

*Wade*

---

# DS990 System Model 1 Field Maintenance Test Operating Procedures

---



• Part No. 2262570-9701 \*A  
1 November 1979

---

# TEXAS INSTRUMENTS

We put computing within everyone's reach.

---

© Texas Instruments Incorporated 1979

All Rights Reserved, Printed in U.S.A.

The information and/or drawings set forth in this document and all rights in and to inventions disclosed herein and patents which might be granted thereon disclosing or employing the materials, methods, techniques or apparatus described herein, are the exclusive property of Texas Instruments Incorporated.

## MANUAL REVISION HISTORY

DS990 System Model 1 Field Maintenance Test Operating Procedures (2262570-9701)

Original Issue ..... 15 February 1979

Revised ..... 1 November 1979 (MCR 000249)



## TABLE OF CONTENTS

<u>Paragraph</u>	<u>Title</u>	<u>Page</u>
SECTION I. INTRODUCTION		
1.1	General . . . . .	5
1.1.1	Diskette Loading Procedure . . . . .	5
1.1.2	Write-Protect Feature . . . . .	7
1.2	Program Loading . . . . .	7
1.3	Test Procedure Example . . . . .	10
SECTION II. DS990/1 FMT PROCEDURES		
2.1	General . . . . .	13
2.2	Memory Test Group . . . . .	13
2.2.1	Test 1 - Marching Ones and Zeros . . . . .	14
2.2.2	Test 2 - Parity . . . . .	15
2.2.3	Test 3 - Checkerboard . . . . .	15
2.2.4	Test 4 - Galloping Ones and Zeros . . . . .	16
2.2.5	Test 5 - ROM Memory . . . . .	17
2.3	VDU Screen Test Group . . . . .	18
2.3.1	Test 1 - Barber Pole . . . . .	18
2.3.2	Test 2 - Screen Disable . . . . .	19
2.3.3	Test 3 - Dual Intensity . . . . .	20
2.3.4	Test 4 - Cursor . . . . .	21
2.3.5	Test 5 - Cursor Reverse Video . . . . .	22
2.3.6	Test 6 - Graph Set . . . . .	22
2.4	Keyboard Test Group . . . . .	23
2.4.1	Test 1 - Key Code . . . . .	24
2.4.2	Test 2 - "N" Key Rollover . . . . .	25
2.4.3	Test 3 - Buffer and Overflow . . . . .	26
2.4.4	Test 4 - LED Indicator . . . . .	27
2.5	Floppy Test Group . . . . .	28
2.5.1	Test 1 - Floppy General Test . . . . .	29
2.5.2	Test 2 - Format Disk . . . . .	32
2.5.3	Test 3 - Read . . . . .	33
2.5.4	Test 4 - Write . . . . .	33
2.5.5	Test 5 - Input Write Buffer . . . . .	33
2.5.6	Test 6 - Select . . . . .	34
2.5.7	Test 7 - Special Commands . . . . .	34
2.5.7.1	Special Test 1 - Seek-to-Track . . . . .	34
2.5.7.2	Special Test 2 - Load Head . . . . .	35
2.5.7.3	Special Test 3 - Write All Ones . . . . .	35
2.5.7.4	Special Test 4 - Show SCB . . . . .	35
2.5.7.5	Special Test 5 - Off Track Test . . . . .	36
2.6	Communications Test Group . . . . .	36
2.6.1	Test 1 - Controller Loopback Test . . . . .	37
2.6.2	Test 2 - Modem Loopback Test . . . . .	37
2.6.3	Test 3 - ACU Interface Test . . . . .	38



TABLE OF CONTENTS (Continued)

<u>Paragraph</u>	<u>Title</u>	<u>Page</u>
2.6.4	Test 4 - Auto Answer Performance Test . . . . .	40
2.6.5	Test 5 - Special Option Menu . . . . .	41
2.6.5.1	Special Option One - One/Zero Pattern . . . . .	41
2.6.5.2	Special Option Two - Stop Between Blocks . . . . .	41
2.6.5.3	Special Option Three - No Stop On Errors . . . . .	41
2.7	Printer Test Group . . . . .	42
2.7.1	Test 1 - Carriage Return . . . . .	42
2.7.2	Test 2 - Line Feed . . . . .	44
2.7.3	Test 3 - Column Repeatability . . . . .	45
2.7.4	Test 4 - Backspace . . . . .	45
2.7.5	Test 5 - Printhead Elements . . . . .	45
2.7.6	Test 6 - Barber Pole . . . . .	46
2.8	Optional Communications Test Group . . . . .	47
2.8.1	Test 1 - Controller Loopback Test . . . . .	48
2.8.2	Test 2 - Printer Test . . . . .	48

SECTION III. TROUBLESHOOTING

3.1	General . . . . .	49
-----	-------------------	----

APPENDIXES

<u>Appendix</u>	<u>Title</u>	<u>Page</u>
A	Attaching External Equipment . . . . .	A-1

LIST OF ILLUSTRATIONS

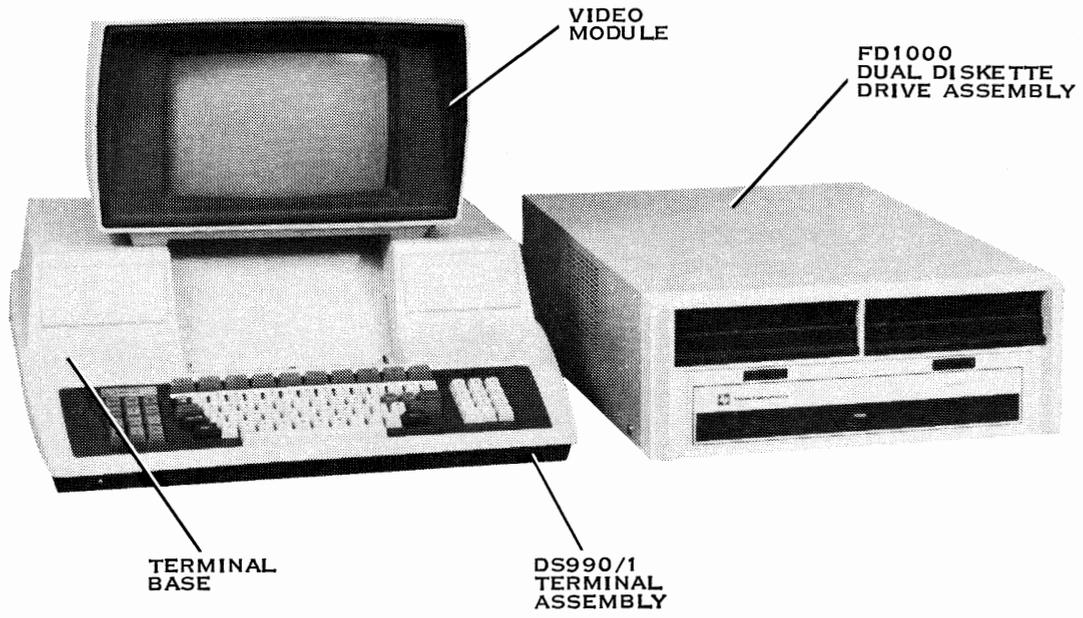
<u>Figure</u>	<u>Title</u>	<u>Page</u>
1-1	DS990/1 Intelligent Terminal System . . . . .	4
1-2	DS990/1 Keyboard . . . . .	6
1-3	Loading the Diskette . . . . .	7
1-4	Diskette Write-Protect Methods . . . . .	8
2-1	Barber Pole Test Pattern . . . . .	20
2-2	Graph Set Test Pattern Display . . . . .	23
2-3	Printout Generated by Carriage Return Test . . . . .	43
2-4	Printout Generated by Line Feed Test . . . . .	44
2-5	Printout Generated by Column Repeatability Test . . . . .	45
2-6	Printout Generated by Backspace Test . . . . .	45
2-7	Printout Generated by Printhead Elements Test . . . . .	46
2-8	Printout Generated by Barber Pole Test . . . . .	47
2-9	Characters Resulting from Incorrect Parity Setting. . . . .	48



TABLE OF CONTENTS (Continued)

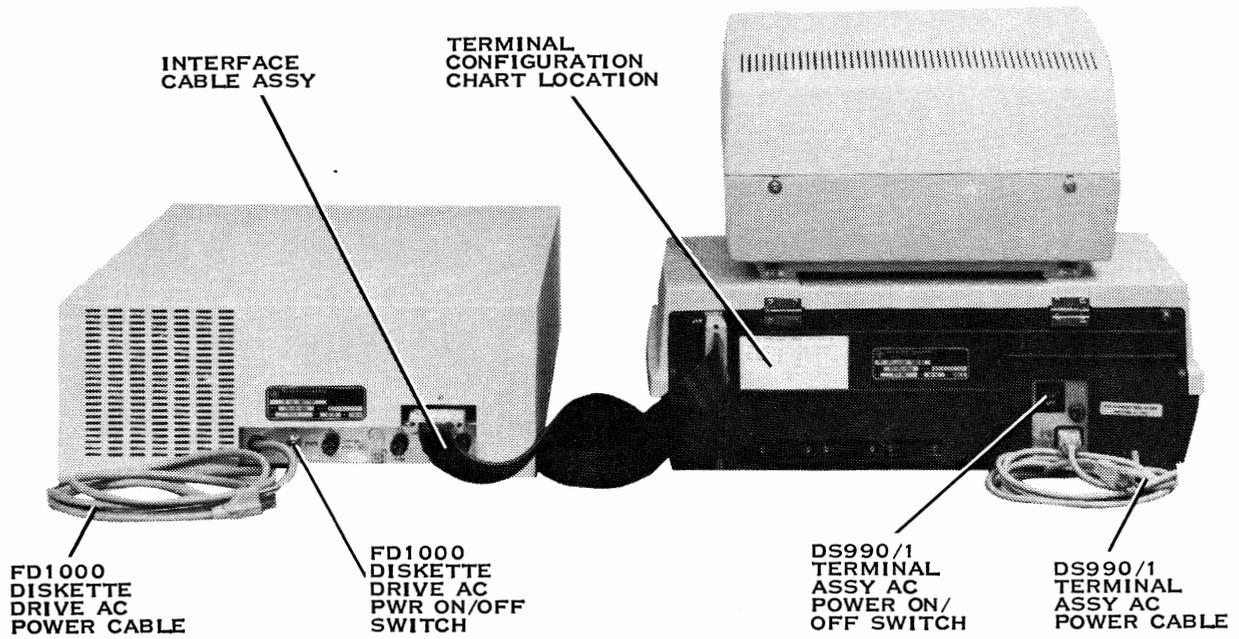
LIST OF TABLES

<u>Table</u>	<u>Title</u>	<u>Page</u>
3-1	Floppy Disk Test Group Error Codes . . . . .	50
3-2	Communications Test Group Error Codes . . . . .	52
3-3	Optional Communications Test Group Error Codes . .	57



(771-578-48-12)

FRONT VIEW



(771-578-48-15)

REAR VIEW

(A) 139381

Figure 1-1. DS990/1 Intelligent Terminal System



## SECTION I

### INTRODUCTION

#### 1.1 GENERAL

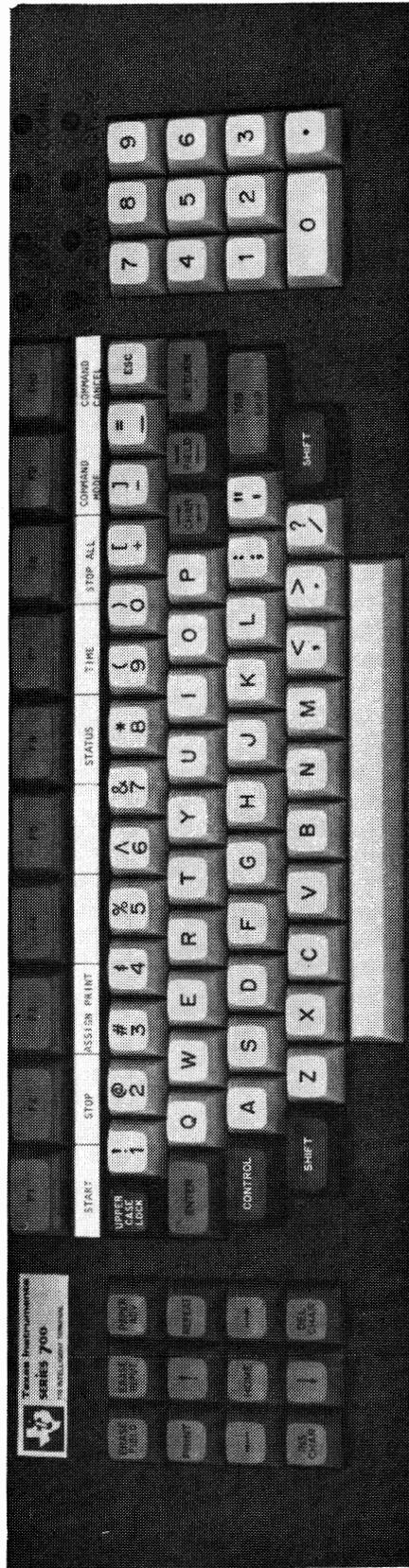
The purpose of this manual is to describe the loading and general operating procedures for the DS990 Model 1 (DS990/1) Field Maintenance Test (FMT). Refer to figure 1-1 for front and rear views of the DS990/1 system and to figure 1-2 for a view of the keyboard.

The DS990/1 system consists of one DS990/1 terminal assembly and one or two FD1000 diskette drive assemblies. Each FD1000 assembly may contain one or two double-sided, double-density (DSDD) diskette drives. One DS990/1 system has a capacity of from 1 to 4 DSDD diskette drives. The DSDD diskette drive may use single-sided (SS) or double-sided (DS) diskettes during normal operation.

The DS990/1 FMT is a comprehensive set of hardware diagnostics designed to assist in DS990/1 system installation checkout or fault isolation. For simplicity, the DS990/1 FMT is divided into seven major test groups. Each test group corresponds to a major assembly configured in the DS990/1 system. Each test group and individual test within a test group is operator-selectable and may be terminated at any time. The seven major test groups are as follows:

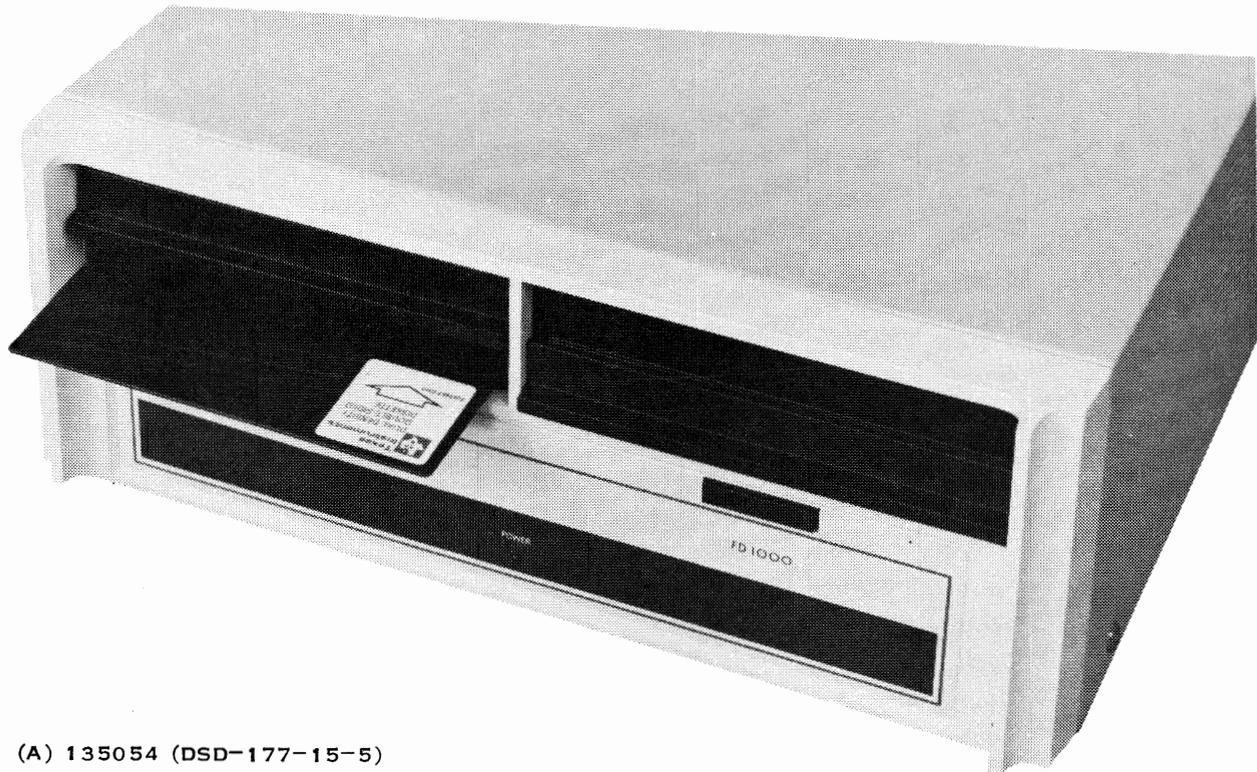
- Memory
- VDU screen
- Keyboard
- Floppy (DSDD diskette drive)
- Communications
- Printer (thermal)
- Optional communications.

1.1.1 DISKETTE LOADING PROCEDURE. The diskette drive unit has a latch release just below the door. Pressing this latch release opens the door so that the diskette can be inserted. To load the diskette, press the latch release, remove the diskette from its envelope and insert the diskette into the slot with the diskette label facing up so that the read/write access slot is inserted first into the disk drive opening, figure 1-3. Fully insert the diskette until the eject spring is latched. Press downward on the door, clamping the diskette into position on the spindle. The diskette can be loaded or unloaded with power on and drive spindle rotating.



(A) 139382 (771-528-48-7)

Figure 1-2. DS990/1 Keyboard



(A) 135054 (DSD-177-15-5)

Figure 1-3. Loading the Diskette

1.1.2 WRITE-PROTECT FEATURE. A diskette can be write-protected by means of a hole or notch at the edge of the diskette jacket near the read/write access slot as shown in figure 1-4. When this hole or notch is open, the diskette is write protected and recording cannot take place on it. When the write operation is to be performed, the hole is closed by placing a tab or tape over it. Note that some diskettes are not supplied with write-protect holes or tabs.

## 1.2 PROGRAM LOADING

The DS990/1 terminal executive program must be loaded into the DS990/1 memory before the FMT program can be loaded and executed. These two programs are on the FMT double-sided (DS) diskette and are loaded as follows:

### NOTE

The DS990/1 terminal executive program on the FMT DS diskette must be used with the FMT program to ensure proper operation of the FMT procedures. Make sure the FMT DS diskette is the double-sided version by checking the label on the diskette.

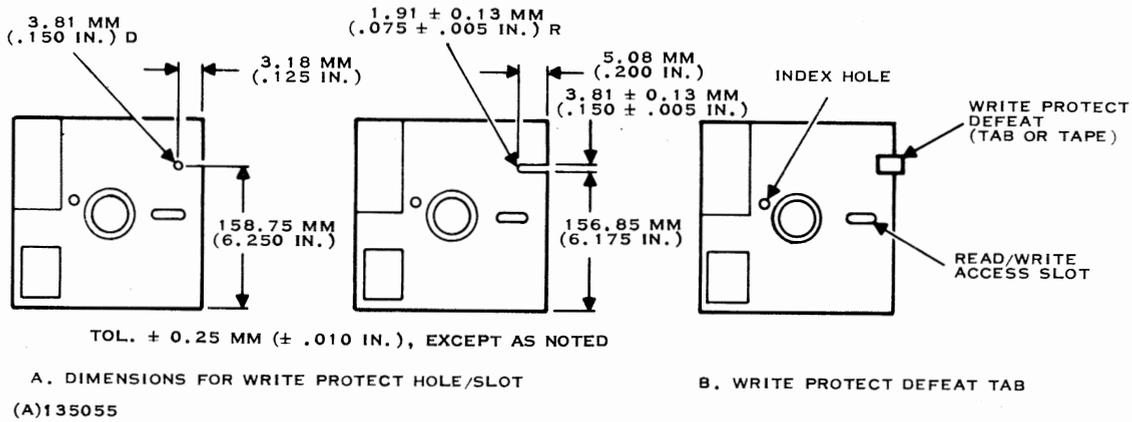


Figure 1-4. Diskette Write Protect Methods

1. Check that the ac power ON/OFF switch on the rear of the dual diskette drive is ON.
2. Set the ac power ON/OFF switch on the rear of the DS990/1 terminal assembly to OFF then to ON. This will ensure that the DS990/1 memory is cleared.
3. Insert the FMT DS diskette into any diskette drive. The DS990/1 terminal executive program will immediately begin loading into the DS990/1 memory. This loading process will take approximately 15 seconds. When the loading process is completed, the following message will be displayed in the lower right-hand corner of the VDU:

DS990/1 SYSTEM READY

4. Depress the F9 key and observe the following prompt on the VDU:

OP: #

NOTE

The position of the cursor is indicated by #.



5. Depress the F1 key and observe the following prompt on the VDU:

OP: START PROGRAM NAME: #\_\_\_\_ VOLUME: \_\_\_\_

6. Enter the letters FMT. Press the SKIP key and observe the following prompt on the VDU:

OP: START PROGRAM NAME: FMT\_\_\_\_ VOLUME: #\_\_\_\_

7. Load the FMT program into the DS990/1 memory using one of the following methods:

- a. If the FMT DS diskette is in diskette drive DS01, press the SKIP key.
- b. Enter the diskette drive identifier (DS01, DS02, DS03, or DS04) that has the FMT DS diskette. Then press the SKIP key.
- c. Enter FMTC for the volume name and press the SKIP key.

The FMT program will immediately begin loading into the DS990/1 memory. This loading process will take approximately 10 seconds. When the loading process is completed, the following menu listing all test groups will be displayed on the VDU:

DS990/1 FIELD MAINTENANCE TEST V1.0

SELECT TEST #\_\_

1. MEMORY
2. VDU SCREEN
3. KEYBOARD
4. FLOPPY
5. COMMUNICATIONS
6. PRINTER
7. OPTIONAL COMMUNICATIONS

NOTE

V1.0 indicates version 1.0 of the FMT program was loaded from the FMT DS diskette. If a different version is used, the version number will change.

The FMT program is now loaded into the DS990/1 memory and the FMT DS diskette may be removed from the diskette drive if desired.



### 1.3 TEST PROCEDURE EXAMPLE

The following procedure is an example of how to select a test group, a test within this test group, and how then to perform the test. Any test group and any test within that group may be selected as desired. This example will select the VDU screen test group and the SCREEN DISABLE test within this test group. This example also assumes that the program loading instructions in paragraph 1.2 have been performed. The example procedure is as follows:

1. Depress the 2 key and observe the following menu of all test groups on the VDU:

DS990/1 FIELD MAINTENANCE TEST V1.0

SELECT TEST 2 # \_\_

1. MEMORY
2. VDU SCREEN
3. KEYBOARD
4. FLOPPY
5. COMMUNICATIONS
6. PRINTER
7. OPTIONAL COMMUNICATIONS

2. Depress the SKIP key and observe the following menu of the VDU SCREEN test group on the VDU:

DS990/1 FIELD MAINTENANCE TEST V1.0  
VDU SCREEN TEST

SELECT TEST # \_\_ DEPRESS "F1" TO RESTART FMT

TABLE OF TEST

1. BARBER POLE
2. SCREEN DISABLE
- \*3. DUAL INTENSITY
4. CURSOR
5. CURSOR REVERSE VIDEO
6. GRAPH SET
- A. ALL THE ABOVE

\*INVALID FOR JAPANESE DS990/1



3. Select the SCREEN DISABLE test by entering a 2 and then depressing the SKIP key. Observing the following display of the operator instructions for the SCREEN DISABLE test on the VDU:

SCREEN DISABLE TEST

CHECK THAT THE ENTIRE SCREEN IS BLANK

DEPRESS "SKIP" KEY FOR PATTERN

DEPRESS "SKIP" KEY FOR NEXT TEST

NOTE

Operator instructions for each test within a test group will be displayed on the VDU prior to test execution. Most tests will require operator intervention for execution. Some tests will execute immediately upon selection.

4. Depress the SKIP key. The test will execute and the entire VDU should be blank.

NOTE

Following each test execution, the test results will be displayed on the VDU. Visual inspection is required for such tests groups as the VDU SCREEN and the PRINTER (thermal). Detailed inspection instructions for each test group are discussed in Section II of this manual.

5. Depress the SKIP key. The VDU SCREEN test group shown in step 2 will be displayed on the VDU.
6. Select another test in the VDU SCREEN test group or another test group by using one of the following methods:
  - a. Select any test in the VDU SCREEN test group by entering the applicable test number or letter, and then by depressing the SKIP key. If the letter A is entered, all tests can be executed in succession by depressing the SKIP key for each test execution.
  - b. Select another test group by pressing the F1 key which will display the menu of all test groups on the VDU. Enter the applicable test group number as shown in step 1, then depress the SKIP key and make observations as shown in step 2.

NOTE

The DS990/1 memory will be cleared and the system will return to the condition specified in step 3 of the program loading instructions in paragraph 1.2. The operator must now reload the FMT program to continue testing.



Upon completion of tests 1 through 4, in order to escape from or to terminate these tests while in the memory test group, depress the F8 key.



## SECTION II

## DS990/1 FMT PROCEDURES

## 2.1 GENERAL

The DS990/1 FMT procedures are presented in this section under the major test groups listed in the following menu:

DS990/1 FIELD MAINTENANCE TEST V1.0

SELECT TEST #\_\_

1. MEMORY
2. VDU SCREEN
3. KEYBOARD
4. FLOPPY
5. COMMUNICATIONS
6. PRINTER
7. OPTIONAL COMMUNICATIONS

Detailed operating instructions are given for the tests in each test group procedure.

## 2.2 MEMORY TEST GROUP

When the memory test group is selected, the following menu will be displayed on the VDU. The five tests in the memory test group have been designed to check the integrity of the DS990/1 memory system. Tests 1 through 4 exercise RAM memory. Test 5 performs a bit-for-bit check of ROM memory (cyclic redundancy check).

DS990/1 FIELD MAINTENANCE TEST V1.0

MEMORY TEST

SELECT TEST #\_\_

DEPRESS "F1" TO RESTART FMT

TABLE OF TEST

1. MARCHING 1's & 0's
2. PARITY
3. CHECKERBOARD
- A ALL THE ABOVE
4. GALLOPING 1's & 0's
5. ROM TEST



RAM memory size is automatically determined by each RAM test and displayed on the VDU. This becomes the default amount of memory to be tested. The operator may modify the RAM memory size prior to test execution. Errors detected will be displayed on the VDU during test execution.

The RAM tests alter read/write memory. This necessitates reloading the FMT program to continue testing following RAM test execution. The ROM test does not require FMT program reloading following ROM test execution.

For routine troubleshooting, tests 1, 2, and 3 should be executed as a composite series of tests. This is accomplished by entering the letter A for test selection. Execution time for these tests is approximately two seconds per 8K bytes of memory tested. Test 4 is an extensive RAM test requiring 10 minutes per 8K bytes of memory tested. Test 4 should be executed only if memory problems are suspected and are not detected by tests 1, 2, and 3.

The following operating instructions assume the memory test group has been selected and the memory test group menu is displayed on the VDU screen. Installed RAM for the examples is 64K bytes.

#### NOTE

To continuously repeat any test, depress the R key prior to entering a test number, for example R1, RA, etc.

2.2.1 TEST 1 – MARCHING ONES AND ZEROS. Perform the marching ones and zeros test as follows:

1. Depress the 1 key.
2. Depress the SKIP key and observe the following error logging display on the VDU:

MEMORY TO TEST 64K BYTES

READ/WRITE ERRORS

ADDRESS CONTENTS EXPECTED ADDRESS CONTENTS EXPECTED

PARITY

PC WP PC WP PC WP PC WP PC WP



3. The amount of memory to be tested is entered via a two digit code corresponding to the amount of memory in K bytes to be tested (01, 02, 07, etc.). Default value is maximum memory installed (64K bytes).
4. Depress the SKIP key. Test execution will begin.

NOTE

Flashing patterns and illumination on the lower half of the screen during RAM test execution is the result of screen RAM memory testing. This is a normal condition and does not constitute a hardware failure.

5. If a read/write error is detected, the memory location, contents, and the expected pattern will be on display on the screen. After six read/write errors, the test will stop. If a parity error occurs, the program counter (PC) and workspace pointer (WP) will be displayed. After five parity errors occur, the test will halt.
6. After completion of the test, the message **\*\*\*DONE\*\*\*** will be displayed in the upper right-hand corner of the VDU.
7. To terminate or escape from this test (after completion of this test), depress the F8 key. The DS990/1 memory will be cleared and the system will return to the condition specified in step 3 of the loading instructions in paragraph 1.2.

NOTE

If continued testing is required, reload the FMT program.

2.2.2 TEST 2 – PARITY. Operating procedures and error logging are identical to test 1 except that in step 1, the 2 key is depressed.

2.2.3 TEST 3 – CHECKERBOARD. Operating procedures and error logging are identical to test 1 except that in step 1, the 3 key is depressed.

NOTE

To execute test 1, test 2 and test 3 in sequence, follow the operating instructions for test 1 except enter the letter A in step 1.



2.2.4 TEST 4 – GALLOPING ONES AND ZEROS. This extensive RAM test requires approximately 2 minutes per 2K bytes of memory tested. Perform the galloping ones and zeros test as follows:

1. Depress the 4 key.
2. Depress the SKIP key and observe the following error-logging display on the VDU:

START ADDRESS 03A0                      END ADDRESS FFFE

READ/WRITE ERRORS

ADDRESS CONTENTS EXPECTED ADDRESS CONTENTS EXPECTED

PARITY

PC WP    PC WP    PC WP    PC WP    PC WP

3. Enter the beginning memory test address. (The default beginning address is 03A0. It is located just above RAM memory used to generate the error-logging display.)
4. Depress the SKIP key.
5. Enter the highest order memory address to be tested.
6. Depress the SKIP key. Test execution will begin. The flashing cursor indicates the test is in progress.

NOTE

Flashing patterns and illumination on the lower half of the VDU screen during RAM test execution is the result of screen RAM memory testing. This is a normal condition and does not constitute a hardware failure.



7. Error logging is maintained during test execution. If a read/write error is detected, the memory location, contents and expected value will be displayed on the screen. After six read/write errors, the test will stop. If a parity error is detected, the PC and WP will be displayed. After five parity errors occur, the test will stop.
8. Upon test completion, the message **\*\*\*DONE\*\*\*** will be displayed on the screen.
9. To terminate or to escape from this test (after completion of the test), press the F8 key. The DS990/1 memory will be cleared and the system will return to the condition specified in step 3 of the loading instructions in paragraph 1.2.

#### NOTE

If continued testing is required reload the terminal executive and the FMT program.

2.2.5 TEST 5 – ROM MEMORY. The ROM test performs a CRC check on system ROM memory. Execution time is approximately two seconds. Execution of the ROM test does not necessitate reloading of the FMT program to continue testing. Perform the ROM memory test as follows:

1. Depress the 5 key.
2. Depress the SKIP key. TEST IN PROGRESS will appear on the VDU as shown below:

DS990/1 FIELD MAINTENANCE TEST      V1.0

MEMORY TEST

SELECT TEST 5

TABLE OF TEST

1. MARCHING 1's & 0's
2. PARITY
3. CHECKERBOARD
- A ALL THE ABOVE
4. GALLOPING 1's & 0's
5. ROM TEST

TEST IN PROGRESS



3. Upon successful execution of the ROM test, the message "TEST PASS" will be displayed. If a ROM failure is detected, the message "TEST FAIL" and the beginning address of the defective ROM will be displayed.

## NOTE

If the DS990/1 under test contains no ROM, the message NO ROM PRESENT will be displayed when this test is selected.

4. To return to the major test group menu shown in paragraph 2.1, depress the F1 key shown in paragraph 2.1 when required.

## NOTE

Flashing patterns on lower portion of VDU during ROM test execution is a normal part of test execution and does not constitute test failure.

### 2.3 VDU SCREEN TEST GROUP

When the VDU screen test group is selected, the following menu will be displayed on the VDU:

DS990/1 FIELD MAINTENANCE TEST V1.0

VDU SCREEN TEST

SELECT TEST #\_\_

DEPRESS "F1" TO RESTART FMT

## TABLE OF TEST

1. BARBER POLE
2. SCREEN DISABLE
- \* 3. DUAL INTENSITY
4. CURSOR
5. CURSOR REVERSE VIDEO
6. GRAPH SET
- A ALL THE ABOVE

\*Invalid for Japanese DS990/1



All VDU screen tests are subjective and visual inspection is required to determine test results. Parameters such as linearity, character legibility, and stability of the display must be evaluated by the operator during each test. All tests are self-instructing with the operating instructions displayed on the VDU. When test A is entered and the SKIP key is depressed, each test will be executed in sequence following the depression of the SKIP key for each test execution.

2.3.1 TEST 1 – BARBER POLE. Perform the barber pole test as follows:

1. Depress the 1 key.
2. Depress the SKIP key and observe the following display on the VDU:

BARBER POLE TEST

CHECK THAT EACH CHR IS LEGIBLE, THAT EVERY CHR IS  
SHIFTED ONE COLUMN TO THE RIGHT OF THE CORRE-  
SPONDING CHR IN THE PREVIOUS LINE.

DEPRESS "SKIP" KEY FOR PATTERN

DEPRESS "SKIP" KEY FOR NEXT TEST.

3. Depress the SKIP key and observe the displayed pattern shown in figure 2-1 on the VDU.
4. Evaluate the displayed pattern on the VDU.
5. Depress the SKIP key or the F2 key to return to the VDU screen test group menu shown in paragraph 2.3.
6. Depress the F1 key to return to the major test group menu shown in paragraph 2.1 when required.

2.3.2 TEST 2 – SCREEN DISABLE. Perform the screen disable test as follows:

1. Depress the 2 key.
2. Depress the SKIP key and observe the following display on the VDU:

SCREEN DISABLE TEST

CHECK THAT THE ENTIRE SCREEN IS BLANK.

DEPRESS "SKIP" KEY FOR PATTERN.

DEPRESS "SKIP" KEY FOR NEXT TEST.



```

@ABCDEFGHIJKLMNPOQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~!"#$%&'()*+,-./0
Y@ABCDEFGHIJKLMNPOQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~!"#$%&'()*+,-./0
>Y@ABCDEFGHIJKLMNPOQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~!"#$%&'()*+,-./
=>Y@ABCDEFGHIJKLMNPOQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~!"#$%&'()*+,-.
<=>Y@ABCDEFGHIJKLMNPOQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~!"#$%&'()*+,-
; <=>Y@ABCDEFGHIJKLMNPOQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~!"#$%&'()*+
9: ; <=>Y@ABCDEFGHIJKLMNPOQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~!"#$%&'()*
89: ; <=>Y@ABCDEFGHIJKLMNPOQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~!"#$%&'()*
789: ; <=>Y@ABCDEFGHIJKLMNPOQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~!"#$%&'
6789: ; <=>Y@ABCDEFGHIJKLMNPOQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~!"#$%&'
56789: ; <=>Y@ABCDEFGHIJKLMNPOQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~!"#$%&'
456789: ; <=>Y@ABCDEFGHIJKLMNPOQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~!"#$%
3456789: ; <=>Y@ABCDEFGHIJKLMNPOQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~!"#$
23456789: ; <=>Y@ABCDEFGHIJKLMNPOQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~!"#
123456789: ; <=>Y@ABCDEFGHIJKLMNPOQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~!"
0123456789: ; <=>Y@ABCDEFGHIJKLMNPOQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~!"
/0123456789: ; <=>Y@ABCDEFGHIJKLMNPOQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~
./0123456789: ; <=>Y@ABCDEFGHIJKLMNPOQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}
-./0123456789: ; <=>Y@ABCDEFGHIJKLMNPOQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}
+,-./0123456789: ; <=>Y@ABCDEFGHIJKLMNPOQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}
*+,-./0123456789: ; <=>Y@ABCDEFGHIJKLMNPOQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}
)++,-./0123456789: ; <=>Y@ABCDEFGHIJKLMNPOQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}

```

(A) 139385

Figure 2-1. Barber Pole Test Pattern

3. Depress the SKIP key. Check that the VDU screen is blank. Any illumination of the screen (dots, characters) is considered to be a test failure.
4. Depress the SKIP key or the F2 key to return to the VDU screen test group menu shown in paragraph 2.3.
5. Depress the F1 key to return to the major test group menu shown in paragraph 2.1 when required.

2.3.3 TEST 3 – DUAL INTENSITY. Perform the dual intensity test as follows:

NOTE

The dual intensity test is invalid for the Japanese DS990/1.

1. Depress the 3 key.



2. Depress the SKIP key and observe the following display on the VDU:

DUAL INTENSITY

CHECK FOR DUAL INTENSITY, EVALUATE FOR  
HORIZONTAL AND VERTICAL LINEARITY OF LINES  
AND COLUMNS.

DEPRESS "SKIP" KEY FOR PATTERN.

DEPRESS "SKIP" KEY FOR NEXT TEST.

3. Depress the SKIP key. The screen should display the letter O in every character position. The borders and horizontal and vertical center lines should be at full intensity. The remaining portions (quadrants) of the screen should be at half intensity. Check screen pattern for horizontal and vertical linearity.
4. Depress the SKIP key or the F2 key to return to the VDU screen test group menu shown in paragraph 2.3.
5. Depress the F1 key to return to the major test group menu shown in paragraph 2.1 when required.

#### 2.3.4 TEST 4 – CURSOR. Perform the cursor test as follows:

1. Depress the 4 key.
2. Depress the SKIP key and observe the following display on the VDU:

CURSOR TEST

CHECK THAT THERE IS A "C" IN EVERY OTHER POSITION  
IN EVERY OTHER LINE.

CHECK THAT EACH CHARACTER IS LEGIBLE AND IS NOT  
IN REVERSE VIDEO.

DEPRESS "SKIP" KEY PATTERN

DEPRESS "SKIP" KEY FOR NEXT TEST.

3. Depress the SKIP key. The screen should display the letter C in every other character position on every other line. Check that each character is legible and not in reverse video.
4. Depress the SKIP key or the F2 key to return to the VDU screen test menu shown in paragraph 2.3.



2.3.5 TEST 5 – CURSOR REVERSE VIDEO. Perform the cursor reverse video test as follows:

1. Depress the 5 key.
2. Depress the SKIP key and observe the following display on the VDU:

CURSOR REVERSE VIDEO TEST

CHECK THAT THERE IS A "C" IN REVERSE VIDEO IN EVERY OTHER POSITION IN EVERY OTHER LINE AND EACH CHARACTER IS LEGIBLE.

DEPRESS "SKIP" KEY FOR PATTERN.

DEPRESS "SKIP KEY FOR NEXT TEST.

3. Depress the SKIP key. The screen should display the letter C in reverse video in every other character position on every other line. Check for character legibility.
4. Depress the SKIP key or the F2 key to return to the VDU screen test menu shown in paragraph 2.3.
5. Depress the F1 key to return to the major test group menu shown in paragraph 2.1 when required.

2.3.6 TEST 6 – GRAPH SET. Perform the graph set test as follows:

NOTE

This test is valid only if the graphic option ROMs, U14 and U15, are installed on the VDU controller board.

1. Depress the 6 key.
2. Depress the SKIP key and observe the following display on the VDU:

GRAPH SET TEST

DEPRESS "SKIP" KEY FOR PATTERN.

DEPRESS "SKIP" KEY FOR NEXT TEST.

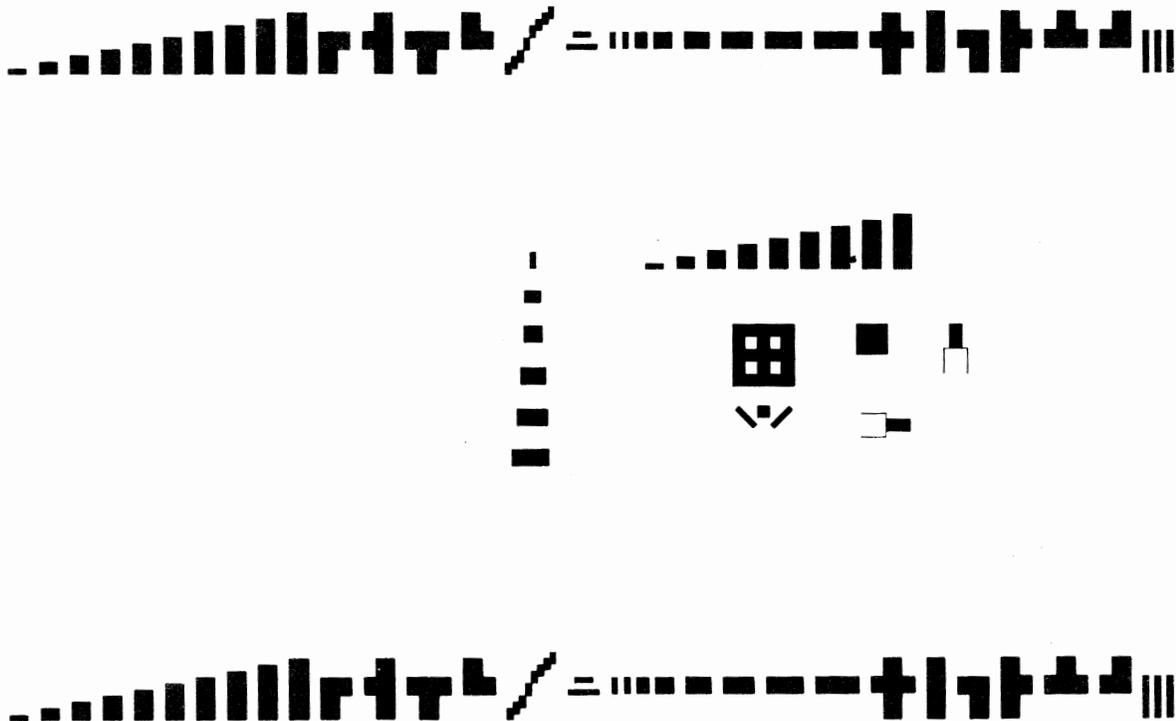
3. Depress the SKIP key. The patterns shown in figure 2-2 should be displayed. Missing patterns or partial patterns indicate a test failure.
4. Depress the SKIP key or the F2 key to return to the VDU screen test group menu shown in paragraph 2.3.



- 5. Depress the F1 key to return to the major test group menu shown in paragraph 2.1 when required.

NOTE

Graphic symbols are not decoded by the internal thermal printer. An asterisk character will be printed for each graphic symbol if a PRINT command is issued.



(B) 139386

Figure 2-2. Graph Set Test Pattern Display

2.4 KEYBOARD TEST GROUP

When the keyboard test group is selected, the following menu will be displayed on the VDU:

DS990/1 FIELD MAINTENANCE TEST V1.0

KEYBOARD TEST

SELECT TEST #\_\_

DEPRESS "F1" TO RESTART FMT

- 1. KEY CODE
- 2. "N" KEY ROLLOVER
- 3. BUFFER & OVERFLOW
- 4. LED INDICATOR
- A ALL TEST



These four tests are intended to verify the integrity of keyboard operation and keyboard indicator LEDs. Tests 2 and 3 will display a TEST PASS or TEST FAIL message on the VDU following execution. Test 4 is subjective and visual inspection is required to determine test results.

Each keyboard test requires manual intervention by the operator. All tests are self-instructing with the operating instructions displayed on the VDU. When test A is entered and the SKIP key is depressed, each test will be executed in sequence following depression of the SKIP key for each test execution.

2.4.1 TEST 1 – KEY CODE. This test checks each key switch on the keyboard. Perform the key code test as follows:

1. Release the UPPER CASE LOCK key.
2. Depress the 1 key.
3. Depress the SKIP key and observe the following display on the VDU:

DS990/1 FIELD MAINTENANCE TEST

KEYBOARD TEST

KEY CODE TEST

STARTING WITH "F1", DEPRESS EACH KEY FROM LEFT TO RIGHT, STARTING ON THE TOP ROW, THEN 2ND ROW, ETC.

4. Starting with the F1 key, depress each key from left to right starting with the first row, then the second row, etc. The space bar is the last key depressed during the test. After each key depression, the key detected will be displayed on the screen. If errors are detected, the display shown below will appear on the VDU:

DS990/1 FIELD MAINTENANCE TEST

KEYBOARD TEST

KEY CODE TEST

STARTING WITH "F1," DEPRESS EACH KEY FROM LEFT TO RIGHT, STARTING ON THE TOP ROW, THEN 2nd ROW, ETC.

KEY DETECTED F9

KEY EXPECTED F1

RESTART WITH KEY F1



## NOTE

The error condition in this example was the detection of the F9 key code instead of the expected F1 key code. If the error condition is actually caused by operator error (depressing the wrong key), restart with the key indicated on the screen. This will clear the error condition and allow the test to continue with the next key in sequence.

5. Depress the F2 key twice to terminate or to escape the test, and return to the keyboard test menu.
6. Depress the F1 key to return to the major test group menu shown in paragraph 2.1 when required.

2.4.2 TEST 2 – "N" KEY ROLLOVER. This test checks the ability of the keyboard to detect more than two keys depressed. Perform the N key rollover test as follows:

1. Depress the 2 key.
2. Depress the SKIP key and observe the following display on the VDU:

DS990/1 FIELD MAINTENANCE TEST

KEYBOARD TEST

"N" KEY ROLLOVER TEST

DEPRESS & HOLD A

DEPRESS & HOLD S

DEPRESS & HOLD D

RELEASE D

RELEASE S

RELEASE A

DEPRESS SKIP

3. Depress and hold the A key.
4. Depress and hold the S key while holding the A key.



5. Depress and hold the D key while holding the A and S keys.
6. Release D, then S, then release A.
7. Depress the SKIP key. The message TEST PASS or TEST FAIL will be displayed.
8. Depress the SKIP key or the F2 key to terminate or to escape this test and return to the keyboard test menu.
9. Depress the F1 key to return to the major test group menu shown in paragraph 2.1 when required.

2.4.3 TEST 3 – BUFFER AND OVERFLOW. Perform the buffer and overflow test as follows:

1. Depress the 3 key.
2. Depress the SKIP key and observe the following display on the VDU:

DS990/1 FIELD MAINTENANCE TEST

KEYBOARD TEST

BUFFER & OVERFLOW TEST

BUFFER TEST

DEPRESS & RELEASE    A

DEPRESS & RELEASE    S

DEPRESS & RELEASE    SHIFT

3. Depress and release the A key followed by the S key. Then depress and release the SHIFT key. The message TEST PASS or TEST FAIL will be displayed. The lower portion of the VDU will display instructions for the overflow test. To execute this test:
4. Depress and release the A, S and D keys simultaneously.



5. Depress and release the SHIFT key. The message TEST PASS or TEST FAIL will be displayed. The following display shows the successful execution of the buffer and overflow test:

DS990/1 FIELD MAINTENANCE TEST

KEYBOARD TEST

BUFFER & OVERFLOW TEST

BUFFER TEST

DEPRESS & RELEASE    A  
DEPRESS & RELEASE    S  
DEPRESS & RELEASE    SHIFT

TEST PASS

OVERFLOW TEST

DEPRESS & RELEASE    A   S   D KEYS  
DEPRESS & RELEASE    SHIFT

TEST PASS

6. Depress the SKIP key or the F2 key to escape or to terminate this test and return to the keyboard test menu.
7. Depress the F1 key to return to the major test group menu shown in paragraph 2.1 when required.

2.4.4 TEST 4 – LED INDICATOR. This test checks each LED indicator on the keyboard. The test is subjective and will require visual inspection by the operator to determine test results. Perform the LED indicator test as follows:

1. Depress the 4 key.
2. Depress the SKIP key and observe the following display on the VDU:

DS990/1 FIELD MAINTENANCE TEST

KEYBOARD TEST

DEPRESS F3 AND LED #1 SHOULD TURN ON      LED LIGHTS  
DEPRESS F3 AGAIN AND LED #1 WILL TURN      NUMBER  
OFF AND LED #2 WILL TURN ON, ETC.

(display continued on next page)



	1	2	3	4
DEPRESS F4 AND ALL LIGHTS SHOULD TURN ON. DEPRESS F4 AGAIN AND ALL LIGHTS SHOULD TURN OFF.	5	6	7	8

3. Depress the F3 key. LED #1 (upper row, left LED) should light. Subsequent depressions of the F3 key will light each LED in sequence and turn off all other LEDs. LED sequence is the first row left to right; then second row, left to right. Depress the F3 key seven more times to complete the test sequence.
4. Depress the F4 key. All LEDs should light.
5. Depress the F4 key. All LEDs should turn off.
6. Depress the SKIP key or the F2 key to return to the keyboard test group menu shown in paragraph 2.4.
7. Depress the F1 key to return to the major test group menu shown in paragraph 2.1 when required.

## 2.5 FLOPPY TEST GROUP

The floppy test group has been designed to verify the operation of the floppy disk interface and the disk drives. Upon selection of the floppy test group, the following menu will be displayed on the VDU.

```

DS990/1 FIELD MAINTENANCE TEST   V1.0

      FLOPPY TEST

SELECT TEST ____      DEPRESS "F1" TO RESTART FMT

      HOW MANY DRIVES?  2

      ARE TEST DISKS DSDD?  Y

```

1. The number of drives may be 1, 2, 3, or 4. Enter the number of drives to be tested or depress the SKIP key to default for two drives.

### NOTE

In step 2 below, do not use the FMT program diskette as a test disk. Use scratch diskettes as test disks.

2. Enter a Y (yes) or depress the SKIP key to default for an indication that the test disk(s) to be used are double-sided. An N (no) may be entered to indicate that the test disk(s) to be used are single-sided. After the Y or N has been entered, the following menu will be displayed on the VDU:

### NOTE

The use of single-sided test disks will not allow full testing of the FD1000 drives. They should only be used when double-sided disks are not available.



DS990/1 FIELD MAINTENANCE TEST V1.0

FLOPPY TEST

SELECT TEST #\_\_ DEPRESS "F1" TO RESTART FMT

1. FLOPPY GENERAL TEST
2. FORMAT DISK
3. READ SECTOR #01
4. WRITE SECTOR #01
5. INPUT WRITE BUFFER
6. SELECT DISK #1 HEAD #0 TRACK #0
7. SPECIAL COMMANDS

The floppy general test is designed to test all floppy disk functions and to serve as a short general purpose diagnostic to help determine specific types of failures, if any. The remaining tests concentrate on specific disk operations to aid in troubleshooting specific failures or to aid in head alignment procedures. Tests 1, 2, 3, 4 and special test 5 may be repeated continuously by entering R1, R2, etc.

2.5.1 TEST 1 - FLOPPY GENERAL TEST. Perform the floppy general test as follows:

1. Depress the 1 key.
2. Depress the SKIP key and observe the following applicable display on the VDU for one, two, three, or four drives:
  - a. For one drive, the display should be as follows:

DS990/1 FIELD MAINTENANCE TEST V1.0

FLOPPY TEST

PUT WRITE PROTECTED DISK IN DRIVE 1

DEPRESS "SKIP" TO CONTINUE

- b. The display for two, three, or four drives should read as follows:

DS990/1 FIELD MAINTENANCE TEST V1.0

FLOPPY TEST

PUT WRITE PROTECTED DISK IN DRIVE 1  
PUT NO DISK IN DRIVE 2

DEPRESS "SKIP" TO CONTINUE



3. After placing diskettes in drives as specified in step 2, depress the SKIP key. If the conditions described in step 2 are correctly detected, one of the following applicable displays will be shown on the VDU:

- a. Display for one drive:

```
DS990/1 FIELD MAINTENANCE TEST  V1.0
      FLOPPY TEST
      PUT NO DISK IN DRIVE 1
      DEPRESS "SKIP" TO CONTINUE
```

- b. Display for two drives:

```
DS990/1 FIELD MAINTENANCE TEST  V1.0
      FLOPPY TEST
      PUT WRITE PROTECTED DISK IN DRIVE 2
      PUT NO DISK IN DRIVE 1
      DEPRESS "SKIP" TO CONTINUE
```

- c. Display for three drives:

```
DS990/1 FIELD MAINTENANCE TEST  V1.0
      FLOPPY TEST
      PUT WRITE PROTECTED DISK IN DRIVE 2
      PUT NO DISK IN DRIVE 1
      DEPRESS "SKIP" TO CONTINUE
```

```
DS990/1 FIELD MAINTENANCE TEST  V1.0
      FLOPPY TEST
      PUT WRITE PROTECTED DISK IN DRIVE 3
      DEPRESS "SKIP" TO CONTINUE
```

```
DS990/1 FIELD MAINTENANCE TEST  V1.0
      FLOPPY TEST
      PUT NO DISK IN DRIVE 3
      DEPRESS "SKIP" TO CONTINUE
```



d. Display for four drives:

DS990/1 FIELD MAINTENANCE TEST V1.0

FLOPPY TEST

PUT WRITE PROTECTED DISK IN DRIVE 2  
PUT NO DISK IN DRIVE 1

DEPRESS "SKIP" TO CONTINUE

DS990/1 FIELD MAINTENANCE TEST V1.0

FLOPPY TEST

PUT WRITE PROTECTED DISK IN DRIVE 3  
PUT NO DISK IN DRIVE 4

DEPRESS "SKIP" TO CONTINUE

DS990/1 FIELD MAINTENANCE TEST V1.0

FLOPPY TEST

PUT WRITE PROTECTED DISK IN DRIVE 4  
PUT NO DISK IN DRIVE 3

- DEPRESS "SKIP" TO CONTINUE

4. Again, after placing the diskettes in the drives as specified, depress the SKIP key. If the above described conditions are correctly detected, the following display will be shown on the VDU:

DS990/1 FIELD MAINTENANCE TEST V1.0

FLOPPY TEST

PLACE SCRATCH DISKS IN ALL DRIVES

**\*\*WARNING — THE FOLLOWING TESTS WILL WRITE ON ALL DISKS\*\***

PRESS "SKIP" TO CONTINUE



5. If an error is detected in the previous two steps, an error message describing the error will be displayed on the VDU, and the test will continue.
6. The test will then perform read/write operations, seeking, formatting, controller memory testing, multisector read/write, and unit to unit switching. This portion of the test will require approximately 60 seconds to complete for the two drive configuration. The time will be directly proportional for other configurations.
7. If an error is detected, an error code will be displayed on the VDU. This message will show which diskette, and track the test was on when the error was detected, along with a code to specify what type of error. For an explanation of the error codes along with possible causes, see Section III. Upon completion of the test, a TEST PASS or TEST FAIL message will be displayed automatically.

NOTE

During portions of this test the lower three lines of the VDU will show the write/read buffer. Flashing characters do not constitute an error.

8. Depress the SKIP key or the F2 key to return to the floppy test group menu shown in paragraph 2.5.
9. Depress the F1 key to return to the major test group menu shown in paragraph 2.1 when required.

2.5.2 TEST 2 – FORMAT DISK. The format disk test will format a single track. Perform the format disk test as follows:

1. Depress the 2 key.
2. Depress the SKIP key. The following message will appear on the VDU upon completion of the format PRESS SKIP TO CONTINUE.
3. If an error is detected, an error code will be displayed. See Section III for explanation of error codes.
4. Depress the SKIP key or the F2 key to return to the floppy test group menu shown in paragraph 2.5.
5. Depress the F1 key to return to the major test group menu shown in paragraph 2.1 when required.



2.5.3 TEST 3 – READ. Perform the read test as follows:

1. Depress the 3 key.
2. Depress the SKIP key. The cursor will move to the sector number on the menu.
3. Enter the desired sector number and depress the SKIP key. The desired sector is read and placed on the lower three lines of the VDU.
4. Depress the SKIP key or F2 key to return to the floppy test group menu shown in paragraph 2.5.
5. Depress the F1 key to return to the major test group menu shown in paragraph 2.1 when required.

2.5.4 TEST 4 – WRITE. Perform the write test as follows:

1. Depress the 4 key.
2. Depress the SKIP key. The cursor will move to the sector number on the menu.
3. Enter the desired sector number and depress the SKIP key. The input write buffer shown on the lower three lines of the VDU screen will be written to the specified sector.
4. Depress the SKIP key or the F2 key to return to the floppy test group menu shown in paragraph 2.5.
5. Depress the F1 key to return to the major test group menu shown in paragraph 2.1 when required.

2.5.5 TEST 5 – INPUT WRITE BUFFER. This test allows for the operator to alter the input write buffer directly from the keyboard. Perform the input write buffer test as follows:

1. Depress the 5 key.
2. Depress the SKIP key. The cursor will move down to the last three lines on the VDU.
3. Enter the desired input write buffer from the keyboard.
4. Depress the SKIP key to terminate altering the input write buffer and return to the floppy test group menu shown in paragraph 2.5.
5. Depress the F1 key to return to the major test group menu shown in paragraph 2.1 when required.



2.5.6 TEST 6 – SELECT. This test allows the operator to alter the disk, head, and track used on the READ, WRITE, and FORMAT commands. Perform the selected test as follows:

1. Depress the 6 key.
2. Depress the SKIP key. The cursor will move to the disk number on the menu.
3. Enter the desired disk number. Depress the SKIP key. The cursor will move to the head number on the menu.
4. Enter the desired head number ("0" for the bottom head and "1" for the upper head). Depress the SKIP key. The cursor will move to the track number on the menu.
5. Enter the desired track number. Depress the SKIP key. The test then returns automatically to the floppy test group menu shown in paragraph 2.5.

2.5.7 TEST 7 – SPECIAL COMMANDS. The special commands are used for specialized functions in disk drive maintenance. These tests may be used for head alignment with the SA120 alignment disk (see head alignment procedure described in Shugart Associates Maintenance Manual, vendor part number 50858-0). To return to the main floppy test group menu, enter 6 and depress the SKIP key.

When the special command group of the floppy test is selected, the following menu will be displayed on the VDU screen:

```
DS990/1 FIELD MAINTENANCE TESTS      V1.0
                                     FLOPPY TEST
SELECT TEST #__                      DEPRESS "F1" TO REPEAT FMT
1.  SEEK TO TRACK #00
2.  LOAD HEAD
3.  WRITE ALL ONES
4.  SHOW SCB
5.  OFF TRACK TEST
6.  RETURN TO MAIN TESTS
```

2.5.7.1 Special Test 1 – Seek-to-Track. Perform the seek-to-track test as follows:

1. Depress 1 key.
2. Depress the SKIP key. The cursor will move to the track number shown on the menu.



3. Enter the desired track number.
4. Depress the SKIP key. The head will move to the desired track number. Depress the SKIP key again.

2.5.7.2 Special Test 2 – Load Head. This test allows the operator to load the disk drive head and keep it loaded until a command to stop is given. Perform the load head test as follows:

1. Depress the 2 key.
2. Depress the SKIP key. The head will load and the following prompt will appear on the VDU.

PRESS SKIP TO UNLOAD HEAD AND CONTINUE.

3. Depress SKIP key to unload the head and return to special command group menu shown in paragraph 2.5.7.

2.5.7.3 Special Test 3 – Write All Ones. This test will write all ones to the track specified in the SELECT command (command 6) of the floppy test group. Upon completion of the write, the head remains loaded until the SKIP key is depressed. Perform the write all ones test as follows:

1. Depress the 3 key.
2. Depress the SKIP key. The specified track will be written to with all ones and the head will remain loaded. The following prompt will appear on the VDU:

PRESS SKIP TO UNLOAD HEAD AND CONTINUE

3. Depress the SKIP key to unload the head and return to the special command group menu shown in paragraph 2.5.7.

2.5.7.4 Special Test 4 – Show SCB. This test displays the floppy disk supervisor control block. Perform the show supervisor call block (SCB) test as follows:

1. Depress the 4 key.
2. Depress the SKIP key and observe the following display on the VDU:

DS990/1 FIELD MAINTENANCE TEST      V1.0  
FLOPPY TEST

SELECT TEST – 4

1. SEEK TO TRACK #00
2. LOAD HEAD
3. WRITE ALL ONES
4. SHOW SCB
5. OFF TRACK TEST
6. RETURN TO MAIN SETS

PRESS SKIP TO CONTINUE

SCB    XXXX    XXXX    XXXX    XXXX – – –



3. Depress the SKIP key to return to the special command group menu shown in paragraph 2.5.7.

2.5.7.5 Special Test 5 – Off Track Test. This test is designed to verify head alignment using the SA125 off track diskette. The SA125 diskette has two tracks (71 and 73) written with sectors which are progressively more off of the center of the track. The off track test will attempt to read the specified track and if the test passes, the head alignment is assumed correct. Perform the off track test as follows:

1. Depress the 5 key.
2. Depress the SKIP key and observe the following display on the VDU:

INSERT OFF TRACK DISK

TEST TRACK #

3. Enter the desired track number and depress the SKIP key. The off track test will be performed on the selected track. TEST PASS will be displayed if no error is incurred. The error code will be displayed if an error does occur.
4. Depress the SKIP key to return to the floppy special test group shown in paragraph 2.5.7.

## 2.6 COMMUNICATIONS TEST GROUP

The tests in this group are designed to test the integrity of the controller board in slot 10 (EIA port), the optional internal or external modem in slot 11, and the ACU interface in slot 12. Upon selection of the communications test group, the following menu will be displayed on the VDU:

DS990/1 FIELD MAINTENANCE TEST V1.0

COMMUNICATION TEST

SELECT TEST #\_\_

DEPRESS "F1" TO RESTART FMT

1. CONTROLLER LOOPBACK
2. MODEM LOOPBACK TEST
3. ACU INTERFACE TEST
4. AUTO ANSWER PERFORMANCE
5. SPECIAL OPTION MENU

These tests will automatically display TEST PASS or TEST FAIL upon completion of the test. These four tests will repeat continuously by entering R before the test number.



2.6.1 TEST 1 – CONTROLLER LOOPBACK TEST. This test places the controller in loopback mode and sends 16 blocks of 256 characters to its receiver. Perform the controller loopback test as follows:

1. Depress the 1 key.
2. Depress the SKIP key.
3. The menu will disappear and a TEST IN PROGRESS message will flash on and off indicating that data is being transmitted.
4. The actual block being transmitted will be displayed on the lower 4 lines of the VDU. Upon successful completion of the test, this block will be cleared and a TEST PASS message will be displayed.
5. If an error occurs, an error message or code will be displayed on the lower portion of the VDU. Consult Section III for an explanation of errors and their possible causes.
6. Depress the SKIP key to return to command group menu shown in paragraph 2.6.
7. Depress the F1 key to return to major test group menu shown in paragraph 2.1 when required.

2.6.2 TEST 2 – MODEM LOOPBACK TEST. This test places the modem in loopback mode and sends eight blocks of 256 characters from the transmitter, through the modem, and back to the receiver. Perform the modem loopback test as follows:

1. Depress the 2 key.
2. Depress the SKIP key.
3. If external modem is being used, specify yes in response to prompt. Place modem in loopback mode by pressing the AL switch on the modem. Connect the external modem to EIA port J6 and be sure slot 11 is empty.
4. For both internal and external modems, the block transmitted will be displayed on the last four lines of the VDU, while a TEST IN PROGRESS message will flash on the screen.
5. If an error occurs, an error code or message will be displayed on the lower portion of the VDU. A list of errors and their possible causes is shown in Section III.
6. Depress the SKIP key to return to command test group menu shown in paragraph 2.6.



7. Depress the F1 key to return to major test group menu shown in paragraph 2.1 when required.

NOTE

If an internal modem is being used, there should be no external device connected to the EIA port, J6.

2.6.3 TEST 3 – ACU INTERFACE TEST. This test verifies the integrity of the ACU interface board in slot A12. The first part of this test puts the ACU interface board in digital loopback mode, electrically disconnecting itself from the DAA. If this part of the test passes, the operator will be asked to enter the phone number to be dialed. When the number has been entered, indicate whether the station to be called will generate an answerback tone. An answerback tone is an audible tone produced by the modem at the station to be called and does not exceed five seconds in duration. After operator response, the ACU will dial the number online and wait for a connection, busy signal, or timeout. Upon successful completion of this part of the test, a TEST PASS message will be displayed. Perform the ACU interface test as follows:

1. Depress the 3 key.
2. Depress the SKIP key.
3. The menu will disappear and upon successful completion on the ACU digital loopback part, a message asking for the phone number will be displayed.
4. Enter a phone number of up to 20 digits, then depress the SKIP key.
5. Upon successful detection of an answerback tone, a TEST PASS message will be displayed. If no answerback tone is detected, the test will ask whether the phone rang. When the response is entered, a test pass or fail message will be displayed. If an error occurs, consult Section III for an explanation of errors and their possible causes. For additional details on this test, refer to the detailed description that follows step 7.
6. Depress the SKIP key to return to command group menu shown in paragraph 2.6.
7. Depress the F1 key to return to major test group menu shown in paragraph 2.1 when required.

A detailed description of test 3 is as follows:



The first part of this test is automatic and requires no operator interaction. The second part starts by the operator entering the phone number (up to 20 digits). Since this part is online, ensure that the modem and cable are properly installed. If an internal ACU is used, the selector switch should be set for TOUCH TONE or PULSE DIAL. Before running the test, manually dial the number to be called to be sure the line is not busy, out of order, or that there is no switchboard operator intervention. After entering the number, indicate whether the number to be called will generate an answerback tone. Be sure to manually call the number before running the test to verify that the answerback tone is generated. Enter yes or no, and the dialer will wait for the dialtone. When it is received, a message DIALTONE RECEIVED will be printed in the upper part of the screen. After all the digits have been dialed, a message NUMBER DIALED will be put on the screen. A flashing cursor next to the WAITING FOR RESPONSE message indicates that the test is still running and that the ACU is waiting for an answerback tone or a ring. A TEST PASS message will be displayed when an answerback tone is received, regardless of whether one was expected. If no answerback tone is received, the operator will be asked if the phone rang. If yes, and it expected an answerback tone, an error will be shown NO ANS TONE. If yes, and it was not expecting answerback a TEST PASS message will be displayed. If the answer is no, the program looks at ACR (abandon call and retry). If this line is high, an error LINE BUZY will be shown. If this line is low, an error MISDIAL - ACR NOT SET will be shown. This would indicate that some number was dialed successfully, the phone did not ring, and it did not get a busy signal, such as a NOT IN SERVICE AT THIS TIME tape recorded message.

Part 2 of the test can be repeated continuously by entering R3. The loopback test will be performed once and then the operator will be asked to enter the phone number. If answerback is used, no operator interaction is needed for each pass. When the answerback tone is received, the beeper will sound and the dialer will wait 5 seconds before dialing again. This will repeat until an error occurs or F9 and F8 (stop all programs) are depressed. If answerback is not used, the operator will be asked if the phone rang after each pass so that the program will know how to interpret the results.

When using a TI internal ACU, placing the special character C at the end of the phone number will transfer control to the modem (will set DSS) immediately after dialing and the test will pass in a normal fashion even though no answerback tone is received. The special character D will wait for a dialtone before dialing the following digit. If a TI internal modem is used and no dialtone is received after about eight seconds, the following digits will be dialed anyway. This allows the ACU to be used with phone systems which use nonstandard dialtone frequencies. Placing two Ds and a C at the end of the phone number will allow the test to pass after ringing the phone for about 16 seconds without any operator interaction. This is useful in the repeat mode when no answerback is used. Note that if an external modem is being used, an external ACU must be used. The ACU cable must be plugged into connector J8 in addition to the cable connecting the external modem to connector J6. To terminate this test before completion, depress F9 and F8. Note the ACU may not shut down completely, causing the station called to ring continuously, or causing the line being tested to be busy until the first part of test 3 is run again.



2.6.4 TEST 4 – AUTO ANSWER PERFORMANCE TEST. This test allows the operator to manually call (or automatically call from another terminal if one is available with an ACU) the terminal being tested and listen for an answerback tone. Perform the auto answer test as follows:

1. Depress the 4 key.
2. Depress the SKIP key.
3. The menu will disappear and a READY message will appear on the VDU.
4. Call the terminal being tested by dialing its phone number from another phone.
5. Verify that the phone rang and an answerback tone was generated for a brief moment.
6. Verify that a TEST PASS message appeared on the VDU. If an error occurred, consult Section III for a list of possible causes. For additional details on this test refer to the detailed description that follows step 8.
7. Depress SKIP to return to the command test group menu shown in paragraph 2.6.
8. Depress the F1 key to return to the major test group menu shown in paragraph 2.1 when required.

A detail description of test 4 is as follows:

This test checks to see if a controller board is present in slot A10. If so, it is set on-line and waits for an incoming call. If no call is received within five minutes, an error message will be displayed. If the modem successfully answers the phone and DSR goes high, a TEST PASS message will be displayed. The operator should verify that an answerback tone was generated by listening at the calling station. This test assumes that parts 1 & 2 have already been run (although they are not required). Any errors detected at the controller end will be posted as controller status errors. If the telephone receiver goes off hook, a message ILLEGAL INTERRUPT will be displayed.

If the test cannot detect an internal modem present, the operator will be asked if the external modem is connected. If the answer is no, the error NO MODEM PRESENT will be displayed. If yes, the controller is put online and waits for an incoming call. If DSR goes high, a test pass message will be displayed.

To terminate this test before normal completion, depress F9 and F8. Note that stopping the test before normal test completion may not completely shutdown the controller and/or modem, causing false errors to be generated on the next pass of parts 1, 2, or 4.



2.6.5 TEST 5 – SPECIAL OPTION MENU. The special options are used for specialized board repair techniques and are not normally needed in field maintenance. They allow the operator control over functions not usually needed for board replacement level repair.

When the special option menu is selected, the following menu will be displayed on the VDU screen:

DS990/1 Field Maintenance Tests	V1.2
Communications Test	
One/Zero Pattern?	N
Stop Between Blocks?	N
No Stop On Errors?	N
No Internal Loopback?	N

The operator places a Y beside the options desired and skips through the Ns beside the options not desired. Any number of options may be selected concurrently. When the last entry has been made, the test will automatically return to the communication test menu. The options that were selected will remain active until the special option menu is reentered.

2.6.5.1 Special Option One – One/Zero Pattern. When this option is selected, an alternating one/zero pattern is used as the 256 character transmit/receive block used in the controller and modem loopback tests.

2.6.5.2 Special Option Two – Stop Between Blocks. This option specifies that the test will pause between each of the transmission blocks described in paragraphs 2.6.1 and 2.6.2. When a block is being transmitted, the "Test in Progress" message is displayed. When the block is complete the message "Press skip to continue" will appear. To transmit the next blocks, press skip. This will continue until the specified number of blocks have been transmitted.

2.6.5.3 Special Option Three – No Stop On Errors. The selection of this option specifies that the test will not stop if an error is detected while data is being transmitted and received during Test 1 or Test 2.

2.6.5.4 Special Option Four – No Internal Loopback. When this option is selected, the device under test is not placed in the internal loopback mode (modem or controller). This allows an operator to mechanically connect the transmitter to the receiver of the device under test (Tables A-10, A-11).

#### NOTE

If this option is selected, but no connection is made by the operator, an error will be reported which is not a hardware failure.



## 2.7 PRINTER TEST GROUP

### NOTE

These tests are valid only when the thermal internal printer is installed.

When the printer test group is selected, the menu shown below will be displayed on the VDU. The printer tests are subjective and visual inspection is required to determine results.

DS990/1 FIELD MAINTENANCE TEST          V1.0

### PRINTER TEST

SELECT TEST #\_\_

DEPRESS "F1" TO RESTART FMT

1. CARRIAGE RETURN
2. LINE FEED PERFORMANCE
3. COLUMN REPEATABILITY
4. BACKSPACE PERFORMANCE
5. PRINthead ELEMENTS
6. BARBER POLE
- A ALL TEST

Upon selecting any (or all) of these tests the message TEST IN PROGRESS will be displayed. When test A is entered and the SKIP key is depressed, each test will be executed in sequence following the depression of the SKIP key for each test execution. Tests 1 through 6 will repeat continuously by entering R1, R2, RA, etc.

2.7.1 TEST 1 – CARRIAGE RETURN. Perform the carriage return test as follows:

1. Depress the 1 key.



2. Depress the SKIP key. Test execution will begin. Figure 2-3 shows a sample print out generated by this test. Each line should begin with the number 1. For the first twenty lines, line length is increased one character per line. Smearing of characters or loss/addition of characters indicates a test failure.
3. Depress the SKIP key or the F2 key upon completion of this test and return to the printer test menu shown in paragraph 2.7.
4. Depress the F1 key to return to the major test group menu shown in paragraph 2.1 when required.

TEST 1: CARRIAGE RETURN TEST

```

1
12
123
1234
12345
123456
1234567
12345678
123456789
1234567890
12345678901
123456789012
1234567890123
12345678901234
123456789012345
1234567890123456
12345678901234567
123456789012345678
1234567890123456789
12345678901234567890
1234567890123456789012345678901234567890
12345678901234567890123456789012345678901234567890
123456789012345678901234567890123456789012345678901234567890
1

```

CHECK: EACH LINE BEGINS WITH THE NUMBER 1  
 THE FIRST CHR IS NOT SMEARED ON ANY LINE  
 FIRST 20 LINES, EACH LINE IS ONE CHR LONGER THEN THE PRECEEDING LINE.

(A) 139387

Figure 2-3. Print Out Generated by Carriage Return Test





2.7.3 TEST 3 – COLUMN REPEATABILITY. Perform the column repeatability test as follows:

1. Depress the 3 key.
2. Depress the SKIP key. Test execution will begin. Figure 2-5 shows a sample generated by this test. Inspect each character for smearing due to overprinting.
3. Depress the SKIP key or the F2 key upon completion of this test and return to the printer test menu shown in paragraph 2.7.
4. Depress the F1 key to return to the major test group menu shown in paragraph 2.1 when required.

TEST 3: COLUMN REPEATABILITY

oo

CHECK: NONE OF THE O'S ARE SMEARED DUE TO OVERPRINTING.

(A) 139389

Figure 2-5. Print Out Generated by Column Repeatability Test

2.7.4 TEST 4 – BACKSPACE. Perform the backspace test as follows:

1. Depress the 4 key.
2. Depress the SKIP key. Test execution will begin. Figure 2-6 shows a sample generated by this test. Check each column; smearing of character(s) indicates test failure.
3. Depress the SKIP key or the F2 key upon completion of this test and return to printer test menu shown in paragraph 2.7.
4. Depress the F1 key to return to the major test group menu shown in paragraph 2.1 when required.

TEST 4: BACKSPACE TEST

xx

CHECK: EACH COLUMN, PARTICULARLY COLUMN 2, THAT NO X'S ARE SMEARED.

(A) 139390

Figure 2-6. Print Out Generated by Backspace Test

2.7.5 TEST 5 – PRINthead ELEMENTS. Perform the printhead elements test as follows:

1. Depress the 5 key.







2.8.1 TEST 1 – CONTROLLER LOOPBACK TEST. This test places the controller in loopback mode and sends 16 blocks of 256 characters to its receiver. Perform the controller loopback test as follows:

1. Depress the 1 key.
2. Depress the SKIP key.
3. The menu will disappear and a TEST IN PROGRESS message will flash on and off indicating that data is being transmitted.
4. The actual block begin transmitted will be displayed on the lower four lines of the VDU. Upon successful completion of the test, this block will be cleared and a TEST PASS message will be displayed.
5. If an error occurs, an error message or code will be displayed on the lower portion of the VDU. Consult Section III for an explanation of errors and their possible causes.
6. Depress the SKIP key to return to command group menu shown in paragraph 2.8.
7. Depress the F1 key to return to major test group menu shown in paragraph 2.1 when requiried.

2.8.2 TEST 2 – PRINTER TEST. This test verifies the ability of the controller to communicate with an external printer. The printer should be connected to AUX port J7, set for 9600 baud, and should ignore parity. This test will not run with a synchronous controller present.

The test consists of sending a form feed and a single page of barber pole to the printer. If more than one page is desired, enter R2 as mentioned above. All error messages are in English. For further explanation of errors, refer to Section III.

For full verification of test, the barber pole should be inspected to insure that all characters have printed correctly. If the character shown in figure 2-9 is printed, or if any erroneous results are printed, such as line and form feeds at incorrect times, then check that the 810 printer is set correctly (9600 baud and ignore parity).

```

! " $ % & ' ( ) * + , - . : ; < = > ? @ A B C D E F G H I J K L M N O P Q R S T U V W X Y Z [ \ ] ^ _ ` a b c d e f g h i j k l m n o p q r s t u v w x y z { | } ~
! " $ % & ' ( ) * + , - . : ; < = > ? @ A B C D E F G H I J K L M N O P Q R S T U V W X Y Z [ \ ] ^ _ ` a b c d e f g h i j k l m n o p q r s t u v w x y z { | } ~

```

(A) 139393

Figure 2-9. Characters Resulting From Incorrect Parity Setting



SECTION III  
TROUBLESHOOTING

3.1 GENERAL

Refer to Model 770 Intelligent Data Terminal Maintenance Manual, part number 993024-9701, for troubleshooting information on all major test groups except the communications and floppy groups. Refer to the DS990 System Model 1 Maintenance Supplement, part number 993024-9704, for maintenance information on the double-sided, double-density diskette drive assembly. Error codes with their description and probable causes for the communications and floppy test groups are listed in tables 3-1, 3-2, and 3-3 as follows:

<u>Table</u>	<u>Description</u>
3-1	Floppy Disk Test Group Error Codes
3-2	Communications Test Group Error Codes
3-3	Optional Communications Test Group Error Codes



Table 3-1. Floppy Disk Test Group Error Codes

Error Code	Description	Possible Cause*
0001	Error in ROM or RAM section of self-test	1. I/O processor board failure
0002	Invalid command number	1. FMT program error (clear machine and reload FMT)
0003	Disk has been changed (drive door opened and closed) since last operation	1. Disk was changed 2. Disk I/F board 3. Cable 4. Drive
0004	Seek incomplete	1. Disk interface board 2. Cable 3. Drive
0005	Disk drive not ready	1. Disk not in place 2. Disk interface board 3. Cable 4. Drive
0006	Disk write protected	1. Disk is write protected (tab missing) 2. Disk I/F board 3. Cable 4. Drive
0007	Disk "type"	1. Disk I/F board 2. Cable 3. Drive
0008	Read Data error	1. Disk I/F board 2. Disk I/O processor 3. Drive
0009	Read ID error	1. Disk I/F board 2. Drive
000A	Data Mark error	1. Disk I/F board
000B	"No Data Found" error	1. Disk I/F board 2. Cable 3. Drive
000C	No memory available	1. FMT error (clear machine and reload FMT) 2. Disk I/O processor



Table 3-1. Floppy Disk Test Group Error Codes (Continued)

Error Code	Description	Possible Cause*
000D	Size error	1. FMT error (clear machine and reload FMT) 2. Disk I/O processor
000E	Transfer size error to/from host computer	1. Disk I/O processor
000F	Data separator over/under flow error	1. Disk I/F board
00AA	Seek error	1. Disk I/F board 2. Drive

\*Causes are listed in order of descending probability



Table 3-2. Communications Test Group Error Codes

ERROR CODE/ ENGLISH MESSAGE	ERROR DESCRIPTION	POSSIBLE CAUSE
Test Part 1	Controller Loopback Test	
01-No Controller Present	FRMERR & SYNCHR are high	1) No Controller present in Slot A10 2) Replace Controller in Slot A10
02-No Interrupt	CIRRDY and RNGING did not generate interrupt while in loopback mode and set online	1) Replace Controller in Slot A10
03-	RCRCVR not high when RCXMIR was set	1) Replace Controller in Slot A10
04-	CTRRDY or RNGING will not clear in the test mode	1) Replace Controller in Slot A10 2) See Test 2, Error 04 if modem test was run
05-	NSFLAG or INTRID will not clear and/or set correctly	1) Replace Controller in Slot A10 2) See Test 2, Error 05, if modem test was run
06-No Break	RCVBFR, INTRID, CLRBRL or RCVBRL malfunction while sending break sequence	1) Replace Controller in Slot A10
07-No SYNC CHR (SYNC Only)	RCVBFR, INTRID, CLRBRL or RCVBRL malfunction while sending SYNC characters	1) Replace Controller in Slot A10
08-Illegal INTR	Illegal interrupt generated during loopback data transmission	1) Replace Controller in Slot A10



2262570-9701

Table 3-2. Communications Test Group Error Codes (Continued)

ERROR CODE/ ENGLISH MESSAGE	ERROR DESCRIPTION	POSSIBLE CAUSE
Test 1 Controller Loopback Test		
09-Receiver Timeout	Receiver did not receive any or some characters	1) Replace Controller in Slot A10
0A-Transmitter Timeout	Interrupt not generated when data loaded in buffer	1) Replace Controller in Slot A10
0B-Data Transfer Timeout	Neither Receiver nor Transmitter completed block	1) Replace Controller in Slot A10
Test 2 Modem Loopback Test		
Codes 01 through 0B are the same as in Test 1 except:		
04-	RCVRDY and/or DCD not high XMTRDY and/or CIS not high	1) External Modem not in Analog loopback mode 2) No external Modem connected to EIA Port (J6)
05-		1) Check that no external device is connected to EIA Port (J6) while internal Modem is present in Slot A11 2) Replace internal Modem 3) Replace Controller 4) Replace external Modem (if any)
No Modem Present	TESTDS was set but DSTEST never went high	1) Operator did not indicate that an external Modem is being used 2) No internal Modem is present in Slot A11 3) Replace internal Modem



Table 3-2. Communications Test Group Error Codes (Continued)

ERROR CODE/ ENGLISH MESSAGE	ERROR DESCRIPTION	POSSIBLE CAUSE
Test 3	ACU Interface Test	
21-No ACU Present	PWIBAR is high	1) No ACU present in Slot A12
22-ACU Will Not Clear	Status will not clear after five attempts	1) Replace ACU interface
23-ACU Status	New status not generated when digit presented	1) Replace ACU interface
24-Data Loop	Digit presented not equal digit read	1) Replace ACU interface
25-No Interrupt	No interrupt generated when digit presented	1) Replace ACU interface
26-	Not used	
27-Status Error	Status incorrect for dialing	1) Replace ACU interface
28-DLO Error	Data line occupied	1) Replace cable(s) External ACU cable not connected (J8) DAA not connected Phone off hook 2) Replace ACU interface 3) Replace DAA
29-PND Error	Present next digit error	1) Take DAA out of test mode 2) Headset off hook 3) Replace ACU interface 4) Replace cable(s) 5) Replace DAA



2262570-9701

Table 3-2. Communications Test Group Error Codes (Continued)

ERROR CODE/ ENGLISH MESSAGE	ERROR DESCRIPTION	POSSIBLE CAUSE
Test 3	ACU Interface Test	
2A-Dial Timeout	Timeout occurred during dialout	1) Replace ACU interface
2B-Misdial-ACR Low	Phone did not ring	1) Operator indicated that the phone did not ring when it really did 2) Incorrect phone number entered 3) DAA is in 'Test' mode 4) Check pulse tone/touch tone setting-Slot A12 5) Replace ACU interface 6) Replace ACU
2C-No ANS Tone	Phone rang but no answerback tone was received	1) Check station called for answer tone 2) Replace Modem 3) Replace Controller
2D-Illegal INTR	Illegal sequence of events	1) Phone went off hook-cable disconnected 2) Try again 3) Replace ACU interface 4) Replace Modem
2E-Line Busy	ACR set - Busy signal detected	1) Check number called 2) Replace ACU interface 3) Replace ACU



Table 3-2. Communications Test Group Error Codes (Continued)

ERROR CODE/ ENGLISH MESSAGE	ERROR DESCRIPTION	POSSIBLE CAUSE
Test 4	Auto Answer Performance Test	
2F-Timeout Error	Station being tested was never called	1) Take DAA out of test mode 2) Try again 3) Replace Modem 4) Replace DAA
2G-Controller Status	Error detected by Controller	1) Run Part 1 & 2 2) Replace Controller 3) Replace Modem
2H-Illegal INTR	Illegal sequence of events	1) Cable became disconnected or headset went off hook while expecting to receive a call. NOTE: Do not use the phone connected to the terminal being tested. 2) Replace Cable 3) Replace Modem 4) Replace DAA
2I-No Modem Present	DSTEST did not go high when TESTDS was set	1) No internal Modem present in Slot A11 2) Replace internal Modem NOTE: This error will not occur if operator indicates external Modem being used. 3) Replace Controller



2262570-9701

Table 3-3. Optional Communications Test Group Error Codes

ERROR CODE/ ENGLISH MESSAGE	ERROR DESCRIPTION	POSSIBLE CAUSE
Test 1	Controller Loopback Test	
01-No Controller Present	FRMERR & SYNCHR are high	1) No controller present in slot A9 2) Replace controller in slot A9
02-No Interrupt	CIRRDY and RNGING did not generate interrupt while in loopback mode and set online	1) Replace controller in slot A9
03-	RCRCVR not high when RCXMTR was set	1) Replace controller in slot A9
04-	CTRRDY or RNGING will not clear in the test mode	1) Replace controller in slot A9
05-	NSFLAG or INTRID will not clear and/or set correctly	1) Replace controller in slot A9
06-No Break (ASYNCR only)	RCVBFR, INTRID, CLRBRL or RECBRL malfunction while sending break sequence	1) Replace controller in slot A9
07-No SYNC CHAR (SYNC only)	RCVBFR, INTRID, CLRBRL or RCVBRL malfunction while sending SYNC characters	1) Replace controller in slot A9
08-Illegal INTR	Illegal interrupt generated during loopback data transmission	1) Replace controller in slot A9
09-Receiver Timeout	Receiver did not receive any or some characters	1) Replace controller in slot A9



Table 3-3. Optional Communications Test Group Error Codes (Continued)

ERROR CODE/ ENGLISH MESSAGE	ERROR DESCRIPTION	POSSIBLE CAUSE
Test 1	Controller Loopback Test	
OA-Transmitter Timeout	Interrupt not generated when data loaded in buffer	1) Replace controller in slot A9
OB-Data Transfer Timeout	Neither receiver nor transmitter completed block	1) Replace controller in slot A9
Test 2	Printer Test	
No Printer Present	CTRRDY was low when printer was online	1) No printer connected 2) Printer not on line 3) Faulty printer cable 4) Replace controller board in slot A9 5) J7
Printer Not Ready	XMTRDY did not go high when online and XMTRDM high	1) Faulty cable 2) Faulty printer 3) Replace controller
Printer Went Off Line	CTRRDY went low during data transmission	1) Operator pushed on line switch 2) Intermittent cable connection 3) Intermittent controller board 4) Intermittent printer
Printer Busy	RCRCVR went low during data transmission and did not go high again	1) Faulty cable 2) Replace controller in slot A9 3) Faulty printer
SYNC Board Present	SYNCHR went high after XMTBRK was set	1) Replace SYNC board in slot A9 with an ASYNC board 2) Replace Controller in slot A9



## APPENDIX A

## ATTACHING EXTERNAL EQUIPMENT

Many applications require the use of external equipment attached to the DS990/1. These devices, when needed, are attached via cable to the connector ports of the DS990/1. These ports are labeled J6, J7, and J8 and are located in the lower rear area of the terminal as shown in figure A-1.

In the area of the back faceplate directly above the connector ports is a sticker labeled DS990/1 INTELLIGENT TERMINAL CONFIGURATION. Xs placed in appropriate positions on the sticker indicate which options are associated with that particular DS990/1. Some of the options are for use with external devices. When these external options are indicated, a cable or cables are provided for making the appropriate connections. The end of the cable that is to be attached to the DS990/1 will be labeled with a designator P6, P7, or P8 or possibly a combination such as P6/P7. The other end of the cable is to be attached to the external equipment and is labeled appropriately.

Configuration drawings are provided to show the possible cable connections. Also included is a cross reference between the external options listed on the DS990/1 TERMINAL CONFIGURATION label and the appropriate CONFIG number. The configuration number drawings include the cable names and part numbers required. Table A-1 is a cross reference between the options indicated on the configuration label and a configuration number which is used as a reference in figure A-2 to determine the cable connections.

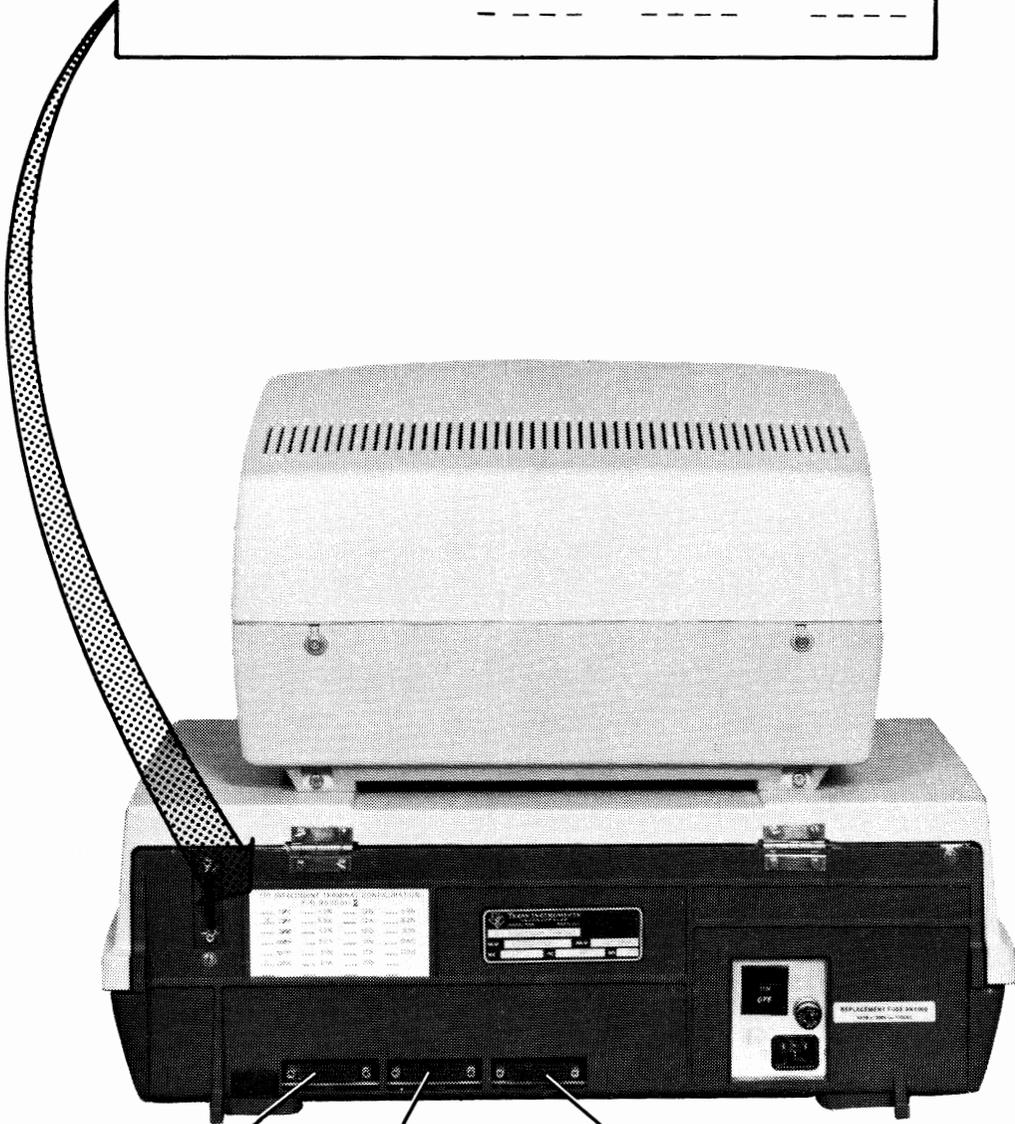
Table A-1. Option to Configuration Cross Reference

Option	Configuration Number*	Option	Configuration Number*
E3N	1	11A	10
E3A	2	11D	11
E2N	3	OAC	13
E2A	4	S3N	7
E1N	5	S2N	8
E1A	6	S1N	9
12N	10	MCO	12
12A	10	MC1	12
12D	11	MC2	12
11N	10	OSC	13

\*References cable configurations in figure A-2.



DS990/1 INTELLIGENT TERMINAL CONFIGURATION			
P/N 2267375-	7----	S E	N MC
P/N 2263562-	7----	P E	A O
P/N 2263583-	-- 100	I	N
	-- 200	I	A
	M----	I	D
	85----	S	N
	-	-	-



PORT J6

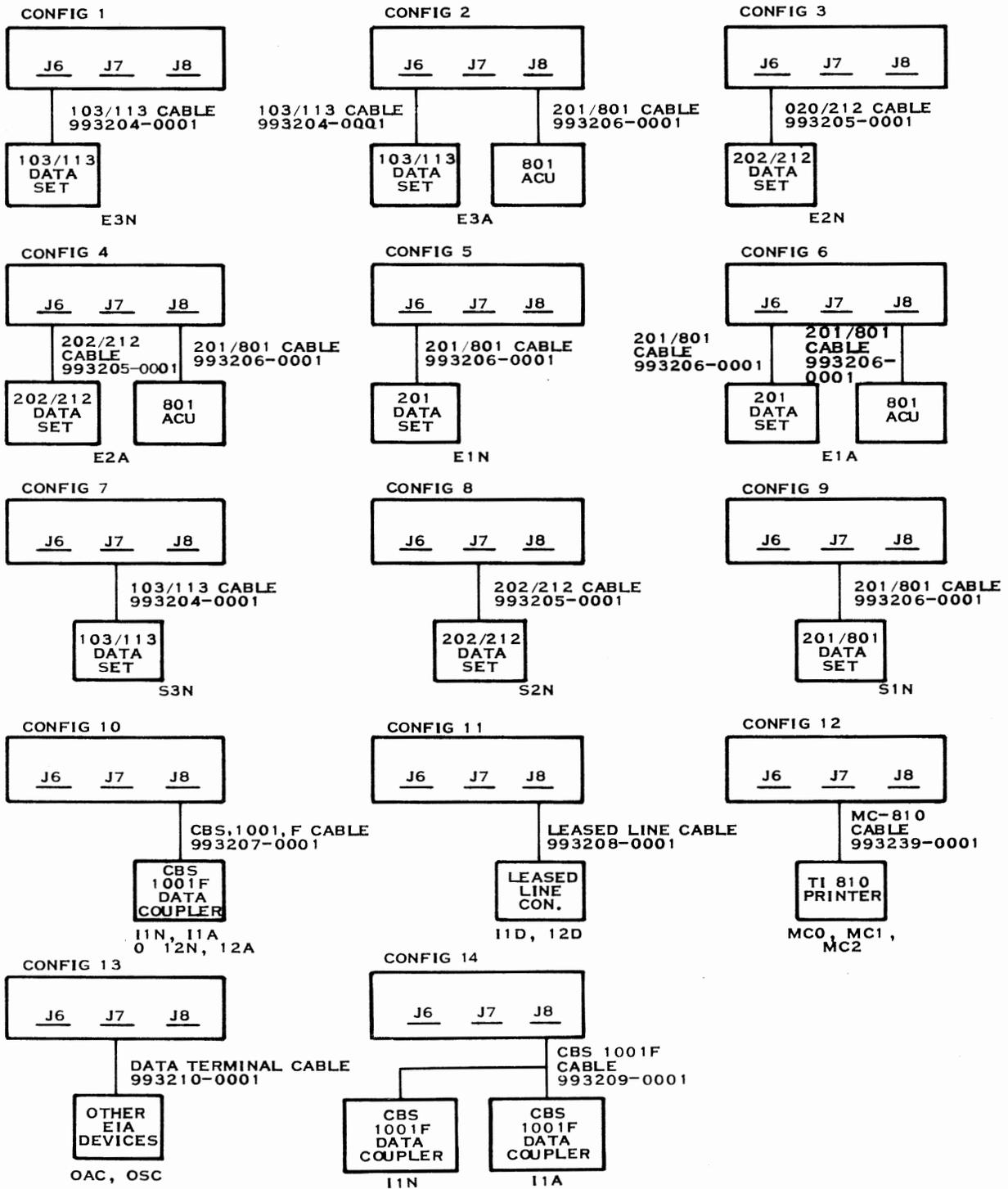
PORT J7

PORT J8

J6-EIA ACCESS TO PRIMARY COMMUNICATIONS PORT  
 J7-EIA ACCESS TO AUXILIARY COMMUNICATIONS PORT  
 J8-ACCESS TO INTERNAL MODEM OR ACU INTERFACE  
 TO PRIMARY COMMUNICATION PORT

(A)139159

Figure A-1. Terminal Communications Ports



(A) 139163A

Figure A-2. Communications Equipment Cable Connections



## A.1 CABLE PIN ASSIGNMENTS

Tables A-2 through A-9 provide pin assignment information for the standard cables available for the terminal. Where wiring is not one-to-one, a schematic of the cable is given.

Table A-2. 103/113 Data Set Cable Part Number 993204-0001

DS990/1 Pin P6-P7 (Male)	Modem Pin 103/113 (Male)	RS232-C Circuit	Function
1	1	AA	Protective Ground
2	2	BA	Transmitter Data
3	3	BB	Receiver Data
4	4	CA	Request to Send
5	5	CB	Clear to Send
6	6	CC	Data Set Ready
7	7	AB	Signal Ground
8	8	CF	Received Line Signal Detector (DCD)
20	20	CD	Data Terminal Ready
22	22	CE	Ring Indicator

Table A-3. 202/212 Data Set Cable Part Number 993205-0001

DS990/1 Pin P6-P7 (Male)	Modem Pin 202/212 (Male)	RS232-C Circuit	Function
1	1	AA	Protective Ground
2	2	BA	Transmitter Data
3	3	BB	Receiver Data
4	4	CA	Request to Send
5	5	CB	Clear to Send
6	6	CC	Data Set Ready
7	7	AB	Signal Ground
8	8	CF	Received Line Signal Detector (DCD)
11	11	SA	Secondary Request to Send (RCT)
12	12	SB	Secondary Received Line Signal Detector (RCR)
20	20	CD	Data Terminal Ready
22	22	CE	Ring Indicator



Table A-4. 201/801 Data Set Cable Part Number 993206-0001

771 Pin P6-P7-P8 (Male)	Data Set Pin 201/801 (Male)	Circuit		Function	
		201	801	201	801
1	1	AA	FGD	Protective Ground	Frame Ground
2	2	BA	DPR	Transmit Data	Digit Present
3	3	BB	ACR	Receive Data	Abandon Call and Retry
4	4	CA	CRQ	Request to Send	Call Request
5	5	CB	PND	Clear to Send	Present Next Digit
6	6	CC	PW1	Data Set Ready	Power Indication
7	7	AB	SGD	Signal Ground	Signal Ground
8	8	CF	—	Data Carrier Detect	Not Used
13	13	—	DSS	Not Used	Data Set Status
14	14	NS	NB1	New Synchronization	BCD Digit 1
15	15	DB	NB2	Transmitter Signal Element Timing	BCD Digit 2
16	16	—	NB4	Not Used	BCD Digit 4
17	17	DD	NB8	Receiver Signal Element Timing	BCD Digit 8
20	20	CD	—	Data Terminal Ready	Not Used
22	22	CE	DLO	Ring Indicator	Data Line Occupied



Table A-5. CBS1001F Coupler (DAA) Cable Part Number 993207-0001

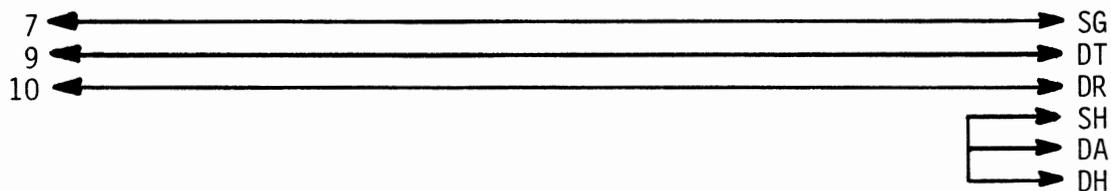
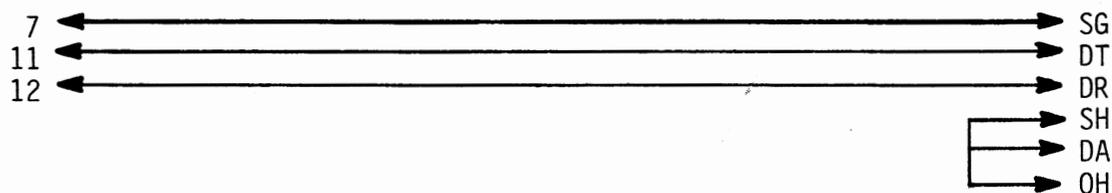
771 P8 (Male)	Coupler Pin (Paddle Board)	Function
7	SG	Signal Ground
9	+V	For Test Only
10	-V	For Test Only
11	DT	Data Tip
12	DR	Data Ring
18	OH	Off Hook
19	DA	Data Access
21	CCT	Coupler Cut Through
23	R1	Ring Indicate
24	SH	Switch Hook

Table A-6. Leased-Line Cable Part Number 993208-0001

771 Pin P8 (Male)	Cable Marker	Wire Color (Spade Lugs)	Function
7		Tinned Copper	Drain (Signal Ground)
9	RCVR	Black	T (Tip)
10	Pair	Red	R (Ring)
7		Tinned Copper	Drain (Signal Ground)
11	XMTR	Black	DT (Data Tip)
12	Pair*	Red	DR (Data Ring)
25		White	AXORA1 (Hook Switch)



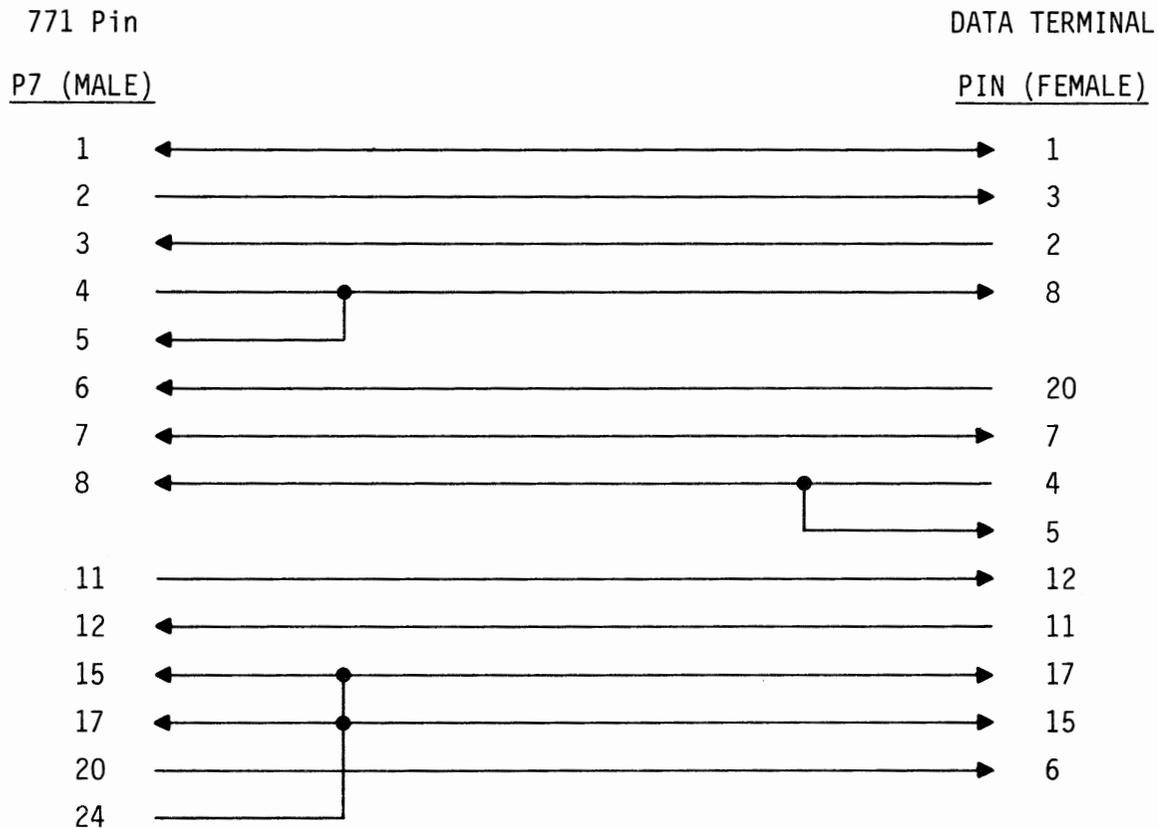
Table A-7. Dial-Back Cable Part Number 993209-0001

771 Pin  
P8 (Male)Data Coupler  
PWB P2  
RCVR LINEData Coupler  
PWB P3  
XMTR LINE

<u>P8 Pin</u>	<u>Circuit</u>	<u>Wire Color</u>	<u>Function</u>
7	SG	Tinned Copper	Drain (Signal Ground)
9	DT	Black	Data Tip
10	DR	Red	Data Ring
11	DT	Black	Data Tip
12	DR	Red	Data Ring
	SH	White	Switch Hook
	DA	White	Data Access
	OH	White	Off Hook



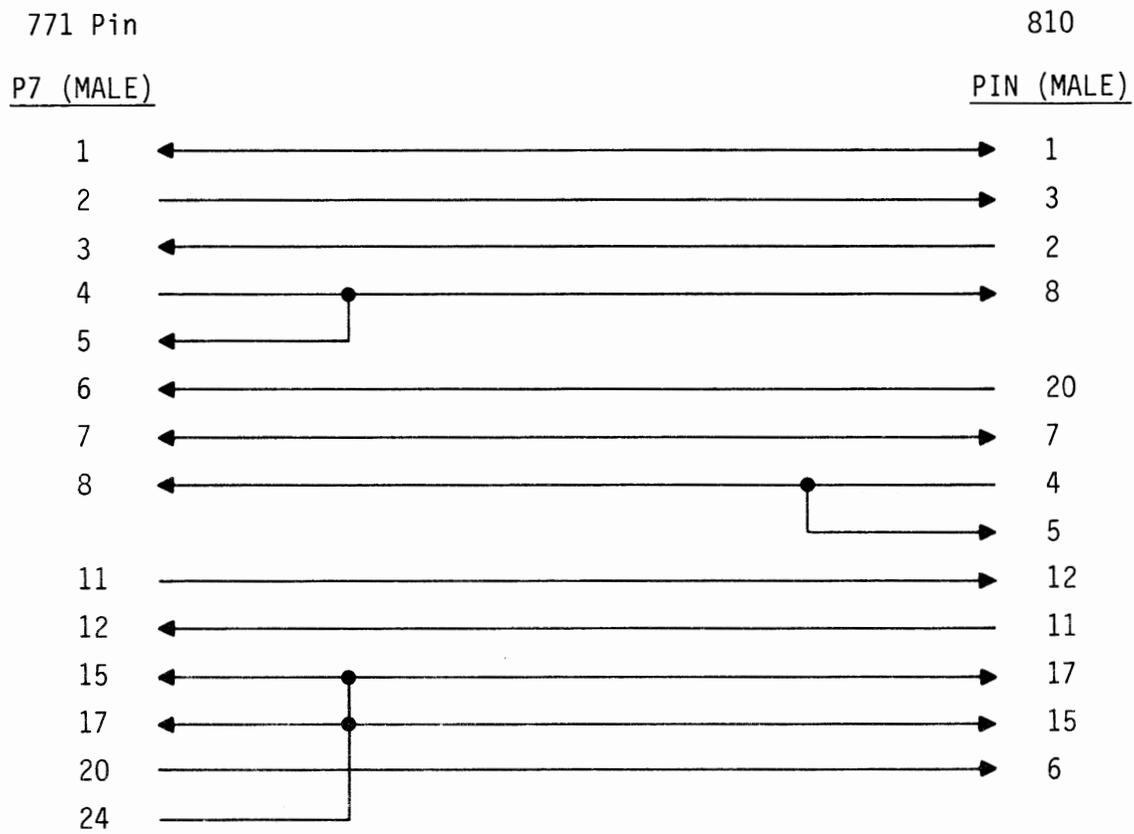
Table A-8. Data Terminal Cable Part Number 993210-0001



<u>P7 PIN</u>	<u>RS232C CIRCUIT</u>	<u>FUNCTION</u>
1	AA	PROTECTIVE GROUND
2	BA	TRANSMITTER DATA
3	BB	RECEIVER DATA
4	CA	REQUEST TO SEND
5	CB	CLEAR TO SEND
6	CC	DATA SET READY
7	AB	SIGNAL GROUND
8	CF	DATA CARRIER DETECT
11	SCA	REVERSE CHANNEL TRANSMIT
12	SCF	REVERSE CHANNEL RECEIVE
15	DB	TRANSMISSION SIGNAL ELEMENT TIMING
17	DD	RECEIVE SIGNAL ELEMENT TIM- ING
20	CD	DATA TERMINAL READY
24	AUXLIO	AUXILIARY INPUT/OUTPUT CON- TROL



Table A-9. MC 810 Cable Part Number 993239-0001



<u>P7 PIN</u>	<u>CIRCUIT</u>	<u>FUNCTION</u>
1	AA	PROTECTIVE GROUND
2	BA	TRANSMITTER DATA
3	BB	RECEIVER DATA
4	CA	REQUEST TO SEND
5	CB	CLEAR TO SEND
6	CC	DATA SET READY
7	AB	SIGNAL GROUND
8	CF	DATA CARRIER DETECT
11	SCA	REVERSE CHANNEL TRANSMIT
12	SCF	REVERSE CHANNEL RECEIVE
15	DB	TRANSMISSION SIGNAL ELEMENT TIM- ING
17	DD	RECEIVE SIGNAL ELEMENT TIMING
20	CD	DATA TERMINAL READY
24	AUXLIO	AUXILIARY INPUT/OUTPUT CONTROL



Table A-10. Connections For Mechanical Loopback Of Controller

On connector P6:

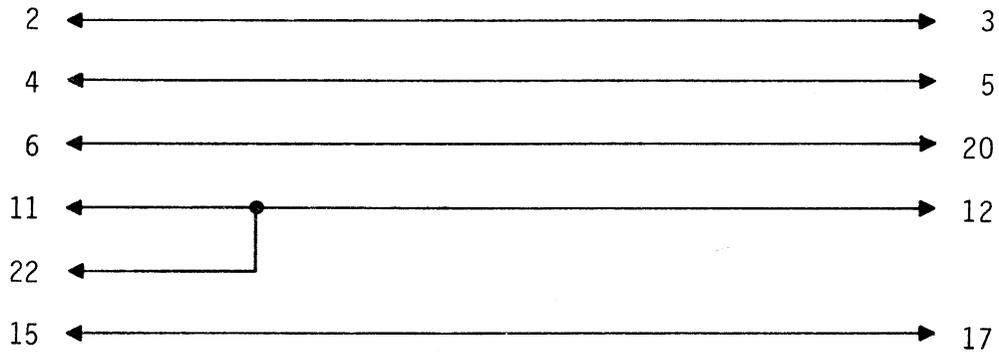
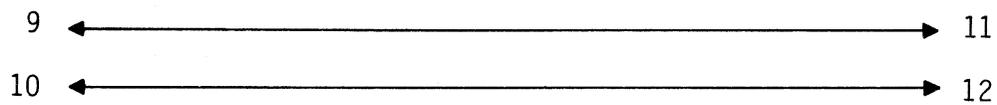
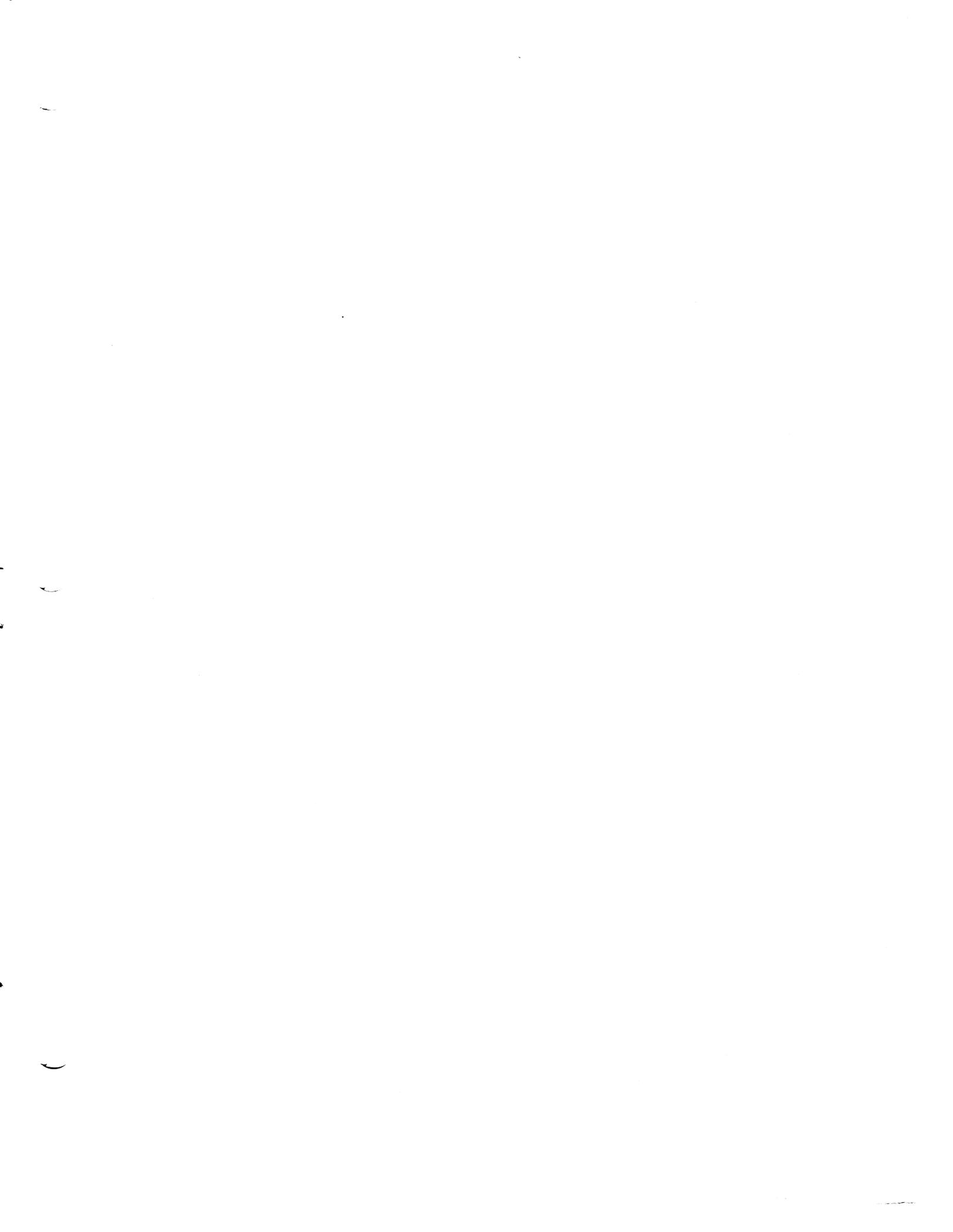
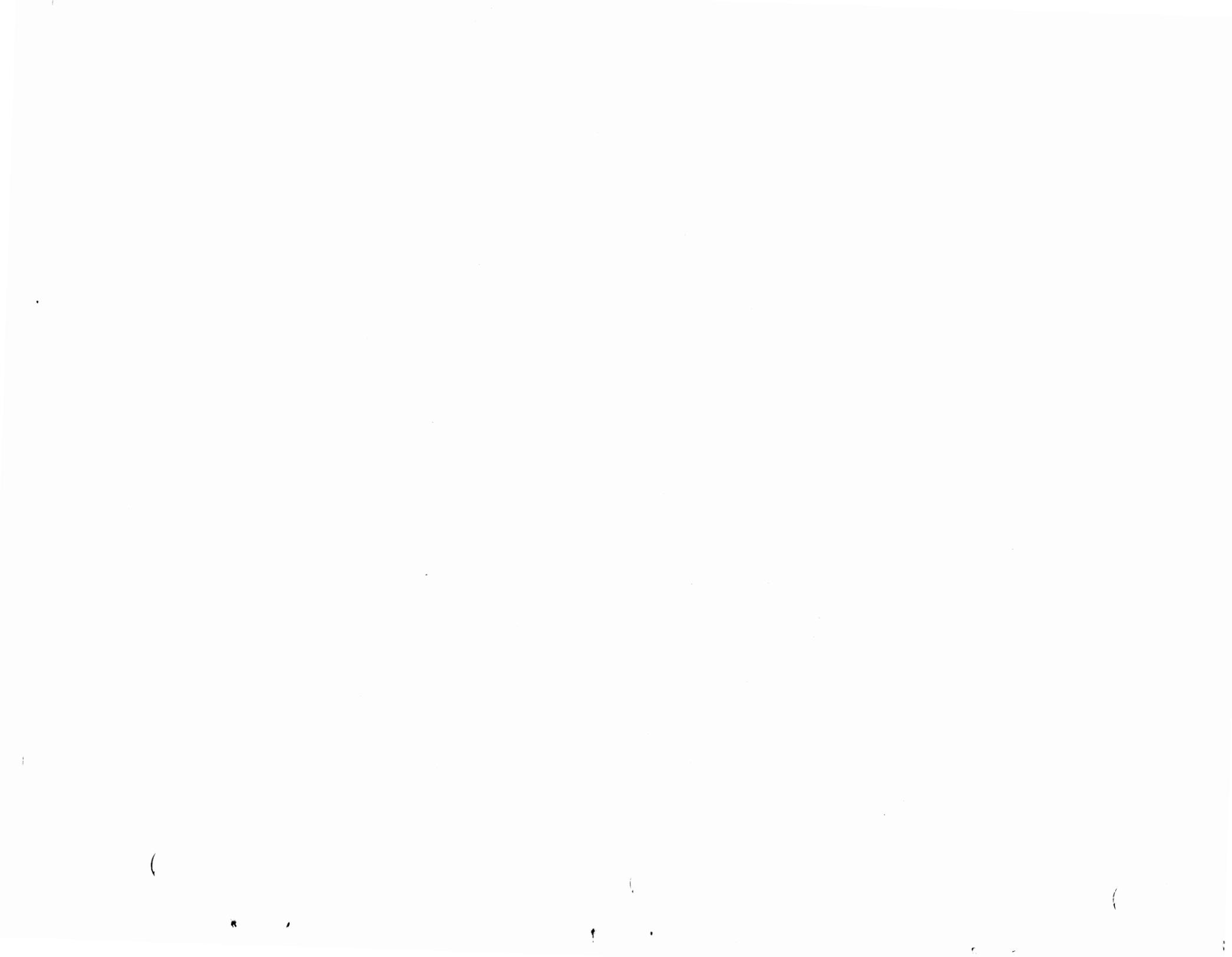


Table A-11. Connections For Mechanical Loopback Of Internal Modem

On connector P8:

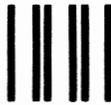








FOLD



NO POSTAGE  
NECESSARY  
IF MAILED  
IN THE  
UNITED STATES

**BUSINESS REPLY MAIL**

FIRST CLASS PERMIT NO. 7284 DALLAS, TX

POSTAGE WILL BE PAID BY ADDRESSEE

**TEXAS INSTRUMENTS INCORPORATED**

DIGITAL SYSTEMS GROUP

ATTN: TECHNICAL PUBLICATIONS

P.O. Box 2909 M/S 2146

Austin, Texas 78769



FOLD

**Texas Instruments U.S. District Sales and Service Offices**

(A complete listing of U.S. offices is available from the district office nearest your location)

**California**

831 S. Douglas Street  
El Segundo, California 90245  
(213) 973-2571

100 California Street  
Suite 480  
San Francisco, California 94111  
(415) 781-9470

776 Palomar Avenue  
P.O. Box 9064  
Sunnyvale, California 94086  
(408) 732-1840\*

3186 J Airway  
Costa Mesa, California 92626  
(714) 540-7311

**Colorado**

9725 East Hampden Avenue  
Suite 301  
Denver, Colorado 80231  
(303) 751-1780

**Florida**

1850 Lee Road  
Suite 115  
Winter Park, Florida 32789  
(305) 644-3535

**Georgia**

3300 Northeast Expressway  
Building 9  
Atlanta, Georgia 30341  
(404) 458-7791

**Illinois**

515 West Algonquin Road  
Arlington Heights, Illinois 60005  
(312) 640-2900  
(800) 942-0609\*

**Massachusetts**

504 Totten Pond Road  
Waltham, Massachusetts 02154  
(617) 890-7400

**Michigan**

24293 Telegraph Road  
Southfield, Michigan 48034  
(313) 353-0830  
(800) 572-8740\*

**Minnesota**

7625 Parklawn Avenue  
Minneapolis, Minnesota 55435  
(612) 830-1600

**Missouri**

2368 Schuetz  
St. Louis, Missouri 63141  
(800) 392-4225\*

**New Jersey**

1245 Westfield Avenue  
Clark, New Jersey 07066  
(201) 574-9800

**Ohio**

4124 Linden Avenue  
Dayton, Ohio 45432  
(513) 258-3877

**Pennsylvania**

420 Rouser Road  
Coraopolis, Pennsylvania 15108  
(412) 771-8550

**Texas**

8001 Stemmons Expressway  
P.O. Box 226080  
M/S 3108  
Dallas, Texas 75266  
(214) 689-4460

13536 North Central Expressway  
P.O. Box 5012  
M/S 917  
Dallas, Texas 75222  
(214) 238-3881

9000 Southwest Freeway  
P.O. Box 1444  
M/S 6500  
Houston, Texas 77001  
(713) 776-6577

8585 Commerce Drive, Suite 518  
Houston, Texas 77036  
(713) 776-6511

**Virginia**

1745 Jefferson Davis Highway  
Crystal Square 4, Suite 600  
Arlington, Virginia 22202  
(703) 553-2200

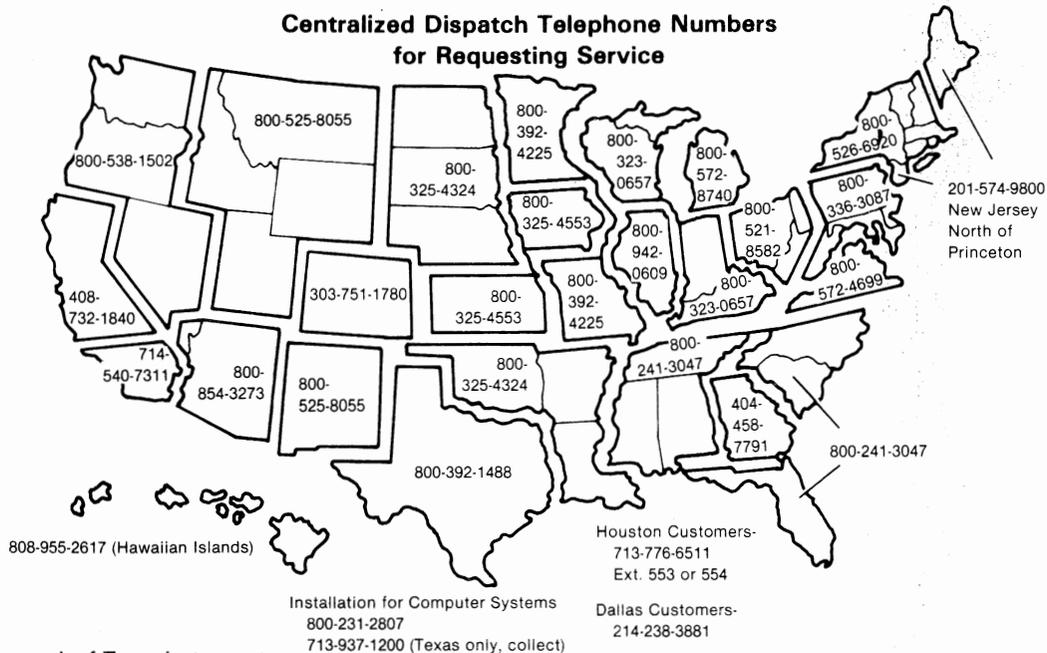
**Wisconsin**

205 Bishops Way  
Suite 214  
Brookfield, Wisconsin 53005  
(414) 784-1323

\*Service telephone number

**TI-CARE\***

**Centralized Dispatch Telephone Numbers  
for Requesting Service**



\*Service mark of Texas Instruments

The TI Customer Support Line is available to answer our customers' complex technical questions. The extensive experience of a selected group of TI senior engineers and systems analysts is made available directly to our customers. The TI Customer Support Line telephone number is (512) 250-7407.



**TEXAS INSTRUMENTS**  
INCORPORATED

DIGITAL SYSTEMS GROUP  
POST OFFICE BOX 2909      AUSTIN, TEXAS