



MS1 56K CSU/DSU Module

MS10 Dual 56K CSU/DSU Module

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WARNING!

Fuse replacement or any other maintenance that requires access to the interior of the unit must be performed only by a qualified technician. Before any such work may be performed, and to avoid any possibility of electrical shock, the power-supply cord must be disconnected from the power source.

CANADIAN NUMBERS EQUIVALENT TO USOC

Canadian numbers equivalent to USOC are:

CA11A for RJ-11C

CA1DA for RJ-1DC

CA41A for RJ-41S

CA45A for RJ-45S

INSTRUCCIONES DE SEGURIDAD (Normas Oficiales Mexicanas Electrical Safety Statement)

1. Todas las instrucciones de seguridad y operación deberán ser leídas antes de que el aparato eléctrico sea operado.
2. Las instrucciones de seguridad y operación deberán ser guardadas para referencia futura.
3. Todas las advertencias en el aparato eléctrico y en sus instrucciones de operación deben ser respetadas.
4. Todas las instrucciones de operación y uso deben ser seguidas.
5. El aparato eléctrico no deberá ser usado cerca del agua—por ejemplo, cerca de la tina de baño, lavabo, sótano mojado o cerca de una alberca, etc..
6. El aparato eléctrico debe ser usado únicamente con carritos o pedestales que sean recomendados por el fabricante.
7. El aparato eléctrico debe ser montado a la pared o al techo sólo como sea recomendado por el fabricante.
8. Servicio—El usuario no debe intentar dar servicio al equipo eléctrico más allá a lo descrito en las instrucciones de operación. Todo otro servicio deberá ser referido a personal de servicio calificado.
9. El aparato eléctrico debe ser situado de tal manera que su posición no interfiera su uso. La colocación del aparato eléctrico sobre una cama, sofá, alfombra o superficie similar puede bloquea la ventilación, no se debe colocar en libreros o gabinetes que impidan el flujo de aire por los orificios de ventilación.
10. El equipo eléctrico debe ser situado fuera del alcance de fuentes de calor como radiadores, registros de calor, estufas u otros aparatos (incluyendo amplificadores) que producen calor.
11. El aparato eléctrico deberá ser conectado a una fuente de poder sólo del tipo descrito en el instructivo de operación, o como se indique en el aparato.
12. Precaución debe ser tomada de tal manera que la tierra física y la polarización del equipo no sea eliminada.
13. Los cables de la fuente de poder deben ser guiados de tal manera que no sean pisados ni pellizcados por objetos colocados sobre o contra ellos, poniendo particular atención a los contactos y receptáculos donde salen del aparato.
14. El equipo eléctrico debe ser limpiado únicamente de acuerdo a las recomendaciones del fabricante.
15. En caso de existir, una antena externa deberá ser localizada lejos de las líneas de energía.
16. El cable de corriente deberá ser desconectado del cuando el equipo no sea usado por un largo periodo de tiempo.
17. Cuidado debe ser tomado de tal manera que objetos líquidos no sean derramados sobre la cubierta u orificios de ventilación.
18. Servicio por personal calificado deberá ser provisto cuando:
 - A: El cable de poder o el contacto ha sido dañado; u
 - B: Objetos han caído o líquido ha sido derramado dentro del aparato; o
 - C: El aparato ha sido expuesto a la lluvia; o
 - D: El aparato parece no operar normalmente o muestra un cambio en su desempeño; o
 - E: El aparato ha sido tirado o su cubierta ha sido dañada.

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1. Specifications

Unless otherwise noted, these specifications apply to both the MS1 56K CSU/DSU Module (MT150C) and the MS10 Dual 56K CSU/DSU Module (MT152C).

Network Application	4-wire DDS interface to AT&T® Digital Data Service network (or equivalent)
Line Interface	MT150C: (1) RJ-45 8-pin modular jack; MT152C: (2) RJ-45 8-pin modular jacks
Data Rate	56 Kbps
Transmission Mode	Full duplex, synchronous
Loop Range	15,000 ft. (4570 m) over 26-AWG wire
Output Signal	1.4 V peak at 56K (135Ω load)
Operating Modes	Data Mode, Idle Mode, Out-of-Service Mode, Test Mode
Timing	Network-derived (internal crystal)
Clocking	Internal/External
Diagnostics	Local Loopback, Digital Loopback, End-to-End Test Pattern, Self-Test, Telco CSU and DSU tests
Indicators	LL - Local Loop RT - Remote Test SI - Signal Indicator RD - Receive Data TD - Transmit Data
Operating Environment	
Temperature	32 to 113°F (0 to 45°C)
Humidity	10 to 90% noncondensing
Certifications	FCC Part 68 FCC 15, Subpart J, Class A UL® and CSA
FCC Registration Number	BEB9E9-16166-DE-N
Ringer Equivalency	0.0 B

2. Introduction

2.1 Overview

The MS1 56K CSU/DSU Module (MT150C) and the MS10 Dual 56K CSU/DSU Module (MT152C) are optional expansion modules for use with the Multiserver family of voice/data/fax multiplexors.

The MS1 module is for use with a Multiserver 1000, 5000, or 10000 base unit, and provides a single access channel to the telephone company's 56,000-bps Digital Data System (DDS) network or to a non-DDS private network (see Figure 2-1).

The MS10 dual-channel module provides two channels to the same high-speed digital data service (see Figure 2-2).

Telecommunication service providers require that you use a Channel Service Unit (CSU) and a Data Service Unit (DSU) to connect to a DDS network. The CSU/DSU Modules described in this manual are Integrated Service Units (ISU), supporting the functions of both a CSU and a DSU.

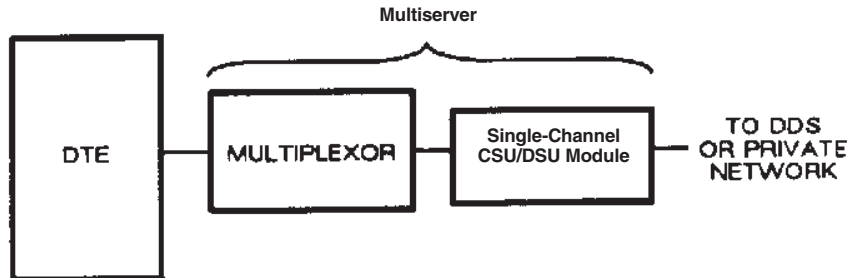


Figure 2-1. Multiserver-to-DDS Link Using an Optional Single-Channel CSU/DSU Expansion Module.

DDS supports full-duplex operation. The ISU synchronizes its Transmit and Receive clocks derived from the DDS network, and then provides the clocking to the composite channel of the multiplexor. DDS provides point-to-point and multipoint service to most major cities in the U.S.A. and a limited area in Canada (where DDS is called Datastream). A typical point-to-point application of the single-channel CSU/DSU module is shown in Figure 2-3.

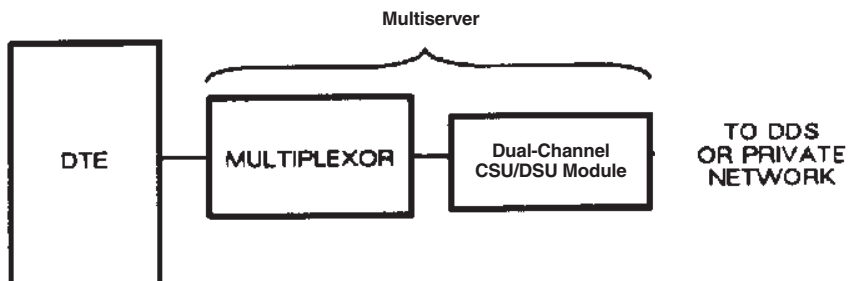


Figure 2-2. Multiserver-to-DDS Link Using an Optional Dual-Channel CSU/DSU Expansion Module.

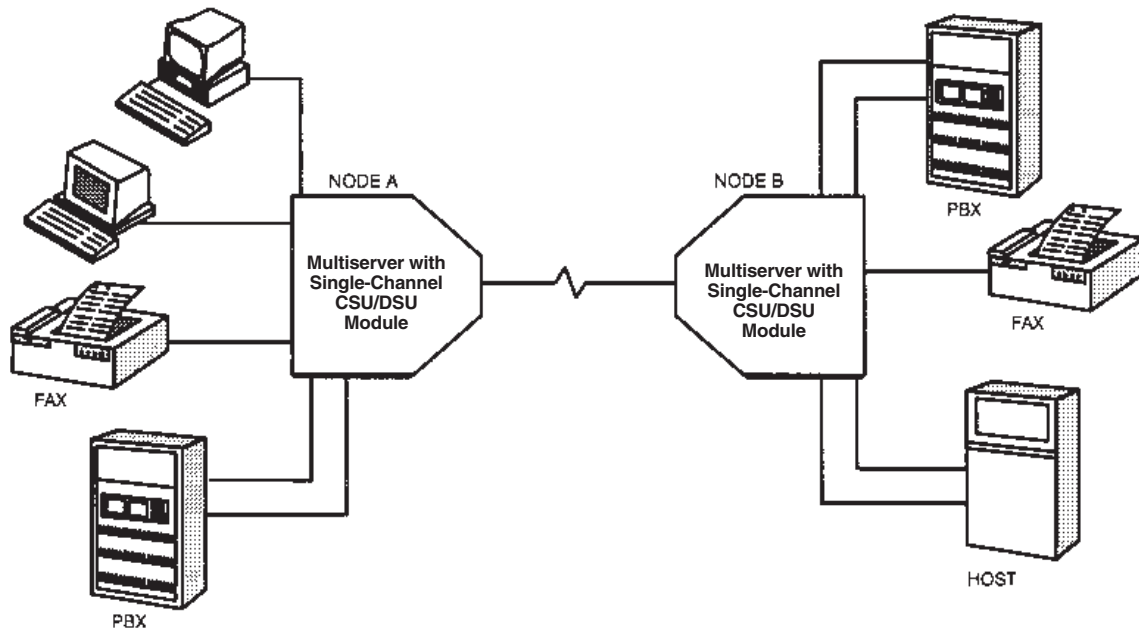


Figure 2-3. Typical Multiserver Application Using Single-Channel CSU/DSU Modules.

2.2 Applications for the Dual-Channel Module

Using the dual-channel module with a Multiserver 10000 lets you make point-to-point or multipoint connections between Multiservers.

When connected point-to-point, network traffic is balanced between both channels. If operation over either of the channels is disrupted, all network traffic is automatically routed through the remaining channel (see Figure 2-4).

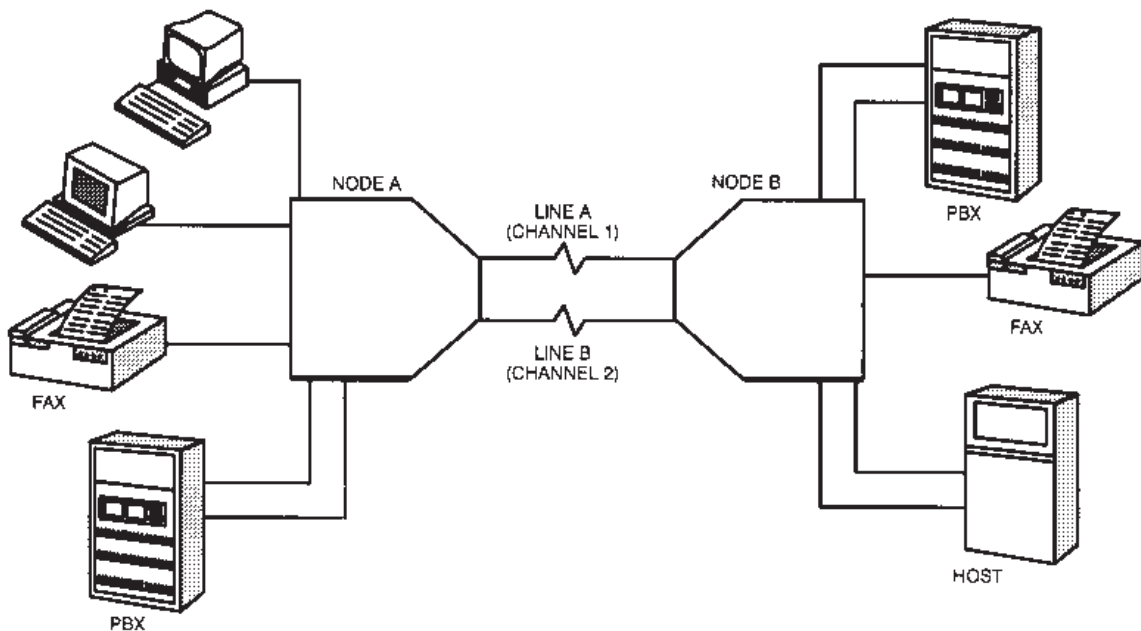


Figure 2-4. Point-to-Point Multiserver Application Using Dual-Channel CSU/DSU Modules.

When used for a multipoint connection, each channel acts as a single link between two nodes, operating independently of the other channel (see Figure 2-5).

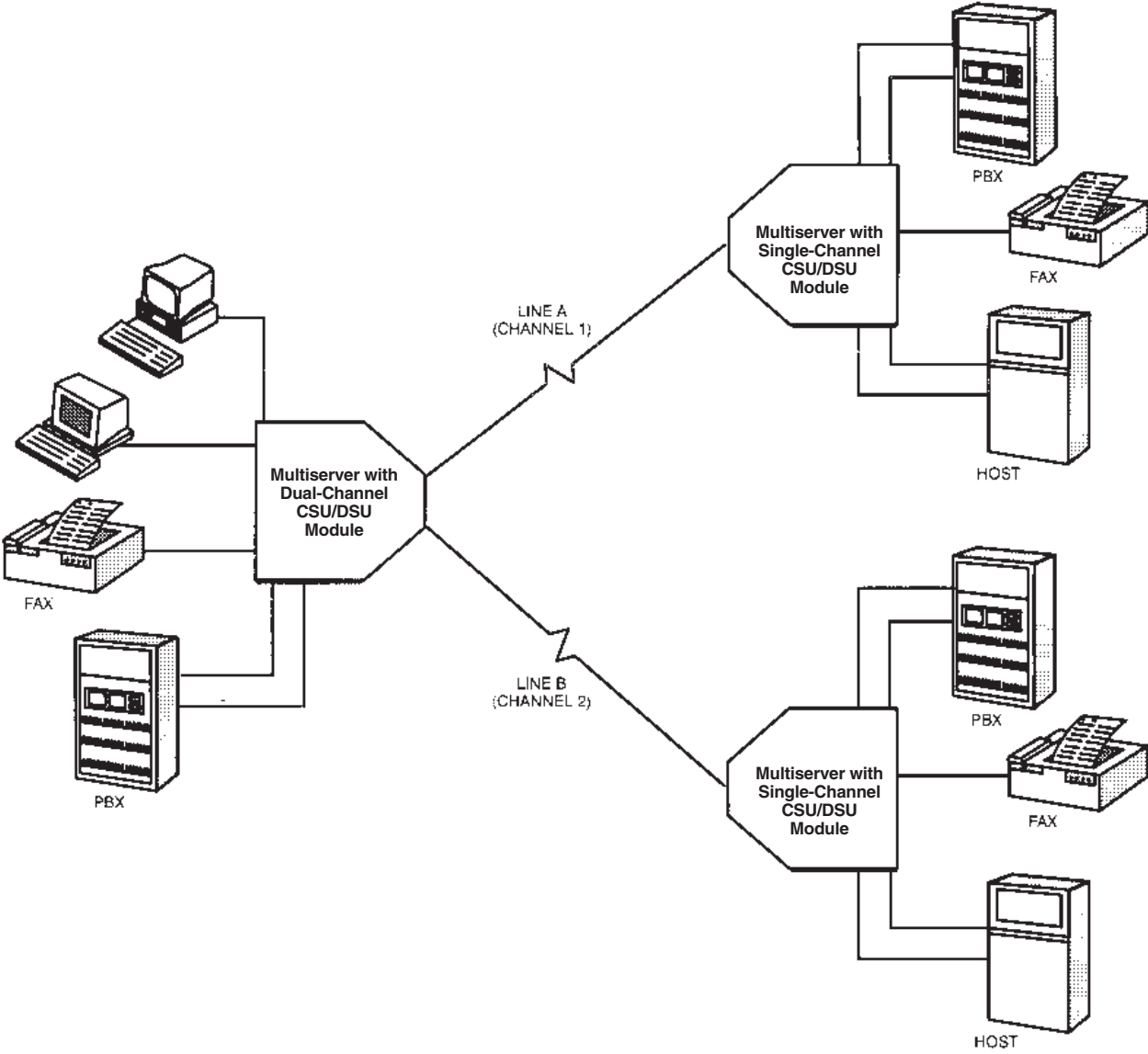


Figure 2-5. Multipoint Application Using Dual-Channel CSU/DSU Modules.

3. Installation

3.1 Installation

Before installing the module, make sure that the clock jumper at location E2 (E3 for Dual-Channel Models) is set appropriately for your application.

When connecting to a DDS network:

- Your CSU/DSU's clock should be set to EXTERNAL.

When connecting to a non-DDS private line:

- One CSU/DSU Module must be configured for INTERNAL clock and the other for EXTERNAL clock.

To make your selection, place the jumper over the middle pin and either the pin labeled EXT for external clocking, or the pin labeled INT for internal clocking (see Figure 3-1).

Once clocking is selected, you're ready to install the CSU/DSU Module in your Multiserver.

3.1.1 SAFETY INFORMATION

When working inside the Multiserver 1000, take precautions against electrostatic discharge.

- To discharge any buildup of static electricity, touch any metal part of the Multiserver 1000 unit before handling any module. (A ground-ing strap, if available, can be worn to further protect the equipment while the unit is open.)
- Avoid working on carpet.

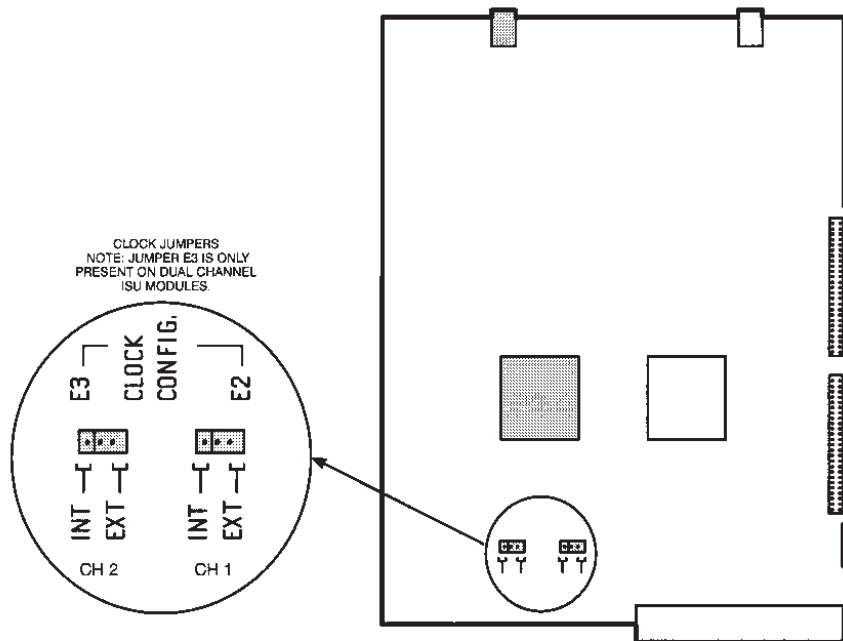


Figure 3-1. Setting the Clock Jumper(s) on the CSU/DSU Module.

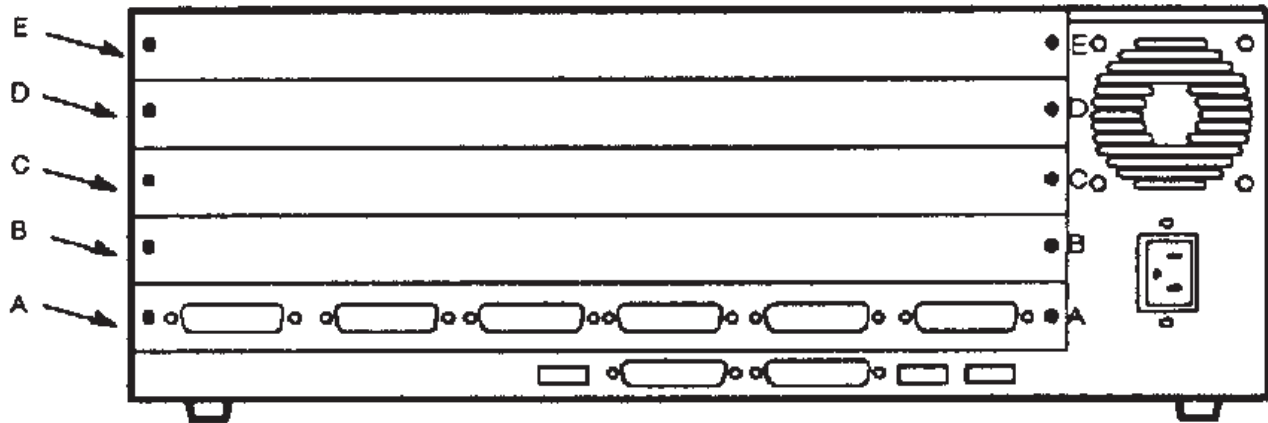


Figure 3-2. Module stacking order in the Multiserver 1000.

3.1.2 MODULE STACKING ORDER

Before you install the MS1 56K CSU/DSU Module, it is important that you become familiar with the five module locations available in the Multiserver unit. These are identified from bottom to top as module locations A through E (see Figure 3-2).

There are many possible hardware-configuration combinations. However, in every Multiserver the Command Control Module (CCM) is always in Location A. The CSU/DSU Module is normally placed above the other modules, unless a modem module is also installed. No other module can be positioned above a modem module. If there is a modem module, the CSU/DSU must be installed in the slot immediately below it.

Modules must be stacked from bottom to top without skipping a module location. For example, if there are four modules, location E will be unused. Unused module locations are filled with blank panels installed in the rear of the Multiserver.

3.1.3 DISASSEMBLING THE MULTISERVER 1000 UNIT

To disassemble a Multiserver base unit, you must remove the cover and back panels (both blanks and those on the modules). If sufficient clearance is available (approximately six inches above the cover and the length of the screwdriver on both sides), you may disassemble the unit at your regular work station. Otherwise, move the unit to a more accessible location. Before you move the unit, disconnect all external cables.

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Removing the Cover

1. Using a Number 2 or Number 3 Phillips screw-driver, remove and save the four screws (two on each side) from the cover (see Figure 3-3.)
2. Lift off the cover.

CAUTION

Be careful not to touch the delicate metallic finger stocks, which are located along each rim of the cover. These are needed to make contact with the bottom enclosure to ensure the safety required by FCC Part 15 or FTZ radiated-emission standards.

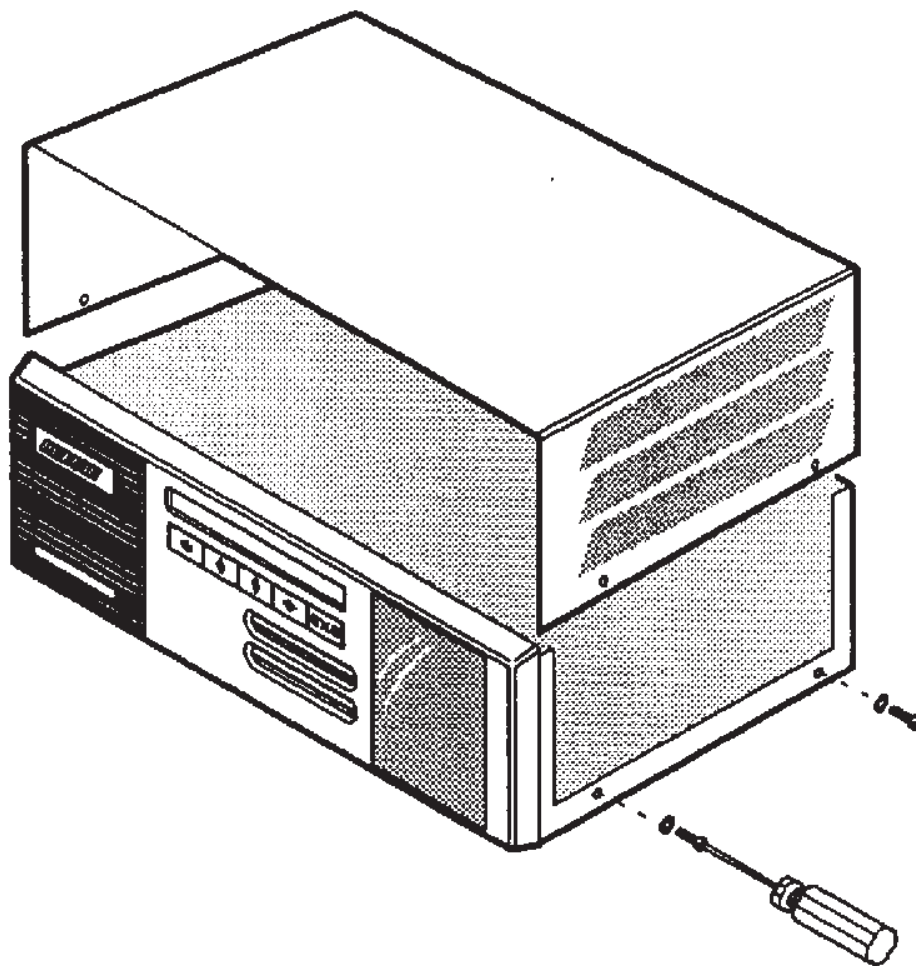


Figure 3-3. Removing the cover of a Multiserver Base Unit.

Removing the Blank Panel(s)

Any installed blank back panel is supported by two retaining screws. To remove the panel, remove and save the screws. Then pull off the panel (see Figure 3-4). Remove all blank back panels down to the top module board.

Removing the Spacer

Inside the front of the Multiserver are six spacers for positioning modules (see Figure 3-5). To remove a spacer, simply slide it up and out. Save the spacer for reassembly.

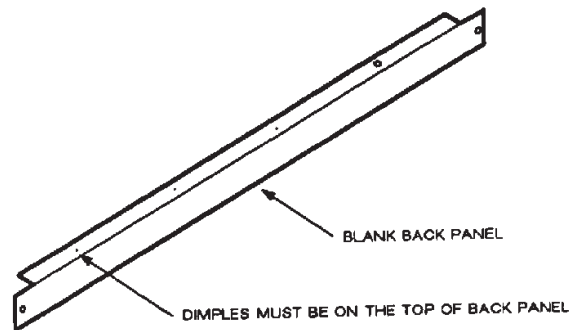


Figure 2-4. Blank Back Panel

Figure 3-4. Rear blank panel.

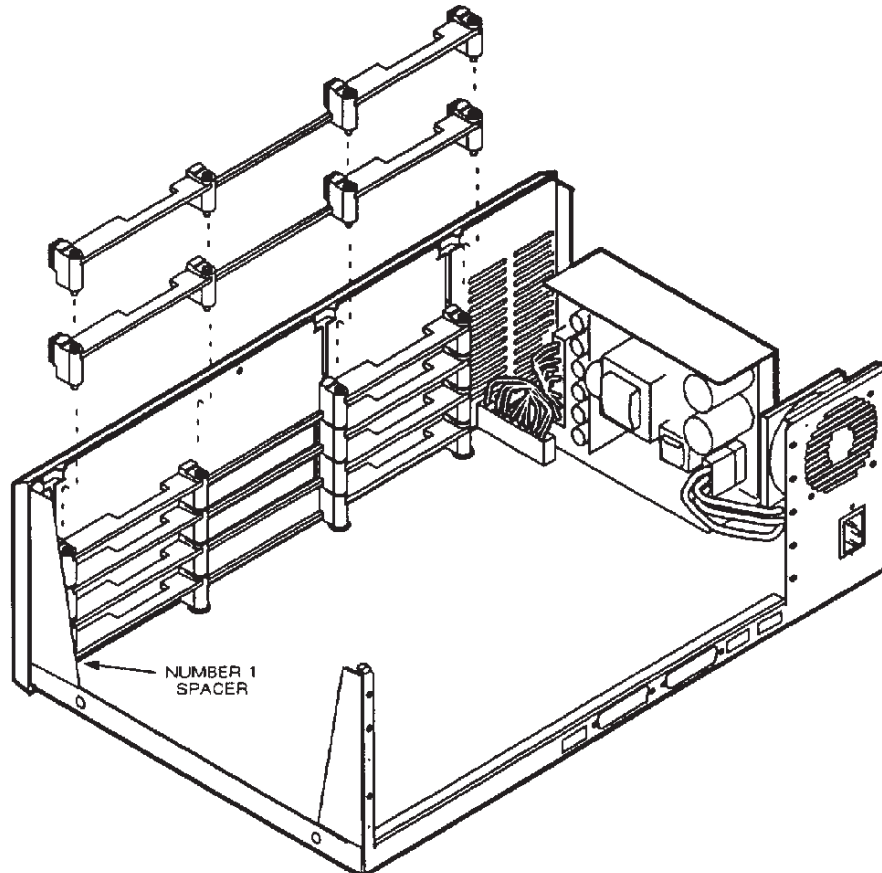


Figure 3-5. Removing Spacers from a Multiserver Base Unit.

MS1 56K CSU/DSU MODULE AND MS10 DUAL 56K CSU/DSU MODULE

3.1.4 MODULE LOCATION SWITCH SETTINGS

Each expansion module has a module-location switch group that informs the software of its location in the Multiserver base unit (see Figure 3-6). The exception to this is the CCM, which is assumed to be in module location A.

Each switch group consists of four switches, 1 through 4. A decal in front of the switch group maps the switch with the module locations. Before setting the switch, first determine the slot location where the CSU/DSU Module will be installed. Then set the switch to match the intended module location. For example, if the intended module location is D, set switch 3 to ON, and the other three to OFF. To set a switch segment to ON, use a ballpoint pen or similar pointed tool and push the switch segment down.

NOTE: Make sure that only one switch in the switch Group is ON (down) and that the remaining three segments are OFF (up).

3.1.5 REASSEMBLING THE MULTISERVER

Make sure that a spacer assembly is inserted at the front of the Multiserver base unit, between the CSU/DSU Module you're installing and the modules above and below it. Place the CSU/DSU Module on the spacer.

Inter-Module Stacking Connectors

The modules are powered via stacking connectors located on the left side of the unit (looking at the back of the unit—Figure 3-7). A stacking connector has two parts: a shroud and a block. The shroud is on the bottom of the module being installed and fits over the block on the module below. As you position the module, align the shroud and the block. Press the two together until the connector is completely coupled. Make sure that the holes in the front of the module are aligned with the pins on the spacer.

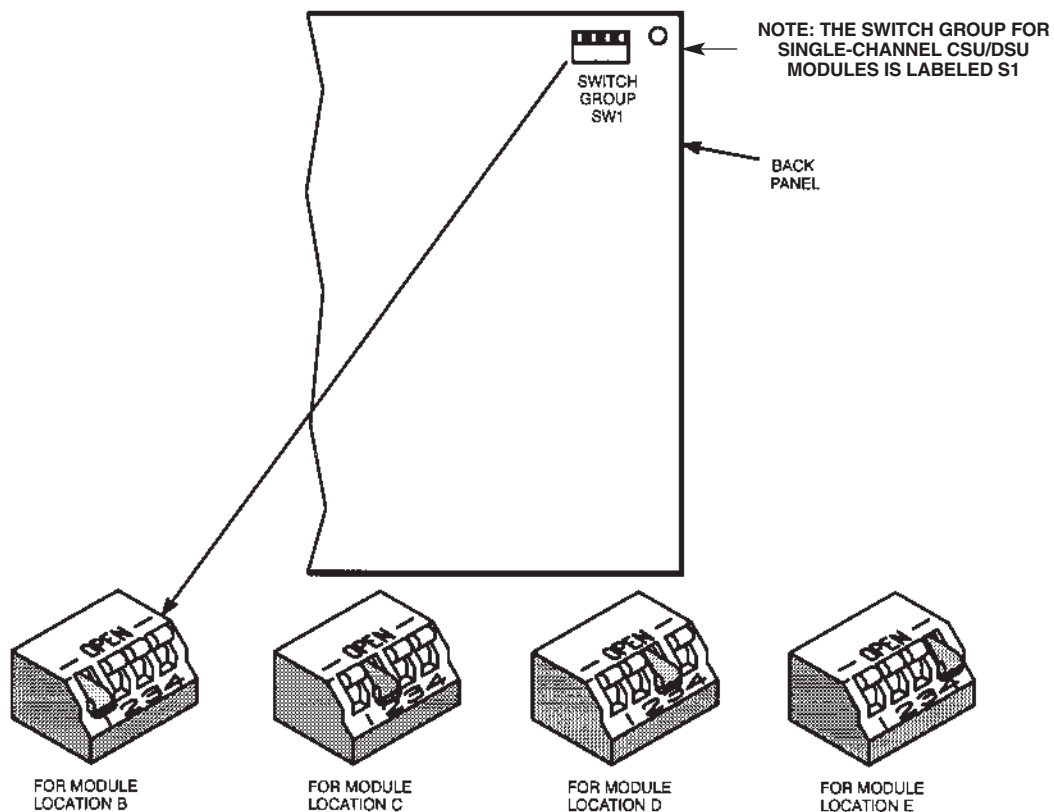


Figure 3-6. Switch S1 and the Module location settings.

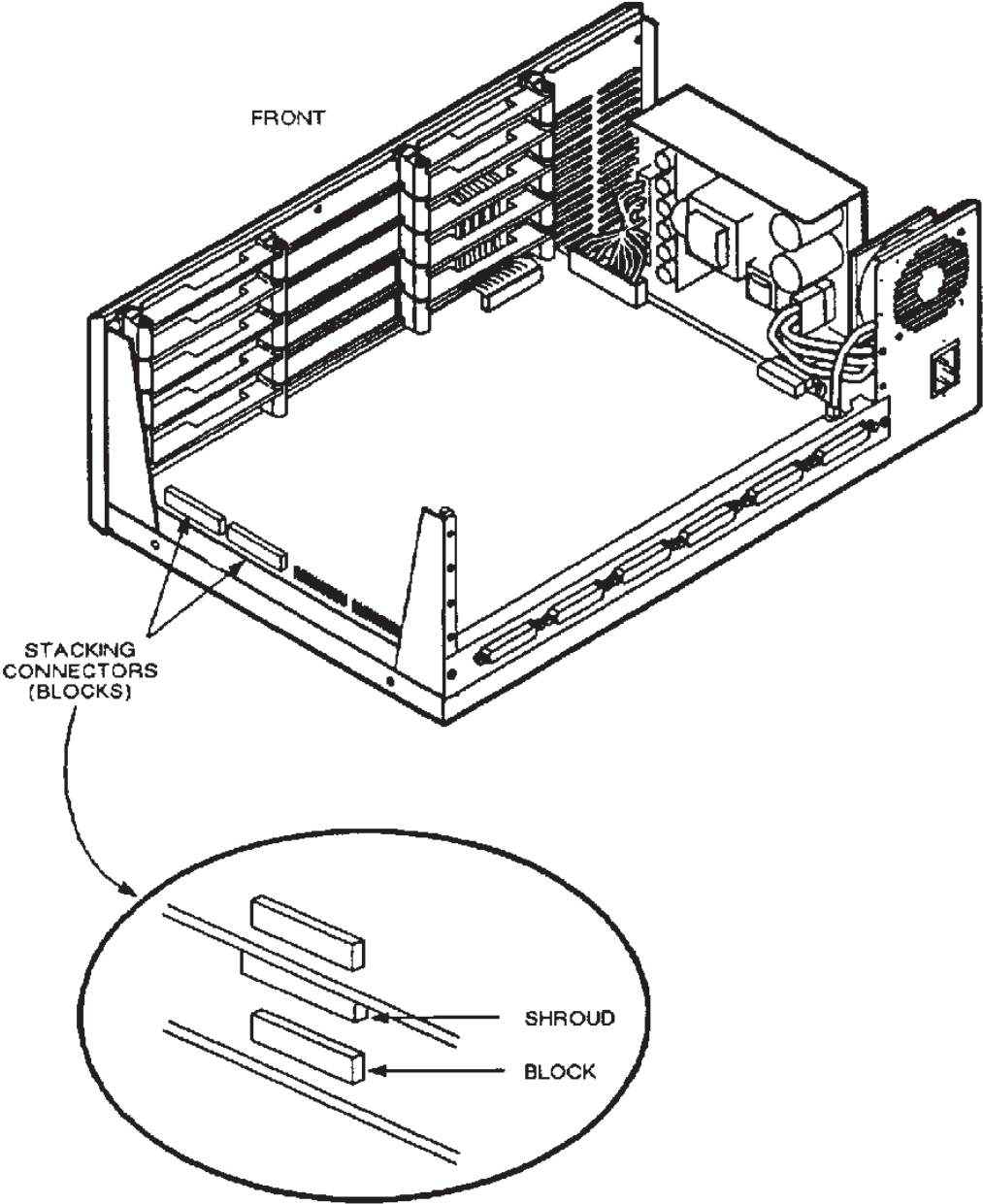


Figure 3-7. Location of module stacking connectors.

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Align the two holes in the back of the module with the two holes in the back of the chassis. Screw the back panel to the chassis.

Attach one end of the CSU/DSU Module cable to the RJ-45 connector on the back of the module (insert the second connector for the dual-channel CSU/DSU Module), and the other end to the DDS connector.

This provides the connection for the Receive and Transmit Data leads, as shown in Figure 3-8:

Blank Back Panel

The Multiserver base unit is delivered with blank back panels to eliminate an open area in the rear of the unit where there are no modules installed (see Figure 3-9). Do not discard these blank panels when you remove them to install additional modules. You might need them later.

3.2 Startup

When the Multiserver is powered up, the system will begin operation over the DDS network.

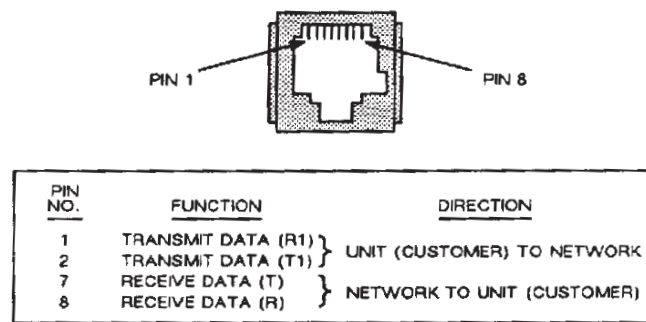


Figure 3-8. The module connection for Transmit and Receive leads.

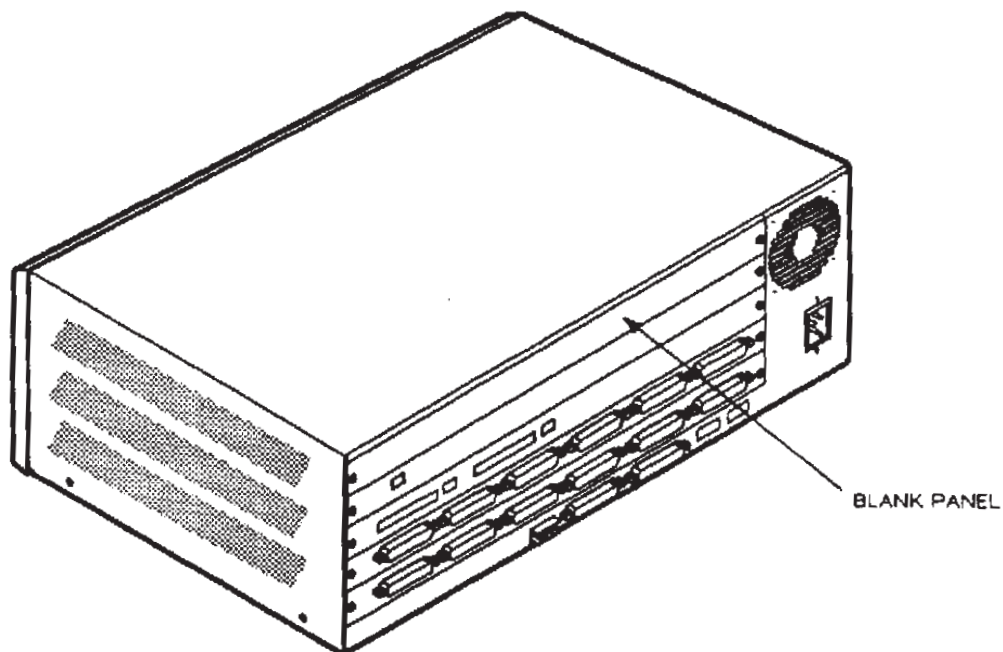


Figure 3-9. A Blank Back Panel on Back of a Multiserver.

4. Operation

This section describes the CSU/DSU Module indicators and modes of operation.

4.1 Indicators

The CSU/DSU Module has five indicators for each channel that display current status (the dual-channel model has a duplicate set of five indicators—ten in all). Figure 4-1 shows their location; Table 4-1 describes their functions.

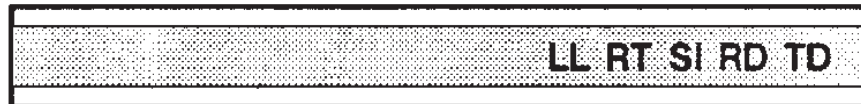


Figure 4-1. Location of the Indicators

Table 4-1. CSU/DSU Indicators and Their Functions.

INDICATOR	OFF	FLASHING	ON
LL Local Loop	Normal operation.	Local Loopback Test is active.	—
RT Remote Test	Normal operation.	Digital Loopback or Remote Terminal Loopback Test is active.	—
SI Signal Indicator	Power is off or module is defective.	The CSU/DSU is receiving out-of-service signals from code, or out-of-frame DDS code, or no DDS signal is being passed.	Power is on and the CSU/DSU is synchronized with the network.
RD Receive Data	No data is being received by the CSU/DSU Module.	The CSU/DSU is receiving an error during Test Pattern Test.	CSU/DSU is receiving data.
TD Transmit Data	No data is being transmitted.	Data is being transmitted.	Data is being transmitted.

4.2 Modes of Operation

DATA MODE

The CSU/DSU Module's transmitter and receiver operate independently on the DDS network channel. However, the Multiserver module sends continuous transmissions to the remote unit to maintain synchronization. Thus, when the CSU/DSU is in the normal Data Mode, it will be continuously transmitting and receiving data in synchronization with the DDS clock. The indicator displays for this mode are as follows:

LL.....OFF
RT.....OFF
SI.....ON
RD.....FLICKERING or ON
TD.....FLICKERING or ON

While receiving data, the CSU/DSU monitors the DDS line for Out-Of-Service, Out-Of-Frame, Telco RT Loopback, and Idle codes, as well as loss of signal (cable disconnection). When any of these codes or loss of signal is detected, the CSU/DSU goes into the Out-Of Service Mode. When this state occurs with a dual-channel CSU/DSU, traffic automatically reroutes to the remaining link, and the disconnected channel goes into Out-of-Service mode.

IDLE MODE

The CSU/DSU Module *transmitter* goes into the Idle Mode if the multiplexor module stops sending data. This condition does not normally occur, as the multiplexor module should be continuously transmitting a synchronous data stream of the composite link. When the transmitter is idle, it transmits Idle codes to the DDS network. The indicator displays for the CSU/DSU transmitter in Idle Mode are:

LL.....OFF
RT.....OFF
SI.....ON
RD.....ON, FLICKERING or OFF
TD.....FLICKERING or OFF

The CSU/DSU *receiver* goes into the Idle Mode if the CSU/DSU is receiving Idle codes from the Central Office. This condition may occur if the remote unit is disconnected from the network. The indicator displays for the CSU/DSU receiver in Idle Mode are:

LL.....OFF
RT.....OFF
SI.....ON
RD.....OFF
TD.....FLICKERING or OFF

OUT-OF-SERVICE MODE

The CSU/DSU is in this mode if any of the following conditions exist in the DDS line:

- The local CSU/DSU detects a loss of signal on the DDS lines. The CSU/DSU will stop transmitting and receiving data until the signal is restored.
- The DDS maintenance facility detects an error condition in the DDS network. The DDS maintenance facility will cause Out-of-Service or Out-of-Frame codes to be sent to the local CSU/DSU module. An Out-of-Service display is as follows:

```

LL.....OFF
RT.....OFF
SI.....FLASHING
RD.....OFF
TD.....OFF or ON

```

The most common cause of this mode is a disconnection of the CSU/DSU from the DDS line.

When you see an out-of-service indication, check the connection to the DDS jack. Make sure the phone-line cable is properly connected. If the Out-of-Service indication persists, report the condition to the local telephone company. They will advise you on how to solve the problem.

While the CSU/DSU is out of service, the **SI** indicator **FLASHING** shows that the DDS line is unavailable. This state will exist until data other than Out-of-Service or Out-of-Frame codes is received, or the signal on the DDS line is restored. Then the system will revert to the Idle or Data Mode.

5. Troubleshooting

There are multiple tests you can run to verify the performance of the CSU/DSU Module and the DDS line. There are also several tests that your telephone company can run, at your request, to test the DDS line and your CSU/DSU.

Section 5.3 describes the telephone-company tests. **Section 5.1** defines the user-selectable tests and explains how to run them using the Multiserver Command Facility via an attached ASCII terminal. **Section 5.2** shows how to run the same tests using the LCD/Keypad controls on the front panel of your Multiserver.

5.1 Running Tests From the Command Facility

Working at an ASCII terminal attached to your Multiserver, enter the ISU TEST menu (shown below) by selecting item 7, DIAGNOSTICS, from the Command Facility Main Menu.

```

                ISU TEST [NONE]
1.  LOCAL LOOPBACK
2.  DIGITAL LOOPBACK
3.  TEST PATTERN (TP)
4.  LOCAL LOOPBACK WITH TP
5.  NONE
<CR> - ACCEPT ENTRY
M - MAIN MENU

```

Then select item 6, INTEGRAL DEVICE TEST, from the DIAGNOSTICS menu. The system will prompt you for the CSU/DSU channel number with the following:

ENTER LINK CHANNEL# (^X TO ABORT):

Enter link channel number **A1** for the single-channel CSU/DSU module, or to test channel 1 on the dual-channel module. Enter **A2** to test channel 2 on the dual-channel module.

With the ISU TEST menu onscreen, you're ready to run any of the four tests listed.

5.1.1 LOCAL LOOPBACK TEST

Local Loopback tests the integrity of the CSU/DSU module's RJ-45 port, the Multiserver terminal, cabling, and the interconnect (composite) link for both the local and the remote unit.

IMPORTANT

This test interrupts normal operation over the selected link.

Figure 5-1 shows the data path of a Local Loopback test initiated at the local Multiserver base unit. The display on the CSU/DSU module indicators should be as follows:

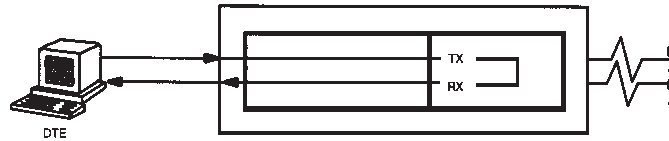


Figure 5-1. Local Loopback Test.

```
LL.....FLASHING
RT .....OFF
SI.....ON
RD .....FLICKERING
TD .....FLICKERING
```

To activate a test of the link from the local unit, use the following sequence:

1. From the DIAGNOSTICS Menu, enter Item 1, REMOTE COMPOSITE LOOPBACK.
 2. Enter Link Channel Number **A1** (or **A2**).
 3. From the Diagnostics Menu, enter Item 2, LINK CHANNEL LOOPBACK.
 4. From the LINK CHANNEL LOOPBACK menu, enter either Item 2, REMOTE ECHO or Item 4, REMOTE FOX.
- Reenter Link Channel Number A1 (or A2).

If Item 2 is entered, the data entered at the terminal should be echoed back exactly as sent.

If Item 4 is entered, the continuous fox message should be returned correctly, as follows:

THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG. 1234567890

5.1.2 DIGITAL LOOPBACK TEST

Two Digital Loopback Tests, one initiated from the local Multiserver, and one initiated from the remote Multiserver, will verify the data path from a local terminal up to the CSU/DSU module, and the data path of the network from a terminal at the remote site.

NOTE

These tests require operator intervention at both sides of the link, *and* the selected link must be operational to perform the tests.

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Figure 5-2 shows the data path of a Digital Loopback Test run from the Local DTE.

To run the Digital Loopback Test, perform the following steps at the remote unit:

1. From the Command Facility Main Menu, enter Item 7, DIAGNOSTICS.
2. From the DIAGNOSTICS Menu, enter Item 6, INTEGRAL DEVICE TEST.
3. Enter Link Channel Number **A1** (or **A2**) at the prompt. The ISU Test menu will appear.
4. From the ISU Test Menu, select Item 2, DIGITAL LOOPBACK.

Now, perform the following steps at the local unit:

1. Enter the Command Facility Menu from the port specified for the test.
2. Select item 7, DIAGNOSTICS.
2. From the DIAGNOSTICS Menu, enter item 1, REMOTE COMPOSITE LOOPBACK.
3. Enter Link Channel Number **A1** (or **A2**) at the prompt. The ISU Test menu will appear.
4. Return to the DIAGNOSTICS menu and select item 2, LINK CHANNEL LOOPBACK.
5. Select either item 2, REMOTE ECHO, or item 4, REMOTE FOX.

When selecting item 2, REMOTE ECHO:

- At the prompt, enter the link channel number (**A1** or **A2**) previously entered in step 3.
- Enter a character string at the keyboard. The characters will be sent through the Multiserver, the local CSU/DSU, and across the selected channel link. At the remote CSU/DSU, the character string is looped back and returned to the local terminal. The returned echo should appear exactly as originally keyed in.

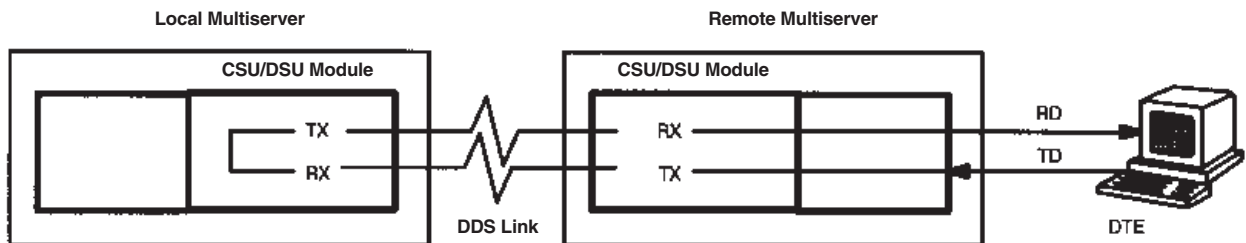


Figure 5-2. Digital Loopback Test Initiated at the Local Multiserver.

When selecting item 4, REMOTE FOX:

- At the prompt, enter the link channel number (**A1** or **A2**) previously entered in step 3.
- The fox generator in the local Multiserver will send the fox message to the remote ISU, where it will loop back and appear on the terminal generating the test.
- To terminate the test at both the remote and local Multiservers, select item 8, TERMINATE COMPOSITE LOOPBACK and INTEGRAL TESTS, from the Command Facility Main Menus of each base unit.

5.1.3 TEST PATTERN (TP) TEST

This is an end-to-end test that generates a test pattern within the CSU/DSU module to verify the ability of the CSU/DSU and the DDS line to transfer data in both directions (see Figure 5-3).

NOTE

This test requires operator intervention at both sides of the link.

If errors are detected, the CSU/DSU's **RD** LED will flash ON one-half second for each bit error.

If the **RD** LED is continuously ON, there is an excessively high error rate.

During a test that is passing, the front-panel LEDs will appear like this:

- LL.....OFF
- RT.....OFF
- SI.....ON
- RD.....OFF
- TD.....OFF

During a test that is failing, the front-panel LEDs will appear like this:

- LL.....OFF
- RT.....OFF
- SI.....ON
- RD.....ON
- TD.....ON or OFF

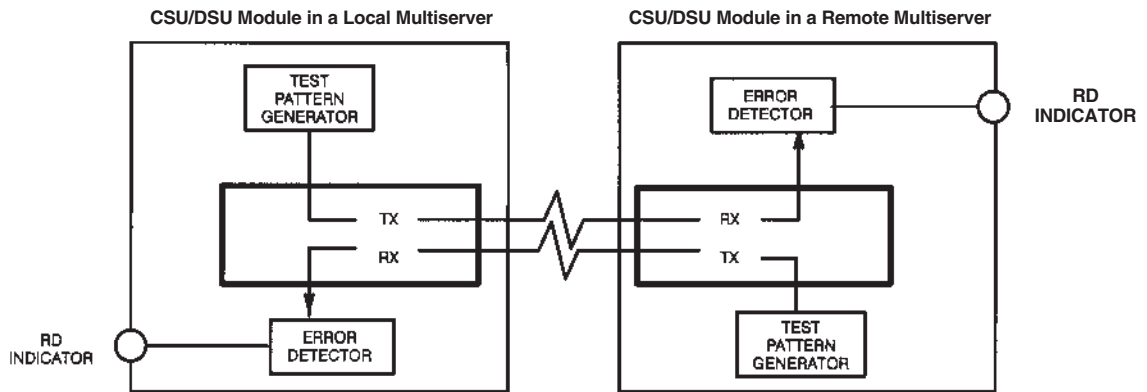


Figure 5-3. Data Flow During a Test Pattern (TP) Test.

5.1.4. LOCAL LOOPBACK TEST WITH TP

This verifies the local CSU/DSU module by using a test pattern generated within the CSU/DSU module (see Figure 5-4 below).

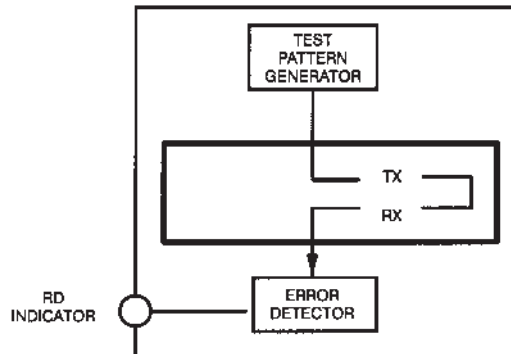


Figure 5-4. The Local Loopback Test with TP.

If errors are detected, the CSU/DSU's **RD** indicator will go ON one-half second for each bit error.

If the **RD** indicator is continuously ON, there's an excessively high error rate. During a test that is passing, the front-panel LEDs will appear like this:

```

LL.....FLASHING
RT .....OFF
SI.....ON
RD .....OFF
TD .....OFF
  
```

During a test that is failing, the front-panel LEDs will appear like this:

```

LL.....FLASHING
RT .....OFF
SI.....ON
RD .....ON
TD .....OFF
  
```

5.1.5. TERMINATING DIAGNOSTIC TESTS

If you enter item 5, NONE, at the ISU TEST menu, any test option (1 through 4) will terminate.

5.2 LCD/Keypad Tests

The LCD/Keypad on the top front of your Multiserver base unit includes a Liquid Crystal Display (LCD) and a Keypad. The LCD consists of two 40-character lines used to display status and alarm messages, as well as diagnostic menus. All functions are for the local Multiserver base unit only. No remote functions are possible. The keys are marked as follows:

←	Left Arrow
↑	Up Arrow
↓	Down Arrow
→	Right Arrow
EXE	Execute

5.2.1 CONVENTIONS

The arrow and EXEcute keys control menu action. Figure 5-5 shows how the keys are used.

← and →	— select the desired menu
↓	—moves into the menu
↑	—exits the current menu
EXE	—accepts (executes) the entry

If the LCD requests confirmation (by displaying ARE YOU SURE), the EXEcute key accepts the entry. Any other key will abort the function and return the LCD to the first selection of the menu. Each key will repeat an action in rapid succession if it is held longer than one second. This is valuable for a quick exit from any menu to the top level. Just press the Up arrow and hold it until the Banner Message is displayed.

During a test the LCD will display ACTIVATED at the lower right. When you select a menu item from the previous menu (and the test has not been terminated), the display will read ACTIVE.

Should a message appear that relates to the function being attempted (such as OUT OF RANGE), press any key to clear the message, and the display will return to where you were in the menus.

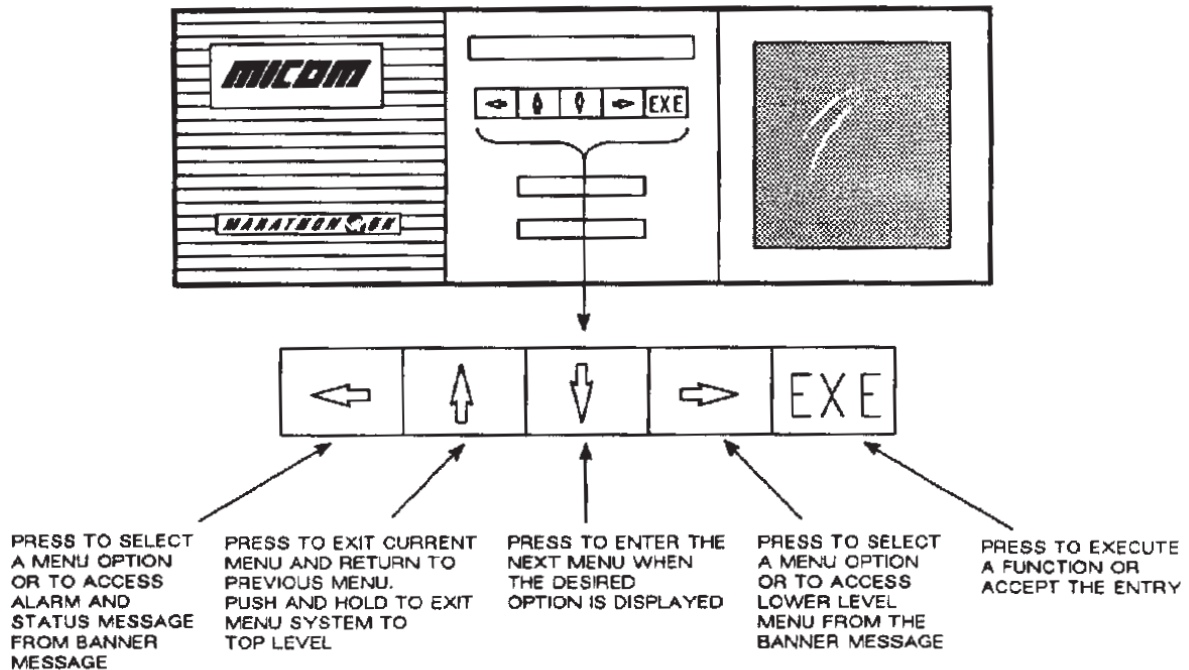


Figure 5-5. Menu Access Using the Front-Panel Keypad.

5.2.2 DIAGNOSTICS USING THE LCD MENU TREE

The top level of the menu tree is the Banner Message Display. As shown in Figure 5-6 the two options below are Review System Message Log and Menu Functions. Figure 5-7 shows the diagnostic branch of the Menu tree. To access ISU diagnostics using the keypad:

1. Press the RIGHT arrow to display the Menu Function message.
2. Press the DOWN arrow to move to the Administration menu.
3. Press the RIGHT arrow to display the Diagnostics message.
4. Pressing the DOWN arrow displays the System message. Then press the RIGHT arrow until you reach the Integral Devices menu.
5. Select channel A1 (or A2) by pressing the DOWN arrow key. Press EXE to select the channel.
6. Press the RIGHT arrow to toggle through the list of tests. Press EXE to start a test or to terminate testing (after selecting Terminate Test from the ISU Diagnostics menu).

When the Integral Devices Menu is displayed, the screen prompts for the channel number to be tested.

If a CSU/DSU module is attached to the selected channel, the following items will be offered:

1. **Local Loopback** — Verifies the local CSU/DSU module from data entered from an attached terminal.
2. **Digital Loopback** — A bidirectional loopback test to verify the data path of the system from terminal at the remote unit, and to verify the data path from a local terminal up to the CSU/DSU module. This test requires operator intervention at the remote unit. The Multiserver base unit must be set for Remote Composite Loopback Test at both ends to perform this test.

3. **Test Pattern (TP)** — Generates a test pattern within the CSU/DSU to verify the ability of the CSU/DSU and DDS line to transfer data in both directions. This test requires operator intervention at the remote unit.
4. **Local Loopback With TP** — Verifies the local CSU/DSU module by using a test pattern generated within the CSU/DSU module.
5. **Terminate Test** — Terminates all the tests initiated at this menu.

Once initiated, all tests remain active until terminated with Terminate Test.

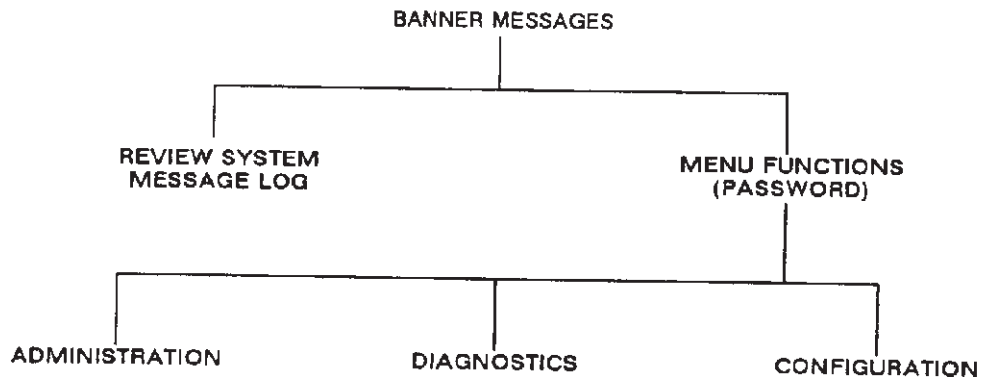


Figure 5-6. The Top of the LCD Menu Tree.

5.3 Telephone Company Tests

The telephone company's DDS Test Center may test your Multiserver base unit in response to your complaint. Their two tests are designed to test the DDS network and the CSU/DSU module.

The DDS Test Center can remotely command the CSU/DSU into a loopback as part of link-quality tests of the DDS line.

The CSU Loopback Test takes priority over any other mode of operation, including tests you may be conducting. However, the CSU/DSU must be in the Data or Idle Mode to allow the telephone company to perform the Remote Terminal Loopback Test.

The telephone-company tests are conducted to determine link quality for a given DDS line. The telephone company should notify you if they intend to run such a test.

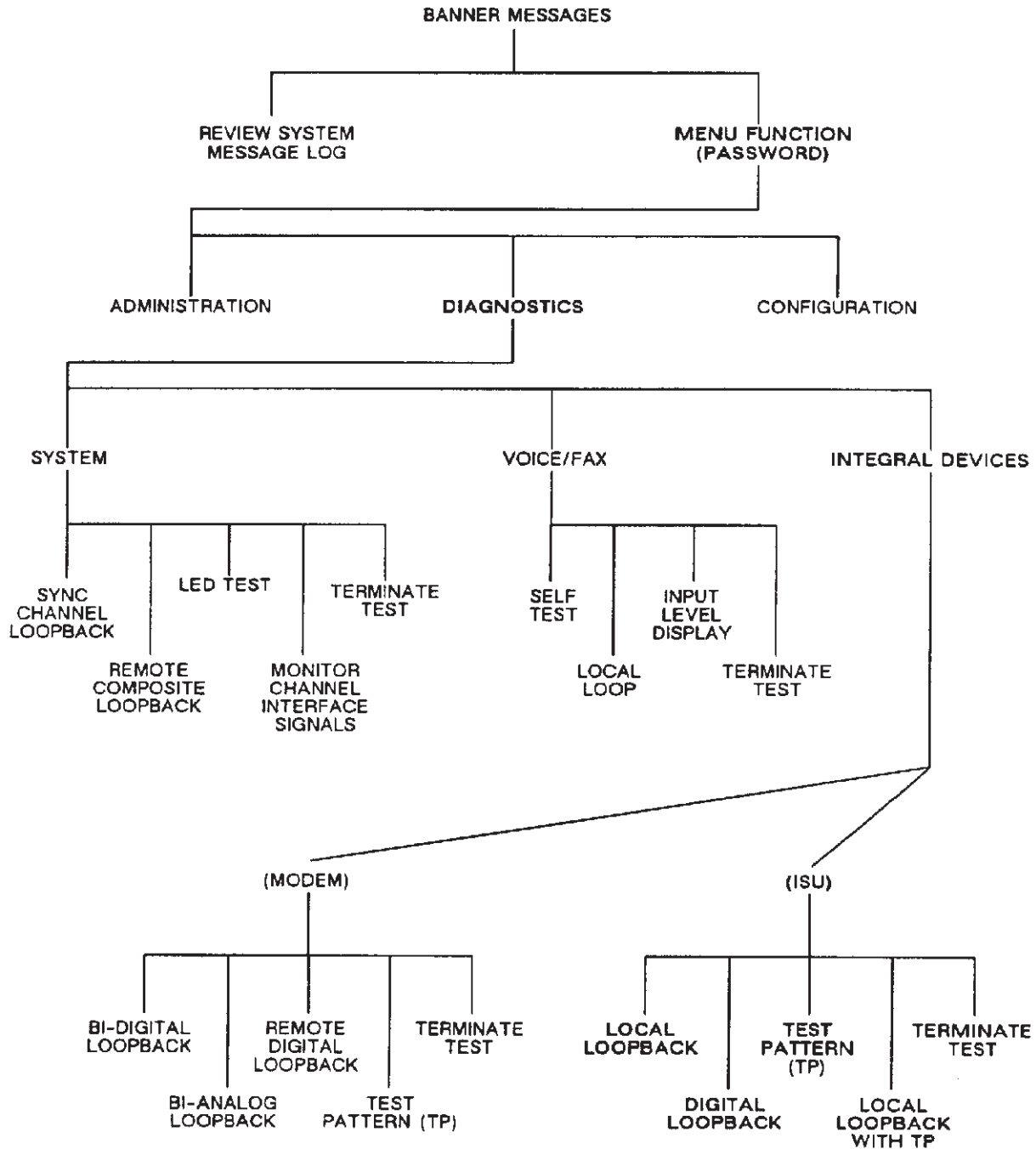


Figure 5-7. The LCD/Keypad Diagnostic Menu Tree.

Tests that can be initiated from the DDS Test Center are:

- **CSU Loopback Test (see Figure 5-8).** This test mode is referred to as the *Mandatory Channel Loopback* by *Bell Publication 62310*. If the CSU/DSU detects a reversal of Central Office's reading of current polarity, the CSU/DSU will loop back the data on the Receive wire pair to the Transmit wire pair. Physically, this loopback will take the test signal received from the Central Office and equalize, reshape, and retransmit it back to the network without decoding or encoding.

During the CSU Loopback Test, the front-panel LEDs on the CSU/DSU will appear like this:

```

LL.....FLASHING
RT .....OFF
SI.....ON
RD .....OFF
TD .....OFF or ON or FLASHING
    
```

- **RT Loopback Test.** This loopback mode is referred to as the *Remote Terminal Loopback* by *Bell Publication 41450*, or the *Optional Channel Loopback*. When this test is activated by the Central Office, the Receive data output of the data decoder is connected to the Transmit data input of the encoder. This creates a loopback that allows the Central Office to test the decoder/encoder, as well as the analog portions of the receiver and transmitter. During the RT Loopback Test, the indicators on the CSU/DSU module will appear like this:

```

LL.....OFF
RT .....FLASHING
SI.....OFF
RD .....OFF
TD .....OFF or ON or FLASHING
    
```

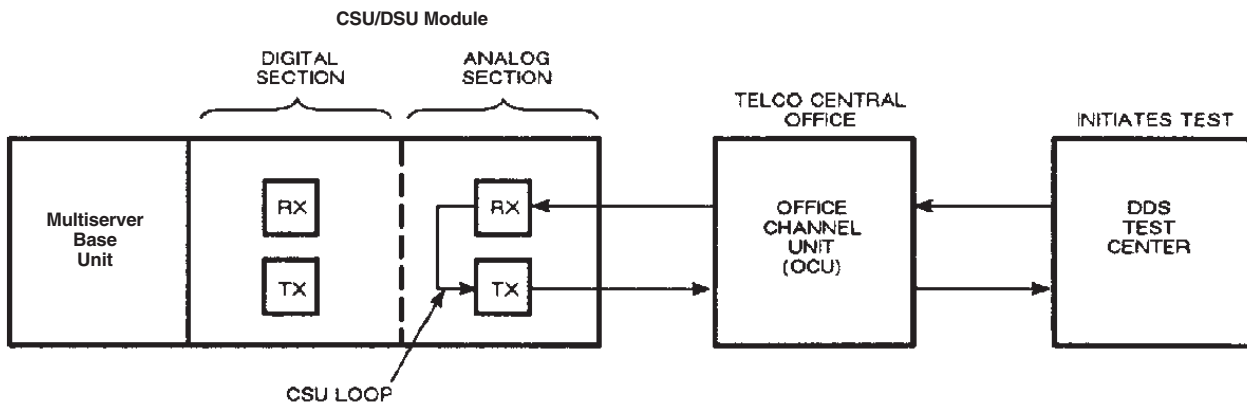
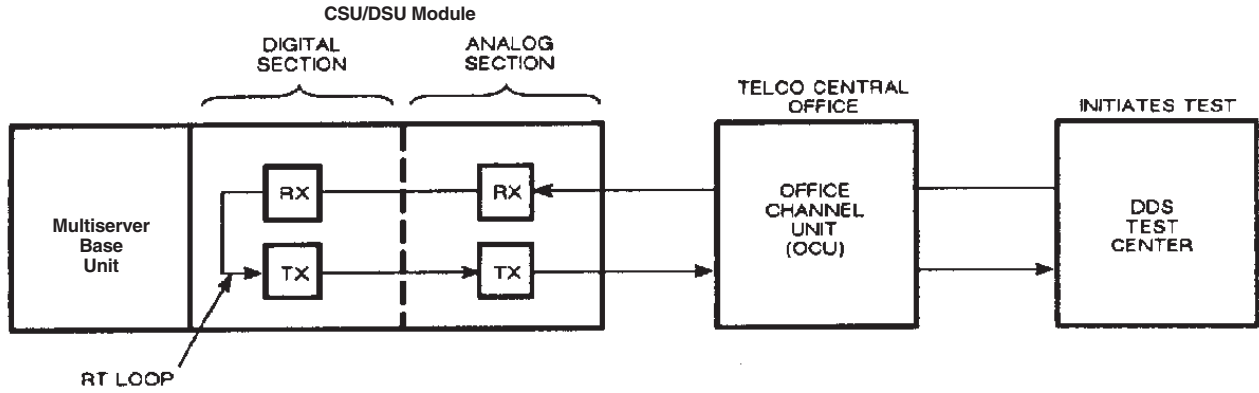


Figure 5-8. The CSU Loopback Test (Telephone Company).

MS1 56K CSU/DSU MODULE AND MS10 DUAL 56K CSU/DSU MODULE



NOTE

If a CSU/DSU test is attempted from the multiplexor while the DDS Test Center is running these tests, this message is displayed by the Command Facility:

**** DDS RUNNING LOOP TEST ****

Appendix: Command-Facility Messages

Message	Message Type	Explanation
CHECK FOR PROPER DEVICE INSTALLATION	Info	The selection entered required either an integral modem or ISU.
<i>ni</i> DDS IN SERVICE LINK <i>ci</i>	Event	The ISU at node <i>ni</i> has returned to service for link <i>ci</i> .
<i>ni</i> DDS OUT OF SERVICE LINK <i>ci</i>	Event	The ISU at node <i>ni</i> is out-of-service for link <i>ci</i> .
<i>ni</i> DDS RUNNING LOOP TEST LINK <i>ci</i>	Event	A loop test is being run on the ISU node <i>ni</i> for link <i>ci</i> .
ISU DIGITAL LOOPBACK ACTIVE LINK # <i>ci</i>	Diag	The ISU on link <i>ci</i> has been placed in digital loopback.
ISU LOCAL LOOPBACK ACTIVE LINK # <i>ci</i>	Diag	The ISU on link <i>ci</i> has been placed in local loopback.
ISU LOCAL LOOPBACK WITH TP ACTIVE LINK # <i>ci</i>	Diag	The ISU on link <i>ci</i> has been placed in local loopback mode with a test pattern generator.
ISU TEST PATTERN ACTIVE LINK # <i>ci</i>	Diag	The test pattern generator on the ISU on link <i>ci</i> has been activated.
ISU TEST TERMINATED LINK # <i>ci</i>	Diag	The test for the ISU on link <i>ci</i> has been terminated.
NO DEVICE ASSOCIATED WITH CHANNEL	Info	The selected link channel has no integral device associated with it.
NO DEVICES INSTALLED. DEPRESS ANY KEY	Info	The integral device path has been selected and no devices are installed.
SLOT EMPTY OR MODULE ID INVALID	Info	Either the module location is empty or the ID of the installed module is somehow invalid.



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