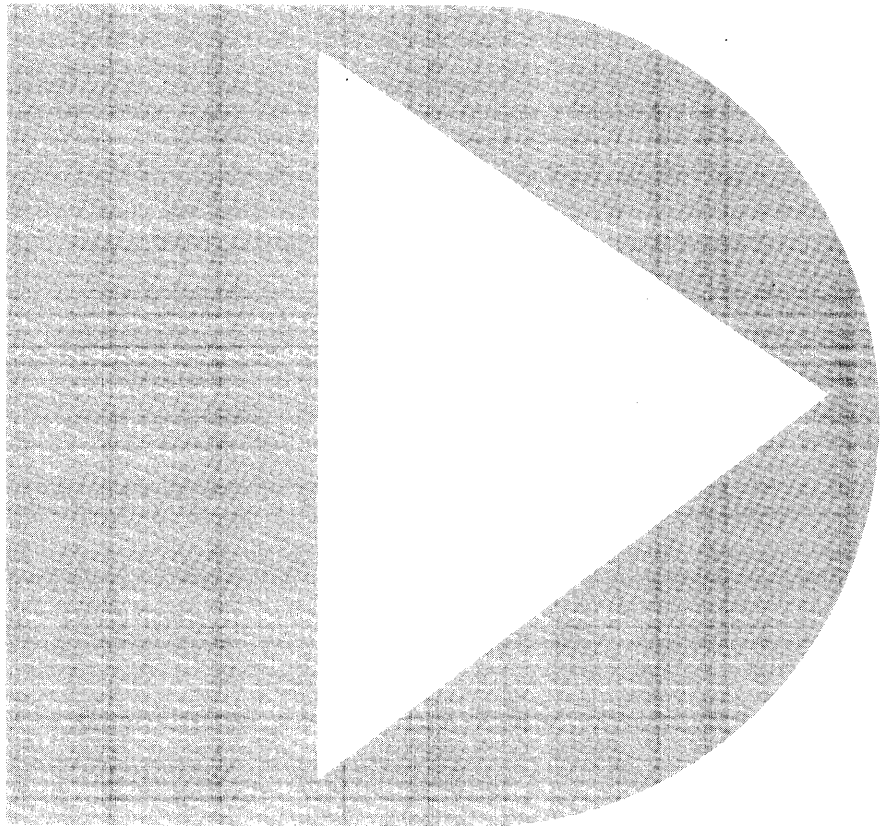


Product Specification



Datapoint

DATAPOINT CORPORATION

PRODUCT SPECIFICATION

11/22/71

ASYNCHRONOUS COMMUNICATIONS ADAPTOR

2200-400

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1.0 GENERAL DESCRIPTION

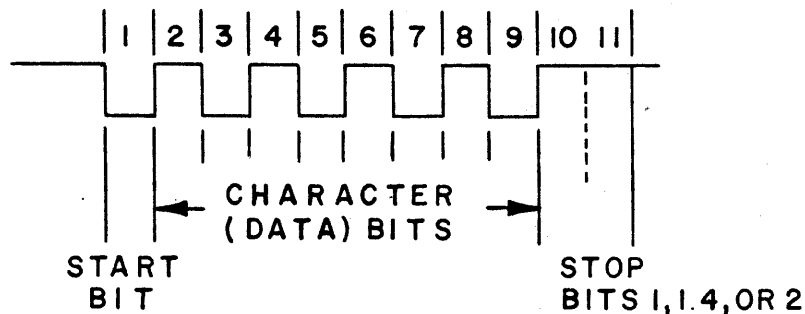
Many digital data communications systems and data processing devices utilize a start-stop asynchronous mode of communication. To allow the Datapoint 2200 to interface with this serial form of communication, the Asynchronous Communication Adaptor is used. The Communications Adaptor converts the internal parallel I/O bus data of the Datapoint 2200 into a serial form complete with start and stop pulses (bits). Output and input of the adaptor meet the Electrical Industries Association RS232B specifications.

The 2200-400 operates completely under program control. The device is assigned a unique address and attaches directly to the 2200 I/O bus. Character length and data rate are controlled by the 2200 processor. No manual adjustments are present on the adaptor. The required number of start and stop pulses are automatically added and subtracted on transmitted and received data.

The EIA RS232B serial output of the Asynchronous Communications Adaptor can be connected to a wide variety of devices. Interface requirements are met for Bell Datasets, acoustic couplers and serial format peripherals such as teletypes and many printers.

1.1 Asynchronous Communications Format

In asynchronous communications, the characters generated are preceded by a 'start' bit and terminated with 1, 1.4 or 2 'stop' bits.



Using this format, characters can be transmitted without regard to frequency of sending. Characters can be sent occasionally or packed one after the other. The start and stop bits provide complete identification for each character. The baud, or pulse rate, must be equal at the sending and receiving devices.

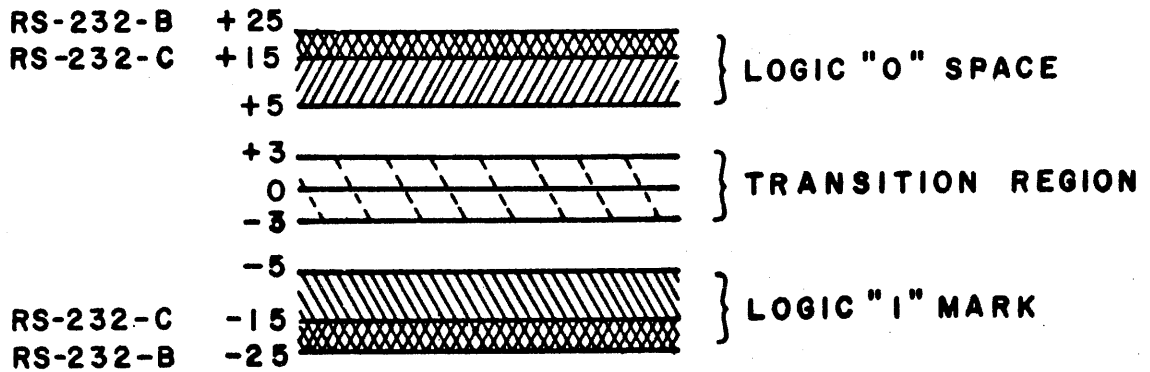
1.2 Codes

Many codes are used in asynchronous formats. The 2200-400 will accept any bit pattern from the Datapoint 2200 and, as the Adaptor is under processor control, virtually any code within the limits of the character length can be used. ASCII, EBCDIC, BAUDOT and others are commonly transmitted and received with the 2200-400. Pure binary data can also be used in the asynchronous format.

1.3 RS232B Data

The Adaptor is designed to send RS232B and receive EIA RS232B (or C) level data. The Electrical Industries Association defines this data as having a polar +25 to -25 volt logic level (+15 to -15 for RS232C) with a specific rise and fall time.

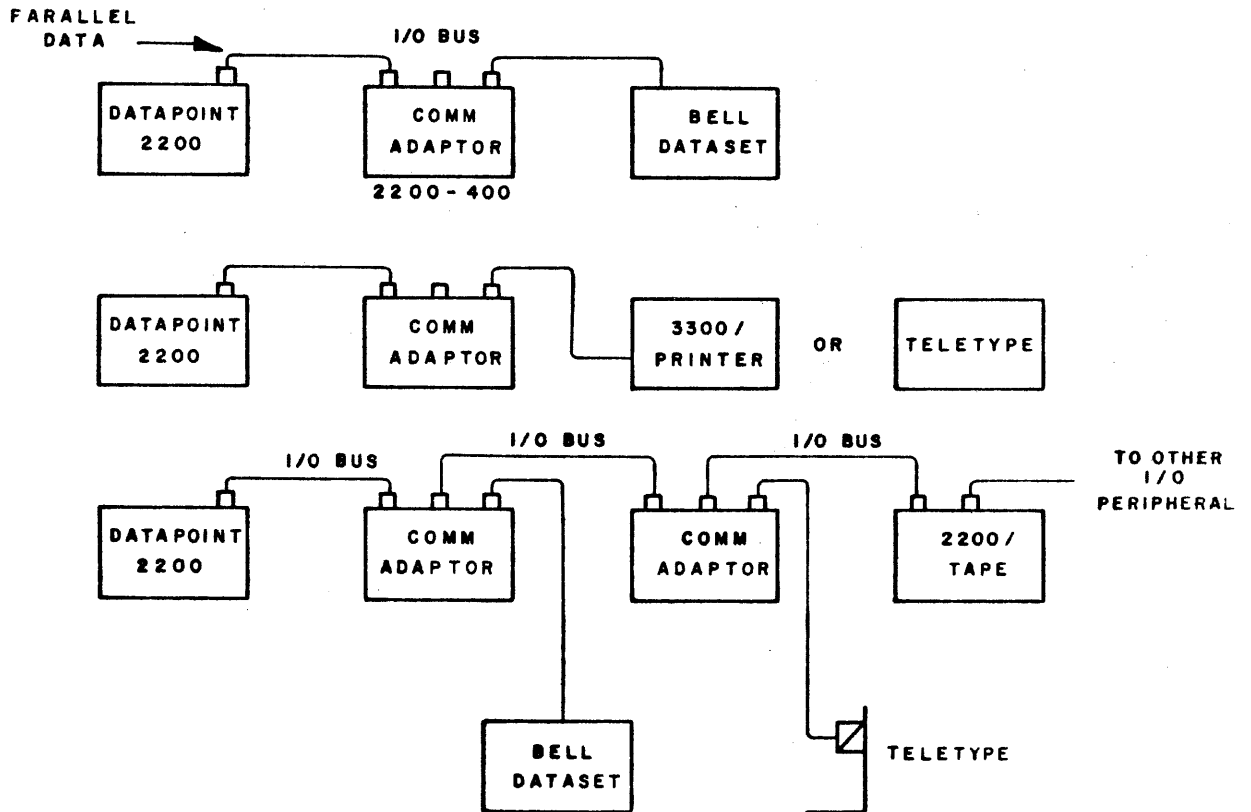
RS232B level data is widely used for modems, datasets, and many serial format peripherals.



VOLTAGE LEVELS

2.0 SYSTEM CONFIGURATION

2.1 Typical Systems



2.2 Datapoint 2200 Interface

The Asynchronous Communications Adaptor connects directly to the Datapoint 2200 by the 2200-160 Universal I/O cable. Power for

the Adaptor is supplied by the Datapoint 2200 and up to two adaptors can be operated in this manner. For over two Communications Adaptors external power must be supplied and is available. This system can be ordered under a different model code.

2.3 Communications Interface

The Communications Adaptor can be connected to a variety of serial devices. See Section 6.0, Interface Requirements, for a complete description of functions and pin connections available at the Adaptor. Many cables are available for connection to EIA-Standard devices such as Bell Datasets^R and acoustic couplers.

3.0 TECHNICAL DESCRIPTION

The 2200-400 has six major sections:

1. Device Address Control
2. Status Register
3. Command Register
4. Character Rate Register
5. Character Length Register
6. Data Output Control

Figure A shows a block diagram of the structure of the 2200-400.

3.1 Operation

The Adaptor runs completely under program control. No manual adjustments are present. In the application program the length, rate and number of start and stop bits are defined by loading registers with command words. By checking status registers the Datapoint 2200 program can determine when data has been received and transmitted.

3.2 Device Address

The Adaptor connects directly to the I/O Bus of the 2200 and is factory assigned an address of 322 octal. This address can be easily changed in the field by rearranging jumpers. (See Table 4.2 in 2200 Reference Manual.) (Note: Some early models of the Adaptor are not equipped with jumpers. Address is changed by rearranging pin connections.)

3.3 Status

Upon addressing the Adaptor and executing an Input Command, the status will be presented into the A (I/O Bus) register of the 2200.

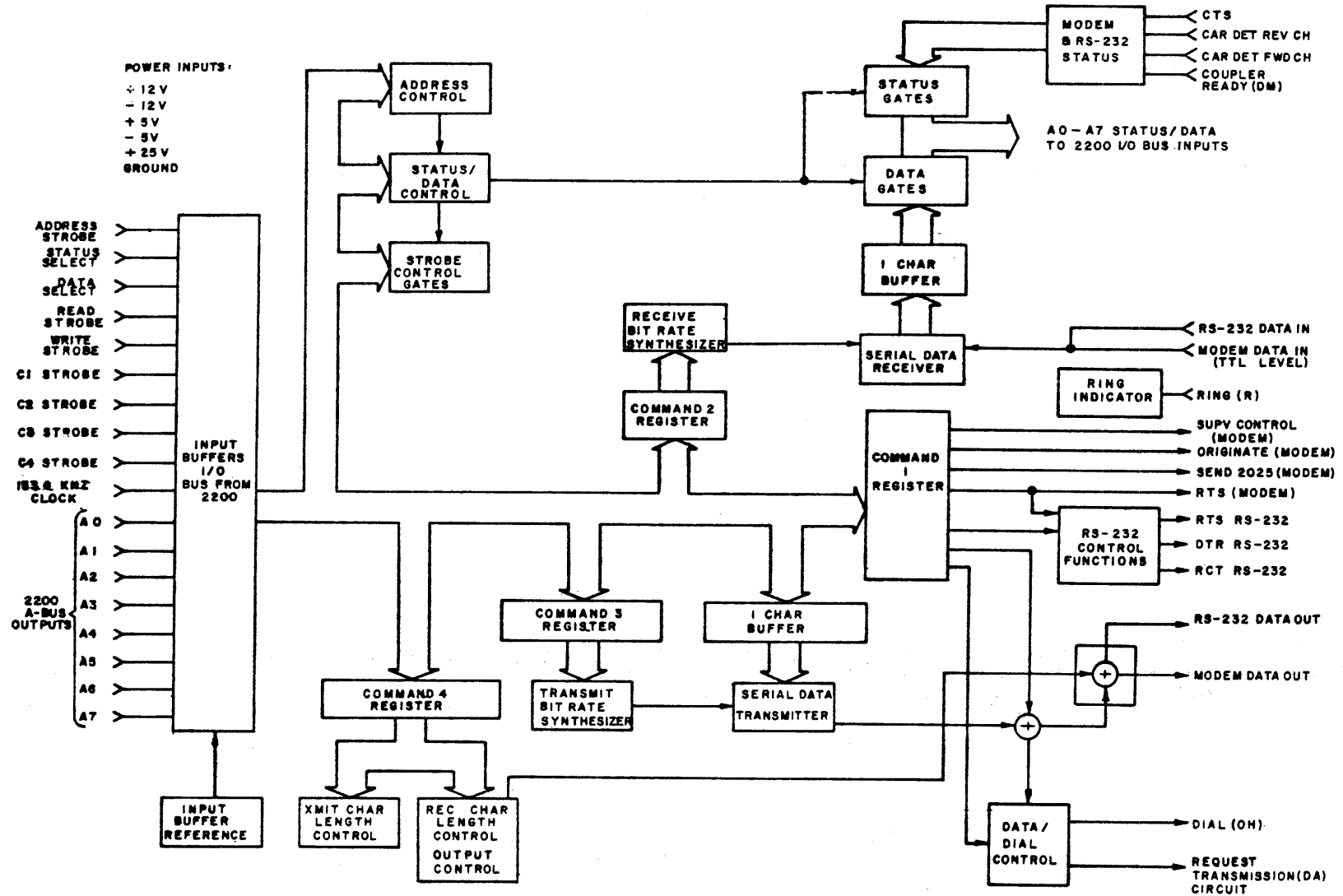
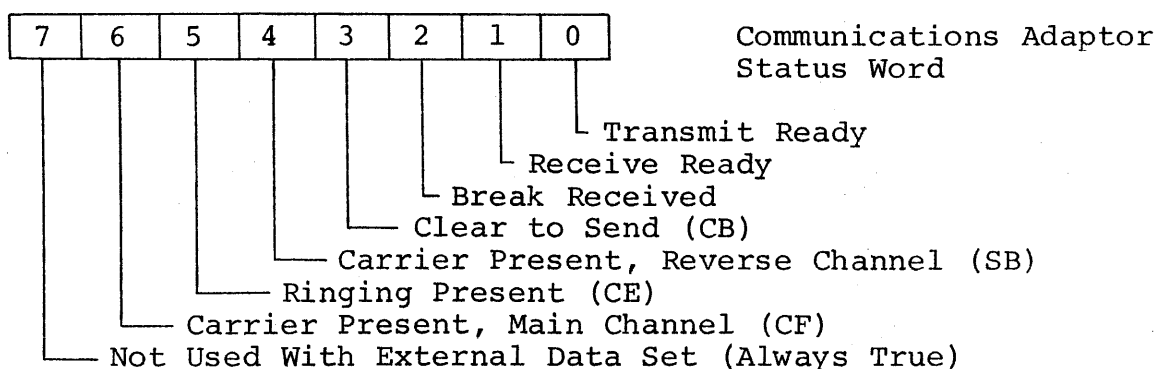


Figure A 2200-400 Communications Adaptor Block Diagram



Letters in parenthesis refer to Bell Dataset connections.

Description of Status Bits:

Bit 0: Transmit Ready. A true (1) condition indicates that the one-character transmit buffer is now empty and a new character can be loaded.

Bit 1: Receive Ready. A true (1) condition indicates that the one-character buffer has received a character. If the processor of the 2200 does not input the data prior to the reception of a new character, the new character will move into the buffer and the previous character will be lost.

Bit 2: Break Received. The presence of a true bit (1) in this position indicates that the received data has been in the 'zero' or 'space' condition for longer than one character time. Except during bad line conditions or equipment malfunction, this is used as a signalling technique.

Bit 3: Clear to Send. The true condition (1) of this bit indicates that the data set (Bell or otherwise) is prepared to accept data for transmission. This bit is used only with an appropriate external modem or data set.

Bit 4: Carrier Present - Reverse Channel. This bit is used only when operating with a Bell 202 or equivalent dataset in a half-duplex mode. A true status (1) indicates that the reverse (supervisory) channel is being received.

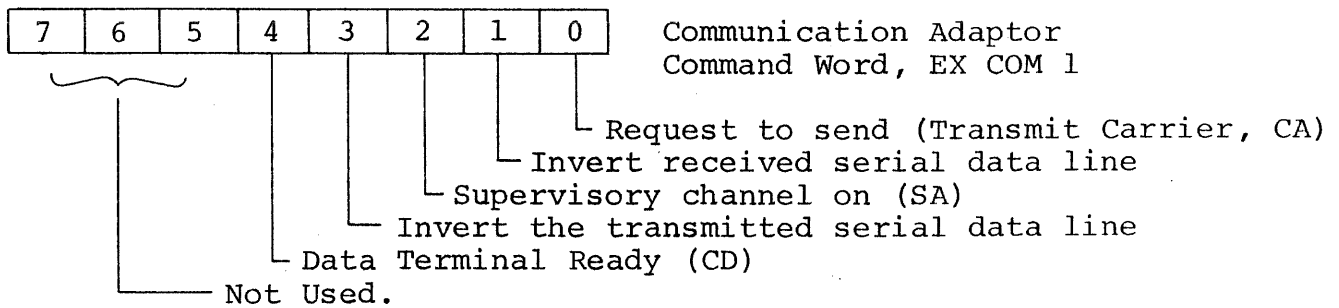
Bit 5: Ringing Present. When used with an appropriate Bell or equivalent dataset with necessary options, a true condition of this bit indicates that a ringing signal is being received at the dataset.

Bit 6: Carrier Present - Main Channel. A true (1) condition indicates that the external dataset shows that the main channel carrier frequency is being received.

Bit 7: Not used.

3.4 Data Control Command

Control of the Communications Adaptor is accomplished through the use of a command word. The 'A' register (I/O Bus) is loaded with the appropriate 8 bit word and transmitted to the adaptor by the EX COM instruction. The following list indicates the functions of each bit in the command register.



Letters in parenthesis refer to Bell Dataset connections.

Bit 0: Request to Send. A true bit (1) placed in this position turns on the transmitter carrier of an external data set indicating to the dataset that it must prepare for data transmission.

Bit 1: Invert Received Serial Data. If the incoming serial data is inverted, a true (1) bit will re-invert the data, restoring it to usable form.

Bit 2: Supervisory Channel On. This command is only used with a 202 type modem operating in a half-duplex mode. A true bit (1) indicates to the modem that the supervisory (or reverse channel) will be operative, transmit or receive.

Bit 3: Invert Transmitted Serial Data. With this bit set true (1), the serial output data is inverted.

Bit 4: Data Terminal Ready. With this bit set true (1), the external dataset is advised that the 2200 is ready (power on) for on-line communications.

Bit 5, 6 and 7: Not used.

3.5 Character Rate Command

The speed of transmission and reception of characters is controlled by loading mask words into the Comm-Adaptor. The speeds of transmission and reception are independent and different rates can be used for data in and data out.

After addressing the communication interface, two eight-bit mask words are loaded into the time base registers to synthesize

the selected bit rates. As each respective byte is presented, a corresponding EX COM2 instruction must be executed to load the receive time base and an EX COM3 instruction to load the transmit time base.

These two bytes are combined to form a 16 bit word which is placed in a holding register. Given a bit rate (bps), the following formula can be used to determine the number N to be entered into the holding register:

$$N = 65,536 - \left(\frac{76,800}{\text{bps}} \right)$$

This number N can be converted to a 16 bit binary number and separated into the two 8-bit words.

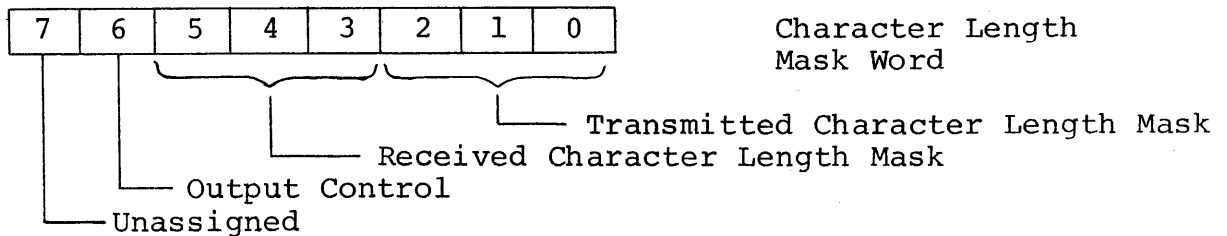
The octal codes for some of the more frequently used rates are listed below:

TIME-BASE TABLE

RECEIVE TRANSMIT BIT RATE	EX COM2 EX COM3 1ST MASK WORD	EX COM2 EX COM3 2ST MASK WORD
1) 110	375	106
2) 220	376	243
3) 440	377	121
4) 150	376	000
5) 300	377	000
6) 600	377	200
7) 1200	377	300
8) 2400	377	340

3.6 Character Length Command

Character lengths for the transmit and receive sections and its output control bit are determined by a character length mask word which is transmitted to the communications adaptor with an EX COM4 instruction.



The functions of the mask bits are given in the following tables:

TRANSMITTED CHARACTER LENGTH MASK BITS

MASK BIT POSITION	START UNITS	INFORMATION UNITS	STOP UNITS	CODE BIT POSITIONS
210				76543210
000	1	8	1	87654321
001	1	8	2	87654321
010	1	7	1	7654321
011	1	6	1	654321
100	1	5	1	54321
101	-	-	-	--
110	-	-	-	--
111	-	-	-	--

RECEIVED CHARACTER LENGTH MASK BITS

MASK BIT POSITION	START UNITS	INFORMATION UNITS	STOP UNITS	CODE BIT POSITIONS
543				76543210
000	1	8	1 or more	87654321
001	1	8	1 or more	87654321
010	1	7	1 or more	7654321x
011	1	6	1 or more	654321xx
100	1	5	1 or more	54321xxx
101	-	-	-	--
110	-	-	-	--
111	-	-	-	--

When codes having 5, 6, or 7 information units are to be transmitted, the remaining high-order bits in the character byte must be coded to "1".

When a two-unit stop pulse is required for characters having 5, 6 or 7 information bits, the next larger character length is used; the remaining high-order bits (all coded 1) form the stop pulses.

When received characters contain 5, 6 or 7 information bits, the remaining low order bits (as shown above) must be disregarded.

One additional command bit, Bit 6 (output control) of the Character Length Mask Word, is used to control the EIA RS232 Transmitted Data. A "one" in this command bit enables serial data to be transmitted and received only to the EIA RS-232 output. A setting of 'zero' is used only when an optional CTC-manufactured modem is installed. The bit should always be set to one for operation of a 2200-400 on it.

For users who plan to use the 2200-400 connected to a 3300/Thermal Printer, an appropriate clock signal is available at J3 of the adaptor.

4.0 PHYSICAL DESCRIPTION

The 2200-400 is mounted in an injection-molded high-strength two-part housing. Color and style are coordinated with the Datapoint 2200. The rear of the housing is designed to attach directly to the rear of a Datapoint console. It can also be wall or surface mounted in any position. Figure No. 1 provides complete dimensions.

5.0 ENVIRONMENT REQUIREMENTS

The Communications Adaptor is designed to operate without special considerations for heating or cooling. The operating range is 0° to 50°C (32°F to 122°F), 10 to 90% humidity without condensation.

6.0 INTERFACE CONNECTIONS

This interface is provided through an Amphenol 17-10500-1 connector. Pin assignments are as follows:

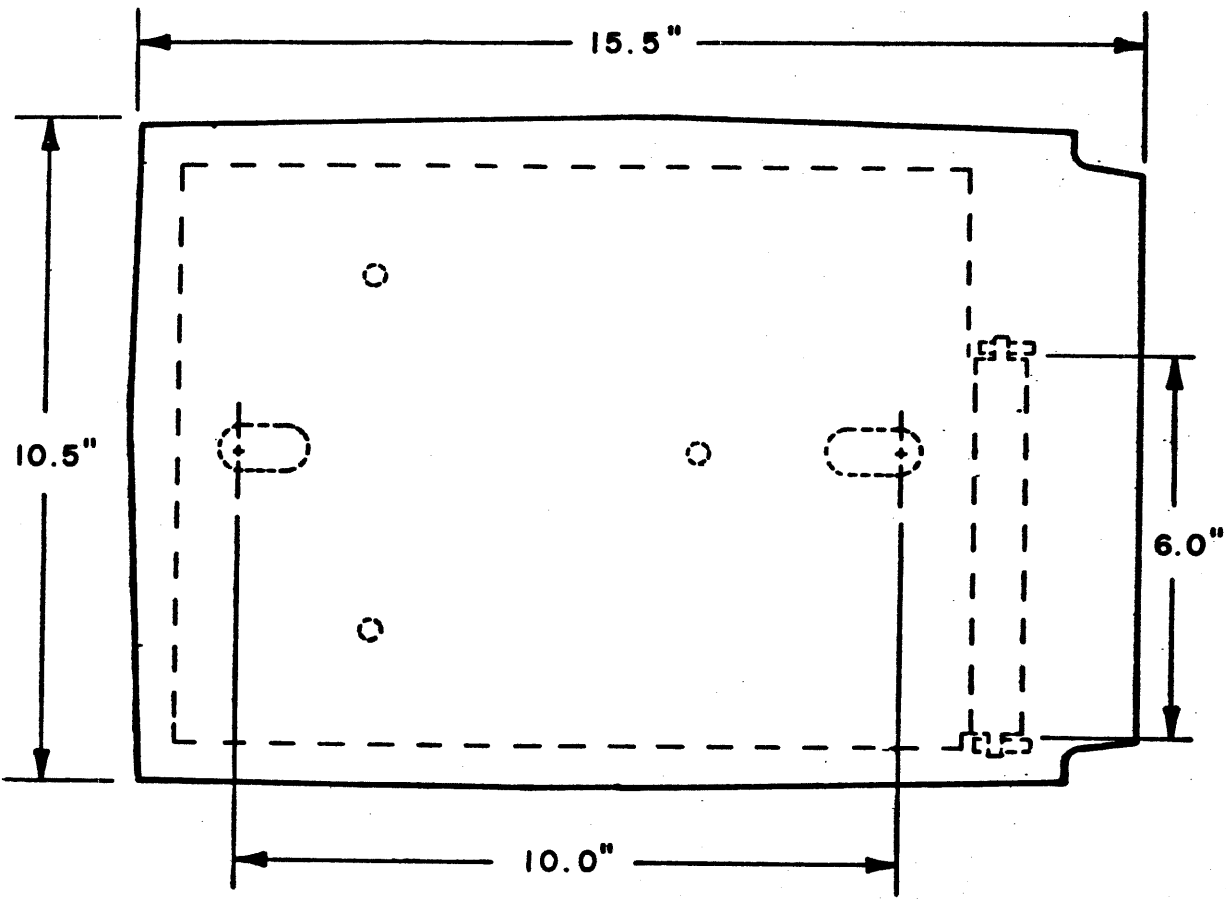
LEAD	FUNCTION	INPUT/OUTPUT
1	Protective Ground	-----
2	Protective Ground	-----
3	Not Used	-----
4	+25v	-----
5	Not Used	-----
6	Not Used	-----
7	Not Used	-----
9	DT (4 wire)	Direct
10	DT (2 wire)	Private
11	DR (2 wire)	Line
12	DR (4 wire)	Connection
23	Clear to Send (RS-232)	Input
24	Transmitted Data (RS-232)	Output
28	Signal Ground	-----
29	Signal Ground	-----
32	+5v	-----
33	+5v	-----
40	Request to Send (RS-232)	Output
41	Received Data (RS-232)	Input
42	Data Terminal Ready (RS-232)	Output
44	Supervisory Transmitted Data (RS-232)	Output
45	Data Carrier Detector (RS-232)	Input
46	Supervisory Received Data (RS-232)	Input
49	Clock for 3300/THERMAL PRINTER	Output
50	Transmit Bit Rate Clock	Output

7.0 OPTIONS

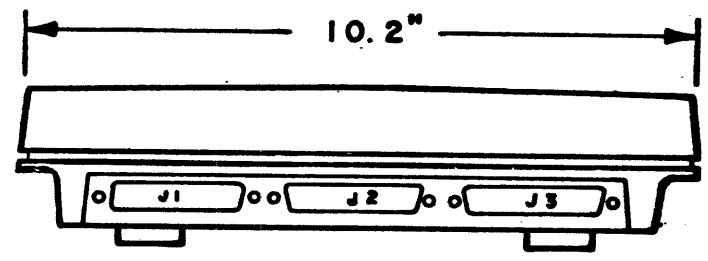
The Communication Adaptor can be ordered with an internal CTC-manufactured modem or configured as a high-level key for telegraph loop operation. The following list can be used as a guide to these other communications adaptors. For further information, see the appropriate Product Specification Sheet.

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TOP VIEW



REAR VIEW



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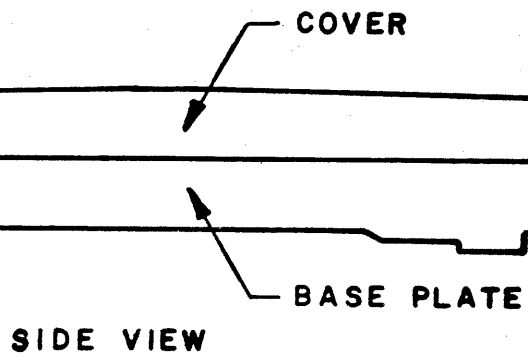


Figure 1 2200-400 Housing

2200-160 Universal I/O Cable, Datapoint 2200 to Comm Adaptors
 2200-400 Communications Adaptor, Asynchronous, EIA Interface
 2200-401 Communications Adaptor, Asynchronous, 103 Interface
 2200-402 Communications Adaptor, Asynchronous, 202 Interface
 2200-403 Communications Adaptor, Asynchronous, Telegraph
 Interface
 2200-404 Communications Adaptor, Synchronous, (ASCII/EBCDIC),
 EIA Interface
 2200-420 Interface Adaptor, 8-bit-data/8-bit-status Parallel
 2200-430 Cable, 2200-401/402 to Direct-Access Arrangement
 2200-431 Cable, 2200-401/402 to Direct Access Arrangement
 and 3300P
 2200-432 Cable, 2200-401/402 to Direct-Access Arrangement
 & EIA (Output)
 2200-433 Cable, 2200-400/404 to Modem
 2200-434 Cable, 2200-400/404 to EIA (Pins & Connector as
 on Modem)
 2200-435 Cable, 2200-400 to 3300P
 2200-436 Cable, Universal Connector Kit 2200-401/402/403/404/420
 2200-440 Cable, Made to Customer Specifications

For systems with more than one communications adaptor, the following items are available:

2200-450 Card Tray for UP to 10 2200-451/452/453
 2200-451 Communications Adaptor, Asynchronous, EIA Interface,
 Use with 2200-450
 2200-452 Communications Adaptor, Asynchronous, 103 Interface,
 Use with 2200-450
 2200-453 Communications Adaptor, Asynchronous, 202 Interface,
 Use with 2200-450

8.0 PARTS LIST

The following items are shipped with each 2200-400.

1	2200-160 Universal I/O Cable	} One of these cables must be specified
1	2200-343 Comm to Modem Cable or 2200-435 Comm to 3300/Thermal Printer	
1	P00010 ASR 103 Tape	
1	P00010 ASR 103 Listing	