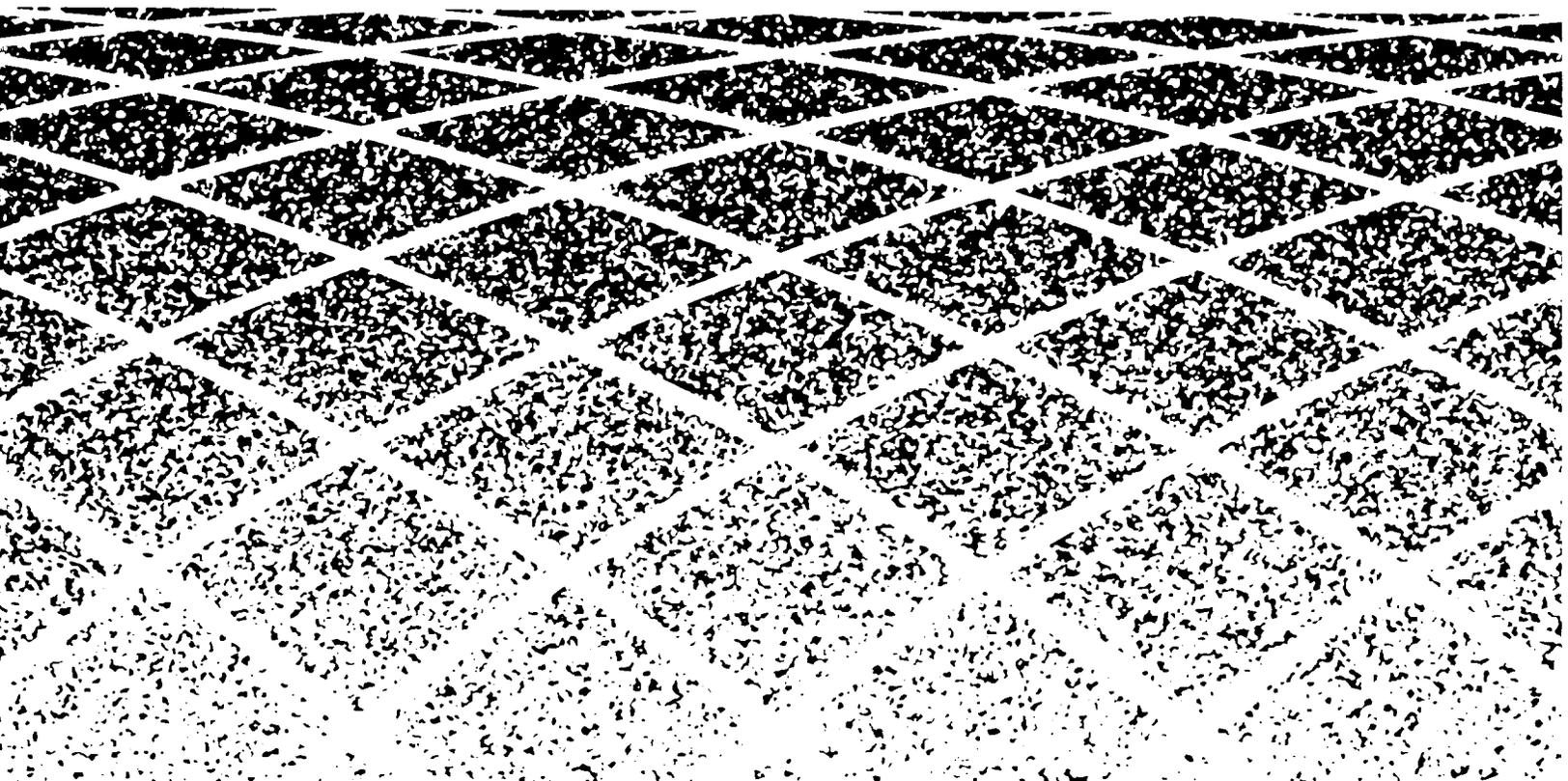




AT&T 363-206-151  
Issue 1  
November 1991

# **DDM-Plus**

## Installation Manual



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Document No.: AT&T 363-206-151

Issue 1

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## About This Document

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### Purpose

This manual provides installation instructions on the DDM-Plus for end users responsible for their own equipment installations. This manual is only intended for central office environment network equipment-building system (NEBS) installation and tests performed prior to turnover to central office personnel. This manual is not a service manual. Refer to AT&T 363-206-150, *DDM-Plus User/Service Manual*, for any activity involving circuit turn-up, normal maintenance, or trouble analysis.

### Intended Audiences

This installation manual is for DDM-Plus customers who maintain their own installation organization to install their telecommunications equipment.

### General Information

DDM-Plus installation procedures are also available for traditional loop enclosure arrangements such as 51-, 80-, and 90-type cabinets, control environment vaults (CEVs), etc. These procedures are covered in a number of AT&T practices which are referenced in AT&T 363-205-000, **SLC**<sup>®</sup> *Series 5 Carrier System Ordering Guide*,

This issue of the Installation Manual only supports the J98725DB, List 1 DDM-Plus Extension Shelf. Information on the other DDM-Plus housings, Cabinet Distant Terminal, and Wall Distant Terminal, is contained in AT&T 363-206-150, *DDM-Plus User/Service Manual*.

This manual is divided into several chapters. The chapters are numbered in the order in which they are to be performed; however, each chapter was developed to stand alone. If installing several DDM-Plus systems at the same time, a considerable time savings may be achieved by performing each chapter on all the DDMs before continuing to the next chapter.

## **Safety Instructions**

---

### **Product Safety Labels**

---

Important safety instructions are in this chapter. In addition to the instructions on the following page, there are other safety instructions you must follow. These instructions involve lasers, lightwave optical cable and connectors, and precautions when handling circuit packs to prevent damage from electrostatic discharge. This manual also contains admonishments in the form of **DANGERS**, **WARNINGS**, and **CAUTIONS** which must be followed at all times.

The symbol in Figure 1 appears throughout this manual to alert the user to the presence of important operating and maintenance (servicing) instructions for the DDM-Plus.



---

Figure 1. Alert Symbol

## IMPORTANT SAFETY INSTRUCTIONS

1. Read and understand all instructions.
2. Follow all warnings and instructions marked on the product.
3. Do not place this product on an unstable cart, stand, or table. The product may fall, causing serious damage to the product.
4. Slots and openings in this product cabinet and the back or bottom are provided for ventilation. To protect it from overheating, these openings must not be blocked or covered. This product should not be placed in a built-in installation unless proper ventilation is provided.
5. This product should be operated only from the type of power source indicated on the marking label. For information on proper electrical distribution and power requirements, consult T-82046-30.
6. Do not allow anything to rest on the power cord. Do not locate this product where it will be abused by persons walking on it.
7. Never push objects of any kind into this product through cabinet slots as they may touch dangerous voltage points or short out parts that could result in a risk of fire or electrical shock. Never spill liquid of any kind on the product.
8. To reduce the risk of electrical shock, do not disassemble this product. Service should be performed by trained personnel only. Opening or removing covers and/or circuit packs may expose you to dangerous voltages or other risks. Incorrect reassembly can cause electrical shock when the unit is subsequently used.
9. Do not touch any components on the AEK-type repeater circuit pack when installed in the DDM-Plus; high voltage is present. Touch only the faceplate; up to 130 V is present on the AEK-type T1 repeaters.
- 10.



**CAUTION:**

*Disconnect both (BAT A and BAT B) power connections from the shelf when removing power from the system.*

11. Use only AT&T manufactured *UL*\* Recognized circuit packs in this system.

## SAVE THESE INSTRUCTIONS

---

\* Registered trademark of Underwriters Laboratories Inc.

## **IMPORTANT INSTALLATION SAFETY INSTRUCTIONS**

1. Read and understand all instructions.
2. Installation and maintenance procedures must be followed and performed by trained personnel only.
3. All DS1 interfaces should not leave the building premises unless connected to telecommunications devices providing primary or secondary protection, as applicable.
4. Never install telecommunications wiring during a lightning storm.
5. Never install telecommunications jacks in wet locations.
6. Never touch uninsulated telecommunications wires or terminals unless the telecommunications line has been disconnected at the DS1 interface.
7. Use caution when installing or modifying telecommunications lines.

## **SAVE THESE INSTRUCTIONS**

## Admonishments

Admonishments in this document have the following definitions:

- **Danger** indicates the presence of a hazard that *will* cause death or severe personal injury if the hazard is not avoided.
- **Warning** indicates the presence of a hazard that can cause death or severe personal injury if the hazard is not avoided.
- **Caution** indicates the presence of a hazard that *will* or can cause minor personal injury or property damage if the hazard is not avoided. This includes equipment damage, loss of software, or service interruption.

## Lightwave Safety

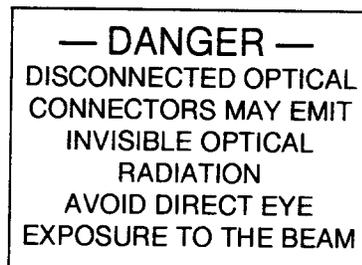
An AT&T lightwave digital transmission system and associated optical test sets use semiconductor laser transmitters. The lasers emit lightwaves, at or near infrared wavelengths, into lightguide cables. This light is at the red end of the visible spectrum. Although, at present, the transmitter power levels are below those known to cause injury to the eye (for example, from a direct inadvertent exposure to the end of an energized fiber), direct exposure at close distances should be avoided.



### CAUTION:

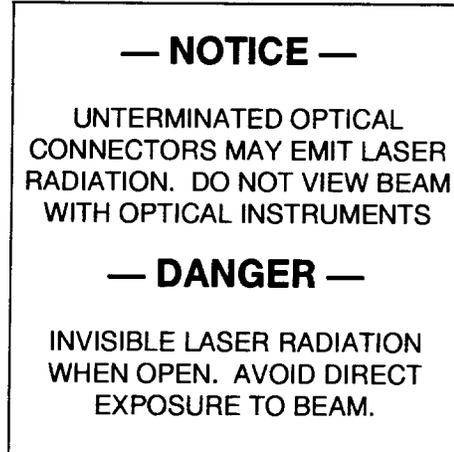
*Never view any unterminated optical connector with optical instruments other than indirect image-converting devices such as the FIND-R-SCOPE, since viewing optics tends to collimate the energy from an optical connector and, hence, increases the potential risk for injury.*

Laser danger labels are attached to the left circuit board of the optical line interface unit (OLIU) (Figure 2) and to the shelf assembly (Figure 3).



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Figure 2. OLIU's Laser Danger Label



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Figure 3. Shelf's Laser Danger Label

### Electrostatic Discharge (ESD) Considerations

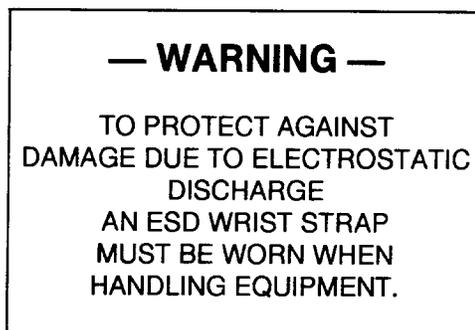


**CAUTION:**

*Industry experience has shown that all integrated circuit packs can be damaged by static electricity that builds up on work surfaces and personnel. The static charges are produced by various charging effects of movement and contact with other objects. Dry air allows greater static charges to accumulate. Higher potentials are measured in areas with low relative humidity, but potentials high enough to cause damage can occur anywhere.*

The warning label (Figure 4) is attached to the right side of the shelf assembly.

---



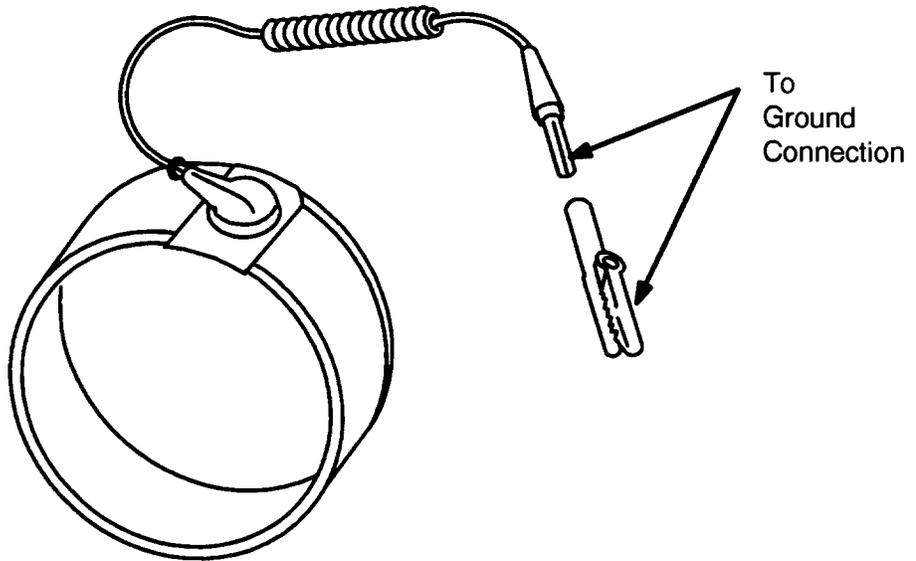
---

Figure 4. ESD Warning Label

The following list of precautions should be observed when handling circuit packs in order to prevent damage by electrostatic discharge.

- (a) Assume all circuit packs contain solid-state electronic components that can be damaged by ESD.
- (b) When handling circuit packs (storing, inserting, removing, etc.) or when working on the backplane, always wear a grounded wrist strap or wear a heel strap and stand on a grounded, static-dissipating floor mat.
- (c) Handle all circuit packs by the faceplate or latch and by the top and bottom outermost edges. Never touch the components, conductors, or connector pins.
- (d) Observe warning labels on bags and cartons. Whenever possible, do not remove circuit packs from antistatic packaging until ready to insert them into slots.
- (e) If possible, open all circuit packs at a static-safe work position, using properly grounded wrist straps and static-dissipating table mats.
- (f) Always store and transport circuit packs in static-safe packaging. Shielding is not required unless specified.
- (g) Keep all static-generating materials such as food wrappers, plastics, and styrofoam containers away from all circuit packs. Upon removal from bay, immediately put circuit packs into static-safe packages.
- (h) Whenever possible, maintain relative humidity above 20 percent.

To reduce the possibility of ESD damage, assemblies are equipped with grounding jacks to enable personnel to ground themselves using wrist straps (see Figure 5) while handling circuit packs or working on an assembly(s). The jacks for connection of wrist straps are located at the lower right-hand corner of each assembly and are labeled. When grounding jacks are not provided, an alligator clip adapter enables connection to bay frame ground.



---

Figure 5. Static Control Wrist Strap

## **Related Documentation**

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The following documents provide additional information pertinent to the DDM-Plus applications:

- AT&T 363-205-010 — SLC<sup>®</sup> Series 5 Carrier System Applications and Planning Guide
- AT&T 363-205-401 — SLC<sup>®</sup> Series 5 Carrier System Remote Terminal Acceptance and Turnup Procedure (TOP)
- AT&T 363-206-150 — DDM-Plus User/Service Manual
- AT&T 363-206-152 — DDM-Plus Quick Reference Guide
- AT&T 363-206-154 — DDM-Plus Wall Distant Terminal Installation Manual
- AT&T 363-206-200 — DDM-2000 Multiplexer Application, Planning, and Ordering Guide
- AT&T 365-200-107 — DS1 Extension Shelf Description, Installation, and Maintenance T1 Digital Line
- AT&T 365-227-500 — T1 Digital Line — Trouble Locating Procedures
- AT&T 365-800-002 — T1 Digital Line — Acceptance and Maintenance Tasks — Digital Transmission Tasks
- AT&T 855-350-104 — T1, T1 Outstate, T1C and T1D - Fault-Locate System Engineering Design
- AT&T 855-351-101 — T1 Digital Line — Transmission and Outside Plant Design Procedures
- AT&T 915-710-115 — SLC<sup>®</sup> Series 5 Carrier System Applications Engineering
- FPD 801-525-169 — DDM-Plus System Recommended Bay Line-Up — Floor Plan Data Sheet

The following drawings provide additional information about the DDM-Plus:

- |             |   |
|-------------|---|
| J98725DB    | DDM-Plus Extension Shelf Assembly                             |
| ED-8C726-30 | Fuse and Alarm Assembly                                       |
| ED-8C730-10 | Typical Bay Arrangement                                       |
| ED-8C730-15 | Cabling Plan  |
| ED-8C730-20 | Cabling Assemblies (Extension Shelf, Cabinet DT, and Wall DT) |
| ED-8C730-30 | Shelf Assembly (Wall DT)                                      |
| ED-8C730-31 | Shelf Assembly (Cabinet DT)                                   |
| ED-8C730-32 | Plug-In Group Ordering  |

SD-7C514-01	Application Schematic, Wall DT
SD-7C515-01	Application Schematic, Cabinet DT
SD-7C559-01	DDM-Plus Extension Shelf Application Schematic
T-7C559-31	DDM-Plus Extension Shelf Interconnect Circuit

Related drawings:

ED-7C601-30	51A Cabinet
ED-7C621-30	80D Cabinet (DIST)
ED-7C699-30	90A Cabinet
ED-7C703-30	80E Cabinet (BULK)
ED-7C706-30	90B Cabinet
ED-7C711-30	80A Cabinet (BULK)
ED-7C716-30	80D Cabinet (BULK)
ED-8C501-50	Network Bay Frame
ED-8C724-30	Heat Baffle Assembly
T-82046-30	Power Systems DC Distribution Circuit for Digital Transmission System





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# General Information

# 1

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## General Information

# 1

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### DDM-Plus Description

Refer to AT&T 363-206-150, *DDM-Plus User/Service Manual*, for detailed descriptions on the different housings and plug-in units.

### Extension Shelf Description

The DDM-Plus Extension Shelf is divided into seven groups of four DS1s each. The group designations are labeled (A through G) above the circuit pack slots. Each of the 7 groups can accommodate two 25-type OLIUs or 4 T1 repeater circuit packs. The OLIUs and repeater circuit packs **CANNOT** be mixed in the same group. For mixed shelves, it is recommended that optical line interface units (OLIUs) grow from left to right and AEK-type repeaters grow from right to left. All connections, except the power cable and the optical fibers, are connected to the front side of the backplane, just under the circuit pack slots. The fuse card is located in the center of the shelf and contains the two 10-ampere feeder fuses. Located on the J98725DB-1, L1 shelf assembly below the fuse card is an ESD jack, alarm cutoff (ACO) light/button, and the Major (MJ) and Minor (MN) alarm LEDs.

### System Description

The DDM-Plus consists of a housing (shelf), a number of OLIUs and/or T1 repeater circuit packs, and associated cables.

The 25A or 25F OLIU is used in conjunction with the housing to provide a basic optical transport system in which four DS1s are transported between two locations. The 25A OLIU spans up to 3.7 km for single-mode and 3.0 km for

multimode fiber. The 25F OLIU spans up to 23 km for single-mode and 13.9 km for multimode fiber. At each end, the OLIU receives four DS1s from the equipment side; multiplexes them up to a DS2; converts the DS2 to an optical signal; transmits over fiber to the OLIU at the receive end, which converts the optical signal back to an electrical signal; demultiplexes the DS2 to four DS1s; and provides the DS1s to the equipment side. An unprotected system consists of a housing and an OLIU at one end connected to a housing and an OLIU at a remote end by a pair of optical fiber cables.

The DDM-Plus Extension Shelf can also be used in a protected mode in which two OLIUs are located at each end for the four DS1s. Also, two additional optical fiber cables are required. In the protection mode, if an OLIU fails or if a fiber is cut, an automatic switch to protection will occur and service will not be lost.

As shown in Figure 1-1, the DDM-Plus Extension Shelf can accommodate up to 7 OLIU pairs (14 OLIUs), which provides a transport system for up to 28 DS1s. In addition, the DDM-Plus Extension Shelf can also support the AEK-type T1 repeater packs (28 T1 repeaters) or a mixture of T1 repeaters and OLIUs.

**⇒ NOTE:**

OLIUs and repeater circuit packs CANNOT be mixed in the same group.

The AEK-type repeaters equalize and regenerate T1 line signals which have experienced cable losses. In the receive direction, the T1 repeater provides secondary surge protection, automatic line buildout, and signal regeneration. In the transmit direction, the T1 repeater provides only secondary surge protection.

## Equipment

### Miscellaneous Equipment

Miscellaneous equipment is listed in Table 1-1.

**⇒ NOTE:**

Not all equipment is required for each installation.

### Test Equipment

Tools, test sets, and accessories are listed in Table 1-2.

**⇒ NOTE:**

Not all tools are required for each installation.

## **Precautions**

---

### **General**

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An antistatic wrist strap must be worn when handling circuit packs or connecting cables to the shelf.

Unterminated optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam. Do not view beam with optical instruments.

Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous laser radiation exposure.

## **DDM-Plus Installation Checklist**

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The following is a checklist to assist installers who are familiar with and who have already installed a DDM-Plus. Every item on this checklist must be performed for the installation to be completed.

### **Chapter 2, Equipment and Cable Installation**

---

- Verify that the bay has been properly installed and grounded.
- Inspect the DDM-Plus for visible damage.
- Verify that the shelf installation kit, fault locate plugs, power dangler, front cover, and rear cover have shipped with the shelf.
- Verify the baffle installation kit has shipped with the baffle.
- Place shelf and baffle mounting brackets in the position for the bay being used.
- Install the DDM-Plus shelf and verify that it is grounded.
- Install the DDM-Plus heat baffle (for spacing purposes) then remove.
- Install the two 10-ampere shelf fuses.
- Install the optical fiber conduit.
- Install the power cable and label at the battery distribution fuse board (BDFB) or equivalent fusing equipment.
- Verify that the proper size fuses (15-amp single, 20-amp multi) are available at the BDFB. Do not install them.
- Install the line interface DS1 cables; wire wrap to protector block.
- Install the equipment interface DS1 cables; wire wrap to digital signal cross connect (DSX).

- Install the optical fiber jumpers from the DDM-Plus to the LGX<sup>®</sup> fiber optic distributing system.
- Install the office alarm cable; wire wrap to office alarms.
- Install the parallel telemetry cable; wire wrap to terminal block. (Ground the ground return lead, B8 on P07.)
- Install the fault locate cable; wire wrap to terminal block.
- Attach cable clamps.
- Verify that cables are properly dressed and labeled.
- Install the DDM-Plus heat baffle.

### **Chapter 3, Powering and Verification**

---

- Verify that the bay and shelf are properly grounded.
- Verify that the two 10-ampere shelf fuses are installed.
- Disconnect the power cable from the shelf.
- Install the proper size fuses (15-amp single, 20-amp multi) at the BDFB.
- Measure and verify that the proper voltage is observed at the end of the power cable.
- Connect the power cable to the shelf.

### **Chapter 4, Circuit Pack Installation**

---

**⇒ NOTE:**

For mixed shelves it is recommended that OLIUs grow from left to right and AEK-type repeaters grow from right to left as shown in Figure 1-1.

- Option OLIUs in accordance with office records.
- Install OLIUs in shelf.
- Install AEK-type repeaters.
- Verify that repeaters and OLIUs are not mixed in the same group.

### **Chapter 5, Stand-Alone Installation Tests**

- LED Test
- Local Test
- Cross-Connect Test
- Office Alarm and Automatic Protection Switching Test
- Parallel Telemetry Test (includes miscellaneous telemetry)
- DS1 Transmission Test (optional).

### **Chapter 6, End-to-End Installation Tests**

This chapter requires that outside plant fiber be installed and that Stand-Alone testing be completed at each end.

- Fiber Verification and Automatic Protection Switching Test
- End-to-End System Test
- End-to-End DS1 Transmission Test
- End-to-End Telemetry Test
- Final Operations.

**Table 1-1. Miscellaneous Equipment**

---

<u>Item</u>	<u>Equipment Code or Commercial Code</u>	<u>Comcode</u>
Network Bay Frame (Front or Rear Access-7 ft.)	ED-8C500-50, G1	—
Network Bay Frame (Rear Access Only-7 ft.)	ED-8C501-50, G1	—
DDM-Plus Extension Shelf	J98725DB-1, L1	—
Heat Baffle Assembly	J98725DB-1, L2	—
DDM-Plus Cable Assemblies	ED-8C730-20	—
Bracket*	4.82" for ED-8C500 Frame	846592913
Bracket*	5.94" for ED-8C500 Frame	846593002
Bracket*	2.00" for ED-8C501 Frame	846600229
Bracket*	3.82" for ED-8C501 Frame	846592905
AT&T Fiber Protection System†	NE-09800-50	

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\* These brackets are used to hold the fiber conduit flush with the front of the shelf and to allow easier cable handling/dressing at the rear of the bay.

† The AT&T Fiber Protection System is a completely enclosed PVC ductwork that encloses/protects optical fiber cables routed in central office and controlled environment vault (CEV) frames and cableways.

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**Table 1-2. Tools, Test Sets, and Accessories**

<u>Description</u>	<u>Commercial or Comcode</u>	<u>See Note</u>
Multimeter		1,4
Screwdriver with appropriate head(s)		1
Electrostatic discharge (ESD) wrist strap	900486994	1
Wire-wrap gun		1,5
Optical fiber cables with <i>ST</i> <sup>®</sup> connectors on each end, 4 ft. (min. of 2)	105357735	2,6
Optical fiber cables with biconic connectors on each end, 5 ft. (min. of 2)	104149216	2,6
Microduster air (clean) (12 cans/case)	900709361	
Microduster nozzle assembly	900709338	
Absorbond cleaner (300 wipes/pkg.)	900709379	
DS1 transmission Test Set with DS1 cables		3,7

**Notes:**

1. Required for all installations.
2. Required if performing the "Stand-Alone Installation Tests" chapter.
3. Required if performing the optional DS1 transmission tests contained in the "Stand-Alone" or "End-to-End" Test chapter.
4. The multimeter must be capable of measuring DC voltage in the 40- to 60-volt range.
5. The wire-wrap gun must be able to accommodate 22- or 26-gauge wire.
6. The optical fiber cables can be single or multimode fiber and the recommended length is 3 feet. Select either the optical fiber cables with *ST* connectors or biconic connectors depending on the connectors used at the *LGX*<sup>®</sup> panel. The optical fiber cables with *ST* connectors can be used to loop the OLIUs directly on themselves.
7. The DS1 test set must include a transmitter and a receiver capable of sending/receiving a framed quasi-random bit pattern.

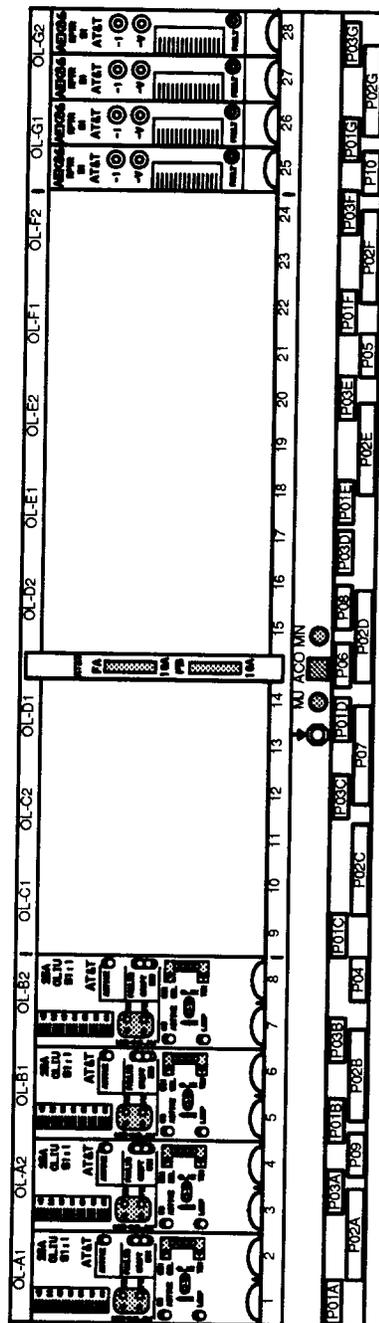


Figure 1-1. DDM-Plus Shelf with Circuit Packs

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# Equipment and Cable Installation

# 2

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# Equipment and Cable Installation

# 2

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## General

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### Description

This chapter provides procedures for the installation of the shelf, heat baffles, cables, and grounding. Perform this chapter on all installations.

Front or rear access installations are essentially the same, except that front access cabling will exit the shelf from the cable cutouts in the front of the shelf, and rear access cables will exit from the rear cable cutouts.

Front cable cutouts will be positioned in front of the side of the bay frame when the shelf is mounted for front access installations. Rear cable cutouts will be positioned in back of the bay frame side when the shelf is mounted for rear access installations.

The only recommended network bay frame for front access installations is the ED-8C500 frame.

**⇒ NOTE:**

This installation manual contains the latest cable information at the time of issue. For up-to-date cable and connection information refer to the following:

ED-8C730-10	Typical Bay Arrangement
ED-8C730-20	Cabling Assemblies
T-7C559-31	DDM-Plus Extension Shelf Interconnect Circuit

**⇒ NOTE:**  
This chapter is best performed if all procedures are performed on one entire shelf before installing or wiring any additional shelves.

**⇒ NOTE:**  
This chapter requires previous bay frame installation and grounding.

**⇒ NOTE:**  
The shelf is grounded by its mounting screws.

**⇒ NOTE:**  
Circuit packs must not be installed at any time during this chapter.

**⇒ NOTE:**  
The location of all backplane plugs and jacks are shown in Figure 2-5.

**⇒ NOTE:**  
It is important to carefully follow the procedures in this chapter to ensure that the bay will accommodate all of the cables. In order to install the cabling for the maximum capacity of six DDM-Plus shelves in a bay, follow the procedure in Figure 2-6, 2-7, or 2-8, depending on the bay arrangement.

**⇒ NOTE:**  
Shelves and cables are to be installed from the bottom of the bay to the top.

**⇒ NOTE:**  
Cable assembly options are listed in Tables 2-1 and 2-2.

**⇒ NOTE:**  
All of the cables, except power and the optical fibers, are connected to the front side of the DDM-Plus backplane.

**⇒ NOTE:**  
Install cable brackets as required.



**NOTE:**

Miscellaneous equipment is listed in Chapter 1, *General Information*.

### **Tools, Test Sets, and Accessories**

The following tools are required:

<u>Qty.</u>	<u>Description</u>	<u>Usage</u>
	Screwdriver(s)	A screwdriver is required, with the appropriate head(s) for mounting the shelf, heat baffles, cable brackets and removing the front cover.
1	Ohmmeter	The ohmmeter is required to verify that the DDM-Plus shelf is properly grounded.
1	Wrist strap	A wrist strap must be worn when touching the DDM-Plus backplane, and when connecting cables. Use an available ESD jack.
1	Wire-wrap gun	A wire wrap gun is required to make connections on the DS1 alarm, telemetry, and fault locate cables. The wire wrap gun must be able to accommodate 22- or 26-gauge wire.

### **Planning**

The DDM-Plus shelf may be mounted as follows:

- a. Mounted in network bay frames. The recommended network bay frames for rear access are the ED-8C500 and the ED-8C501. The ONLY recommended network bay frame for front access is the ED-8C500. Refer to Figures 2-1, 2-2, and 2-3 for DDM-Plus shelf placement in a network bay frame.
- b. Miscellaneously mounted, meeting requirements in *Equipment Installation Considerations*.

## Equipment Installation Considerations

Detailed network bay frame installation information is contained in ED-8C730-10 Typical Bay Arrangements. The information in this chapter is of general nature.

The equipment listed below has the following height dimensions:

J98725DB-1, L1	DDM-Plus Extension Shelf	5.0 in.
J98725DB-1, L2	Heat Baffle	4.0 in.

If the DDM-Plus Extension Shelf is installed at the bottom of the bay frame, there should be an air gap of at least 8.5 inches below the first shelf in the bay.

If the DDM-Plus Extension Shelf is installed in a central office environment [network equipment building system (NEBS)], a baffle must be installed above each DDM-Plus, unless the DDM-Plus is installed at the top of a 7-foot bay frame. For taller bay frames, a baffle is required above every DDM-Plus. Also, if the DDM-Plus Extension Shelf is to be installed in a typical central office environment (NEBS), a maximum of six shelves is allowed per bay when no other equipment is installed in the same bay.

A baffle must be installed below the DDM-Plus Extension Shelf if any heat-generating equipment is located below the DDM-Plus.

**⇒ NOTE:**

DDM-Plus heat baffles must be used as specified. There is no equivalent air gap.

## Inspection

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### Procedure

---

1. Verify that the frame or structure into which the DDM-Plus Extension Shelf will be installed is properly grounded.
2. Each shelf and heat baffle comes equipped with an installation kit (a white pouch attached to the shelf or baffle) containing the hardware required for mounting and grounding. The baffle installation kit contains four screws. The shelf installation kit has the following contents:

<u>Qty.</u>	<u>Description</u>
4	0.216-24 x 5/16-inch screws (C803535012)
5	Spare 10-ampere shelf fuses (3 of which are spares)
4	Cable grounding clamps



**NOTE:**

Each DDM-Plus Extension Shelf also comes equipped with AT&T 363-206-150, *DDM-Plus User/Service Manual*.

3. Open the front cover from the DDM-Plus Extension Shelf by loosening the screw located in the center of the cover.



**NOTE:**

The cover must be installed and closed later to assure compliance with EMI requirements.

4. Remove the front cover by holding it at a 45 degree angle and pulling it away from the shelf.



**NOTE:**

The cover should be positioned at a 45 degree angle when removed or installed.

5. Inspect the shelf for visible damage including bent or touching backplane pins.
6. Verify that the fault locate shorting plugs are connected on P04 and P05.



**NOTE:**

Fault locate shorting plugs should only be removed when the fault locate cable assembly is installed.

7. Verify that the shelf power dangler cable is properly installed on the backplane of the DDM-Plus Extension Shelf.

<u>Backplane Connection</u>	<u>Designation</u>	<u>Wire Color</u>	<u>Alternative Wire Color</u>
E1	GND	Black	White
E2	BAT A	Red	Red
E3	BAT B	Green	Red



**NOTE:**

The power dangler cable could have either color code.

8. Verify that the rear plastic protective cover is attached to the back of the shelf.
9. Determine the type of bay frame the DDM-Plus Extension Shelf will mount in. Position the shelf side-mounting brackets (if necessary) as shown in Figure 2-4.
10. Position the DDM-Plus heat baffle side-mounting brackets (if necessary) as shown in Figure 2-4.

## **Equipment Installation**

---

### **Description**

---

This procedure describes how to install both front and rear access equipment.

**⇒ NOTE:**

For rear access installations, place the shelf and heat baffle in a network bay frame with the wide flange of the bay frame to the front as shown in Figure 2-1.

**⇒ NOTE:**

For front access installations, place the shelf and heat baffle in a network bay frame with the narrow flange of the bay frame to the front as shown in Figure 2-2.

### **Procedure**

---

1. Position the shelf and heat baffle in the bay frame as shown in Figure 2-3.

**⇒ NOTE:**

Shelves and heat baffles should be installed at the bottom of the bay first and then added upward. The heat baffles should be installed at this time to allow proper positioning of the shelves.

**⇒ NOTE:**

An 8.5-inch space must be left below shelf 1.

**⇒ NOTE:**

An 8.5-inch space must be left above the shelf 3 baffle for future use.

**⇒ NOTE:**

Install front access shelves so that the power dangler is routed out the front of the bay above the baffle.

2. Use the hardware provided in the installation kits to mount the shelf and baffle.

3. Install two 10-ampere fuses, provided in the installation kit, into the fuse card located in the center of the shelf.
4. Using the ohmmeter, verify that the DDM-Plus is grounded to the bay frame.
5. Install the required fiber conduit shelf brackets as shown in Figure 2-1 or 2-2.



**NOTE:**

There are four brackets required per shelf to hold the fiber conduit in place.

6. Install the required fiber conduit for the optical fiber cables as shown in Figure 2-1 or 2-2.
7. Remove the heat baffles from the bay frame.



**NOTE:**

The heat baffles will later be installed after the cabling of the shelf has been completed.

## **Power Cable Installation**

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### **Description**

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This procedure describes how to attach the power cable to the shelf's power dangler cable and to the battery distributing fuse board (BDFB).

### **Procedure**

---

1. Two feeders (A and B) are required for each DDM-Plus Extension Shelf.
2. Obtain the G9 power cable for multiple shelves or the G21 for powering a single shelf in the bay as listed in Table 2-2.

**⇒ NOTE:**

The power dangler cable is installed on the backplane at the factory and does not require any additional installation.

3. Connect the connectorized end of the G9 or G21 power cable to the power dangler connector, which is attached to the DDM-Plus Extension Shelf.

**⇒ NOTE:**

If the G9 cable is used, leave one of the G9 power dangles of each feeder assembly above shelf 3. The space above shelf 3 has been reserved for future use.

4. Route the power cable to the left side of the shelf and out of the bay toward the BDFB or other protection equipment, stacking the cable in the bay as shown in Figure 2-6, 2-7, or 2-8 depending if the installation is front or rear access.

**▲ WARNING:**

*Verify that the breakers are off or that the fuses are not installed.*

**⇒ NOTE:**

The DDM-Plus is powered by -48 V DC.

5. Verify that the power cable routed along the backplane is not touching any backplane pins.

6. Splice feeders from the BDFB to the loose end of the DDM-Plus Extension Shelf power cable.

<u>Designation</u>	<u>Wire Color</u>
BAT A (-48V)	Red
GND	Black
BAT B (-48V)	Green
GND	White

**⇒ NOTE:**  
A red (-48V)/black(GND) wire pair may be substituted for the BAT B green/white pair.

**⇒ NOTE:**  
Four cables are spliced to each power cable: BAT A, BAT B, BAT A RTN, and BAT B RTN.

**⇒ NOTE:**  
The feeders must be 10 gauge or greater.

7. At the BDFB, label the feeders BAT A, BAT B, BAT A RTN, and BAT B RTN.
8. Verify that each feeder at the BDFB will be fused for a minimum of 15 amperes for each single shelf, and 20 amperes for multiple shelf arrangements.
9. Leave the fuses out or turn the breakers off until Chapter 3, *Powering and Verification*.

## **T1 Line Interface Cable Installation**

---

### **Description**

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The following procedure describes how to connect the T1 line interface cables required if the AEK-type T1 repeater circuit packs are used.

**⇒ NOTE:**

For the T1 line interface cable assemblies, do not exceed a cable length of 200 feet to the main distributing frame (MDF) or protection blocks.

**⇒ NOTE:**

It is important that the T1 line interface cabling is routed properly below the shelf as shown in Figure 2-9.

### **Procedure**

---

1. Obtain a T1 line interface cable as listed in Table 2-1.

**⇒ NOTE:**

This cable has two cable assemblies each with seven connectors. Cable assembly 1 (CA1), for input into the T1 Line, has connectors J03A, J03B, J03C, J03D, J03E, J03F, and J03G. Cable assembly 2 (CA2), for output from the T1 Line, has connectors J01A, J01B, J01C, J01D, J01E, J01F, and J01G.

2. Route cable assembly 2 (CA2) to the right side of the shelf (as viewed from the front) and out of the bay to the MDF or protection blocks per Figure 2-9.
3. Route cable assembly 1 (CA1) to the left side of the shelf (as viewed from the front) and out of the bay to the MDF or protection blocks per Figure 2-9.

4. Connect cable assembly 2 (CA2) to the corresponding plugs located below the circuit pack slots on the front of the shelf.

**⇒ NOTE:**  
All backplane cables must route properly underneath the DDM-Plus Extension Shelf to allow the cables to exit properly from the shelf.

**⇒ NOTE:**  
Retainers must be in-place on all backplane pins used for cable connections.

**⇒ NOTE:**  
The backplane plug identifications are adjacent to the corresponding plugs.

**⇒ NOTE:**  
The cable must be attached so that the label on the cable connector is facing down.

5. Connect cable assembly 1 (CA1) to the corresponding plugs located below the circuit pack slots on the front of the shelf backplane.

**⇒ NOTE:**  
The cable must be attached so that the label on the cable connector is facing down.

6. Dress and tie cable assembly 1 (CA1) to the bottom of the shelf using the holes provided in the row closest to the rear of the shelf per Figure 2-9.

**⇒ NOTE:**  
Cable assembly 2 (CA2) should rest on top of cable assembly 1 (CA1).

7. Separate cable assemblies 1 and 2 from each other as much as possible as shown in Figure 2-9.

8. Dress the T1 cables in the bay frame cable duct to ensure that the cables will later fit properly in the cable clamps.

**⇒ NOTE:**  
After all cabling has been installed, all cables will be placed in a cable clamp and attached directly to the bay.

9. Verify that the cable is not touching any backplane pins and that no pins are bent.
10. Remove slack and cut the cables to the desired length at the MDF or protection blocks.
11. Referring to Table 2-4, carefully observe color codes and wire-wrap the cables at the MDF or protection blocks.
12. Label all connections at the MDF or protection blocks.

## Equipment Interface DS1 Cable Installation

---

### Description

---

The following procedure describes how to connect the equipment interface DS1 transmission cables to the shelf, how to route the cables out of the bay, and how to connect the cables to the DSX-1.

**⇒ NOTE:**

The DS1 cables are required to have a minimum length of 30 feet.

**⇒ NOTE:**

When the AEK-type T1 repeater packs are being used, do not exceed a DS1 cable length of 85 feet for 22- or 26-gauge cable.

**⇒ NOTE:**

When equipping the DDM-Plus Extension Shelf with optical line interface unit (OLIU) circuit packs do not exceed a DS1 cable length of 655 feet for 22-gauge cable (613C type) or 440 feet for 26-gauge cable (1249C type).

**⇒ NOTE:**

Cables are stacked in the bay as shown in Figure 2-6, 2-7, or 2-8 depending if the installation is front or rear access.

**⇒ NOTE:**

It is important that the equipment interface DS1 cabling is routed properly below the shelf as shown in Figure 2-9.

## Procedure

---

1. Obtain a DS1 cable as listed in Table 2-1.



**NOTE:**

This cable has two cable assemblies combining into seven connectors labeled J02A, J02B, J02C, J02D, J02E, J02F, and J02G.

2. Route the DS1 cable to the left side of the shelf (as viewed from the front) and out of the bay to the DSX-1 per Figure 2-6, 2-7, or 2-8 depending if the installation is front or rear access.



**NOTE:**

All backplane cables must route properly underneath the DDM-Plus Extension Shelf to allow the cables to exit properly from the shelf.



**NOTE:**

Retainers must be in-place on all backplane pins used for cable connections.



**NOTE:**

The backplane plug identifications are adjacent to the corresponding plugs.



**NOTE:**

The cables must be attached so that the label on the cable connector is facing down.

3. Connect the DS1 cable to the corresponding backplane plugs located below the circuit pack slots on the front of the shelf.
4. Dress and tie the DS1 cables to the bottom of the shelf using the holes provided in the row closest to the front of the shelf per Figure 2-9.



**NOTE:**

It is important that the equipment DS1 cabling is routed properly below the shelf. The DS1 cabling is routed below the T1 line cabling.

5. Dress the DS1 cables in the bay frame cable duct to ensure that the cables will later fit properly in the DS1 cable clamps.

**⇒ NOTE:**

After all cabling has been installed, all cables will be placed in a cable clamp and attached directly to the bay.

6. Verify that the DS1 cables are not touching any backplane pins and that no backplane pins were bent when routing the DS1 cable along the backplane.

**⇒ NOTE:**

The DS1 cables are required to have a minimum length of 30 feet.

7. Remove slack and cut the DS1 cables to the desired length at the equipment DSX-1.
8. Referring to Table 2-3, carefully observe color codes and wire-wrap the cables at the equipment DSX-1.

**⇒ NOTE:**

Cable assembly 1 contains the DS1 OUT leads. Cable assembly 2 contains the DS1 IN leads.

9. Label all connections at the equipment DSX-1.

## Optical Fiber Cable Installation

### Description

The following procedure describes how to connect the fiber optic cables to the shelf, how to route the cables out of the bay, and how to connect to the optical cross-connect lightguide cable interconnection equipment (LCIE/M or LGX<sup>®</sup> fiber optical distributing frame).

The procedure does not cover routing the optical fiber cable between central office locations.



**WARNING:**

*Invisible laser radiation when open. Avoid direct exposure to beam.*



**NOTE:**

The optical fiber cable is fragile and must be protected. The fibers should be placed in a protective fiber conduit, like the AT&T Fiber Protection System, when running the cable from the DDM-Plus to the cable rack. The fibers should be placed in the cable rack in a fiber conduit with nothing on top of them. DO NOT use cable ties with the optical fiber cables.



**NOTE:**

Optical fibers associated with the left side of the shelf (positions 1 to 14) must be routed to the left side of the shelf. Optical fibers associated with the right side of the shelf (positions 15 to 28) must be routed to the right side of the shelf. Therefore, fiber conduit is required on each side of the bay frame.



**NOTE:**

Determine the mode of fiber (single-mode or multimode) that is connected between the LGX panels at each end. The fiber from the DDM-Plus OLIU transmitter to the LGX panel must be single-mode or the same mode as exists between the LGX. The fiber from the DDM-Plus OLIU receiver to the LGX panel must be multimode or the same mode as exists between the LGX panels.



**NOTE:**

Unterminated optical connectors may emit laser radiation. DO NOT view beam with optical instruments.

**⇒ NOTE:**  
Prior to connecting the optical fiber cables, clean them following the *Fiber Cleaning Instructions* section.

**⇒ NOTE:**  
The fibers can be cleaned with optical lint-free tissue or with a compressed air duster.

**⇒ NOTE:**  
The optical fiber cables require *ST*<sup>®</sup> type connectors for connection to the DDM-Plus OLIUs.

**⇒ NOTE:**  
The optical fiber cables must be connected to the DDM-Plus OLIUs before the OLIUs are installed.

### **Fiber Cleaning Instructions**

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**▲ WARNING:**  
*Open optical connectors may emit invisible radiation. Do not view beam with optical instruments. Avoid direct exposure to the beam.*

**⇒ NOTE:**  
Always clean all *ST* connectors and couplings before doing initial connections or reconnections per the following instructions.

1. Clean the end and sides of the connector tips with a lint-free, optical quality tissue dampened with isopropyl alcohol.
2. Carefully wipe the connector end again with clean dry lint-free, optical quality tissue.
3. Blow any lint or dust from the connector using a canned air duster 3 inches from the face of the connector.

## Procedure

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1. Install the required conduit shelf brackets as shown in Figure 2-1 or 2-2, if this has not already been done.

**⇒ NOTE:**

There are four brackets required per shelf to hold the fiber conduit in place.

2. Install the required fiber conduit for the optical fiber cables as shown in Figure 2-1 or 2-2, if this has not already been done.
3. Connect the optical cables to the *LGX* panel.

**⇒ NOTE:**

Cables should not be energized. Leave protective covers on cables.

4. Route the optical fiber cables from the *LGX* panel into the DDM-Plus bay stacking the cables as shown in Figure 2-6, 2-7, or 2-8 depending if the installation is front or rear access.
5. Label the optical fiber cables, indicating bay, shelf, OLIU (A1 or A2 etc.) and direction (IN or OUT).
6. Place the optical fiber cables in the fiber conduit.

## **Office Alarm Cable Installation**

### **Description**

Office alarms are the common method used in a central office for maintenance personnel to quickly isolate a failure to the correct system.

Perform this procedure if connection to the central office alarm system is required.

**⇒ NOTE:**

Office alarm cable options are listed in Table 2-2.

**⇒ NOTE:**

Office alarm connections are listed in Table 2-5.

**⇒ NOTE:**

The office alarms provide a relay closure between the alarm lead and alarm return lead.

**⇒ NOTE:**

The office alarm dry contacts will support up to 1.0 amps at 60 V DC switching current and will support a current surge up to 18 amps for 20 ms or less. If transient voltages or currents are above these limits, transient noise suppressing devices such as diodes or contact protection networks must be used to keep within the voltage and current limits. If these protection devices are not sufficient, then an external buffer relay must be provided.

## Procedure

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1. Obtain an office alarm cable listed in Table 2-2 (Group 2 or 10).
2. Route the office alarm cable out of the right side of the DDM-Plus Extension Shelf (as viewed from the front) and out of the bay to the office alarm panel, stacking the cables as shown in Figure 2-6, 2-7, or 2-8 depending if the installation is front or rear access.
3. Connect the office alarm cable to P06 of the shelf.



**NOTE:**

The cable must be attached so that the label on the cable connector is facing down.



**NOTE:**

The cable must be routed above the DS1 equipment cable which has been attached to the bottom of the shelf.

4. Dress and tie the cables in the bay frame cable duct and as close to the bottom of the shelf as possible without touching any backplane pins.



**NOTE:**

After all cabling has been installed, all cables will be placed in a cable clamp and directly attached to the bay.

5. Cut the office alarm cable to the desired length.
6. Wire-wrap the loose end of the office alarm cable to the alarm panel making connections as shown in Table 2-5.



**NOTE:**

If only one lead is wired for each alarm, then wire all the alarm returns to ground.

7. Inspect the office alarm panel and add contact protection network (if required).
8. Label all designations on the alarm panel.

## **Parallel Telemetry Cable Installation**

### **Description**

Parallel telemetry is a minimum set of alarm and status outputs in the form of contact closures that can be reported to a maintenance center through a telemetry system.

Connection of parallel telemetry requires a parallel telemetry system in the office.

Perform this procedure if connection to parallel telemetry system is required.

**⇒ NOTE:**

Parallel telemetry cable options are listed in Table 2-2.

**⇒ NOTE:**

Parallel telemetry connections are listed in Tables 2-6, and 2-7.

### **Procedure**

1. Obtain a parallel telemetry cable listed in Table 2-2 (Group 3, 11, 22 or 23).
2. Route the parallel telemetry cable to the right side of the DDM-Plus Extension Shelf (as viewed from the front) and out of the bay to the telemetry system, stacking the cables as shown in Figure 2-6, 2-7, or 2-8 depending if the installation is front or rear access.
3. Connect the telemetry cable to P07, P09, and P10 of the shelf.

**⇒ NOTE:**

The Group 3 and Group 11 version of this cable only connects to P07.

**⇒ NOTE:**

The cable must be attached so that the label on the cable connector is facing down.

**⇒ NOTE:**

The cable must be routed above the DS1 equipment cable which has been attached to the bottom of the shelf.

4. Dress and tie the cables in the bay frame cable duct as close as possible to the bottom of the shelf without touching any backplane pins.

**⇒ NOTE:**

After all cabling has been installed, all cables will be placed in a cable clamp and directly attached to the bay.

5. Cut the parallel telemetry cable to the desired length at the telemetry panel.
6. Wire-wrap the loose end of the parallel telemetry cable to the telemetry panel making connections as shown in Table 2-6 (for Group 3 and 11) or Table 2-7 (for Group 22 or 23).

**⇒ NOTE:**

The ground return lead in the telemetry cable must be wired to ground.

**⇒ NOTE:**

The miscellaneous inputs are activated by a closure between the RMTIA( ) and RMTIB( ) leads for each group.

**⇒ NOTE:**

When an alarm condition exists, a voltage potential of approximately 48 volts exists between -48 V and the alarm lead.

7. Label all designations on the telemetry panel.

## **Fault Locate Cable Installation**

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### **Description**

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The DDM-Plus Extension Shelf provides fault locating for all 28 DS1s when the system is used with AEK-type T1 repeater packs.

There are four fault-locating wire pairs per shelf. Each pair serves a group of seven T1 repeaters. Pair one is used to access positions 1 through 7, pair two for positions 8 through 14, pair three for positions 15 through 21, and pair four is used for positions 22 through 28.

The DDM-Plus Extension Shelf is shipped with fault locate shorting contacts on P04 and P05. These contacts are to be removed only if the shelf is equipped with a fault locate cable assembly connected to a filter on the fault locate alarm panel.

**⇒ NOTE:**

Fault locate cable options are listed in Table 2-2.

**⇒ NOTE:**

Fault locate cable connections are listed in Table 2-8.

### **Procedure**

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1. Remove the shorting connectors from connectors P04 and P05.
2. Obtain a fault locate cable listed in Table 2-2 (G4 or 12). Route the fault locate cable out of the right side of the DDM-Plus shelf (as viewed from the front of the bay) and out of the bay to the fault locate panel, stacking the cables as shown in Figure 2-6, 2-7, or 2-8 depending if the installation is front or rear access.
3. Connect the fault locate cable to P04 and P05 of the shelf.

**⇒ NOTE:**

The cable must be attached so that the label on the cable connector is facing down.

**⇒ NOTE:**

The cable must be routed above the DS1 equipment cable which has been attached to the bottom of the shelf.

4. Dress and tie the cables in the bay frame cable duct and as close to the bottom of the DDM-Plus Extension Shelf as possible without touching any backplane pins.

**⇒ NOTE:**

After all cabling has been installed, all cables will be placed in a cable clamp and directly attached to the bay.

5. Verify that cables are not touching any backplane pins and that no pins are bent.
6. Remove any slack and cut the cables to the desired length at the fault locate alarm panel.
7. Referring to Table 2-8, carefully observe color codes and wire-wrap the cables at the fault locate alarm panel.

**⇒ NOTE:**

If the fault locate cable is not connected to a fault locate filter, then the shorting contacts must be in-place instead.

8. Label all designations on the fault locate alarm panel.

## **Cable Clamp Attachment**

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### **Description**

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Four cable clamps of different sizes ship with the shelf. These cable clamps are used to provide electrostatic discharge (ESD) and electromagnetic interference (EMI) shielding of the transmission and alarm cables. The largest and third largest cable clamps are intended to accommodate 22-gauge transmission cable. The other two cable clamps are intended to accommodate 26-gauge transmission cable. One cable clamp will be attached to the left side of the bay frame; one cable clamp will be attached to the right side of the bay frame; and two cable clamps will be left over and not used.

**⇒ NOTE:**

Use the two cable clamps which provide the best fit.

### **Procedure**

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**⇒ NOTE:**

This procedure is described as viewing from the back of the shelf.

1. On all the DS1 and T1 cables, fold back the blue foil over the plastic sheathing 2.5 inches, to expose the silver foil.
2. Wrap the drain wire, which is in the cable, around the silver foil.
3. Place the DS1 and T1 cables located on the right side of the shelf in a cable clamp so the silver foil makes a good electrical connection.
4. Attach the cable clamp to the right side of the bay (as viewed from the rear) as close to possible to the bottom of the shelf.
5. Place the T1 and alarm cables located on the left side of the shelf in a cable clamp so the silver foil makes a good electrical connection.

**⇒ NOTE:**

If necessary remove a strip of the alarm cables plastic sheath to expose the inner foil.

6. Attach the cable clamp to the left side of the bay as close as possible to the bottom side of the shelf.
7. Dress and tie the cables in the bay frame cable duct as shown in Figures 2-6, 2-7, and 2-8.

## **Final Operations**

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### **Procedure**

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1. Verify that all the cables are properly dressed.
2. Verify that all cables are properly labeled.
3. Verify that designation where cables were wire-wrapped are properly labeled.
4. Verify that no backplane pins are bent or touching.
5. Install the heat baffle below the shelf.

**Table 2-1. DS1/T1 Cable Assemblies**

Description	ED-8C730-20 Group (Note 1)	Cable Length (Ft.) (Note 2)	Cable Type (Note 3)	DDM-Plus Backplane Connections
J98725DB-1, L1 Shelf DSX-1 Equipment Cable Assemblies	G7	30 to 655	613C	P02A-P02G
	G17	85		
	G18	150		
	G8	30 to 450	1249C	
	G19	85		
	G20	150		
J98725DB-1, L1 Shelf T1 Line Cable Assemblies	G5	30 to 200	613C	P03A-P03G and P01A-P01G
	G13	75		
	G14	150		
	G6	30 to 200	1249C	
	G15	75		
	G16	150		

**Notes:**

- Each group listed for either equipment or line cable assemblies includes connections for all 28 DS1s. Each T1 line cable group consists of two separate cable assemblies.
- The maximum length of line cable assemblies is 200 feet.  
 The maximum length of equipment cable assemblies where AEK type repeaters are used is 85 feet.  
 The maximum length of equipment cable assemblies where OLIUs are used is 655 feet for 613C type cable (22 gauge).  
 The maximum length of equipment cable assemblies where OLIUs are used is 450 feet for 1249C type cable (26 gauge). The minimum length for all cables is 30 feet.
- 613C type cable is 22 gauge.  
 1249C type cable is 26 gauge and is the recommended cable for lengths up to 450 feet.  
 Equipment cable assemblies are terminated in 963P9-16 or 963T-16 connectors at the DDM-Plus end and unterminated at the other end for wire-wrap installation.  
 Line cable assemblies are terminated in 963P9-8 or 963T-8 connectors at the DDM-Plus end and unterminated at the other end for wire-wrap installation.

**Table 2-2. Power, Alarm, Telemetry and Fault Locate Cable Assemblies**

Description	ED-8C730-20 Group	Cable Length (Ft.) (Note 1)	Cable Type (Notes 2,3)	DDM-Plus Backplane Connections
Power Dangler-Attached to Shelf*	—	3	—	E1, E2, E3
Power Cable-Single Shelf†	G21	12	KS-13385, L1	—
Power Cable-MultiShelf† ‡	G9	12	KS-13385, L1	—
Office Alarms-For Each Shelf	G2	as required	816AS	P06
	G10	150		
Parallel Telemetry-For Each Shelf§	G3	as required	816AS	P07
	G11	150		
Parallel/Misc. Telemetry-For Each Shelf¶	G22	as required	800AS	P07, P09, P10
	G23	150		
Fault Locate-For Each Shelf**	G4	as required	812AS	P04 & P05
	G12	150		

**Notes:**

1. Cable lengths listed as required are specified by the customer.
2. The KS-13385, L1 type cable is 10 gauge.
3. The 812AS and 816AS type cable is 26 gauge.

- \* This cable comes attached to the shelf.
- † This cable attaches to the power dangler.
- ‡ This cable accommodates six shelves. (Seven interfaces to the power dangler, one reserved for future use)
- § This cable does not include user settable miscellaneous telemetry. This cable is only used on an older version of the DDM-Plus shelf.
- ¶ This cable includes user settable miscellaneous telemetry.
- \*\* Two fault locate shorting contacts (846750875) ship with the shelf with one contact on P04 and the other contact on P05. These shorting contacts are to be removed only when the fault locate cable assembly is installed.

**Table 2-3. Equipment DSX-1 Connections**

Quad	Chan (DS1)	Loose End			Connector End		
		613C (22 Gauge) T Color R Color		1249018C (26 Gauge) T/R Color	Connector (Note 1)	Plus IN (CA2) T/R Term (Note 2)	Plus OUT (CA1) T/R Term (Note 3)
A	1 (1)	W-BL,	BL-W	W, BL	J02A	A2, B2	A1, B1
	2 (2)	W-O,	O-W	W, O		A4, B4	A3, B3
	3 (3)	W-G,	G-W	W, G		A6, B6	A5, B5
	4 (4)	W-BR,	BR-W	W, BR		A8, B8	A7, B7
B	1 (5)	W-S,	S-W	W, S	J02B	A2, B2	A1, B1
	2 (6)	R-BL,	BL-R	R, BL		A4, B4	A3, B3
	3 (7)	R-O,	O-R	R, O		A6, B6	A5, B5
	4 (8)	R-G,	G-R	R, G		A8, B8	A7, B7
C	1 (9)	R-BR,	BR-R	R, BR	J02C	A2, B2	A1, B1
	2 (10)	R-S,	S-R	R, S		A4, B4	A3, B3
	3 (11)	BK-BL,	BL-BK	BK, BL		A6, B6	A5, B5
	4 (12)	BK-O,	O-BK	BK, O		A8, B8	A7, B7
D	1 (13)	BK-G,	G-BK	BK, G	J02D	A2, B2	A1, B1
	2 (14)	BK-BR,	BR-BK	BK, BR		A4, B4	A3, B3
	3 (15)	BK-S,	S-BK	BK, S		A6, B6	A5, B5
	4 (16)	Y-BL,	BL-Y	Y, BL		A8, B8	A7, B7
E	1 (17)	Y-O,	O-Y	Y, O	J02E	A2, B2	A1, B1
	2 (18)	Y-G,	G-Y	Y, G		A4, B4	A3, B3
	3 (19)	Y-BR,	BR-Y	Y, BR		A6, B6	A5, B5
	4 (20)	Y-S,	S-Y	Y, S		A8, B8	A7, B7
F	1 (21)	V-BL,	BL-V	V, BL	J02F	A2, B2	A1, B1
	2 (22)	V-O,	O-V	V, O		A4, B4	A3, B3
	3 (23)	V-G,	G-V	V, G		A6, B6	A5, B5
	4 (24)	V-BR,	BR-V	V, BR		A8, B8	A7, B7
G	1 (25)	V-S,	S-V	V, S	J02G*	A2, B2	A1, B1
	2 (26)	W-BL,	BL-W	W, BL		A4, B4	A3, B3
	3 (27)	W-O,	O-W	W, O		A6, B6	A5, B5
	4 (28)	W-G,	G-W	W, G		A8, B8	A7, B7

**Notes:**

1. Each connector contains both transmit and receive leads.
2. Wire-wrap the Cable Assembly 2 (CA2) portion of the cable to the DSX-1 IN. This cable assembly contains the IN leads from the DSX-1 equipment for transmission through the DDM-Plus OLIUs or T1 repeaters.
3. Wire-wrap the Cable Assembly 1 (CA1) portion of the cable to the DSX-1 OUT. This cable assembly contains the OUT leads to the DSX-1 equipment received from the DDM-Plus OLIUs or T1 repeaters.

\* The last three DS1 pairs are contained in a second (blue) binder.

**Table 2-4. T1 Line Connections**

Quad	Chan (DS1)	Loose End			Connector End		
		613C (22 Gauge) T Color R Color		1249028C (26 Gauge) T/R Color	Line IN, TRMT to Line (CA1) (Note 1)	Line OUT, RCV from Line (CA2) (Note 2)	T/R Term
A	1 (1)	W-BL,	BL-W	W, BL	J03A	J01A	A1, B1 A2, B2 A3, B3 A4, B4
	2 (2)	W-O,	O-W	W, O			
	3 (3)	W-G,	G-W	W, G			
	4 (4)	W-BR,	BR-W	W, BR			
B	1 (5)	W-S,	S-W	W, S	J03B	J01B	A1, B1 A2, B2 A3, B3 A4, B4
	2 (6)	R-BL,	BL-R	R, BL			
	3 (7)	R-O,	O-R	R, O			
	4 (8)	R-G,	G-R	R, G			
C	1 (9)	R-BR,	BR-R	R, BR	J03C	J01C	A1, B1 A2, B2 A3, B3 A4, B4
	2 (10)	R-S,	S-R	R, S			
	3 (11)	BK-BL,	BL-BK	BK, BL			
	4 (12)	BK-O,	O-BK	BK, O			
D	1 (13)	BK-G,	G-BK	BK, G	J03D	J01D	A1, B1 A2, B2 A3, B3 A4, B4
	2 (14)	BK-BR,	BR-BK	BK, BR			
	3 (15)	BK-S,	S-BK	BK, S			
	4 (16)	Y-BL,	BL-Y	Y, BL			
E	1 (17)	Y-O,	O-Y	Y, O	J03E	J01E	A1, B1 A2, B2 A3, B3 A4, B4
	2 (18)	Y-G,	G-Y	Y, G			
	3 (19)	Y-BR,	BR-Y	Y, BR			
	4 (20)	Y-S,	S-Y	Y, S			
F	1 (21)	V-BL,	BL-V	V, BL	J03F	J01F	A1, B1 A2, B2 A3, B3 A4, B4
	2 (22)	V-O,	O-V	V, O			
	3 (23)	V-G,	G-V	V, G			
	4 (24)	V-BR,	BR-V	V, BR			
G	1 (25)	V-S,	S-V	V, S	J03G*	J01G	A1, B1 A2, B2 A3, B3 A4, B4
	2 (26)	W-BL,	BL-W	W, BL			
	3 (27)	W-O,	O-W	W, O			
	4 (28)	W-G,	G-W	W, G			

**Notes:**

1. Wire-wrap the Cable Assembly 1 (CA1) portion of the cable to the LINE IN protection block. This cable assembly contains the "hot" transmit signals from the T1 repeater for transmitting over the line.
2. Wire-wrap the Cable Assembly 2 (CA2) portion of the cable to the LINE OUT protection block. This cable assembly contains the "cold" receive signals to the T1 repeater received from the line.

\* The last three DS1 pairs are contained in a second (blue) binder.

**Table 2-5. Office Alarm Connections (Notes)**

Name	Desig.	Conn.	Term	Color
Minor Alarm Visible	MN	J06	A2	BL-W
Minor Alarm Visible Return	MNR		A1	W-BL
Minor Alarm Audible	MNA		B2	BR-W
Minor Alarm Audible Return	MNAR		B1	W-BR
Major Alarm Visible	MJ		A6	G-W
Major Alarm Visible Return	MJR		A5	W-G
Major Alarm Audible	MJA		B6	BL-R
Major Alarm Audible Return	MJAR		B5	R-BL
ACO Control Input*	RACO		B3	W-S
ACO Control Return*	RACOR		B4	S-W
ACO Control Input*	RACO1		A3	W-O
ACO Control Return*	RACOR1		A4	O-W

**Notes:**

1. The office alarm cable is 26 gauge (816AS type cable).
  2. Some cables may be manufactured using wires following old color code standards. A color code cross-reference is located in Table 2-9.
  3. If only one alarm lead is to be wired for each alarm, then wire all the alarm returns to ground.
- \* Connect either pair of ACO leads. Two pairs are provided to allow ACO control from two locations.
-

**Table 2-6. Parallel Telemetry Connections (Notes)**

Name	Desig.	Conn.	Term	Color
Major Alarm	MJA	J07	B5	S-W
Minor Alarm	MNA		A5	W-S
Near End Fail	NEAR END FAIL		A6	R-BL
Far End Fail	FAR END FAIL		B6	BL-R
Ground Return	GRD RTN		B4	BR-W
Optical Extension A ID	OPTEXTA ID		A1	W-BL
Optical Extension B ID	OPTEXTB ID		B1	BL-W
Optical Extension C ID	OPTEXTC ID		A2	W-O
Optical Extension D ID	OPTEXTD ID		B2	O-W
Optical Extension E ID	OPTEXTE ID		A3	W-G
Optical Extension F ID	OPTEXTF ID		B3	G-W
Optical Extension G ID	OPTEXTG ID		A4	W-BR

**Notes:**

1. These connections are only for use with the DDM-Plus shelf coded as a J98725DB-1, List 1. If the shelf DOES NOT have connectors P08, P09, and P10, then this table can be used.
  2. The ground return lead (terminal B4 in connector P07) must be wired to ground.
  3. When an alarm condition exists, a voltage potential of approximately 48 volts exists between -48 V and the alarm lead.
  4. The parallel telemetry cable is 26 gauge (816AS type cable).
  5. Some cables may be manufactured using wires following old color code standards. A color code cross-reference is located in Table 2-9.
-

**Table 2-7. Parallel with Miscellaneous Telemetry Connections (Notes)**

Name	Desig.	Conn.	Term	Color
Minor Alarm	E2MN	J07	A9	BK-BL
Major Alarm	E2MJ		B9	BL-BK
Near End Fail	E2NF		A10	BK-O
Far End Fail	E2FF		B10	O-BK
Ground Return	E2R		B8	S-R
Optical Extension A ID	E2SYSIDA		A5	R-O
Optical Extension B ID	E2SYSIDB		B5	O-R
Optical Extension C ID	E2SYSIDC		A6	R-G
Optical Extension D ID	E2SYSIDD		B6	G-R
Optical Extension E ID	E2SYSIDE		A7	R-BR
Optical Extension F ID	E2SYSIDF		B7	BR-R
Optical Extension G ID	E2SYSIDG		A8	R-S
Misc. Input C	RMTIA(C)		A2	W-BR
Misc. Input C	RMTIB(C)		B2	BR-W
Misc. Input D	RMTIA(D)		A4	R-BL
Misc. Input D	RMTIB(D)		B4	BL-R
Misc. Output C	RMTO(C)	B3	S-W	
Misc. Output D	RMTO(D)	A3	W-S	
No Connection	NC	A1	—	
No Connection	NC	B1	—	
Misc. Input A	RMTIA(A)	J09	B1	BL-W
Misc. Input A	RMTIB(A)		A1	W-BL
Misc. Input B	RMTIA(B)		B3	G-W
Misc. Input B	RMTIB(B)		A3	W-G
Misc. Output A	RMTO(A)		B2	O-W
Misc. Output B	RMTO(B)		A2	W-O
No Connection	NC		B4	—
No Connection	NC		A4	—
Misc. Input E	RMTIA(E)	J10	A3	BK-BR
Misc. Input E	RMTIB(E)		B3	BR-BK
Misc. Input F	RMTIA(F)		B5	BL-Y
Misc. Input F	RMTIB(F)		B4	Y-BL
Misc. Input G	RMTIA(G)		A6	Y-O
Misc. Input G	RMTIB(G)		B6	O-Y
Misc. Output E	RMTO(E)		A2	BK-G
Misc. Output F	RMTO(F)		A4	BK-S
Misc. Output G	RMTO(G)		A5	S-BK
No Connection	NC		A1	—
No Connection	NC	B1	—	
No Connection	NC	B2	—	

See notes on the following page.

Table 2-7 — *Continued*

---

**Notes:**

1. These connections are only for use with the DDM-Plus shelf coded as a J90725DB-1, List 1 and List A, or a J98725DB-1, List 1 and List B. If the shelf has connectors P08, P09, and P10, then this table can be used.
  2. The ground return lead (terminal B8 in connector J07) must be wired to ground.
  3. The miscellaneous inputs are activated by a closure between the RMTIA( ) and RMTIB( ) leads for each group. RMTO( ) is the output lead.
  4. When an alarm condition exists, a voltage potential of approximately 48 volts exists between -48 V and the alarm lead.
  5. The parallel telemetry cable is 26 gauge (816AS type cable).
  6. Some cables may be manufactured using wires following old color code standards. A color code cross-reference is located in Table 2-9.
-

**Table 2-8. Fault Locate Connections (Notes)**

Name	Desig.	Conn.	Term	Color
Fault at Pos. 1 through 7 Fault Return	FL1A FL2A	J04	B2 A2	BL-W W-BL
Fault at Pos. 8 through 14 Fault Return	FL1B FL2B		B3 A3	O-W W-O
Fault at Pos. 15 through 21 Fault Return	FL1C FL2C	J05	B2 A2	G-W W-G
Fault at Pos. 22 through 28 Fault Return	FL1D FL2D		B3 A3	BR-W W-BR

**Notes:**

1. The fault locate cable is 26 gauge (812AS type cable).
  2. There are two fault locate cables contained in one cable assembly. One cable connects to P04 and the other one connects to P05 on the backplane.
  3. Two fault locate shorting contacts (846750875) ship with the shelf with one contact on P04 and the other contact on P05. These shorting contacts are to be removed only when the fault locate cable assembly is installed. If the fault locate cable assembly is not installed, the shorting contacts must remain on the shelf.
  4. Some cables may be manufactured using wires following old color code standards. A color code cross-reference is located in Table 2-9.
-

**Table 2-9. Color Code Cross-Reference (Note)**

No.	Color		Paired With	
	Old	New	Old	New
1C OR 26C	BL1W	W-BL	BL2W	BL-W
2C OR 27C	O1W	W-O	O2W	O-W
3C OR 28C	G1W	W-G	G2W	G-W
4C OR 29C	BR1W	W-BR	BR2W	BR-W
5C OR 30C	S1W	W-S	S2W	S-W
6C OR 31C	BL1R	R-BL	BL2R	BL-R
7C OR 32C	O1R	R-O	O2R	O-R
8C OR 33C	G1R	R-G	G2R	G-R
9C OR 34C	BR1R	R-BR	BR2R	BR-R
10C OR 35C	S1R	R-S	S2R	S-R
11C OR 36C	BL1BK	BK-BL	BL2BK	BL-BK
12C OR 37C	O1BK	BK-O	O2BK	O-BK
13C OR 38C	G1BK	BK-G	G2BK	G-BK
14C OR 39C	BR1BK	BK-BR	BR2BK	BR-BK
15C OR 40C	S1BK	BK-S	S2BK	S-BK
16C OR 41C	BL1Y	Y-BL	BL2Y	BL-Y
17C OR 42C	O1Y	Y-O	O2Y	O-Y
18C OR 43C	G1Y	Y-G	G2Y	G-Y
19C OR 44C	BR1Y	Y-BR	BR2Y	BR-Y
20C OR 45C	S1Y	Y-S	S2Y	S-Y
21C OR 46C	BL1V	V-BL	BL2V	BL-V
22C OR 47C	O1V	V-O	O2V	O-V
23C OR 48C	G1V	V-G	G2V	G-V
24C OR 49C	BR1V	V-BR	BR2V	BR-V
25C OR 50C	S1V	V-S	S2V	S-V

**Note:**

Some cables may be manufactured using wires following old color code standards.

⇒ **NOTE:**  
There are four brackets required per shelf to hold the fiber conduit in place.

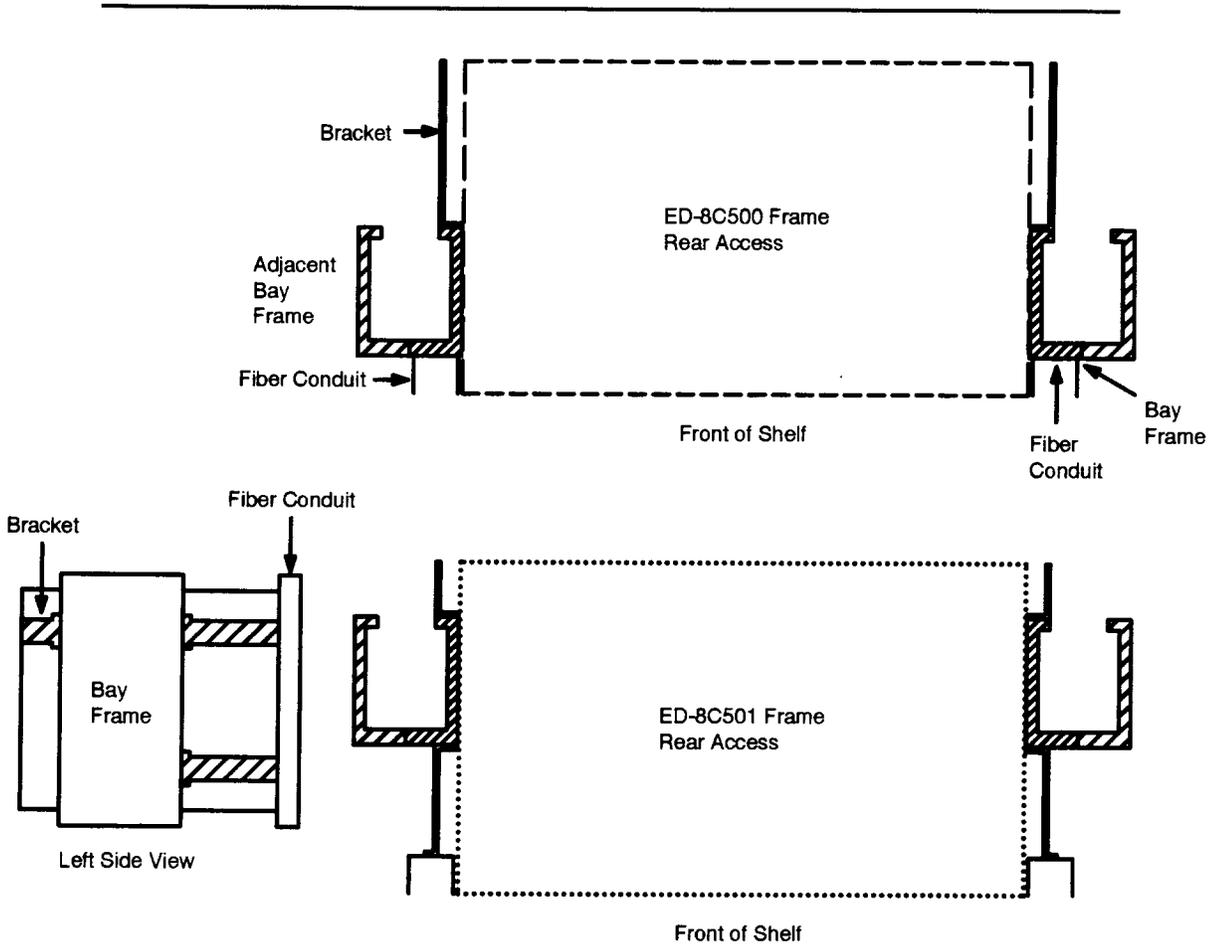


Figure 2-1. DDM-Plus Shelf Rear Access Mounting — Top View

⇒ **NOTE:**  
There are four brackets required per shelf to hold the fiber conduit in place.

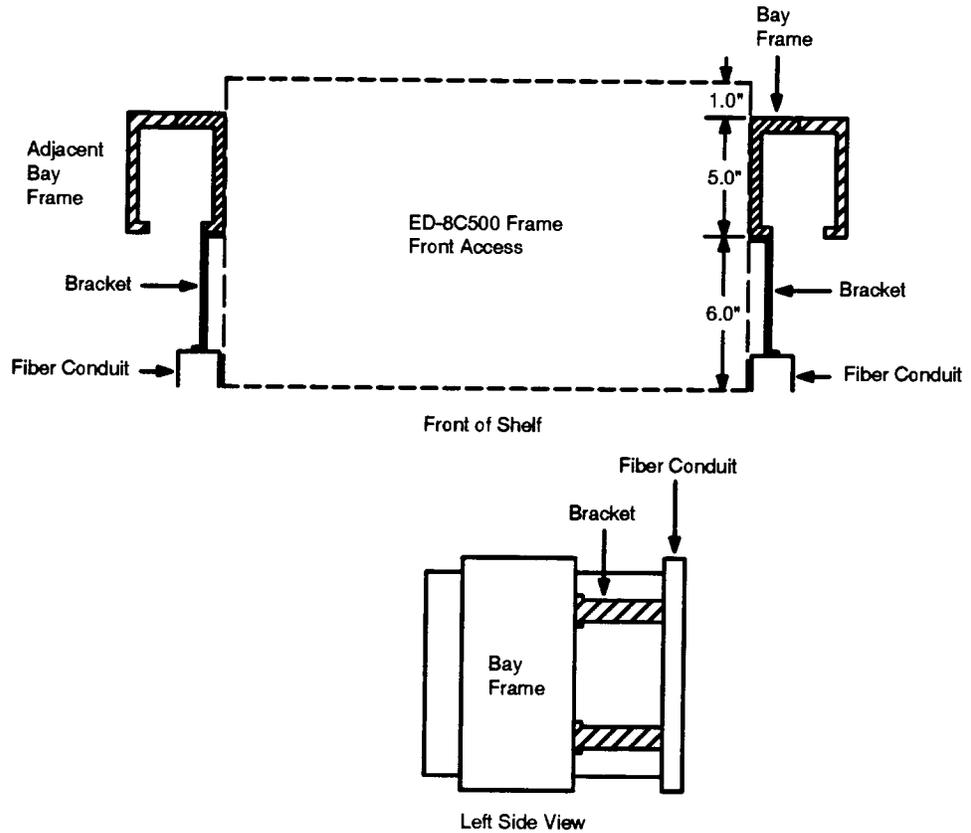
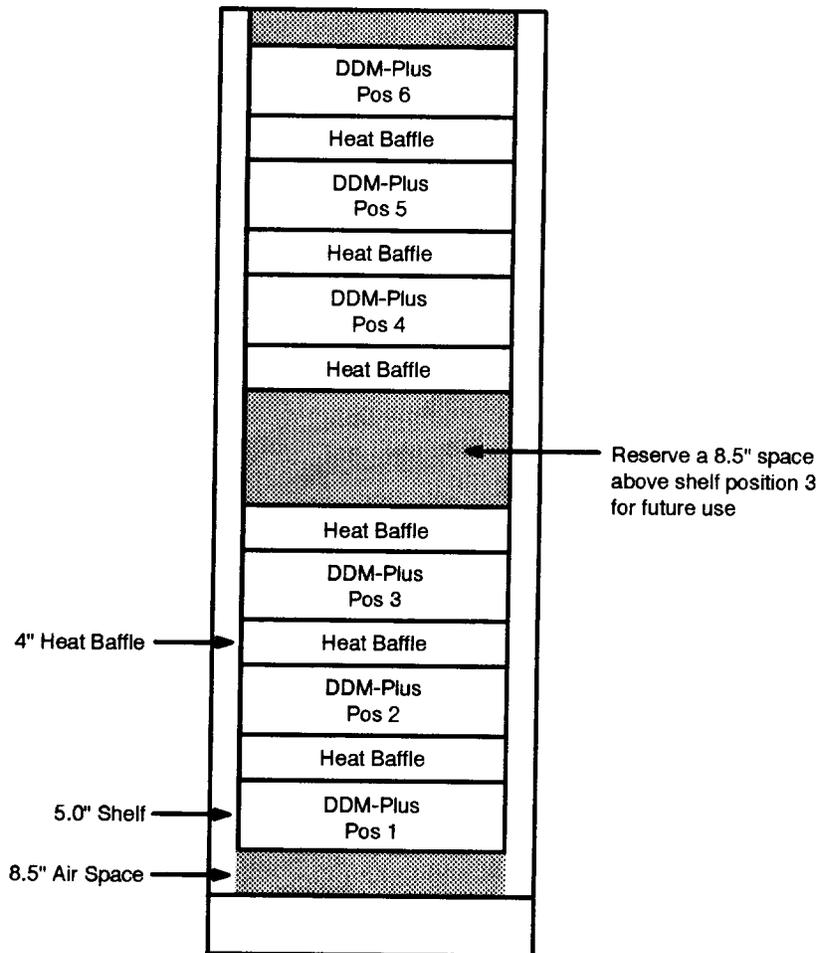


Figure 2-2. DDM-Plus Shelf Front Access Mounting — Top View

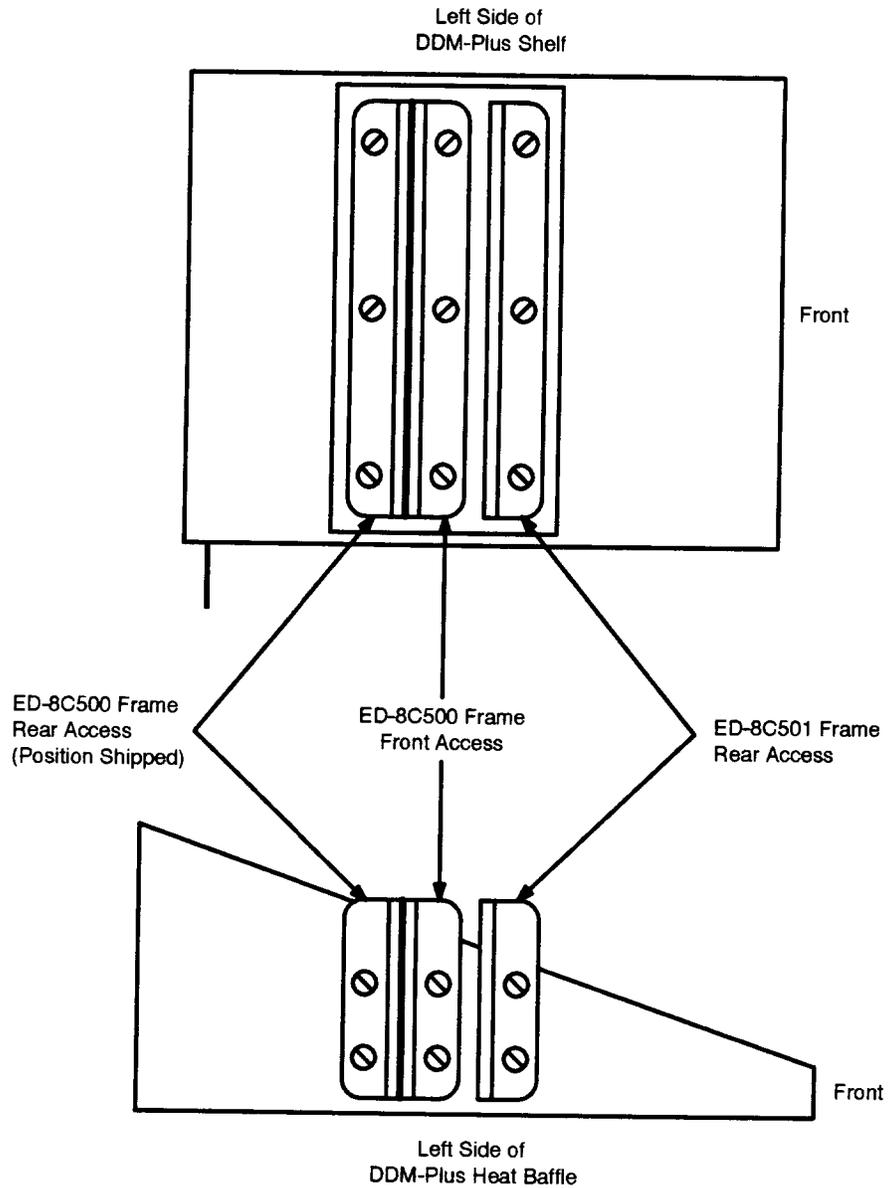


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Figure 2-3. Bay Mounting Arrangement

**⇒ NOTE:**  
Position the DDM-Plus shelf and heat baffle side mounting brackets (if necessary) according to the bay frame being mounted in.

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**Figure 2-4. Side Mounting Bracket Positions**

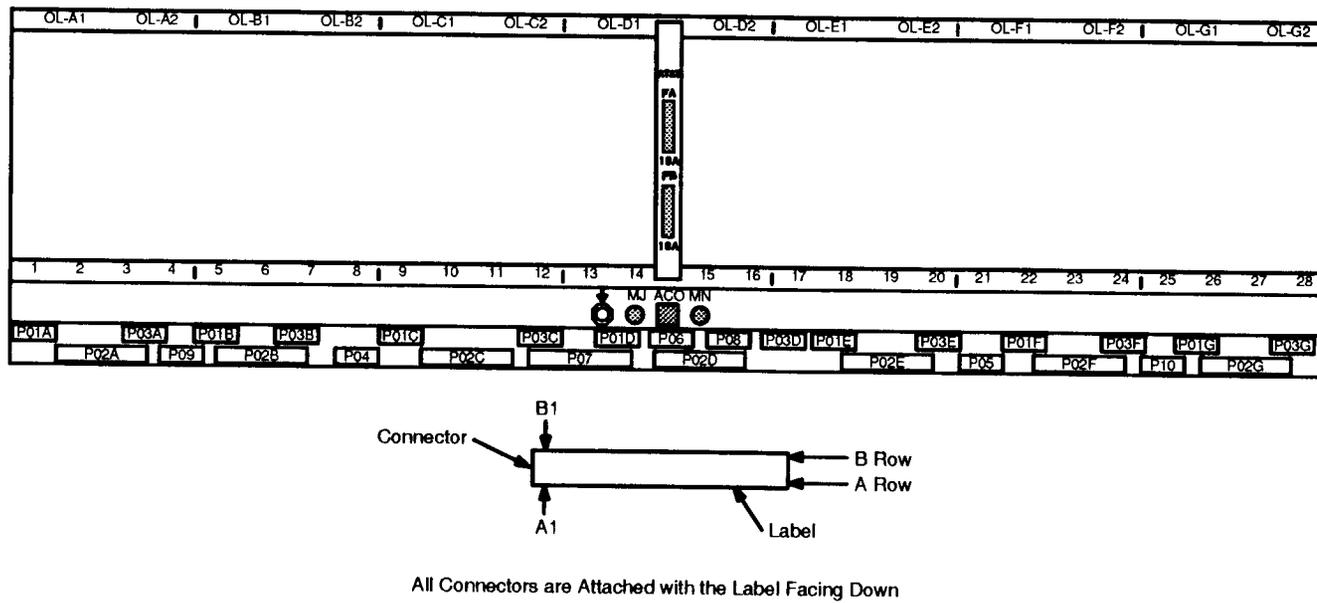


Figure 2-5. DDM-Plus Backplane as Viewed from the Front of the Shelf

**NOTE:**  
The cabling stacking order is shown in the figure below. The numbers on the cables indicate the shelf associated with that cable.

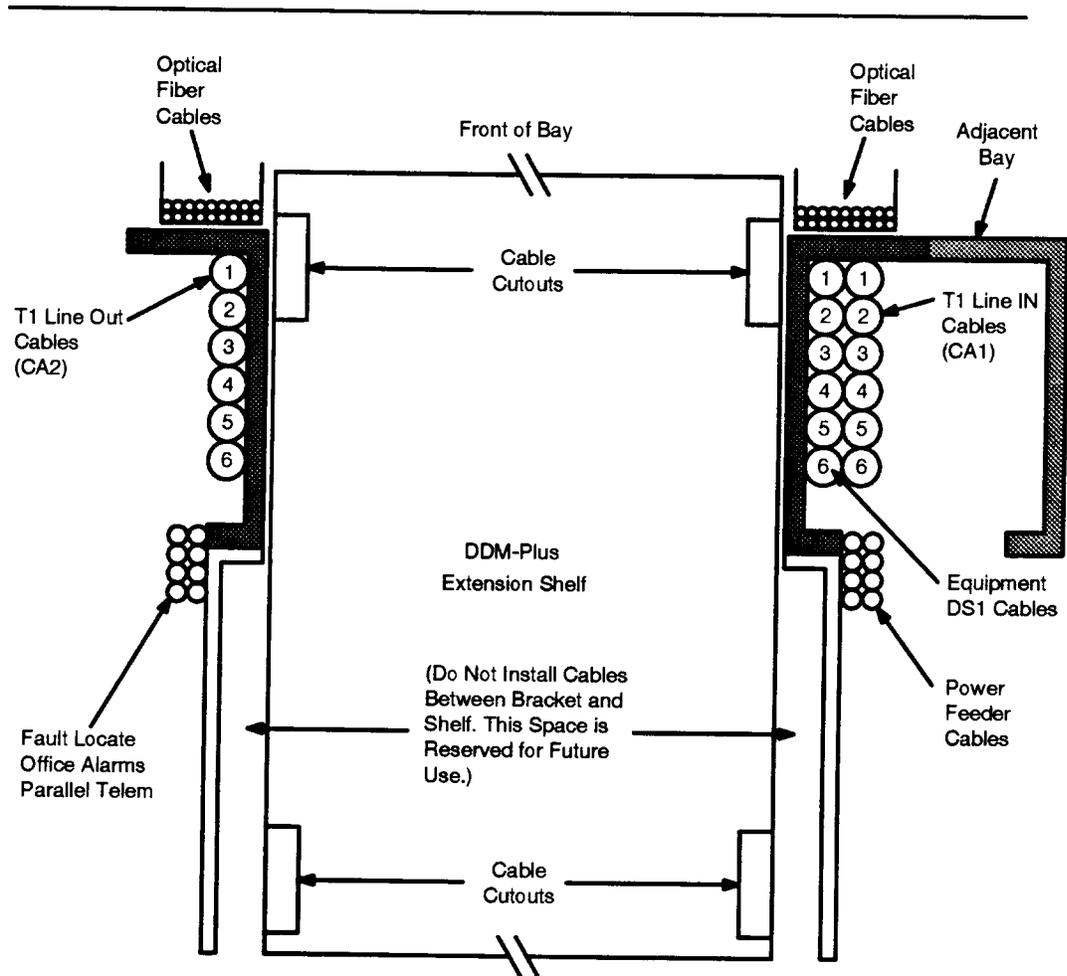


Figure 2-6. ED-8C500 Frame—Rear Mount with Rear Access

⇒ **NOTE:**  
The cabling stacking order is shown in the figure below. The numbers on the cables indicate the shelf associated with that cable.

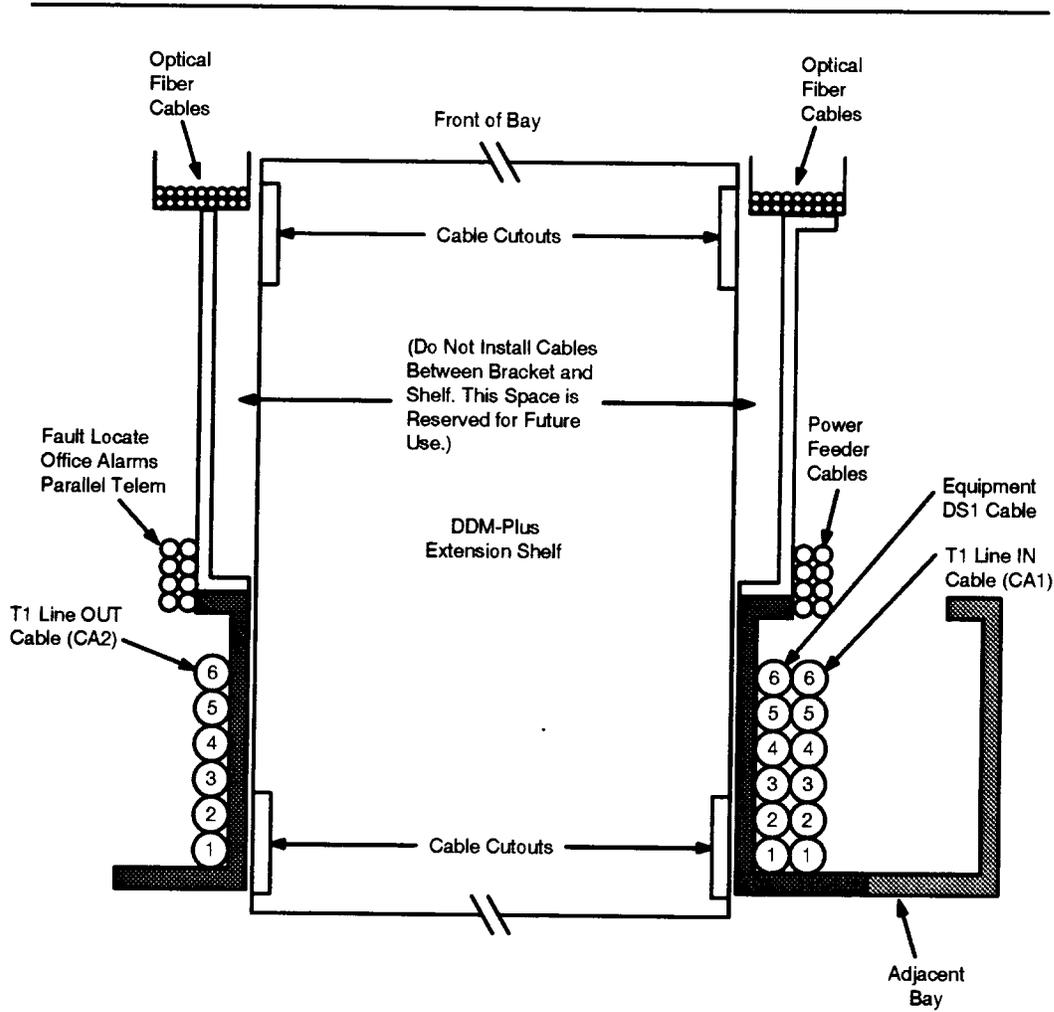


Figure 2-7. ED-8C500 Frame—Front Mount with Front Access

➡ **NOTE:**  
The cabling stacking order is shown in the figure below. The numbers on the cables indicate the shelf associated with that cable.

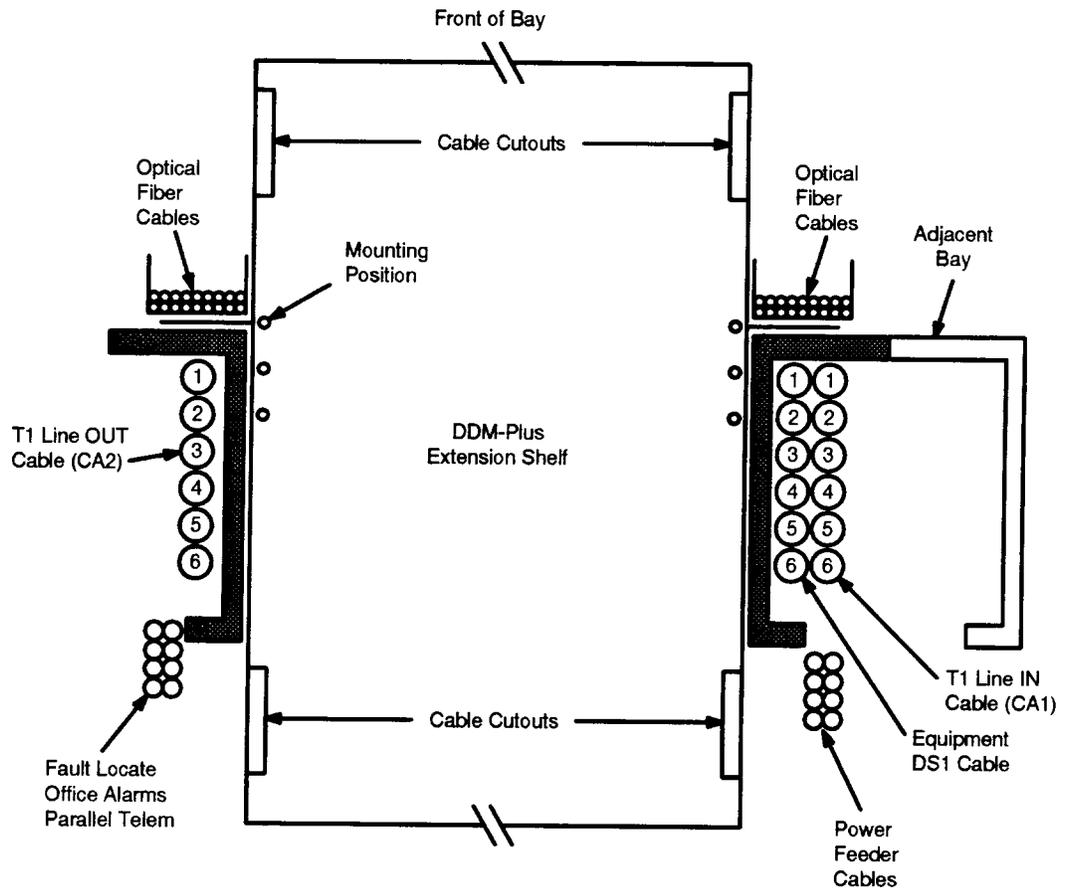


Figure 2-8. ED-8C501 Frame—Front Mount with Rear Access

⇒ **NOTE:**  
Refer to Table 2-1 for specific DS1/T1 cable assemblies.

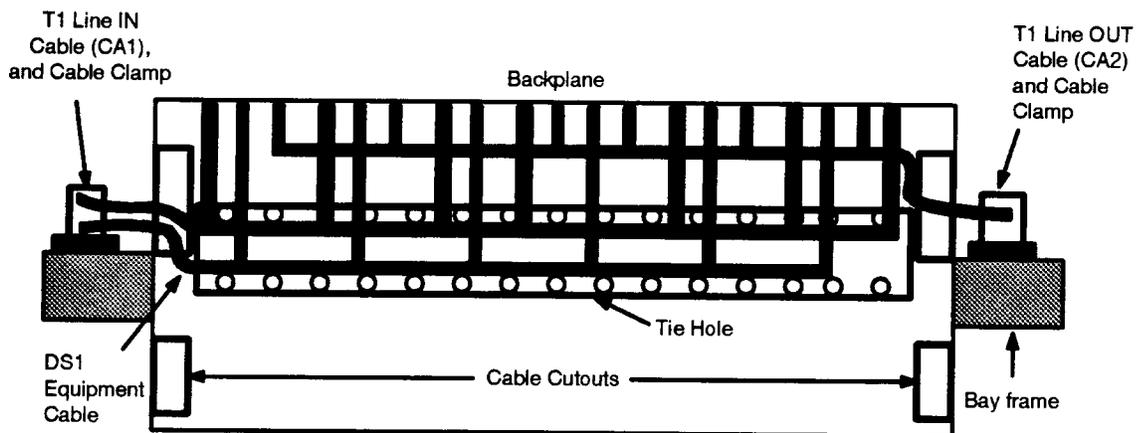
⇒ **NOTE:**  
Lace the T1 line in cable to the back row of tie holes.

⇒ **NOTE:**  
Lace the DS1 equipment cables to the front row of tie holes.

⇒ **NOTE:**  
Separate the T1 line CA1 and CA2 cables as much as possible.

---

Cables may exit the shelf through either the front or rear cable cutouts depending if the shelf is mounted for front or rear access (shown exiting the rear cutouts).



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Figure 2-9. DS1/T1 Cabling

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# Powering and Verification

# 3

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■ Procedure	3-2

---

# Powering and Verification

# 3

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## General

---

### Description

This chapter verifies that the shelf is properly fused and is being supplied with the proper power.

---

### Tools, Test Sets, and Accessories

The following are required:

<u>Qty.</u>	<u>Description</u>	<u>Usage</u>
1	Multimeter	The voltmeter must be capable of measuring DC voltage in the 40- to 60-volt range.
1	Wrist Strap	A wrist strap grounded into an ESD jack must be worn when connecting cables to the backplane.

## Verification

---

### Procedure

---

1. Verify that the frame or structure into which the DDM-Plus Extension Shelf is installed is properly grounded.
2. Verify that the DDM-Plus Extension Shelf is properly grounded to the frame or structure.
3. Verify that two 10-ampere fuses are installed in the DDM-Plus fuse card, (one for each feeder). These fuses shipped in the installation kit with the shelf.
4. Verify that the power dangler cable is properly connected on the backplane. The red wire (BAT A) should be on terminal E2, green wire (BAT B) should be terminal E3, and the black wire (GND) should be on E1.

## Powering

---

### Procedure

---

1. Disconnect the power feeder connectors from the power dangler connectors.



**NOTE:**

For bay arrangements, a 20-amp fuse or breaker minimum is required.



**NOTE:**

For a single shelf arrangement, a 15-amp fuse or breaker minimum is required.

2. If fuses are being used, install fuses specified per the line engineering requirements in the customer's Battery Distribution Fuse Board (BDFB) that fuses the DDM-Plus Extension Shelf.
3. If breakers are being used, verify that they are rated per the line engineering requirements.
4. If breakers are being used, put the breakers in the ON position.

- Using a voltmeter, measure the voltage between BAT A and GND, and then BAT B and GND on the two connectors on the power feeder cable. The BAT A feeder connector has a red (-48 V)/black (GND) wire pair and the BAT B connector contains a green (-48 V)/white (GND) wire pair, as follows:

<u>Designation</u>	<u>Wire Color</u>
BAT A (-48 V)	RED
GND	BLACK
BAT B (-48 V)	GREEN
GND	WHITE

**⇒ NOTE:**

A red (-48 V)/black (GND) wire pair may be substituted for the BAT B green/white pair.

Requirement:

- The voltage MUST be between -41.75 and -60.0 V DC.

- Reconnect the power feeder connector to power dangler connector.

**⇒ NOTE:**

If circuit packs are not going to be installed immediately, remove power from the shelf by removing BDFB fuses or placing breakers in the OFF position.

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# Circuit Pack Installation

# 4

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# Circuit Pack Installation

# 4

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## General

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### Description

This chapter provides instructions for circuit pack option setting and installation into the J98725DB-1, List 1 DDM-Plus Extension Shelf.

This chapter is only to be performed AFTER the shelf has been powered. Perform Chapter 3, *Powering and Verification*, if this has not been done.

The DDM-Plus Extension Shelf supports the 25A and 25F optical line interface units (OLIUs). Detailed information on the function of each of the OLIU circuit packs is contained in AT&T 306-206-150, *DDM-Plus User/Service Manual*.

The DDM-Plus Extension Shelf supports the AEK86 and AEK88 T1 repeater circuit packs. The AEK86 equalizes and regenerates T1 line signals which have experienced cable losses ranging between 0 and 35 dB at 0.772 MHz. In the receive direction, the T1 circuit pack provides secondary surge protection, automatic line buildout, and signal regeneration. In the transmit direction, the T1 circuit pack provides only secondary surge protection. The AEK88 performs the same functions as the AEK86 and is intended for short loop applications. Detailed information on the function of the AEK-type T1 repeater circuit packs is contained in AT&T 365-200-107.

The product codes for the DDM-Plus circuit packs are located in Table 4-1.

#### ⇒ NOTE:

If office alarms are connected (connector P06), it is advisable to disconnect them while performing testing to prevent spurious alarms from being reported. Reconnect the office alarms after completion of all testing.

### Tools, Test Sets, and Accessories

The following is required:

<u>Qty.</u>	<u>Description</u>	<u>Note</u>
1	Wrist strap	Use the ESD jack provided on the DDM-Plus Extension Shelf just below the fuse card.



**CAUTION:**

*To protect against damage due to electrostatic discharge, an ESD wrist strap must be worn when handling equipment.*

## Circuit Pack Option Settings

### Description

This procedure provides instructions for setting the circuit pack option settings. After the circuit packs have been optioned they may be placed in the shelf, but **NOT FULLY INSTALLED**.

**⇒ NOTE:**

Rules on equipping circuit pack positions in the shelf are contained in the "Circuit Pack Installation" procedure in the chapter.

### 25-Type OLIUs

1. The *ST*<sup>®</sup> connectors on the OLIU should **ALWAYS** be either connected to fiber, or covered by the protective covers that shipped on them.
2. The 25-type OLIU has option switches for setting the following:
  - DS1 line code
  - DS1 line buildout
  - DS1 LOS indication
  - BER threshold
  - OLIU output power.

**⇒ NOTE:**

If protection OLIUs are used, both OLIUs in the same group **MUST** be optioned identically.

**⇒ NOTE:**

Refer to Figure 4-2 for location of option switches and Tables 4-2, 4-3, 4-4, 4-5, and 4-6 for option switch settings.

**⇒ NOTE:**

Set the 25-type OLIU option switches per customer engineering records or requirements.



**NOTE:**

In the absence of engineering records, set the 25-type OLIU option settings for the following:

<u>Option</u>	<u>Recommended Setting</u>
DS1 Line Code	AMI
DS1 Line Buildout	Cable Length
LOS Indication	No Alarm
BER Threshold	$10^{-6}$
OLIU Output Power	Low

3. Set the DS1 line code for AMI or B8ZS for each DS1. This is done by positioning section 1 on switches S6, S7, S8, and S9, for DS1-1, DS1-2, DS1-3, and DS1-4, respectively. Refer to Table 4-2.
4. Set the DS1 line buildout for the distance to the DSX-1 for each DS1. This is done by positioning sections 2, 3, and 4 on switches S6, S7, S8, and S9, for DS1-1, DS1-2, DS1-3, and DS1-4, respectively. Refer to Table 4-3.
5. Set the DS1 loss of signal alarm for Minor Alarm or No Alarm for each DS1. This is done by positioning S10-1, S10-2, S10-3, and S10-4 for DS1-1, DS1-2, DS1-3, and DS1-4, respectively. Refer to Table 4-4.
6. Set the desired OLIU bit error rate threshold for OLIU protection switching. This is done by rotating the S12 dial to position the desired number at the hash mark. Refer to Table 4-5.
7. Set the OLIU output power for high or low power. This is done by positioning S13, which is located on the lower circuit board. Refer to Table 4-6.
8. Verify S11 is set to the ON position. Refer to Figure 4-2.
9. Place, but do not fully install, the OLIUs into the shelf.

### AEK Type T1 Repeaters

The AEK86 and AEK88 repeater circuit packs have no option settings.

Place, but do not fully install, the repeater circuit packs into the shelf.

## Circuit Pack Installation

Figure 4-1 shows a DDM-Plus Extension Shelf partially equipped.

 **WARNING:**  
*Invisible laser radiation when open. Avoid direct exposure to beam.*

 **NOTE:**  
Unterminated optical connectors may emit laser radiation. Do not view beam with optical instruments.

 **NOTE:**  
The DDM-PLUS shelf is divided into seven groups of four DS1s each. The group designations are labeled (A through G) above the circuit pack slots.

 **NOTE:**  
Each 25-type OLIU consists of two printed circuit boards (PCBs) and occupies two T1 repeater positions. The left PCB must be installed in an odd numbered slot.

 **NOTE:**  
Each of the seven groups can accommodate two OLIUs or four T1 repeater circuit packs. Both OLIU and T1 repeater circuit packs can be equipped in the same shelf, but **NOT** in the same group.

 **NOTE:**  
For mixed shelves it is recommended that OLIUs grow from left to right and AEK-type repeaters grow from right to left.

 **NOTE:**  
An OLIU must be connected by optical fiber cables to an OLIU of the same type (25A or 25F). However, both OLIUs in the same group can be of different types.

 **NOTE:**  
Observe all precautions when handling fiber optic cables. When fiber cables are not connected to equipment, the protective fiber covers should be in place.

## Procedure

---

1. Verify that OLIUs and T1 repeaters have not been placed in the same group in the shelf.
2. Verify that the optical fiber cables have been placed in a protective tube or channel.
3. Verify that the optical fiber cables are properly labeled indicating bay, shelf, OLIU (position) and direction (IN or OUT).
4. Examine the optical fiber cables to ensure that the fibers are clean.



**NOTE:**

The fiber can be cleaned with optical quality lint-free tissue or with a compressed air duster. For detailed cleaning instructions refer to the "Troubleshooting" chapter.

5. Connect the optical fiber cables to the OLIUs.



**CAUTION:**

*Do not bend the optical fiber cables sharply. Exceeding the bending radius of optical fiber cables may cause permanent damage.*



**NOTE:**

The optical fiber cables must be connected to the OLIUs before the OLIUs can be fully seated in the shelf.



**NOTE:**

The left *ST* connector on the OLIU is the receiver (IN). The right *ST* connector on the OLIU is the transmitter (OUT).

6. Route the optical fiber cables in the fiber tray to the proper side of the shelf.



**NOTE:**

Optical fibers associated with the left side of the shelf (positions 1 to 14) must be routed to the left side of the shelf. Optical fibers associated with the right side of the shelf (positions 15 to 28) must be routed to the right side of the shelf.

7. Fully insert all the OLIUs into the shelf.

**⇒ NOTE:**  
Installing circuit packs requires some force.

**⇒ NOTE:**  
When installing the circuit packs, be careful to insert them straight to avoid damaging the LEDs.

8. If one OLIU in a group has its DS1 LED(s) illuminated steady, verify that the options of both OLIUs in the same group agree.

**⇒ NOTE:**  
Ignore other circuit pack LED indications at this time.

**⇒ NOTE:**  
If protection is not used, two AEK39 BP1 apparatus blanks (presently used in DDM-1000) may be placed in the unused 25-type positions to avoid inadvertently inserting an AEK-type repeater which could cause service degradation.

9. Fully insert all the AEK-type repeaters into the shelf.

## **Final Operations**

---

### **Procedure**

---

1. Verify that all circuit packs are installed.
2. Verify that the optical fiber cables are connected.
3. Leave the office alarm cables disconnected at this time.

**Table 4-1. DDM-Plus Circuit Pack Codes (Note)**

---

<u>Product Code</u>	<u>Description</u>
25A OLIU	780-nm, 3.7 km span range on SM fiber; 3.0 km span range on MM fiber
25F OLIU	1300-nm, 23 km span range on SM fiber; 13.9 km span range on MM fiber
AEK86 RPTR	T1 repeater pack, max loop resistance of 2100 ohms, capable of powering 9 line repeaters and 50 kft of 22 AWG PIC cable
AEK88 RPTR	T1 repeater pack, max loop resistance of 300 ohms, capable of powering 1 line repeater over 9 kft of 22 AWG PIC cable
AEK39 BP1	Apparatus blank, used with unprotected OLIUs

---

**Note:**

For ordering information refer to the Equipment *Engineering and Ordering* chapter of AT&T 363-206-150, *DDM-Plus User/Service Manual*.

---

**Table 4-2. 25-Type DS1 Line Code Settings**

---

<u>Switch 6 (DS1-1), Switch 7 (DS1-2), Switch 8 (DS1-3) &amp; Switch 9 (DS1-4)</u>	
<u>Line Code</u>	<u>Section 1</u>
AMI	ON
B8ZS	OFF

---

**Table 4-3. 25-Type DS1 Line Buildout Settings (Note)**

<b>Switch 6 (DS1-1), Switch 7 (DS1-2), Switch 8 (DS1-3) &amp; Switch 9 (DS1-4)</b>				
<b>(26 Gauge) 1249028C Cable Length (ft)</b>	<b>(22 Gauge) 613C Cable Length (ft)</b>	<b>Section 2</b>	<b>Section 3</b>	<b>Section 4</b>
0 to 90	0 to 133	OFF	OFF	OFF
>90 to 180	>133 to 267	OFF	OFF	ON
>180 to 270	>267 to 400	OFF	ON	OFF
>270 to 360	>400 to 533	OFF	ON	ON
>360 to 450	>533 to 655	ON	OFF	OFF

**Note:**

Set the LBO setting based on the type of cable used and the cable length.

**Table 4-4. 25-Type DS1 LOS Settings**

<b>Switch 10</b>				
<b>DS1 LOS Alarm</b>	<b>Section 1 (DS1-1)</b>	<b>Section 2 (DS1-2)</b>	<b>Section 3 (DS1-3)</b>	<b>Section 4 (DS1-4)</b>
Minor	ON	ON	ON	ON
No Alarm	OFF	OFF	OFF	OFF

**Table 4-5. 25-Type BER Threshold Settings**

---

**Switch 12**

<u>Switch Position</u>	<u>BER Threshold</u>
1	Invalid setting
2	Invalid setting
3	Invalid setting
4	$10^{-4}$
5	$10^{-5}$
6	$10^{-6}$
7	$10^{-7}$
8	$10^{-8}$
9	$10^{-9}$
0	$10^{-10}$

---

**Table 4-6. 25-Type Output Power Settings**

---

**Switch 13**  
**(on right-hand PCB)**

<u>Output Power (Note)</u>	<u>Selection</u>
-3.3 to -7.4 dBm	HIGH (right position)
-7.4 to -9.6 dBm	LOW (left position)

---

**Note:**

As shown on the circuit pack figure, the output power switch is located on the lower PCB, when the faceplate latch is on the right. The low power position is with the switch to the left.

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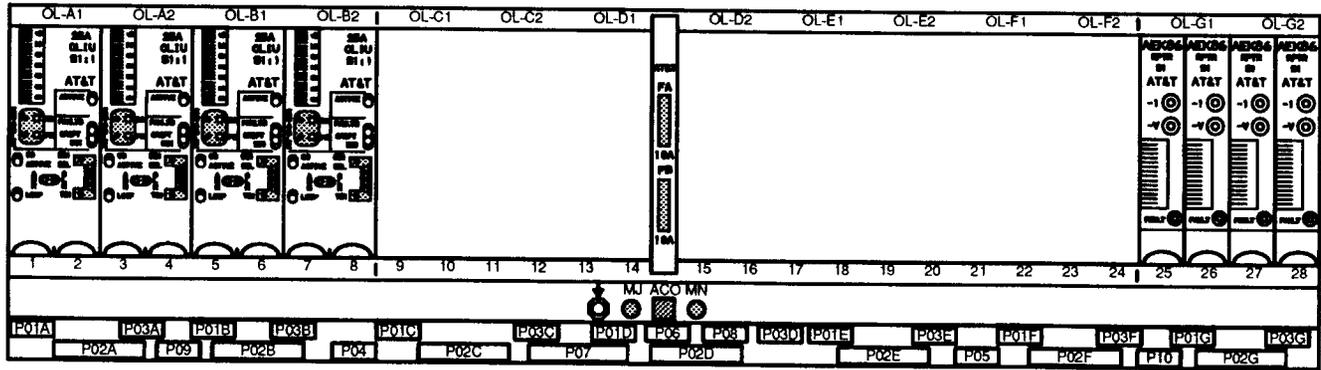


Figure 4-1. DDM-Plus Shelf with Circuit Packs

25-Type OLIU Option Notes:

1. The 25-type OLIU has option switches which must be properly set. Refer to the option switch settings on Tables 4-2 through 4-6.
2. All switches should be set per the customer's engineering records.

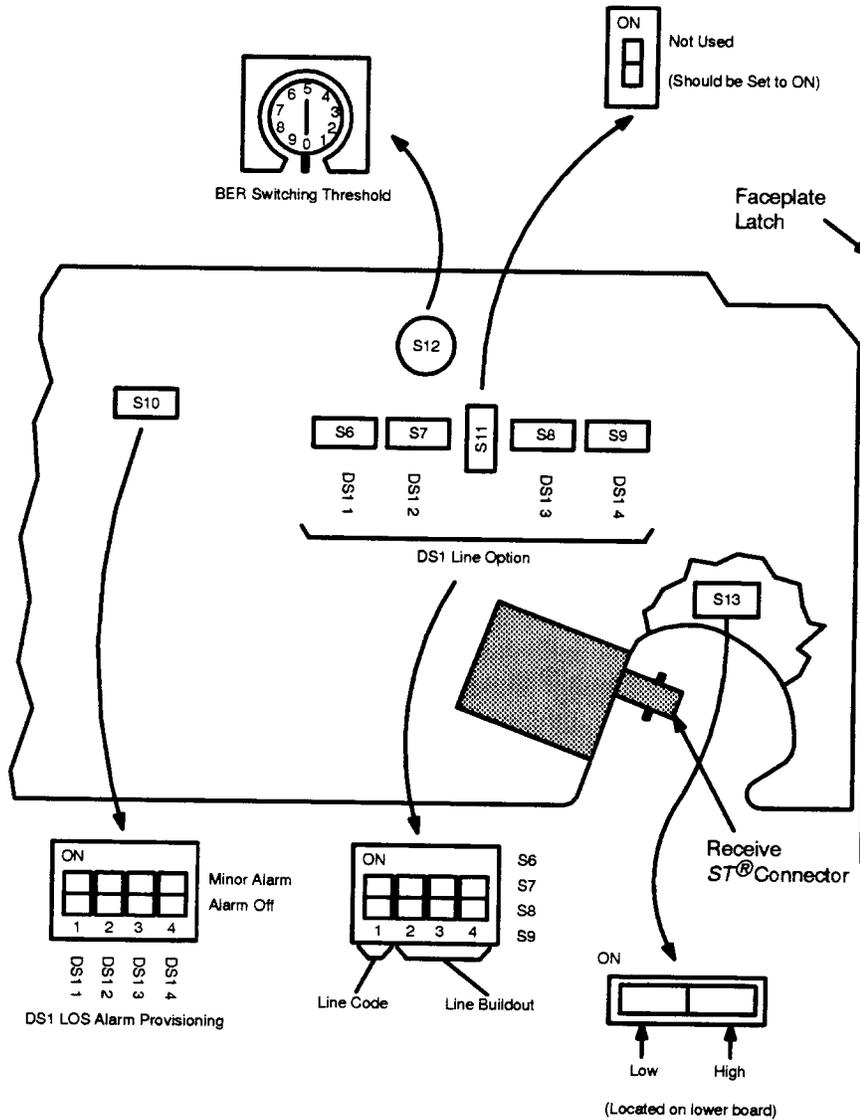


Figure 4-2. 25-Type OLIU Option Switches

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## Stand-Alone Installation Tests

# 5

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---

## Stand-Alone Installation Tests

# 5

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### General

---

#### Description

---

This chapter provides instructions on the stand-alone installation tests that should be performed at each end.

The stand-alone installation tests examine the shelf, circuit packs, local optical fiber cables, wiring to the equipment DSX-1, wiring to the line DSX-1 (if equipped), office alarms, parallel telemetry, and automatic protection switching.

This chapter is only intended to be used in central offices, since the cabinet wiring is tested at the factory. However, if instructed, this chapter can also be used to test DDM-Plus wiring in a cabinet.

The following installation tests are run only in an out-of-service mode of operation. Interruption of service will result if these tests are run on an operating in-service system.

If problems are encountered refer to Chapter 7, *Troubleshooting*. For detailed troubleshooting, refer to AT&T 363-206-150, *DDM-Plus User/Service Manual*.

**⇒ NOTE:**

Observe all precautions when handling fiber.

**⇒ NOTE:**

Prior to beginning the following installation tests, disconnect the office alarm cables from the shelf (connector P06), if this has not already been done, to prevent alarming in the office during tests.

### LED, Pushbutton, and Display Descriptions



**NOTE:**

The DDM-Plus alarms and LEDs have a delay of one second. This delay is not user-settable.



**NOTE:**

For detailed LED descriptions, refer to AT&T 363-206-150, *DDM-Plus User/Service Manual*.

The following LEDs/pushbutton are located on the DDM-Plus Extension Shelf as shown in Figure 5-1:

<u>LED/Pushbutton</u>	<u>Description</u>
ACO (Alarm Cut-Off)	Used to silence audible office alarms; lights if activated.
MJ (Major)	Indicates a service affecting failure.
MN (Minor)	Indicates a nonservice affecting failure.

The following LEDs are located on the 25-type optical line interface units (OLIUs) as shown in Figure 5-2:

<u>LED</u>	<u>Description</u>
ACTIVE	Indicates the pack is selected to carry service. One OLIU from each pair (if equipped for protection) should have its ACTIVE LED lighted.
CP/OPT FAULT	When blinking, it indicates an optical line failure; when continuously lighted, it indicates a circuit pack failure.
DS1 FAULT	When blinking, it indicates a loss of signal from the equipment DSX-1; when continuously lighted, it indicates inconsistent option settings between the OLIU pair or indicates a DS1 failure in turnup tests.
NE (Near End)	Indicates an alarm condition at the near end. Near end faults are displayed when the NE/Enable pushbutton is pressed.
FE (Far End)	Indicates an alarm condition at the far end. Far end faults are displayed when the FE/Enable pushbutton is pressed.
ABN (Abnormal)	Indicates an abnormal condition (that is turnup test in progress, loopback, lockout).
1→4 Indicators	Used with auto turnup tests to indicate the test in progress or a specific DS1 failure; also used to test or loopback a specific DS1.

The following pushbuttons are located on the 25-type OLIUs as shown in Figure 5-2:

<u>Pushbutton</u>	<u>Description</u>
ENABLE (NE)	Must be pressed in conjunction with GO ACTIVE, LOOP, or TST to initiate function at the Near End and prevent accidental operation.
ENABLE (FE)	Must be pressed in conjunction with GO ACTIVE, LOOP, or TST to initiate function at the Far End and prevent accidental operation.
GO ACTIVE	Must be pressed in conjunction with ENABLE (NE or FE). If pressed on the active pack, it performs a lock; if pressed on the standby pack, it performs a protection switch.
DS1 SEL	Used to show and update in-service DS1 ports, or select an individual DS1 to test or perform a loop.
LOOP	Must be pressed in conjunction with ENABLE (NE or FE). Used to perform a loopback on a selected DS1.
TST	Must be pressed in conjunction with ENABLE (NE or FE); used to perform a transmission test on a selected DS1; if no DS1 is selected, it is used to initiate the auto turnup tests.
CLR	Used to stop the auto turnup or DS1 tests, remove loop, or remove lock.

### Tools, Test Sets, and Accessories

The following are required:

<u>Qty.</u>	<u>Description</u>	<u>Usage</u>
1	Wrist strap	A wrist strap must be worn when handling circuit packs. Use the ESD jack provided on the front of the shelf.
2	Single mode optical fiber cables	These cables are required for looping back the OLIUs at the LGX <sup>®</sup> panel. The cables must be single mode fiber and must have the same connector as the LGX. If the OLIUs are going to be looped back directly on themselves, then fibers with ST connectors on each end are required. If multimode fiber is used, the OLIU will not be harmed, but it may not operate properly because of a detector overload. The recommended cable length is 2 feet.
4	DSX-1 loopback cables	These cables are required to perform the cross-connect test which verifies cabling to the equipment DSX-1.
1	DS1 Transmission Test Set	The DS1 Test Set is only required if the DDM-Plus Extension Shelf is equipped with AEK-type repeaters, and they are cabled to a DSX-1 or additional DS1 transmission tests on the OLIUs are desired.

## LED Test

---

### Description

---

This test procedure verifies proper operation of all the LEDs on the 25-type OLIU. Operation of all LEDs is necessary to assist in trouble isolation.

 **NOTE:**

If there are any LED failures, determine if the problem is with the OLIU or shelf and replace the faulty unit.

### Procedure

---

1. Simultaneously press and hold the NE/ENABLE and FE/ENABLE buttons on the OLIU.
2. Verify that all LEDs on the OLIU under test remain illuminated while the NE/ENABLE and FE/ENABLE buttons are pressed.
3. Repeat this procedure on each OLIU.

## Local Test

---

### Description

---

This test procedure verifies proper operation of the circuit pack positions, the OLIUs, and the cabling from the OLIUs to the LGX panel.

 **WARNING:**

*Invisible laser radiation when open. Avoid direct exposure to beam.*

 **NOTE:**

Unterminated optical connectors may emit laser radiation. DO NOT view beam with optical instruments.

 **NOTE:**

After completing this procedure, replace any failed units. If any OLIUs are replaced, repeat this procedure until it passes without failures.

**⇒ NOTE:**  
If the shelf is not fully equipped, move OLIUs around and repeat this procedure. Test all circuit pack positions.

**⇒ NOTE:**  
Perform this procedure on each OLIU pair. If protection OLIUs are not equipped, then ignore any reference to them.

**⇒ NOTE:**  
Refer to Figure 5-3 for test connections.

### **Procedure**

---

1. Loopback the OLIUs on themselves by placing fiber loopbacks at the *LGX* panel.
2. Verify that the ACTIVE LED is illuminated on one OLIU and extinguished on the other OLIU.
3. Verify that no other LEDs are illuminated on the OLIU pair.
4. Perform the following on the ACTIVE pack.

**⇒ NOTE:**  
This test will also work if initiated on the standby pack, but the LED on and off descriptions will be slightly different.

5. Initiate automatic turnup Test 1 by pressing and holding the NE/ENABLE button (on the ACTIVE pack) and then pressing the TST button once until the first DS1 LED is illuminated.
6. After 10 seconds, the test will begin and the ABN LED on both OLIUs will illuminate.

**⇒ NOTE:**  
If there are no failures, the DS1 SELECT LEDs will cycle on and off.

**⇒ NOTE:**  
If there are any failures, the NE and CP/OPT LEDs on the pack under test will illuminate and the DS1 LED(s) of the failed DS1(s) will illuminate. If the test fails, press CLR on the OLIU and isolate the problem.

7. If no failure is displayed after 10 seconds of testing, press CLR on the OLIU to end the test.



**NOTE:**

The OLIU is considered to have passed the test.



**NOTE:**

All LEDs on the pack under test will blink on and off twice.

8. After the LEDs on the OLIU under test have blinked twice, verify that the same OLIU remains ACTIVE.
9. Verify that no other LEDs are illuminated on the OLIU pair.
10. Perform a manual protection switch by holding the NE/ENABLE button and pressing GO ACTIVE on the standby pack.
11. Verify that the other OLIU becomes ACTIVE.
12. Verify that the ABN LED is illuminated on both OLIUs. (The ABN LED is illuminated because a protection switch lockout condition exists.)
13. Remove the protection switch lockout by pressing CLR on one of the OLIUs.
14. Verify that the ABN LEDs extinguish and that no alarm LEDs are illuminated on the OLIU pair.
15. Repeat this procedure on the OLIU which is now active.
16. Repeat this procedure on each OLIU pair.



**NOTE:**

If the shelf is not fully equipped, move OLIUs around and repeat this procedure. Test all circuit pack positions.

17. After completion of the Local Test, leave the OLIU loopbacks in-place at the LGX panel in preparation for the next test.

## **Cross-Connect Test**

---

### **Description**

---

This test procedure verifies proper wiring of the cabling from the DDM-Plus Extension Shelf to the equipment DSX-1.

**⇒ NOTE:**

After completing this procedure, replace any failed OLIUs and isolate and correct any incorrect wiring. If any OLIUs are replaced or cabling is corrected, repeat this test until it passes without failures.

**⇒ NOTE:**

If the shelf is not fully equipped, move OLIUs around and repeat this procedure. Test all circuit pack positions which have equipment DSX-1 cabling.

**⇒ NOTE:**

Perform this procedure on each OLIU pair. If protection OLIUs are not equipped, then ignore any reference to them.

**⇒ NOTE:**

This procedure is performed on two DS1s on an OLIU at a time. Testing only two DS1s at a time instead of four is a better test of channel turnover wiring errors.

**⇒ NOTE:**

Refer to Figure 5-3 for test connections.

## Procedure

---

1. Verify that both OLIUs are looped on themselves at the *LGX* panel.
2. Verify that the ACTIVE LED is illuminated on one OLIU and extinguished on the other OLIU.
3. Verify that no other LEDs are illuminated on the OLIU pair.
4. Place a loopback at the equipment DSX-1 on DS1s 1 and 3 associated with this pair.

 **NOTE:**  
Leave DS1s 2 and 4 open.

5. Perform the following on the ACTIVE pack.

 **NOTE:**  
This test will fail if initiated on the standby pack.

6. Initiate automatic turnup Test 2 by pressing and holding the NE/ENABLE button (on the ACTIVE pack) and then pressing the TST button twice until the first two DS1 LEDs are illuminated.
7. After 10 seconds, the test will begin and the ABN LED on both OLIUs will illuminate.

 **NOTE:**  
If there are no failures, the DS1 SELECT LEDs will cycle on and off.

 **NOTE:**  
If there are any failures, the NE and CP/OPT LEDs on the pack under test will illuminate and the DS1 LED(s) of the failed DS1(s) will illuminate.

8. Verify that the NE and CP/OPT LEDs and DS1 LEDs 2 and 4 are illuminated.

 **NOTE:**  
DS1s 2 and 4 failed because they were not looped-back. This also indicates that DS1s 1 and 3 passed.

9. Press CLR on the OLIU to end this test.
10. Place a loopback at the equipment DSX-1 on DS1s 2 and 4.

11. Remove the loopback from DS1s 1 and 3.
12. Perform a DS1 port equipage update on each OLIU by pressing and holding the NE/ENABLE button and then pressing the DS1 SELECT button.



**NOTE:**

This will stop the OLIU from alarming for a DS1 input which was removed.



**NOTE:**

DS1 LEDs 2 and 4 will illuminate when the NE/ENABLE and DS1 SELECT buttons are pressed because they are in-service (looped-back) ports.

13. Verify that the ACTIVE LED is illuminated on the same OLIU and extinguished on the other OLIU.
14. Verify that no other LEDs are illuminated on the OLIU pair.
15. Initiate automatic turnup Test 2 by pressing and holding the NE/ENABLE button (on the ACTIVE pack) and then pressing the TST button twice until the first two DS1 LEDs are illuminated.
16. After 10 seconds, the test will begin and the ABN LED on both OLIUs will illuminate.
17. After the test begins, verify the NE and CP/OPT LEDs and DS1 LEDs 1 and 3 are illuminated.



**NOTE:**

DS1s 1 and 3 failed because they were not looped-back. This also indicates that DS1s 2 and 4 passed.

18. Press CLR on the OLIU to end this test.
19. Place a loopback at the equipment DSX-1 on DS1s 1 and 3.



**NOTE:**

All four DS1s should be looped back.

20. Initiate automatic turnup Test 2 by pressing and holding the NE/ENABLE button (on the ACTIVE pack) and then pressing the TST button twice until the first two DS1 LEDs are illuminated.

21. After 10 seconds, the test will begin and the ABN LED on both OLIUs will illuminate.

**⇒ NOTE:**

If there are no failures, the DS1 SELECT LEDs will cycle on and off.

**⇒ NOTE:**

If there are any failures, the NE and CP/OPT LEDs on the pack under test will illuminate and the DS1 LED(s) of the failed DS1(s) will illuminate. If the test fails, press CLR on the OLIU and isolate the problem.

22. If no failure is displayed after 10 seconds of testing, press CLR on the OLIU to end the test.

**⇒ NOTE:**

The equipment DSX-1 cabling is considered to have passed the test.

**⇒ NOTE:**

All LEDs on the pack under test will blink on and off twice.

23. After the LEDs on the OLIU under test have blinked twice, verify that the same OLIU remains ACTIVE.
24. Verify that no other LEDs are illuminated on the OLIU pair.
25. Perform a manual protection switch by holding the NE/ENABLE button and pressing GO ACTIVE on the standby pack.
26. Verify that the other OLIU becomes ACTIVE.
27. Verify that the ABN LED is illuminated on both OLIUs. (The ABN LED is illuminated because a protection switch lockout condition exists.)
28. Remove the protection switch lockout by pressing CLR on one of the OLIUs.
29. Verify that the ABN LEDs extinguish and that no alarm LEDs are illuminated on the OLIU pair.
30. Repeat this procedure on the OLIU which is now active.

**⇒ NOTE:**

This procedure can be repeated on the second OLIU in a group with all four DS1s looped back, since all equipment DSX-1 cabling has been tested.

31. Repeat this procedure on each OLIU pair.

**⇒ NOTE:**

If the shelf is not fully equipped, move OLIUs around and repeat this procedure. Test all circuit pack positions with DSX-1 cabling.

32. After completion of the Cross-Connect Test, leave the OLIU loopbacks in-place at the *LGX* panel in preparation for the next test.
33. Remove all loopbacks at the DSX-1.
34. Perform a DS1 port equipage update on each OLIU by pressing and holding the NE/ENABLE button and then pressing the DS1 SELECT button.

**⇒ NOTE:**

This will stop the OLIU from alarming for a DS1 input which was removed.

## **Office Alarm and Automatic Protection Switching Test**

---

### **Description**

---

This test procedure verifies proper operation/wiring of the major and minor office alarms and automatic protection switching.

The DDM-Plus has four office alarms and they are major audible, major visual, minor audible, and minor visual. When a new alarm condition exists, both audible and visual alarms are activated. Audible alarms are silenced by pressing the ACO button on the DDM-Plus shelf. The ACO LED on the shelf will illuminate when the ACO has been activated and audible alarms are silenced.

**⇒ NOTE:**

The office alarms provide a closure between the alarm and alarm return leads when an alarm condition exists.

**⇒ NOTE:**

It is a requirement that alarms on the DDM-Plus do not affect and are not affected by other equipment via office alarm connections. During this test, examine the alarm state of other equipment connected to the same office alarms as the DDM-Plus after creating or clearing every alarm.

**⇒ NOTE:**

Prior to and after completing this test, verify that the DDM-Plus is clear, of all alarms. If alarms do not clear refer to Chapter 7, *Troubleshooting*.

**⇒ NOTE:**

Testing the Minor office alarm requires two OLIUs installed in the same group.

## Procedure

---

1. Verify that both OLIUs are looped on themselves at the *LGX* panel.
2. Verify that the ACTIVE LED is illuminated on one OLIU and extinguished on the other OLIU.
3. Verify that no other LEDs are illuminated on the OLIU pair.
4. Verify that no alarms are present on the shelf.

**⇒ NOTE:**

Remove circuit packs not under test (if necessary) to eliminate alarms.

5. Connect the office alarm cable to P06 on the front of the backplane (located below the shelf).

**⇒ NOTE:**

The cable must be attached so that the label on the cable connector is facing down.

6. Remove the loopback from the ACTIVE OLIU at the *LGX* panel.
7. Verify that the ACTIVE LED on the other OLIU illuminates.

**⇒ NOTE:**

This indicates that an automatic protection switch has occurred.

8. On the OLIU with the removed loopback, verify that the NE LED illuminates and the CP/OPT LED blinks.
9. Verify that the shelf MN (audible and visual) office alarms are generated.
10. Press the ACO button on the shelf.
11. Verify that the shelf ACO LED illuminates and that the shelf MN LED remains illuminated.

**⇒ NOTE:**

This indicates that the MN visual alarm is still activated and that the MN audible alarm has been silenced.

12. Remove the loopback at the *LGX* panel from the other OLIU (which is now active) in this OLIU pair.
13. Verify that the ACTIVE LED on this OLIU remains illuminated.
14. On both OLIUs verify that the NE LED illuminates and the CP/OPT LED blinks.

15. Verify that the shelf MJ (audible and visual) office alarms are generated.
16. Press the ACO button on the shelf.
17. Verify that the shelf ACO LED illuminates and that the shelf MJ LED remains illuminated.



**NOTE:**

This indicates that the MJ visual alarm is still activated and that the MJ audible alarm has been silenced.

18. Restore both loopbacks on the OLIUs at the *LGX* panel.
19. Verify that all alarms extinguish.
20. Verify that the ACTIVE LED is illuminated on one OLIU and extinguished on the other OLIU.
21. Verify that no other LEDs are illuminated on the OLIU pair.
22. If the office alarms are connected to an audible alarm system, then disconnect the office alarm cable from the DDM-Plus Extension Shelf (connector P06).



**NOTE:**

This is done to prevent alarming in the office during other tests.

23. Leave the OLIU loopbacks in-place at the *LGX* panel in preparation for the next test.

## Parallel Telemetry Test

### Description

This test verifies proper operation/wiring of the parallel telemetry which includes miscellaneous telemetry.

**⇒ NOTE:**

A miscellaneous discrete alarm condition is generated by providing a closure between the two corresponding miscellaneous input leads.

**⇒ NOTE:**

A parallel telemetry alarm condition is observed by a low voltage state on the corresponding alarm lead.

**⇒ NOTE:**

A parallel telemetry alarm condition can be measured with a voltmeter by measuring the voltage between the -48 V battery input and the alarm lead. With no alarm, there is an open circuit and 0 V will be measured. With an alarm condition, the alarm lead is at a low voltage state and approximately 48 V will be measured.

**⇒ NOTE:**

Prior to and after completing this test, verify that the DDM-Plus is clear of all alarms. If alarms do not clear, refer to Chapter 7, *Troubleshooting*.

**⇒ NOTE:**

Testing the Minor office alarm requires two OLIUs installed in the same group.

## Procedure

---

1. Verify that both OLIUs are looped on themselves at the *LGX* panel.



**NOTE:**

Place both OLIUs in group A (the group farthest left in the shelf) when performing this procedure for the first time.

2. Verify that the ACTIVE LED is illuminated on one OLIU and extinguished on the other OLIU.
3. Verify that no other LEDs are illuminated on the OLIU pair.
4. Verify that no alarms are present on the shelf.



**NOTE:**

Remove circuit packs not under test (if necessary) to eliminate alarms.

5. Remove the loopback from the ACTIVE OLIU at the *LGX* panel.
6. Verify that the ACTIVE LED on the other OLIU illuminates.



**NOTE:**

This indicates that an automatic protection switch has occurred.

7. On the OLIU with the removed loopback, verify that the NE LED illuminates and the CP/OPT LED blinks.
8. Verify that the shelf MN, NE, and correct Optical Extension ID parallel telemetry points are set.



**NOTE:**

If the OLIUs under test are located in positions OL-A1 and OL-A2 in the shelf, then Optical Extension ID A will be set.

9. Remove the loopback at the *LGX* panel from the other OLIU (which is now active) in this OLIU pair.
10. Verify that the ACTIVE LED on this OLIU remains illuminated.
11. On both OLIUs verify that the NE LED illuminates and the CP/OPT LED blinks.
12. Verify that the shelf MJ, NE, and correct Optical Extension ID parallel telemetry points are set.
13. Restore both loopbacks on the OLIUs at the *LGX* panel.

14. Verify that all alarms extinguish.
15. Verify that the ACTIVE LED is illuminated on one OLIU and extinguished on the other OLIU.
16. Verify that no other LEDs are illuminated on the OLIU pair.
17. Set the miscellaneous telemetry input point in OLIU group A by placing a closure between the two group A input leads RMTIA(A) and RMTIB(A).



**NOTE:**

The letter in the ( ) above indicates the OLIU Optical Extension ID.

18. Verify that the corresponding miscellaneous telemetry output point in OLIU group A is set by observing a low voltage state on the group A output lead RMTO(A).



**NOTE:**

The letter in the ( ) above indicates the OLIU Optical Extension ID.

19. Remove the closure between the two miscellaneous input leads and verify that the low voltage state is removed on the corresponding miscellaneous output lead.
20. Repeat this procedure on every OLIU group (A through G) to verify all the Optical Extension ID and miscellaneous telemetry wiring.

## **DS1 Transmission Test**

---

### **Description**

---

This test procedure verifies valid transmission, using a transmission test set, to and from the equipment DSX-1.

The procedure should be performed on all circuit pack positions equipped with T1 line wiring cabled to a DSX-1 or protection block. If the AEK-type repeaters cannot be looped back on themselves, then this procedure cannot be performed with them.

This procedure can also be performed with the OLIUs looped back on themselves to verify transmission through them using a test set. However, this test is not required on OLIUs since equipment DSX-1 cabling was tested in the Cross-Connect Test.

### **Procedure**

---

1. Configure a DS1 Transmission Test Set Transmitter for the following:
  - PRBS Pattern
  - DS1 Frame
  - BIT Errors Inject (Error Free)
2. Configure a DS1 Transmission Test Set Receiver for the following:
  - PRBS Pattern
  - DS1 Frame
  - BIT Errors Measurement (Total)



**NOTE:**

Refer to Figure 5-3 for test connections.

3. Verify that both OLIUs are looped on themselves at the *LGX* panel.
4. Verify that the ACTIVE LED is illuminated on one OLIU and extinguished on the other OLIU.
5. Verify that no other LEDs are illuminated on the OLIU pair.
6. Connect the DS1 Test Set Transmitter to the DS1 IN jack at the equipment DSX-1.
7. Connect the DS1 Test Set Receiver to the corresponding DS1 OUT jack at the equipment DSX-1.

8. If testing OLIUs, loopback the OLIUs on themselves by placing fiber loopbacks at the *LGX*.
9. If testing AEK-type repeaters, loopback the repeaters on themselves by placing loopbacks at the T1 line DSX-1 or protection block.
10. Verify that there are no ALARM LEDs illuminated on the circuit packs for the DSX-1 position under test.

**⇒ NOTE:**

If there are ALARM LEDs illuminated, determine if the problem is with the shelf or the circuit pack and replace the faulty unit.

11. Verify that error-free transmission is being received on the DS1 Test Set receiver.
12. If a signal is not detected on the DS1 Test Set Receiver [that is, loss of signal (LOS) is observed], isolate and correct the problem. Verify that:
  - The test set cables are connected to the correct cross-connect position.
  - DS1 cables are present and connected both the DDM-Plus and the DSX-1.
  - The AEK-type repeaters or OLIUs are looped back.
13. If a signal with errors is observed, isolate and correct the problem. Most problems can be cleared by the following:
  - Loss of Frame: Verify that both the test set transmitter and receiver are set for a framed format.
  - All 1's: This indicates AIS is being detected. The problem could be that the test cables are connected to the wrong terminals at the DSX-1.

14. If error-free transmission is observed, repeat for the next DS1 position.



**NOTE:**

Perform this on each DS1 position with DSX-1 cabling.



**NOTE:**

If a valid DS1 signal is applied on the equipment side to the DDM-Plus then removed, the DS1 FAULT LED and the corresponding DS1 SELECT LED on the OLIU will blink.



**NOTE:**

After removing a DS1 input, perform a DS1 port equipage update on each OLIU by pressing and holding the NE/ENABLE button and then pressing the DS1 SELECT button.

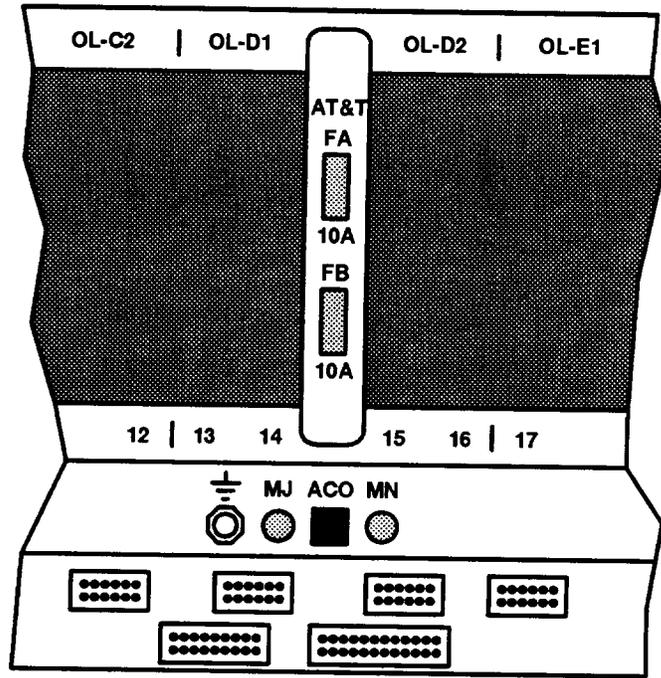
## **Final Operations**

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### **Procedure**

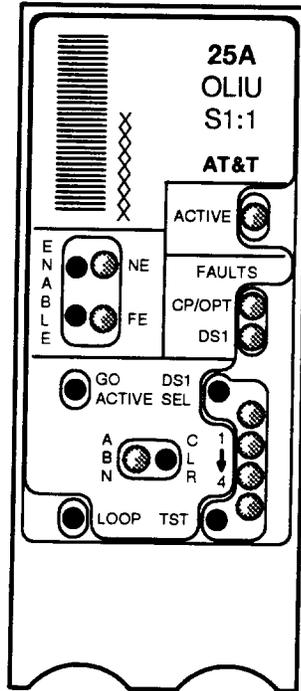
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- Remove all test signals and loopbacks at the DSX-1.
- Perform a DS1 port equipage update on each OLIU by pressing and holding the NE/ENABLE button and then pressing the DS1 SELECT button.
- Remove all loopbacks from the OLIUs at the LGX panel.
- Set the OLIU Output Power on each OLIU for its required setting (high or low power).
- Connect the optical fiber cables to their normal condition.



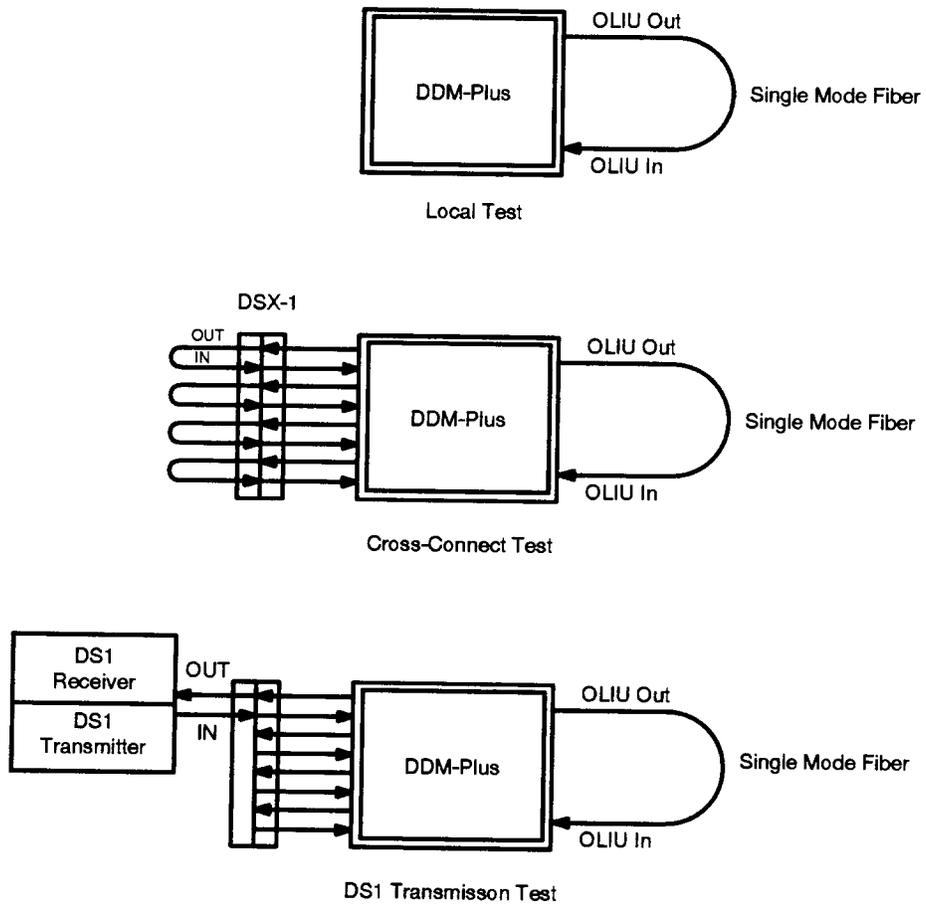
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Figure 5-1. DDM-Plus Fuse Card and Alarm Indications



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Figure 5-2. 25-Type OLIU Faceplate



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Figure 5-3. Installation Test Connections

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## End-to-End Installation Tests

# 6

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## End-to-End Installation Tests

# 6

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### General

#### Description

This chapter provides instructions to verify optical fiber connections, test automatic protection switching, test miscellaneous parallel telemetry, and end-to-end transmission.

This chapter should ONLY be performed after each end has been tested. For central offices Chapter 5, *Stand-Alone Installation Tests* MUST have been previously completed.

This chapter requires personnel at both ends of the system.

The following installation tests are run only in an out-of-service mode of operation. Interruption of service will result if these tests are run on an operating in-service system.

If problems are encountered, refer to Chapter 7, *Troubleshooting*. For detailed troubleshooting, refer to AT&T 363-206-150, *DDM-Plus User/Service Manual*.

Descriptions of LEDs and pushbuttons are located in Chapter 5, *Stand-Alone Installation Tests*.

#### **⇒ NOTE:**

Prior to beginning the following installation tests, disconnect the office alarm cables from the shelf (connector P06), if this has not already been done, to prevent alarming in the office during tests.

### Tools, Test Sets, and Accessories

The following are required:

<u>Qty.</u>	<u>Description</u>	<u>Usage</u>
1	Wrist strap	A wrist strap must be worn when handling circuit packs. Use the ESD jack provided on the front of the shelf.
2	DSX-1 cables	These cables and the DS1 test set are required to perform end-to-end DS1 transmission tests.
1	DS1 Transmission Test Set	These cables and the DS1 test set are required to perform end-to-end DS1 transmission tests.

## **Fiber Verification and Automatic Protection Switching Test**

---

### **Description**

---

This test procedure verifies that the optical fiber cables are properly connected and tests automatic protection switching.

 **WARNING:**  
*Invisible laser radiation when open. Avoid direct exposure to beam.*

 **NOTE:**  
Unterminated optical connectors may emit laser radiation. DO NOT view beam with optical instruments.

 **NOTE:**  
This procedure requires personnel at both the central office (CO) and remote terminal (RT) ends of the DDM-Plus system.

 **NOTE:**  
Observe all precautions when handling fiber.

 **NOTE:**  
If protection optical line interface units (OLIUs) are not equipped, then automatic protection switching is unavailable and cannot be tested. However, this procedure should still be performed to verify the optical fiber cable connections.

### **Procedure**

---

1. On each OLIU, verify that the output power option switch has been set per office records.

 **NOTE:**  
The low power position is with the switch to the left.

2. At each end, verify that all the transmission cables are set-up for normal end-to-end operation and that OLIUs are installed.

3. At each end, verify that the ACTIVE LED is illuminated on one OLIU and extinguished on the other OLIU.
4. At each end, verify that no alarms are present on the shelf.
5. At the CO, disconnect the transmit fiber from the ACTIVE OLIU at the LGX<sup>®</sup> panel.
6. Verify that the ACTIVE LEDs on the end-to-end pair under test extinguish and that the ACTIVE LEDs on the other end-to-end pair illuminate.



**NOTE:**

This indicates that an automatic protection switch occurred.

7. At the CO, verify that the proper OLIU (the one with the disconnected transmit fiber) illuminates its FE LED and blinks its CP/OPT LED.
8. At the RT, verify that the proper OLIU (the OLIU in the same position) illuminates its NE LED and blinks its CP/OPT LED.



**NOTE:**

This verifies that the transmit fiber, which has been disconnected, was connected properly to the correct OLIU at the far end.

9. At the CO, reconnect the optical fiber cable at the LGX panel.
10. At the CO, verify that the FE and CP/OPT LEDs extinguish.
11. At the RT, verify that the NE and CP/OPT LEDs extinguish.
12. Verify that the ACTIVE LEDs are illuminated on the end-to-end pair which did not have the fiber removed.
13. At each end, verify that no alarms are present on the shelf.
14. Repeat this procedure on the other OLIU end-to-end pair (that is, the pair which is now active.)
15. Repeat this procedure at the RT end.



**NOTE:**

This will verify that the transmit fibers in the other direction are connected properly.

## **End-to-End System Test**

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### **Description**

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This test procedure verifies valid transmission over the optical fiber cables between the DDM-Plus shelves.

Typically, the entire shelf will pass or fail this test indicating that the transmission path is good or bad. If a problem is isolated to the path, determine and correct the path problem and repeat the system test.

If the optical fiber path is trouble-free, but a problem still exists, isolate and correct the pack/shelf/cable problem. Repeat any of the installation tests as necessary.

**⇒ NOTE:**

This test is initiated at one end of the system and does not need to be repeated at the other end of the system.

### **Procedure**

---

1. At each end, verify that all the transmission cables are set-up for normal end-to-end operation and that OLIUs are installed.
2. At each end, verify that the ACTIVE LED is illuminated on one OLIU and extinguished on the other OLIU.
3. At each end, verify that no other LEDs are illuminated on the OLIU pair.
4. Perform the following on the ACTIVE pack.

**⇒ NOTE:**

This test will also work if initiated on the standby pack, but the LED on and off descriptions will be slightly different.

5. At the CO, initiate automatic turnup Test 3 by pressing and holding the NE/ENABLE button (on the ACTIVE OLIU) and then pressing the TST button three times until the first three DS1 LEDs are illuminated.
6. After 10 seconds, the test will begin and the ABN LED on all four OLIUs will be illuminated.

**⇒ NOTE:**

If there are no failures, the DS1 SELECT LEDs on the end-to-end pair will cycle on and off.

**⇒ NOTE:**

If there are any failures, the NE and CP/OPT LEDs on the pack under test will illuminate and the DS1 LED(s) of the failed DS1(s) will illuminate. If the test fails, press CLR and isolate the problem.

7. If no failure is displayed after 10 seconds of testing, press CLR on the OLIU to end the test.

**⇒ NOTE:**

The optical fiber cables are considered to have passed the test.

**⇒ NOTE:**

All LEDs on the pack under test will blink on and off twice.

8. After the LEDs on the OLIU under test have blinked twice, verify that the same OLIU remains ACTIVE.
9. Verify that no other LEDs are illuminated on the OLIU pair.
10. At the CO, perform a manual protection switch by holding the NE/ENABLE button and then pressing GO ACTIVE on the standby pack.
11. Verify that the other end-to-end pair becomes ACTIVE and that the pair that was active becomes standby.
12. Verify that the ABN LED is illuminated on all four OLIUs. (Because, a protection switch lockout condition exists.)
13. Remove the protection switch lockout by pressing CLR on one of the OLIUs.
14. Verify that the ABN LEDs extinguish and that no alarm LEDs are illuminated on the OLIU pair.
15. Repeat this procedure on the other OLIU end-to-end pair in this group which is now active.
16. Repeat this procedure on each OLIU group.

## **End-to-End DS1 Transmission Test**

### **Description**

This procedure verifies valid transmission, using a transmission test set, over the optical fiber cables between the DDM-Plus shelves or over the AEK-type repeaters.



**NOTE:**

Perform this procedure on all OLIUs and AEK-type repeaters installed.



**NOTE:**

This procedure is performed in the CO.

### **Procedure**

1. Configure a DS1 Transmission Test Set Transmitter for the following:
    - PRBS Pattern
    - DS1 Frame
    - BIT Errors Inject (Error Free)
  2. Configure a DS1 Transmission Test Set Receiver for the following:
    - PRBS Pattern
    - DS1 Frame
    - BIT Errors Measurement (Total)
-  **NOTE:**  
Refer to Figure 6-1 for test connections.
3. At each end, verify that all the transmission cables are set-up for normal end-to-end operation and that OLIUs are installed.
  4. At each end, verify that the ACTIVE LED is illuminated on one OLIU and extinguished on the other OLIU.
  5. At each end, verify that no other LEDs are illuminated on the OLIU pair.
  6. At the CO, connect the DS1 Test Set Transmitter to the DS1 IN jack at the equipment DSX-1.

7. At the CO, connect the DS1 Test Set Receiver to the corresponding DS1 OUT jack at the equipment DSX-1.
8. At the RT, place a loopback cable between the corresponding IN and OUT jacks at the equipment DSX-1.

**⇒ NOTE:**

An internal loopback can be placed at the RT instead. At the CO, press DS1 SELECT (until the desired DS1 is selected); press and hold FE/ENABLE; then press LOOP.

9. Verify that there are no ALARM LEDs illuminated on the circuit packs for the DSX-1 position under test.

**⇒ NOTE:**

If there are ALARM LEDs illuminated, determine if the problem is with the shelf or the circuit pack and replace the faulty unit.

10. Verify that error-free transmission is being received on the DS1 Test Set receiver.
11. If a signal is not detected on the DS1 Test Set Receiver [that is, loss of signal (LOS) is observed] isolate and correct the problem. Verify that:
  - The test set cables are connected to the correct cross-connect position.
  - DS1 cables are present and connected to both the DDM-Plus and DSX-1.
12. If a signal with errors is observed, isolate and correct the problem. Most problems can be cleared by the following:
  - Loss of Frame: Verify that both the test set transmitter and receiver are set for a framed format.
  - All 1's: This indicates AIS is being detected. The problem could be that the test cables are connected to the wrong terminals at the DSX-1 at the CO, or loopback cables are not in-place at the RT.
  - High BER: This may be caused by a DS1 line code mismatch between the end-to-end OLIU pairs.
13. If error-free transmission is observed, repeat for the next DS1 position.

**⇒ NOTE:**

Perform this procedure on all OLIUs and AEK-type repeaters installed.

**⇒ NOTE:**  
On OLIUs, if a valid DS1 signal is applied on the equipment side to the DDM-Plus then removed, the DS1 FAULT LED and the corresponding DS1 SELECT LED on the OLIU will blink.

**⇒ NOTE:**  
On OLIUs, after removing a DS1 input perform a DS1 port equipage update on the OLIU by pressing and holding the NE/ENABLE button and then pressing the DS1 SELECT button.

## **End-to-End Telemetry Test**

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### **Description**

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This test procedure verifies proper end-to-end operation/wiring of the miscellaneous parallel telemetry and tests the far end telemetry point.

**⇒ NOTE:**  
A miscellaneous discrete alarm condition is generated by providing a closure between the two corresponding miscellaneous input leads.

**⇒ NOTE:**  
A parallel telemetry alarm condition is observed by a low voltage state on the corresponding alarm lead.

**⇒ NOTE:**  
A parallel telemetry alarm condition can be measured with a voltmeter by measuring the voltage between the -48 V battery input and the alarm lead. With no alarm, there is an open circuit and 0 V will be measured. With an alarm condition, the alarm lead is at a low voltage state and approximately 48 V will be measured.

**⇒ NOTE:**  
Prior to and after completing this test, verify that the DDM-Plus is clear of all alarms. If alarms do not clear, refer to Chapter 7, *Troubleshooting*.

**⇒ NOTE:**  
Perform this procedure on each equipped OLIU group. Moving OLIUs around to test each position is not necessary.

## Procedure

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1. At each end, verify that all the transmission cables are set-up for normal end-to-end operation and that OLIUs are installed.
2. At each end, verify that the ACTIVE LED is illuminated on one OLIU and extinguished on the other OLIU.
3. At each end, verify that no other LEDs are illuminated on the OLIU pair.
4. At the RT, set the miscellaneous telemetry input point in the OLIU group under test by placing a closure between the two group input leads RMTIA( ) and RMTIB( ).



**NOTE:**

The letter in the ( ) about indicates OLIU Optical Extension ID.

5. At the CO, verify that the corresponding miscellaneous telemetry output point in the OLIU group under test is set by observing a low voltage state on the group output lead RMTRO( ).



**NOTE:**

The letter in the ( ) above indicates the OLIU Optical Extension ID.

6. Remove the closure between the two miscellaneous input leads and verify that the low voltage state is removed on the corresponding miscellaneous output lead.
7. Repeat this procedure on every optical group equipped with OLIUs to verify end-to-end operation of the miscellaneous telemetry.
8. At each end, verify that no alarms are present on the shelf.



**NOTE:**

Remove circuit packs not under test (if necessary) to eliminate alarms.

9. At the CO, disconnect the transmit optical fiber cable from the ACTIVE OLIU at the LGX panel.
10. At both ends, verify that the ACTIVE LED on the other OLIU illuminates.



**NOTE:**

This indicates that an automatic protection switch has occurred.

11. At the CO, on the OLIU with the removed transmit fiber, verify that the FE LED illuminates and the CP/OPT LED blinks.

12. Verify that the shelf FE parallel telemetry point is set.



**NOTE:**

The shelf MN and Optical Extension ID parallel telemetry points will also be set.

13. At the CO, reconnect the transmit optical fiber cable.
14. Verify that all alarms extinguish.
15. Verify that the ACTIVE LED is illuminated on one OLIU and extinguished on the other OLIU.
16. Verify that no other LEDs are illuminated on the OLIU pair.

## **Final Operations**

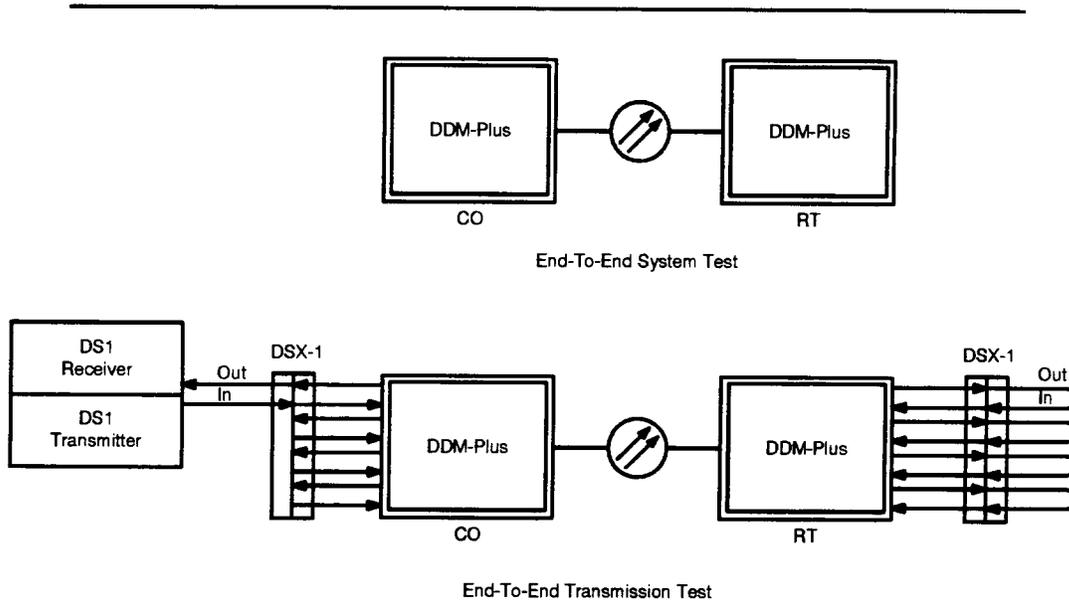
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### **Procedure**

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1. Remove all test signals and loopbacks at the DSX-1.
2. Perform a DS1 port equipage update on each OLIU by pressing and holding the NE/ENABLE button and then pressing the DS1 SELECT button.
3. Connect the office alarm cable (connector P06) if it has been disconnected.
4. Verify that all the cables are properly dressed in the bay frame cable duct.
5. Verify that designation where cables were wire-wrapped are properly labeled.
6. Verify that the cables are not touching any backplane pins and that no backplane pins are bent.
7. Verify that one OLIU is ACTIVE in each OLIU pair.
8. Verify that there are no FAULT LEDs lighted on any circuit packs. If there are FAULT LEDs lighted, determine if the problem is with the shelf or the circuit pack and replace the faulty unit.
9. Notify the customer that the installation has been completed.

⇒ **NOTE:**  
For the OLIUs, the DS1 loopbacks at the RT can be internal or external (cables).



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**Figure 6-1. Installation Test Connections**

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# Troubleshooting

# 7

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## General

### Description

This chapter covers some basic installation troubleshooting techniques and how to obtain technical support.

This chapter is intended for troubleshooting out-of-service systems only and should not be performed on in-service equipment. For detailed troubleshooting, refer to AT&T 363-206-150, *DDM-Plus User/Service Manual*.

**⇒ NOTE:**

For a description of the LEDs, refer to Chapter 5, *Stand-Alone Installation Tests*.

### For Normal Operation

1. Verify that the DSX-1 equipment cables are properly connected.
2. If T1 repeater circuit packs are going to be used, verify that the line interface cables are properly connected.
3. Verify that the associated equipment is operating properly and providing the DDM-Plus with valid DS1 signals.
4. Verify that there are no FAULT LEDs lighted on any circuit packs.

5. If the ABN LED is lighted on any circuit packs, press CLR.
6. Verify that one optical line interface unit (OLIU) is ACTIVE on each OLIU group.

### Diagnostic Codes for OLIUs

If the DDM-Plus is not operating as described in *For Normal Operation*, use the following to isolate and correct the problem.

- A steady CP/OPT FAULT LED on both OLIUs in the pair may indicate inconsistent option settings. Check the options on all four OLIUs (two at each end) associated with the OLIU group in alarm.
- If the option settings are consistent between all four OLIUs in the same group, then a steady CP/OPT FAULT LED indicates a circuit pack failure. Replace the failed circuit pack.
- A blinking CP/OPT FAULT LED indicates a loss of signal on the optical fiber. Check the condition of the fiber and the OLIU circuit pack at the far end.

#### NOTE:

Dirty optical fiber cables can cause high BER or loss of signal. Whenever optical fiber cables are removed they should be cleaned before replacement. Refer to the fiber cleaning instructions in this chapter.

- A steady DS1 FAULT LED indicates a specific DS1 failure during turnup tests. Also, a steady DS1 FAULT LED may indicate that option switches on OLIUs in the same group are set differently. Isolate the failure to a circuit pack or cable and replace the faulty component.
- A blinking DS1 FAULT LED indicates a loss of DS1 from the adjacent equipment. The corresponding LED of the failed DS1 should also light. Determine if the problem is caused by the adjacent equipment or the cable in between. Isolate the problem and correct.
- Exactly one OLIU in each pair should be ACTIVE. If this is not the case, press CLR on both of the OLIUs. If this does not clear the problem, try reseating one (or both) of the OLIUs.

### Diagnostic Code for T1 Repeaters

A steady FAULT LED indicates an open circuit through the repeater pack.

## Fiber Cleaning Instructions

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**WARNING:**

*Open optical connectors may emit invisible laser radiation. Do not view beam with optical instruments. Avoid direct exposure to the beam.*



**NOTE:**

Always clean all *ST*<sup>®</sup> connectors and couplings before doing initial connections or reconnections per the following instructions.



**NOTE:**

Disconnect and clean only one set of connectors at a time when cleaning internal OLIU connectors.

On the OLIU, disconnect one of the *ST* connectors.

1. Clean the end and sides of the connector tips with a lint-free, optical quality tissue dampened with isopropyl alcohol.
2. Carefully wipe the connector end again with a clean dry lint-free, optical quality tissue.
3. Blow any lint or dust from the connector using a canned air duster 3 inches from the face of the connector.
4. Blow any lint or dust from inside the coupling using a canned air duster 3 inches from the coupling.
5. Install the *ST* connectors onto the coupling by aligning the mark on the rim of the connector body with the slot in the coupling. Push the connector onto the coupling with a clockwise twist-locking motion.

## **Technical Support**

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### **Description**

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AT&T is committed to providing total product coverage 24 hours a day, troubleshooting installation or service problems over the phone and if necessary on-site.

Regional Training Assistance Center (RTAC) organizations are established to provide the customer with a single point of contact supporting all of the AT&T transmission and switching products. Each RTAC supports a specific territory and they are located in the following areas:

Newark, NJ  
Cockeysville, MD  
Atlanta, GA  
Rolling Meadows, IL  
Ballwin, MO  
Denver, CO  
Sunnyvale, CA

For RTAC support, dial 1-800-225-7822 which will direct the call to the RTAC center supporting your location.

— NOTICE —  
FOR FIELD SUPPORT  
DIAL 1-800-225-7822.

The RTACs are supported by a centralized Technical Support Organization (TSO) for transmission products. The TSO maintains a close relationship with Bell Laboratories and other AT&T organizations to expedite resolutions and maintain contact with the development community. This association provides continuous accessibility to every phase of the product life cycle and assures a prompt resolution to all inquiries.

## **COACH Description**

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### **Description**

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The DDM-Plus is fully supported by customized on-line aid for customer help (COACH).

COACH is a system of on-line support tools which provide product news and bulletins, diagnostic services, compatibility information, and on-line documents.

The COACH tools reside on a dedicated time-share computer accessible over toll free lines and are available 24 hours a day, 7 days a week.

The following COACH tools are available:

Diagnostic Dictionary

Contains previously encountered problems and their solutions.

News and Bulletins

Immediately after a user logs into COACH, the news and bulletins tool displays bulletins containing urgent information related to the product. Users are informed about the presence of news items, which are less urgent, and can be read at their leisure.

Compatibility Data

This tool lists solutions to hardware/firmware configuration problems in the form of product changes which are available.

Ordering Guides

This tool contains the current issue of the DDM-Plus Equipment Engineering and Ordering Guide, which is also provided in AT&T 363-206-150, *DDM-Plus User/Service Manual*.

COACH User's Guide

This is an on-line version of how to use COACH.

For information on obtaining a COACH login contact:

COACH Software Development  
Department NBMV003120  
AT&T  
1600 Osgood St.  
North Andover, MA. 01845

OR

FAX to: 508-960-1772

## **Required Product Changes**

### **Description**

During the life of a product, changes in the field may be required to correct an existing or potential problem.

Product changes are issued in the form of Product Change Notifications (PCNs).

The customer is notified about PCNs through the Design Change Management System (DCMS) which is an on-line tool similar to COACH.

For more information regarding DCMS contact:

Terry Davis (314) 891-4213 or  
Bob Gniadek (314) 891-3660