MAINTENANCE MANUAL

Serial Number _____

DATA TO TTY DIR 1

DATA COMMUNICATIONS INTERFACE UNIT

021–0033–00

Tektronix, Inc. ● P. O. Box 500 ● Beaverton, Oregon 97005 ● Phone 644-0161 ● Cables: Tektronix

070-1235-00

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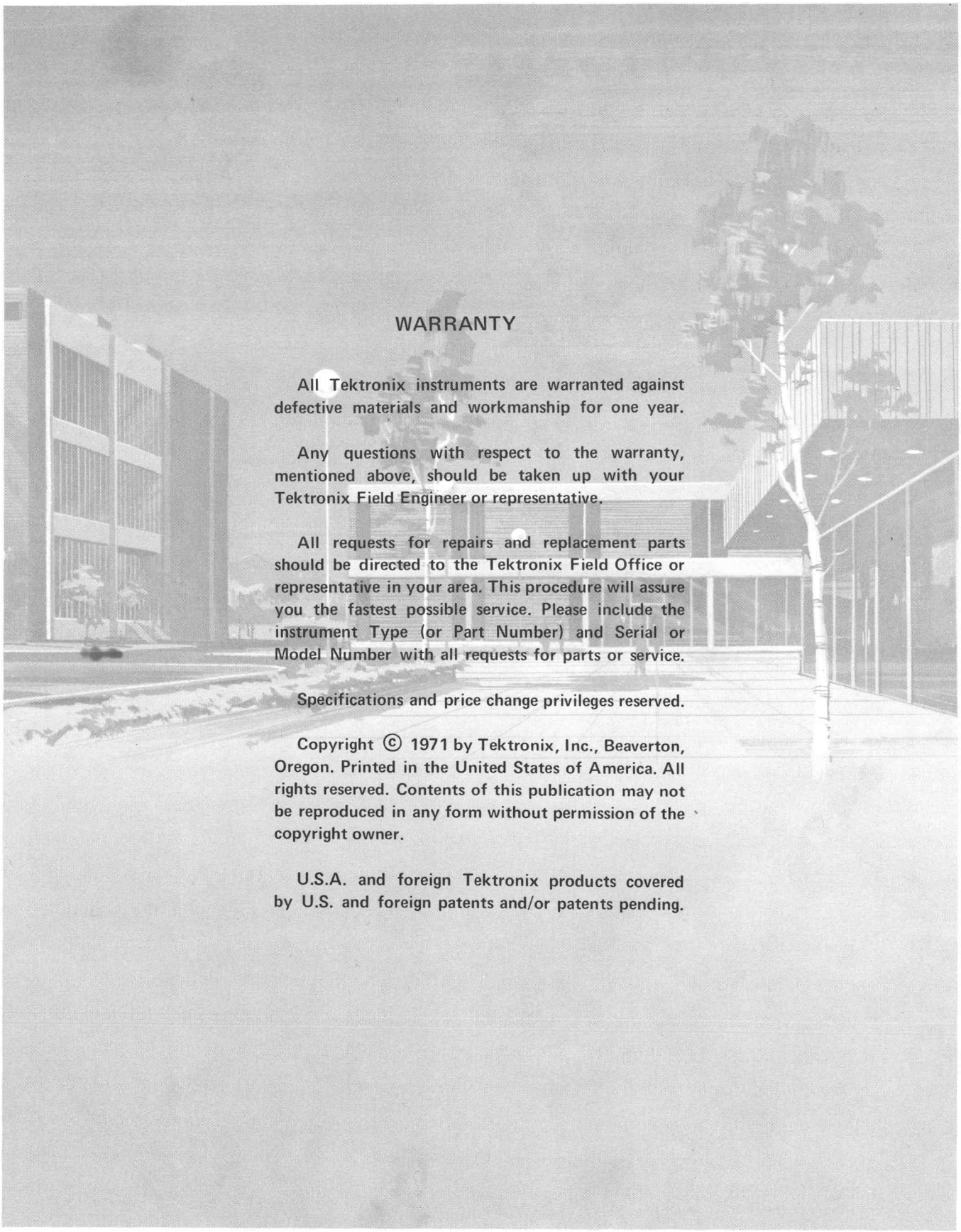

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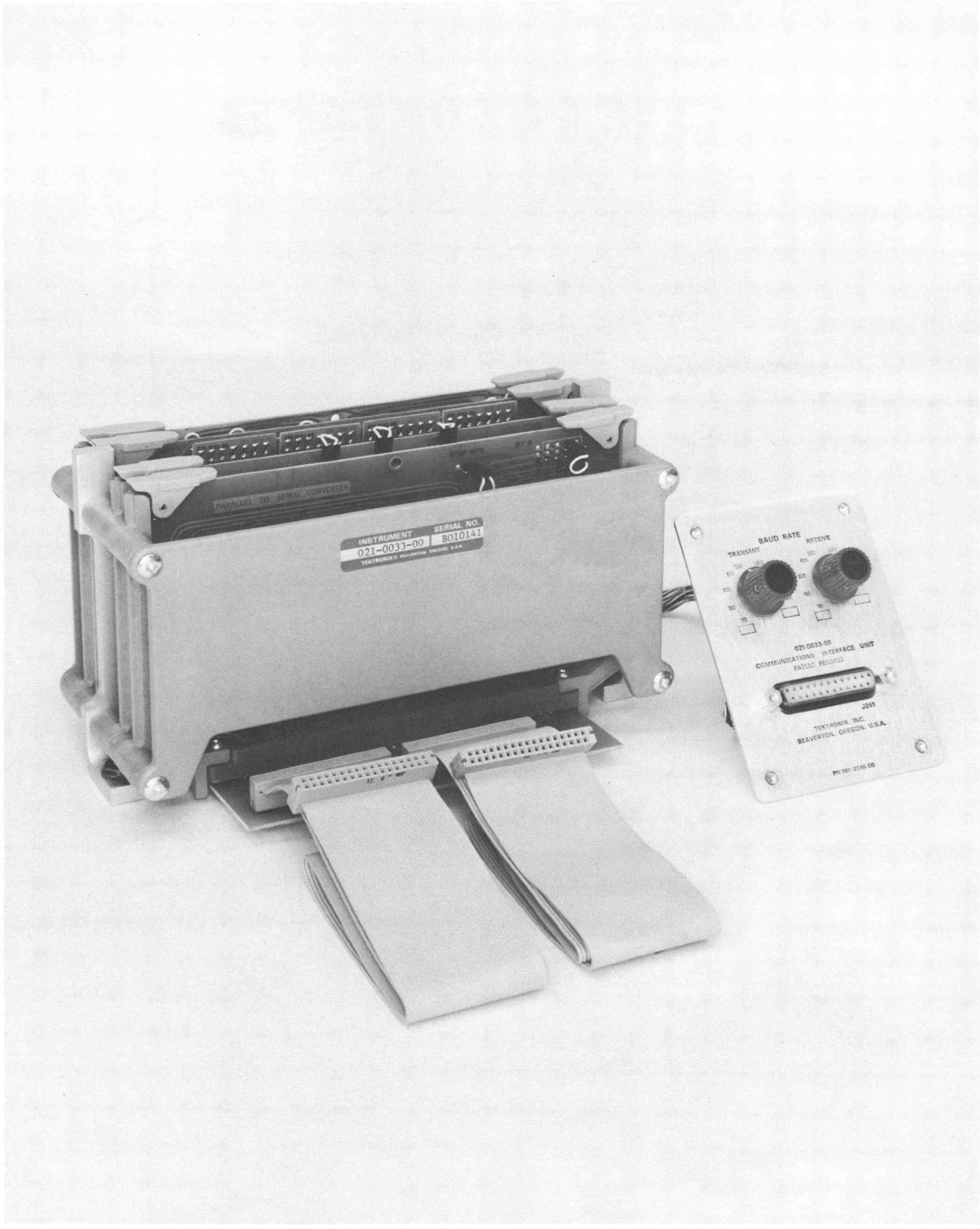


Fig. 1-1. Data Communications Interface Unit.

SECTION 1
SPECIFICATION

Introduction

The 021-0033-00 Data Communications Interface allows the Tektronix Graphic Computer Terminal (GCT) to communicate with devices which transfer data serially in either a full-duplex or a half-duplex mode. It conforms to EIA Standard RS-232-C (August, 1969) which defines the minimum required circuits and electrical signal characteristics for exchanging binary serialized data. The Interface has its own internal clocks, or it can be synchronized with external timing signals; therefore, it is compatible with synchronous and asynchronous modems. The Interface gives the GCT the capability of working with time-sharing computers over telephone lines.

Physically the interface unit is housed completely within the 4002A console. The interface frame has vertical guides for four removable solid state circuit boards. Removable cables connect the Interface to the serial data I/O line to Terminal Control.

The electrical characteristics and general characteristics briefly summarize the data transfer capabilities of the Communications Interface regarding logic, levels, and data control lines.

The environmental characteristics outline the conditions under which the Interface will operate properly.

General Characteristics

TABLE 1-1

OPTIONS

Options	Strap or switch location
Full or half-duplex service	Level Converter Board (Normally Full)
Internal or External Timing	Timing Interface Board (Controlled by switch on rear panel)
	Int—Choice of 110, 150, 300, 600, 1200, 4800, 9600, & PROG
	Ext—Modem Rate

TABLE 1-1 (cont)

Options	Strap or switch location
Transmit 1 or 2 Stop Bits	Parallel to Serial Converter Board (Normally 2 stop bits)
Even or Odd Parity	Parallel to Serial Converter Board and Serial to parallel Converter Board (Normally Even)
Receiver Blanking and Unblanking	Level Converter Board (Normally Off)
Local Echo	Level Converter Board (Normally Off)
Data Carrier Sensing	Serial to Parallel Converter Board (Normally On)
Modulation Sensing	Serial to Parallel Converter Board (Normally On)

TABLE 1-2

SPECIAL USE OF ASCII CONTROL CHARACTERS

STX	Unblanks the receiver if strapped on.
EOT	Blanks the receiver if strapped on. (Any ASCII code can be used for blanking a given terminal when more than one terminal is used in a TIME SHARE mode.)

Half-duplex Service. Sequence to Initiate Line Turnaround or Transmission by either the Terminal or the Computer.

1. Strap must be in Half-duplex (Request To Send) position.

2. Strap may be in the Receiver Blanking In position.

3. Interface receiver unblanked by receipt of the control character "STX" (if strap selects Receiver Blanking).

4. Computer sends message followed by "EOT", blanking the terminal (if strap selects Receiver Blanking).

5. Terminal transmission initiated by raising the Transmit Ready flag. When the computer has sent "EOT" or cut off the carrier signal (if strap selects Receiver Blanking), the interface turns on Request To Send when Transmit Ready is raised.

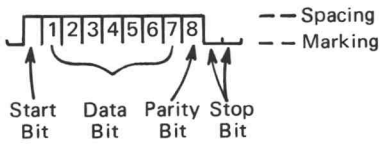
6. Data transmission begins when the modem turns on the Clear to Send.

7. Request to Send turned off and transmission terminated by a local copy of "EOT", by pushing the SEND button, or by a Marking Signal on the Reverse Channel (if option is selected).

Local Echo-plexing. Strapping Local Echo On provides a local copy of the outgoing serial data in cases of a full-duplex modem where the computer does not echo characters. One restriction is that data can only be sent in one direction at a time, or the received data will be in error.

TABLE 1-3

ELECTRICAL CHARACTERISTICS

Communication Mode	Serial data transfer. Full- or half-duplex. Start-Stop synchronous.
Bit Format	
Receiving	1 Start Bit 7 Data Bits ┐ 1 Parity Bit ┘ or 8 Data Bits 1 or 2 Stop Bits (Fractional values possible with internal clock)
Transmitting	Same format as receiving 1 Start Bit 7 Data Bits ┐ 1 Parity Bit ┘ or 8 Data Bits 1 or 2 Stop Bits (No fractional values)

Electrical Characteristics (cont)

Data Transmission Timing	When the Interface is Receiving on External or Internal clocks, the 4002A timing requirements govern the actual transmission rates.
External	Function of Modem clock. Maximum 50,000 bits/s; Transmit and Receive
Internal	
Range	Receive and Transmit; 75 to 307 K Baud Interface rate (See 4002A Specification for Maximum Baud rate)
Accuracy	Factory supplied rates within .75%. Digitally selectable to any rate 75 to 6K within 1%;
	Faster rates dependent on even division of Baud rate formula (Sec. 2).
Drift	Within .1% (0°C to 40°C)
Data Signal Conversion	
Outgoing Data	Converted from 8 bit parallel form to serial form with 8th bit strappable for parity
Incoming Data	Converted from 7 or 8-bit serial form to parallel form
Half-Duplex Turnaround Time	Function of modem (modulator-demodulator) unit
Electrical Signal Characteristics	
Maximum Open Circuit Voltage	±25 V between any interchange circuit and ground
Maximum Short Circuit Current	0.5 A between any two interchange circuits
Data Recognition Circuits	
Marking Condition	At least −3 V referenced to Circuit AB (Signal Ground). Circuit recognizes binary state ONE. (Normal state in no-signal conditions)

Electrical Characteristics (cont)

Spacing Condition	At least +3 V referenced to Circuit AB (Signal Ground). Circuit recognizes binary state ZERO
Control Functions	
ON	At least +3 V referenced to Circuit AB
OFF	At least −3 V referenced to Circuit AB
Receiving End Terminating Impedance, DC Resistance	3 kΩ to 7 kΩ
Receiving End Open Circuit Voltage	±2 V or less
Receiving End Shunt Capacitance	2500 pF or less (including cable)
Risetime Capability of Output Lines	3% or less of nominal duration of signal element
Interchange Circuits	Interchange circuits meet EIA standard RS-232-C for exchanging control signals and binary serialized data signals between data processing terminal, equipment and data communication equipment

Required Circuits	Name	Pin No.
AA (101)	Protective Ground	J261-1
AB (102)	Signal Ground	J261-7
BA (103)	Transmitted Data	J261-2
BB (104)	Received Data	J261-3
CA (105)	Requested To Send	J261-4
CB (106)	Clear To Send	J261-5
CC (107)	Data Set Ready	J261-6

Electrical Characteristics (cont)

Additional Defined Circuits	Name	Pin No.
CD (108.2)	Data Terminal Ready	J261-20
CF (109)	Data Carrier Detector	J261-8
CG (110)	Data Modulation Detector	J261-21
DB (114)	Transmitter Signal Element Timing (Data Communication Equipment Source)	J261-15
DD (115)	Receiver Signal Element Timing (Data Communication Equipment Source)	J261-17
SCA (120)	Secondary Request to Send	J261-19
SCF (122)	Sec. Rec'd Line Signal Detector	J261-12

ENVIRONMENTAL CHARACTERISTICS

(APPLICABLE ONLY WHEN OPERATED WITHIN A CALIBRATED 4002A SYSTEM)

Temperature (Ambient)	
Operating Range	+20°C to +40°C (at sea level)
Storage Range	−40°C to +65°C
Altitude	
Operating Range	To 15,000 feet (+20°C to +30°C)
Storage Range	To 50,000 feet

PHYSICAL CHARACTERISTICS

Materials	Gray phenylene oxide end-plates, spacers and guides
Connector Type	56-pin Viking

NOTES

SECTION 2
CIRCUIT DESCRIPTION

This section of the manual contains a description of the circuity used in the Data Communications Interface Unit. The purpose of the circuit description is to provide information for troubleshooting and evaluation of the Interface Unit. Input/Output information is contained in Section 1, Specification. The operation of the circuits within the Interface Unit are described using the graphic symbols and terminology set forth in military standard MIL-STD-806B. The use of an overline on a signal name (e.g., $\overline{\text{Xmit Comp}}$) is to indicate that the active state of the signal is a low state.

Parallel to Serial Converter

The parallel to serial converter changes the parallel data, from the keyboard, to serial data to be transmitted to the computer. The parity bits and the stop bits are also generated on this board. The serial data is transmitted to the modem out the T Data line. The function of the $\overline{\text{Trans Comp}}$ signal is to terminate the Xmit Ready after the input data has been accepted by the shift register.

At initial turn-on, the conditions of the JK flip-flops are as follows: the J input of U11A is tied to a one through R10. The Xmit Clock is running; therefore, the one at the J input of U11A is propagated through the flip-flops down through U15A, putting the shift register in the set condition. The condition of U11B is undefined at this time. All the inputs to U9 are ones at this time; therefore, the output is low. This condition, inverted through U33C, appears as a one at the J input of U17A. The one is clocked through U17A, putting U17A and U17B in a set condition. Since no character on the keyboard has been depressed, the inputs to U31A are not all ones, and the output of U31A is high. This causes U15B to be in the cleared condition. The collector of Q24 is high. This high is inverted through U33D and appears as a low on the J inputs of U27A and U27B. The zero output of U27B (which is the $\overline{\text{Trans Comp}}$ line) is in the high state. U15A is the 0 start bit flip-flop, U11B is the data or parity bit flip-flop (depending on strapping), and U17 is the stop bit flip-flop.

When U31A receives a Clear to Send signal from the modem, and a key is depressed on the keyboard which generates the Xmit Ready pulse, all the inputs to U31A are in the one condition. This casues the J input of U15B to go high. This high is clocked through U15B, causing Q24 to turn on. The low on the collector of Q24 puts U11A, U11B, U17A, and U17B in the cleared condition. This low also opens the gates U23 and U21 to enter the transmitted data into the shift register. When U17A and U17B were set in the cleared condition, the zero output of each of the flip-flops went high. This caused all the inputs to U19B to be high, generating the 0 start bit. After seven clock pulses, the data stored in the shift register has been shifted down the line and out through U19B. At this time all the inputs to U9 are ones, and the one appears at the J input of U17A. The eighth clock pulse causes U17A to toggle, which disables U19B and enables U19C, which then governs the next bit to be transmitted. This bit is determined by the state of the parity flip-flop U11B, and the position of the parity jumper. The jumper also has the option of using the eight parity bit as a data bit. On the ninth clock pulse, the one output of U17A goes to the low state and the one output of U17B goes high to generate the first stop bit. The tenth clock pulse causes both U17A and U17B to be high, generating the second stop bit. The outputs of U17A and U17B are connected back through the stop bit jumper to the input of U31A. When the inputs to U31A are satisfied with either one or two stop bits, its output goes low again, causing Q24 to turn on. U27A and U27B are triggered on the negative-going pulse from the collector of Q24, which generates a $\overline{\text{Trans Comp}}$ signal and terminates the Xmit Ready signal in the terminal control.

Serial to Parallel Converter

The serial to parallel converter converts the serial information from the computer to parallel information to be used in the 4002A terminal. The outputs from the converter are Bit 1 through Bit 8 as a parallel word, the Strobe which is developed at the end of a data word, a $\overline{\text{Comm Error}}$ signal if an error occurs, a parity correct signal, and a stop pulse.

The data word from the computer comes into the converter at pin 11, Serial In. At this point, a mark is a low and a space is a high. A start bit is high and a stop bit is low. The data word is entered into a shift register, consisting of U23B through U15A. The data is clocked through the shift register by the Rec Clock In, which comes in on pin 7 from the timing board. U33B is used to detect the start and stop bits so that a complete data word can be recognized. U33B looks at the new start bit from pin 9 of U15B, the stop bit of the last word which was stored in U15A, and the stop bit from pin 8 of U23B. When all three inputs go high indicating a complete data word, the J input of U7A goes high. On the next negative edge of the $\overline{\text{2 MHZ}}$ signal from the

terminal, U7A clocks the high to U7B and U13D. When the $\overline{\text{2 MHZ}}$ goes positive again, a strobe is generated at pin 21 of the board. After a delay provided by U7B, the shift register and the parity flip-flop U23A is reset. U23A is counting zeroes in the data string, and parity can be checked for odd, even, or ignore, depending on the strapping position. At the completion of the data word, the strobe developed at pin 8 of U13C is used to gate U33C and check parity. If the proper parity is not received, $\overline{\text{Comm Error}}$ goes low, telling the terminal that a mistake has occurred.

Timing Interface

The timing interface contains two divide by n (any number) baud rate counters which generate the Rec Clock and the Xmit Clock.

A 4.9152 Megahertz crystal controlled clock, formed by U19, is used to drive three synchronous 4-bit counters in each divider.

The receive counter consists of U1, U3, U5, U11A, and the gates U7A and U9B. By grounding the appropriate inputs as determined by the formula given below, the complement of the binary decimal equivalent for the baud rate is loaded into the counter. When pin 9 is high, U1 is allowed to count up until the overflow causes pin 15 to go high. The highs at pin 10 and pin 7 of U3 allow it to count up until its overflow is carried to U5. When all inputs to U7A are high, the output goes low, disabling the counters. The counter outputs will then agree with the data inputs after the next clock pulse. U11A is a divide-by-two counter which is used at baud rates less than 150. The diode at bit 12 puts a high at pin 4 of U11A, allowing it to count down. At rates faster than 150 baud, the counter is not needed and is disabled by removing the diode for bit 12.

The transmit counter consists of U13, U15, U17, U11B, and the gates U7B and U9C. The operation of the transmit counter is identical to the receive counter.

A rotary switch on the rear panel of the interface grounds the correct inputs for many standard baud rates. When the switch is turned to 110 Baud or Program, a ground is applied to pin 13 of a diode mini-board. This diode mini-board contains 13 diodes which are clipped out or left in, depending on the desired baud rate. One of the boards is clipped for 110 baud, but may be modified to a second program channel. The other board has all the diodes installed and the ones to be clipped out can be determined by the following formula:

$$B = \left(\frac{fx}{8R\ (1 + B12)}\right) - 1$$

where: B = Binary number decimal equivalent for bits 0-11 where bit 0 = LSB

R = Baud rate

B12 = logical level at the Preset of U11A or U11B

B12 = 0 for 150 baud or greater (diode 12 removed)

B12 = 1 for less than 150 baud (diode 12 installed)

$fx = 4.9152 \times 10^6$ clock frequency

As an example, a 9600 baud rate is desired. The formula would be:

$$B = \left(\frac{4.9152 \times 10^6}{(8)\ (9600)\ (1+0)}\right) - 1$$

B = 63 = 000000111111

Bit 12 ↑ ↑ LSB

Therefore, to load the complement of the binary equivalent, all diodes except 0 through 5 would be removed for a 9600 baud rate.

Any baud rate from 75 to 6 Kbaud can be programmed with an accuracy of 1% or less. At rates above 6 Kbaud, the accuracy may vary depending on the ratio of the binary number decimal equivalent and the baud rate. When the formula divides evenly, the error is negligible, but at certain rates the formula doesn't divide evenly and the error may increase. The formula can be used to calculate the accuracy for any desired baud rate.

The location of the diodes on the mini-board is shown in Fig. 2-1.

The output of the receive counter, which is running at eight times the baud rate, is fed to U47, U25, and U45A. U47A and U47B are used to synchronize the Serial In to the Rec Clock. When there is no information coming in, $\overline{\text{RCVG}}$ goes high and resets U25 on the next positive edge of the start bit. Once U25 is reset, it runs until the next start bit is detected. U25 takes the clock output, divides it by eight, and passes it to U45A so that the Rec Clock will be running in phase with the Serial In. Since there are eight clock pulses for each data bit, U25 also performs the function of counting down three clock pulses to insure that the Rec Clock out is centered in time with the serial out.

When the timing interface is used in external mode, a low at $\overline{\text{EXT R}}$ causes U29B and U49D to disconnect the internal receive counter. The Modem Rec Clock and the Serial In are passed directly out, with the synchronizing dependent upon the modem.

The output of the transmit counter goes to U31, which divides it by eight, and passes it through U29A to the Xmit Clock output. The Xmit Clock is also fed back to pin 14 of U31 to be divided by two and passed to U57A and U53. U55B takes the output of the divider U53 and combines it with a high from the Power On to reset U57B. U57A and U57B have the function of timing the break character to the transmit clock. U57A also resets U53 when break is low.

When the interface is used in external mode, the low at $\overline{\text{EXT T}}$ disconnects the transmit counter and passes the Modem Xmit Clock directly to the output.

Level Converter

The level converters convert the data from the terminal and from the modem to the correct levels to be transmitted to the terminal and to the modem.

U41 and U45 are line receivers capable of handling wide input voltages with an output compatible with logic circuits. The threshold-control terminals are tied to V_{CC} to provide a wide hysteresis loop for noise immunity. In this mode of operation, if the input goes to zero, the output voltage will remain at the low or high level as determined by the previous input.

Upon receipt of the control character STX which unblanks the terminal, the inputs to U31 are all highs, putting a high at the J input of U5A. During the next strobe the Blanking is high, enabling the REC DATA STROBE at pin 17 of the board. Any low on the inputs of U31 and U33 puts $\overline{\text{RCVG}}$ low, telling the receive timing board that data is still being received. When there is no information coming in, $\overline{\text{RCVG}}$ goes high and resets U25 (card 3) on the next positive serial bit in (start bit). When more than one terminal is used with a computer in a time share mode, any ASCII code can be used to blank a given terminal. One terminal can be used to blank on one code and another terminal programmed to blank on a different ASCII code.

U47A and U47B are line drivers capable of taking information from the terminal and raising it to suitable levels to be transmitted to the modem. The Power On at pin 3 applies a high to U7C from the power supply. This prevents a Xmitted Data output at pin S during the time the supplies are coming up or being discharged.

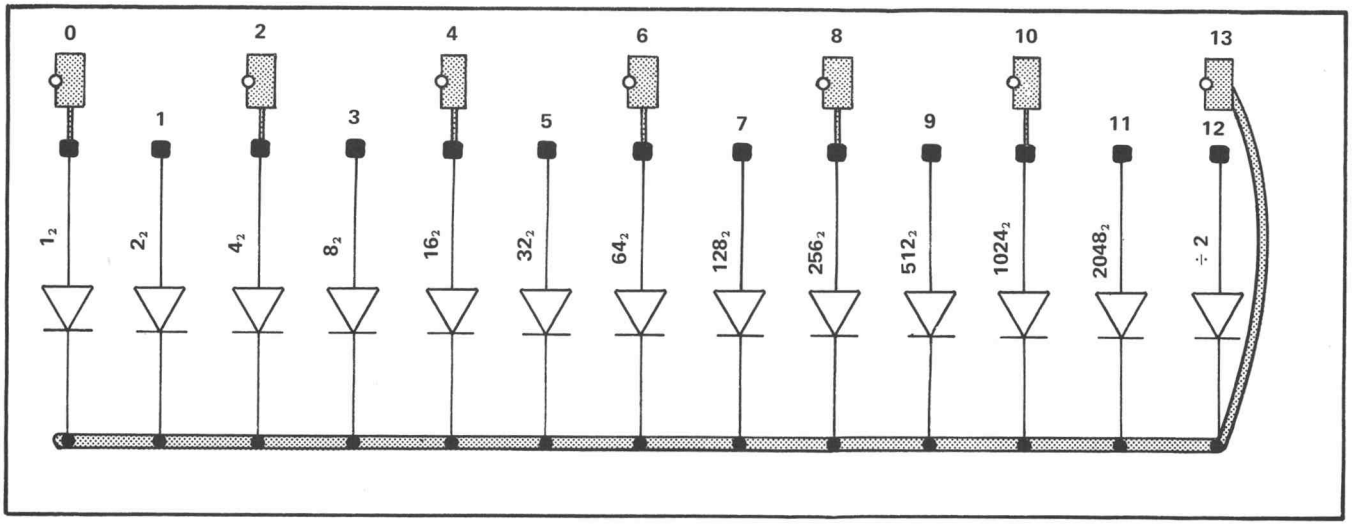


Fig. 2-1. Illustration of Diode Mini-board for programming Baud Rate Counters.

NOTES

SECTION 3
SERVICING

Introduction

Servicing information peculiar to the Interface and applicable precautions are contained in this section. Conventional preventive maintenance, troubleshooting, and corrective maintenance techniques apply to the Interface circuit cards. Refer to the servicing information in the Terminal's Drawer Unit Maintenance Manual if details regarding these techniques are required.

WARNING

(1) Dangerous potentials exist at several points in the Terminal Drawer Unit. Do Not touch electrical connections or components while power is applied.

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

(3) Disconnect the unit from its source of power before soldering on it. Turning the Power Switch off is not an adequate precaution.

CAUTION

Do not remove or replace the Interface or any of its circuit cards while the equipment is energized.

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 Drawer Unit must be pulled out from the Terminal in order to troubleshoot the Interface. Refer to the Drawer Unit Maintenance Manual for instructions.

The circuit card being checked should be placed on an extender (Extender Card, Tektronix Part No. 067-0615-00) to permit access to the entire board. Circuit cards can be removed from the chassis by pulling up equally on the two extractor tabs attached to the cards.

Complete circuit diagrams are given on foldout pages in the Diagrams Section. The component number and electrical value of each component in this unit are shown on the diagrams.

The circuit board pictures are shown in the Diagrams Section. Each electrical component on the boards is identified by its circuit number. These pictures, used with the diagrams aid in locating the components mounted on the circuit boards. Fig. 3-1 shows the location of the circuit cards within the Interface Unit.

Table 3-1 shows the signals present at the I/O connector.

TABLE 3-1

Data Communication Interface Wire List

J221

Pin No.	To	Signal Name	Origin
1	J134-27	Pagefull Light	J121-1
2			
3	J130-J, J146-V	$\overline{\text{Initial}}$	J121-3
4			
5	J146-R	$\overline{\text{Pagefull}}$	J121-5
6	J146-Y	EOT	J121-6
7	J124-8	TB 7	J121-7
8	J134-12	$\overline{\text{Break}}$	J121-8
9	J146-D	$\overline{\text{Aux Plot}}$	J121-9
10	J121-10	$\overline{\text{Local Echo}}$	J146-EE
11			
12			
13	J124-F	TB 4	J121-13
14			
15	J124-H	TB 6	J121-15
16	J124-7	TB 5	J121-16
17	J124-E	TB 2	J121-17
18	J146-16	$\overline{\text{Send}}$	J121-18
19			

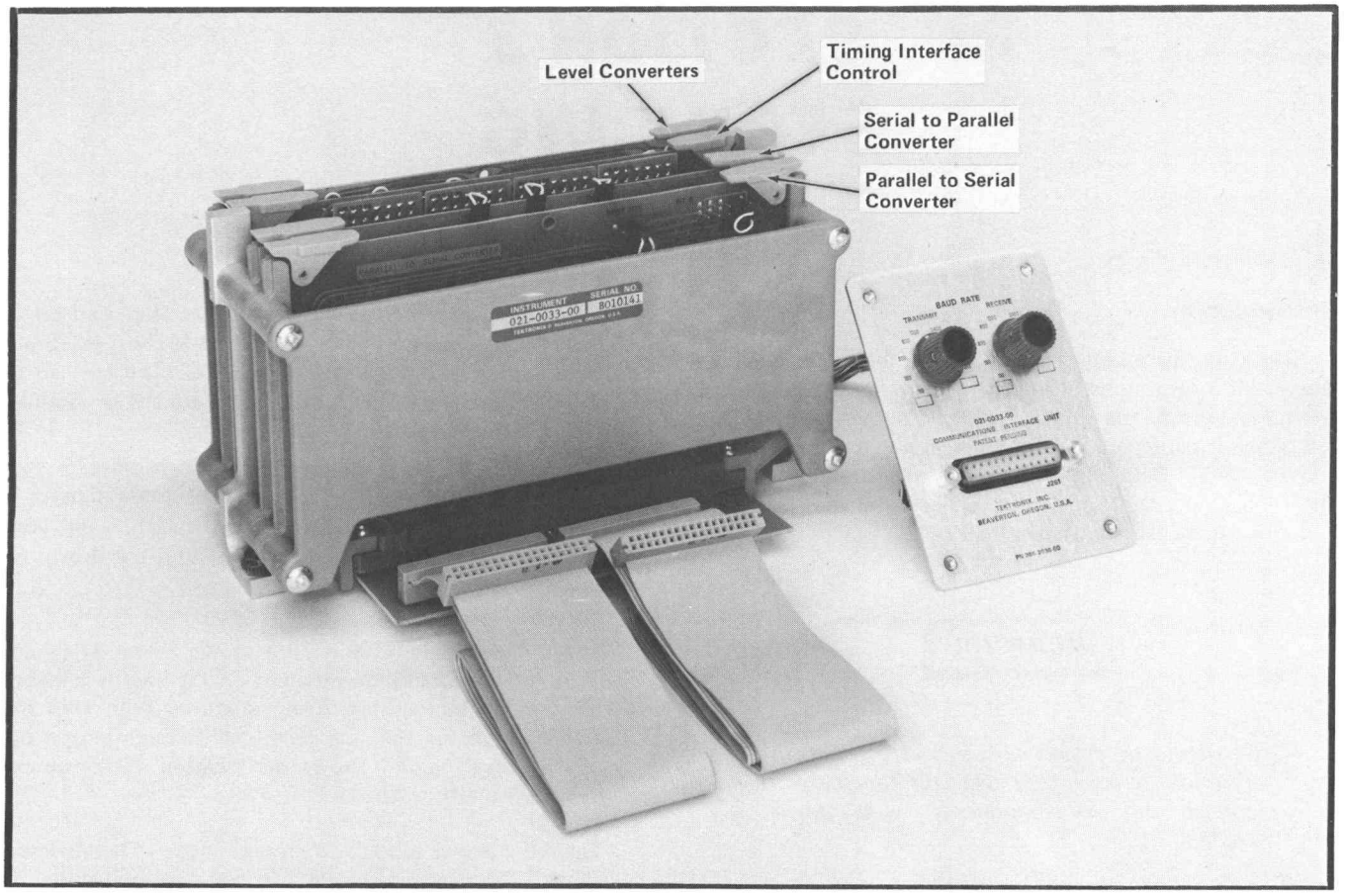


Fig. 3-1. Location of Circuit Cards in Data Communication Interface Unit.

TABLE 3-1 (cont)

J221 (cont)

Pin No.	To	Signal Name	Origin
20	J134-L, J146-CC	$\overline{\text{Pagefull Pulse}}$	J121-20
21	J124-J	TB 8	J121-21
22	J121-22	Clear To Send	J134-Z
23	J121-23	$\overline{\text{Comm Error}}$	J130-19
24			
25			
26			
27	J121-27	$\overline{\text{Trans Comp}}$	J124-L
28	J146-14	On Line	J121-28
29			
30	J124-10 J146-4	Xmit Rdy	J121-30
31			
32			
33	J121-33	$\overline{\text{I/O Mar Shift}}$	J134-11
34	J121-34	Rec Data Strobe	J146-17

TABLE 3-1 (cont)

J222

Pin No.	To	Signal Name	Origin
1			
2	J124-5	TB 1	J122-2
3			
4			
5			
6			
7			
8	J124-K	1 MHZ	J122-8
9	J134-17	2 MHZ	J122-9
10	J122-10	RB 6	J130-L
11	J122-11	RB 8	J130-E
12	J122-12	RB 5	J130-N
13	J122-13	RB 4	J130-Y
14			
15			
16	J122-16	RB 7	J130-H
17			
18			

TABLE 3-1 (cont)

J222 (cont)

Pin No.	To	Signal Name	Origin
19			
20			
21			
22	J122-22	$\overline{\text{I/O PF Reset}}$	J146-DD
23	J146-BB	SEND	J121-23
24			
25			
26			
27			
28			
29			
30	J124-6	TB 3	J122-30
31	J122-31	RB 3	J130-X
32	J122-32, J146-27	RB 2	J130-AA
33	J122-33, J146-28	RB 1	J130-CC
34			

		J161	
1	J261-19	SCA (120) Sec Req to Send	J146-U
2	J146-P	SCF (122) Sec Req to Send Det	J261-12
3	J146-F	DB (114) Xmit Sig El Timing	J261-15
4	J146-H	DD (115) Rec Sig El Timing	J261-17
5	J261-20	CD (108.2) Data Term Ready	J146-AA
6	J146-L	CG (110) Sig Qual Det	J261-20

		J162	
2	J261-2	BA (103) Transmitted Data	J146-S
3	J146-J	BB (104) Received Data	J261-3
4	J261-4	CA (105) Req to Send	J146-T
5	J146-M	CB (106) Clear to Send	J261-5
6	J146-N	CC (107) Data Set Ready	J261-6
7	J146-E	AB (102) Signal Ground	J261-7
8	J146-K	CF (109) Rec Line Sig Det	J261-8

	J171
Pin No.	Power Connector Line
1	Power On (+5 volts)
2	+5 volt supply
3	−15 volt supply
4	+15 volt supply
5	Ground

TABLE 3-1 (cont)

J261

Pin No.	To	Signal Name	Origin
1		AA (101) Ground	Chassis
2	J162-2	BA (103) Transmitted Data	J146-S
3	J162-3, J146-J	BB (104) Received Data	Modem
4	J162-4	CA (105) Request to Send	J146-T
5	J162-5, J146-M	CB (106) Clear to Send	Modem
6	J162-6, J146-N	CC (107) Data Set Ready	Modem
7	J162-7	AB (102) Signal Ground	J146-E
8	J162-8	CF (109) Rec Line Sig Det	Modem
9			
10			
11			
12	J161-2, J146-P	SCF (122) Sec Rec'd Line Sig Det	Modem
13			
14			
15	J161-4, J146-H	DB (114) Xmiter Sig El Timing	Modem
16			
17	J161-4, J146-H	DD (115) Rec Sig El Timing	Modem
18			
19	J161-1	SCA (120) Sec Req to Send	J146-U
20	J161-5	CD (108.2) Data Term Ready	J146-AA
21	J161-6, J146-L	CG (110) Sig Quality Det	Modem
22			
23			
24			
25			
26			
27			
28			
29			
30			
31			
32			
33			
34			

Interface Unit Removal

To remove the Interface from the 4002A Drawer Unit, first disconnect the connectors, J221 and J222; then remove the two phillips-head screws located on the bottom

side of the Drawer Unit which hold the Interface Unit in place. Lift the Interface Unit out the top of the Drawer Unit and disconnect the harmonica connectors. When reconnecting these connectors, they are keyed with an arrow on the connector which points to a 1 silk-screened on the mother board.

To replace the Interface Unit, reverse the order of removal. Table 3-2 lists the interconnection of the Interface connectors.

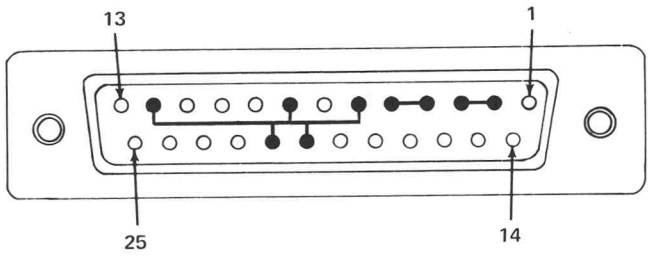
TABLE 3-2

Interface Interconnections

J161 and J162 connect to J261 on the connector block.
J221 connects to J121 on Terminal Control I/O.
J222 connects to J122 on Terminal Control I/O.
J171 connects to the 4002A Low Voltage Power Supply.
J163, J164, J165, J166 connects to the Transmit and Receive Baud rate switches.

Mini-Modem

Construct, as shown in Fig. 3-2, from an ITT Cannon DB25P connector. On Line operation of the 4002A can be simulated by connecting the Mini-Modem to J261 and selecting On Line on the 4002A keyboard. The switches or straps for the Timing Board must be in the following position: R Clock and T Clock on internal Baud rates, Local Echo OFF, Blanking OUT, Full Duplex.



ITT Cannon plug
DB-25P

Fig. 3-2. Mini-Modem, used to troubleshoot Interface Unit.

Semiconductor Lead Configuration

Fig. 3-3 shows the lead configuration for the semiconductors used in this instrument.

Strap Options

Fig. 3-4 shows the location of the Interface strap options.

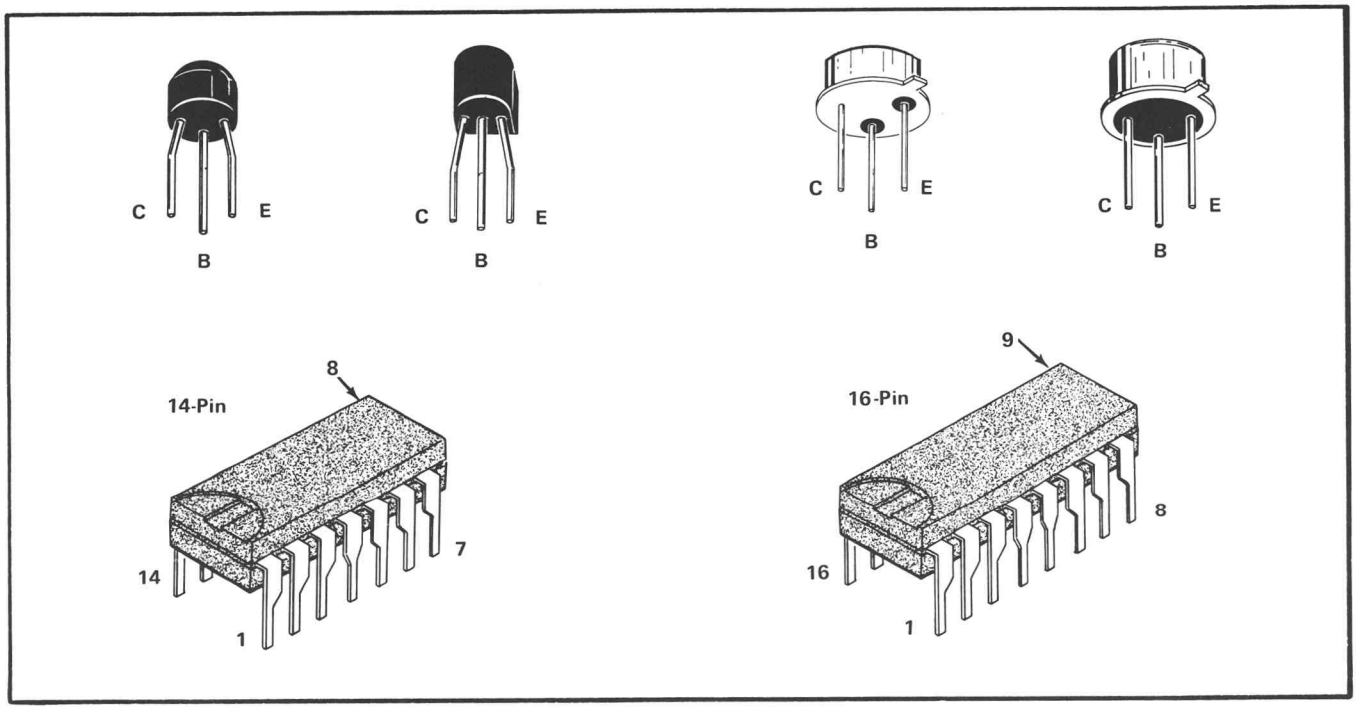


Fig. 3-3. Lead configuration of the semiconductors used in the Interface.

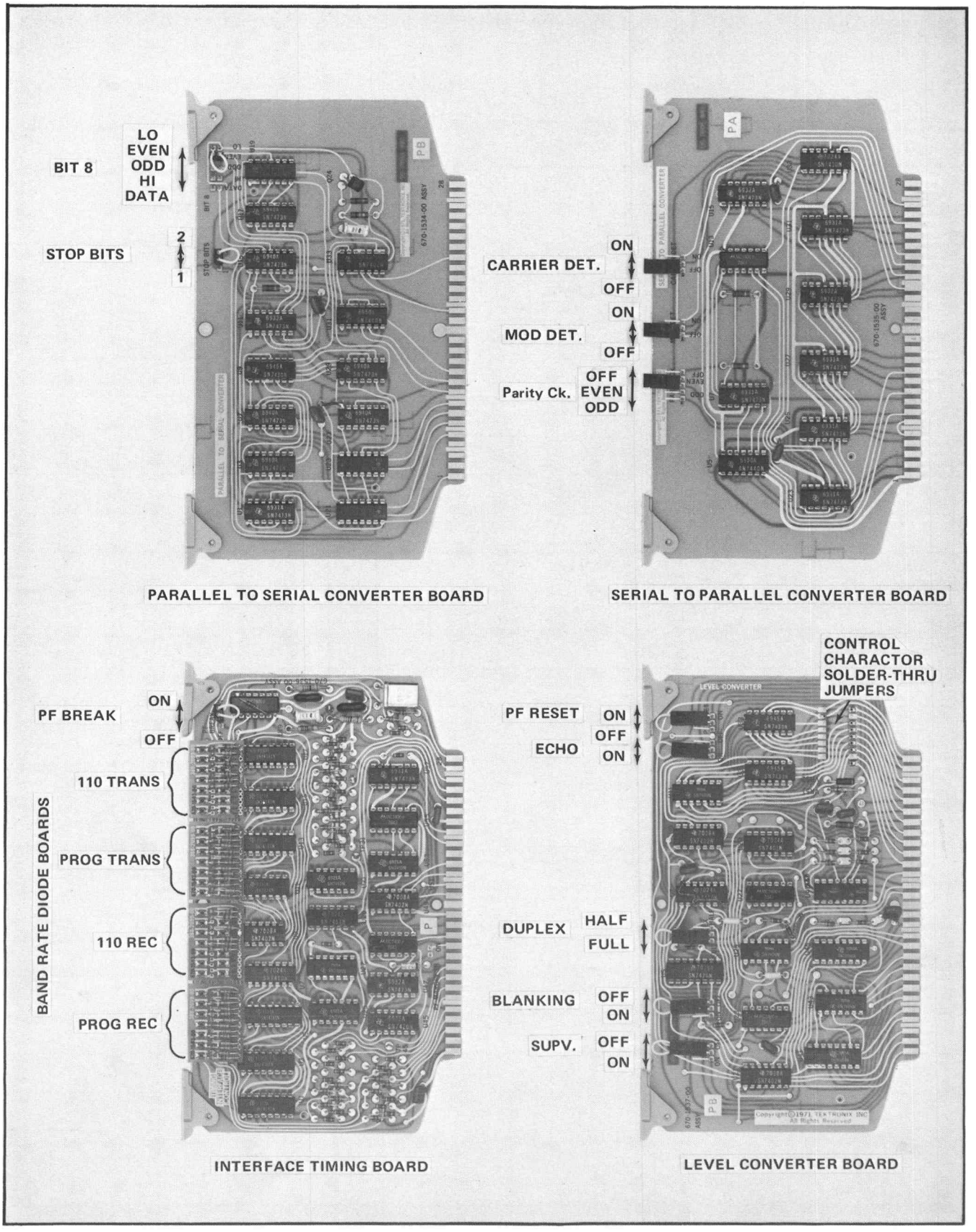


Fig. 3-4. Location of Interface strap options.

NOTES

PARTS LIST ABBREVIATIONS

BHB	binding head brass
BHS	binding head steel
cap.	capacitor
cer	ceramic
comp	composition
conn	connector
CRT	cathode-ray tube
csk	countersunk
DE	double end
dia	diameter
div	division
elect.	electrolytic
EMC	electrolytic, metal cased
EMT	electrolytic, metal tubular
ext	external
F & I	focus and intensity
FHB	flat head brass
FHS	flat head steel
Fil HB	fillister head brass
Fil HS	fillister head steel
h	height or high
hex.	hexagonal
HHB	hex head brass
HHS	hex head steel
HSB	hex socket brass
HSS	hex socket steel
ID	inside diameter
inc	incandescent
int	internal
lg	length or long
met.	metal
mtg hdw	mounting hardware
OD	outside diameter
OHB	oval head brass
OHS	oval head steel
P/O	part of
PHB	pan head brass
PHS	pan head steel
plstc	plastic
PMC	paper, metal cased
poly	polystyrene
prec	precision
PT	paper, tubular
PTM	paper or plastic, tubular, molded
RHB	round head brass
RHS	round head steel
SE	single end
SN or S/N	serial number
S or SW	switch
TC	temperature compensated
THB	truss head brass
thk	thick
THS	truss head steel
tub.	tubular
var	variable
w	wide or width
WW	wire-wound

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 or model 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.

SPECIAL NOTES AND SYMBOLS

X000	Part first added at this serial number
00X	Part removed after this serial number
*000-0000-00	Asterisk preceding Tektronix Part Number indicates manufactured by or for Tektronix, Inc., or reworked or checked components.
Use 000-0000-00	Part number indicated is direct replacement.

SECTION 4
ELECTRICAL PARTS LIST

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
CONNECTOR				
J261	131-0569-00			Receptacle, electrical, 25 pin
SWITCHES				
S1	260-1251-01			Rotary, RECEIVE BAUD RATE
S2	260-1251-01			Rotary, TRANSMIT BAUD RATE
ASSEMBLY				
A1	670-1534-00			PARALLEL TO SERIAL CONVERTER Circuit Card
CAPACITORS				
C1	283-0177-00			1 µF, Cer, 25 V, +80%-20%
C2	283-0177-00			1 µF, Cer, 25 V, +80%-20%
C22	281-0546-00			330 pF, Cer, 500 V, 10%
TRANSISTOR				
Q24	151-0190-02			Silicon, NPN, replaceable by 2N3904, checked
RESISTORS				
R10	315-0102-00			1 kΩ, 1/4 W, 5%
R22	315-0103-00			10 kΩ, 1/4 W, 5%
R24	315-0102-00			1 kΩ, 1/4 W, 5%
INTEGRATED CIRCUITS				
U1	156-0039-00			Dual 15. MHz J-K master-slave flip-flop, replaceable by SN7473N, checked
U3	156-0039-00			Dual 15. MHz J-K master-slave flip-flop, replaceable by SN7473N, checked
U7	156-0039-00			Dual 15. MHz J-K master-slave flip-flop, replaceable by SN7473N, checked
U9	156-0035-00			Single 8-input positive nand gate, replaceable by SN7430N, checked
U11	156-0039-00			Dual 15. MHz J-K master-slave flip-flop, replaceable by SN7473N, checked
U15	156-0039-00			Dual 15. MHz J-K master-slave flip-flop, replaceable by SN7473N, checked
U17	156-0039-00			Dual 15. MHz J-K master-slave flip-flop, replaceable by SN7473N, checked
U19	156-0047-00			Triple 3-input positive nand gate, replaceable by SN7410N, checked
U21	156-0030-00			Quad 2-input positive nand gate, replaceable by SN7400N, checked
U23	156-0030-00			Quad 2-input positive nand gate, replaceable by SN7400N, checked
U27	156-0039-00			Dual 15. MHz J-K master-slave flip-flop, replaceable by SN7473N, checked
U29	156-0039-00			Dual 15. MHz J-K master-slave flip-flop, replaceable by SN7473N, checked
U31	156-0036-00			Dual 4-input positive nand buffer, replaceable by SN7440N, checked
U33	156-0043-00			Quad 2-input positive nor gate, replaceable by SN7402N, checked

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
ASSEMBLY				
A2	670-1535-00			SERIAL TO PARALLEL Circuit Card
CAPACITORS				
C20	283-0177-00			1 μF, Cer, 25 V, +80%-20%
C21	283-0177-00			1 μF, Cer, 25 V, +80%-20%
RESISTORS				
R3	315-0222-00			2.2 kΩ, 1/4 W, 5%
R5	315-0472-00			4.7 kΩ, 1/w W, 5%
INTEGRATED CIRCUITS				
U5	156-0036-00			Dual 4-input positive nand buffer, replaceable by SN7440N, checked
U7	156-0039-00			Dual 15. MHz J-K master-slave flip-flop, replaceable by SN7473N, checked
U13	156-0030-00			Quad 2-input positive nand gate, replaceable by SN7400N, checked
U15	156-0039-00			Dual 15. MHz J-K master-slave flip-flop, replaceable by SN7473N, checked
U23	156-0039-00			Dual 15. MHz J-K master-slave flip-flop, replaceable by SN7473N, checked
U25	156-0039-00			Dual 15. MHz J-K master-slave flip-flop, replaceable by SN7473N, checked
U27	156-0039-00			Dual 15. MHz J-K master-slave flip-flop, replaceable by SN7473N, checked
U29	156-0039-00			Dual 15. MHz J-K master-slave flip-flop, replaceable by SN7473N, checked
U31	156-0039-00			Dual 15. MHz J-K master-slave flip-flop, replaceable by SN7473N, checked
U33	156-0047-00			Triple 3-input positive nand gate, replaceable by SN7410N, checked
ASSEMBLY				
A3	670-1536-00			TIMING INTERFACE Circuit Board
CAPACITORS				
C31	283-0602-00			53 pF, Cer, 300 V, 5%
C32	281-0546-00			330 pF, Cer, 500 V, 10%
C35	283-0602-00			53 pF, Cer, 300 V, 5%
C90	283-0177-00			1 μF, Cer, 25 V, +80%-20%
C91	283-0177-00			1 μF, Cer, 25 V, +80%-20%
C92	283-0177-00			1 μF, Cer, 25 V, +80%-20%
SEMICONDUCTOR DEVICE, DIODES				
CR3	152-0185-00			Silicon, selected from 1N4152 or 1N3605
CR5	152-0185-00			Silicon, selected from 1N4152 or 1N3605
CR7	152-0185-00			Silicon, selected from 1N4152 or 1N3605
CR17	152-0185-00			Silicon, selected from 1N4152 or 1N3605

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
SEMICONDUCTOR DEVICE, DIODES (cont)				
CR19	152-0185-00			Silicon, selected from 1N4152 or 1N3605
CR23	152-0185-00			Silicon, selected from 1N4152 or 1N3605
CR25	152-0185-00			Silicon, selected from 1N4152 or 1N3605
CR27	152-0185-00			Silicon, selected from 1N4152 or 1N3605
CR29	152-0185-00			Silicon, selected from 1N4152 or 1N3605
CR43	152-0185-00			Silicon, selected from 1N4152 or 1N3605
CR45	152-0185-00			Silicon, selected from 1N4152 or 1N3605
CR47	152-0185-00			Silicon, selected from 1N4152 or 1N3605
CR49	152-0185-00			Silicon, selected from 1N4152 or 1N3605
CR57	152-0185-00			Silicon, selected from 1N4152 or 1N3605
CR59	152-0185-00			Silicon, selected from 1N4152 or 1N3605
CR63	152-0185-00			Silicon, selected from 1N4152 or 1N3605
CR65	152-0185-00			Silicon, selected from 1N4152 or 1N3605
CR67	152-0185-00			Silicon, selected from 1N4152 or 1N3605
CR69	152-0185-00			Silicon, selected fron 1N4152 or 1N3605
CR95	152-0075-00			Germanium, replaceable by GD238 or ED48
RESISTORS				
R1	317-0472-00			4.7 kΩ, 1/8 W, 5%
R3	317-0472-00			4.7 kΩ, 1/8 W, 5%
R5	317-0472-00			4.7 kΩ, 1/8 W, 5%
R7	317-0472-00			4.7 kΩ, 1/8 W, 5%
R9	317-0472-00			4.7 kΩ, 1/8 W, 5%
R13	317-0472-00			4.7 kΩ, 1/8 W, 5%
R15	317-0472-00			4.7 kΩ, 1/8 W, 5%
R17	317-0472-00			4.7 kΩ, 1/8 W, 5%
R19	317-0472-00			4.7 kΩ, 1/8 W, 5%
R23	317-0472-00			4.7 kΩ, 1/8 W, 5%
R25	317-0472-00			4.7 kΩ, 1/8 W, 5%
R27	317-0472-00			4.7 kΩ, 1/8 W, 5%
R29	317-0472-00			4.7 kΩ, 1/8 W, 5%
R31	321-0147-00			332 Ω, 1/8 W, 1$
R32	317-0681-00			680 Ω, 1/8 W, 5%
R33	321-0097-00			100 Ω, 1/8 W, 1%
R35	321-0147-00			332 Ω, 1/8 W, 1%
R37	317-0681-00			680 Ω, 1/8 W, 5%
R41	317-0472-00			4.7 kΩ, 1/8 W, 5%
R43	317-0472-00			4.7 kΩ, 1/8 W, 5%
R45	317-0472-00			4.7 kΩ, 1/8 W, 5%
R47	317-0472-00			4.7 kΩ, 1/8 W, 5%
R49	317-0472-00			4.7 kΩ, 1/8 W, 5%
R53	317-0472-00			4.7 kΩ, 1/8 W, 5%
R55	317-0472-00			4.7 kΩ, 1/8 W, 5%
R57	317-0472-00			4.7 kΩ, 1/8 W, 5%
R59	317-0472-00			4.7 kΩ, 1/8 W, 5%
R63	317-0472-00			4.7 kΩ, 1/8 W, 5%
R65	317-0472-00			4.7 kΩ, 1/8 W, 5%
R67	317-0472-00			4.7 kΩ, 1/8 W, 5%
R69	317-0472-00			4.7 kΩ, 1/8 W, 5%
R71	317-0472-00			4.7 kΩ, 1/8 W, 5%
R75	317-0472-00			4.7 kΩ, 1/8 W, 5%

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
INTEGRATED CIRCUITS				
U1	156-0117-00			Single 20. MHz sync. 4-bit binary counter, replaceable by SN74161N, checked
U3	156-0117-00			Single 20. MHz sync. 4-bit binary counter, replaceable by SN74161N, checked
U5	156-0117-00			Single 20. MHz sync. 4-bit binary counter, replaceable by SN74161N, checked
U7	156-0047-00			Triple 3-input positive nand gate, replaceable by SN7410N, checked
U9	156-0043-00			Quad 2-input positive nor gate, replaceable by SN7402N, checked
U11	156-0041-00			Dual 15. MHz D-type pos-edge trig flip-flop, replaceable by SN7474N, checked
U13	156-0117-00			Single 20. MHz sync. 4-bit binary counter, replaceable by SN74161N, checked
U15	156-0117-00			Single 20. MHz sync. 4-bit binary counter, replaceable by SN74161N, checked
U17	156-0117-00			Single 20. MHz sync. 4-bit binary counter, replaceable by SN74161N, checked
U19	156-0030-00			Quad 2-input positive nand gate, replaceable by SN7400N, checked
U25	156-0032-00			Single 10. MHz 1 & 3 bit binary ripple counter, replaceable by SN7493N, checked
U27	156-0058-00			Hex. inverter, replaceable by SN7404N, checked
U29	156-0037-00			Dual 2-wide 2-input pos and-or-invert gate, replaceable by SN7451N, checked
U31	156-0032-00			Single 10. MHz 1 & 3 bit binary ripple counter, replaceable by SN7493N, checked
U45	156-0034-00			Dual 4-input positive nand gate, replaceable by SN7420N, checked
U47	156-0039-00			Dual 15. MHz J-K master-slave flip-flop, replaceable by SN7473N, checked
U49	156-0030-00			Quad 2-input positive nand gate, replaceable by SN7400N, checked
U51	156-0043-00			Quad 2-input positive nor gate, replaceable by SN7402N, checked
U53	156-0032-00			Single 10. MHz 1 & 3 bit binary ripple counter, replaceable by SN7493N, checked
U55	156-0030-00			Quad 2-input positive nand gate, replaceable by SN7400N, checked
U57	156-0039-00			Dual 15. MHz J-K master-slave flip-flop, replaceable by SN7473N, checked
CRYSTAL				
Y33	158-0072-00			4.9152 MHz
ASSEMBLY				
A3.1-A3.4	670-1543-00			TIMING INTERFACE PLUG ON Circuit Board Assembly
SEMICONDUCTOR DEVICE, DIODES				
CR10	152-0185-00			Silicon, selected from 1N4152 or 1N3605
CR20	152-0185-00			Silicon, selected from 1N4152 or 1N3605
CR40	152-0185-00			Silicon, selected from 1N4152 or 1N3605
CR50	152-0185-00			Silicon, selected fron 1N4152 or 1N3605

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
ASSEMBLY				
A4	670-1537-00			LEVEL CONVERTER Circuit Card
CAPACITORS				
C20	283-0000-00			0.001 µF, Cer, 500 V
C30	283-0177-00			1 µF, Cer, 25 V, +80%-20%
C33	283-0177-00			1 µF, Cer, 25 V, +80%-20%
C36	283-0177-00			1 µF, Cer, 25 V, +80%-20%
C37	283-0177-00			1 µF, Cer, 25 V, +80%-20%
C38	283-0177-00			1 µF, Cer, 25 V, +80%-20%
SEMICONDUCTOR DEVICE, DIODES				
CR10	152-0185-00			Silicon, selected from 1N4152 or 1N3605
CR12	152-0185-00			Silicon, selected from 1N4152 or 1N3605
CR14	152-0185-00			Silicon, selected from 1N4152 or 1N3605
CR18	152-0185-00			Silicon, selected fron 1N4152 or 1N3605
CR20	152-0185-00			Silicon, selected from 1N4152 or 1N3605
VR51	152-0278-00			Zener, replaceable by 1N4372A, 400 mW, 3 V, 5%
VR52	152-0278-00			Zener, replaceable by 1N4372A, 400 mW, 3 V, 5%
RESISTORS				
R3	317-0472-00			4.7 kΩ, 1/8 W, 5%
R5	317-0472-00			4.7 kΩ, 1/8 W, 5%
R7	317-0472-00			4.7 kΩ, 1/8 W, 5%
R10	317-0472-00			4.7 kΩ, 1/8 W, 5%
R12	317-0472-00			4.7 kΩ, 1/8 W, 5%
R14	317-0472-00			4.7 kΩ, 1/8 W, 5%
R18	317-0472-00			4.7 kΩ, 1/8 W, 5%
R20	317-0302-00			3 kΩ, 1/8 W, 5%
R22	317-0102-00			1 kΩ, 1/8 W, 5%
R25	317-0202-00			2 kΩ, 1/8 W, 5%
R42	315-0102-00			1 kΩ, 1/4 W, 5%
INTEGRATED CIRCUITS				
U5	156-0042-00			Dual 15. MHz J-K master-slave flip-flop, replaceable by SN7476N, checked
U7	156-0047-00			Triple 3-input positive nand gate, replaceable by SN7410N, checked
U9	156-0043-00			Quad 2-input positive nor gate, replaceable by SN7402N, checked
U11	156-0058-00			Hex. inverter, replaceable by SN7404N, checked
U21	156-0043-00			Quad 2-input positive nor gate, replaceable by SN7402N, checked
U23	156-0030-00			Quad 2-input positive nand gate, replaceable by SN7400N, checked
U25	156-0058-00			Hex. inverter, replaceable by SN7404N, checked
U27	156-0030-00			Quad 2-input positive nand gate, replaceable by SN7400N, checked
U29	156-0057-00			Quad 2-input positive nand gate, replaceable by SN7401N, checked
U31	156-0035-00			Single 8-input positive nand gate, replaceable by SN7430N, checked
U33	156-0035-00			Single 8-input positive nand gate, replaceable by SN7430N, checked

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
INTEGRATED CIRCUITS (cont)				
U41	156-0138-00			Quad ln recor, replaceable by SN75154N, checked
U43	156-0058-00			Hex. inverter, replaceable by SN7404N, checked
U45	156-0138-00			Quad in recor, replaceable by SN75154N, checked
U47 A,B	156-0139-00			Dual ln dr, replaceable by SN7515OP
ASSEMBLY				
A5	670-1538-00			INTERFACE Circuit Board
CONNECTORS				
J124	131-0762-01			Receptacle, electrical, 56 pin
J130	131-0762-01			Receptacle, electrical, 56 pin
J134	131-0762-01			Receptacle, electrical, 56 pin
J146	131-0762-01			Receptacle, electrical, 56 pin

SECTION 5

DIAGRAMS AND CIRCUIT BOARD ILLUSTRATIONS

Symbols and Reference Designators

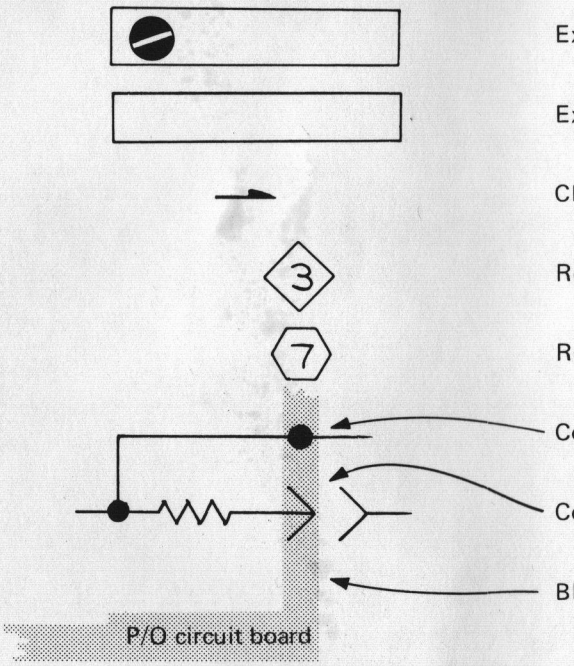
Electrical components shown on the diagrams are in the following units unless noted otherwise:

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.

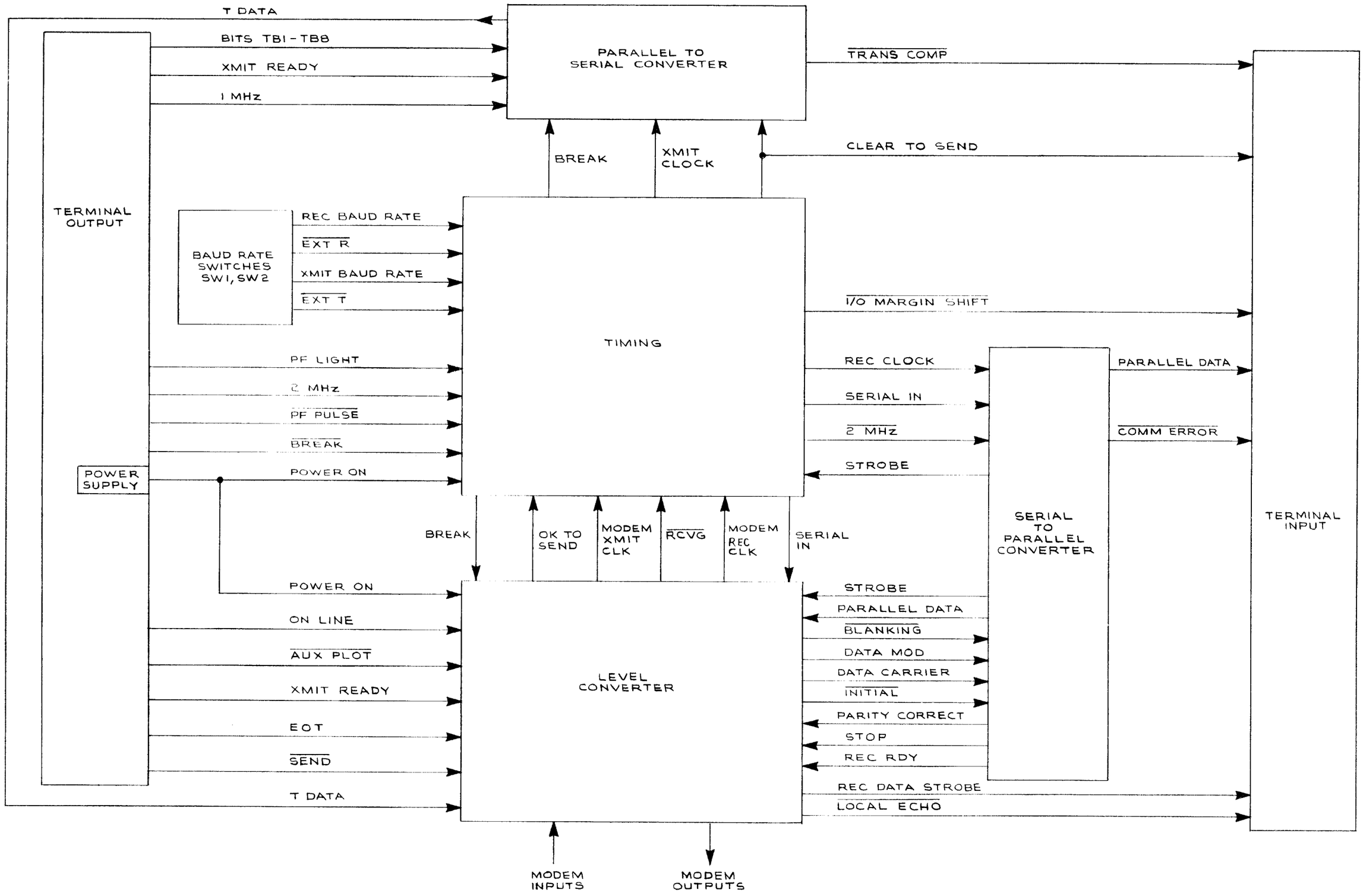
Connection soldered to circuit board.

Connection made to circuit board with interconnecting pin.

Blue tint encloses components located on circuit board.

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

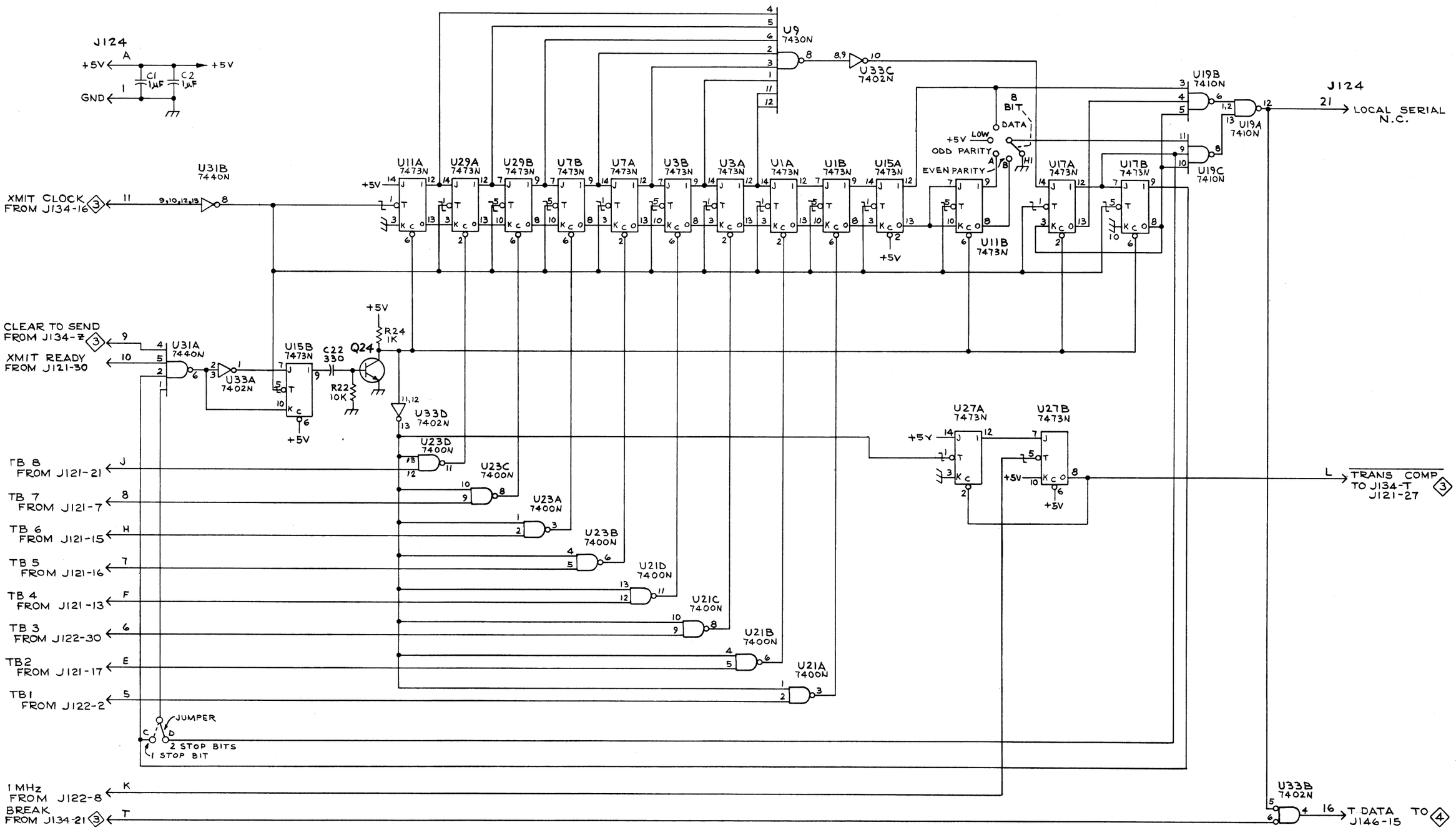
A	Assembly, separable or repairable (circuit board, etc.)
AT	Attenuator, fixed or variable
B	Motor
BT	Battery
C	Capacitor, fixed or variable
CR	Diode, signal or rectifier
DL	Delay line
DS	Indicating device (lamp)
F	Fuse
FL	Filter
H	Heat dissipating device (heat sink, heat radiator, etc.)
HR	Heater
J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



DATA COMMUNICATION
INTERFACE 021-0033-00

Ⓐ

BLOCK DIAGRAM 971 EKP

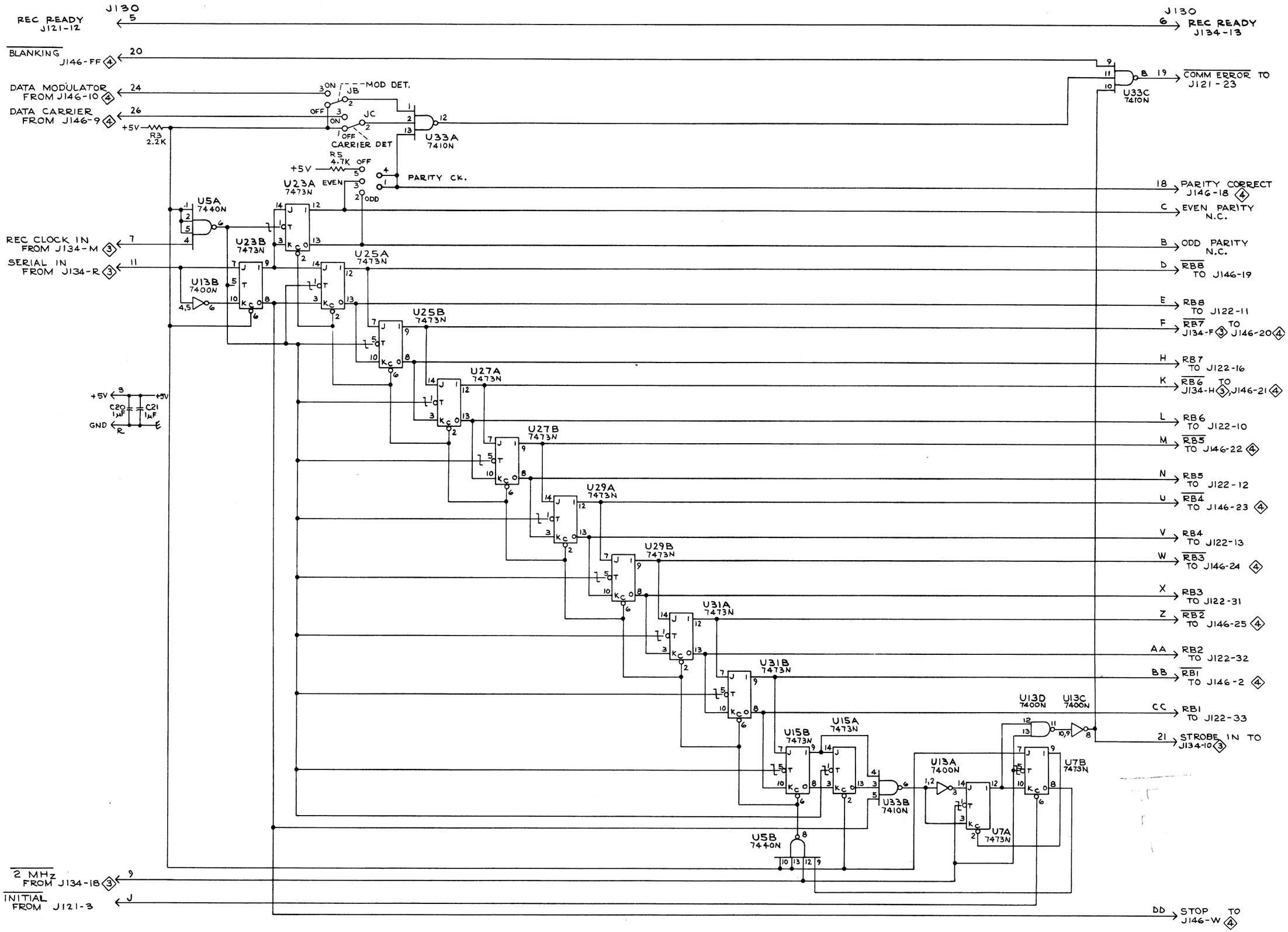


DATA COMMUNICATION
INTERFACE 021-0033-00

A1

A1 PARALLEL TO SERIAL CONVERTER- CARD #1 1 871

PARALLEL TO SERIAL CONVERTER 1



DATA COMMUNICATION
INTERFACE 021-0033-00

A1 **A2** SERIAL TO PARALLEL CONVERTER – CARD #2 2 871

SERIAL TO PARALLEL CONVERTER 2

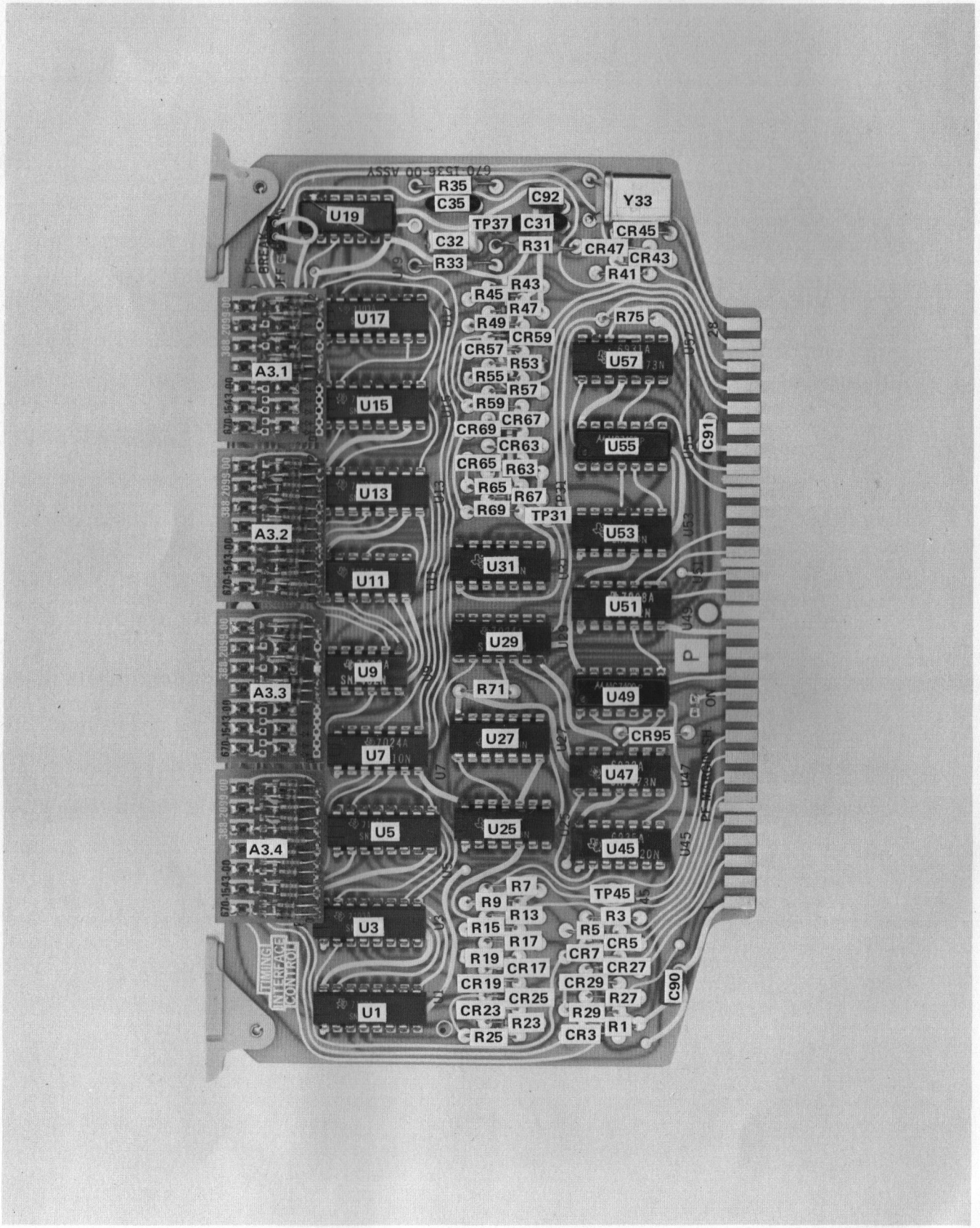


Fig. 5-2. Timing board component location.

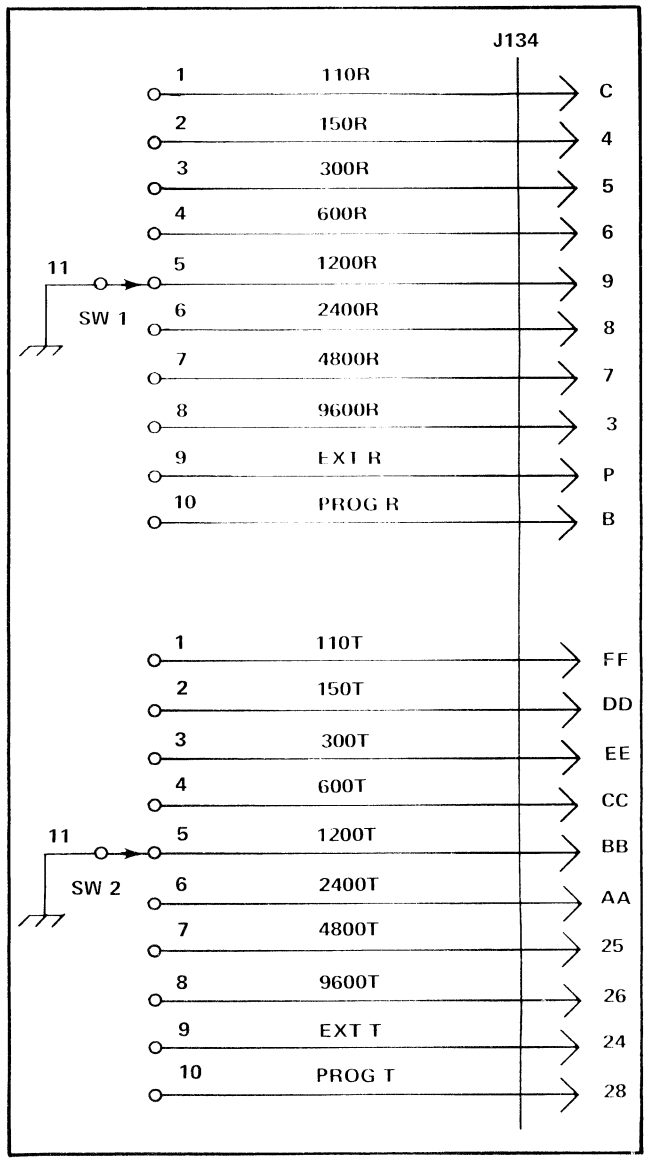
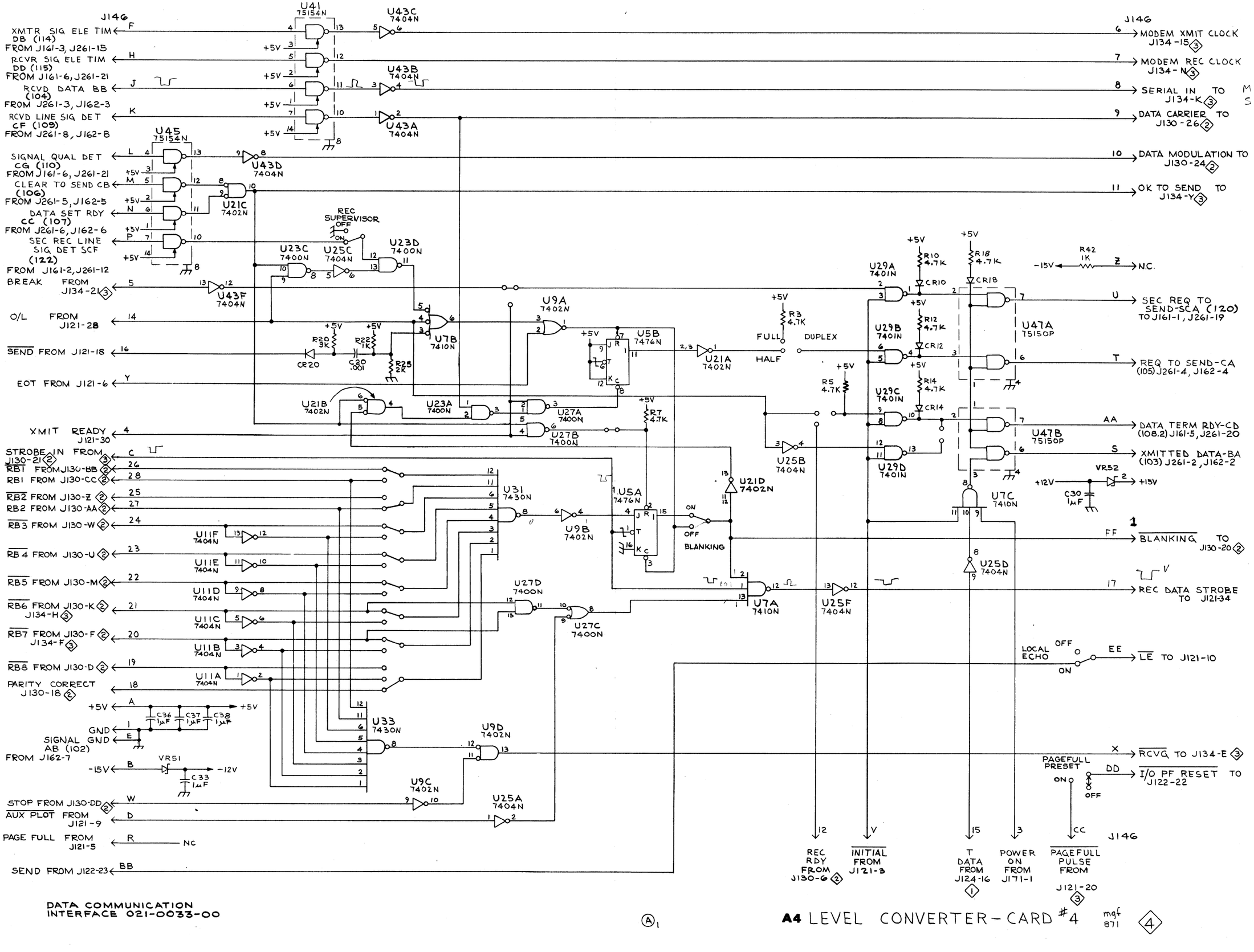


Fig. 5-1. Wiring diagram for receive and transmit baud rate switches.

J134
C
110R FROM SW1-1
B
PROG R FROM SW1-10
CR20
+5V
R1 4.7K
U9D 7402N
CR3
CR7
CR5
150 R FROM SW1-2
300 R FROM SW1-3
600 R FROM SW1-4
1200R FROM SW1-5
2400R FROM SW1-6
4800R FROM SW1-7
9600R FROM SW1-8
2048₂
1024₂
512₂
256₂
128₂
64₂
32₂
16₂
8₂
4₂
2₂
1₂
0
R3 4.7K
R5 4.7K
R7 4.7K
R9 4.7K
R13 4.7K
R15 4.7K
R17 4.7K
R19 4.7K
R23 4.7K
R25 4.7K
R27 4.7K
R29 4.7K
7416IN
U5
U3
U1
CR17
CR19
CR23
CR25
CR27
CR29
CR10
U7A 7410N
U11A 7474N
U9B 7402N
TP45
SERIAL IN FROM J146-8
MODEM REC CLK FROM J146-7
EXT R FROM SW1-9
RCVG FROM J146-X
2MHz FROM J122-9
J134
U51C 7402N
2MHz TO J130-9 2
R71 4.7K
U45B 7420N
U27D 7404N
U27E 7404N
U27C 7404N
U47A 7473N
U47B 7473N
U29B 7451N
R SERIAL TO J130-11 2
U27A 7404N
U49B 7400N
U25 7493N
U45A 7420N
U49A 7400N
U49D 7400N
M REC CLOCK TO J130-7 2
C31 33
C32 330
C35 33
R31 332 U19B 7400N
R32 680
R33 100
Y33 4.9152 MHz
R35 332 U19C 7400N
R37 680
U19D 7400N
U19A 7400N
TP37
U9A 7402N
R41 4.7K
C90 1μF
C91 1μF
C92 1μF
A +5V
1 GND
14
22
PAGEFULL MARGIN SHIFT
OFF
ON
CR95
L PAGEFULL PULSE TO J146-CC 4 J121-20
11 I/O MAR SH TO J121-33
CR43
CR47
CR45
150T FROM SW2-2
300T FROM SW2-3
600T FROM SW2-4
1200T FROM SW2-5
2400T FROM SW2-6
4800T FROM SW2-7
9600T FROM SW2-8
DD
EE
CC
BB
AA
25
26
R43 4.7K
R45 4.7K
R47 4.7K
R49 4.7K
R53 4.7K
R55 4.7K
R57 4.7K
R59 4.7K
R63 4.7K
R65 4.7K
R67 4.7K
R69 4.7K
U17
U15
U13
CR57
CR59
CR63
CR65
CR67
CR69
CR40
CR50
U7B 7410N
U11B 7474N
U9C 7402N
TP31
U31 7493N
U51A 7402N
U29A 7451N
16 XMIT CLOCK TO J124-11 1
U55B 7400N
U53 7493N
21 BREAK TO J146-5 4, J124-T 1
U57A 7473N
U57B 7473N
U55C 7400N
U51B 7402N
U55D 7400N
OFF
ON
PAGEFULL BREAK
Z CLEAR TO SEND TO J124-9 1 J121-22
U49C 7400N
J134
Y
U51D 7402N
EXT T FROM SW2-9
MODEM XMIT CLK FROM J146-6 4
BREAK FROM J121-8
PAGEFULL LIGHT FROM J121-1
POWER ON FROM J171-1
OK TO SEND FROM J146-11 4
PROG T FROM SW2-10
110T FROM SW2-1
28
FF
DATA COMMUNICATION INTERFACE 021-0033-00
A1
A3 TIMING INTERFACE - CARD #3 3 871



DATA COMMUNICATION INTERFACE 021-0033-00

A1

A4 LEVEL CONVERTER – CARD #4 mgf 871

SECTION 6
MECHANICAL PARTS LIST

FIGURE 1 EXPLODED

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Serial/Model No. Disc	Qty	Description 1 2 3 4 5
1-	021-0033-00			1	COMMUNICATIONS INTERFACE UNIT
	----- -----			-	communications interface unit includes:
-1	175-1289-00			2	CABLE, special purpose
-2	670-1538-00			1	CIRCUIT BOARD ASSEMBLY--INTERFACE A5
	----- -----			-	circuit board assembly includes:
	388-2094-00			1	CIRCUIT BOARD
-3	131-0589-00			5	TERMINAL, pin, 0.50 inch long
-4	131-0608-00			105	TERMINAL, pin, 0.365 inch long
-5	131-0762-01			4	CONNECTOR, receptacle, 56 pin
-6	214-0702-00			18	KEY, polarizing, connector
	----- -----			-	mounting hardware: (not included w/circuit board assembly)
-7	211-0097-00			8	SCREW, 4-40 x 0.312 inch, PHS
-8	426-0509-00			2	FRAME-PLATE
	----- -----			-	mounting hardware for each: (not included w/frame-plate)
-9	211-0540-00			4	SCREW, 6-32 x 0.50 inch, THS
-10	129-0245-00			4	POST, 2.989 inches long
-11	361-0263-00			24	SPACER, sleeve
-12	361-0264-00			4	SPACER, plate
-13	351-0200-00			8	GUIDE, circuit card
-14	386-1665-00			1	SUPPORT, card guide, left
-15	386-1716-00			1	SUPPORT, card guide, right
-16	366-1024-00			2	KNOB, gray--TRANSMIT & RECEIVE
	----- -----			-	each knob includes:
	213-0153-00			2	SETSCREW, 5-40 x 0.125 inch, HSS
-17	260-1251-01			2	SWITCH, rotary--TRANSMIT & RECEIVE, unwired
	----- -----			-	mounting hardware for each: (not included w/switch)
-18	210-0413-00			1	NUT, hex., 0.375-32 x 0.50 inch
-19	210-0978-00			1	WASHER, flat, 0.375 ID x 0.50 inch OD
-20	131-0569-00			1	CONNECTOR, receptacle, 25 pin
	----- -----			-	mounting hardware: (not included w/connector)
-21	129-0260-00			2	POST, stud, 4-40 thread
-22	210-0202-00			1	LUG, solder, SE #6
-23	210-0586-00			2	NUT, keps, 4-40 x 0.25 inch
-24	179-1679-00			1	WIRING HARNESS
	----- -----			-	wiring harness includes:
-25	131-0707-00			37	CONNECTOR, terminal
-26	352-0163-00			2	HOLDER, terminal connector, 5 wire(black)
-27	352-0164-00			2	HOLDER, terminal connector, 6 wire(black)
-28	352-0165-00			1	HOLDER, terminal connector, 7 wire(black)
-29	352-0166-00			1	HOLDER, terminal connector, 8 wire(black)
-30	386-2036-00			1	PANEL, rear
	----- -----			-	mounting hardware: (not included w/panel)
	211-0542-00			4	SCREW, 6-32 x 0.312 inch, THS (not shown)
-31	670-1534-00			1	CIRCUIT CARD ASSEMBLY--PARALLEL TO SERIAL A1
	----- -----			-	circuit card assembly includes:
	388-2090-00			1	CIRCUIT CARD
-32	131-0608-00			13	TERMINAL, pin, 0.365 inch long
	131-0993-00			2	LINK, terminal connecting
	----- -----			-	each link includes:
-33	131-0707-00			2	CONNECTOR, terminal
-34	352-0169-00			1	HOLDER, terminal connector, 2 wire(black)
	105-0160-03			2	EJECTOR, circuit card
	----- -----			-	mounting hardware for each: (not included w/ejector)
	214-1337-00			1	PIN, spring

FIGURE 1 EXPLODED (cont)

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Q t y	Description 1 2 3 4 5
1-35	670-1535-00			1	CIRCUIT CARD ASSEMBLY--SERIAL TO PARALLEL A2
	----- -----			-	circuit card assembly includes:
	388-2091-00			1	CIRCUIT CARD
-36	131-0589-00			11	TERMINAL, pin, 0.50 inch long
	131-0993-00			2	LINK, terminal connecting
	----- -----			-	each link includes:
-37	131-0707-00			2	CONNECTOR, terminal
-38	352-0169-00			1	HOLDER, terminal connector, 2 wire(black)
	131-1154-00			1	LINK, terminal connecting
	----- -----			-	link includes:
	131-0707-00			3	CONNECTOR, terminal
-39	352-0161-00			1	HOLDER, terminal connector, 3 wire(black)
	105-0160-03			2	EJECTOR, circuit card
	----- -----			-	mounting hardware for each: (not included w/ejector)
	214-1337-00			1	PIN, spring
-40	670-1536-00			1	CIRCUIT CARD ASSEMBLY--TIMING INTERFACE A3
	----- -----			-	circuit card assembly includes:
	388-2092-00			1	CIRCUIT CARD
-41	214-0579-00			3	PIN, test point
-42	131-0608-00			61	TERMINAL, pin, 0.365 inch long
	131-0993-00			1	LINK, terminal connecting
	----- -----			-	link includes:
-43	131-0707-00			2	CONNECTOR, terminal
-44	352-0169-00			1	HOLDER, terminal connector, 2 wire(black)
	105-0160-03			2	EJECTOR, circuit card
	----- -----			-	mounting hardware for each: (not included w/ejector)
	214-1337-00			1	PIN, spring
-45	670-1543-00			4	CIRCUIT BOARD ASSEMBLY--BAUD RATES A3.1 to A3.4
	----- -----			-	each circuit board assembly includes:
	388-2099-00			1	CIRCUIT BOARD
-46	136-0327-01			14	SOCKET, pin terminal
-47	670-1537-00			1	CIRCUIT CARD ASSEMBLY--LEVEL A4
	----- -----			-	circuit card assembly includes:
	388-2093-00			1	CIRCUIT CARD
-48	131-0566-00			2	LINK, terminal connecting
-49	131-0589-00			15	TERMINAL, pin, 0.50 inch long
	131-0993-00			5	LINK, terminal connecting
	----- -----			-	each link includes:
-50	131-0707-00			2	CONNECTOR, terminal
-51	352-0169-00			1	HOLDER, terminal connector, 2 wire(black)
	136-0252-00			8	SOCKET, pin connector, 0.145 inch long
-52	105-0160-03			2	EJECTOR, circuit card
	----- -----			-	mounting hardware for each: (not included w/ejector)
-53	214-1337-00			1	PIN, spring

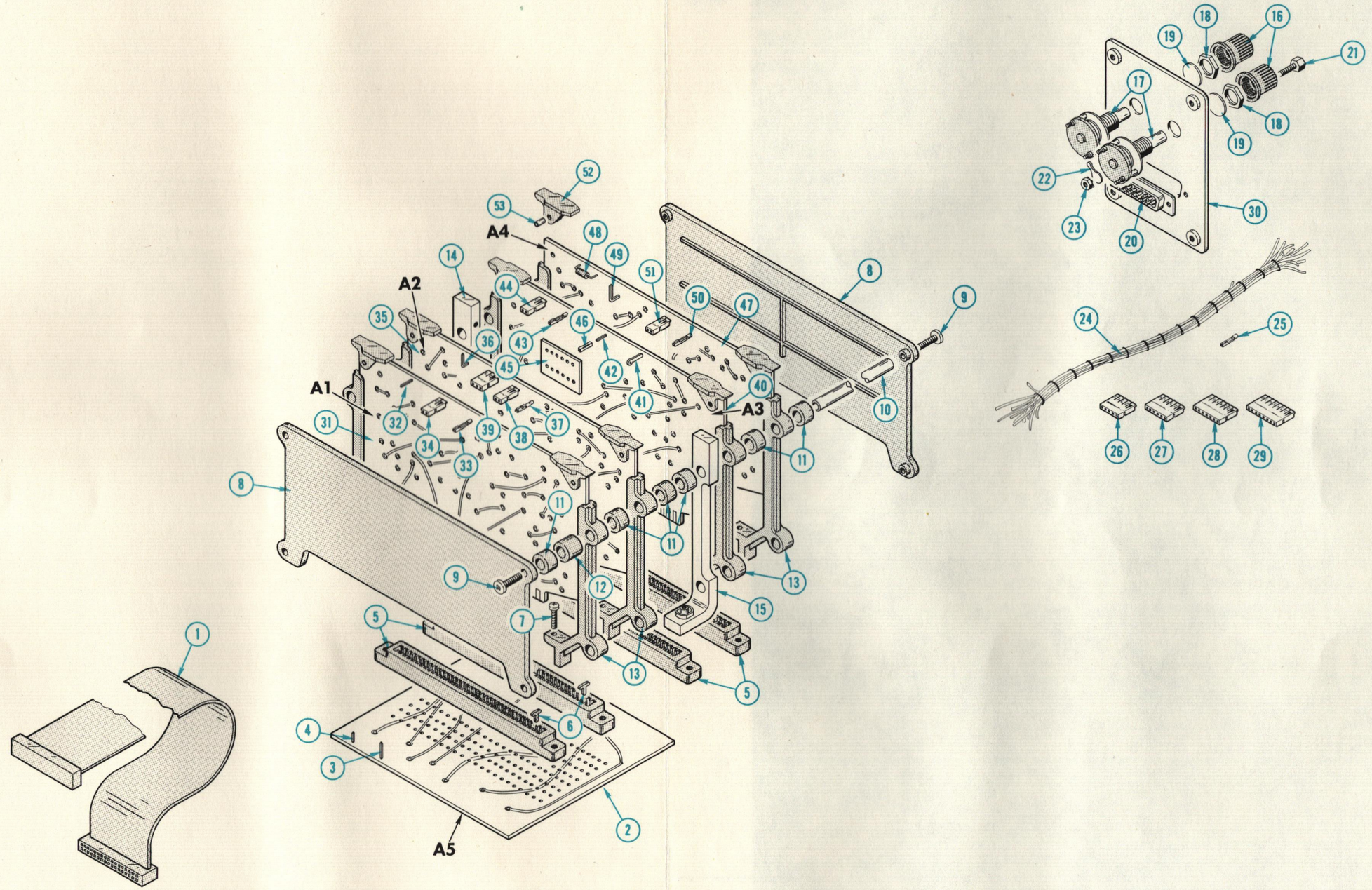


FIG. 1 EXPLODED

STANDARD ACCESSORIES

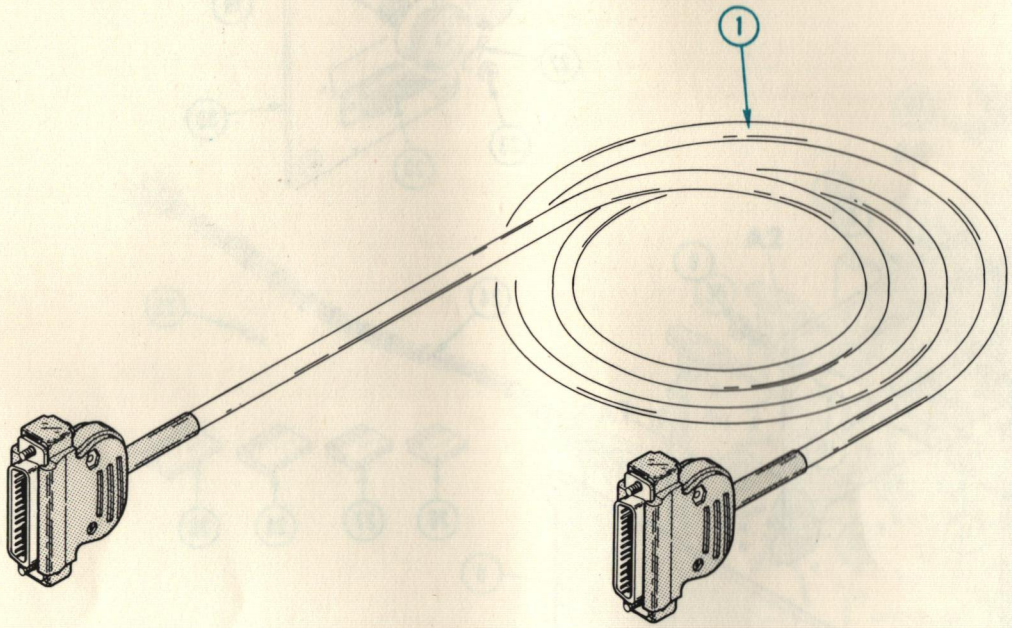


Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Qty	1 2 3 4 5	Description
2-1	015-0202-00			1		INTERCONNECTING CABLE
	070-1235-00			1		MANUAL, instruction (not shown)