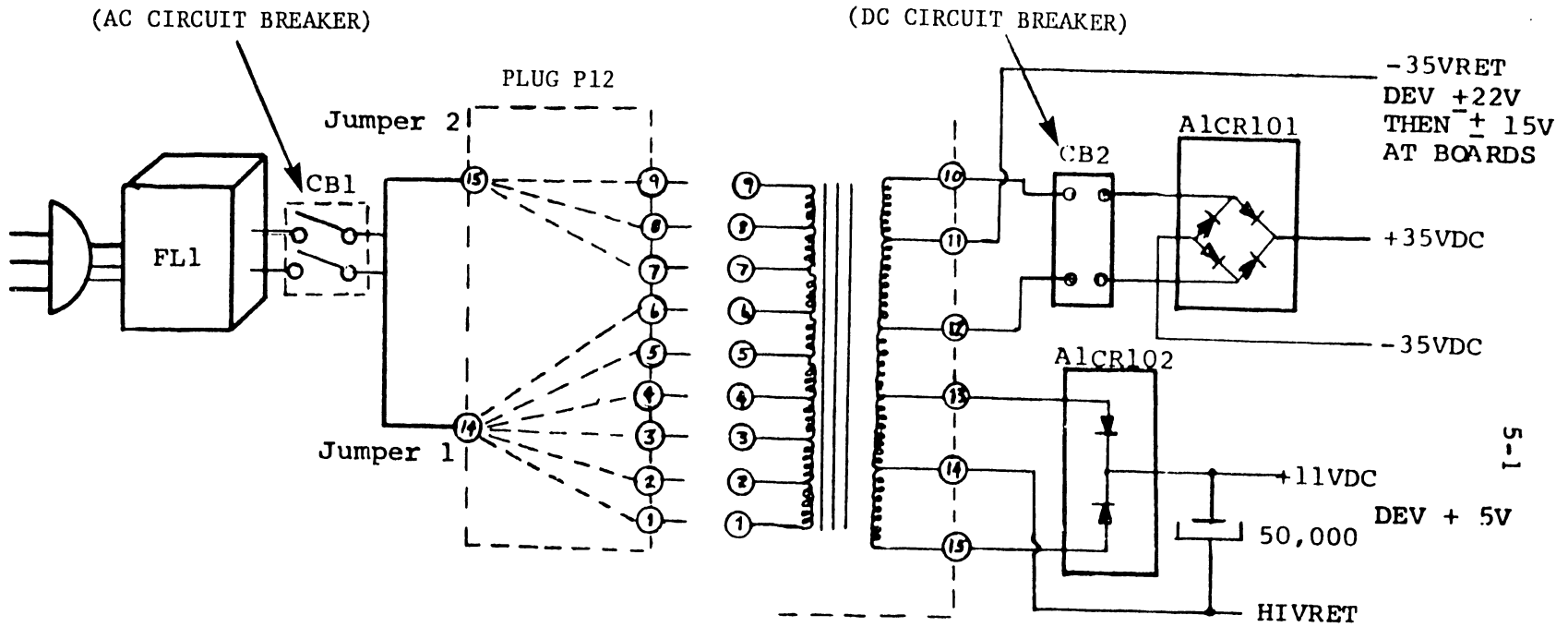
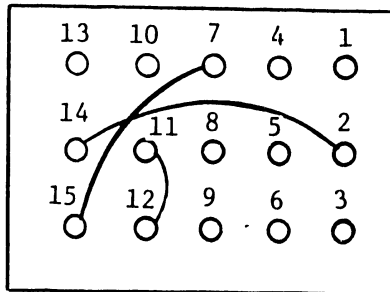


FIGURE 5-18 MODULE LOCATION (ABOVE DECK)

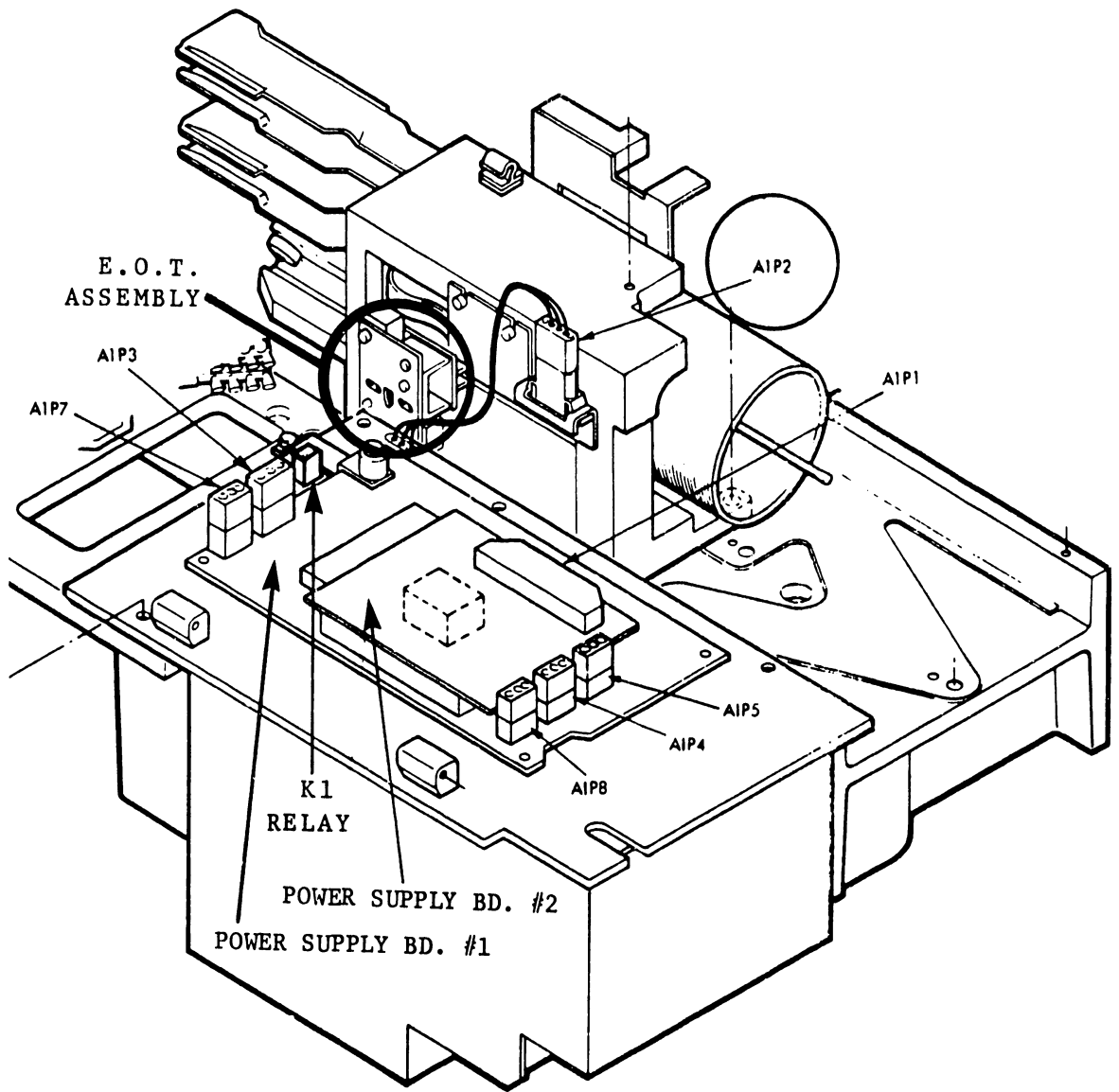


P12 PLUG  
(VIEWED FROM REAR)



VOLTAGE	JUMPER #1		JUMPER #2	
	FIXED PIN	MOVABLE PIN	FIXED PIN	MOVABLE PIN
100	14	4	15	7
110	14	3	15	7
120	14	2	15	7
130	14	1	15	7
140	14	6	15	8
150	14	5	15	8
160	14	4	15	8
170	14	3	15	8
180	14	2	15	8
190	14	1	15	8
200	14	6	15	9
210	14	5	15	9
220	14	4	15	9
230	14	3	15	9
240	14	2	15	9
250	14	1	15	9

FIGURE 19 POWER SUPPLY CHASSIS



POWER SUPPLY ASSEMBLY

FIGURE 5-20

The +11VDC is regulated down to +5VDC and routed through POWER BOARD #2 to the various logic boards as illustrated in Figure 5-21.

Voltages +22VDC and -22VDC are derived from the +35VDC and -35VDC on Power Supply board #1 and used on Power Supply board #2 which sends the voltages to the various logic boards. The +35VDC and -35VDC are used for operating the "POWER AMPLIFIER" on power supply boards #1 and #2. The -7.5VDC is derived on the power board #2 using -22VDC and a 7.5 V zener diode. All these voltages except -7.5VDC can be monitored from the Power Supply board #2 on connector plug P6. (See Pin numbers and voltages listed on Figure 5-22.) The +5V and +35V RETURN can be used for the + and -0V reference.

#### 5.6.8 GROUNDING OPTIONS

Signal ground may be isolated from chassis ground or connected to chassis ground by interchanging a brass spacer with a fiber (insulating) spacer as indicated in Figure 5-23. The 928 WP systems require that the signal ground be connected to chassis ground. This arrangement is located on the front left hand corner of the power supply board #1.

#### 5.6.9 PREVENTIVE MAINTENANCE

A maintenance index of items and schedules for replacing, cleaning and inspecting areas of the CDC HAWK disk drive are included in this section. Implementation of a prevent program will reduce trouble and delays of word processing functions if pursued at intervals commensurate with system use. The schedules recommended are general and therefore should be arranged for the convenience of the user and the service activity.

PREVENTIVE MAINTENANCE	SCHEDULE
1. Control Panel Lamp Replacement	6
2. Inspect and Clean Read/Write Heads	3
3. Disk Cartridge Inspection and Cleaning	3
4. Fixed Disk Inspection and Cleaning	3
5. Absolute Filter Removal and Replacement (Office or Industrial Environment)	4

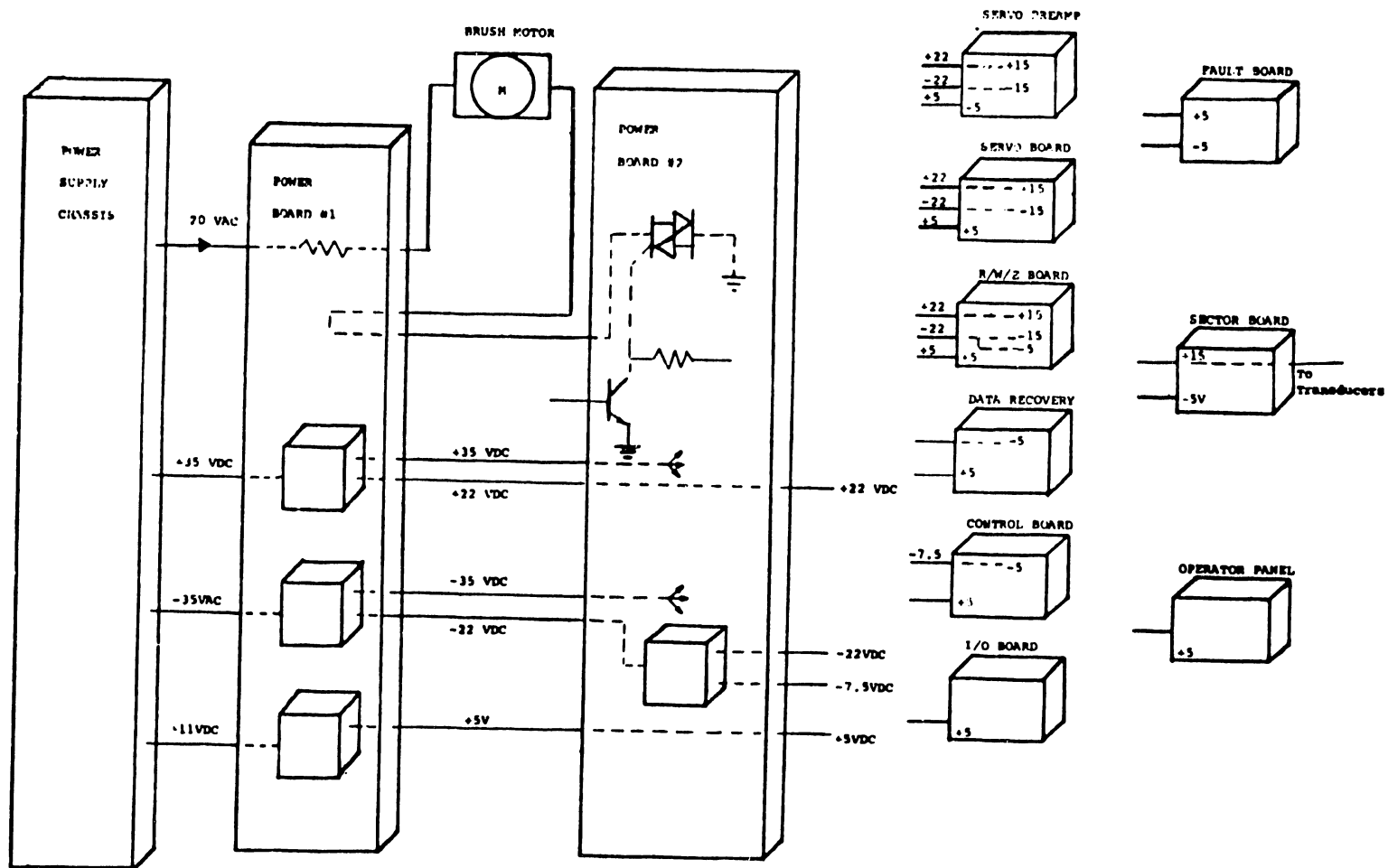


FIGURE 5-21 DC POWER DISTRIBUTION

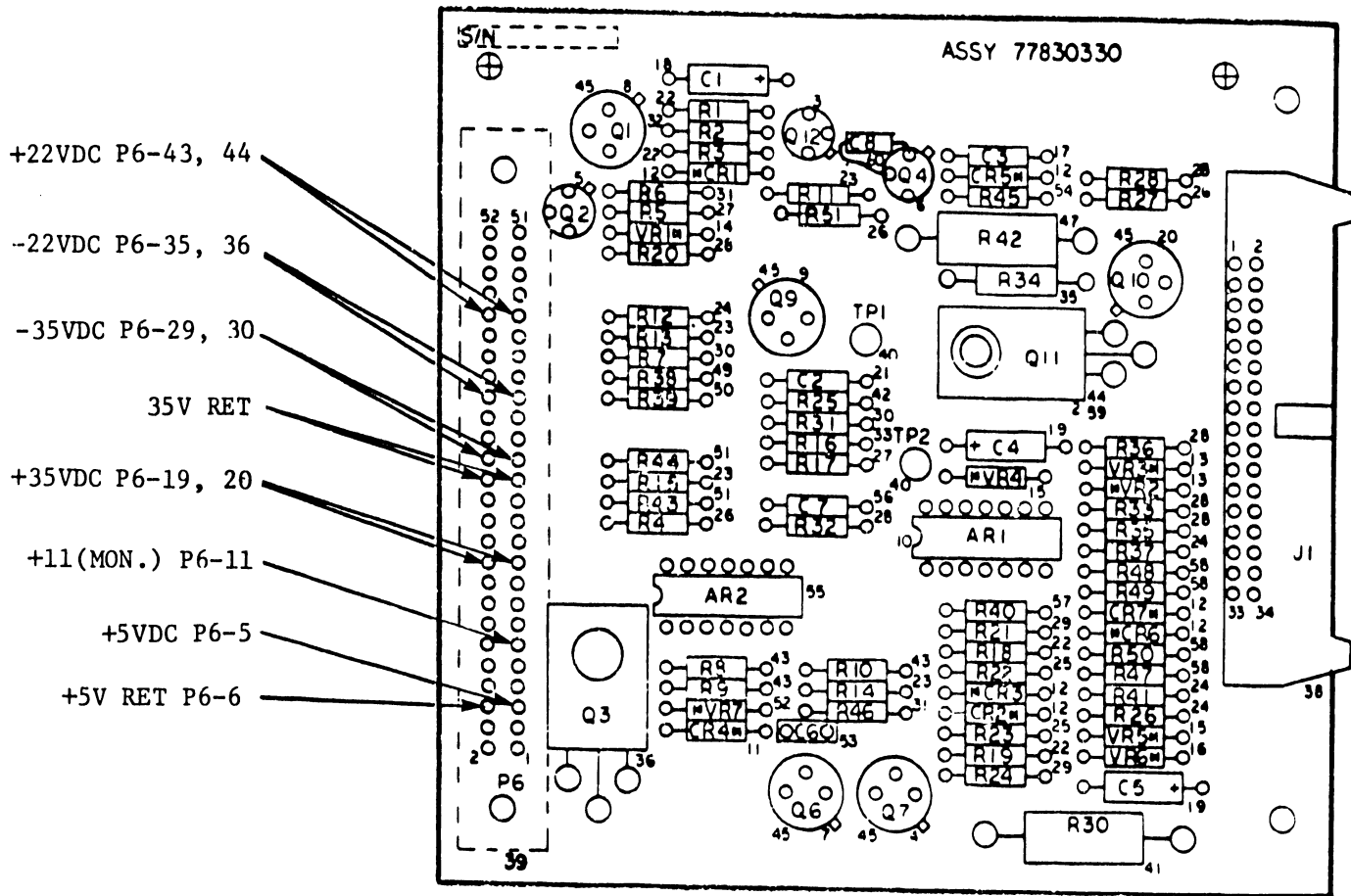
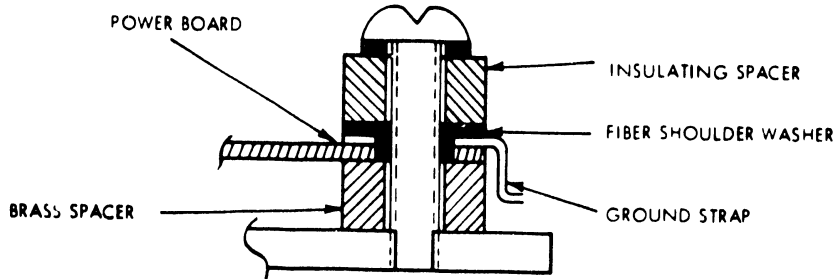


FIGURE 5-22 POWER SUPPLY BD. NO. 2

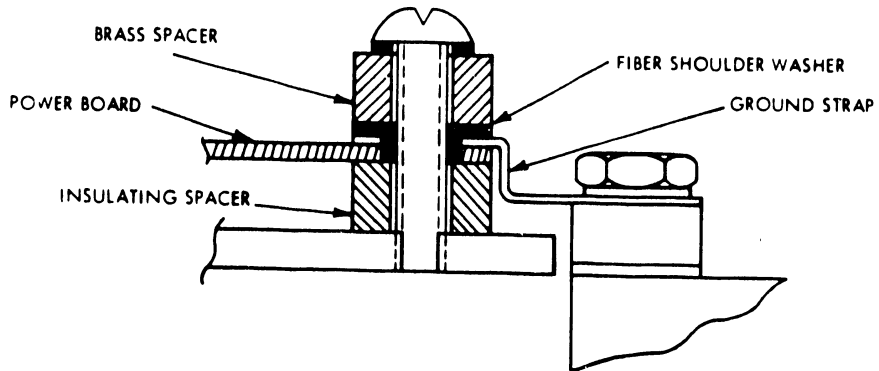
NOTE

GROUND MUST BE INSTALLED WHEN  
DYNAMIC BRAKE OPTION IS INSTALLED.



(A)

LOGIC (DC) GROUND CONNECTED TO CHASSIS (AC) GROUND



(B)

LOGIC (DC) GROUND ISOLATED FROM CHASSIS (AC) GROUND

FIGURE 5-23 GROUNDING OPTION



6.	Absolute Filter Removal and Replacement (Computer Room Environment)	5
7.	Pre-Filter Cleaning (Rack Mount Unit Only)	3
8.	Disk Brush - Check and Replacement	5
9.	Inspect and Dry Magnetic Ring on Spindle	6

#### DEFINITION OF SCHEDULE

- Level 0 - Daily, depending on condition state
- Level 1 - Weekly or 150 hours (no preventive maintenance scheduled)
- Level 2 - Monthly or 500 hours (no preventive maintenance scheduled)
- Level 3 - Quarterly or 1500 hours
- Level 4 - Semi-annually or 3000 hours (no preventive maintenance scheduled)
- Level 5 - Annually or 6000 hours
- Level 6 - 15,000 hours

#### PREVENTIVE MAINTENANCE PROCEDURES

##### 5.6.9.1 CONTROL PANEL LAMP REPLACEMENT

1. Remove the Pushbutton Cover from the switch assembly by pulling the cover outward from the switch. Note the orientation of the metal bracket inside pushbutton cover for re-installation during step 4.
2. Using the bulb removal tool, remove the lamp from the socket (Do not turn the lamp since it is a plug-in device).
3. Install new lamp.
4. Re-install lamp cover. Care must be taken that the metal tabs on the pushbutton bracket do not come into contact with the metal clamps that supply voltage to the lamp or damage to the switch logic will occur.

##### 5.6.9.2 INSPECT AND CLEAN READ/WRITE HEADS

1. Depress START/STOP switch to STOP (out) and wait for spindle to stop rotating (START/STOP light extinguished).
2. Open top cover.

3. Set main circuit breaker to off position.
4. Remove electronics cover.
5. Upper heads can be cleaned and removed without removal of actuator. To clean and remove lower heads, perform removal steps 1 through 21 of the actuator assembly removal and replacement procedure.

NOTE:

The Actuator Assembly R&R exceeds the LEVEL 1 maintenance requirements for this manual. However, there is a preventive maintenance requirement for the cleaning of the R/W heads. Refer to SECTION 6 (PARA.6.6.1) of the CDC HAWK Field Level Maintenance Guide 77834675

CAUTION:

Do not smoke while cleaning heads. Do not touch head face. When cleaning or buffing, always move tongue depressor perpendicular to length of head/arm assembly. Do not leave residue or lint on head faces.

6. Inspect heads for dirt on head face. Clean heads, if required, as follows:
  - a. Use lint-free gauze on a tongue depressor to lightly dry buff head face.
  - b. If dry buffing does not remove dirt, dampen (do not soak) gauze with media cleaning solution and wipe head face. Use dry gauze to lightly buff head face.
7. Install actuator by performing replacement steps 1 through 22 of Actuator Removal and Replacement procedure, if lower heads were cleaned.

#### 5.6.9.3 DISK CARTRIDGE INSPECTION and CLEANING

1. Depress START/STOP switch to STOP (out) and wait for spindle to stop rotating (START/STOP lamp extinguished).

2. Remove disk cartridge.
3. Using a bright, directional light, inspect both sides of disk. If disk is dirty, have disk cartridge cleaned.
4. If disk surface is scratched, cartridge should be replaced.

#### 5.6.9.4 FIXED DISK INSPECTION and CLEANING

Cleaning of fixed disk will not normally be necessary, if disk area is kept covered. Clean disk by performing the following procedure.

1. Perform removal steps 1 through 11 of fixed disk removal and replacement procedures.
2. Inspect fixed disk brushes for dust. If brushes are dirty and show excessive wear, replace all brushes.
3. Slowly rotate spindle by hand and inspect both sides of disk. If scratches are found, replace disk.
4. To clean disk, wrap a piece of lint free gauze around tongue depressor and dampen (do not soak) with media cleaning solution.
5. While rotating spindle by hand, move tip of spatula (applying moderate pressure) across disk to outer edge.
6. Repeat step 5 for both disk surfaces until gauze comes away clean from disk surface.
7. Wrap a clean, dry piece of gauze around a spatula and repeat step 5 to remove any residue left by cleaning solution.
8. To complete installation, perform replacement steps 4 through 9 of fixed disk removal and replacement procedure.

#### 5.6.9.5 ABSOLUTE FILTER R & R (PART #726-5625)

1. Depress START/STOP switch to STOP (out) and wait for spindle to stop rotating (START/STOP lamp extinguished).
2. Set main circuit breaker to off position.
3. For Rack mounted drives, slide unit out for access to the filter.
4. Loosen filter clamp (figure 5-24)) and swing clamp clear of filter.

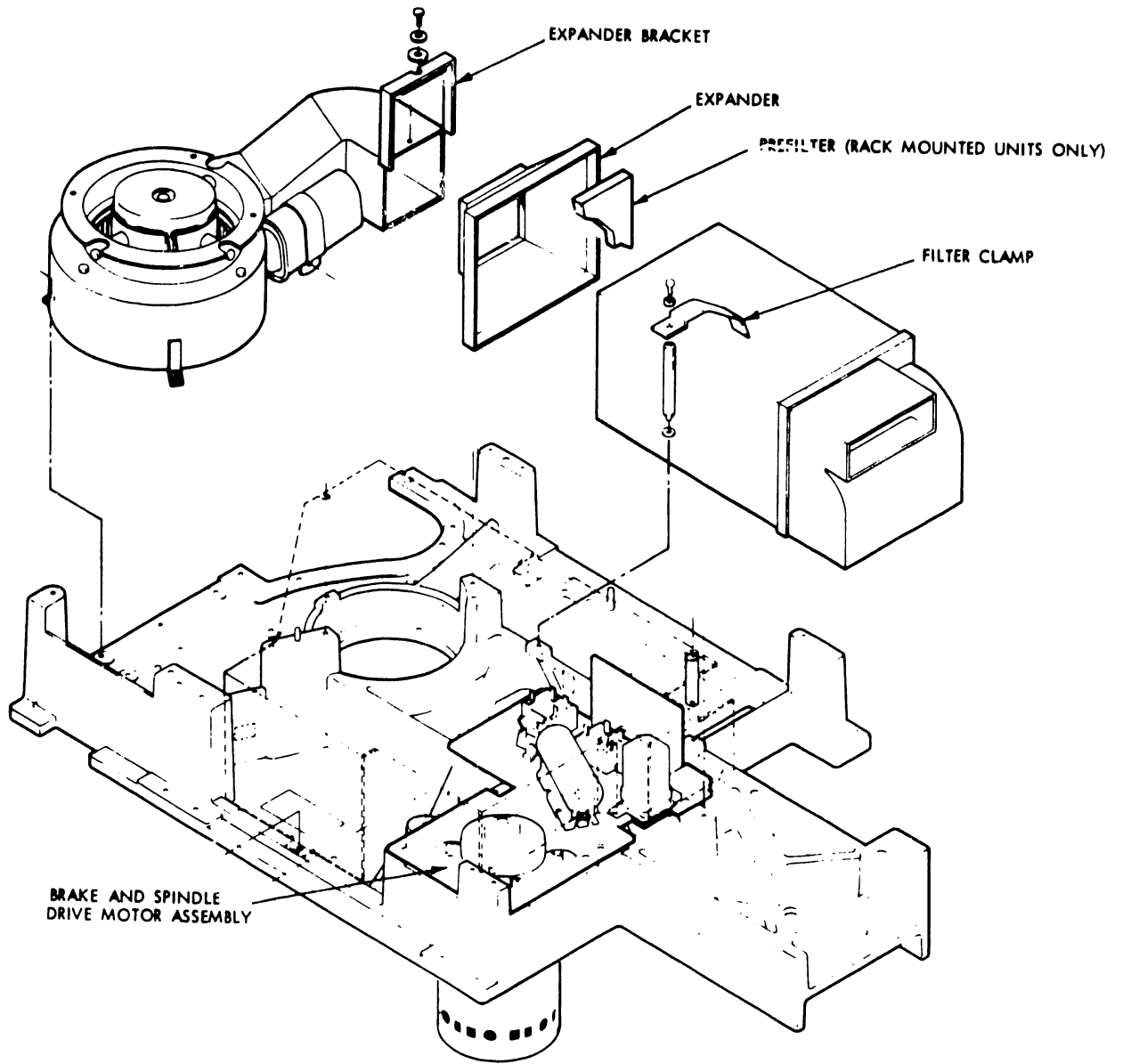


FIGURE 5-24 FILTER MOUNTING

5. Remove filter expander bracket.
6. Slide blower expander forward until filter is free.
7. Remove absolute filter. Prefilter is installed into the end of the absolute filter with an adhesive. (See figure 5-25.)
8. Remove pre-filter (Rack Mount Units only).
9. Clean pre-filter (See section 5.12.7) and reinstall into new absolute filter.
10. Install replacement absolute filter and pre-filter.
11. Install filter expander.
12. Install expander bracket.
13. Install filter clamp.
14. Slide unit into rack and secure.

#### 5.6.9.6 PRE-FILTER CLEANING (Rack Mount Unit Only)

1. Depress START/STOP switch to STOP (out) and wait for spindle to stop rotating (START/STOP lamp extinguished).
2. Set main circuit breaker to off position.
3. Loosen filter clamp (Figure 5-24) and swing clamp clear of filter.
4. Remove filter expander bracket.
5. Slide blower expander forward until absolute filter is free.
6. Remove pre-filter from the end of the dirty absolute filter.
7. Clean pre-filter by washing in warm water and soap.
8. Rinse and dry pre-filter.
9. Install pre-filter into the end of the absolute filter as shown in figure 5-25 and let adhesive dry.
10. Install absolute filter as explained in section 5.15.5.

#### 5.6.9.7 DISK BRUSH CHECK and REPLACEMENT

1. Perform removal steps 1 through 11 of disk brush assembly R&R procedure.
2. If disk brushes are dirty and show excessive wear, replace all brushes. Pull brush horizontally to remove from holding bracket. The new brush snaps into place when seated properly.

FIGURE 5-25 REMOVE & REPLACE ABSOLUTE FILTER

5-75

ADHESIVE  
RESIDUE

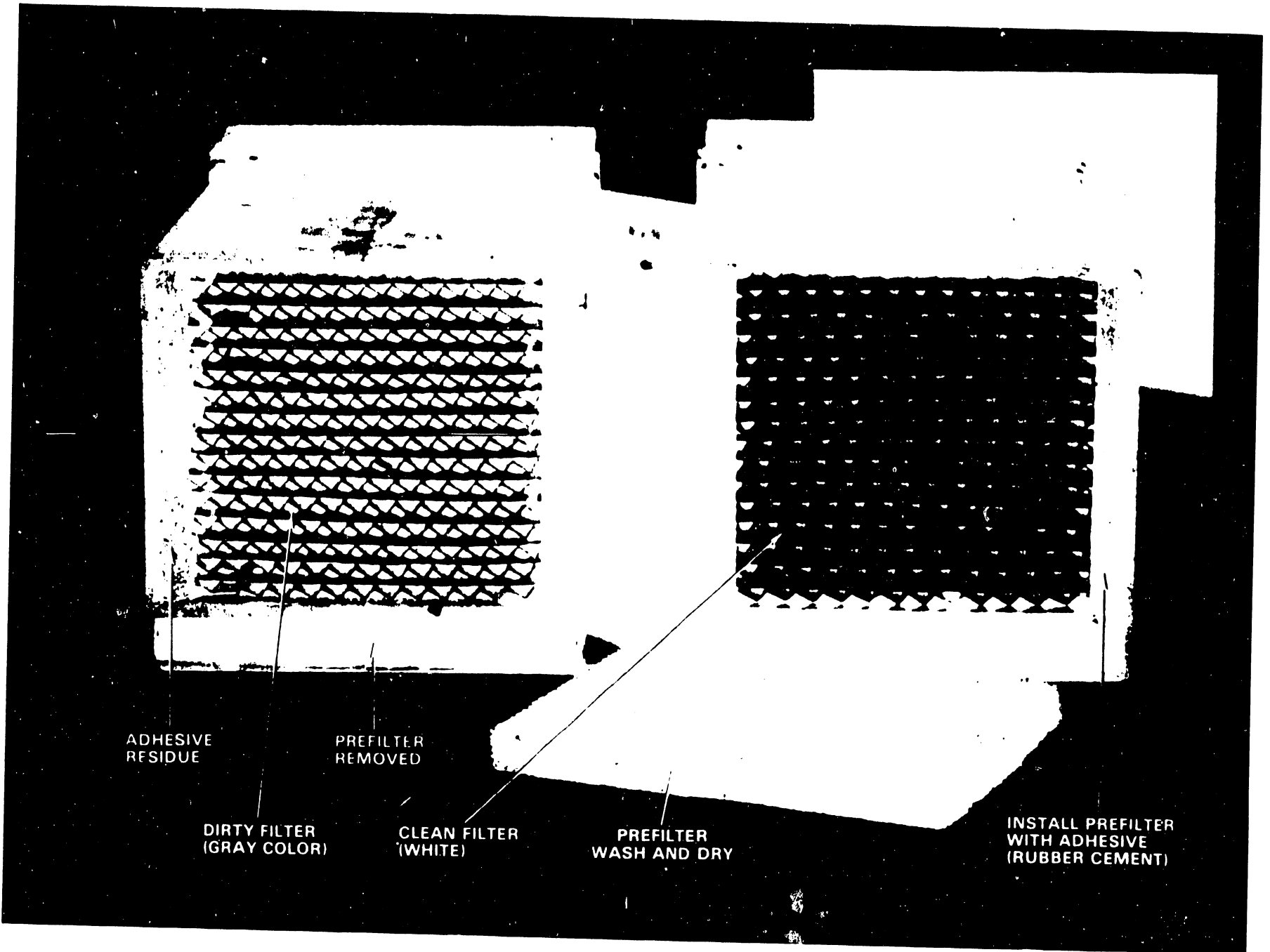
PREFILTER  
REMOVED

DIRTY FILTER  
(GRAY COLOR)

CLEAN FILTER  
(WHITE)

PREFILTER  
WASH AND DRY

INSTALL PREFILTER  
WITH ADHESIVE  
(RUBBER CEMENT)



3. Perform replacement steps 3 through 11 of disk brush assembly removal and replacement procedure.

#### 5.6.9.8 INSPECT and DRY MAGNETIC CHUCK (MAGNETIC RING)

This procedure should be performed at least once each day, if device goes through dewpoint daily.

#### NOTE

If the Drive is stored or operated in environmental conditions outside the envelope in the product specification, condensation will form in the drive. In order to prevent corrosion, use a soft absorbent cotton cloth and wipe dry the surface of the chuck.

1. Depress START/STOP switch to STOP (out) and wait for spindle to stop rotating.
2. Remove disk cartridge.
3. Inspect Magnetic Chuck for condensation.
4. If condensation is present use a soft absorbent cotton cloth and wipe dry.

CORRECTIVE MAINTENANCE PROCEDURES contained in the CDC HAWK manual 77834675 require a minimum of level 2 maintenance, therefore, these procedures will not be included. In several instances the preventive maintenance items require R&R.

Example: Cleaning of the R/W heads. The appropriate section and paragraph will be indicated in the CDC manual.

**CHAPTER**

**6**

**WP**

**SYSTEMS**

**OPTIONS**



CHAPTER 6  
WP SYSTEMS OPTIONS

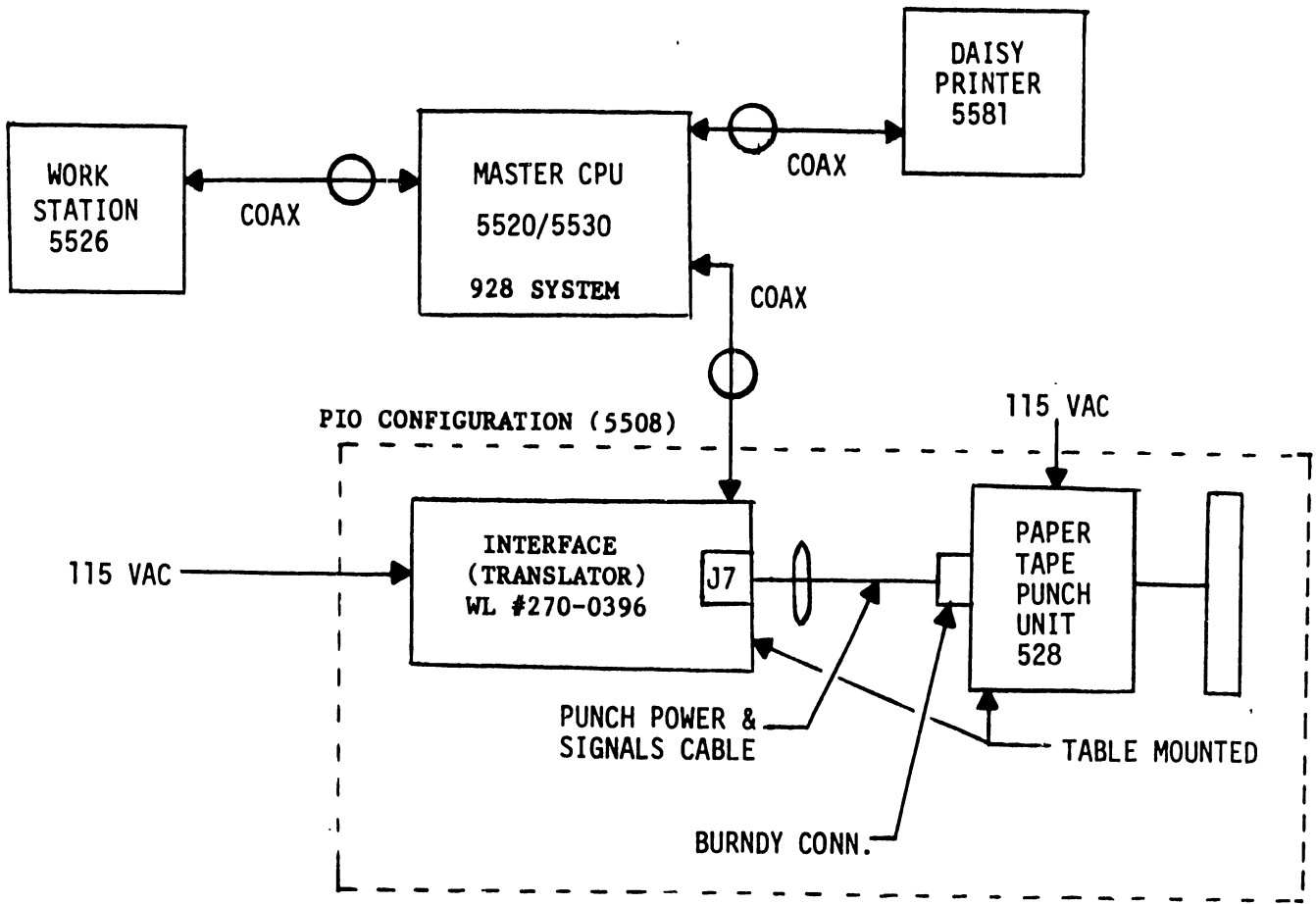
6.1 WORD PROCESSING OPTIONS

The Word Processing options listed below have a common hardware unit required for each to operate with the desired or specified Word Processing System. The exceptions are the Wide Platen Option (WPO) and the Twin Sheet Feeder (TSF). The WPO is a modification to an existing slave unit (Workstation) and the Twin Sheet Feeder is an accessory to another slave, the Daisy Printer. The remaining four options are treated as additional slave units. The common hardware unit, required to operate these four slave options, is a black box interface. Each of these options has been assigned a WP model number. The black box utilized with each of the options is not standardized electrically and mechanically because of the differences required to implement the options. The Word Processing Options available to the Customer at the present time are as follows:

1. PHOTOCOMPOSITION INPUT OPTION (PIO)(5508)
2. LINE PRINTER OPTION (LPO)(5521/5531)
3. WIDE PLATEN OPTION (WPO)(Horizontal scroll)  
WORKSTATION (5526H)
4. TELECOMMUNICATIONS (TC)(5528)
5. OPTICAL CHARACTER RECOGNITION (OCR)(5595-9)
6. TWIN SHEET FEEDER (TSF) (5538)

6.2 PHOTOCOMPOSITION INPUT OPTION (PIO)(5508)

The PIO option (5508) consists of a self contained paper tape punch and a electronic translator (PIO interface box). These two units produce TTS (TeleTypeSetting code) punched paper tape for use with any photocomposer accomodating six-level punched paper tape. When the PIO is connected (using a coaxial cable) to a 928 Word Processing System Master CPU output channel, the electronic translator (interface) black box will enable the tape punching operation. (See Figure 6-1.) For actual photographs of PIO units and for all PIO operating and tape loading details refer to WPNL #30.



TYPICAL 928 SYSTEM  
WITH PIO OPTION  
FIGURE 6-1

The maintenance specified for the PIO is limited to voltage checks and adjustments, removal and replacement of electrical circuit boards and the description of the operating controls.

#### 6.2.1 PIO INTERFACE (TRANSLATOR) (5508)

The PIO interface translator (black box) contains the 8080 microprocessor and 8K of memory for the translation and formatting of display codes suitable for input to a phototypesetter. The power supply for the translator is self contained providing its own operating voltages and operating voltages for the tape punch unit.

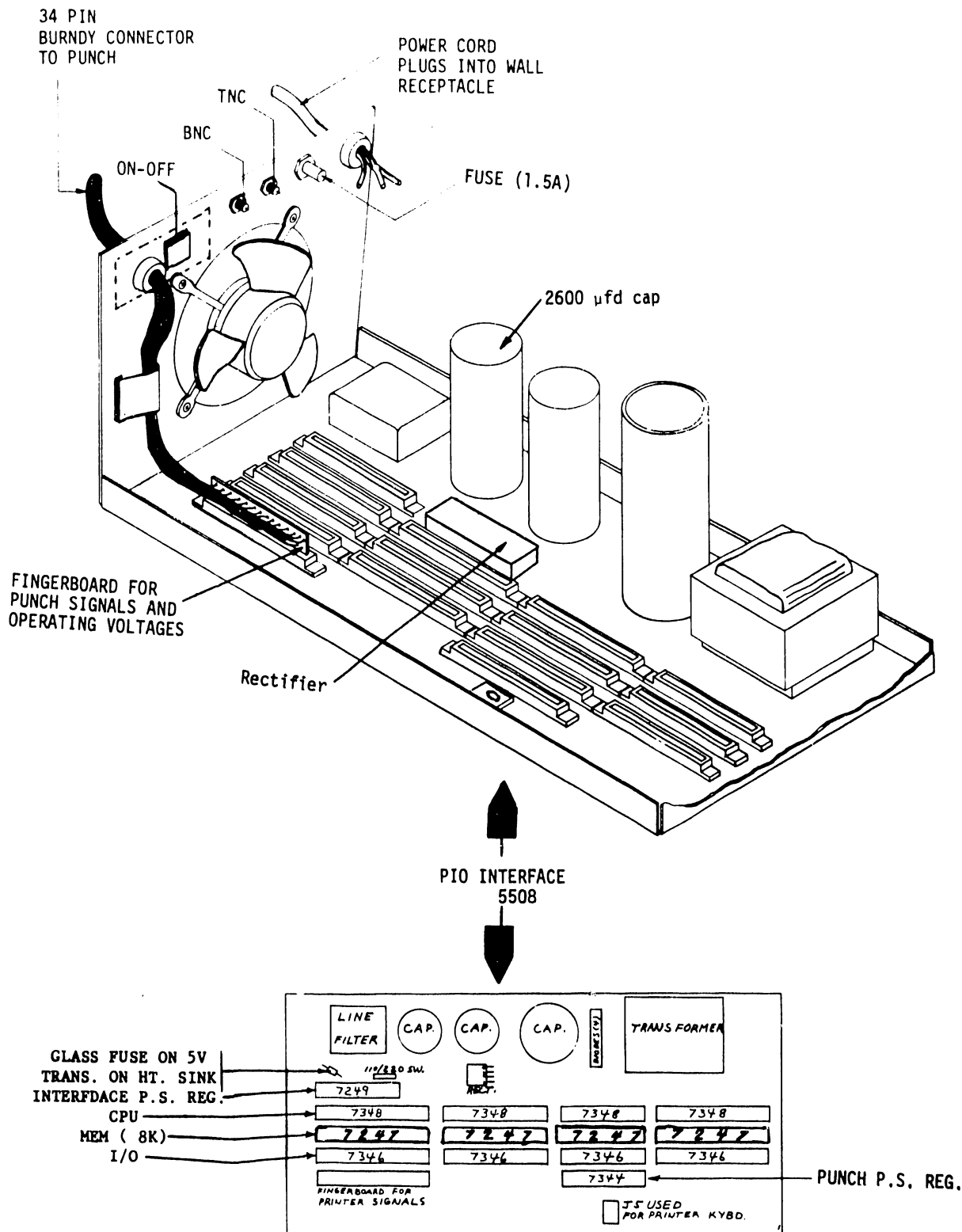
#### 6.2.2 VOLTAGE CHECKOUT FOR TRANSLATOR AND PUNCH

Remove top cover on translator box that is secured to the chassis with eight flat phillips head screws (4 on each side). This exposes all the boards internally as illustrated in figure 6-2. Convenient test points for checking the operating voltages for the translator box are located on the motherboard 7343. (See figure 6-3.)

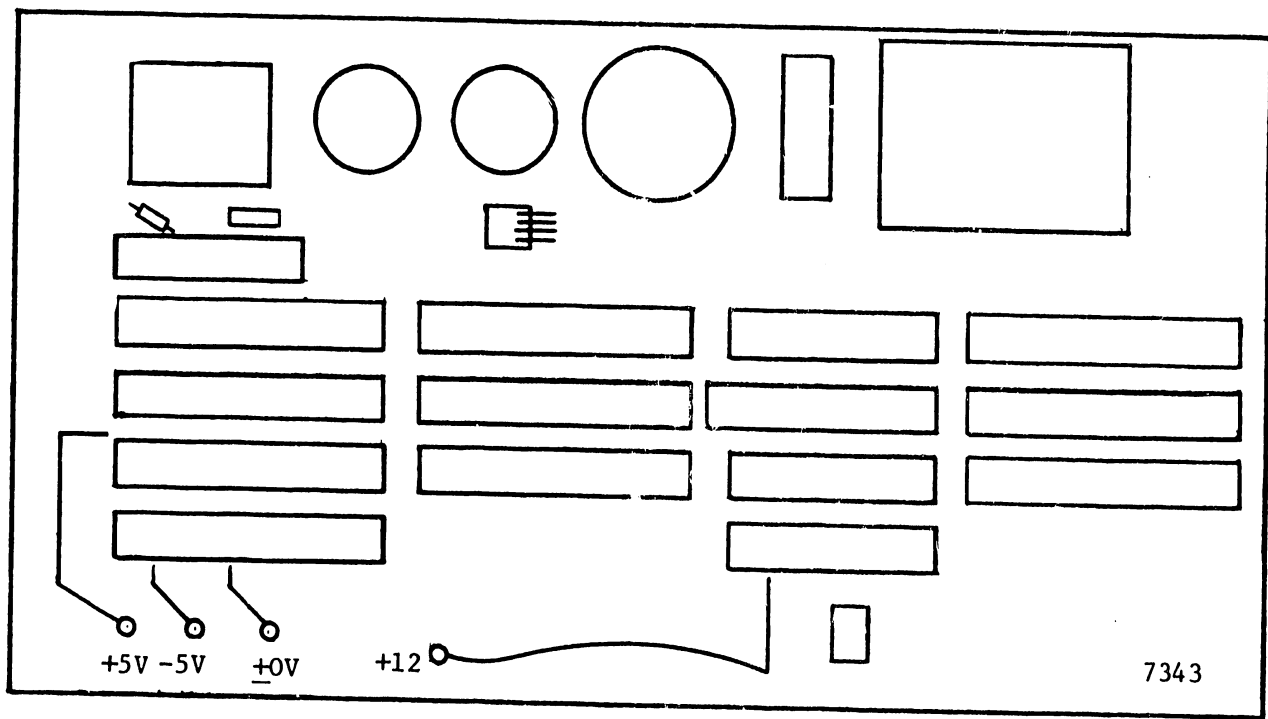
The 7249 power supply regulator circuit board furnishes the voltages for the translator. (Refer to figure 6-4 for location of adjustment controls.)

TP LOCATION	7249 ADJ	VOLTAGE	LIMITS
7343		+or-0V	
7343	R8	+5VR	+4.90 to +5.10
7343	R4	-5VR	-4.90 to -5.10
7343	R13	+12VR	+11.80 to +12.20

Power for the paper tape punch is furnished by an additional power supply regulator board 7344 housed in the translator. The power, data bits and punch controls are supplied to and from the punch via a cable with a BURNDY connector that mates with the punch. The voltages furnished to the punch are +5VP and +24V and adjustable. Adjustable potentiometers R13 (+5VP) and R6 (+24V) are available on



PIO INTERFACE (WITH ADDITIONAL RECTIFIER AND CAPACITOR)  
FIGURE 6-2



6-5

FIGURE 6-3 VOLTAGE TEST POINTS FOR PIO/LPO

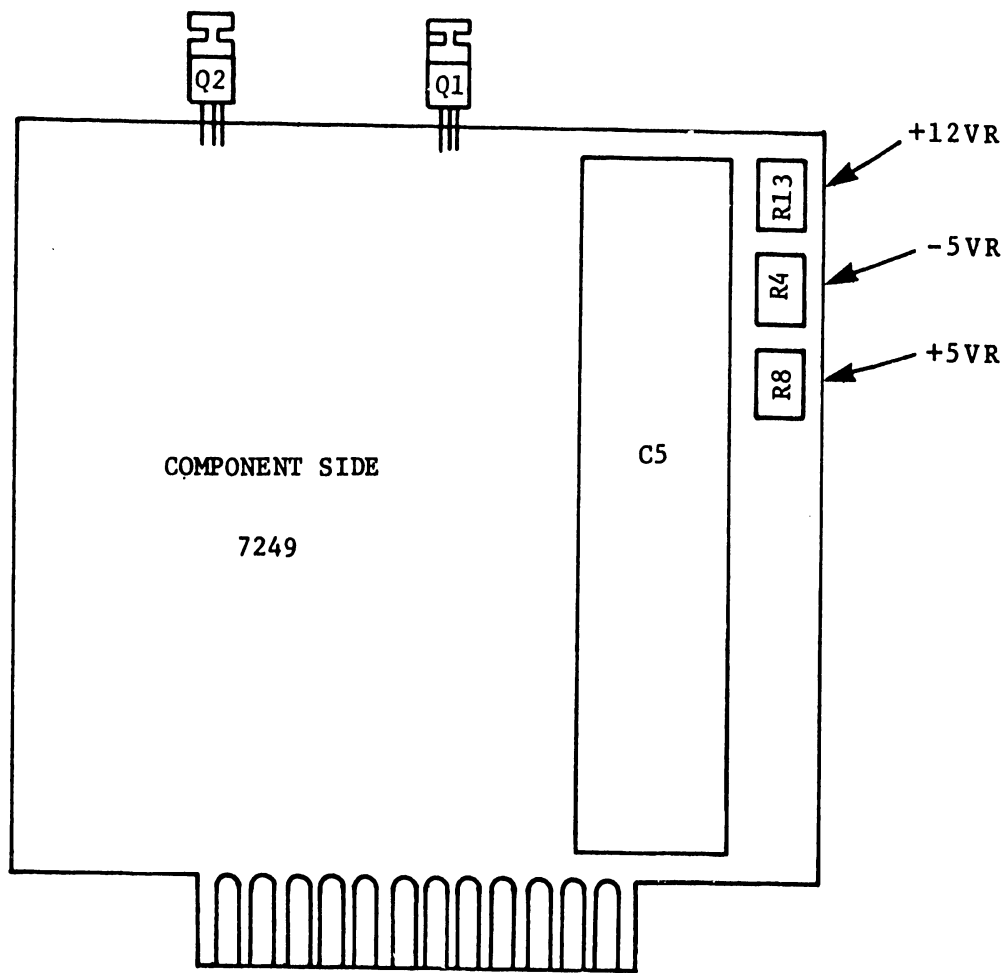


FIGURE 6-4

7249 P.S. REGULATOR CONTROLS FOR PIO/LPO OPERATING VOLTAGES

the 7344 board. (See figure 6-5.) Because of the cable length to the punch the +5VP must be adjusted to +5.1VP to compensate for the loss in the cable.

To check the punch voltages the punch cover must be removed. Turn the punch power off. Remove the paper tape from the punch mechanism. Remove chad box and chad tube. Loosen the four screws holding the cover and remove cover. DO NOT turn the power ON until you are clear of the fan blades. The fan blades are sharp and can cause injury. Check test points on the upper left corner of the punch driver board as follows:

TEST POINTS

E1 = +24V +or-10%

E2 = +5.1VP +or-5%

E3 = +or-0V

Replace cover and chad box accessories.

### 6.2.3 TRANSLATOR/INTERFACE BOX PCB COMPLEMENT

The following complement of printed circuit boards is used in the PIO translator box. These boards are easily replaced if defective. The following table will identify each board by part number and a description of its function.

- a) 7247 - 8K Printer (Punch) Memory Board.(Used for PIO only).
- b) 7249 - Power Supply Regulator for Translator PCBs.
- c) 7343 - Printer Motherboard.
- d) 7344 - Power Supply Regulator for paper tape punch.  
(+24V to punch solenoids) & (+5VP for SEL and Electronics).
- e) 7346 - I/O PCB for 928 Matrix, Daisy Printer and PIO
- f) 7348 - CPU PCB for 928 Matrix, Daisy Printer and PIO
- g) Set jumpers for punch operation on PCB 7346 and switch settings on 7348. Refer to APPENDIX B.

### 6.2.4 PIO CONTROLS AND INDICATORS

Control switches and indicators used for the operation of the PIO are listed below:

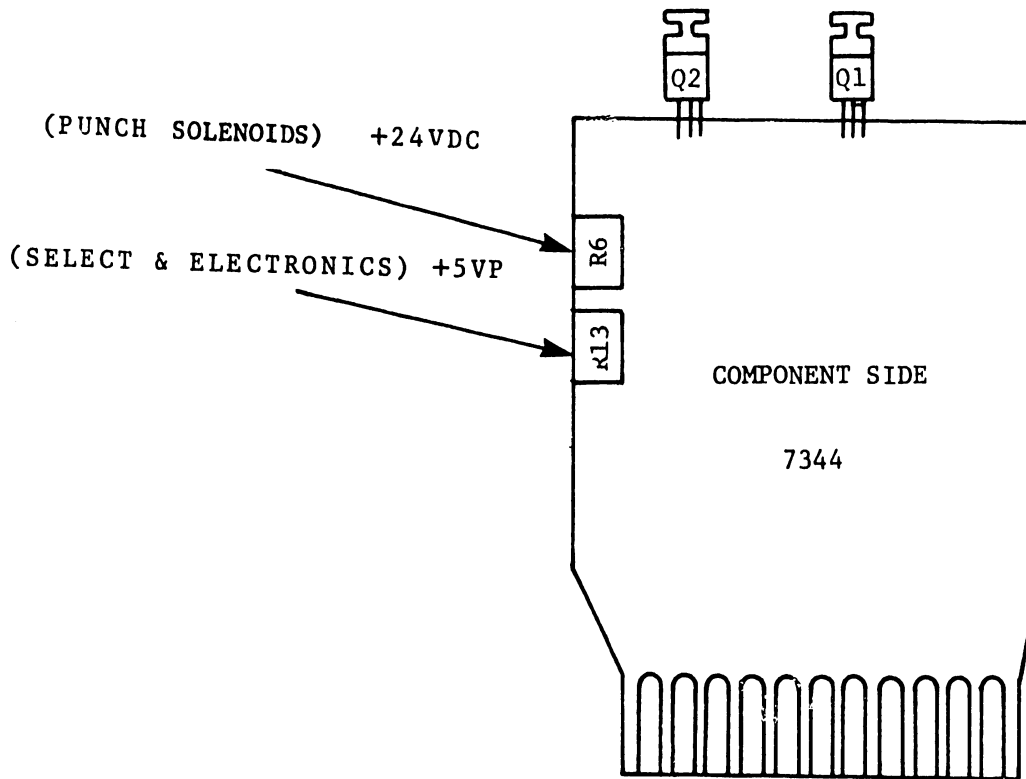


FIGURE 6-5

7344 PCB VOLTAGE REGULATOR CONTROLS FOR PUNCH OPERATION



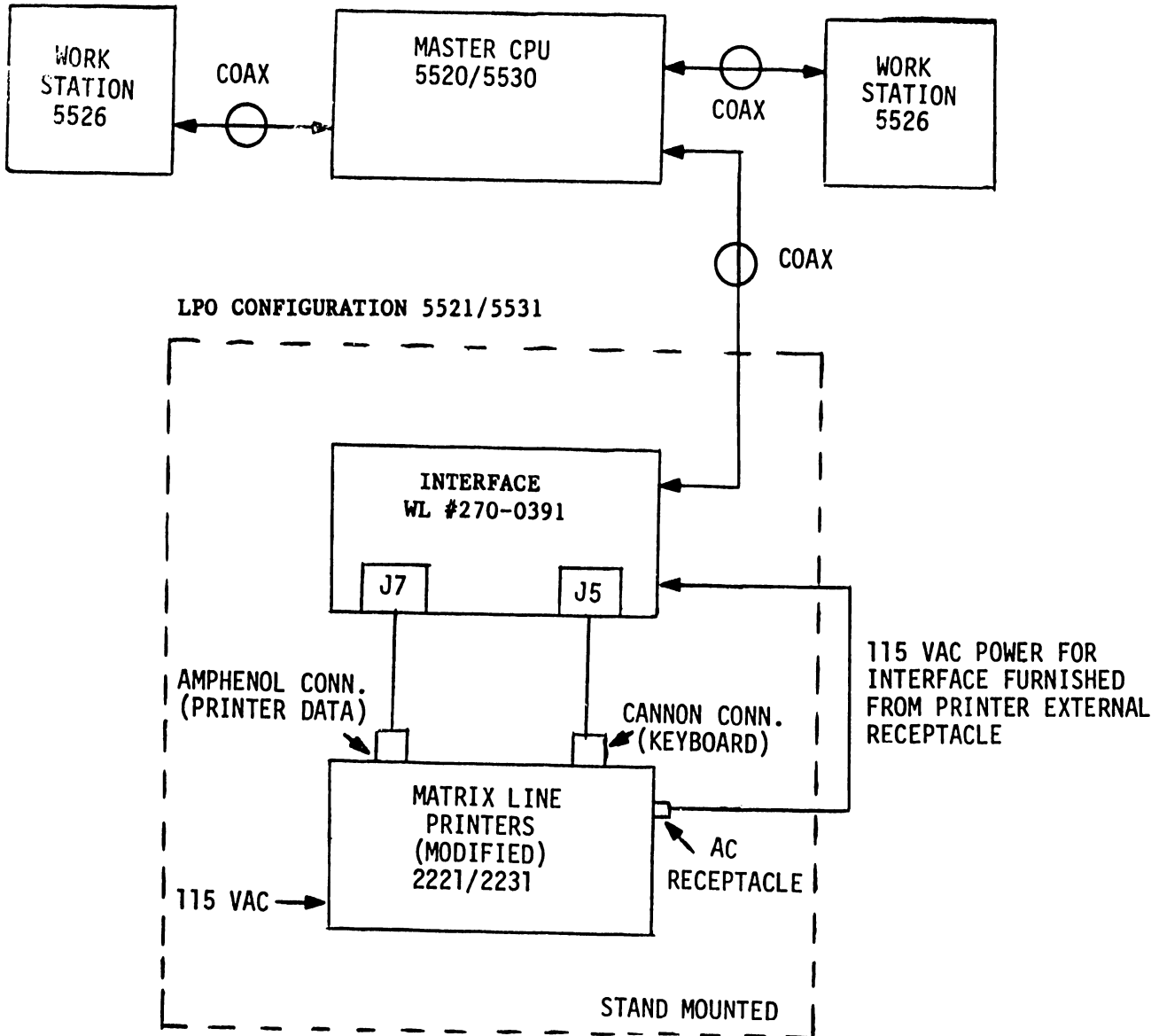
1. Translator/Interface: ON/OFF POWER SWITCH - This rocker switch located on the upper right rear panel furnishes the power for the translator.
2. Paper Tape Punch: Power ON/OFF switch - This switch supplies the power for the punch input shaft drive motor. The motor operates continuously as long as the power is ON. (The punching of tape characters is a result of data supplied to the punch).
  - a) Idle/take-up/feed: This three position rocker switch is located to the right of the ON/OFF switch. In IDLE, the take-up reel motor idles and the reel does not move. In TAKE-UP, the take-up reel motor is activated. In FEED, the take-up reel motor is activated and paper tape is fed through the punch mechanism.
  - b) Tape tension/out-of-tape indicator: The desk type punch incorporates a tape tension switch which also serves as an out-of-tape indicator. This switch will stop the punch from punching if tape runs out or if it hangs up at the input to the punch. The tape tension switch is manually set.
  - c) Select switch: When this indicator switch is depressed, the SELECT lamp lights and the punch tape operation is initiated.

NOTE:

There are no fault indicators for the PIO operation.

### 6.3 LINE PRINTER OPTION (LPO) (5521,5531)

The Line Printer Option results in a choice of one of two MATRIX line printers with a black box interface unit. The interface unit with either line printer is an option which supplements the daisy printer, offering a faster and greater printing capacity. (See figure 6-6.)



TYPICAL 928 SYSTEM WITH LPO CONFIGURATION  
 FIGURE 6-6

This option is furnished with a slightly modified 2221W or 2231W printer mounted on a printer stand with the Interface unit mounted on the same stand as shown in figures 6-7 and 6-8. This option is adapted to WP Systems 20 and 30.

The operating specifications for the 5521/5531 matrix printers can be found in the original maintenance manuals for Models 72 (2221W) and 61 (2231W). The manual numbers are 03-0027-0 and 03-0029-0 respectively. (Refer to WPNL #30 Appendix A for LPO printer modifications.)

#### 6.3.1 928 MATRIX PRINTER INTERFACE ASSEMBLY

Electrically and mechanically, the LPO Interface assembly (WLI #270-0391) differs slightly from the PIO translator/interface. (See figure 6-9.) The interface is assembled to adapt to both printer options. (The differences between the LPO and PIO are detailed in Appendix A of WPNL #30.)

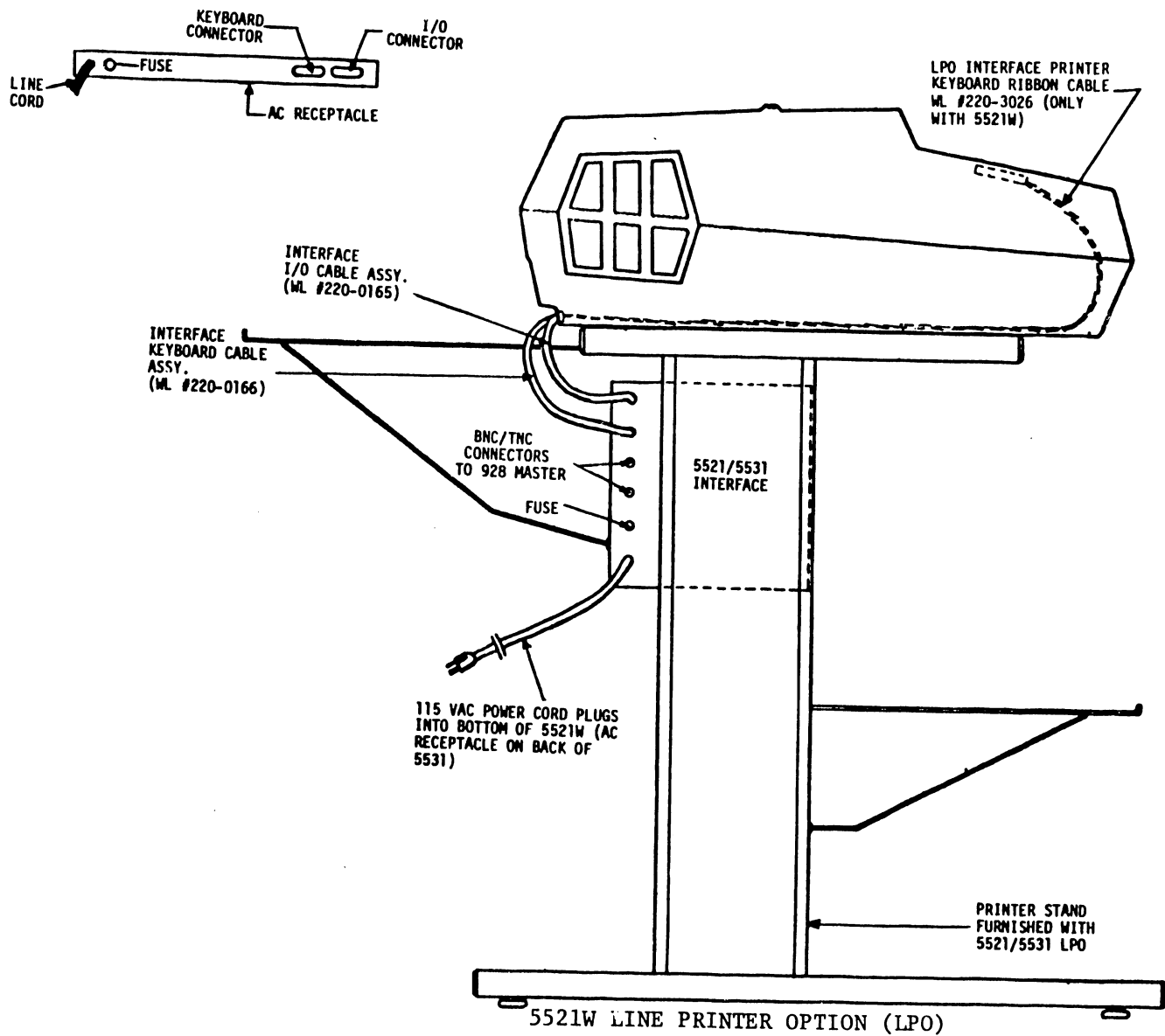
#### 6.3.2 LPO CONTROLS AND INDICATORS

##### a) Model 5521

The controls and indicators are as follows for Model 5521:

- 1) Master power switch - The Master power switch is located on the control panel of the Model 5521 printer. This switch furnishes power to the interface box which is plugged into the printer auxiliary AC receptacle on the bottom rear of the modified printer chassis.
- 2) Power ON lamp - Indicator on printer control keyboard 7038
- 3) Select switch - Enables printing operation. Select switch illuminates when selected.
- 4) Top of page - Causes paper feed to Top of Form (new page)
- 5) Malfunction Lamp and Change Paper Lamp.

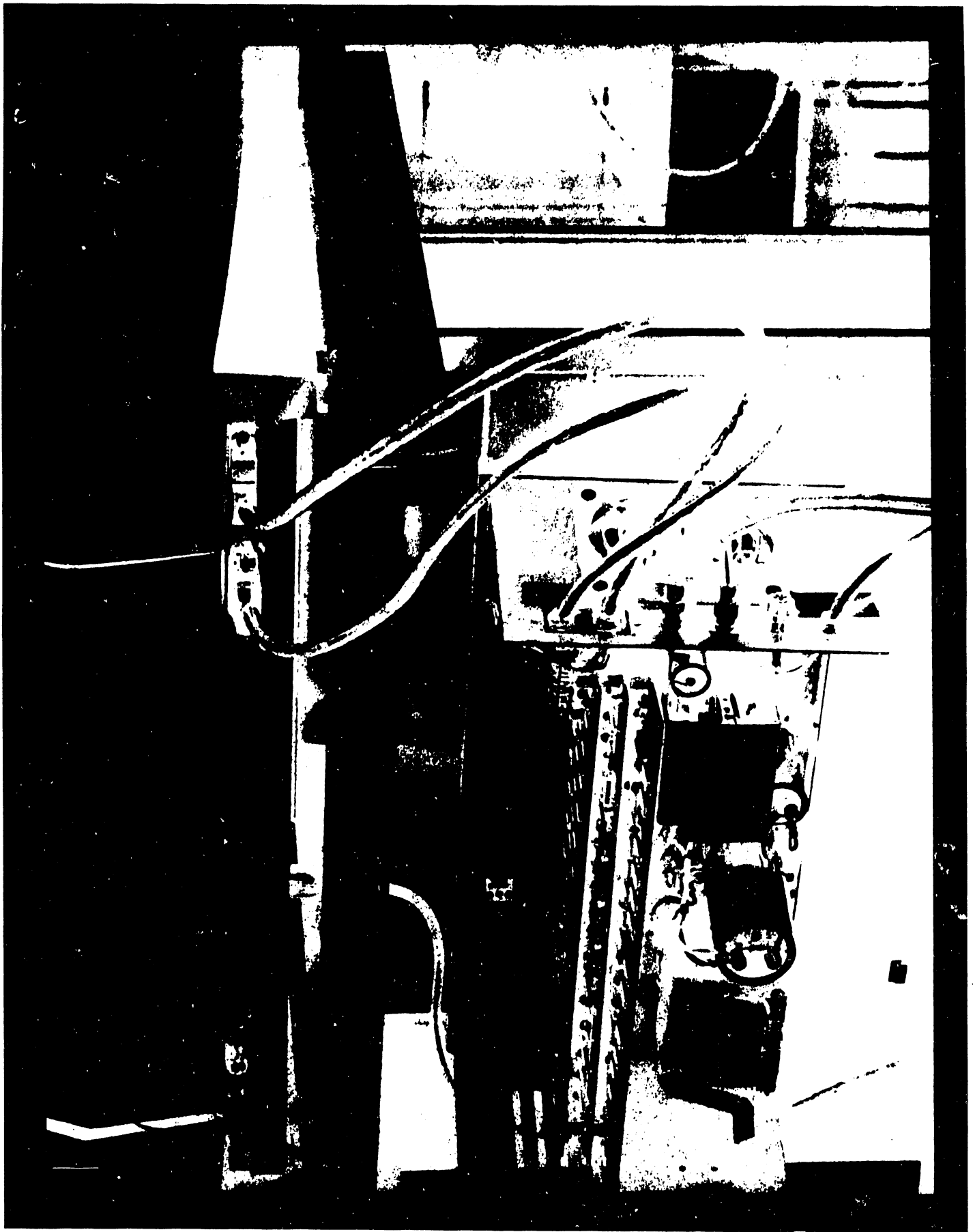
##### b) Printer Model 5531



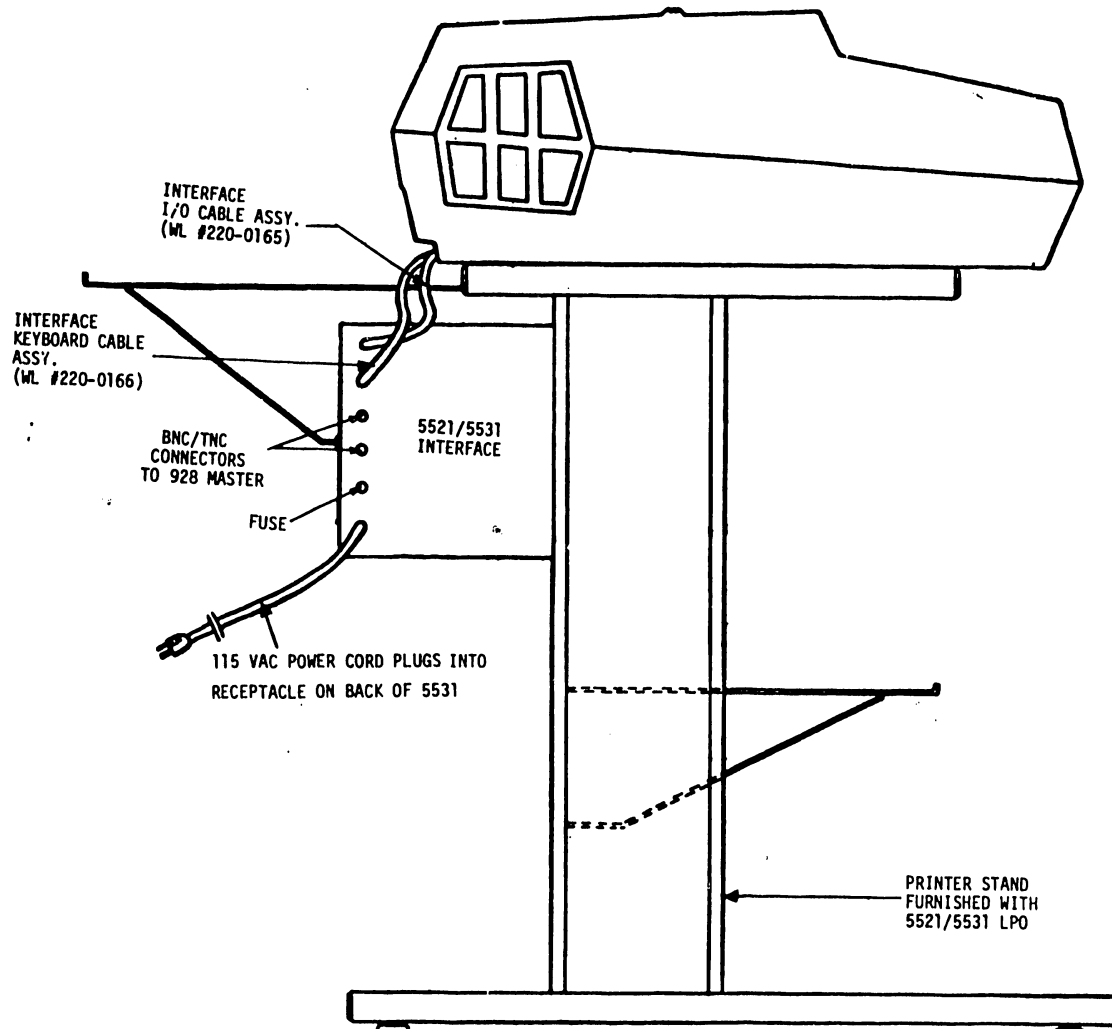
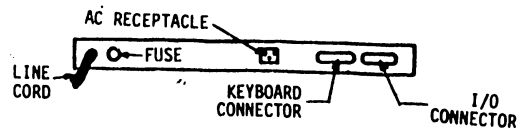
5521W LINE PRINTER OPTION (LPO)

FIGURE 6-7

6-12



**FIGURE 6-8 LPO OPTION 5521 WITH BLACK BOX COVER REMOVED**



5531W LINE PRINTER OPTION (LPO)

FIGURE 6-9

The controls and indicators for the Model 5531 are as follows:

- 1) Master power switch - The Master ON/OFF power switch is located on the rear of the printer. Power is furnished to the Interface box from an auxiliary AC receptacle on the rear panel of the printer.
  - 2) Power on lamp - Illuminates when power is on.
  - 3) SELECT switch - Enables printing operation (Switch lights when selected)
  - 4) Top of Page - Paper feeds to the next page top.
  - 5) Change Paper and Malfunction are the remaining indicators.
- The 5531 printer has a modified keyboard 6762-1.

### 6.3.3 VOLTAGE CHECKOUT FOR INTERFACE BOX (5521W/5531W)

The checks and adjustments for the LPO Interface voltages are the same as for the PIO translator/interface except for the additional regulator board 7344 that supplied the punch. Check the LPO operating voltages as shown in figure 6-3 on the 7343 motherboard. The 7249 regulator board adjustment potentiometers are shown in Figure 6-5.

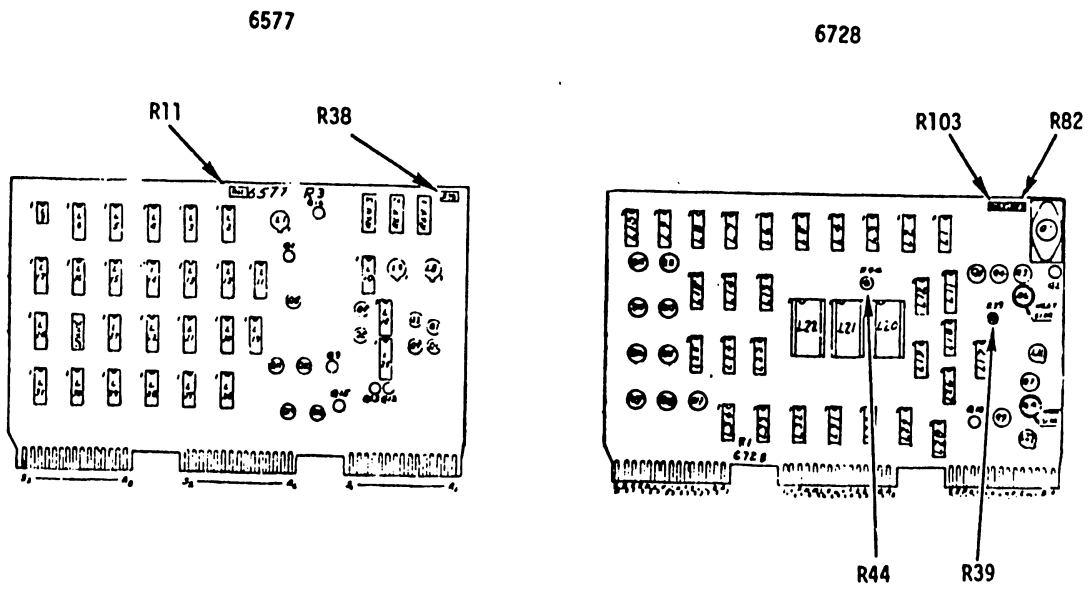
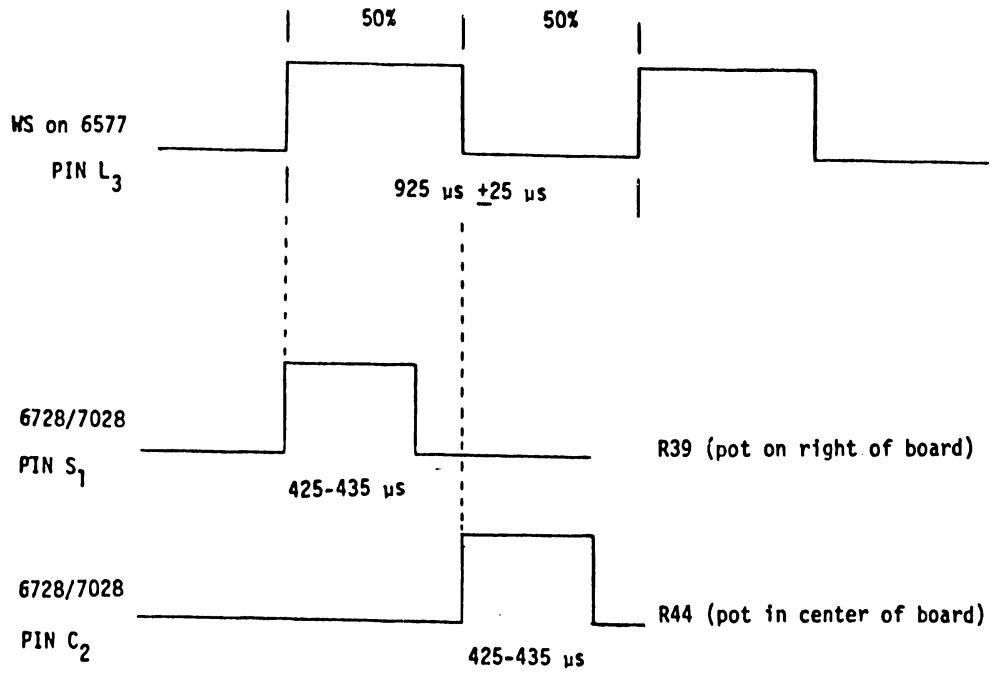
### 6.3.4 VOLTAGE AND PRINT TIMING ADJUSTMENTS FOR PRINTER MODEL 5521W

The Model 5521W Matrix Printer has two (2) variable voltage adjustments that interact with the Print Timing adjustments. Each adjustment required for Print Timing is listed below. To prevent damage to the print head, disconnect the finger board providing solenoid currents. Set up a continuous printing program while the adjustments are made. The REGULATOR AND SERVO CONTROL boards used in this Model 72 are either 6728 or 7028. (7028 supercedes 6728). If either of these two boards or the 6577 (Format and Printing Control) board are replaced then the following adjustments must be checked. See voltage and Window Stobe (WS) adjustments for Model 5521W below. The illustration is included for locating adjustments and the correct timing waveforms for WS.

NOTE: WS = Window Strobe ( The signal generated when light scans the fence during carriage movement.)

LEVEL OR SIGNAL	BOARD	LOCATION	MEASUREMENT	ADJUSTMENTS
+5VR	6728/7028	Pin B <sub>1</sub>	+5 volts $\pm$ .25 volts	R82
-12VR	6728/7028	Pin 13 <sub>1</sub>	-12 volts $\pm$ .25 volts	R103
WS	6577	Pin L <sub>3</sub>	925 $\mu$ s $\pm$ 25 $\mu$ s full cycle squarewave (50% duty cycle)	R38 R11
WS (TRAILING EDGE)	6728/7028	Pin C <sub>2</sub>	425-435 $\mu$ s positive pulse	R44
WS (LEADING EDGE)	6728/7028	Pin S <sub>1</sub>	425-435 $\mu$ s positive pulse	R39





MODEL 5521W VOLTAGE AND WS TIMING ADJUSTMENTS

### 6.3.5 VOLTAGE AND PRINT TIMING ADJUSTMENTS FOR PRINTER MODEL 5531W

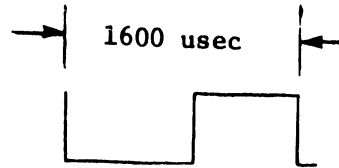
The Model 5531W Matrix Printer electrical adjustments are Print Timing adjustments and should be performed in the order listed below.

To prevent damage to the print head while making these adjustments, disconnect the print head electrically by disconnecting the finger board which plugs into the 6756 PCB. Then run a program for continuous printing. Perform the +5VR adjustment prior to print timing.

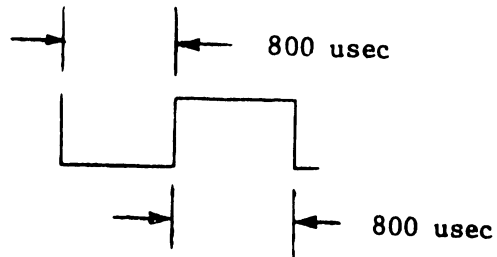
NOTE: WS (Window Strobe) is generated by the timing disk teeth passing the magnetic reluctance pick-up. See below for adjustments, WS waveforms and timing.

LEVEL OR SIGNAL	BOARD	LOCATION	MEASUREMENT	ADJUSTMENTS
+5VR	6756	Pin C <sub>1</sub>	+5 volts $\pm$ .25 volts	-R24
WS	6761	L19 pin 5	1600 $\mu$ s $\pm$ 25 $\mu$ s full cycle squarewave (50% duty cycle)	R71 R10
WS (TRAILING EDGE)	6761	L19 Pin 7	550-560 $\mu$ s negative pulse	R16
WS (LEADING EDGE)	6761	L19 Pin 9	550-560 $\mu$ s negative pulse	R19
INDEX	6761	Ch. 1 L3 pin 13 and Ch. 2 L3 pin 12 (Trig. Ch. 1)	L3 pin 13 should lead L3 pin 12 by 800 $\mu$ s	Pivot plate

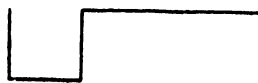
SCOPE: L19-5  
NEG. TRIGGER  
ADJUST: R71



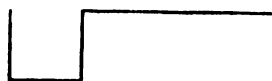
SCOPE: L19-5  
NEG. TRIGGER  
ADJUST: R10



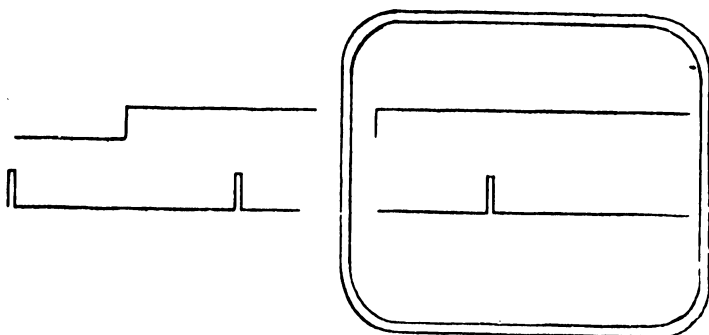
SCOPE: L19-7  
NEG. TRIGGER  
ADJUST: R16



SCOPE: L19-9  
NEG. TRIGGER  
ADJUST: R19



SCOPE: Channel 1 L13-3  
POS TRIGGER  
Channel 2 L3-12  
ADJUST: Pivot Plate



MODEL 5531W WS TIMING ADJUSTMENT

#### 6.4 WIDE PLATEN OPTION (Horizontal Scroll)

Wide Platen Option (WPO) is a CRT (workstation) hardware change that will permit the screen to scroll to the left and extend the screen width up to 158 characters wide. (Hence the name Horizontal Scroll). Without this option the screen is limited to a maximum width of 80 characters. The format line appears always to be 80 characters wide to the operator. In the WPO mode the screen moves to the left a column for each character typed after position 80. The position or character count continues to increase while folding the lower position characters under as they reach the left margin of the screen.

There are no special commands required to access this feature once the CRT/workstation has been retrofitted with this change. All the operator needs to do, to extend the format line beyond the standard 80 characters, is perform the following:

Touch the FORMAT key (to create a new format) or touch SHIFT FORMAT (to change an existing format) and move the cursor across the format line using either the space bar or cursor control keys touching the tab key whenever a tab stop is required. Once the cursor reaches the 80th character, the screen will scroll to the left. To set the right margin, place the carriage RETURN symbol at the position desired to end the format and touch EXECUTE.

When inputting text on a CRT/workstation with horizontal scroll and using a format greater than 80 characters, the system will scroll to the left when the 80th character is typed as position indicator in the status line will confirm. Once the operator has reached the last character position available on the line, the CRT will word wrap to the first position of the next line.

EXAMPLE OF 90 CHARACTER FORMAT: - If the operator is creating a single formatted document with only one format of 90 characters, the first screen will show characters 0-80. When the CRT scrolls to the left limit, the next screenload will show the characters 11-90.

EXAMPLE OF MULTI-FORMATTED DOCUMENT: - If a document has three formats within it, 90, 158, and 80 characters, the system will always scroll for the largest format recognized in the edit session regardless of the format in operation. Therefore, the first screen will display characters 0-80, and the second screen will display characters 78-158.

When working with a multi-station system having mixed CRTs, some with and some without WPO, the following editing rules apply:

- 1) Documents created on a CRT w/o WPO can be edited on a CRT with WPO.
- 2) Documents created on a CRT with WPO can be edited on a CRT w/o WPO provided the format has never exceeded 80 characters.
- 3) A document created or edited on a CRT with WPO that has exceeded a format of 80 characters can NOT be edited on a CRT w/o WPO. The system will prompt "USE WIDE PLATEN WORKSTATION" on the lower right corner of the screen and will not permit alteration of that document.

#### 6.4.1 MAINTENANCE REQUIREMENTS FOR CRT/WORKSTATION WITH WPO.

The maintenance required for a CRT equipped with WPO is the same as for the standard CRT without this option. The major hardware difference is the workstation (W.S. CRT CONTROL) circuit board 7235 which includes the additional circuitry for the WPO. The removal and replacement of this board during any maintenance period as prescribed in chapter 3 for all CRTs will correct a horizontal scroll problem if all other checks have been proven to be O.K. It should also be noted that the WPO requires jumper changes on the 7227 board (Workstation Data Link). A jumper chart located under L33 on the schematic indicates that 158 column operation requires 0 volts on L33-3 and +5 volts on L33-6.

#### 6.5 TELECOMMUNICATIONS OPTION (TC) 5528

The Telecommunications option for WP Systems 10A, 20 and 30 and Editing Station, WPS-ES, consists of the black box with its own

microprocessor, memory and power supply. The black box (Model 5528 Communications Controller) connects to the WP Master CPU in the same manner as other options. (PIO, LPO, CRT and DAISY PRINTER). The hardware in the black box (TC channel) interface is capable of supporting asynchronous as well as synchronous transmissions.

The operating instructions, installation and features are incorporated in WPNLs #40 and #40.1.

The maintenance provisions for the Telecommunications Controller are the same as for the other options using the black box. The voltage checks and adjustments, removal and replacement of defective circuit boards and switch settings are included for this option.

#### 6.5.1 MAINTENANCE REQUIREMENTS FOR TC OPTION (Model 5528 Communications Controller)

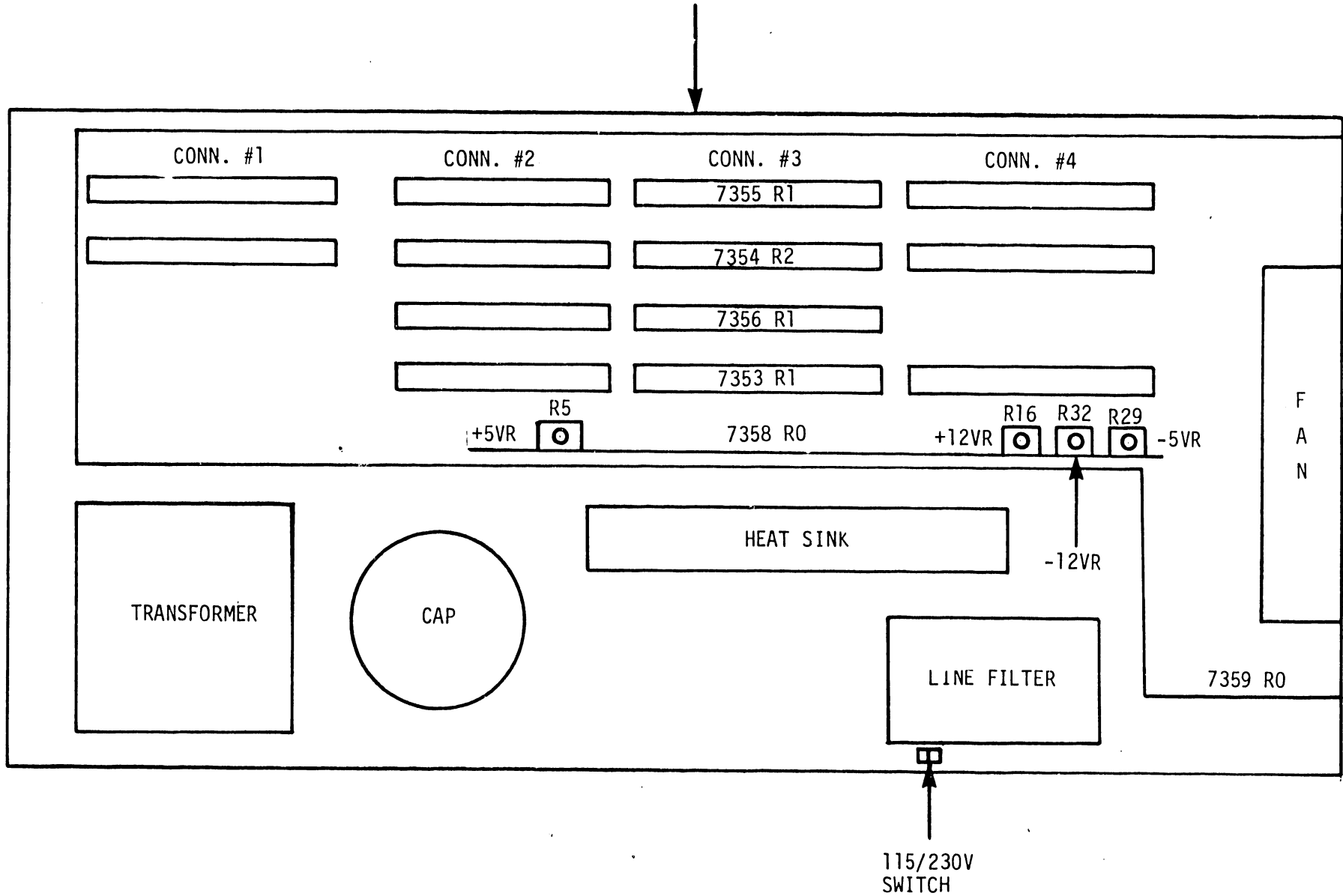
##### a) Printed circuit board complement

210-7353	Data Link TC
210-7354	Memory
210-7355	CPU
210-7356	Modem/ALU Interface (RS-232)
210-7357	TCP Current Loop (replaces 7356 PCB)
210-7358	Voltage Regulator
210-7359	Motherboard (Chassis)

##### b) D.C.Voltage adjustments and checks

The operating voltages for the 5528 communications controller are regulated by circuit board 7358. The adjustment potentiometers for the operating voltages are also mounted on the same board and located as shown in Figure 6-10. The following chart lists the controls, check points and tolerances for the controller. The cover on the controller must be removed for access to the following adjustments and voltage checks as well as the R & R of the electrical circuit boards.

COMPONENT SIDE



6-23

TC CONTROLLER (BLACK BOX) WITH COVER REMOVED  
FIGURE 6-10

ADJ POT	REGULATED		ADJ. VOLTAGE
ON 7358	VOLTAGE	LOCATION	RANGE
R5	+5 Volts	7355 Pin Y Conn.4	+4.9 to +5.1
R16	+12Volts	7355 Pin S Conn.2	+11.7to +12.2
R29	-5Volts	7355 Pin X Conn.4	-4.9 to -5.1
R32	-12Volts	7356 Pin 14 Conn.2	-11.7 to -12.2

OR

L4 (75150 IC) Pin 5

c) Address switch settings on PCBs 7353 and 7355

PCB 7353 has a bank of five Device Type microswitches to be set as specified when a Model 5528 is connected to the Master CPU (Device Type = HEX 08). Set switches as follows:

	1	2	3	4	5
ON	*	*	*	*	
OFF					*

The Model 5528 hardware also has the facility to have more than one (1) Model 5528 connected to the Master CPU. In this case, each TC channel must have its unique address set by the bank of 8 channel I.D. microswitches on PCB 7355. At this time, only one Model 5528 can be attached to the WP System. Only address switch No.1 must be set to "ON". See OCR settings in section 6.6

d) Controls and Indicators (See figure 6-10 and 6-11)

1. Input Power Voltage Switch--- 110V/220V (switch selectable)
2. Power Switch - ON/OFF (Rear Panel)
3. Disconnect Switch - A recessed pushbutton on the front panel for Data Communication Mode.
4. Power fuse rating (Rear panel)- 1.5A(115V)/3A(220V)



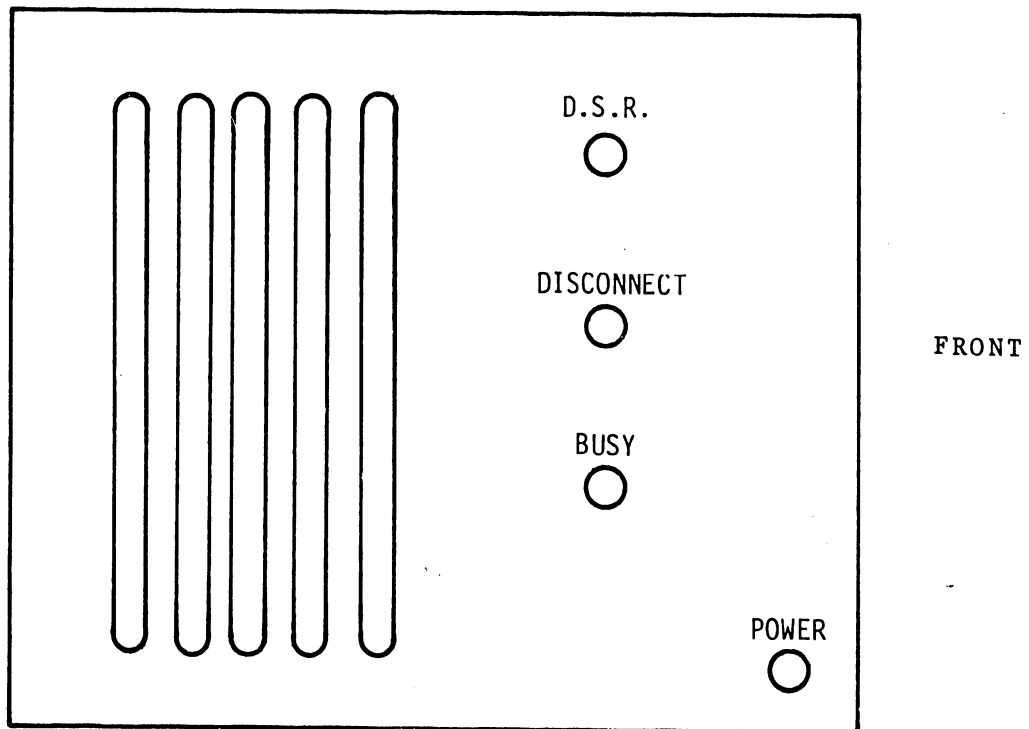
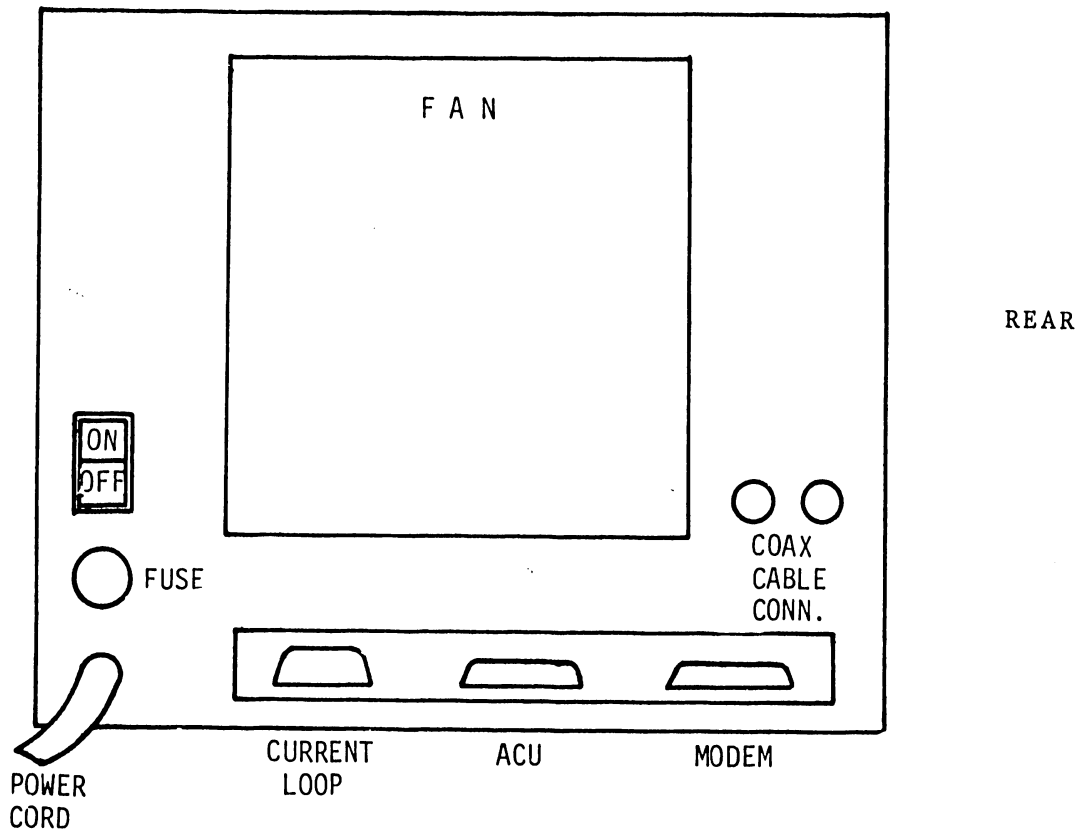


FIGURE 6-11 COMMUNICATIONS CONTROLLER

Status Lamps (Front panel-See Figure 6-11)

1. Data Set Ready (DSR)
2. Busy (Communications in progress)
3. Power ON

I/O Connectors

1. Modem (RS-232-C)
2. AUTO Calling Unit (ACU)
3. Current Loop
4. I/O Data Link co-ax connectors.

6.6 OPTICAL CHARACTER RECOGNITION (OCR) OPTION (5595-9)

The Optical Character Recognition (OCR) option is an automatic means of entering human readable information directly into a computer. It eliminates the keyboard and keyboard operators to translate typewritten information into computer code. The OCR is now available as an option for Wang Word Processing Systems. The OCR Model #5595-9 includes the 4000 Series Autoreader (figure 6-12) and the familiar Wang black box (5528) used with WP Telecommunications option. The Autoreader made by ECRM, INC scans typewritten pages and translates them into computer code. The black box is the same Model 5528 used as a controller with the TC option discussed in section 6.5. The hardware furnished by Wang consists of the following items:

Wang Hardware

- a) 1 5528 OCR Interface unit
- b) 1 Null Modem (2227 or 2228N)
- c) 1 Co-axial cable (WLI #220-0148)
- d) 2 TC cables (WLI #220-0113)

6.6.1 MAINTENANCE REQUIREMENTS FOR THE OCR OPTION

- a) Autoreader

All maintenance performed on the Autoreader will be the responsibility of the Mfr. ECRM INC. The customer purchases the

Autoreader direct and the installation results in a joint effort between the two companies.

b) Model 5528 OCR Interface unit (Same as TC)

Level 1 maintenance for the 5528 Interface unit is identical to the maintenance specified in the TC section 6.5. Maintenance is limited to R & R of circuit boards, voltage checks and adjustments.

c) OCR Address Switch Settings

PCB 7353 has a bank of five Device Type microswitches to be set as specified for a Model 5528 that is connected to the Master CPU (Device Type = 08)

	1	2	3	4	5
ON	*	*	*	*	
OFF					*

The Model 5528 hardware also has a facility when more than one Model 5528 is connected to the Master CPU. In this case, each TC channel (substitute OCR) must have its unique address coded on the bank of 8 channel I.D. microswitches mounted on circuit board 7355. Set the Channel(I/O port) identification switches 1 through 5 to the ON position.

6.7 TWIN SHEET FEEDER OPTION (TSF) (5538)

The Model 5538 Twin Sheet Feeder is an electronically controlled Wang WP Accessory designed for use with the Model 5581 Daisy Printer. The TSF automatically and continuously feeds single sheets of paper to the printer as they are needed.

Enough information has been disseminated in WPNL #43.1 (Supercedes WPNL #43) to provide field personnel with the installation, operation and theory necessary to maintain an operating TSF option.

Enough information has been disseminated in WPNL #43.1 (Supercedes WPNL #43) to provide field personnel with the installation, operation and theory necessary to maintain an operating TSF option.

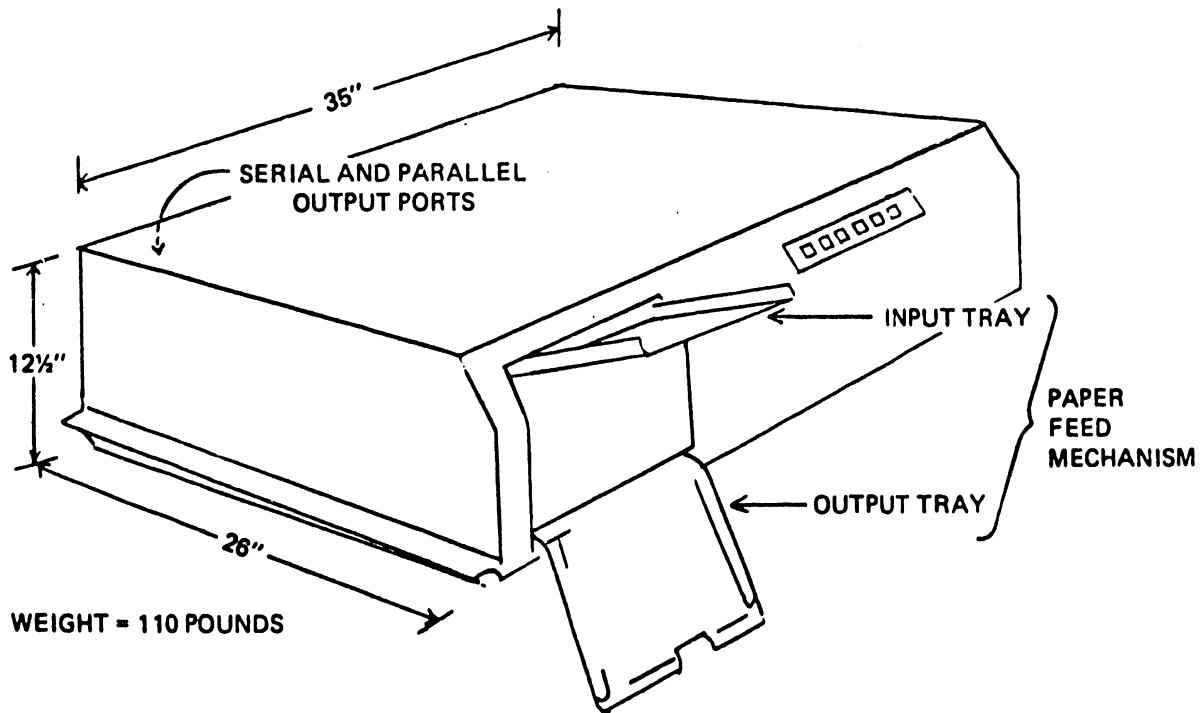


FIGURE 6-12  
THE 4000 SERIES AUTOREADER

# **APPENDIX**

## **A**

APPENDIX A

Interconnection Drawings

1. D 6840-999--(928 MASTER)
2. D 6843-999--(Model 5581 PRINTER 928 P1)

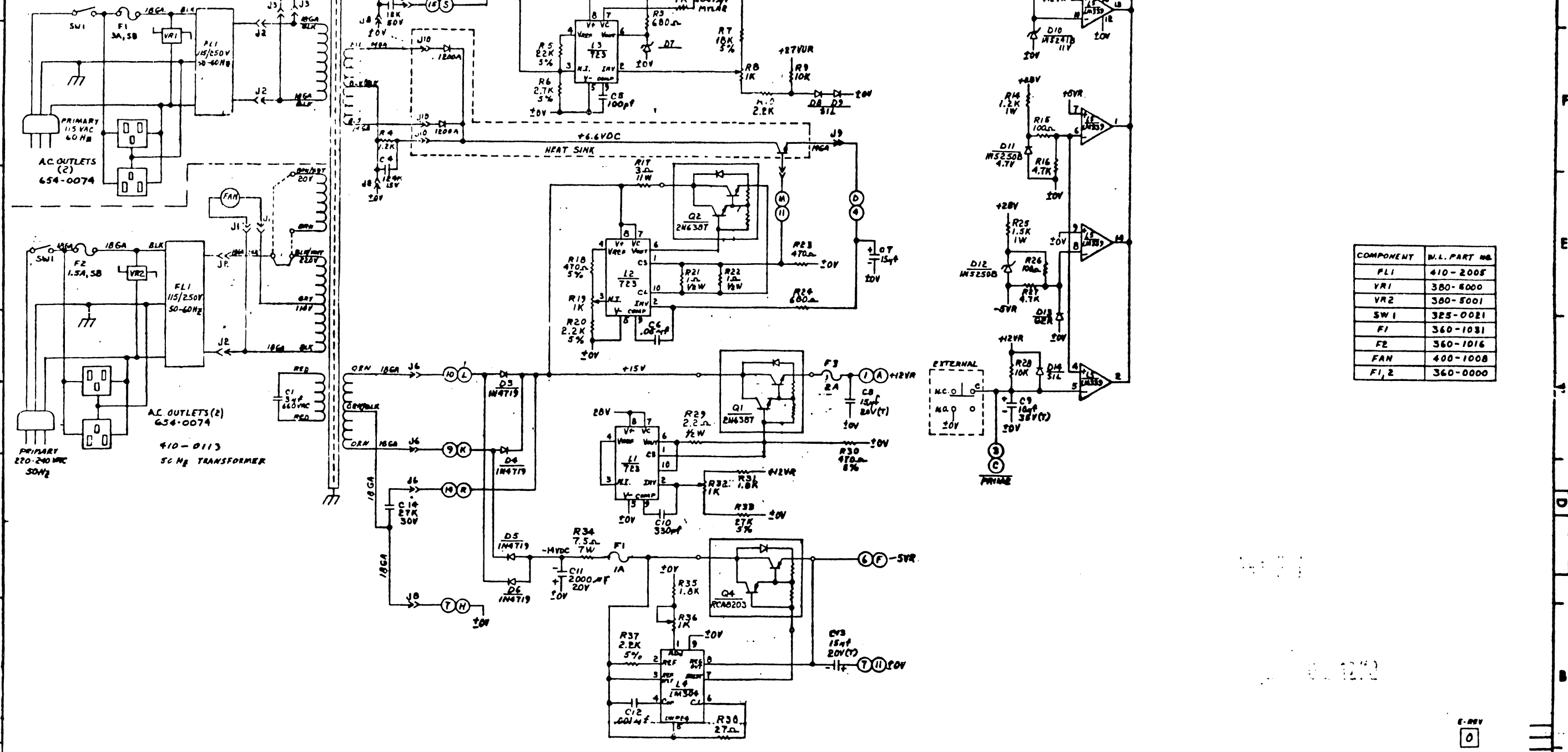
Schematics for 9" and 12" Monitor (CRT) Boards.

1. D 210-7256
2. D 210-7456

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MILLIMETERS IN PARENTHESES  
TOLERANCES TO BE EQUIVALENT TO INCH DIMENSIONS

TRANSFORMER  
VIL # 410-0111  
DWG # 5068-107



HOLE LEGEND & TOLERANCES	
NO. 1 DIA.	±.002
NO. 2 DIA.	±.003
NO. 3 DIA.	±.004
NO. 4 DIA.	±.005
NO. 5 DIA.	±.006
NO. 6 DIA.	±.007
NO. 7 DIA.	±.008
NO. 8 DIA.	±.009
NO. 9 DIA.	±.010
NO. 10 DIA.	±.011
NO. 11 DIA.	±.012
NO. 12 DIA.	±.013
NO. 13 DIA.	±.014
NO. 14 DIA.	±.015
NO. 15 DIA.	±.016
NO. 16 DIA.	±.017
NO. 17 DIA.	±.018
NO. 18 DIA.	±.019
NO. 19 DIA.	±.020
NO. 20 DIA.	±.021
NO. 21 DIA.	±.022
NO. 22 DIA.	±.023
NO. 23 DIA.	±.024
NO. 24 DIA.	±.025
NO. 25 DIA.	±.026
NO. 26 DIA.	±.027
NO. 27 DIA.	±.028
NO. 28 DIA.	±.029
NO. 29 DIA.	±.030
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NO. 31 DIA.	±.032
NO. 32 DIA.	±.033
NO. 33 DIA.	±.034
NO. 34 DIA.	±.035
NO. 35 DIA.	±.036
NO. 36 DIA.	±.037
NO. 37 DIA.	±.038
NO. 38 DIA.	±.039
NO. 39 DIA.	±.040
NO. 40 DIA.	±.041
NO. 41 DIA.	±.042
NO. 42 DIA.	±.043
NO. 43 DIA.	±.044
NO. 44 DIA.	±.045
NO. 45 DIA.	±.046
NO. 46 DIA.	±.047
NO. 47 DIA.	±.048
NO. 48 DIA.	±.049
NO. 49 DIA.	±.050
NO. 50 DIA.	±.051
NO. 51 DIA.	±.052
NO. 52 DIA.	±.053
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NO. 58 DIA.	±.059
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NO. 68 DIA.	±.069
NO. 69 DIA.	±.070
NO. 70 DIA.	±.071
NO. 71 DIA.	±.072
NO. 72 DIA.	±.073
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NO. 75 DIA.	±.076
NO. 76 DIA.	±.077
NO. 77 DIA.	±.078
NO. 78 DIA.	±.079
NO. 79 DIA.	±.080
NO. 80 DIA.	±.081
NO. 81 DIA.	±.082
NO. 82 DIA.	±.083
NO. 83 DIA.	±.084
NO. 84 DIA.	±.085
NO. 85 DIA.	±.086
NO. 86 DIA.	±.087
NO. 87 DIA.	±.088
NO. 88 DIA.	±.089
NO. 89 DIA.	±.090
NO. 90 DIA.	±.091
NO. 91 DIA.	±.092
NO. 92 DIA.	±.093
NO. 93 DIA.	±.094
NO. 94 DIA.	±.095
NO. 95 DIA.	±.096
NO. 96 DIA.	±.097
NO. 97 DIA.	±.098
NO. 98 DIA.	±.099
NO. 99 DIA.	±.100
NO. 100 DIA.	±.101

COMPONENT	M.L. PART NO.
FL1	410-2005
VR1	380-4000
VR2	380-5001
SW1	325-0021
F1	360-1031
FE	360-1016
FAN	400-1008
F1,2	360-0000

NO.	REVISION	DATE	BY	APPROVED BY
1	DESIGNED PER			
2	REVISED PER			
3	REVISED PER			
4	REVISED PER			
5	REVISED PER			
6	REVISED PER			
7	REVISED PER			
8	REVISED PER			
9	REVISED PER			
10	REVISED PER			
11	REVISED PER			

QTY	ITEM	WANG PART NO.	DRAWING NO.	DESCRIPTION
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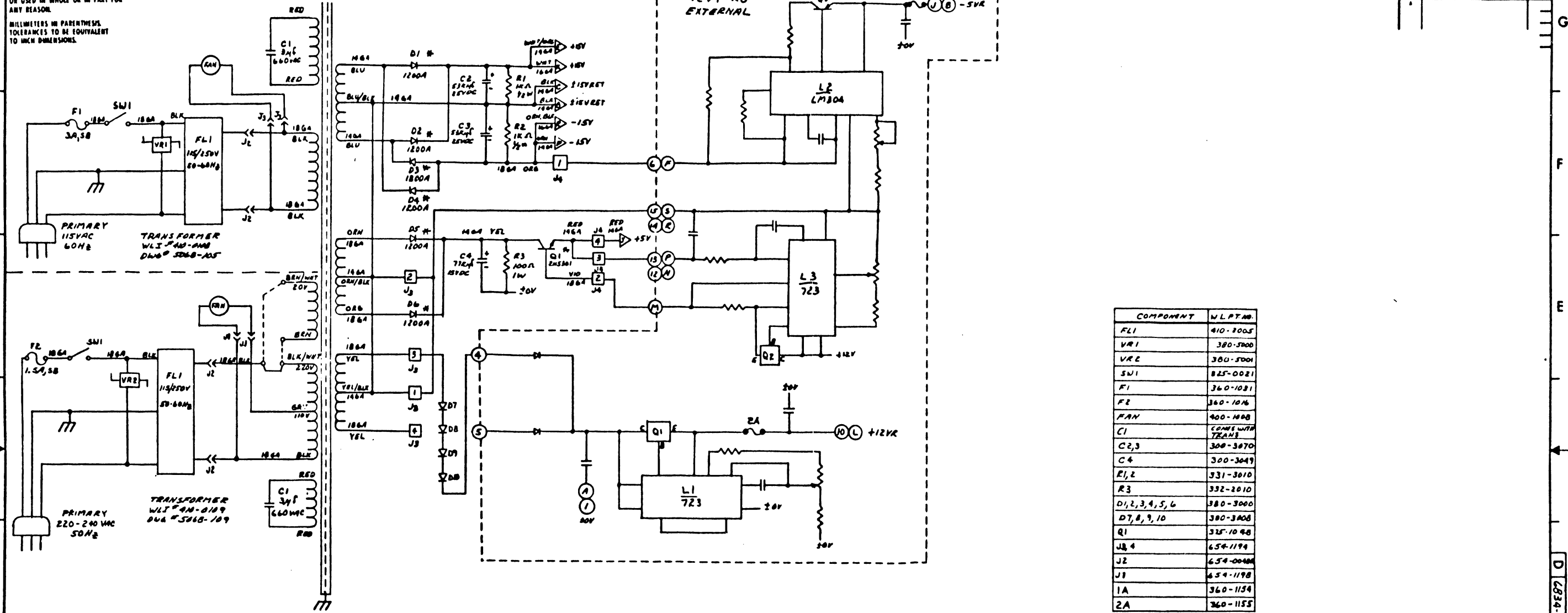
MODEL NO. 928  
TITLE: INTERCONNECTION DIAGRAM FOR MODEL 928 MASTER  
DATE: 6-77  
BY: [Signature]  
APPROVED BY: [Signature]  
D 6840-999 3

11 10 9 8 7 5 4 3 2 1

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G MILLIMETERS IN PARENTHESES. TOLERANCES TO BE EQUIVALENT TO MICH DIMENSIONS.

MOM LEGEND & TOLERANCES			
SYM	DESCRIPTION	QTY	SYM



COMPONENT	W.L.P.T.M.
FL1	410-1005
VR1	380-3000
VR2	380-3001
SW1	825-0021
F1	360-1031
F2	360-1016
FAN	400-1008
C1	COMES WITH TRANS
C2,3	300-3070
C4	300-3049
L1,2	331-3010
R3	332-2010
D1,2,3,4,5,6	380-3000
D7,8,9,10	380-3008
Q1	325-1048
J1,4	654-1194
J2	654-0048
J3	654-1198
1A	360-1154
2A	360-1155

NOTES: 1.  $\nabla$  DENOTES POWER CABLE TO DRAST PRINTER. SEE DWG (6402-118).  
 2. ADD 5 FOR 240VAC AND REMOVE 6 JUMPER  
 \* LOADED ON HEAT SINK

REV 0

REV	DATE	BY	DESCRIPTION
1	1/10/71	WJH	REVISED PER 6402-118
2	1/10/71	WJH	REVISED PER 6402-118
3	1/10/71	WJH	REVISED PER 6402-118
4	1/10/71	WJH	REVISED PER 6402-118

QTY	ITEM	WANG PART NO	DRAWING NO	DESCRIPTION

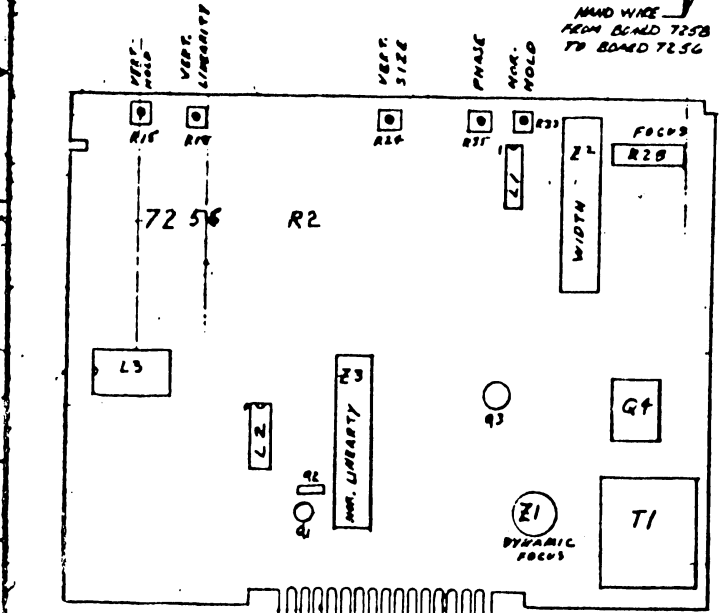
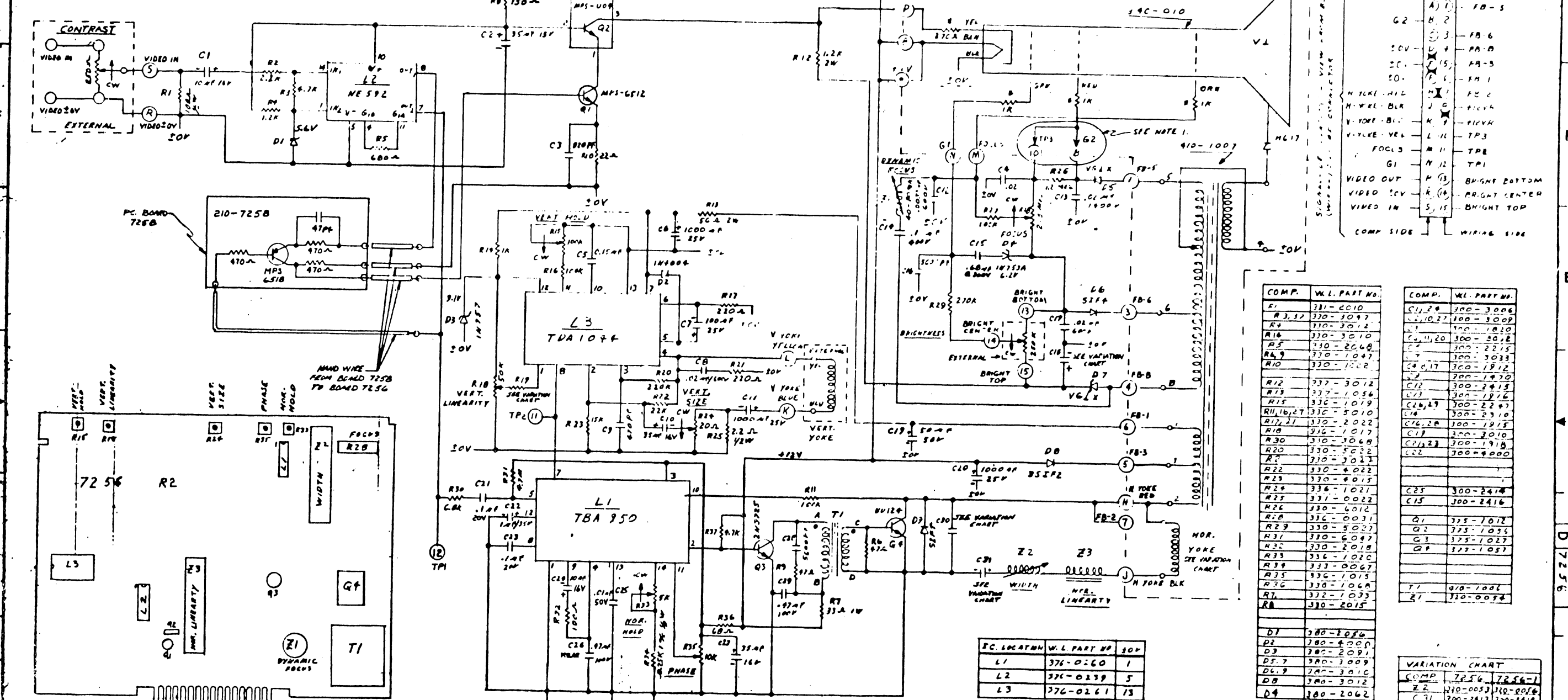
<b>WANG</b> LABORATORIES, INC.		BY	DATE	APPROVED BY	DATE
		DWN	1/23/71	ENG	1/27/71
		ENG		ENG	
		MFG		ENG	
MATERIAL		TITLE INTERCONNECTION DIAGRAM FOR MODEL 920 PI			
FINISH		SEE ENGR SPECIFICATIONS			
		100% AS BUILT		D 6843-999 2	
		100% TESTED		D 6843-999 2	

11 10 9 8 7 5 4 3 2 1



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MILLIMETERS IN PARENTHESES  
DIMENSIONS TO BE EQUIVALENT TO INCH DIMENSIONS



COMP.	W.L. PART NO.
R1	331-2010
R2, R3	330-3097
R4	330-3012
R5	330-3070
R6	330-2068
R7	330-1047
R8	330-1002
R9	330-3012
R10	330-1056
R11	336-1019
R12, R13	330-5010
R14	330-2022
R15	336-1017
R16, R17	330-3069
R18	330-5022
R19	330-3033
R20	330-4023
R21	330-8015
R22	336-1021
R23	331-0022
R24	330-6012
R25	336-0031
R26	330-5027
R27	330-6047
R28	330-2018
R29	336-1020
R30	333-0067
R31	336-1015
R32	330-106A
R33	332-1035
R34	330-2015
D1	330-2056
D2	330-4000
D3	330-2081
D4, D5	330-3009
D6, D7	330-3010
D8	330-3012
D9	330-2062

COMP.	W.L. PART NO.
C1, C2	300-3006
C3, C4	300-3009
C5	300-1810
C6, C7	300-3010
C8	300-2215
C9	300-3033
C10	300-1812
C11	300-1810
C12	300-2415
C13	300-1816
C14, C15	300-2215
C16	300-2310
C17, C18	300-1915
C19	300-2010
C20, C21	300-1918
C22	300-4000
C23	300-2414
C24	300-2416
G1	335-1012
G2	335-1055
G3	335-1027
G4	333-1057
T1	410-1001
T2	330-0094

COMP.	W.L. PART NO.	7256-1
Z1	330-0053	330-0056
Z2	300-2413	300-2418
Z3	300-2412	300-2417
Z4	330-3068	330-4017
Z5	330-2417	300-1818
Z6	330-0051	330-0058
Z7	330-2033	330-0035
Z8	330-0061	330-0077
Z9	330-1014	330-1014

PC LOCATION	W.L. PART NO.	30P
L1	336-0260	1
L2	336-0259	5
L3	336-0261	13

NOTES:  
1. THE G2 LEAD CAN BE TIED TO EITHER PIN B OR PIN 10 WHICH EVER GIVES BEST PERFORMANCE.

E-REV 7256-1  
2

SYMBOL	DESCRIPTION	QTY	ITEM	WANG PART NO.	DRAWING NO.	DESCRIPTION	BY	DATE	APPROVED BY	DATE
0	ORIGINATED PER									
1	DESIGNED PER									
2	REVISED PER									
3	REVISED PER									
4	REVISED PER									
5	REVISED PER									
6	REVISED PER									
7	REVISED PER									
8	REVISED PER									
9	REVISED PER									
10	REVISED PER									
11	REVISED PER									

**WANG LABORATORIES, INC.**

MODEL NO. 9" x 12"

WANG MONITOR

ELECTRONICS FOR 9" AND 12" MONITOR

DATE: 11/20/71

BY: [Signature]

APPROVED BY: [Signature]

DATE: 11/20/71

FINISH: [Blank]

DATE: 11/20/71

BY: [Signature]

APPROVED BY: [Signature]

DATE: 11/20/71

DATE: 11/20/71

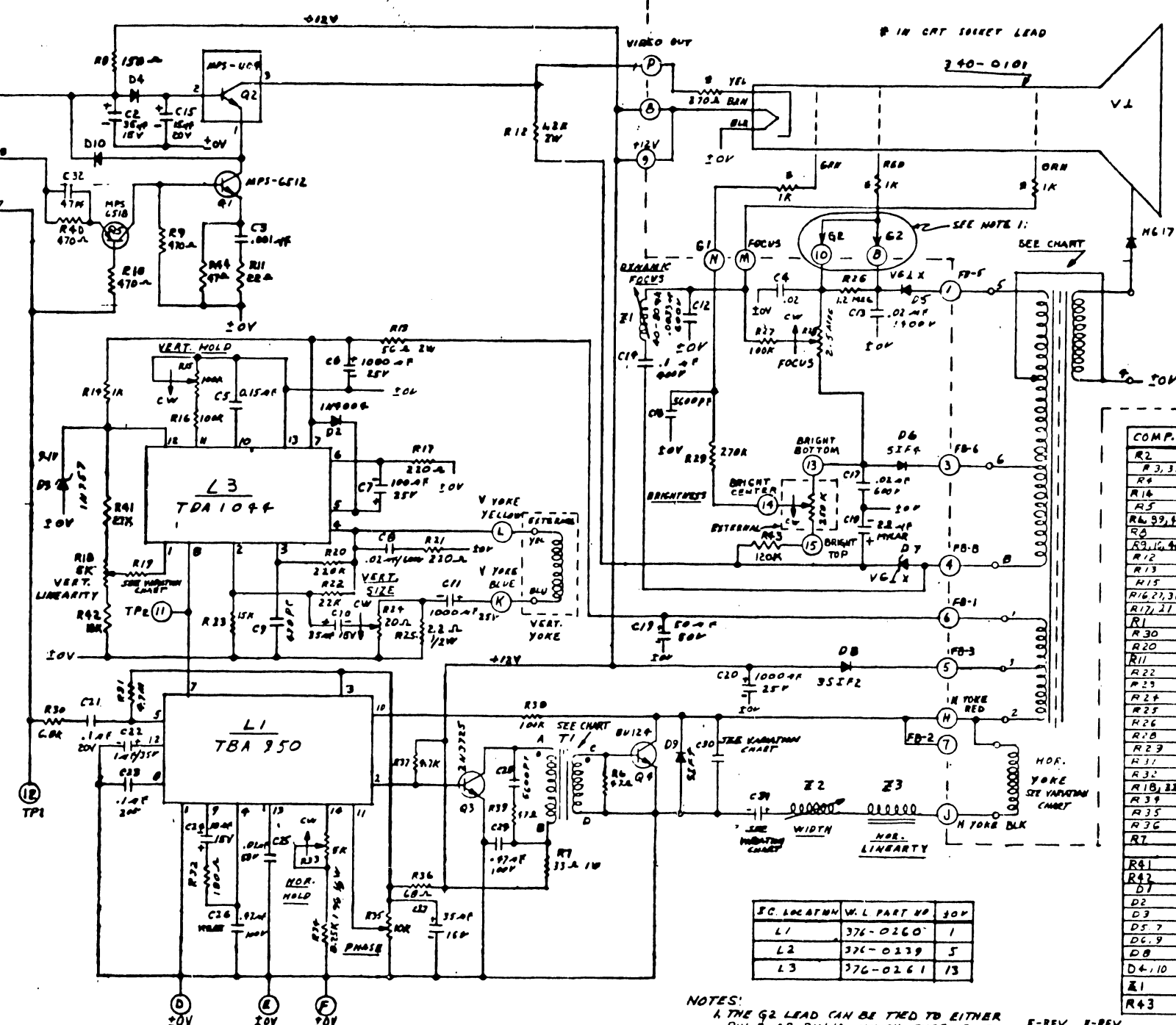
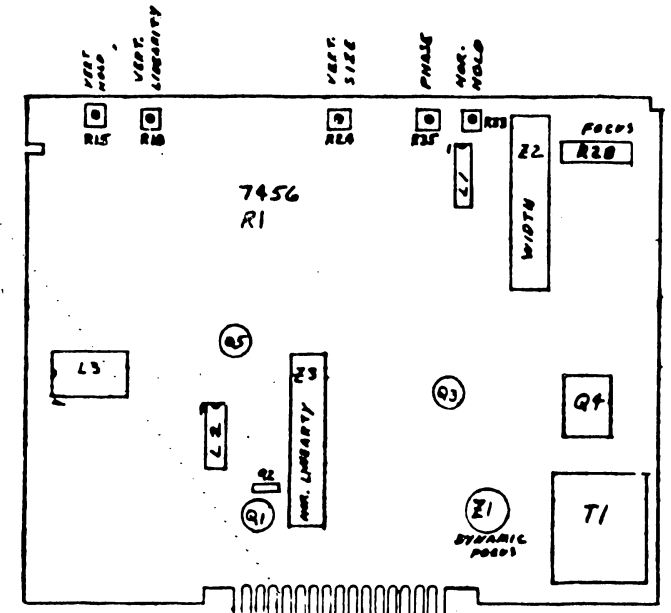
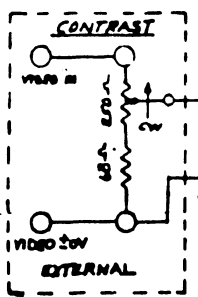
BY: [Signature]

APPROVED BY: [Signature]

DATE: 11/20/71

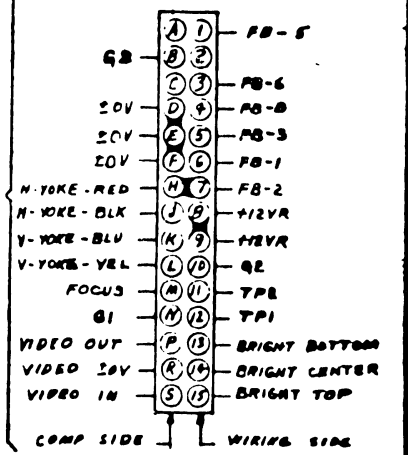
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MILLIMETERS IN PARENTHESES. TOLERANCES TO BE EQUIVALENT TO DIMENSIONS.



NC 1 LEGEND & TOLERANCES

UNIT	TOLERANCE
RESISTOR	± 5%
CAPACITOR	± 10%
INDUCTOR	± 10%



COMP.	VL PART NO.
R2	330-3022
R3,37	330-3047
R4	330-3012
R14	330-3010
R5	330-2068
R6,99,14	330-1047
R8	330-2015
R9,10,40	330-2047
R12	337-3012
R13	337-1056
R15	336-1019
R16,21,38	330-5010
R17,27	330-2022
R1	331-2010
R30	330-3068
R20	330-5022
R11	330-1022
R22	330-4022
R23	330-4015
R24	336-1021
R25	331-0022
R26	330-4012
R18	336-0031
R29	330-5027
R11	330-2010
R32	330-2010
R18,23	336-1020
R39	333-0067
R35	336-1015
R26	330-1068
R7	332-1039
R41	330-4027
R42	330-4018
D1	380-2056
D2	380-4000
D3	380-2091
D5,7	380-3009
D6,9	380-3010
D8	380-3012
D4,10	380-1001
R1	320-0054
R43	330-5012

COMP.	VL PART NO.
C1,2,9	300-3006
C2,10,27	300-3009
C3	300-1906
C9	300-1470
C12	300-2415
C6,29	300-2247
C14	300-2310
C16,34	300-1475
C19	300-3010
C21,23	300-1918
C22	300-4000
C25	300-2414
C18	300-2418
C4,8,17	300-1312
C5	300-2215
C6,11,20	300-3022
C7	300-3033
C13	300-1214
C32	300-1647
G1	375-1012
G2	375-1056
Z3	375-1027
Z4	375-1057
S5	375-1014
C15	300-4022
T1	410-1006

IC LOCATION	VL PART NO.	30V
L1	376-0260	1
L2	376-0239	5
L3	376-0261	13

COMP.	7456	7456-1
RF	330-3068	330-4027
C30	300-2417	300-2417
C21	300-2413	300-2418
R2	300-0053	320-0056
Z3	300-0051	320-0058
HOR. YOKE	320-0052	320-0057
FLY BACK	410-1007	410-1008

NOTES:  
 1. THE G2 LEAD CAN BE TIED TO EITHER PIN 8 OR PIN 10 WHICH EVER GIVES BEST PERFORMANCE.  
 E-REV 7456  
 E-REV 7456-1

CHANGE IN PROCESS

PER DATE 9/27/78  
 DATE 11-07-1978

REV	DATE	BY	DESCRIPTION
1	11/07/78	...	...
2	...	...	...

QTY	ITEM	WANG PART NO.	DRAWING NO.	DESCRIPTION
	...	...	...	...



BY	DATE	APPROVED BY	DATE
...	...	...	...

TITLE	SCALE	DATE	REV
ELECTRONICS FOR 9" x 12" MONITOR	SEE CHART	D	7456

# **APPENDIX**

## **B**

APPENDIX B

WORD PROCESSING NEWSLETTER #54 (Company Confidential) dated September 1, 1978 will be issued to all WANG activities when final printing is completed. This document is a "PRELIM" version of instructions for the loading of EVENT HANDLER software. Until this document is issued the following settings of all PROGRAM LEVEL switches for WP Systems 10, 10A, 20, and 30 and options will remain as illustrated below. System 25 switch setting information is included with options in WPNL #54.

PROGRAM LEVEL SWITCH SETTINGS FOR WP SYSTEM MASTERS (7202 PCB)

SYSTEM #	SWITCH #	1	2	3	4	5	6	7	8
	10		*					*	
	10A		*	*	*	*			*
	10A(Mod.II)			*				*	
	20			*	*		*	*	
	30	*					*		

\* Indicates switch position ON

PCB 7346 (I/O BOARD FOR 928 MATRIX, DAISY PTR & PIO)

JUMPERS	IN	OUT
H, I	LINE PTR, PUNCH	DAISY PTR
D, E	LINE PTR, PUNCH	DAISY PTR
A, C	LINE PTR, DAISY PTR	PUNCH
A, B	PUNCH	LINE PTR, DAISY PTR
G, F	DAISY PTR	LINE PTR, PUNCH

PCB 7446 (I/O BOARD FOR 928 MATRIX, DAISY PTR. & PIO)

PCB 7446 is the new Universal I/O board that replaces PCB 7346. Incorrect settings of the new OPTION select switch (5 position) has caused some problems. See chart below for settings presently in use. The following devices can interface with this board:

5511- 8K Daisy printer  
 5521W- Matrix printer (200 CPS)  
 5508- PIO (Systems 25 & 30)  
 5581W- Wang Daisy PTR  
 5581- 12K Daisy Printer  
 5531W- Matrix Printer (120 CPS)  
 5571- Chain Printer  
 5581WWP- Wang Daisy (Wide Platen)  
 5581&TSF (Daisy PTR. with Twin Sheet Feeder)

SWITCH #	1	2	3	4	5
5511					
5581					
5521W					
5531W					
5508					
5571		*			
5581W		*			
5581WWP	*				
5581& TSF					

NOTE:

ONLY THE SWITCHES MARKED WITH AN \* SHOULD  
 BE IN THE "ON" POSITION.

PCB 7348 (I/O BOARD FOR 928 MATRIX, DAISY PTR. & PIO)

TYPE OF DEVICE	SW1	SW2	SW3	SW4	SW5
HY-TYPE II (DAISY)	*	*		*	
MATRIX PRINTERS(21W, 31W)			*	*	
PAPER TAPE PUNCH				*	

**END**