

# Graphic7

## COMPUTER GRAPHICS DISPLAY SYSTEM

ACCEPTANCE TEST  
PROCEDURE  
1088690 REV F



**SANDERS**  
ASSOCIATES, INC.

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APPLICATION		REVISIONS			
NEXT ASSY	USED ON	LTR	DESCRIPTION	DATE	APPROVED
		-	ADDED CONIC GENERATOR & HARD COPY TESTS	10/7/77	QOT
		A	<sup>1</sup> ADDED TESTS FOR 2-D COORD. CONV & 23 INCH DISPLAY INDICATOR.	1/18/78	QOT
			<sup>2</sup> REL FOR DEVELOPMENT	1-26-78	RT/QOT
Final	GRAPHIC 7	B	CORRECTED SHEETS 16, 40, 58 REVISED PHOTOPEN TEST 4.3.3 REVISED HARD COPY TEST 4.4.3	MAR 13, 78	QOT
		C	ADDED 64K MEMORY TEST SECTION 4.2.5	JAN. 19, 79	QOT
		D	ADDED HARD COPY MULTIPLEX SWITCH TEST, SECTION 4.4.4 REVISED 3.1.1, 2. & 3.2.1, 2. UPDATED TEST RECORD FOR NEW TEST	MAY 4, 79	QOT
		E	ADDED THE FOLLOWING TESTS: 3D COORD. CONV, EXPANSION MODULE, MULTI-PORT I/O (SWITCH OPTIONS), DATA TABLET, MODEL 5783+5784 KEY-BOARDS, 700 SERIES INDICATORS, DRIB (D) PARALLEL INTERFACE, HARRIS ABC/CBC/UBC PARALLEL INTERFACE	APR 21, 80	QOT
		F	CORRECTIONS AND CLARIFICATIONS MADE TO PAGES 21, 23, 61, 77, 79 & 82	DEC 16, 80	RTG

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES  
 .XX DECIMAL .XXX DECIMAL  
 ± ±  
 ANGLES SURFACE QUALITY  
 ± √ MAX  
 INTERPRET DWG PER 815002

**DEVELOPMENT CHANGE BY REV.**

MFG *W. Koch* 2-22-78

CONT NO.		DATE
ENGINEER	DR	
	APPD	
	CHK	
	DEV	<i>A. D. Tomlin</i> 20 JUL 77
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 <b>SANDERS ASSOCIATES, INC</b> NASHUA, NEW HAMPSHIRE	
ACCEPTANCE TEST PROCEDURE GRAPHIC 7 DISPLAY SYSTEM	
SIZE <b>A</b>	CODE IDENT NO. <b>94117</b>
DWG NO. 1088690	
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INTRODUCTION

The GRAPHIC 7 is a high performance, intelligent, refreshed graphics terminal system. It can be operated in a stand-alone configuration or it can be connected to a host computer. The system includes standard computer interfaces, built-in automatic self-test and diagnostics for fault isolation, and complete interactive graphics processing. The GRAPHIC 7 system comprises a terminal controller, display indicators, data entry devices, host computer interfaces, and various other options.

This document is the Acceptance Test Procedure for the GRAPHIC 7 Computer Graphics Display System. The procedures detailed herein provide for acceptance testing for each of the GRAPHIC 7 system elements configured for a customer's application.

The tests included in this document apply to the following equipment models:

<u>MODEL NO.</u>	<u>EQUIPMENT NAME</u>	<u>TEST PARAGRAPH</u>
5709, 7709	Terminal controller	3.0
5713	Multiport serial interface	4.2.1
5712	Parallel interface, PDP-11, DR11C	4.2.2
5743	Conic Generator	4.2.3
5752	2D coordinate converter	4.2.4
7702 thru 7704	Large read/write memory	4.2.5
5753	2-D/3-D coordinate converter	4.2.6
7750	Expansion module	4.2.7
5744	Floating point converter	4.2.8
5782 thru 5785	Alphanumeric/function keyboards	4.3.1
5786	Trackball	4.3.2
5787	Forcestick	4.3.2
5788	Data tablet	4.3.2
5781	PHOTOPEN	4.3.3
530 series	} 21-inch display indicators	4.4.1
730 series		
740 series		

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<u>MODEL NO.</u>	<u>EQUIPMENT NAME</u>	<u>TEST PARAGRAPH</u>
0565	23-inch display indicators	4.4.2
750, 753		
760, 763		
570	Hardcopy unit	4.4.3
575	Hardcopy multiplex switch	4.4.4
-	GSS-4 software	4.5.1
7775	GET-2 Tektronix simulator	4.5.2
5714	Parallel interface, PDP-11, DR11B	4.7.2
5715	Parallel interface, Interdata 7/16, 7/32, 8/32 SELCH; ULI	4.7.3
5716	Parallel interface, SEL-32; HSD-9132	4.7.4
5717	Parallel interface, Harris ABC, CBC, UBC	4.7.5
5718	Parallel interface, HP2100/21MXE	4.7.6
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5720	Parallel interface, NTDS Fast	4.7.8
5721	Parallel interface, NTDS Slow	4.7.9
5722	Parallel interface, Honeywell 516 DMC	4.7.10
5723	Parallel interface, NORD-10	4.7.11
5734	Long line parallel interface, PDP-11, DR11B	4.7.12

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SECTION 1

TEST REQUIREMENTS

1.1 General

Acceptance testing will be performed on each GRAPHIC 7 display system manufactured as a contract end item prior to customer delivery. The testing will verify that each item conforms to the customer's requirements of configuration and performance.

Section 3.0 describes those tests required to verify correct performance of a GRAPHIC 7 terminal controller without options.

All GRAPHIC 7 display system options are tested as part of Section 4.0. A complete ATP therefore would include the tests of Section 3.0 and those portions of Section 4.0 applicable to that customer's configuration.

1.1.1 Responsibility for Testing

Sanders Associates, Inc. shall be responsible for the performance of all test requirements herein. The testing shall be performed in strict accordance with this test procedure by employees of Sanders Associates.

1.1.2 Customer Representative(s)

A customer representative(s) may witness the testing but shall not have procedural jurisdiction. He shall have final acceptance/rejection authority within the guidelines of paragraph 1.4. He shall have the authority to have certain tests repeated if the test data is inconclusive.

1.1.3 Quality Assurance

A Sanders quality assurance representative shall witness the performance of this test to ensure that all aspects of the test are conducted within the provisions of this procedure. Customer acceptance test shall be conducted

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1.1.3 (continued)

under the direction of Sanders Quality Assurance who shall interface with the customer representative, and shall resolve all procedural disputes.

1.2 Equipment Configuration

The acceptance test article shall be of the approved configuration.

1.3 Test Results

All test results shall be entered on the Equipment Acceptance Test Record in the appropriate place. All test data taken shall remain on file at Sanders Associates and be available for customer review upon request.

1.4 Acceptance Criteria

Final acceptance of the GRAPHIC 7 display system is contingent upon successful completion of procedures contained herein. Any deviation from the performance specified in this procedure shall be classified as non-conformance. Non-conformance shall be categorized as follows:

- a. Display format presentation error
- b. Parameter out of tolerance

1.4.1 Display Format Presentation Error

A display format presentation error shall be defined as the displaying of incorrect data. The error shall not be a subjective measurement but shall be a hard data presentation error. It shall constitute a failure.

1.4.2 Parameter Out of Tolerance

A parameter out of tolerance is defined as a procedural parameter measurement that falls outside the limits defined on the Test Record. The measurement may be repeated a second time to verify the parameter value. A second non-conformance shall constitute a failure.

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1.4.3 Operator or Test Set-Up Error

Upon the occurrence of an operator, support equipment failure, or test set-up error, Sanders may restart the test at a point that will assure test validity after corrective action has been taken.

1.4.4 Occurrence of Non-Conformance

Upon the occurrence of a display format error, all further testing shall cease. The failure shall be analyzed to determine where it occurred. If support equipment failed, 1.4.3 shall apply. If the unit under test failed, it shall be rejected.

1.4.5 Certification of Test Data

Section 5 contains Test Record sheets for recording all observation and measurements required by this procedure. When signed at the conclusion of the test, these sheets shall serve as certification that the equipment under test has successfully met the requirements contained herein.

1.5 Test and Support Equipment

The following test and support equipment shall be used in the performance of this test procedure. Equivalent test or support equipment may be used subject to customer approval.

Prior to the start of testing, verification shall be made that all test equipment subject to calibration has been maintained in accordance with the calibration system requirements of MIL-C-45662 as evidenced by the presence of a valid, stamped, calibration sticker on the equipment.

Additional items other than those called out here may be included in the individual procedures for testing of special options (Section 4.0). These items will be so noted in the appropriate section.

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1.5.1 Support Equipment Required

1.5.1.1 Hardware

<u>ITEM</u>	<u>DESCRIPTION</u>	<u>MODEL OR PART NUMBER</u>
1*	Display indicator**	0530 or 730 (monochrome); 740 if color required
2*	Teletypewriter	ASR-33 or -35
3	Alphanumeric/function keyboard**	5782, 5783, 5784 or 5785
4*	Paper tape reader	Teleterminal 232
5	Multiport serial interface**	5713
6	Parallel interface test cable	1088691
7***	Multiport test plug	1088692

\* These items are required for terminal controller tests. If the customer's configuration includes display indicators and keyboards, those items shall be tested as described in Section 4.0.

\*\* Vendor is Sanders Associates, Inc. unless otherwise noted.

\*\*\*Not required if serial interface is part number 5976251.

1.5.1.2 Test Software

<u>ITEM</u>	<u>DESCRIPTION</u>	<u>PART NUMBER</u>
1	ROM comparison test program paper tape	
2	ROM comparison master source paper tape	
3	Multiport serial test program paper tape	
4	Parallel interface test program paper tape	
5	2-D coordinate converter ATP tape	
6	2-D/3-D coordinate converter ATP tape	
7	16K/32K/64K read/write memory test tape	
8	Expansion module test tape	
9	Floating point converter test tape	
10	Model 5784 keyboard test tape	G7 KEYS.LDA
11	T2C data load test program	

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1.5.2 Test Equipment

<u>ITEM</u>	<u>DESCRIPTION</u>	<u>VENDOR</u>	<u>PART/MODEL NUMBER</u>
1.	Oscilloscope	Tektronix	Model 465
2.	Harris I/O channel interface simulator	Sanders	
3.	Data General I/O channel interface simulator	Sanders	
4.	Digital Equipment Corp. I/O channel interface simulator	Sanders	
5.	SEL I/O channel interface simulator	Sanders	

1.6 Test Environment

The operating conditions shall be as follows:

Ambient temperature	Normal room
Relative humidity	Normal room
Primary voltage	One of the following (per customer's configuration):
	100 Vac $\pm$ 10%
	115 Vac $\pm$ 10%
	120 Vac $\pm$ 10%
	220 Vac $\pm$ 10%
	230 Vac $\pm$ 10%
	240 Vac $\pm$ 10%
Primary frequency	60 Hz $\pm$ 5%

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SECTION 2

PRE-TEST CONDITIONS

2.1 Introduction

The following paragraphs are for reference information only. The ATP can begin with Sections 3.0 and 4.0 (if applicable). This assumes that the unit or system under test is already operational prior to the start of the ATP. Additional items, such as options, will be connected as indicated in the appropriate sections.

The pre-turn-on checks listed below must be made before the system can be energized from a full power-off condition to a full power-on condition.

2.2 Pre-Turn-On Checks and Settings

Prior to connecting AC power cords or energizing the main power bus, all units must be checked for proper switch and control settings as follows:

2.2.1 Voltage Selection Tabs and Jumpers

- a. Verify that the removable printed circuit tab in the power control panel is inserted in the appropriate voltage position (120 or 240). (Not applicable to Model 5709 terminal controller.)
- b. Verify that the low voltage power supply in the display indicator is properly strapped for the designated voltage (refer to drawing 5978887). (Not applicable to 0530-series display indicators.)
- c. If a hardcopy unit is included in the configuration, verify that the removable printed circuit tab in the power control panel is inserted in the appropriate voltage position (120 or 240).

2.2.2 Terminal Controller

- a. POWER ON/OFF switch to OFF.

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2.2.3 Display Indicator

MODEL 0530

MODEL 730

MODEL 740

- |   |   |   |
|---|---|---|
| a. POWER switch to OFF                      | Press 0 side of power switch                        | Press 0 side of power switch                        |
| b. CONTRAST control fully counterclockwise  |   |   |
| c. INTENSITY control fully counterclockwise | Intensity control (sunburst) fully counterclockwise | Intensity control (sunburst) fully counterclockwise |

2.2.4 Paper Tape Reader

- a. POWER switch to OFF.

2.3 Equipment Connections

Before performing the ATP, interconnect the terminal controller and the following units:

1. Paper tape reader to multiport serial interface assembly port 1 (J3).
2. Teletypewriter to ROM and status card assembly (A9 slot), serial I/O port (J2)

or

keyboard to multiport serial interface assembly port 3 (J5).

3. Display indicator X, Y, Z inputs to the appropriate X, Y, and Z outputs on the output channel card assembly:
  - a. X - J1
  - b. Y - J3
  - c. Z - J5
4. Connect all AC power cords.

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2.4 Turn-On/Turn-Off Sequence

After all AC power cords are connected and main power bus is energized, perform turn-on sequence as follows (turn-off is the reverse of turn-on):

1. At teletypewriter, set rotary switch to ON LINE.
2. At terminal controller, set POWER switch to ON. Verify that proper indicator lights (Model 5709, red POWER indicator; Model 7709, RUN/SYS indicator lit).
3. Turn on display indicator (Model 0530: press ON side of POWER switch; Models 730 or 740, press 1 side of power switch).

2.5 Equipment Warm-Up

All test and support equipment and the GRAPHIC 7 system under test shall be turned on at least 30 minutes before the start of the ATP.

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SECTION 3

STANDARD GRAPHIC 7 ATP TESTS

3.1 General

These tests are designed to verify performance of the basic GRAPHIC 7 terminal controller, without options. The test assumes that the display indicator, teletypewriter and/or keyboard have been previously verified and are part of the test set-up.

If a display indicator is being tested as part of this ATP, it can be substituted for the indicator normally used as support equipment. This applies to the keyboard also. These items will then be tested as part of Section 4.0.

The basic terminal controller consists of the following assemblies:

<u>NAME</u>	<u>ASSEMBLY NUMBER</u>
Display processor	1086779
ROM and status	1086746 or [    ]
Graphic controller	1086758 or [    ]
R/W memory (RAM)	(See note)
D/A converter (2)	1086775
Ramp generator	1086798
Character generator	1086783
Output channel	1086771 or [    ]

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NOTES

1. A multiport serial interface shall be installed. Even if a multiport serial interface is not part of the basic terminal controller, it is required for loading ROM comparison test tapes (paragraph 3.3).
2. R/W (RAM) memory can be any of the following configurations:
  - a. 8K to 24K, consisting of one, two, or three Model 5702 8K modules.
  - b. 16K to 64K, consisting of a single Model 7702, 7703, or 7704 large R/W memory card.
  - c. 80K to 128K, consisting of a Model 7704 large R/W memory card plus a Model 7702, 7703, or 7704 card.
  - d. 48K, consisting of a Model 7703 large R/W memory card plus a Model 7702 card.

Acceptance testing of configuration a. above is performed as part of the terminal verification memory diagnostic test (paragraph 3.1.1). A separate section 4.0 test is not required.

Acceptance testing of configurations b., c., or d. above is described in paragraph 4.2.5.

3.1.1 Standard Tests

1. The standard tests for the terminal controller are:
  - a. Terminal verification pattern test
  - b. ROM comparison test
2. The standard controller tests of this section are run prior to testing the various system options. Note that in the terminal verification pattern test, circles and conics and/or translated, rotated data

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3.1.1 (continued)

elements will be missing or present in the test pattern depending on the options configured. This fact must be taken into consideration prior to verifying test pattern results.

For example, if the conic generator option is not installed, the circles and ellipses of figure 3-1 will be displayed as diamonds. Character generators containing special symbols will have the special symbols displayed below the standard character set shown in figure 3-1. Installation of a 2-D coordinate converter will result in the center ellipses rotated and translated to the upper left-hand corner of the display.

3.2 Terminal Verification Pattern Test

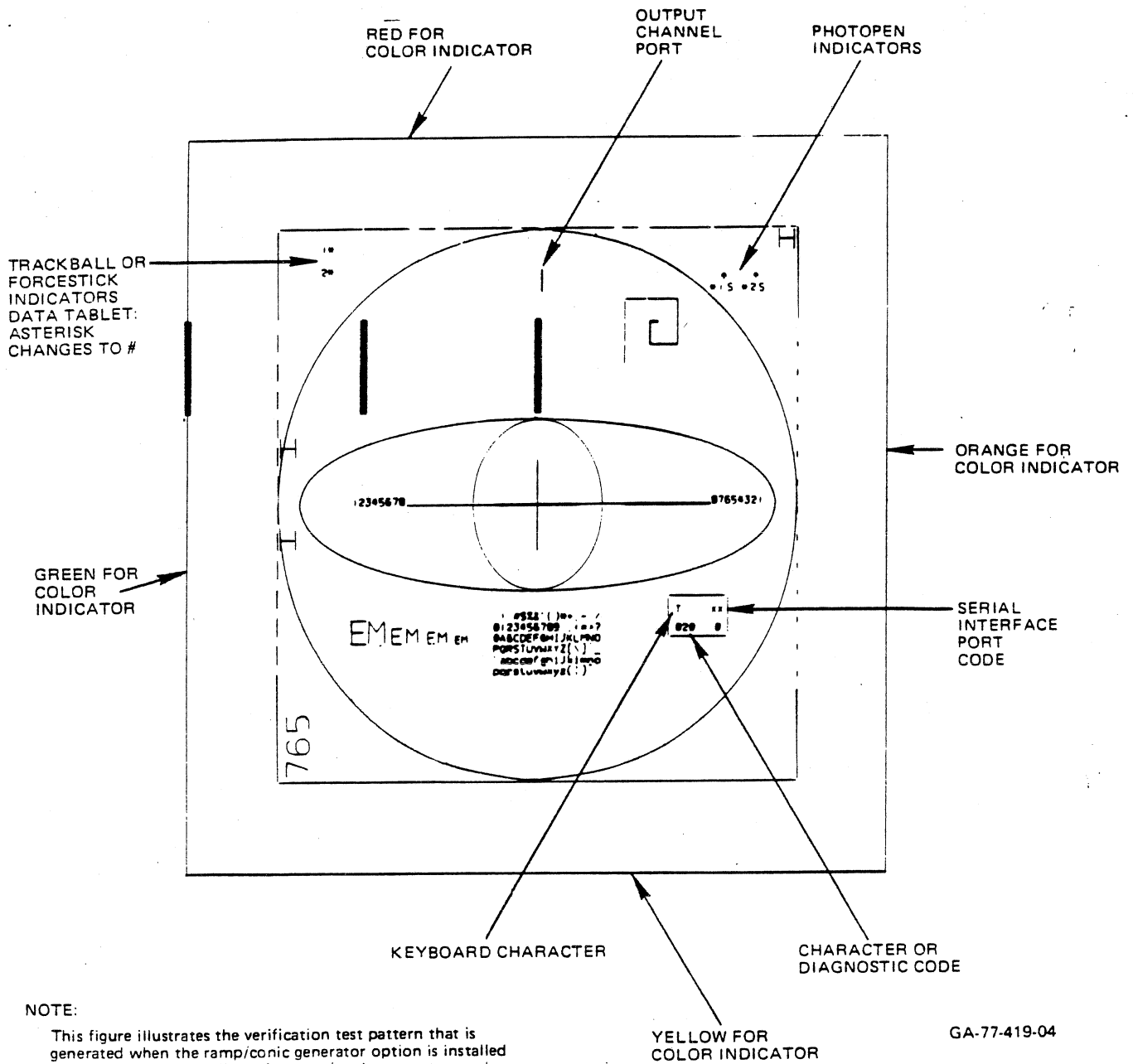
This test utilizes the built-in, ROM diagnostic program of the GRAPHIC 7. The terminal verification pattern (figure 3-1) is used to verify correct operation of the vector/position generator, 2-D coordinate converter, conic generator, character generator, and output channel. It also provides a go/no-go readout that verifies the digital processing circuits in the terminal controller by means of a display processor diagnostic, memory diagnostic, display generator diagnostic, and an interface diagnostic. All of these diagnostics are contained in ROM and are run automatically without operator intervention required.

3.2.1 Procedure

1. With all equipment energized, place the terminal controller in the LOCAL mode by pressing the LOCAL pushbutton on the GRAPHIC 7 control panel. The terminal verification test pattern (figure 3-1) is displayed on the display indicator.

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**NOTE:**

This figure illustrates the verification test pattern that is generated when the ramp/conic generator option is installed in the terminal controller. If a ramp/conic generator card is not installed, each circle and ellipse will be displayed as four straight lines. If a 2-D coordinate converter card is installed in the terminal controller, all information contained within the ellipse will be rotated, translated and displayed at the top left of the display.

GA-77-419-04

Figure 3-1. Terminal Verification Test Pattern

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2. Verify that the pattern displayed on the display indicator is the same as the pattern shown in figure 3-1. Ensure that:
  - (1) No X-axis ghosting appears in the letters H at the left vertical edge.
  - (2) The 3/4 screen box is composed of the four types of line structure shown in figure 3-1.
  - (3) The bold vertical bars located at the full, 1/4 and 1/2 screen horizontal positions consist of nine parallel lines each with no offset evident at the tops or bottoms.
  - (4) The boxes appear as shown in figure 3-1 without excessive bright spots.
  - (5) In the "EM" displays at the lower left of the screen, the upper edge of the largest E is aligned with the topmost dot and the right side edge of the largest M is aligned with the right-most dot. (Note: This assumes a 12 x 12 inch display area.)
  - (6) The complete set of alphanumeric characters shown at the bottom center of figure 3-1 is displayed on the screen.
  - (7) The numbers 7 through 0 (0 not visible) are shown rotated 90° counterclockwise at the lower left corner of the 3/4 screen box in vertically oriented descending order with brightness levels varying from greatest intensity for 7 to fully blanked for 0.
  - (8) The number at the top center of the screen reflects the Z-axis channel (1 through 4) of the output channel card to which the display indicator Z input is connected (in figure 3-1, channel 1 is used).

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3.2.1 (continued)

- (9) The readout box at the lower right of the display contains 070 (a go indication) in the left field with a "T" above it (indicating test). The right field of the readout box indicates the initialized state with the code "XX". The single changing number is the real-time clock test changing at a one-second interval. Verify that the code 070 is displayed.\*\*

3.3 ROM Comparison Test

3.3.1 General

Supplied with the GRAPHIC 7 terminal controller is a control, or monitor program, called the graphics control program (GCP)\*. GCP is contained in firmware located on the ROM and status card. The contents of the GCP firmware is tested by the ROM comparison test. This test verifies that the bit pattern stored in the GCP PROM's agrees with a software master source tape which contains the master GCP ROM bit patterns.

3.3.2 Procedure

1. Position the ROM comparison test program tape in the paper tape reader and load it according to the loading procedure contained in Appendix A.
2. After the test program is loaded, the terminal controller will be in the MONITOR mode. This is indicated by the alphabetic character M (B0 M for GCP+) in the center of the display.

\* Unless otherwise specified, all statements with respect to GCP also apply to GCP+ (Graphic Control Program Enhanced).

\*\* For systems containing optional circuit cards, see Section 2.2.1 of the Programmers Reference Manual for the correct code.

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▼

**REVISIONS**

LTR	DESCRIPTION	DATE	APPROVED

3.3.2 (continued)

3. Position the ROM comparison master source tape in the paper tape reader and type the following command: 3000G RETURN or 3000G NEW LINE.
4. Upon execution, verify that the ROM comparison master source tape has been read and loaded and that the display indicator display is as shown in figure 3-2.
5. If FAILED should be displayed instead of PASSED, the number of errors detected will be displayed on the ERROR COUNT IN BYTES line and the location of the last error detected will be displayed on the ERROR LOCATION line. Figure 3-3 shows a typical (software simulated) failure display in which one error was detected at location 151112.
6. This test may be rerun by pressing the LOCAL pushbutton on the terminal controller, pressing the RETURN key on the teletypewriter or NEW LINE on the keyboard, and rerunning the ROM comparison master source tape according to paragraph 3.3.2, step 3.

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SANDERS ASSOCIATES  
 GRAPHIC 7  
 ATP ROM TEST

CURRENT MEMORY LOCATION: 173777\*  
 ERROR COUNT IN BYTES: 000000  
 ERROR LOCATION: 000000

PASSED

\*This location is for REV1 of GCP+. For any other version of GCP this listing must be consulted for the highest byte address in the program. This address is the one which will be displayed as the Current Memory Location.

Figure 3-2. ROM Comparison Test, GO Display

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REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

SANDERS ASSOCIATES  
 GRAPHIC 7  
 ATP ROM TEST

CURRENT MEMORY LOCATION: 157777  
 ERROR COUNT IN BYTES: 000001  
 ERROR LOCATION: 151112

FAILED

Figure 3-3. ROM Comparison Test, Typical Error Display

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SECTION 4

GRAPHIC 7 OPTIONS, ATP TESTS

4.1 General

These tests are designed to verify performance of the various GRAPHIC 7 options. These options can be classified into five groups:

- Terminal controller options
- Data entry options
- Display indicator options
- Software/firmware options
- Special options

A further breakdown of these groups is as follows:

- |    |  |                             |
|----|--|-----------------------------|
| 1. | <u>Terminal Controller Options</u>       | <u>Model Number</u>         |
|    | • Multiport serial interface             | 5713                        |
|    | • Parallel interface                     | Various                     |
|    | • Ramp/conic generator                   | 5734                        |
|    | • 2-D coordinate converter               | 5752                        |
|    | • 2-D/3-D coordinate converter           | 5753                        |
|    | • Large R/W memory                       | 7702/7703/7704              |
|    | • Expansion module                       | 7750                        |
|    | • Floating point converter               | 5744                        |
| 2. | <u>Data Entry Options</u>                |                             |
|    | • Alphanumeric/function keyboard         | 5782/5783                   |
|    | • Lighted alphanumeric/function keyboard | 5784/5785                   |
|    | • PED - Trackball or forcestick          | 5786/5787                   |
|    | • Data tablet                            | 5788                        |
|    | • PHOTOPEN                               | 5781                        |
| 3. | <u>Display Indicator Options</u>         | <u>Model Number</u>         |
|    | • 21-inch rectangular, monochrome        | 0530 series/<br>0730 series |
|    | • 23-inch round, monochrome              | 0565/750/753                |
|    | • 21-inch rectangular, four color        | 740 series                  |
|    | • 23-inch round, four color              | 760 series                  |

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4.1 (continued)

3.	<u>Display Indicator Options (Cont)</u>	<u>Model Number</u>
	• Hardcopy Unit	0570
	• Hardcopy Multiplex Switch	0575
4.	<u>Software/Firmware Options</u>	<u>Model Number</u>
	• GSS-4	
	• Special GCP (multitask)	
	• GET-2 Tektronix® Emulator	7775

4.1.1 Option Testing Sequence

The GRAPHIC 7 display system can be assembled in any number of different configurations using the various options and subsystem elements. The testing sequence for any of these configurations should be as follows:

1. Test the basic terminal controller as per Section 3.0.
2. Test each option as per the applicable paragraph of Section 4.0.
3. Perform special tests as per the applicable paragraph of Section 4.0.
4. Repeat the tests for duplicate options.

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SECTION 4.2

TERMINAL CONTROLLER OPTIONS TESTS

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4.2.1 Multiport Serial Interface Test

4.2.1.1 General

This test verifies that each multiport serial interface sends and receives a table of test characters with the transmit and receive interrupt both enabled and disabled. This test is performed in a "wrap-around" mode. That is, the output of each port is fed directly back to the input, thereby verifying the correct transmission and reception of data without requiring another device.

NOTE

Two models of serial interface are now in use. To test part number 1086750 requires that an external jumper be connected between pins 1 and 5 of each of the ports. Part number 5976251 can be tested without external jumpers; it contains an internal loopback circuit.

4.2.1.2 Procedure

NOTES

This test can be conducted with either one or two multiport serial interfaces installed in the terminal controller. The test shall be conducted on every port. On part number 1086750, more than one port can be tested without external jumpers; it contains an internal loopback circuit.

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4.2.1.2 (continued)

1. (Part number 1086750 only) Connect multiport test plugs to 10-pin connectors of multiport serial interface card.
2. (Both models) Position multiport serial test program tape in paper tape reader and load it as described in Appendix A.
3. Verify that the tape has been read and loaded and the display indicator presentation is as shown in figure 4-1.

NOTE

Figure 4-1 is for the case of a part number 5976251. The display for part number 1086750 pays "EXTERNAL LOOPBACK TEST." In the latter case, each port with a test plug connected should show as passing. Ports without test plugs connected should show as failing. See figures 4-2 and 4-3.

4. If necessary, move the multiport test plug to the next port to be tested. Rerun the test as follows:
  - a. Press LOCAL pushbutton.
  - b. Type NEW LINE or RETURN to get back to monitor mode.
  - c. Type 3000G RETURN on teletypewriter or NEW LINE on keyboard.

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LTR	DESCRIPTION	DATE	APPROVED

SANDERS ASSOCIATES  
 GRAPHIC 7

SERIAL MULTIPOINT ATP  
 INTERNAL LOOPBACK TEST

PORT	PASS	FAIL
Ø1	**	
Ø2	**	
Ø3	**	
Ø4	**	
Ø5	**	
Ø6	**	
Ø7	**	
Ø8	**	

\*\*\*\*\* DONE \*\*\*\*\*

Figure 4-1. Serial Multipoint Test, GO Display

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LTR	DESCRIPTION	DATE	APPROVED

SANDERS ASSOCIATES  
 GRAPHIC 7  
 SERIAL MULTIPOINT ATP

INTERNAL LOOPBACK TEST

PORT	PASS	FAIL
Ø1		**
Ø2	**	
Ø3	**	
Ø4	**	
Ø5	**	
Ø6	**	
Ø7	**	
Ø8	**	

\*\*\*\*\* DONE \*\*\*\*\*

Figure 4-2. Serial Multipoint Test, Typical Error Display  
 (Port 1 Failure)

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SANDERS ASSOCIATES  
 GRAPHIC 7  
 SERIAL MULTIPOINT ATP

INTERNAL LOOPBACK TEST

PORT	PASS	FAIL
Ø1		**
Ø2	**	
Ø3	**	
Ø4		**
Ø5	**	
Ø6		**
Ø7	**	
Ø8	**	

\*\*\*\*\* DONE \*\*\*\*\*

Figure 4-3. Serial Multipoint Test, Typical Error Display  
 (Ports 1, 4 and 6 Failures)

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4.2.2 Parallel Interface Test, Model 5712

NOTE

If parallel interface is not Model 5712, go to paragraph 4.7.

4.2.2.1 General

This test verifies that the parallel interface transmits and receives data under the following conditions:

1. Single word transfer without any interrupts enabled (DMA OFF).
2. DMA IN transfer without any interrupts enabled.
3. DMA OUT transfer without any interrupts enabled.
4. Single word transfer with input interrupt enabled (DMA OFF).
5. Single word transfer with output interrupt enabled (DMA OFF).
6. DMA IN transfer with input interrupt enabled.
7. DMA OUT transfer with output interrupt enabled.

This test is performed in a "wrap-around" mode. That is, output data is fed directly back to the input; this allows for a standalone test without benefit of a host computer.

4.2.2.2 Procedure

1. Connect the parallel interface test cable between input and output connectors (J2 and J3) on the parallel interface card.

NOTE

When connecting the test cable, ensure that the red edge of the cable ribbon faces upward at both connectors.

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REVISIONS

LTR	DESCRIPTION	DATE	APPROVED

4.2.2.2 (continued)

2. Position the parallel interface test program tape in the paper tape reader and load it according to the loading procedure described in Appendix A.
3. Upon execution, verify that the tape has been read and the display indicator displays that all tests have passed. See figure 4-4.
4. Change the processor priority level of the test program in order to test the parallel interface board interrupt level. This is done by performing the following:
  - a. Restart system by pressing LOCAL pushbutton on terminal controller
  - b. Type RETURN or NEW LINE to enter MONITOR mode.
  - c. Type 3010/
  - d. The contents of location 3010 is displayed with the teletypewriter readout now being 3010/000230.
  - e. Change contents of location 3010 from 230 to 237 (priority level set to 7) by typing 237 RETURN.
  - f. The teletypewriter readout is now:
 

3010/000230 237 RETURN
5. Execute program again by typing 3000G RETURN.
6. Upon execution, verify that the display indicator displays that the tests without interrupts enabled still pass while those with interrupts enabled have failed. (See figure 4-5.)
7. Disconnect one end of the parallel interface test cable from the parallel interface card and change contents of location 3010 back to 230 using the procedure established in step 4.

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REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

SANDERS ASSOCIATES  
 GRAPHIC 7  
 PARALLEL INTERFACE ATP  
 PASS      FAIL

WITHOUT INTERRUPTS

DMA OFF            \*\*  
 DMA IN            \*\*  
 DMA OUT           \*\*

WITH INTERRUPTS

DMA OFF            \*\*  
 DMA IN            \*\*  
 DMA OUT           \*\*

\*\*\*\*\* DONE \*\*\*\*\*

Figure 4-4. Parallel Interface Test Display, All Tests Pass

SIZE	CODE IDENT NO.	DWG NO.
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REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

SANDERS ASSOCIATES  
GRAPHIC 7

PARALLEL INTERFACE ATP

PASS      FAIL

WITHOUT INTERRUPTS

DMA OFF      \*\*  
DMA IN        \*\*  
DMA OUT      \*\*

WITH INTERRUPTS

DMA OFF                    \*\*  
DMA IN                     \*\*  
DMA OUT                    \*\*

\*\*\*\*\* DONE \*\*\*\*\*

Figure 4-5. Parallel Interface Test Display, Interrupt Tests Fail

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4.2.2.2 (continued)

- 8. Execute program again by typing 3000G RETURN.
- 9. Upon execution, verify that the display indicator displays that all tests have failed (see figure 4-6).

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LTR	DESCRIPTION	DATE	APPROVED

SANDERS ASSOCIATES  
GRAPHIC 7

PARALLEL INTERFACE ATP

PASS      FAIL

WITHOUT INTERRUPTS

DMA OFF	**
DMA IN	**
DMA OUT	**

WITH INTERRUPTS

DMA OFF	**
DMA IN	**
DMA OUT	**

\*\*\*\*\* DONE \*\*\*\*\*

Figure 4-6. Parallel Interface Test Display, All Tests Fail

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LTR	DESCRIPTION	DATE	APPROVED

4.2.3 Conic Generator Test

4.2.3.1 General

This test verifies that the conic generator is capable of generating circles and on-axis ellipses. The conic generator option replaces the ramp generator that is normally part of the basic terminal controller, and serves both as a ramp generator and a conic generator.

4.2.3.2 Procedure

1. Place the terminal controller in the LOCAL mode by pressing the LOCAL pushbutton on the GRAPHIC 7 control panel.
2. Verify that the pattern displayed on the display indicator is as shown in figure 3-1.
3. In particular, note the following:
  - a. A circle is drawn tangent to the four cardinal points of the inner square.
  - b. Two on-axis ellipses are drawn about the center cross. The larger ellipse has its major axis in the X-plane, the smaller ellipse has its major axis in the Y-plane.

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4.2.4 2D Coordinate Converter Test

4.2.4.1 General

This test verifies that the 2D coordinate converter option provides for programmed translation and rotation of displayed data (characters and vectors).

4.2.4.2 Procedure

1. Using the tape loading procedure of Appendix A, load the 2-D coordinate converter ATP test tape. The test is self-starting and requires no operator intervention after it is loaded.
2. Verify that the test pattern displayed on the display indicator is the same as that shown in figure 4-7 and as described below:
  - a. This is a dynamic test pattern and as such requires approximately six seconds for a complete cycle.

NOTE

The pattern cycle time is not an acceptance requirement and does not require measurement.

- b. The two logo boxes located above the ROTATION nomenclature rotate 360° about a center axis in a counterclockwise rotation.
- c. The two logo boxes located above the ZOOM nomenclature zoom in and out from a point. In addition, the box orientation is upside down during part of the cycle.
- d. In particular note the following:
  1. No jumping or discontinuous action such as stopping and starting.
  2. Rotation and zooming shall each be a continuous, smooth operation.

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LTR	DESCRIPTION	DATE	APPROVED



SANDERS GRAPHIC SEVEN  
 COMPUTER GRAPHICS DISPLAY SYSTEM  
 2-D COORDINATE  
 CONVERTER ATP



ZOOM  
 -X TRANSLATION  
 +Y TRANSLATION

ROTATION  
 +X TRANSLATION  
 +Y TRANSLATION



ROTATION  
 -X TRANSLATION  
 -Y TRANSLATION



ZOOM  
 +X TRANSLATION  
 -Y TRANSLATION

Figure 4-7. 2D Coordinate Converter Test Display

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▼

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4.2.4.2 (continued)

3. The boxes shall only move about a center axis and not be displaced as they rotate or zoom.
3. The complete cycle that the test pattern goes through is as follows:
    - a. At the start (0°), all four logo boxes are the same size and oriented in the same direction (horizontal).
    - b. As the two boxes rotate, the zoom logos recede to a dot - this is at the 90° point of rotation.
    - c. The zoom logos now zoom out from a point to full size, upside down. They are full size at the 180° point of rotation.
    - d. As the rotation continues counterclockwise, the boxes again recede to a dot; this occurs at 270°.
    - e. The boxes zoom out from a dot, reaching full size at the 360° point of rotation, and with all boxes in the correct orientation. The cycle now repeats.

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4.2.5 Large R/W Memory Test

4.2.5.1 General

The large R/W memory test verifies operation of:

- a. Single Model 7702, 7703, or 7704 memory cards.
- b. Various two-card combinations up to a total of 128K words of memory.
- c. The special (discontinuous) 32K memory card.

The large R/W memory test consists of the following sub-tests:

- a. Memory sizing check, direct
- b. Memory sizing check, indirect
- c. Memory exerciser check, direct
- d. Memory mapping test (not applicable to Model 7702)

The Model 7702 16K memory consists of four 4K blocks of R/W memory (each 4K block is called a page). The model 7703 has eight such pages and the model 7704 has sixteen such pages. The special (discontinuous) memory card contains pages 0-3 and 8-11.

Models 7703, 7704, and the special memory card have three designated map areas.

The program resides in the first 4K words of memory (page 0).

4.2.5.2 Test Description

When the program is loaded via a paper tape reader, a prompt is given by the teletypewriter printing "\*". This prompt is given by a debugger program which resides along with the test program.

The program begins by checking for memory size by direct addressing. Next, using one of the page registers and mapper (initially checked), the memory is sized for the number of pages - either 8 or 16. Once the memory

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4.2.5.2 (continued)

is sized, an exhaustive check of page 1 (second 4K of memory) is made. The program then relocates to this page and performs the same test on page 0, where the program normally resides. After this test the program relocates itself back to page 0. This completes sub-tests 1-3. .

The fourth sub-test now performs the following checks (not applicable to Model 7702):

1. Verifies page register operation.
2. Verifies that data can be mapped anywhere in memory using the page register feature.
3. Verifies that mapped data appears only in the map area that is supposed to be in and no other.
4. Using the mapper, the program checks every location of each page for integrity.

Test times are as follows (assuming a 64K memory is undergoing test):

<u>Subtest</u>	<u>Time (approximate)</u>
1 and 2	1 minute
3	2 minutes
4	1 minute

Total test time is approximately 4 minutes.

4.2.5.3 Procedure

1. Using the tape loading procedure of Appendix A, load the 16K/32K/64K R/W memory test tape.
2. After the tape loading procedure is complete, using the teletypewriter, type the following after the \* prompt:

```

* 15050/000726           240
* 15240/012737           470
* 14200: G
```

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4.2.5.3 (continued)

NOTE: The /000726 and /012737 will be printed by the debugger.

3. The program will now print the title  

GRAPHIC 7 MEMORY TEST 128K

and additional data as shown in figures 4-8 through 4-11.
4. After "PAGE #01" is printed, type control C ( C) on the teletypewriter.  

The \* prompt will now be typed signifying the end of the test.
5. There is a 2-second delay loop in the program which allows the operator time enough to hit any teletypewriter character and interrupt the program. Once hit, the program goes to the debugger and the \* prompt appears on the teletypewriter. If the operator misses the 2-second debug, he can still interrupt the program by hitting a control character. However, response to this interrupt will take about 1 minute.

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MEMORY SIZING-DIRECT

<u>PAGE NO.</u>	<u>MEM. TYPE</u>	<u>COMMENT</u>
Ø1	RAM	
Ø2	RAM	
Ø3	RAM	
Ø4	RAM	
Ø5	RAM	
Ø6	ROM	

MEM. SIZING-VIA MAPPER

<u>PAGE NO.</u>	<u>MEM. TYPE</u>	<u>COMMENT</u>
Ø1	RAM	
Ø2	RAM	
Ø3	RAM	
Ø4	RAM	
Ø5	RAM	
Ø6	RAM	
Ø7	RAM	
Ø8	RAM	
Ø9	RAM	
1Ø	RAM	
11	RAM	
12	RAM	
13	RAM	
14	RAM	
15	RAM	

RAM TESTING-DIRECT

PAGE # Ø1  
PAGE # ØØ

BEGIN MAP TEST  
PAGES Ø1 - 15

END OF PASS # Ø1

RAM TESTING-DIRECT  
PAGE # Ø1

Figure 4-8. Printout for Model 7704 (64K Memory)

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MEMORY SIZING-DIRECT

<u>PAGE NO.</u>	<u>MEM. TYPE</u>	<u>COMMENT</u>
Ø1	RAM	
Ø2	RAM	
Ø3	RAM	
Ø4	RAM	
Ø5	RAM	
Ø6	ROM	

MEM. SIZING-VIA MAPPER

<u>PAGE NO.</u>	<u>MEM. TYPE</u>	<u>COMMENT</u>
Ø1	RAM	
Ø2	RAM	
Ø3	RAM	
Ø4	RAM	NONE
Ø5	RAM	NONE
Ø6	RAM	NONE
Ø7	RAM	NONE
Ø8	RAM	
Ø9	RAM	
1Ø	RAM	
11	RAM	
12	RAM	NONE
13	RAM	NONE
14	RAM	NONE
15	RAM	NONE

RAM TESTING-DIRECT

PAGE # Ø1  
PAGE # ØØ

BEGIN MAP TEST  
PAGES Ø - 15

END OF PASS # Ø1

RAM TESTING-DIRECT  
PAGE # Ø1

Figure 4-9. Printout for Special 32K Memory Card

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MEMORY SIZING-DIRECT

<u>PAGE NO.</u>	<u>MEM. TYPE</u>	<u>COMMENT</u>
Ø1	RAM	
Ø2	RAM	
Ø3	RAM	
Ø4	RAM	
Ø5	RAM	
Ø6	ROM	

MEM. SIZING-VIA MAPPER

<u>PAGE NO.</u>	<u>MEM. TYPE</u>	<u>COMMENT</u>
Ø1	RAM	
Ø2	RAM	
Ø3	RAM	
Ø4	RAM	
Ø5	RAM	
Ø6	RAM	
Ø7	RAM	

RAM TESTING-DIRECT

PAGE # Ø1  
 PAGE # ØØ

BEGIN MAP TEST

PAGES Ø1 - Ø7

END OF PASS # Ø1

RAM TESTING-DIRECT

PAGE # Ø1

Figure 4-10. Printout for Model 7703 (32K Memory)

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MEMORY SIZING-DIRECT

<u>PAGE NO.</u>	<u>MEM. TYPE</u>	<u>COMMENT</u>
Ø1	RAM	
Ø2	RAM	
Ø3	RAM	

RAM TESTING-DIRECT

PAGE # Ø1  
PAGE # ØØ

END OF PASS # Ø1

RAM TESTING-DIRECT

PAGE # Ø1

Figure 4-11. Printout for Model 7702 (16K Memory)

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4.2.6 2-D/3-D Coordinate Converter Test

4.2.6.1 General

This test verifies that the 2-D/3-D coordinate converter option performs three-dimensional translation with zoom.

4.2.6.2 Procedure

1. Using the tape loading procedure of Appendix A, load the 2-D/3-D coordinate converter ATP tape. The test is self-starting and requires no operator intervention after it is loaded.
2. Verify that the test pattern presented on the display indicator is as follows:

NOTE

This is a dynamic test pattern and requires approximately ten seconds for a complete cycle. Pattern cycle time is not an acceptance requirement and does not require measurement.

- a. The display consists of a cube, tumbling in all directions.
- b. As the cube tumbles, it zooms in and out from a point.
- c. In particular observe the following:
  1. No jumping or discontinuous action such as stopping and starting.
  2. Tumbling and zoom shall each be a continuous, smooth operation.

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4.2.7 Expansion Module Tests

The expansion module assembly is tested as a function of the programs installed on it. Refer to the appropriate software test in Section 4.5.

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4.2.8 Floating Point Converter Test

4.2.8.1 General

This procedure tests the ability of the Model 5744 floating point converter to make input and output conversions.

NOTE

When the floating point converter is installed in the GRAPHIC 7, the ROM and Status card must be part number 1088682G2 (8K model) with the floating point converter program installed in the lower 4K. The operating program must be the basic GCP. The floating point converter does not work with GCP+.

4.2.8.2 Procedure

1. Using the tape loading procedure of Appendix A, load the floating point converter test tape.
2. On the teletypewriter (connected to the ROM and status card), press the % key. The display shows DATA CONVERTER TEST and the teletypewriter prints \*.
3. From this point on, the test is fully automatic. Proper operation is indicated by the following sequences on the display indicator:

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4.2.8.2 (continued)

<u>SEQUENCE</u>	<u>DURATION</u>	<u>DISPLAY</u>
1	<div style="font-size: 4em; font-family: serif;">}</div> <p>Too fast to see. If you want to see them, go to step 6.</p>	00000000,0000 00000000,0000
2		-                   2 -                   2
3		00,50000E+01EAST 00,50000E+01EAST
4		00000000,0000
5		-                   2
6		00.50000E+01EAST
7	5 seconds	+55555.555 +55555.555
8	5 seconds	+999999. +999999.
9	5 seconds	+999999 +999999
10	5 seconds	99:59:59 99:59:59
11	5 seconds	+299:59:59 +299:59:59
12	5 seconds	+299:59:59.9 +299:59:59.9
13	5 seconds	FFFFFFFF FFFFFFFF
14	5 seconds	177777 177777
15	5 seconds	1111111111111111 1111111111111111
16	5 seconds	YES YES
17	5 seconds	E179.999 E179.999
18	5 seconds	E099.999 E099.999

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4.2.8.2 (continued)

4. If the test program detects an error, it produces the following display:

BE nnnnnn

where n (octal) is the step number in the program at the point of failure.

5. On successful completion of the test, the teletypewriter prints an asterisk and the display indicator shows the following:

DATA CONVERTER TEST

6. To rerun the test and examine the sequences at a slower pace:
- a. Press CTRL C to reinitialize the program.
  - b. Press the ! key. Now each of the first six sequences remains displayed until you press the space bar. Subsequent sequences advance at 5-second intervals but you can hurry them along by pressing the space bar after each display.

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SECTION 4.3  
DATA ENTRY OPTIONS TESTS

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4.3.1 Alphanumeric Keyboard Tests

4.3.1.1 General

These tests are designed to verify performance of the following keyboard options:

1. Model 5782
2. Model 5783
3. Model 5784
4. Model 5785

The keyboard test program, which is also part of the terminal verification test, verifies operation of the alphanumeric keys, matrix keys, and function keys. When a key is pressed, the ASCII code for that key is displayed on the CRT screen. If a code represents a displayable character, the character symbol is also displayed. Pressing a matrix or function key causes the octal equivalent of the ASCII code for that key to be displayed. In the Model 5785, alternate depressions light and turn out the lighted keys. In the Models 5784 and 5785, function/matrix key lamps are lit and turned off by instructions from the host.

4.3.1.2 Procedure, Model 5782 Keyboard Test

1. Follow the procedure of paragraph 3.2.1 to display the terminal verification pattern.
2. Verify that the flying lead connector from the Model 5782 is connected to J5 of the multiport serial interface.
3. Observe the box in the lower right-hand quadrant of the display. Displayable characters are drawn in the upper left portion of the box with the octal code displayed directly underneath.

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4.3.1.2 (continued)

Press each alphanumeric, function, and matrix key in turn, and verify that each code displayed is as per table 4-1.

4. The following keys are tested using the SHIFT, CONTROL, and combined SHIFT and CONTROL functions as indicated.

<u>KEY</u>	<u>SHIFT</u>	<u>CODE CONTROL</u>	<u>SHIFT AND CONTROL</u>
Ø	260	260	260
K	333 ([)	213	233
L	334 (\)	214	234
M	335 (])	215	235
N	336 (↑)	216	236
O	337 (←)	217	237
P	300 (@)	220	200

Displayable characters are shown in parenthesis where appropriate.

TABLE 4-1. MODEL 5782 KEYBOARD CODES

<u>KEY</u>	<u>CODE</u>	<u>KEY</u>	<u>CODE</u>
M0	000	M9	011
M1	001	M10	012
M2	002	M11	013
M3	003	M12	014
M4	004	M13	015
M5	005	M14	016
M6	006	M15	017
M7	007	F0	020
M8	010	F1	021

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TABLE 4-1. MODEL 5782 KEYBOARD CODES (continued)

<u>KEY</u>	<u>CODE</u>	<u>KEY</u>	<u>CODE</u>
F2	022	K	313
F3	023	L	314
F4	024	M	315
F5	025	N	316
F6	026	O	317
F7	027	P	318
F8	030	Q	321
F9	031	R	322
F10	032	S	323
F11	033	T	324
F12	034	U	325
F13	035	V	326
F14	036	W	327
F15	037	X	330
		Y	331
A	301	Z	332
B	302	,	254
C	303	-	255
D	304	.	256
E	305	/	257
F	306	∅	260
G	307	1	261

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TABLE 4-1. MODEL 5782 KEYBOARD CODES (continued)

KEY	CODE	KEY*	CODE
H	310	2	262
I	311	3	263
J	312	4	264
5	265	<	274
6	266	=	275
7	267	>	276
8	270	?	277
9	271	!	241
:	272	"	242
;	273	#	243
.	256	%	245
		&	246
ADV →	200	/	247
BS ←	210	(	250
TAB	211	)	251
·LF	212	*	252
RETURN	215	+	253
ESC	233		
RUBOUT	377		
SPACE (bar)	240		

\*Keyboard in SHIFT mode of operation

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4.3.1.3 Procedure, Model 5783 Keyboard Test

1. Verify that the Model 5783 keyboard is connected to port number 3(J5) of the multiport serial interface.
2. Refer to paragraph 3.2.1 and display the terminal verification pattern.
3. Press each alphanumeric key. Verify that the octal code displayed (lower left corner of small box) agrees with the normal codes of table 4-2. Verify that the proper alphanumeric character is displayed (upper left corner of small box).

NOTE

Lower case letters typed on the keyboard may be displayed as capitals in the verification test pattern. The octal code should be that of the lower case letter.

4. Press CAPS LOCK key. Observe that CAPS LOCK lamp lights.
5. While CAPS LOCK lamp is lit, press each alphanumeric key. Verify that the octal code displayed (lower left corner of small box) agrees with the shifted codes of table 4-2. Verify that the proper alphanumeric character is displayed.
6. Release CAPS LOCK key. Observe that CAPS LOCK lamp goes out.
7. Press and hold CTRL key, then press each alphanumeric key. Verify that the octal code displayed agrees with the control codes of table 4-2.
8. Release CTRL key. Press each function and matrix key in turn. Verify that the octal code displayed agrees with table 4-2.

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Table 4-2. Model 5783 Key Codes

Unshifted ASCII Character	Unshifted	Shifted	Control	Shift and Control
M0	000	000	000	000
M1	001	001	001	001
M2	002	002	002	002
M3	003	003	003	003
M4	004	004	004	004
M5	005	005	005	005
M6	006	006	006	006
M7	007	007	007	007
M8	010	010	010	010
M9	011	011	011	011
M10	012	012	012	012
M11	013	013	013	013
M12	014	014	014	014
M13	015	015	015	015
M14	016	016	016	016
M15	017	017	017	017
F0	020	020	020	020
F1	021	021	021	021
F2	022	022	022	022
F3	023	023	023	023
F4	024	024	024	024
F5	025	025	025	025
F6	026	026	026	026
F7	027	027	027	027
F8	030	030	030	030
F9	031	031	031	031
F10	032	032	032	032
F11	033	033	033	033
F12	034	034	034	034
F13	035	035	035	035
F14	036	036	036	036
F15	037	037	037	037
LF	212	232	212	212
RETURN	215	215	215	215
ESC	233	233	233	233
RUBOUT	377	377	377	377
BACKSPACE	210	230	210	210
SPACE (bar)	240	240	240	240
TAB	211	231	231	231
,	254	274 (<)	254	254
-	255	275 (=)	255	255
.	256	276 (>)	256	256
/	257	277 (?)	257	257
0	260	260	260	260

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Table 4-2. Model 5783 Key Codes (continued)

Unshifted ASCII Character	Unshifted	Shifted	Control	Shift and Control
1	261	241 (!)	261	261
2	262	242 (")	262	262
3	263	243 (#)	263	263
4	264	244 (\$)	264	264
5	265	245 (%)	265	265
6	266	246 (&)	266	266
7	267	247 (')	267	267
8	270	250 ((	270	270
9	271	251 ())	271	271
:	272	252 (*)	272	272
;	273	253 (+)	273	273
	333	373 ({)	233	233
	334	374 (:)	234	234
	335	375 (})	235	235
	336	376 (~)	236	236
	337	337	237	237
@	300	340 (`)	200	200
A	341 (a)	301	201	201
B	342 (b)	302	202	202
C	343 (c)	303	203	203
D	344 (d)	304	204	204
E	345 (e)	305	205	205
F	346 (f)	306	206	206
G	347 (g)	307	207	207
H	350 (h)	310	210	210
I	351 (i)	311	211	211
J	352 (j)	312	212	212
			P1   P2	
K	353 (k)	313	233   213	233
L	354 (l)	314	234   214	234
M	355 (m)	315	235   215	235
N	356 (n)	316	236   216	236
O	357 (o)	317	237   217	237
P	360 (p)	320	200   200	200
Q	361 (q)	321	221	221
R	362 (r)	322	222	222
S	363 (s)	323	223	223
T	364 (t)	324	224	224
U	365 (u)	325	225	225
V	366 (v)	326	226	226
W	367 (w)	327	227	227
X	370 (x)	330	230	230
Y	371 (y)	331	231	231
Z	372 (z)	332	232	232

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4.3.1.3 (continued)

NOTE

The following steps test the repeat function.  
 Not all Model 5783 keyboards contain this  
 function.

9. Put the GRAPHIC 7 in teletype emulator mode, half duplex, as follows:
  - a. Press SHIFT and Y.
  - b. Press RETURN.
  - c. Press function key F0.
  - d. Display indicator screen clears except for G7 at the top, followed by an F or an H. F stands for full duplex, H for half duplex. Every time you press the F1 key, the duplex mode changes.
  
10. Now anything you type appears on the screen and you can test the repeat function. Press and hold any alphanumeric key. After the initial strike and a one second delay, the character repeats at a 10 Hz rate. Use the LF (line feed) key to start a new line. (Line feed can also repeat, dropping your next line further down the page.)
  
11. To return to local mode, press the LOCAL pushbutton on the GRAPHIC 7. You cannot go from teletype emulator mode to local mode from the keyboard.

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4.3.1.4 Procedure, Model 5784 Keyboard Test

NOTE

You can test all the functions of the Model 5784 keyboard except the lamps in the function and matrix switches by following the procedure of paragraph 4.3.1.3 (Model 5783 keyboard). All Model 5784 keyboards have the repeat function.

The following procedure tests the lamplighting circuits for the function and matrix key lamps. The graphic control program must be GCP+.

1. Using the tape loading procedure of Appendix A, load the Model 5784 keyboard test tape (G7KEYS.LDA). The test is self starting.
2. Observe the following sequence of events:
  - a. All function and matrix key lamps are lit.
  - b. All function and matrix key lamps go out.
  - c. Each function and matrix key lamp lights, then goes out, in sequence.
  - d. All function and matrix key lamps are lit.
  - e. Each function and matrix key lamp goes out, then back on, in sequence.
  - f. The cycle repeats from step a.
3. To stop the lamp test, hit the space bar.

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4.3.1.4 (continued)

NOTE

At this point you can make another test of all keys. If you press any key, the display shows the key code, the port of the multiport serial interface, and a count of the number of keys struck. If you strike a function or matrix key, its lamp lights.

4. To return to the lamplighting cycle, press RETURN.

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4.3.1.5 Procedure, Model 5785 Keyboard Test

1. Verify that the 5785 keyboard is connected to port number 3 (J5) of the multiport serial interface.
2. Refer to the procedure of paragraph 3.2.1 and display the terminal verification pattern.
3. Press each alphanumeric key and verify that octal code displayed (lower left-hand corner of small box) agrees with figure 4-12 for unshifted keys and that, for displayable characters, the proper character symbol is displayed.
4. Press SHIFT LOCK and repeat step 3 except use figure 4-12 for shifted characters.
5. Press SHIFT and then depress and hold CTRL. Then repeat step 3, except use figure 4-12 for control characters.
6. Press, in turn, all matrix and function keys and verify that the code agrees with figure 4-12.

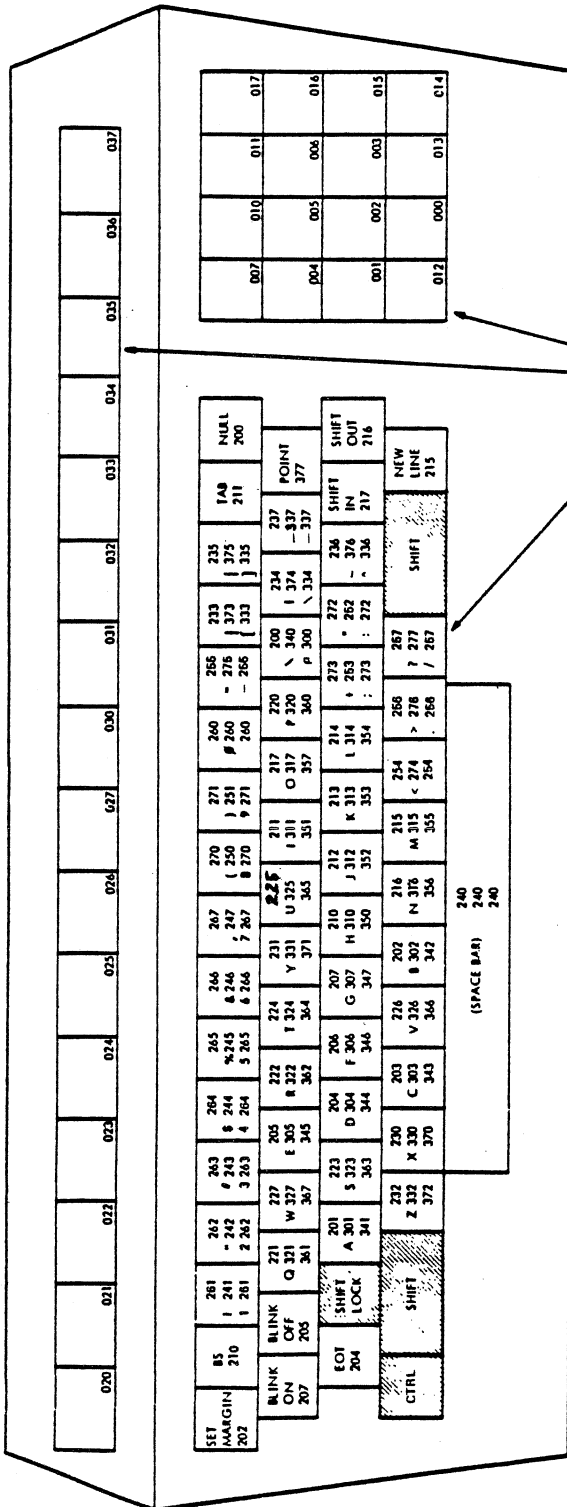
The lamp functions of the matrix and function keys of the 5785 are verified with the following procedure. This procedure tests the lamps in four steps:

- a. Turn off all (32) lamps at once.
- b. Light all (32) lamps at once.
- c. Light alternate lamps (every other one).
- d. Light lamps opposite to c.

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MATRIX KEYS  
 FUNCTION KEYS  
 ASCII KEYS  
 MOST KEYS GENERATE THREE CODES  
 DEPENDING ON THE POSITION OF  
 THE SHIFT AND CONTROL KEYS.  
 SOME KEYS GENERATE ONE CODE  
 ONLY, NOT AFFECTED BY SHIFT  
 OR CONTROL KEYS.

STANDARD KEY  
 MARKING SHOWN  
 ON LEFT OF KEY

CODES GENERATED  
 BY EACH KEY SHOWN  
 ON RIGHT OF KEY  
 (OCTAL)

CONTROL CODE  
 SHIFTED CODE  
 NORMAL CODE

201  
 A 301  
 341

STANDARD KEY  
 MARKING SHOWN  
 ABOVE CODE

SET MARGIN  
 202

CONTROL, SHIFTED, &  
 NORMAL CODES SAME

GA-76-165-015

NOTE  
 NO INTERRUPT OR CODE GENERATED  
 MODIFIES ASCII KEY CODES

CODE MARKINGS DO NOT  
 APPEAR ON KEY CAPS

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Figure 4-12. Model 5785 Keyboard Layout

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4.3.1.5 (continued)

7. Type the following:

```

176526/000000    224/
176530/000000    ^
176526/000000    0
176530/000000    ^
176526/000000    0 /
176530/000000    ^
176526/000000    0 /
176530/000000    ^
176526/000000    0 /
    
```

Verify that all 32 lamps are out.

8. Using the keyboard type the following:

```

176526/000000    224/
176530/000000    ^
176526/000000    377/
176530/000000    ^
176526/000000    377/
176530/000000    ^
176526/000000    377/
176530/000000    ^
176526/000000    377/
    
```

Verify that all 32 lamps are lit.

9. Repeat step 7. To light lamps, type the following:

```

176526/000000    224/
176530/000000    252/
176530/000000    ^
176526/000000    252/
176530/000000    ^
176526/000000    252/
176530/000000    ^
176526/000000    252/
    
```

Verify that every other lamp (16) is lit.

10. Type the following to light 16 lamps opposite to those of step 9.

```

176526/000000    224/
176530/000000    125/
176530/000000    ^
    
```

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4.3.1.5 (continued)

176526/0000000	125/
176530/0000000	^
176526/0000000	125/
176530/0000000	^
176526/0000000	125/

Verify that every other lamp (16), opposite to those in step 9, is lit.

NOTE

The above test is for a single Model 5785 configuration. If a system has two Model 5785's connected, change the second instruction address for each test from 176530/ to 176566/ to test the second keyboard.

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4.3.2 PED Tests

4.3.2.1 General

The PED tests verify the operation of the position entry device (trackball, forcestick, or data tablet) at each display station. The test is performed using the terminal verification test pattern.

NOTE

All PED's connect to port 4 (J7 of the first multiport serial interface) or to port 8 (J7 of the second multiport serial interface). Each terminal controller can support two PED's.

When the terminal verification pattern is first called up, the symbols 1\* and 2\* appear in the upper left corner of the display (see figure 3-1). When these symbols appear, the GRAPHIC 7 interprets all messages at ports 4 and 8 as coming from trackball or forcestick. To test a data tablet, press function switch F1 on the keyboard. The symbols now change to 1# and 2# and the GRAPHIC 7 interprets incoming messages at ports 4 and 8 as coming from a data tablet. Pressing F1 again restores the 1\* and 2\* symbols.

4.3.2.2 Trackball/Forcestick Procedure

1. Verify that the trackball/forcestick being tested is connected to J7 of the multiport serial interface.
2. Verify that the verification test pattern shows the 1\* and 2\* symbols.
3. Operate the PED. Verify that the asterisk for the selected PED can be located anywhere on the display. The asterisk should move smoothly, without jumping. Moving the PED beyond the programmable boundaries causes the asterisk to "wrap around" and reappear on the opposite side of the screen.

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**4.3.2.3 Data Tablet Procedure**

1. Verify that the data tablet being tested is connected to J7 of the multiport serial interface.
2. Verify that the verification test pattern shows the 1# and 2# symbols.
3. Press the data table pen switch and move the pen over the active area of the data tablet. The appropriate symbol (1# or 2#) shall follow the movement of the pen.

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4.3.3 PHOTOPEN® Test

4.3.3.1 General

Each terminal controller can support two PHOTOPEN's and each should operate independently of the other. This test verifies proper operation of up to two PHOTOPEN units.

NOTES

It is assumed that the PHOTOPEN is connected to the PHOTOPEN intensifier panel mounted on the display indicator. Display brightness should be set for normal viewing. Brightness levels should not be dim or barely viewable.

4.3.3.2 Procedure

1. Refer to the procedure of section 3.2.1 and display the terminal verification test pattern as shown on figure 3-1.
2. PHOTOPEN indicators are displayed in the upper right corner of the verification test pattern. The "\*1S" with an arrow is associated with a PHOTOPEN connected to the PPN1 connector on the front of the terminal controller. The "\*2S" with an arrow is associated with a PHOTOPEN connected to the PPN2 connector. Like the trackball/forcestick indicators, the PHOTOPEN indicators appear on the verification test pattern whether or not PHOTOPEN's are connected to the system.
3. If a PHOTOPEN is connected to the system, its associated indicator, \*1S or \*2S, responds as light from various data items is sensed by the PHOTOPEN. Whenever an item of data is sensed, the sensed point is

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4.3.3.2 (continued)

the PHOTOPEN. Whenever an item of data is sensed, the sensed point is intensified and the indicator moves so that the arrow points to the location at which the data item ends.

Do not point the PHOTOPEN at data such that ambiguous results occur with the indicator pointing at the extreme end of lines or at the end of a character, for example.

Circles and/or vectors are processed in the same manner. Operations of the PHOTOPEN on this type of data is identical; therefore separate tests are not called out.

4. Point the PHOTOPEN at various types of graphics data, as called out in the following sections, and observe operation of the indicator. The graphics data to be sensed is noted by the circled numbers as shown on figure 4-14.
5. Character Data - Alphanumeric data is normally stored with two characters per word (TEXT command). Therefore the indicator arrow should point to the right of the second character in a pair. Select a character to be sensed from the groups noted by 1 .
6. Verify that if the PHOTOPEN is pointed at either of the two characters in a pair, the indicator points to the right of the second character. In addition, verify that if the PHOTOPEN is pointed at the first character in a pair, the asterisk (\*) is not displayed.
- 7A. This step applies if the program is GCP:  
Verify that if the PHOTOPEN is pointed at any of the characters in the center block, all characters after the indicator are blanked or removed.

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4.3.3.2 (continued)

- 7B. This step applies if the program is GCP+:  
Verify that if the PHOTOPEN is pointed at any of the characters in the center block, the intensifier works but the characters are insensitive to PHOTOPEN strikes.
  
- 8. Vector Data - Point the PHOTOPEN at a point on any line denoted by 2 . Verify that the indicator points to the end of that line. The asterisk is not displayed for any line selected.  
  
As the PHOTOPEN is moved along the line, the indicator should remain fixed. At the extreme end of the line, the indicator is not solid. Operating the PHOTOPEN in this manner should be avoided, as noted previously.
  
- 9. Points (or Dots) Data - Verify that the PHOTOPEN is pointed to any dot in the group noted by 3 , the indicator (less asterisk) points to the same point or dot that is being sensed.
  
- 10. The "S" in each indicator provides an indication of PHOTOPEN switch operation. With the "S" displayed, while pointing the PHOTOPEN at a data item, actuate the switch by pressing the PHOTOPEN against the CRT screen. Verify that the "S" is removed or blanked. Verify that a second actuation of the switch causes the "S" to reappear with indicator (arrow and number).

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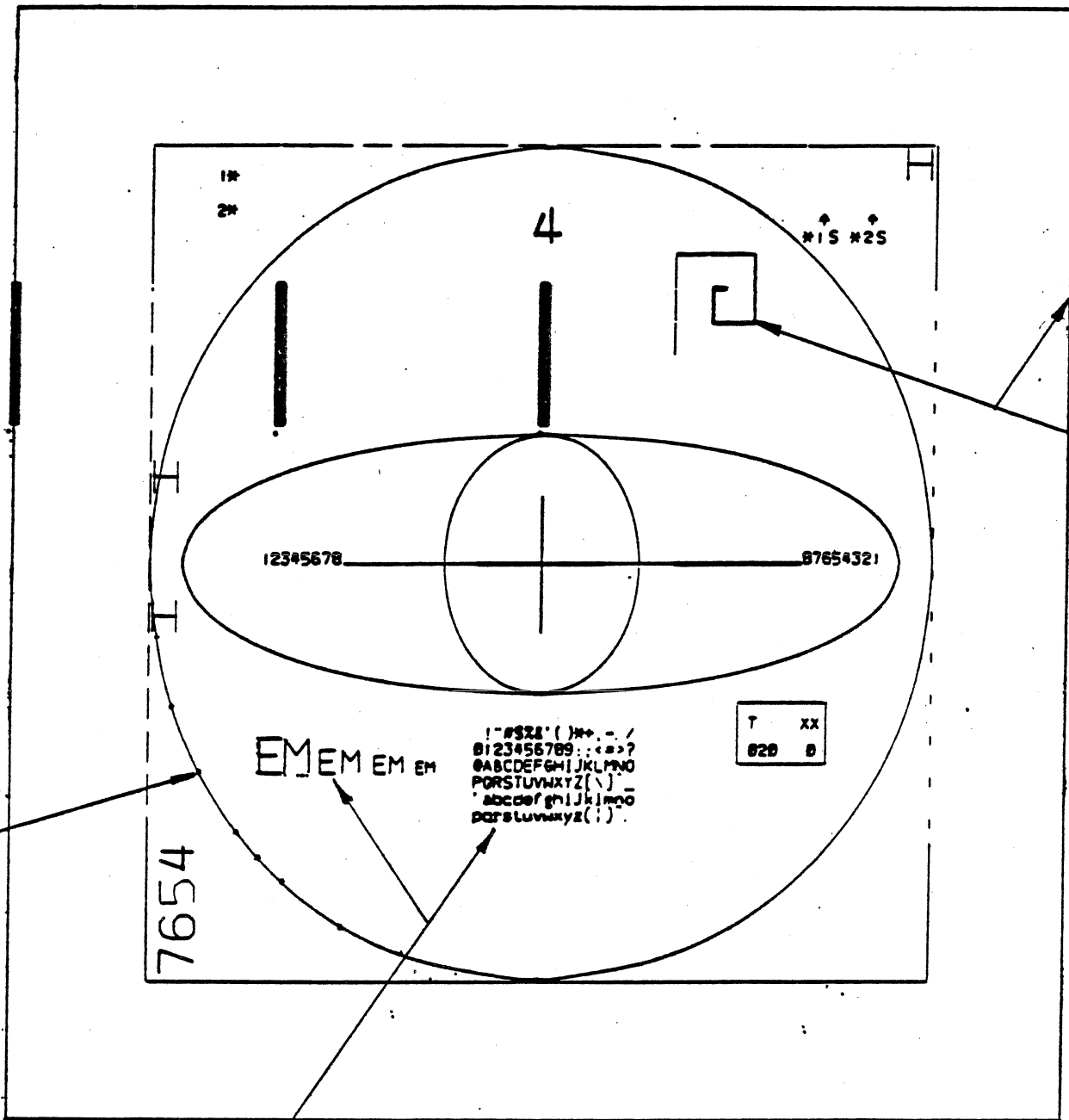


Figure 4-13. PHOTOPEN Test Display Pattern

**NOTE**

If Conic Generator is installed, diamonds will be circles as shown.

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SECTION 4.4

DISPLAY INDICATOR OPTIONS TESTS

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4.4.1 21-Inch Display Indicator Test

4.4.1.1 General

This test verifies operation of the 21-inch diagonal display indicator, either vertically or horizontally oriented. These units can be configured for either desk top or rack mounted operation.

4.4.1.2 Procedure

1. Refer to paragraph 3.1. In place of the display indicator normally provided as support equipment for the terminal controller test, substitute the display indicator being tested.
2. Follow the procedure of paragraph 3.2.1 to display the terminal verification test pattern.
3. Verify that the display indicator displays the test pattern shown in figure 3-1. (If UUT is four-color display, see step 5.)
4. Verify that the display field is 12 x 12 inches. If customer requirements are for a non-standard display field, the display indicator gain adjustments will be set prior to the ATP and so noted as a special requirement.
5. For display indicators Models 740-743, verify that the four colors appear as shown in figure 3-1 and that the color controls operate smoothly and are effective.
6. For display indicators Models 730-733 and 740-743, test internal pattern generator as follows:
  - a. At rear of display indicator, press SELF TEST pushbutton.
  - b. Display shall be a circle, approximately tangent to the edges of the display area.

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4.4.2 23-Inch Round Display Indicator Test

4.4.2.1 General

This test verifies operation of the 23-inch diameter high speed display indicator.

4.4.2.2 Procedure

1. Refer to paragraph 3.1. In place of the display indicator normally provided as support equipment for the terminal controller test, substitute the display indicator being tested.
2. Follow the procedure of paragraph 3.2.1 to display the terminal verification test pattern.
3. Verify that the display indicator displays the test pattern shown in figure 3-1. (If UUT is four color display, see step 5.)
4. Verify that the display size is 20 inches in diameter as follows:
  - a. Using a ruler, measure from the center cross to the lines of the full screen box. This dimension shall be 10 inches in both the horizontal and vertical axes.

NOTE

The lines of the full screen box shall be just visible inside the edge of the indicator bezel only at the cardinal points due to the circular viewing area.

5. For display indicators Models 760 or 763, verify that the four colors appear as in figure 3-1 and that the color controls operate smoothly and are effective.
6. For display indicators 750, 753, 760, or 763, test internal pattern generator as follows:

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4.4.2.2 (continued)

- a. At rear of display indicator, press SELF TEST pushbutton.
- b. Display shall be a circle, approximately tangent to the edges of the display area.

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4.4.3 Hardcopy Unit Test

4.4.3.1 General

This test verifies that the hardcopy unit can produce a paper copy of a displayed graphics presentation in the LOCAL mode. The test assumes that the hardcopy unit has been previously connected to one of the output channels of the terminal controller. There is a 10 minute warm-up for the hardcopy developer to come to temperature, after the initial power-on.

4.4.3.2 Procedure

1. With all equipment energized, place the terminal controller in the LOCAL mode by pressing the LOCAL pushbutton on the GRAPHIC 7 control panel.
2. Verify that the terminal verification pattern of figure 3-1 is displayed on the display indicator.

NOTE

The display indicator used can either be a unit undergoing test as part of this ATP or one provided as support test equipment.

3. Set brightness control on hardcopy unit to 12 o'clock setting.
4. Press the COPY switch on the hardcopy unit (right-hand side).
5. Verify that a paper copy of the terminal verification pattern is produced within 20 seconds.
6. The hardcopy should be a faithful rendition of the test pattern; however, the three groups of vertical bars located at the full, 1/4, and 1/2 screen horizontal positions respectively, may show up as solid bars on the paper copy. In addition, those graphics elements such as circles, conics, translated and rotated data, will not be present in

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4.4.3.2 (continued)

the copy unless the appropriate function generators are present in the system configuration.

NOTES

- The single digit number used for display ID over the center bar may or may not be copied. This is a blinking number.
- The small box in the lower right hand quadrant has a number, in its right corner, which is sequentially counting. This could be copied as two numbers overlaying each other.

7. Paper Size

Paper length should be approximately 11 inches top to bottom.

8. Image Size

Square format: (CRT image 12" x 12")  
 7 1/2" long x 7 1/2" wide  
 (Measure large outside box only)

or

Vertical format: (CRT image 16" x 12")  
 8 1/2" long x 6 3/8" wide  
 (L = measure outside box  
 W = measure small inside box)

or

Horizontal format: (CRT image 12" x 16")  
 6 3/8" long x 8 1/2" wide  
 (L = measure small inside box  
 W = measure large outside box  
 Image axis must be changed by swapping X & Y coax input)

9. Brightness Control

As brightness setting goes from "light" to "dark" in a clockwise direction (12 o'clock to 3 o'clock setting): Verify that within this range, a legible hardcopy print is obtained.

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4.4.4 Hardcopy Multiplex Switch Test

4.4.4.1 General

This test verifies that the hardcopy multiplex switch can control the generation of copies by allowing a single hardcopy unit to service four terminal controllers. This procedure assumes that a Model 0570 hardcopy unit (HCU) is available to run the test. If a HCU is not available, then a display indicator may be substituted for it. Refer to paragraph 4.4.4.4 for this optional procedure.

4.4.4.2 Initial Setup

1. Connect three cables from the XYZ outputs on the rear of the multiplex switch to the XYZ inputs on the hardcopy unit.
2. Connect the data cable from the J2 connector on the rear of the multiplex switch to the input connector in the hardcopy unit.
3. Connect a set of X, Y, and Z cables between the terminal controller output channel and the X<sub>1</sub>, Y<sub>1</sub>, and Z<sub>1</sub> inputs on the front of the multiplex switch.
4. Connect the data cable between the multiport serial interface card, port number 4, and J1 on the front of the multiplex switch. This assumes port number 4 is configured as Port 5, a hardcopy unit.

4.4.4.3 Procedure

1. Energize all equipment and place the terminal controller in the LOCAL mode by pressing the LOCAL pushbutton on the GRAPHIC 7 control panel.
2. Verify that the terminal verification pattern of figure 3-1 is displayed on the display indicator.
3. Allow a 10 minute warm-up for the hardcopy unit.
4. Set the AUTO switch on the front of the multiplex switch to position 1.

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4.4.4.3 (continued)

5. Press the COPY switch on the hardcopy unit.
6. Verify that a paper copy of the terminal verification pattern is produced.
7. Repeat steps 4, 5 for positions 2, 3, and 4 of the AUTO switch.
8. Verify that a blank copy is produced.
9. Set the AUTO switch to the AUTO position.
10. Generate a software-initiated copy as follows:
  - a. Press the RETURN key on the keyboard.
  - b. Enter 176546/ from the keyboard.
  - c. Enter a non-zero value (1 for example).
  - d. Press RETURN.
11. Verify that a copy with an M in the center is produced.
12. Repeat step 10 for positions 1-4 of the AUTO switch.
13. Verify that no copy is generated.
14. De-energize the terminal controller and multiplex switch.
15. Move the data cable from J1 to J2 and the signal cables (XYZ) from X<sub>1</sub>, Y<sub>1</sub>, Z<sub>1</sub> to X<sub>2</sub>, Y<sub>2</sub>, Z<sub>2</sub> on the multiplex switch.
16. Re-energize the multiplex switch and terminal controller.
17. Repeat the procedure, steps 2 through 13.
18. Repeat steps 14 through 17 for the remaining two sets of inputs: (J3, X<sub>3</sub>, Y<sub>3</sub>, Z<sub>3</sub>); (J4, X<sub>4</sub>, Y<sub>4</sub>, Z<sub>4</sub>).

4.4.4.4 Optional Procedure

As noted in 4.4.4.1, this procedure is to be used if a hardcopy unit is not available.

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4.4.4.4.1 Initial Set-Up

1. Connect the X, Y, and Z video cables from the multiplex switch to the X, Y, and Z inputs of the display.
2. Connect the data cable between terminal controller multiport number 4 and J1 on the front panel of the multiplex switch.

4.4.4.4.2 Procedure

1. Follow steps 1 through 8 of 4.4.4.3. Instead of generating a paper copy, verify that the terminal verification pattern appears on the display.
2. Follow steps 9 through 13 and verify that the M appears on the screen for 20 seconds, then goes off.
3. Follow steps 14 through 18 of 4.4.4.3 in the manner outlined in 1 and 2 above.

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SECTION 4.5

SOFTWARE/FIRMWARE TESTS

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4.5.1 GSS-4 Test

See Acceptance Test Procedure 1089696 for the GSS-4 acceptance test.

4.5.2 GET-2 Tektronix Emulator Test

4.5.2.1 General

This test verifies that the expansion module with the GET-2 Tektronix Emulator program installed can be device-accessed; that the program can be downloaded to RAM; and that the checksum of the downloaded program is correct.

4.5.2.2 Procedure

1. Follow the procedure of paragraph 3.2.1 to display the terminal verification test pattern.
2. At the keyboard, press RETURN. You are now in debug mode.
3. Using the keyboard, load the following:

MEMORY LOCATION	VALUE	TERMINATOR	MEMORY LOCATION	VALUE	TERMINATOR
2000/	5000	LINE FEED	2016/	2375	LINE FEED
2002/	12702	LINE FEED	2020/	10037	LINE FEED
2004/	13736	LINE FEED	2022/	2030	LINE FEED
2006/	12701	LINE FEED	2024/	137	LINE FEED
2010/	3000	LINE FEED	2026/	157750	LINE FEED
2012/	62100	LINE FEED	2030/	0	RETURN
2014/	20201	LINE FEED			

4. At keyboard, type 4002L RETURN. This instruction downloads the GET-2 program to RAM.
5. At keyboard, type 2000G RETURN. This instruction executes the routine. Display indicator shows "BØM" at center of screen.
6. At keyboard, type 2030/. Display shall show 2030/ 121313.

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SECTION 4.6

SPECIAL TESTS

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4.6.1 Data Load Test

4.6.1.1 General

This test verifies the data load capability of the GRAPHIC 7 display system using a data load display program consisting of three different display formats. Each format contains the following types and quantities of data:

DISPLAY DATA TYPE	QUANTITY PER DISPLAY FORMAT		
	A	B	C
Alphanumerical characters, small	1000	750	750
Alphanumerical characters, large	1000	250	250
Vectors, short	--	100	500
Vectors, long	15	60	30
Circle, small	--	15	30
Circle, large	--	15	10
Average positioning	40	60	100

Each format will be displayed simultaneously on a different display indicator with a fourth indicator displaying a composite pattern consisting of formats A, B, and C combined.

4.6.1.2 Procedure

1. Verify that four display indicators are connected as per figure 4-14. It is assumed that each indicator was previously tested as part of paragraph 4.4 (display indicator options tests).
2. Position the GRAPHIC 7 T2C data load test program in the paper tape reader and load it according to the loading procedure contained in Appendix A.
3. Start the program as follows using the keyboard:

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DISPLAY INDICATORS

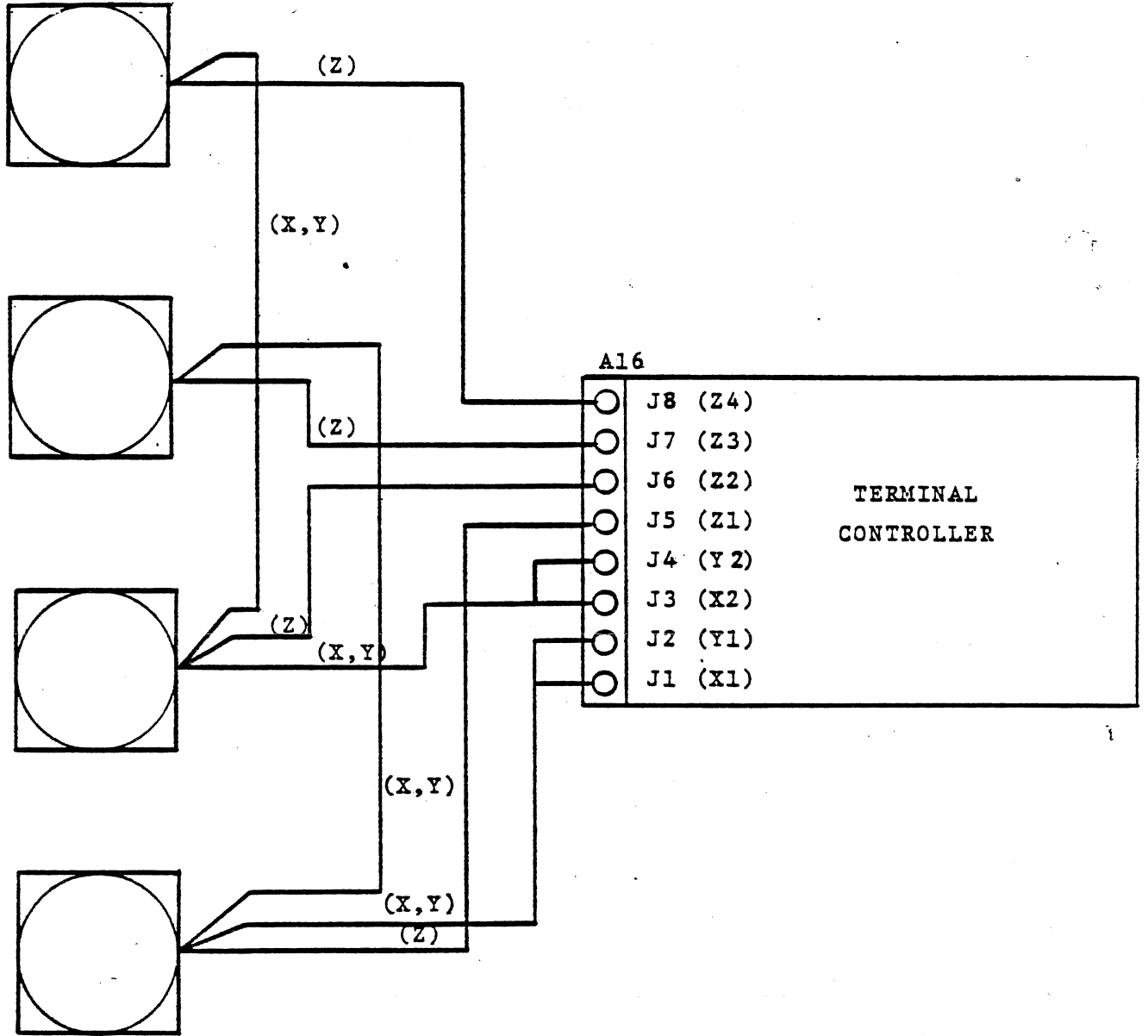


Figure 4-14. Data Load Test Test Set-Up

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4.6.1.2 (continued)

- a. Carriage return
  - b. 1000 G
  - c. Carriage return
4. Verify that the display patterns of figures 4-15, 4-16, 4-17, and 4-18 appear simultaneously on all four display indicators.
  5. Verify that there is no observable flicker (see note).

NOTE

No observable flicker for P39 phosphor only.

6. Verify, using an oscilloscope, that the frame time is less than 33 ms when measured on the terminal controller output channel for indicator number 4 (composite picture), figure 4-18.

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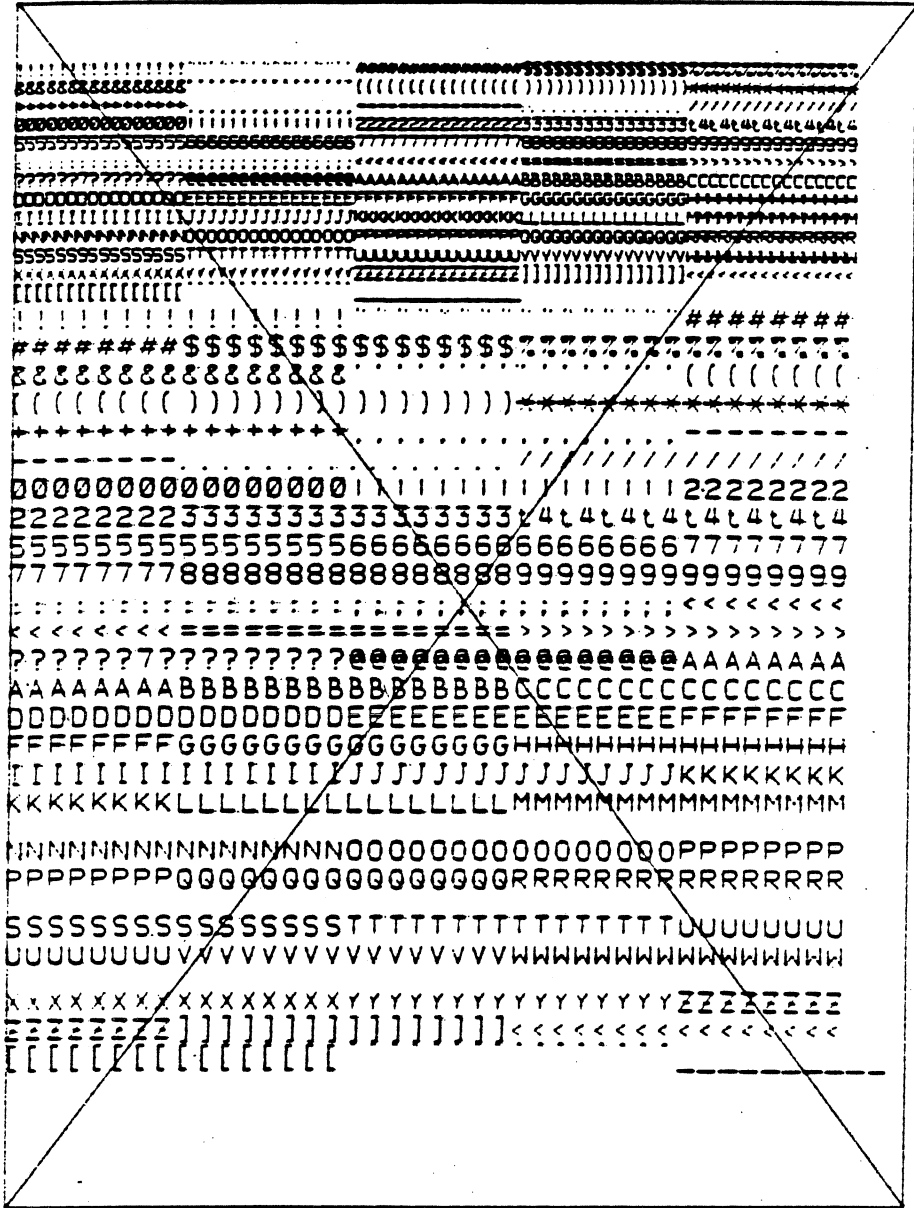


Figure 4-15. Format A

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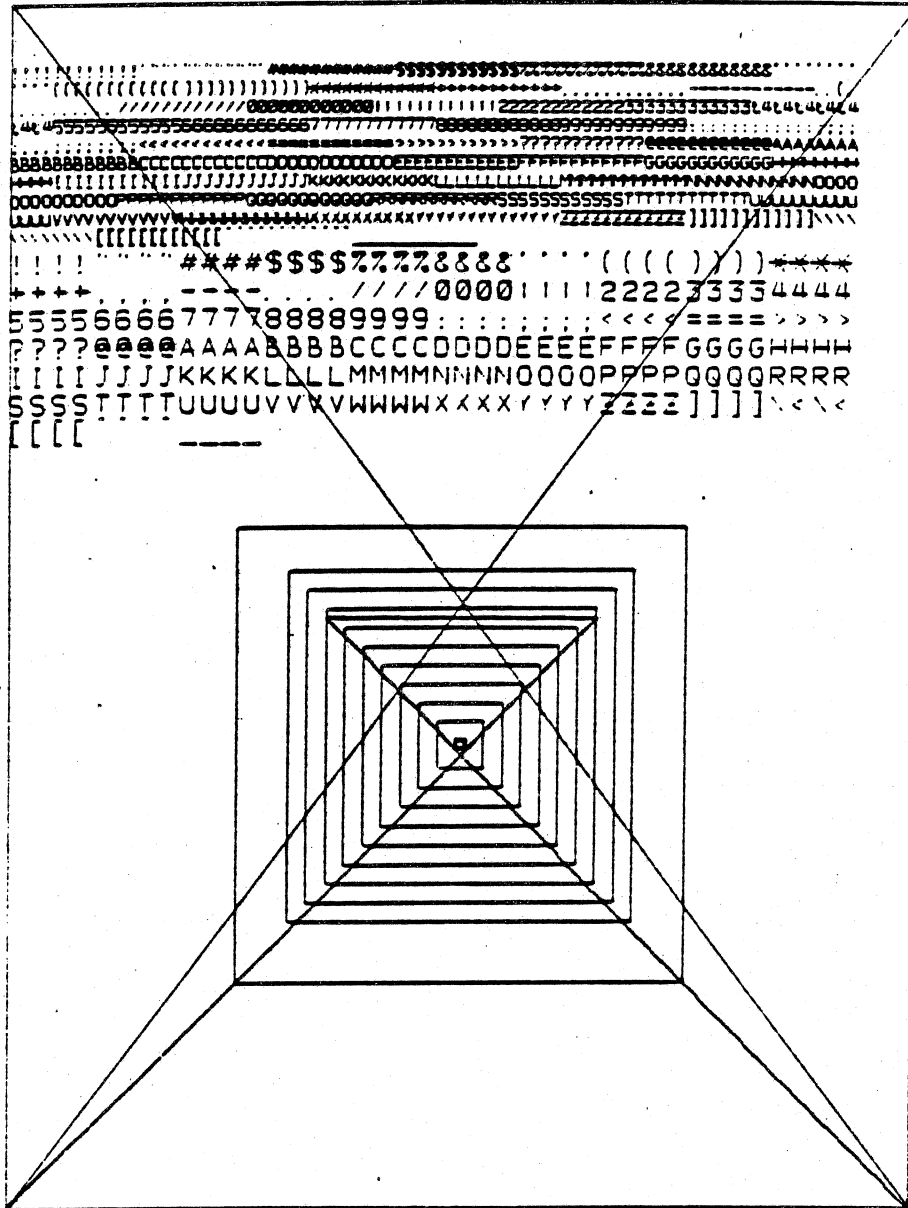


Figure 4-16. Format B

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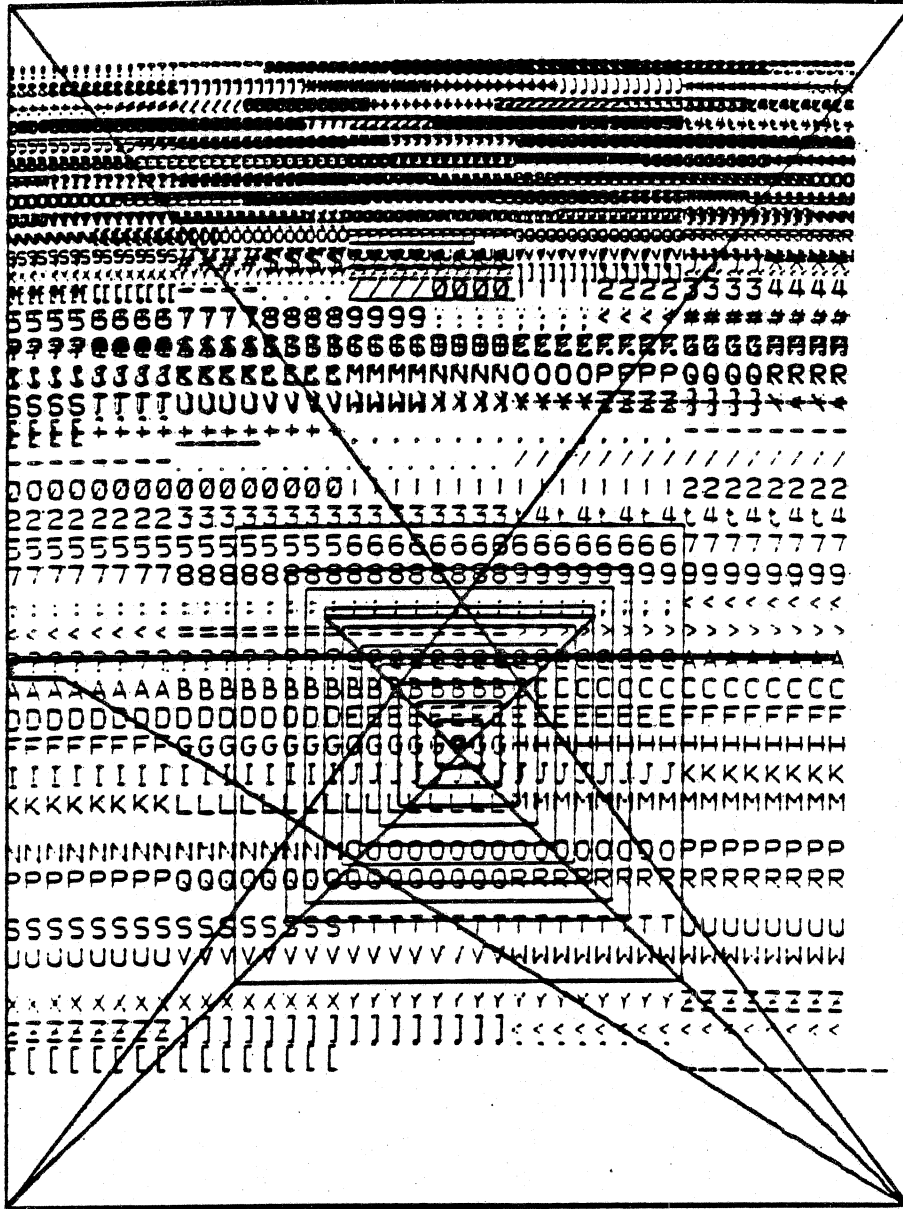


Figure 4-18. Composite Format

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SECTION 4.7

NON-STANDARD PARALLEL INTERFACE TESTS

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4.7.1 Introduction

This section contains acceptance test instructions for the following parallel interfaces.

<u>Model</u>	<u>Description</u>	<u>Paragraph</u>
5714	Parallel interface to PDP-11/DR11B	4.7.2
5715	Parallel interface to Interdata 7/16, 7/32, 8/32 SELCH; ULI	4.7.3
5716	Parallel interface to SEL32; HSD-9132	4.7.4
5717	Parallel interface to Harris ABC, CBC, UBC	4.7.5
5718	Parallel interface to HP2100/21MXE; 12930 A-002	4.7.6
5719	Parallel interface to Data General NOVA and ECLIPSE	4.7.7
5720	Parallel interface, NTDS Fast, to Univac military computers	4.7.8
5721	Parallel interface, NTDS Slow, to Univac military computers	4.7.9
5722	Parallel interface to Honeywell 516 DMC	4.7.10
5723	Parallel interface to NORD-10	4.7.11
5734	Long line parallel interface to DEC PDP-11, DR11B, including 200-foot cable	4.7.2

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4.7.2 Parallel Interface to PDP-11/DR11B(D)

4.7.2.1 General

This procedure tests the ability of the Model 5714 or 5734 to pass messages from the GRAPHIC 7 to a simulated host and from a simulated host to the GRAPHIC 7.

This procedure requires a test fixture that simulates the DR11-B(D) interface.

4.7.2.2 Procedure

1. Connect +5V and GND to the test fixture from the back of the GRAPHIC 7.
2. Connect the cable between the test fixture and the interface. In the case of the long line cable, Model 5734, a DEC long line adapter board, DEC Model 5947, is required.
3. Select either single step or continuous operation. Single step operation does not operate on the Model 5734.
4. Push the reset button on the test fixture.
5. If single step operation was chosen, the step button must be pressed after each transfer. The data lights indicate what word is being sent or received during each transfer.
6. At the end of the test, G7 should appear on the display, the send and receive lights should be on, and the error light should be off.
7. If an error occurs, the error light lights, and the data lights display the last word that should have been transferred.

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4.7.2.2 (continued)

Message

Reset - Puts GRAPHIC 7 into SYSTEM mode

Initialization { 054130  
100000 100020  
101114 107731  
000000

This is sent to the GRAPHIC 7. At the end of this, the SENT light turns on.

{ 046525  
002000  
000012  
016313  
013707  
140136  
020000  
060000  
003000  
007000  
133707  
001000  
002000

Display image {

Send back the data sent {

043511  
002000  
000012  
000000  
051111  
002000  
000012  
000000  
053114  
000012  
016313  
013707  
140136  
020000  
060000  
003000  
007000  
133707  
001000  
002000

This is received back from the GRAPHIC 7. At the end, the RECEIVED light is lit.

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4.7.3 Parallel Interface to Interdata 7/16, 7/32, 8/32, SELCH; ULI

To be supplied

4.7.4 Parallel Interface to SEL-32; HSD-9132

To be supplied

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4.7.5 Parallel Interface to Harris ABC/CBC/UBC

4.7.5.1 General

This procedure tests the ability of the Model 5717 to pass messages from the GRAPHIC 7 to a simulated host and from a simulated host to the GRAPHIC 7.

This procedure requires a test fixture that simulates the Harris I/O channel interface.

4.7.5.2 Procedure

1. Connect the test fixture cables to the parallel interface (UUT) and plug the interface into the GRAPHIC 7.
2. Place the Terminal Controller in the local mode by pressing the LOCAL pushbutton on the GRAPHIC 7.
3. Set switches A, B, C, and D on the test fixture to match the address of the parallel interface set by the DIP switches on the interface.
4. Push the DISC button on the test fixture. When the button is pushed, the DISC lamp lights. When the button is released, the CNCT lamp lights if the interface has been addressed properly.
5. Place the terminal controller in the SYSTEM mode by pressing the SYSTEM pushbutton.
6. The IIFU lamp on the test fixture should light and the first word of the GRAPHIC 7 initialization message (IZ) appears on the data lights. Successively pressing the SS pushbutton causes the rest of the message to be displayed. Verify that the data displayed is as shown below:

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4.7.5.2 (continued)

<u>Data Word</u>		<u>Lamp Data</u>					
1	0	101	100	001	011	000	
2	1	000	000	000	000	000	
3	1	000	001	001	001	100	
4	0	000	000	000	000	000	
5	0	000	000	000	000	000	

7. The test fixture is now used to send data to the GRAPHIC 7. The first word to be sent is loaded into the data switches and the SEND and the SS pushbuttons are pressed. This operation is repeated for each successive data word shown below by loading the next data word and then pressing SS:

<u>Data Word</u>		<u>Switch Data</u>					
1	0	100	110	101	010	101	
2	0	000	010	000	000	000	
3	0	000	000	000	001	010	
4	0	001	110	011	001	011	
5	0	001	011	111	000	111	
6	1	100	000	001	011	110	
7	0	010	000	000	000	000	
8	0	110	000	000	000	000	
9	0	000	011	000	000	000	
10	0	000	111	000	000	000	
11	1	011	011	111	000	111	
12	0	000	001	000	000	000	
13	0	000	010	000	000	000	
14	0	101	001	101	010	000	
15	0	000	010	000	000	000	

8. After sending the above data words, verify that a G7 appears on the display screen.
9. Continue sending the following data words in the same manner; load the word, then press the SS pushbutton:

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4.7.5.2 (continued)

<u>Data Word</u>			<u>Switch Data</u>			
16	0	100	011	101	001	001
17	0	000	010	000	000	000
18	0	000	000	000	001	010

10. Continue pressing the SS pushbutton and the following message, sent back from the GRAPHIC 7, appears on the data lights:

<u>Data Word</u>			<u>Switch Data</u>			
1	0	101	001	001	001	001
2	0	000	010	000	000	000
3	0	000	000	000	001	010
4	0	000	000	000	000	000
5	0	101	011	001	001	100
6	0	000	000	000	001	010
7	0	001	110	011	001	011
8	0	001	011	111	000	111
9	1	100	000	001	011	110
10	0	010	000	000	000	000
11	0	110	000	000	000	000
12	0	000	011	000	000	000
13	0	000	111	000	000	000
14	1	011	011	111	000	111
15	0	000	001	000	000	000
16	0	000	010	000	000	000

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4.7.6 Parallel Interface to HP2100/21MXE; 12930 A-002

To be supplied

4.7.7 Parallel Interface to Data General NOVA and ECLIPSE

To be supplied

4.7.8 Parallel Interface, NTDS Fast, to Univac Military Computers

To be supplied

4.7.9 Parallel Interface, NTDS Slow, to Univac Military Computers

To be supplied

4.7.10 Parallel Interface to Honeywell 516 DMC

To be supplied

4.7.11 Parallel Interface to NORD-10

To be supplied

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SECTION 5

EQUIPMENT ACCEPTANCE TEST RECORD

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**REVISIONS**

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5.1 Equipment Acceptance Test Record

CUSTOMER _____	SSO NO. _____
DATE _____	SYSTEM/PART NO. _____
PERFORMED BY _____	SERIAL NO. _____
WITNESSED BY _____	
SANDERS QA _____	

<u>PARAGRAPH</u>	<u>TEST PERFORMED</u>	<u>REQUIRED</u>	<u>MEASURED/VERIFIED</u>
-	Visual and Mechanical Inspection Complete	Verify	_____
	<u>Terminal Controller Tests</u>		
3.2	Terminal Verification Test	Verify	_____
3.3	ROM Comparison Test	Verify	_____
	<u>Terminal Controller Option Tests</u>		
4.2.1	Multiport Serial Interface Test	Verify	_____
4.2.2	Parallel Interface Test	Verify	_____
4.2.3	Conic Generator Test	Verify	_____
4.2.4	2D Coordinate Converter Test	Verify	_____
4.2.5	Large Read/Write Memory Test	Verify	_____
4.2.6	2-D/3-D Coordinate Converter Test	Verify	_____
4.2.8	Floating Point Converter Test	Verify	_____
	<u>Data Entry Options Tests</u>		
4.3.1	Alphanumeric Keyboard Test	Model No. Verify	_____ _____
4.3.2	PED Test	Verify	_____
4.3.3	PHOTOPEN® Test	Verify	_____

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5.1 (continued)

<u>PARAGRAPH</u>	<u>TEST PERFORMED</u>	<u>REQUIRED</u>	<u>MEASURED/VERIFIED</u>
<u>Display Indicator Options Tests</u>			
4.4.1	21-Inch Display Indicator	Verify	_____
4.4.2	23-Inch Round Indicator	Verify	_____
4.4.3	Hardcopy Unit Test	Verify	_____
4.4.4	Hardcopy Multiplex Switch Test	Verify	_____
<u>Software/Firmware Options Tests</u>			
4.5.1	GSS-4 Test	Verify	_____
4.5.2	GET-2 Tektronix Emulator Test	Verify	_____
<u>Special Tests</u>			
4.6.1	Data Load Test	Verify	_____
4.7	Non-Standard Parallel Inter- face Test	Model No. Verify	_____ _____

QUALITY ASSURANCE STAMP \_\_\_\_\_

NOTES

1. Place N/A on MEASURED line if test is not applicable.
2. When multiple quantities of items are being tested, note quantity in parenthesis after MEASURED entry.
3. Acceptance to be noted by a check mark or initialed.

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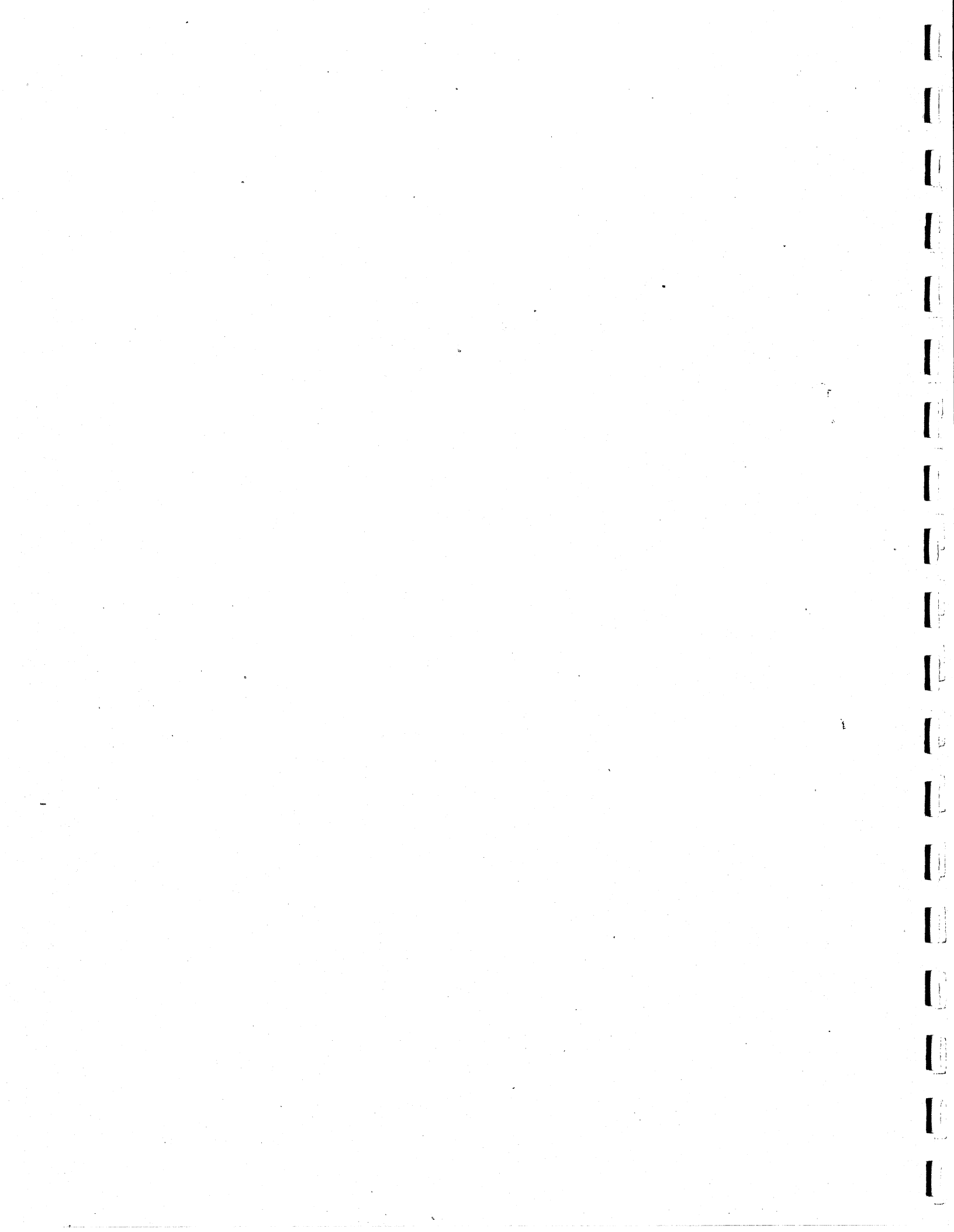
APPENDIX A

TAPE LOADING PROCEDURE

To load programs into the GRAPHIC 7 terminal controller from paper tape, proceed as follows:

- a. Position the paper tape in the paper tape reader.
- b. Press the LOCAL button on the terminal controller.
- c. Type RETURN on the teletypewriter or NEW LINE on the keyboard.
- d. Type L RETURN on the teletypewriter or type L NEW LINE on the keyboard.
- e. Observe paper tape being read by the paper tape reader and loaded into the terminal controller.

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Address: \_\_\_\_\_  
\_\_\_\_\_

Telephone: [   ] \_\_\_\_\_

Date: \_\_\_\_\_

Description of problem (or suggestion for improvement):

Sanders Equipment \_\_\_\_\_

Part Number \_\_\_\_\_

Software/Firmware System \_\_\_\_\_

Version \_\_\_\_\_

Host computer \_\_\_\_\_

Host operating system \_\_\_\_\_ Version \_\_\_\_\_

Host-GRAPHIC 7 interface \_\_\_\_\_

My problem is: hardware  software

firmware  manual

Related tech manual number \_\_\_\_\_