COMMUNICATIONS DISPLAY

INTERFACE MODULE CDIF810

CHECKOUT AND TROUBLESHOOTING

CONTENTS PAGE

1. GENERAL

1.01 This section contains procedures to checkout and troubleshoot the CDIF810 interface module when installed with either a 2511 CDT or DATASPEED 40 terminal. Checkout tests, test arrangement diagrams, and trouble related charts are provided to aid in isolation of an operational difficulty.

1.02 Issue 1 of this section was a limited printing edition and was not made available nor generally distributed on a system wide basis. This reissue includes the latest troubleshooting information available at the time of this printing. This is the first standard printing available for Bell System distribution.

1.03 The checkout procedures and troubleshooting charts are written to enable isolation of a trouble to module circuit cards, interconnecting cabling, or the peripheral equipment connected to the module.

1.04 If a trouble is isolated to a module circuit card, the troubleshooting charts will recommend the card be replaced. Before replacing the card, use a known good circuit card in that location to check that the original trouble is corrected. If a trouble is not corrected using the substituted part, the original card should be reinstalled and the good part returned to maintenance stock.

WARNING: ALL POWER TO THE MODULE MUST BE OFF WHENEVER A CIRCUIT CARD IS REMOVED OR REPLACED.

1.05 If any of the circuit card assemblies are found defective, they should be returned to the nearest WE Service Center or Teletype Corporation Product Service Center for repair or replacement.

1.06 It is intended that the 1097SD logic flow diagram provided in 0267WDP be used in conjunction with this section when troubleshooting the CDIF810.

1.07 Teletype Change Notice (TCN) information has been reviewed and does not affect the content of this document. However, information contained in TCN 1516 and TCN 1581 does affect the TP322501 (Issue 1 and 2) and TP322986 (Issue 1 only) module circuit card assemblies respective to wiring changes.

1.08 In interest of brevity, reference to a 2511 CDT or DATASPEED 40 will be listed as a send/receive device or set whenever the procedure or instruction is applicable to either set.

*Registered Trademark of AT&TCo.

Prepared for American Telephone and Telegraph Company by Teletype Corporation

2. EQUIPMENT

2.01 The following test equipment is required for troubleshooting the interface module:

(a) A Tektronix 422-type oscilloscope or its equivalent

(b) A calibrated KS14510 volt-ohmmeter or its equivalent.

2.02 It is suggested that the recommended volt-ohmmeter be properly set for the appropriate scale by the user before attempting to make a measurement. The ohms scale may be used for point-to-point checks of module wiring, cabling, and interconnecting cords after circuit cards are removed from the circuit wiring being checked.

WARNING: NEVER USE A VOLT-OHMMETER TO CHECK VOLTAGE OUTPUT OR CONTINUITY OF THE MICROLOGIC ELEMENTS ON A CIRCUIT CARD. ONLY AN OSCILLOSCOPE OR LOGIC PEN SHOULD BE USED FOR MICROLOGIC SIGNAL OR VOLTAGE CHECKS OR PERMANENT DAMAGE MAY OCCUR TO A MICROLOGIC DEVICE.

2.04 The CDIF810 module was designed for use in a 2550 Cluster Controller Station arrangement. It provides a means of data recovery for the station standby magnetic tape set when a system-down time occurs due to a central processor or line problem. During a system malfunction, the cluster controller is operated in standby which allows the peripheral equipment to send to the MTT set.

2.05 When the system is restored to operation with the central processor, the main editing send/receive device, either a CDT or DATASPEED 40, locally retrieves the stored data from the tape cartridge in the MTT set (Interrupt Operation) makes deletions or additions, and then sends the data to the central processor.

2.06 Operation testing of the module requires that it be interconnected with the associated station equipment. All devices connected to the module should be in good operating order before any checkout procedures are begun. Refer to the associated checkout procedures for the interconnected equipment.

2.07 Interconnection diagrams to a CDT or DATASPEED 40 Send/Receive device are provided in Figures 2 and 3 respectively. Cable wiring diagrams and other information are provided in Installation Section 578-110-202.

2.08 The spare parts listed in Table A are necessary for troubleshooting and repair of the module. Figure 1 provides a circuit card location chart for verification of correct circuit card installation. The view is from the wired side of the module which also lists all connector identifications.

2.09 Table B provides a listing of troubleshooting sections for the equipment interconnected to the CDIF810.

3. CHECKOUT PROCEDURE

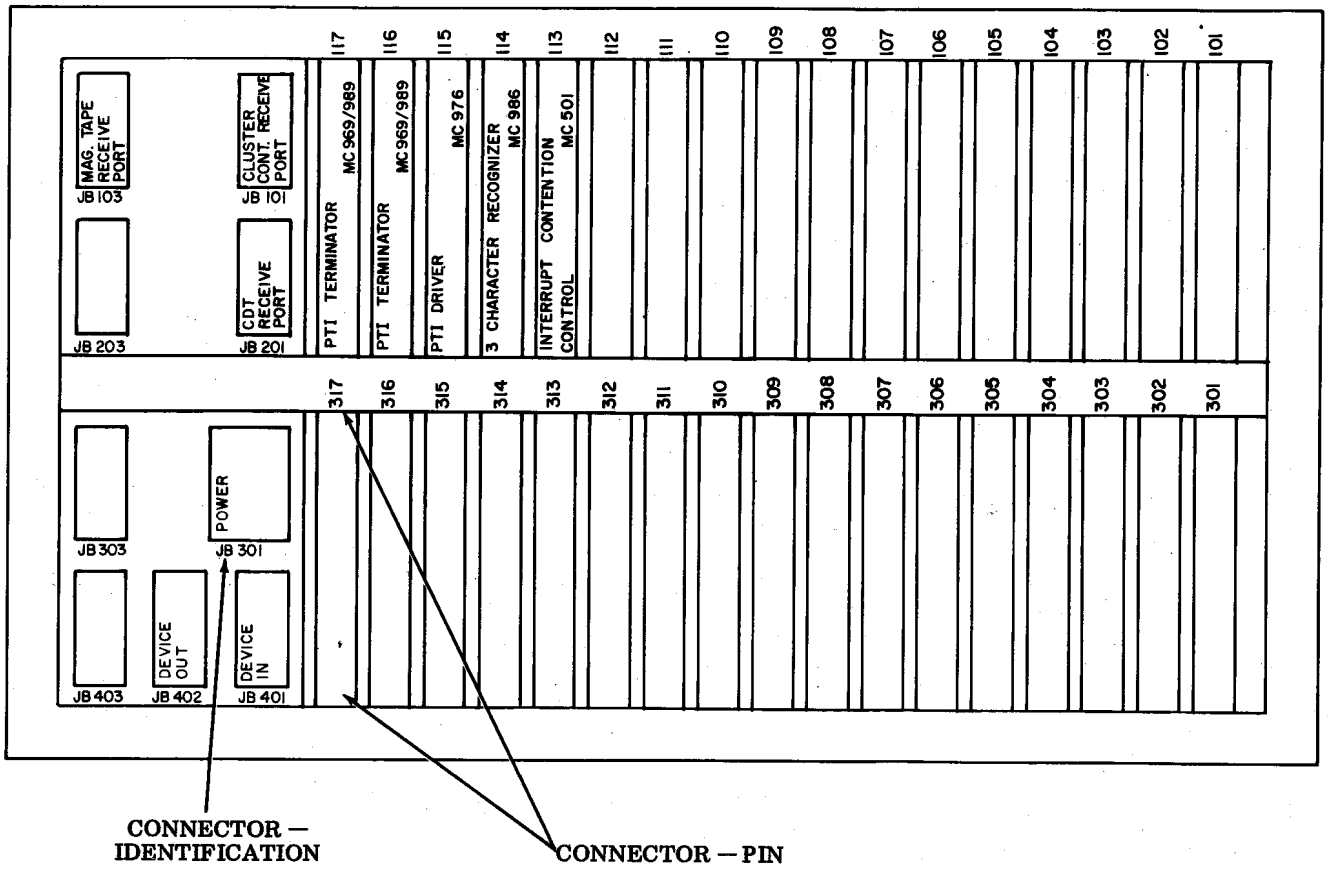
3.01 Checkout tests are provided to assure that the module or system is in proper working order. The checkout tests are divided into three columns: step, action, and verification. The step column denotes the progression in performing the test. The action column denotes arrangements and test conditions. The verification column denotes what should occur with respect to the action column.

3.02 With the exception of the preliminary dc power input check, consider the following before proceeding to checkout operation.

(a) All circuit cards must be firmly seated in their appropriate connectors.

(b) All cable connectors must be securely connected. When a cable connection to an external device is installed, make sure that the interconnecting cable meets all interface requirements listed in the cable diagrams in 578-110-202.

(c) All equipment connected to the interface module should function in accordance with the module operation requirements.



Note: Trouble chart references to ZB (wired side) 317-34 refer to connector receptacle 317 pin 34. Likewise, JB301-A5 refers to connector JB301-row A pin 5.

Figure 1 - CDIF810 Identification Chart

TABLE A

MAINTENANCE PARTS

PART NUMBER	DESCRIPTION	QUANTITY		
		1 SET	5 SETS	10 SETS
TP322501	Interrupt Contention Control Circuit Card	1	1	1
TP322969	PTI Terminator Circuit Card	1	2	3
TP322976	PTI Driver Circuit Card	1	2	3
TP322986	3-Character Recognizer Circuit Card	1	1	1
TP147307	Strap	15	15	15
TP328022	Screw (used on circuit cards)	10	10	10
TP335611	Cable Assembly	1	1	2

TABLE B

SECTION	EQUIPMENT	CONTENT
575-100-350	DATAPSEED 40	FIMP
575-100-352	BIS Station Arrangements	FIMP
578-101-300	2511 CDT	TS
578-110-202	CDIF810	I
578-150-100	2550 Cluster Controller	D & O
578-150-300	2550 Cluster Controller	TS
578-300-300	4210 MTT	TS
999-300-114	4210 MTT	How to Operate

4. CHECKOUT TESTS

4.01 Test arrangement connections to the 4210 Magnetic Tape Terminal (MTT) Set, 2511 CDT or DATASPEED 40, 2550 Cluster Controller, and the CDIF810 module are provided in Installation Section 578-110-202.

4.02 Wherever a small m precedes an abbreviation of the word seconds, it means that the time is in milliseconds, thousandths of a second, or 10^{-3} power. If a small μ symbol precedes the word or abbreviation of the word second, the time is given in microseconds, millionths of a second, or 10^{-6} power.

POWER FAILURE

4.03 All direct current voltage to operate the module is furnished from the CDPS802 low voltage power supply. The voltages used are +5 volts dc, +12 volts dc, -12 volts dc, and voltage return (circuit common).

4.04 If the power supply is suspected of causing a trouble, check for the following: power cable is plugged into module securely at connector JB301, ON-OFF power supply control is in ON position, and that any fuses in the power supply are not blown.

4.05 With power supply and equipment turned on (set interlocks in bypass, etc), use an oscilloscope or a voltmeter and check for the following dc voltage levels to the station controller JB301 connector.

CONNECTOR JB301	TERMINAL
Frame Ground	C6
Voltage Return (common)	A5, B5, and C5
+5 volts ±10%	A1 and B1
+12 volts ±10%	A3
-20 volts ±10%	B9

4.06 If an oscilloscope is used to monitor logic signals in the troubleshooting charts, all circuit card receptacles in the module have signal ground (voltage common) on pin 36 and +5 volts dc (+Vcc) on pin 35.

BASIC TROUBLESHOOTING PROCEDURE

4.07 The following checks should be made prior to troubleshooting:

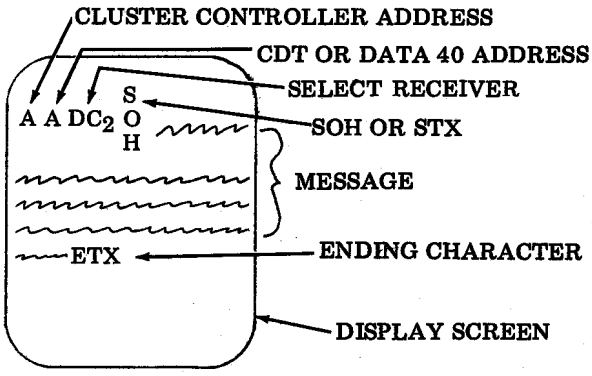
(a) Check that optional features are in accordance with the system programming requirements (data transfer rates, codes, formats, SID programming, etc).

(b) Check that no terminal pins are bent over and touching or are damaged.

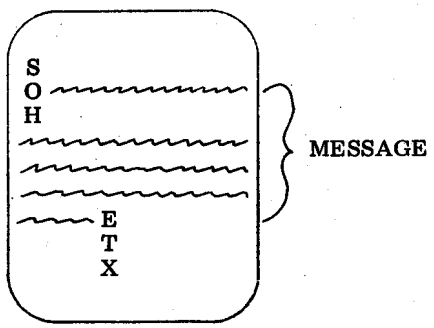
4.08 Reminder: Circuit cards have integrated circuit (IC) packages and other components that are low voltage and low power devices. They can be permanently damaged if subjected to voltages in excess of their rating. NEVER ATTEMPT TO REMOVE A CIRCUIT CARD WHEN POWER IS ON. After power is off, wait approximately 20 or 25 seconds; then only if necessary, remove the circuit card. This insures that the power supplies in the equipment have drained sufficiently. Oily skin and other body chemicals present on your fingers may also cause circuit card terminals to become resistive after short periods of time — DO NOT TOUCH CARD CONTACT AREAS.

RECEIVE SECTION

4.09 Checkout Test for the Receive Section

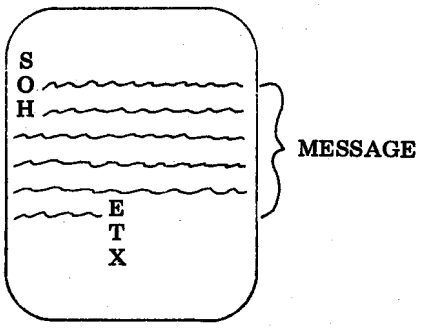
STEP	ACTION	VERIFICATION
1	Interconnect the module cabling to the associated devices as shown in the respective cabling diagram in Section 578-110-202.	
2	Condition the cluster controller for test operation as described in Section 578-150-100.	(Depress TEST button on the cluster controller control panel; the button lights.)
3	Turn on all related equipment power switches. The CDT and/or DATASPEED 40 set should turn on and the LOCAL button(s) should light.	The POWER and LOCAL buttons should light on the 2510 CDT. Only the LOCAL buttons should light on the 2511 CDT and the DATASPEED 40.
4	Prepare a test message at another send/receive device connected to the cluster controller. The message heading should be prefixed with an address heading (A is used in the sample display) that will direct it to the CDT or DATASPEED 40 connected to the CDIF810 module. Always end all messages with the ending character ETX.	Prepare Address Heading: 
5	At the send/receive device connected to the CDIF module, be sure that the screen is clear and that the cursor is in home position (line one and character one positions). If not, place set in LOCAL and depress HOME and CLEAR buttons.	The cursor should be in home and no characters should be displayed.
6	Depress REC (Receive) button on the set connected with the CDIF810 module.	REC button should light and LOCAL button should extinguish.
7	Place the send/receive set containing the test message into transmit by depressing TRANS or SEND button.	The TRANS (Transmit) or SEND button should illuminate and the cursor should move through the message. (With CDT only, if the blanking option is used, the display will appear blank.)

Checkout Test for the Receive Section (continued)

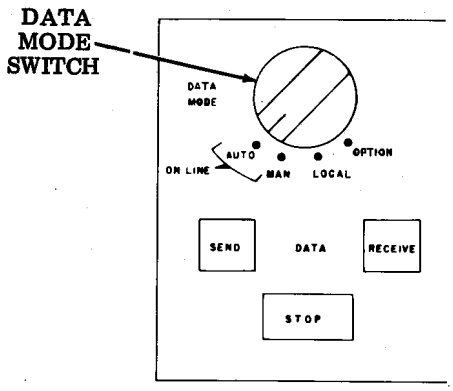
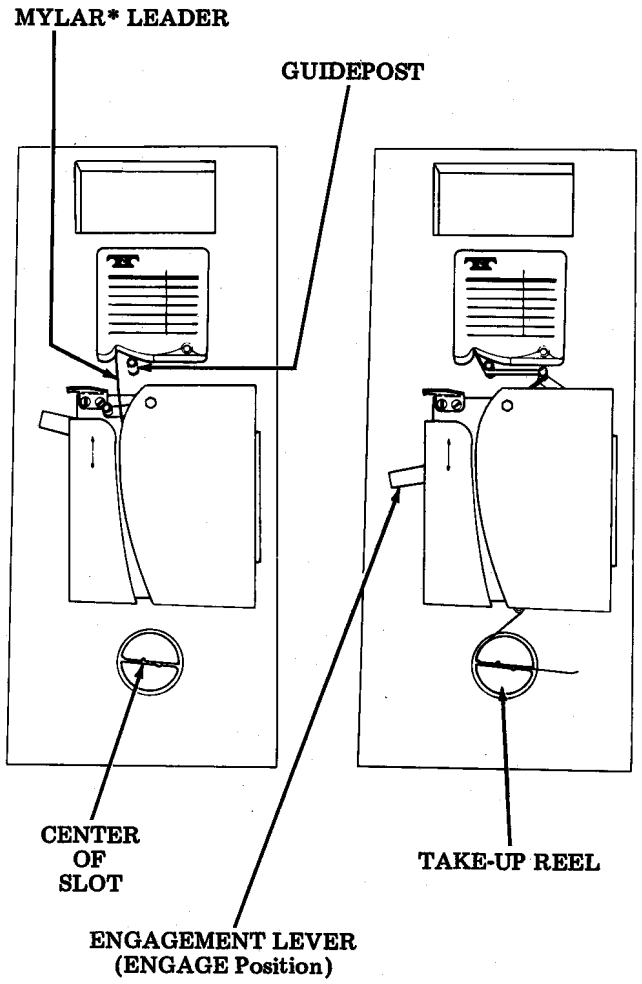
STEP	ACTION	VERIFICATION
8	Both sets should stop after the ETX is transmitted. End of Receive Section Checkout Test.	The set that transmitted the message should go from transmit or send to receive (or to local depending upon set option programming). The TRANS or SEND button should go out and the REC button should light. The set that received the message should go from receive to local. The REC button should go out and the LOCAL button should light. Both displays should be the same except that the address heading will be missing on the receiving set. RECEIVING SET 

INTERRUPT SECTION

4.10 Checkout Test for the Interrupt Section

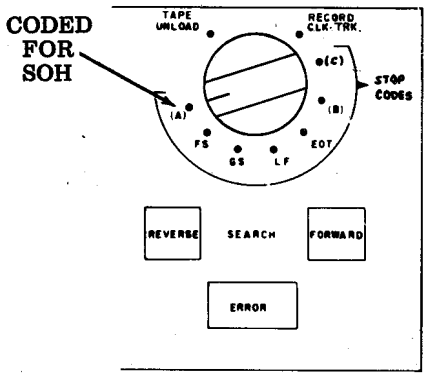
STEP	ACTION	VERIFICATION
1	Prepare a test message on one of the sets connected to the cluster controller. A few lines of U* prefixed with an SOH and terminated with an ETX would be sufficient.	PREPARED MESSAGE 

Checkout Test for the Interrupt Section (continued)

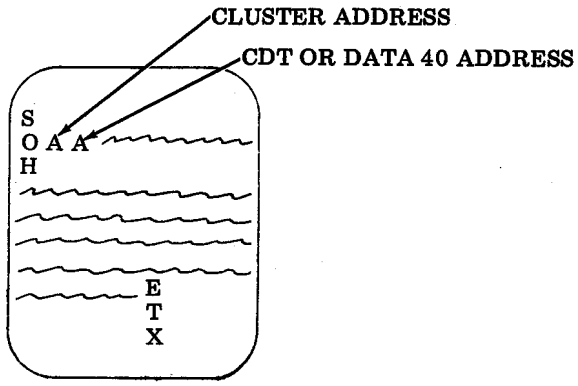
STEP	ACTION	VERIFICATION
2	Place the cluster controller in the standby operation by depressing the STANDBY ON button.	The STANDBY ON button should light.
3	Make certain that the magnetic tape set is on and loaded with an erased tape with a valid clock track recorded on it. ● Make sure function selector switch is not on TAPE UNLOAD. ● Lift plastic lid. Pull out enough tape leader to place between read/write heads and position cartridge on transport (label side up). ● While holding cartridge in position, draw tape leader between guides and into take-up spool. ● Place square hole of tape leader in the center of the slot in the take-up spool. ● Move engagement lever to engage. ● Close plastic lid and depress SINGLE STEP FWD once. The tape should advance to the first character position on the tape. ● Place the data mode switch in AUTO and depress the STOP switch. 	 B.O.T. lamp lights and goes out when tape moves to the first character position. The motor remains on. MTT set motor stops.

*Trademark of DuPont for polyester film

Checkout Test for the Interrupt Section (continued)

STEP	ACTION	VERIFICATION
4	Place the cursor in the home position on the set that contains the test message. Transmit the test message to the magnetic tape set by depressing the set TRANS or SEND button.	The TRANS or SEND button should light and the cursor should move through the message. (Some CDT sets have a screen blanking option. If it is used, the display will appear blank.) The magnetic tape set will start. When ETX is transmitted, the set will change to receive. TRANS or SEND button should go out and the REC button should light and the magnetic tape set should stop.
5	Repeat Step 4; then depress STAND BY off switch on cluster controller.	Cluster controller: Standby on lamp goes off. Magnetic tape set: The motor turns off.
6	Place the search character switch in the SOH (Start of Heading) position. 	
7	Reverse search for two SOH characters.	When the REVERSE SEARCH button is released, the magnetic tape set will start moving the tape backwards and continue to do so until a SOH character is detected.
8	Place the cursor in the home position on the set containing the CDIF810 interface module. Depress the EXT RELS (External Release) button. DATASPEED 40 sets have a REC MAG TAPE (Receive Magnetic Tape) button in place of the EXT RELS button.	As the EXT RELS (External Release) or REC MAG TAPE button is depressed, both the EXT RELS or REC MAG TAPE and the REC buttons should light. The cursor should begin to move through the message. (If the CDT set has the blanking option, the display will appear blank.) The magnetic tape set will start. When the ETX is received, the set will go into local. The EXT RELS or REC MAG TAPE and REC buttons should go out, and the LOCAL

Checkout Test for the Interrupt Section (continued)

STEP	ACTION	VERIFICATION
8 (Cont)		button should light. The magnetic tape set should stop. The test message should be displayed at the receive set with an SOH and two alpha characters before the STX. 
9	Repeat Step 8. Start the message with an SOH character instead of STX. End of Interrupt Section Checkout Test.	SOH should be the first character in the first line of the display.

5. TROUBLESHOOTING CHARTS

5.01 The purpose of the troubleshooting charts is to assist in locating system malfunctions related to the CDIF810 module. The charts should be used in conjunction with the logic flow diagram included in the 0267 wiring diagram package (WDP). This provides the easiest means of tracing signals through the module on a point-to-point basis.

5.02 Several of the tests included in the troubleshooting charts require that a distinction be made between various voltage levels to determine the condition of a signal. In the internal module circuitry, circuits between the input and output interfaces, a high or +5 volts dc represents a marking data bit. A low or 0 volts represents a spacing data bit. The CA (character available), M (message), and R (ready) message control signals for the module message handshake signals are high, +5 volts for off, and low or 0 volts for the on condition.

5.03 Signals at the PTI interface are such that an on or space will appear as a voltage level of approximately +4 volts, while an off or mark will appear as a voltage level of approximately 0 volts. It is important that a distinction can be made between the +4 volt level and the slightly higher +5 volt (power supply) level. The +5 volt value would be an indication of a problem such as an open return lead, an open optical isolator diode, etc. Therefore, when monitoring signals on the cable side of either the PTI driver (MC976) or the PTI terminator (MC969/989) circuit cards, care must be taken to accurately determine the condition of the signal.

5.04 If a malfunction does occur, make certain that the problem is not due to defective peripheral equipment. Recheck all cables and, if possible, test equipment in the local operation or from an alternate source. Improper cabling or broken wires within a cable are common causes of system malfunctions.

5.05 The following charts refer to the CDIF810 interface module receive section.

Chart 1 — Receiving CDT Does Not Receive Data

Chart 2 — Data Received by CDT is Garbled

5.06 The following charts refer to the CDIF810 interface module standby operation.

Chart 3 — EXT REL (External Release) Button or REC (Receive) Button Does Not Illuminate

Chart 4 — Magnetic Tape Set Does Not Start or Improper Operation

Chart 5 — MTT Data Received by CDT is Garbled

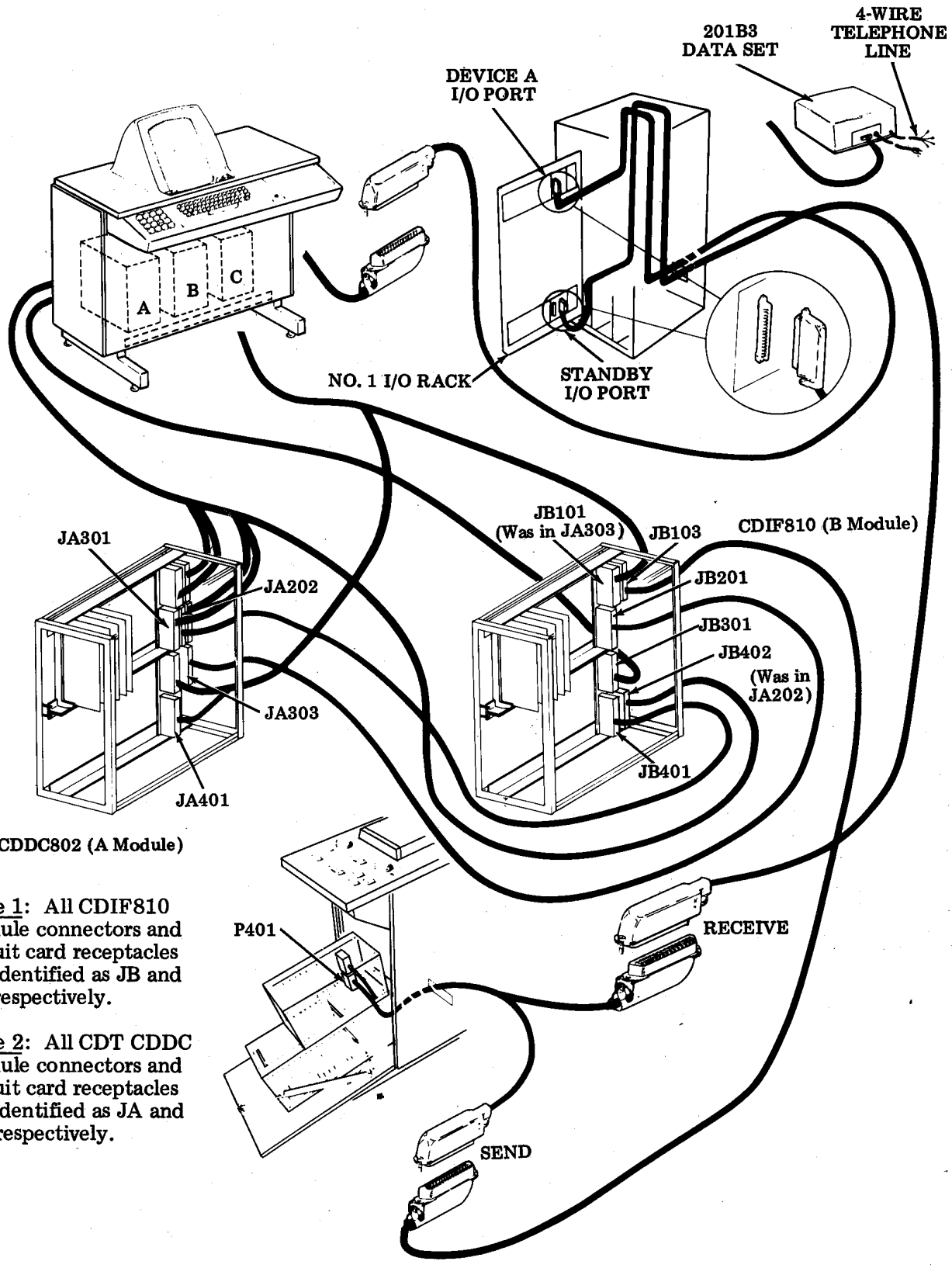
Chart 6 — Receiving DATASPEED 40 Does Not Receive Data

Chart 7 — Data Received by the DATASPEED 40 is Garbled

Chart 8 — REC MAG TAPE Button or REC Button Does Not Illuminate on DATASPEED 40

Chart 9 — Magnetic Tape Set Does Not Start or Improper Operation

Chart 10 — MTT Data Received by the DATASPEED 40 is Garbled



Note 1: All CDIF810 module connectors and circuit card receptacles are identified as JB and ZB respectively.

Note 2: All CDT CDDC module connectors and circuit card receptacles are identified as JA and ZA respectively.

Figure 2 - CDIF810 Connector and Cable Location Diagram With CDT Hook-Up Arrangement

FOR OPERATION WITH CDT SET (Charts 1 Through 5)

CHART 1

RECEIVING CDT DOES NOT RECEIVE DATA
(Cluster Controller in Test Operation)

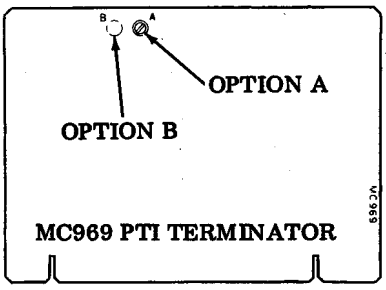
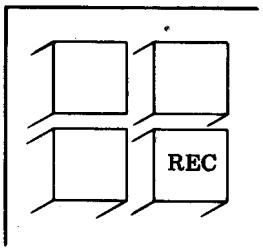
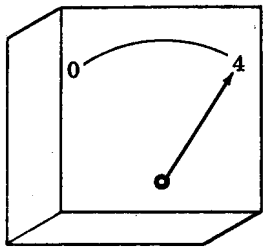
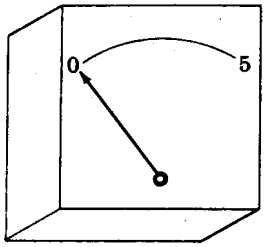
STEP	ACTION	NORMAL INDICATION AND PROCEDURE	PROBLEM OR CORRECTIVE PROCEDURE
1	At the CDIF module, set a voltmeter to measure +5 volts dc and connect + probe to JB201 pin A3. Connect - lead to pin A5 of JB301.	At receive CDT, voltage reading is 0.	
2	Depress REC button.	Voltage goes to +4 volts. If voltage is higher than +4 volts, see 5.03. 1097SD-B1	Receive CDT not selectable: (a) Check for B option on CDT at ZA316 card.  (b) Check for continuity on cable from JA303-A3 to JB201-A3, Figure 2.
3	Move + probe of voltmeter to JB101-A3 (Figure 1) and depress LOCAL button.	Voltage at 0.	
4	Depress REC button.  	Voltage goes to +4 volts. 1097SD-B1  	Trace selectable signal through the B module (Figure 1) at the following points: +4 volts from JB201-A3 to ZB115-14. 0 volts from ZB115-32 to ZB113-31. 0 volts from ZB113-29 to ZB117-32. +4 volts from ZB117-11 to JB101-A3.

CHART 1

RECEIVING CDT DOES NOT RECEIVE DATA (Continued)
(Cluster Controller in Test Operation)

STEP	ACTION	NORMAL INDICATION AND PROCEDURE	PROBLEM OR CORRECTIVE PROCEDURE
4 (Cont)			Make certain that MC969 card in ZB117 of B module is programmed for B option. Check for continuity on PTI return from ZB115 -13 to JB201-A8 and A9.
5	Move + probe of voltmeter to JB101-A1 The following test requires the cluster controller be operated in test operation. Select one of the other CDT sets as a send device and prepare the following test message for sending to the CDT with the CDIF810 module.	Voltage at 0.  	

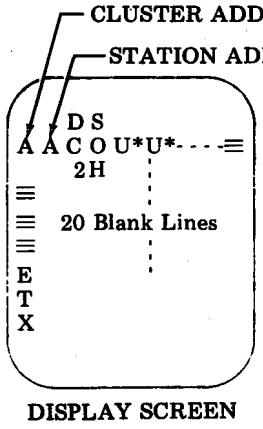
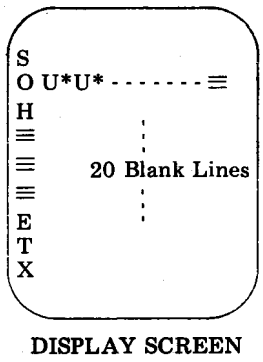
ACTION	NORMAL INDICATION AND PROCEDURE
Place the send CDT in local and prepare the following test message:  DISPLAY SCREEN Note: Address of cluster controller and station may be different than that shown; check local programming listing.	When the operating problem is corrected, the receive CDT with the CDIF810 should receive the data as shown:  DISPLAY SCREEN Note: After the message is received, the CDT will change from receive to local.

CHART 1

RECEIVING CDT DOES NOT RECEIVE DATA (Continued)
(Cluster Controller in Test Operation)

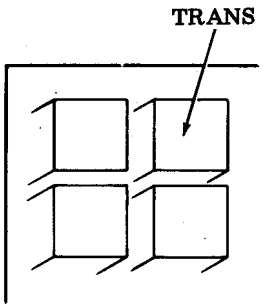
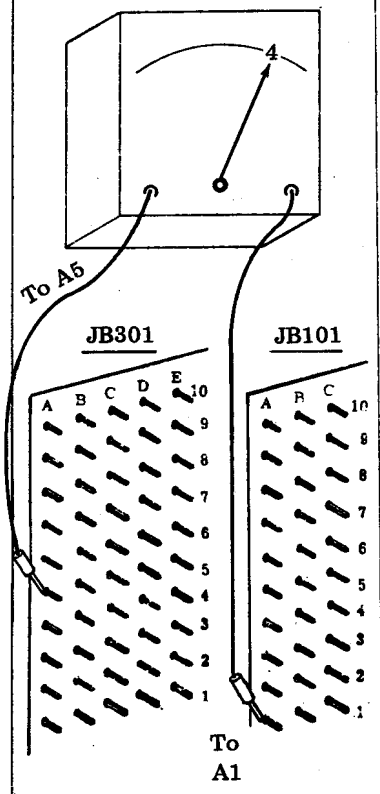
STEP	ACTION	NORMAL INDICATION AND PROCEDURE	PROBLEM OR CORRECTIVE PROCEDURE
6	Depress TRANS button on CDT used for transmit device. 	At B module connector JB101-A1, voltage goes from 0 to +4 volts (only when sender is in transmit).  (View of Wired Side)	Sender CDT message signal not getting through cluster controller, see Section 578-101-300. Cluster controller problem: Go to Section 578-150-300 and check for the message signal. If signals are good, change D-50 cable to cluster I/O port. Check that message heading is addressing the correct CDT; check that message is not displayed at another set.

CHART 1

RECEIVING CDT DOES NOT RECEIVE DATA (Continued)
(Cluster Controller in Test Operation)

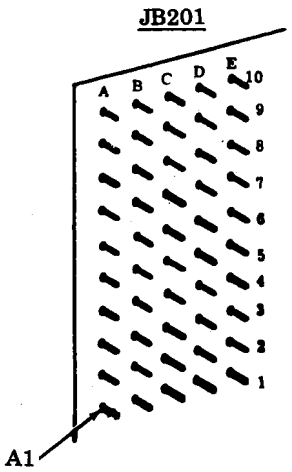
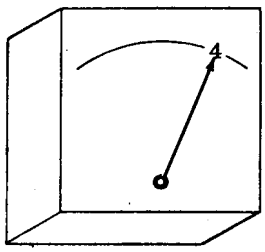
STEP	ACTION	NORMAL INDICATION AND PROCEDURE	PROBLEM OR CORRECTIVE PROCEDURE
6 (Cont)	Move + probe of voltmeter to JB201-A1.  (Wired Side)	Voltage to receive CDT at +4 volts when sending CDT is in transmit. 1097SD-B1  	Check for message signal through B module at the following points: +4 volts from JB101-A1 to ZB117-10 0 volts from ZB117-19 to ZB113-6 0 volts from ZB113-19 to ZB115-19 +4 volts from ZB115-10 to JB201-A1. Check for continuity on PTI return from ZB117-17 to JB101-B9.
7	Move the + probe of the voltmeter to JB201-A2 and depress LOCAL button. Note: The message signal at JB201-A1 must be high (+5 volts) when all subsequent signals are checked for condition.	Voltage at 0 volts with set in local.	
	Depress set REC button.	Voltage goes from 0 to +4 volts.	Receive CDT ready signal problem — refer to Section 578-101-300. Bad cable from JA303-A2 to JB201-A2.
	Move the + probe of the voltmeter to JB101-A2 and depress LOCAL button.	Voltage at 0 with set in local.	

CHART 1

RECEIVING CDT DOES NOT RECEIVE DATA (Continued)
(Cluster Controller in Test Operation)

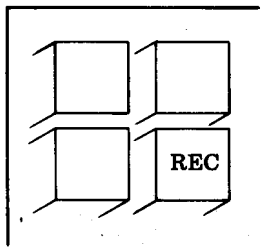
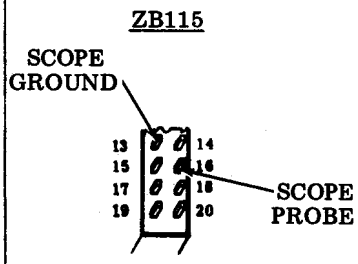
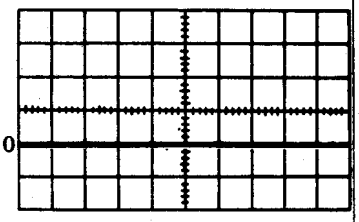
STEP	ACTION	NORMAL INDICATION AND PROCEDURE	PROBLEM OR CORRECTIVE PROCEDURE
7 (Cont)	Depress REC button on the set. 	Voltage goes from 0 to +4 volts.	"B" module problem — trace the ready signal through the following points: +4 volts from JB201-A2 to ZB115-15 0 volts from ZB115-34 to ZB113-33 0 volts from ZB113-27 to ZB117-34 +4 volts from ZB117-15 to JB101-A2. Check PTI return signals between JB201-A8 and A9 to ZB115-13.
	This completes the check for CDT device message signaling (handshake). In the following checks, the signals will be pulsing; therefore, an oscilloscope is required.	Set oscilloscope as follows: Vertical Sensitivity 5 volts/division Horizontal Sweep Rate 500 µseconds/division	
8	Connect the oscilloscope probe to pin 16 of ZB115. Connect scope ground to pin 13 of ZB115. 	Observe action of signal: Signal stays at 0 volts  1097SD-B1 Signal is pulsating from 0 to +4 volts	The CDT is not requesting characters. Check for next character signal in CDT — see 578-101-300. Check interconnecting cable continuity from JA303-A10 to JB201-A10. Problem could be either bad send CDT or bad data. Remove cards from CDIF810 module at ZB114 and ZB116 to isolate remote input (MTT).

CHART 1

RECEIVING CDT DOES NOT RECEIVE DATA (Continued)
(Cluster Controller in Test Operation)

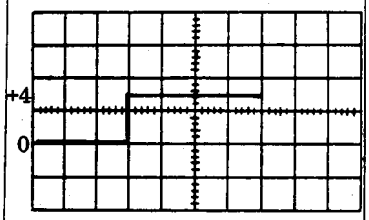
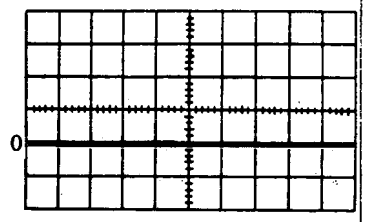
STEP	ACTION	NORMAL INDICATION AND PROCEDURE	PROBLEM OR CORRECTIVE PROCEDURE
8 (Cont)			Trace incoming data from cluster controller by monitoring JB101 pins B1 through B8 to ZB117 pins 1 through 8 (0 volts is marking and +4 volts is spacing). Trace data from ZB117 pins 21 through 28 to ZB115 pins 21 through 28 (+5 volts is marking and 0 volts is spacing). Trace data from ZB115 pins 1 through 8 to JB201 pins B1 through B8 (0 volts is marking and +4 volts is spacing).
		Signal stays at +4 volts.	Move scope probe as indicated in action column.
	Move scope ground to JB101 pin A8 and connect probe to JB101 pin A10.	Observe signal level:	
		Signal level stays at 0 volts 1097SD-B1	Next character (NC) request from receive CDT not getting through B module. Trace NC signal as follows: +4 volt signal at ZB115-33 to ZB113-15 +5 volt signal at ZB113-16 to ZB117-33 0 volt signal at ZB117-16 to JB101-A10. Check PTI return on ZB115-13 to JB201 pins A8 and A9.
			
		Signal level is at +4 volts.	Move to Step 9.

CHART 1

RECEIVING CDT DOES NOT RECEIVE DATA (Continued)
(Cluster Controller in Test Operation)

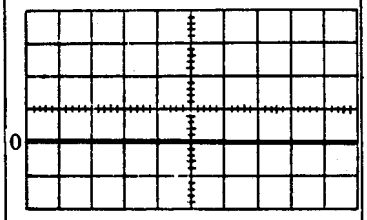
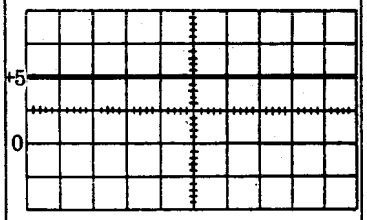
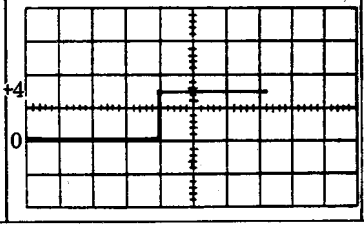
STEP	ACTION	NORMAL INDICATION AND PROCEDURE	PROBLEM OR CORRECTIVE PROCEDURE
9	Move scope ground to JB101-B9 and connect probe to JB101-B10.	Observe action of signal:	
		Signal level stays at either 0 volts or +5 volts	Bad D-50 cable from cluster controller (CC) I/O port to receive CDT. No character available signal from cluster controller — refer to CC wiring diagram 1107SD sheets B99 and B117.
		Signal is pulsating from 0 to +5 volts.	CA signal is being received from the cluster controller — move to Step 10.
10	Move oscilloscope ground to JB201-A9 and connect probe to JB201-B10.	Observe signal level:	
		Signal level stays at either 0 or +5 volts  or  	Check that CA signal is going through the B module at the following points: A +4 volt signal should be present at JB101-B10 to ZB117 pin 9 A 0 volt signal should be present at ZB117-29 to ZB115 pin 29 A +4 volt signal should be present at ZB115-9 to JB201-B10. Check PTI returns at ZB117-17 to JB101-B9
		Signal level is pulsing from 0 to +4 volts  	Signal is passing through B module to CDT. CDT is bad or cable from JB201-B10 to JA303-B10 is open. Also, check for PTI signal-return between JB201-B9 to JA303-B9.

CHART 2

DATA RECEIVED BY CDT IS GARBLED
(Cluster Controller in Test Operation)

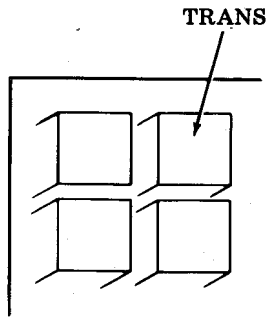
STEP	ACTION	NORMAL INDICATION AND PROCEDURE	PROBLEM OR CORRECTIVE PROCEDURE
	Note: If the CDT has the view while transmit or view while receive option installed (screen does not blank during transmit or receive operation), make certain that the CDT has a MC646 card in module position ZA304.		
1	If possible, transmit the test message to a different CDT in the cluster arrangement to verify that the send CDT is working properly. A sample test message is given in Step 5 of Chart 1. (In place of the test message text, include three lines of U and three lines of *.)	Check accuracy of received data at the other receive CDT: Received data is garbled Received data is correct.	 Send CDT or cluster controller problem — refer to Section 578-101-300 or 578-150-300 respectively. Go to Step 2.
2	Readdress the test message for the CDT connected to the B module (CDIF810). Transmit the message from the send CDT.  	Use an ASCII code chart and determine what bit levels were received or not received in place of the three lines of U (bits 1, 3, 5, and 7 marking) and the three lines of * (bits 2, 4, 6, and 8 marking). Determine error pattern: Marking bits received as space bits.	 Remove cards in B module position ZB116 and ZB114 one at a time and check if either one is causing the problem by resending the message. If the problem is eliminated with one of the cards out, replace that card.

CHART 2

DATA RECEIVED BY CDT IS GARBLED (Continued)
(Cluster Controller in Test Operation)

STEP	ACTION	NORMAL INDICATION AND PROCEDURE	PROBLEM OR CORRECTIVE PROCEDURE
2 (Cont)		Spacing bits received as mark bits 1097SD-B1	Use an oscilloscope and trace mark or space data bit signals received from JB101 pins B1 through B8 to ZB117 pins 1 through 8 (a +4 volt signal is space and a 0 volt signal is mark). From ZB117 pins 21 through 28 to ZB115 pins 21 through 28 (0 volts is space and +5 volts is mark). From ZB115 pins 1 through 8 to JB201 pins B1 through B8 (0 volts is marking and +4 volts is spacing). If any of the signals are not present, replace the circuit card in the respective connector.
		Random bit level errors received.	Replace MC969 in card position ZB117. Replace MC976 in card position ZB115.

CHART 3

EXT RELS BUTTON OR REC BUTTON DOES NOT ILLUMINATE ON CDT

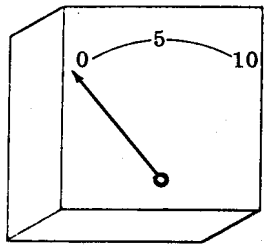
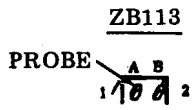
STEP	ACTION	NORMAL INDICATION AND PROCEDURE	PROBLEM OR CORRECTIVE PROCEDURE
1	At CDT with B module, connect common lead of voltmeter to JB301 pin A5 (1174SD-B8) on the CDIF810 module. Set meter to measure +5 volts dc and connect + probe to JB401 pin B2.	Voltage indicated on meter is slightly negative. 	
2	Depress EXT RELS button on CDT.	Voltage reading on meter goes to +5 volts.	CDT EXT RELS wiring is bad at switch or at cable from switch to B module.
3	Move + probe of voltmeter to ZB113 pin 2 on the CDIF810 module.	Voltage indicated on meter is slightly negative.	
4	Depress EXT RELS button.	Voltage reading on meter goes to +5 volts.	At B module, check for broken wire or wiring error from JB402 pin B2 to ZB113 pin 2.
5	Move + probe of voltmeter to ZB113 pin 1 on the CDIF810 module. 	Voltage indicated on meter is slightly negative. 1097SD-B2	
6	Depress EXT RELS button.	Voltage reading on meter goes to +5 volts.	Replace MC501 card in connector ZB113.

CHART 3

EXT RELS BUTTON OR REC BUTTON DOES NOT ILLUMINATE ON CDT (Continued)

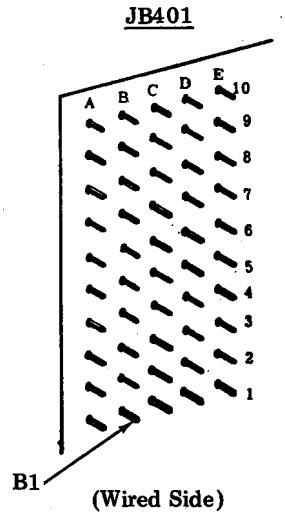
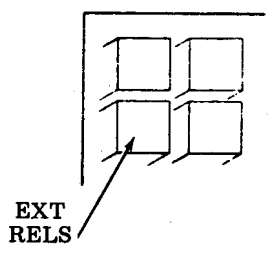
STEP	ACTION	NORMAL INDICATION AND PROCEDURE	PROBLEM OR CORRECTIVE PROCEDURE
7	Move + probe of voltmeter to JB401 pin B1 on CDIF810.  	Voltage reading on meter is slightly negative. 1097SD-B2	
8	Depress EXT RELS button.	Voltage reading on meter goes to +5 volts.	At B module, check for broken wire, connection, or miswired connection between ZB113 pin 1 to JB401 pin B1.
9	Depress LOCAL button.	Go to Step 10.	
10	Move + probe of voltmeter to JB401 pin A5 on CDIF810.	Voltage reading on meter is at 0.	
11	Depress EXT RELS button.  	Voltage reading goes to +5 volts. REC lamp on CDT should light.	CDT is not responding to module signal. Check for bad cable from JB401 pin B1 (or JB402-B1) to JA202 B1 on CDT. If cable is OK, refer to 578-101-300 for CDT troubleshooting. If lamp does not light refer to CDT troubleshooting.

CHART 3

EXT RELS BUTTON OR REC BUTTON DOES NOT ILLUMINATE ON CDT (Continued)

STEP	ACTION	NORMAL INDICATION AND PROCEDURE	PROBLEM OR CORRECTIVE PROCEDURE
12	Depress LOCAL button on CDT. Move + probe of voltmeter to ZB113 pin 32.	Voltage reading at +5 volts.	Go to Step 13.
13	Depress EXT RELS button on CDT.	Voltage reading on meter falls to 0.	Replace MC501 card in the CDIF810.
14	Depress LOCAL button. Move + probe of meter to JB401-A7.	Voltage reading on meter at +5 volts.	Replace MC501 card in ZB113. Check wiring between JB401-A7 and ZB113-32.
15	Depress EXT RELS button.	Voltage goes to 0. EXT RELS lamp on CDT should light.	Wire between ZB113-32 and JB401-A7 is miswired. EXT RELS lamp wiring bad on CDT or cable from set operational buttons to device controls connector on CDIF module may be defective.

CHART 4

MAGNETIC TAPE SET DOES NOT START OR IMPROPER OPERATION
(Cluster Controller Conditioned for Normal Operation — Standby Off)

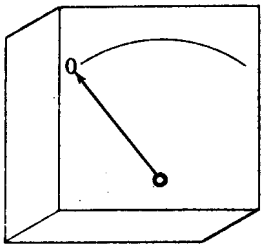
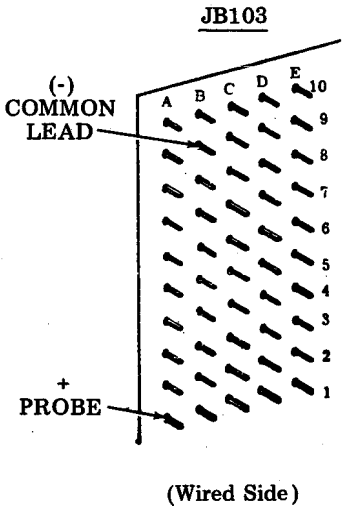
STEP	ACTION	NORMAL INDICATION AND PROCEDURE	PROBLEM OR CORRECTIVE PROCEDURE
1	Place a cartridge containing a test message into the magnetic tape set and depress the EXT RELS button on the CDT.	The EXT RELS and REC button lamps on the CDT should light.	Go to Chart 3 for trouble analysis.
2	If both the EXT RELS and REC lamps light, set a voltmeter to read +5 v dc and connect the common probe to ZB115 pin 13. Connect the + probe to JB201 pin A3.	Observe meter reading: Meter at 0 volts  Meter reads +4 volts.	Check that the CDT MC969 card in ZA316 is programmed for B option. Check cable from JA303-A3 to JB201-A3 for continuity. Trouble in CDT, refer to 578-101-300 for CDT troubleshooting and 1174SD Sheet B5. Go to Step 3.
3	Move the common lead of the voltmeter to JB103 pin B9 and connect the + probe to JB103 pin A1.  	Observe meter reading: Meter reads 0 volts Meter reads +4 volts.	Module not receiving selectable signal from magnetic tape set; check if tape and cartridge is properly installed and that thread lever is engaged. Check that power to MTT is on. Check cable from MTT send connector P113 pin B1 to JB103 pin A1 for continuity. If trouble is still present, refer to 578-300-300 for MTT troubles. Go to Step 4.

CHART 4

MAGNETIC TAPE SET DOES NOT START OR IMPROPER OPERATION (Continued)
(Cluster Controller Conditioned for Normal Operation — Standby Off)

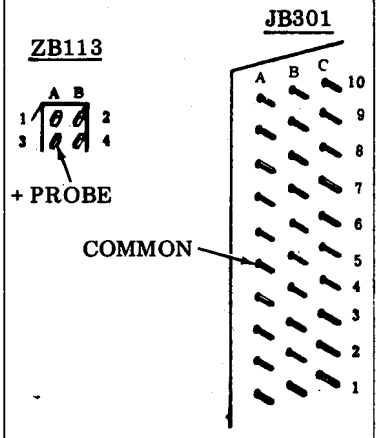
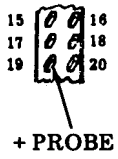
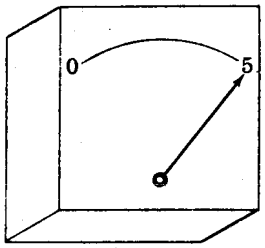
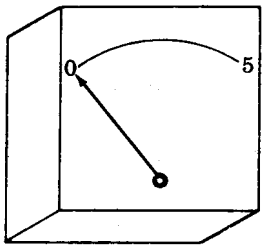
STEP	ACTION	NORMAL INDICATION AND PROCEDURE	PROBLEM OR CORRECTIVE PROCEDURE
4	Move the common lead of the voltmeter to JB301-A5 and connect the + probe to ZB113 pin 3. 	Observe the meter reading: Meter reads +5 volts Meter reads 0 volts.	 Check wire continuity from ZB116 pin 17 to JB103 pin 9. If wire is OK, replace MC969 in ZB116. Go to Step 5.
5	Move the + probe to pin 19 of ZB113. 	Observe the meter reading: Meter reads +5 volts  Meter reads 0 volts. 	 Replace the MC501 card in ZB113. Go to Step 6.

CHART 4

MAGNETIC TAPE SET DOES NOT START OR IMPROPER OPERATION (Continued)
(Cluster Controller Conditioned for Normal Operation — Standby Off)

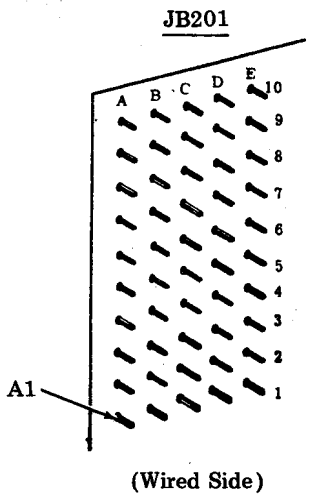
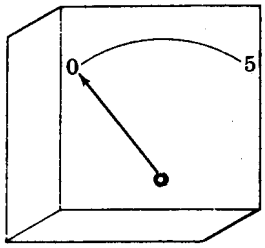
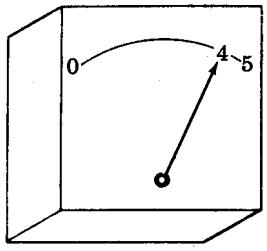
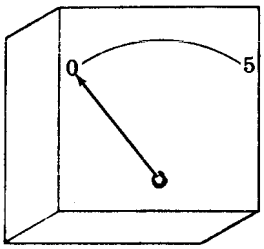
STEP	ACTION	NORMAL INDICATION AND PROCEDURE	PROBLEM OR CORRECTIVE PROCEDURE
6	Move the + probe of the meter to pin A1 of JB201.  	Observe the meter reading: Meter reads 0 volts  Meter reads +4 volts.  	Use an oscilloscope and trace message signal as follows: 0 volts from ZB113-19 to ZB115-19 +5 volts from ZB115-10 to JB201-A1. Go to Step 7.
7	Move the common lead of the meter to pin A9 of JB201. Connect the + probe to pin A2 of JB201.	Observe the meter reading: Meter reads 0 volts.  	CDT is not returning ready signal to the CDIF module, replace MC969 in CDT ZA316. Check interconnecting cable between JA303-A2 to JB201-A2. Also check PTI return in cable from JB201-B9 to JB301-A5 for continuity.

CHART 4

MAGNETIC TAPE SET DOES NOT START OR IMPROPER OPERATION (Continued)
(Cluster Controller Conditioned for Normal Operation — Standby Off)

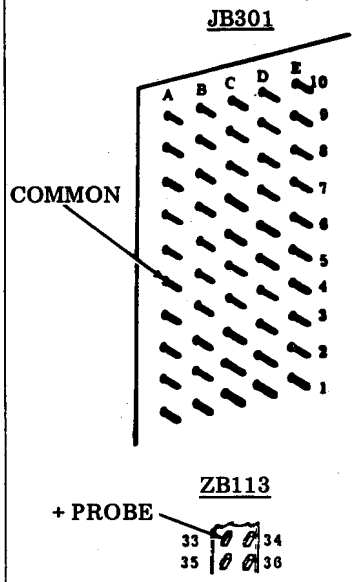
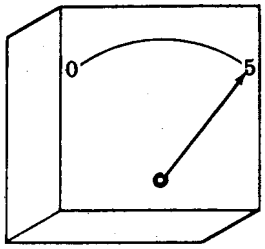
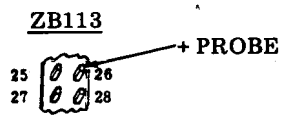
STEP	ACTION	NORMAL INDICATION AND PROCEDURE	PROBLEM OR CORRECTIVE PROCEDURE
8	Move the common probe of the voltmeter to pin A5 of JB301. Connect the + probe to ZB113 pin 33. 	Observe meter reading: Meter reads +5 volts  Meter reads 0 volts.	CDT ready signal not getting through CDIF module, replace the MC501 in ZB113 or replace the MC976 in ZB115. If the problem is not corrected, use an oscilloscope and trace ready signal as follows: +5 volts from JB201-A2 to ZB115-15 0 volts from ZB115-34 to ZB113-33. Also check for continuity for PTI signal return between ZB115-13 to JB201-A8 and A9. Go to Step 9.
9	Move the + probe of the meter to ZB113-26. 	Observe meter reading: Meter reads +5 volts Meter reads 0 volts.	Replace MC501 card in ZB113. Go to Step 10.

CHART 4

MAGNETIC TAPE SET DOES NOT START OR IMPROPER OPERATION (Continued)
(Cluster Controller Conditioned for Normal Operation — Standby Off)

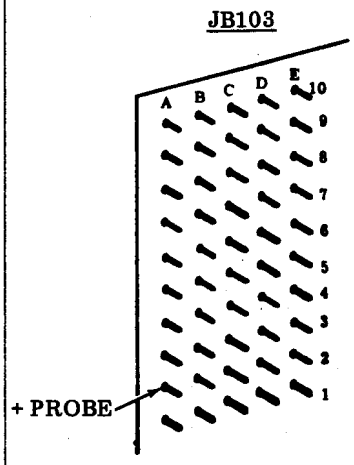
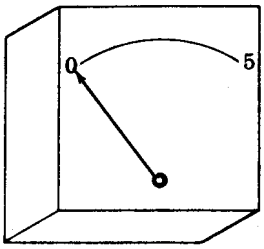
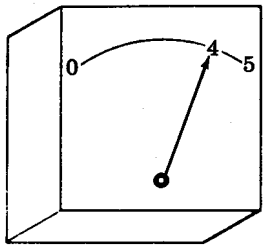
STEP	ACTION	NORMAL INDICATION AND PROCEDURE	PROBLEM OR CORRECTIVE PROCEDURE
10	Move the + probe of the voltmeter to pin A2 of JB103. 	Observe meter reading: Meter reads 0 volts  Meter reads +4 volts. 	Use the + probe of the voltmeter and check that message signal is at the following points: 0 volts from ZB113-26 to ZB116-34 +5 volts from ZB116-15 to JB103 pin A2. Go to Step 11.
11		Is MTT motor running or can it be started? Motor is running Motor is not running.	Go to Step 12. Check for cable continuity on cable from MTT connector P401 pin D10 to JB103-A2 (send message signal). Check B module PTI return for continuity from JB103-A8 and A9 to JB103-A5. Also, if possible check for common between B module PTI return from JB103-A8 and the MTT DMAM800 module PTI return at P401 pins C6, C7, E6, E7, E8, and E9. If trouble still exists, refer to MTT troubleshooting in 578-300-300 and related MTT wiring diagrams.

CHART 4

MAGNETIC TAPE SET DOES NOT START OR IMPROPER OPERATION (Continued)
(Cluster Controller Conditioned for Normal Operation — Standby Off)

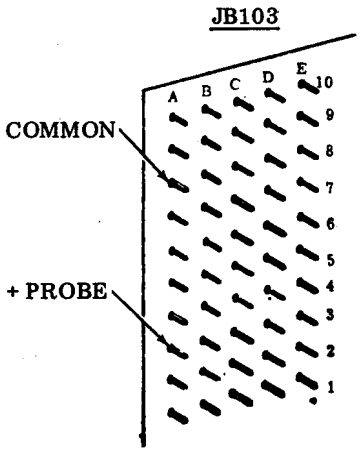
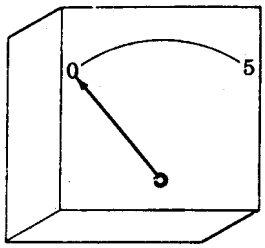
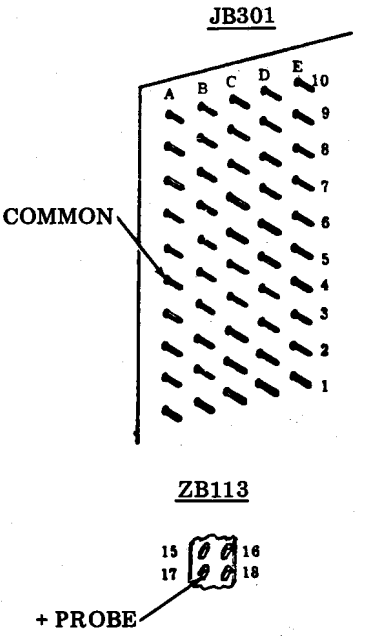
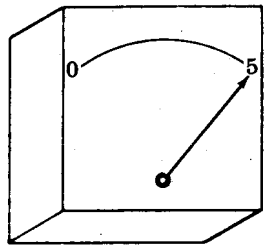
STEP	ACTION	NORMAL INDICATION AND PROCEDURE	PROBLEM OR CORRECTIVE PROCEDURE
12	Move common lead of the voltmeter to JB103 pin B9. Also move the + probe to JB103-A3.  	Observe meter reading: Meter reads 0 volts  Meter reads +4 volts.	MTT set is not returning ready signal to the B module. Check that the tape cartridge is properly installed in MTT set. Check for cable continuity from MTT connector P401 pin 41 to JB103-A3. If bad, replace cable. If trouble still exists, refer to MTT troubleshooting in 578-300-300. Go to Step 13.
13	Move common lead of voltmeter to pin A5 of JB301. Move + probe to pin 17 of ZB113.  	Observe meter reading: Meter reads +5 volts  Meter reads 0 volts	MTT set ready signal is not getting through B module. Trace ready signal as follows: 0 volts from JB103-A3 to ZB116-11 +5 volts from ZB116-31 to ZB113-17. Check that the MC969 card in ZB116 has the option A programming (A is the unmarked location on the card). Check for continuity on PTI signal return from JB103-B9 to ZB116-17. Go to Step 14.

CHART 4

MAGNETIC TAPE SET DOES NOT START OR IMPROPER OPERATION (Continued)
(Cluster Controller Conditioned for Normal Operation — Standby Off)

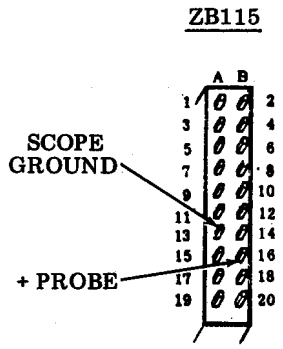
STEP	ACTION	NORMAL INDICATION AND PROCEDURE	PROBLEM OR CORRECTIVE PROCEDURE
14	This completes the verification of the message interface ("device handshake"). In the checks that follow, the signals will be pulsing on and off; therefore an oscilloscope is required.	Adjust the oscilloscope as follows: Vertical Sensitivity: 5 volts/division Sweep Rate: .5 ms/division Trigger Sweep: Free-running.	
15	Connect the scope ground to pin 13 of ZB115. Connect the probe to pin 16 of ZB115.  	Observe signal level: Signal level stays at 0 volts Signal level is pulsing from 0 to +4 volts Signal level stays at +4 volts	 Next character signal not received from CDT, check for continuity on cable from CDT JA303 pin A10 to JB201 pin A10 at B module. If problem is not corrected, refer to CDT troubleshooting in 578-101-300. Isolate module circuits not used for this operation by pulling the MC969 and MC986 cards from ZB117 and ZB114 one at a time. If the problem is eliminated with the cards out, replace the defective card. Check for incoming data from the MTT at the following pin numbers: JB103 pins B1 through B8 to ZB116 pins 1 through 8 (0 volts is mark and +4 volts is space) ZB116 pins 21 through 28 to ZB115 pins 21 through 28 (+5 volts is mark and 0 volts is space) ZB115 pins 1 through 8 to JB201 pins B1 through B8 (0 volts is mark and +5 volts is space). Go to Step 16.

CHART 4

MAGNETIC TAPE SET DOES NOT START OR IMPROPER OPERATION (Continued)
(Cluster Controller Conditioned for Normal Operation — Standby Off)

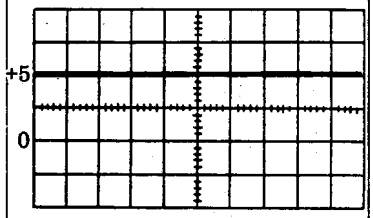
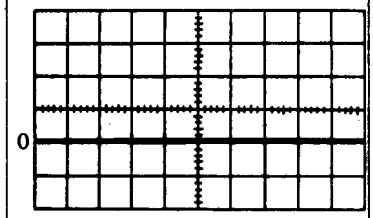
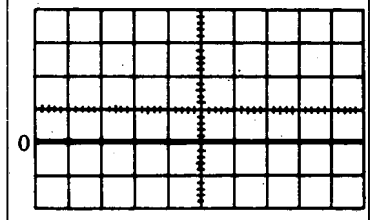
STEP	ACTION	NORMAL INDICATION AND PROCEDURE	PROBLEM OR CORRECTIVE PROCEDURE
16	Move scope probe to ZB113 pin 15. Connect scope ground to JB301 pin A5.	Observe signal level: Signal level at +5 volts  Signal level stays at 0 volts 	Check that next character request is getting through B module at the following points: +4 volts (ready on) at JB201-A10 to ZB115 pin 16 0 volts (ready on) at ZB115 pin 33 to ZB113 pin 15. Check PTI signal return for continuity from ZB115 pin 13 to JB201 pins A8 and A9. Go to Step 17.
17	Move scope probe to ZB113 pin 14.	Observe signal level: Signal level at +5 volts Signal level at 0 volts	Replace MC501 card in ZB113. Go to Step 18.
18	Move scope probe to JB103 pin A10.	Observe signal level: Signal level stays at 0 volts  Signal level stays at +4 volts.	Check that next character request is going through B module at the following points: 0 volts at ZB113 pin 14 to ZB116 pin 33 +5 volts at ZB116 pin 16 to JB103 pin A10. Go to Step 19.

CHART 4

MAGNETIC TAPE SET DOES NOT START OR IMPROPER OPERATION (Continued)
(Cluster Controller Conditioned for Normal Operation — Standby Off)

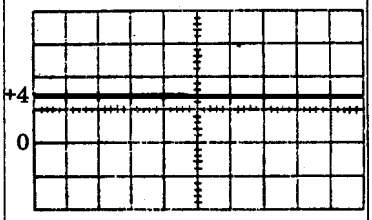
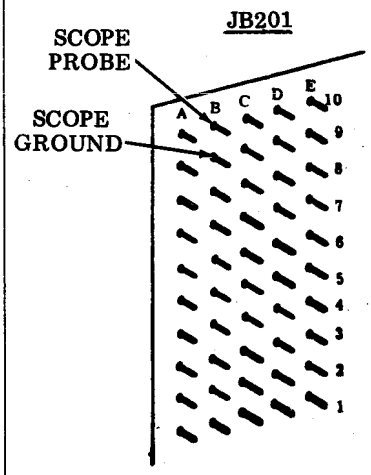
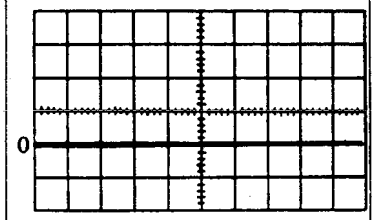
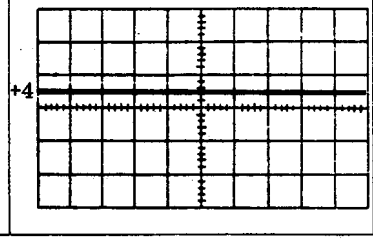
STEP	ACTION	NORMAL INDICATION AND PROCEDURE	PROBLEM OR CORRECTIVE PROCEDURE
19	Move scope ground to JB103 pin B9. Move scope probe to JB103 pin B10.	Observe signal level: Signal level at 0 volts	MTT character available signal not getting to B module. Check cable from P401 connector at DMAM800 module of MTT to the B module at JB103 connector for continuity at the following pins: P401 pin E3 to JB103 pin B10. At B module, check for PTI signal return continuity from JB103 A8 and A9 to JB301 pin A5.
		Signal level stays at +4 volts.  	Go to Step 20.
20	Move scope ground to JB201 pin B9. Move scope probe to JB201 pin B10.  	Observe signal level: Signal level stays at 0 volts  	MTT character available signal is not getting through B module, check for CA signal at the following pins: +4 volts from JB103-B10 to ZB116-9 0 volts from ZB116-29 to ZB115-29 +4 volts from ZB115-9 to JB201-B10.
		Signal level stays at +4 volts.  	CA signal is passing through B module to CDT, but CDT is not responding. Check for cable continuity from JB201-B10 of B module to JA303-B10 at CDT set. If cable is OK, refer to 578-101-300 for CDT trouble-shooting. Check B module PTI signal return from JB201-B9 to JB301-A5.

CHART 5

MTT DATA RECEIVED BY CDT IS GARBLED
(Cluster Controller Conditioned for Normal Operation)

STEP	ACTION	NORMAL INDICATION AND PROCEDURE	PROBLEM OR CORRECTIVE PROCEDURE
	Note: If the CDT has the view while transmit or view while receive options installed (screen does not blank during transmit or receive operation), make certain that a MC646 card is in the CDT A module at ZA304.		
1	Place a tape cartridge into the MTT. It should have several lines of U and * for the message and end with the ETX character.	See the Interrupt checkout procedure (4.07) for recording test message on tape.	
2	Depress the EXT RELS button on the CDT.	EXT RELS and REC buttons on the CDT should light.	Go to Chart 3 for problem analysis.
3		Use an ASCII code chart and determine what bit levels were received or not received in place of the three lines of U (bits 1, 3, 5, and 7 marking) and the three lines of * (bits 2, 4, 6, and 8 marking). Try to determine error pattern: Marking bits received as space bits	Remove cards in B module at positions ZB114 and 117 one at a time and check if either one is causing the problem by resending the message. If problem is eliminated with one of the cards out, replace that card.

CHART 5

MTT DATA RECEIVED BY CDT IS GARBLED (Continued)
(Cluster Controller Conditioned for Normal Operation)

STEP	ACTION	NORMAL INDICATION AND PROCEDURE	PROBLEM OR CORRECTIVE PROCEDURE
3 (Cont)		Spacing bits received as mark bits	Use an oscilloscope and trace mark or space data bit signals received from MTT at the following points: JB103-B1 through B9 to ZB116 pins 1 through 8 (0 volts is mark and +4 volts is space) ZB116 pins 21 through 28 to ZB115 pins 21 through 28 (+5 volts is mark and 0 volts is space) ZB115 pins 1 through 8 to JB201 pins B1 through B8 (0 volts is mark and +4 volts is space). Check PTI signal returns for continuity from JB103 pins A4 through A7 to ZB116 pins 12, 13, 14, 18, and JB201 pins A4 through A7 to ground at JB301 pin A5.
		Random bit level errors received.	Replace the MC969 card in ZB116. Replace the MC976 card in ZB115. If data is still garbled, refer to 578-300-300 for MTT trouble-shooting.

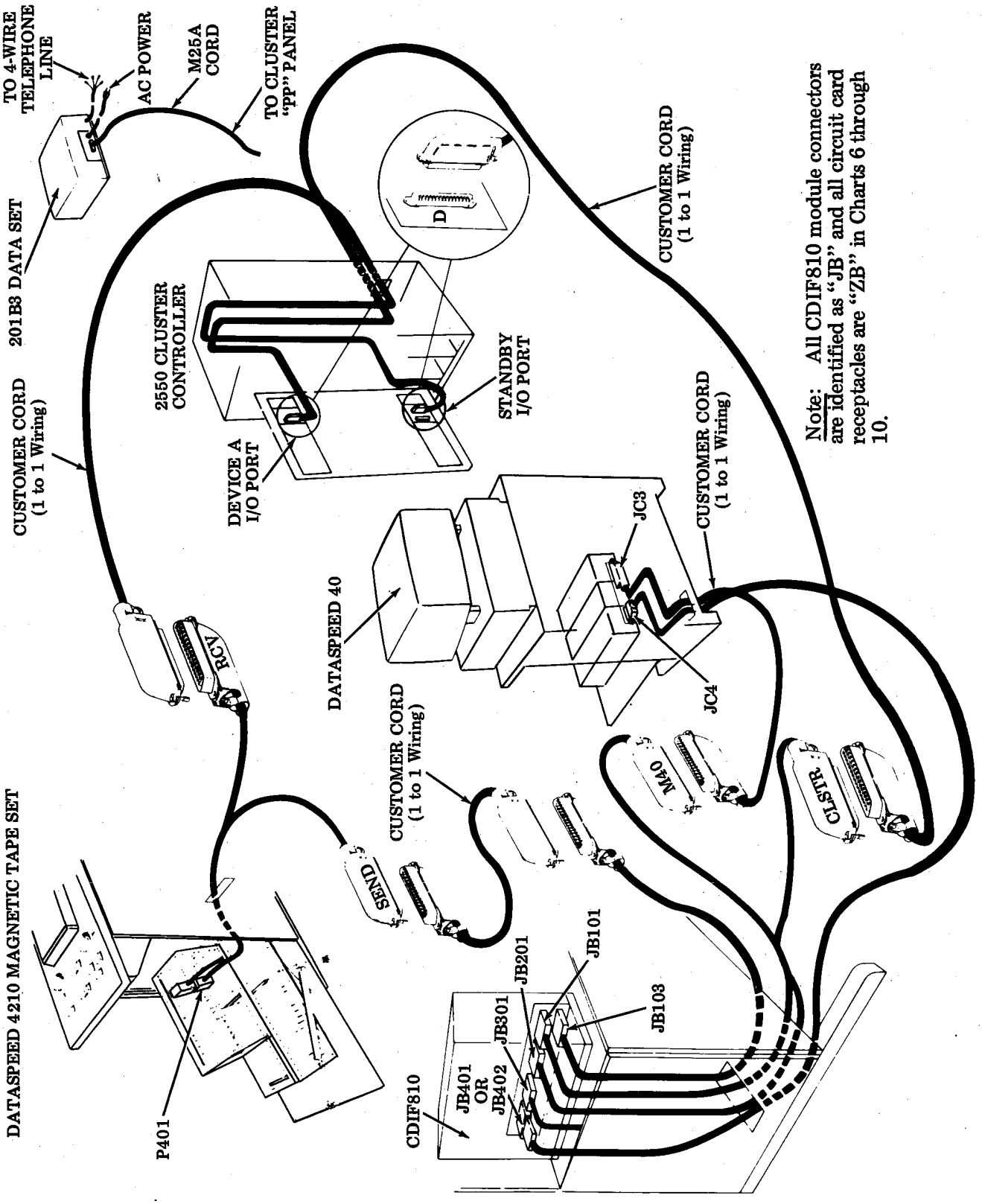


Figure 3 - CDIF810 Connector and Cable Location Diagram With DATASPEED 40 Hook-Up Arrangement

FOR OPERATION WITH "DATASPEED" 40 SET (Charts 6 Through 10)

CHART 6

RECEIVING "DATASPEED" 40 DOES NOT RECEIVE DATA
(Cluster Controller in Test Operation)

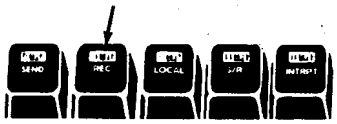
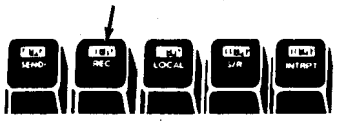
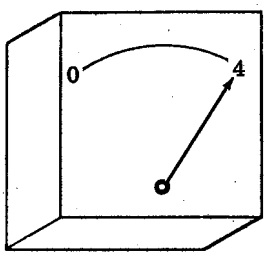
STEP	ACTION	NORMAL INDICATION AND PROCEDURE	PROBLEM OR CORRECTIVE PROCEDURE
1	At the CDIF module, set a voltmeter to measure +5 volts dc and connect + probe to JB201 pin A3. Connect - lead to pin A5 of JB301.	Voltage reading is 0 (DATASPEED 40 (D40) in local).	If D40 is not in local or if local fails to come on, refer to 575-100-350 for troubleshooting.
2	Depress REC button. 	Voltage goes to +4 volts. If voltage is higher than +4 volts, see 5.03. 1097SD-B1	Receive D40 not sending selectable signals: Check that "receive selectable on" option is on at D40 TP410677 card (see 575-100-350). Remove JC3 plug at D40 (Figure 3), and check for cable continuity from JC3 pin 9 to connector at B module, JB201 pin A3. Also, check for continuity from JC3 pin 20 to JB201 pin 13. If no continuity exists, repair or replace cable. If trouble still exists, refer to 575-100-350 for D40 troubleshooting.
3	Move + probe of voltmeter to JB101-A3 (Figure 1) and depress LOCAL button.	Voltage at 0.	
4	Depress REC button. 	Voltage goes to +4 volts. 1097SD-B1 	Trace selectable signal through the B module (Figure 1) at the following points: +4 volts from JB201-A3 to ZB115-14. 0 volts from ZB115-32 to ZB113-31. 0 volts from ZB113-29 to ZB117-32. +4 volts from ZB117-11 to JB101-A3.

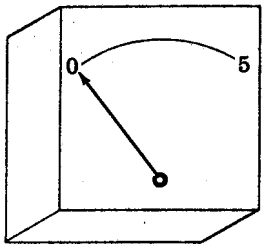
CHART 6

RECEIVING "DATASPEED" 40 DOES NOT RECEIVE DATA (Continued)
(Cluster Controller in Test Operation)

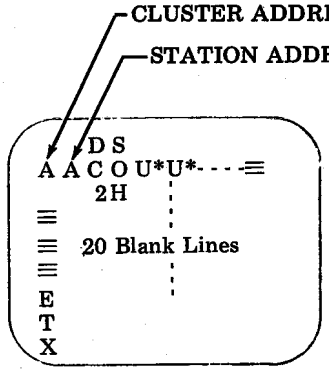
<table>
<tr><th>STEP</th><th>ACTION</th><th>NORMAL INDICATION AND PROCEDURE</th><th>PROBLEM OR CORRECTIVE PROCEDURE</th></tr>
<tr><td>4 (Cont)</td><td></td><td></td><td>Make certain that card in ZB117 of B module is programmed for B option.

Check for continuity on PTI return from ZB115 -13 to JB201-A8 and A9.</td></tr>
<tr><td>5</td><td>Move + probe of voltmeter to JB101-A1

Select one of the other D40 sets as a send device and prepare the following test message for sending to the D40 with the CDIF810 module.</td><td>Voltage at 0.

 
</td><td></td></tr>
<tr><td></td><td colspan="2">ACTION

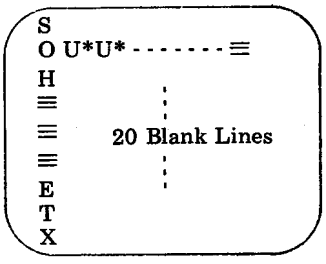
Place the send D40 in local and prepare the following test message:

DISPLAY SCREEN

Note: Address of cluster controller and station may be different than that shown; check local programming listing.</td><td>NORMAL INDICATION AND PROCEDURE

When the operating problem is corrected, the receive D40 with the CDIF810 should receive the data as shown:

DISPLAY SCREEN

Note: After the message is received, the D40 will change from receive to local.</td></tr>
</table>

CHART 6

RECEIVING "DATASPEED" 40 DOES NOT RECEIVE DATA (Continued)
(Cluster Controller in Test Operation)

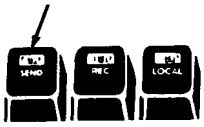
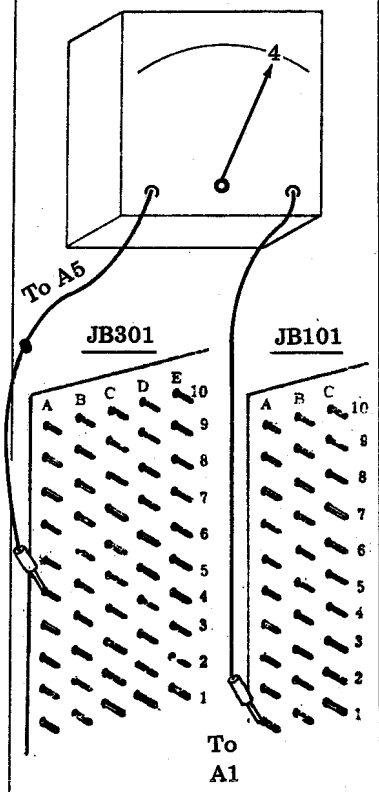
STEP	ACTION	NORMAL INDICATION AND PROCEDURE	PROBLEM OR CORRECTIVE PROCEDURE
6	Depress SEND button on D40 used for transmit device.  	At B module connector JB101-A1, voltage goes from 0 to +4 volts (only when sender is in transmit).  (View of Wired Side)	Sender D40 message signal not getting through cluster controller, see Section 578-101-300. Cluster controller problem: Go to Section 578-150-300 and check for the message signal. If signals are good, change D-50 cable to cluster I/O port or TP344952 cable connected to the B module. Check that message heading is addressing the correct D40; check that message is not displayed at another set.

CHART 6

RECEIVING "DATASPEED" 40 DOES NOT RECEIVE DATA (Continued)
(Cluster Controller in Test Operation)

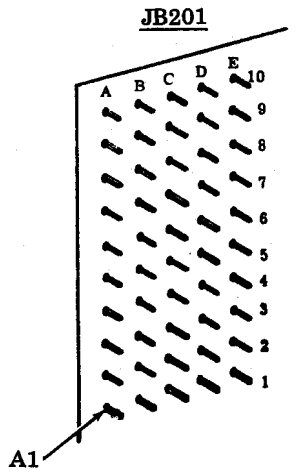
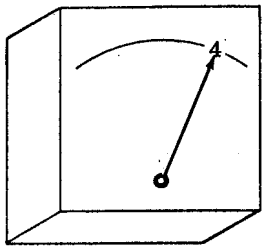
STEP	ACTION	NORMAL INDICATION AND PROCEDURE	PROBLEM OR CORRECTIVE PROCEDURE
6 (Cont)	Move + probe of voltmeter to JB201-A1.  	Voltage at +4 volts when sending D40 is in transmit. 1097SD-B1  	Check for message signal through B module at the following points: +4 volts from JB101-A1 to ZB117-10 0 volts from ZB117-19 to ZB113-6 0 volts from ZB113-19 to ZB115-19 +4 volts from ZB115-10 to JB201-A1. If any of the signals are missing, check wiring or replace the circuit card. Check for continuity on PTI return from ZB117-17 to JB101-B9.
7	Move the + probe of the voltmeter to JB201-A2 and depress LOCAL button. Note: The message signal at JB201-A1 must be high (+5 volts) when all subsequent signals are checked for condition.	Voltage at 0 volts with set in local.	
	Depress set REC button.	Voltage goes from 0 to +4 volts.	Receive D40 ready signal problem — refer to Section 575-100-350. Remove JC3 Plug at D40 and check cable continuity from JC3 pin 11 to JB201-A2 at B module. Also check for signal return continuity from JC3 pin 20,22,26 and 27 to JB201 pins A7 and A8.
	Move the + probe of the voltmeter to JB101-A2 and depress LOCAL button.	Voltage at 0 with set in local.	

CHART 6

RECEIVING "DATASPEED" 40 DOES NOT RECEIVE DATA (Continued)
(Cluster Controller in Test Operation)

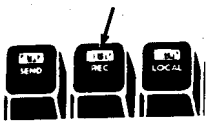
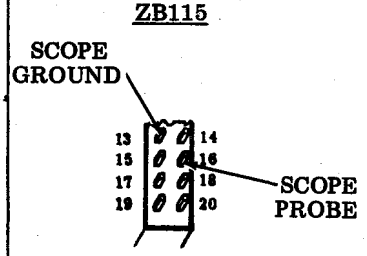
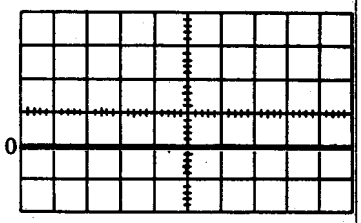
STEP	ACTION	NORMAL INDICATION AND PROCEDURE	PROBLEM OR CORRECTIVE PROCEDURE
7 (Cont)	Depress REC button on the set.  	Voltage goes from 0 to +4 volts.	"B" module problem — trace the ready signal through the following points: +4 volts from JB201-A2 to ZB115-15 0 volts from ZB115-34 to ZB113-33 0 volts from ZB113-27 to ZB117-34 +4 volts from ZB117-15 to JB101-A2. Remove JC3 plug at D40 and JP201 plug at B module. Check PTI return signals between JB201-A8 and A9 to JC3 pins 20, 22, 26, and 27.
	This completes the check for D40 device message signaling (handshake). In the following checks, the signals will be pulsing; therefore, an oscilloscope is required.	Set oscilloscope as follows: Vertical Sensitivity 5 volts/division Horizontal Sweep Rate 500 μseconds/division	
8	Connect the oscilloscope probe to pin 16 of ZB115. Connect scope ground to pin 13 of ZB115 on the B module.  	Observe action of signal: Signal stays at 0 volts  1097SD-B1 Signal is pulsating from 0 to +4 volts	The D40 is not requesting characters. Check for next character signal in D40 — see 575-100-350. Remove JC3 plug at D40 and JP201 plug at B module. Check cable continuity from JC3 pin 12 to JB201-A10. Problem could be either bad send D40 or bad data: Remove cards from CDIF810 module at ZB114 and ZB116 to isolate remote input (MTT).

CHART 6

RECEIVING "DATASPEED" 40 DOES NOT RECEIVE DATA (Continued)
(Cluster Controller in Test Operation)

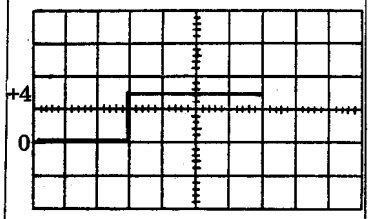
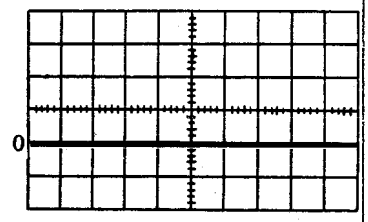
STEP	ACTION	NORMAL INDICATION AND PROCEDURE	PROBLEM OR CORRECTIVE PROCEDURE
8 (Cont)			Trace incoming data from cluster controller by monitoring JB101 pins B1 through B8 to ZB117 pins 1 through 8 (0 volts is marking and +4 volts is spacing). Trace data from ZB117 pins 21 through 28 to ZB115 pins 21 through 28 (+5 volts is marking and 0 volts is spacing). Trace data from ZB115 pins 1 through 8 to JB201 pins B1 through B8 (0 volts is marking and +4 volts is spacing).
		Signal stays at +4 volts.	Move scope probe as indicated in action column.
	Move scope ground to JB101 pin A8 and connect probe to JB101 pin A10.	Observe signal level:	
		Signal level stays at 0 volts 1097SD-B1	Next character (NC) request from receive D40 not getting through B module. Trace NC signal as follows: +4 volt signal at ZB115-33 to ZB113-15 +5 volt signal at ZB113-16 to ZB117-33 0 volt signal at ZB117-16 to JB101-A10. Check PTI return on ZB115-13 to JB201 pins A8 and A9.
			
		Signal level is at +4 volts.	Move to Step 9.

CHART 6

RECEIVING "DATASPEED" 40 DOES NOT RECEIVE DATA (Continued)
(Cluster Controller in Test Operation)

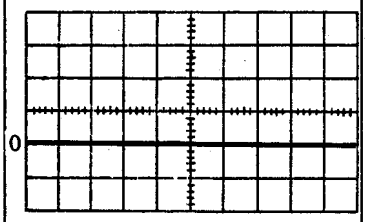
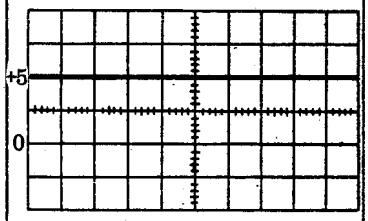
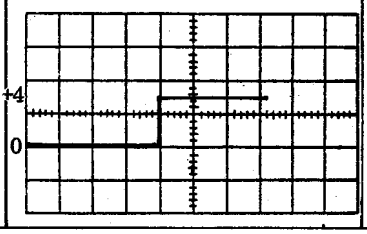
STEP	ACTION	NORMAL INDICATION AND PROCEDURE	PROBLEM OR CORRECTIVE PROCEDURE
9	Move scope ground to JB101-B9 and connect probe to JB101-B10.	Observe action of signal:	
		Signal level stays at either 0 volts or +5 volts	Bad D-50 cable from cluster controller (CC) I/O port to receive D40. No character available signal from cluster controller — refer to CC wiring diagram 1107SD sheets B99 and B117.
		Signal is pulsating from 0 to +5 volts.	CA signal is being received from the cluster controller — move to Step 10.
10	Move oscilloscope ground to JB201-A9 and connect probe to JB201-B10.	Observe signal level:	
		Signal level stays at either 0 or +5 volts  or  	Check that CA signal is going through the B module at the following points: A +4 volt signal should be present at JB101-B10 to ZB117 pin 9 A 0 volt signal should be present at ZB117-29 to ZB115 pin 29 A +4 volt signal should be present at ZB115-9 to JB201-B10. Check PTI returns at ZB117-17 to JB101-B9
		Signal level is pulsing from 0 to +4 volts  	Signal is passing through B module to D40. D40 is bad or cable from JB201-B10 to JC3 to pin 13 is open. Also, check for PTI signal-return between JB201-B9 to JC3 pin 27.

CHART 7

DATA RECEIVED BY "DATASPEED" 40 IS GARBLED
(Cluster Controller in Test Operation)

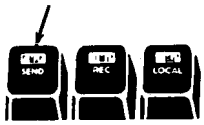
STEP	ACTION	NORMAL INDICATION AND PROCEDURE	PROBLEM OR CORRECTIVE PROCEDURE
1	If possible, transmit the test message to a different D40 in the cluster arrangement to verify that the send D40 is working properly. A sample test message is given in Step 5 of Chart 6. (In place of the test message text, include three lines of U and three lines of *.)	Check accuracy of received data at the other receive D40: Received data is garbled Received data is correct.	 Send D40 or cluster controller problem — refer to Section 575-100-350 or 578-150-300 respectively. Go to Step 2.
2	Readdress the test message for the D40 connected to the B module (CDIF810). Transmit the message from the send D40.  	Use an ASCII code chart and determine what bit levels were received or not received in place of the three lines of U (bits 1, 3, 5, and 7 marking) and the three lines of * (bits 2, 4, 6, and 8 marking). Determine error pattern: Marking bits received as space bits.	 Remove cards in B module position ZB116 and ZB114 one at a time and check if either one is causing the problem by resending the message. If the problem is eliminated with one of the cards out, replace that card.

CHART 7

DATA RECEIVED BY "DATASPEED" 40 IS GARBLED (Continued)
(Cluster Controller in Test Operation)

STEP	ACTION	NORMAL INDICATION AND PROCEDURE	PROBLEM OR CORRECTIVE PROCEDURE
2 (Cont)		Spacing bits received as mark bits 1097SD-B1	Use an oscilloscope and trace mark or space data bit signals received from JB101 pins B1 through B8 to ZB117 pins 1 through 8 (a +4 volt signal is space and a 0 volt signal is mark). From ZB117 pins 21 through 28 to ZB115 pins 21 through 28 (0 volts is space and +5 volts is mark). From ZB115 pins 1 through 8 to JB201 pins B1 through B8 (0 volts is marking and +4 volts is spacing). If any of the signals are not present, replace the circuit card in the respective connector.
		Random bit level errors received.	Replace MC969 in card position ZB117, Figure 1. Replace MC976 in card position ZB115, Figure 1.

CHART 8

REC MAG TAPE BUTTON OR REC BUTTON DOES NOT ILLUMINATE ON "DATASPEED" 40

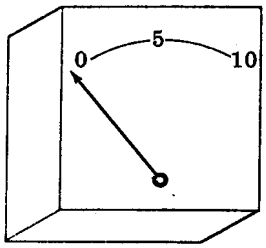
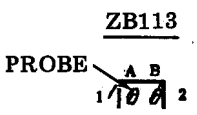
STEP	ACTION	NORMAL INDICATION AND PROCEDURE	PROBLEM OR CORRECTIVE PROCEDURE
1	At D40 with B module, connect common lead of voltmeter to JB301 pin A5 (1174SD-B8) on the CDIF810 module. Set meter to measure +5 volts dc and connect + probe to JB401 pin B2.	Voltage indicated on meter is slightly negative. 	
2	Depress REC MAG TAPE button on D40.	Voltage reading on meter goes to +5 volts.	D40 set TP410678 card bad or cable from JP4 pin 12 to B module at JC401 pin B2 is open or shorted. Remove JC3 and JC401 and check for continuity.
3	Move + probe of voltmeter to ZB113 pin 2 on the CDIF810 module.	Voltage indicated on meter is slightly negative.	
4	Depress REC MAG TAPE button.	Voltage reading on meter goes to +5 volts.	At B module, check for broken wire or wiring error from JB402 pin B2 to ZB113 pin 2.
5	Move + probe of voltmeter to ZB113 pin 1 on the CDIF810 module. 	Voltage indicated on meter is slightly negative. 1097SD-B2	
6	Depress REC MAG TAPE button.	Voltage reading on meter goes to +5 volts.	Replace MC501 card in connector ZB113.

CHART 8

REC MAG TAPE BUTTON OR REC BUTTON DOES NOT ILLUMINATE
ON "DATASPEED" 40 (Continued)

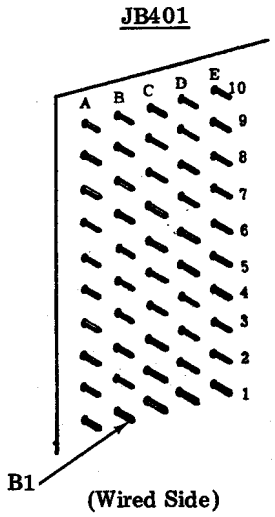
STEP	ACTION	NORMAL INDICATION AND PROCEDURE	PROBLEM OR CORRECTIVE PROCEDURE
7	Move + probe of voltmeter to JB401 pin B1 on CDIF810.  	Voltage reading on meter is slightly negative. 1097SD-B2	
8	Depress REC MAG TAPE button.	Voltage reading on meter goes to +5 volts.	At B module, check for broken wire, connection, or miswired connection between ZB113 pin 1 to JB401 pin B1.
9	Depress LOCAL button.	Go to Step 10.	
10	Move + probe of voltmeter to JB401 pin A5 on CDIF810.	Voltage reading on meter is at 0.	
11	Depress REC MAG TAPE button.	Voltage reading goes to +5 volts. REC lamp on D40 should light.	D40 is not responding to module signal. Check for bad cable from JB401 pin B1 (or JB402-B1) to JC4 pin 5 at D40. If cable is OK, refer to 575-100-350 for D40 troubleshooting. If lamp does not light refer to D40 troubleshooting.

CHART 8

REC MAG TAPE BUTTON OR REC BUTTON DOES NOT ILLUMINATE ON "DATASPEED" 40 (Continued)

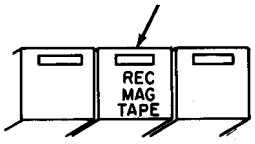
STEP	ACTION	NORMAL INDICATION AND PROCEDURE	PROBLEM OR CORRECTIVE PROCEDURE
12	Depress LOCAL button on D40. Move + probe of voltmeter to ZB113 pin 32.	Voltage reading at +5 volts.	Go to Step 13.
13	Depress REC MAG TAPE button on D40.	Voltage reading on meter falls to 0.	Replace MC501 card in the CDIF810.
14	Depress LOCAL button. Move + probe of meter to JB401-A7.	Voltage reading on meter at +5 volts.	Replace MC501 card in ZB113. Check wiring between JB401-A7 and ZB113-32.
15	Depress REC MAG TAPE button. 	Voltage goes to 0. REC MAG TAPE lamp on D40 should light.	Wire between ZB113-32 and JB401-A7 is miswired. Refer to 575-100-350 for trouble-shooting the D40.

CHART 9

MAGNETIC TAPE SET DOES NOT START OR IMPROPER OPERATION
(Cluster Controller Conditioned for Normal Operation — Standby Off)

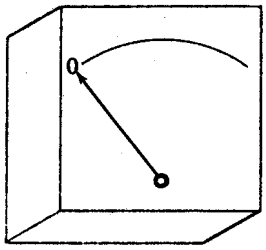
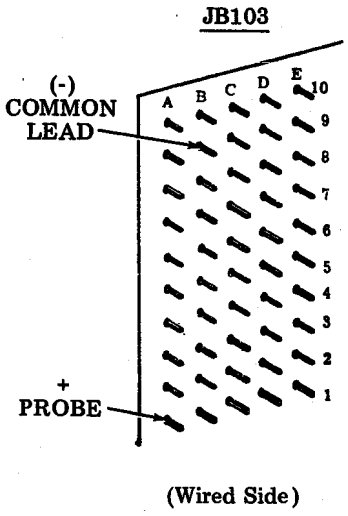
STEP	ACTION	NORMAL INDICATION AND PROCEDURE	PROBLEM OR CORRECTIVE PROCEDURE
1	Place a cartridge containing a test message into the magnetic tape set and depress the REC MAG TAPE button on the D40.	The REC MAG TAPE and REC button lamps on the D40 should light.	Go to Chart 3 for trouble analysis.
2	If both the REC MAG TAPE and REC lamps light, set a voltmeter to read +5 v dc and connect the common probe to ZB115 pin 13. Connect the + probe to JB201 pin A3 on the B module.	Observe meter reading: Meter at 0 volts  Meter reads +4 volts.	Check that the D40 TP410677 card is programmed for "Receive Selectable On." Refer to 575-100-350. Check cable from JC3 pin 9 to JB201-A3 for continuity. Trouble in D40, refer to 575-100-350 for D40 trouble-shooting. Go to Step 3.
3	Move the common lead of the voltmeter to JB103 pin B9 and connect the + probe to JB103 pin A1. 	Observe meter reading: Meter reads 0 volts Meter reads +4 volts.	Module not receiving selectable signal from magnetic tape set; check if tape and cartridge is properly installed and that thread lever is engaged. Check that power to MTT is on. Check cable from MTT send connector P113 pin B1 to JB103 pin A1 for continuity. If trouble is still present, refer to 578-300-300 for MTT troubles. Go to Step 4.

CHART 9

MAGNETIC TAPE SET DOES NOT START OR IMPROPER OPERATION (Continued)
(Cluster Controller Conditioned for Normal Operation — Standby Off)

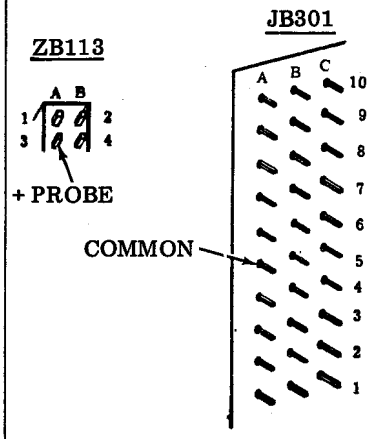
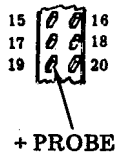
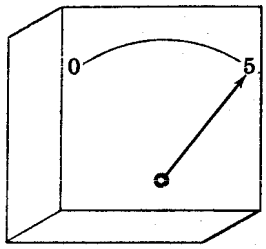
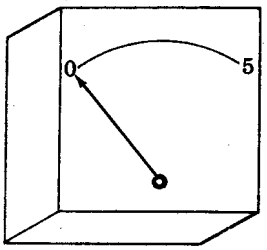
STEP	ACTION	NORMAL INDICATION AND PROCEDURE	PROBLEM OR CORRECTIVE PROCEDURE
4	Move the common lead of the voltmeter to JB301-A5 and connect the + probe to ZB113 pin 3. 	Observe the meter reading: Meter reads +5 volts Meter reads 0 volts.	 Check wire continuity from ZB116 pin 17 to JB103 pin 9. If wire is OK, replace MC969 in ZB116. Go to Step 5.
5	Move the + probe to pin 19 of ZB113. 	Observe the meter reading: Meter reads +5 volts  Meter reads 0 volts. 	 Replace the MC501 card in ZB113. Go to Step 6.

CHART 9

MAGNETIC TAPE SET DOES NOT START OR IMPROPER OPERATION (Continued)
(Cluster Controller Conditioned for Normal Operation — Standby Off)

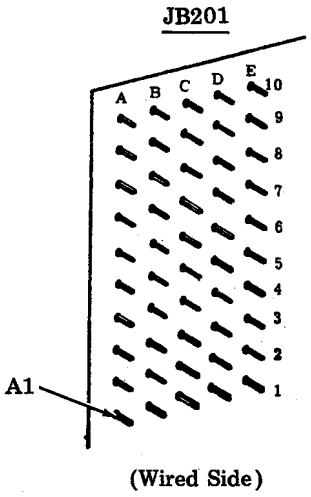
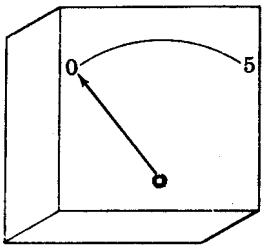
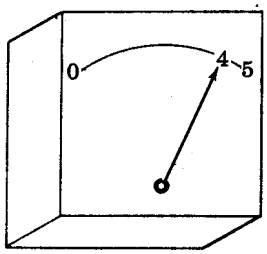
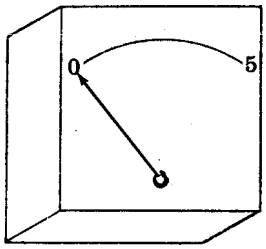
STEP	ACTION	NORMAL INDICATION AND PROCEDURE	PROBLEM OR CORRECTIVE PROCEDURE
6	Move the + probe of the meter to pin A1 of JB201.  	Observe the meter reading: Meter reads 0 volts  Meter reads +4 volts.  	Use an oscilloscope and trace message signal as follows: 0 volts from ZB113-19 to ZB115-19 +5 volts from ZB115-10 to JB201-A1. Go to Step 7.
7	Move the common lead of the meter to pin A9 of JB201. Connect the + probe to pin A2 of JB201.	Observe the meter reading: Meter reads 0 volts.  	D40 is not returning ready signal to the CDIF module, replace TP410677 card in the D40 controller. Refer to 575-100-350. Remove plug JC3 from D40 and check interconnecting cable for continuity between JC3 pin 11 to JB201-A2. Also check PTI return in cable from JB201-B9 to JC3 pin 20 for continuity.

CHART 9

MAGNETIC TAPE SET DOES NOT START OR IMPROPER OPERATION (Continued)
(Cluster Controller Conditioned for Normal Operation — Standby Off)

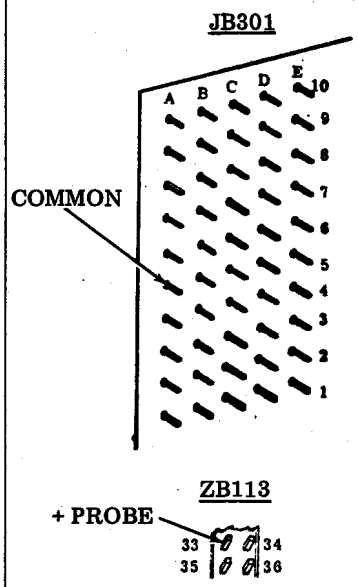
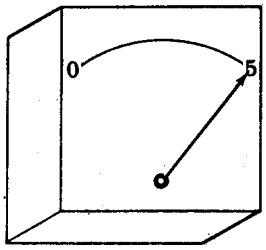
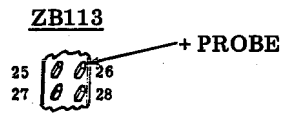
STEP	ACTION	NORMAL INDICATION AND PROCEDURE	PROBLEM OR CORRECTIVE PROCEDURE
8	Move the common probe of the voltmeter to pin A5 of JB301. Connect the + probe to ZB113 pin 33. 	Observe meter reading: Meter reads +5 volts  Meter reads 0 volts.	D40 ready signal not getting through CDIF module, replace the MC501 in ZB113 or replace the MC976 in ZB115. If the problem is not corrected, use an oscilloscope and trace ready signal as follows: +5 volts from JB201-A2 to ZB115-15 0 volts from ZB115-34 to ZB113-33. Also check for continuity for PTI signal return between ZB115-13 to JB201-A8 and A9. Go to Step 9.
9	Move the + probe of the meter to ZB113-26. 	Observe meter reading: Meter reads +5 volts Meter reads 0 volts.	Replace MC501 card in ZB113. Go to Step 10.

CHART 9

MAGNETIC TAPE SET DOES NOT START OR IMPROPER OPERATION (Continued)
(Cluster Controller Conditioned for Normal Operation — Standby Off)

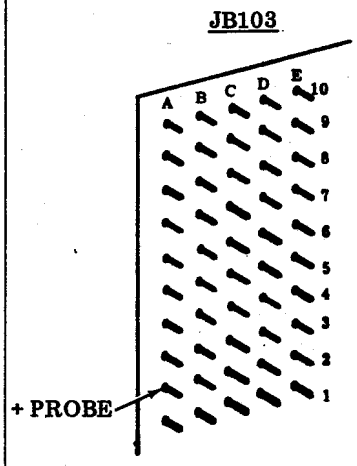
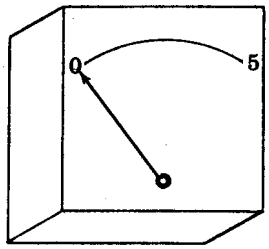
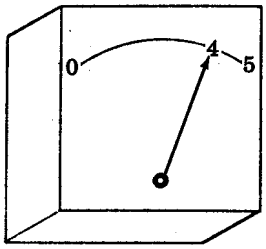
STEP	ACTION	NORMAL INDICATION AND PROCEDURE	PROBLEM OR CORRECTIVE PROCEDURE
10	Move the + probe of the voltmeter to pin A2 of JB103. 	Observe meter reading: Meter reads 0 volts  Meter reads +4 volts. 	Use the + probe of the voltmeter and check that message signal is at the following points: 0 volts from ZB113-26 to ZB116-34 +5 volts from ZB116-15 to JB103 pin A2. Go to Step 11.
11		Is MTT motor running or can it be started? Motor is running Motor is not running.	 Go to Step 12. Check for cable continuity on cable from MTT connector P401 pin D10 to JB103-A2 (send message signal). Check B module PTI return for continuity from JB103-A8 and A9 to JB103-A5. Also, if possible check for common between B module PTI return from JB103-A8 and the MTT DMAM800 module PTI return at P401 pins C6, C7, E6, E7, E8, and E9. If trouble still exists, refer to MTT troubleshooting in 578-300-300 and related MTT wiring diagrams.

CHART 9

MAGNETIC TAPE SET DOES NOT START OR IMPROPER OPERATION (Continued)
(Cluster Controller Conditioned for Normal Operation — Standby Off)

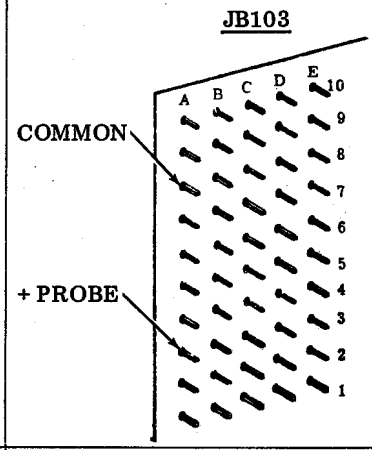
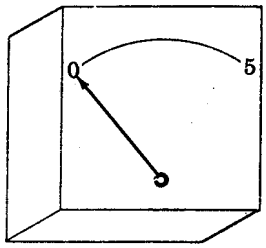
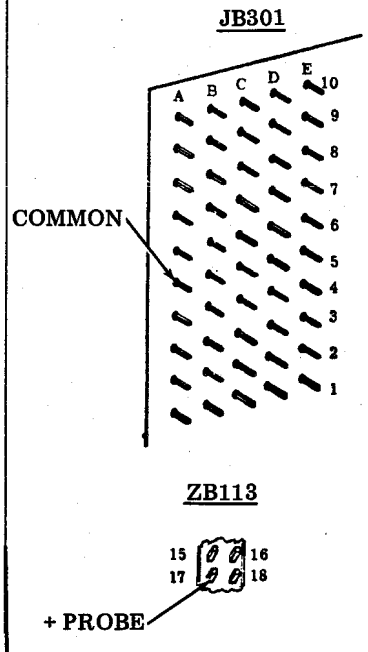
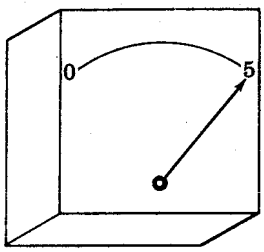
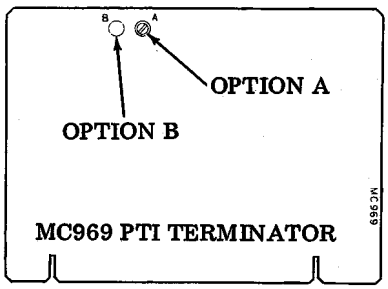
STEP	ACTION	NORMAL INDICATION AND PROCEDURE	PROBLEM OR CORRECTIVE PROCEDURE
12	Move common lead of the voltmeter to JB103 pin B9. Also move the + probe to JB103-A3. 	Observe meter reading: Meter reads 0 volts  Meter reads +4 volts.	MTT set is not returning ready signal to the B module. Check that the tape cartridge is properly installed in MTT set. Check for cable continuity from MTT connector P401 pin 41 to JB103-A3. If bad, replace cable. If trouble still exists, refer to MTT troubleshooting in 578-300-300. Go to Step 13.
13	Move common lead of voltmeter to pin A5 of JB301. Move + probe to pin 17 of ZB113. 	Observe meter reading: Meter reads +5 volts  Meter reads 0 volts	MTT set ready signal is not getting through B module. Trace ready signal as follows: 0 volts from JB103-A3 to ZB116-11 +5 volts from ZB116-31 to ZB113-17. Check that the MC969 card in ZB116 has the option A programming (A is the unmarked location on the card).  Check for continuity on PTI signal return from JB103-B9 to ZB116-17. Go to Step 14.

CHART 9

MAGNETIC TAPE SET DOES NOT START OR IMPROPER OPERATION (Continued)
(Cluster Controller Conditioned for Normal Operation — Standby Off)

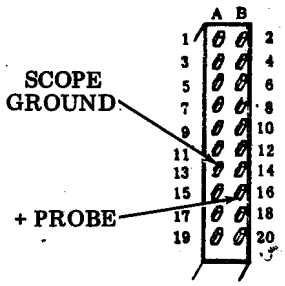
STEP	ACTION	NORMAL INDICATION AND PROCEDURE	PROBLEM OR CORRECTIVE PROCEDURE
14	This completes the verification of the message interface ("device handshake"). In the checks that follow, the signals will be pulsing on and off; therefore an oscilloscope is required.	Adjust the oscilloscope as follows: Vertical Sensitivity: 5 volts/division Sweep Rate: .5 ms/division Trigger Sweep: Free-running.	
15	Connect the scope ground to pin 13 of ZB115. Connect the probe to pin 16 of ZB115. ZB115  	Observe signal level: Signal level stays at 0 volts Signal level is pulsing from 0 to +4 volts Signal level stays at +4 volts	 Next character signal not received from D40, check for continuity on cable from D40 JC3 pin 12 to JB201 pin A10 at B module. If problem is not corrected, refer to D40 troubleshooting in 575-100-350. Isolate module circuits not used for this operation by pulling the MC969 and MC986 cards from ZB117 and ZB114 one at a time. If the problem is eliminated with the cards out, replace the defective card. Check for incoming data from the MTT at the following pin numbers: JB103 pins B1 through B8 to ZB116 pins 1 through 8 (0 volts is mark and +4 volts is space) ZB116 pins 21 through 28 to ZB115 pins 21 through 28 (+5 volts is mark and 0 volts is space) ZB115 pins 1 through 8 to JB201 pins B1 through B8 (0 volts is mark and +5 volts is space). Go to Step 16.

CHART 9

MAGNETIC TAPE SET DOES NOT START OR IMPROPER OPERATION (Continued)
(Cluster Controller Conditioned for Normal Operation — Standby Off)

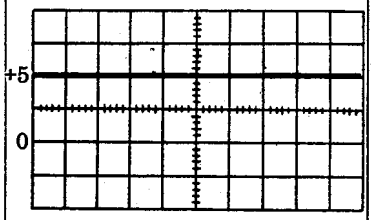
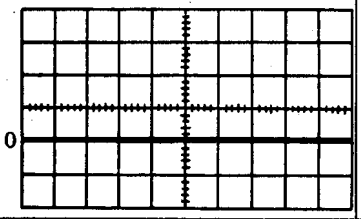
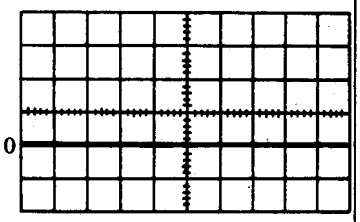
STEP	ACTION	NORMAL INDICATION AND PROCEDURE	PROBLEM OR CORRECTIVE PROCEDURE
16	Move scope probe to ZB113 pin 15. Connect scope ground to JB301 pin A5.	Observe signal level: Signal level at +5 volts  Signal level stays at 0 volts  	Check that next character request is getting through B module at the following points: +4 volts (ready on) at JB201-A10 to ZB115 pin 16 0 volts (ready on) at ZB115 pin 33 to ZB113 pin 15. Check PTI signal return for continuity from ZB115 pin 13 to JB201 pins A8 and A9. Go to Step 17.
17	Move scope probe to ZB113 pin 14.	Observe signal level: Signal level at +5 volts Signal level at 0 volts	 Replace MC501 card in ZB113. Go to Step 18.
18	Move scope probe to JB103 pin A10.	Observe signal level: Signal level stays at 0 volts  Signal level stays at +4 volts.	 Check that next character request is going through B module at the following points: 0 volts at ZB113 pin 14 to ZB116 pin 33 +5 volts at ZB116 pin 16 to JB103 pin A10. Go to Step 19.

CHART 9

MAGNETIC TAPE SET DOES NOT START OR IMPROPER OPERATION (Continued)
(Cluster Controller Conditioned for Normal Operation — Standby Off)

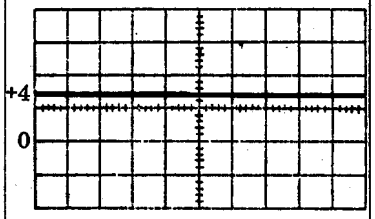
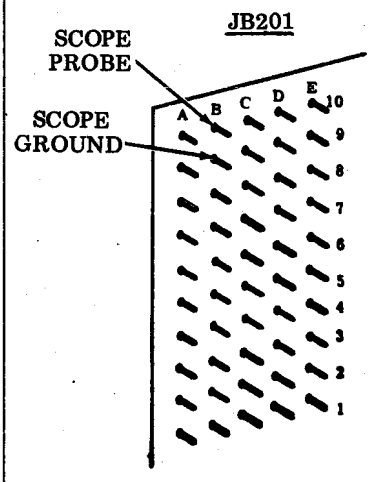
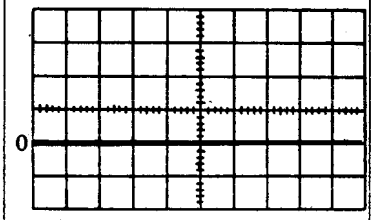
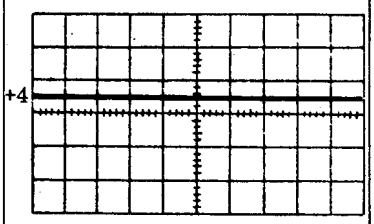
STEP	ACTION	NORMAL INDICATION AND PROCEDURE	PROBLEM OR CORRECTIVE PROCEDURE
19	Move scope ground to JB103 pin B9. Move scope probe to JB103 pin B10.	Observe signal level: Signal level at 0 volts Signal level stays at +4 volts. 	MTT character available signal not getting to B module. Check cable from P401 connector at DMAM800 module of MTT to the B module at JB103 connector for continuity at the following pins: P401 pin E3 to JB103 pin B10. At B module, check for PTI signal return continuity from JB103 A8 and A9 to JB301 pin A5. Go to Step 20.
20	Move scope ground to JB201 pin B9. Move scope probe to JB201 pin B10. 	Observe signal level: Signal level stays at 0 volts  Signal level stays at +4 volts. 	MTT character available signal is not getting through B module, check for CA signal at the following pins: +4 volts from JB103-B10 to ZB116-9 0 volts from ZB116-29 to ZB115-29 +4 volts from ZB115-9 to JB201-B10. CA signal is passing through B module to D40, but D40 is not responding. Check for cable continuity from JB201-B10 of B module to JC pin 13 of D40 set. If cable is OK, refer to 575-100-350 for D40 troubleshooting. Check B module PTI signal return from JB201-B9 to JC3 pin 27 at D40 Set.

CHART 10

MTT DATA RECEIVED BY THE "DATASPEED" 40 IS GARBLED
(Cluster Controller Conditioned for Normal Operation)

STEP	ACTION	NORMAL INDICATION AND PROCEDURE	PROBLEM OR CORRECTIVE PROCEDURE
1	Place a tape cartridge into the MTT. It should have several lines of U and * for the message and end with the ETX character.	See the Interrupt checkout procedure (4.07) for recording test message on tape.	
2	Depress the REC MAG TAPE button on the D40.	REC MAG TAPE and REC buttons on the D40 should light.	Go to Chart 8 for problem analysis.
3		Use an ASCII code chart and determine what bit levels were received or not received in place of the three lines of U (bits 1, 3, 5, and 7 marking) and the three lines of * (bits 2, 4, 6, and 8 marking). Try to determine error pattern: Marking bits received as space bits	Remove cards in B module at positions ZB114 and 117 one at a time and check if either one is causing the problem by resending the message. If problem is eliminated with one of the cards out, replace that card.

CHART 10

MTT DATA RECEIVED BY THE "DATASPEED" 40 IS GARBLED (Continued)
(Cluster Controller Conditioned for Normal Operation)

STEP	ACTION	NORMAL INDICATION AND PROCEDURE	PROBLEM OR CORRECTIVE PROCEDURE
3 (Cont)		Spacing bits received as mark bits	Use an oscilloscope and trace mark or space data bit signals received from MTT at the following points: JB103-B1 through B9 to ZB116 pins 1 through 8 (0 volts is mark and +4 volts is space) ZB116 pins 21 through 28 to ZB115 pins 21 through 28 (+5 volts is mark and 0 volts is space) ZB115 pins 1 through 8 to JB201 pins B1 through B8 (0 volts is mark and +4 volts is space). Check PTI signal returns for continuity from JB103 pins A4 through A7 to ZB116 pins 12, 13, 14, 18, and JB201 pins A4 through A7 to ground at JB301 pin A5.
		Random bit level errors received.	Replace the MC969 card in ZB116. Replace the MC976 card in ZB115. If data is still garbled, refer to 578-300-300 for MTT trouble-shooting.