MEMORANDUM

TO: RM-9400/RM-9460 GRAPHIC DISPLAY SYSTEM customers

FROM: Ramtek Corporation

SUBJECT: Acceptance and diagnostic test tapes

The RM-9400/RM-9460 GRAPHIC DISPLAY SYSTEM Diagnostic and Acceptance Test Operators Manual For VAX/VMS System (Publication No. 8000088-01) is for use with the acceptance and diagnostic test tapes. The acceptance test tape (P/N 506492) is in binary format and is neither bootable nor executable. Therefore, only section 4.8 of the manual is relevant to this tape. The procedure for using this type of binary tape is as follows:

1. Load tape into host computer.
2. Check that host to Ramtek driver is working.
3. Send data to Ramtek.
4. Verify that display matches figures in section 4.8 of manual.

If you have P/N 509191 (VAX/VMS) or P/N 506490 (RT11), the Diagnostic and Acceptance Test manual can be used in its entirety.

If you wish to purchase the diagnostic and acceptance test tapes for either VAX/VMS or RT11, contact your sales representative.

RM-9400/RM-9460
GRAPHIC DISPLAY SYSTEM

Diagnostic and Acceptance Test
Operators Manual
For VAX/VMS System

Publication No. 8000088-01, Rev. A

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Ramtek

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Santa Clara, California 95050

LIST OF EFFECTIVE PAGES

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Chapter 1

GENERAL INFORMATION

1.1 INTRODUCTION

This manual describes the RM-9400/RM-9460 diagnostic and acceptance tests. These tests check RM-9400/RM-9460 (Ramtek) hardware and firmware; but the tests also check the VAX interface. The tests run under the control of the VAX/VMS operating system, and can run concurrently with other host programs. But the tests cannot run concurrently with other programs that also access the Ramtek.

1.2 HOW TO USE THIS MANUAL

This volume is a single-volume reference for the computer operator. Chapter divisions are as follows:

- Chapter 1 - General Information
- Chapter 2 - System Requirements
- Chapter 3 - Diagnostic Tests
- Chapter 4 - Acceptance Tests
- Appendix A - Console Messages and Error Codes
- Appendix B - Ramtek Instructions Used by Test Programs
- Appendix C - Available Media
- Appendix D - Diagnostic Test Worksheets

1.2.1 General Information

Chapter 1 includes an overview of the manual and a summary of related documents.

1.2.2 System Requirements

Chapter 2 provides the configurational and operational requirements and the operating procedures for the RM-9400/RM-9460 diagnostic and acceptance tests.

1.2.3 Diagnostic Tests

Chapter 3 describes the diagnostic tests used to verify the functioning of the Ramtek and interface hardware.

1.2.4 Acceptance Tests

Chapter 4 describes the acceptance tests used to verify the functioning of the Ramtek firmware.

1.2.5 Console Messages and Error Codes

Appendix A lists console messages generated by the diagnostic and acceptance tests, and error codes generated by the Ramtek firmware.

1.2.6 Ramtek Instructions Used by Test Programs

Appendix B lists the Ramtek instructions used by each of the diagnostic and acceptance test programs.

1.2.7 Available Media

Appendix C describes the media on which the diagnostic and acceptance tests are available.

1.2.8 Diagnostic Test Work Sheets

Appendix D contains work sheets for writing test input data and recording output information.

1.3 MANUAL REVISION INFORMATION

Periodically, Ramtek publishes a change package or reissues a manual to stay current with software, circuit, and component improvements as they develop and are tested. This manual has the following revision information:

- ¤ List of Effective Pages
- ¤ Request for Changes Form
- ¤ Reader Comment Form
- ¤ Notice of Changes (not included in new or reissued manuals)

1.3.1 List of Effective Pages

This is a list of all manual pages referenced to the current revision number. Ramtek publishes a list of effective pages each time a manual is issued, reissued, or a change package is issued. Insert the list of effective pages when you add or delete change pages.

1.3.2 Request for Changes Form

If you wish to receive change packages, please fill out and mail the self-addressed postcard at the front of this manual. You will then receive change packages as they are published.

1.3.3 Reader Comment Form

Ramtek Technical Publications Department supplies a self-addressed Reader Comment Form to obtain user feedback. Please enter any comments, suggestions, or complaints on the form. Include page, paragraph, figure, or table number as applicable. The Reader Comment Form is inserted as the last manual page.

1.3.4 Notice of Changes

A notice of changes will accompany each change package. Follow the information in the notice when inserting and deleting pages. New or reissued manuals do not require a notice of changes.

1.4 RELATED DOCUMENTS

This reference manual describes the diagnostic and acceptance tests that verify Ramtek and VAX/VMS interface hardware and firmware functioning. Table 1-1 lists supporting Ramtek and VAX/VMS reference documents that contain supplementary information to the material contained in this manual.

Table 1-1. Related Documents

TITLE	COMPANY	DATE
RM-9400 Graphic Display System Software Reference Manual	Ramtek Corporation	May, 1982
RM-9400 Graphic Display System Hardware Reference Manual	Ramtek Corporation	Nov., 1981
RM-9460 Graphic Display System Software Reference Manual	Ramtek Corporation	July, 1983
RM-9460 Graphic Display System Hardware Reference Manual	Ramtek Corporation	May, 1983
VAX/VMS System Management and Operations Guide	Digital Equipment Corporation	May, 1982

Chapter 2

SYSTEM REQUIREMENTS

2.1 CONFIGURATIONAL REQUIREMENTS

The RM-9400/RM-9460 diagnostic and acceptance tests can run on the RM-9400 or RM-9460 Series Graphic Display System. The RM-9460 may have either a Z80- or an MC68000-based display processor. Some diagnostic and acceptance tests require hardware or firmware features (table 2-1).

2.2 OPERATIONAL REQUIREMENTS

The diagnostic and acceptance test program requires a VAX computer using the VMS operating system, a console terminal, the Ramtek DEC UNIBUS interface, and the Ramtek driver (part number 509024-01). The console terminal interface must conform to the DEC standard.

2.3 OPERATING PROCEDURES

The diagnostic and acceptance tests are VAX/VMS operating-system dependent and can run concurrently with other host programs. VAX/VMS treats the diagnostics as a privileged operation and requires PHY_IO privilege (see VAX/VMS System Management and Operations Guide for a full discussion of PHY_IO privileges).

To load the executable image from magnetic tape, mount the tape onto the drive and copy the file into the desired account:

```
MOUNT/DENSITY=1600 MTA0: DIAG
COPY MTA0:*.* *.*
DISMOUNT MTA0:
```

NOTE

MTA0: is not the device name for every system.
Tape density may be 800 bpi.

Table 2-1. RM-9400/RM-9460 Hardware and Firmware Option Requirements

AG = Advanced Graphics
EI = Extended Image
PF = Pixel Formatter
T = Trending
X = Test cannot run successfully

RM-9400					
Diagnostic Tests	Firmware	Hardware	Acceptance Tests	Firmware	Hardware
B	AG,T	T	,0030	AG	-
I	AG	-	,0031	AG	-
M	AG	-	,0032	AG	-
N	AG	-	,0033	AG	-
O	X	X	,0034	AG	-
T	T	T	,0035	AG	-
.A	*	*	,0036	AG	-
			,0040	AG	-
			,0041	AG	-
			,0042	AG	-
			,0043	AG	-
			,0050	AG	-
			,0051	AG	-
			,0052	AG	-
			,0059	-	PF
			,0060	EI	-
			,0061	EI	-
			,0062	EI	-
			,0063	EI	-
RM-9460					
B	T(Z80)	T(Z80)	,0059	PF(Z80)	PF(Z80/MC68000)
O	X(Z80)	X(Z80)			
T	T(Z80)	T(Z80)			
.A*	T(Z80)	T(Z80)			

* .A can execute any Ramtek instruction, and therefore may require firmware or hardware options, based on use.

To run the diagnostic or acceptance tests, enter the following commands on the console keyboard:

```
ASSIGN RMA0: RM
ALLOCATE RMA0
ALLOCATE RMA1          (if 2 MCPs installed in system)
ALLOCATE RMA2          (if 3 MCPs installed in system)
RUN RMDIAGx
```

NOTE

RMA0, RMA1, and RMA2 are not the device names for every system.

The value of x in the RMDIAGx test file name depends on the resolution of the Ramtek screen installed in your system. Replace the x with a numeric value in the range of 1 through 6. Table 2-2 defines the test file names for Ramtek screen resolutions.

Table 2-2. Test File Names for Ramtek Screen Resolutions

File	Spatial Lines	Resolution Elements
RMDIAG1	1024	1280
RMDIAG2	512	1280
RMDIAG3	1024	1024
RMDIAG4	512	640
RMDIAG5	480	640
RMDIAG6	256	640

Interact with the test program through the console terminal. Numeric input is four-digit hexadecimal, unless indicated otherwise.

NOTE

Do not use the RETURN key to terminate input. The test program uses the RETURN key response for test exits and other special purposes described in specific diagnostic tests.

Upon starting, the test program writes the following message on the console screen:

RM94X0 ACCEPTANCE TEST V1-002

The test program goes through the I/O mode selection dialogue, which is the same as for test .T (see chapter 3 for a full discussion of test .T). The test program writes the following on the console screen:

Select transfer mode: P(program) or D(DMA) =

Respond P for programmable input/output (PIO) transfers, or D for direct memory access (DMA) transfers. DMA transfers are much faster than PIO transfers. You should normally run the diagnostic and acceptance tests in DMA transfer mode, because tests that perform heavy input/output will time out in PIO mode.

The test program then writes the following message on the console screen:

Test =

You may now select a diagnostic or acceptance test. A one- or two-character identifier selects a diagnostic test (a single alpha character or a period followed by an alpha character). A five-character identifier (a comma followed by four hexadecimal digits) selects an acceptance test.

For a general checkout of an interface, run the diagnostic tests in the following order: .B, B, A, D, and C. For the Ramtek checkout, run diagnostic tests B, A, D, E, C, G, and H, followed by the acceptance tests. Finally, if you want to test the interface and the Ramtek, run diagnostic tests .B, B, A, D, E, C, G, and H, followed by the acceptance tests. Chapter 3 describes the diagnostic tests, and chapter 4 describes the acceptance tests.

To exit from the test program and return to the operating system, press the ESCAPE key on the console keyboard in response to the **Test =** prompt.

NOTE

The position of switch 3 in the dip switch pack at location 7W on the Z80 system processor PCB or at location 3X on the MC68000 system processor PCB affects the test images displayed for acceptance tests ,0011, ,0023, ,0024, ,0025, ,0040, ,0041, ,0042, and ,0043. If switch 3 is set to ON, the reset between tests will erase the Ramtek screen. If switch 3 is set to OFF, the reset between tests will not erase the Ramtek screen, and the test plates for the above acceptance tests will overlay the results of the previous acceptance test plate.

Chapter 3

DIAGNOSTIC TESTS

3.1 INTRODUCTION

This chapter describes 25 diagnostic tests that test Ramtek and interface hardware functioning. The diagnostic tests perform automated write/read testing.

A one- or two-character identifier selects a diagnostic test. A one-character identifier has a single alpha character. A two-character identifier has a period followed by an alpha character. To enter a test, type the test identifier on the console keyboard in response to the **Test =** prompt on the console screen. Refer to chapter 2 for directions on calling up the **Test =** prompt.

Each diagnostic test has either a manual exit or an automatic exit. For a diagnostic test with a manual exit, end the test by pressing the RETURN key on the console keyboard. When you exit a test manually, the test program writes another **Test =** prompt on the console screen. Diagnostic tests, which exit automatically, return a **Test =** prompt on the console screen. You may then type the test identifier for the next test.

If you are in a test that prompts you for input data and you wish to exit the test rather than continue, respond to the specific test prompt by pressing the ESCAPE key on the console keyboard. The test program will write another **Test =** prompt on the console screen.

To exit from the test program and return to the operating system, press the ESCAPE key on the console keyboard in response to the **Test =** prompt.

The test program informs you of test results and errors by writing messages on the console screen. These messages are either test specific or they are generated by the Ramtek firmware. Appendix A has a complete list of console messages from the diagnostic tests.

NOTE

The tests are based on the most current configuration of PROMS.

If you are using an acceptance test tape (part number 509192-02 or 509193-02), chapter 3 is not applicable. See appendix C for further information on these tapes.

3.2 TEST A: READ SOFT REGISTER INSTRUCTION (GPIF)

Test A checks the general purpose TTL-compatible interface (GPIF) firmware and hardware with the Ramtek instruction READ SOFT REGISTER (READ). The test program sets data values for the following seven internal registers with the Ramtek instruction SET PARAMETER (SET):

- X origin
- Y origin
- X start-point
- Y start-point
- Write mask
- Foreground
- Background

The test program issues a READ instruction for each internal register, and compares the set value with the data value read back. Test A reports any discrepancies with a console message. If the system is running properly, the blinking rate of the processor idle lights on the Ramtek processor PCB slows down.

ENTRY: Respond A to **Test** = prompt.

EXECUTION: Test A has no prompts for input data.

Test A compares data values sent to the Ramtek by the SET instruction with the data values read back by the READ instruction for each internal register. When there is a discrepancy between the values for any register, Test A reports the discrepancy by writing a message on the console screen specifying the name of the internal register, the hexadecimal data value sent to the Ramtek (YYYY), and the hexadecimal data value read back from the Ramtek (XXXX):

```
X origin  XXXX  should be  YYYY
Y origin  XXXX  should be  YYYY
X start-point  XXXX  should be  YYYY
Y start-point  XXXX  should be  YYYY
Write mask  XXXX  should be  YYYY
Foreground  XXXX  should be  YYYY
Background  XXXX  should be  YYYY
```

If the test program does not write one of the above messages within 30 seconds of test start, you can conclude that test A has run successfully, and exit the test manually.

EXIT: Press RETURN key on console keyboard.

3.3 TEST B: COMMAND/STATUS ENABLE (GPIF)

Test B verifies that interrupt enable commands issued to the general purpose TTL-compatible interface (GPIF) show up properly in the GPIF status lists. Test B checks each of the 16 possible combinations of interrupt enables. The test program indicates discrepancies by writing a message on the console screen.

ENTRY: Respond B to **Test =** prompt.

EXECUTION: Test B has no prompts for input data.

Test B sends interrupt enable commands to the Ramtek, and for each command compares the GPIF status before sending the command with the status value read back from the GPIF. When there is a discrepancy between the status values for any command, Test B notes the discrepancy by writing the following message on the console screen:

```
Current status  XXXX  should be  YYYY
Command issued  ZZZZ
```

XXXX is the hexadecimal value read back from the GPIF, YYYY is the hexadecimal value expected, and ZZZZ is the hexadecimal interrupt enable command issued to the GPIF.

EXIT: Test B automatically exits at end of test (almost immediately).

3.4 TEST C: PERIPHERAL INTERRUPT

Test C verifies the proper functioning of peripheral interrupts. This test consists of two independent subtests: subtest I, which tests illegal instruction interrupts, and subtest T, which tests transmitter interrupts.

ENTRY: Respond C to **Test =** prompt.

EXECUTION: Select the appropriate subtest by responding I or T to the following prompt:

Subtest: I(illegal instruction) or T(transmitter) =

EXIT: Press RETURN key on console keyboard.

3.4.1 Subtest I: Illegal Instruction Interrupt

Subtest I checks for the occurrence of an illegal instruction interrupt after the test program issues an illegal Ramtek instruction. If the interrupt does not occur, subtest I writes a message on the console screen. When subtest I is operating normally, the Ramtek processor self-test light and chassis self-test LED flash repeatedly.

ENTRY: Respond I to **Subtest: I or T =** prompt.

EXECUTION: Subtest I has no prompts for input data.

Subtest I issues an illegal instruction to the Ramtek. If an illegal instruction interrupt does not occur, the test program writes the following message on the console screen:

RAMTEK failed to recognize illegal instruction

The test program continues issuing illegal instructions and checking for illegal instruction interrupts until you manually exit the program.

EXIT: Press RETURN key on console keyboard.

3.4.2 Subtest T: Transmitter Interrupt

Subtest T verifies that transmitter interrupts occur after issuing the Ramtek instruction WRITE KEYBOARD (WKB). The test also verifies that the Ramtek keyboard status lights (the LEDs directly above the special function keys) are working. When the test runs normally, the status lights on the Ramtek keyboard light and go out in sequence, and the Ramtek processor lights cycle slower.

ENTRY: Respond T to **Subtest: I or T =** prompt.

EXECUTION: The test program asks for a device number, one digit in the range of zero through seven:

Device (0-7) =

Your response should be the value of the keyboard device number for the Ramtek keyboard you are testing.

The program then asks for the baud rate class of the Ramtek keyboard, an alpha character in the range of A through D:

Baud rate class (A-D) or ?(for menu) =

If you do not know the alpha character which represents the baud rate of the Ramtek keyboard, respond to the prompt with a question mark, and subtest T will write a menu containing the baud rate classes on the console screen:

Class	Baud rates
A	50 to 109
B	110 to 299
C	300 to 599
D	600 and above

After writing the baud rate class menu, the test program will write the baud rate class prompt again.

Subtest T issues WKB instructions, turning the Ramtek keyboard status lights on and off in sequence, and checking for transmitter interrupts. Your response to the baud rate class prompt determines the speed of the status light cycle. When the test program does not receive an expected transmitter interrupt, subtest T writes the following message on the console screen:

Timeout

The test continues looping until you exit manually.

EXIT: Press RETURN key on console keyboard.

3.5 TEST D: WRITE/READ IMAGE

Test D checks refresh memory by performing a write/read/compare test with the Ramtek instructions WRITE IMAGE (WI) and READ IMAGE (RI). The test program checks any selected combination of refresh memory planes, and stores the image data in refresh memory using selected scan and image modes, with or without reverse packing.

The pattern written into refresh memory is a simple ascending data pattern: the value written at location N+1 is one more than the value written into location N (masked by the selected memory plane mask). The value written into the first location of the defined window area is initially zero, and is incremented by one after each pass of the test.

The diagnostic and acceptance test program normally executes a system reset between tests. The default memory control processor (MCP) and memory group selection at system reset is MCP 0 and group 0. If you wish to test an MCP or memory group other than zero, run test .R to disable system resets between tests and then run test .G to select the particular MCP and memory group you wish to test. You may now run test D on the selected MCP and memory group. Test only one MCP and one memory group per pass of test D.

For a comprehensive check, execute multiple passes of test D, varying the memory plane mask, scan and image modes, and window location.

NOTE

If you do not disable resets with test .R before selecting an MCP and memory group with test .G, the Ramtek firmware will erase the selected MCP and memory group between tests, returning the processor to the default normal-format parameters (including MCP 0 and group 0).

ENTRY: Respond D to **Test =** prompt.

EXECUTION: Test D first asks for the memory plane mask:

Memory plane mask =

Respond with a hexadecimal value representing the bit mask of refresh memory plane(s) you are testing. For example, bit mask 000F represents memory planes zero through three, bit mask 00F0 represents memory planes four through seven, and bit mask 00FF represents memory planes zero through seven. The memory plane mask value you enter can be affected by your response to the reverse packing prompt.

The test program then asks for the minimum X and Y window values:

Window minimum X =
Window minimum Y =

Enter the hexadecimal values for the starting coordinates of the window area you are testing in this run of test D. The window size tested is 256 words by 256 words (0100 by 0100 hex.). To test the full screen resolution, run test D repeatedly, varying the X and Y window minimums by incremental step values of 0100 hex. The maximum response values to the window minimum prompts are as follows:

Screen Resolution (decimal) X x Y	Screen Resolution (hexadecimal) X x Y	Window Minimum X
640 x 256	0280 x 0100	0180
640 x 480	0280 x 01E0	0180
640 x 512	0280 x 0200	0180
1024 x 1024	0400 x 0400	0300
1280 x 1024	0500 x 0400	0400

You will notice that in each case the maximum response values to the window minimum prompt is 0100 hex. less than the screen resolution.

For example, if your system has a 1280 by 1024 screen resolution (0500 by 0400 hex.), you would need to run test D 20 times to cover the entire screen:

Window minimum X	Window minimum Y	Window minimum X	Window minimum Y	Window minimum X	Window minimum Y	Window minimum X	Window minimum Y
0000	0000	0000	0100	0000	0200	0000	0300
0100	0000	0100	0100	0100	0200	0100	0300
0200	0000	0200	0100	0200	0200	0200	0300
0300	0000	0300	0100	0300	0200	0300	0300
0400	0000	0400	0100	0400	0200	0400	0300

Next, the test program asks for the scan mode in which you wish to run the test:

Scan mode (0-7) =

Acceptance test ,0002 checks the eight possible scan modes. Unless you have a reason for testing a non-standard scan mode, respond 0 to the above prompt.

Test D then asks for the image mode in which you wish to run:

Image mode (0-2) =

The codes for the image mode prompt are: 0 = word mode, 1 = low-byte mode, and 2 = high-byte mode. Image modes 1 and 2 test two windows simultaneously (0200 by 0100 hex.). If you run in image mode 1 or 2, you can use an incremental value of 0200 hex. to step through the X resolution. The maximum response to the window minimum X prompt must be 0200 hex. less than the screen X resolution for image modes 1 and 2.

The final prompt for test D asks whether or not you want reverse packing:

Reverse packing (Y/N)?

Respond Y or N to this prompt. Reverse packing affects the memory planes checked by test D. For example, both cases below check memory planes zero through seven:

Memory plane mask =	00FF	FF00
Image mode (0-7) =	0	0
Reverse packing (Y/N)?	N	Y

Test D writes an incremental pattern to the memory plane(s) selected by the memory plane mask prompt within the window area defined by the window prompts. The test program then reads back the data from the Ramtek and compares the data read back with the data written.

If test D detects a discrepancy between the data written and the data read back, the test program writes the following message on the console screen:

```
At buffer address       AAAA
Data read from RAMTEK   XXXX  should be  YYYY
```

AAAA is the hexadecimal sequential buffer address at which the discrepancy occurred, YYYY is the hexadecimal value written to the Ramtek, and XXXX is the hexadecimal value read back from the Ramtek. If the MCP is operating correctly, the buffer address indicates the row and column location within the window area. Depending on the selected scan mode, the high order and low order bytes reflect the row or column values. The low order byte reflects the sequential word in the primary scan direction, and the high order byte reflects the sequential word in the secondary scan direction. For example, in scan mode 0, the low order byte reflects the sequential row and the high order byte reflects the sequential column within the window area. In scan mode 5, the low order byte reflects the inverse sequential column and the high order byte reflects the sequential row within the window area.

If refresh memory has caused the problem, the console message provides enough information to narrow the write/read discrepancy to the memory PCB level. Refresh memory errors usually are apparent in the display on the Ramtek screen as an evenly spaced array of failing pixels. Interface and cable problems are more random in appearance.

Test D executes repeatedly until you exit manually.

EXIT: Press RETURN key on console keyboard.

Table 3-1 is an example of test D. Memory planes zero through five are tested. The Y response to the reverse packing prompt affects the memory plane mask selection. (An N response to the reverse packing prompt would test memory planes eight through thirteen in this example.) Scan mode 0 is left to right in the primary scan and top to bottom in the secondary scan. Image mode 0 represents the word mode.

Table 3-1. Test D (Read/Write Image) Example

Prompt	Response
Test =	D
Memory plane mask =	3F00
Window minimum X =	0000
Window minimum Y =	0000
Scan mode (0-7) =	0
Image mode (0-2) =	0
Reverse packing (Y/N)?	Y

3.6 TEST E: VIDEO LOOKUP TABLE

Test E checks the Ramtek video lookup tables (VLTs) on V2, V7, V8, and V12 video PCBs. The test program writes color data values in a graphic VLT and character data values in a text VLT with the Ramtek instruction LOAD AUXILIARY MEMORY (LAM) and reads back data values from the VLT with the Ramtek instruction READ AUXILIARY MEMORY (RAM).

Test E loads color and character data values in the VLT with the LAM instruction in the following loop-within-a-loop process:

1. Test E assigns the value 0000 (hex.) to the starting color or character value.

2. The test program masks the starting color/character value with the specified lookup table mask, and stores the resulting value in the selected starting address.

3. For each successive location in the VLT, test E increments the color/character value by 1, masks the color/character value with the specified lookup table mask, and stores the result in the next VLT location.

4. This incremental process continues for the selected number of VLT locations.

5. Test E then increments the starting color/character value by 1 and returns to step 2 for the next iteration of the inner loop.

The test program follows each LAM instruction with a RAM instruction to read back the value written in the VLT location. When there is a discrepancy between the value written and the value read back, test E writes a message on the console screen. Run test E for each VLT in your system.

NOTE

Test E changes the color values stored in a graphic VLT. If you plan to run the acceptance tests after running test E, run test H to restore the VLT to the appropriate colors for the acceptance tests.

ENTRY: Respond E to **Test =** prompt.

EXECUTION: Test E first asks for a lookup table number, a digit in the range of 0 through 7:

Lookup table number (0-7) =

Respond with the device code value defined by the lookup table identifier switch on the video PCB. If you have a V12 PCB, the even numbered lookup tables (0,2,4,6) are graphic VLTs, and the odd numbered lookup tables (1,3,5,7) are the text VLTs.

The test program then asks:

Start address =

Respond with a hexadecimal value representing the lowest address you want to test in the specified VLT. The normal response to the above prompt is the hexadecimal value 0000.

The following prompt:

Length (in words) =

is asking for the number of locations you want to test in the VLT. Respond with a hexadecimal value that is a multiple of decimal 256 (that is, 0100, 0200, 0300, etc.). The normal responses to the above prompt for each video PCB are:

Video PCB Type	Length (in hex.)
V2 or V7A (high res)	0800
V2 or V7A (low res)	1000
V7B	0800
V8	0800
V12 graphic (high res)	0100
V12 graphic (low res)	0200
V12 text	0800

Test E then asks for the code representing the video type, either 0 or 1:

Video type: 0(V2,V7A,V8,V12) or 1(V7B) =

Respond with the video PCB code for the VLT you are testing.

Next, the test program asks for a lookup table mask. Test E masks the incrementing color/character value with the lookup table mask, and loads the VLT with the resulting value.

If your response to the video type prompt is 0 (that is, a V2, V7A, V8, or V12 PCB), specify a one word lookup table mask:

Lookup table mask =

The normal responses to the above prompt are as follows:

Lookup table Type	Mask (in hex.)
V2 or V7A	1FFF
V8	00FF
V12 graphic	00FF
V12 text	0FFF

If your response to the lookup table type prompt is 1 (that is, a V7B PCB), specify a two word lookup table mask:

Lookup table low word mask =
Lookup table high word mask =

The normal mask values are FFFF for low word mask, and 01FF for high word mask.

Test E writes incrementing masked color/character values in the selected VLT with the LAM instruction from the specified starting address for the specified number of locations. After each LAM instruction, the test program reads back the data from the Ramtek with a RAM instruction, and compares the data read back with the data written.

If test E detects a discrepancy between the data written and the data read back, the test program writes the following message on the console screen:

```
At buffer address       AAAA
Data read from RAMTEK   XXXX  should be  YYYY
```

AAAA is the hexadecimal buffer address at which the discrepancy occurred, YYYY is the hexadecimal value written to the Ramtek, and XXXX is the hexadecimal value read back from the Ramtek. The buffer address is the relative offset address from the starting address specified in the start address prompt.

Test E continues to run until you exit manually.

EXIT: Press RETURN key on console keyboard.

3.7 TEST F: CONVERGENCE

Test F uses the Ramtek instructions WRITE POINT (WPT) and WRITE VECTOR LINKED (WVL) to display a convergence pattern on the Ramtek screen. The convergence pattern is an 8 by 8 grid of squares with a pixel dot at the center of each square. If your system has a video PCB installed, run test H to change the display to white-on-black for convergence.

ENTRY: Respond F to **Test =** prompt.

EXECUTION: The test program asks for the number value of the desired foreground color:

Foreground =

Respond with a hexadecimal value representing the color in which you wish the convergence pattern to be drawn. If you have run test H, the hexadecimal color values are:

Color	Hexadecimal Value
Black	0000
Blue	0001
Green	0002
Cyan	0003
Red	0004
Magenta	0005
Yellow	0006
White	0007

The test program draws the convergence pattern for the resolution of the Ramtek screen in the selected foreground color.

EXIT: Press RETURN key on console keyboard.

3.8 TEST G: INTERACTIVE PERIPHERAL INTERRUPT

Test G consists of three subtests, each of which interactively test a selected peripheral device: cursor controller (subtest C), keyboard (subtest K), and graphic tablet (subtest T).

ENTRY: Respond G to **Test =** prompt.

EXECUTION: Select the appropriate subtest by responding C , K , or T to the following prompt:

Subtest: C(cursor), K(keyboard), T(tablet) =

EXIT: Press RETURN key on console keyboard.

3.8.1 Subtest C: Cursor Controller

Subtest C checks the Ramtek cursor controller. Whenever the test program receives a cursor interrupt from the Ramtek peripheral device, subtest C displays a pixel in foreground color at the cursor position on the Ramtek screen with the Ramtek instruction WRITE RANDOM PIXEL (WRP). The test program checks the difference in position between successive track-mode interrupts. If the difference is greater than one pixel in either dimension, subtest C can write a gap in track mode message on the console screen.

NOTE

Gaps in track mode are not an error condition. Unless the cursor is moved very slowly gaps will be a normal occurrence.

ENTRY: Respond C to **Subtest: C, K, T =** prompt.

EXECUTION: Subtest C asks for a device number, which must be one digit in the range of zero to seven:

Device (0-7) =

The number you specify should be the cursor-controller device number for the Ramtek peripheral you are testing.

The test program then asks if you want a message written on the console screen whenever a gap in track mode occurs:

Write gaps in track mode (Y/N)?

If you do not wish to see the record of gaps in track mode, respond N to the question.

After responding to the above prompt, turn on the cursor-controller device and set the VISIBLE and TRACK switches on the device to ON. The cursor will now be visible on the Ramtek screen. Move the joystick or trackball in any direction, and the cursor position moves accordingly. If you move the cursor slowly enough, the test program echoes the path of cursor movement on the Ramtek screen in the foreground color stored in the VLT.

However, when you move the cursor too quickly, gaps in track mode will occur, and you will see breaks in the drawn cursor path. If you have requested that gaps in track mode be written, subtest C writes the following message on the console screen for each gap occurrence:

```
Gap in track mode data
```

The test program acknowledges interrupts but does not process them while writing the console message. If the test stops echoing the cursor position, check the console screen to see if subtest C is writing the gap in track mode message.

You can also test the ENTER switch on the cursor-controller device. Set the TRACK switch on the device to OFF, move the joystick or trackball to cause the cursor to move to a new position, and depress the ENTER switch. The test program displays a pixel in the foreground color at the cursor position where you depressed the ENTER switch. Proceed to move the cursor to a new position on the Ramtek screen and depress the ENTER switch again. Subtest C will display another pixel in the foreground color. Each time you move the cursor and depress the ENTER switch, the test program displays a pixel at the screen position where you depressed the ENTER switch.

If you set the BLINK switch on the cursor-controller device to ON, the cursor will blink on the Ramtek screen.

EXIT: Press RETURN key on console keyboard.

3.8.2 Subtest K: Keyboard

Subtest K checks the Ramtek keyboard. The test program displays any keys typed on the Ramtek keyboard on the Ramtek screen with the Ramtek instruction WRITE TEXT (WT). The Ramtek can generate only 64 of the ASCII characters; lower-case alphabetic characters and control characters generate an undefined display.

ENTRY: Respond K to **Subtest = C, K, T =** prompt.

EXECUTION: The test program asks for a device number (0-7):

Device (0-7) =

Respond with the corresponding keyboard device number for the Ramtek keyboard you are testing.

Proceed with the test by entering characters on the Ramtek keyboard. Subtest K displays, on the Ramtek screen, the characters you enter on the keyboard.

EXIT: Press RETURN key on console keyboard.

3.8.3 Subtest T: Graphic Tablet

Subtest T checks the Ramtek graphic tablet. The graphic tablet has two operating modes: menu mode and non-menu mode. Dip switch pack switch settings on the serial link PCB determine whether the graphic tablet is in menu or non-menu mode. Refer to the hardware reference manual for your Ramtek system for the appropriate switch settings.

When the test program receives a graphic tablet interrupt, subtest T displays a foreground color pixel with the Ramtek instruction WRITE RANDOM PIXEL (WRP). The pixel is at the cursor position on the Ramtek screen. When the graphic tablet is in menu mode, the test program checks the difference in position between successive track-mode interrupts. If the difference is greater than one pixel in either X or Y dimension, subtest T can write a gap in track mode message on the console screen.

ENTRY: Respond T to **Subtest: C, K, T =** prompt.

EXECUTION: The test program asks for a device number, which must be one digit in the range from zero to seven:

Device (0-7) =

Specify the cursor-controller device number for the graphic tablet you are testing.

The test program then asks if you want a message written on the console screen whenever a gap in track mode occurs:

Write gaps in track mode data (Y/N)?

If you want to see the record of gaps in track mode, respond Y to the question. The message only applys if the graphic tablet is in menu mode and you have enabled track mode.

After responding to the above prompt, turn on the graphic tablet cursor controller and proceed to perform testing in menu or non-menu mode.

Menu mode:
Figure 3-1 shows the graphic tablet layout in menu mode.

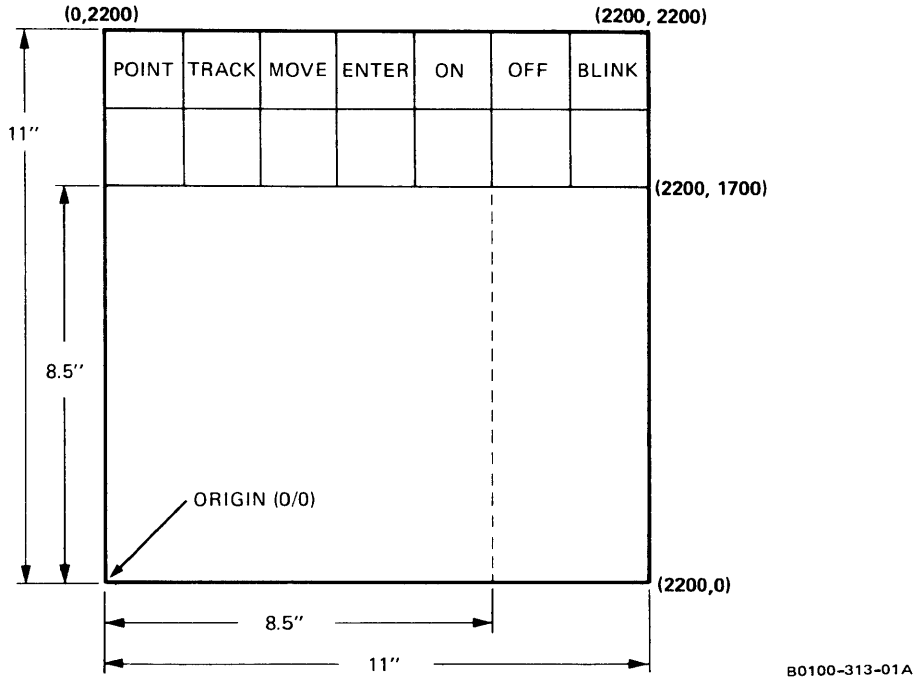


Figure 3-1. Graphic Tablet Layout in Menu Mode

The surface of the tablet is divided into an 11 x 8 1/2-inch work area (2200 x 1700 in tablet coordinates) and a function menu. The function menu selects the tablet modes POINT, TRACK, AND MOVE, and cursor states ON, OFF, and BLINK.

Turn on the cursor by moving the puck/stylus to the ON function box and depressing the puck ENTER button or stylus. The cursor will now be visible in the upper left-hand corner of the Ramtek screen. Select track mode on the function menu by moving the puck/stylus to the TRACK function box and depressing the puck ENTER button or stylus. Then move the puck/stylus in any direction in the tablet work area while continuously depressing the puck ENTER button or stylus, and the cursor position moves accordingly. If you move the cursor slowly enough, the test program echoes the path of cursor movement on the Ramtek screen in the foreground color stored in the VLT.

However, when you move the cursor too quickly, gaps in track mode will occur. The test program draws a vector from the last acknowledged interrupt position to the current interrupt position

causing an inaccurate representation of the actual cursor path. You may be drawing a curve with the cursor, but if there are gaps in track mode, subtest T will display an angular path of straight lines. The faster you move the puck/stylus, the more disjointed the lines on the Ramtek screen will be. If you have requested that gaps in track mode be written, subtest T writes the the following message on the console screen for each gap occurrence:

Gap in track mode data

If you release the puck ENTER button or raise the stylus from the tablet surface, move the puck/stylus to a new position on the tablet and again depress the puck ENTER button or stylus, the test program draws a straight line between the two points.

Selecting point mode in the function menu turns off track mode. Move the puck/stylus to the POINT function box and depress the puck ENTER button or stylus. Move the puck/stylus to a position in the tablet work area and depress the puck ENTER button or depress the stylus against tablet surface. The test program moves the cursor to the corresponding position on the Ramtek screen, generates an interrupt, and draws a straight line between the last interrupt position and the current interrupt position. You must now release the puck ENTER button or raise the stylus from the tablet surface, move the puck/stylus to a new tablet position, and again depress the puck ENTER button or stylus to generate another interrupt. Every interrupt causes subtest T to draw a line between the point of the last interrupt and the current interrupt point.

You can also test move mode in the function menu. Move the puck/stylus to the MOVE function box and depress the puck ENTER button or stylus. Move mode differs from the point mode in that the cursor position on the Ramtek screen moves to the new position of the puck/stylus when you depress the puck ENTER button or stylus, but the test program does not generate an interrupt for that cursor position or draw a line on the Ramtek screen until you select the ENTER menu function to enter the tablet point.

Selecting BLINK in the function menu causes the cursor on the Ramtek screen to blink, and selecting OFF in the function menu causes the cursor to become non-visible.

Non-menu mode:
No cursor is visible on the Ramtek screen in non-menu mode. Move the puck/stylus in any direction, continuously depressing the ENTER button on the puck or depressing the stylus against the tablet surface. The test program echoes the path of the puck/stylus movement in the foreground color on the Ramtek screen. If you move the puck/stylus to a new position without depressing the ENTER button on the puck or depressing the stylus, the test program does not echo any cursor movement on the Ramtek screen. If you now depress the puck ENTER button or stylus again and move

the puck/stylus, subtest T draws a straight line between the position where the puck ENTER button or stylus was last depressed and the position where the puck ENTER button or stylus is again depressed, and then resumes echoing the path of further stylus/puck movements, as long as you continue to depress the puck ENTER button or stylus.

EXIT: Press RETURN key on console keyboard.

3.9 TEST H: VIDEO LOOKUP TABLE PRESET

Test H loads the video lookup tables (VLTs) in video option PCBs. Using the Ramtek instruction LOAD AUXILIARY MEMORY (LAM), the test program loads the VLTs with values that produce a white-on-black and standard color display. Run test H prior to running diagnostic tests F and G and the acceptance tests.

ENTRY: Respond H to **Test =** prompt.

EXECUTION: Test H asks for a video type code, which must be one digit in the range of zero through three:

Video type: 0(V2,V7A), 1(V7B), 2(V8), 3(V12) =

Respond with the video PCB code for the VLT you are loading in test H.

The test program then asks for a VLT number, a digit in the range of zero through seven:

Lookup table number (0-7) =

Respond with the device code value defined by the lookup table identifier switch on the video PCB. If you have a V12 PCB, the odd numbered lookup tables (1,3,5,7) are graphic VLTs, and the even numbered lookup tables (0,2,4,6) are the text VLTs. Test H loads the graphics VLTs with colors and loads the text VLTs with blanks.

If your response to the video type prompt is 0, 1, or 2, test H asks for a memory plane mask:

Memory plane mask =

Specify a hexadecimal bit mask value representing the existing memory planes that are physically wired to the selected VLT on the video PCB. The video lookup table location specified in the memory plane mask value is the foreground color location addressed by the acceptance tests. Test H loads this foreground color location with the color white.

EXIT: Test H automatically exits at end of test.

3.10 TEST I: ENTITY DETECTION

Test I checks the Ramtek entity-detection firmware. This test loads a selected acceptance test into display list 0, executes the acceptance test, and performs entity detection on selected memory planes with the detect parameters supplied.

ENTRY: Respond I to **Test =** prompt.

EXECUTION: Test I first asks for an acceptance test number:

Test number =

Enter only the four-digit hexadecimal value of the acceptance test you wish to run through test I. Do not enter the comma preceding the acceptance test number. Acceptance test ,0021 was designed specifically for use with test I, but you may use other acceptance tests as well. Test I will not run properly with acceptance tests ,0030, ,0031, ,0044, ,0052, and ,0059. These tests contain Ramtek instructions that are not compatible with the entity detection firmware.

The test program then asks for the detect window parameters:

Detect window minimum X =
Detect window minimum Y =
Detect window maximum X =
Detect window maximum Y =

Respond with a four-digit hexadecimal number for each detect window value. The values specified define a rectangular area (detect window). The detect window is an area within which you want hits detected. A detect hit is an attempt to write within the detect window to memory planes that are detect-enabled. Specify a rectangular area within the limits of your screen resolution.

Next, you are asked for a value of the number of hits to ignore:

Number of hits to ignore =

This value is also a hexadecimal value. Normally on a first pass, this value should be zero. The Ramtek entity-detect firmware can record a maximum of 64 (0040 hex.) hits. If you run test I and the test program writes a detect buffer overflow message on the console, you can rerun the test with this value set to multiple of 64 (0040, 0080, 0100, ... hex.), and test I will write out the next set of detect hits.

Test I then asks for a range of detect classes:

Minimum detect class =
Maximum detect class =

Specify the hexadecimal values within the range 8000 to 7FFF (-32768 to 32767 decimal) representing the minimum and maximum detect classes for which you want to have detect hits recorded.

Finally, the test program asks for a detect memory plane mask:

Detect memory plane mask =

Respond with a bit mask representing the memory planes in your Ramtek system that you want detect-enabled.

For each detect hit, the test program writes the data returned by the Ramtek instruction READ BACK DETECT BUFFER (RDB) on the console screen:

```
Number of hits  XXXX
      - or -
Number of hits  >  YYYY

Data word 1  WWW1
Data word 2  WWW2
Detect class  CCCC
Display list  DDDD
Absolute address  AAAA
Relative instruction IIII
```

If the value for the number of hits is non-zero, test I writes the data for the first hit on the console screen. After writing the data for the first hit, the test program pauses. Press the RETURN key on the console keyboard and test I will write the data for the next hit on the console screen. You must exhaust the complete list of hits before you exit the test.

If the number of hits message contains a greater-than sign, a detect buffer overflow occurred during entity detection. If you want to see the data for the next set of hits, run test I again and respond 0040 to the number of hits to ignore prompt. The test program will record hit data starting with hit 0041 and continuing until the last hit or until the detect buffer overflows again. Continue running test I, incrementing the value for number of hits to ignore by 0040 hex. for each run, until the number of hits message written does not contain the greater-than sign.

EXIT: Exit occurs automatically if test I detects no hits. If test program detects hits, press the RETURN key on console keyboard after last hit.

Examples 1 and 2 show typical dialogues for test I. Example 1 yields no hits, while example 2 yields two hits using the parameters described. For this example, the memory plane mask reflects eight memory planes.

Table 3-2. Test I (Entity Detection) Example 1

Test Prompt	System Resolution 2x6	5x6	10x10	10x12
Test number =	0021	0021	0021	0021
Detect window minimum X =	0000	0000	0000	0000
Detect window minimum Y =	0000	0000	0000	0000
Detect window maximum X =	027F	027F	03FF	04FF
Detect window maximum Y =	00FF	01FF	03FF	03FF
Number of hits to ignore =	0000	0000	0000	0000
Minimum detect class =	0004	0004	0004	0004
Maximum detect class =	7FFE	7FFE	7FFE	7FFE
Detect memory plane mask =	00FF	00FF	00FF	00FF

Table 3-3. Test I (Entity Detection) Example 2

Test Prompt	System Resolution 2x6	5x6	10x10	10x12
Test number =	0021	0021	0021	0021
Detect window minimum X =	0000	0000	0000	0000
Detect window minimum Y =	0000	0000	0000	0000
Detect window maximum X =	027F	027F	03FF	04FF
Detect window maximum Y =	00FF	01FF	03FF	03FF
Number of hits to ignore =	0000	0000	0000	0000
Minimum detect class =	0003	0003	0003	0003
Maximum detect class =	7FFF	7FFF	7FFF	7FFF
Detect memory plane mask =	00FF	00FF	00FF	00FF

3.11 TEST J: CONTEXT SWITCHING

Test J checks the context-switching firmware using the Ramtek instructions ALLOCATE CONTEXT (ALCON) and SELECT CONTEXT (SCON). The test program displays portions of two selected acceptance tests, one acceptance test in context 0, and the other acceptance test in context 1. Each context has a separate write-enable window.

ENTRY: Respond J to **Test =** prompt.

EXECUTION: Test J runs the first acceptance test in context 0. The test program asks for the minimum X and maximum X for context 0:

Context 0 minimum X =
Context 0 maximum X =

Respond to the above prompts with hexadecimal values representing the portion of the acceptance test plate you want displayed in context 0. Test J uses the context 0 minimum X coordinate and the context 0 maximum X coordinate to determine the write-enable window for context 0. For example, if your screen X resolution is 1280 (0500 hex.), and if you want to display the left half of an acceptance test plate, respond to the above prompts with a minimum X = 0000 and a maximum X = 027F. If you want to display the right half of an acceptance test plate, respond to the above prompts with a minimum X = 0280 and a maximum X = 04FF. The write-enable offset for context 0 is zero.

Test J runs the second acceptance test in context 1. The test program sets up the write-enable window for context 1 with the minimum X coordinate you specify in response to the following prompt:

Context 1 minimum X =

Select the minimum X that defines the hexadecimal starting X coordinate for the write-enable window in context 1. Test J sets the write-enable window offset for context 1 so that the minimum X maps just to the right of the write-enable window used for context 0. The test program computes the size of the write-enable window for context 1 as the minimum of the following two values:

(XRES - minX1 - 1) and [XRES - (maxX0 - minX0 - 1)]

where XRES = screen X resolution
minX0 = context 0 minimum X
maxX0 = context 0 maximum X
minX1 = context 1 minimum X

Test J computes a value for context 1 maximum X as follows:

context 1 minimum X + context 1 write-enable window size - 1

For a full screen display, choose the context 1 minimum X so that the computed context 1 maximum X maps to the right edge of the Ramtek screen.

You do not have to set the write-enable windows to display just one-half of each acceptance test plate. You could set the context 0 minimum X and maximum X to display two-thirds of an acceptance test plate, and set the context 1 minimum X to display one-third of an acceptance test plate.

Test J then asks for the identifying numbers of the acceptance tests you want to run in each context:

Context 0 test number =
Context 1 test number =

Enter only the four-digit hexadecimal values of the acceptance tests you wish to run in context 0 and 1. Do not enter the comma preceding the acceptance test numbers.

The test program alternately executes instructions from the two acceptance tests, using the SCON instruction to switch contexts between tests. Refer to the chapter 4 test plates for each of the selected acceptance tests to verify that the two contexts work correctly.

EXIT: Press RETURN key on console keyboard.

Table 3-4 shows some sample input for test J with different screen resolutions.

Table 3-4. Test J (Context Switching) Example

	SYSTEM RESOLUTION			
Test Prompt	2x6	5x6	10x10	10x12
Test =	J	J	J	J
Context 0 minimum X =	0000	0000	0000	0000
Context 0 maximum X =	013F	0140	01FF	0280
Context 1 minimum X =	0000	0000	0000	0000
Context 0 test number =	0001	0001	0001	0001
Context 1 test number =	0001	0001	0001	0001

3.12 TEST K: DISPLAYABLE CLASS

Test K tests the display class features of the Ramtek. This test verifies the interaction of the Ramtek instruction SET DISPLAY CLASS RANGES (SETDC) and the normal-format parameter DISPLAY CLASS (DCL).

ENTRY: Respond K to **Test =** prompt.

EXECUTION: Test K first asks for the number of ranges:

Number of ranges (0001-000F) =

Respond with a hexadecimal value representing the number of display class ranges that you want to define. The maximum number of ranges is 15.

The program then asks for the minimum and maximum display class values for each range:

Minimum display class =
Maximum display class =

Respond with the hexadecimal values representing the sequential display classes for each display class range.

Next, you must select the displayable class value:

Displayable class: (8000-7FFF) or LF(common) =

Respond with a hexadecimal value within the range 8000 to 7FFF (-32768 to 32767 decimal) representing the display class number you want test K to display. If you want to see the common display class, press the LINE FEED key on the console keyboard.

The test program now asks for the number of the acceptance test you wish to run through test K:

Test number =

Enter only the four-digit hexadecimal value of the acceptance test. Do not enter the comma preceding the acceptance test number.

Test K runs the selected acceptance test, assigning the acceptance test to the display class specified by the displayable class prompt. If the displayable class falls within one of the selected display class ranges, the selected acceptance test plate is visible on the Ramtek screen.

EXIT: Press RETURN key on console keyboard.

Table 3-5 shows two examples of test K. The prompt responses in column 1 result in a visible display, since the displayable class (0006) falls within the selected display class range of 0000 -000F. The prompt responses in column 2 result in a nonvisible display because the displayable class (0020) does not fall within either selected display class range 0000 - 000F or 0030 - 003F.

Table 3-5. Test K (Displayable Class) Example

Test Prompt	Visible Display Response	Nonvisible Display Response
Test =	K	K
Number of ranges (0001 to 000F) =	0001	0002
Minimum display class =	0000	0000
Maximum display class =	000F	000F
Minimum display class =		0030
Maximum display class =		003F
Displayable class: (8000-7FFF) =	0006	0020
Test number =	0001	0001

3.13 TEST L: READ NORMAL-FORMAT PARAMETERS

Test L is a write/read/compare test which checks the Ramtek instruction READ NORMAL PARAMETERS (READP). The test program sets selected normal-format parameter values with the Ramtek instruction SET PARAMETER (SET), reads the parameter values back from the Ramtek with READP, and compares the values written and read back. If there is a discrepancy between the two values, test L writes a message on the console screen.

ENTRY: Respond L to **Test =** prompt.

EXECUTION: Test L asks for a code value indicating which normal-format parameters you want to check:

Operand flags: 1(OF1), 2(OF2), 3(OF1+OF2) =

If the normal-format parameters you are checking occur only in operand flag word 1, respond with code 1. If the normal-format parameters you are checking occur only in operand flag word 2, respond with code 2. If the normal-format parameters you are checking occur both in operand flag words 1 and 2, respond with code 3.

If your response to the above prompt was either code 1 or code 3, the test program then issues the following prompt:

Operand flag word 1 =

Respond with a hexadecimal value that represents the bit mask of the normal-format parameters in operand flag word 1 that you wish to check.

If your response to the operand flag prompt was either code 2 or code 3, test L then asks for the following value:

Operand flag word 2 =

Respond with a hexadecimal value that represents the bit mask of the normal-format parameters in operand flag word 2 that you wish to check. Only the six low-order bits of operand flag word 2 are valid flags. If you respond to the above prompt with a hexadecimal value larger than 003F, test L writes the following message on the console screen and then issues the OF2 prompt again.

Illegal bit in flag word

The test program sends a SET instruction to the Ramtek, assigning values to the normal-format parameters selected in the operand flag word 1 and 2 prompts. Test L then reads back the parameters with the READP instruction and compares the two sets of values.

If there is a discrepancy between the values written and the values read back, the test program writes the following message on the console screen, then continues processing.

```
At buffer address       AAAA
Data read from RAMTEK   XXXX  should be  YYYY
```

AAAA is the hexadecimal buffer address at which the discrepancy occurred, YYYY is the hexadecimal value written to the Ramtek, and XXXX is the hexadecimal value read back from the Ramtek.

When the normal-format parameters have been written, read, and compared, test L writes the following message on the console screen:

```
End of pass
```

The test program increments the values assigned to the normal-format parameters and continues performing the write/read/compare loop until you exit manually.

EXIT: Press RETURN key on console keyboard.

Table 3-6 gives an example of test L. The user has selected operand flags OF1 and OF2, and set the bits for the write mask (WMSK) and current operating point (COP) in operand flag word 1, and read mask (RMSK) in operand flag word 2.

Table 3-6. Test L (Read Normal-Format Parameter) Example

Test Prompt	Response
Test =	L
Operand flags: 1(OF1), 2(OF2), 3(OF1+OF2) =	3
Operand flag word 1 =	8001
Operand flag word 2 =	0001

3.14 TEST M: ALLOCATE MEMORY

Test M allocates display list memory with the Ramtek instruction ALLOCATE DISPLAY LIST (ALDL). The purpose of this test is to inform you how much display list memory is available in your system.

ENTRY: Respond M to **Test =** prompt.

EXECUTION: Test M has no prompts for input data.

The test program allocates display lists until it runs out of memory, then writes the following message on the console screen:

There are XXXX pages of memory available

XXXX is the hexadecimal number of 4K blocks available.

EXIT: Test M automatically exits at end of test.

3.15 TEST N: DISPLAY LIST READ BACK

Test N tests the two Ramtek instruction pairs LOAD DISPLAY LIST (LDL)/READ DISPLAY LIST (RDL) and LOAD DISPLAY LIST REVERSE PACKING (LDLRP)/READ DISPLAY LIST REVERSE PACKING (RDLRP) with a write/read/compare test of display list memory. The test program transfers a large volume of data with the above instructions, so test N is also useful as a write/read test for diagnosing I/O problems.

Run test N with the common display list or any of the 32 numbered display lists. Select any amount of display list memory from 4K to 16K bytes in 4K-byte blocks.

ENTRY: Respond N to **Test =** prompt.

EXECUTION: Test N asks for a display list number:

Display list number: (0000-001F) or LF(common) =

Respond with a hexadecimal value representing the display list number you want to test. If you wish to test only the common display list, press the LINE FEED key in response to the prompt.

The test program then asks for the amount of memory to allocate:

Number of 4K-byte blocks (1-4) =

Respond with the number of 4K-byte blocks you wish to allocate to the display list you have selected.

Test N runs with the LDL and RDL instructions unless you respond Y to the following prompt:

Reverse packing (Y/N)?

When you respond Y to the prompt, the test runs with the LDLRP and RDLRP instructions.

The test program allocates the specified 4K-byte blocks of memory for the selected display list. Test N then loads the display list with data in either normal packing using the LDL instruction, or reverse packing using the LDLRP instruction. The test program reads back the display list data with the RDL or RDLRP instruction and compares the values read back with the values written (loaded). If there is a discrepancy between the data values written and the values read back, test N writes the following message on the console screen, then continues processing.

```
At buffer address      AAAA
Data read from RAMTEK  XXXX  should be  YYYY
```

AAAA is the hexadecimal buffer address at which the discrepancy occurred, YYYY is the hexadecimal value written to the Ramtek, and XXXX is the hexadecimal value read back from the Ramtek.

At the end of a write/read/compare pass, test N writes the following message on the console screen:

End of pass

Depending on the number of blocks tested and the display list number selected, one pass runs about 120 seconds. The test program increments the data values and continues performing the write/read/compare loop until you exit manually.

EXIT: Press RETURN key on console keyboard.

Table 3-7 shows two typical test N runs. In run A, display list 0 (decimal) has been selected with one 4K-byte block of memory allocated to the display list. The test runs with the LDL and RDL instructions. In run B, display list 10 (decimal) has been selected with two 4K-byte block of memory allocated to the display list. The test runs with the LDLRP and RDLRP instructions.

Table 3-7. Test N (Display List Read Back) Example

Test Prompt	Response Run A	Response Run B
Test =	N	N
Display list number: (0000-001F) or LF(common) =	0000	000A
Number of 4K-byte blocks (1-4) =	1	2
Reverse packing (Y/N)?	N	Y

3.16 TEST 0: ROTATE AND MAGNIFY IMAGE

Test 0 runs only on an RM-9460 with an MC68000 system processor. This test checks the Ramtek instructions COPY IMAGE AND ROTATE (COPYIR) and COPY IMAGE AND MAGNIFY (COPYIM). Test 0 displays the image of a circle and rectangle in the upper left hand corner of the Ramtek screen. The test program executes the COPYIR instruction three times, copying the image and rotating the image 90° with each successive copy. At the end of the first segment of test 0, the upper third of the Ramtek screen contains four images of a circle and a rectangle. The rectangle is rotated 90° counterclockwise around the circle in each of the four images. Test 0 then executes the COPYIM instruction to copy and magnify the four images in the upper third of the screen, doubling the Y axis. The test program displays the magnified images on the lower two-thirds of the Ramtek screen (figure 3-2).

ENTRY: Respond 0 to **Test =** prompt.

EXECUTION: Test 0 asks for a source MCP and group:

Source MCP (0-7) =
Source MCP group (0-7) =

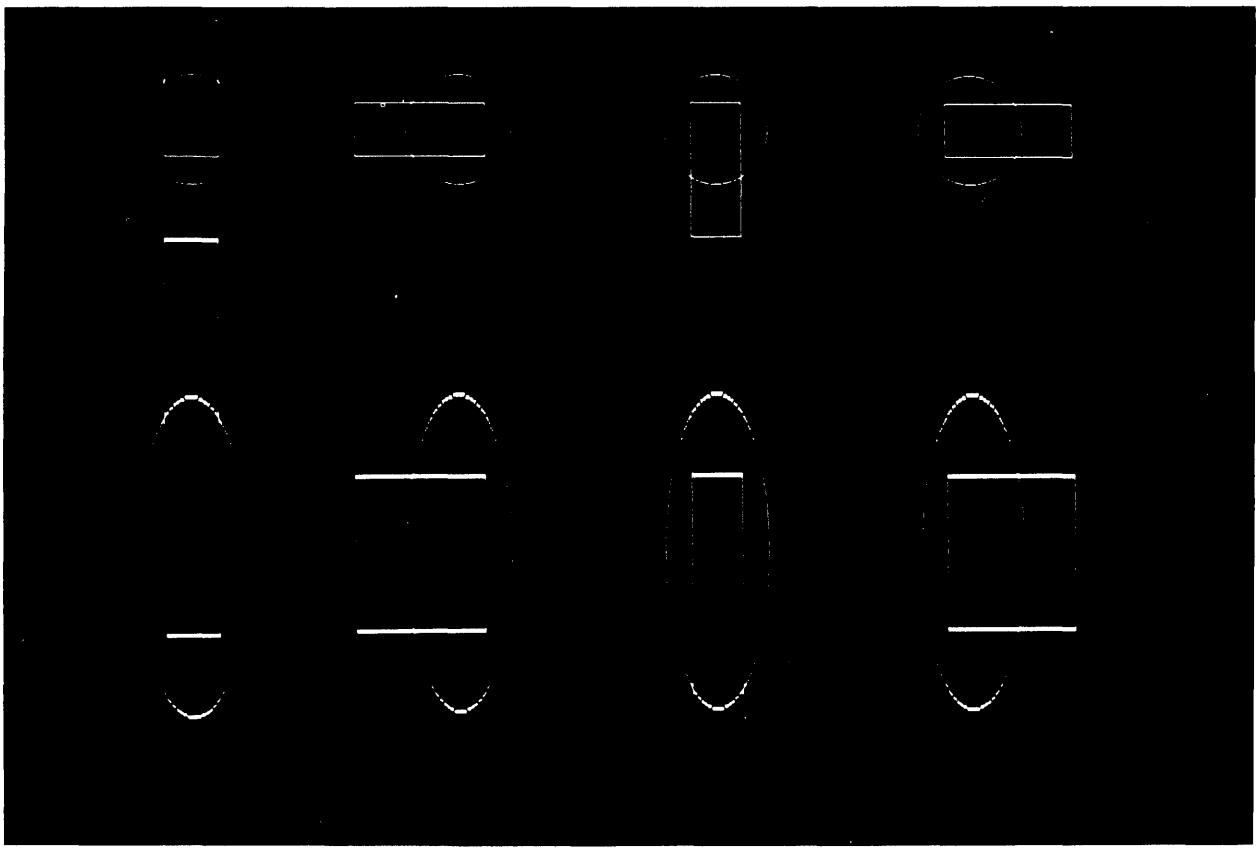
Respond with the decimal values representing the MCP and group in which you want the test program to display the original circle and rectangle.

Test 0 then asks for the destination MCP and group:

Destination MCP (0-7) =
Destination MCP group (0-7) =

Respond with the decimal values representing the MCP and group into which you want the original image copied, rotated, and magnified. Test 0 will accept the same values for source MCP and group and destination MCP and group if you have only one MCP and memory group in your Ramtek system.

EXIT: Press RETURN key on console keyboard.



A0042-060-01A

Figure 3-2. Test 0: Rotate and Magnify Image

3.17 TEST S: MEMORY PLANE INDEPENDENCE

Test S verifies the correspondence between input bits of video lookup tables (VLTs) and output bits of memory planes. In the Ramtek screen display, the position of the text and the digits displayed indicate the memory plane. The color of the digits indicates the VLT bit or overlay to which that plane is connected.

NOTE

Test S changes the color values stored in the VLT. If you plan to run the acceptance tests after running test S, run test H to restore the VLT to the appropriate colors for the acceptance tests.

ENTRY: Respond S to **Test =** prompt.

EXECUTION: Test S asks for the number of video lookup tables, a digit in the range of one through eight:

Number of video lookup tables (1-8) =

Respond with the total number of graphic VLTs on the video PCB installed in your Ramtek system. Do not include V12 PCB text lookup tables in this test.

Next, the test program asks for the following information for each video lookup table:

Lookup table number (0-7) =
Video type: 0(V2), 1(V7), 2(V8), 3(V12) =

Respond with the appropriate VLT number and video type code for each video lookup table. If you have a V12 PCB (video type 3), the even numbered lookup tables (0,2,4,6) are the graphic lookup tables.

The test program then displays a table on the Ramtek screen showing the memory plane bit assignments for each MCP and group. The sample display below shows ten memory planes for MCP 0, group 0.

```
MCP  GRP  ----------MEMORY PLANES----------

 0    0   0 1 2 3 4 5 6 7 8 9
```

Test S writes the table below on the console screen:

	VLT bit color assignments					
	blu	grn	cyn	red	mag	yel
Full intensity	0	1	2	3	4	5
1/3 intensity	6	7	8	9	10	11

You can cross reference the table appearing on the Ramtek screen with the VLT bit color assignment table on the console screen to determine how the memory planes are connected to the video lookup tables associated with the Ramtek screen you are using. The number of visible colors on the Ramtek screen corresponds to the number of memory planes. Also, the bit color assignments tell you what color is associated with the video lookup table address input bit.

For example, in the VLT bit color assignments table above, the color blue is assigned to VLT address bit 0. If the digit 2 under the memory plane heading in the Ramtek display is blue, the third memory plane (that is, plane 2) is wired to address line 0 in the VLT.

Test S loads grey in every VLT location except the locations addressed by a single memory plane (that is, entries 0001, 0002, 0004, 0008, 0010, 0020, etc.). A grey digit under the memory plane heading in the Ramtek display indicates that at that particular location on the Ramtek screen, the video lookup table is receiving a number with more than one memory plane turned on. Only one memory plane in the system should be turned on for a given X,Y location on the screen. Some probable causes for the occurrence of a grey memory plane digit are:

- bad memory PCB
- faulty MCP
- strapping error

EXIT: Press RETURN key on console keyboard.

3.18 TEST T: TRENDING

Test T tests the trend data firmware of the Ramtek. The test program draws a specified number of trend lines in selected patterns and colors with the Ramtek trending instructions. The number of trend lines, patterns, colors, or line characteristics can be updated during the test run.

ENTRY: Respond T to **Test =** prompt.

EXECUTION: Test T asks for the number of trend lines:

Number of lines (0001-0010 hex.) =

Respond with a hexadecimal value representing the number of trend lines you want to draw.

The test program then asks for the number of points:

Number of points (0001-0200 hex.) =

Respond with a hexadecimal value that defines the maximum number of points to buffer for each line.

Next, test T asks if you want to set patterns for the lines:

Set line pattern (Y/N)?

If you respond N the test program displays all trend lines as solid lines in the foreground color. If you respond Y to the above prompt, test T then asks for the trend line pattern data for each line:

Pattern, size/repeat, foreground, background for:
Line 01 =
Line 02 =
:
:

The test program issues a line prompt for the number of lines you have specified in the number of lines prompt. Respond with a four-digit hexadecimal number for each data value.

The line pattern is a 16-bit pattern that will be shifted out along the line as it is drawn.

The size/repeat value contains the pattern size in the high-order byte and the repeat count in the low order byte. The pattern size defines how many bits of the line pattern are to be used before repeating the pattern. The pattern size can vary from 1 to 16 (01 to 10 hex.). The repeat count defines how many times each pattern bit is repeated as the line is drawn. The repeat count can vary from 0 to 15 (00 to 0F hex.).

The foreground value defines the color/intensity value used for data bits of logical 1 in the line pattern.

The background value defines the color/intensity value used for data bits of logical 0 in the line pattern.

Test T then asks for the perpendicular resolution:

Perpendicular resolution =

Respond with a hexadecimal value representing the distance along the Y axis between which you want the trend points distributed. The perpendicular resolution specified cannot exceed the Y resolution value of your Ramtek screen.

The test program then asks for trend display data:

Start coord.,spacing,start time,display points,mode =

The same trend display data is used for each trend line. Respond with hexadecimal values that define the following parameters:

Start coord. defines a perpendicular baseline or margin from which all lines in this trend are drawn.

Spacing defines the increment in the trend mode direction between displayed points.

Start time defines which point in the database will correspond to the start coordinate.

Display points determines how much data will be displayed on each line. If the display points value is greater than the current number of displayable points after start time, then only the current points are displayed.

Mode specifies the plotting direction from the baseline, and whether the data is plotted horizontally or vertically:

```
Mode  0  -  trend direction is positive along the X axis
      1  -  trend direction is negative along the X axis
      2  -  trend direction is negative along the Y axis
      3  -  trend direction is positive along the Y axis
```

Test T now displays the specified number of trend lines on the Ramtek screen using the data provided in the above prompts. After completing the display, the test program asks for update information:

Update: D(display trend), R(reinit trend lines),
U(update after 1st display), CR(continuous) =

If you respond D to the prompt, test T loops back to the trend display data prompt. If you respond R to the prompt, the test program loops back to the number of trend lines prompt. (If you have disabled the GPIF reset between tests in test .R, the test program issues a trend allocate error.) If you respond U to the prompt, test T updates the trend lines with a new set of points and issues the update prompt again. If you respond to the prompt with a carriage return, the test program continuously updates the trend lines.

If test T encounters errors during the trending process, the test program writes the appropriate message on the console screen:

Display trend error
Trend allocate error
Trend data initialize error
Trend data update error
Trend line pattern init error

EXIT: If you are in continuous update mode, press RETURN key on console keyboard. Otherwise, press RETURN key on console keyboard twice in rapid succession.

Table 3-8 is an example of test T prompt responses. Four lines are drawn, with 256 (0100 hex.) points buffered for each line. If test H loads the VLT with standard colors, the lines displayed are as follows: line 1 is a solid blue line, line 2 is a dashed line with a green foreground and cyan background, line 3 is a dashed line with a red foreground and yellow background, line 4 is a dashed line with a magenta foreground and black background. All four lines are drawn within an area of 200 pixels on the Y axis. The trend lines update continuously until the RETURN key is pressed to exit the test.

Table 3-8. Test T (Trending) Example

Test Prompt	Response
Test =	T
Number of lines (0001-0010 hex.) =	0004
Number of points (0001-0200 hex.) =	0100
Set line pattern (Y/N)?	Y
Pattern, size/repeat, foreground, background for:	
Line 01 =	FFFF,FFFF,0001,0000
Line 02 =	F000,FFFF,0002,0003
Line 03 =	0FF0,FFFF,0004,0006
Line 04 =	F0F0,FFFF,0005,0000
Perpendicular resolution =	0200
Start coord.,spacing,start time,display points,mode =	0000,0100,0000,0020,0000
Update: D(display trend), R(reinit trend lines), U(update after 1st display), CR(continuous) =	CR

3.19 TEST V: VIDEO RAMPING

Test V checks V2, V7, V8, and V12 video option PCBs by loading colors in the graphic video lookup table (VLT) with the Ramtek instruction LOAD AUXILIARY MEMORY (LAM). The test program loads an assortment of characters with varying attributes in the text VLT. Test V displays a 256 x 256 word (0100 x 0100 hex.) color test pattern in a selected ramp for a graphic VLT, and a full-screen character display for a text VLT.

NOTE

Test V changes the color values stored in the graphic VLT. If you plan to run the acceptance tests after running test V, run test H to restore the graphic VLT to the colors required for the acceptance tests.

ENTRY: Respond V to **Test =** prompt.

EXECUTION: Test V asks for a video lookup table number, one digit in the range of zero through seven:

Lookup table number (0-7) =

Respond with the device code value defined by the lookup table identifier switch on the video PCB. If you have a V12 PCB, the odd numbered lookup tables (1,3,5,7) are graphic VLTs, and the even numbered lookup tables (0,2,3,4) are the text VLTs.

The test program then asks for the video PCB type:

Video type: 0(V2), 1(V7A), 2(V7B), 3(V8), 4(V12A), 5(V12B) =

Respond with the video PCB code for the VLT you are checking in this test.

Depending on your response to the above prompt, test V will then prompt you with a menu of ramp types for your video PCB. Video type 1(V7A PCB) and video type 4(V12A PCB) do not have ramp type options.

If you select video type 0 (V2 PCB), the menu prompt is:

V2: 0(8 bit updown), 1(8 bit stepper), 2(4 bit updown) =

If you select video type 2 (V7B PCB), the menu prompt is:

V7B: 0(8 bit updown), 1(8 bit stepper) =

If you select video type 3 (V8 PCB), the menu prompt is:

V8: 0(2 bit updown), 1(8 bit updown blink) =

If you select video type 5 (V12B PCB), the menu prompt is:

V12B: 0(8 bit updown), 1(8 bit stepper) =

In each case, respond with the code for the ramp type you wish to test. The updown ramp increments each graphic VLT location by the value one, so test V displays a continuous color scale on the Ramtek screen. The stepper ramp increments the graphic VLT locations by a step value, so the test program displays a discrete color step scale on the Ramtek screen.

If you are testing any VLT other than a V12A graphic VLT, test V then asks if you want to use the low or high 8 bits:

Low or high 8 bits (L/H)?

Respond L if the VLT is wired to the lower 8 bits of image memory. Respond H if the VLT is wired to the upper 8 bits of image memory.

The test program uses your responses to the above prompts to load the graphic VLT with the appropriate colors and display the test pattern in the upper left corner on the Ramtek screen. The test pattern color spectrum for the various DACs are as follows:

2-bit DAC - red scale, green scale, blue scale, grey scale
4-bit DAC - blue scale, green scale, red scale, grey scale
8-bit DAC - grey scale for V7B
- red scale, green scale, blue scale, grey scale for V2, V8, V12

Test V loads the text VLT with an assortment of characters and attributes, displaying a full screen test pattern.

When the test pattern is completed, test V writes the following message on the console screen:

Ramping done

EXIT: Press RETURN key on console keyboard.

The example shown in table 3-9 tests VLT 0 on a V7B PCB. The test pattern produced is an updown grey scale ramp.

Table 3-9. Test V (Video Ramping) Example

Test Prompt	Response
Test =	V
Lookup table number (0-7) =	0
Video type: 0(V2), 1(V7A), 2(V7B), 3(V8), 4(V12A), 5(V12B) =	2
V7B: 0(8 bit updown), 1(8 bit stepper) =	0
Low or high 8 bits (L/H)?	L
Ramping done	

3.20 TEST .A: RAMTEK USER-CONTROL ROUTINE

Test .A provides you with direct control on the Ramtek. The test program allows you to read and write data, send GPIF commands, and read GPIF status. You may use any of the commands listed in table 3-10.

Table 3-10. Commands of the Ramtek User-Control Routine Test

Command	Operand (Hex.)	Description
W	XXXX	Writes one instruction or data word to the Ramtek
R		Reads one instruction or data word from the Ramtek
C	XXXX	Issues a GPIF command
S		Reads the GPIF status
H		Issues hard reset (GPIF RES) without waiting for the DR status-ready line (DRST RDY) to set
I	E	Repeatedly executes the commands entered. The test program saves in a buffer the valid commands you have typed. "I E" executes the commands repeatedly until you press the RETURN key on the console keyboard. The test program clears the buffer when the test starts.
E		Exits the .A test.
,	00XX	Displays any of the acceptance tests selected where XX is a hexadecimal test number including a selection of ,0000.

ENTRY: Respond .A to **Test =** prompt.

EXECUTION: Test .A does not issue a prompt for command entry. Once you type .A to enter the test, you can begin entering commands listed in the above table.

If you enter a command other than those listed in the above table, the test program writes the following message on the console screen:

```
Bad command selection
```

You must reenter the correct command after the test program writes the message.

If one of the read commands (R or S) detects a bad buffer, test .A writes the following message and exits the test.

```
Bad command in buffer
```

EXIT: Type the command E to exit. If you are in repeat-execution mode ("I E"), press the RETURN key on the console keyboard.

The example below shows one application of test .A. You can execute the Ramtek instructions WRITE CURSOR STATE SCREEN (WCSS) and READ CURSOR STATUS SCREEN (RCSS) to write the cursor to the Ramtek screen and read back the cursor from the Ramtek screen for different cursor-controller devices. The example below performs the following steps:

- Sets the cursor for the cursor-controller devices to the following positions on the Ramtek screen with the WCSS instruction:

Device	Position
0	(00FF,0400)
1	(0110,0410)
2	(0120,0420)

- Executes an RCSS instruction and readback command for each cursor-controller device to write the Ramtek screen cursor position on the console screen. The values read back are shown in bold type to the right of each R command.

The test entry and commands for this process are as follows:

```
                                    Description
Test =  .A
W  1600             WCSS instruction for cursor-controller device 0
W  00FF             WCSS data: screen X-address
W  0400             WCSS data: screen Y-address
W  1601             WCSS instruction for cursor-controller device 1
W  0110             WCSS data: screen X-address
W  0410             WCSS data: screen Y-address
W  1602             WCSS instruction for cursor-controller device 2
W  0120             WCSS data: screen X-address
W  0420             WCSS data: screen Y-address
W  1700             RCSS instruction for cursor-controller device 0
C  0400             Issues a GPIF command for setting prefetch bit
R    00FF           Readback word from Ramtek (contents = 00FF)
R    0400           Readback word from Ramtek (contents = 0400)
W  1701             RCSS instruction for cursor-controller device 1
C  0400             Issues a GPIF command for setting prefetch bit
R    0110           Readback word from Ramtek (contents = 0110)
R    0410           Readback word from Ramtek (contents = 0410)
W  1702             RCSS instruction for cursor-controller device 2
C  0400             Issues a GPIF command for setting prefetch bit
R    0120           Readback word from Ramtek (contents = 0120)
R    0420           Readback word from Ramtek (contents = 0420)
E                   Exit test .A
```

3.21 TEST .B: INTERFACE REGISTER (DRST)

Test .B verifies that the interface word count, bus address, and command/status registers can be read and written. Unlike tests A and B, test .B takes several seconds.

ENTRY: Respond .B to **Test =** prompt.

EXECUTION: Test .B has no prompts for input data. The test program loads the registers with the possible values they can contain.

When there is a discrepancy between the value written to a register and the value read back, test .B writes the message for the appropriate register on the console screen:

```
Word count  XXXX  should be  YYYY
Bus address  XXXX  should be  YYYY
Status  XXXX  should be  YYYY
```

YYYY is the hexadecimal value written to the Ramtek, and XXXX is the hexadecimal value read back from the Ramtek.

EXIT: Test .B automatically exits at end of test.

3.22 TEST .D: FULL SCREEN IMAGE WRITE/READ

Test .D is a full-screen image memory check. The test program performs write/read/compare tests on image memory within the format window defined by the normal-format parameters. Test .D reads the normal-format parameters with the Ramtek instruction READ NORMAL PARAMETERS (READP). A system power-on or a hard reset between tests sets the format window size to the full screen resolution.

The test program displays four full-screen color patterns: FFFF, 5555, AAAA, and an incrementing STEP value similar to the test D pattern. Test .D masks each color pattern with the specified memory plane mask before writing the pattern and before reading back and checking the results. The test program writes each line with the Ramtek instruction WRITE IMAGE (WI) and reads back the line with the Ramtek instruction READ IMAGE (RI). The line length written by WI and read by RI depends on the format window size.

ENTRY: Respond .D to **Test =** prompt.

EXECUTION: Test .D asks for an MCP number:

MCP number (0-7) =

Respond with the number representing the MCP whose image memory you want to test.

The test program then asks for an MCP group number:

MCP group number (0-7) =

Respond with the group number associated with the MCP you selected above.

The final prompt asks for the memory plane mask:

Memory plane mask =

Respond with the bit mask representing the memory planes associated with the selected MCP and group. Test .D uses the specified value to mask the color patterns before each WI and RI instruction.

The test program displays a color pattern on the Ramtek screen, one line at a time, masking the colors FFFF, 5555, AAAA, and the incremental STEP value with your specified memory plane mask. While test .D executes the WI instruction, the test program also writes a message on the console screen describing the progress:

```
Writing XXXX.................
```

XXXX is the hexadecimal masked color value or the word STEP. The test program writes a period on the console screen for every 16 lines displayed on the Ramtek screen.

After writing the data, the test program reads back the data and writes the following message on the console screen:

```
Reading XXXX.................
```

XXXX is the hexadecimal masked color value or the word STEP. Test .D writes a period on the console screen for every 16 lines read back from the Ramtek.

As test .D reads back the data, the test program compares the data value written to the value read back. If there is a discrepancy between the two values, test .D writes a message on the console screen describing the line and element where the comparison error occurred, and the values written and read back:

```
At line LLLL element EEEE
Data read from RAMTEK XXXX should be YYYY
```

LLLL is the hexadecimal line value and EEEE is the hexadecimal element value where the comparison error occurred, YYYY is the hexadecimal value written to the Ramtek, and XXXX is the hexadecimal value read back. The test program continues processing after writing the above message.

At the end of processing for a pass, test .D writes the following message on the console screen:

```
End of pass XXXX
```

XXXX is the hexadecimal value of the pass. The test program begins another pass, and continues processing through passes until you exit manually.

EXIT: Press RETURN key on console keyboard.

3.23 TEST .G: MCP/GROUP SELECTION

Test .G allows you to select the refresh memory groups that will be associated with the current context. The diagnostic and acceptance test program normally executes a system reset between tests. The default MCP and memory group selection at system power-on or system reset is MCP 0 and group 0. If you want to run diagnostic tests on memory control processors (MCPs) and memory groups other than zero, run test .R to disable system resets between tests and then run test .G to select the particular MCPs and memory groups.

NOTE

If you do not disable resets with test .R before selecting MCPs and memory groups with test .G, the Ramtek firmware will erase the selected MCPs and memory groups between tests, returning the processor to the default normal-format parameters (including MCP 0 and group 0).

ENTRY: Respond .G to **Test =** prompt.

EXECUTION: Test .G asks for an MCP select mask:

MCP select mask (0001-00FF) =

Respond with the hexadecimal value that represents the MCPs you want to select. Each bit position in the select mask corresponds to the relative MCP number (that is, bit 0 corresponds to MCP 0 with a hexadecimal value of 0001, bit 1 corresponds to MCP 1 with a hexadecimal value of 0002, bit 2 corresponds to MCP 2 with a hexadecimal value of 0004, bits 1 and 2 correspond to MCPs 1 and 2 with a hexadecimal value of 0006, etc.). You can select up to eight MCPs with the MCP select mask.

The test program then asks for a group select mask for each MCP you have selected in the MCP select mask:

Group select mask for MCP 0000 (0001-00FF) =
Group select mask for MCP 0001 (0001-00FF) =
•
•
•
Group select mask for MCP 0007 (0001-00FF) =

Respond to the prompt for each MCP with the hexadecimal value that represents the bit mask of the refresh memory groups you want to select for that particular MCP.

Test .G assigns the selected MCPs and memory groups to the current context with the Ramtek instruction SELECT MCP/GROUP (SELMG).

EXIT: Test .G automatically exits at end of test.

3.24 TEST .I: INDIVIDUAL MEMORY PLANE SCROLL

Test .I is applicable only for RM-9400 systems that have an ISCROLL memory PCB installed. The test program .I displays a selected acceptance test image on the Ramtek screen and then performs test segments in the following sequence (with a two-second wait between each segment):

- Moves the ISCROLL plane toward the upper-left corner and zooms the display twice (from normal size to triple size).
- Returns the display to normal size and the lower-left origin.
- Zooms the display up twice (from normal size to triple size) and back down again to the upper-left origin.

ENTRY: Respond .I to **Test =** prompt.

EXECUTION: Test .I asks for the MCP, group, and plane select masks in the following prompts:

```
MCP select mask (0001-00FF) =
Group select mask (0001-00FF) =
Plane select mask (0001-00FF) =
```

Respond with the appropriate hexadecimal bit mask values representing the MCPs, groups, and refresh memory planes you want to test.

The test program then asks for a test number:

```
Test number =
```

Respond with a hexadecimal acceptance test number. Do not include the comma that is usually part of the acceptance test number.

Test .I runs the selected acceptance test and displays the acceptance test image on the Ramtek screen. The test program then performs the four image manipulations described above.

EXIT: Test .I automatically exits at end of test.

Table 3-11 shows an example of test .I. MCP 0, memory group 0, and refresh memory plane 0 have been selected. The test program executes acceptance test ,0005.

Table 3-11. Test .I (Individual Memory Plane Scroll) Example

Test Prompt	Response
Test =	.I
MCP select mask (0001-00FF) =	0001
Group select mask (0001-00FF) =	0001
Plane select mask (0001-00FF) =	0001
Test number =	0005

3.25 TEST .R: ENABLE/DISABLE RESET

Test .R enables or disables the GPIF reset function between individual tests. Use test .R in conjunction with test .G to test MCPs and memory groups other than zero. You can also use test .R in conjunction with test .A.

ENTRY: Respond .R to **Test =** prompt.

EXECUTION: Test .R asks whether or not to enable the GPIF reset function between tests:

GPIF reset between tests (Y/N)?

The system default value for the GPIF reset function is enable. Respond N if you wish to have the GPIF reset function disabled between tests.

EXIT: Test .R automatically exits at end of test.

3.26 TEST .T: TRANSFER MODE SELECTION

Use test .T to select the interface mode of operation. You may select programmable input/output (PIO) or direct memory access (DMA) modes of operation. DMA transfers are much faster than PIO transfers. You should normally run the diagnostic and acceptance tests in DMA transfer mode, because tests that perform heavy input/output will time out in PIO mode.

ENTRY: Respond .T to **Test =** prompt.

EXECUTION: Select DMA or PIO mode of operation by responding D or P to the following prompt:

Transfer mode: P(program) or D(DMA) =

EXIT: Test .T automatically exits at end of test.

Chapter 4

ACCEPTANCE TESTS

4.1 INTRODUCTION

This chapter describes 60 acceptance tests that verify the Ramtek firmware functioning. The test program provides 52 spare tests for future expansion. Each acceptance test (with the exception of test ,0058) displays a test plate on the Ramtek screen. All the test plate images are included at the end of this chapter.

A five-character identifier selects an acceptance test: a comma followed by four hexadecimal digits. To enter a test, type the test identifier on the console keyboard in response to the **Test =** prompt on the console screen. Refer to chapter 2 for directions on calling up the **Test =** prompt.

To exit an acceptance test, press the return key on the console keyboard. When you exit a test, the test program writes another **Test =** prompt on the console screen. You may then type the test identifier for the next test.

To exit from the test program and return to the operating system, press the ESCAPE key on the console keyboard in response to the **Test =** prompt.

NOTES

If you have not run the diagnostic tests prior to executing the acceptance tests, run diagnostic test H to set the correct values in the graphic video lookup table (VLT).

The position of switch 3 in the dip switch pack at location 7W on the Z80 system processor PCB or at location 3X on the MC68000 system processor PCB affects the test images displayed for acceptance tests ,0011, ,0023, ,0024, ,0025, ,0040, ,0041, ,0042, and ,0043. If switch 3 is set to ON, the reset between tests will erase the Ramtek screen. If switch 3 is set to OFF, the reset between tests will not erase the Ramtek screen, and the test plates for for the above acceptance tests will overlay the results of the previous acceptance test plate.

4.2 STANDARD ACCEPTANCE TESTS

The following paragraphs describe the 37 standard acceptance tests and the standard acceptance test loop.

4.2.1 Test ,0000: Standard Acceptance Test Loop

Test ,0000 rapidly shows the displays of standard acceptance tests ,0001 through ,0025. After running the displays, the program will pause until you press the RETURN on the console.

ENTRY: Respond ,0000 to **Test =** prompt.

EXIT: Press RETURN key on console keyboard.

NOTE

You may set up a looping pattern for a nonstop running of test ,0000 by using the "I E" command of diagnostic test .A (see chapter 3).

4.2.2 Test ,0001: Erase

Test ,0001 displays nested black and white boxes using the Ramtek instruction ERASE (ERS) (figure 4-1). This test establishes that:

- the Ramtek and the test program are matched in resolution,
- the ERS instruction operates properly in conjunction with reverse background and window,
- the test program can address and modify the entire display.

ENTRY: Respond ,0001 to **Test =** prompt.

EXIT: Press RETURN key on console keyboard.

4.2.3 Test ,0002: Image Scan Mode

This test demonstrates the windowing of the data from the Ramtek instruction WRITE IMAGE (WI) in the eight possible scan modes (figure 4-2).

ENTRY: Respond ,0002 to **Test =** prompt.

EXIT: Press RETURN key on console keyboard.

4.2.4 Test ,0003: Text Scan Mode

This test verifies that eight character orientations can be produced (figure 4-3).

ENTRY: Respond ,0003 to **Test =** prompt.

EXIT: Press RETURN key on console keyboard.

4.2.5 Test ,0004: Text Windowing

The text-windowing test demonstrates the windowing of text data in the eight possible scan modes (figure 4-4).

ENTRY: Respond ,0004 to **Test =** prompt.

EXIT: Press RETURN key on console keyboard.

4.2.6 Test ,0005: Standard Font

This test displays the standard character set in reverse background, and verifies the functioning of the carriage return and line feed codes (figure 4-5).

ENTRY: Respond ,0005 to **Test =** prompt.

EXIT: Press RETURN key on console keyboard.

4.2.7 Test ,0006: Additive Write

The additive-write test demonstrates that the additive-write flag may be used to erase data generated by the Ramtek instruction WRITE TEXT (WT) (figure 4-6). Test ,0006 displays the text ADDITIVE WRITE TEST ERROR on the Ramtek screen and erases the word ERROR using the WT instruction with the additive-write and reverse-background bits set.

ENTRY: Respond ,0006 to **Test =** prompt.

EXIT: Press RETURN key on console keyboard.

4.2.8 Test ,0007: Additive-Write and Reverse-Background Text

Test ,0007 demonstrates the functioning of the additive-write and reverse-background flags in the Ramtek instruction WRITE TEXT (WT) (figure 4-7). The test program displays the four combinations against both the foreground and background colors:

- The letter "A" is drawn with both flags set to 0.
- The letter "B" is drawn with reverse background flag set to 1.
- The letter "C" is drawn with additive-write flag set to 1.
- The letter "D" is drawn with both flags set to 1.

ENTRY: Respond ,0007 to **Test =** prompt.

EXIT: Press RETURN key on console keyboard.

4.2.9 Test ,0008: Raster Scan Mode

This test verifies the operation of the Ramtek instruction WRITE RASTER (WR) in eight scan modes (figure 4-8).

ENTRY: Respond ,0008 to **Test =** prompt.

EXIT: Press RETURN key on console keyboard.

4.2.10 Test ,0009: Full Screen Scroll

This test writes a box in the upper-left corner of the display, and scrolls the box clockwise around the screen with the Ramtek instructions SCROLL X (SCRX) and SCROLL Y (SCRY) (figure 4-9).

ENTRY: Respond ,0009 to **Test =** prompt.

EXIT: Press RETURN key on console keyboard.

4.2.11 Test ,000A: New Scroll

This test exercises all the possible scrolling methods of the Ramtek instructions SCROLL X (SCRX) and SCROLL Y (SCRY) (figure 4-10).

Test ,000A draws eight boxes and fills in each box one pixel from the outline. The test program uses two boxes (one taller and one wider) with each scroll direction; thus testing both scroll options for each direction.

ENTRY: Respond ,000A to **Test =** prompt.

EXIT: Press RETURN key on console keyboard.

4.2.12 Test ,000B: Index Register

This test demonstrates that both index registers function with negative and positive offsets (figure 4-11).

ENTRY: Respond ,000B to **Test =** prompt.

EXIT: Press RETURN key on console keyboard.

4.2.13 Test ,000C: No Operation and Parameters Discard

This test demonstrates that the Ramtek instructions NO OPERATION (INOP) and SET PARAMETER (SET) perform their functions: that the INOP instruction discards the normal-format parameters, and that the SET instruction discards data (figure 4-12).

ENTRY: Respond ,000C to **Test =** prompt.

EXIT: Press RETURN key on console keyboard.

4.2.14 Test ,000D: Initialize Instruction

This test demonstrates that the Ramtek instruction INITIALIZE (INIT) resets the normal-format parameters to their default value (figure 4-13).

ENTRY: Respond ,000D to **Test =** prompt.

EXIT: Press RETURN key on console keyboard.

4.2.15 Test ,000E: Memory Plane Selection

Test ,000E writes the message MEMORY PLANE NN in each of the 16 memory planes with the Ramtek instruction WRITE TEXT (WT). NN is the number of the memory plane (figure 4-14). Test ,000E does not load the video lookup table (VLT). The number of visible memory planes depends on the current contents of the VLT.

ENTRY: Respond ,000E to **Test =** prompt.

EXIT: Press RETURN key on console keyboard.

4.2.16 Test ,000F: Video Outline

Test ,000F draws a one-pixel-wide border around the outer edge of the display using the Ramtek instruction ERASE (ERS) (figure 4-15).

ENTRY: Respond ,000F to **Test =** prompt.

EXIT: Press RETURN key on console keyboard.

4.2.17 Test ,0010: Y-Origin

This test verifies the operation of the Ramtek normal-format parameter ORIGIN (figure 4-16). The pattern displayed is the same as for test ,000F.

ENTRY: Respond ,0010 to **Test =** prompt.

EXIT: Press RETURN key on console keyboard.

4.2.18 Test ,0011: Video Orientation FLIP

Test ,0011 demonstrates the operation of the Ramtek instruction SELECT VIDEO ORIENTATION (SELVO), and also demonstrates the interaction of SELVO and the Ramtek instruction WRITE TEXT (WT) (figure 4-17).

ENTRY: Respond ,0011 to **Test =** prompt.

EXIT: Press RETURN key on console keyboard.

4.2.19 Test ,0012: Wait for Vertical Retrace

This test checks the Ramtek instruction WAIT FOR VERTICAL RETRACE (WAITVR). Test ,0012 executes the Ramtek instruction BULK ERASE (BERS) with the BK switch = 1 (FGD) to set the display screen to white. Executing WAITVR makes the display screen remain white for approximately two seconds. The test then executes BERS with the BK switch = 0 (BGD) to set the display screen to black (figure 4-18). Another WAITVR makes the display screen remain black for approximately two seconds. The test repeats the above sequence three times.

If the WAITVR instruction is working properly, the above sequence will cause the screen to blink with a delay time of approximately two seconds between blinks. If WAITVR is not working properly, you will see either no blink or a rapid blink that is indistinguishable.

ENTRY: Respond ,00012 to **Test =** prompt.

EXIT: Press RETURN key on console keyboard.

4.2.20 Test ,0013: Zoom

This test verifies the operation of the Ramtek instruction ZOOM (ZOOM) (figure 4-19). Test ,0013 writes ZOOM in the upper-left corner of the display. The test program then varies the zoom factor from 1:1 to 16:16, and back down to 1:1 (30 steps). The test program inserts the Ramtek instruction WAIT FOR VERTICAL RETRACE (WAITVR) with COUNT = 1 between each ZOOM instruction to synchronize the instruction with video. This procedure slows down the test so that the operations can be verified.

ENTRY: Respond ,0013 to **Test =** prompt.

EXIT: Press RETURN key on console keyboard.

4.2.21 Test ,0014: Save/Restore Environment

This test saves four environments and then restores them using the Ramtek instructions SAVE ENVIRONMENT (PUSHE) AND RESTORE ENVIRONMENT (POPE) (figure 4-20). The test program displays the word ENVIRONMENT in each environment on the Ramtek screen before saving the environment with the PUSHE instruction. Then after executing the POPE instruction, the test program displays the numeric value of each environment on the Ramtek screen.

ENTRY: Respond ,0014 to **Test =** prompt.

EXIT: Press RETURN key on console keyboard.

4.2.22 Test ,0015: Conic

This test checks the operation of the conics firmware by writing a pattern of rotated ellipses (figure 4-21) with the Ramtek instruction WRITE CONIC (WC).

ENTRY: Respond ,0015 to **Test =** prompt.

EXIT: Press RETURN key on console keyboard.

4.2.23 Test ,0016: Write Plot Box with No Baseline

Test ,0016 verifies the operation of the Ramtek instruction WRITE PLOT BOX (WPB) in the linked mode (figure 4-22). The bars overlap by one pixel in the vertical dimension. Test ,0016 uses the same coordinate data as test ,0017, but produces very different effects in the linked mode.

ENTRY: Respond ,0016 to **Test =** prompt.

EXIT: Press RETURN key on console keyboard.

4.2.24 Test ,0017: Write Plot Box with Baseline

Test ,0017 verifies the operation of the Ramtek instruction WRITE PLOT BOX (WPB) in the fixed-baseline mode (figure 4-23). Test ,0017 uses the same coordinate data as test ,0016, but produces very different effects in the fixed-baseline mode.

ENTRY: Respond ,0017 to **Test =** prompt.

EXIT: Press RETURN key on console keyboard.

4.2.25 Test ,0018: Write Vector Linked

Test ,0018 verifies the operation of the Ramtek instruction WRITE VECTOR LINKED (WVL) (figure 4-24).

ENTRY: Respond ,0018 to **Test =** prompt.

EXIT: Press RETURN key on console keyboard.

4.2.26 Test ,0019: Vector Texture

Test ,0019 verifies the action of the normal-format parameter VECTOR TEXTURE (VTX) in the Ramtek instruction WRITE VECTOR LINKED (WVL) (figure 4-25). The test program uses a texture pattern of four pixels on, two off, two on, two off, three on, one off, one on, and one off (sixteen bits long). You may use the Ramtek instruction ZOOM (ZOOM) to examine the display in detail.

The test also verifies the action of the normal-format BACKGROUND (BK) flag. The upper-right display is in INDEX 1 addressing mode with BK set to 1. The lower-left display is in INDEX 2 addressing mode with BK set to 0, but with the normal foreground and background values reversed. The lower-right display is in relative addressing mode with the BK flag set to 1 and the foreground and background values reversed.

ENTRY: Respond ,0019 to **Test =** prompt.

EXIT: Press RETURN key on console keyboard.

4.2.27 Test ,001A: Additive Vector Texture

Test ,001A is identical to test ,0019 except that the normal-format ADDITIVE (AD) flag is set to 1 in all instructions (figure 4-26).

ENTRY: Respond ,001A to **Test =** prompt.

EXIT: Press RETURN key on console keyboard.

4.2.28 Test ,001B: Write Plot Point

This test checks the Ramtek instruction WRITE PLOT POINT (WPP) (figure 4-27). The coordinate data for this test is the same as the data used in tests ,0018, ,0019, and 001A. The test in the upper-left corner is in normal addressing mode. The test in the upper-right is in INDEX 1 addressing mode, with the BK flag set to 1. The test in the lower-left is in INDEX 2 addressing mode, and the test in the lower-right is in relative addressing mode, with the BK flag set to 1.

ENTRY: Respond ,001B to **Test =** prompt.

EXIT: Press RETURN key on console keyboard.

4.2.29 Test ,001C: Write Plot Point Scan Mode 4

Test ,001C is identical to test ,001B except that this test uses scan mode 4 and rotates the four displays 90° (figure 4-28).

ENTRY: Respond ,001C to **Test =** prompt.

EXIT: Press RETURN key on console keyboard.

4.2.30 Test ,001D: Write Plot Vector

Test ,001D demonstrates the operation the Ramtek instruction WRITE PLOT VECTOR (WPV) (figure 4-29). The display in the upper-left corner is in normal addressing mode, with the same vector texture used in test ,0019. The display in the upper-right is in INDEX 1 addressing mode, with the BK flag set to 1. The display in the lower-left corner is in relative addressing mode, with both the AD and BK flags set to 1.

ENTRY: Respond ,001D to **Test =** prompt.

EXIT: Press RETURN key on console keyboard.

4.2.31 Test ,001E: Write Plot Vector Scan Mode 4

Test ,001E is identical to test ,001D except that that this test uses scan mode 4 and rotates the plots 90° counter-clockwise. Figure 4-30 shows a test display.

ENTRY: Respond ,001E to **Test =** prompt.

EXIT: Press RETURN key on console keyboard.

4.2.32 Test ,001F: Write Point

This test checks the Ramtek instruction WRITE POINT (WPT), producing a display (figure 4-31) identical to the display of test ,001B.

ENTRY: Respond ,001F to **Test =** prompt.

EXIT: Press RETURN key on console keyboard.

4.2.33 Test ,0020: Write Random Pixel

Test ,0020 checks the Ramtek instruction WRITE RANDOM PIXEL (WRP), producing a display (figure 4-32) identical to the display of test ,001B.

ENTRY: Respond ,0020 to **Test =** prompt.

EXIT: Press RETURN key on console keyboard.

4.2.34 Test ,0021: Detection Data

Test ,0021, used in conjunction with test I, verifies operation of the Ramtek instruction SET DETECT DATA (SDD). The test program displays three lines of text, each line having its own unique detect class and detect data (figure 4-33). The top line is detect class 8000 (-32768 decimal) with hexadecimal data 1234 and 5678. The middle line is detect class 3 with hexadecimal data 9ABC and DEF0. The bottom line is detect class 7FFF (32767 decimal) with hexadecimal data 3141 and 5927.

ENTRY: Respond ,0021 to **Test =** prompt.

EXIT: Press RETURN key on console keyboard.

4.2.35 Test ,0022: Suspend/Resume Detection

Test ,0022, used in conjunction with test I, verifies operation of the Ramtek instructions SUSPEND DETECT (SD) and RESUME DETECT (RD). The test displays a single line of text (figure 4-34). The middle of the line (from the comma through the exclamation point) is preceded by an SD instruction and followed by an RD instruction.

ENTRY: Respond ,0022 to **Test =** prompt.

EXIT: Press RETURN key on console keyboard.

4.2.36 Test ,0023: Programmable-Cursor Font 1

This test functions only when a serial link PCB is present in the system (figure 4-35).

ENTRY: Respond ,0023 to **Test =** prompt.

EXIT: Press RETURN key on console keyboard.

4.2.37 Test ,0024: Programmable-Cursor Font 2

This test functions only when a serial link PCB is present in the system (figure 4-36).

ENTRY: Respond ,0024 to **Test =** prompt.

EXIT: Press RETURN key on console keyboard.

4.2.38 Test ,0025: Programmable-Cursor Font 3

This test functions only when a serial link PCB is present in the system (figure 4-37).

ENTRY: Respond ,0025 to **Test =** prompt.

EXIT: Press RETURN key on console keyboard.

4.2.39 Test ,0026: Spare

4.2.40 Test ,0027: Spare

4.2.41 Test ,0028: Spare

4.2.42 Test ,0029: Spare

4.2.43 Test ,002A: Spare

4.2.44 Test ,002B: Spare

4.2.45 Test ,002C: Spare

4.2.46 Test ,002D: Spare

4.2.47 Test ,002E: Spare

4.2.48 Test ,002F: Spare

4.3 DISPLAY LIST TESTS

The following paragraphs describe the 16 display list tests.

4.3.1 Test ,0030: Execute Instruction Memory

Test ,0030 exercises the Ramtek instruction EXECUTE INSTRUCTION MEMORY (XIM) (figure 4-38). The test program displays the message SUBROUTINE TEST ERROR in the middle of the Ramtek screen, erases the word ERROR from the message using an XIM instruction with reverse-background additive-write, and then adds the word PASS to the end of the message on the Ramtek screen using an XIM instruction with additive write.

ENTRY: Respond ,0030 to **Test =** prompt.

EXIT: Press RETURN key on console keyboard.

4.3.2 Test ,0031: Display List (Sierpinsky Curve)

Test ,0031 uses the Ramtek instruction WRITE VECTOR LINKED (WVL) and the Ramtek display list instructions to write a Sierpinsky curve in display list 2 (figure 4-39).

ENTRY: Respond ,0031 to **Test =** prompt.

EXIT: Press RETURN key on console keyboard.

4.3.3 Test ,0032: Programmable Font Scan Mode

Test ,0032 verifies the operation of the Ramtek programmable font instructions (figure 4-40). The test program uses the programmable font instructions to produce lower-case Greek letters in a display similar to the display of test ,0003.

ENTRY: Respond ,0032 to **Test =** prompt.

EXIT: Press RETURN key on console keyboard.

4.3.4 Test ,0033: Programmable Font with Scaling

Test ,0033 tests the scaling of programmable font characters (figure 4-41).

ENTRY: Respond ,0033 to **Test =** prompt.

EXIT: Press RETURN key on console keyboard.

4.3.5 Test ,0034: Large Programmable Font

This test demonstrates the operation of the 16 x 20 pixel programmable font firmware (figure 4-42).

ENTRY: Respond ,0034 to **Test =** prompt.

EXIT: Press RETURN key on console keyboard.

4.3.6 Test ,0035: Large Programmable Font Reverse Packing

Test ,0035 uses the Ramtek instruction LOAD MULTIPLE PROGRAMMABLE FONTS (LMPF) in the reverse packing mode (figure 4-43).

ENTRY: Respond ,0035 to **Test =** prompt.

EXIT: Press RETURN key on console keyboard.

4.3.7 Test ,0036: Local Functions

This test uses the keyboard and cursor to exercise the Ramtek local function instructions (figure 4-44). A Ramtek keyboard and cursor-controller device must be installed in your system for test ,0036 to run successfully. The test program draws random vectors based on the end-points received via the ENTER push button or switch on the cursor controller. Press the ENTER push button or switch (depending on the cursor controller type) to define the start-point of the first vector. Move the cursor to a new point and press ENTER again to define the end-point. The test program draws a line between the start-point and end-point. Each successive pair of points entered causes the test program to draw another line segment.

ENTRY: Respond ,0036 to **Test =** prompt.

EXECUTION: Use the keyboard to pick foreground colors, to fill areas, and to bulk erase. Table 4-1 describes the function keys, from left to right, at the top of the keyboard. The colors listed for the hexadecimal values 0000 through 0004 are the colors assigned to the VLT in test H.

EXIT: Press RETURN key on console keyboard.

NOTE

Drawing a figure in track mode will cause gaps in the figure you have outlined. If you then try to fill the figure you have outlined in track mode, the gaps will cause the FILL instruction to overflow the boundaries of the defined figure.

Table 4-1. Function Keys

KEY	DESCRIPTION
0	Sets foreground to 0001 (blue)
1	Sets foreground to 0002 (green)
2	Sets foreground to 0003 (cyan)
3	Sets foreground to 0004 (red)
4	Starts filling in foreground color from the cursor position in FILL-WHILE mode.
5	Sets foreground to 0000 (black)
6	Bulk erases

4.3.8 Test ,0037: Spare

4.3.9 Test ,0038: Spare

4.3.10 Test ,0039: Spare

4.3.11 Test ,003A: Spare

4.3.12 Test ,003B: Spare

4.3.13 Test ,003C: Spare

4.3.14 Test ,003D: Spare

4.3.15 Test ,003E: Spare

4.3.16 Test ,003F: Spare

4.4 COORDINATE TRANSFORMATION (CT) TESTS

The following paragraphs describe the 16 coordinate transformation (CT) tests.

4.4.1 Test ,0040: CT Translate

Test ,0040, displays RM9400 on the Ramtek screen using the Ramtek instructions WRITE VECTOR LINKED (WVL) and WRITE VECTOR UNLINKED (WVU) (figure 4-45). The test defines each letter in local space, centered about (0,0).

ENTRY: Respond ,0040 to **Test =** prompt.

EXIT: Press RETURN key on console keyboard.

4.4.2 Test ,0041: CT Translate and Scale

Test ,0041 displays RM9400 twice using the Ramtek instructions WRITE VECTOR LINKED (WVL) and WRITE VECTOR UNLINKED (WVU) (figure 4-46). The test program scales up the word RM9400 from test ,0040 by a factor of three in the upper portion of the display. In the lower portion of the display, the test program scales down the upper display by a factor of two, resulting in a net scale factor of one and one-half for the lower display. Then test ,0041 draws each of the scaled displays by prefixing the test ,0040 instructions with the Ramtek instruction SCALE MATRIX (SCALE). The test program demonstrates the utility of the SIGGRAPH concept of local space and graphic subroutines.

ENTRY: Respond ,0041 to **Test =** prompt.

EXIT: Press RETURN key on console keyboard.

4.4.3 Test ,0042: CT Translate, Scale, and Rotate

This test displays the word RM9400 from test ,0040 (figure 4-47). Test ,0042 first rotates the word 45° counter-clockwise at a scale factor of two, and then rotates the word 45° counter-clockwise at a scale factor of one-half.

ENTRY: Respond ,0042 to **Test =** prompt.

EXIT: Press RETURN key on console keyboard.

4.4.4 Test ,0043: Set and Multiply Matrices

This test displays the word RM9400 twice (figure 4-48). The top display is at a scale factor of one; and the bottom display, at a scale factor of one and one-half. Test ,0043 sets up the transformation matrix with the Ramtek instructions SET MATRIX (SETM), MULTIPLY MATRICES (MM), and MULTIPLY MATRICES IMMEDIATE (MMI).

ENTRY: Respond ,0043 to **Test =** prompt.

EXIT: Press RETURN key on console keyboard.

4.4.5 Test ,0044: High Speed Coordinate Transform

Test ,0044 confirms the proper operation of the high speed coordinate transform (HCT) PCB. The test program displays the word RM9400 on the Ramtek screen and then rotates the word 360° counter-clockwise (figure 4-49). You can determine from the rotation speed whether or not the system recognizes the HCT PCB. First run test ,0044 with the HCT PCB installed. Then pull the HCT PCB and run the test again. The time needed to draw the test image should increase by a factor of six when you are not using the HCT PCB.

NOTE

The comparative times from this test should not be used as a standard estimate for other applications using the HCT PCB.

ENTRY: Respond ,0044 to **Test =** prompt.

EXIT: Press RETURN key on console keyboard.

4.4.6 Test ,0045: Spare

4.4.7 Test ,0046: Spare

4.4.8 Test ,0047: Spare

4.4.9 Test ,0048: Spare

4.4.10 Test ,0049: Spare

4.4.11 Test ,004A: Spare

4.4.12 Test ,004B: Spare

4.4.13 Test ,004C: Spare

4.4.14 Test ,004D: Spare

4.4.15 Test ,004E: Spare

4.4.16 Test ,004F: Spare

4.5 EXTENDED GRAPHICS TESTS

The following paragraphs describe the eight extended graphics tests.

4.5.1 Test ,0050: Circle

This test exercises the Ramtek instruction WRITE CIRCLE (CIRC) (figure 4-50). Test ,0050 draws four triplets of circles using four address modes:

- Absolute addressing for the upper-left triplet
- INDEX 1 addressing for the upper-right triplet
- INDEX 2 addressing for the lower-left triplet
- COP relative addressing for the lower-right triplet.

ENTRY: Respond ,0050 to **Test =** prompt.

EXIT: Press RETURN key on console keyboard.

4.5.2 Test ,0051: Arcs

Test ,0051 exercises the Ramtek instructions WRITE ARC TYPE 1 (ARC1), WRITE ARC TYPE 2 (ARC2), and WRITE ARC TYPE 3 (ARC3) (figure 4-51). The test program draws four 90° arcs using each arc type instruction and each addressing mode:

- The ARC1 instruction draws a large circle in the following manner:
  - The upper-left arc in absolute addressing mode
  - The upper-right arc in INDEX 1 addressing mode
  - The lower-right arc in INDEX 2 addressing mode
  - The lower-left arc in COP relative addressing mode
- The ARC2 instruction draws a small circle is drawn inside the large circle with the same arc/addressing association.
- The ARC3 instruction draws four arcs outside the large circle with the same arc/addressing association.

ENTRY: Respond ,0001 to **Test =** prompt.

EXIT: Press RETURN key on console keyboard.

4.5.3 Test ,0052: Fill

Test ,0052 sets the foreground to 0007 and draws a Sierpinsky curve (figure 4-52). The test program then sets the foreground to 0001 and fills the inside of the curve using the Ramtek instruction FILL (FILL) in the FILL-WHILE mode. Test ,0052 then sets the foreground to 0002 and fills the outside of the curve using the FILL instruction in the FILL-UNTIL mode. When the test is complete, the Sierpinsky curve outline is gone.

ENTRY: Respond ,0052 to **Test =** prompt.

EXIT: Press RETURN key on console keyboard.

4.5.4 Test ,0053: Spare

4.5.5 Test ,0054: Spare

4.5.6 Test ,0055: Spare

4.5.7 Test ,0056: 32-Bit Conics 1

Test ,0056 exercises the Ramtek instruction WRITE CONIC 32 BITS (WC32) to draw two concentric ellipses (figure 4-53).

ENTRY: Respond ,0056 to **Test =** prompt.

EXIT: Press RETURN key on console keyboard.

4.5.8 Test ,0057: 32-Bit Conics 2

Test ,0057 exercises the Ramtek instruction WRITE CONIC 32 BITS (WC32) to draw a pattern of rotated ellipses (figure 4-54).

ENTRY: Respond ,0057 to **Test =** prompt.

EXIT: Press RETURN key on console keyboard.

4.6 PIXEL FORMATTER TESTS

The following paragraphs describe the two pixel formatter tests.

4.6.1 Test ,0058: Load Lookup Table for Pixel Formatter Test

Test ,0058 loads the video lookup table (VLT) used in test ,0059 for systems that have a 4-bit DAC V2 or V7A PCB installed. Test ,0058 does not produce a visible display on the Ramtek screen.

ENTRY: Respond ,0001 to **Test =** prompt.

EXIT: Press RETURN key on console keyboard.

4.6.2 Test ,0059: Pixel Formatter

This test functions only when a pixel formatter PCB is present in the system. Test ,0059 checks the four pixel formatter PCB pixel lengths with the Ramtek instruction WRITE PACKED IMAGE (WPI) (figure 4-55). If you are using an acceptance test tape with a 4-bit DAC V2 or V7A video PCB, test ,0058 loads the VLT with colors to produce the correct display for test ,0059.

Test ,0059 writes four lines using colors 0-7:

- 2 bits per pixel, with a shift right and no initial shift
- 3 bits per pixel, with a shift right and no initial shift
- 4 bits per pixel, with a shift left and an initial shift = 4
- 5 bits per pixel, with a shift left and an initial shift = 6

ENTRY: Respond ,0059 to **Test =** prompt.

EXIT: Press RETURN key on console keyboard.

4.6.3 Test ,005A: Spare

4.6.4 Test ,005B: Spare

4.6.5 Test ,005C: Spare

4.6.6 Test ,005D: Spare

4.6.7 Test ,005E: Spare

4.6.8 Test ,005F: Spare

4.7 EXTENDED IMAGE TESTS

The following paragraphs describe the four extended image tests.

4.7.1 Test ,0060: Copy Image

This test demonstrates the operation of the Ramtek instruction COPY IMAGE (COPY) (figure 4-56).

ENTRY: Respond ,0060 to **Test =** prompt.

EXIT: Press RETURN key on console keyboard.

4.7.2 Test ,0061: Copy Image Triggered

Test ,0061 demonstrates the operation of the Ramtek instruction COPY IMAGE TRIGGERED (COPYT) (figure 4-57).

ENTRY: Respond ,0061 to **Test =** prompt.

EXIT: Press RETURN key on console keyboard.

4.7.3 Test ,0062: Combine Image

This test demonstrates the operation of the Ramtek instruction COMBINE IMAGE (COMBI) (figure 4-58).

ENTRY: Respond ,0062 to **Test =** prompt.

EXIT: Press RETURN key on console keyboard.

4.7.4 Test ,0063: Combine Image Triggered

Test ,0063 demonstrates the operation of the Ramtek instruction COMBINE IMAGE TRIGGERED (COMBT) (figure 4-59).

ENTRY: Respond ,0063 to **Test =** prompt.

EXIT: Press RETURN key on console keyboard.

4.7.5 Test ,0064: Spare

4.7.6 Test ,0065: Spare

4.7.7 Test ,0066: Spare

4.7.8 Test ,0067: Spare

4.7.9 Test ,0068: Spare

4.7.10 Test ,0069: Spare

4.7.11 Test ,006A: Spare

4.7.12 Test ,006B: Spare

4.7.13 Test ,006C: Spare

4.7.14 Test ,006D: Spare

4.7.15 Test ,006E: Spare

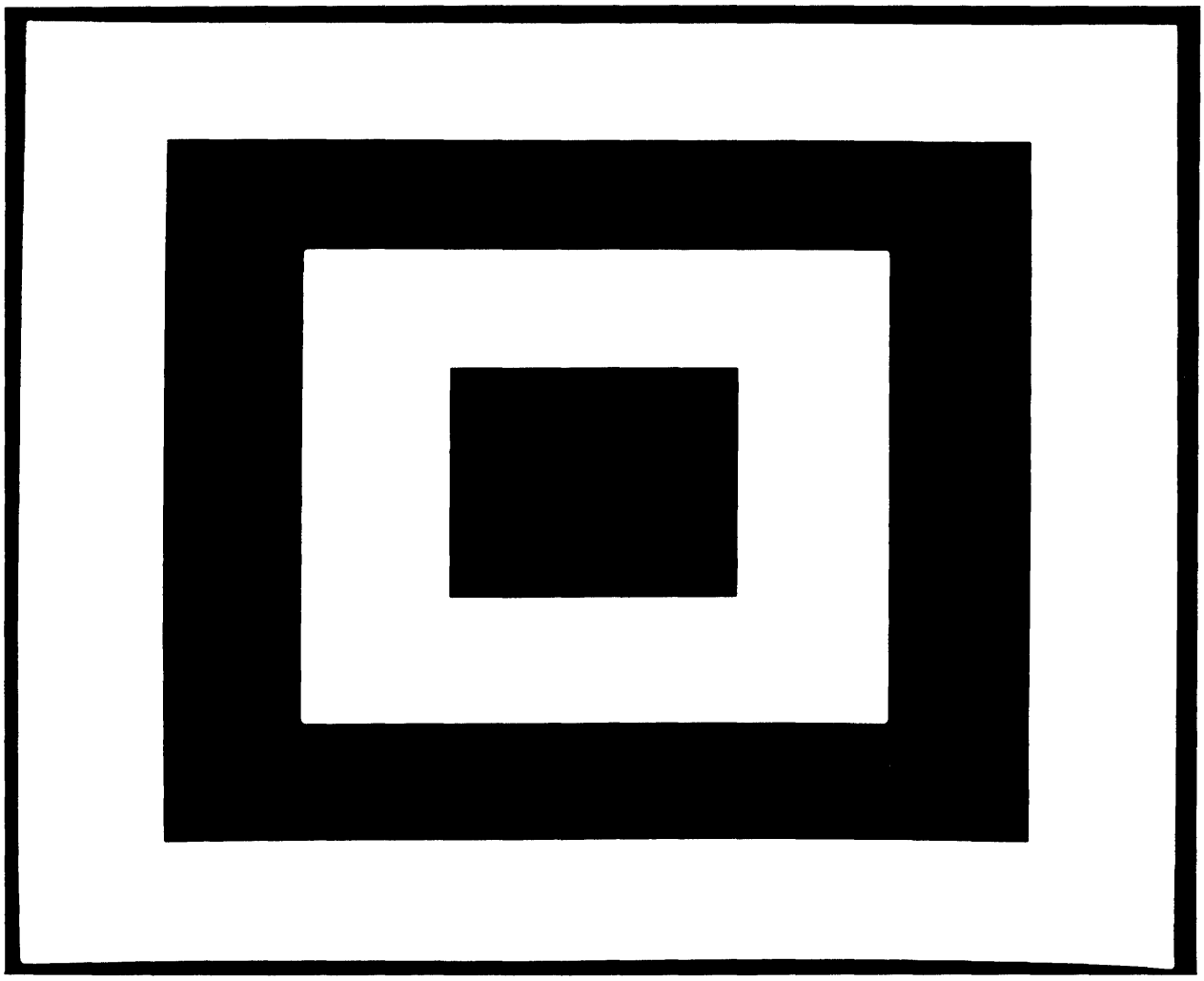
4.7.16 Test ,006F: Spare

4.8 ACCEPTANCE TEST DISPLAYS

Figures 4-1 through 4-59 illustrate the acceptance test displays. For clarity, some displays have been zoomed up with the Ramtek instruction ZOOM (ZOOM). The figure captions indicate the zoom factors. To operate the ZOOM instruction, refer to the "RM-9400 Series Graphic Display System, Software Reference Manual" or the "RM-9460 Series Graphic Display System, Software Reference Manual."

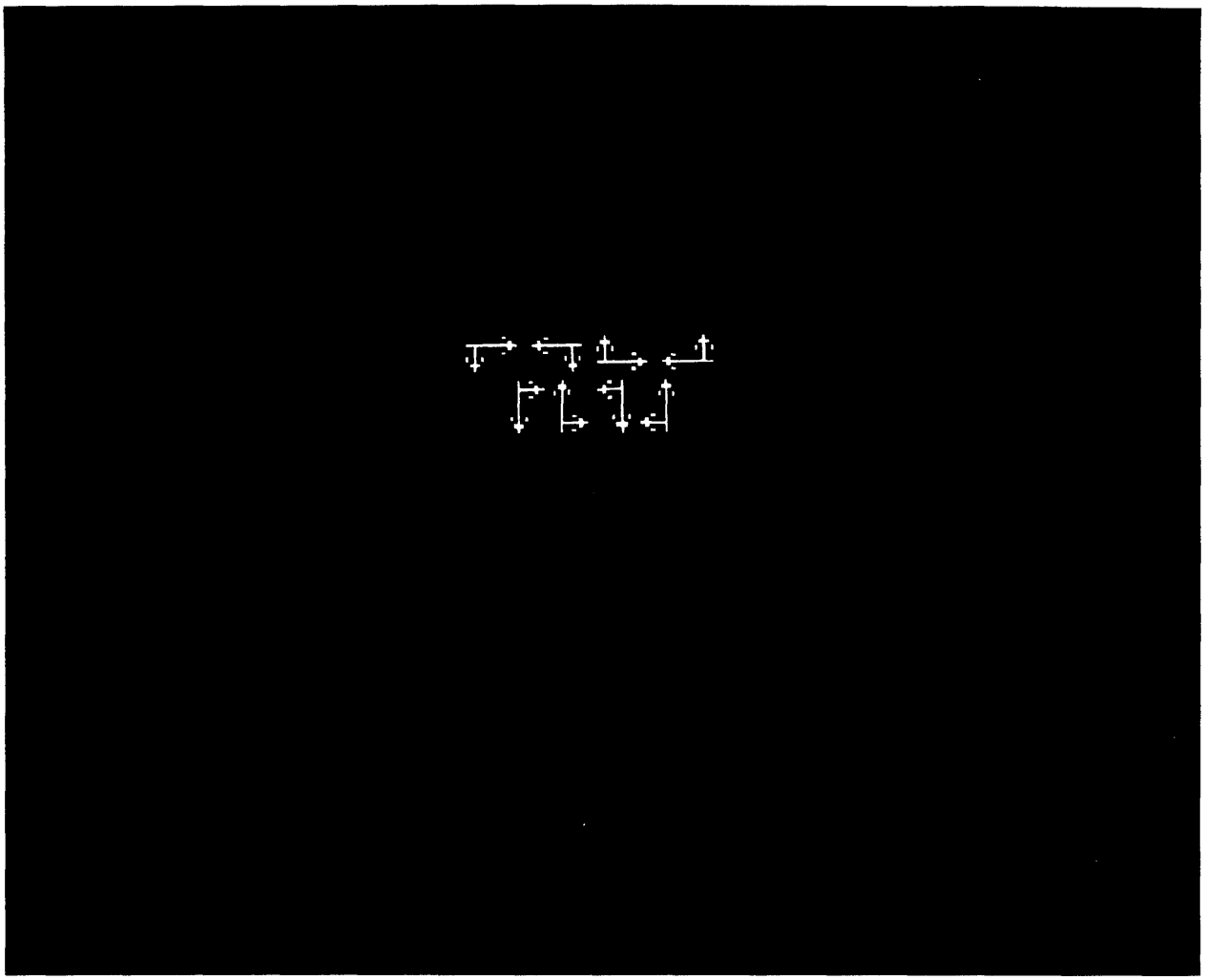
NOTE

All test displays have been reduced 45% . Except for figure 4-20 (mechanically drawn), the displays have been generated on a high resolution system (1024 lines x 1280 elements).



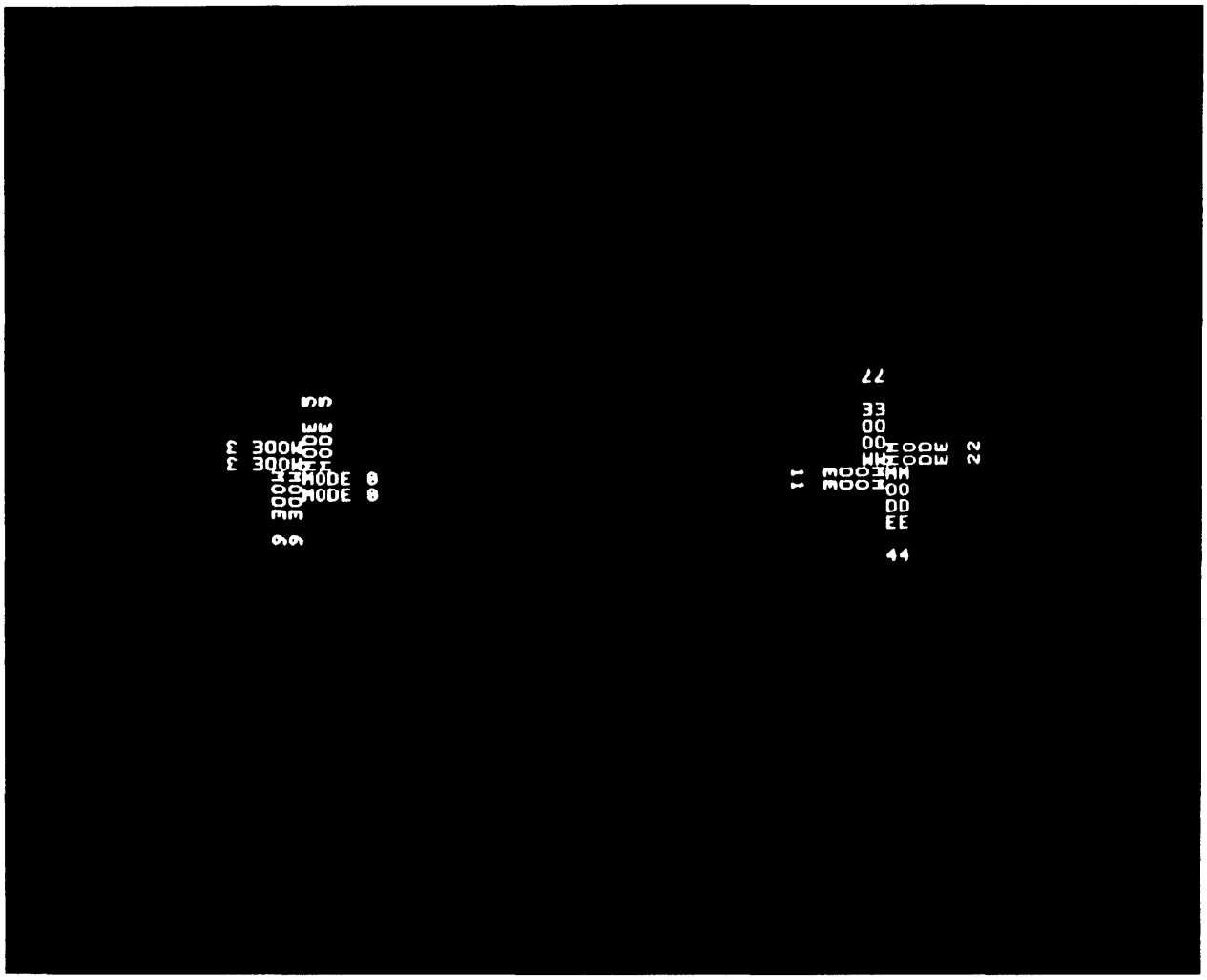
A0042-001-01A

Figure 4-1. Test ,0001: Erase



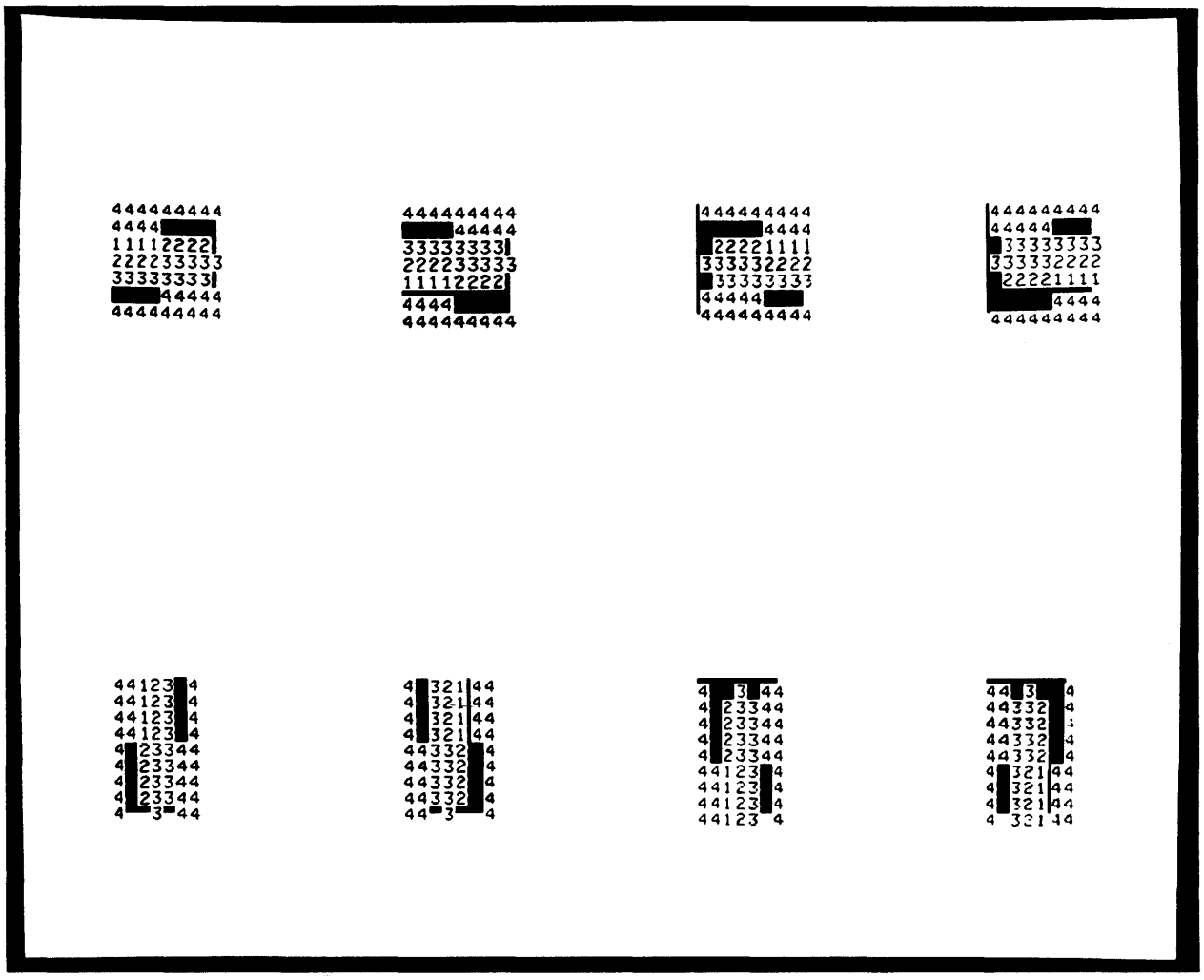
A0042-002-01A

Figure 4-2. Test ,0002: Image Scan Mode (Zoom Factor 2:2)



A0042-003-01A

Figure 4-3. Test ,0003: Text Scan Mode (Zoom Factor 1:1)



A0042-004-01A

Figure 4-4. Test ,0004: Text Windowing (Zoom Factor 1:1)

A0042-005-01A

Figure 4-5. Test ,0005: Standard Font (Zoom Factor 1:1)

A0042-006-01A

Figure 4-6. Test ,0006: Additive Write (Zoom Factor 1:1)

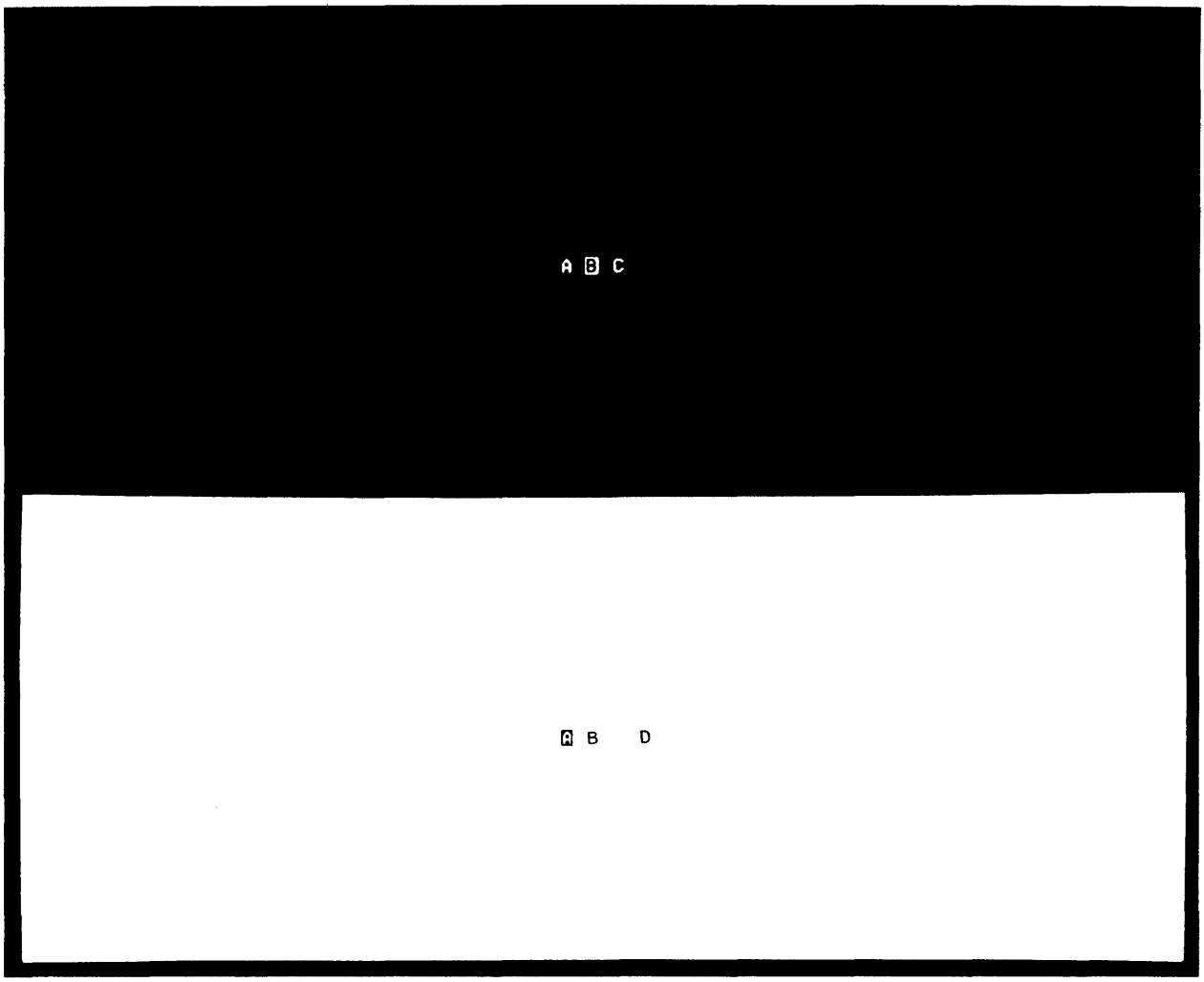
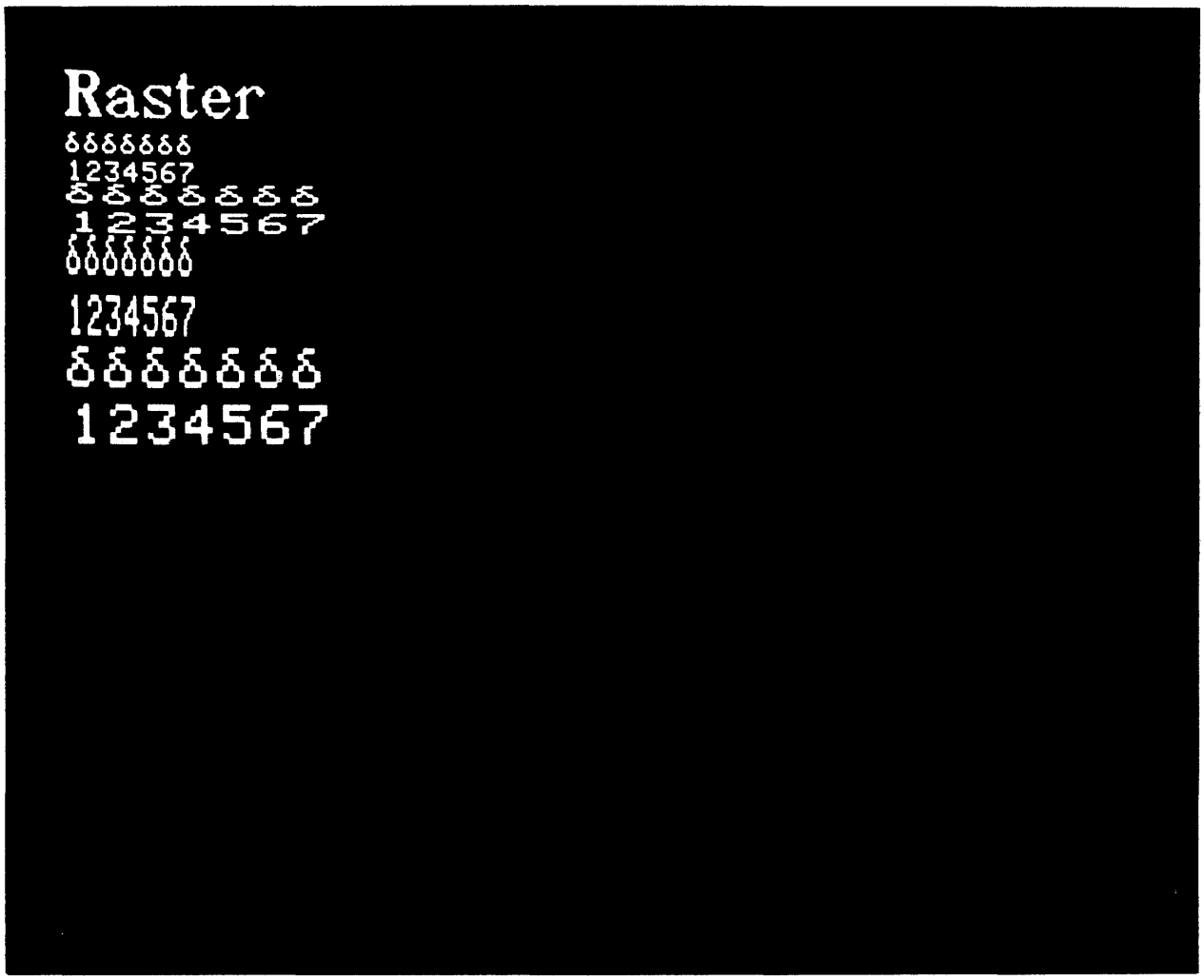


Figure 4-7. Test ,0007: Additive Write and Background Text (Zoom Factor 1:1)



A0042-008-01A

Figure 4-8. Test ,0008: Raster Scan Mode (Zoom Factor 2:2)

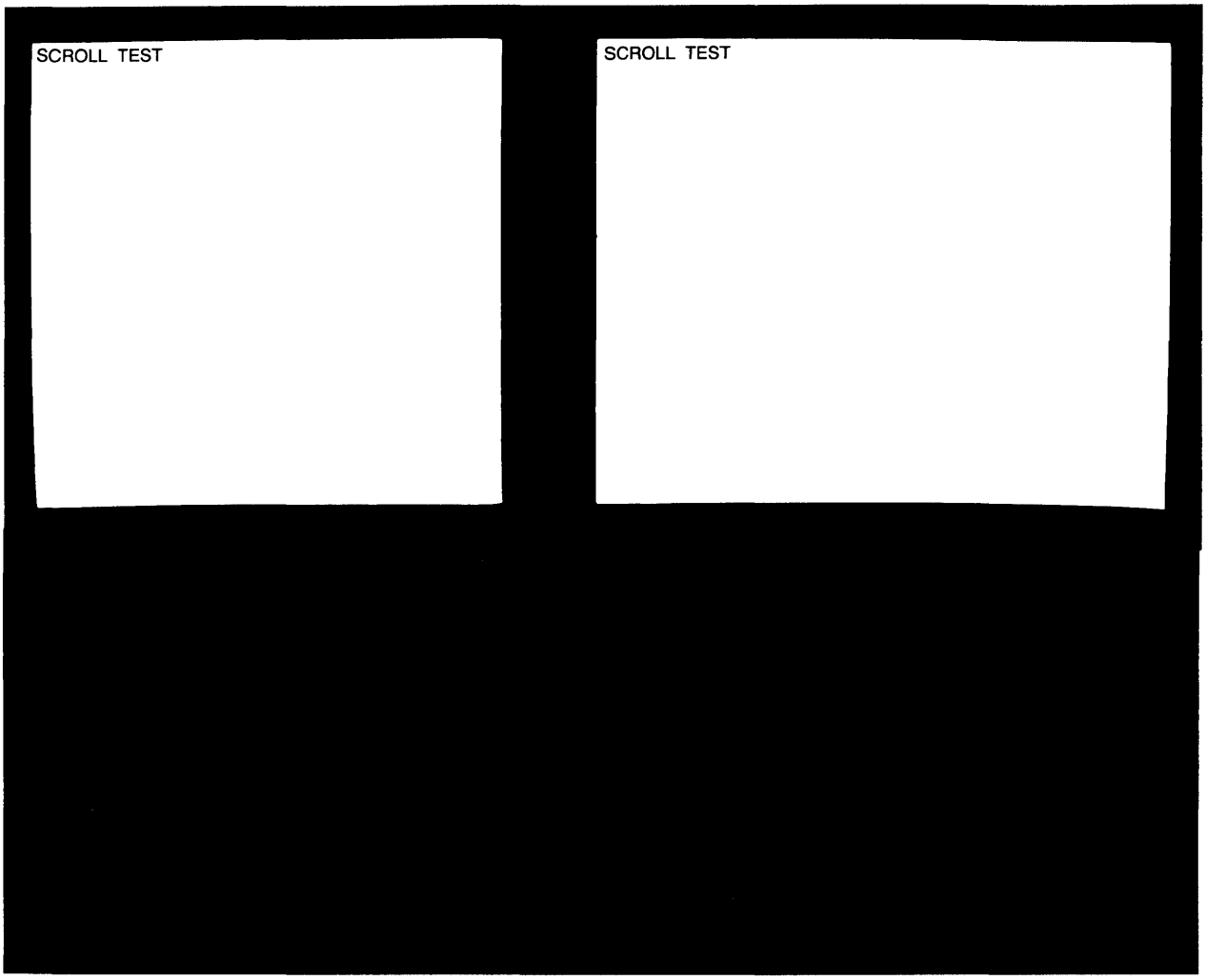
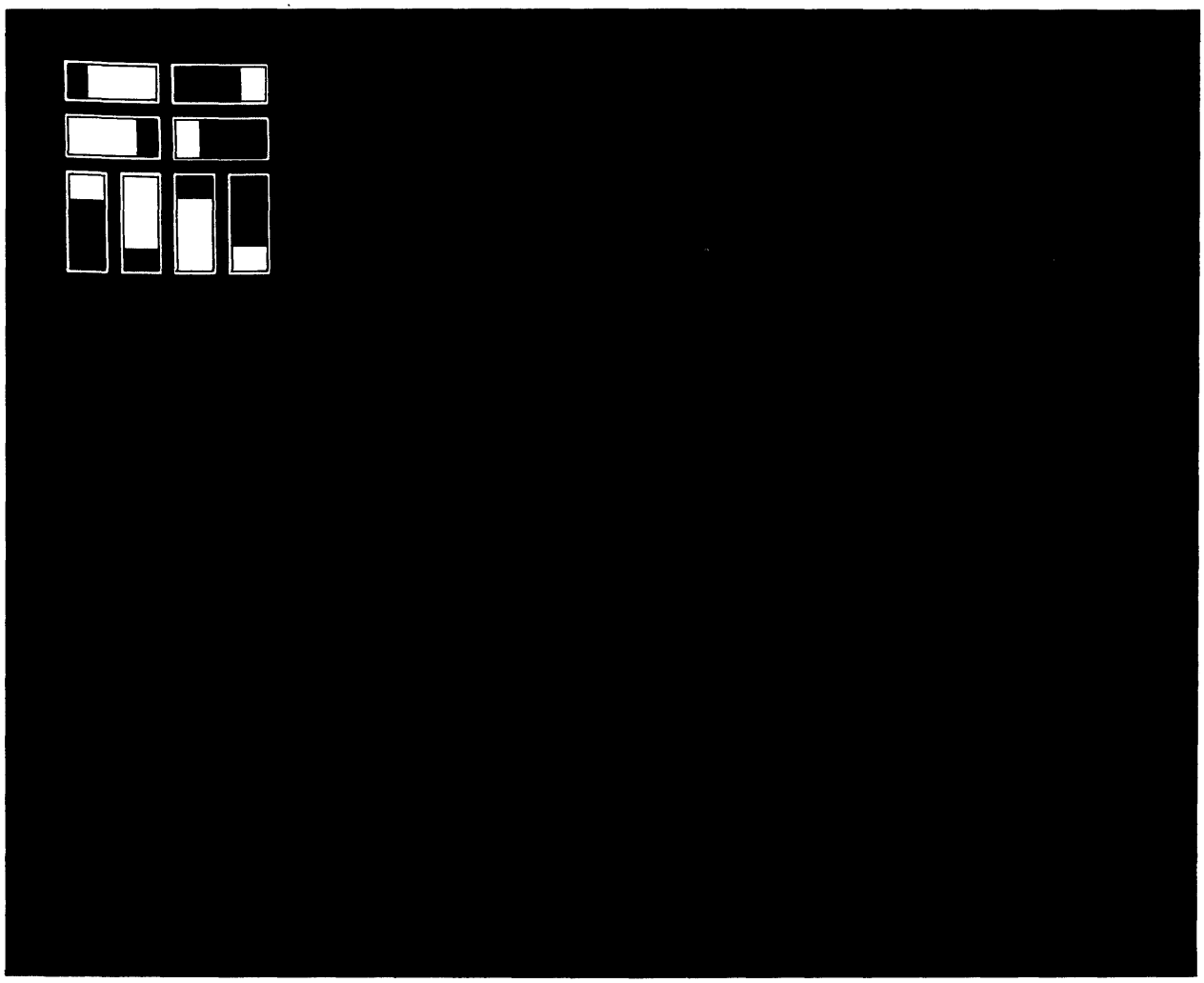
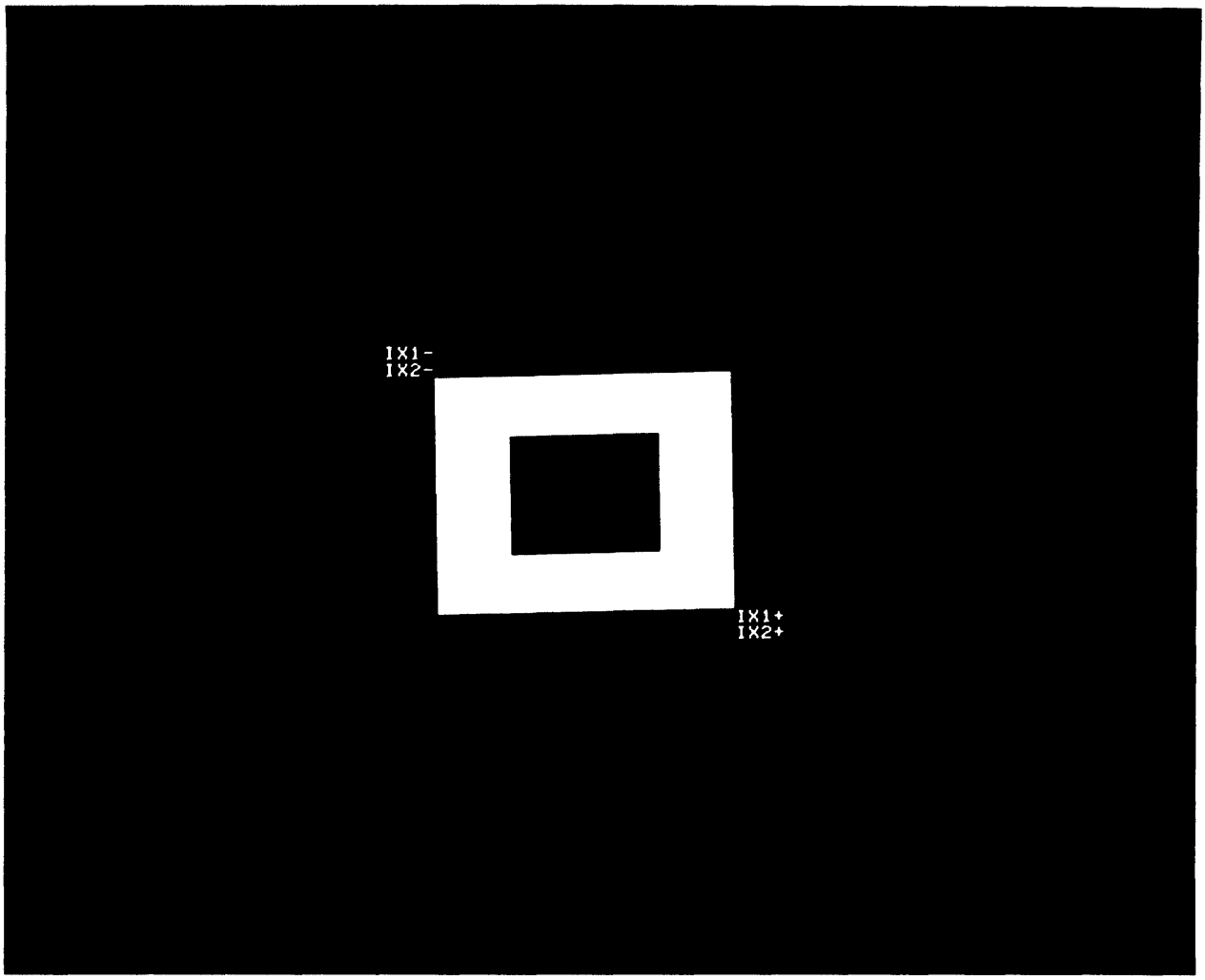


Figure 4-9. Test ,0009: Full Screen Scroll (Zoom Factor 1:1)



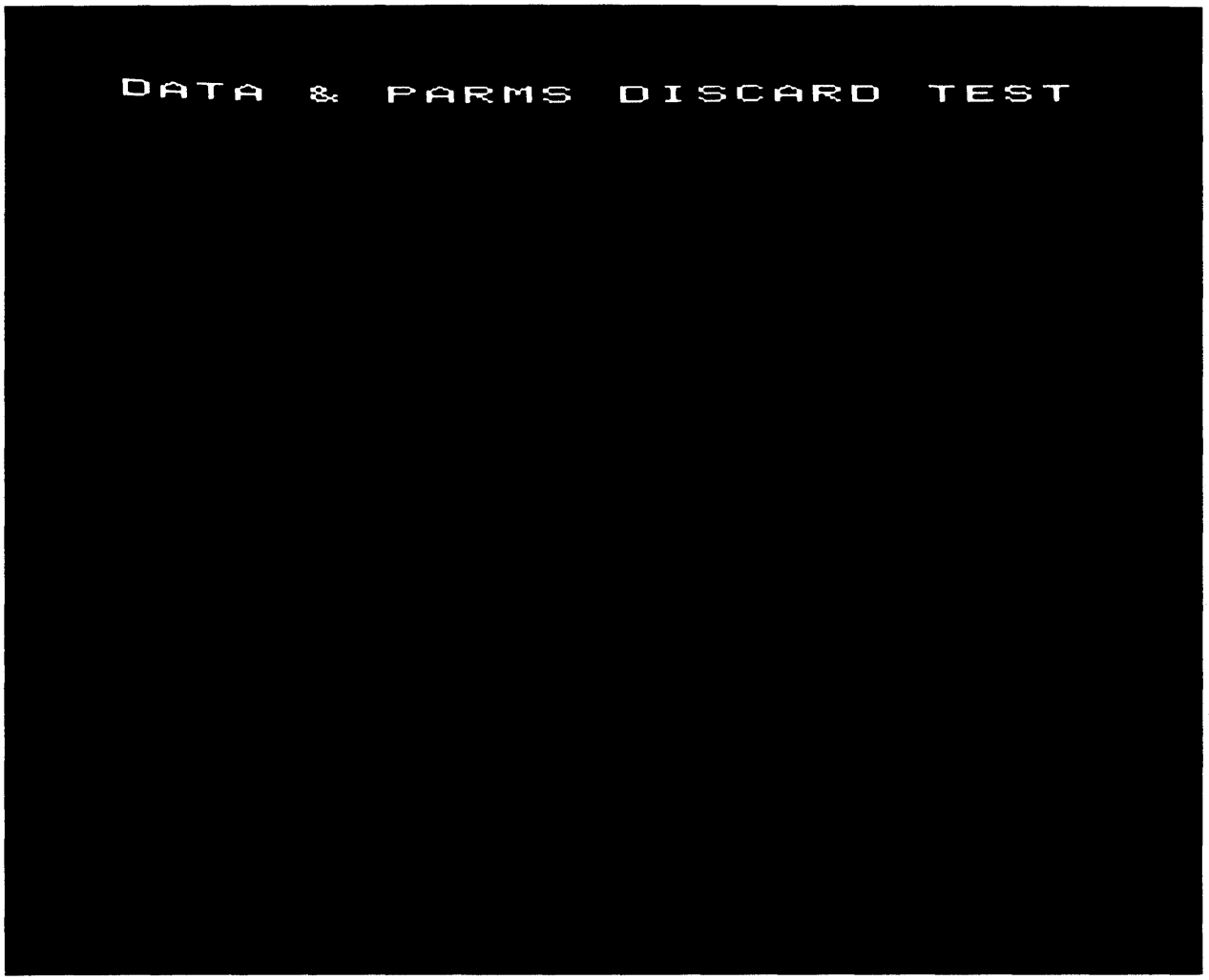
A0042-010-01A

Figure 4-10. Test ,000A: New Scroll



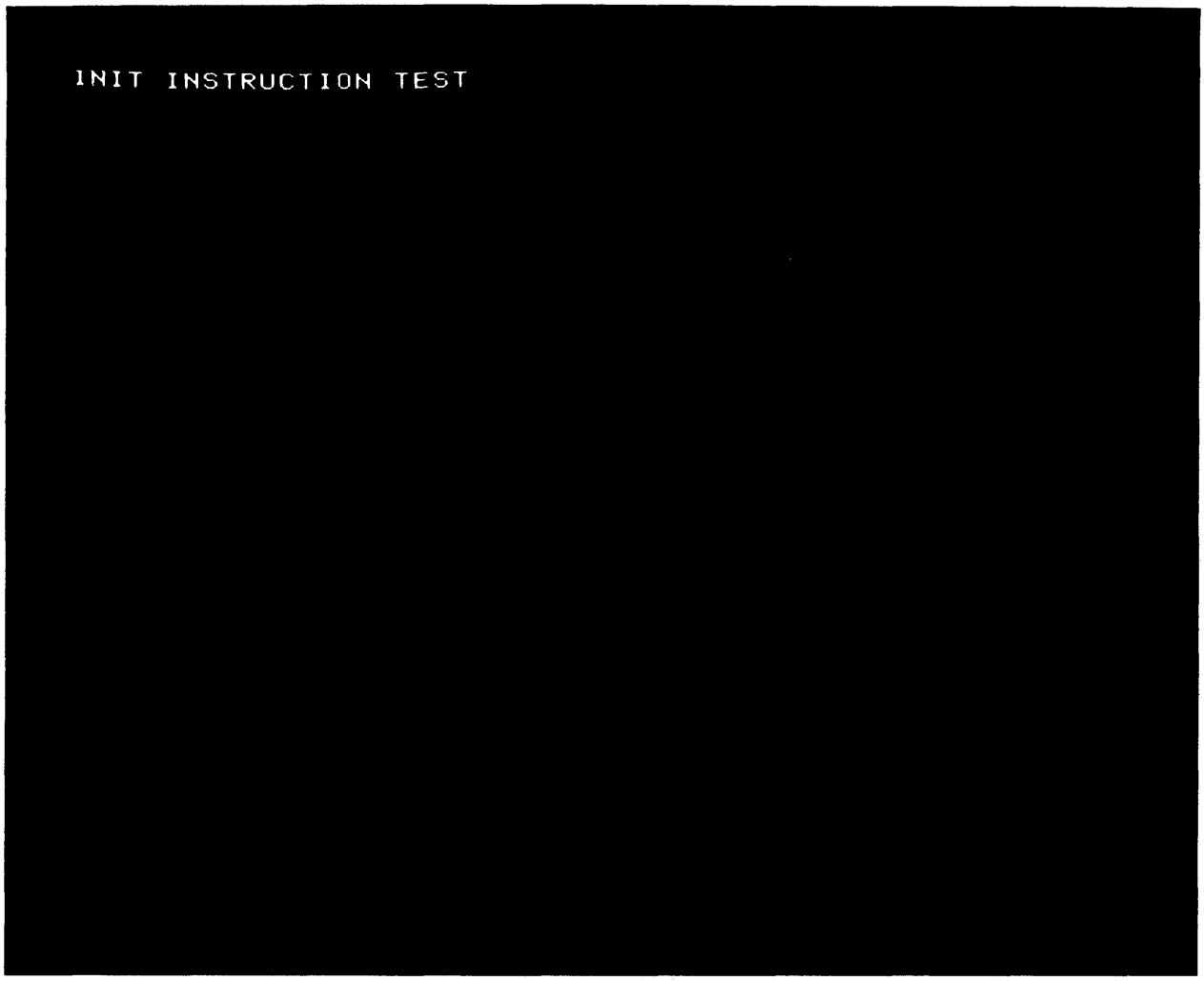
A0042-011-01A

Figure 4-11. Test ,000B: Index Register (Zoom Factor 1:1)



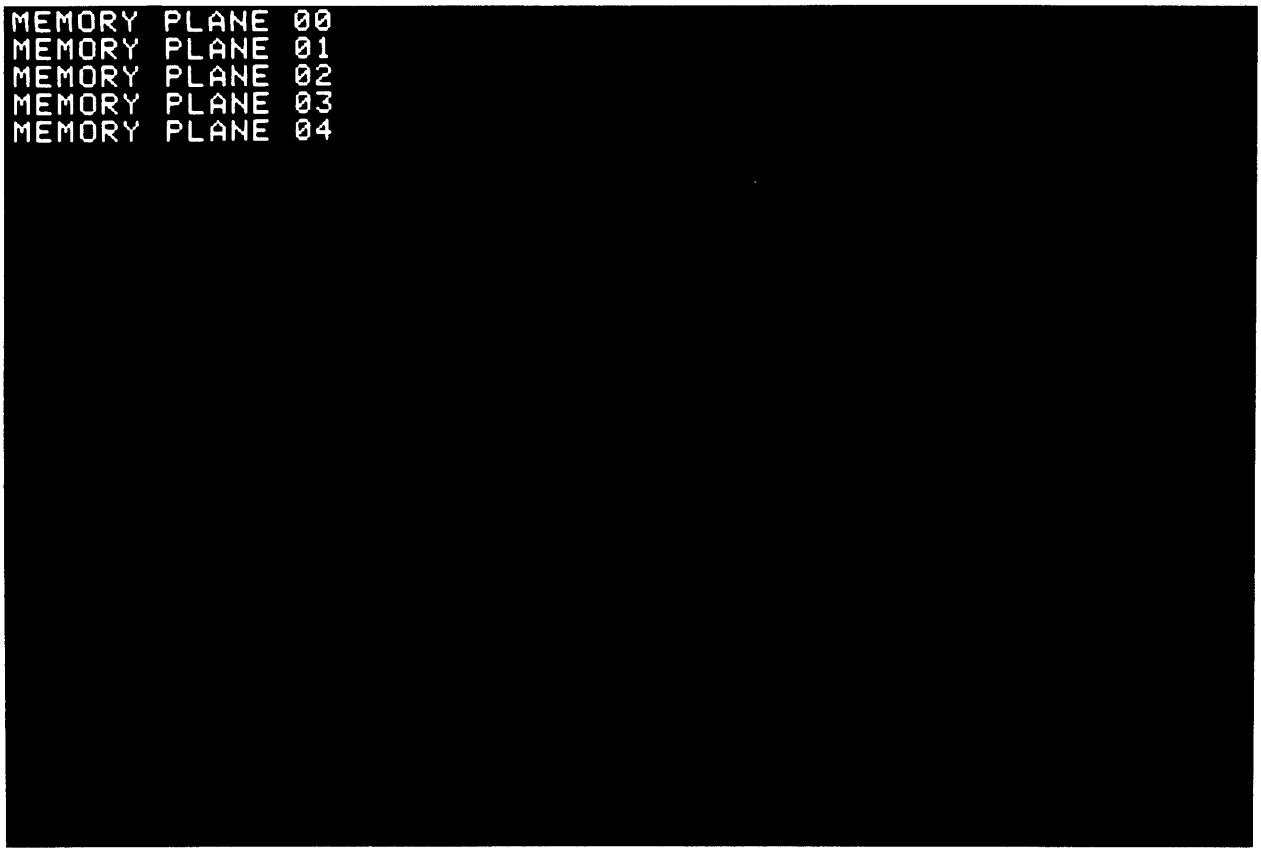
A0042-012-01A

Figure 4-12. Test ,000C: No Operation and Parameters Discard (Zoom Factor 4:4)



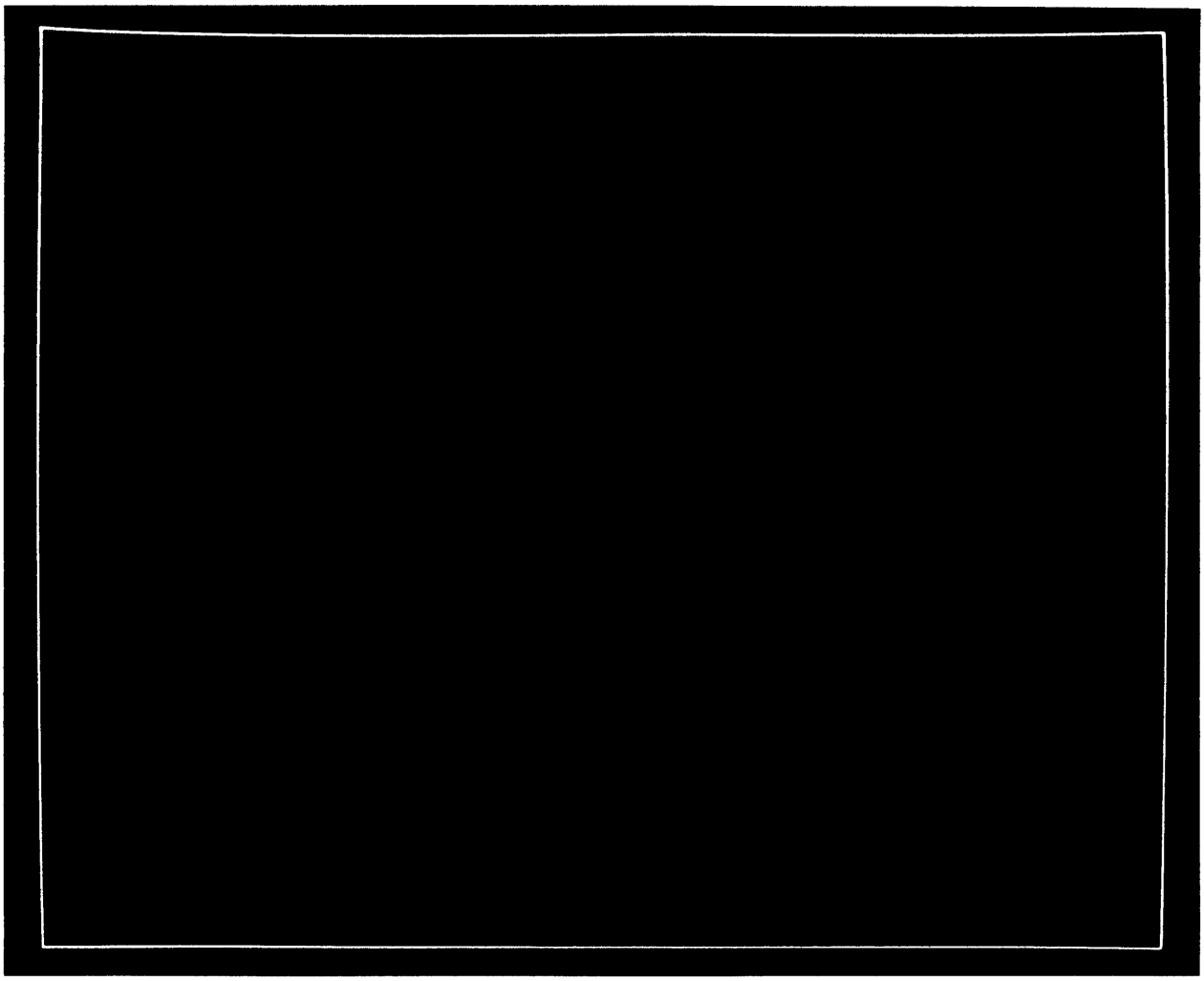
A0042-013-01A

Figure 4-13. Test ,000D: Initialize Instruction (Zoom Factor 2:2)



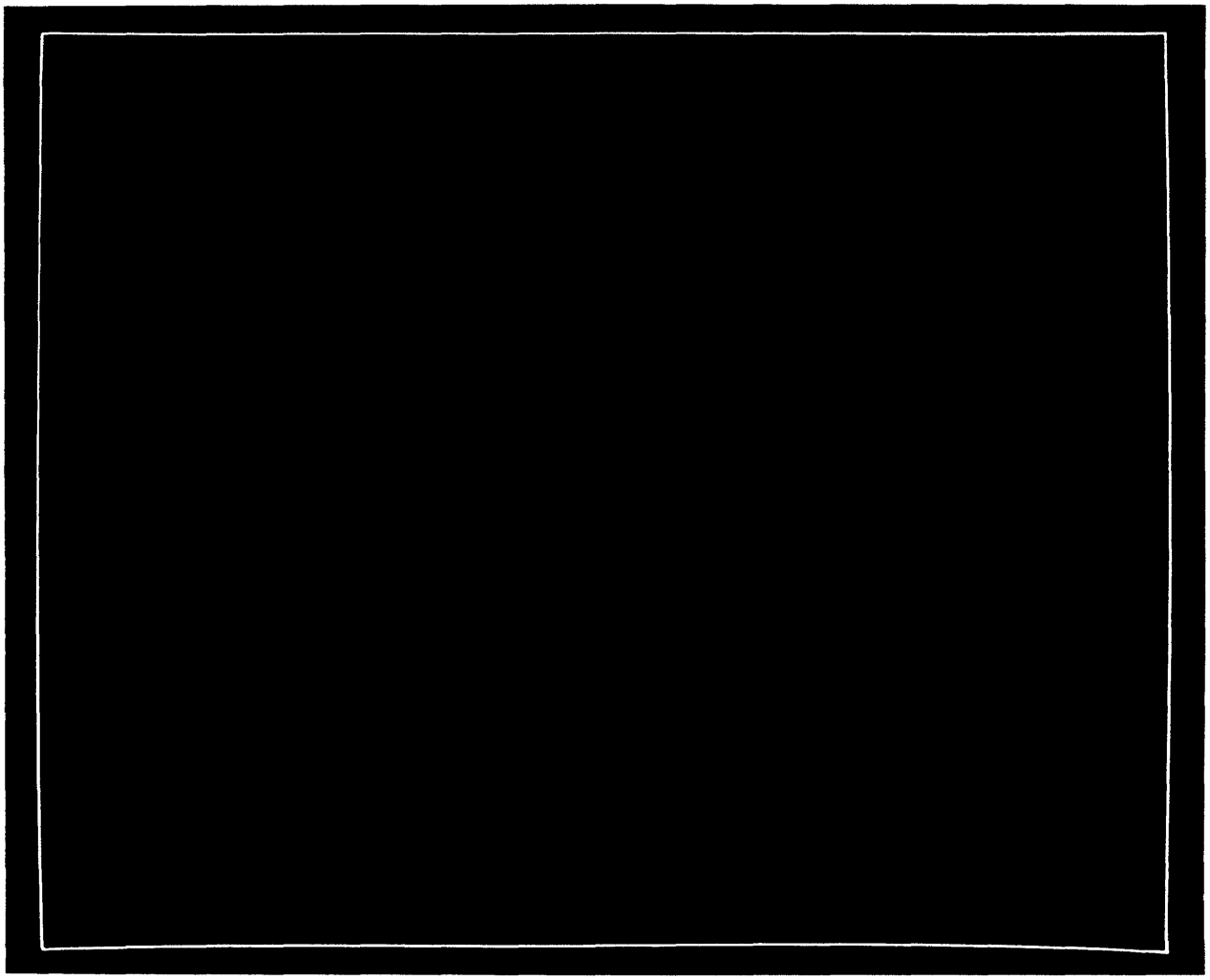
A0042-014-01A

Figure 4-14. Test ,000E: Memory Plane Selection (Zoom Factor 2:2)



A0042-015-01A

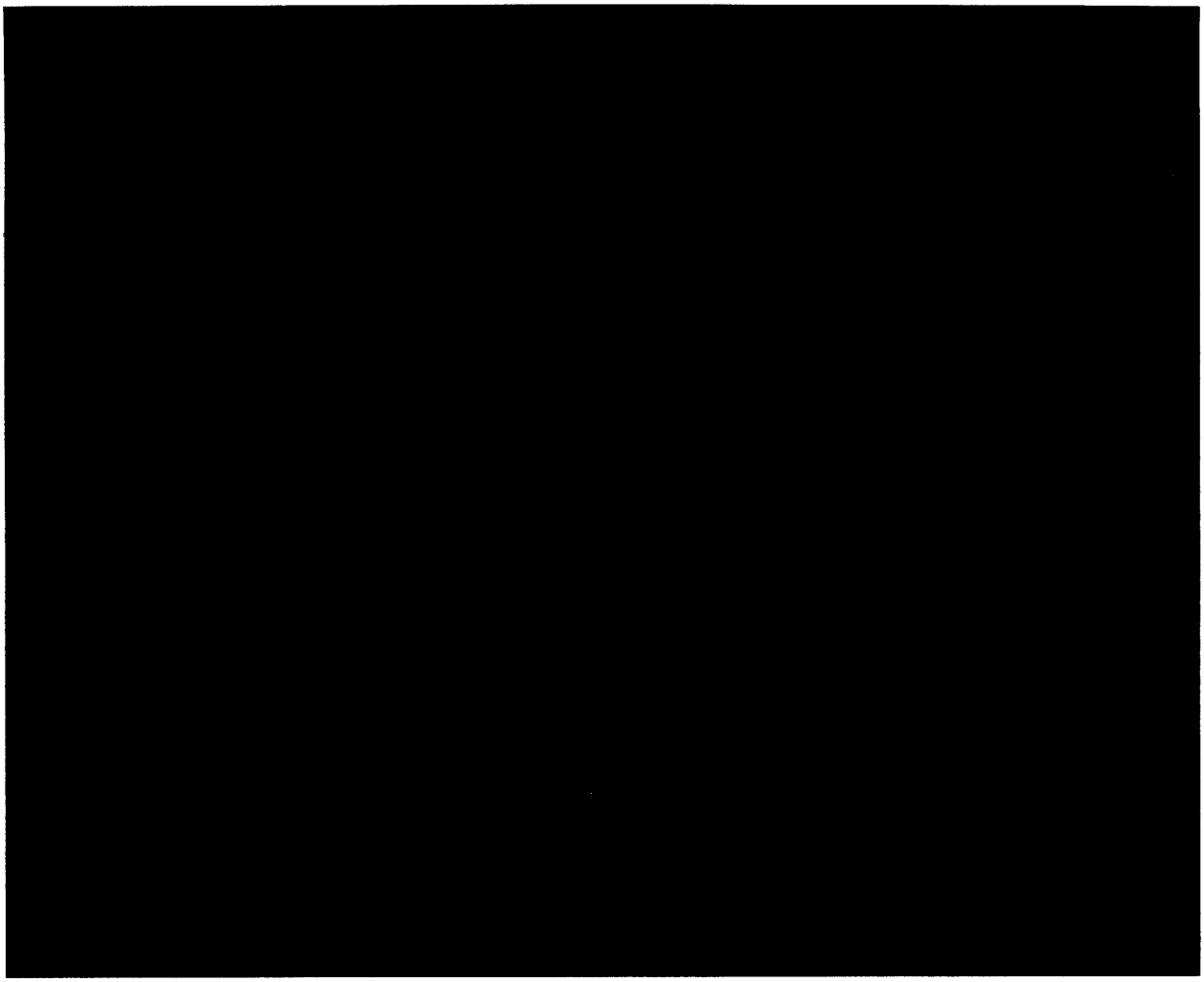
Figure 4-15. Test ,000F: Video Outline



A0042-016-01A

Figure 4-16. Test ,0010: Y-Origin

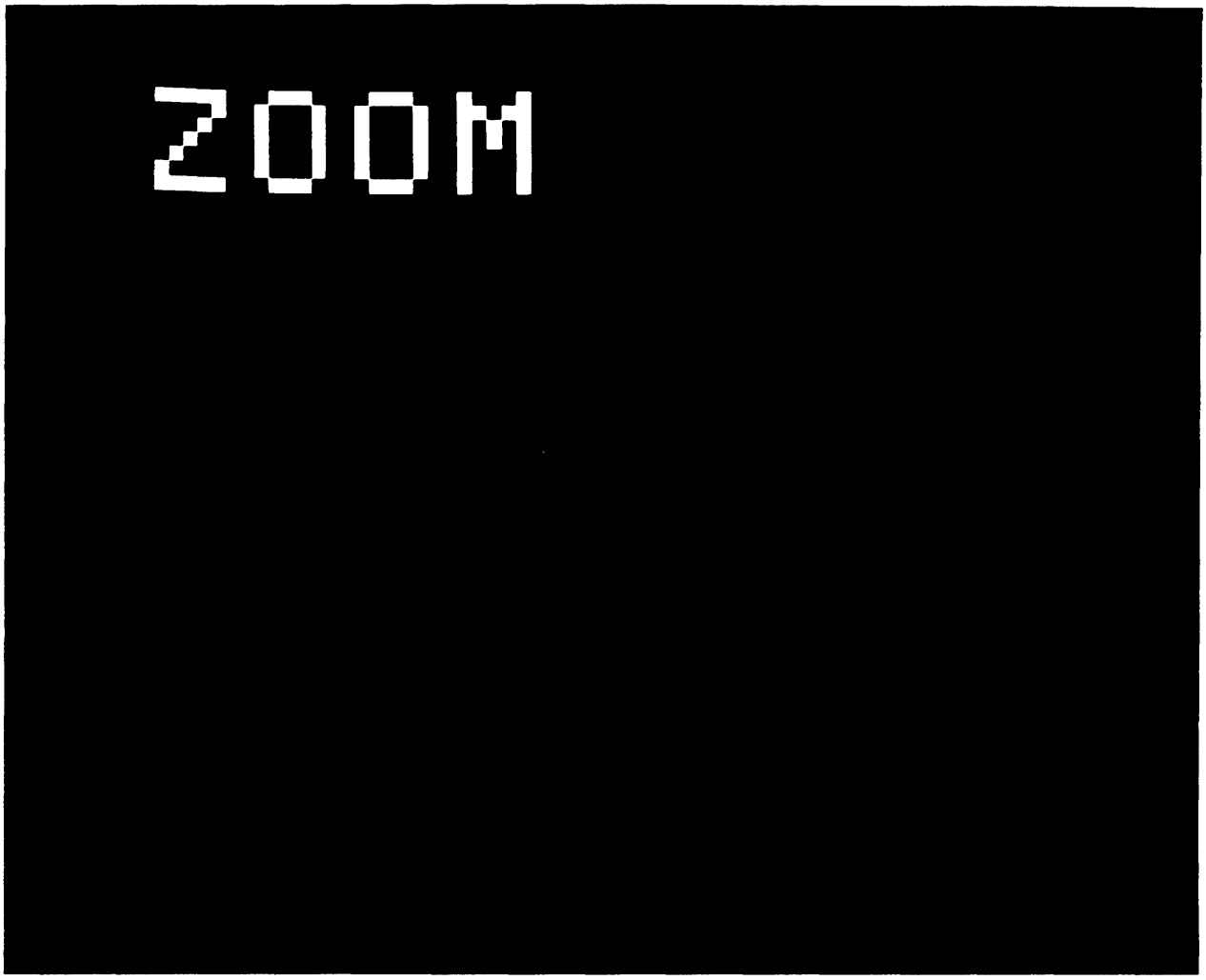
Figure 4-17. Test ,0011: Video Orientation FLIP (Zoom Factor 3:3)



A0042-018-01A

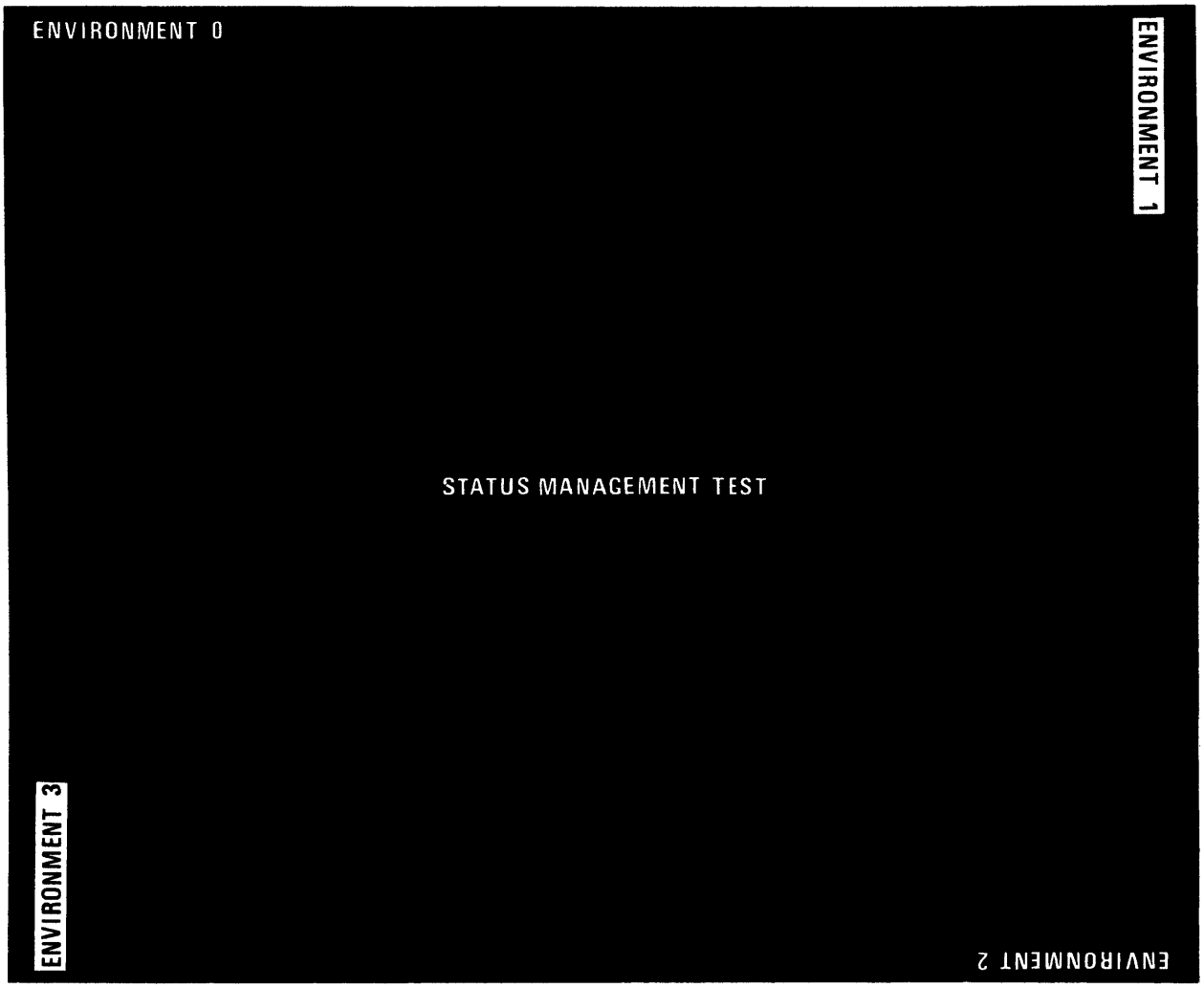
The screen blinks from white to black with a two second delay between blinks.

Figure 4-18. Test ,0012: Wait for Vertical Retrace



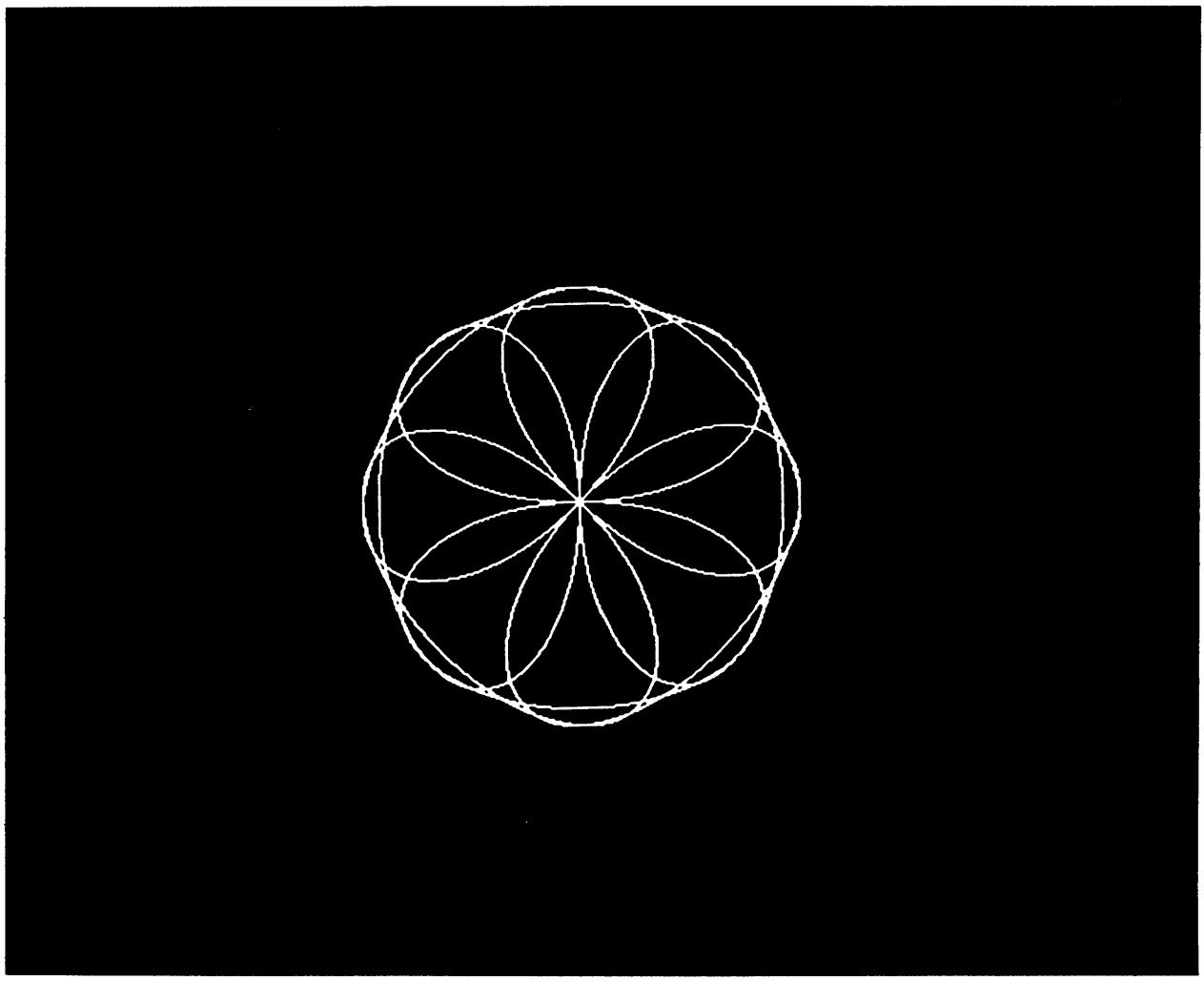
A0042-019-01A

Figure 4-19. Test ,0013: Zoom (Zoom Factor F:F)



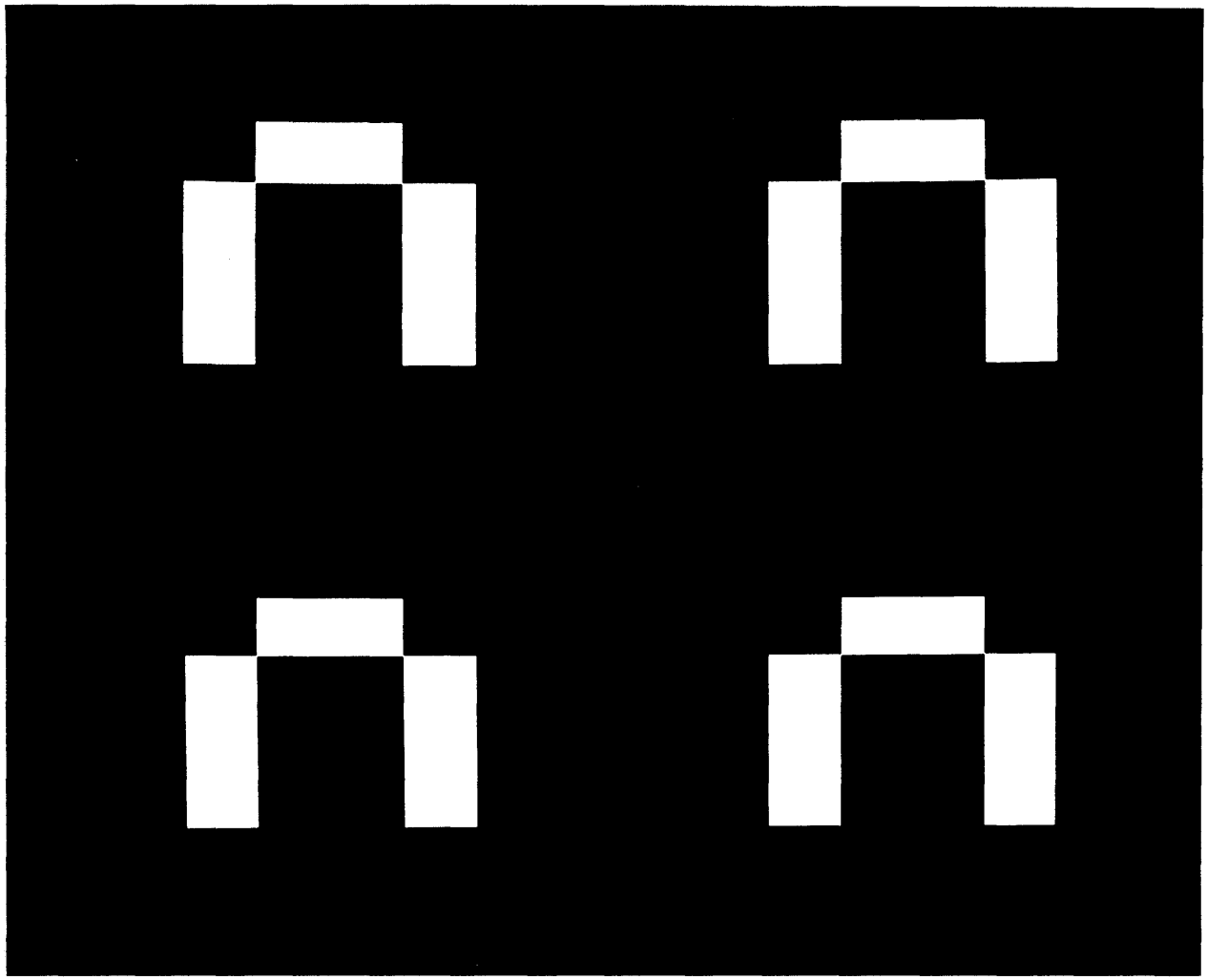
A0042-020-01A

Figure 4-20. Test ,0014: Save/Restore Environment (Mechanically Drawn)



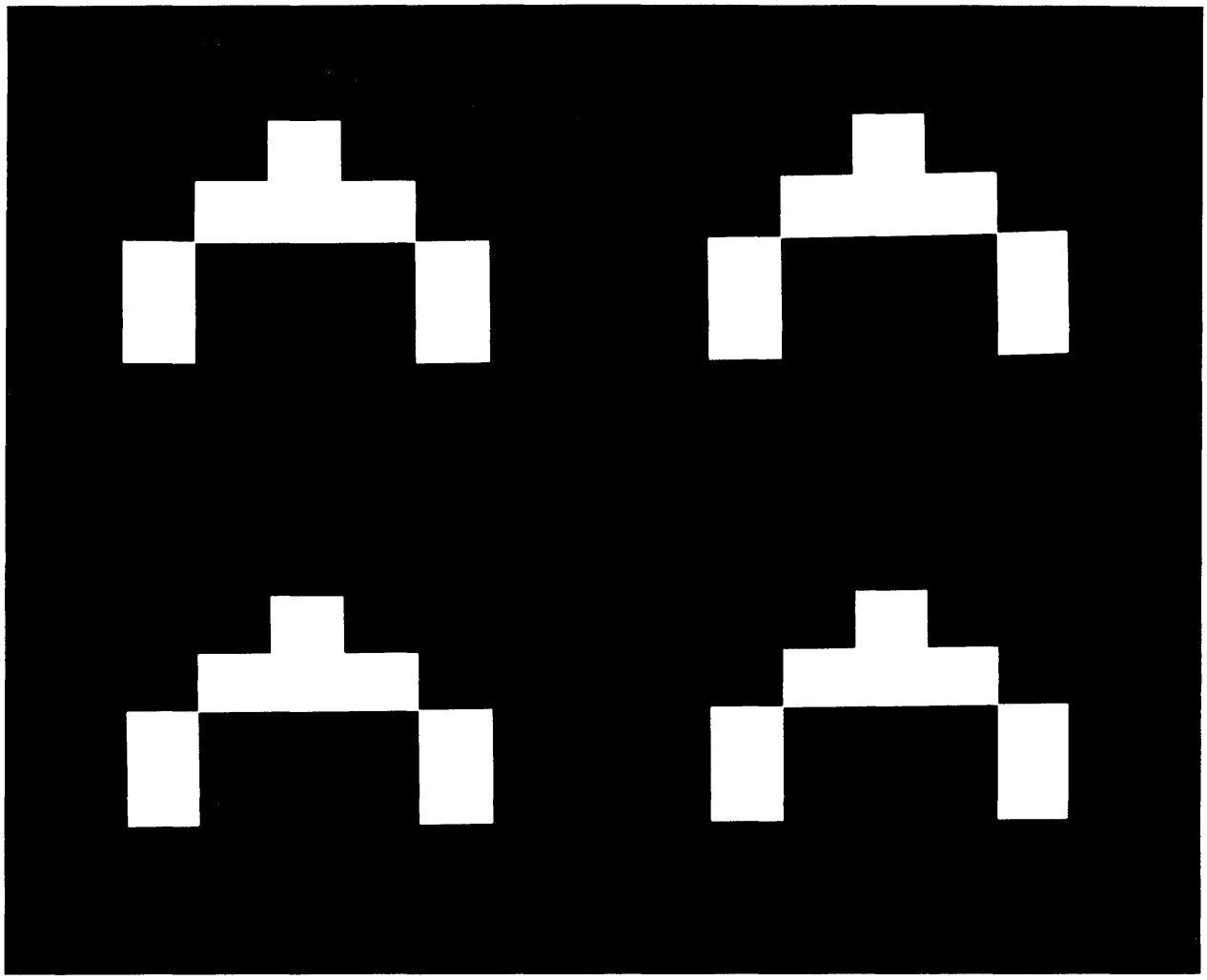
A0042-021-01A

Figure 4-21. Test ,0015: Conic (Zoom Factor 1:1)



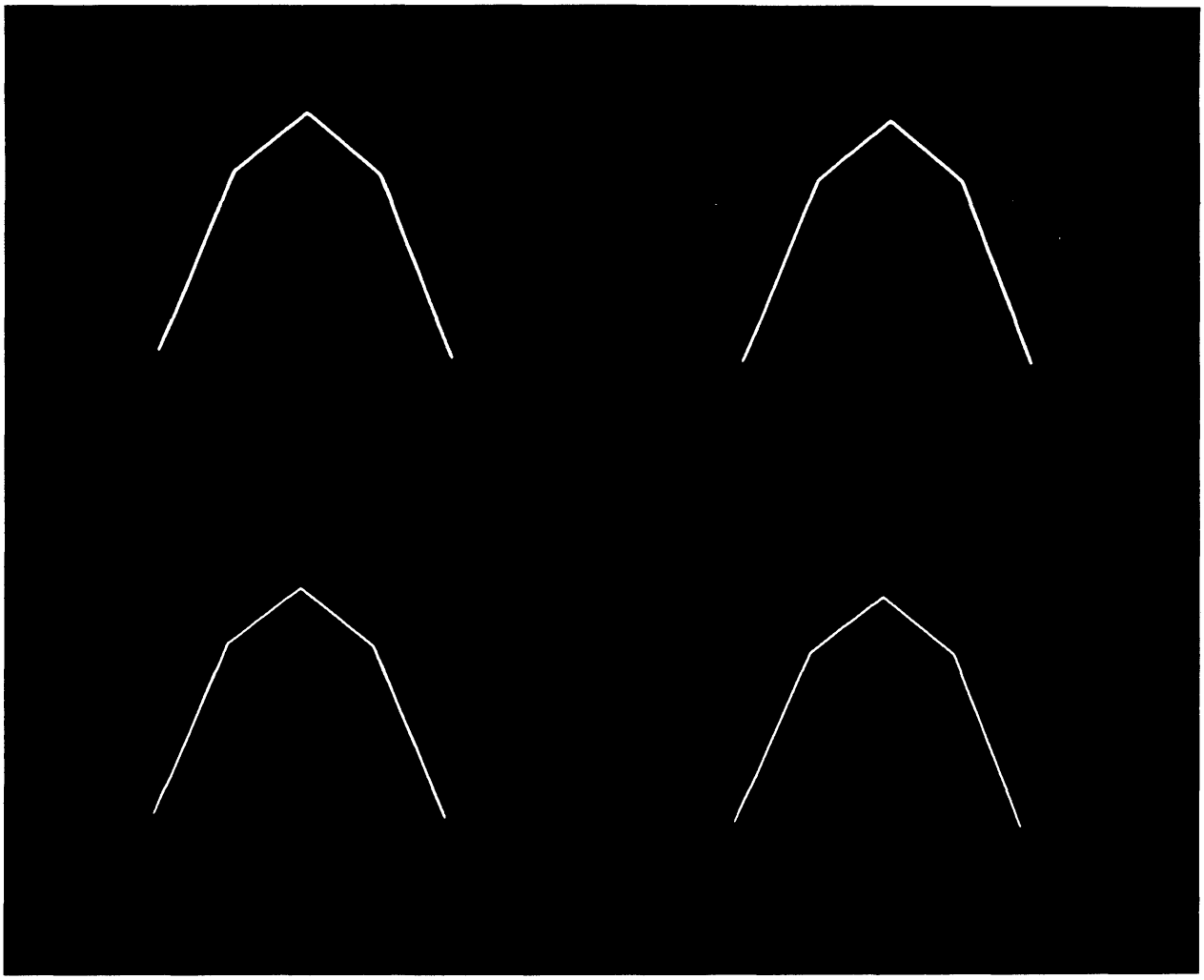
A0042-022-01A

Figure 4-22. Test ,0016: Write Plot Box with No Baseline



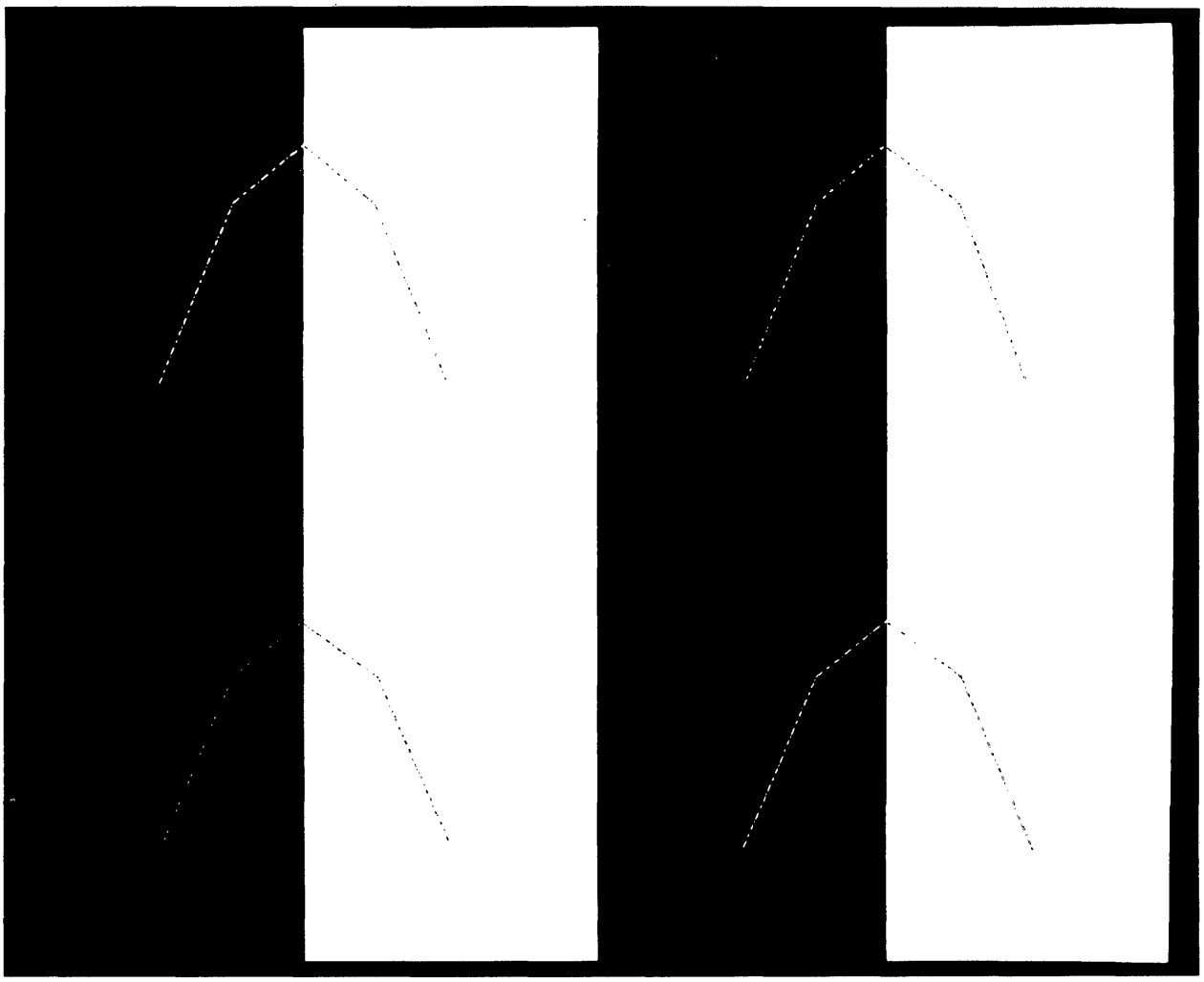
A0042-023-01A

Figure 4-23. Test ,0017: Write Plot Box with Baseline



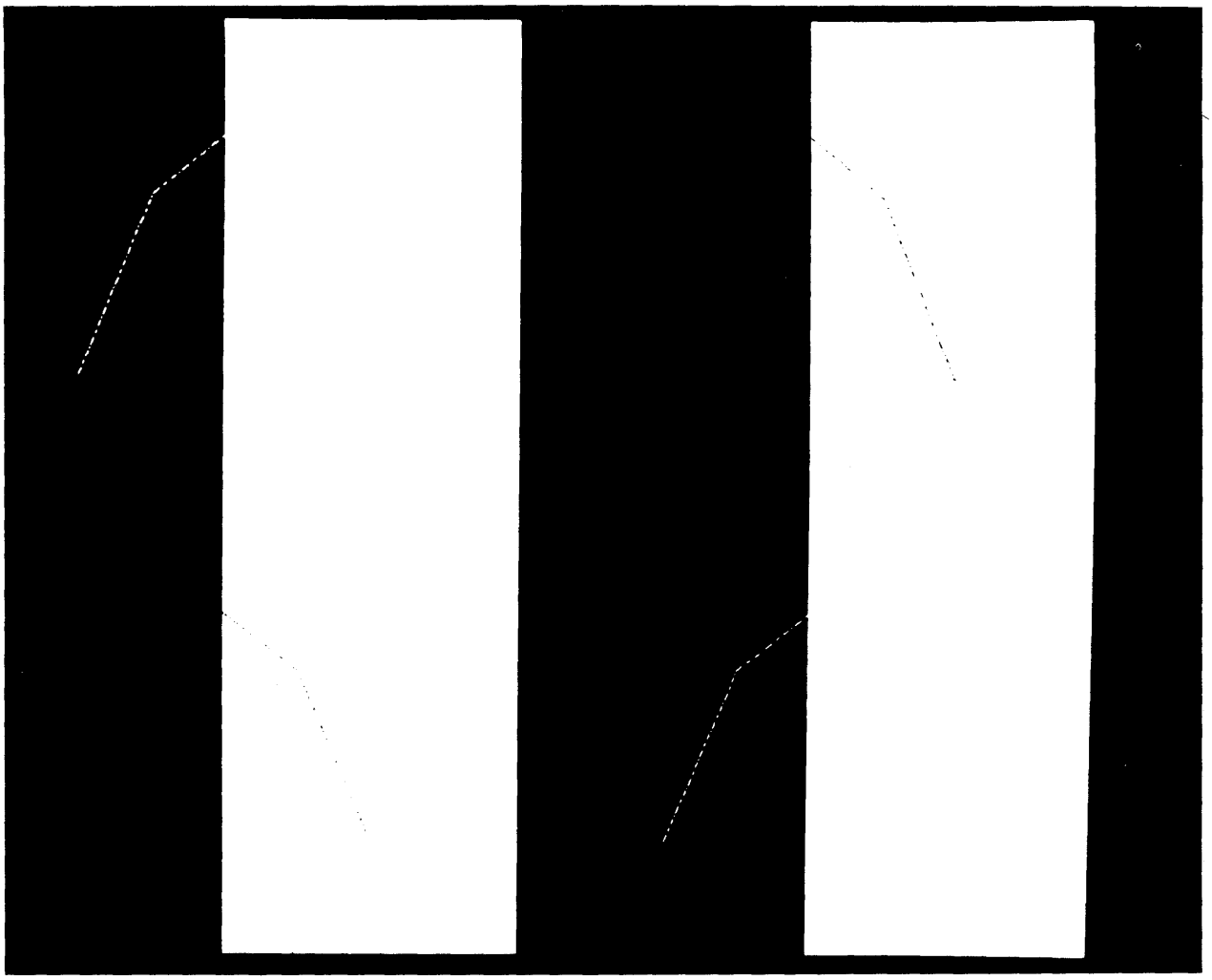
A0042-024-01A

Figure 4-24. Test ,0018: Write Vector Linked



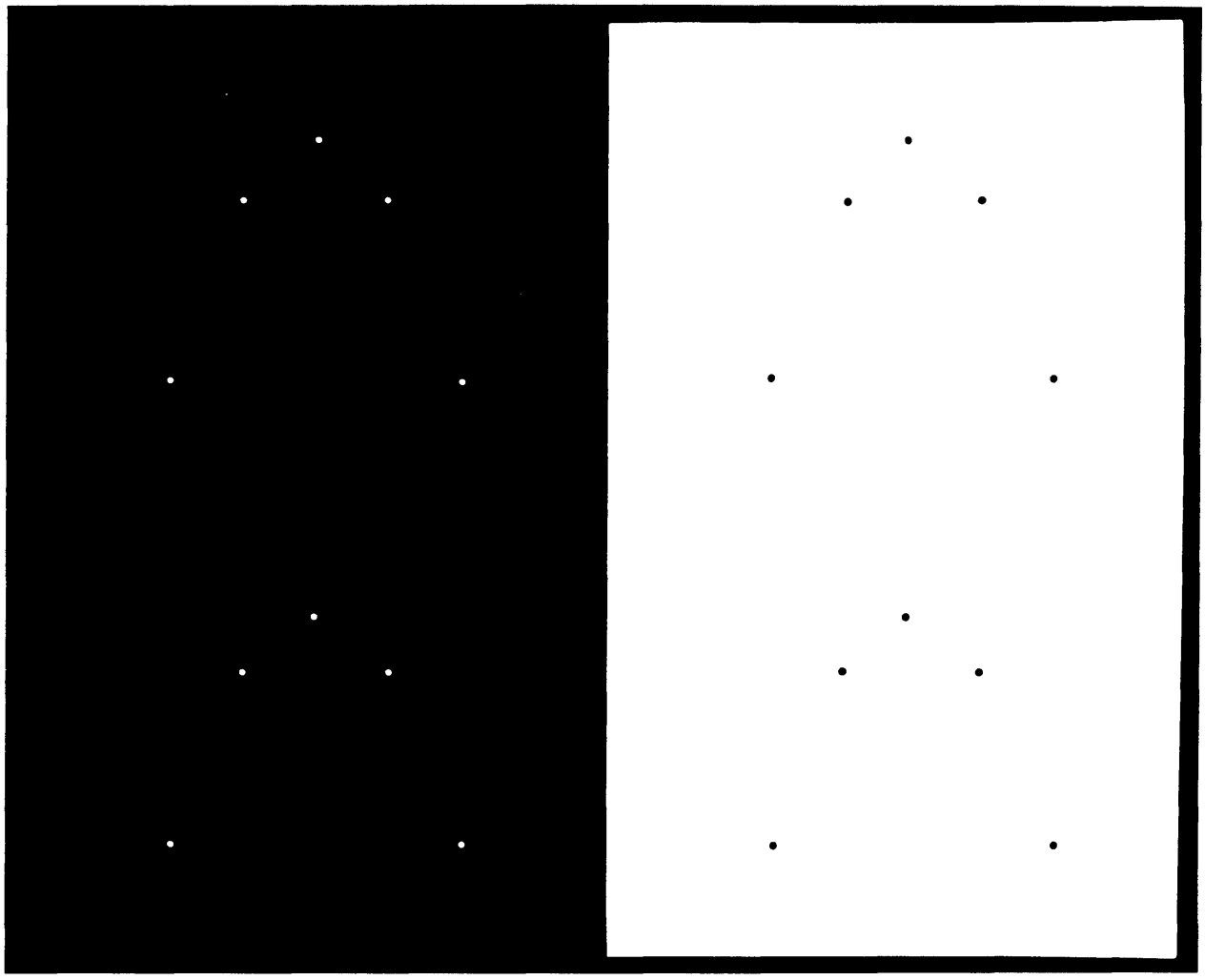
A0042-025-01A

Figure 4-25. Test ,0019: Vector Texture



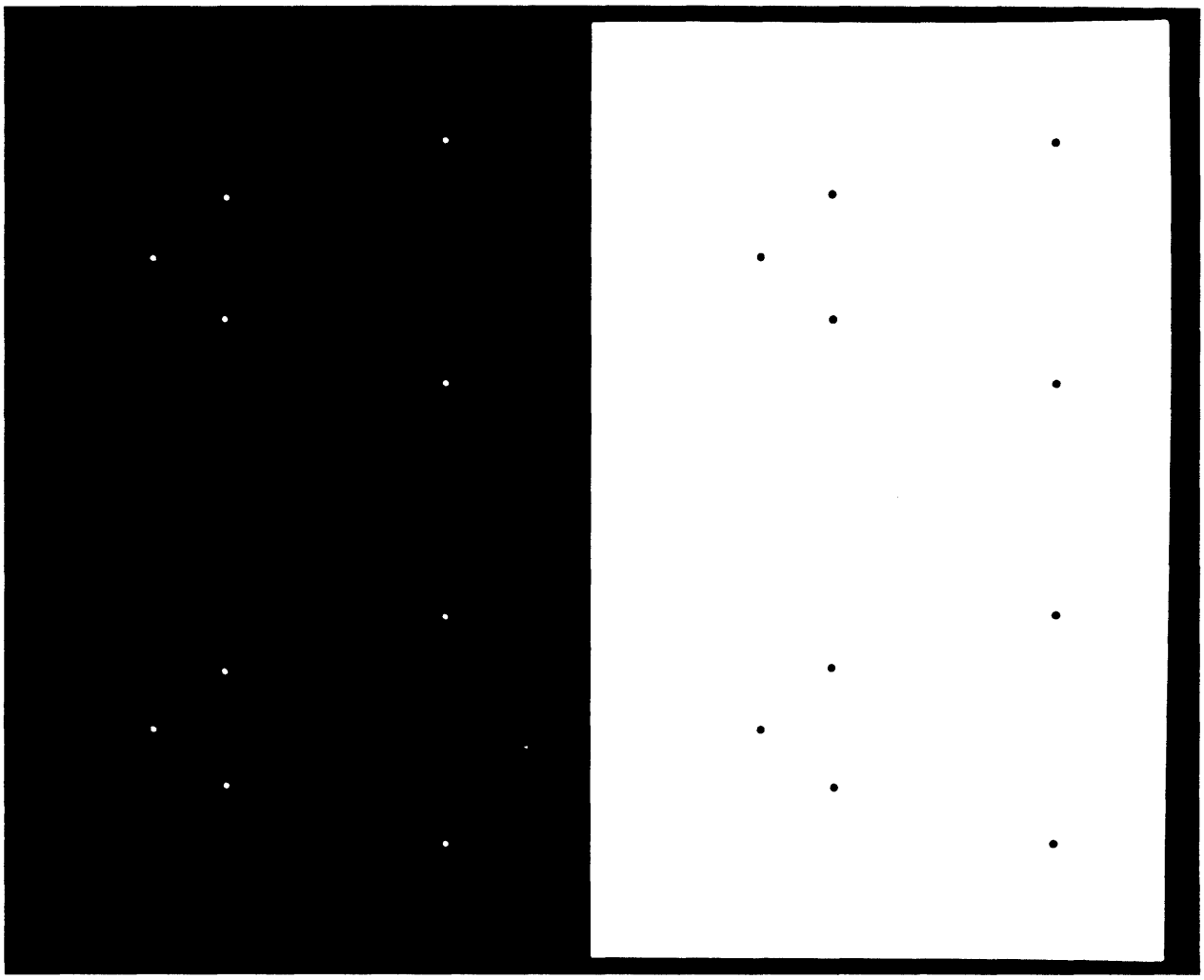
A0042-026-01A

Figure 4-26. Test ,001A: Additive Vector Texture



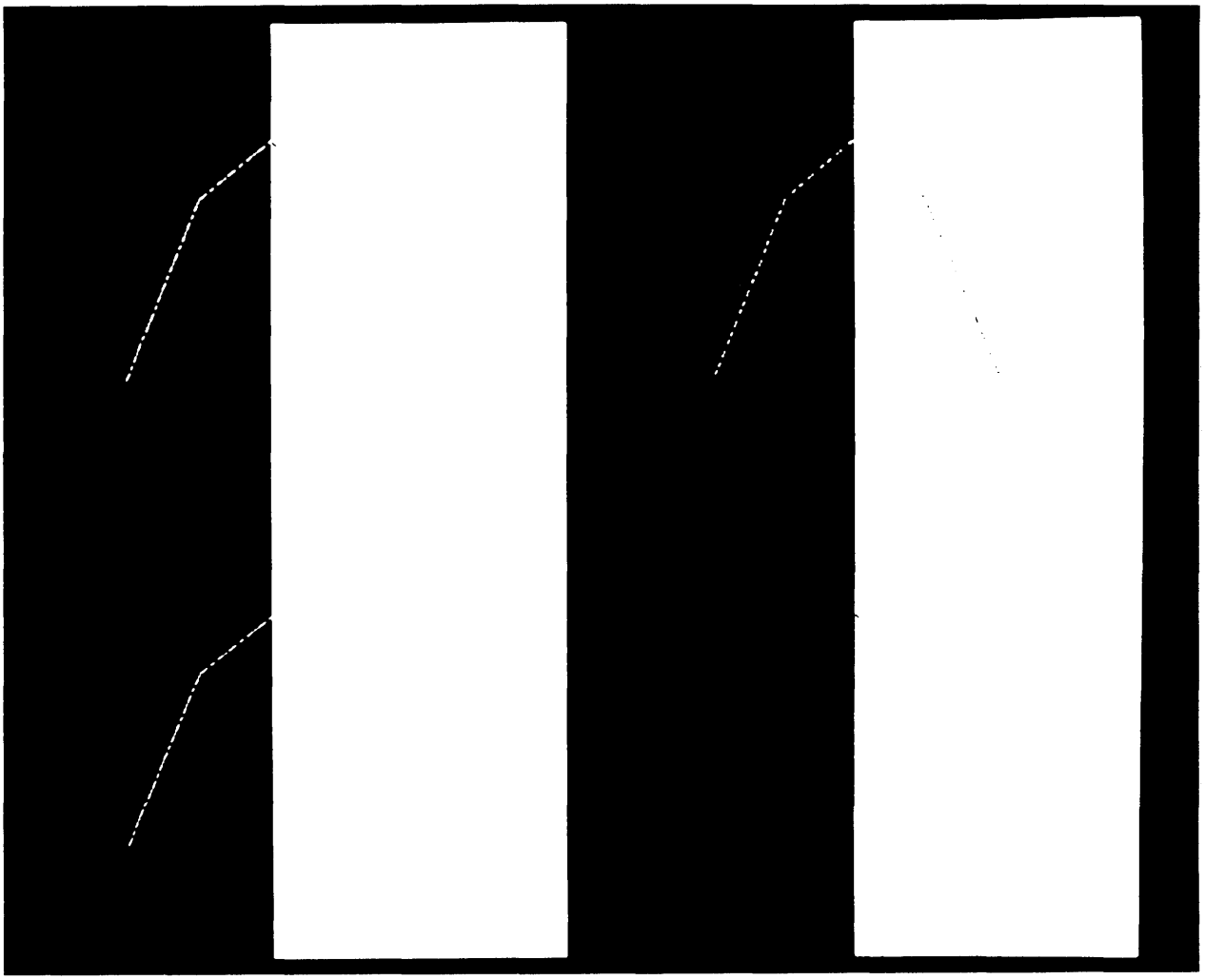
A0042-027-01A

Figure 4-27. Test ,001B: Write Plot Point



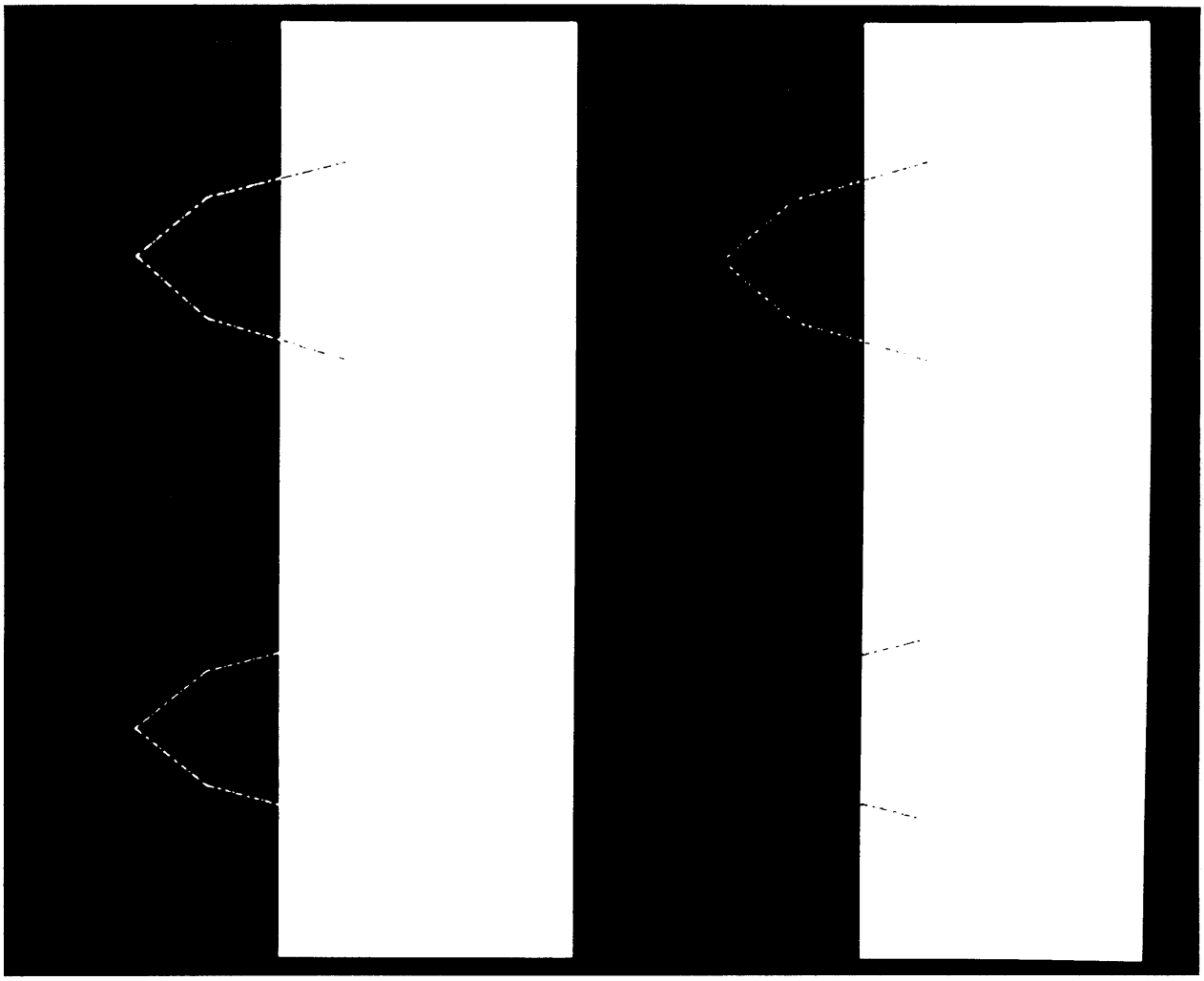
A0042-028-01A

Figure 4-28. Test ,001C: Write Plot Point Scan Mode 4



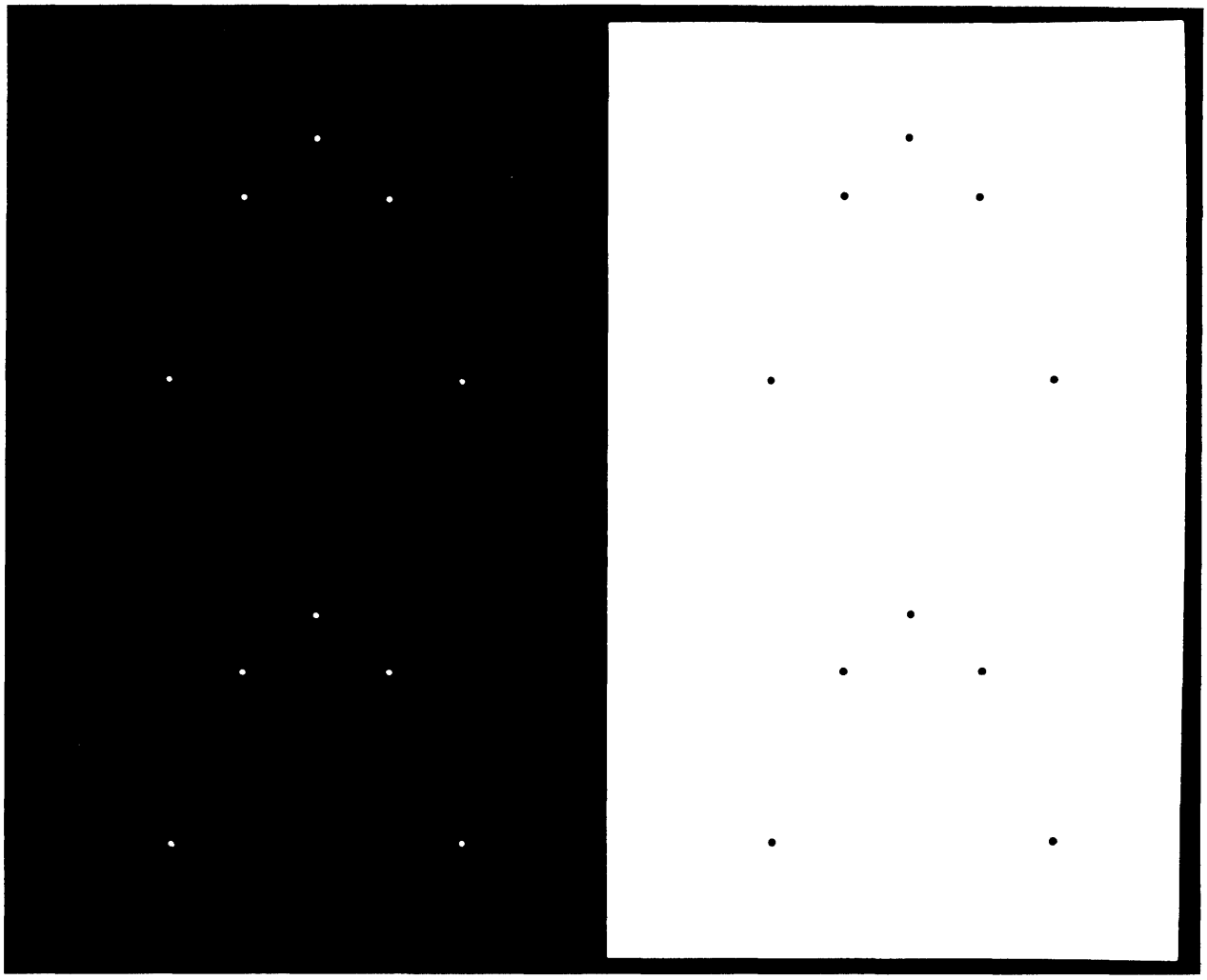
A0042-029-01A

Figure 4-29. Test ,001D: Write Plot Vector



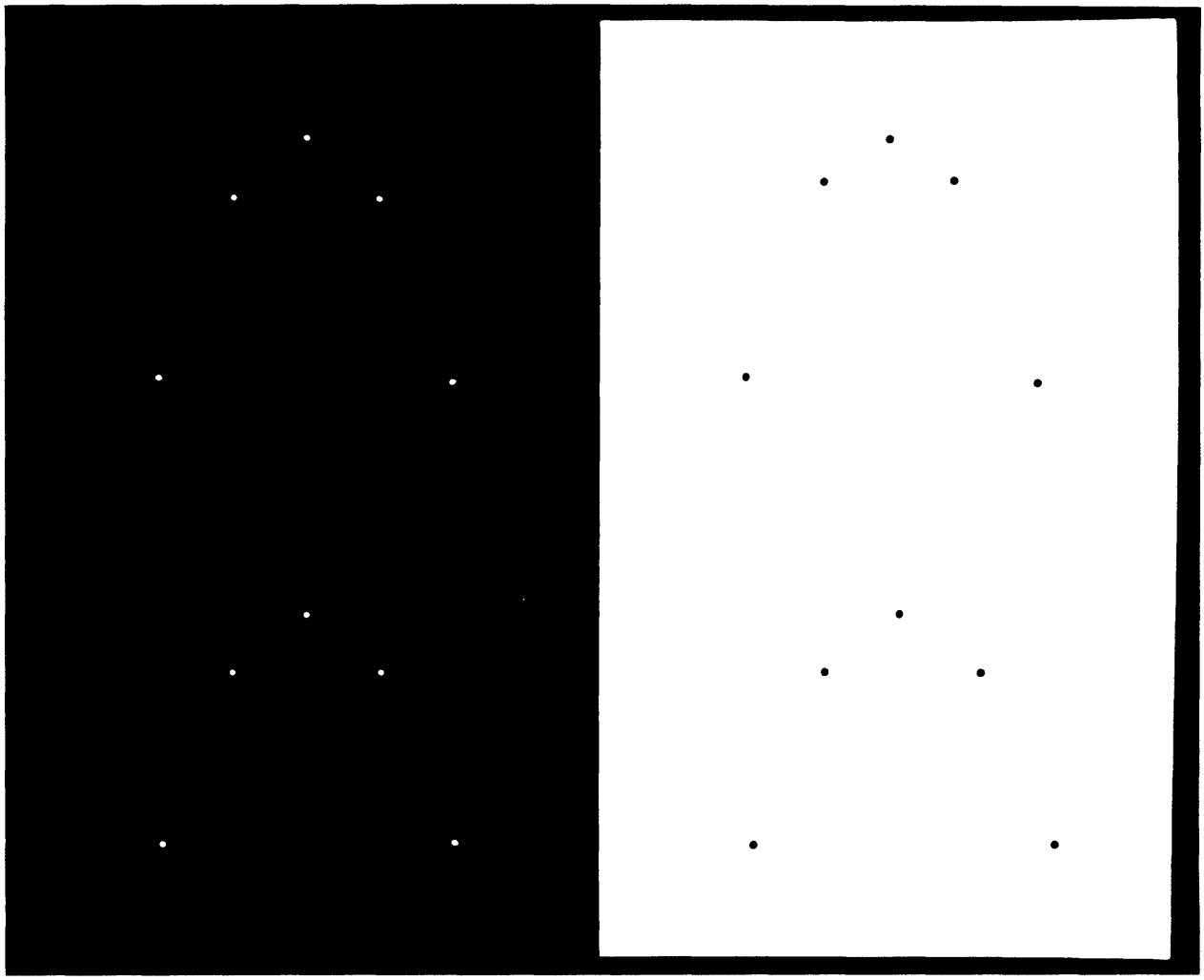
A0042-030-01A

Figure 4-30. Test ,001E: Write Plot Vector Scan Mode 4



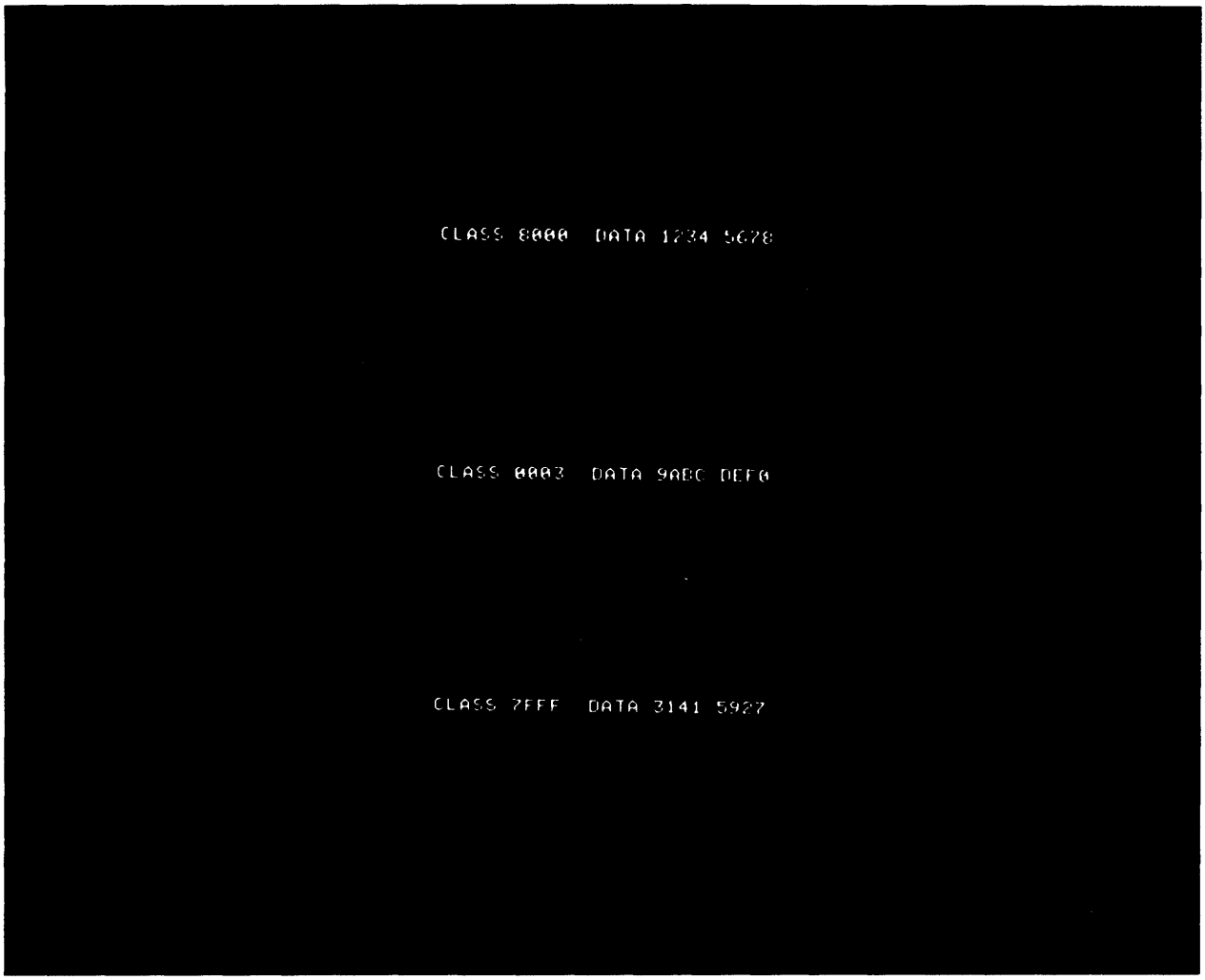
A0042-031-01A

Figure 4-31. Test ,001F: Write Point



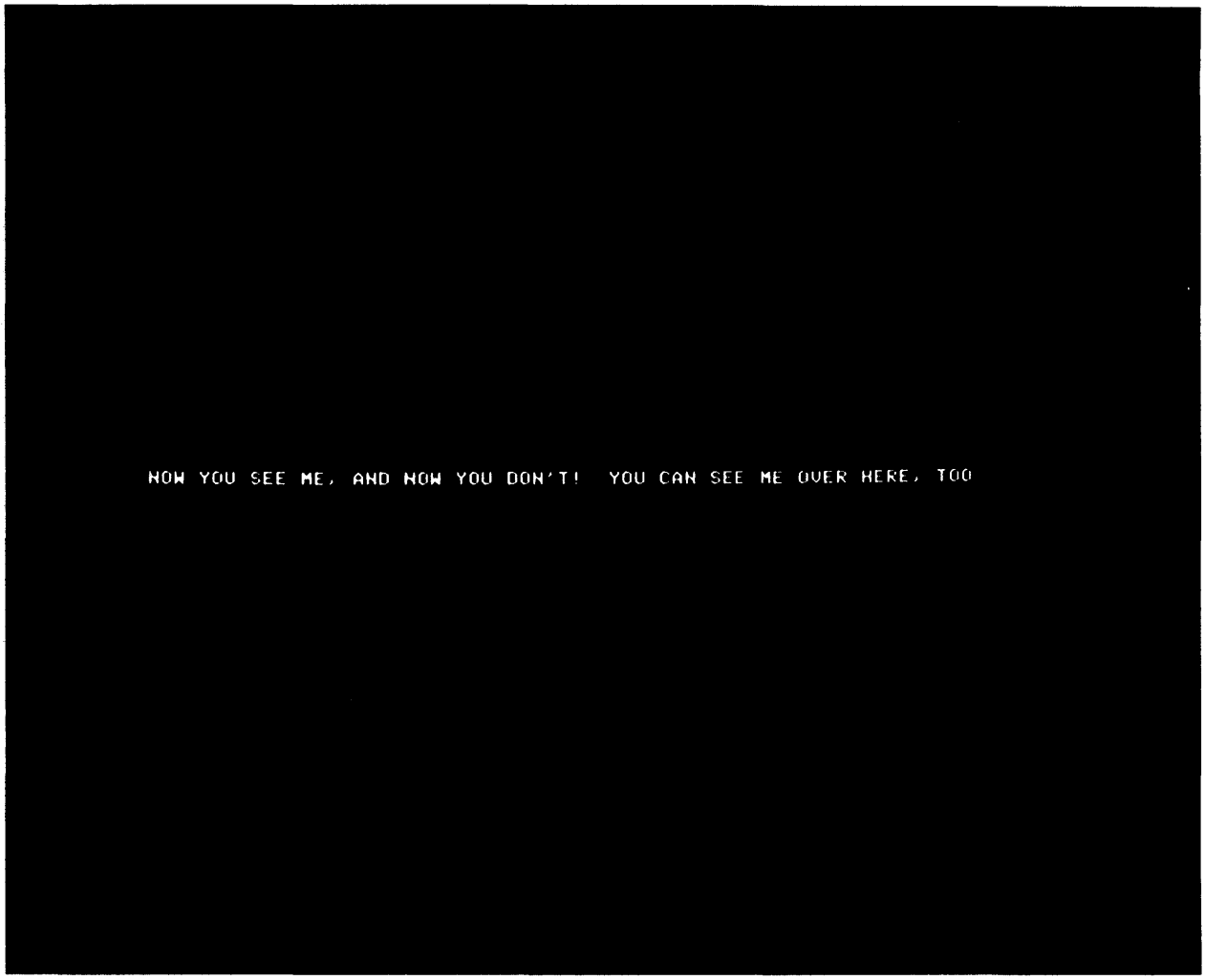
A0042-032-01A

Figure 4-32. Test ,0020: Write Random Pixel



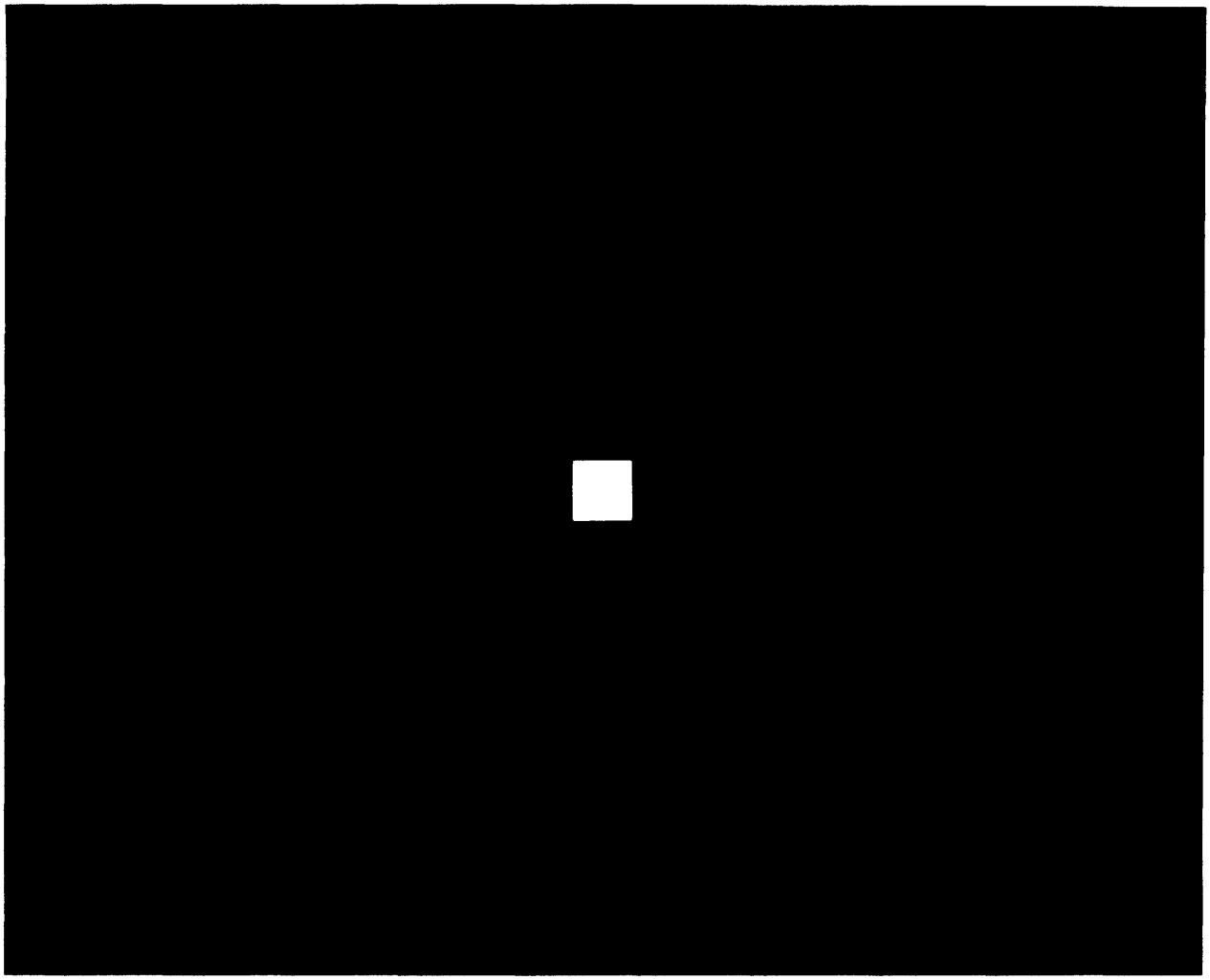
A0042-033-01A

Figure 4-33. Test ,0021: Detection Data (Zoom Factor 1:1)



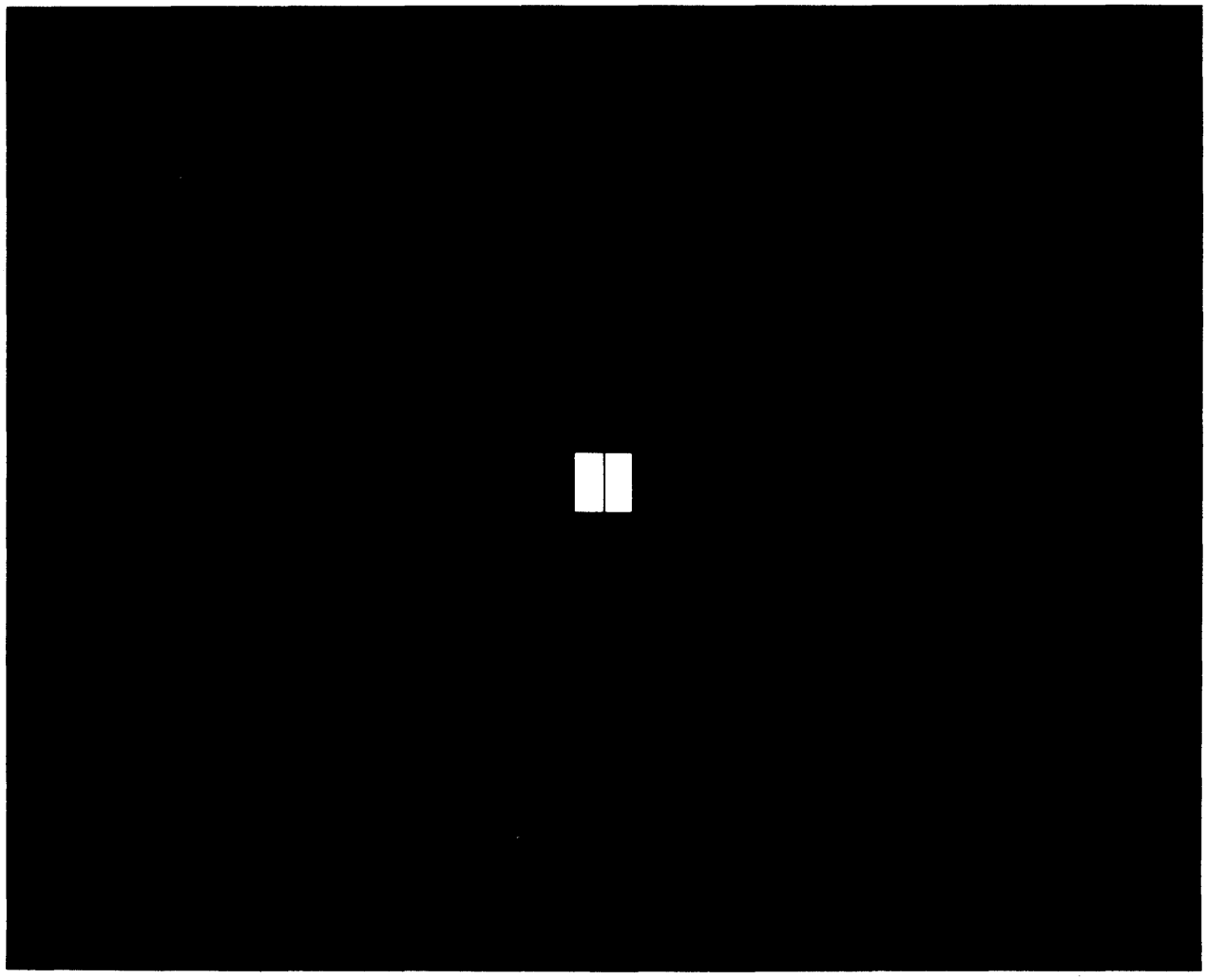
A0042-034-01A

Figure 4-34. Test ,0022: Suspend/Resume Detection (Zoom Factor 1:1)



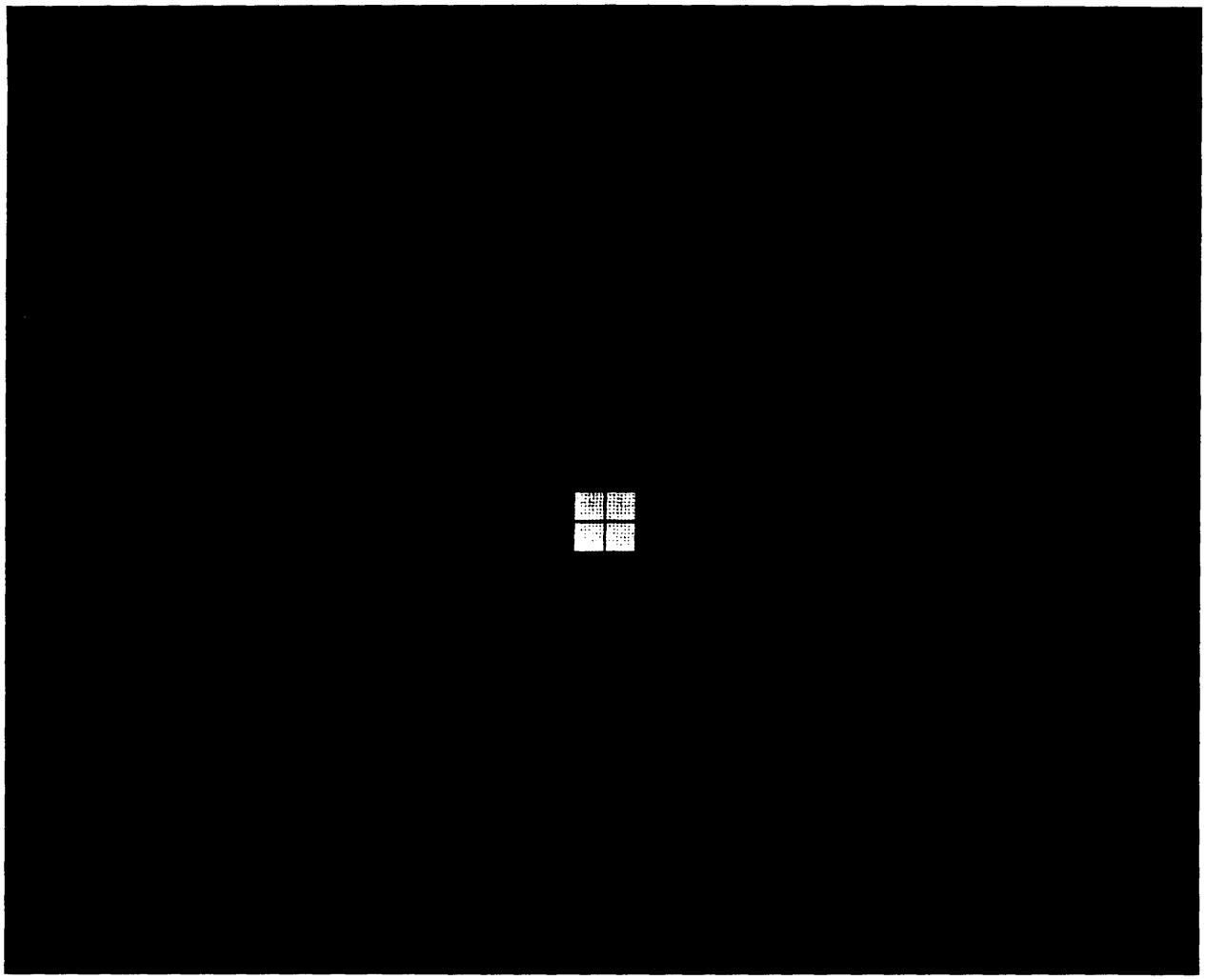
A0042-035-01A

Figure 4-35. Test ,0023: Programmable Cursor Font 1



A0042-036-01A

Figure 4-36. Test ,0024: Programmable Cursor Font 2

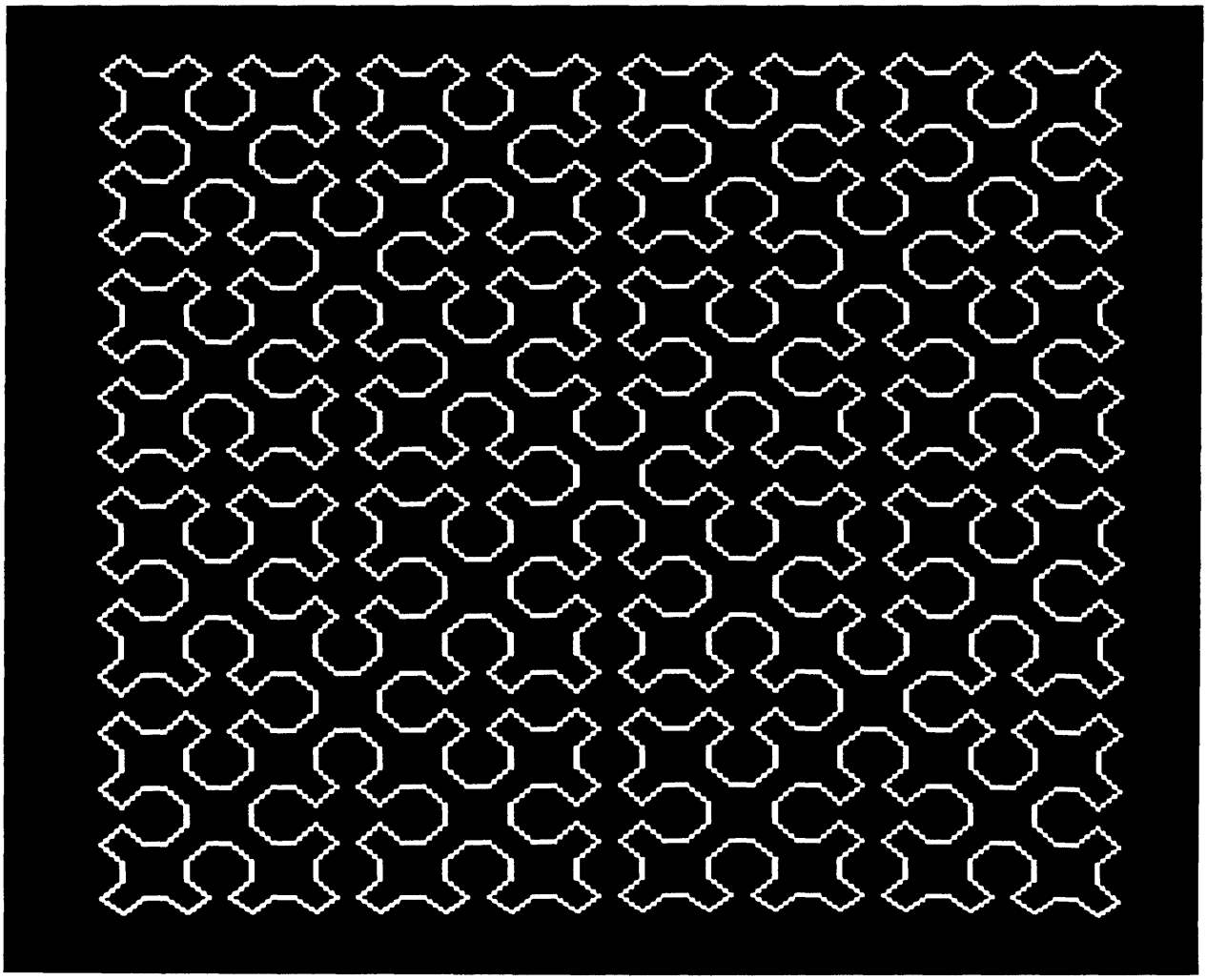


A0042-037-01A

Figure 4-37. Test ,0025: Programmable Cursor Font 3

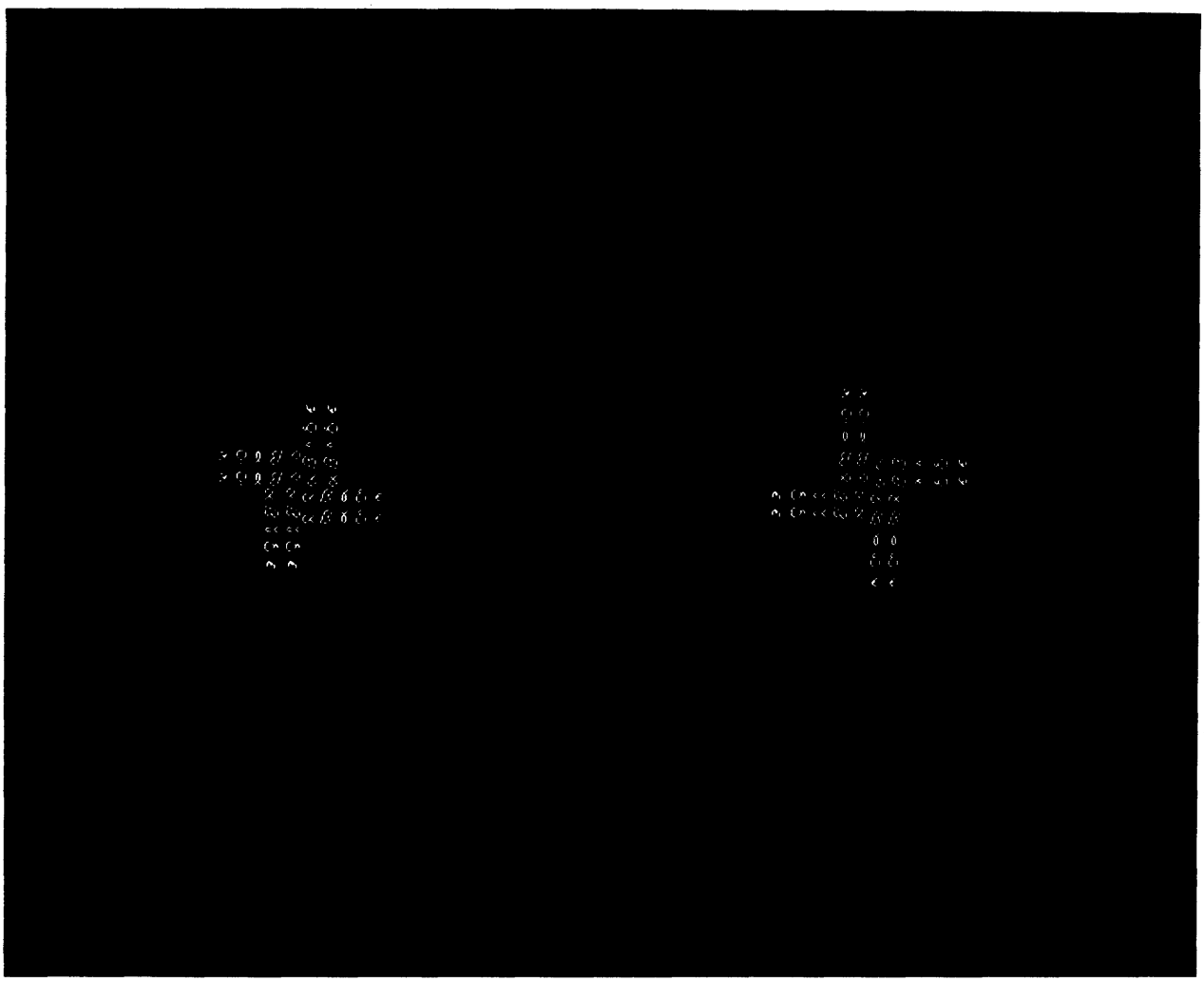
A0042-038-01A

Figure 4-38. Test ,0030: Execute Instruction Memory (Zoom Factor 1:1)



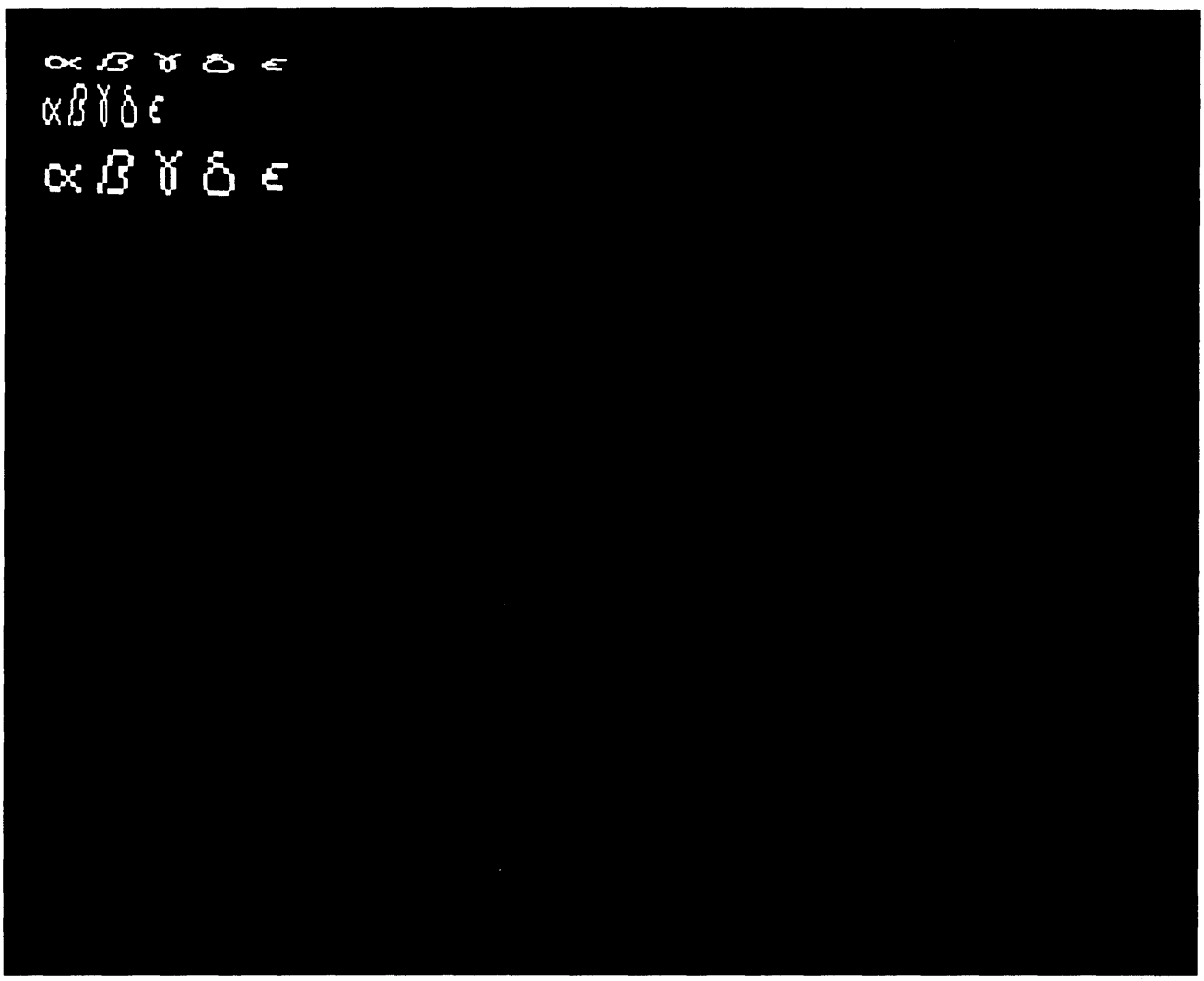
A0042-039-01A

Figure 4-39. Test ,0031: Display List (Zoom Factor 4:5)



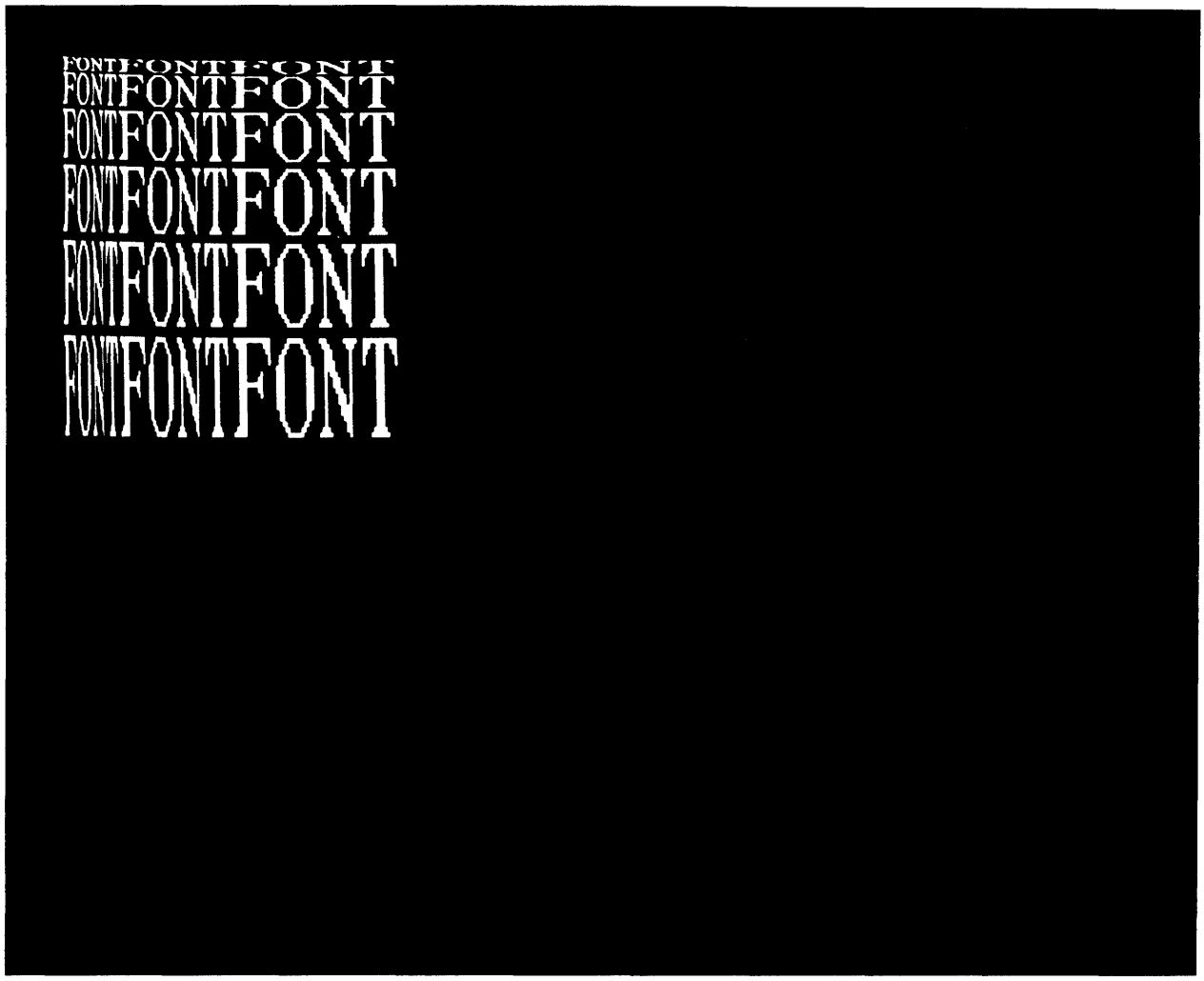
A0042-040-01A

Figure 4-40. Test ,0032: Programmable Font Scan Mode (Zoom Factor 1:1)



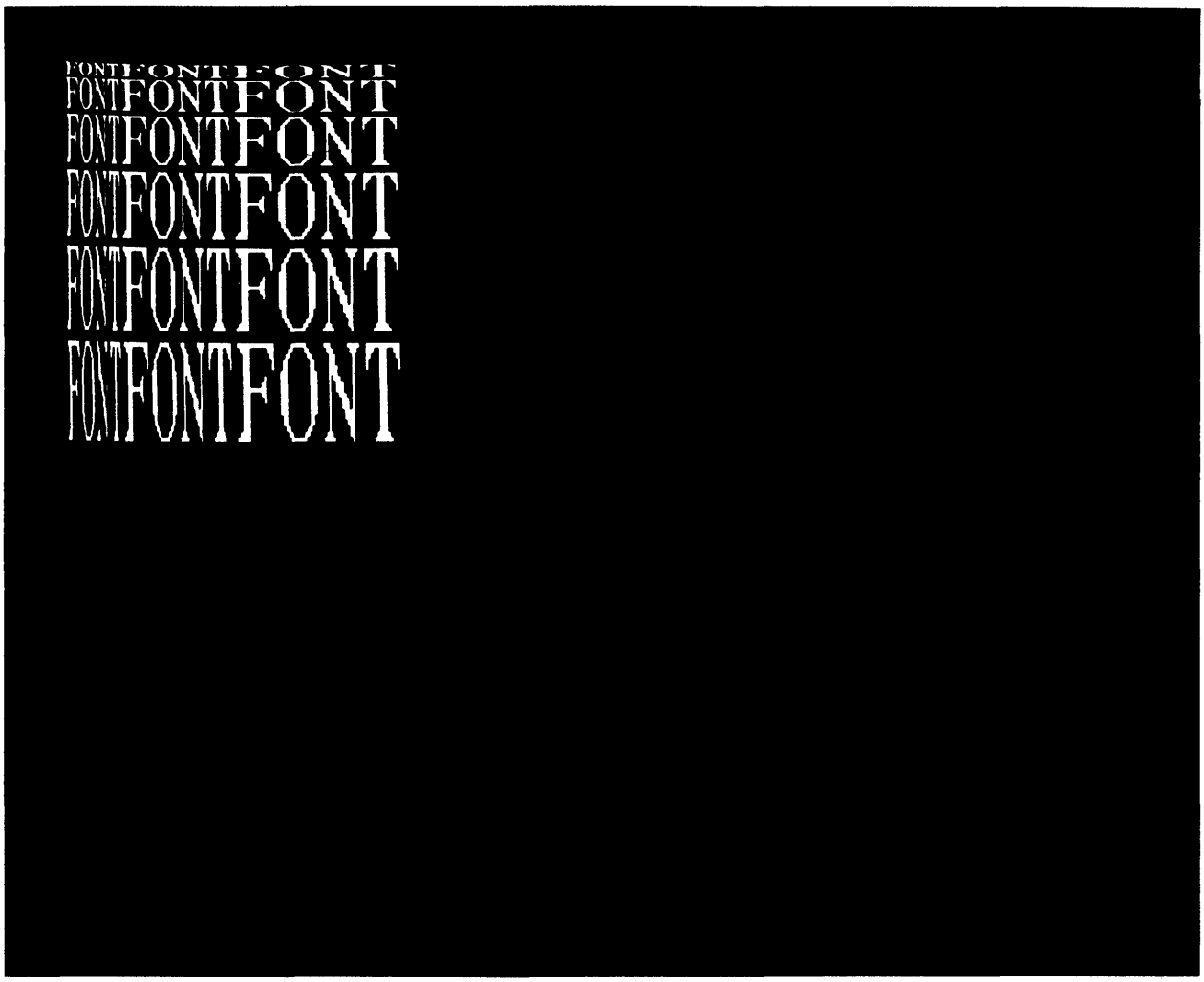
A0042-041-01A

Figure 4-41. Test ,0033: Programmable Font with Scaling (Zoom Factor 2:2)



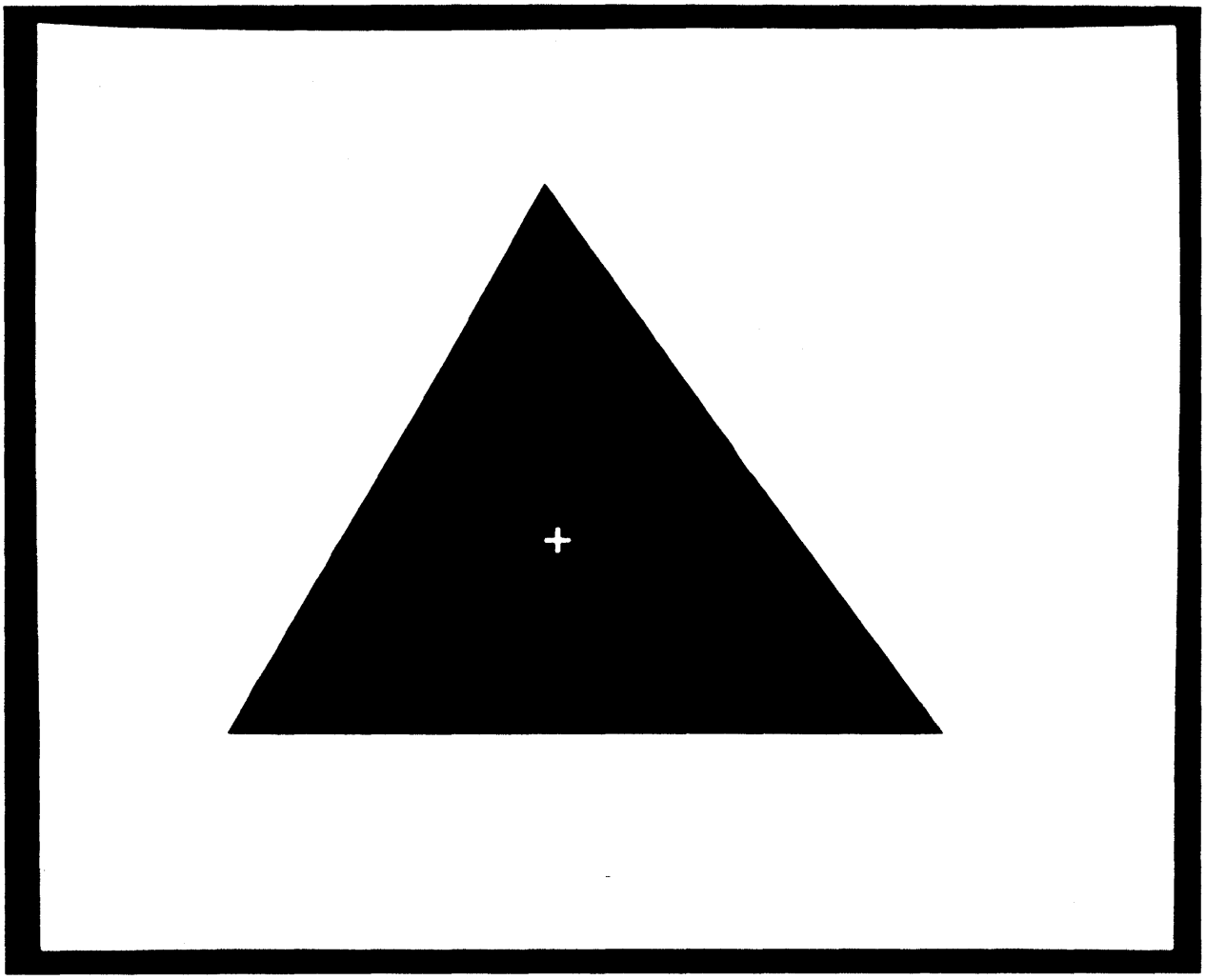
A0042-042-01A

Figure 4-42. Test ,0034: Large Programmable Font



A0042-043-01A

Figure 4-43. Test ,0035: Large Programmable Font Reverse Packing



A0042-044-01A

Figure 4-44. Test ,0036: Local Functions (Representative Display)

A0042-045-01A

Figure 4-45. Test ,0040: CT Translate (Zoom Factor 1:1)

A0042-046-01A

Figure 4-46. Test ,0041: CT Translate and Scale (Zoom Factor 1:1)

A0042-047-01A

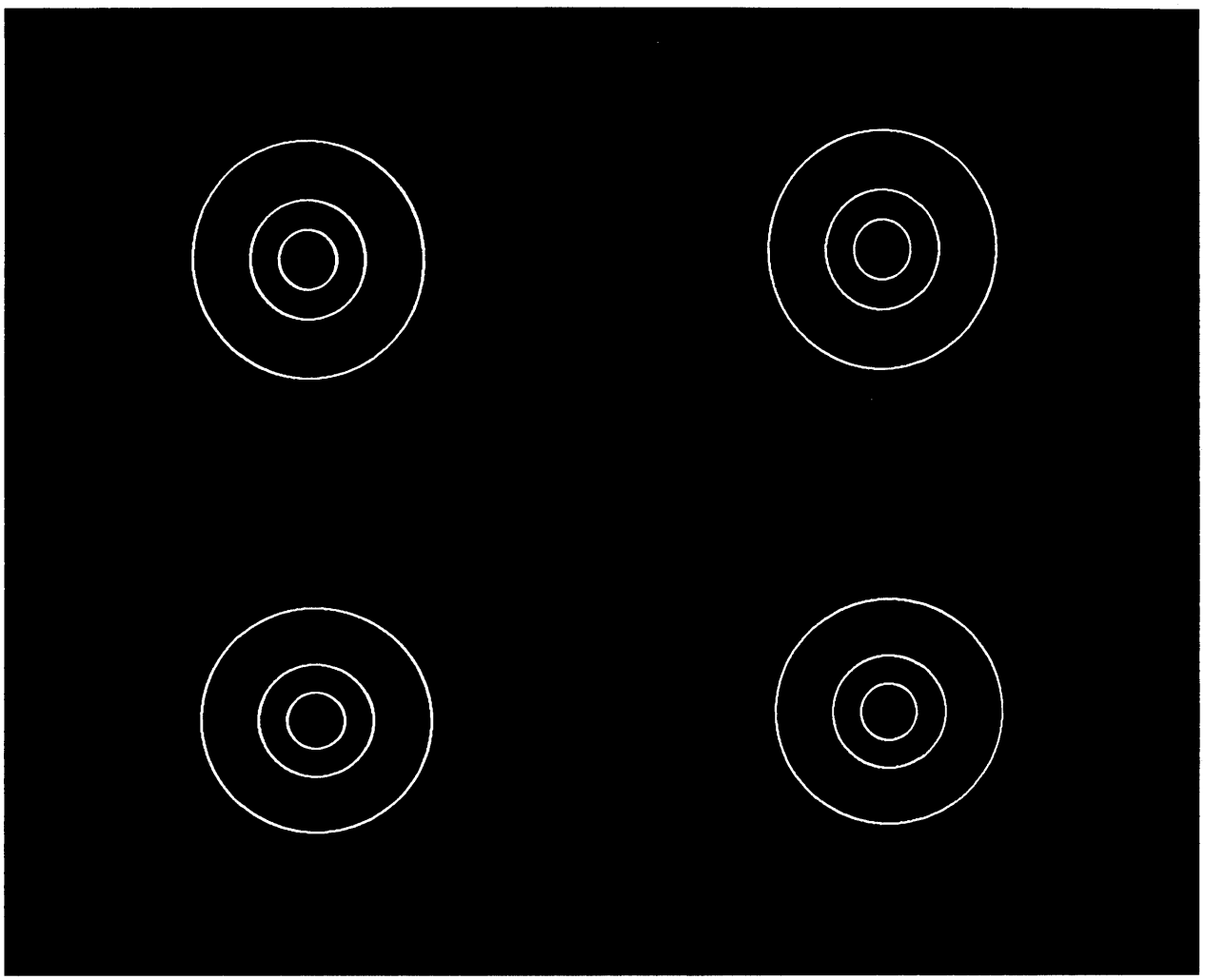
Figure 4-47. Test ,0042: CT Translate, Scale, and Rotate (Zoom Factor 1:1)

A0042-048-01A

Figure 4-48. Test ,0043: Set and Multiply Matrices (Zoom Factor 1:1)

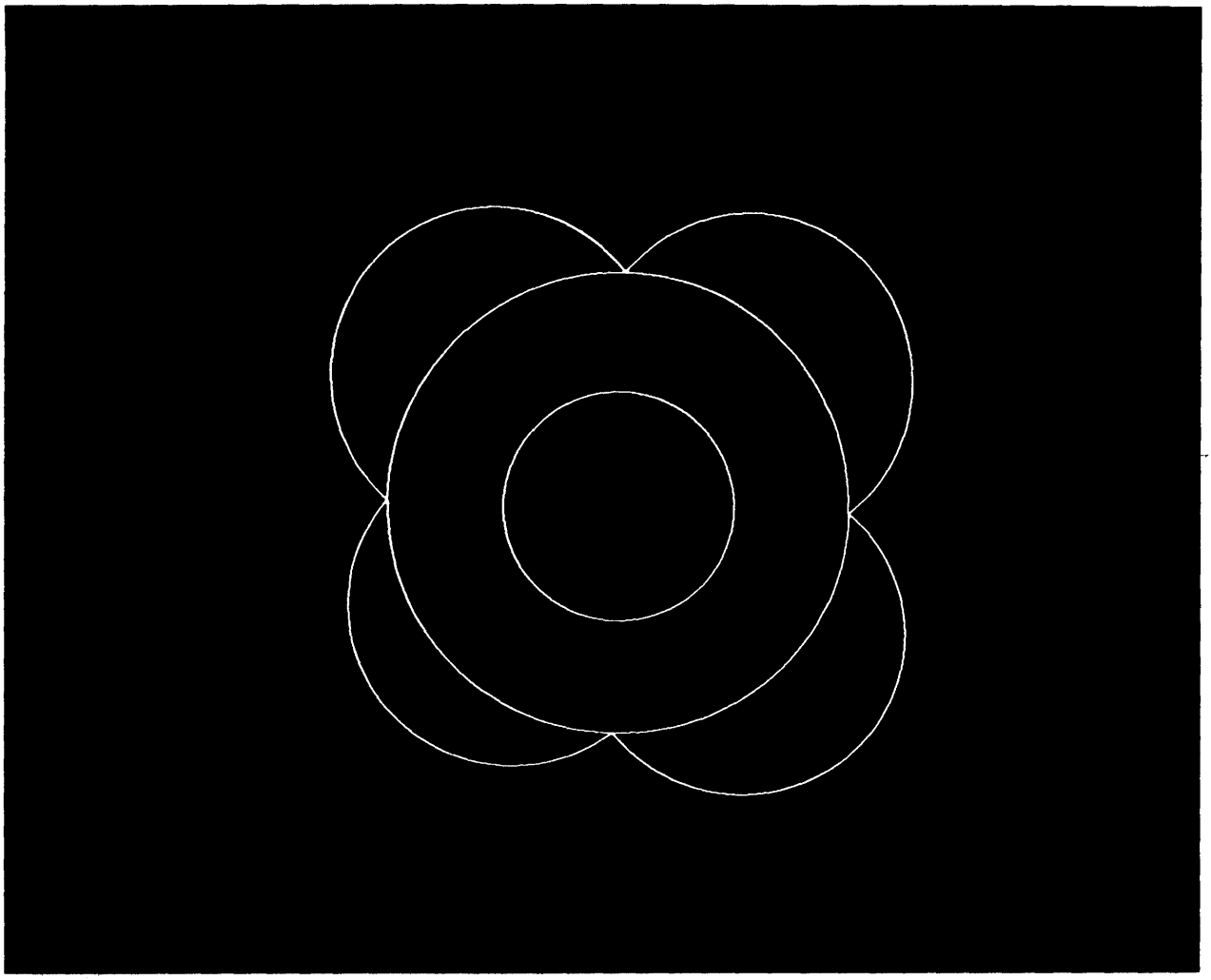
A0042-059-01A

Figure 4-49. Test ,0044: High Speed Coordinate Transform



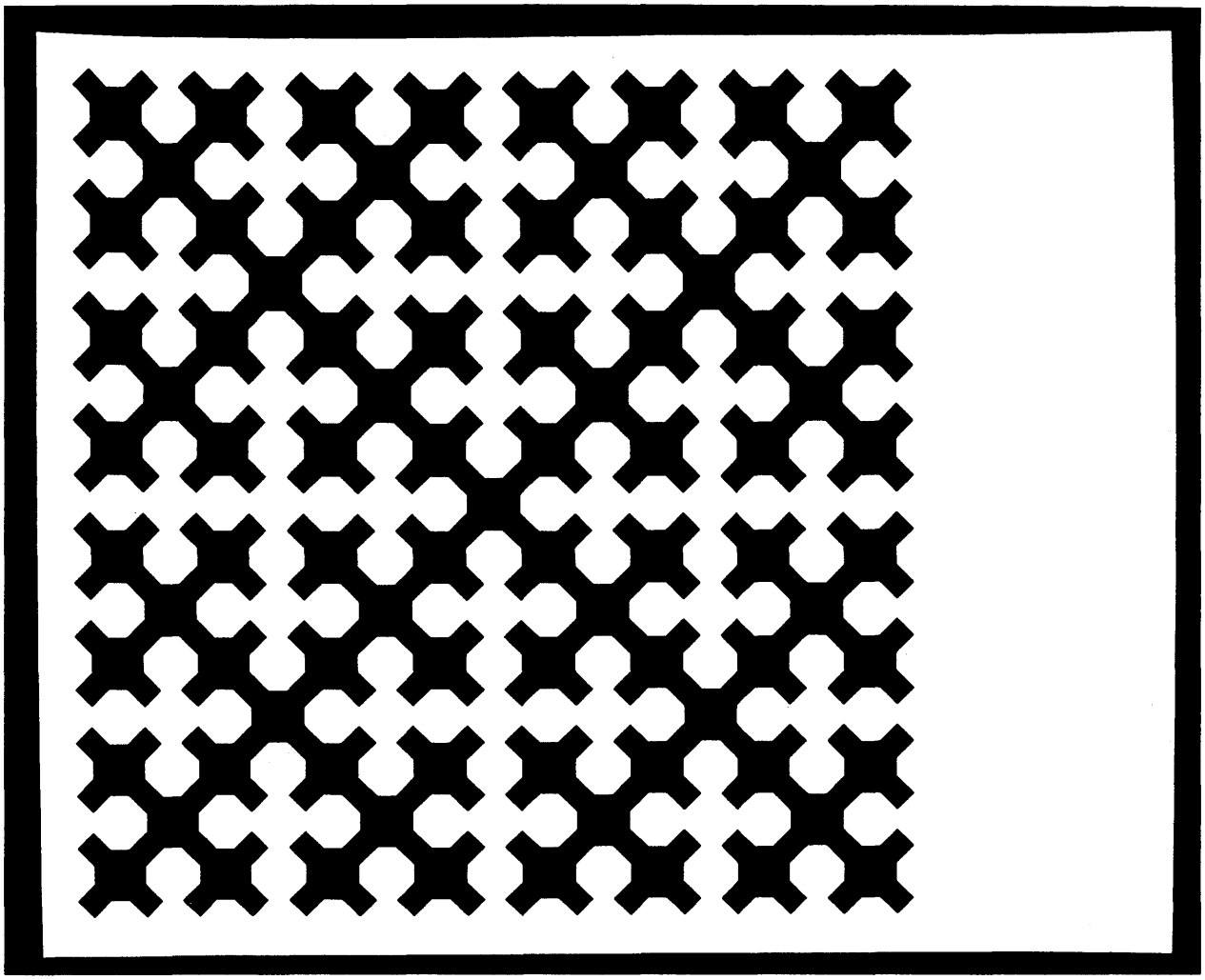
A0042-049-01A

Figure 4-50. Test ,0050: Circle



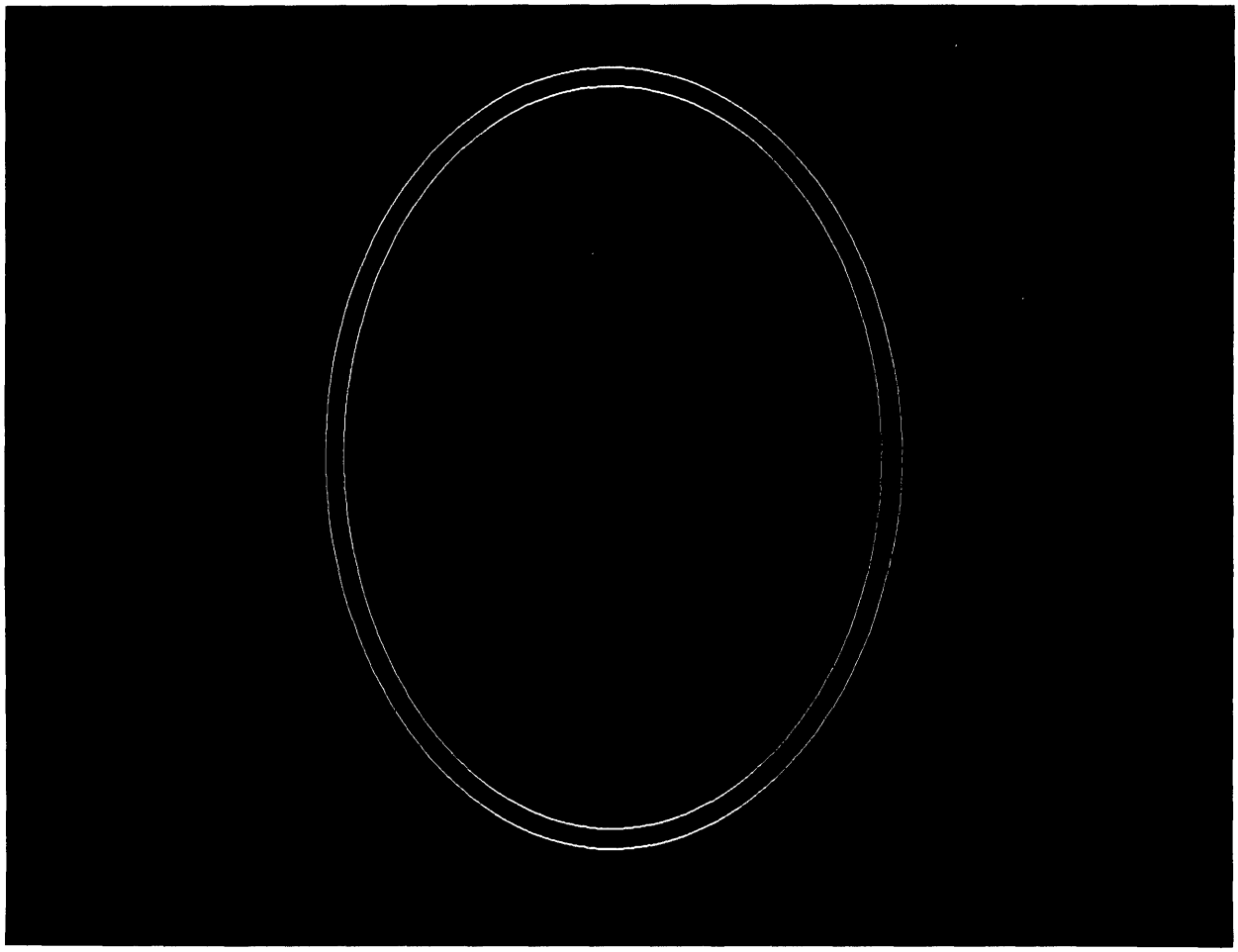
A0042-050-01A

Figure 4-51. Test ,0051: Arcs



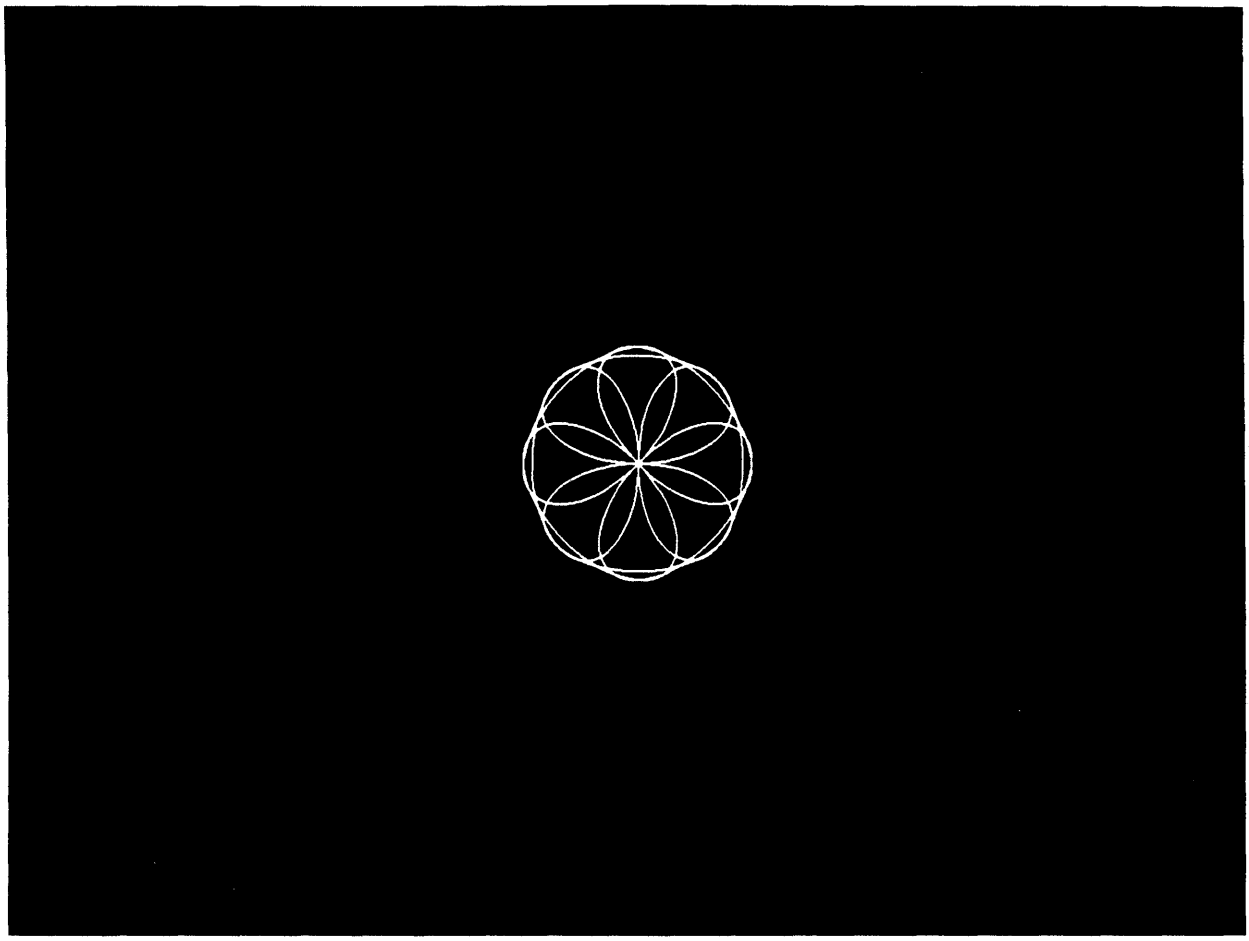
A0042-051-01A

Figure 4-52. Test ,0052: Fill



A0042-052-01A

Figure 4-53. Test ,0056: 32-Bit Conics 1

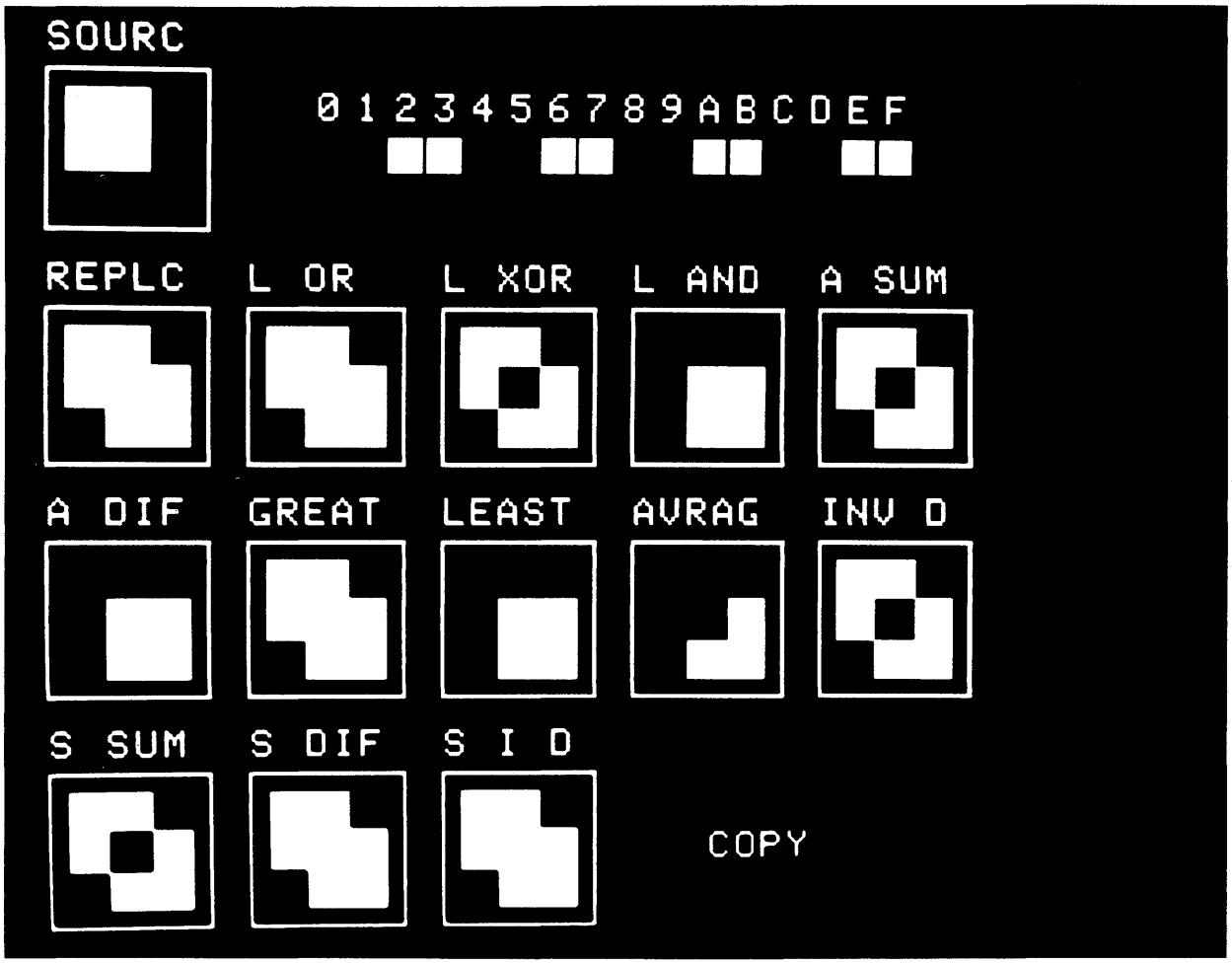


A0042-053-01A

Figure 4-54. Test ,0057: 32-Bit Conics 2

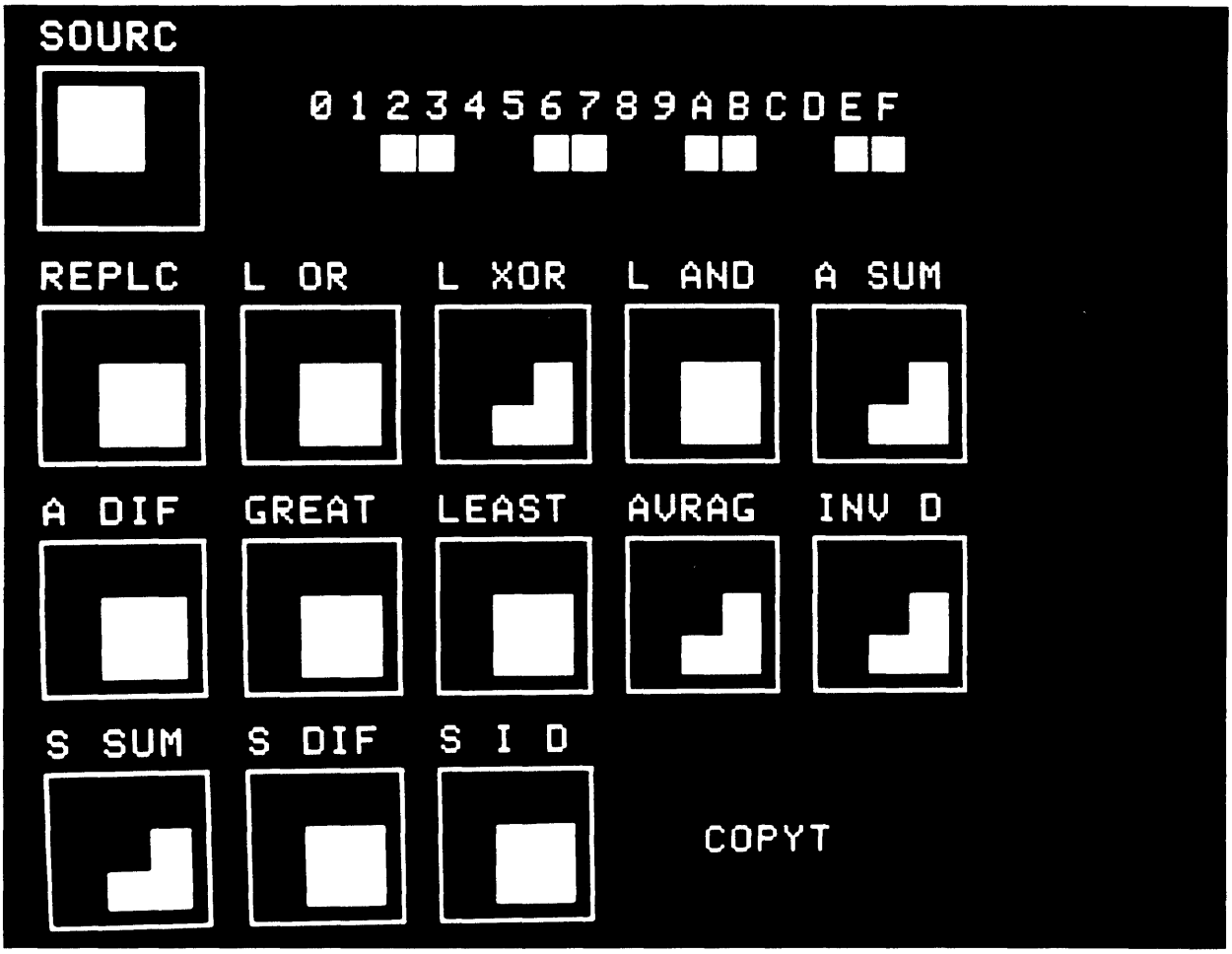
A0042-054-01A

Figure 4-55. Test ,0059: Pixel Formatter



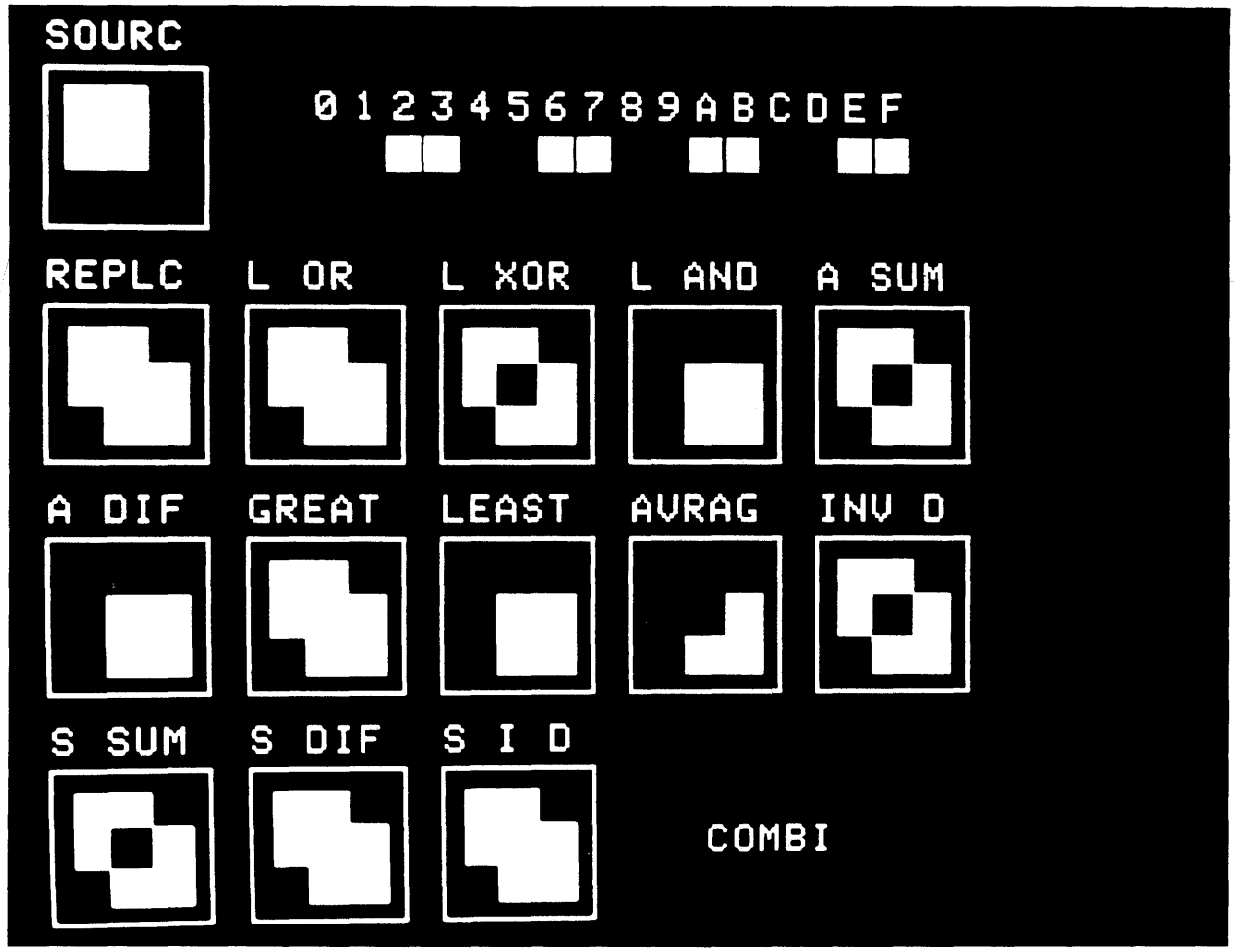
A0042-055-01A

Figure 4-56. Test ,0060: Copy Image



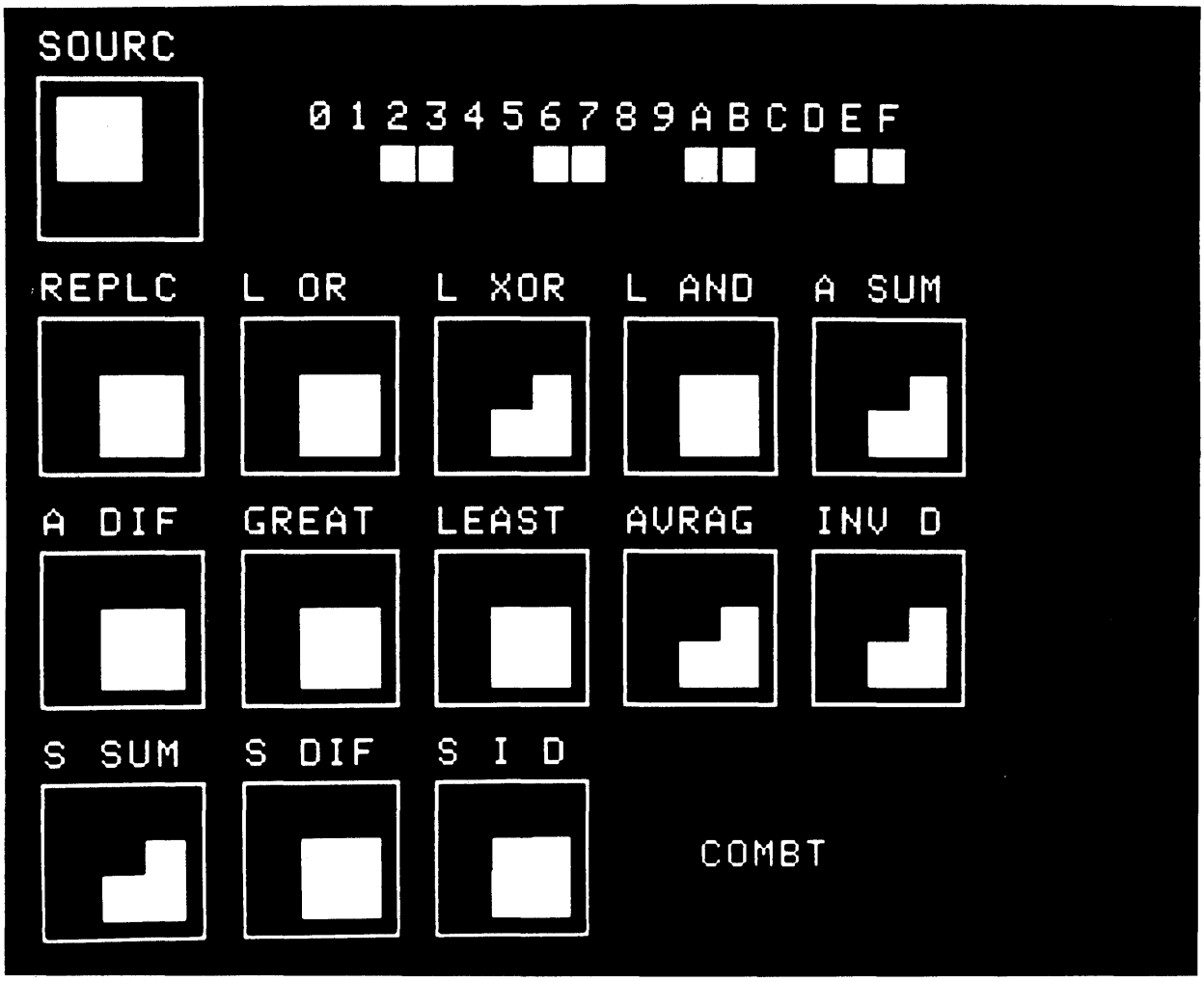
A0042-056-01A

Figure 4-57. Test ,0061: Copy Image Triggered



A0042-057-01A

Figure 4-58. Test ,0062: Combine Image



A0042-058-01A

Figure 4-59. Test ,0063: Combine Image Triggered

Appendix A

CONSOLE MESSAGES AND ERROR CODES

A.1 INTRODUCTION

The test program writes messages on the console screen whenever an error occurs during the diagnostic and acceptance testing. There are also instances when the test program writes informational messages on the console screen. When an error occurs during execution of a Ramtek instruction, the test program writes a console message containing a hexadecimal error code. Specific diagnostic and acceptance tests generate the console messages, and the Ramtek firmware generates the hexadecimal error codes.

A.2 CONSOLE SCREEN MESSAGES

Table A-1 describes the console messages generated by specific tests and system routines. The messages are ordered alphabetically by the first word in the message. No code identifies which specific test or routine generates the message. The message refers to the test or routine you are running when the test program writes the message.

A.3 RAMTEK FIRMWARE ERROR CODES

When a Ramtek firmware error occurs, the following message appears on the console screen:

RAMTEK error code = XXXX

XXXX is a hexadecimal Ramtek firmware error code number.

This message describes an error that has occurred during execution of a Ramtek firmware instruction. The host CPU does not generate these error codes. The Ramtek firmware internally generates the error codes, and they are independent of the diagnostic or acceptance test being run when the error occurs.

Table A-2 lists all the Ramtek firmware error codes, together with the associated op codes and brief descriptions of the error conditions. For a complete explanation of the Ramtek firmware error codes, refer to the RM-9400 Graphic Display System Software Reference Manual or to the RM-9460 Graphic Display System Software Reference Manual.

Table A-1. Console Screen Messages

Console Message	Issued by	Description
At buffer address AAAA Data read from RAMTEK XXXX should be YYYY	Tests D, E, L, N	The data (YYYY) sent to the Ramtek at address AAAA was read back as XXXX.
At line LLLL element EEEE Data read from RAMTEK XXXX should be YYYY	Test .D	Discrepancy between data value written to the Ramtek (YYYY) and value read back (XXXX). Error occurred at line LLLL element EEEE in the display.
Background XXXX should be YYYY	Test A	Background sent to the Ramtek (YYYY) was read back as XXXX.
Bad command in buffer	Test .A	Read back command R or S detected a bad buffer.
Bad command selection	Test .A	Invalid command entered. Valid commands are: C E H I R S W and ,
Bus address XXXX should be YYYY	Test .B	Error in bus address register (DRBA). Test loaded value YYYY in register, XXXX was value read back. Test continues to execute after printing message.
Bus-address overflow during DMA	I/O routine	DMA is terminated.
Can't read data from RAMTEK	I/O routine	Error occurred while reading from the Ramtek.
Can't write data to RAMTEK	I/O routine	Error occurred while writing to the Ramtek.
Current status XXXX should be YYYY Command issued ZZZZ	Test B	GPIF status value sent to the Ramtek (YYYY) by interrupt enable command ZZZZ was read back as XXXX.
Display trend error	Test T	System error occurred during execution of Ramtek instruction DISPLAY TREND (DISTD).
DMA error	I/O routine	Error occurred while in DMA operation mode.

Table A-1. Console Screen Messages (Continued)

Console Message	Issued by	Description
DRIF not ready after timeout	I/O routine	DRIF status register READY bit not set.
End of pass	Tests L, N	Completion of one pass of test.
End of pass XXXX	Test .D	Completion of pass XXXX of test.
Foreground XXXX should be YYYY	Test A	Foreground value sent to the Ramtek (YYYY) was read back as XXXX.
Gap in track mode data	Test G	Diagnostic received two successive track-mode interrupts with cursor-coordinate values which differed by more than one pixel. Message issued when cursor is taken out of track mode, moved, and placed back in track mode without an intervening ENTER interrupt being generated. Message also issued when cursor wraps around a screen boundary.
GPIF status register = XXXX	I/O routine	XXXX is hexadecimal number returned by Ramtek I/O driver from the GPIF.
Illegal bit in flag word	Test L	Operand flag word 2 mask larger than 003F.
IOSB error = XXXX	I/O routine	XXXX is hexadecimal number returned by Ramtek I/O driver.
Non hex character - enter value again:	Hexadecimal input routine	Program expected four-digit hexadecimal value, but received illegal non-hexadecimal character. This message is useful for correcting hexadecimal numeric input. When you type an incorrect digit, type a non-hexadecimal character and message will appear. Program waits for entry of of valid four-digit hexadecimal number.

Table A-1. Console Screen Messages (Continued)

Console Message	Issued by	Description
Nonexistent memory addressed during DMA	I/O routine	Status bit 15 in the DRIF status register has been set to 1 by a write to the Ramtek.
Number of hits XXXX - or - Number of hits > XXXX Data word 1 WWW1 Data word 2 WWW2 Detect class CCCC Display list DDDD Absolute address AAAA Relative instruction IIII	Test I	Entity detect information. If no greater-than sign in message, XXXX is the actual number of hits. Greater-than sign denotes detect buffer overflow. Remaining messages list the entity detect data for each hit.
PIO error	I/O routine	Error occurred while in PIO operation mode.
Ramping done	Test V	Successful end of test.
RAMTEK error code = XXXX	I/O routine	XXXX is hexadecimal number indicating the Ramtek firmware error code.
RAMTEK failed to recognize illegal instruction	Test C	Test program sent illegal instruction to the Ramtek. The Ramtek did not respond with an error interrupt.
RAMTEK received illegal instruction during DMA	I/O routine	Ramtek received an illegal instruction during DMA. DMA will try to continue, but other errors may occur later as a result of illegal instruction.
Reading XXXX	Test .D	Informational message written to mark path of progress in reading back test pattern displayed on Ramtek screen. XXXX is the color value read back or the word STEP. Test program writes a period for every 16 lines read back.

Table A-1. Console Screen Messages (Continued)

Console Message	Issued by	Description
Status XXXX should be YYYY	Test .B	Error occurred in command/status register (DRST). Value XXXX is read back after the CSR has been loaded with value YYYY.
Test selection error - try again	Diagnostic system executive	Test selection entered is not implemented. Enter another selection.
Test selection range error - try again	Diagnostic system executive	Test selection entered is outside range of allowable characters. Enter another selection.
There are XXXX pages of memory available	Test M	XXXX is the number of 1K blocks available.
Timeout	Test C	Console keyboard did not respond with transmitter interrupt.
Timeout on DMA transfer	I/O routine	DMA took longer than time allocated within Ramtek I/O driver.
Trend allocate error	Test T	System error occurred during execution of Ramtek instruction ALLOCATE TREND (ALTD).
Trend data initialize error	Test T	System error occurred during execution of Ramtek instruction INIT TREND (ITD).
Trend data update error	Test T	System error occurred during execution of Ramtek instruction UPDATE TREND (UDTD).
Trend line pattern init error	Test T	System error occurred during execution of Ramtek instruction LOAD TREND PATTERNS (LTDP).

Table A-1. Console Screen Messages (Continued)

Console Message	Issued by	Description
VLT bit color assignments blu grn cyn red mag yel Full intensity 0 1 2 3 4 5 1/3 intensity 6 7 8 9 10 11	Test S	Color bit assignment table to use for cross referencing the the memory plane assignments displayed on the Ramtek screen.
Word count XXXX should be YYYY	Test .B	Error occurred in word-count register (DRWC). Value XXXX is read back after the register is loaded with value YYYY.
Write mask XXXX should be YYYY	Test A	Write mask value sent to the Ramtek (YYYY) was read back as XXXX.
Writing XXXX	Test .D	Informational message written to mark path of progress in displaying test pattern on Ramtek screen. XXXX is the color value displayed or the word STEP. Test program writes a period for every 16 lines displayed on the Ramtek screen.
X origin XXXX should be YYYY	Test A	X origin value sent to the Ramtek (YYYY) was read back as XXXX.
X start-point XXXX should be YYYY	Test A	X start-point value sent to the Ramtek (YYYY) was read back as XXXX.
Y origin XXXX should be YYYY	Test A	Y origin value sent to the Ramtek (YYYY) was read back as XXXX.
Y start-point XXXX should be YYYY	Test A	Y start-point value sent to the Ramtek (YYYY) was read back as XXXX.

Table A-2. Ramtek Firmware Error Codes

ERROR CODE	OP CODE	DESCRIPTION
0201	READ	Attempt to execute READ from within a display list.
0307	LAM	Illegal byte count.
0321	LAM	No VLT corresponding to device number. All data discarded.
0401	RAM	Attempt to execute RAM from within a display list.
0407	RAM	Illegal byte count.
0421	RAM	No VLT corresponding to device number.
0A07	RI	Odd byte count in word mode.
0B01	RI	Attempt to execute RI from within a display list.
0B07	RI	Odd byte count in word mode.
0B17	RI	No MCPs selected to read from.
0B18	RI	Too many MCPs selected to read from.
0B19	RI	No groups selected to read from.
0B1A	RI	Too many groups selected to read from.
0E07	WVL	Illegal value for DATA LENGTH WORD; not a multiple of four.
0F07	WC	Odd byte count.
1007	WPB	Odd byte count.
1102	SCRX	No (scratch) RAM available.
1202	SCRY	No (scratch) RAM available.
130A	PUSHE	No room on environment stack.
140B	POPE	No data on environment stack.
1503	LPF	Font RAM not allocated and attached to the current context; data discarded.
1513	LPF	Font to be loaded not 8 by 12; data discarded.
1514	LPF	Illegal ASCII CHARACTER CODE; data discarded.

Table A-2. Ramtek Firmware Error Codes (Continued)

ERROR CODE	OP CODE	DESCRIPTION
1701	RCSS	Attempt to execute RCSS from within a display list.
1901	RKB	Attempt to execute RKB from within a display list.
1A01	SPS	Attempt to execute SPS from within a display list.
1B01	LDL	Attempt to execute LDL from within a display list.
1B0C	LDL	Invalid DL NUMBER; all data is discarded.
1B0D	LDL	DL does not exist. Either has been deleted or not allocated. All data is discarded.
1C01	RDL	Attempt to execute RDL from within a display list.
1C0C	RDL	Invalid DL NUMBER; no data readback.
1C0D	RDL	DL does not exist; no data readback.
1D01	CCM	Illegal instruction; attempt to use CCM instruction on RM-9460 with an MC68000 system processor.
1D0C	CCM	Invalid DL NUMBER; call to subroutine not attempted.
1D0D	CCM	DL does not exist; call to subroutine not attempted.
1E0C	XIM	Invalid DL NUMBER; all data discarded.
1E0D	XIM	DL does not exist; all data discarded.
1F01	LDLRP	Attempt to execute LDLRP from within a display list.
1F0C	LDLRP	Invalid DL NUMBER; all data discarded.
1F0D	LDLRP	DL does not exist; all data discarded.
2001	RDLRP	Attempt to execute RDLRP from within a display list.
200C	RDLRP	Invalid DL NUMBER; no data readback.
200D	RDLRPC	DL does not exist; no data readback.
2103	LPF	Font RAM not allocated and attached to the current context; data discarded.
2113	LPF	Font to be loaded not 8 by 12; data discarded.

Table A-2. Ramtek Firmware Error Codes (Continued)

ERROR CODE	OP CODE	DESCRIPTION
2114	LPF	Illegal ASCII CHARACTER CODE; data discarded.
2307	SETDC	DATA BYTE COUNT not a multiple of 4 or greater than 64.
2308	SETDC	One of the range pairs does not follow rule that [RANGE n DATA (HI)] $\geq$ [RANGE n DATA (LO)]
2401	READP	Attempt to execute READP from within a display list.
2501	RERR	Attempt to execute RERR from within a display list.
2E01	RCSP	Attempt to execute RCSP from within a display list.
2F01	RCSG	Attempt to execute RCSG from within a display list.
3327	DDCC	Illegal device/cursor association attempted.
3428	DCVC	Illegal cursor to video line association was attempted.
3507	WVU	Illegal value for DATA LENGTH WORD, not a multiple of eight.
3607	WPP	DATA LENGTH WORD does not reflect an even number of bytes.
3707	WPV	DATA LENGTH WORD does not reflect an even number of bytes.
3807	WPT	Illegal value for DATA LENGTH WORD; not a multiple of four.
3907	WPR	DATA LENGTH WORD not a multiple of six.
3A07	FILL	Illegal byte count.
3A17	FILL	No MCPs selected.
3A18	FILL	More than one MCP selected.
3A19	FILL	No memory group selected.
3A1A	FILL	More than one memory group selected.
3A39	FILL	Polygon too complex. Out of room to save pending fill operations.
3A3A	FILL	Illegal fill parameter (not logical 0 or logical 1).
3A41	FILL	Fill boundary not found when using FILL-UNTIL.

Table A-2. Ramtek Firmware Error Codes (Continued)

ERROR CODE	OP CODE	DESCRIPTION
3A42	FILL	When using FILL-WHILE: WRITE MASK .AND. READ MASK = 0 (do not overlap) or WRITE MASK .AND. READ MASK .AND. fill value = match value (COP pixel value).
3A43	FILL	WRITE MASK = 0.
3B01	ALDL	Attempt to execute ALDL from within a display list.
3B02	ALDL	Not enough RAM available for allocation.
3B0C	ALDL	Invalid DL NUMBER.
3B0E	ALDL	Attempt to allocate a display list already allocated.
3B0F	ALDL	Invalid NUMBER OF BLOCKS value, 0 or a value greater than 4.
3C01	DEDL	Attempt to execute DEDL from within a display list.
3C0C	DEDL	Invalid DL NUMBER.
4001	RTC	Attempt to execute RTC from within a display list.
410C	CDL	Invalid DL NUMBER (display list execution is terminated).
410D	CDL	DL does not exist (display list execution is terminated).
4310	SDLR	DLR NUMBER out of range.
4410	DDLR	DLR NUMBER out of range.
4510	IDLR	DLR NUMBER out of range.
4610	SUBDLR	DLR NUMBER out of range.
4710	ADLR	DLR NUMBER out of range.
4810	LDLR	DLR NUMBER out of range.
4910	STDLR	DLR NUMBER out of range.
4A10	PLDLR	DLR NUMBER out of range.
4A11	PLDLR	Illegal CONDITION TYPE was specified.
4B0C	JDLR	Invalid DL NUMBER (display list execution terminated).
4B0D	JDLR	DL NUMBER does not exist.

Table A-2. Ramtek Firmware Error Codes (Continued)

ERROR CODE	OP CODE	DESCRIPTION
4B10	JDLR	DLR NUMBER out of range.
4B20	JDLR	Illegal CONDITION value.
4C02	ALPF	Attempt to allocate a font where not enough free RAM exists.
4C0E	ALPF	Attempt to allocate a font that has already been allocated.
4C12	ALPF	PF NUMBER is out of range.
4D03	DEPF	Attempt to deallocate standard font.
4D12	DEPF	PF NUMBER is out of range.
4E12	ATTPF	The font defined by PF NUMBER is out of range.
4E13	ATTPF	The font defined by PF NUMBER has not been allocated.
4F07	LMPF	DATA BYTE COUNT not a valid multiple of either 14 or 42.
4F12	LMPF	PF NUMBER is out of range.
4F13	LMPF	Attempt to load font which has not been allocated.
4F14	LMPF	Invalid ASCII code detected; font data for code discarded.
501B	PUSHM	MATRIX NUMBER out of range.
501C	PUSHM	Matrix stack full.
511B	POPM	MATRIX NUMBER out of range.
511C	POPM	No data on matrix stack.
521B	SETM	MATRIX NUMBER out of range.
531B	LM	MATRIX NUMBER out of range.
541B	SM	MATRIX NUMBER out of range.
551B	MM	MATRIX NUMBER out of range.
561B	MM1	MATRIX NUMBER out of range.
571B	IM	MATRIX NUMBER out of range.
581B	SCALE	MATRIX NUMBER out of range.

Table A-2. Ramtek Firmware Error Codes (Continued)

ERROR CODE	OP CODE	DESCRIPTION
591B	TRANS	MATRIX NUMBER out of range.
5A1B	ROTAT	MATRIX NUMBER out of range.
5B1B	READM	MATRIX NUMBER out of range.
5C01	ALCON	Attempt to execute ALCON from within a display list.
5C02	ALCON	Not enough RAM available for allocation of a new context.
5C0E	ALCON	Attempt to allocate a context already allocated.
5C16	ALCON	CONTEXT NUMBER out of range.
5D01	DECON	Attempt to execute DECON from within a display list.
5D15	DECON	Attempt to deallocate the current context.
5D16	DECON	CONTEXT NUMBER out of range.
5D1F	DECON	Attempt to deallocate context 0.
5E01	SCON	Attempt to execute SCON from within a display list.
5E05	SCON	Attempt to select a context that has not been allocated.
5E16	SCON	CONTEXT NUMBER out of range.
5F01	READAS	Attempt to execute READAS from within a display list.
6001	RCON	Attempt to execute RCON from within a display list.
6701	SDS	Attempt to execute SDS from within a display list.
6801	RDB	Attempt to execute RDB from within a display list.
6902	COPY	Not enough RAM available.
6907	COPY	Illegal byte count; not equal to 4.
6917	COPY	No MCPs selected to read from or write into.
6918	COPY	Too many MCPs selected to read from or write into.
6919	COPY	No group selected to read from or write into.
691A	COPY	Too many groups selected to read from or write into.

Table A-2. Ramtek Firmware Error Codes (Continued)

ERROR CODE	OP CODE	DESCRIPTION
6A02	COPYT	Not enough RAM available.
6A07	COPYT	Illegal byte count; not equal to 6.
6A17	COPYT	No MCPs selected to read from or write into.
6A18	COPYT	Too many MCPs selected to read from or write into.
6A19	COPYT	No group selected to read from or write into.
6A1A	COPYT	Too many groups selected to read from or write into.
6B07	COMBI	Odd byte count in word mode.
6C07	COMBT	Odd byte count in word mode.
6D07	CIRC	Illegal value for DATA LENGTH WORD; not a multiple of six.
6D35	CIRC	Negative radius value specified.
6E07	ARC1	Illegal value for DATA LENGTH WORD; not a multiple of 12.
6E32	ARC1	Division by zero; no center can be found for the circle containing these points.
6F07	ARC2	Illegal value for DATA LENGTH WORD; not a multiple of 10.
7007	ARC3	Illegal value for DATA LENGTH WORD; not a multiple of ten.
7035	ARC3	Distance between end-points greater than twice the radius.
71XX	SLFS	XX defines error number associated with a local function. Part of the associated environment does not exist at execution time.
7203	SLKF	PROGRAMMABLE FONT does not exist.
7205	SLKF	CONTEXT does not exist.
720C	SLKF	DISPLAY LIST number out of range.
720D	SLKF	DISPLAY LIST does not exist.
7212	SLKF	PROGRAMMABLE FONT number out of range.
7216	SLKF	CONTEXT number out of range.

Table A-2. Ramtek Firmware Error Codes (Continued)

ERROR CODE	OP CODE	DESCRIPTION
7233	SLKF	No room in local function table.
7403	SLCF	PROGRAMMABLE FONT does not exist.
7405	SLCF	CONTEXT does not exist.
740C	SLCF	DISPLAY LIST number out of range.
740D	SLCF	DISPLAY LIST does not exist.
7412	SLCF	PROGRAMMABLE FONT number out of range.
7416	SLCF	CONTEXT number out of range.
7433	SLCF	No room in local function table.
7603	SKES	PROGRAMMABLE FONT does not exist.
7605	SKES	CONTEXT does not exist.
7612	SKES	PROGRAMMABLE FONT number out of range.
7616	SKES	CONTEXT number out of range.
7802	ALTD	No RAM blocks available.
780E	ALTD	TREND already exists.
7823	ALTD	Attempt to set up a trend with more than 12,000 trend points or more than 255 lines.
7824	ALTD	Illegal TREND number.
7924	DETD	Illegal TREND number.
7A07	ITD	BYTE COUNT will not allow an equal number of points to be loaded into each trend line. BYTE COUNT defines a number of trend points greater than the number allocated for the trend. All data will be discarded.
7A24	ITD	Illegal TREND number.
7B07	LTDP	Illegal BYTE COUNT. All data will be discarded and an illegal instruction will be generated.
7B24	LTDP	Illegal TREND number.

Table A-2. Ramtek Firmware Error Codes (Continued)

ERROR CODE	OP CODE	DESCRIPTION
7C07	UDTD	Illegal BYTE COUNT. The specified BYTE COUNT will not allow an equal amount of new data points to be added to each trend line. The data will be received and discarded, and an illegal instruction interrupt will be generated.
7C24	UDTD	Illegal TREND number.
7D24	ERSTD	Illegal TREND number.
7E25	DISTD	No trend database to display.
7E26	DISTD	START TIME is greater than the number of points per line. No change to the display will occur.
7F01	WPI	Attempt to execute WPI from within a display list.
7F07	WPI	Illegal byte count; either odd byte count or not enough data to fill the last line.
7F30	WPI	Illegal packing parameter; either pixel length less than 2 or greater than 5, or pixel count * pixel length > 16.
7F31	WPI	COP not positioned at the FORMAT WINDOW starting edge of primary scan.
8001	WIV	Attempt to execute WIV from within a display list.
8007	WIV	Odd byte count.
8036	WIV	Illegal PACKING DESCRIPTOR.
8038	WIV	VECTOR COUNT equals zero.
8203	WRCT	No programmable font attached.
8207	WRCT	Illegal byte count; DATA LENGTH WORD is not equal to text string data.
8240	WRCT	DATA LENGTH WORD not equal to colored text data embedded counts.
8301	RCSL	Attempt to execute RCSL from within a display list.
8510	DIVDLR	DLR NUMBER out of range.
8610	MULDLR	DLR NUMBER out of range.

Table A-2. Ramtek Firmware Error Codes (Continued)

ERROR CODE	OP CODE	DESCRIPTION
8710	ANDDLR	DLR NUMBER out of range.
8810	ORDLR	DLR NUMBER out of range.
8910	XORDLR	DLR NUMBER out of range.
8A07	WC32	Odd byte count.
8C01	RTCS	Attempt to execute RTCS from within a display list.
8D07	WCVU	Illegal value for DATA LENGTH WORD; not a multiple of ten.
8E48	V12LD	Invalid DEVICE NUMBER specified.
8F07	MCPWT	Odd byte count.
9001	RCFG	Attempt to execute RCFG from within a display list.
9007	RCFG	Illegal byte count.
9101	ACS	Attempt to execute ACS from within a display list.
9102	ACS	Not enough RAM available for allocation.
9201	LCS	Attempt to execute LCS from within a display list.
9207	LCS	Odd byte count.
9245	LCS	Illegal load address.
9246	LCS	Illegal S2 record.
9247	LCS	Checksum fault.
9307	CCS	Illegal byte count; not a multiple of four.
9344	CCS	Too many CCS parameters (more than 16).
9345	CCS	Illegal start address.
9407	RSM	Illegal byte count (not equal to 2).
9507	COPYIR	Odd byte count.
9517	COPYIR	No MCP selected to read from.
9518	COPYIR	Too many MCPs selected to read from.

Table A-2. Ramtek Firmware Error Codes (Continued)

ERROR CODE	OP CODE	DESCRIPTION
9519	COPYIR	No group selected to read from.
951A	COPYIR	Too many groups selected to read from.
9607	COPYIM	Odd byte count.
9617	COPYIM	No MCP selected to read from.
9618	COPYIM	Too many MCPs selected to read from.
9619	COPYIM	No group selected to read from.
961A	COPYIM	Too many groups selected to read from.
964A	COPYIM	Bad magnification range; allowable range is 1 through 16.

Appendix B

RAMTEK INSTRUCTIONS USED BY TEST PROGRAMS

B.1 INTRODUCTION

The diagnostic and acceptance tests execute instructions from the Ramtek instruction set. The following sections provide a listing of the instructions called by each test. Both the full instruction name and its mnemonic are listed for reference purposes. The instructions are ordered alphabetically on mnemonic.

B.2 DIAGNOSTIC TESTS

Test A:
- Read Soft Register (READ)
- Set Parameter (SET)

Test B:
- Allocate Trend (ALTD)
- Write Arc Type 3 (ARC3)
- Load Cursor Font (LCF)
- Load Display List Register (LDLR)
- Load Subchannel Origins (LOADSO)
- Push Matrix (PUSHM)
- Read Context Associations (RCON)
- Read Back Detect Buffer (RDB)
- Read Display List Reverse Packing (RDLRP)
- Read Tablet Coordinates (RTC)
- Scale Matrix (SCALE)
- Set Parameter (SET)
- Write Keyboard (WKB)
- Write Plot Box (WPB)
- Write Point (WPT)

Test C:
- Write Keyboard Block Reverse Packing (WBLKRP)

Test D:
- Erase (ERS)
- Read Image (RI)
- Set Parameter (SET)
- Write Image (WI)

Test E:
- Load Auxiliary Memory (LAM)
- Read Auxiliary Memory (RAM)

Test F:
- Write Point (WPT)
- Write Vector Linked (WVL)

Test G:
Read Cursor Status Screen (RCSS)
Read Keyboard (RKB)
Set Tablet Mode (STM)
Write Point (WPT)
Write Text (WT)

Test H:
Load Auxiliary Memory (LAM)

Test I:
Allocate Display List (ALDL)
Call Display List (CDL)
Disable Detect (DD)
Enable Detect (ED)
Initialize (INIT)
Load Display List Reverse Packing (LDLRP)
Read Back Detect Buffer (RDB)
Return from Display List (RETDL)
Set Detect Parameters (SDP)
Sense Detect Status (SDS)
Write Vector Linked (WVL)

Test J:
Allocate Context (ALCON)
Select Context (SCON)
Select MCP/Group (SELMG)
Set Parameter (SET)

Test K:
Set Parameter (SET)
Set Display Class (SETDC)

Test L:
Read Normal Parameters (READP)
Set Parameter (SET)

Test M:
Allocate Display List (ALDL)

Test N:
Allocate Display List (ALDL)
Load Display List (LDL)
Load Display List Reverse Packing (LDLRP)
Read Display List (RDL)
Read Display List Reverse Packing (RDLRP)

Test 0:
Bulk Erase (BERS)
Write Circle (CIRC)
Copy Image and Magnify (COPYIM)
Copy Image and Rotate (COPYIR)
Initialize (INIT)
Select MCP/Group (SELMG)
Set Parameter (SET)
Write Vector Linked (WVL)

Test S:
Load Auxiliary Memory (LAM)
Read Auxiliary Memory (RAM)
Read Normal Parameters (READP)
Select MCP/Group (SELMG)
Write Text (WT)
Zoom (ZOOM)

Test T:
Allocate Trend (ALTD)
Display Trend (DISTD)
Init Trend (ITD)
Load Trend Patterns (LTDP)
Update Trend (UDTD)

Test V:
Load Auxiliary Memory (LAM)
Set Parameter (SET)
Write Image (WI)

Test .A:
Any instruction entered by user

Test .B:
No Ramtek instructions used

Test .D:
Erase (ERS)
Read Normal Parameters (READP)
Read Image (RI)
Select MCP/Group (SELMG)
Write Image (WI)

Test .G:
Select MCP/Group (SELMG)

Test .I:
Load Subchannel Origins (LOADSO)
Select Video Orientation (SELVO)
Wait for Vertical Retrace (WAITVR)
Zoom (ZOOM)

Test .R: No Ramtek instructions used

Test .T: No Ramtek instructions used

B.3 ACCEPTANCE TESTS

Test ,0001: Erase (ERS)
Initialize (INIT)

Test ,0002: Erase (ERS)
Initialize (INIT)
Write Image (WI)

Test ,0003: Erase (ERS)
Initialize (INIT)
Write Image (WI)

Test ,0004: Erase (ERS)
Initialize (INIT)
Set Parameter (SET)
Write Text (WT)

Test ,0005: Erase (ERS)
Initialize (INIT)
Write Text (WT)

Test ,0006: Erase (ERS)
Initialize (INIT)
Write Text (WT)

Test ,0007: Erase (ERS)
Initialize (INIT)
Write Text (WT)

Test ,0008: Erase (ERS)
Initialize (INIT)
Write Raster (WR)
Write Text (WT)

Test ,0009: Erase (ERS)
Initialize (INIT)
Scroll X (SCRX)
Scroll Y (SCRY)
Write Text (WT)

Test ,000A: Erase (ERS)
Initialize (INIT)
Scroll X (SCRX)
Scroll Y (SCRY)
Set Parameter (SET)
Write Vector Linked (WVL)

Test ,000B: Erase (ERS)
Initialize (INIT)
Set Parameter (SET)
Write Text (WT)

Test ,000C: Erase (ERS)
Initialize (INIT)
No Operation (INOP)
Set Parameter (SET)
Write Text (WT)

Test ,000D: Erase (ERS)
Initialize (INIT)
Set Parameter (SET)
Write Text (WT)

Test ,000E: Erase (ERS)
Initialize (INIT)
Write Text (WT)

Test ,000F: Erase (ERS)
Initialize (INIT)

Test ,0010: Erase (ERS)
Initialize (INIT)

Test ,0011: Initialize (INIT)
Select Video Orientation (SELVO)
Wait for Vertical Retrace (WAITVR)
Write Text (WT)

Test ,0012: Bulk Erase (BERS)
Initialize (INIT)
Wait for Vertical Retrace (WAITVR)

Test ,0013: Erase (ERS)
Initialize (INIT)
Wait for Vertical Retrace (WAITVR)
Zoom (ZOOM)

Test ,0014: Erase (ERS)
Initialize (INIT)
Restore Environment (POPE)
Save Environment (PUSHE)
Write Text (WT)

Test ,0015: Erase (ERS)
Initialize (INIT)
Write Conic (WC)

Test ,0016: Erase (ERS)
Initialize (INIT)
Set Parameter (SET)
Write Plot Box (WPB)

Test ,0017: Erase (ERS)
Initialize (INIT)
Set Parameter (SET)
Write Plot Box (WPB)

Test ,0018: Erase (ERS)
Initialize (INIT)
Set Parameter (SET)
Write Vector Linked (WVL)

Test ,0019: Erase (ERS)
Initialize (INIT)
Set Parameter (SET)
Write Vector Linked (WVL)

Test ,001A: Erase (ERS)
Initialize (INIT)
Set Parameter (SET)
Write Vector Linked (WVL)

Test ,001B: Erase (ERS)
Initialize (INIT)
Set Parameter (SET)
Write Plot Point (WPP)

Test ,001C: Erase (ERS)
Initialize (INIT)
Set Parameter (SET)
Write Plot Point (WPP)

Test ,001D: Erase (ERS)
Initialize (INIT)
Set Parameter (SET)
Write Plot Vector (WPV)

Test ,001E: Erase (ERS)
Initialize (INIT)
Set Parameter (SET)
Write Plot Vector (WPV)

Test ,001F: Erase (ERS)
Initialize (INIT)
Set Parameter (SET)
Write Point (WPT)

Test ,0020: Erase (ERS)
Initialize (INIT)
Set Parameter (SET)
Write Random Pixel (WRP)

Test ,0021: Erase (ERS)
Initialize (INIT)
Set Detect Data (SDD)
Write Text (WT)

Test ,0022: Erase (ERS)
Initialize (INIT)
Resume Detect (RD)
Suspend Detect (SD)
Write Text (WT)

Test ,0023: Initialize (INIT)
Load Cursor Font (LCF)
Write Cursor State Screen (WCSS)

Test ,0024: Initialize (INIT)
Load Cursor Font (LCF)
Write Cursor State Screen (WCSS)

Test ,0025: Initialize (INIT)
Load Cursor Font (LCF)
Write Cursor State Screen (WCSS)

Test ,0030: Allocate Display List (ALDL)
Deallocate Display List (DEDL)
Erase (ERS)
Initialize (INIT)
Load Display List Reverse Packing (LDLRP)
Write Text (WT)
Execute Instruction Memory (XIM)

Test ,0031: Add Display List Registers (ADLR)
Allocate Display List (ALDL)
Call Display List (CDL)
Decrement Display List Register (DDLR)
Deallocate Display List (DEDL)
Erase (ERS)
Increment Display List Register (IDLR)
Initialize (INIT)
Jump Conditional Upon Display List Register (JDLR)
Load Display List Reverse Packing (LDLRP)
Parameter Load Display List Registers (PLDLR)
Return from Display List (RETDL)
Set Display List Register (SDLR)
Set Parameter (SET)
Store Display List Register (STDLR)
Subtract Display List Register (SUBDLR)
Write Vector Linked (WVL)

Test ,0032: Erase (ERS)
Initialize (INIT)
Load Multiple Programmable Fonts (LMPF)
Load Programmable Font (LPF)
Load Programmable Font Reverse Packing (LPFRP)
Write Text (WT)

Test ,0033: Erase (ERS)
Initialize (INIT)
Load Programmable Font (LPF)
Write Text (WT)

Test ,0034: Allocate Programmable Font (ALPF)
Attach Programmable Font (ATTPF)
Deallocate Programmable Font (DEPF)
Erase (ERS)
Initialize (INIT)
Load Multiple Programmable Fonts (LMPF)
Set Parameter (SET)
Write Text (WT)

Test ,0035: Allocate Programmable Font (ALPF)
Attach Programmable Font (ATTPF)
Deallocate Programmable Font (DEPF)
Erase (ERS)
Initialize (INIT)
Load Multiple Programmable Fonts (LMPF)
Set Parameter (SET)
Write Text (WT)

Test ,0036: Allocate Display List (ALDL)
Bulk Erase (BERS)
Fill (FILL)
Initialize (INIT)
Jump Conditional Upon Display List Register (JDLR)
Load Cursor to COP/Index/Origin (LCCIO)
Load Display List Register (LDLR)
Load Display List Reverse Packing (LDLRP)
Return from Display List (RETDL)
Set Display List Register (SDLR)
Set Parameter (SET)
Set Local Cursor Function (SLCF)
Set Local Function State (SLFS)
Set Local Keyboard Function (SLKF)
Store Display List Register (STDLR)
Subtract Display List Register (SUBDLR)
Write Vector Unlinked (WVU)

Test ,0040: Initialize (INIT)
Pop Matrix (POPM)
Push Matrix (PUSHM)
Select Video Orientation (SELVO)
Set Parameter (SET)
Translate Matrix (TRANS)
Write Vector Linked (WVL)
Write Vector Unlinked (WVU)

Test ,0041: Initialize (INIT)
Pop Matrix (POPM)
Push Matrix (PUSHM)
Scale Matrix (SCALE)
Select Video Orientation (SELVO)
Set Parameter (SET)
Translate Matrix (TRANS)
Write Vector Linked (WVL)
Write Vector Unlinked (WVU)

Test ,0042: Initialize (INIT)
Pop Matrix (POPM)
Push Matrix (PUSHM)
Rotate Matrix (ROTAT)
Scale Matrix (SCALE)
Select Video Orientation (SELVO)
Set Parameter (SET)
Translate Matrix (TRANS)
Write Vector Linked (WVL)
Write Vector Unlinked (WVU)

Test ,0043: Initialize (INIT)
Multiply Matrices (MM)
Multiply Matrices Immediate (MMI)
Pop Matrix (POPM)
Push Matrix (PUSHM)
Set Parameter (SET)
Set Matrix (SETM)
Translate Matrix (TRANS)
Write Vector Linked (WVL)
Write Vector Unlinked (WVU)

Test ,0044: Allocate Display List (ALDL)
Call Display List (CDL)
Decrement Display List Register (DDLR)
Erase (ERS)
Initialize (INIT)
Jump Conditional Upon Display List Register (JDLR)
Load Display List Reverse Packing (LDLRP)
Pop Matrix (POPM)
Push Matrix (PUSHM)
Return from Display List (RETDL)
Rotate Matrix (ROTAT)
Scale Matrix (SCALE)
Set Display List Register (SDLR)
Select Video Orientation (SELVO)
Set Parameter (SET)
Translate Matrix (TRANS)
Write Vector Linked (WVL)
Write Vector Unlinked (WVU)

Test ,0050: Write Circle (CIRC)
Erase (ERS)
Initialize (INIT)
Set Parameter (SET)

Test ,0051: Write Arc Type 1 (ARC1)
Write Arc Type 2 (ARC2)
Write Arc Type 3 (ARC3)
Erase (ERS)
Initialize (INIT)
Set Parameter (SET)
Zoom (ZOOM)

Test ,0052: Allocate Display List (ALDL)
Call Display List (CDL)
Decrement Display List Register (DDLR)
Deallocate Display List (DEDL)
Erase (ERS)
Fill (FILL)
Increment Display List Register (IDLR)
Initialize (INIT)
Jump Conditional Upon Display List Register (JDLR)
Load Display List Reverse Packing (LDLRP)
Parameter Load Display List Registers (PLDLR)
Return from Display List (RETDL)
Scale Matrix (SCALE)
Set Display List Register (SDLR)
Set Parameter (SET)
Store Display List Register (STDLR)
Subtract Display List Register (SUBDLR)
Translate Matrix (TRANS)
Write Vector Linked (WVL)

Test ,0056: Erase (ERS)
Initialize (INIT)
Write Conic 32 Bits (WC32)

Test ,0057: Erase (ERS)
Initialize (INIT)
Write Conic 32 Bits (WC32)

Test ,0058: Erase (ERS)
Initialize (INIT)
Load Auxiliary Memory (LAM)

Test ,0059: Erase (ERS)
Initialize (INIT)
Set Parameter (SET)
Write Packed Image (WPI)
Zoom (ZOOM)

Test ,0060: Bulk Erase (BERS)
Copy Image (COPY)
Erase (ERS)
Initialize (INIT)
Load Auxiliary Memory (LAM)
Set Parameter (SET)
Write Text (WT)
Write Vector Linked (WVL)
Zoom (ZOOM)

Test ,0061: Bulk Erase (BERS)
Copy Image Triggered (COPYT)
Erase (ERS)
Initialize (INIT)
Load Auxiliary Memory (LAM)
Set Parameter (SET)
Write Text (WT)
Write Vector Linked (WVL)
Zoom (ZOOM)

Test ,0062: Bulk Erase (BERS)
Combine Image (COMBI)
Erase (ERS)
Initialize (INIT)
Load Auxiliary Memory (LAM)
Set Parameter (SET)
Write Text (WT)
Write Vector Linked (WVL)
Zoom (ZOOM)

Test ,0063: Bulk Erase (BERS)
Combine Image Triggered (COMBT)
Erase (ERS)
Initialize (INIT)
Load Auxiliary Memory (LAM)
Set Parameter (SET)
Write Text (WT)
Write Vector Linked (WVL)
Zoom (ZOOM)

Appendix C

AVAILABLE MEDIA

C.1 INTRODUCTION

The RM-9400/RM-9460 diagnostic and acceptance tests are available on the media listed in table C-1.

Table C-1. Available Media

Medium	Content	Density	Part Number
Magnetic tape of binary executable image	Diagnostic & Acceptance Tests, VAX/VMS	800 bpi 1600 bpi	509190-02 509191-02
Magnetic tape of acceptance tests	RM-9400/RM-9460 Acceptance Tests only, ASCII encoded	800 bpi 1600 bpi	509192-02 509193-02
Diskette of binary executable image	Diagnostic & Acceptance Tests, VAX/VMS	Single density	509194-02

C.2 MAGNETIC TAPE OF BINARY EXECUTABLE IMAGE

This tape is a VAX/VMS, nine-track, odd-parity tape. Available in 800 bpi (part #509190-02) and 1600 bpi (part #509191-02), the tape is non-return-to-zero-at-initialization (NRZI). The tape contains the six binary executable image files shown in table C-2.

Table C-2. Executable Files

File	Spatial Lines	Resolution Elements
RMDIAG1.EXE	1024	1280
RMDIAG2.EXE	512	1280
RMDIAG3.EXE	1024	1024
RMDIAG4.EXE	512	640
RMDIAG5.EXE	480	640
RMDIAG6.EXE	256	640

To load the executable images from magnetic tape, mount the tape onto the drive copy the files into the desired account:

```
MOUNT/DENSITY=1600 MTA0: DIAG
COPY MTA0:*.* *.*
DISMOUNT MTA0:
```

NOTE

MTA0: is not the device name for every system.
Tape density may 800 bpi.

To run the diagnostic or acceptance tests, enter the following:

```
ASSIGN RMA0: RM
ALLOCATE RMA0
ALLOCATE RMA1          (if 2 MCPs installed in system)
ALLOCATE RMA2          (if 3 MCPs installed in system)
RUN RMDIAGx
```

NOTE

RMA0, RMA1, and RMA2 are not the device names for every system.

The value of x in the RMDIAGx test file name depends on the resolution of the Ramtek screen installed in your system. Replace the x with a numeric value in the range of 1 through 6, corresponding to the file name in table C-2 that describes your Ramtek screen resolution.

You may begin testing after the test program displays the following message on the console screen:

```
RM94X0 ACCEPTANCE TEST V1-002
Select transfer mode: P(program) or D(DMA) =
```

C.3 MAGNETIC TAPE OF ACCEPTANCE TESTS

This acceptance test is intended for users of non-VAX/VMS compatible software, primarily non-DEC host CPUs. This is a nine-track, NRZI, odd parity, magnetic tape, available in 800 bpi (part #509192-02) and 1600 bpi (part #509193-02).

Due to compatibility differences, the tape contains the ASCII-encoded acceptance test data only (see chapter 3). The user, therefore, must write his own host driver program to send the decoded ASCII instruction buffer from the magnetic tape to the RM-9400/RM-9460.

There are six files of data on the tape: one file for each of six resolutions (see table C-3). Each file is followed by an EOF (end-of-file) mark, except the last file, which is followed by two EOF marks.

Table C-3. File Resolutions

File Number	Spatial Lines	Resolution Elements
1	1024	1280
2	512	1280
3	1024	1024
4	512	640
5	480	640
6	256	640

Each file on the magnetic tape is written in records of 128 byte ASCII characters. There are two types of records; header records and data records. Figure C-1 shows the order of the header and data records for the test plates on the magnetic tape. The header record indicates the test number and the number of bytes of data, in the data records which follow the header, that comprise the test. Table C-4 shows the 16-bit hexadecimal Ramtek instructions that produce test plate #0001. Table C-5 shows the order of bytes (hexadecimal) written on the magnetic tape for the header of test plate #0001, and table C-6 shows the order of the encoded hexadecimal Ramtek instructions from table C-4 as they are written on the magnetic tape as a data record for test plate #0001. If the last data record for a test plate is only partially full, then the remaining bytes for that record will contain ASCII spaces (20 hex.).

C.4 SINGLE-DENSITY BINARY DISKETTE EXECUTABLE IMAGE

The single-density eight-inch binary diskette (part #509194-02) is a VAX/VMS format disk containing the executable image of the diagnostic and acceptance tests.

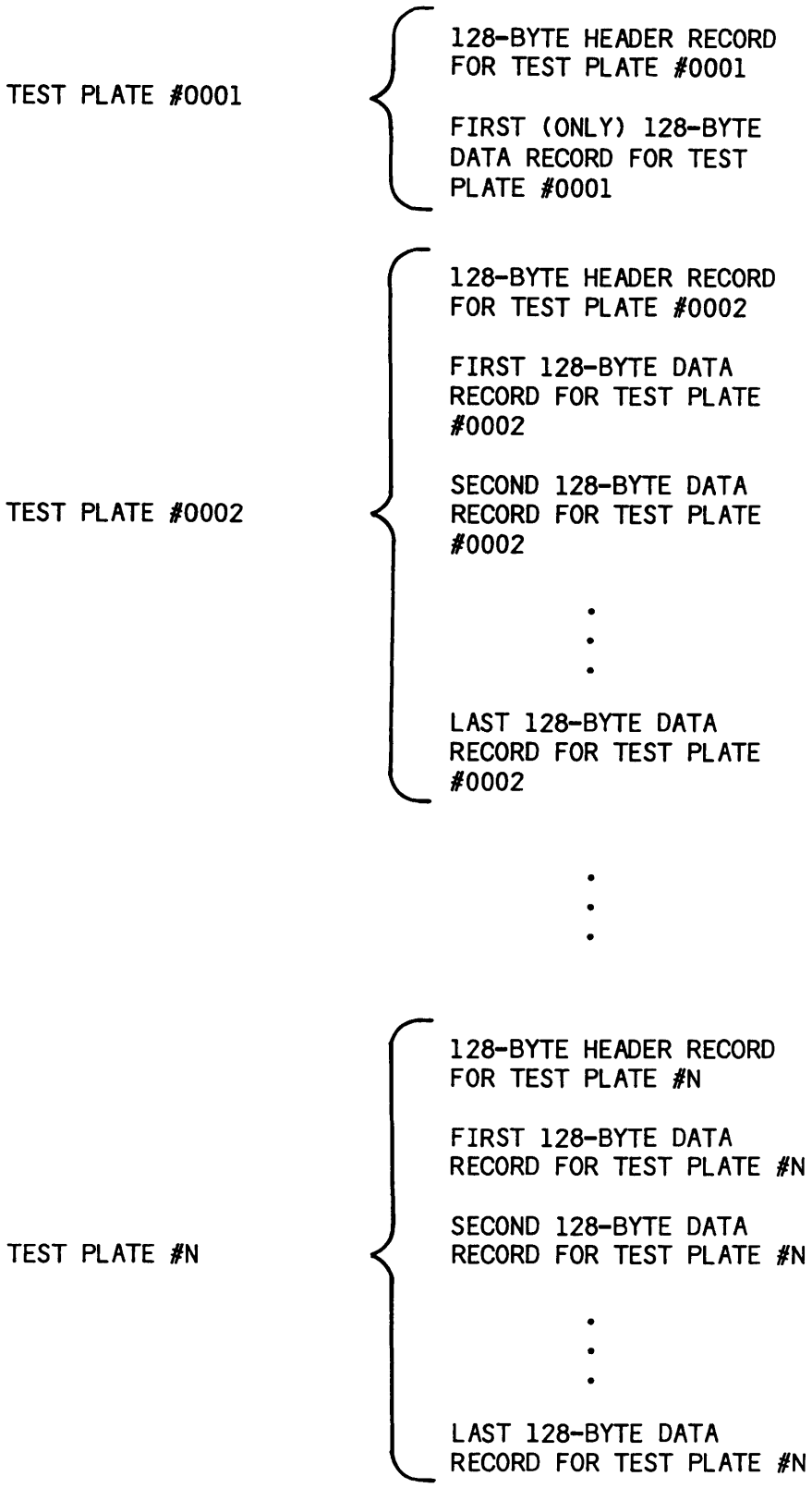


Figure C-1. Acceptance Tests Magnetic Tape Format

Table C-4. Ramtek Instructions That Produce Test Plate #0001

The following are the 25 16-bit hexadecimal words that must be sent to the Ramtek to produce test plate #0001.

1. 0600	6. 04FF	11. 0080	16. 0140	21. 0040
2. 0912	7. 03FF	12. 0460	17. 0100	22. 01E0
3. 0040	8. 0902	13. 0380	18. 03C0	23. 0180
4. 0000	9. 0040	14. 0912	19. 0300	24. 0320
5. 0000	10. 00A0	15. 0040	20. 0902	25. 0280

Table C-5. Header Record for Test Plate #0001

The following is the order of ASCII hexadecimal bytes on magnetic tape that comprise the header record for test plate #0001. The character code follows each byte in parenthesis (^ = space).

1. 54 (T)	23. 43 (C)	45. 4F (O)	67. 20 (^)	89. 20 (^)	111. 20 (^)
2. 45 (E)	24. 49 (I)	46. 57 (W)	68. 20 (^)	90. 20 (^)	112. 20 (^)
3. 53 (S)	25. 4D (M)	47. 20 (^)	69. 20 (^)	91. 20 (^)	113. 20 (^)
4. 54 (T)	26. 41 (A)	48. 20 (^)	70. 20 (^)	92. 20 (^)	114. 20 (^)
5. 20 (^)	27. 4C (L)	49. 20 (^)	71. 20 (^)	93. 20 (^)	115. 20 (^)
6. 23 (#)	28. 29 ())	50. 20 (^)	72. 20 (^)	94. 20 (^)	116. 20 (^)
7. 30 (0)	29. 20 (^)	51. 20 (^)	73. 20 (^)	95. 20 (^)	117. 20 (^)
8. 30 (0)	30. 44 (D)	52. 20 (^)	74. 20 (^)	96. 20 (^)	118. 20 (^)
9. 30 (0)	31. 41 (A)	53. 20 (^)	75. 20 (^)	97. 20 (^)	119. 20 (^)
10. 31 (1)	32. 54 (T)	54. 20 (^)	76. 20 (^)	98. 20 (^)	120. 20 (^)
11. 20 (^)	33. 41 (A)	55. 20 (^)	77. 20 (^)	99. 20 (^)	121. 20 (^)
12. 20 (^)	34. 20 (^)	56. 20 (^)	78. 20 (^)	100. 20 (^)	122. 20 (^)
13. 30 (0)	35. 42 (B)	57. 20 (^)	79. 20 (^)	101. 20 (^)	123. 20 (^)
14. 30 (0)	36. 59 (Y)	58. 20 (^)	80. 20 (^)	102. 20 (^)	124. 20 (^)
15. 30 (0)	37. 54 (T)	59. 20 (^)	81. 20 (^)	103. 20 (^)	125. 20 (^)
16. 31 (1)	38. 45 (E)	60. 20 (^)	82. 20 (^)	104. 20 (^)	126. 20 (^)
17. 30 (0)	39. 53 (S)	61. 20 (^)	83. 20 (^)	105. 20 (^)	127. 20 (^)
18. 30 (0)	40. 20 (^)	62. 20 (^)	84. 20 (^)	106. 20 (^)	128. 20 (^)
19. 20 (^)	41. 46 (F)	63. 20 (^)	85. 20 (^)	107. 20 (^)	
20. 28 (()	42. 4F (O)	64. 20 (^)	86. 20 (^)	108. 20 (^)	
21. 44 (D)	43. 4C (L)	65. 20 (^)	87. 20 (^)	109. 20 (^)	
22. 45 (E)	44. 4C (L)	66. 20 (^)	88. 20 (^)	110. 20 (^)	

Table C-6. Data Record for Test Plate #0001

The following is the order of ASCII hexadecimal bytes on magnetic tape that comprise the data record for test plate #0001.

1. 30	17. 30	33. 30	49. 30	65. 30	81. 30	97. 30
2. 30	18. 30	34. 34	50. 38	66. 30	82. 34	98. 38
3. 36	19. 30	35. 30	51. 33	67. 31	83. 30	99. 32
4. 30	20. 30	36. 30	52. 30	68. 30	84. 30	100. 30
5. 32	21. 46	37. 30	53. 32	69. 30	85. 30	101. 20
6. 31	22. 46	38. 41	54. 31	70. 43	86. 45	102. 20
7. 39	23. 34	39. 30	55. 39	71. 33	87. 31	103. 20
8. 30	24. 30	40. 30	56. 30	72. 30	88. 30	104. 20
9. 30	25. 46	41. 30	57. 30	73. 30	89. 30	105. 20
10. 34	26. 46	42. 38	58. 34	74. 30	90. 38	106. 20
11. 30	27. 33	43. 30	59. 30	75. 33	91. 31	107. 20
12. 30	28. 30	44. 30	60. 30	76. 30	92. 30	108. 20
13. 30	29. 32	45. 30	61. 30	77. 32	93. 30	109. 20
14. 30	30. 30	46. 36	62. 34	78. 30	94. 32	110. 20
15. 30	31. 39	47. 34	63. 31	79. 39	95. 33	111. 20
16. 30	32. 30	48. 30	64. 30	80. 30	96. 30	112. 20

Appendix D

DIAGNOSTIC TEST WORK SHEETS

D.1 INTRODUCTION

This appendix contains work sheets for every diagnostic test and subtest. The work sheets are designed to be photocopied for multiple pass runs of a diagnostic test or subtest.

Use the worksheets in conjunction with the material presented in chapter 3. The worksheets do not explain the data input values. Refer to the appropriate section in chapter 3 that describes the diagnostic test or subtest. Use one sheet or set of sheets for each diagnostic test or subtest you want to run. Fill in the blank fields in the PROMPT RESPONSES section with the data input values you want to use for a specific run. Record the messages or values the test program writes on the console screen in the blank fields in the CONSOLE MESSAGES section. The worksheets also provide spaces to note the Ramtek screen display results.

W O R K S H E E T

TEST A: READ SOFT REGISTER INSTRUCTION (GPIF)

ENTRY:

Test = A

PROMPT RESPONSES:

Test A has no prompts for input data.

CONSOLE MESSAGES:

If test A writes one of the messages below on the console screen, fill in the values in the appropriate spaces:

X origin __ __ __ __ should be __ __ __ __

Y origin __ __ __ __ should be __ __ __ __

X start-point __ __ __ __ should be __ __ __ __

Y start-point __ __ __ __ should be __ __ __ __

Write mask __ __ __ __ should be __ __ __ __

Foreground __ __ __ __ should be __ __ __ __

Background __ __ __ __ should be __ __ __ __

If the test program does not write one of the above messages within 30 seconds of test start, you can conclude that test A has run successfully, and exit the test manually.

EXIT:

Press RETURN key on console keyboard.

W O R K S H E E T

TEST B: COMMAND/STATUS ENABLE (GPIF)

ENTRY:

Test = B

PROMPT RESPONSES:

Test B has no prompts for input data.

CONSOLE MESSAGES:

If test B writes the message below on the console screen, fill in the values in the appropriate spaces:

Current status __ __ __ __ should be __ __ __ __

Command issued __ __ __ __

EXIT:

Test B automatically exits at end of test (almost immediately).

W O R K S H E E T

TEST C: PERIPHERAL INTERRUPT - SUBTEST I: ILLEGAL INSTRUCTION INTERRUPT

ENTRY:

Test = C

Subtest: I(illegal instruction) or T(transmitter interrupt) = I

PROMPT RESPONSES:

Subtest I has no prompts for input data.

CONSOLE MESSAGES:

Note the number of times subtest I writes the following message on the console screen: __ __ __

RAMTEK failed to recognize illegal instruction

The test program continues executing until you exit manually.

EXIT:

Press RETURN key on console keyboard.

W O R K S H E E T

TEST C: PERIPHERAL INTERRUPT - SUBTEST T: TRANSMITTER INTERRUPT

ENTRY:

Test = C

Subtest: I(illegal instruction) or T(transmitter interrupt) = T

PROMPT RESPONSES:

Device (0-7) = __

Baud rate class (A-D) or ?(for menu) = __

CONSOLE MESSAGES:

Note the number of times subtest T writes the following message on the console screen: __ __ __

Timeout

Do the Ramtek keyboard lights turn on and off in sequence? __ YES __ NO

The test program continues executing until you exit manually.

EXIT:

Press RETURN key on console keyboard.

W O R K S H E E T

TEST D: WRITE/READ IMAGE

ENTRY:

Test = D

PROMPT RESPONSES:

Memory plane mask = __ __ __ __

Window minimum X = __ __ __ __

Window minimum Y = __ __ __ __

Scan mode (0-7) = __

Image mode (0-2) = __

Reverse packing (Y/N)? __

CONSOLE MESSAGES:

If test D writes the message below on the console screen, fill in the values values in the appropriate spaces:

At buffer address __ __ __ __

Data read from RAMTEK __ __ __ __ should be __ __ __ __

Test D continues executing until you exit manually.

EXIT:

Press RETURN key on console keyboard.

WORKSHEET

TEST E: VIDEO LOOKUP TABLE

ENTRY:

Test = E

PROMPT RESPONSES:

Lookup table number (0-7) = __

Start address = __ __ __ __

Length (in words) = __ __ __ __

Video type: 0(V2,V7A,V8,V12) or 1(V7B) = __

If video type = 0: **Lookup table mask = __ __ __ __**

If video type = 1: **Lookup table high word mask = __ __ __ __**

Lookup table low word mask = __ __ __ __

CONSOLE MESSAGES:

If test E writes the message below on the console screen, fill in the values in the appropriate spaces:

At buffer address __ __ __ __

Data read from RAMTEK __ __ __ __ should be __ __ __ __

Test E continues executing until you exit manually.

EXIT:

Press RETURN key on console keyboard.

W O R K S H E E T

TEST F: CONVERGENCE

ENTRY:

Test = F

PROMPT RESPONSES:

Foreground = __ __ __ __

CONSOLE MESSAGES:

Test F writes no console messages.

The test program displays a convergence pattern on the Ramtek screen. The convergence pattern is an 8 by 8 grid of rectangles with a pixel dot at the center of each rectangle. Use the space below to record any irregularities in the convergence pattern displayed on the Ramtek screen.

EXIT:

Press RETURN key on console keyboard.

W O R K S H E E T

TEST G: INTERACTIVE PERIPHERAL INTERRUPT - SUBTEST C: CURSOR CONTROLLER

ENTRY:

Test = G

Subtest: C(cursor), K(keyboard), T(tablet) = C

PROMPT RESPONSES:

Device (0-7) = __

Write gaps in track mode (Y/N)? __

CONSOLE MESSAGES:

Turn on the cursor-controller device (joystick or trackball) and set the VISIBLE and TRACK switches on the device to ON. The cursor will be visible on the Ramtek screen. Move the joystick or trackball in any direction, and the cursor position echoes the cursor-controller movement. If you move the cursor too quickly, gaps in track mode occur, and you will see breaks in the drawn cursor path. If you responded Y to the gaps in track mode prompt, the test program writes the following message on the console screen:

Gap in track mode data

Record your cursor movements and the Ramtek screen results in the space below:

Device: Joystick __ Trackball __

Switches: VISIBLE - ON TRACK - ON

WORKSHEET

TEST G: INTERACTIVE PERIPHERAL INTERRUPT - SUBTEST C: CURSOR CONTROLLER

Test the ENTER switch on the cursor-controller device by setting the TRACK switch on the device to OFF. Move the cursor-controller to a new position and depress the ENTER switch. Subtest C displays a pixel at the new cursor position. Move the cursor to a new position and depress the ENTER switch again. The test program displays another pixel at the new position. Each time you move the cursor and depress the ENTER switch, subtest C displays a pixel at the screen position where you depressed the ENTER switch.

Set the BLINK switch on the cursor-controller device to ON. The cursor will blink on the Ramtek screen.

Record your cursor movements and the Ramtek screen results in the space below:

Device: Joystick __ Trackball __

Switches: VISIBLE - ON TRACK - OFF
ENTER - press when cursor at new position

_____

_____

_____

EXIT:

Press RETURN key on console keyboard.

W O R K S H E E T

TEST G: INTERACTIVE PERIPHERAL INTERRUPT - SUBTEST K: KEYBOARD

ENTRY:

Test = G

Subtest: C(cursor), K(keyboard), T(tablet) = K

PROMPT RESPONSES:

Device (0-7) = __

CONSOLE MESSAGES:

Subtest K writes no console messages.

Press any character key on the console keyboard. The test program echoes the character on the Ramtek screen.

Record your keyboard entries and the Ramtek screen results:

_____

_____

_____

EXIT:

Press RETURN key on console keyboard.

W O R K S H E E T

TEST G: INTERACTIVE PERIPHERAL INTERRUPT - SUBTEST T: GRAPHIC TABLET (Non-Menu Mode)

ENTRY:

Test = G

Subtest: C(cursor), K(keyboard), T(tablet) = T

PROMPT RESPONSES:

Device (0-7) = __

Write gaps in track mode (Y/N)? N

CONSOLE MESSAGES (Non-menu Mode):

Subtest T writes no messages in non-menu mode.

The cursor is not visible on the Ramtek screen in non-menu mode. Move the puck/stylus in any direction, continuously depressing the ENTER button on the puck or depressing the stylus against the tablet surface. The test program echoes the path of the puck/stylus movement on the Ramtek screen. Move the puck/stylus to a new tablet position without depressing the ENTER button on the puck or depressing the stylus. Subtest T will not echo the cursor movement on the Ramtek screen. Depress the puck ENTER button or stylus again and move the puck/stylus. The test program draws a straight line between the position where the puck ENTER button or stylus was last depressed and the position where the puck ENTER button or stylus is again depressed. Subtest T resumes echoing the puck/stylus movements, as long as you continue to depress the puck ENTER button or stylus.

Record your puck/stylus movements and the Ramtek screen results:

_____

_____

_____

EXIT:

Press RETURN key on console keyboard.

W O R K S H E E T

TEST G: INTERACTIVE PERIPHERAL INTERRUPT - SUBTEST T: GRAPHIC TABLET (Menu Mode)

ENTRY:

Test = G

Subtest: C(cursor), K(keyboard), T(tablet) = T

PROMPT RESPONSES:

Device (0-7) = __

Write gaps in track mode (Y/N)? __

CONSOLE MESSAGES (Menu Mode):

Turn on the graphic tablet cursor controller, then turn on the cursor by moving the puck/stylus to the ON function box and depressing the puck ENTER button or stylus. Select track mode on the function menu by moving the puck/stylus to the TRACK function box and depressing the puck ENTER button or stylus. Move the puck/stylus in any direction in the tablet work area while continuously depressing the puck ENTER button or stylus. The cursor position moves accordingly. If you move the cursor too quickly, gaps in track mode occur. The test program draws a straight line across gaps, causing an inaccurate representation of the actual cursor path. You may be drawing a curve with the cursor, but if there are gaps in track mode, subtest T displays an angular path of straight lines. If you responded Y to the gaps in track mode prompt, the test program writes the following message on the screen:

Gap in track mode data

Release the puck ENTER button or raise the stylus from the tablet surface, move the puck/stylus to a new position on the tablet, and again depress the puck ENTER button or stylus. The test program draws a straight line between the two points.

Record your cursor movements and the Ramtek screen results:

Menu functions: ON, TRACK

W O R K S H E E T

TEST G: INTERACTIVE PERIPHERAL INTERRUPT - SUBTEST T: GRAPHIC TABLET
Menu Mode

Select point mode in the function menu by moving the puck/stylus to the POINT function box and depressing the puck ENTER button or stylus. Move the puck/stylus to a position in the tablet work area and depress the puck ENTER button or stylus. Subtest T moves the cursor to the corresponding position on the Ramtek screen and draws a straight line between the last cursor position and the present cursor position. Continue moving the puck/stylus around the tablet work area, depressing the puck ENTER button or stylus at desired locations. The test program draws connected straight lines between the points where you depress the puck ENTER button or stylus.

Record your cursor movements and the Ramtek screen results:

Menu functions: ON, POINT

Select move mode in the function menu by moving the puck/stylus to the MOVE function box and depressing the puck ENTER button or stylus. Move the puck/stylus to a position in the tablet work area and depress the puck ENTER button or stylus. Then select the ENTER menu function by moving the puck/stylus to ENTER function box and depressing the puck ENTER button or stylus. Subtest T moves the cursor to the position in the tablet work area where you depressed the puck ENTER button or stylus. The test program draws a line between the last cursor position and the present cursor position. Continue moving the puck/stylus around the tablet work area, depressing the puck ENTER button or stylus at desired locations and selecting the ENTER menu function for each location. Subtest T draws connected straight lines on the Ramtek screen between the points selected in the tablet work area.

Move the puck/stylus to the BLINK function box and depress the puck ENTER button or stylus. The cursor on the Ramtek screen will blink on and off.

Record your cursor movements and the Ramtek screen results:

Menu functions: ON, MOVE, ENTER

EXIT:

Press RETURN key on console keyboard.

W O R K S H E E T

TEST H: VIDEO LOOKUP TABLE PRESET

ENTRY:

Test = H

PROMPT RESPONSES:

Video type: 0(V2,V7A),1(V7B),2(V8),3(V12) = __

Lookup table number (0-7) = __

Memory plane mask = __ __ __ __

CONSOLE MESSAGES:

Test H writes no console messages.

EXIT:

Test H automatically exits at end of test.

W O R K S H E E T

TEST I: ENTITY DETECTION

ENTRY:

Test = I

PROMPT RESPONSES:

Test number = I

Detect window minimum X = __ __ __ __

Detect window minimum Y = __ __ __ __

Detect window maximum X = __ __ __ __

Detect window maximum Y = __ __ __ __

Number of hits to ignore = __ __ __ __

Minimum detect class = __ __ __ __

Maximum detect class = __ __ __ __

Detect memory plane mask = __ __ __ __

CONSOLE MESSAGES:

Write the number of hits test I detects:

Number of hits __ __ __ __ - or - Number of hits > __ __ __ __

If the value for the number of hits is non-zero, test I writes the data for the first hit immediately after the above message. Record the hit data:

Data word 1 __ __ __ __

Data word 2 __ __ __ __

Detect class __ __ __ __

Display list __ __ __ __

Absolute address __ __ __ __

Relative instruction __ __ __ __

WORKSHEET

TEST I: ENTITY DETECTION

If the value for the number of hits is not 0001, press the RETURN key to see the data for each successive hit, and record the data below.

Data word 1 __ __ __ __

Data word 2 __ __ __ __

Detect class __ __ __ __

Display list __ __ __ __

Absolute address __ __ __ __

Relative instruction __ __ __ __

Data word 1 __ __ __ __

Data word 2 __ __ __ __

Detect class __ __ __ __

Display list __ __ __ __

Absolute address __ __ __ __

Relative instruction __ __ __ __

Data word 1 __ __ __ __

Data word 2 __ __ __ __

Detect class __ __ __ __

Display list __ __ __ __

Absolute address __ __ __ __

Relative instruction __ __ __ __

Data word 1 __ __ __ __

Data word 2 __ __ __ __

Detect class __ __ __ __

Display list __ __ __ __

Absolute address __ __ __ __

Relative instruction __ __ __ __

Data word 1 __ __ __ __

Data word 2 __ __ __ __

Detect class __ __ __ __

Display list __ __ __ __

Absolute address __ __ __ __

Relative instruction __ __ __ __

Data word 1 __ __ __ __

Data word 2 __ __ __ __

Detect class __ __ __ __

Display list __ __ __ __

Absolute address __ __ __ __

Relative instruction __ __ __ __

EXIT:

Test I automatically exits with no hits detected. If test I detects hits, press RETURN key on console keyboard after test I writes data for last hit.

WORKSHEET

TEST J: CONTEXT SWITCHING

ENTRY:

Test = J

PROMPT RESPONSES:

Context 0 minimum X = __ __ __ __

Context 0 maximum X = __ __ __ __

Context 1 minimum X = __ __ __ __

Context 0 test number = __ __ __ __

Context 1 test number = __ __ __ __

CONSOLE MESSAGES:

Test J writes no console messages. The test program displays the selected acceptance tests on the Ramtek screen. Refer to the acceptance test plates (chapter 4) to verify that the two contexts are working correctly. Record the Ramtek screen contents below:

_____

_____

_____

EXIT:

Press RETURN key on console keyboard.

W O R K S H E E T

(Sheet 1 of 2)

TEST K: DISPLAYABLE CLASS

ENTRY:

Test = K

PROMPT RESPONSES:

Number of ranges (0001-000F) = __ __ __ __

Minimum display class = __ __ __ __

Maximum display class = __ __ __ __

If the value for number of ranges is greater than 0001, the test program issues prompts for a minimum and maximum display class for each range.

Minimum display class = __ __ __ __	**Minimum display class = __ __ __ __**
Maximum display class = __ __ __ __	**Maximum display class = __ __ __ __**
Minimum display class = __ __ __ __	**Minimum display class = __ __ __ __**
Maximum display class = __ __ __ __	**Maximum display class = __ __ __ __**
Minimum display class = __ __ __ __	**Minimum display class = __ __ __ __**
Maximum display class = __ __ __ __	**Maximum display class = __ __ __ __**
Minimum display class = __ __ __ __	**Minimum display class = __ __ __ __**
Maximum display class = __ __ __ __	**Maximum display class = __ __ __ __**
Minimum display class = __ __ __ __	**Minimum display class = __ __ __ __**
Maximum display class = __ __ __ __	**Maximum display class = __ __ __ __**
Minimum display class = __ __ __ __	**Minimum display class = __ __ __ __**
Maximum display class = __ __ __ __	**Maximum display class = __ __ __ __**
Minimum display class = __ __ __ __	**Minimum display class = __ __ __ __**
Maximum display class = __ __ __ __	**Maximum display class = __ __ __ __**

W O R K S H E E T

TEST K: DISPLAYABLE CLASS

PROMPT RESPONSES (continued):

Displayable class: (8000-7FFF) = __ __ __ __

Test number = __ __ __ __

CONSOLE MESSAGES:

Test K writes no console messages. The test program displays the selected acceptance tests on the Ramtek screen if the displayable class falls within a specified display class range. Refer to chapter 4 to check the acceptance test plate. Note the Ramtek screen contents below:

_____

_____

_____

EXIT:

Press RETURN key on console keyboard.

WORKSHEET

TEST L: READ NORMAL-FORMAT PARAMETERS

ENTRY:

Test = L

PROMPT RESPONSES:

Operand flags: 1(OF1), 2(OF2), 3(OF1+OF2) = __

If operand flags = 1 or 3: **Operand flag word 1 = __ __ __ __**

If operand flags = 2 or 3: **Operand flag word 2 = __ __ __ __**

CONSOLE MESSAGES:

If the input value for the operand flag word 2 prompt is greater than 003F, test L writes the following message on the console screen:

Illegal bit in flag word

If the above message occurs, check the value for operand flag word 2. If the correct value is greater than 003F, note the occurrence of the above message message and exit the test by pressing the ESC (ESCAPE) key. If the value is less than 0040, enter the correct value in response to the reissued prompt.

If test L writes the message below in the console screen, fill in the values in the appropriate spaces:

At buffer address __ __ __ __

Data read from RAMTEK __ __ __ __ should be __ __ __ __

The test program writes the message below for each pass:

End of pass

Test L continues executing until you exit manually. Record the number of times the test program writes the end of pass message before you exit: __ __ __

EXIT:

Press RETURN key on console keyboard.

W O R K S H E E T

TEST M: ALLOCATE MEMORY

ENTRY:

Test = M

PROMPT RESPONSES:

Test M has no prompts for input data.

CONSOLE MESSAGES:

Test M writes the following message on the console screen after allocating display list memory. Record the value written:

There are __ __ __ __ pages of memory available

EXIT:

Test M automatically exits at end of test.

W O R K S H E E T

TEST N: DISPLAY LIST READ BACK

ENTRY:

Test = N

PROMPT RESPONSES:

Display list number: (0000-001F) or LF(common) = __

Number of 4K-byte blocks (1-4) = __ __ __ __

Reverse packing (Y/N)? __ __ __ __

CONSOLE MESSAGES:

If test N writes the message below on the console screen, fill in the values in the appropriate spaces:

At buffer address __ __ __ __

Data read from RAMTEK __ __ __ __ should be __ __ __ __

The test program writes the message below for each pass:

End of pass

Test N continues executing until you exit manually. Record the number of times the test program writes the end of pass message before you exit: __ __ __

EXIT:

Press RETURN key on console keyboard.

W O R K S H E E T

TEST 0: DISPLAY LIST READ BACK (RM-9460 with MC68000 system processor only)

ENTRY:

Test = 0

PROMPT RESPONSES:

Source MCP (0-7) = __

Source MCP group (0-7) = __

Destination MCP (0-7) = __

Destination MCP group (0-7) = __

CONSOLE MESSAGES:

Test 0 writes no console messages. The test program displays a test plate on the Ramtek screen. Refer to chapter 3 to check the test plate. Note the Ramtek screen contents below:

_____

_____

_____

EXIT:

Press RETURN key on console keyboard.

WORKSHEET

TEST S: MEMORY PLANE INDEPENDENCE

ENTRY:

Test = S

PROMPT RESPONSES:

Number of video lookup tables (1-8) = __

Lookup table number (0-7) = __

Video type: 0(V2), 1(V7), 2(V8), 3(V12) = __

CONSOLE MESSAGES:

Test S writes the following message on the console screen:

	VLT bit color assignments					
	blu	grn	cyn	red	mag	yel
Full intensity	0	1	2	3	4	5
1/3 intensity	6	7	8	9	10	11

The test program also displays a table on the Ramtek screen. Fill in the MCP and GRP numbers and the color values for each memory plane number shown in the Ramtek screen display. Use the color abbreviations from the above table (blu, grn, cyn, ..., 1/3 blu, 1/3 grn, 1/3 cyn, ...) or gry for grey.

MCP	GRP	MEMORY PLANES															
		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
__	__	__	__	__	__	__	__	__	__	__	__	__	__	__	__	__	__
__	__	__	__	__	__	__	__	__	__	__	__	__	__	__	__	__	__
__	__	__	__	__	__	__	__	__	__	__	__	__	__	__	__	__	__
__	__	__	__	__	__	__	__	__	__	__	__	__	__	__	__	__	__
__	__	__	__	__	__	__	__	__	__	__	__	__	__	__	__	__	__

EXIT:

Press RETURN key on console keyboard.

WORKSHEET

TEST T: **TRENDING**

ENTRY:

Test = I

PROMPT RESPONSES:

Number of lines (0001-0010 hex.) = __ __ __ __

Number of points (0001-0200 hex.) = __ __ __ __

Set line pattern (Y/N)? __

If response to above prompt is Y , enter one line of data for each of the number of lines specified in the number of lines prompt:

Pattern, size/repeat, foreground, background for:

Line 01 =	__ __ __ __	__ __ __ __	__ __ __ __	__ __ __ __
Line 02 =	__ __ __ __	__ __ __ __	__ __ __ __	__ __ __ __
Line 03 =	__ __ __ __	__ __ __ __	__ __ __ __	__ __ __ __
Line 04 =	__ __ __ __	__ __ __ __	__ __ __ __	__ __ __ __
Line 05 =	__ __ __ __	__ __ __ __	__ __ __ __	__ __ __ __
Line 06 =	__ __ __ __	__ __ __ __	__ __ __ __	__ __ __ __
Line 07 =	__ __ __ __	__ __ __ __	__ __ __ __	__ __ __ __
Line 08 =	__ __ __ __	__ __ __ __	__ __ __ __	__ __ __ __
Line 09 =	__ __ __ __	__ __ __ __	__ __ __ __	__ __ __ __
Line 10 =	__ __ __ __	__ __ __ __	__ __ __ __	__ __ __ __
Line 11 =	__ __ __ __	__ __ __ __	__ __ __ __	__ __ __ __
Line 12 =	__ __ __ __	__ __ __ __	__ __ __ __	__ __ __ __
Line 13 =	__ __ __ __	__ __ __ __	__ __ __ __	__ __ __ __
Line 14 =	__ __ __ __	__ __ __ __	__ __ __ __	__ __ __ __
Line 15 =	__ __ __ __	__ __ __ __	__ __ __ __	__ __ __ __

W O R K S H E E T

TEST T: TRENDING

PROMPT RESPONSES (continued):

Line 16 = __ __ __ __ __ __ __ __ __ __ __ __ __ __ __ __

Perpendicular resolution = __ __ __ __

Start coord.,spacing,start time,display points,mode =

__ __ __ __ __ __ __ __ __ __ __ __ __ __ __ __ __ __ __ __

Test T displays the specified trend lines on the Ramtek screen, then issues the following prompt:

Update: D(display), R(reinit trend lines),
U(update after 1st display), CR(continuous) = __

Response to the update prompt causes one of the following actions:

Response	Test T Action
D	Issues another trend data prompt - enter data on new work sheet
R	Issues another trend line prompt - enter data on new work sheet
U	Updates the trend lines and issues another update prompt
RETURN	Continuously updates the trend lines

CONSOLE MESSAGES:

If test T writes any of the messages below on the console screen, record their occurrence:

Display trend error _____

Trend allocate error _____

Trend data initialize error _____

Trend data update error _____

Trend line pattern init error _____

EXIT:

If you are in continuous update mode, press RETURN key on console keyboard. Otherwise, press RETURN key on console keyboard twice in rapid succession.

WORKSHEET

TEST V: VIDEO RAMPING

ENTRY:

Test = V

PROMPT RESPONSES:

Lookup table number (0-7) = __

Video type: 0(V2), 1(V7A), 2(V7B), 3(V8), 4(V12A), 5(V12B) = __

If video type = 0: **V2: 0(8 bit updown), 1(8 bit stepper), 2(4 bit updown) = __**

If video type = 2: **V7B: 0(8 bit updown), 1(8 bit stepper) = __**

If video type = 3: **V8: 0(2 bit updown), 1(8 bit updown blink) = __**

If video type = 5: **V12B: 0(8 bit updown), 1(8 bit stepper) = __**

Low or high 8 bits (L/H)? __

CONSOLE MESSAGES:

After test V displays the test pattern in upper left hand corner of the Ramtek screen, the test program writes the following message on the console screen:

Ramping done

Record description of test pattern on the Ramtek screen:

_____

_____

_____

EXIT:

Press RETURN key on console keyboard.

W O R K S H E E T

TEST .A: RAMTEK USER-CONTROL ROUTINE

ENTRY:

Test = .A

PROMPT RESPONSES:

Test .A has no prompts for input data. Begin entering commands once you have typed .A on console keyboard.

	Command	Operand (Hex.)		Command	Operand (Hex.)		Command	Operand (Hex.)
1.	__	__ __ __ __	11.	__	__ __ __ __	21.	__	__ __ __ __
2.	__	__ __ __ __	12.	__	__ __ __ __	22.	__	__ __ __ __
3.	__	__ __ __ __	13.	__	__ __ __ __	23.	__	__ __ __ __
4.	__	__ __ __ __	14.	__	__ __ __ __	24.	__	__ __ __ __
5.	__	__ __ __ __	15.	__	__ __ __ __	25.	__	__ __ __ __
6.	__	__ __ __ __	16.	__	__ __ __ __	26.	__	__ __ __ __
7.	__	__ __ __ __	17.	__	__ __ __ __	27.	__	__ __ __ __
8.	__	__ __ __ __	18.	__	__ __ __ __	28.	__	__ __ __ __
9.	__	__ __ __ __	19.	__	__ __ __ __	29.	__	__ __ __ __
10.	__	__ __ __ __	20.	__	__ __ __ __	30.	__	__ __ __ __

CONSOLE MESSAGES:

If test .A writes the following message on the console screen:

Bad command selection

verify correct entry of data. If you entered data correctly, record command and operand that caused the test program to write message.

Command = __ Operand = __ __ __ __

WORKSHEET

TEST .A: RAMTEK USER-CONTROL ROUTINE

Record Ramtek screen and console screen results of above commands:

_____

_____

_____

_____

_____

EXIT:

Type the command E to exit. If you are in repeat-execution mode (command I, operand E), press RETURN key on the console keyboard.

W O R K S H E E T

TEST .B: INTERFACE REGISTER (DRST)

ENTRY:

Test = .B

PROMPT RESPONSES:

Test .B has no prompts for input data.

CONSOLE MESSAGES:

If test .B writes one of the messages below on the console screen, fill in the values in the appropriate spaces:

Word count __ __ __ __ should be __ __ __ __

Bus address __ __ __ __ should be __ __ __ __

Status __ __ __ __ should be __ __ __ __

EXIT:

Test .B automatically exits at end of test.

W O R K S H E E T

TEST .D: FULL SCREEN IMAGE WRITE/READ

ENTRY:

Test = .D

PROMPT RESPONSES:

MCP number (0-7) = __

MCP group number (0-7) = __

Memory plane mask = __ __ __ __

CONSOLE MESSAGES:

Record the values as test .D writes the messages below:

Writing __ __ __ __	Writing __ __ __ __ .....
Reading __ __ __ __	Reading __ __ __ __ .....
Writing __ __ __ __	Writing __ __ __ __ .....
Reading __ __ __ __	Reading __ __ __ __ .....
Writing __ __ __ __	Writing __ __ __ __ .....
Reading __ __ __ __	Reading __ __ __ __ .....
Writing __ __ __ __	Writing __ __ __ __ .....
Reading __ __ __ __	Reading __ __ __ __ .....
End of pass __ __ __ __	End of pass __ __ __ __

WORKSHEET

TEST .D: FULL SCREEN IMAGE WRITE/READ

Writing __ __ __ __	.....	Writing __ __ __ __	.....
Reading __ __ __ __	.....	Reading __ __ __ __	.....
Writing __ __ __ __	.....	Writing __ __ __ __	.....
Reading __ __ __ __	.....	Reading __ __ __ __	.....
Writing __ __ __ __	.....	Writing __ __ __ __	.....
Reading __ __ __ __	.....	Reading __ __ __ __	.....
Writing __ __ __ __	.....	Writing __ __ __ __	.....
Reading __ __ __ __	.....	Reading __ __ __ __	.....
End of pass __ __ __ __		End of pass __ __ __ __	

If test .D writes the message below on the console screen, fill in the values in the appropriate spaces:

At line __ __ __ __ element __ __ __ __

Data read from RAMTEK __ __ __ __ should be __ __ __ __

EXIT:

Press RETURN key on console keyboard.

W O R K S H E E T

TEST .G: MCP/GROUP SELECTION

ENTRY:

Test = .G

PROMPT RESPONSES:

MCP select mask (0001-00FF) = __ __ __ __

Test .G prompts for a group select mask for each MCP specified in the MCP select mask prompt:

Group select mask for MCP 0000 (0001-00FF) = __ __ __ __

Group select mask for MCP 0001 (0001-00FF) = __ __ __ __

Group select mask for MCP 0002 (0001-00FF) = __ __ __ __

Group select mask for MCP 0003 (0001-00FF) = __ __ __ __

Group select mask for MCP 0004 (0001-00FF) = __ __ __ __

Group select mask for MCP 0005 (0001-00FF) = __ __ __ __

Group select mask for MCP 0006 (0001-00FF) = __ __ __ __

Group select mask for MCP 0007 (0001-00FF) = __ __ __ __

CONSOLE MESSAGES:

Test .G writes no console messages.

EXIT:

Test .G automatically exits at end of test.

W O R K S H E E T

TEST .I: INDIVIDUAL MEMORY PLANE SCROLL (RM-9400 with ISCROLL memory only)

ENTRY:

Test = .I

PROMPT RESPONSES:

MCP select mask (0001-00FF) = __ __ __ __

Group select mask (0001-00FF) = __ __ __ __

Plane select mask (0001-00FF) = __ __ __ __

Test number = __ __ __ __

CONSOLE MESSAGES:

Test .I writes no console messages. The test program displays the selected acceptance test on the Ramtek screen and performs manipulations on the test image. Refer to chapter 4 to check the acceptance test image, then describe the results of the test image manipulations in the space below:

_____

_____

_____

_____

EXIT:

Test .I automatically exits at end of test.

W O R K S H E E T

TEST .R: ENABLE/DISABLE RESET

ENTRY:

Test = .R

PROMPT RESPONSES:

GPIF reset between tests (Y/N)? __

CONSOLE MESSAGES:

Test .R writes no console messages.

EXIT:

Test .R automatically exits at end of test.

W O R K S H E E T

TEST .T: TRANSFER MODE SELECTION

ENTRY:

Test = .T

PROMPT RESPONSES:

Transfer mode: P(program) or D(DMA) = __

CONSOLE MESSAGES:

Test .T writes no console messages.

EXIT:

Test .T automatically exits at end of test.