SYNCHRONOUS "DATASPEED*" 40/4

MAXI-CLUSTER AND MINI-CLUSTER STATION ARRANGEMENTS

TESTING AND TROUBLESHOOTING

CONTENTS

1. GENERAL

1.01 This section includes all testing of the Synchronous DATASPEED 40/4 maxi-cluster and mini-cluster station arrangements (hereafter referred to as 40/4 type). It also includes trouble analysis.

1.02 **The reason for reissue of this section is to provide information for testing SSI cable for 40/4 applications.**

1.03 Troubles isolated to the data set, telephone lines, or associated systems are not analyzed in this section.

1.04 **The correction of troubles in this section is based on replacement of defective major subassemblies (eg, monitor, opcon, printer, power supply, etc). Field level repair of the major subassemblies are given in the DATASPEED 40 Component Service Manual.**

Note: Before replacing PROM or EPROM circuit cards in a controller, see 4. CIRCUIT CARD COMPATIBILITY.

1.05 See Section 582-200-701 for grounding strap locations.

Note: When ordering replaceable parts or components, unless otherwise specified, prefix each part number with the letters "TP" (ie, TP410055).

1.06 Test switches and indicators are shown in Fig. 1.

Note: The operation of test switches and indicators should be done under the direction of Parts 2. TESTS and 3. TROUBLESHOOTING of this section or referenced sections.

1.07 Reference Sections

582-200-101 — Description and Operation
582-200-201 — Installation
582-200-212 — Keyboard Display Amplifier
582-200-300 — Maintenance Controller Arrangements
582-200-401 — Wiring Diagrams
582-200-701 — Disassembly/Reassembly and Parts
582-200-751 — Routine Maintenance
582-211-210 — Keyboard Disable Lock

1.08 ASCII indicates American National Standard Code for Information Interchange. EBCDIC indicates Extended Binary Coded Decimal Interchange Code.

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Prepared for American Telephone and Telegraph Company by Teletype Corporation

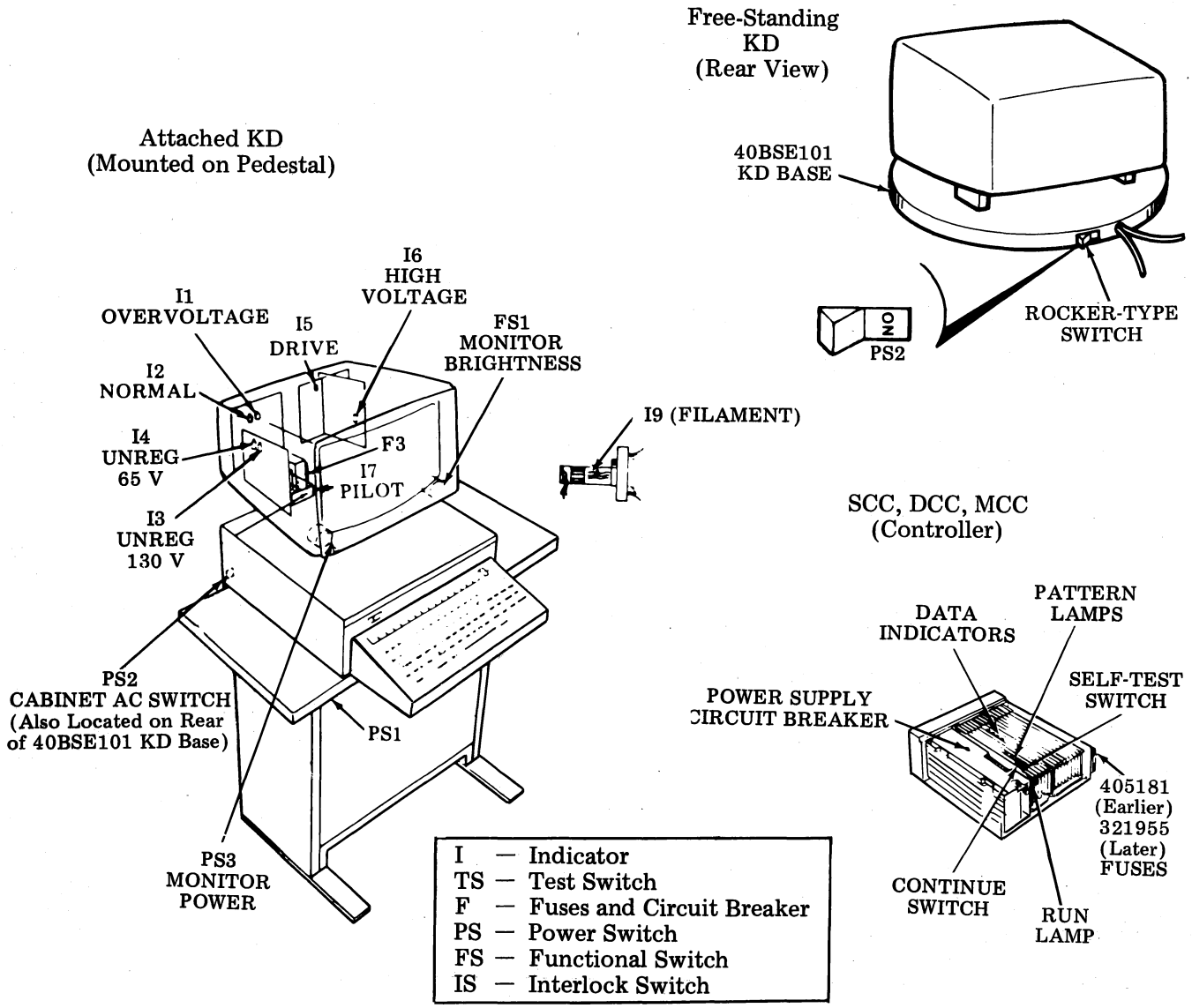
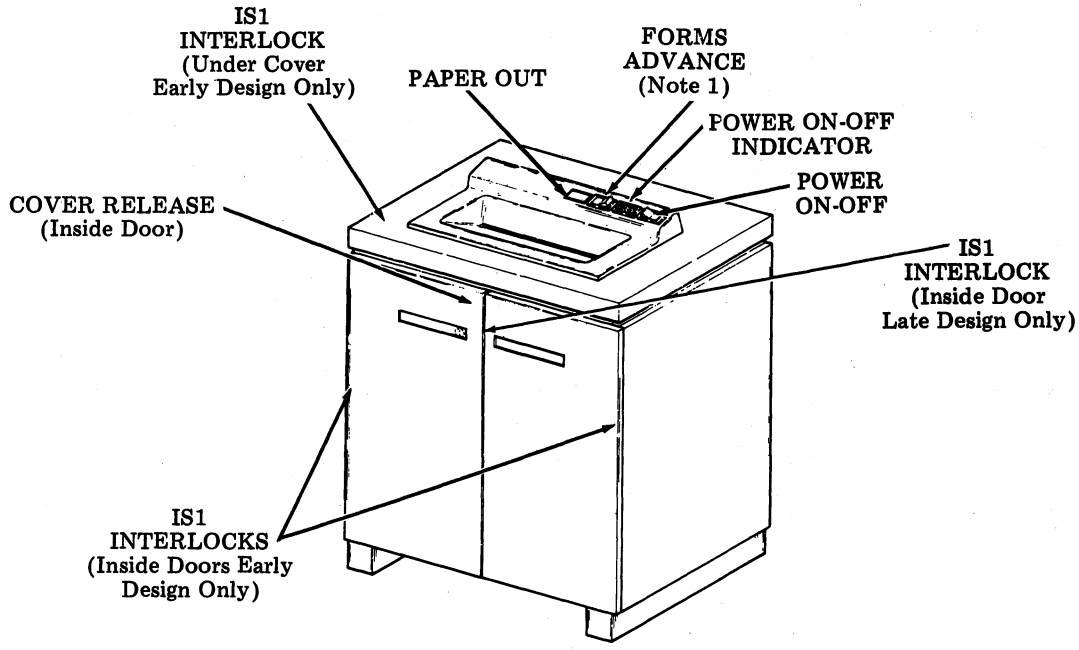

Free-Standing
KD
(Rear View)
40BSE101
KD BASE
ON
PS2
ROCKER-TYPE
SWITCH
Attached KD
(Mounted on Pedestal)
I6
HIGH
VOLTAGE
I1
OVERVOLTAGE
I5
DRIVE
FS1
MONITOR
BRIGHTNESS
I2
NORMAL
I9 (FILAMENT)
I4
UNREG
65 V
F3
I7
PILOT
I3
UNREG
130 V
SCC, DCC, MCC
(Controller)
PATTERN
LAMPS
DATA
INDICATORS
SELF-TEST
SWITCH
POWER SUPPLY
CIRCUIT BREAKER
PS2
CABINET AC SWITCH
(Also Located on Rear
of 40BSE101 KD Base)
PS1
405181
(Earlier)
321955
(Later)
FUSES
CONTINUE
SWITCH
RUN
LAMP
PS3
MONITOR
POWER
I — Indicator
TS — Test Switch
F — Fuses and Circuit Breaker
PS — Power Switch
FS — Functional Switch
IS — Interlock Switch

Fig. 1

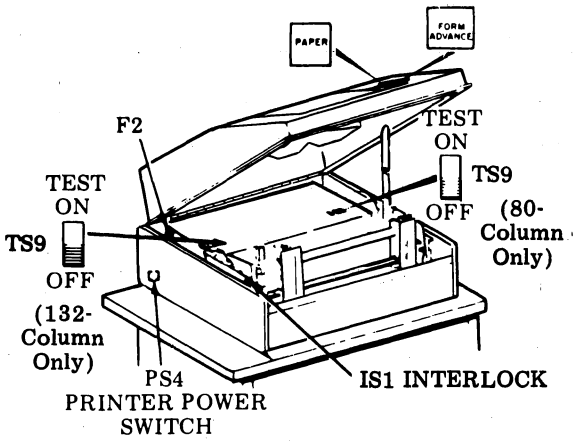
80-Column Forms
Access Printer



Note 1: For security reasons, some cabinets may be modified to have access to forms advance switch inside of cabinet. They may also be modified to have lock on left door.

Note 2: Printer test switch and fuse location, same as tractor feed printer below.

Tractor Feed Printer
(in cabinet)



Friction Feed Printer
(in cabinet)

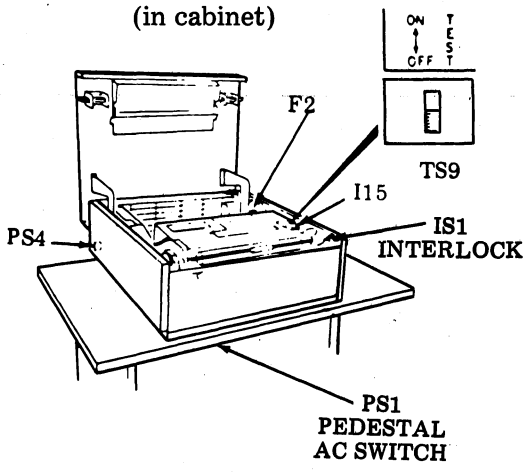


Fig. 1 (Contd)

1.09 A 40MN101/AA monitor is generally used, however, a 40MN201/AA may be used to avoid "waviness" of displayed data when the 60 hertz voltage varies by more than 0.1 percent for an extended time. The 40MN201/AA can operate over a range of 48 hertz to 62 hertz.

2. TESTS

CONTROLLER SELF-TEST

2.01 The Controller Self-Test should be performed on each controller in the station. This test requires the use of the Controller Arrangement Form which is taped to the inside cover of the controller.

2.02 If during a controller self-test, a circuit card is indicated to be defective per the self-test trouble pattern, perform the following before replacing the card:

(a) Remove card and check for bent connector pins.
(b) If circuit card contains sockets, make sure all IC packs are firmly seated.
(c) Reinstall circuit card and make sure card is firmly seated in connector.
(d) Perform the self-test again.

If the circuit card is still indicated as defective, then replace the card.

2.03 Chart 1 is divided into two parts; Steps 1 through 4 and Steps 5 through 7. In the first part, each controller is checked before cabling is connected to other controllers or devices. In the second part, the controller cabling is connected to other controllers or devices.

Warning: The ac power must be OFF before removing or replacing a circuit card.

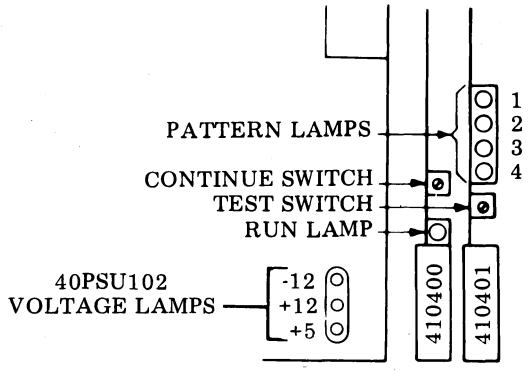


Fig. 2

CHART 1

CONTROLLER SELF-TEST PROCEDURES

STEP	PROCEDURE	CORRECT RESPONSE	ANALYSIS
1	Connect ac cable from pedestal to power source. Turn on pedestal ac switch. (On rack mount, plug in controller ac power cord to 115 V ac.) *Note:* Be sure that power supply circuit breaker is on (down).	All power supply voltage lamps lit. Fans at rear of controller must be moving air.	Perform 40PSU102 power supply analysis.
2	Observe	Run lamp lit on 410400. 1st pattern lamp (toward rear of controller) on 410401 is dimly lit. *Note:* If run lamp is blinking, go to Chart 7.	a. Check switches on all circuit cards per Controller Arrangement Form. b. Perform power supply analysis (even if all lamps are lit). c. Remove all circuit cards except 410400, 410401, 4108XX and 4109XX (PROM version), or 4105XX (EPROM version). If two 41046X cards are present, remove only the one closest to the power supply. (Continued on Page 5)

CHART 1 (Cont)

CONTROLLER SELF-TEST PROCEDURES

STEP	PROCEDURE	CORRECT RESPONSE	ANALYSIS
2 (Cont)			If run lamp is still off but correct power supply voltages are measured, one of cards present (or back panel) is at fault. If lamp is on, replace removed cards one at a time until lamp goes off. Card causing lamp to go off is at fault.
3	Depress and hold TEST switch (Fig. 2).	All pattern lamps on 410401 circuit card light.	a. 410401, 410400. b. Perform power supply analysis.
4	Release self-test switch.	All pattern lamps go off. Pattern and run lamps may flicker during test. While observing light patterns, disregard the display on monitor(s) connected to a DCC or MCC. *Note 1:* Disregard lamps on 410408, 410409 or 410411 circuit card during test. After 1 to 2 minutes, the pattern lamps should blink sequentially for about 15 seconds; however, if a continue pattern appears during test (refer to applicable Controller Arrangement Form); depress the continue switch. The pattern lamps will again go off and test will resume. *Note 2:* There may be more than one continue pattern. Each time a continue pattern occurs, depress the continue switch. Run lamp extinguishes when continue pattern appears and blinks during sequential sequence. After sequential blink pattern on pattern lamps, run lamp should light indicating test in completed.	If trouble pattern appears on pattern lamps, match the pattern against those shown under the circuit cards on Controller Arrangement Form; replace circuit card to which the pattern relates. *Note:* If trouble pattern that appears is shown under two circuit cards, replace cards one at a time. Card replaced prior to trouble pattern not showing up is at fault.

If testing a SCC, test is complete at this point. If testing a DCC or MCC, proceed to Step 5.

CHART 1 (Cont)

CONTROLLER SELF-TEST PROCEDURES

<table>
<tr><th>STEP</th><th>PROCEDURE</th><th>CORRECT RESPONSE</th><th>ANALYSIS</th></tr>
<tr><td>5</td><td>If performing the first part of Chart 1, Steps 1 through 4 (cabling not connected to other controllers or devices), the self-test is completed; turn off power to controller.

If performing the second part of Chart 1, Steps 5 through 7 (cabling connected to other controllers or devices), check the pattern on the monitor and continue with Steps 5 through 7.

Note: With 410509 or 410510 card (Issues 2A- or earlier) in a DCC, the 4th KD may flicker during this test.</td><td>The display pattern appears corresponding to the 41043N circuit card used. Sample displays follow (Fig. 3). Check that cursor moves through all positions on display.</td><td>• Monitor support cabinet or support base ac switch off.
• Monitor power switch off (turn counterclockwise for on).
• Monitor brightness low (turn counterclockwise for high).
• 41043N circuit card associated with monitor.
<table><tr><th>41043N IN CARD POS.</th><th>ASSOCIATED MONITOR CONNECTED TO VIDEO CONNECTOR</th></tr><tr><td>3</td><td>A</td></tr><tr><td>4</td><td>B</td></tr><tr><td>5</td><td>C</td></tr><tr><td>6</td><td>D</td></tr></table>• Monitor fuse on interconnection module.
• Cable (KD).</td></tr>
<tr><td>6</td><td>If there is more than one monitor, depress continue switch† and check monitor 2. Repeat this step for all monitors associated with the DCC or MCC.</td><td>Same as Step 4.</td><td>Same as Step 4.</td></tr>
<tr><td>7</td><td>To return controller to normal operating mode, push continue switch. Proceed to Chart 2, KD/Controller Local Test Procedures.</td><td>Opcons are enabled (local light(s) on). Cursor in home position on all monitors. Run lamp ON. 1st pattern lamp (toward rear of controller) is dimly lit.</td><td>If local lamps on opcons do not light, determine which SSI sockets the opcons are connected to and check the associated 410406 circuit card and fuses per the following:
<table><tr><th rowspan="2">OPCONS CONNECTED TO SSI PORTS</th><th rowspan="2">ASSOCIATED 410406 CIRCUIT CARD IN CARD POS.</th><th colspan="2">ASSOCIATED INTERCONNECT MODULE FUSES</th></tr><tr><th>EARLY VERSION (Note 2)</th><th>LATE VERSION</th></tr><tr><td>1 THROUGH 4</td><td>5 OR 7</td><td>F2 AND F3</td><td rowspan="2">F1 (+12 Volt) and F2 (-12 Volt)</td></tr><tr><td>5 THROUGH 7</td><td>4 OR 6 OR 8</td><td>F5 AND F6</td></tr></table></td></tr>
</table>

†If the continue switch is not depressed, the display pattern will remain on monitor for approximately five minutes. The pattern will then automatically switch to the next monitor. This is especially useful when monitors are located in different rooms. Disregard the display on other monitors connected to a DCC or MCC while checking a monitor.

Note 1: After performing the first or second part of Chart 1, it may be necessary to turn the ac power off, then on. If this action is not performed, the Chart 2, KD/Controller Local Test Procedures may be prevented from operating when LCL/TST key is depressed.

Note 2: Early version interconnects module fuses F1 on DCC or MCC, F7 on DCC, and F1 through F7 on SCC are not used at this time and may be used as spares.

CHART 1 (Cont)

CONTROLLER SELF-TEST PROCEDURES

Display Pattern for a 410431 D I/O Circuit Card — ASCII — Up-Low

*NORMAL	S_H S_X E_X E_T E_Q A_K B_L B_S ▶ ≡ V_T F_F ← S_0 S_1 D_L D_1 D_2 D_3 D_4 N_K S_Y E_B C_N E_M S_B E_C F_S G_S P_S U_S
UNDERLINED	! " # $ % & ' ( ) * + , - . / 0 1 2 3 4 5 6 7 8 9 : ; < = > ?
HALF	@ A B C D E F G H I J K L M N O P Q R S T U V W X Y Z [\ ] ^ _
INTENSIFIED	` a b c d e f g h i j k l m n o p q r s t u v w x y z { ¦ } ~ ▨

Display Pattern for a 410432 D I/O Circuit Card — ASCII — Line Drawing

*NORMAL	S_H S_X E_X E_T E_Q A_K B_L B_S ▶ ≡ V_T F_F ← S_0 S_1 D_L D_1 D_2 D_3 D_4 N_K S_Y E_B C_N E_M S_B E_C F_S G_S P_S U_S
UNDERLINED	! " # $ % & ' ( ) * + , - . / 0 1 2 3 4 5 6 7 8 9 : ; < = > ?
HALF	@ A B C D E F G H I J K L M N O P Q R S T U V W X Y Z [\ ] ^ _
INTENSIFIED	┌ ┐ └ ┘ ▘ ▝ ▀ ▖ ▌ ▞ ▛ \ / ← → ↑ ↓ ↖ ↗ ↙ ↘ · . . ' - ┴ ┬ ┼ ¦ ├ ┤ ▨

Display Pattern for a 410434 D I/O Circuit Card — ASCII — Monocase

*NORMAL	! " # $ % & ' ( ) * + , - . / 0 1 2 3 4 5 6 7 8 9 : ; < = > ?
UNDERLINED	! " # $ % & ' ( ) * + , - . / 0 1 2 3 4 5 6 7 8 9 : ; < = > ?
HALF	@ A B C D E F G H I J K L M N O P Q R S T U V W X Y Z [\ ] ^ _
INTENSIFIED	` A B C D E F G H I J K L M N O P Q R S T U V W X Y Z [\ ] ^ _

Display Pattern for a 410435 D I/O Circuit Card — EBCDIC — Up-Low

*NORMAL	S_H S_X E_X E_T E_Q A_K B_L B_S ▶ ≡ V_T F_F ← S_0 S_1 D_L D_1 D_2 D_3 D_4 N_K S_Y E_B C_N E_M S_B E_C F_S G_S P_S U_S
UNDERLINED	! " # $ % & ' ( ) * + , - . / 0 1 2 3 4 5 6 7 8 9 : ; < = > ?
HALF	@ A B C D E F G H I J K L M N O P Q R S T U V W X Y Z ¬ \ ¦ ¢ _
INTENSIFIED	` a b c d e f g h i j k l m n o p q r s t u v w x y z { ¦ } ~ ▨

Display Pattern for a 410436 D I/O Circuit Card — EBCDIC — Monocase

*NORMAL	! " # $ % & ' ( ) * + , - . / 0 1 2 3 4 5 6 7 8 9 : ; < = > ?
UNDERLINED	! " # $ % & ' ( ) * + , - . / 0 1 2 3 4 5 6 7 8 9 : ; < = > ?
HALF	@ A B C D E F G H I J K L M N O P Q R S T U V W X Y Z ¬ \ ¦ ¢ _
INTENSIFIED	@ A B C D E F G H I J K L M N O P Q R S T U V W X Y Z ¬ \ ¦ ¢ _

Fig. 3

LOCAL TESTS

A. KD/Controller Local Test

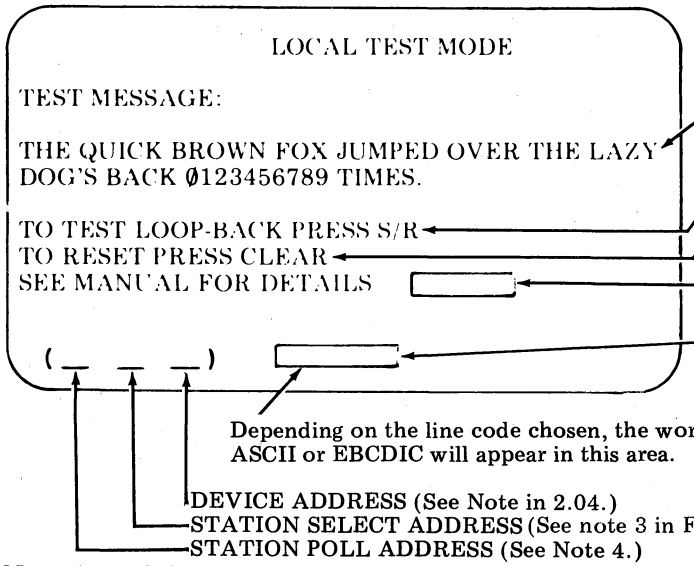
2.04 Chart 2 procedures should be performed on each KD device in the station. After successful completion of the chart for all KDs, proceed to Chart 3, Printer Local Test Procedures. If printer is not part of station, proceed to Chart 4, KD Local Test Procedures. If this test is performed during customer operations of the other KD devices (if present), SEND operation will be momentarily interrupted during the test.

Note: If maxi-cluster station is EBCDIC but SCC is not EPROM version, the following four characters: ¬ , ! , | , and ¢ will be displayed in place of the ¢ , | , ! , and ¬ device addresses, respectively. This only pertains to local test, refer to Fig. 4.

CHART 2

KD/CONTROLLER LOCAL TEST PROCEDURES

STEP	PROCEDURE	CORRECT RESONSE	LOCAL TEST ANALYSIS
1	*Note:* Start with Step 1 if KD has a typewriter style opcon. Start with Step 7 if KD has an internal numeric cluster style opcon. Depress LOCAL if the key is not lit. Request a local test by depressing the L/TST key while CONTROL key is held down.	The following message is displayed on the monitor.	•If Step 1 is attempted following a controller self test, it may be required to turn ac power off then on to allow operation. •Check cabling. •Check fuses on interconnect module.



See Note 2.
See Note 5.
See Note 3.
If the word BAD appears in this area, replace the D I/O circuit card (41043N) for device being tested. (See Chart 1, Step 5.)
If the wrong line code appears, check SPC17-6 of 410403 or SPB7-6 of 410411 circuit card. Switch ON = ASCII Switch OFF = EBCDIC
If addresses are incorrect per customer order and Fig. 4, check switches selected on 410403 or 410411 circuit card and all controller and device connections per Controller Arrangement Form.

Note 1: If the above message is not responded to within 20 seconds, the display will clear and the test will be automatically canceled.

Note 2: The QUICK BROWN FOX. . . message (appears on one time) may be changed provided that the first character remains a "T". If "T" is changed to any other character, the display will clear and the test will be canceled when S/R is depressed.

(Notes 3, 4 and 5 on Page 8.)

CHART 2 (Cont)

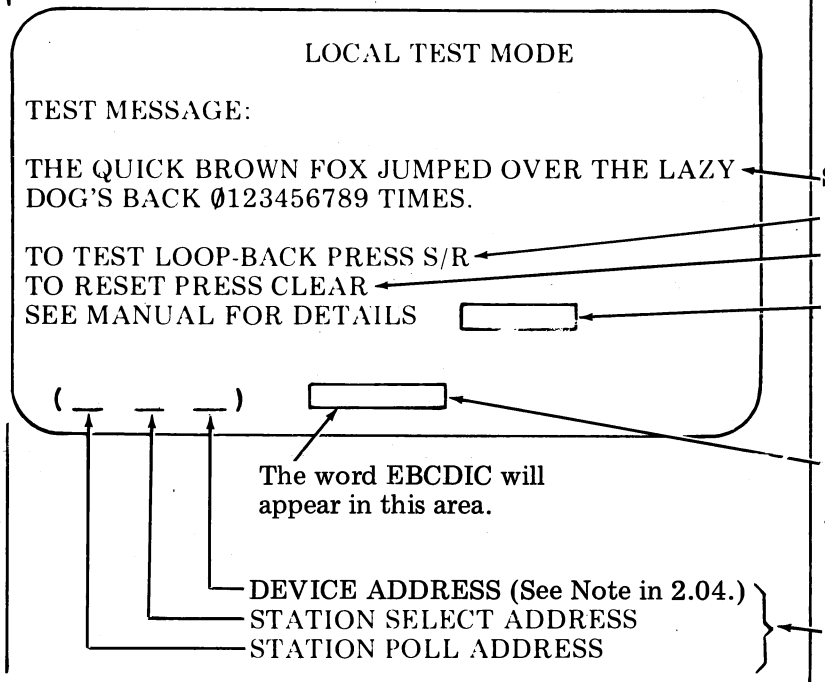
KD/CONTROLLER LOCAL TEST PROCEDURES

STEP	PROCEDURE	CORRECT RESPONSE	LOCAL TEST ANALYSIS
	Note 3: Besides CLEAR key, depression of any PA or PF key will clear display and cancel test. MCC only: Test should be run to completion (Step 2), failure to do so will cause Print Local operation to fail; to correct, perform Steps 1 and 2. *Note 4:* Three address characters will be present within the parentheses. If an address character(s) is not displayed, it is assumed that the address character(s) is SPACE. *Note 5:* For EPROM version SCC, the words "OR ENTER" will appear after "S/R". For EPROM version MCC with Internal Numeric Cluster Opcon, the word "ENTER" will appear in place of "S/R".		
2	(If alarm sounds repeatedly, depress LOCAL.) Depress S/R key. THE QUICK BROWN FOX JUMPED OVER THE LAZY DOG'S BACK Ø123456789 TIMES. *Note:* If any characters in the QUICK BROWN FOX . . . message were changed before depressing S/R indicator, those characters will appear in the above message.	If received without error, the following message will appear on the monitor. If optioned for 1-second alarm, alarm will sound once and LOCAL indicator should light. If optioned for continuous alarm, alarm will sound repeatedly until LOCAL key is manually depressed.	• If S/R indicator is flashing or LOCAL indicator turns OFF but nothing else happens, go • to Step 4, Local Test Analysis. If "test failed" message is received, go to Step 4, Procedure.
3	Depress CLEAR key. Depress LOCAL key if station is not connected to LCU.	Test is completed. Display is cleared. Proceed to Step 6.	
4	If message is received with an error, the following message will be displayed on the monitor. **TEST FAILED** TEST MESSAGE: THE QUICK BROWN FOX JUMPED OVER THE LAZY DOG'S BACK Ø123456789 TIMES. RE-TEST LOOP-BACK, PRESS S/R TO RESET PRESS CLEAR SEE MANUAL FOR DETAILS (__ __ __) [ ] See Note 5 of Step 1.	Go to Step 5.	• Normal Local Test: Replace 410408 (or 410409 or 410411) or check cable between SCC and DCC. • Analog Loopback Test: Check data set or data set cable. Replace 410408 (or 410409 or 410411). Replace controller back panel or interconnection module. (Data set DSR not "on" in AL mode can cause this failure.) • Far-End Digital Loopback Test: Check far-end data set or check facilities between data sets. *Note 1:* Local test is canceled by symptom. *Note 2:* Depress LOCAL key to stop flashing S/R indicator.

CHART 2 (Cont)

KD/CONTROLLER LOCAL TEST PROCEDURES

STEP	PROCEDURE	CORRECT REPONSE	LOCAL TEST ANALYSIS
5	Depress LOCAL key if station is not connected to LCU. Retry Steps 1 and 2 once, then cancel test by depressing CLEAR key.		If test still fails, run controller self-tests. Replace associated 410406 circuit card (see Chart 1, Step 7). Replace 410408 or 410409 or 410411 circuit card.
6	If local test of all KD devices is successfully completed, continue to Chart 3 and Chart 4.		
	40K105 OPCON — INTERNAL NUMERIC CLUSTER OPCON (Steps 7 through 15)		
7	Request a local test by depressing the L/TST key and the ALPHA key simultaneously.	The following message is displayed on the monitor.	•If Step 7 is attempted following a controller self test, it may be required to turn ac power off, then on again to allow operation. •Check cabling. •Check fuses on interconnect module.



Note 1: If the above message is not responded to within 20 seconds, the display will clear and the test will be canceled.

Note 2: The QUICK BROWN FOX . . . message (appears on one line) may be changed provided that the first character remains a "T". If "T" is changed to any other character, the display will clear and the test will be canceled when ENTER key is depressed.

Note 3: Depression of CLEAR or any PA or PF key will clear display and cancel test. MCC only: Test should be run to completion (Step 8), failure to do so will cause Print Local operation to fail; to correct, perform Steps 7 and 8.

See Note 4 of Step 1

CHART 2 (Cont)

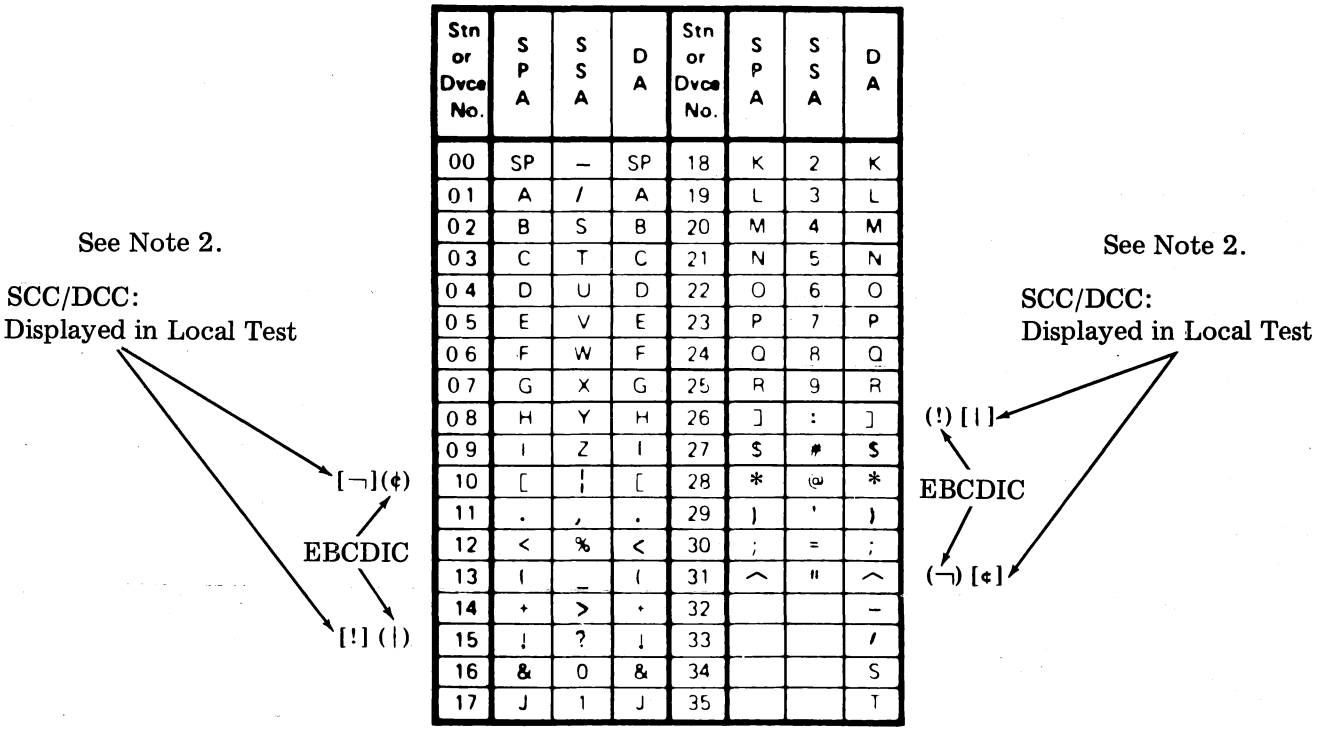
KD/CONTROLLER LOCAL TEST PROCEDURES

STEP	PROCEDURE	CORRECT RESPONSE	LOCAL TEST ANALYSIS
8	Depress ENTER key. (If the continuous alarm option is selected, depress RESET first.)	If received without error, the following message will appear on the monitor. If optioned for 1-second alarm, alarm will sound once and LOCAL indicator should light. If optioned for continuous alarm, alarm will sound repeatedly until RESET key is manually depressed. THE QUICK BROWN FOX JUMPED OVER THE LAZY DOG'S BACK Ø123456789 TIMES. *Note:* If any characters in the QUICK BROWN FOX. . . message were changed before depressing ENTER kev. those characters will appear in the above message.	• If S/R indicator is flashing, go to Step 4, Local Test Analysis. • If "test failed", message is received, go to Step 13, Procedure.
9	Depress CLEAR key and then RESET key.	Display is cleared.	
10	Request a local test by depressing the L/TST key and the NUMERIC key simultaneously.	The message of Step 7 is displayed.	Replace opcon.
11	Depress ENTER key.	(As given in Step 8.)	(As given in Step 8.)
12	Depress CLEAR key.	Test is completed. Display is cleared. Proceed to Step 15.	
13	If message is received with an error, the following message will be displayed on the monitor. **TEST FAILED** TEST MESSAGE: THE QUICK BROWN FOX JUMPED OVER THE LAZY DOG'S BACK Ø123456789 TIMES. RE-TEST LOOP-BACK, PRESS S/R TO RESET PRESS CLEAR SEE MANUAL FOR DETAILS (_ _ _) [ ]	See Note 5 of Step 1. Go to Step 14.	(As given in Step 4.)

CHART 2 (Cont)

KD/CONTROLLER LOCAL TEST PROCEDURES

STEP	PROCEDURE	CORRECT RESPONSE	LOCAL TEST ANALYSIS
14	Depress RESET key if station is not connected to LCU. Retry Steps 7 and 8 once then cancel test (depress CLEAR key).		If test still fails, run controller self-tests of Chart 1. Replace associated 410406 circuit card (see Chart 1, Step 7). Replace 410408, 410409 or 410411 circuit card.
15	If local test of all KD devices is successfully completed, proceed to Chart 3.		



Stn or Dvce No.	SPA	SSA	DA	Stn or Dvce No.	SPA	SSA	DA
00	SP	–	SP	18	K	2	K
01	A	/	A	19	L	3	L
02	B	S	B	20	M	4	M
03	C	T	C	21	N	5	N
04	D	U	D	22	O	6	O
05	E	V	E	23	P	7	P
06	F	W	F	24	Q	8	Q
07	G	X	G	25	R	9	R
08	H	Y	H	26	]	:	]
09	I	Z	I	27	$	#	$
10	[	¦	[	28	*	@	*
11	.	,	.	29	)	'	)
12	<	%	<	30	;	=	;
13	(	_	(	31	^	"	^
14	+	>	+	32			–
15	!	?	!	33			/
16	&	0	&	34			S
17	J	1	J	35			T

Note 1: This figure is used with Steps 1 and 7 of Chart 2. This figure indicates all station and device identification for ASCII or EBCDIC coded stations except where noted otherwise, see Note 2.

Note 2: SPA and DA characters for EBCDIC coded stations at 10, 15, 26, and 31 are located within the parentheses. The graphic character displayed on the screen during local test is enclosed within the brackets (SCC/DCC) or is within the parentheses (MCC).

Note 3: In local test only, a monocase D I/O 410434 or 410436 circuit card will cause fold-over of the SSA of Station No.10 from ¦ to \ (" \" will be displayed instead of " ¦ ").

Fig. 4—ASCII or EBCDIC Station and Device Identification

B. Printer Local Tests

CHART 3

PRINTER LOCAL TEST PROCEDURES

Note: If a printer is not part of the station, proceed to Chart 4.

STEP	PROCEDURE	RESULTS	TROUBLE ANALYSIS
1	Preliminary requirements of printer: a. Ribbon and paper loaded. b. Switches (top right or left of printer, cabinet cover raised). LF-1 Test-Off Forms (Tractor Feed Only) — On c. Cabinet cover closed and ac power switched ON.	Printer motor is off. PAPER indicator is OFF. Fan in tractor feed printer cabnet must be moving air. *Note:* If tractor feed printer is 40P204 type or has paper jam modification kit (402920). PAPER indicator may be on. If so, refer to printer How to Operate to reset alarm.	Refer to Section 582-210-500.
2	Momentarily depress PAPER button (red) on cover of printer cabinet. *Note:* Step 2 does not apply to forms access printer, go to Step 3.	Paper feeds out while button is depressed.	•Check for: a. Printer cable not connected. (Cable required only if printer has 410640 or 410729 circuit card.) b. Printer cable defective or miswired. c. Defective 410406 circuit card (DCC, MCC). Refer to Section 582-210-500. *Note:* Continuous feedout will occur if form selector lever not fully seated in slot 1, 2, 3, or 4.
3	TRACTOR FEED PRINTER ONLY: Depress and release FORMS ADVANCE button (black) on printer cabinet cover. (See Note in Trouble Analysis column.)	Printer Forms switch ON: Paper feeds out until first line of next form is reached, then stops (provided forms are registered, refer to printer How to Operate if required). Printer Forms switch OFF: Paper feeds as long as button is depressed. *Note:* See chart on top of printer to determine the correct form-out selection. Check that the selection is what the customer needs.	
4	Unlatch and raise printer cabinet cover.	None	
5	Raise cover interlock switch to maintenance position.	None	

CHART 3 (Contd)

PRINTER LOCAL TEST PROCEDURES

<table>
<tr><th>STEP</th><th>PROCEDURE</th><th>RESULTS</th><th>TROUBLE ANALYSIS</th></tr>
<tr><td>6</td><td>Push test switch to ON, allow printer to print several lines, then push test switch OFF.

Note: On later version printers (which have 410071, 410072 and 410076 circuit cards), the font identification symbol will not be printed in the columns margined per Option 17.</td><td>Printer turns on and prints font identification symbol repeatedly in all columns until switch is turned OFF. (See Note.)

<table>
<tr><th rowspan="2">Carrier Type</th><th colspan="4">Type Carrier Font ID Symbol</th></tr>
<tr><th colspan="2">132-Column</th><th colspan="2">80-Column</th></tr>
<tr><th></th><th>ASCII</th><th>EBCDIC</th><th>ASCII</th><th>EBCDIC</th></tr>
<tr><td>Monocase Standard</td><td>=A=
=J=</td><td>=A=
=S=</td><td>=A=
=A=</td><td>=A=
=0=</td></tr>
<tr><td>Up-Low Standard</td><td>=A=
=0=</td><td>=A=
=M=</td><td>=A=
=8=</td><td>=A=
=N=</td></tr>
<tr><td>Monocase OCR-B</td><td>=8=
=E=</td><td>=8=
=K=</td><td>=8=
=0=</td><td>=8=
=M=</td></tr>
<tr><td>Up-Low OCR-B</td><td>=8=
=C=</td><td>=8=
=J=</td><td>=8=
=8=</td><td>=8=
=N=</td></tr>
<tr><td>Monocase Line Drawing</td><td>—</td><td>—</td><td>=A=
=0=</td><td>—</td></tr>
</table>
</td><td>Refer to Section 582-210-500.

Note: Interface may be defective in maintenance position, check by closing cover.</td></tr>
<tr><td>7</td><td>FRICTION FEED PRINTER:

Lift paper roll to simulate a paper alarm. Lower paper roll, guide paper through window, and close cabinet cover.

TRACTOR FEED PRINTER:

Tear off next form at perforations under pedestal top, then depress PAPER button on cabinet cover until last form passes through printer. On forms access printer, depress FORMS ADVANCE button since there is no PAPER button.

Note: If printer is forms access printer and includes a 406374 pre-sensor modification kit, tear paper below the sensor mechanism.

Reload forms, guide first form through window, and close cabinet cover.</td><td>Paper indicator lights.
Paper indicator goes out.

<u>80-Column Printer With 410640 Circuit Card</u> — PAPER indicator lights and printer motor turns off.

<u>80-Column Printer With 410076 or 410071 Circuit Card And All 132-Column Printers</u> — If Option 48a is selected, PAPER indicator lights and printer motor turns off when last form is partly through printer. If Option 48b is selected, PAPER indicator does not light and printer motor does not turn off until form is completely out of printer (<u>Forms Access Printer With 406374 Modification Kit</u> — last form is above paper sensor mechanism) and end of form contact is sensed.
PAPER indicator goes out.</td><td>Refer to Section 582-210-500.</td></tr>
</table>

CHART 3 (Contd)

PRINTER LOCAL TEST PROCEDURES

STEP	PROCEDURE	RESULTS	TROUBLE ANALYSIS
8	Type some text on the display (lower case and upper case if possible) and then depress PRINT LOCAL key. *Note:* The 406086 modification kit (display fractions), 408868 modification kit (fraction keytops), and 408521 type carrier (print fractions) affects this step.	LOCAL indicator extinguishes and PRINT LOCAL indicator lights and then goes off when printer buffer receives the message; LOCAL indicator lights. Printer copies entire display (24 lines): Monocase Printer — All display characters print as capitals. See Note following Step 5 of Chart 4. Up-Low Printer — All display characters are copied as displayed.	•Flashing PRINT LOCAL indicator indicates: a. Printer cabinet lid open. b. Form or paper-out condition. c. Printer ac power is off. d. Printer is not print local to the KD. e. Printer cable defective or miswired may include printer extension cable. Refer to Section 582-210-500.
		Note 1: Friction feed printer may or may not feed out 16 lines of paper before turning off, depending on Option 18. Tractor feed printer may or may not form feed before turning off depending on Options 18 and 39. *Note 2:* After printer is finished copying, the motor will remain on for approximately 20 seconds before turning off.	•Option 18c not installed in monocase printer. •Character set of type carrier in printer does not match Option 19. •Option 19c not installed in printer. Refer to Section 582-210-500.

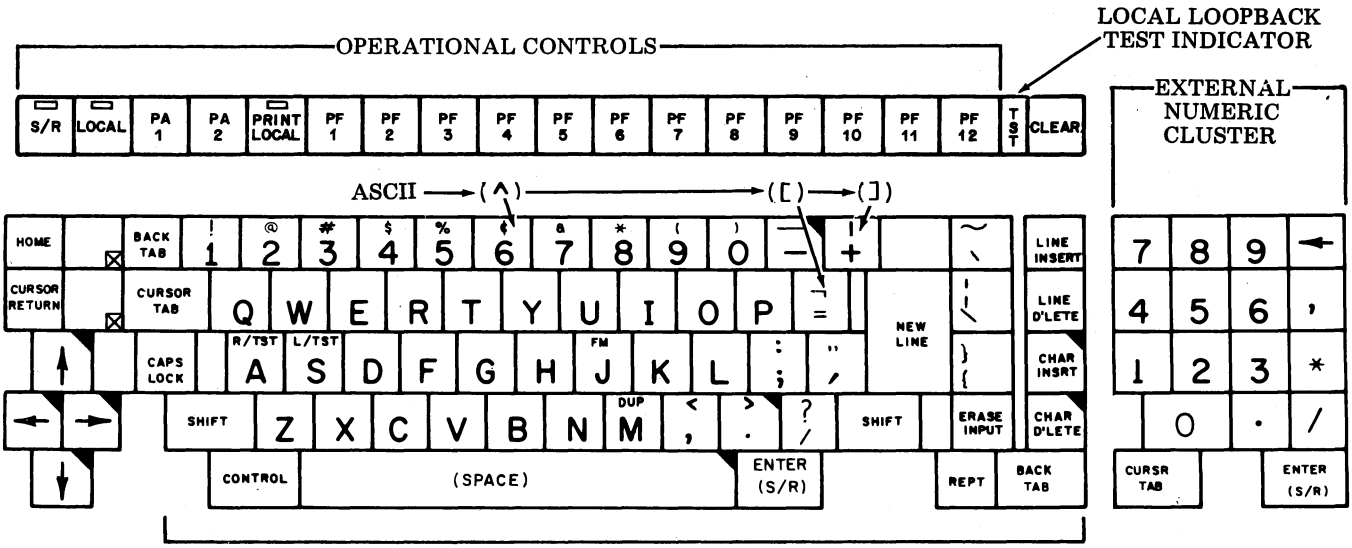
C. KD Local Test

2.05 Each KD in the station must be checked using the procedure given in 2.06 and Chart 4. Locations of various control and data keys referred to the chart are given in Fig. 5.

2.06 Follow these instructions before beginning Chart 4:

(a) Turn on power to the set or station (LOCAL indicator lights on each opcon).

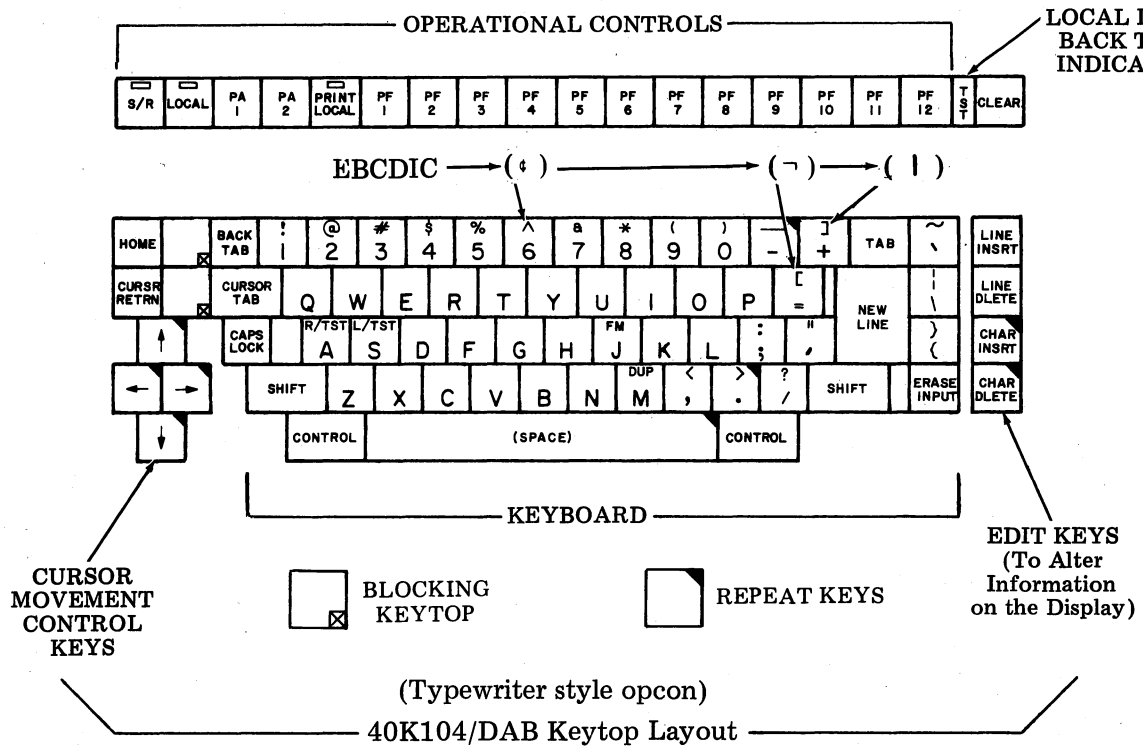
(b) Turn on power to the display and adjust brightness.



Note: The , (comma), *, and / keys located within the External Numeric Cluster are not functional with DCCs or MCCs which employ PROM version circuit cards and, therefore, may be covered with blocking keys.

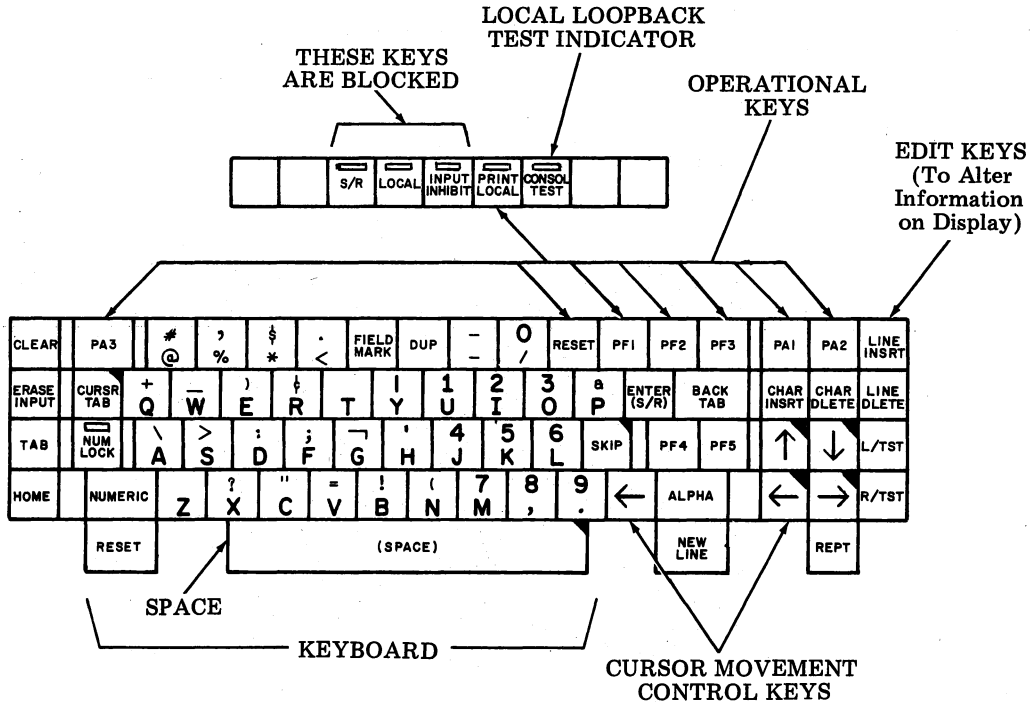
(External numeric cluster style opcon — In test procedures, treat as typewriter style opcon.)

Fig. 5—Opcon Keytop Layouts



(Typewriter style opcon)

40K104/DAB Keytop Layout



Note: The only locking keytop is NUM LOCK, depress to set (lights), depress to release (light goes out).

(Internal numeric cluster style opcon)

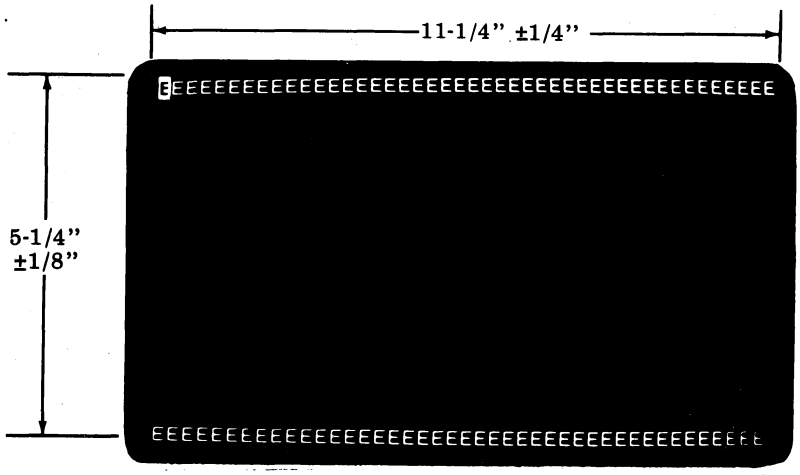
40K105/CAA Keytop Layout

Fig. 5 (Cont)

CHART 4

KD LOCAL TEST PROCEDURES

STEP	PROCEDURE	RESULTS	TROUBLE ANALYSIS
Note: Start with Step 1 if any KD of the station has typewriter style opcon (typewriter style includes external numeric cluster style). Start with Step 21 if KD has an internal numeric cluster style opcon.			
1	a. Place typewriter style opcon into the caps mode by depressing and latching the CAPS LOCK key. (Opcons with no CAPS LOCK key require no action.)		
	b. At each KD: • Observe that the raster is barely present when brightness control is turned up fully. • The display (80 characters by 24 lines) should meet the size requirements shown below as gauged by eye. • Enter a line of Es at top and bottom of display, then HOME cursor. Check that the requirements below are met.		• If raster is not present, go to Chart 8. • If a requirement is not met, refer to adjustments of monitor in Section 582-213-700 to meet requirement. • If E cannot be entered, go to Chart 9.



Requirements:

- Raster aligned vertically and horizontally.
- All Es sharply defined.
- Height and width of display as indicated.
- Es uniform across full width.
- Height of Es same at top and bottom lines.

CHART 4 (Cont)

KD LOCAL TEST PROCEDURES

STEP	PROCEDURE	RESULTS	TROUBLE ANALYSIS
2	Home the cursor and depress a few keys on the keyboard portion of the opcon.	*Note:* Each keytop need not be checked except for a trouble call. Each keytop shall function each time it is depressed.	
	Note: Steps 3 through 19 need not be performed except for a trouble call.		
3	Disengage the CAPS LOCK key by depressing it again momentarily. Again depress a couple of keys on the keyboard portion of the opcon. (Opcons with no CAPS LOCK key require no action; go to Step 4.)	The alpha characters described in Step 2 are displayed in lower case (ie, abcdef, etc).	

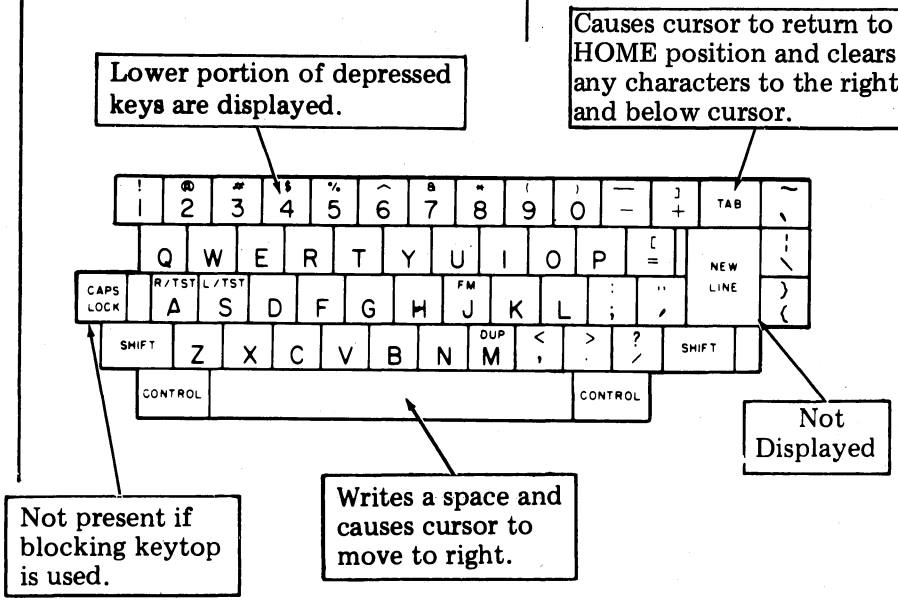


CHART 4 (Cont)

KD LOCAL TEST PROCEDURES

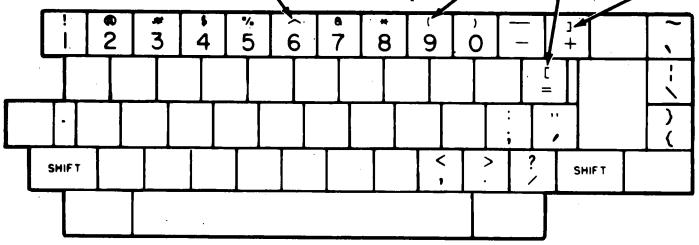
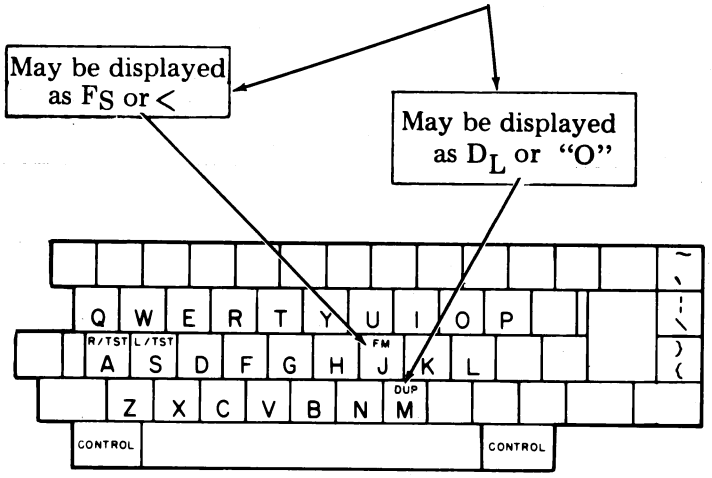
STEP	PROCEDURE	RESULTS	TROUBLE ANALYSIS
4	Depress the left then the right SHIFT key while depressing and checking operation of one of the following alpha keys (ie, !@#$, etc).	Upper portion of the depressed keys are displayed. EBCDIC (Or ¢) EBCDIC (Or ¬) (Or |)  See Note following Step 5.	
5	Depress the CONTROL key together with the FM J key; then depress the CONTROL key together with the DUP M key.	See Note following Step 5. 	

CHART 4 (Cont)

KD LOCAL TEST PROCEDURES

STEP	PROCEDURE	RESULTS	TROUBLE ANALYSIS

Note: Some characters may not be displayed or may be displayed as a character other than the character received on-line or entered from the opcon. See the table below which also provides printer actions for applicable characters. Observe that the foldover of "~" and " { " are different (for monocase EBCDIC) for the display and printer.

Type of 40K104 Opcon or 40K203 Opcon		ASCII or EBCDIC					ASCII			EBCDIC			ASCII or EBCDIC	
Character Received From LCU or Entered on 40K104 or 40K203 Type Opcon		~	\	¦	{	}	^	]	[	¢	¦	¬	D U_P	FM
Character Displayed Using D I/O:	410431 ASCII UP-LO	~	\	¦	{	}	^	]	[	^	]	[	DL	FS
	410434 ASCII MONO	^	@	\	[	]	^	]	[	^	]	[	Ø	<
	410435 EBCDIC UP-LO	~	\	¦	{	}	¢	¦	¬	¢	¦	¬	DL	FS
	410436 EBCDIC MONO	¢	@	\	¬	¦	¢	¦	¬	¢	¦	¬	Ø	<
	410432 ASCII LINE-DRAW	┤	┌	¦	+	├	^	]	[	^	]	[	DL	FS
Character Printed Using Type Carrier:	400629 80C ASCII UP-LO	~	\	¦	{	}	^	]	[	^	]	[	SP	SP
	400645 80C ASCII MONO	^	@	\	[	]	^	]	[	^	]	[	SP	SP
	400775 80C ASCII LINE-DRAW	┤	┌	¦	+	├	^	]	[	^	]	[	SP	SP
	400777 132C ASCII UP-LO	~	\	¦	{	}	^	]	[	^	]	[	SP	SP
	400780 132C ASCII MONO	^	@	\	[	]	^	]	[	^	]	[	SP	SP
	400783 132C EBCDIC UP-LO	~	\	¦	{	}	¢	¦	¬	¢	¦	¬	SP	SP
	400784 80C EBCDIC UP-LO	~	\	¦	{	}	¢	¦	¬	¢	¦	¬	SP	SP
	400785 80C EBCDIC MONO	¢	@	\	¬	¦	¢	¦	¬	¢	¦	¬	SP	SP
	400887 132C EBCDIC MONO	¢	@	\	¬	¦	¢	¦	¬	¢	¦	¬	SP	SP

LEGEND:

◥ Will print with fold-over option in printer enabled. Error symbol will print if fold-over option is not enabled.

Note: Ø is displayed as 0 but printed as Ø.

CHART 4 (Cont)

KD LOCAL TEST PROCEDURES

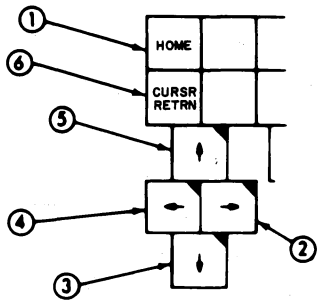
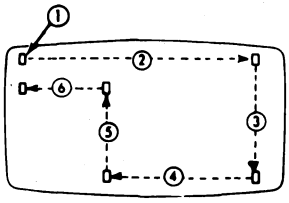
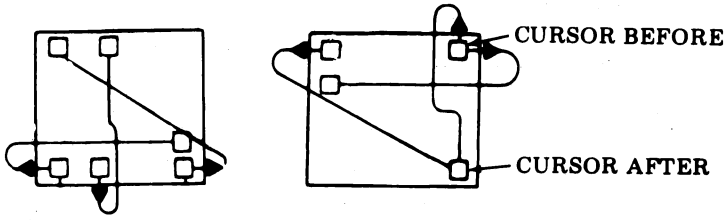
STEP	PROCEDURE	RESULTS	TROUBLE ANALYSIS
6	Depress one of the following keys with additional force, [- _] [> .] [(SPACE)]	---------- . . . . . . The space key repeatedly moves the cursor.	
7	Depress the [HOME] key. Then in sequence depress momentarily with more force than normally required, each cursor movement key shown. 	 *Note:* In local opcon operation, attempts to move the cursor off the display will result as shown: 	
8	Depress ERASE INPUT key.	Display clears and cursor goes to home position. LOCAL indicator remains lit.	
9	Type the alpha characters A through J on the display. Place the cursor over the character E and depress the [CHAR INSRT] key once, then depress it fully — releasing it after the characters move to the next line.	① ABCD[E]FGHIJ ② ABCD[ ]EFGHIJ ③ ABCD[ ] EFGHIJ *Note:* CHAR INSRT and CHAR DLETE affect all 24 lines on a DCC KD. CHAR INSRT and CHAR DLETE affect only 4 lines including the line with the cursor on MCC KD. Characters move slowly.	

CHART 4 (Cont)

KD LOCAL TEST PROCEDURES

STEP	PROCEDURE	RESULTS	TROUBLE ANALYSIS
10	Depress the CHAR DLETE key momentarily, then depress it fully.	ABCD ☐ EFGHIJ ABCD E FGHIJ Characters delete one at a time or repeatedly when key is held depressed. See Note in Step 9.	
11	Depress the LINE INSRT key three times.	The cursor remains at its present location, and the line of data moves down three lines.	
12	Depress the LINE DLETE key once, then depress it fully.	The line of data moves up one line, then stops on the first line.	
13	Depress PRINT LOCAL key, (if printer is not provided, go to Step 14).	LOCAL indicator extinguishes, PRINT LOCAL indicator lights and then goes off when printer buffer receives the message; LOCAL indicator lights. Printer copies entire display (24 lines):	•Flashing PRINT LOCAL indicator indicates printer: a. is not print local to the KD. b. cabinet lid is open. c. is in form-out or paper our condition. d. ac power is off. e. defective printer cable or cable not connected. *Note:* Depress LOCAL to clear flashing PRINT LOCAL.
14	Place the cursor away from home position and depress the CURSOR TAB key.	The cursor returns to home position. *Note:* Displayed data is not affected by CURSOR TAB and BACK TAB keys.	
15	Place the cursor away from home position and depress the BACK TAB key.	The cursor returns to home position.	
16	Place the cursor away from home position and depress the TAB key.	Cursor returns to home position. Any characters to the right of and below cursor will be cleared.	

CHART 4 (Cont)

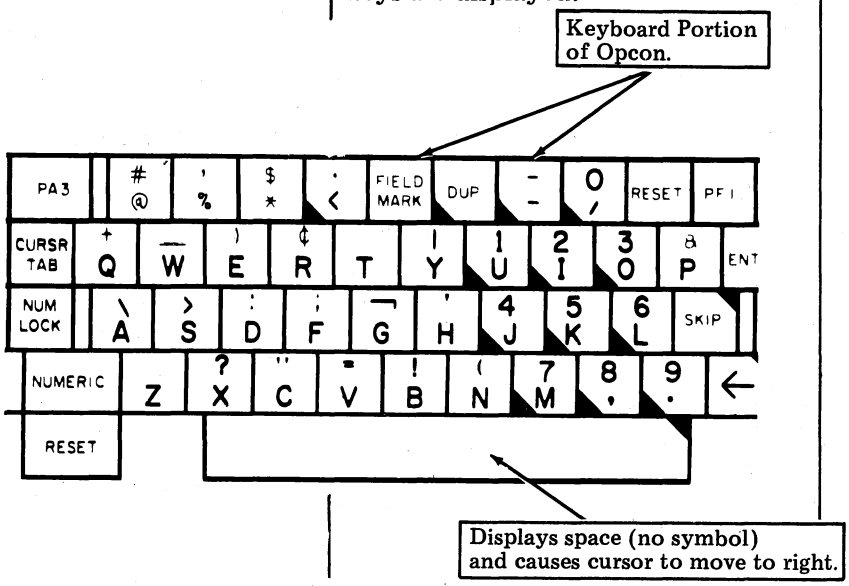
KD LOCAL TEST PROCEDURES

STEP	PROCEDURE	RESULTS	TROUBLE ANALYSIS
17	Type some text on the opcon and then depress [S/R]. Attempt to type some text on the opcon.	Text is displayed. LOCAL indicator extinguishes when S/R is depressed. Attention bell sounds each time a key is depressed (provided typing rate does not exceed maximum repeat bell rate).	
18	Alternately depress LOCAL then depress [PA 1] key, then [LOCAL] key and [PF 2], [PF 1], [PF 2] through [PF 12], [R/TST] and [CLEAR] keys in the same manner.	[LOCAL] is lit and extinguishes when a key is depressed (same for each key). Data on display remains unchanged, except when CLEAR key is depressed; all data clears from display and cursor goes to home position.	
19	This step applies only to monocase opcons (blocking keytop over CAPS LOCK position).		
	a. Depress ERASE INPUT and QUOTES keys together with additional force.	TST indicator lights and remains lit.	Chart 9
	b. Depress A (do not depress SHIFT).	S/R key lights.	•Remove blocking keytop, check that plunger is in lower position. •Replace opcon.
	c. Depress ERASE INPUT and P keys together with additional force.	TST indicator light goes out.	Chart 9
20	When all typewriter style opcons have successfully passed these tests: a. Go to Step 21 if an internal numeric cluster style opcon is part of the station. b. Go to Chart 5 if no internal numeric cluster style opcon is part of the station.		
	INTERNAL NUMERIC CLUSTER OPCON (Steps 21 through 41)		
21	a. Perform Step 1b.	Results and Trouble Analysis of 1b apply.	
	b. Place internal numeric cluster style opcon into the NUM LOCK mode by depressing and latching the NUM LOCK key.	The indicator lights.	

CHART 4 (Cont)

KD LOCAL TEST PROCEDURES

STEP	PROCEDURE	RESULTS	TROUBLE ANALYSIS
22	Home the cursor and depress a few keys on the keyboard portion of the opcon.	Upper portion of depressed keys are displayed.	



Note 1: Each key need not be checked except for a trouble call. Each should function each time it is depressed. Depressing [Z] or [T] while NUM LOCK is lit, will display space (no symbol) and cause cursor to move to right.

Note 2: TAB causes cursor to move to home position. NEW LINE is not displayed when NEW LINE is depressed.

Note 3: If Option 407a is installed in SCC (or MCC), NUMERIC key must be depressed (or NUM LOCK indicator lit) to enter characters outside the numeric cluster (keys in cluster are marked: [ ]).

Note: Steps 23 to 41 need not be performed except for a trouble call.

23	Hold down the [ALPHA] key while depressing an alphanumeric key (ie, A, B, C, etc).	The corresponding alpha character (ie, A, B, C, etc) is displayed.	
24	Disengage the [NUM LOCK] key by depressing it again momentarily. The indicator light goes out. Depress a couple of keys (ie, A, B, C, D, etc) on the keyboard portion of the opcon.	 The alpha characters shown in the figure of Step 22 (lower portion of keytops) are displayed (ie, A, B, C, D, etc).	

CHART 4 (Cont)

KD LOCAL TEST PROCEDURES

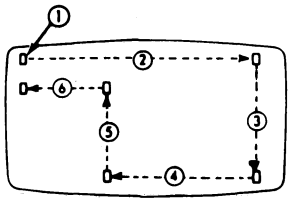
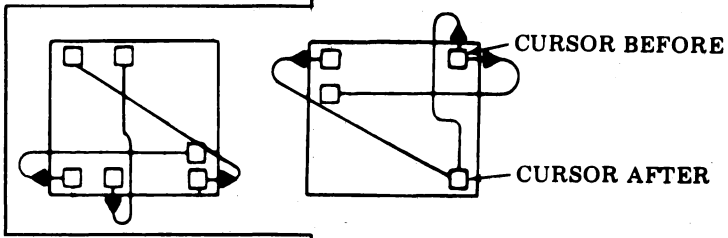
STEP	PROCEDURE	RESULTS	TROUBLE ANALYSIS
25	Hold down the [NUMERIC] key while depressing and checking operation of one of the following alpha keys: (#, +, \, etc.).	Upper portion of depressed keys are displayed.	
26	Depress the [FIELD MARK] key, then depress the [DUP] key.	FIELD MARK is displayed as < . DUP is displayed as ∅.	
27	Fully depress the [(SPACE)] key.	The space key repeatedly moves the cursor.	
28	Hold down the [REPT] key while depressing any alphanumeric key.	The alphanumeric character is repeated.	
29	① Depress [HOME] key. ② Depress ‡ [→] key. ③ Depress ‡ [↓] key. ④ and ⑥ Depress ‡ [←] key. (Try both [←] keys.) ⑤ Depress ‡ [↑] key. ‡ With more force than normally required. *Note:* There is no CURSR RTRN key on this opcon.	 *Note:* In local opcon operation, attempts to move the cursor off the display will result as shown: 	

CHART 4 (Cont)

KD LOCAL TEST PROCEDURES

STEP	PROCEDURE	RESULTS	TROUBLE ANALYSIS
30	Depress ERASE INPUT key.	Display clears and cursor goes to home position. LOCAL indicator remains lit.	
31	Type the alpha characters A through J on the display. Place the cursor over the character E and depress the CHAR INSRT key once, then also depress REPT key — releasing both after the characters move to the next line.	① ABCD[E]FGHIJ ② ABCD□EFGHIJ ③ ABCD□ EFGHIJ *Note:* CHAR INSRT and CHAR DLETE affect all 24 lines on a DCC KD. CHAR INSRT and CHAR DLETE affect only 4 lines including the line with the cursor on MCC KD. Characters move slowly.	
32	Depress the CHAR DLETE key momentarily.	ABCD □ EFGHIJ ABCD □ EFGHIJ Characters EFGHIJ move one position to the left as shown.	
33	Depress the LINE INSRT key three times.	The cursor remains at its present location, and the line of data moves down three lines.	
34	Depress the LINE DLETE key once.	The line of data moves up one line.	
35	Depress PRINT LOCAL key, (if printer is not provided, go to Step 36).	LOCAL indicator extinguishes, PRINT LOCAL indicator lights and then goes off when printer buffer receives the message; LOCAL indicator lights. Printer copies entire display (24 lines). *Note:* Depress LOCAL to clear flashing PRINT LOCAL.	• Flashing PRINT LOCAL indicator indicates printer: a. is not print local. b. cabinet lid is open. c. is in form-out or paper-out condition. d. ac power is off. e. defective cable or cable not connected.
36	Place the cursor away from home position and depress the CURSR TAB key. Repeat Step 36 but depress the SKIP key.	The cursor returns to home position. *Note:* Displayed data is not affected by CURSOR TAB, SKIP and BACK TAB keys.	

CHART 4 (Cont)

KD LOCAL TEST PROCEDURES

STEP	PROCEDURE	RESULTS	TROUBLE ANALYSIS
37	Place the cursor away from home position and depress the [BACK TAB] key.	The cursor returns to home position.	
38	Place the cursor away from home position and depress the [TAB] key.	Cursor returns to home position. Any characters to the right of and below cursor will be cleared.	
39	Type some text on the opcon and then depress [ENTER (S/R)]	Text is displayed. When ENTER key is depressed, LOCAL indicator extinguishes, INPUT INHIBIT indicator lights.	
40	Type some text on the keyboard portion of the opcon.	Attention bell sounds each time a key is depressed. No more text is displayed. *Note:* The audible alarm control on the opcon should be adjusted to allow bell to be heard.	
41	Alternately depress [RESET] (next to PF1) then depress [PA 1] key, then [RESET] key and [PA 2], [PF 3], [PF 1] through [PF 5] and [CLEAR] keys in the same manner. Depress [RESET] key, then depress [ALPHA] key at the same time as [R/TST] key. Depress [RESET] key (next to NUMERIC key). *Note:* The PF6 through PF12 are not present on this opcon.	[LOCAL] is lit and extinguishes when PA1 key is depressed (same for each key). Data on display remains unchanged, except when CLEAR key is depressed; all data clears from display and cursor goes to home position.	
When all KDs in the station have successfully completed these tests, proceed to Chart 5.			

D. Data Set Analog Loopback Self-Test

CHART 5

DATA SET SELF-TEST PROCEDURES

STEP	PROCEDURE	RESULTS	TROUBLE ANALYSIS
Note: If Station has a Data Set 201B or a 500A-Type Data Service Unit (DSU), go to Step 3. If a Data Set 208A or 209A is used, go to Step 2.			
1	Data Set 201C L1 and 201C L1D:		
	Apply ac power to data set.	ON, TR, MR, and MC are lit.	
	Perform Analog Loopback Self-Test as follows:		
	• Depress AL button.	AL button latches, TM lights and MR goes off. *Note:* MR stays on if 201C L1D is used.	
	• Depress ST button.	ST button latches. All indicators except MC should be on.	
	• Observe MC lamp for 30 seconds.	MC indicator should not blink on.	
	• Depress RO button.	RO button latches. RS and CS indicators should be off; MC indicator should be on. If data set has continuous carrier (Option XB), CO indicator should be on. If data set has switched carrier (Option XA), CO indicator should be off.	•If MC and CO lamps are on, check that data set has switched carrier option (multipoint private line). *Note:* If station is operated on a nonshared private line, it is recommended that continuous carrier option be used; see Section 582-200-201, Data Set Options.
	• Release RO, ST, and AL buttons.	TM indicator should turn off. This completes the data set self-test; go to Step 3.	

CHART 5 (Cont)

DATA SET SELF-TEST PROCEDURES

STEP	PROCEDURE	RESULTS	TROUBLE ANALYSIS
2	Data Set 208A and 209A: Apply ac power to data set. Perform Analog Loopback Self-Test as follows:		
	• Depress LP nonlocking button.	All indicators on the data set should be lighted.	•If ON indicator is off, check that ac voltage to data set is between 105 to 130 volts. *Note:* The ON indicator will go off if the output voltage of the power supply becomes excessive. The power cord must be unplugged and plugged in again after correcting the overvoltage to make the indicator light again. *Note:* (208B only) TR is on or off dependant on the state of the 40/4 DTR signal.
	• Depress AL button.		
	• Depress ST button.	ON, RS, CS, TM (209A only) and CO indicator should be lighted. MR and ER indicators should be OFF.	ER indicator should not blink on. If ER indicator is ON or blinks, this indicates that the data set has failed the Analog Loopback Self-Test.
	• Observe ER indicator for 30 seconds.		
	• Depress AL and ST buttons.	The data set is returned to normal operating condition. This completes the data set self-test; go to Step 4. All buttons should be released.	If test fails, replace data set.

CHART 5 (Contd)

DATA SET SELF-TEST PROCEDURES

STEP	PROCEDURE	RESULTS	TROUBLE ANALYSIS
3	48230 LADS: Apply ac power to the data set. Perform Analog Loopback Self-Test as follows: Depress the Data Clamp (DC) and Local Loopback (LL) buttons (behind front panel). Observe the SIGNAL DETECT indicator for 30 seconds. Depress the DC and LL buttons again to release.	Power ON indicator should be on. The TEST and SIGNAL DETEST indicators should turn on. *Note:* Signal Detect may already be on. SIGNAL DETECT indicator should not turn off or blink. The data set is returned to normal operating condition. This completes self-test. Go to Step 5.	•If test fails, replace data set.
4	201C, 208, 209A, 500 and 4830 LADS only: With all equipment power switches on and conditioned for operation (paper installed in printer; cabinet lid closed, etc), check for the correct data set indicator lights. (Initial Operating Conditions)	Data Set 201B3 None Data Set 201C ON — Lighted TR — Lighted MR — Lighted RS — Off CS — Off CO — Off, MC — Lighted (See Note 1) TM — Off Data Set 208A or 209A ON — Lighted MR — Lighted RS — Off CS — Off CO — Off, ER — Lighted (See Note 1) TM — Off (209A Only) 500A DSU PWR -- Lighted NS — Off LL — Off, RT — Off 4820 LADS Power on Lighted Signal Detect Off (See Note 2) Remote Loopback Off, Test off Go to 2.08 on next page.	•Replace data set. •Replace CIU circuit card. •Replace data set. •Check that data set buttons are released, replace data set. •Replace data set. •Replace 500A DSU. •Check DSU test switch is in center position. •Replace data set. •Check that LADS button are released.

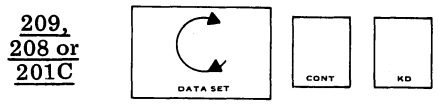
Note 1: CO should be lit (MC not lit on Data Set 201C, or ER not lit on Data Set 208A or 209A) when the distant end (CPE) is providing carrier-on condition. Before beginning on-line test with STC/DTC, notify customer of intended test and 40/4 Station test will take approximately 5 minutes per device.

Note 2: When distant end (CPE) is providing carrier on condition; NS will be off for 500A DSU, SIGNAL DETECT will be lighted.

ON-LINE TESTS

A Preliminary On-Line Testing

2.07 Preliminary Requirements — The data set must pass the requirements of Chart 5. Chart 5 makes this test:

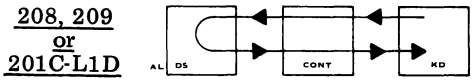


B. On-Line Test Methods

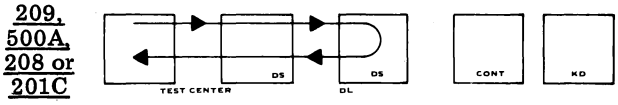
2.08 On-Line tests require access to a Data Test Center (DTC) by way of a Servicing Test Center (STC). Hereafter, the DTC is called the Test Center. Access to the Test Center may require a four-wire DDD backup connection at the STC or installation site. This connection is beyond the scope of this section (refer to Section 598-082-201, if required).

On-Line Testing is divided into three parts as follows:

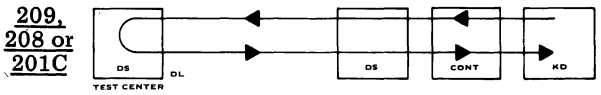
① Near-End Analog Loopback Test



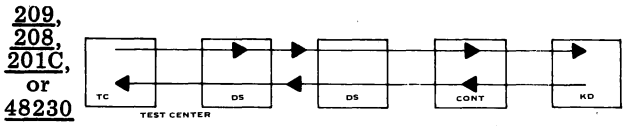
② Far-End Digital Loopback Test to 40/4 From Test Center



If ② cannot be performed, a Far-End Digital Loopback Test to Test Center from 40/4 may be performed.



③ End-to-End Installation Test — Performed with assistance of DATASPEED Test Center



Near-End Analog Loopback Test

2.09 This test provides a craftsperson with a local test method to check station and data set operation prior to requesting an End-to-End Installation Test from Test Center or prior to doing "in service operation acceptance" test with customer's equipment. This test must be performed, if possible, one time before continuing testing. Stations equipped with a Data Set 201C-L1 (or 500A-Type DSU) cannot perform this test. This test must be performed only after successfully performing KD/Controller Local Test of Chart 2 and Data Set Analog Loopback Test of Chart 5.

2.10 This step applies only to Data Seta 208A, 209A, and 201C-LID and 48230 LADS. If another type of data set is present, go to 2.11

(a) Depress AL button (locking) on the data set (all other buttons released). (48230 LADS depress LP (Local Loopback button).

(b) Turn off ac power to the SCC or MCC controller.

(c) Remove the 410403 or 410411 circuit card from the SCC or MCC controller of the station. At coordinates A13 on the 410403 circuit card, place switches 7 and 8 to the ON position. At B3 on the 410411 circuit card, place switches 7 and 8 to the ON position.

(d) Reinstall the 410403 or 410411 circuit card into the controller.

(e) Turn all ac power to ON position.

(f) Perform local tests using the same test routine given in Chart 2, KD/Controller local Test Procedures. The test occurs when S/R or ENTER key is depressed. Perform test on one KD only.

(g) If test is not successfully completed, the 410408, 410409, or 410411 circuit card, data set or data set cable is at fault. If test is successfully completed, perform the digital loopback test as instructed in 2.11, 2.12, or 2.13. See Note following 2.13.

Caution 1: Do not release AL button (208, 209, or 201C-L1D only) during or after this test. If AL is released while switches A13-7 and A13-8 of 410403 (or B3-7 and B3-8 of 410411) are in ON position, data sent by S/R or ENTER key depression can be sent into the customer's data system during the test; any data operations occurring at that time would be scrambled.

Far-End Digital Loopback Test to 40/4

Caution 2: Do not perform the digital loopback test if the customer data channel is on the same circuit with other stations which are actively sending or receiving data. If this test is performed on an active circuit, data transmissions on that circuit will be scrambled and possibly halt the data system operation. BEFORE TESTING, REQUEST PERMISSION FROM CUSTOMER AND DATA TRANSMISSION CENTER FOR TIME AND COOPERATION TO TEST

2.11 Release AL button (Data Sets 208, 209 or 201C-LID and 48230 LADS only). If permission to perform this test is not granted, see Note following 2.13. If permission to perform the test is granted:

Depress the data set DL key (locking) when directed by the attendant at the far end. When the test is complete, the attendant at the far end will tell you to release the DL key to the released position.

500A only: When directed by far-end attendant, place DSU into RT (see Section 595-200-200).

Far-End Digital Loopback Test to Test Center

Note: If far-end digital loopback test to 40/4 has been performed, do not perform 2.12, go to 2.13.

Caution: Caution 2 following 2.10 applies.

2.12 If permission to perform this test is not granted, see Note following 2.13. If a multistation arrangement shares the same data communications circuit, all communications on that circuit must cease during the test period. This test can be performed with the assistance of the DATASPEED Test Center (ie, similar type of data set patched into customer circuit to facilitate the test). If permission to perform the test is granted and a 201C, 208, or 209-Type Data Set or 48230 LADS is part of the station, perform 2.12 (a) and (b).

(a) Have far-end attendant depress DL.

(b) Perform steps (b) through (f) of 2.10 at the near end (AL at the near end must be released during this test). Checking at one KD is sufficient. See Note following 2.13. If not successful, trouble is in 410408, 410409 or 410411 circuit card, transmission lines, far-end data set or near-end data set. If successful after performing 2.10 (f), go to 2.13 and inform far-end attendant to release DL.

2.13 This test must be requested from a local area DATASPEED Test Center. In situations where access to a Test Center is not provided for in the customer's system, or where an EBCDIC testing capability is not provided at the Test Center, the required End-to-End Installation Test can be omitted if correct in-service operation testing with the customer equipment or system can be verified by the craftsperson and customer accepted. If trouble does occur in an in-service operation test, refer to trouble analysis or request a Data Test Center to perform line monitor test. If an End-to-End Installation Test is necessary for testing an EBCDIC station, it may be necessary to reprogram the station for ASCII for the test (see 2.15).

Note: Before attempting End-to-End Installation Test or restoring the station to service, follow (a) through (d) below.

(a) Turn off ac power to SCC or MCC controller.

(b) For Data Sets 201C, 208, 209, and 48230 LADS only: Remove 410403 (or 410411) circuit card from MCC or SCC controller. Place switches A13-7 and A13-8 (or B3-7 and B3-8) to OFF position.

(c) (Omitted this issue.)

(d) Inform far-end attendant to release DL button (if not already released).

(e) For Data Sets 208, 201C-L1D and 209 only: If the AL button is not released, depress AL.

End-to-End Installation Test

2.14 If the station uses ASCII line code, proceed to Chart 6, End-to-End Installation Test Procedures.

2.15 If the station uses EBCDIC line code, check if the DTC has EBCDIC test capability, if not, the station must be converted to ASCII to make the End-to-End Installation Test by the following procedures:

(a) Turn off ac power on SCC or MCC controller.

(b) Remove the 410409 (EBCDIC) circuit card. If the 410411 circuit card is present, go to (d).

(c) Install 410408 (ASCII) CIU circuit card into position formerly occupied by 410409 circuit card.

(d) Remove 410403 (or 410411) circuit card:

(1) Reprogram SPA and SSA using Tables A and B given in Section 582-200-201. Reprogram SPC17-6 (or SPB7-6) to ON position. Reprogram DA (MCC only) using Table E given in Section 582-200-201.

(2) Reinstall 410403 (or 410411) circuit card.

(e) Turn on ac power on SCC or MCC controller.

(f) Repeat Chart 2, KD/Controller Local Test Procedures (to Step 5 only).

(g) Perform tests in Chart 6, End-to-End Installation Test Procedures.

CHART 6

END-TO-END INSTALLATION TEST PROCEDURES

STEP	PROCEDURE	RESULTS	TROUBLE ANALYSIS
1	Check that all equipment power switches are on and paper is installed in printer; cabinet lid closed, etc, then depress LOCAL (or RESET) and ERASE INPUT keys on KD device.	LOCAL indicator lights. Cursor returns to row 1 and column 1. Display is cleared of all data.	Go to Chart 7.

CHART 6 (Cont)

END-TO-END INSTALLATION TEST PROCEDURES

STEP	PROCEDURE	RESULTS	TROUBLE ANALYSIS
2	Depress PA1 key on the KD device.	LOCAL indicator extinguishes. (Also see Notes 1 and 2 following Chart 6.) Internal Numeric Cluster Opcon: INPUT INHIBIT indicator lights.	Go to Chart 7.
3	Repeat Steps 1 and 2 on all KD devices.	See Steps 1 and 2.	Go to Chart 7.
4	Go to location of station data set in building. Contact DATASPEED Test Center and request End-to-End Installation Test. • Establish line connections per DTC instructions, then observe carrier on indicators indicating line established to DTC.	201C: MC — Goes off; CO — Lights 208A or 209: ER — Goes off; CO — Lights	Go to Chart 5. Perform Near-End Analog Loopback, Test of 2.10. Perform Far-End Digital Test of 2.11 or 2.12.
5	For DTC only.	Proceed to Step 6.	
6	If talk line to the DTC is not available after test is requested, verify that the test has started by observing the RTS/CTS LEDs on the front of the data set.	RTS/CTS lights on the front of the data set should flash ON then OFF during testing. *Note:* If RTS/CTS are on constantly (data set has continuous carrier option), go to station SCC or MCC and observe LEDs on 410408 (or 410409 or 410411) circuit card. RS and SD "M" and "S" LEDs flash indicating data was received and response was sent. Proceed to Step 7.	Inform DTC of problem. Go to Chart 7.
7	The DTC will perform the remainder of the test. Proceed to devices and check for correct test results; Fig. 6 and 7.	DTC will inform of test acceptance or trouble. Call DTC back, if required. See Note 3 on following page. Proceed to 2.16.	

Note 1: If a KD device is observed during this test, the S/R key must operate as follows:
S/R indicator flashing continuously (aborted condition) should be reported to the Test Center.
S/R indicator flashes once when KD has sent data.
S/R indicator lights when KD is selected to receive data.

Note 2: If tractor feed printers are part of station, check that the forms switch of each is in ON position.

Note 3: If you are not in "talk" communication with the Test Center during this test, be sure to "call back" Test Center for verification of correct operation. After verification of correct operation using this test procedure (including Test Center approval), depress LOCAL (or RESET) then CLEAR keys on the KD to normalize station. Verify correct operation in customer system before leaving site. EBCDIC stations can be tested as EBCDIC if Test Center is so equipped.

C. Checkout of Received Printer Message

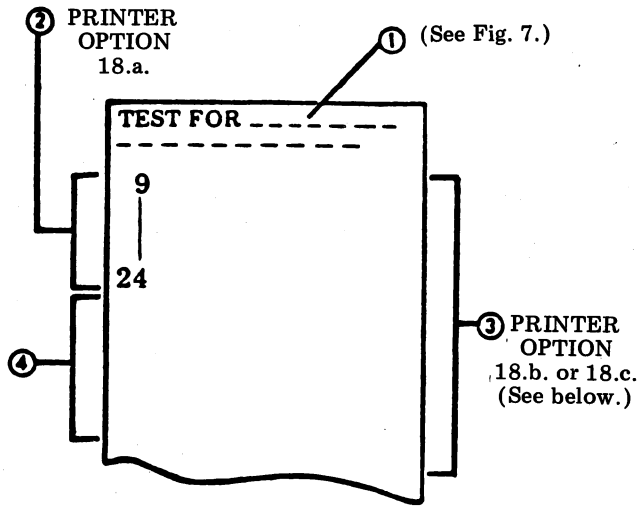


Fig. 6—Printed Test Message

2.16 If a printer is part of the station, check for correctness of printed test message, see above. If printer is not part of station, proceed to 2.20.

2.17 The printer motor will remain on for approximately 10 seconds after the test message is received. Later version printers will keep the motor on for 20 seconds.

Note: Paragraphs 2.18 and 2.19 check the options that are located on the printer circuit card.

2.18 Option 18a (No Feedout) — The blank lines ② are determined only by message length and column format sent to the printer. This test uses an 80-column format, therefore, lines 9 through 24 feed out (total of 1920 characters).

2.19 Options 18b or 18c (16-line feed out on RM loss or 16-line feed out on RM loss or ETX). This option illustrated as , operates the same as for Option 18a with the exception that after the blank lines 9 through 24 a 16-line feed out (friction feed printer only) will occur. If Option 39a is installed, tractor feed printer will form feed out to the length of ④, if the printer forms switch is ON. Refer to the Form Selector Pointer Setting and the Belt and Form Length table on the printer to determine proper forms operation.

D. Checkout of Received KD Message

Note: A KD device having D I/O 410434 or 410436 circuit cards (monocase display) will display an asterisk (*) in place of the NEW LINE symbol (≡).

2.20 Check for correctness of display and station options (Fig. 7):

Option 402a — Continuous attention (the opcon bell repeatedly sounds if volume is turned up) until LOCAL key is depressed; depress LOCAL key. Bell silences.

or

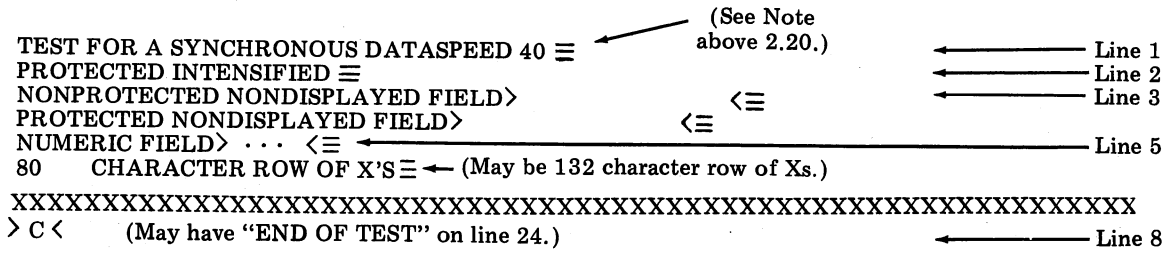
Option 402b — One second attention (the opcon bell sounds if volume is turned up) and LOCAL indicator lights.

Option 406a (or 407a or 407b) — Alpha characters can be typed over periods in the numeric field (bell sounds for 406 only) — line 5. (407 only: Hold down ALPHA key.)

or

Option 406b — Bell sounds when alpha is typed over numeric field; only numeric data can be entered into field — line 5.

Line 1 is copied as shown (Fig. 7).
Line 2, the word PROTECTED begins in the fifth character position and is followed by the word INTENSIFIED (which is brighter than normal for Option 403a or 403c; or blinks for Option 403b).
Lines 3 through 8 are as shown in Fig. 7; the cursor must be positioned over "C" on line 8. Automatic "upshift" (to numeric) occurs on line 5 for 40K105 opcon only.



Note: When message is sent to printers from a Digitech Corporation PACER Test Set, it may not be in the format shown.

Fig. 7—SYNC 40 Test Message

2.21 If the station is to remain ASCII, all testing is complete at this point. Confirm system operation with customer's equipment.

2.22 If the station is to be converted back to EBCDIC, go to E. Completion of End-to-End Installation Test.

E. Completion of End-to-End Installation Test

2.23 Requirements after successful completion of End-to-End Installation Test of converted EBCDIC to ASCII station:

(a) Turn off ac power on SCC or MCC controller.

(b) Remove 410408 (or 410411) circuit card.

(c) If applies, install original 410409 circuit card into position formerly occupied by 410408 circuit card.

(d) Remove 410403 circuit card. (If a 410411 circuit card is present, it was removed in (b).)

(1) Reprogram SPA and SSA using EBCDIC Tables C and D given in Section 582-200-201.

(2) Reprogram SPC17-6 (or SPB7-6) to OFF position.

(3) Reinstall 410403 (or 410411) circuit card.

(e) Turn on ac power on SCC or MCC controller.

(f) Repeat Chart 2, KD/Controller Local Test. Perform test on one KD only.

(g) Verify correct in-service station operation with customer's equipment or system.

(h) All testing is completed.

2.24 If an ASCII station successfully completed the End-to-End Installation Test, all testing is complete.

3. TROUBLESHOOTING

3.01 The troubleshooting procedures for the mini-cluster controller, station cluster controller, and device cluster controller are included in the controller self-test procedures (Chart 1).

3.02 A brief troubleshooting reminder on the monitor is provided in Chart 8. For detailed analysis, refer to Section 582-213-200.

3.03 Limited troubleshooting for the opcon is provided in Chart 9, For detailed analysis, refer to Section 582-211-500.

3.04 Trouble analysis of the printer is not provided in this section. Refer to Section 582-210-500.

3.05 The use of Controller Arrangement Forms (Section 582-200-201) is necessary to troubleshoot using self-test.

3.06 For detailed analysis of the power supply, refer to Section 582-214-500.

CHART 7

STATION ANALYSIS

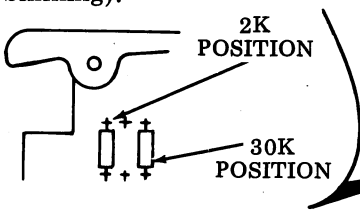
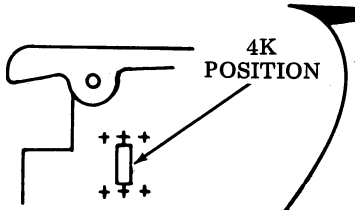
ANALYSIS QUESTION	"YES" RESPONSE DIRECTIVE	"NO" RESPONSE DIRECTIVE
1. Are all power supply voltage indicators lit?	Go to 2.	Go to Chart 10, 40PSU102 Power Supply Analysis.
2. Is run lamp on or blinking and 1st pattern lamp (toward rear of controller) on 410401 circuit card dimly lit when controller is <u>not</u> in test mode?	Go to 3 (if run lamp is on or blinking).  4108NN CARD  4109NN CARD	Perform steps below one at a time until problem is corrected. a. 40PSU102 Power Supply Analysis beginning at Step 2. b. If used: Check 4108NN circuit card(s) in controller for required strap positions "2K" and "30K". Strap can be 22 AWG wire. c. If used: Check 4109NN circuit card(s) in controller for required strap in position "4K". Strap can be 22 AWG wire. d. Use (c) in analysis column of Step 2 in Chart 1.
3. Is run lamp blinking when controller is <u>not</u> in test mode?	Go to 4 (if run lamp is steadily on). *Note:* If removal of SSI cable to another controller corrects the problem, that controller may be at fault.	Perform steps below one at a time until problem is corrected. a. Remove SSI cables to opcons and other controller(s) one at a time (connectors at right side of controller). (See Note.) b. Replace 410406 circuit card. c. Replace 410200 or 410201 back panel.
4. Depress and hold test switch. Do all pattern lamps light?	Go to 5.	Replace in order: 410401 circuit card, repeat Step 4. 410400 circuit card, repeat Step 4. 4108NN or 4105NN circuit card(s), repeat Step 4. All other circuit cards until defective circuit card is found.

CHART 7 (Cont)

STATION ANALYSIS

ANALYSIS QUESTION	"YES" RESPONSE DIRECTIVE	"NO" RESPONSE DIRECTIVE
5. Release test switch. Does controller pass self-test of Chart 1? This includes display patterns when checking DCC or MCC.	Go to 6. *Note:* If display pattern appears with errors or is distorted, replace associated D I/O 41043N circuit card.	Replace circuit card indicated by pattern lamps, however, if more than one trouble pattern appears, replace card indicated by last trouble pattern first. Repeat Step 5.
6. Does the local test work? (CTRL (or ALPHA) and L/TST keys on opcon.)	Go to 8.	Go to 7.
7. Depress the LOCAL (or RESET) key on the opcon. Is the LOCAL indicator lit?	Check the cabling from the opcon to DCC, the DCC to SCC, and the DCC to monitor (or opcon to MCC) as applies. Refer to Section 582-200-201.	Go to Chart 9, Opcon Analysis.
8. In the local mode, do all keys on the opcon function properly? Refer to KD Local Test, 2.05.	Go to 9.	Replace opcon. Replace 410406 circuit card interfacing opcon in trouble.
9. Input data on opcon so that it appears on monitor. Depress PRINT LOCAL key. Does the print local printer print the data properly?	Go to 10.	Check cables. Replace printer. Replace associated SSI 410406 circuit card.
10. Does the station pass the on-line checkout?	Place in service.	Go to 11.
11. Do RD lamps flash on 410408, 410409, or 410411 circuit card during polling or selecting?	Go to 12.	Check data set options. Check data set and data set cable (EIA pin 3).
12. Does RS lamp light on data set after polling or selecting?	Go to 13.	• Check data set cable (EIA pin 4). • Replace 410408, 410409, or 410411 circuit card (as applies).
13. Does CS lamp light on data set after polling or selecting?	Go to 14.	Check data set or data set options.

OPCON OR PRINTER CONNECTED TO SSI	ASSOCIATED 410406
PORTS 1 THROUGH 4	IN CARD POS. 5 OR 7
PORTS 5 THROUGH 8	IN CARD POS. 4 OR 6 OR 8

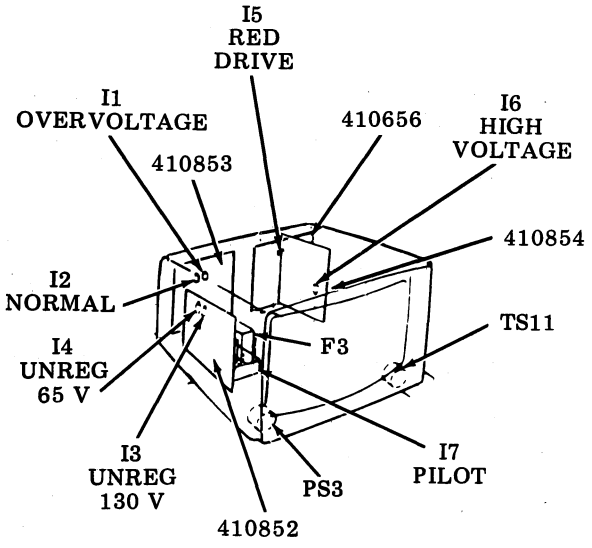
CHART 7 (Cont)

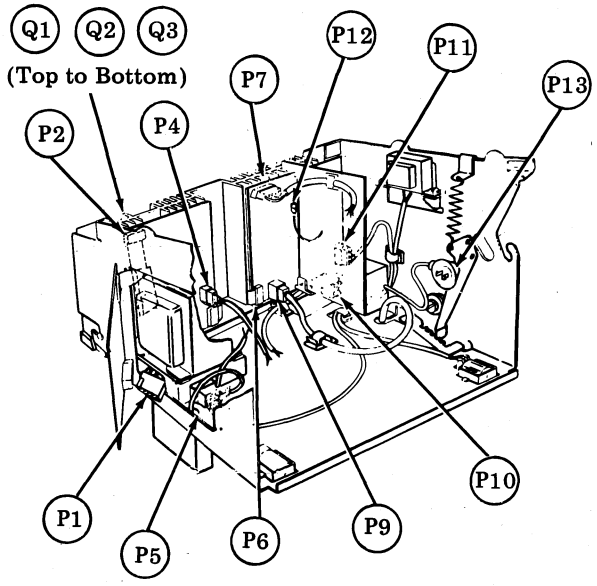
STATION ANALYSIS

ANALYSIS QUESTION	"YES" RESPONSE DIRECTIVE	"NO" RESPONSE DIRECTIVE
14. Do SD lamps flash on 410408, 410409 or 410411 circuit card after polling or selecting?	a. Check data set. b. Check data set cable (EIA pin 2). c. Replace 410408, 410409 or 410411 circuit card (as applies).	• Check data set cable (EIA pin 5). • Replace 410408, 410409, or 410411 circuit card (as applies).

CHART 8

40MN101 MONITOR ANALYSIS





ANALYSIS QUESTION	"YES" RESPONSE DIRECTIVE	"NO" RESPONSE DIRECTIVE
1. Is red drive lamp 15 lit?	Go to 2.	• Check cables. • DCC, MCC: Check 405181 fuse, F4 (early version) or 321955 video fuse (late version) on interconnection module. • DCC, MCC: D I/O (41043N)¶. • 410656 in monitor.

¶41043N — Any D I/O circuit card.

CHART 8 (Cont)

40MN101 MONITOR ANALYSIS

ANALYSIS QUESTION	"YES" RESPONSE DIRECTIVE	"NO" RESPONSE DIRECTIVE
2. With PS1 and PS2 on, is pilot I7 lit?	Go to 3.	Check 341578 fuse F3 (1.4 SL-BL), cables.
3. Are I4 and I3 lit?	Go to 4.	Replace 410852 circuit card.
4. Is I2 lit?	Go to 5.	• Replace 410853 circuit card. • Replace Q1.
5. Is I1 lit?	Replace 410853 circuit card.	Go to 6.
6. Is I6 lit?	See Notes below.	• Replace 410854 circuit card. • Replace 410656 circuit card.

Note 1: If 19 (CRT filament) is not lit or if problem still exists in the monitor, go to Section 582-213-200.

Note 2: On early design monitor, 16 high voltage indicator is visible. On late design monitor, 16 high voltage indicator is not visible unless heat sink is tilted back into maintenance position.

CHART 9

OPCON ANALYSIS

Note: Start with Question 1 if KD has typewriter style opcon. Start with Question 4 if KD has internal numeric cluster style opcon.

ANALYSIS QUESTION	"YES" RESPONSE DIRECTIVE	"NO" RESPONSE DIRECTIVE
TYPEWRITER STYLE OPCON ANALYSIS		
1. Depress ERASE INPUT and QUOTES keys together with additional force. Does TST indicator remain lit when keys are released?	Go to 2.	• DCC, MCC: Check 405181 fuse (early version) (F2 or F3 for S1-S4 or F5 or F6 for S5-S8) or 321955 video fuse (late version) on interconnection module. • Check for +12 V and -12 V to opcon. Refer to Section 582-200-401. • Replace opcon.
	Note: If lamps flash or the alarm sounds clear by depressing ERASE INPUT and P keys, then repeat Question 1.	

CHART 9 (Cont)

OPCON ANALYSIS

ANALYSIS QUESTION	"YES" RESPONSE DIRECTIVE	"NO" RESPONSE DIRECTIVE
2. Do the following: (See Note below.) Depress Keys: SHIFT A / CTRL A — Indicator: S/R — ON / OFF SHIFT C / CTRL C — LOCAL — ON / OFF SHIFT F — PRINT — ON / OFF CTRL \ — LOCAL — OFF → / CTRL C — LOCAL — FLASH / OFF		
a. Do all indicators operate as described? *Note:* If opcon has CAPS key when depressing A, C or F, CAPS key must be in latched position (ON) or SHIFT key must be depressed. If opcon has no CAPS key, do not depress SHIFT key.	Depress ERASE INPUT and P keys together with additional force to terminate test. TST indicator light goes out. Go to 2b.	Replace opcon.
b. Is the 40K104 opcon a late design or is 40K203 opcon present? *Note 1:* Late design opcons are sometimes called OPCON II and have a single card of new design. Early design opcons (interface/bell card present) will not cause alarm to ring when ERASE INPUT key is depressed. *Note 2:* To check the vintage of an opcon, it is sufficient to remove opcon from cabinet (or base) and look through the slot at the rear for the interface/bell card.	Interface/bell card not present. Go to 2c.	Interface/bell card present. Go to 3.

CHART 9 (Cont)

OPCON ANALYSIS

ANALYSIS QUESTION	"YES" RESPONSE DIRECTIVE	"NO" RESPONSE DIRECTIVE
c. On late design 40K104 opcon (interface/bell card not present) or 40K203 opcon, fully depress ERASE INPUT key. Does the alarm sound repeatedly as long as the key is depressed? *Note:* The alarm loudness control may require adjustment to hear the tone.	Go to 3.	Replace opcon.
3. Does the opcon fail to generate proper characters?	Replace opcon.	Opcon OK.
INTERNAL NUMERIC CLUSTER OPCON ANALYSIS		
4. Depress CONSOL TEST and LINE INSERT** keys together. Does CONSOL TEST indicator remain lit when keys are released? **Fully depress LINE INSERT key.	Opcon is in loopback mode. Go to 5.	• Check 405181 fuse (early version) (F2 or F3 for S1-S4 or F5 or F6 for S5-S8) or 321955 video fuse (late version) on interconnection module. • Check for +12 V and -12 V to opcon. Refer to Section 582-200-401. • Replace opcon.
	Note: If lamps flash or the alarm sounds more than once or continuously, clear by depressing CONSOL TEST and RESET keys, then repeat Question 4. (Use RESET key adjacent to PF1 key.)	

5. Do the following in the order given:

Depress key(s)	Indicator		Notes
	Key	Condition	
A	S/R	On	
C	LOCAL	On	If entered loopback mode from LOCAL, LOCAL indicator is already on.
M	INPUT INHIBIT	On	
F	PRINT LOCAL	On	(Question 5, continued on Page 42)

CHART 9 (Cont)

OPCON ANALYSIS

ANALYSIS QUESTION	"YES" RESPONSE DIRECTIVE	"NO" RESPONSE DIRECTIVE
5. (Cont)		

Depress key(s)	Indicator		Notes
	Key	Condition	
I	NUM LOCK	On	
R/TST	S/R	Flashing On & Off	Depress only R/TST key.
(Cursor right) →	LOCAL	Flashing On & Off	
LINE DLETE	INPUT INHIBIT	Flashing On & Off	
L/TST	PRINT LOCAL	Flashing On & Off	Depress only L/TST key.
NUM LOCK	NUM LOCK	Flashing On & Off	
ALPHA & A	S/R	On (no flash)	
ALPHA & C	LOCAL	On (no flash)	
ALPHA & M	INPUT INHIBIT	On (no flash)	
ALPHA & F	PRINT LOCAL	On (no flash)	
ALPHA & I	NUM LOCK	On (no flash)	
NUM & R/TST	S/R	Off	LOCAL indicator cannot be turned off while in loopback mode.
ERASE INPUT	INPUT INHIBIT	Off	PRINT LOCAL indicator cannot be turned off while in loopback mode.
TAB	NUM LOCK	Off	Depress TAB key not CURSR TAB key.
R/TST	S/R	Flashing On & Off	Depress only R/TST key.
ALPHA & R/TST	S/R	Off	(Question 5, continued on Page 45)

CHART 9 (Cont)

OPCON ANALYSIS

ANALYSIS QUESTION	"YES" RESPONSE DIRECTIVE	"NO" RESPONSE DIRECTIVE
5. (Cont)		

Depress key(s)	Indicator		Notes
	Key	Condition	
CONSOL TEST	(See note to the right)		Opcon attention bell sounds repeatedly as long as key is depressed.

Do all indicators and bell operate as described?	Depress CONSOL TEST and RESET (adjacent to PF1) keys to terminate test. Go to 6.	Replace opcon.
6. Does the following occur? a. CONSOL TEST indicator goes out, b. PRINT LOCAL indicator goes out, c. LOCAL indicator stays on.	All three conditions are met. Go to 7.	Replace opcon.
7. Does the opcon fail to generate proper characters?	Replace opcon.	Opcon is OK.

CHART 10

40PSU102 POWER SUPPLY ANALYSIS

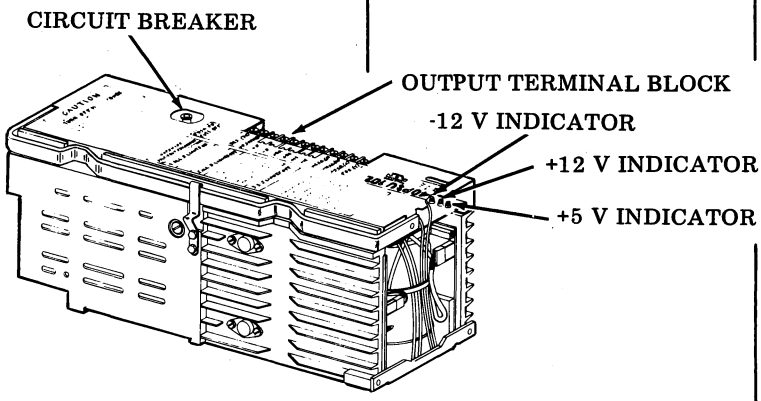
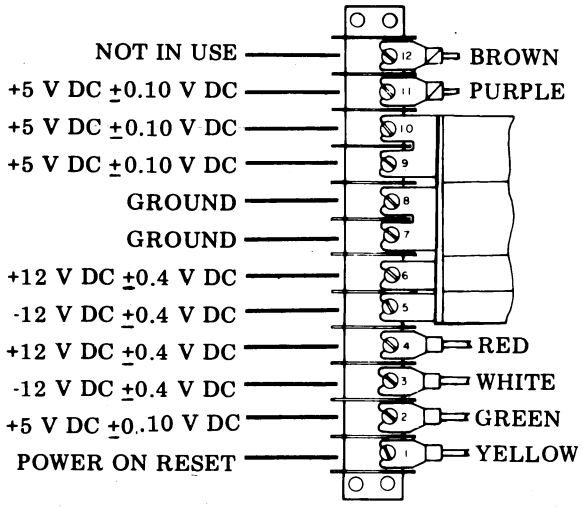
ANALYSIS QUESTION	"YES" RESPONSE DIRECTIVE	"NO" RESPONSE DIRECTIVE
1. With the set plugged in and power on, are all LED indicators on? 	Go to 2.	Go to 5.
2. Are all voltages correct at the output terminal block? Check voltage using voltmeter having 20,000 ohms/volt sensitivity.  Output Terminal Block	Turn power off and back on again. Go to 3.	Turn off power. Remove all connections from back panel to power supply. Retighten all power supply connector screws. Turn on power. Go to 14.
3. a. If power supply is part of SCC (Station Cluster Controller): (Continued on Page 47)		

CHART 10 (Cont)

40PSU102 POWER SUPPLY ANALYSIS

ANALYSIS QUESTION	"YES" RESPONSE DIRECTIVE	"NO" RESPONSE DIRECTIVE
3. (Cont) Does run lamp light? b. If power supply is part of DCC (Device Cluster Controller) or MCC (Mini-Cluster Controller): Does run lamp light? Is cursor in home position on KDs connected to DCC or MCC? Is local lamp of opcons connected to DCC or MCC lit? *Note:* Local lamp may flash ON/OFF, etc.	Put power supply in service.	Momentarily jump terminal 7 (Ground) of the output terminal strip to terminal 1 (POR) of the output terminal strip. Go to 4.
4. Repeat Question 3.	Replace power supply.	Trouble is in logic module. See Chart 7, Station Analysis.
5. Are <u>all</u> LED indicators off?	Go to 6.	Go to 11.
6. Is circuit breaker in ON position? (Down-white band not showing.)	Go to 7.	Depress circuit breaker. Go to 10.
7. Is ac power connector at rear of power supply connected? *Note:* Power supply mounting screw must be removed and the power supply slightly raised to check power connection.	Go to 8.	Connect ac connector. Go to 1.
8. Is there 115 V ac at power supply connector?	Go to 9.	Check main power input switches, cabinet wiring, and connectors, etc, per Section 582-200-401. Correct problem. Go to 1.

CHART 10 (Cont)

40PSU102 POWER SUPPLY ANALYSIS

ANALYSIS QUESTION	"YES" RESPONSE DIRECTIVE	"NO" RESPONSE DIRECTIVE
9. Are fans at rear of logic module operable?	Turn off power. Remove cables from logic package to power supply terminal block. Retighten all screws. Turn on power. Go to 13.	Correct problem in fan assembly. Go to 1.
10. Did circuit breaker pop back to OFF position?	Replace power supply.	Go to 1.
11. Is the +5 V dc LED indicator the only indicator off?	Turn off power. Wait approximately 30 seconds. Turn power back on. Go to 12.	Turn off power. Remove cables from logic package to power supply. Retighten all screws. Turn on power. Go to 13.
12. Did the +5 V dc LED indicator come on?	Go to 2.	Turn off power. Remove cables from logic package to power supply. Retighten all screws. Turn on power. Go to 13.
13. Are all LED (3) indicators on?	Go to 14.	Replace power supply.
14. Are all voltages correct at the output terminal block? *Note:* See Question 2 for values.	Turn off power. Reconnect all leads. Remove one (any) logic card from controller. Turn power on. Go to 15.	Replace power supply.
15. Are all voltages at the output terminal block now correct?	Turn off power. Replace logic card that was removed. Power supply OK.	Continue removing logic circuit cards (see Caution below) until voltages are correct at output terminal block. Circuit card removed prior to voltages being corrected at output terminal block should be replaced.

Caution: The ac power must be OFF, before removing or replacing a circuit card.

4. CIRCUIT CARD COMPATIBILITY

4.01 The following paragraphs contain information pertaining to PROM and EPROM circuit card compatibility. When replacing a PROM or EPROM circuit card, always replace that circuit card with another having the same or a higher issue number. Failure to do so may result in an operational failure which may not be immediately apparent.

Note: If PROM or EPROM circuit card contains a modification kit, the replacement circuit card must also contain the same modification kit.

4.02 The following PROM (or EPROM) circuit cards must be treated as unique sets and cannot be intermixed with PROM (or EPROM) circuit cards of other sets in the same C400 controller.

(a) 410801 PROM Circuit Card
410901 PROM Circuit Card } MARK I — SCC

(b) 410802 PROM Circuit Card
410902 PROM Circuit Card } MARK I — DCC

(c) 410803 PROM Circuit Card
410903 PROM Circuit Card
410904 PROM Circuit Card } MARK I — MCC

(d) 410804 PROM Circuit Card
410905 PROM Circuit Card } MARK II — SCC

(e) 410809 PROM Circuit Card
410911 PROM Circuit Card } MARK II — DCC With Typewriter Style Opcon

(f) 410808 PROM Circuit Card
410909 PROM Circuit Card
410910 PROM Circuit Card } MARK II — MCC With Typewriter Style Opcon

(g) 410810 PROM Circuit Card
410907 PROM Circuit Card } MARK II — DCC With Internal Numeric Cluster Style Opcon

(h) 410812 PROM Circuit Card
410914 PROM Circuit Card
410915 PROM Circuit Card } MARK II — MCC With Internal Numeric Cluster Style Opcon

(i) 410508 or 410535 EPROM Circuit Card — EPROM Version SCC

(j) 410509 EPROM Circuit Card — EPROM Version DCC With Typewriter Style Opcon

(k) 410512 EPROM Circuit Card
410513 or 410525 EPROM Circuit Card } EPROM Version MCC With Typewriter Style Opcon

(l) 410510 EPROM Circuit Card — EPROM Version DCC With Internal Numeric Cluster Style Opcon

(m) 410514 EPROM Circuit Card
410515 EPROM Circuit Card } EPROM Version MCC With Internal Numeric Cluster Style Opcon

4.03 The following PROM or EPROM circuit cards of each set are only compatible with each other when matched by the issue numbers as shown. The issue of each circuit card is found at the top of the circuit card.

(a) 410801 and 410901 Circuit Cards
410801 — Issue 4A or Lower
w/410901 — Issue 3A or Lower
OR
410801 — Issue 5A Through 7A
w/410901 — Issue 4A Through 5B

(b) 410802 and 410902 Circuit Cards
410802 — Issue 3A or Lower
w/410902 — Issue 3A or Lower
OR
410802 — Issue 4A Through 7A
w/410902 — Issue 4A Through 5B

(c) 410803, 410903 and 410904 Circuit Cards
410803 — Issue 3A or Lower
w/410903 — Issue 2A or Lower
and 410904 — Issue 2A or Lower
OR
410803 — Issue 4A Through 7A
w/410903 — Issue 3A Through 4B
and 410904 — Issue 3A Through 4B

(d) 410804 and 410905 Circuit Cards
410804 — Issue 3A or Lower
w/410905 — Issue 2B or Lower
OR
410804 — Issue 4A
w/410905 — Issue 3A
OR
410804 — Issue 5A and 6A
w/410905 — Issue 4A
OR
410804 — Issue 7A
w/410905 — Issue 5A

Note: The 410804, Issue 4A or higher and 410905, Issue 3A or higher are also referred to as MARK II — Issue 2.

(e) 410808, 410909 and 410910 Circuit Cards
410808 — Issue 1A Through 6A
w/410909 — Issue 1A Through 3A
and 410910 — Issue 1A Through 3A

Note: The 410910, Issue 3A is also referred to as MARK II — Issue 2.

(f) 410809 and 410911 Circuit Cards
410809 — Issue 1A Through 3A
w/410911 — Issue 1A Through 2B

(g) 410810 and 410907 Circuit Cards
410810 — Issue 2A or Lower
w/410907 — Issue 1A

(h) 410812, 410914 and 410915 Circuit Cards
410812 — Issue 1A Through 3A
w/410914 — Issue 1A and 2A
and 410915 — Issue 1A

(i) 410508 Circuit Card
410508 — (See Note below.)
(or 410535)

(j) 410509 Circuit Card
410509 — (See Note below.)

(k) 410512 and 410513 Circuit Cards
410512 — Issue 1A
410513 — Issue 2A†† and 3A
(or 410525)

(l) 410510 Circuit Card
410510 — (See Note below.)

(m) 410514 and 410515 Circuit Cards
410514 — Issue 1A
410515 — Issue 2A††
(or 410534)

(n) 410525 Circuit Card — See (k).

(o) 410534 Circuit Card — See (m).

(p) 410535 Circuit Card — See (i).

†† No earlier issues shipped.

Note: Since 410508, 410509, 410510, or 410535 circuit cards are not part of a set of EPROM circuit cards, there are no compatibility considerations.

5. CABLE TROUBLESHOOTING

5.01 When it is suspected that cabling between the controller and data set or device may be a cause of trouble, standard troubleshooting procedures may be used for short cable lengths.

(a) Any cable exhibiting outer jacket damage (shield visible while flexing) should be replaced and the cause of the damage corrected.

(b) Check crimping of terminals to conductors, the lower crimp point must tightly grip the the conductor and the upper crimp point must tightly grip the conductor insulation. Shielded cables have mylar tape wrapped around the conductor bundle under the shield. When the outer shield is removed in preparation for affixing terminals and connectors, the mylar tape must extend approximately 1/4 inch beyond the point of shield removal in order to prevent frayed shield ends from piercing conductor insulation.

(c) Check of connector; disassemble and visually inspect each pin.

(d) When continuity testing is warranted, standard continuity testers (lamp or buzzer type or ohmmeter) may be used, when troubleshooting cable lengths up to 100 feet.

Warning: Before continuity testing is started, unplug all ac cords (KDA, data set, KD, PTR, controller, and pedestal). The cable under test must be disconnected from the controller and the device (or other controller).

5.02 For long cable runs, standard troubleshooting methods may not be applicable since long cable lengths may preclude the use of standard continuity testers (due to increased resistance). When troubleshooting these configurations, standard techniques may be employed only in testing the cables between the controller and the termination box, and between the remote device and the termination box. In order to test the length of cable between termination boxes, the following is one method which may be employed.

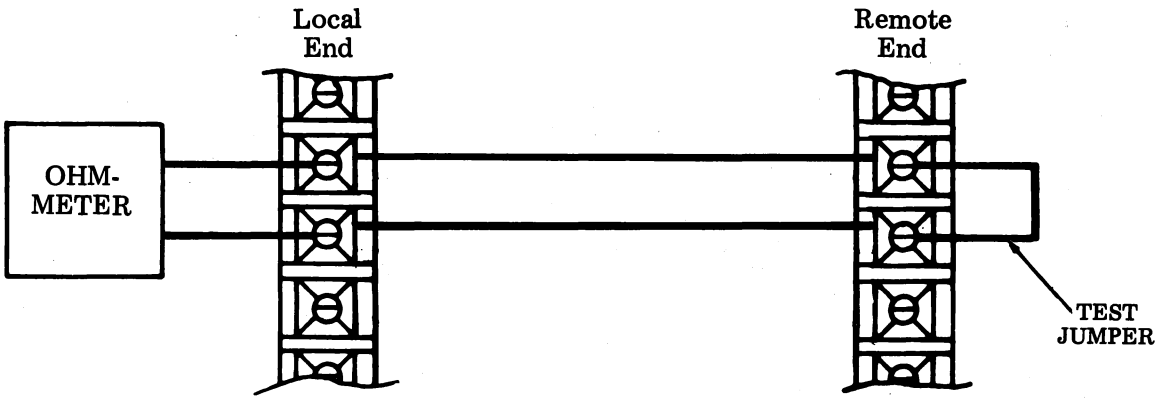
(a) Unplug the cable under test from both the controller and the remote device.

(b) Using an ohmmeter (VOM) on the RX10 or RX100 range, measure conductor to conductor for shorts.

Note: Cables containing more than one shield will indicate continuity when measuring between drain wires.

(c) When it is determined that the cable is free from internal shorts, conductor continuity should be tested. At one termination box; short two terminals together with a jumper wire or test lead (Fig. 7). Using a VOM on the appropriate ohms range at the other termination box, measure across the two terminals with corresponding color codes.

Note: In order to expedite troubleshooting, it is suggested that before continuity testing is started, try to determine the signal or signals that are missing or questionable. This will reduce the number of conductors requiring testing.



WIRE GAUGE	OHMS FOR 100 FT.*
18	0.6 Ohm *
22	1.5 Ohms *
24	2.5 Ohms *
26	4 Ohms *

* Typical

Example: In using this method, if the two wires under test are 26 gauge and 500 feet in length, the length under test is 1000 feet. Consequently, the ohmmeter should indicate approximately 40 ohms (1000 times 4/100). If the two wires under test were 24 gauge and 2000 feet in length, total length would be 4000 feet. Therefore, the ohmmeter should read approximately 100 ohms (4000 times 2.5/100).

Fig. 7—Long Wire Continuity Test

6. WIRING DIAGRAMS AND PARTS

6.01 Wiring diagrams and illustrations of cable parts are given in Section 582-200-401.

7. TESTING SSI CABLE FOR 40/4 APPLICATIONS

7.01 When using SSI cable other than specified by Teletype Corporation, the cable must be tested as outlined in Part 7. The system with cable that passed the tests will operate with an error rate of less than 2 errors in 10^8 bits under normal conditions.

Caution: There is only limited protection against high energy discharges when using unshielded cable. Impulse noise may result in temporary system malfunction.

7.02 When supplied cable has different color wires than Teletype Corporation cable, pay careful attention when interconnecting cables.

7.03 The following test equipment (or equivalent) and materials are required for testing cable:

1 — Simpson 260 Volt-Ohm-Meter (VOM)
2 — 6 inch jumper cables with insulated alligator clips.
2 — 135-ohm ±10 percent, 1/4 watt resistors.
1 — HP 3550B Communication Test Set
1 — 6F (J94006F) Voiceband Noise Measuring Set with 50KHZ network.

Equivalent test equipment such as Wilcom T194B Transmission and Noise Test Set may also be used.

7.04 The dc tests of Part 7 consist of measuring foreign voltages, insulation resistances, and loop resistances. The ac tests of Part 7 con-

sist of measuring crosstalk, loop loss, background circuit noise, and impulse noise. The tables in Part 7 can be copied to provide separate records for different cables.

DC TESTS

7.05 The Foreign Voltage Tests require a VOM or equivalent. See Fig. 8 or 9 (as applies). Perform the tests in Table A.

Table A - Foreign Voltage Tests		
Cable being tested: _____		
Disconnect both ends of cable being tested before making tests.		
Measure the voltage between the following leads:		Measured Voltages (See Note)
1. ITD(N) to ITD(I)		_____ VDC
2. ITC(N) to ITC(I)		_____ VDC
3. ITC(N) to ground		_____ VDC
4. ITC(I) to ground		_____ VDC
5. ITD(N) to ground		_____ VDC
6. ITD(I) to ground		_____ VDC
This cable: (see note) passed ☐		failed ☐

Note: The cable passes foreign voltage tests if all measured voltages are less than 0.1 volt dc.

7.06 The Insulation Resistance Tests require a VOM or equivalent. See Fig. 8 or 9 (as applies) for test arrangment. Perform the tests in Table B.

Table B - Insulation Resistance Tests		
Cable being tested: _____		
Disconnect both ends of cable being tested before making tests.		
Measure the resistance between the following leads:		Measured Resistance (See Note)
1. ITD(N) to ITD(I)		_____ Kohms
2. ITD(N) to ITC(N)		_____ Kohms
3. ITD(N) to ITC(I)		_____ Kohms
4. ITD(I) to ITC(I)		_____ Kohms
5. ITD(I) to ITC(N)		_____ Kohms
6. ITC(N) to ITC(I)		_____ Kohms
7. ITD(N) to ground		_____ Kohms
8. ITD(I) to ground		_____ Kohms
9. ITC(N) to ground		_____ Kohms
10. ITC(I) to ground		_____ Kohms
This cable: (See note) passed ☐		failed ☐

Note: The cable passes Insulation Resistance Tests if all measured resistances are greater than 300Kohms (300,000 ohms).

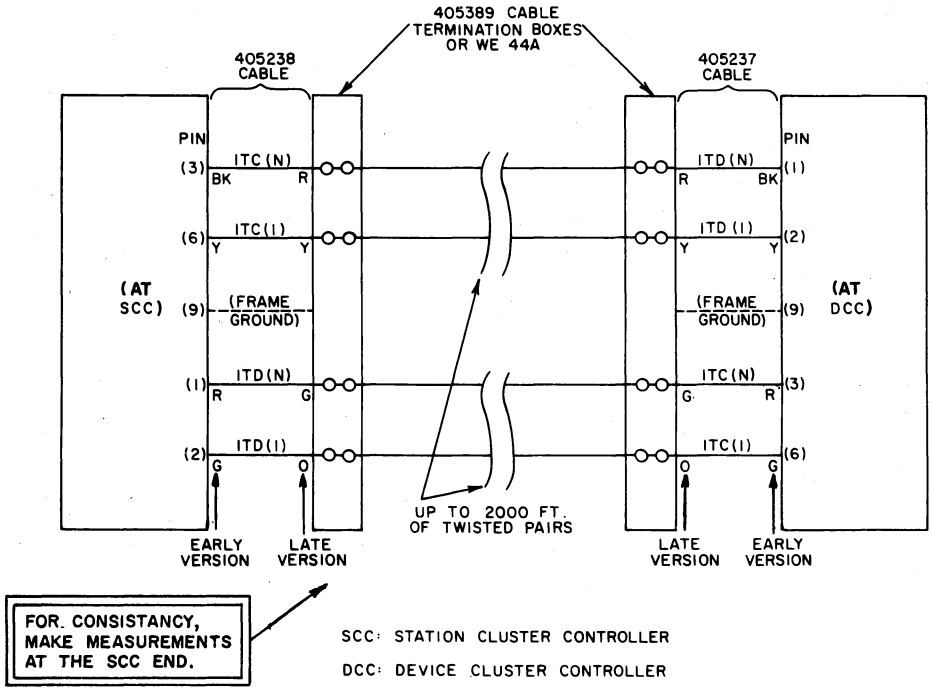


Fig. 8—DC Tests On Cable Pairs Between SCC and DCC

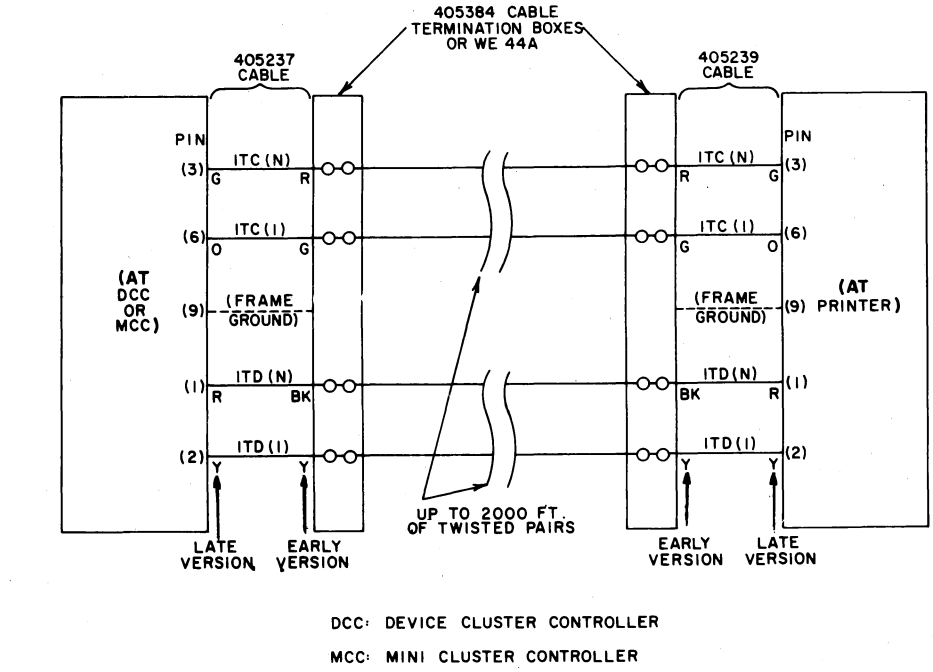


Fig. 9—DC Tests On Cable Pairs Between DCC (Or MCC) and Printer

7.07 The Loop Resistance Tests require a VOM and a jumper. See Fig. 8 or 9 (as applies) for test arrangement. Perform the tests in Table C (check the range setting on the VOM).

Table C — Loop Resistance Tests		
Cable being tested: _____		
(Cables are still disconnected) Measure the resistances between the following leads with the conditions given:	Measured Resistances (See Note)	
1. Short ITD(N) and ITD(I) with a jumper at the DCC (or printer) end of cable. Measure the resistance at the SCC (DCC or MCC for printer cable) end.	1.	_____ ohms
2. Remove jumper from ITC pair and place jumper across ITC pair at the SCC (DCC or MCC for printer cable) end of cable. Measure the resistance at the DCC (printer for printer cable)	2.	_____ ohms
The cable: (See Note)	Passed ☐	Failed ☐

Note: The cable passes Loopback Resistance Tests if all measured values are less than 140 ohms.

AC TESTS

7.08 The Cross-talk Tests require a HP-3550B Communication Test Set or equivalent and two 135 ohm resistors. Connect the test set and resistors as shown in Fig. 10. Perform the tests in Table D.

Table D—Cross-Talk Tests		
Cable being tested: _____		
1. Set up the HP-3550B to the following conditions: (a) Connect the voltmeter common input (black) to the voltmeter ground terminal. (b) Connect the output & input center tap (CT) to voltmeter ground terminal. (c) Input & output impedance to 135 ohms. (d) Set frequency to > 5 Kc (greater than 5 Kc). (e) Set patch panel dB control to 0. (f) Set patch panel MEAS-CAL switch to CAL position, adjust the oscillator amplitude control to obtain a 0-dBm reading on the voltmeter.		
2. Set the MEAS-CAL switch to MEAS position. Measure the cross-talk at the following frequencies:	Measured Cross-Talk	
1. 10 KHz 2. 50 KHz 3. 100 KHz	Recalibration (see 1.f) may be required for each frequency setting.	1. _____ dBm 2. _____ dBm 3. _____ dBm
The cable: (See Note)	Passed ☐	Failed ☐

Note: The cable passes the Cross-Talk Tests if all measured values are lower than —48 dBm. As an example, —50 dBm would pass this test.

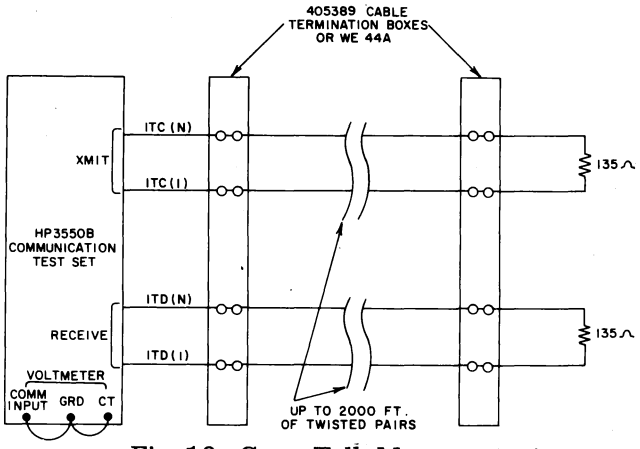


Fig. 10—Cross-Talk Measurements

7.09 The Loop-Loss Tests require a HP-3550B Communication Test Set and two jumpers. Connect the test set as shown in Fig. 11. Perform the tests in Table E.

Table E — Loop-Loss Test

Cable being tested: _____

1. With the test set connected as given in Fig. 11, set up the HP-3550B as instructed in Table D.
2. Set the MEAS-CAL switch to MEAS position.

Measure the loop-loss at the following frequencies:		Measured Loop-Loss	Maximum Loop-Loss allowed
1. 28 KHz 2. 56 KHz 3. 84 KHz	Recalibration (see 1.f of Table D) may be required for each frequency setting.	1. _____ dBm 2. _____ dBm 3. _____ dBm	7.5 dB 10.5 dB 12.5 dB

The cable: (See Note) Passed ☐ Failed ☐

Note: The cable passes Loop-Loss Tests if all measured values are less than maximum allowed values given in Table E.

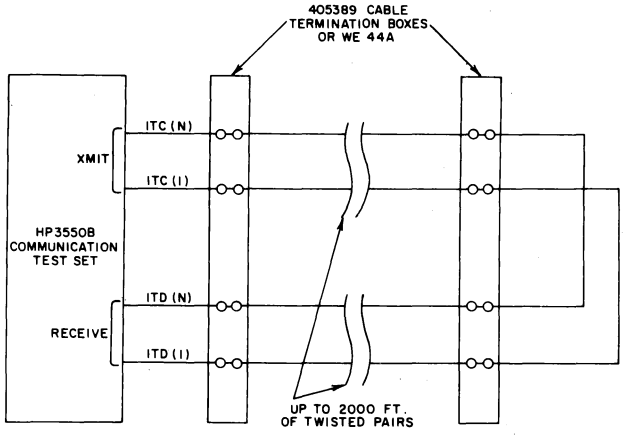


Fig. 11—Loop-Loss Measurements

7.10 The Background Noise Tests require a 6F Voice-band Noise Measuring set (or equivalent) and 2-135 ohm resistors. Connect the test set as shown in "Test 1" of Fig. 12 or 13 (as applies). Perform the tests in Table F.

Table F — Background Circuit Noise Tests

Cable being tested: _____

1. Plug in the 50 KHz weighting network on 6F Voice band Noise Measuring Test Set and calibrate as follows:

   (a) Set the Counter Separation switch to the 2 dB position.

   (b) Set the Function switch to CAL-CTR-BAT and turn the power switch on.

   (c) Verify that the meter indicates in the BAT GOOD area. Replace batteries that do not have good indication.

   (d) Adjust the Counter 1 CAL control until the associated counter just counts (the count will be erratic when properly adjusted).

   (e) Adjust the Counter 2, 3, and 4 controls by depressing the associated push button switch and adjusting the CAL control until the counter just counts as in Step (d). During calibration, only one counter will operate at a time.

   (f) Set the function switch to CAL-MTR and adjust the meter CAL control for a meter indication at the CAL marking.

2. Set the function switch to 600 ohm bridging. Adjust the DBRN dial to obtain a meter reading in the upper half of the meter scale.

3. The background noise level is the sum of the DBRN dial setting and the meter reading.

4. Connect the test set and resistors as shown in "Test 2" of Fig. 12 or 13 (as applies). Make the reading.

   "Test 1" Background noise level _____ DBRN
   "Test 2" Background noise level _____ DBRN

The cable: (See Note) Passed ☐ Failed ☐

Note: The cable passes the Background Noise Level Tests if both the DBRN reading are lower than 49 DBRN which corresponds to 7 millivolts rms.

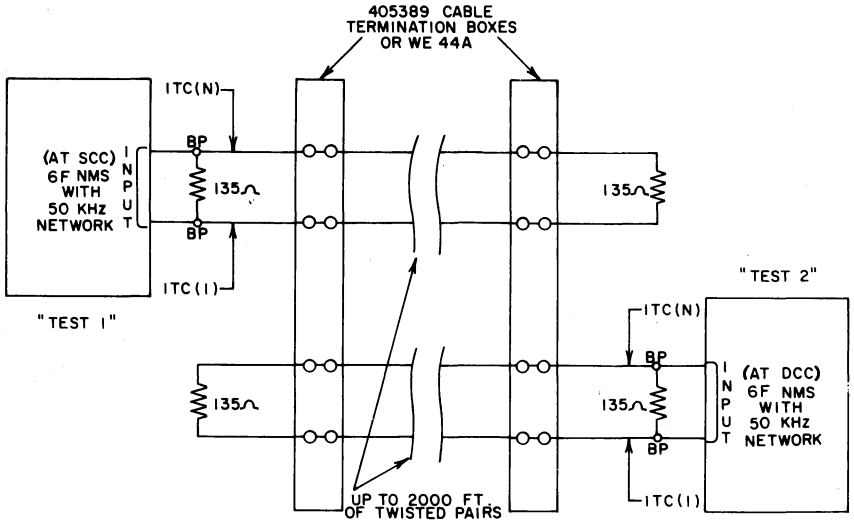
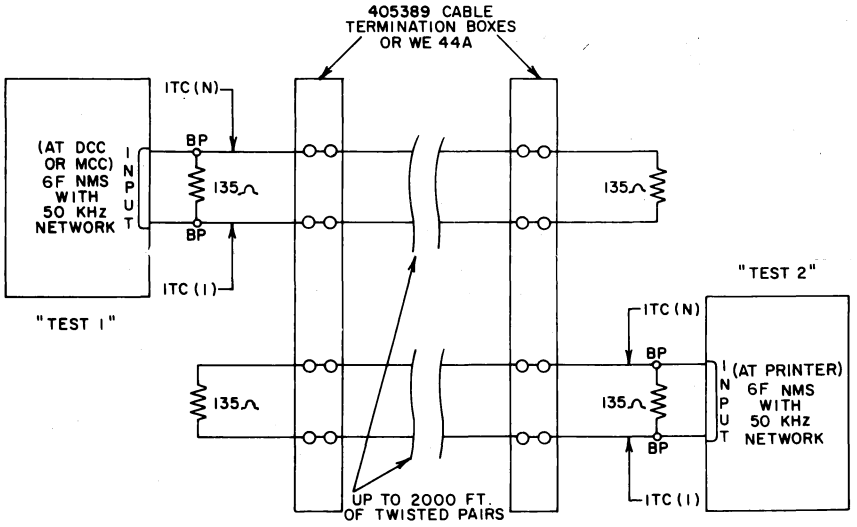


Fig. 12—Noise Measurements



BP = BRIDGE POINT

Fig. 13—Noise Measurements

7.11 The Impulse Noise Tests requires a 6F Voice Band Noise Measuring Set and two 135 ohm resistors. Connect the test set as shown in "Test 1" of Fig. 12 or 13 as applies. Perform the tests in Table G. Test 1 and Test 2 can be done simultaneously with two test sets and four resistors.

Table G — Impulse Noise Tests
Cable being tested: _____ 1. Set up and calibrate the 6F Voice Band Noise Measuring Set as instructed in Step 1 of Table F. 2. Set the function switch to 600 ohm bridging. Adjust the impulse noise threshold to 65 DBRN by setting DBRN dial to 35. Reset the counter to 00. 3. After resetting the counter, run the test for 30 minutes and take a reading. 4. Connect the test set and resistors as shown in "Test 2" of Fig. 12 or 13 as applies. Run test as directed in Steps 1-3. "Test 1" count _____ "Test 2" count _____
The cable: (See Note) Passed ☐ Failed ☐

Note: The cable passes the tests if a count of 1 or less is recorded for both Test 1 and Test 2.

7.12 The cable is considered suitable for use if it passes the tests of Tables A through G.