Tektronix®

COMMITTED TO EXCELLENCE

Please Check for
CHANGE INFORMATION
at the Rear of this Manual

021-0065-00

DATA COMMUNICATIONS
INTERFACE UNIT

INSTRUCTION MANUAL

WARNING

This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instruction manual, may cause interference to radio communications. It has been tested and found to comply with the limits for Class A computing devices pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference in which case the users at their own expense will be required to take whatever measures may be required to correct the interference.
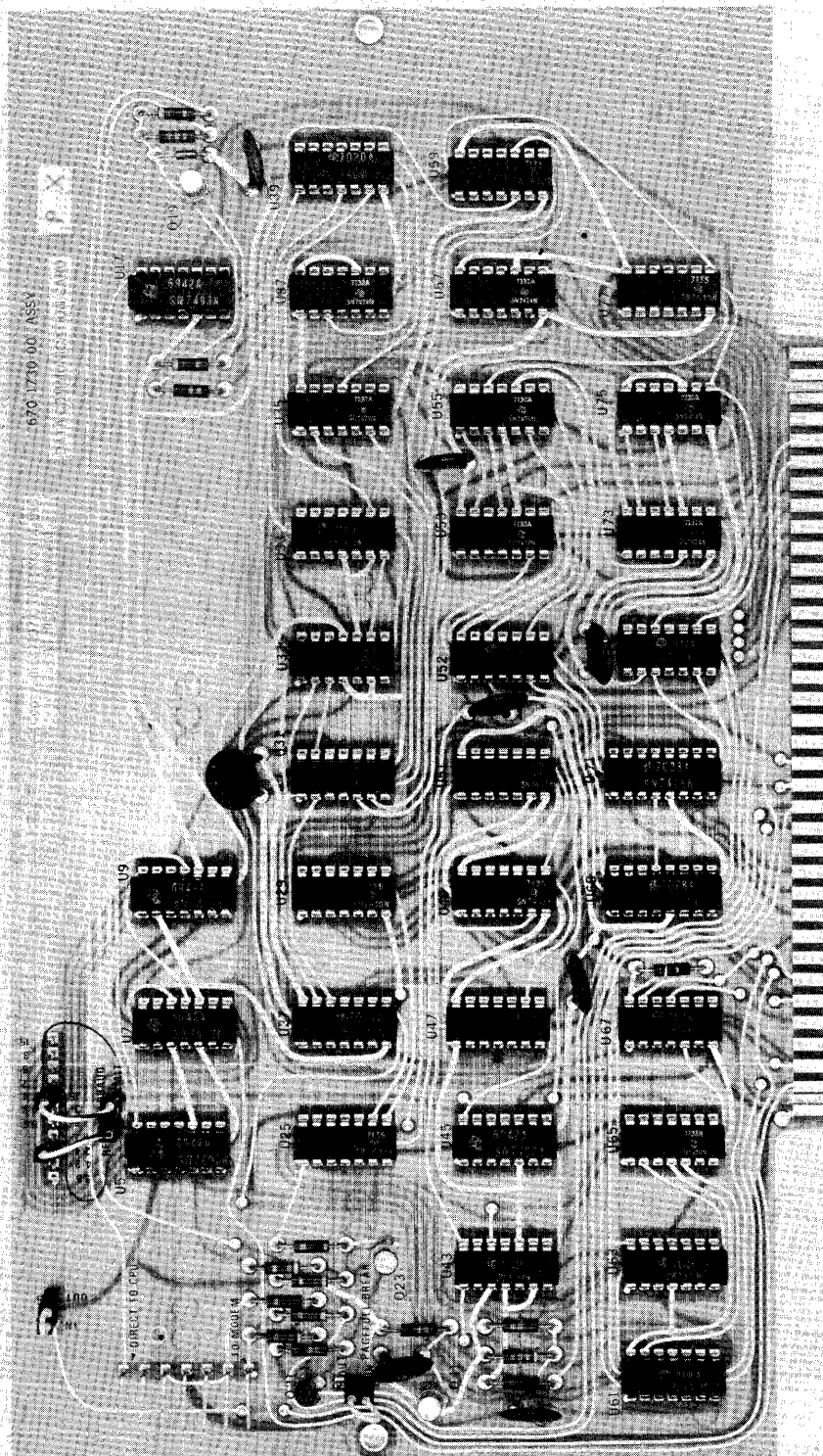
TABLE OF CONTENTS

Fig. 1-1. 021-0065-00 Data Communication Interface Card.

Ⓐ

SPECIFICATIONS

Introduction

The 021-0065-00 Data Communication Interface Card is a basic serial interface which conforms with EIA Standard RS 232-C. It permits the 4010-series Computer Display Terminal to communicate with computers equipped with modem connectors. Data is transferred serially at any one of seven baud rates. The transmitting and receiving baud rates are separately selectable.

The Data Communication Interface Card consists of a circuit card (670-1730-XX) which plugs into the 4010 series, and a cable.

The cable arrangement permits direct connection to a computer, or connection via a modem and telephone line arrangement. Rotating the plug 180° on the circuit card accomplishes the necessary switching when converting from modem to direct operation or vice-versa.

This specification pertains to the Data Communication Interface Card only. For information on other types of interface units, refer to the documentation pertaining to the specific interface unit.

General Characteristics

TABLE 1-1

DATA COMMUNICATION INTERFACE CARD SPECIFICATION

Item	Specification
Communication Discipline	Full duplex, with or without computer echoing characters.
Data Format	Serial, asynchronous ASCII
Baud Rate	Transmit and receive are separately selectable from the following available rates: 150, 300, 600, 1200, 2400, 4800, or 9600 baud.
Line Drivers	5 V or greater (+ and −) at 2 mA; increasing to not more than 15 V (+ and −) at lesser loads. Will withstand short-circuiting to ground.
Line Receivers	5 V (+ and −) nominal inputs; 25 V (+ and −) maximum allowable inputs; 4.7 kΩ nominal input resistance.
Output Signals	
TRANSMITTED DATA	
Start Bit	Space

TABLE 1-1 (cont)

Item	Specification
8 Data Bits	4010-series keyboard outputs bit 8 as fixed by strap option; factory-wired as marked.
Stop Bits	Mark
BREAK	16 spacing bits
REQ TO SEND	Always on
DATA TERMINAL READY	Always on
SIGNAL GND	
RECVD DATA	Start Bit, 8 Data Bits, Stop Bit
Chassis Ground	Connected to shield of output cable; chassis ground connection also provided at 4010-series cable entrance.
Options	
XMIT BAUD RATE	Selectable from .15, .3, .6, 1.2, 2.4, 4.8, 9.6 KILOBAUD
REC BAUD RATE	Selectable from .15, .3, .6, 1.2, 2.4, 4.8, 9.6 KILOBAUD
ECHO	IN, OUT
PAGEFULL BREAK	IN, OUT
Connectors	
Card Edge	72 pin minibus connector; signals same as listed for 4010 minibus
Pin Connector	J360-1 XMITTED DATA
	-2 REQ TO SEND
	-3 BLANK
	-4 SIGNAL GND
	-5 DATA TERMINAL READY
	-6 BLANK
	-7 RECVD DATA

Ⓐ

TABLE 1-1 (cont)

Item	Specification

Cable Information

P360 connected for
operation with Modem

```
                                    J360    P360    P520
          XMITTED DATA       1      1           2      TRANSMITTED
                                                       DATA (BA)
          REQ TO SEND        2      2           4      REQUEST TO
                                                       SEND (CA)
          SIGNAL GND         4      4           7      SIGNAL GROUND
                                                       (AB)
          DATA TERMINAL      5      5          20      DATA TERMINAL
          READY                                        READY (CD)
          RECVD DATA         7      7           3      RECEIVED DATA
                                                       (BB)
              TERMINAL       CABLE         MODEM
```

P360 connected for
operation with Computer

```
                                    J360    P360    P520
          XMITTED DATA       1      7           3      RECEIVED DATA
                                                       (BB)
          REQ TO SEND        2      6           8      RECEIVED LINE
                                                       SIGNAL DETECTOR
                                                       (CF)
          SIGNAL GND         4      4           7      SIGNAL GROUND
                                                       (AB)
          DATA TERMINAL      5      3           5      CLEAR TO SEND
          READY                                        (CB)
          RECEIVED DATA      7      1           2      TRANSMITTED
                                                       DATA (BA)
              TERMINAL       CABLE         COMPUTER
```
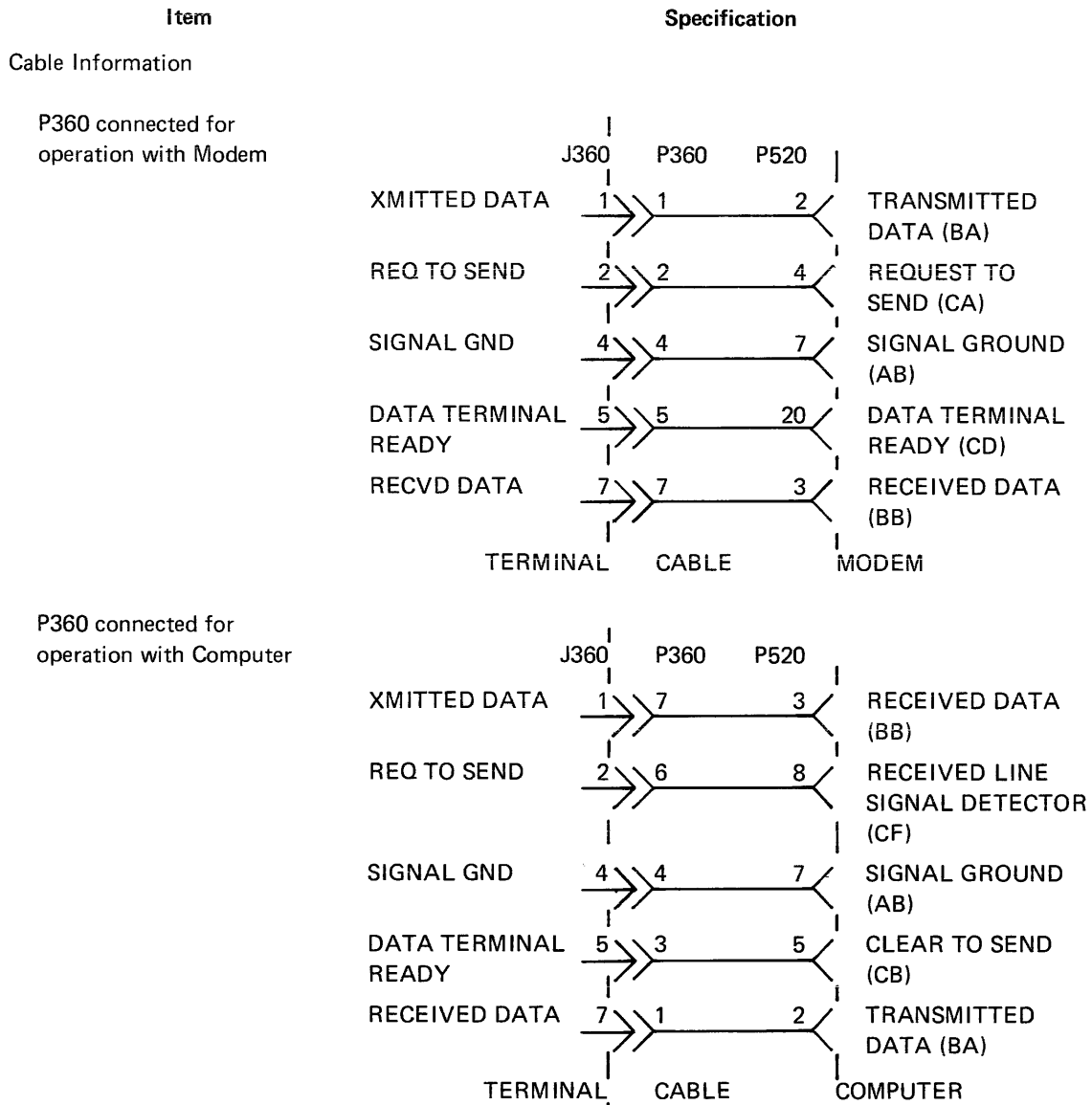
TABLE 1-2

STRAPPABLE OPTIONS OF DATA COMMUNICATION INTERFACE CARD

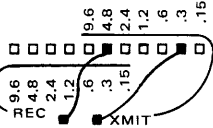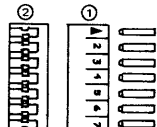| Feature	Location	Choice	Effect
Local Echo	Data Communication Interface Card, top row	①②	1. In (Provides local copy of transmitted writing characters) 2. Out
Page Full Causes Break	Data Communication Interface Card, 2nd row	① ②	1. Out 2. In (Page full causes break signal).

TABLE 1-2 (cont)

Feature	Location	Choice	Effect
Baud Rate	Data Communication Interface Card, top row	(RECEIVE RATE) (TRANSMIT RATE)	1. R (Receive) 150, 300, 600, 1200, 2400, 4800, or 9600 baud. (Shown connected for 300 baud.) 2. T (Transmit) 150, 300, 600, 1200, 2400, 4800, or 9600 baud. (Shown connected for 300 baud.)
Modem/Computer Connection	Data Communication Interface Card, left side (7 pin output connector)	② ①	1. To computer direct 2. To Modem (turn the cable plug over).

Ⓐ

CIRCUIT DESCRIPTION

Introduction

The Data Communication Interface Card consists of the transmitting section and the receiving section.

The transmitting section is a basic parallel to serial circuit and includes the Transmit Latches, Transmitting Shift Register, Parallel Loading Circuit, Transmit Complete Detector, Transmit Enable Gate, and Output Level Converter.

The receiving section is a serial to parallel circuit and consists of the Receiving Level Converter, Receive-Enable Gate, Receiving Shift Register, Strobe-Enable Circuit, T-Strobe Latch, Receiving Gates, Reset Circuit and CPUNT Enable Circuit.

Transmitting

When data is applied to the Transmit Latches on BIT 1 through BIT 8 lines, it is accompanied by a $\overline{\text{CSTROBE}}$ signal. $\overline{\text{CSTROBE}}$ is inverted by U67C and applies a high to the T inputs of U71 and U69. While this pulse is high, the output lines follow the input data. When $\overline{\text{CSTROBE}}$ ends and removes the clock pulse from U71 and U69, the outputs remain at the level determined by the $\overline{\text{BIT 1}}$ through $\overline{\text{BIT 8}}$ lines at the time that $\overline{\text{CSTROBE}}$ is removed.

As a result of a previous transmission, U29 in the Transmit Complete Detector has all highs applied to it and applies a low to U25C. U27C in the shift register also has highs applied to it and is applying a low to U25C. U25C has a high output which disables the Transmit Enable Gate U25D and provides an enabling voltage to U61D in the Parallel Loading Circuit.

With U65A one-set, U61D is enabled to provide a high signal level to the shift registers, loading the data into those devices. As soon as this data is loaded into them, U29 no longer has all highs applied to it and its output goes high, causing the U25C output to go low. This low is referred back to U61D, causing its output to return to a low level. This ends the pulse which parallel-loaded the shift registers. When this pulse ends, U43A becomes one-set, and causes the next 4.9 MHz pulse to one-set U65B. The zero output from U65B then zero-sets U65A and U43A, preparing them for the next input. U65B returns to a zero-set condition after the next excursion of the 4.9 MHz input.

In addition to loading the data bits into the shift registers, specific levels are loaded into the 4, 3 and 2 inputs of U47 when the U61D output pulse is high. With the Transmit Shift Registers loaded, the circuit is ready for transmission of the data through the Transmit Enable Gate U25D. This gate was enabled when the U25C output went low, as a result of loading data into the shift registers. U25D is now permitted to follow the inverse of the pin 10 output of U51, via U25B.

The 614 kHz signal being applied to U7 is counted down (divided by 16) and applied to U9 (another divide by 16 counter), which applies its signal to U5. The divide by 8 output of U5 is then applied to the Clock Shift Inputs of U51, U49 and U47. Each positive excursion causes these registers to advance the data bits one count. For example, the U47 pin 11 output advances to the pin 10 output in response to a clock pulse. Since the pin 10 output of U47 is applied to the serial input of U49, the next clock pulse from U5 causes this data to be advanced to the pin 13 output of U49.

The data bits being loaded into the shift register cause a high to be loaded onto the pin 10 output of U51. This high is felt through U25B, U25D, U25A, Q23, and Q21. It appears as a high at the transmitted data output, and is the start bit for data transmission. After the next clock pulse, the pin 11 output of U51 advances to pin 10, and what has been applied as $\overline{\text{BIT 1}}$ now appears at the transmitted data output. This is repeated for subsequent clock pulses until all eight bits have been placed on the transmitted data line.

After $\overline{\text{BIT 8}}$ has been transmitted, a low is placed on the transmitted data line. This is the low from pin 4 of U47. The next clock pulse causes a high to be felt on the transmitted data line as a result of the high existing on U47 pin 3. The low from pin 4 and the high from pin 3 of U47 serve as stop bits for data transmission. The highs at pins 1 and 2 of U47 are cycled through the shift registers in response to the clock pulses. Since pin 1 is the serial input of U47, all shift register outputs contain highs by the time the stop bit from U47 pin 3 reaches U51 pin 10. At this time U29 and U27C outputs go low, causing U25C output to go high. This enables U25D and provides an enabling voltage to U61D in preparation for the next input data.

Data transmission can be interrupted at any time in response to either a $\overline{\text{BREAK}}$ signal or a MARG signal, due to the effect of U63A and U43B. When the $\overline{\text{BREAK}}$ signal appears, U63A becomes one-set. The next negative transition from U45 (a divide by 16 circuit), causes U43 to become one-set. The resultant high at the U25A input holds a high at the transmitted data output until another divide by 16 pulse is generated by U45, ending the break condition. The highs going out on the transmitted data line are accepted by the computer as an interrupt signal.

Receiving

The Receiving Shift Register is cleared after input of each character. This causes U77, the Receive Enable Gate, to receive all high inputs, providing a low output to U59A. U27A is also receiving all high inputs, causing it to apply a low to U59B. With no received data input, Q19 provides U37A with a high, causing it to apply a high to U59B and U37B. U37B is thus applying a low to U59A, causing that device to apply a high to pin 3 of U17.

When the high start bit is applied to the received data line, it causes Q19 to apply a low to U37A. The 614 kHz clock to pin 3 of U37A causes this low to be passed through U37A, applying a low to U59B. The high from U59B causes U17 to be placed in a cleared condition. The next positive transition on the 614 kHz line causes U37B to become zero-set. This causes the U59A output to go low, permitting the U17 clock to function.

Ⓐ

When pin 11 of U17 goes low, the low from U37A pin 6 is clocked into U57B. The resultant low at pin 8 of U57B disables the Receive Enable Gate U77, preventing the Input Clock from being cleared until receipt of the character has been completed. By the time the next positive transition occurs on pin 11 of U17, the first data bit appears on the Receive Data Line. It is clocked into U57B in a manner similar to that of the start bit. After all data bits have been clocked in, a low stop bit causes a low to appear at pin 6 of U37A. This low is subsequently clocked into U57B.

Now the following situation exists. The zero-set condition that was originally held at U57B has been clocked to U35A, causing U35A to apply a high to U31B. The high start bit has been clocked into U35B, causing a second high to be applied to U31B. The low stop bit has been clocked into U57B, causing a third high to be applied to U31B. With three highs applied, U31B causes a high transition to occur at the U57A T input. U57A becomes one-set, resulting in U31A sending a high to U67A to develop the $\overline{\text{CPUNT}}$ output signal, indicating that data is about to appear on the $\overline{\text{BIT 1}}$ through $\overline{\text{BIT 8}}$ lines.

The next transition of the 19 kHz signal from the Counter circuit causes U32A to become one-set, which causes a low to go to U27D, and allows U61C to enable the Receiving Gates. The data which exists on the Receiving Shift Registers is passed through the gates and appears on the $\overline{\text{BIT 1}}$ through $\overline{\text{BIT 8}}$ lines. The next negative transition of the 614 kHz line causes U32B to become one-set, causing U67D to generate the $\overline{\text{T STROBE}}$ signal to strobe the bits into the receiving circuits. The pin 8 output of U32B is fed back to U57A and U32A to zero-set those devices. The next negative transition of the 614 kHz signal causes U32B to become zero-set, ending the $\overline{\text{T STROBE}}$ and the $\overline{\text{CPUNT}}$ signals. It also causes U33B to become one-set, so U39A applies a low to the Receiving Shift Register flip-flops to zero-set those devices. One more 614 kHz negative transition and U33B becomes zero-set, ending the cycle.

In the event that it is desired to have one terminal communicate with another, an arrangement of the interconnecting plug permits that plug to be reversed and the two terminals connected directly together. This places the output plug pin 1 in direct connection with the pin 7 input of the other terminal, permitting direct transmission between the two.

SERVICING

Introduction

Servicing information peculiar to this interface and applicable precautions are contained in this section. Conventional preventive maintenance, troubleshooting, and corrective maintenance techniques apply to all interface cards. Refer to the servicing information given in the Terminal Maintenance Manual if details regarding these adjustments or corrective techniques are required.

WARNING

(1) Dangerous potentials exist at several points in the pedestal unit. Do not touch electrical connections or components while power is applied.

(2) Disconnect the input power cord before completely removing or replacing the Pedestal Unit.

(3) Disconnect the unit from its source of power before doing any soldering operations on it. Merely turning off the Power switch is not an adequate precaution.

(4) Do not remove or replace any interface or any card while the equipment is energized.

INSTALLATION/REMOVAL

To install the Data Communication Interface Card into a Computer Terminal:

Be sure the Power switch is off.

Disconnect the line cord from the power source.

Remove the front cover from the pedestal.

Insert the card into the Mother Board connector.

(If other optional cards are used in conjunction with the Data Communication Interface Card, an extender card may be required. Consult the 4010/4010-1 instruction manual.)

Feed the Harmonica Connector end of the cable through the access slot in the rear panel of the pedestal. Make sure the outer insulation of the cable extends inside the pedestal beyond the back panel.

Attach a cable clamp over the outside insulation and bolt it to the sill of the access slot.

Connect a ground lug to the spade located above the access slot.

Plug the harmonica connector into the Data Communication Interface Card.

NOTE

Cable information and strappable options are given in the Specification section of this manual.

PREVENTIVE MAINTENANCE

Preventive maintenance consists of cleaning the unit and inspecting it for obvious defects. Preventive maintenance should be performed approximately every six months, or oftener if the instrument is subjected to adverse conditions.

TROUBLESHOOTING

The simplest method for troubleshooting the Data Communication Interface Card is to use an extender card. This allows access to the entire card. Extender card information is given in the 4010/4010-1 instruction manual.

Circuit diagrams and component locations are given in the Diagrams section of this manual giving the diagram number and electrical value of each component.
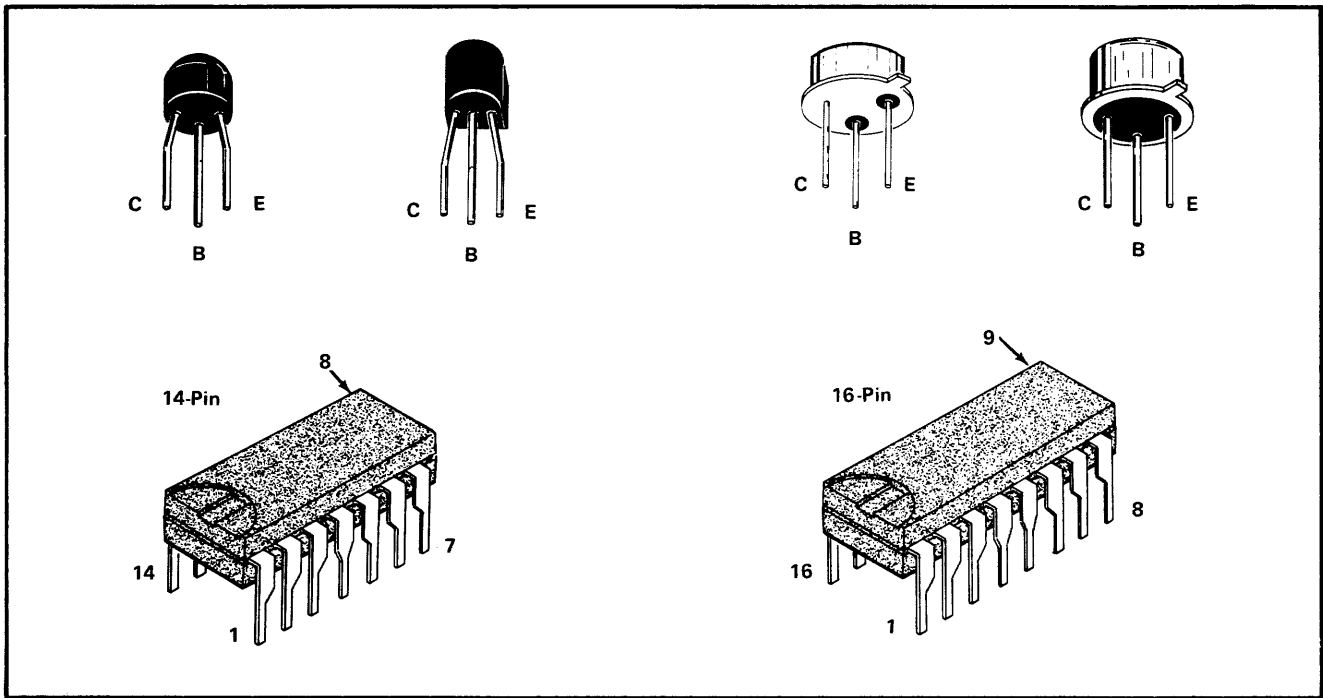

Fig. 3-1. Lead configuration of the semiconductors used in the interface.

Ⓐ

REPLACEABLE
ELECTRICAL PARTS

PARTS ORDERING INFORMATION

Replacement parts are available from or through your local Tektronix, Inc. Field Office or representative.

Changes to Tektronix instruments are sometimes made to accommodate improved components as they become available, and to give you the benefit of the latest circuit improvements developed in our engineering department. It is therefore important, when ordering parts, to include the following information in your order: Part number, instrument type or number, serial number, and modification number if applicable.

If a part you have ordered has been replaced with a new or improved part, your local Tektronix, Inc. Field Office or representative will contact you concerning any change in part number.

Change information, if any, is located at the rear of this manual.

SPECIAL NOTES AND SYMBOLS

X000	Part first added at this serial number
00X	Part removed after this serial number

ITEM NAME

In the Parts List, an Item Name is separated from the description by a colon (:). Because of space limitations, an Item Name may sometimes appear as incomplete. For further Item Name identification, the U.S. Federal Cataloging Handbook H6-1 can be utilized where possible.

ABBREVIATIONS

ACTR	ACTUATOR	PLSTC	PLASTIC
ASSY	ASSEMBLY	QTZ	QUARTZ
CAP	CAPACITOR	RECP	RECEPTACLE
CER	CERAMIC	RES	RESISTOR
CKT	CIRCUIT	RF	RADIO FREQUENCY
COMP	COMPOSITION	SEL	SELECTED
CONN	CONNECTOR	SEMICOND	SEMICONDUCTOR
ELCTLT	ELECTROLYTIC	SENS	SENSITIVE
ELEC	ELECTRICAL	VAR	VARIABLE
INCAND	INCANDESCENT	WW	WIREWOUND
LED	LIGHT EMITTING DIODE	XFMR	TRANSFORMER
NONWIR	NON WIREWOUND	XTAL	CRYSTAL

CROSS INDEX—MFR. CODE NUMBER TO MANUFACTURER

Mfr. Code	Manufacturer	Address	City, State, Zip
01121	ALLEN-BRADLEY COMPANY	1201 2ND STREET SOUTH	MILWAUKEE, WI 53204
01295	TEXAS INSTRUMENTS, INC., SEMICONDUCTOR GROUP	P O BOX 5012, 13500 N CENTRAL EXPRESSWAY	DALLAS, TX 75222
04713	MOTOROLA, INC., SEMICONDUCTOR PROD. DIV.	5005 E MCDOWELL RD,PO BOX 20923	PHOENIX, AZ 85036
07263	FAIRCHILD SEMICONDUCTOR, A DIV. OF FAIRCHILD CAMERA AND INSTRUMENT CORP.	464 ELLIS STREET	MOUNTAIN VIEW, CA 94042
27014	NATIONAL SEMICONDUCTOR CORP.	2900 SEMICONDUCTOR DR.	SANTA CLARA, CA 95051
32997	BOURNS, INC., TRIMPOT PRODUCTS DIV.	1200 COLUMBIA AVE.	RIVERSIDE, CA 92507
56289	SPRAGUE ELECTRIC CO.		NORTH ADAMS, MA 01247
72982	ERIE TECHNOLOGICAL PRODUCTS, INC.	644 W. 12TH ST.	ERIE, PA 16512
80009	TEKTRONIX, INC.	P O BOX 500	BEAVERTON, OR 97077

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
	670-1730-04			CKT BOARD ASSY:DATA COMMUNICATION	80009	670-1730-04
C1	283-0068-00			CAP.,FXD,CER DI:0.01UF,+100-0%,500V	56289	19C241
C25	283-0080-00			CAP.,FXD,CER DI:0.022UF,+80-20%,25V	56289	19C611
C38	283-0068-00			CAP.,FXD,CER DI:0.01UF,+100-0%,500V	56289	19C241
C43	290-0535-00			CAP.,FXD,ELCTLT:33UF,20%,10V	56289	196D336X0010KA1
C45	283-0178-00			CAP.,FXD,CER DI:0.1UF,+80-20%,100V	72982	8131N145651 104Z
C50	283-0068-00			CAP.,FXD,CER DI:0.01UF,+100-0%,500V	56289	19C241
C51	283-0068-00			CAP.,FXD,CER DI:0.01UF,+100-0%,500V	56289	19C241
C52	283-0068-00			CAP.,FXD,CER DI:0.01UF,+100-0%,500V	56289	19C241
C53	283-0068-00			CAP.,FXD,CER DI:0.01UF,+100-0%,500V	56289	19C241
C54	283-0068-00			CAP.,FXD,CER DI:0.01UF,+100-0%,500V	56289	19C241
CR31	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
CR43	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
CR45	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
Q19	151-0302-00			TRANSISTOR:SILICON,NPN	07263	S038487
Q21	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
Q23	151-0302-00			TRANSISTOR:SILICON,NPN	07263	S038487
Q41	151-0302-00			TRANSISTOR:SILICON,NPN	07263	S038487
R1	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R3	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R4	311-1286-00			RES.,VAR,NONWIR:50K OHM,10%,0.5W	32997	3329W-L58-503
R10	315-0302-00			RES.,FXD,CMPSN:3K OHM,5%,0.25W	01121	CB3025
R12	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R14	315-0432-00			RES.,FXD,CMPSN:4.3K OHM,5%,0.25W	01121	CB4325
R15	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
R17	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
R18	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
R20	315-0222-00			RES.,FXD,CMPSN:2.2K OHM,5%,0.25W	01121	CB2225
R23	315-0392-00			RES.,FXD,CMPSN:3.9K OHM,5%,0.25W	01121	CB3925
R24	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R26	315-0513-00			RES.,FXD,CMPSN:51K OHM,5%,0.25W	01121	CB5135
R30	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
R31	315-0563-00			RES.,FXD,CMPSN:56K OHM,5%,0.25W	01121	CB5635
R32	315-0223-00			RES.,FXD,CMPSN:22K OHM,5%,0.25W	01121	CB2235
R35	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
U5	156-0032-00			MICROCIRCUIT,DI:4-BIT BINARY COUNTER	80009	156-0032-00
U7	156-0032-00			MICROCIRCUIT,DI:4-BIT BINARY COUNTER	80009	156-0032-00
U9	156-0032-00			MICROCIRCUIT,DI:4-BIT BINARY COUNTER	80009	156-0032-00
U17	156-0032-00			MICROCIRCUIT,DI:4-BIT BINARY COUNTER	80009	156-0032-00
U25	156-0043-00			MICROCIRCUIT,DI:QUAD 2-INPUT POS NOR GATE	80009	156-0043-00
U27	156-0030-00			MICROCIRCUIT,DI:QUAD 2-INPUT NAND GATE	01295	SN7400(N OR J)
U29	156-0035-00			MICROCIRCUIT,DI:SGL 8-INPUT POS NAND GATE	80009	156-0035-00
U31	156-0047-00			MICROCIRCUIT,DI:TPL 3-INPUT POS NAND GATE	80009	156-0047-00
U32	156-0039-00			MICROCIRCUIT,DI:DUAL J-K FLIP FLOP	80009	156-0039-00
U33	156-0039-00			MICROCIRCUIT,DI:DUAL J-K FLIP FLOP	80009	156-0039-00
U35	156-0041-00			MICROCIRCUIT,DI:DUAL D-TYPE FLIP-FLOP	27014	DM7474N
U37	156-0041-00			MICROCIRCUIT,DI:DUAL D-TYPE FLIP-FLOP	27014	DM7474N
U39	156-0036-00			MICROCIRCUIT,DI:DUAL 4-INPUT POS NAND BFR	80009	156-0036-00
U45	156-0172-00			MICROCIRCUIT,DI:DUAL RETRIG ONE-SHOT W/CLR	80009	156-0172-00
U47	156-0120-00			MICROCIRCUIT,DI:SINGLE 4-BIT R/L SHIFT REG	80009	156-0120-00
U49	156-0120-00			MICROCIRCUIT,DI:SINGLE 4-BIT R/L SHIFT REG	80009	156-0120-00
U51	156-0120-00			MICROCIRCUIT,DI:SINGLE 4-BIT R/L SHIFT REG	80009	156-0120-00
U52	156-0145-00			MICROCIRCUIT,DI:QUAD 2-INPUT POS NAND BFR	80009	156-0145-00
U53	156-0041-00			MICROCIRCUIT,DI:DUAL D-TYPE FLIP-FLOP	27014	DM7474N
U55	156-0041-00			MICROCIRCUIT,DI:DUAL D-TYPE FLIP-FLOP	27014	DM7474N

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
U57	156-0041-00			MICROCIRCUIT,DI:DUAL D-TYPE FLIP-FLOP	27014	DM7474N
U59	156-0043-00			MICROCIRCUIT,DI:QUAD 2-INPUT POS NOR GATE	80009	156-0043-00
U61	156-0129-00			MICROCIRCUIT,DI:QUAD 2-INPUT GATE	80009	156-0129-00
U65	156-0041-00			MICROCIRCUIT,DI:DUAL D-TYPE FLIP-FLOP	27014	DM7474N
U67	156-0145-00			MICROCIRCUIT,DI:QUAD 2-INPUT POS NAND BFR	80009	156-0145-00
U69	156-0040-00			MICROCIRCUIT,DI:QUAD LATCH,TTL	80009	156-0040-00
U71	156-0040-00			MICROCIRCUIT,DI:QUAD LATCH,TTL	80009	156-0040-00
U72	156-0145-00			MICROCIRCUIT,DI:QUAD 2-INPUT POS NAND BFR	80009	156-0145-00
U73	156-0041-00			MICROCIRCUIT,DI:DUAL D-TYPE FLIP-FLOP	27014	DM7474N
U75	156-0041-00			MICROCIRCUIT,DI:DUAL D-TYPE FLIP-FLOP	27014	DM7474N
U77	156-0035-00			MICROCIRCUIT,DI:SGL 8-INPUT POS NAND GATE	80009	156-0035-00

DIAGRAMS AND CIRCUIT BOARD ILLUSTRATION

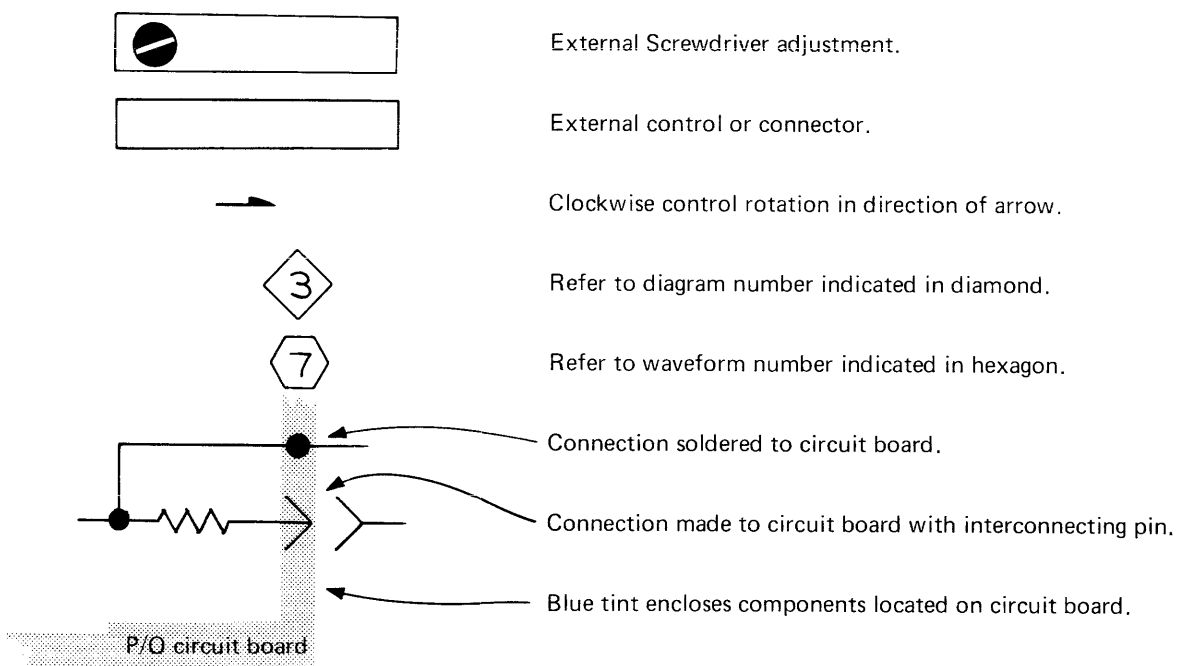## Symbols and Reference Designators

Electrical components shown on the diagrams are in the following units unless noted otherwise:

Capacitors = Values one or greater are in picofarads (pF).
Values less than one are in microfarads (μF).
Resistors = Ohms (Ω)

Symbols used on the diagrams are based on USA Standard Y32.2-1967.
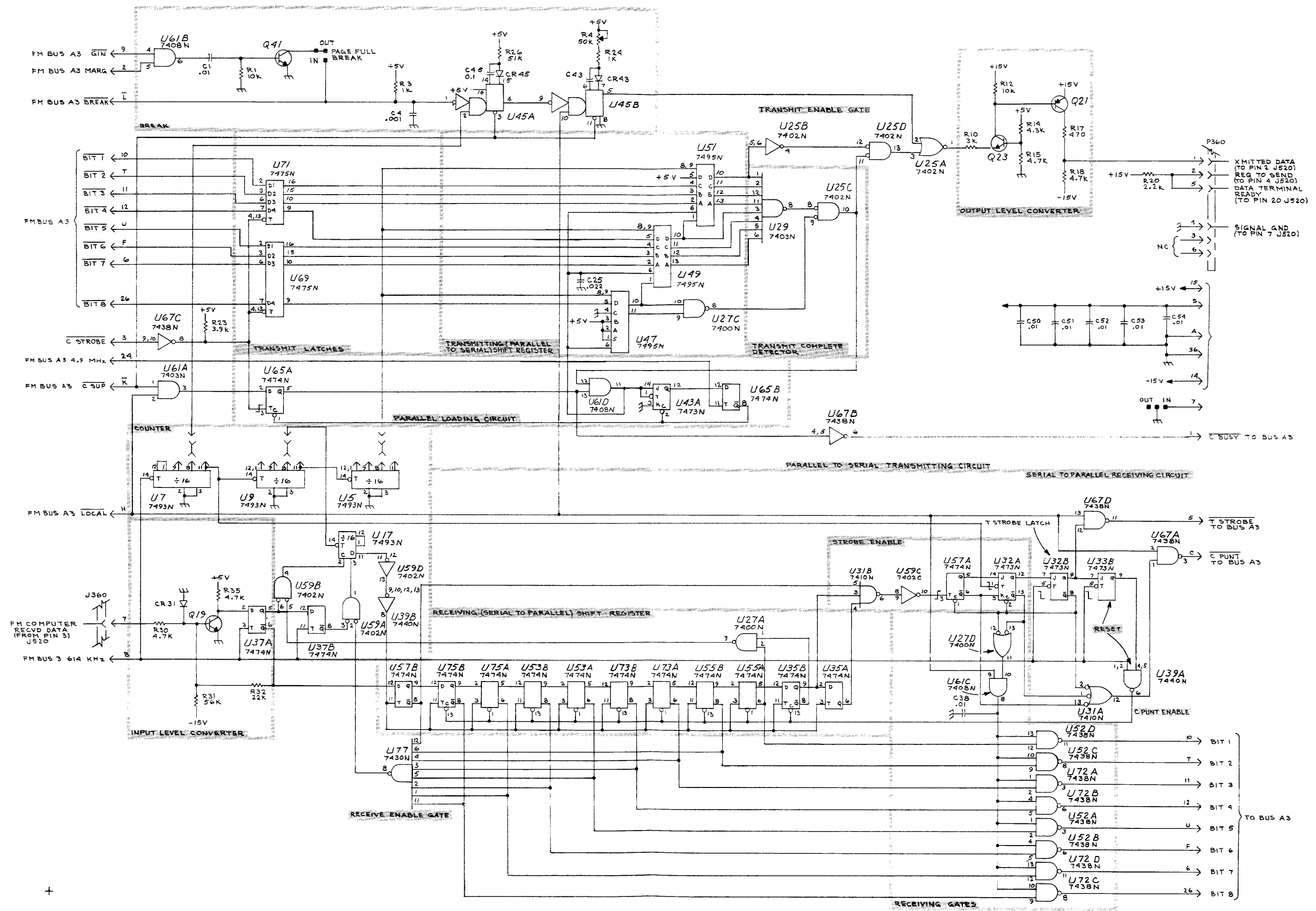
Logic symbology is based on MIL-STD-806B in terms of positive logic. Logic symbols depict the logic function performed and may differ from the manufacturer's data.
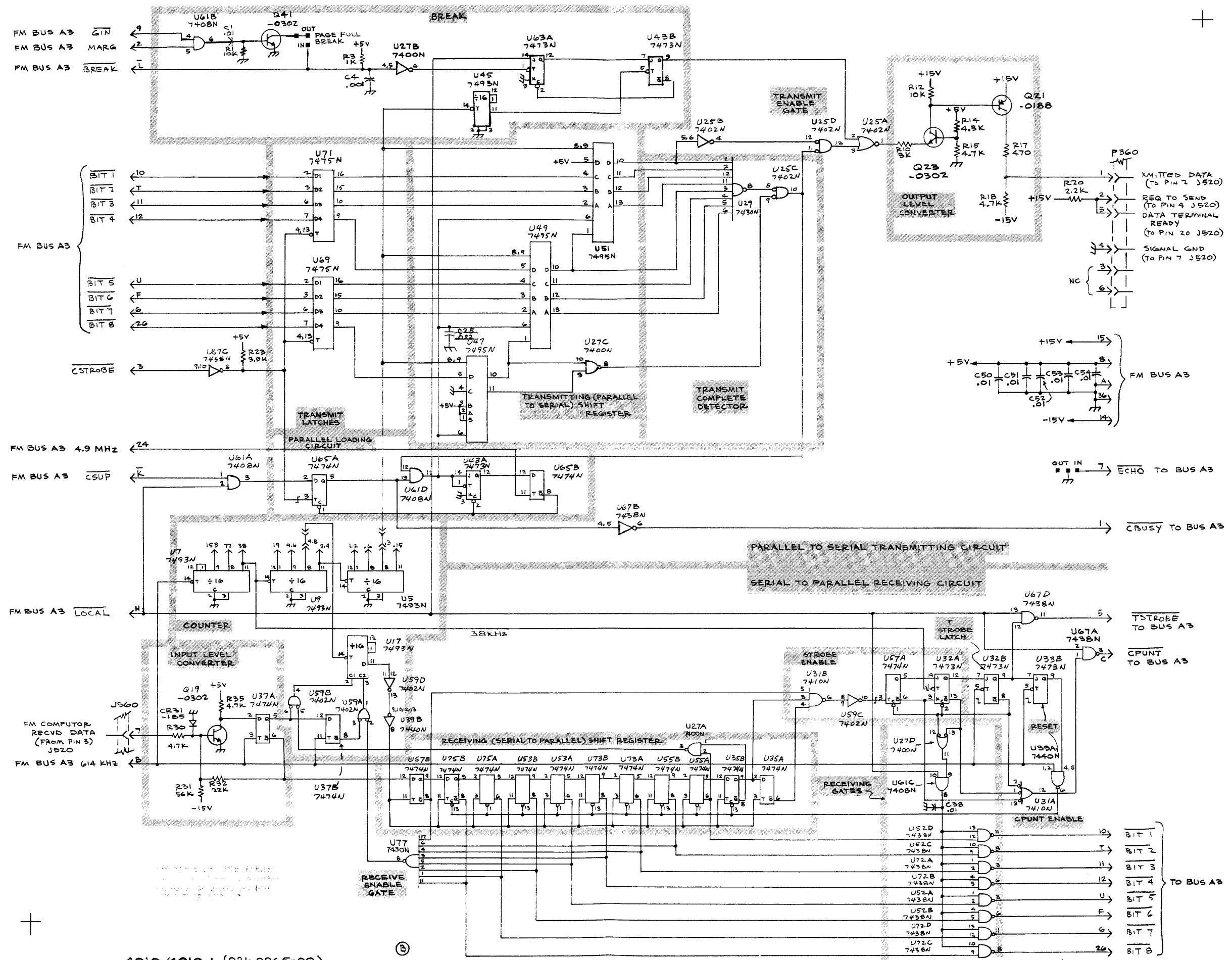
The following special symbols are used on the diagrams:

External Screwdriver adjustment.

External control or connector.

Clockwise control rotation in direction of arrow.

Refer to diagram number indicated in diamond.

Refer to waveform number indicated in hexagon.

Connection soldered to circuit board.

Connection made to circuit board with interconnecting pin.

Blue tint encloses components located on circuit board.

P/O circuit board

The following prefix letters are used as reference designators to identify components or assemblies on the diagrams.

|			
A	Assembly, separable or repairable (circuit board, etc.)	LR	Inductor/resistor combination
AT	Attenuator, fixed or variable	M	Meter
B	Motor	Q	Transistor or silicon-controlled rectifier
BT	Battery	P	Connector, movable portion
C	Capacitor, fixed or variable	R	Resistor, fixed or variable
CR	Diode, signal or rectifier	RT	Thermistor
DL	Delay line	S	Switch
DS	Indicating device (lamp)	T	Transformer
F	Fuse	TP	Test point
FL	Filter	U	Assembly, inseparable or non-repairable (integrated circuit, etc.)
H	Heat dissipating device (heat sink, heat radiator, etc.)		
HR	Heater	V	Electron tube
J	Connector, stationary portion	VR	Voltage regulator (zener diode, etc.)
K	Relay	Y	Crystal
L	Inductor, fixed or variable		

Ⓐ

DATA COMMUNICATION INTERFACE CARD
670-1730-03 & UP

4010/4010-1 (021-0065-00)

REV. B, SEP. 1975

1173
hq

4010/4010-1 (021-0065-00)

DATA COMMUNICATION INTERFACE CARD   670-1730-02 & BELOW
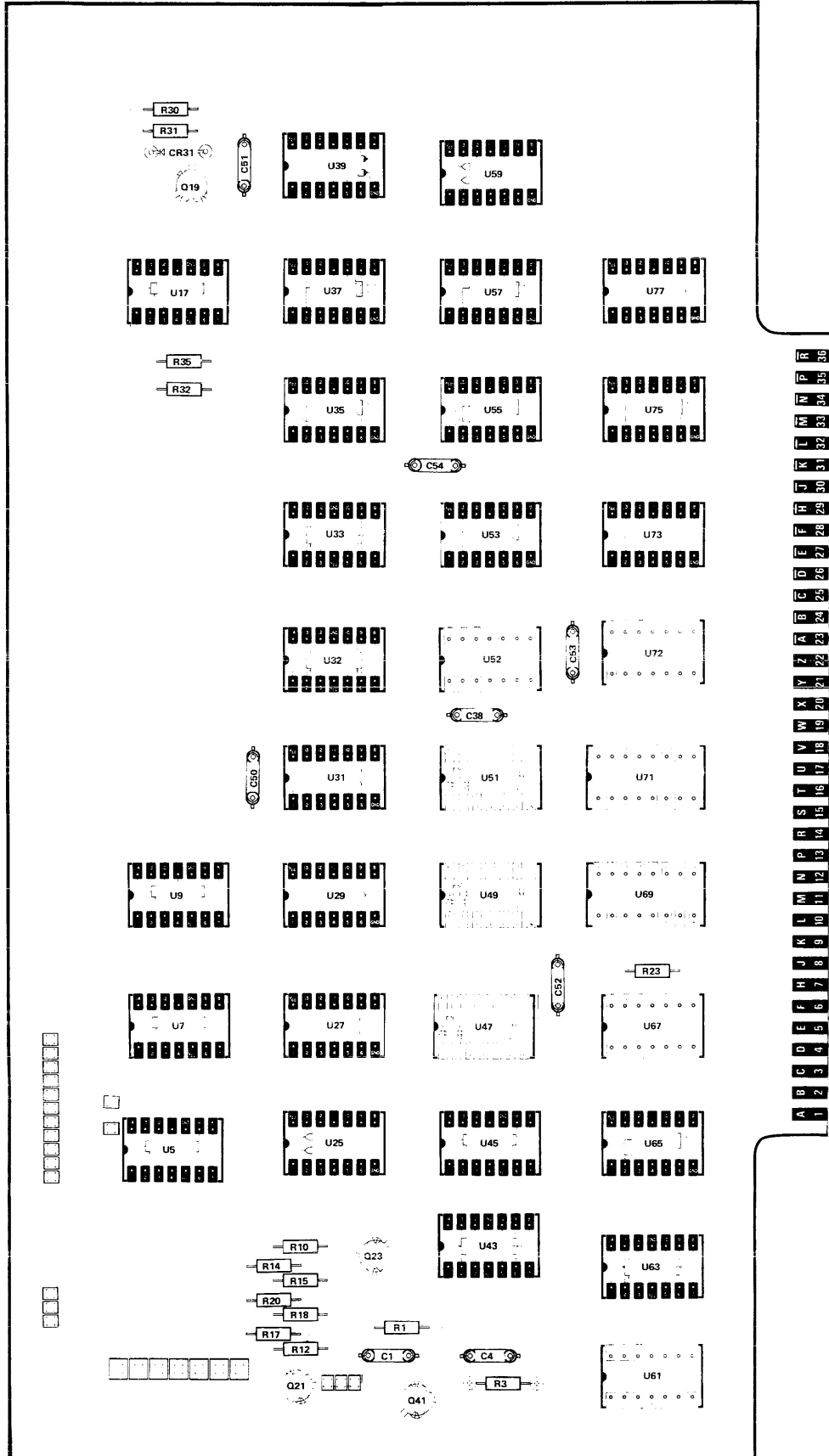
Data Communication Interface component location.

REPLACEABLE
MECHANICAL PARTS

PARTS ORDERING INFORMATION

Replacement parts are available from or through your local Tektronix, Inc. Field Office or representative.

Changes to Tektronix instruments are sometimes made to accommodate improved components as they become available, and to give you the benefit of the latest circuit improvements developed in our engineering department. It is therefore important, when ordering parts, to include the following information in your order: Part number, instrument type or number, serial number, and modification number if applicable.

If a part you have ordered has been replaced with a new or improved part, your local Tektronix, Inc. Field Office or representative will contact you concerning any change in part number.

Change information, if any, is located at the rear of this manual.

SPECIAL NOTES AND SYMBOLS

X000   Part first added at this serial number

00X   Part removed after this serial number

FIGURE AND INDEX NUMBERS

Items in this section are referenced by figure and index numbers to the illustrations.

INDENTATION SYSTEM

This mechanical parts list is indented to indicate item relationships. Following is an example of the indentation system used in the description column.

   1 2 3 4 5   <u>Name & Description</u>

Assembly and/or Component
Attaching parts for Assembly and/or Component
    - - - * - - -

    Detail Part of Assembly and/or Component
    Attaching parts for Detail Part
      - - - * - - -

      Parts of Detail Part
      Attaching parts for Parts of Detail Part
        - - - * - - -

Attaching Parts always appear in the same indentation as the item it mounts, while the detail parts are indented to the right. Indented items are part of, and included with, the next higher indentation. The separation symbol - - - * - - - indicates the end of attaching parts.

Attaching parts must be purchased separately, unless otherwise specified.

ITEM NAME

In the Parts List, an Item Name is separated from the description by a colon (:). Because of space limitations, an Item Name may sometimes appear as incomplete. For further Item Name identification, the U.S. Federal Cataloging Handbook H6-1 can be utilized where possible.

ABBREVIATIONS

"	INCH	ELCTRN	ELECTRON	IN	INCH	SE	SINGLE END
#	NUMBER SIZE	ELEC	ELECTRICAL	INCAND	INCANDESCENT	SECT	SECTION
ACTR	ACTUATOR	ELCTLT	ELECTROLYTIC	INSUL	INSULATOR	SEMICOND	SEMICONDUCTOR
ADPTR	ADAPTER	ELEM	ELEMENT	INTL	INTERNAL	SHLD	SHIELD
ALIGN	ALIGNMENT	EPL	ELECTRICAL PARTS LIST	LPHLDR	LAMPHOLDER	SHLDR	SHOULDERED
AL	ALUMINUM	EQPT	EQUIPMENT	MACH	MACHINE	SKT	SOCKET
ASSEM	ASSEMBLED	EXT	EXTERNAL	MECH	MECHANICAL	SL	SLIDE
ASSY	ASSEMBLY	FIL	FILLISTER HEAD	MTG	MOUNTING	SLFLKG	SELF-LOCKING
ATTEN	ATTENUATOR	FLEX	FLEXIBLE	NIP	NIPPLE	SLVG	SLEEVING
AWG	AMERICAN WIRE GAGE	FLH	FLAT HEAD	NON WIRE	NOT WIRE WOUND	SPR	SPRING
BD	BOARD	FLTR	FILTER	OBD	ORDER BY DESCRIPTION	SQ	SQUARE
BRKT	BRACKET	FR	FRAME or FRONT	OD	OUTSIDE DIAMETER	SST	STAINLESS STEEL
BRS	BRASS	FSTNR	FASTENER	OVH	OVAL HEAD	STL	STEEL
BRZ	BRONZE	FT	FOOT	PH BRZ	PHOSPHOR BRONZE	SW	SWITCH
BSHG	BUSHING	FXD	FIXED	PL	PLAIN or PLATE	T	TUBE
CAB	CABINET	GSKT	GASKET	PLSTC	PLASTIC	TERM	TERMINAL
CAP	CAPACITOR	HDL	HANDLE	PN	PART NUMBER	THD	THREAD
CER	CERAMIC	HEX	HEXAGON	PNH	PAN HEAD	THK	THICK
CHAS	CHASSIS	HEX HD	HEXAGONAL HEAD	PWR	POWER	TNSN	TENSION
CKT	CIRCUIT	HEX SOC	HEXAGONAL SOCKET	RCPT	RECEPTACLE	TPG	TAPPING
COMP	COMPOSITION	HLCPS	HELICAL COMPRESSION	RES	RESISTOR	TRH	TRUSS HEAD
CONN	CONNECTOR	HLEXT	HELICAL EXTENSION	RGD	RIGID	V	VOLTAGE
COV	COVER	HV	HIGH VOLTAGE	RLF	RELIEF	VAR	VARIABLE
CPLG	COUPLING	IC	INTEGRATED CIRCUIT	RTNR	RETAINER	W/	WITH
CRT	CATHODE RAY TUBE	ID	INSIDE DIAMETER	SCH	SOCKET HEAD	WSHR	WASHER
DEG	DEGREE	IDENT	IDENTIFICATION	SCOPE	OSCILLOSCOPE	XFMR	TRANSFORMER
DWR	DRAWER	IMPLR	IMPELLER	SCR	SCREW	XSTR	TRANSISTOR

CROSS INDEX—MFR. CODE NUMBER TO MANUFACTURER

| Mfr. Code	Manufacturer	Address	City, State, Zip
00779	AMP, INC.	P O BOX 3608	HARRISBURG, PA 17105
22526	BERG ELECTRONICS, INC.	YOUK EXPRESSWAY	NEW CUMBERLAND, PA 17070
70485	ATLANTIC INDIA RUBBER WORKS, INC.	571 W. POLK ST.	CHICAGO, IL 60607
71468	ITT CANNON ELECTRIC	666 E. DYER RD.	SANTA ANA, CA 92702
80009	TEKTRONIX, INC.	P O BOX 500	BEAVERTON, OR 97077
83385	CENTRAL SCREW CO.	2530 CRESCENT DR.	BROADVIEW, IL 60153
95987	WECKESSER CO., INC.	4444 WEST IRVING PARK RD.	CHICAGO, IL 60641
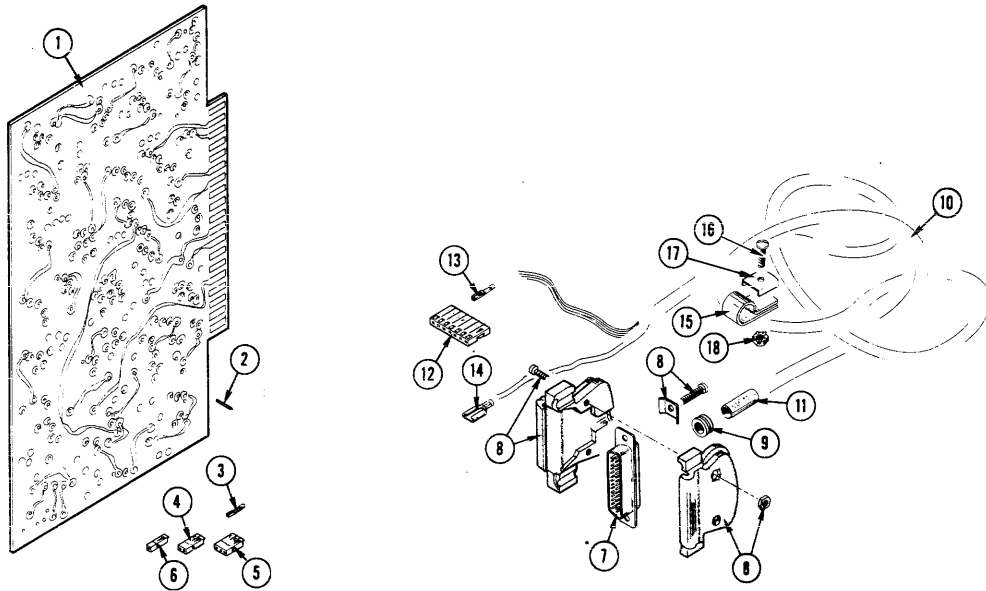
Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5 Name & Description	Mfr Code	Mfr Part Number
1-	021-0065-00			1	INTERFACE ASSY:DATA COMMUNICATION	80009	021-0065-00
-1	----- -----			1	. CKT BOARD ASSY:DATA COMM INTFC(SEE REPL)		
-2	131-0608-00			19	. . TERMINAL,PIN:0.365 L X 0.025 PH BRZ GOLD	22526	47357
	131-0787-00			7	. . CONTACT,ELEC:0.64 INCH LONG	22526	47359
	131-0993-00			2	. . BUS,CONDUCTOR:2 WIRE BLACK	00779	530153-2
	----- -----			-	. . . EACH LINK INCLUDES:		
-3	131-0707-00			2	. . . CONNECTOR,TERM.:22-26 AWG,BRS& CU BE GOLD	22526	47439
-4	352-0169-00			2	. . HLDR,TERM CONN:2 WIRE BLACK	80009	352-0169-00
	131-1206-00			1	. . BUS,CONDUCTOR:1.5 L X 26 AWG WIRE	80009	131-1206-00
	131-0707-00			4	. . . CONNECTOR,TERM.:22-26 AWG,BRS& CU BE GOLD	22526	47439
-5	352-0161-00			1	. . . HLDR,TERM CONN:3 WIRE BLACK	80009	352-0161-00
-6	352-0171-00			2	. . . HLDR,TERM CONN:1 WIRE BLACK	80009	352-0171-00
	012-0373-00			1	. CABLE ASSY,SP E:MODEM	80009	012-0373-00
-7	131-0570-00			1	. . CONNECTOR,RCPT,:25 PIN,MALE	71468	DB25P
-8	200-1667-00			1	. . SHLD ELEC CONN:25 CONTACT,TYPE HD SIZE 3	80009	200-1667-00
-9	348-0020-00			1	. . GROMMET,RUBBER:0.25 INCH	70485	374
-10	175-1747-00			AR	. . CABLE,SP,ELEC:7,26 AWG,0.165 DIA	80009	175-1747-00
-11	334-1939-00			1	. . SLEEVE,MKR,CA:MKD INTERCONNECTING CABLE	80009	334-1939-00
-12	352-0203-00			1	. . HLDR,TERM CONN:7 WIRE BLACK	80009	352-0203-00
-13	131-0621-00			7	. . CONNECTOR,TERM:22-26 AWG,BRS& CU BE GOLD	22526	46231
-14	131-1159-00			1	. . TERM,QIK DISC.:14-18 AWG,U/W0.25 X 0.032	00779	42660-2
					(ATTACHING PARTS)		
-15	343-0001-00			1	. CLAMP,LOOP:0.15 INCH DIA,PLASTIC	95987	1-8-6B
-16	211-0511-00			1	. SCREW,MACHINE:6-32 X 0.500,PNH,STL,CD PL	83385	OBD
-17	210-0863-00			1	. WSHR,LOOP CLAMP:0.187 ID U/W 0.5 W CLP,STL	95987	C191
-18	210-0457-00			1	. NUT,PL,ASSEM WA:6-32 X 0.312 INCH,STL	83385	OBD

- - - * - - -

ACCESSORIES

| | 070-1458-00 | | | 1 | MANUAL,TECH:INSTRUCTION | 80009 | 070-1458-00 |