

Lucent Technologies
Bell Labs Innovations



DDM-Plus
User/Service Manual

363-206-150
Reprinted
Issue 3
June 1996

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Document No.: 363-206-150

Issue 3

Date: June 1993

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- Improve the table of contents
- Improve the organization
- Include more figures
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- Add more detail
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About This Document

Purpose

This DDM-Plus user/service manual provides the following:

- System description
- Examples of applications
- Physical design
- Detailed functional description
- User interface description
- Maintenance description
- Powering information
- Technical specifications
- Operation and maintenance (O&M) task oriented practice (TOP) supporting acceptance, turnup, and maintenance.

Intended Audiences

This user/service manual is provided for end-users responsible for ordering, engineering, operating, and maintaining the DDM-Plus. It may be used by anyone desiring specific information about the DDM-Plus and its operation and maintenance.

Reason for Reissue

This document is reissued for the following reasons.

- Modify the span length for the 25A OLIU
- Modify the general optical specifications and link budgets tables for the 25A and 25F OLIU.
- Add DDM-Plus Wall Distant Terminal ED-8C730-33
- Delete DDM-Plus Wall Distant Terminal ED-8C730-30
- Add additional information on the AEK90 T1 Office Repeater

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 safety labels in the form of **DANGERS**, **WARNINGS**, and **CAUTIONS** which must be followed at all times.

Other important safety instructions that you should read are in the *Operation and Maintenance* chapter of this manual. Only trained personnel should perform the procedures of that chapter.

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



Figure 1. Safety 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. For information on proper ventilation requirements, consult AT&T 363-206-151, *DDM-Plus Installation Manual*.
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 and AT&T 363-206-151, *DDM-Plus Installation Manual*.
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 140 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 listed in this manual in the DDM-Plus.

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. The telecommunication lines that connect to off-premises wiring must be used only with a protected wiring system containing AT&T 4B1E-W protectors. All other metallic interfaces should not leave the building premises unless connected to telecommunication devices providing primary and secondary protection.
4. Suitable for mounting on concrete or other noncombustible surfaces only. For information on proper mounting instructions, consult AT&T 363-206-151, *DDM-Plus Installation Manual*.
5. Risk of electric shock. Voltages up to 140 V DC may be present on telecommunication circuits.
6. Never install telecommunications wiring during a lightning storm.
7. Never install telecommunications jacks in wet locations.
8. Never touch uninsulated telecommunications wires or terminals unless the telecommunications line has been disconnected at the DS1 interface.
9. Use caution when installing or modifying telecommunications lines.
10. Follow instructions in AT&T 363-206-157, *DDM-Plus Wall Distant Terminal Installation Manual*, for wall mount applications of the Wall Distant Terminal.

SAVE THESE INSTRUCTIONS

Safety Labels

Safety labels 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 on the left circuit board of the optical line interface unit (OLIU) (Figure 2) and to the shelf assembly (Figure 3):

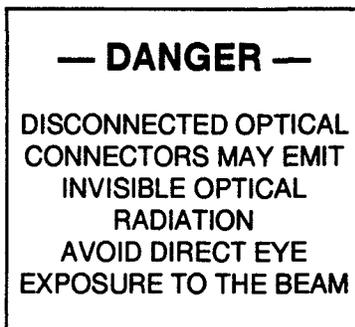


Figure 2. OLIU's Laser Danger Label

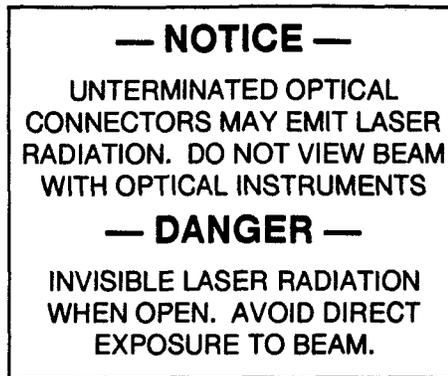


Figure 3. Shelf's Laser Danger Label

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 shelf assembly.

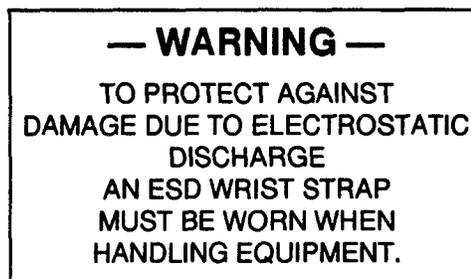


Figure 4. ESD Warning Label

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

- Assume all circuit packs contain solid-state electronic components that can be damaged by ESD.
- 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.
- 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.
- Observe warning labels on bags and cartons. Whenever possible, do not remove circuit packs from antistatic packaging until ready to insert them into slots.
- If possible, open all circuit packs at a static-safe work position, using properly grounded wrist straps and static-dissipating table mats.
- Always store and transport circuit packs in static-safe packaging. Shielding is not required unless specified.
- 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.
- Whenever possible, maintain relative humidity above 20 percent.

To reduce the possibility of ESD damage, grounding jacks are equipped to enable personnel to ground themselves using wrist straps (see Figure 5) while handling circuit packs or working on an assembly(s). The grounding jacks for connection of wrist straps are labeled and are located on the lower center of the DDM-Plus Extension Shelf and on the rear lower right corner of the DDM-Plus Wall Distant Terminal. When grounding jacks are not provided, an alligator clip adapter enables connection to bay frame ground.

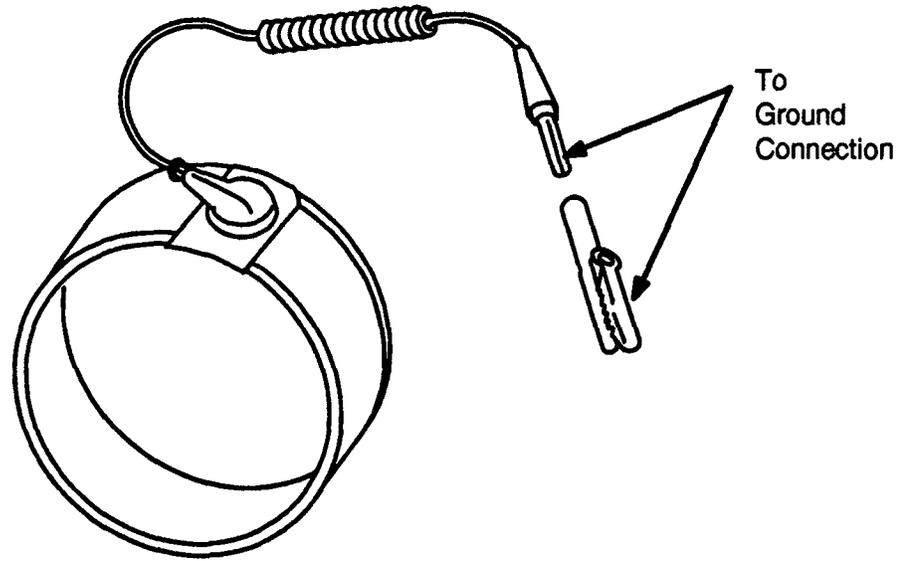


Figure 5. Static Control Wrist Strap

Customer Assistance and Technical Support

AT&T will provide customer assistance on DDM-Plus including, but not limited to, troubleshooting assistance, technical consultation, operational problem consultation, procedural advice, and emergency recovery assistance from a qualified system support professional from the Regional Technical Assistance Center (RTAC).

Service is provided from the RTAC at 1-800-225-RTAC. This telephone number is monitored 24 hours a day, 7 days a week. During regular business hours your call will be answered by your local regional RTAC. Outside of normal business hours all calls will be answered at a centralized technical assistance center where service-affecting problems will be dispatched immediately to your local RTAC. All other problems will be referred to your local RTAC on the next regular business day.

Related Documentation

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

- AT&T 363-205-000 — **SLC® Series 5 Carrier System Ordering Guide — Loop Transmission Systems**
- AT&T 363-205-010 — **SLC® Series 5 Carrier System Applications and Planning Guide**
- AT&T 363-205-100 — **SLC® Series 5 Carrier System General Description**
- AT&T 363-205-401 — **SLC® Series 5 Carrier Remote Terminal Acceptance and Turnup Procedure (TOP)**
- AT&T 363-205-406 — **SLC® Series 5 Carrier System End-to-End Tests**
- AT&T 363-205-500 — **SLC® Series 5 Carrier System — Maintenance and Troubleclearing (TOP)**
- AT&T 363-206-151 — **DDM-Plus Installation Manual**
- AT&T 363-206-152 — **DDM-Plus Quick Reference Guide (Comes with this manual.)**
- AT&T 363-206-153 — **DDM-Plus Software Release Description**
- AT&T 363-206-154 — **DDM-Plus Wall Distant Terminal Installation Manual**
- AT&T 363-206-156 — **DDM-Plus Equipment Engineering and Ordering Guide**
- AT&T 363-206-157 — **DDM-Plus Wall Distant Terminal Installation Manual (New Wall DT model)**

- AT&T 363-206-200 — *DDM-2000 Multiplexer Application, Planning, and Ordering Guide*
- AT&T 365-200-004 — *T1 Carrier System, AEK88 Repeater*
- AT&T 365-200-005 — *T1 Carrier System, AEK90 Repeater*
- AT&T 365-200-006 — *T1 Carrier System, AEK86B Repeater*
- 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 626-500-105 — *80-Type Cabinets Coding Scheme, Ordering Information and Lettering Guidelines*
- AT&T 626-500-115 — *90-Type Cabinets Coding Scheme, Ordering Information and Lettering Guidelines*
- AT&T 626-500-128 — *51A Cabinets Description, Installation, and Splicing Series 5 with DDM-Plus DT*
- AT&T 631-600-243 — *80E-BP Remote Terminal Cabinet General Description and Ordering Information*
- AT&T 631-600-247 — *80A (Bulk Power) Remote Terminal Cabinet General Description*
- AT&T 631-600-249 — *80D-BP (Bulk Power) Cabinet General Description and Ordering Information*
- AT&T 631-600-250 — *80D ED-7C716-30 Cabinet*
- AT&T 640-250-239 — *51A Cabinet with DDM-2000 and DDM-Plus Splicing and Equipment Installation*
- AT&T 640-250-257 — *80E-BP (Bulk Power) Cabinet (Group 90) Splicing and Equipment Installation*
- AT&T 640-250-263 — *80E (Bulk Power) Group 89 Splicing*
- AT&T 640-250-265 — *80D-BP (Bulk Power) Description, Installation, Splicing DDM-2000 OC-12*
- AT&T 640-250-271 — *90A Cabinet Business Remote Terminal (BRT) Equipped with DDM-2000 and DDM-Plus Description, Installation, and Splicing SLC® Series 5 Carrier System*
- AT&T 640-250-272 — *90A Cabinet Business Remote Terminal (BRT) UL Listed Remote Terminal Installation and Safety Notes*
- AT&T 640-250-276 — *80A (Bulk Power) Cabinet (Groups 13, 14, and 89) Splicing and Equipment Installation*

- AT&T 640-250-277 — *80A (Bulk Power) Cabinet (Groups 90 and 91) Splicing and Equipment Installation*
- AT&T 640-250-279 — *80D-BP (Bulk Power) Cabinet Group 90 Splicing and Equipment Installation*
- AT&T 640-250-281 — *90B Cabinet Description, Installation, Splicing Equipped with DDM-2000 and DDM-Plus*
- AT&T 640-250-293 — *80A OC - 12 Splicing*
- AT&T 640-250-295 — *80D (Bulk Power) G89 Splicing*
- AT&T 640-250-298 — *80D (Bulk Power) OC - 12 Splicing*
- 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® Series 5 Carrier System Applications Engineering**
- FPD 801-525-169 — *DDM-Plus System — Floor Plan Data Sheets*

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

- | | |
|-------------|---|
| J98725DB | DDM-Plus Extension Shelf Assembly |
| ED-8C730-10 | Typical Bay Arrangement |
| 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 |
| ED-8C730-33 | Shelf Assembly Wall DT (New Wall DT model) |
| ED-8C732-20 | Cable Assemblies for DDM-Plus J98725, L3 Extension Shelf (Cabinet Arrangements) |
| SD-7C514-01 | Application Schematic, Wall DT |
| SD-7C515-01 | Application Schematic, Cabinet DT |
| SD-7C559-01 | DDM-Plus Extension Shelf Application Schematic |

Related drawings:

- | | |
|-------------|---|
| ED-8C500-50 | Network Bay Frame |
| ED-8C501-50 | Network Bay Frame |
| T-82046-30 | Power Systems DC Distribution Circuit for Digital Transmission System |

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System Overview

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DDM-Plus System Overview

1-1

DDM-Plus System Overview

The DDM-Plus is an optical and electrical transport system that transports DS1s between two locations. The DDM-Plus transports up to four DS1s per pair of optical fiber and can provide T1 extension over existing copper wires. Figure 1-1 shows a DDM-Plus providing optical transport for four DS1s. In each direction, the system multiplexes four DS1s into a DS2 electrical signal and encodes the DS2 electrical signal to an optical signal for transport over fiber to a connecting DDM-Plus. The connecting DDM-Plus converts the optical signal to a DS2 electrical signal, then decodes and demultiplexes the DS2 signal to four DS1s.

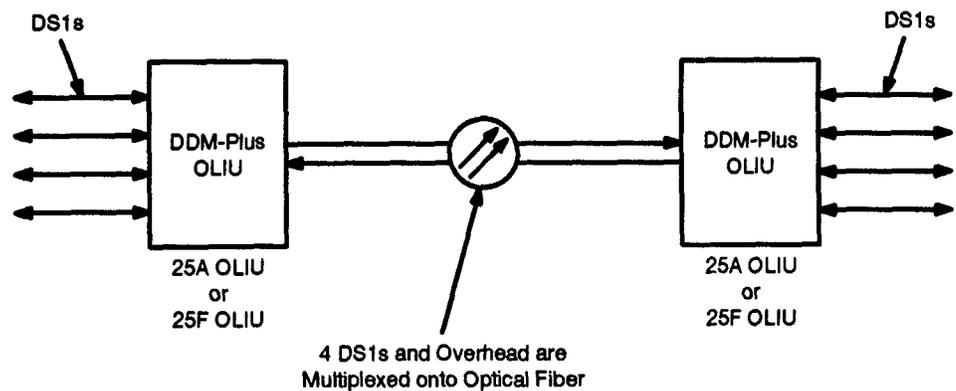


Figure 1-1. DDM-Plus — Simplified Optical Application

The optical transmission signal contains overhead bandwidth capacity for end-to-end communications between the far- and near-end DDM-Plus without using inband DS1 information.

The DDM-Plus provides T1 extension when equipped with AT&T AEK-type T1 repeaters. The AEK-type T1 repeaters were previously deployed with the AT&T DS1 Extension Shelf. Both the DDM-Plus optical line interface unit (OLIU) and the AEK-type T1 repeaters can be equipped in the DDM-Plus housing because each slot can be equipped with either circuit pack, but they cannot be mixed within the same group of 4 DS1s.

Figure 1-2 shows that the DDM-Plus OLIU circuit pack consists of two printed wiring boards and a faceplate. The printed wiring boards are connected together both mechanically and electrically. They provide the physical mounting space and the electrical interconnection for the DDM-Plus OLIU electronic components. The faceplate is hinged at the top front corner of both printed wiring boards and acts as a latch for insertion and removal of the circuit pack. The faceplate pushbuttons and indicators provide the user interface for the DDM-Plus OLIU circuit pack.

Connectors on the back of the printed wiring boards engage the multilayer backplane through edge connectors. The backplane wiring supplies the DDM-Plus with redundant power buses, connections for DS1s, alarms, and 1+1 protection.

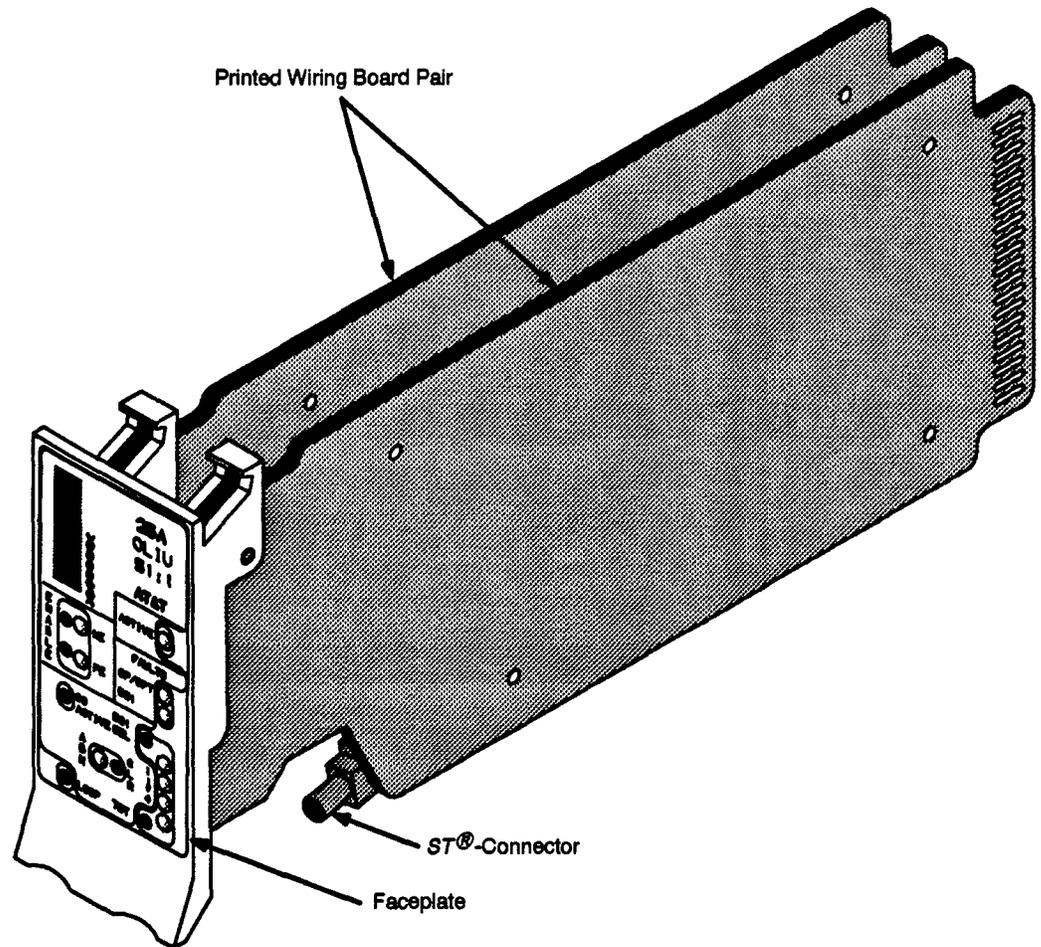


Figure 1-2. DDM-Plus OLIU Circuit Pack 25A or 25F

The DDM-Plus can be equipped with any of the following circuit packs.

25A OLIU -

The DDM-Plus 25A OLIU uses a 780 nm laser with system gain to support operation over a 10.1 kft (3.1 km) span for single-mode fiber and 7.2 kft (2.2 km) for multimode fiber.



NOTE:

The fiber loss will determine the spans of the OLIU. Refer to the link budget table in Chapter 8, *Technical Specifications* for detailed information on the 25A OLIU link budget parameters.

25F OLIU -

The DDM-Plus 25F OLIU uses a 1300 nm laser with system gain to support operation over a 75.5 kft (23 km) span for single-mode fiber and 47.56 kft (14.5 km) for multimode fiber.



NOTE:

The fiber loss will determine the spans of the OLIU. Refer to the link budget table in Chapter 8, *Technical Specifications* for detailed information on the 25F OLIU link budget parameters.

AEK86B -The AEK86B is capable of powering a span of 8 line repeaters and 50 kft of 22 AWG PIC cable.

AEK88 - The AEK88 is capable of powering a span of one line repeater up to 9 kft of 22 AWG PIC cable. The unit may either be office powered with -48 v nominal office battery or line powered with 60 mA line current.

AEK90 - The AEK90 is capable of powering a span of 8 line repeaters and 50 kft of 22 awg PIC cable. The unit also provides a selectable five-range cable equalizer for DS1 signals to DSX equipment.

The DDM-Plus OLIU supports a variety of operations, administrative, maintenance, and provisioning functions including failure detection, alarming, automatic and manual protection switching, loopback/testing of individual DS1s, and provisioning of DS1 line characteristics. The OLIU also supports the automatic turn-up installation test, thus eliminating the need for external test equipment. These functions are initiated and monitored through pushbuttons and indicators on the OLIU faceplate (Figure 1-3). Many of these pushbuttons and indicators affect or report conditions at both the near- and far-end DDM-Plus. Remote capabilities that can be performed from the near-end DDM-Plus include far-end loopbacks, monitoring of far-end alarms, far-end test failures, and far-end DS1 line characteristics.

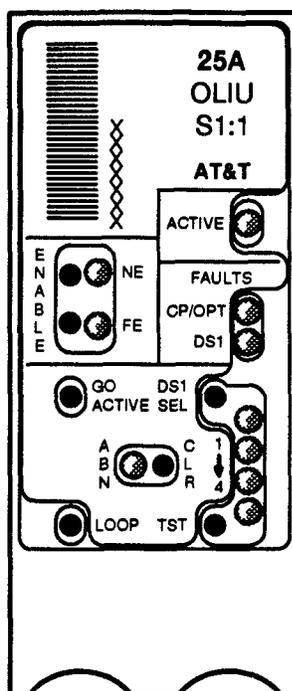


Figure 1-3. DDM-Plus OLIU Circuit Pack Faceplate

The DDM-Plus System can operate in controlled or uncontrolled environments. Refer to Chapter 8, *Technical Specifications*, for information on environmental data. The DDM-Plus can be deployed in the following areas:

- Central offices (COs)
- Controlled environment vaults (CEVs)
- Outside cabinets — 80A, 80D, 80E, and 51A
- Indoor cabinets — 90A, 90B, wall, and desk distant terminal (DT)

At each location, there are one or more DDM-Plus circuit packs (OLIUs or AEK-type T1 repeaters) and a housing into which the circuit packs are placed. The DDM-Plus includes three housings.

DDM-Plus Extension Shelf

The Extension Shelf is a 23-inch miscellaneous mounted shelf that provides a capacity of up to 28 DS1s. These 28 DS1s can be transported on fiber either protected or unprotected, by using OLIUs or copper using AEK-type T1 repeaters. The OLIU and AEK-type circuit packs can be mixed in the Extension Shelf. For detailed information on the Extension Shelf and its circuit pack configurations, refer to Chapter 3, *Physical Design*.

DDM-Plus Wall Distant Terminal (DT)

The DDM-Plus Wall DT provides one DDM-Plus System either protected or unprotected supporting up to four DS1s. The Wall DT is small, attractive, and can be mounted on a wall or placed on a desk. It also provides a storage area for fiber jumpers. A 120 V AC to -48 V DC power converter is available to provide the capability of 120 V AC operation needed in many business locations. For detailed information on the Wall DT, refer to Chapter 3, *Physical Design*.

DDM-Plus Cabinet Distant Terminal (DT)

The DDM-Plus Cabinet DT is a 23-inch miscellaneous mounted shelf that provides a capacity of up to 12 DS1s that can be transported on fiber, either protected or unprotected, using OLIUs or on copper using AEK-type T1 repeaters. The OLIU and AEK-type circuit packs can be mixed in the Cabinet DT. The OLIU and AEK-type circuit packs can be mixed in the Cabinet DT. For detailed information on the Cabinet DT and its circuit pack configurations, refer to Chapter 3, *Physical Design*.

The Cabinet DT provides a fiber jumper storage area and uses the 100A2 LIU to provide an area for outside plant fiber termination, fiber splicing, and fiber cross-connection. The Cabinet DT is extremely useful in smaller cabinets such as the 51A cabinet.

For all housings, DS1s connect to the housing through connectorized backplane cables and interface to the circuit pack using the housing backplane. Fiber connects directly to the circuit packs using *ST*[®] connectors located just behind the OLIU faceplate.

The DDM-Plus System in its optical configuration can be deployed either fully protected or unprotected. An unprotected system is configured by installing one OLIU at each location and connecting these two circuit packs with two optical fibers (Figure 1-4). A 1+1 protection DDM-Plus System protects both electronics and fiber and is configured by installing two OLIUs at each location and connecting them with four optical fibers (Figure 1-4). In a protected system, both OLIUs must be provisioned identically. Since the DDM-Plus System employs nonrevertive protection switching, neither circuit pack is designated as "service" or "protection." Service does not automatically switch back to a primary circuit pack after the correction of a failure.

Protection switching is bidirectional so that all four DS1s are carried on the active line. The OLIU currently carrying service has its **ACTIVE** indicator lighted. In either case, the DDM-Plus System can easily be reconfigured from unprotected to protected or from protected to unprotected without affecting service.

Protection switching is not available for the AEK-type T1 repeaters in the shelf.

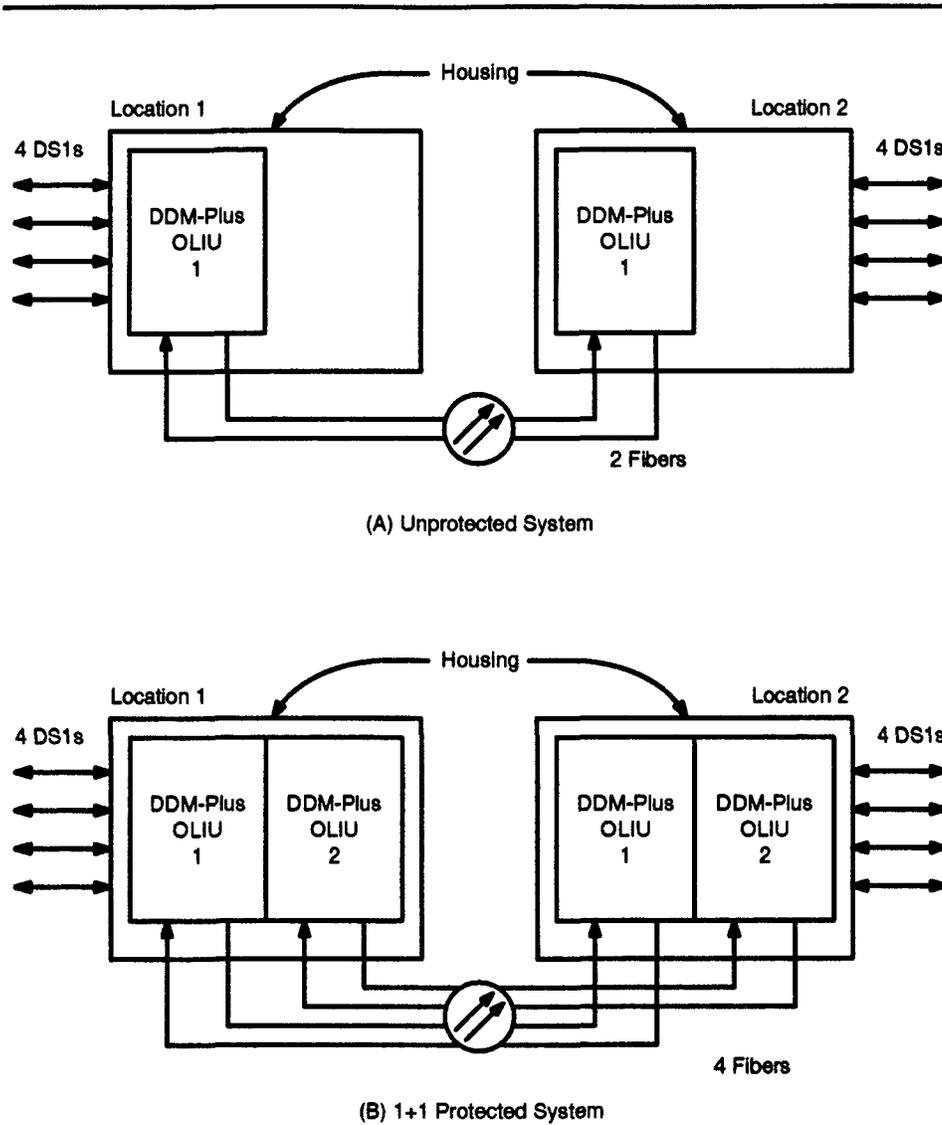


Figure 1-4. Unprotected and Protected DDM-Plus Optical Configurations

Applications

2

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Overview

The DDM-Plus can be used to provide a cost effective solution for optical extension in a loop plant. Features of the DDM-Plus System include compact size, environmental hardening, 1+1 protection, non-service-affecting upgrades; no upgrade of existing fiber facilities is required. The DDM-Plus System is particularly suited for the following applications:

- Hubbing
- Remote hubbing
- Customer premises equipment.

These applications are distinguished by their route geography and traffic characteristics as well as economic concerns for the first cost of equipment and the cost of operations.

In applications where fiber does not currently exist, the DDM-Plus provides a low first-cost solution for deploying fiber or migrating from copper to fiber, thus supplying potential capacity for future needs, upgrading the transport facility, and eliminating expensive copper maintenance.

An application showing how miscellaneous discrettes could be used to monitor a network using DDM-Plus is described.

These are only examples. Many other combinations of protection, capacity, and topologies are possible.

Hubbing Application

Hubbing is a primary application for the DDM-Plus. Figure 2-1 shows a central office-based hubbing application where a DDM-Plus unit at the central office supplies three separate end-user locations. The first DDM-Plus carries four 1+1 protected DS1s to an office building. The second DDM-Plus carries four DS1s on a 1+1 protected fiber link to a *SLC*[®] carrier bank that supplies 96 voice channels to a residential area. The third DDM-Plus delivers two DS1s to an office building using an unprotected optical facility. The DDM-Plus at the central office is also providing two T1 lines. Supplying a single business with both telephone and DS1 service is common. This example shows some of the capacities, methods of protection, and types of end-users that might be found in a typical installation.

An important part of any application is the ability to upgrade capacity. Figure 2-2 shows a possible upgrade for the central office-based hubbing application. The topology of Figure 2-2 is unchanged from the initial installation of Figure 2-1, but several changes in capacity and line format have been made and are highlighted in Figure 2-2. The first DDM-Plus has been upgraded from carrying four DS1s to eight DS1s in a 1+1 protected arrangement to an office building. The second DDM-Plus has been upgraded from carrying four DS1s to eight DS1s in a 1+1 protected arrangement to a *SLC* bank. The third DDM-Plus has been upgraded from two to four DS1s and is now 1+1 protected. For the third DDM-Plus System, another fiber facility will be needed to provide the 1+1 protection. These upgrades can take place without affecting service to the end-user.

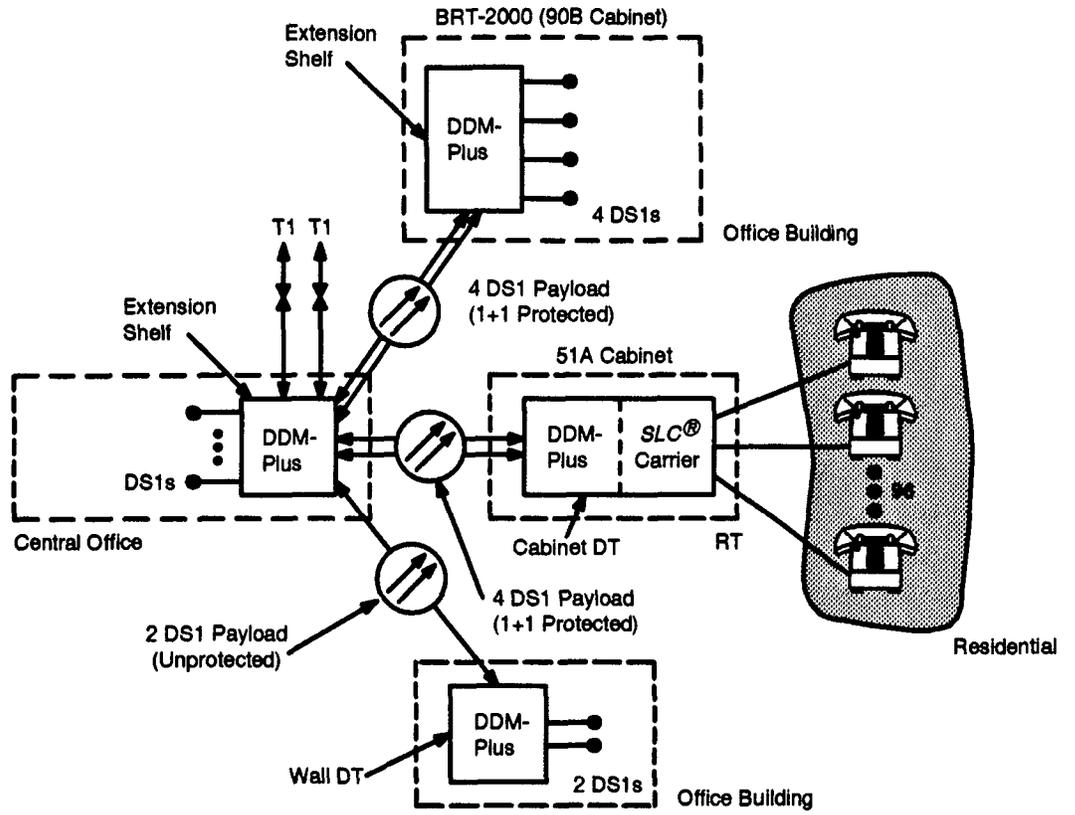


Figure 2-1. DDM-Plus Hubbing Application

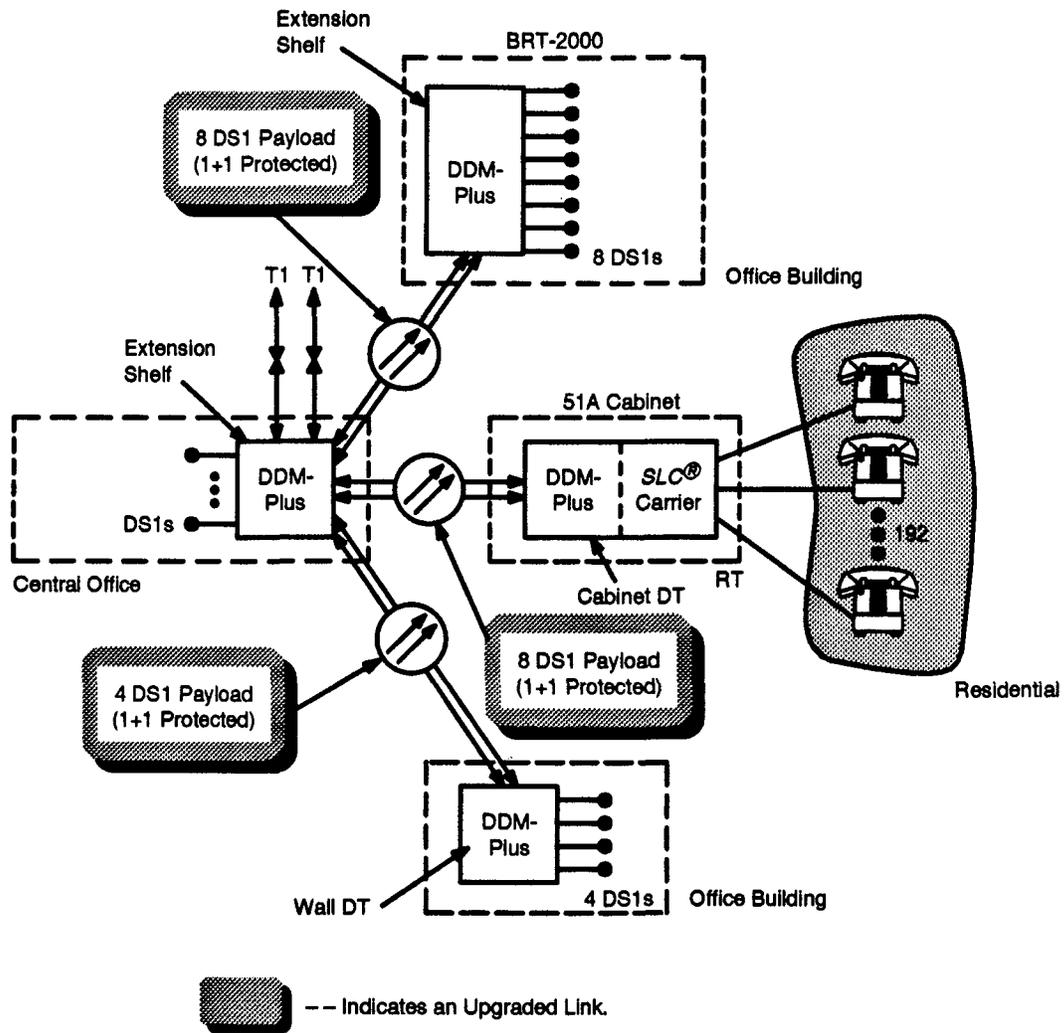


Figure 2-2. Upgrading DDM-Plus Hubbing Application

Remote Hubbing Application

The remote hubbing application has one obvious difference from the previous hubbing application (Figures 2-1 and 2-2). The basic difference is that the hub is located in a remote terminal (RT). At this RT site, the DDM-Plus hub interfaces with the DDM-2000 OC-3 that is in turn connected, using an OC-3 link, to the central office. The RT site can be located in one of many locations including a building's basement, a controlled environment vault (CEV), or a rural cabinet.

The services provided in an RT hubbing application are exactly the same as those provided by the central office-based hubbing application. Figures 2-3 and 2-4 are similar to Figures 2-1 and 2-2 with the exception that several of the line capacities have been changed. This has been done to emphasize the wide range of DS1 capacities desired by end-users.

The remote hubbing topology presents itself in several different scenarios including high-rise buildings, office parks, and campus environments. The high-rise building application in Figures 2-5 and 2-6 uses the same topology, services, and upgrades already described in Figures 2-3 and 2-4. A primary benefit that the DDM-Plus provides is "riser relief"; that is, it reduces the amount of cable congestion in the building riser.

Another benefit of the DDM-Plus is that it works over both multimode and single-mode fiber. Buildings already equipped with multimode fiber can be accommodated to avoid the expense of installing new single-mode fiber.

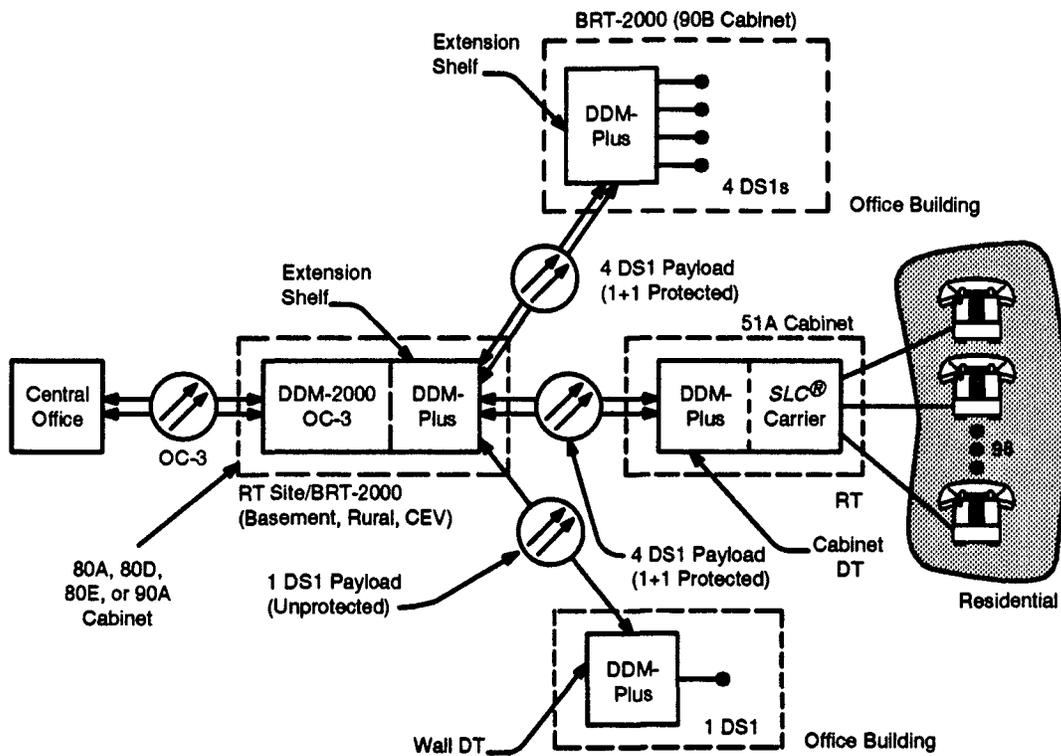


Figure 2-3. DDM-Plus Remote Hubbing Application

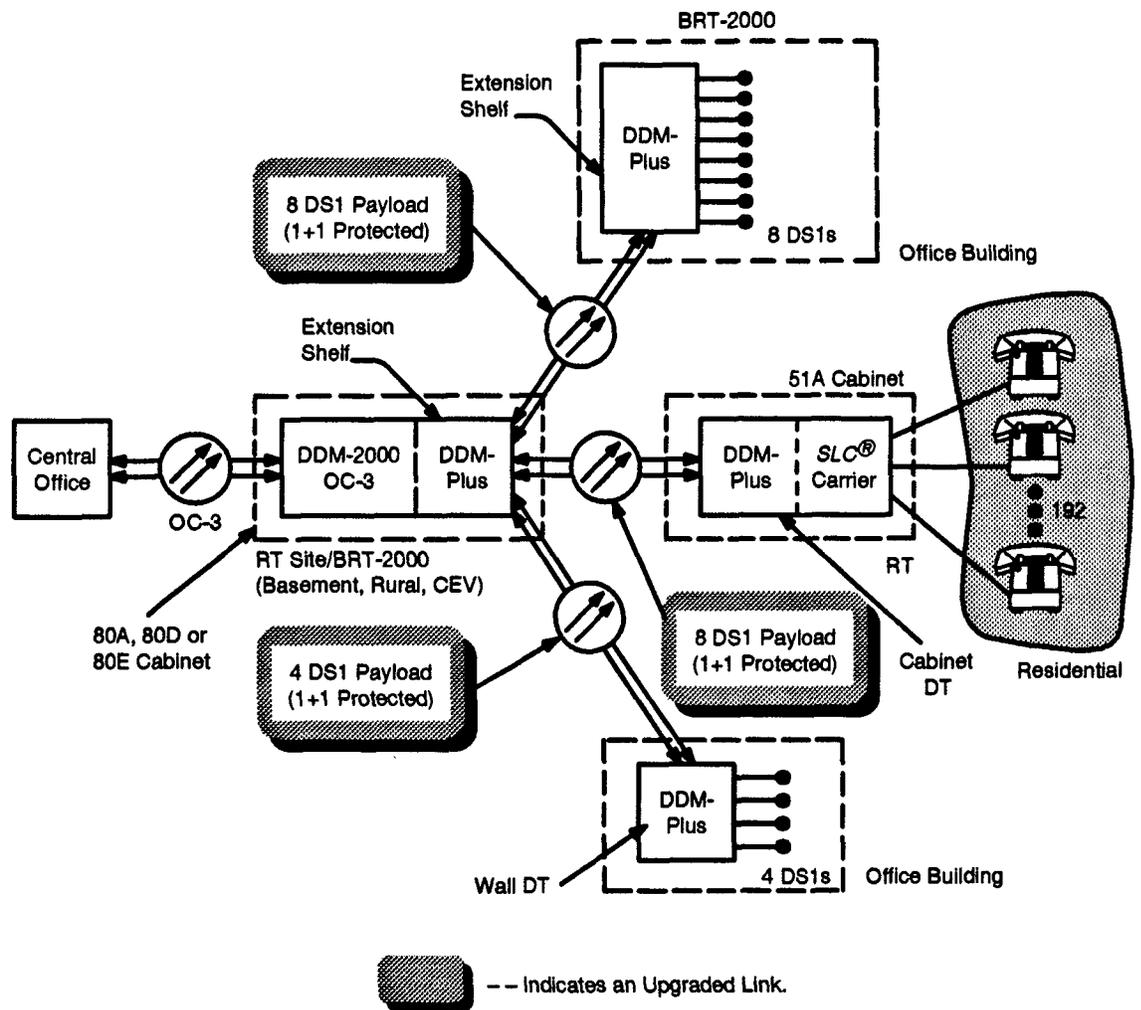


Figure 2-4. Upgrading DDM-Plus Remote Hubbing Application

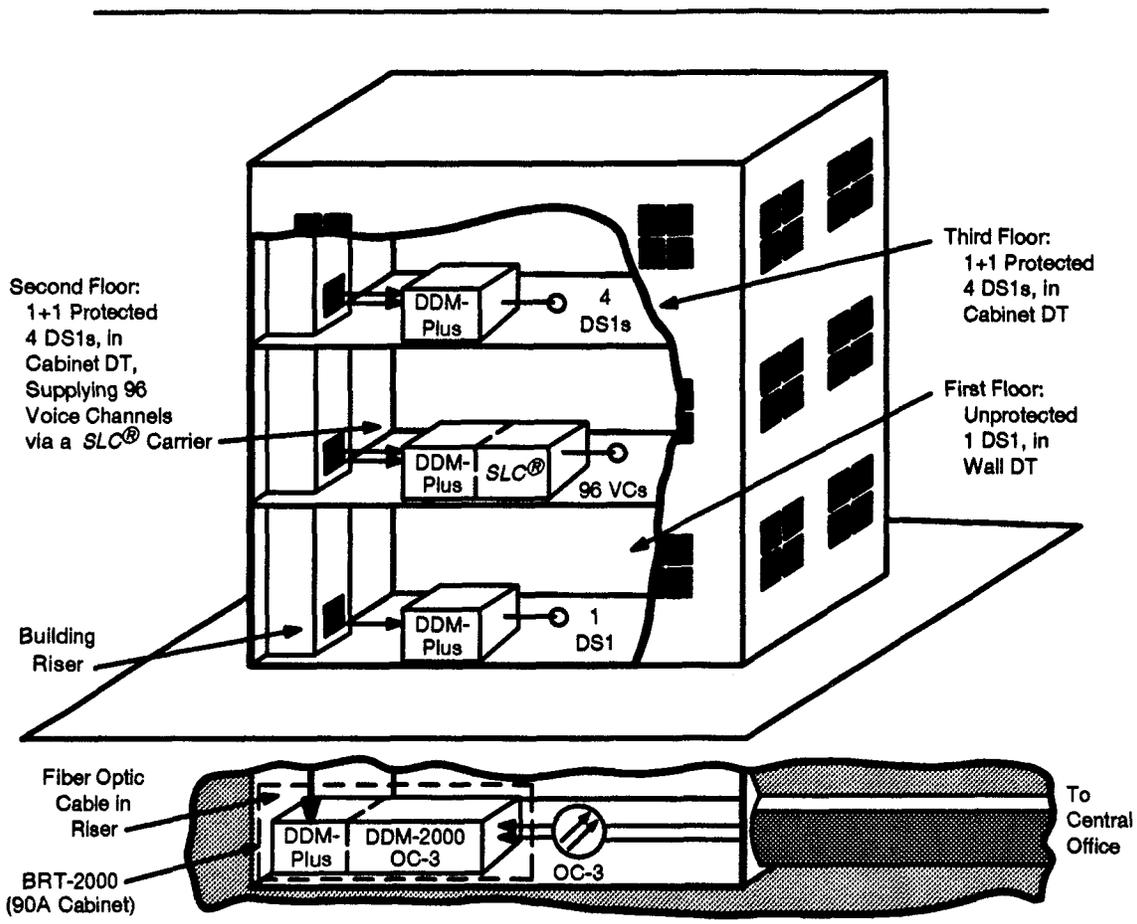


Figure 2-5. DDM-Plus Remote Hubbing Application in High-Rise Building

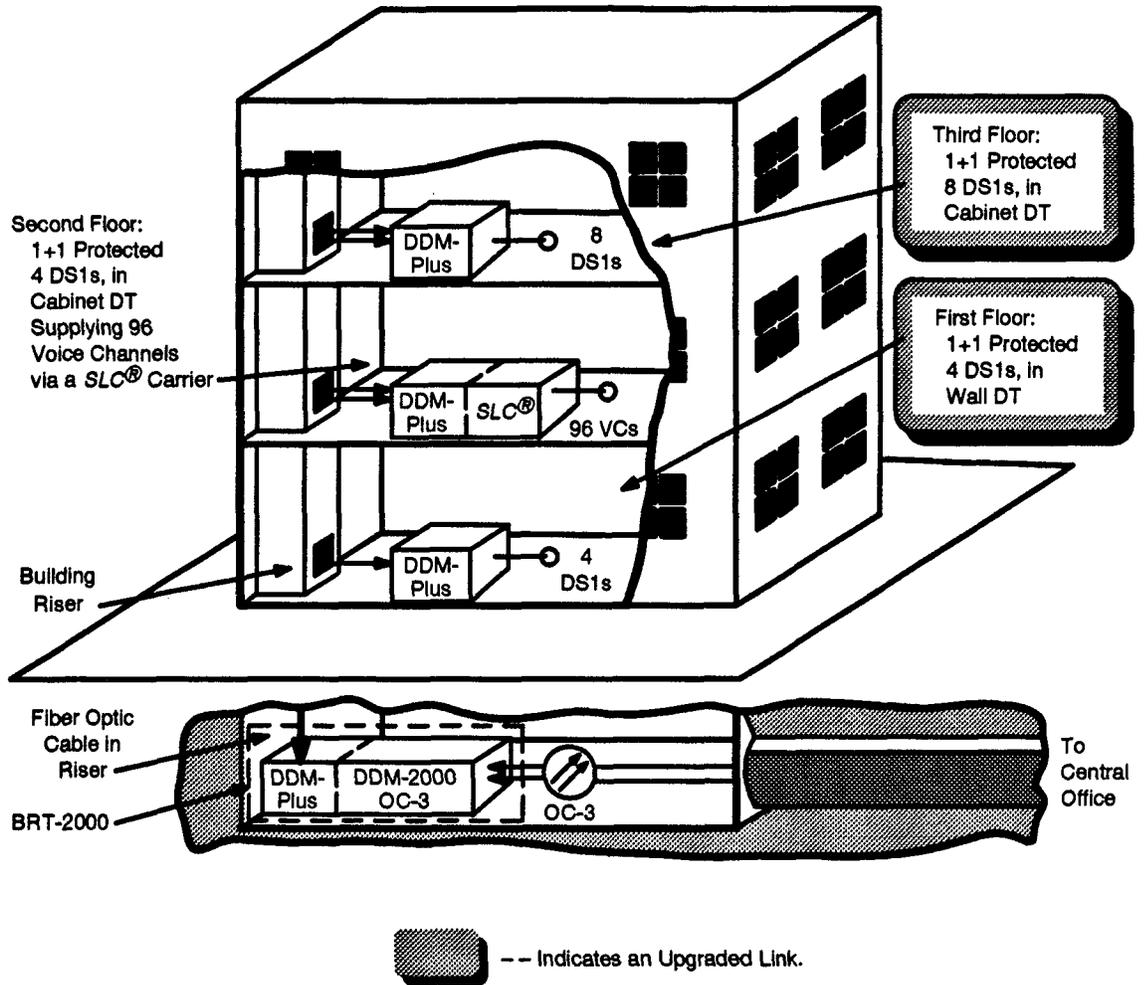


Figure 2-6. Upgrading DDM-Plus Remote Hubbing Application in High-Rise Building

Customer Premises Equipment Application

The applications shown in Figures 2-7 and 2-8 depict the topology of a possible customer premises deployment and a high-rise deployment. In these applications, the DDM-2000 OC-3 interfaces with the DDM-Plus Extension Shelf through a DSX-1 cross-connect panel. In contrast to applications where the network interface is at the DS1 interface of the far-end DDM-Plus, the network interface is at the output of the DSX-1 cross-connect panel. This makes all the DDM-Plus equipment customer premises equipment.

Another customer premises application for the DDM-Plus is between buildings where point-to-point transport is needed.

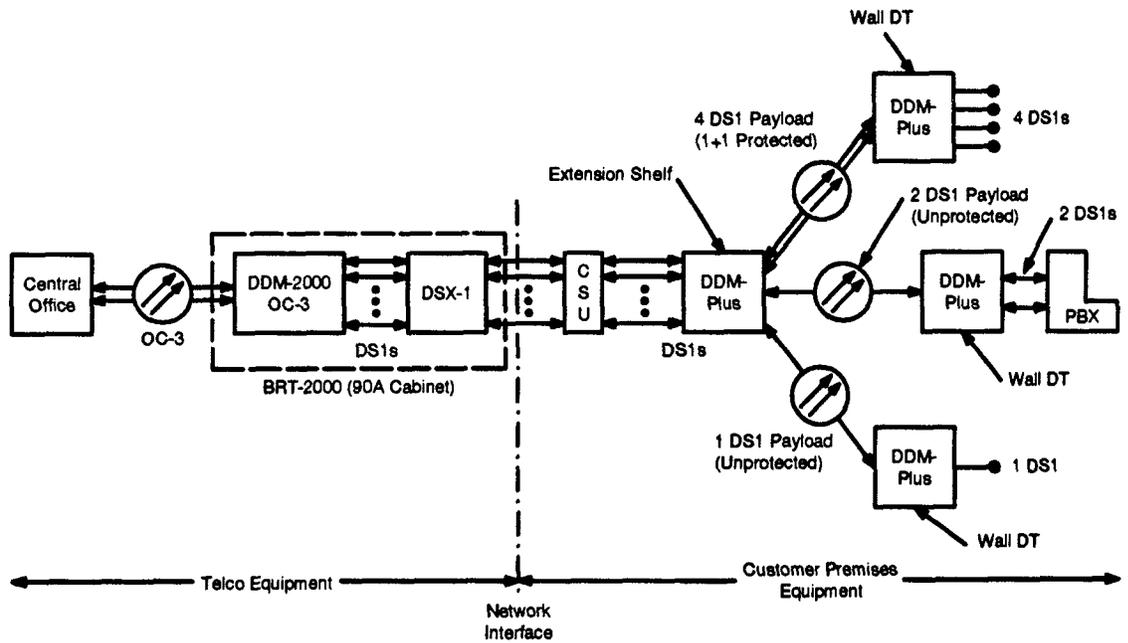


Figure 2-7. Customer Premises Application

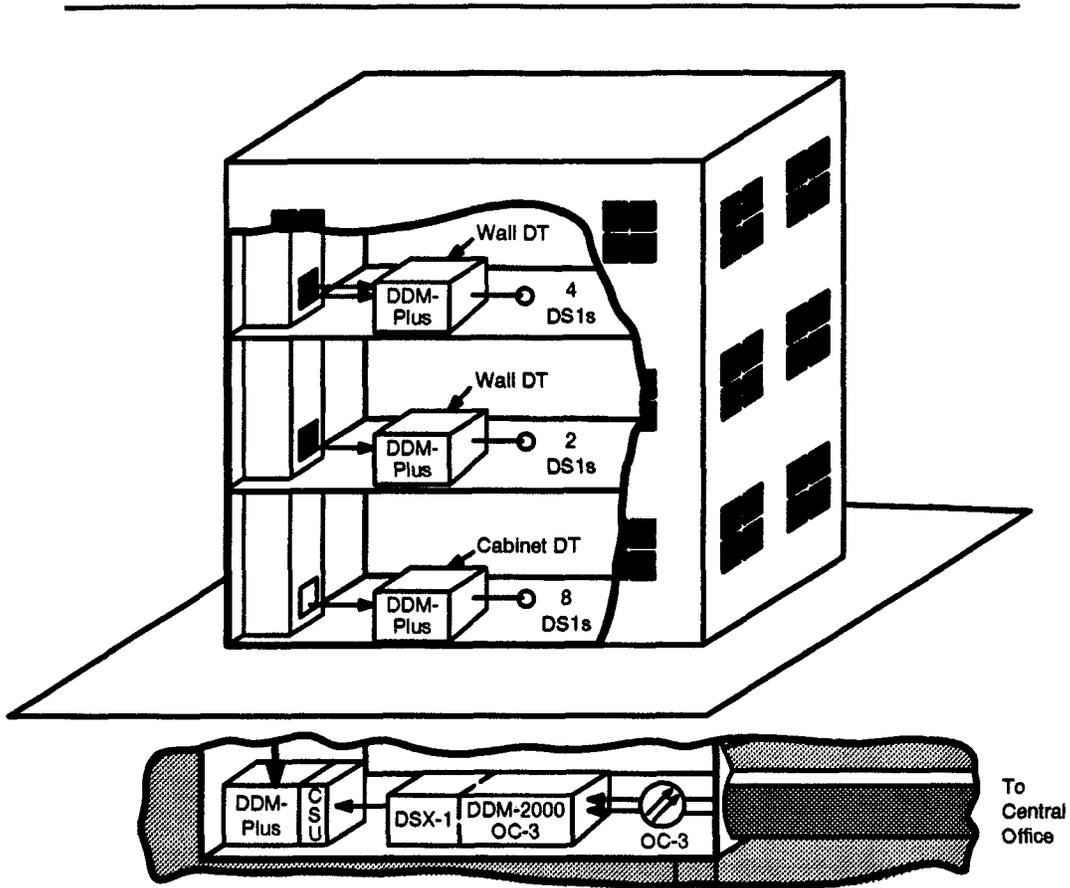


Figure 2-8. High-Rise Deployment of Customer Premises Application

Miscellaneous Discrete Application

The miscellaneous discrettes of the DDM-Plus System can be used to provide transport of certain conditions from one end of the DDM-Plus link to the other. Any condition, which can generate a switch closure, can be transported with the DDM-Plus miscellaneous discrettes. Examples include intrusion alert (open door), fire, smoke, power failure (as long as the failure does not eliminate power to the DDM-Plus), high water, and many others. Figure 2-9 demonstrates the use of the miscellaneous discrete for transport of 120 V AC failure at the far-end DDM-Plus terminal.

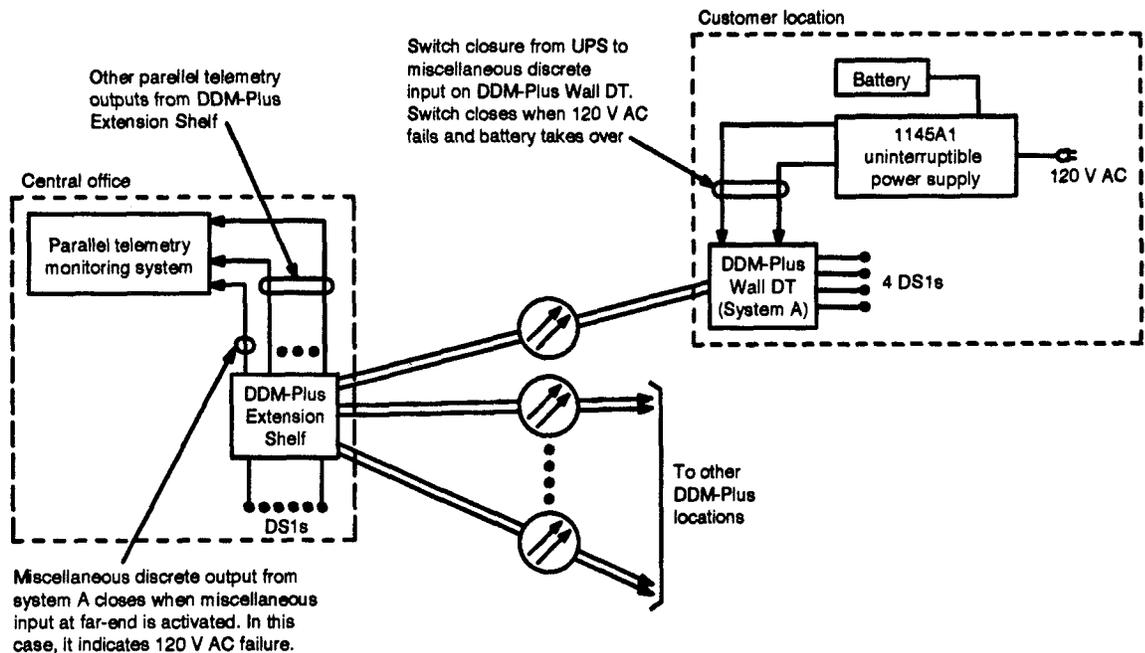


Figure 2-9. Application of Miscellaneous Discrettes — Transport of 120 V AC Failure from Far-End DDM-Plus

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DDM-Plus Housings

The DDM-Plus is available in the following housings:

- Extension Shelf
- Wall Distant Terminal
- Cabinet Distant Terminal.

DDM-Plus Extension Shelf

The DDM-Plus Extension Shelf is the largest capacity housing for the optical line interface unit (OLI) circuit packs. It is used primarily in central offices, controlled environment vaults (CEVs), and medium-to-large capacity cabinets. It mounts in a standard 23-inch equipment rack and has a total capacity of 28 DS1s. It provides the flexibility of carrying 28 DS1s either on copper using the AT&T T1 carrier system or on fiber using either the 25A OLIU or 25F OLIU. The Extension Shelf has a fiber trough along the lower front portion of the shelf to provide a convenient method of routing and managing the fiber. A removable cover gives the DDM-Plus Extension Shelf an attractive appearance and provides additional electromagnetic protection.

Shelf Dimensions

The DDM-Plus Extension Shelf is 23 inches wide, 12.0 inches deep, and 5.0 inches high. These dimensions include the fiber routing trough that extends down and forward from the front edge of the shelf bottom plate. Figure 3-1 shows the DDM-Plus Extension Shelf.

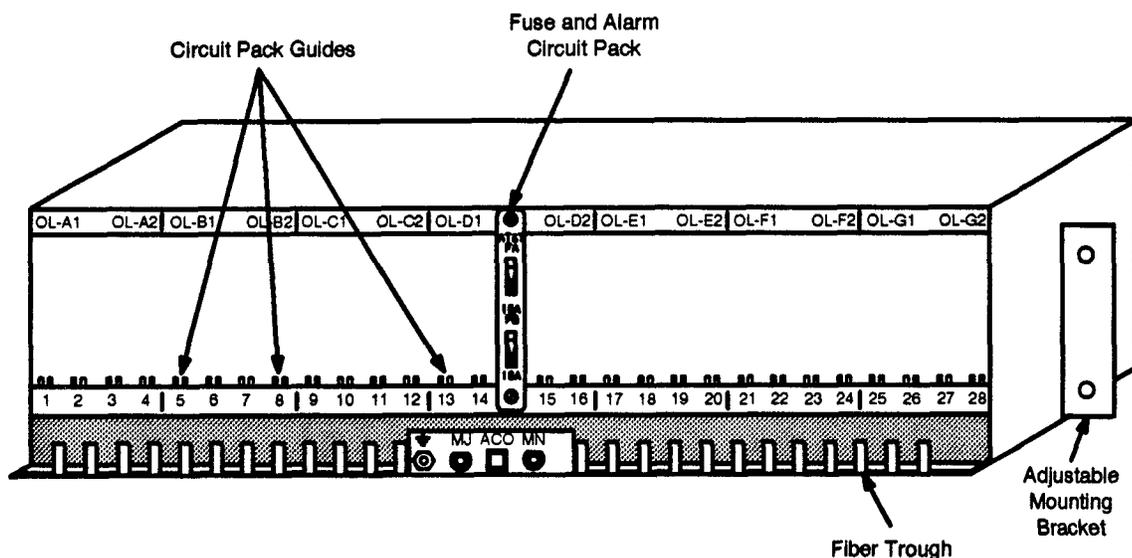


Figure 3-1. DDM-Plus Extension Shelf

Circuit Pack Arrangement

Provisioning of optical DS1 service from the DDM-Plus Extension Shelf is done in groups of four DS1s. The AEK-type T1 repeater circuit packs and the OLIU circuit packs cannot be mixed within a group. For instance, **do not** install two AEK-type T1 repeater circuit packs and one OLIU circuit pack into group A, attempting to transport two DS1s on copper and the other two on fiber. Such a deployment will not work because the OLIU and the AEK-type T1 repeater circuit packs will be accessing the same DS1s causing a dual-feed condition that will corrupt the data on those DS1s. Dedicate all four of the DS1s in each group on either copper or fiber, but not both.

For shelves that are planned to contain both types of circuit packs, the OLIUs should be equipped from left-to-right and the AEK-type repeaters equipped from right-to-left.

It is also recommended that when an OLIU is operated in an unprotected mode that two AEK-39 BP1 circuit packs be placed in the unused slots to prevent accidentally inserting an AEK-type repeater. The AEK-39 BP1 circuit pack is also used by the DDM-1000 in unused DS1 positions.

As Figure 3-2 shows, the shelf is divided into seven groups, denoted **OL-A**, **OL-B**, through **OL-G**. Each group consists of four slots that will support four DS1s. Each group can be equipped with up to four AEK-type T1 repeater circuit packs or up to two OLIU circuit packs, but not both at the same time. The OLIU circuit pack occupies two slots.

The OLIU circuit packs within a group are denoted as **1** or **2**. The circuit pack on the left is **1** and the circuit pack on the right is **2**.

Each slot location follows this notation:

OL-<letter><number>

OL — optical line

letter — denotes the group: A,B,C,D,E,F, or G

number — denotes the OLIU position within the group: 1 or 2

The following notation is an example of an OLIU slot location:

OL-C2

OL — optical line

C — third group from the left

2 — second OLIU in optical group C

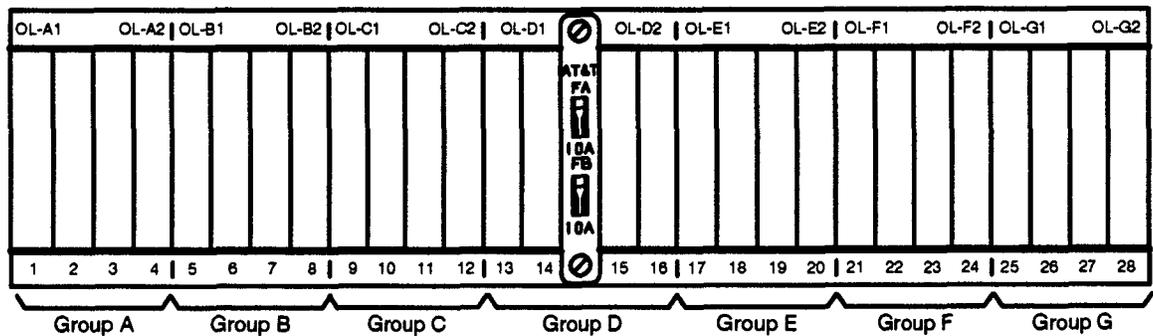


Figure 3-2. Extension Shelf Circuit Pack Groups

The DDM-Plus Extension Shelf can be used to transport 28 DS1s on either copper or fiber if only one type of circuit pack is used in each of the 7 groups.

⇒ **NOTE:**

If a group of four DS1s is incorrectly provisioned by mixing an AEK-type T1 repeater circuit pack with an OLIU, no damage will be done to either circuit pack. The DS1 transmission will be corrupted.

Extension Shelf Cabling

All interfaces to the DDM-Plus Extension Shelf are connectorized. Refer to ED-8C730-20 for detailed cabling information.

The Extension Shelf connector panel is accessible from the front (Figure 3-3). Table 3-1 lists the connector designations and their description. Figure 3-4 shows the rear panel of the Extension Shelf. Refer to Appendix A, *Connectors Pin Assignment*, for detailed connector information.

Table 3-1. Connector Panel Designations

<u>Connector Designation</u>	<u>Connector Description</u>
P01()*	T1 Line Receive †
P02()*	DSX-1 Equipment Transmit and Receive
P03()*	T1 Line Transmit †
P04 and P05	Fault Location
P06	Office Alarm
P08	Extension Shelf Alarms and ACO
P07, P09, and P10	Parallel Telemetry and Miscellaneous Discrete

* These connectors correspond to the shelf groups A through G.

† Connectors P01() and P03() are only used by the T1 carrier systems.

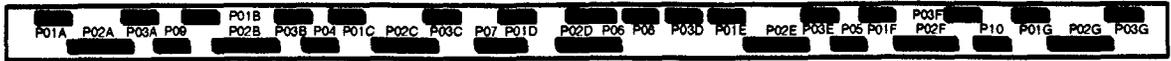


Figure 3-3. Connector Panel - Front View

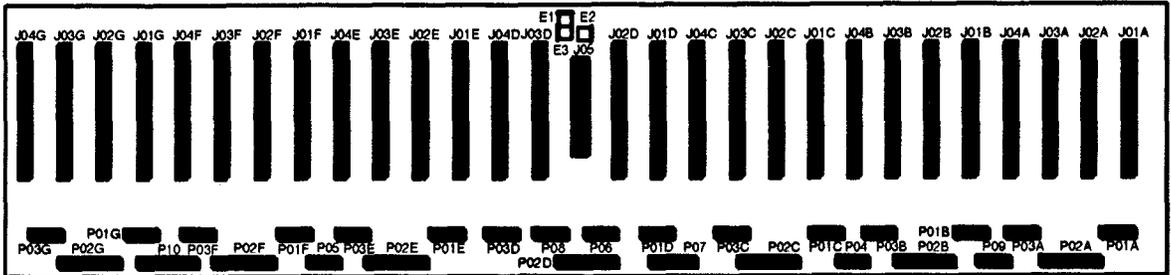


Figure 3-4. Extension Shelf - Rear View

Extension Shelf Interfaces

The DDM-Plus Extension Shelf has the following interfaces:

- Twenty-eight 2-way DS1 electrical signals (DSX-1 compatible) (Equipment side)
- Twenty-eight 2-way T1 carrier signals (Line side)
- Four office alarm closures (major visual, major audible, minor visual, minor audible)
- T1 carrier fault-locating pairs
- Eleven parallel telemetry interface points (used only by the OLIU circuit packs)
- Fourteen miscellaneous discrete input (two input point for each group)
- Seven miscellaneous discrete output (one output point for each group)
- Two -48 V DC power buses with common ground.

DS1 Equipment and T1 Interfaces

The DDM-Plus Extension Shelf provides twenty-eight 2-way DS1 equipment interfaces through connector P02() and twenty-eight 2-way T1 line interfaces through connectors P01() and P03(). Refer to Figure 3-3 and Table 3-1. These connectors are easily accessible for front access using standard cabling arrangements available from AT&T. The T1 line interfaces are only accessed by the AEK-type T1 repeater circuit packs; the OLIU circuit pack does not access the T1 line interfaces. The DS1 equipment interfaces are *ANSI*^{*} standard DS1 signals.

T1 Fault Locating

Four separate T1 fault-locating pairs are provided for the four T1 carrier system groups. The slot locations for the four T1 carrier system groups are as follows:

- Slots 1 through 7
- Slots 8 through 14
- Slots 15 through 21
- Slots 22 through 28.

With this arrangement, up to four separate cable routes from a fiber hub can be fault located. Each fault-locating pair is multiplied between the slot locations within each group and is accessible through connectors P04 and P05 on the connector panel for facilitating the connection to fault-locating filters. When the fault-locating pairs are not being used, an option is provided to terminate the pairs. For applications where fault locating pairs are not used, option jacks are provided to terminate the pairs. These jacks are always shipped *installed* on the shelf.

Dry-Contact Alarm Closures

Connector P06 provides the following four office alarm closures for the DDM-Plus Extension Shelf (refer to Figure 3-3 and Table 3-1):

- Major audible
- Major visual
- Minor audible
- Minor visual.

The major closures are activated if one or more of the circuit packs housed in the shelf signal a major alarm (that is, the shelf alarm closure is a logical OR'ing of all circuit pack alarms). The major closure is also activated if the shelf suffers a complete loss of -48 V DC on either of its power buses. Similarly, for the OLIUs

* Registered trademark of American National Standards Institute, Inc.

the minor closures are activated if one or more of the circuit packs housed in the shelf signal a minor alarm. For the OLIU circuit pack alarming conditions, refer to Table 6-6, *OLIU Circuit Pack Fault and Alarm Indicators*, in Chapter 6, *Maintenance Description*.

The shelf provides an alarm cutoff (ACO) pushbutton located on the front center of the fiber trough to turn off the audible alarms. The ACO pushbutton will not remove any of the visual alarms and lights whenever it is active. There is also a red LED and a yellow LED next to the ACO pushbutton to show major and minor alarm conditions, respectively. The appropriate indicator lights whenever a major or minor alarm condition exists on the shelf.

The dry-contact closures operate normally whenever the open circuit voltage does not exceed 60 volts, the closed circuit current is no more than 1.0 amp, and the transient current during an interval of 20 ms after initial contact closure does not exceed 18 amps. These closures are located on the fuse and alarm circuit pack.

Parallel Telemetry Interface

The DDM-Plus Extension Shelf provides eleven parallel telemetry output points through connector P07. Refer to Figure 3-3 and Table 3-1. These points are used only by the OLIU circuit packs and provide the following:

- Major alarm.
- Minor alarm.
- Failure at near-end (NE).
- Failure at far-end (FE).
- Group failure — 1 output point for each group.

The use of the parallel telemetry interface for the shelf provides enough information to pinpoint failure type (major or minor), failure location (NE or FE), and failure group identification (groups A through G). In most single failure scenarios, this is enough information to determine precisely the location of the failure for quick and easy craft personnel dispatch.

Miscellaneous Discrete Interface

The DDM-Plus Extension Shelf provides miscellaneous discrete input and output points through connectors P07, P09, and P10. Refer to Figure 3-3 and Table 3-1. These points are used only by the OLIU circuit packs and provide the following:

- Group miscellaneous discrete input [status indications (SI)] — 2 input point for each group.
- Group miscellaneous discrete output [remote switch (RS)] — 1 output point for each group.

The miscellaneous discrete interfaces can be used to provide transport of certain conditions from one end of the DDM-Plus System to the other. Any conditions which can generate a switch closure can be transported by the miscellaneous discretes.

Fusing

The DDM-Plus Extension Shelf has two 10 amp fuses. Fuse **FA** powers the odd numbered slots through bus A. Fuse **FB** powers the even numbered slots through bus B. These fuses are located on the fuse and alarm circuit pack. When a fuse operates (blows), a red indicator pops up and initiates a major alarm.

The OLIU occupies both odd and even numbered slots, selects either bus A or B, and switches to the alternate if one bus fails. The T1 repeater occupies only one slot, therefore, connecting to either bus A or B. If the bus supplying the T1 repeater loses power, then the T1 repeater drops service.

Fiber Management

The DDM-Plus Extension Shelf has a fiber trough along its front bottom edge. This trough allows quick and easy management of the optical fibers that travel from the bottom of the OLIU circuit pack faceplate and through the trough to the fiber interconnection equipment. Optical fibers connecting to OLIUs in the left side of the Extension Shelf (slots 1 through 14) are routed out the left side of the fiber trough. Optical fibers connecting to OLIUs in the right side of the Extension Shelf (slots 15 through 28) are routed out the right side of the fiber trough.

Bay Arrangement

The Extension Shelf is designed for miscellaneous mounting in standard network bay frames. Figures 3-5, 3-6, and 3-7 show three different mounting arrangements of the Extension Shelf.

The modular design of the Extension Shelf allows many different bay arrangements. Figure 3-8 shows a typical bay arrangement for up to six Extension Shelves. This arrangement meets Network Equipment Building System (NEBS) central office requirements for bay heat dissipation. Although additional space is available in the bay, it should not be used for miscellaneous equipment if the NEBS requirements are to be met. Refer to ED-8C730-10 and FPD 801-525-169 for information on typical bay arrangements.

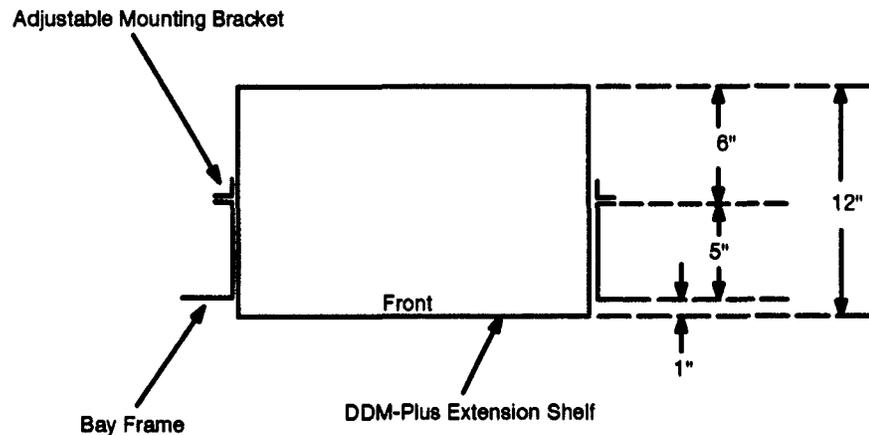


Figure 3-5. ED-8C500-50 — Rear Mount with Rear Access

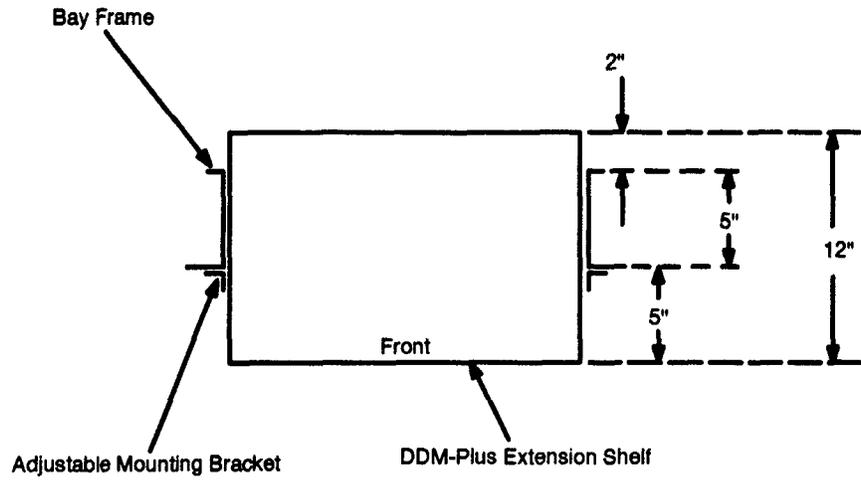


Figure 3-6. ED-8C501-50 — Front Mount with Rear Access

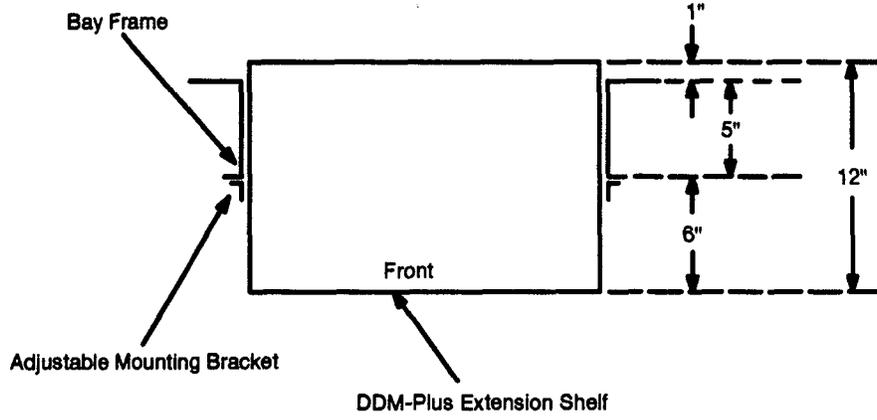


Figure 3-7. ED-8C500-50 — Front Mount with Front Access

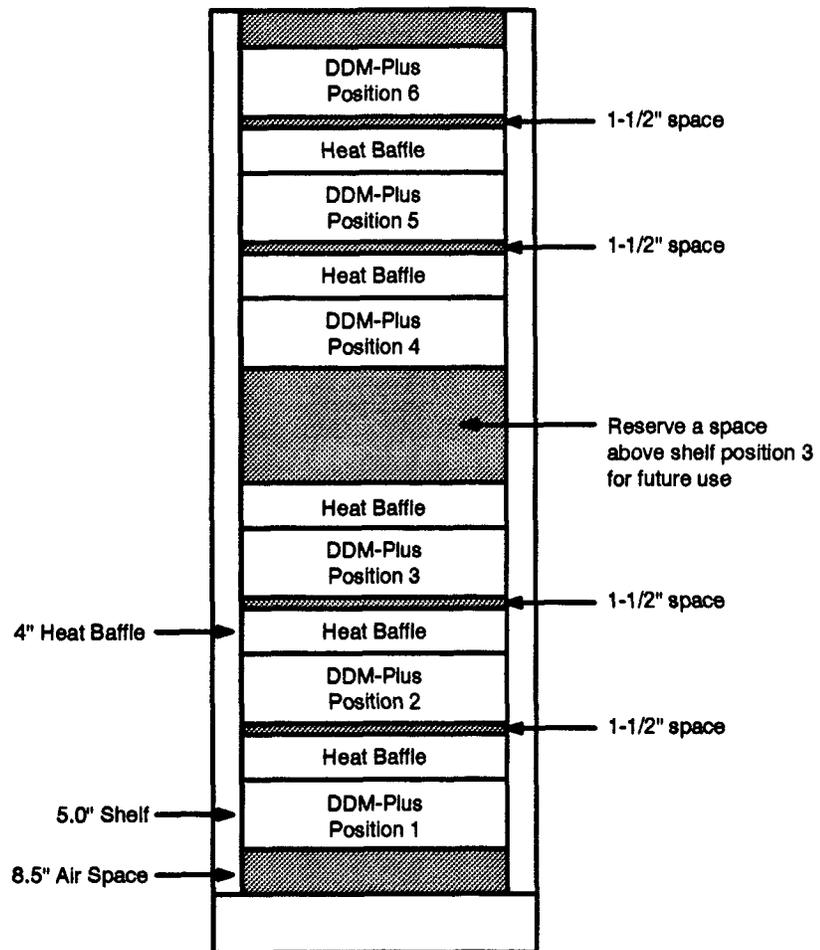


Figure 3-8. Typical DDM-Plus Extension Shelf Bay Arrangement

Cabinet Arrangement

The modular design of the Extension Shelf allows it to be mounted in the following cabinets:

- 80A
- 80D
- 80E
- 90A
- 90B
- 51A.

Refer to AT&T 363-205-000, *SLC® Series 5 Ordering Guide*, for information on cabinet arrangements.

DDM-Plus Wall Distant Terminal

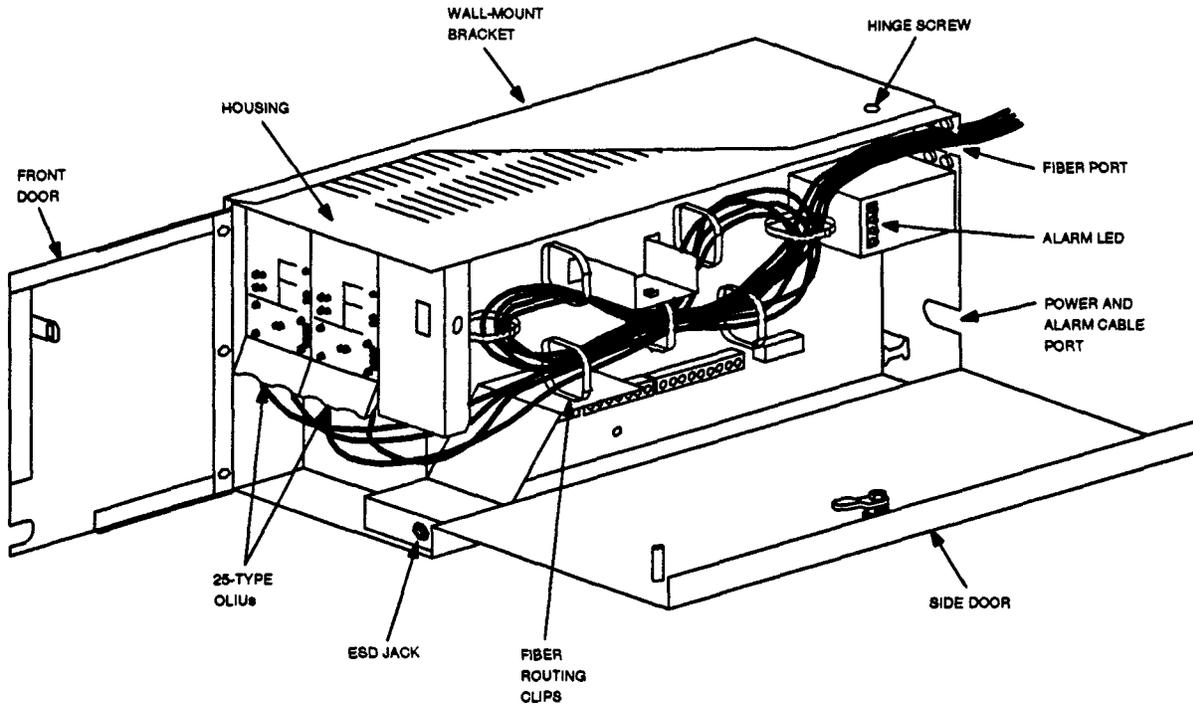
The DDM-Plus Wall Distant Terminal (DT) is designed for use at a customer location. It has the capacity of a single DDM-Plus System (four DS1s) and has an attractive appearance. The DT can be mounted on a wall or can sit on a table or desk. Figure 3-9 shows the Wall DT. A specially designed wall mounting bracket allows it to be swung out from a wall for easy installation and clear access even in crowded equipment rooms. The wall mount bracket secures the housing in two positions. One position is parallel to the wall and the other position is perpendicular to the wall. A spring loaded detent pin stabilizes the unit in these positions for ease of service and installation. To swing the Wall DT out from the wall, disengage the retaining pin from the front bottom of the wall mounting bracket. The Wall DT will then pivot on its hinge pin that is located towards the rear of the mounting bracket. The housing unit interlocks with the wall mount bracket when mounted in a normal manner (parallel to the wall). This makes the Wall DT secure and prevents the housing from swinging out from its installed position by accident.

A protective guard prevents accidental pinching of the fiber by the door locking device and routes the fiber in the side compartment. Two shoulder screws secure the wall mount bracket to the housing. This makes the removal and installation of the bracket easy.

If the wall DT is used on a desk top, then four rubber bumpers provided in the bracket must be installed on the bottom of the unit. To remove the Wall DT from the wall mounting bracket, remove the two shoulder screws at the hinge point. The location for the bumpers are marked with the letter "O" at the bottom of the unit.

The Wall DT houses up to two standard OLIU circuit packs and provides transport for four DS1s. It has a left-hinged front door that opens to provide access to the circuit packs. The door is normally closed. A hinged door on the right side of the Wall DT (as viewed from the front) opens to provide access to a fiber storage area, power connections, alarm connections, miscellaneous discrete connections, parallel telemetry connections, and fuses. These doors can be locked so that access to circuit packs, power connections, fusing, alarm connections, and fiber is only available to appropriate personnel. The front door must be closed before the side door can be locked.

An ESD ground jack located in the front of the unit is accessible with the doors locked. This permits the installer to plug in the grounding wrist strap before opening the housing for service. The rear of the Wall DT housing provides access to all the housing DS1 signals through four RJ48X connectors and a ground jack for connecting wrist straps. Power, alarm, miscellaneous discrete, parallel telemetry cables, and fibers enter the housing through access holes in the rear panel of the housing. See Figure 3-9.



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Figure 3-9. DDM-Plus Wall Distant Terminal

Housing Dimensions

The DDM-Plus Wall DT is 5.5 inches wide, 15.5 inches deep, and 6.75 inches high. These dimensions include the wall mounting bracket.

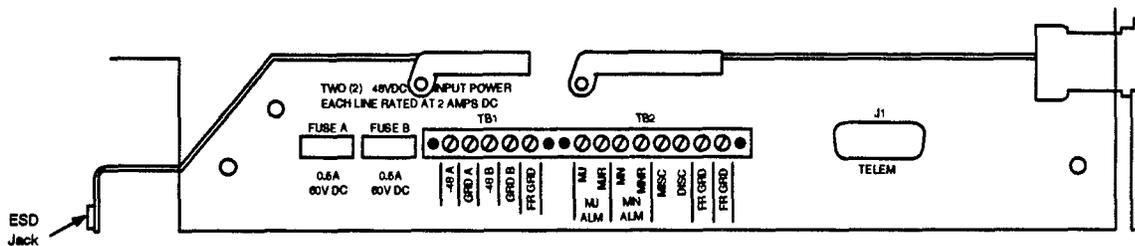
Circuit Pack Arrangement

The DDM-Plus Wall DT can be used to transport four DS1s on fiber only. No T1 carrier interfaces are available. Therefore, the AEK-type T1 repeaters cannot be used in the Wall DT. A marking for identifying the slot location is at the front of the Wall DT. This marking will help identify the OLIU location in the unit.

Wall Distant Terminal Cabling

All interfaces to the DDM-Plus Wall DT are connectorized. Refer to ED-8C730-20 for detailed cabling information.

Power, office alarm, miscellaneous discrete, parallel telemetry, and fuses are accessible from the side (Figure 3-11) and DS1 interfaces are accessible from the rear of the Wall DT (Figure 3-10). Table 3-2 lists the connector designations with a description. Refer to Appendix A, *Connectors Pin Assignment*, for detailed connector information.



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Figure 3-10. Wall DT Side Fuse and Connector Panel

Table 3-2. Connector Designations for Rear and Side Panel

<u>Connector Designation</u>	<u>Connector Description</u>
TB 1	Power Terminal Block
TB 2	Office Alarms and Miscellaneous Discrete Terminal Block
J1	Parallel Telemetry
1, 2, 3, 4 (RJ48X)	DSX-1 Equipment Transmit and Receive

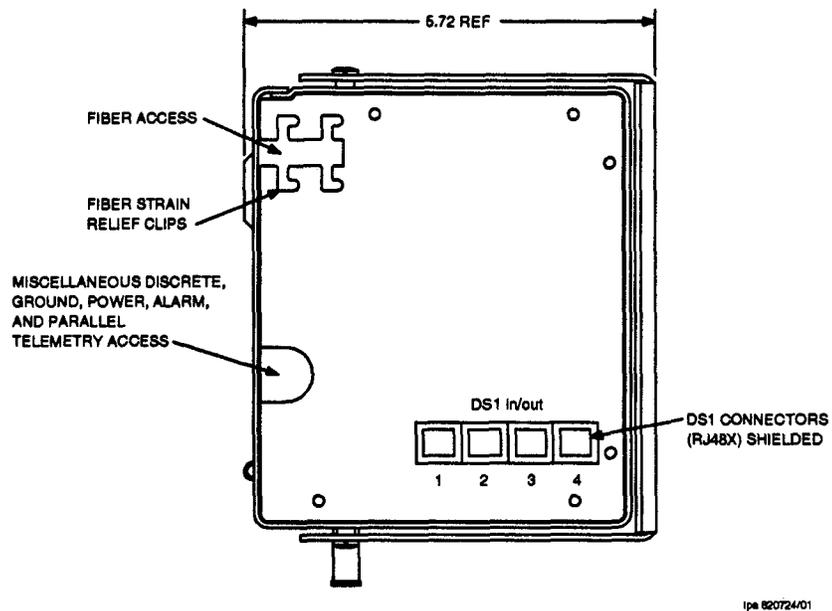


Figure 3-11. Wall DT Rear Panel

Wall Distant Terminal Interfaces

The Wall DT housing has the following interfaces:

- Four 2-way DS1 electrical signals (DSX-1 compatible through four RJ48Xs) (equipment side)
- Two -48 V DC power buses (screw type terminal strip - TB 1)
- Two office alarm closures (major, minor) (screw type terminal strip - TB 2)
- Miscellaneous discrete closures (screw type terminal strip - TB 2)
- Parallel telemetry interface points (a DB15 connector - J1).

The electrical and signal cables exit near the middle section of the backplate. A cable strain relief is built-in for providing strain relief and securing the cables in place. This allows the installer to dress the cables properly. Tie wraps are included in the installation kit and shipped with the unit. The cable layout for power, office alarms, and miscellaneous discretets is shown in Figure 3-12.

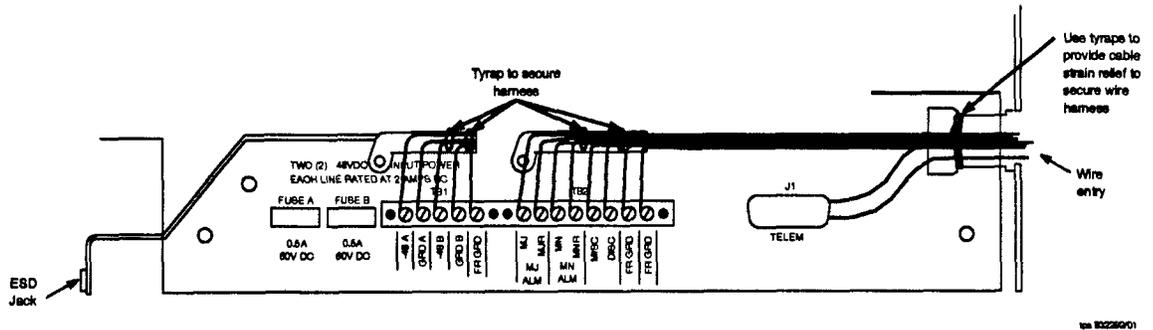


Figure 3-12. Wall DT Power and Office Alarms Cable Layout

DS1 Equipment Interfaces

The DDM-Plus Wall DT provides four 2-way DS1 equipment interfaces through four RJ48X jacks located on the rear panel of the housing. The DS1 equipment interfaces are *ANSI* standard DS1 signals.

Dry-Contact Alarm Closures

The DDM-Plus Wall DT housing provides two alarm closures. The major and minor closures are accessible on the screw terminal block located behind the side door of the housing. The major closure is activated if the circuit packs housed in the Wall DT signal a major alarm. Similarly, the minor closures are activated if the circuit packs housed in the Wall DT signal a minor alarm. For alarming conditions on the OLIU circuit pack, refer to Table 6-6, *OLIU Circuit Pack Fault and Alarm Indicators*, in Chapter 6, *Maintenance Description*.

There is a red LED and a yellow LED on the side of the Wall DT housing to show major and minor alarm conditions, respectively. The appropriate indicator lights whenever a major **MJ** or minor **MN** alarm condition exists. In addition there are two green LEDs, **PWR A** and **PWR B**, that indicate power is on when lighted.

The markings located on the outside of the unit for identifying the LEDs are repeated on the inside of the unit. This helps in identifying the alarms when the side door is open. The dry-contact closures operate normally whenever the open circuit voltage does not exceed 60 volts, the closed circuit current is no more than 1.0 amp, and the transient current during an interval of 20 ms after initial contact closure does not exceed 18 amps. These closures are located inside the Wall DT housing.

Parallel Telemetry Interface

The Wall DT housing provides parallel telemetry output points accessible by a DB15 connector **J1** located behind the housing side door. These points provide the following:

- Major alarm
- Minor alarm
- Failure at near-end (NE)
- Failure at far-end (FE)
- Failure on group A

Thus, use of the parallel telemetry interface for the housing provides enough information to pinpoint failure type (major or minor) and failure location (FE or NE). With this information, the geographical location of single failures can be precisely identified for quick and easy craft personnel dispatch.

Each of these output points can tolerate an open circuit output voltage of up to 60 volts, a transient voltage of up to 135 volts for a maximum of 1 ms, and a closed circuit current of no more than 35 mA.

Miscellaneous Discrete Interface

The DDM-Plus Wall DT provides miscellaneous discrete input points through terminal block **TB 2**, and output points through connector **J1**. Refer to Figures 3-10 and 3-12. The miscellaneous discrete interfaces can be used to provide transport of certain conditions from one end of the DDM-Plus System to the other. Any conditions which can generate a switch closure can be transported by the miscellaneous discretes.

Wall Distant Terminal Housing Powering

The DDM-Plus Wall DT housing is powered by two -48 V DC power buses. Connections to these buses are available through screw terminal block **TB 1** located behind the side door of the housing. The -48 V DC can be supplied by any -48 V DC power source found in telephone equipment rooms. Alternate methods of providing power from 120 V AC are listed in AT&T 363-206-156, *DDM-Plus Equipment Engineering and Ordering Guide*.

Fusing

The DDM-Plus Wall DT has two 0.5 amp fuses. Fuse **FA** powers the odd numbered slots through bus A. Fuse **FB** powers the even numbered slots through bus B. These fuses are located on the right side of the Wall DT behind the side door. When a fuse operates (blows), a red indicator pops up and initiates a major alarm and the appropriate green LED extinguishes.

The OLIU occupies both odd and even numbered slots, selects either bus A or B, and switches to the alternate if one bus fails.

Fiber Management

A guide plate located at the front of the housing routes the optical fibers to and from the OLIUs. Strain relief features included in the guide plate protect each of the fibers from damage due to an accidental tug. The surface finish of the strain relief is such that it will not abrade the fiber jacket.

The DDM-Plus Wall DT housing has a fiber management area on its side for the storage of excess fiber and fiber test jumpers. This area is accessible by lowering the door on the right side of the Wall DT. Behind the door are several fiber clips for coiling excess fiber and test jumpers. These clips are placed so that proper bend radii are maintained on the fiber. The bend radii should not be less than 1.5 inches. To use this storage area, fiber is routed from the OLIU faceplate through the storage clips and then out the back of the housing near the top of the rear panel.

The portion of the wall mount bracket extending beyond the housing at the back has been redesigned, providing features to dress fibers and cables using plastic tie straps. Figure 3-13 shows typical fiber routing.

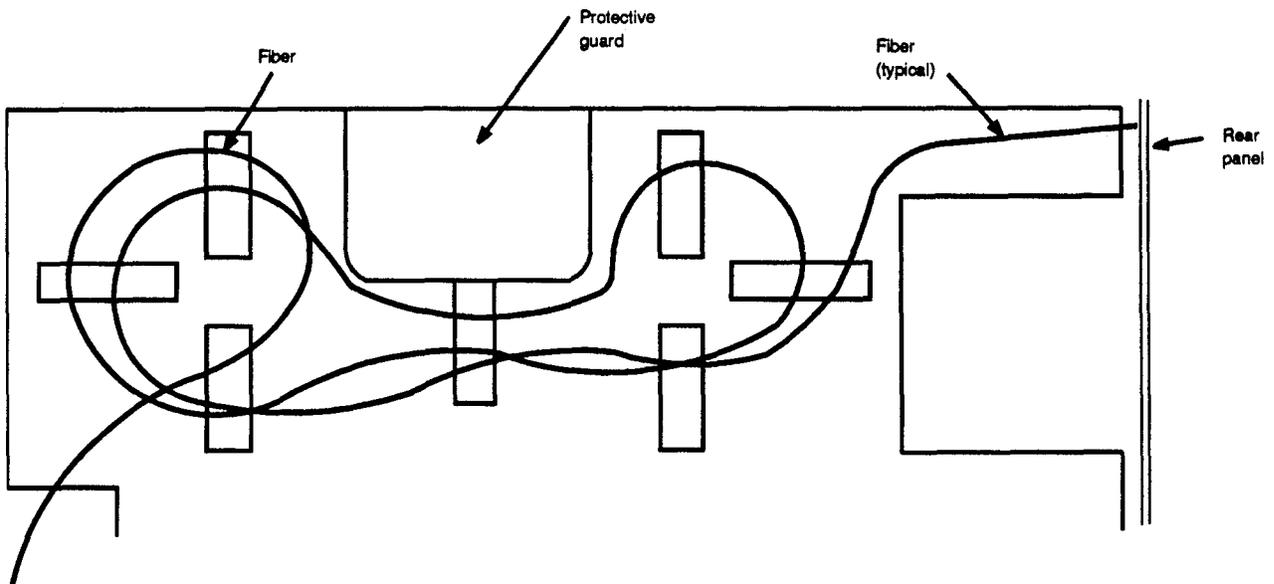


Figure 3-13. Wall DT Fiber Layout

DDM-Plus Cabinet Distant Terminal

The DDM-Plus Cabinet Distant Terminal (DT) provides all the necessary components for deploying three DDM-Plus systems including housing for the circuit packs, fiber jumper storage area, fiber cross connect, fiber splicing, and outside plant fiber cable termination. The Cabinet DT has a total capacity of 12 DS1s. These features make it particularly suitable for use in small outside plant cabinets such as the AT&T 51A cabinet, where space is critical, and there is no room for external fiber management gear. As with the DDM-Plus Extension Shelf, the Cabinet DT provides the flexibility of carrying the DS1s on copper, using AEK-type T1 repeaters, or on fiber using the 25A OLIUs or the 25F OLIUs. Figure 3-14 shows the DDM-Plus Cabinet DT.

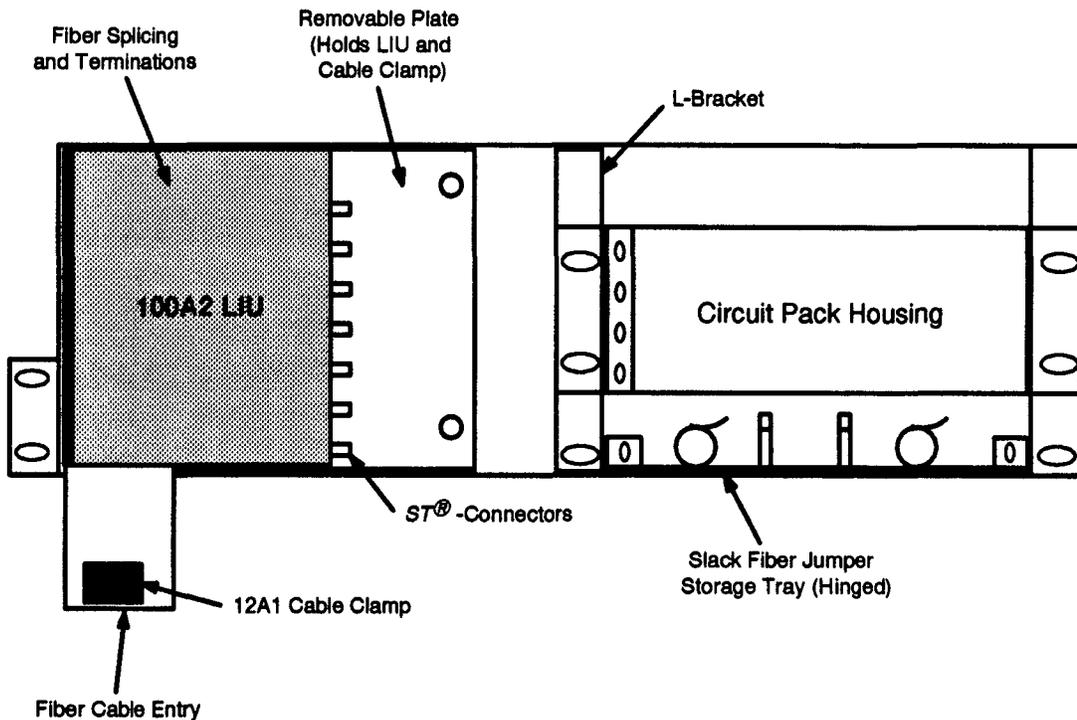


Figure 3-14. DDM-Plus Cabinet Distant Terminal

Shelf Dimensions

The Cabinet DT is 23 inches wide, 12.0 inches deep, and 9.0 inches high. These dimensions include all fiber management equipment and the circuit pack cage.

Circuit Pack Arrangement

Provisioning of optical DS1 service from the Cabinet DT is done in exactly the same way as the Extension Shelf in groups of four DS1s. The AEK-type T1 repeater circuit packs and the OLIU circuit packs cannot be mixed within a group. For instance, **do not** install two AEK-type T1 repeater circuit packs and one OLIU circuit pack into group A, attempting to transport two DS1s on copper and the other two on fiber. Such a deployment will not work because the OLIU and the AEK-type T1 repeater circuit packs will be accessing the same DS1s, causing a dual-feed condition that will corrupt the data on those DS1s. Dedicate all four of the DS1s in each group on either copper or fiber, but not both.

For shelves that are planned to contain both types of circuit packs, it is recommended that the OLIUs be equipped from left-to-right and the AEK-type repeaters be equipped from right-to-left.

It is also recommended that when an OLIU is operated in an unprotected mode that two AEK-39 BP1 circuit packs be placed in the unused slots to prevent accidentally inserting an AEK-type repeater. The AEK-39 BP1 circuit pack is also used by the DDM-1000 in unused DS1 positions.

The shelf is divided into three groups denoted **OL-A**, **OL-B**, and **OL-C**. Each group consists of four slots that will support four DS1s. Each group can be equipped with up to four AEK-type T1 repeater circuit packs or up to two OLIU circuit packs but not both at the same time. The OLIU circuit pack occupies two slots.

The OLIU circuit packs within a group are denoted as **1** or **2**. The circuit pack on the left is **1** and the circuit pack on the right is **2**.

Each slot location follows this notation:

OL-*<letter><number>*

OL — optical line
letter — denotes the group: A,B, or C
number — denotes the OLIU position within the group: 1 or 2

The following notation is an example of an OLIU slot location:

OL-C2

OL — optical line
C — third group from the left
2 — second OLIU in optical group C

The DDM-Plus Cabinet DT can be used to transport 12 DS1s on either copper or fiber as long as only one type of circuit pack is used in each of the three groups.

⇒ NOTE:

If a group of four DS1s is incorrectly provisioned by mixing an AEK-type T1 repeater circuit pack with an OLIU, no damage will be done to either circuit pack. The DS1 transmission will be corrupted.

Cabinet DT Cabling

All interfaces to the DDM-Plus Cabinet DT are connectorized. Refer to ED-8C730-20 for detailed cabling information.

Cabinet DT Electrical Interfaces

The Cabinet DT has the following electrical interfaces:

- Twelve 2-way DS1 electrical signals (DSX-1 compatible) (equipment side)
- Twelve 2-way T1 carrier signals (line side)
- Four office alarm closures (major visual, major audible, minor visual, minor audible)
- T1 carrier fault-locating pairs
- Eleven parallel telemetry interface points (used only by the OLIU circuit packs)
- Three miscellaneous discrete inputs (one input point for each group)
- Three miscellaneous discrete outputs (one output point for each group)
- Two -48 V DC power buses with common ground.

DS1 Equipment and T1 Interfaces

The DDM-Plus Cabinet DT provides twelve 2-way DS1 equipment interfaces or twelve 2-way T1 line interfaces through connectors on its backplane. These connectors are easily accessible for front access through standard cabling arrangements available from AT&T. The T1 line interfaces are only accessed by the AEK-type T1 repeater circuit packs; the OLIU circuit pack does not access the T1 line interfaces. The DS1 equipment interfaces are *ANSI* standard DS1 signals.

Dry-Contact Alarm Closures

The DDM-Plus Cabinet DT provides the following four alarm closures:

- Major audible
- Major visual
- Minor audible
- Minor visual.

Access to these alarm closures is through a connector on the backplane. The major closures are activated if one or more of the circuit packs housed in the Cabinet DT signal a major alarm (that is, the shelf alarm closure is a logical OR'ing of all circuit pack alarms). The major closure is also activated if the shelf suffers a complete loss of -48 V DC on either of its power buses. Similarly, for the OLIUs the minor closures are activated if one or more of the circuit packs housed in the shelf signal a minor alarm. For alarming conditions on the OLIU circuit pack, refer to Table 6-6, *OLIU Circuit Pack Fault and Alarm Indicators*, in Chapter 6, *Maintenance Description*.

Parallel Telemetry Interface

The DDM-Plus Cabinet DT provides 11 parallel telemetry output points. These points are used only by the OLIU circuit packs, are accessible through a DB25 connector on the backplane, and provide the following:

- Major alarm.
- Minor alarm.
- Failure at near-end (NE).
- Failure at far-end (FE).
- Group failure — 1 output point for each group.

This use of the parallel telemetry interface for the shelf provides enough information to pinpoint failure type (major or minor), failure location (NE or FE), and failure group identification (groups A through C). In most single failure scenarios, this is enough information to determine precisely the location of the failure for quick and easy craft personnel dispatch.

Fusing

The DDM-Plus Cabinet DT has two fuses. Fuse **FA** powers the odd numbered slots through bus A. Fuse **FB** powers the even numbered slots through bus B. These fuses are located on the fuse and alarm circuit pack. When a fuse operates (blows), a red indicator pops up and initiates a major alarm.

The OLIU occupies both odd and even numbered slots, selects either bus A or B, and switches to the alternate if one bus fails. The T1 repeater occupies only one slot, therefore, connecting to either bus A or B. If the bus supplying the T1 repeater loses power, then the T1 repeater drops service.

Fiber Management

The DDM-Plus Cabinet DT is equipped with a full complement of fiber management features. Its capabilities are easily described by following the typical routing of the fiber when the housing is deployed in an outside cabinet such as in the AT&T 51A cabinet. Refer to Figure 3-15. The outside plant cable enters the cabinet and is terminated at the 12A1 fiber clamp located on the lower left corner of the Cabinet DT. This clamp terminates and grounds the cable sheath. From the terminated outside plant cable, the fiber bundles enter an AT&T standard 100A2 lightguide interconnect unit where they can be spliced to short connectorized jumpers. The splices and the jumpers are stored inside the 100A2 LIU. The short jumpers run from the splices to inside a cross-connect panel located on the right of the 100A2 LIU. From outside the cross-connect panel of the 100A2 LIU, standard *ST*-connectorized jumpers are used to make the final connection to the OLIUs. Any excess length in these jumpers can be stored in fiber storage clips located just below the circuit pack cage. The DDM-Plus provides a usable and friendly environment for deploying the DDM-Plus System in small spaces.

Cabinet Arrangement

The modular design of the Cabinet DT allows it to be mounted in the 51A cabinets. Figure 3-15 shows a typical cabinet arrangement for the Cabinet DT. Refer to ED-8C730-10 and FPD 801-525-169 for additional information on cabinet arrangements.

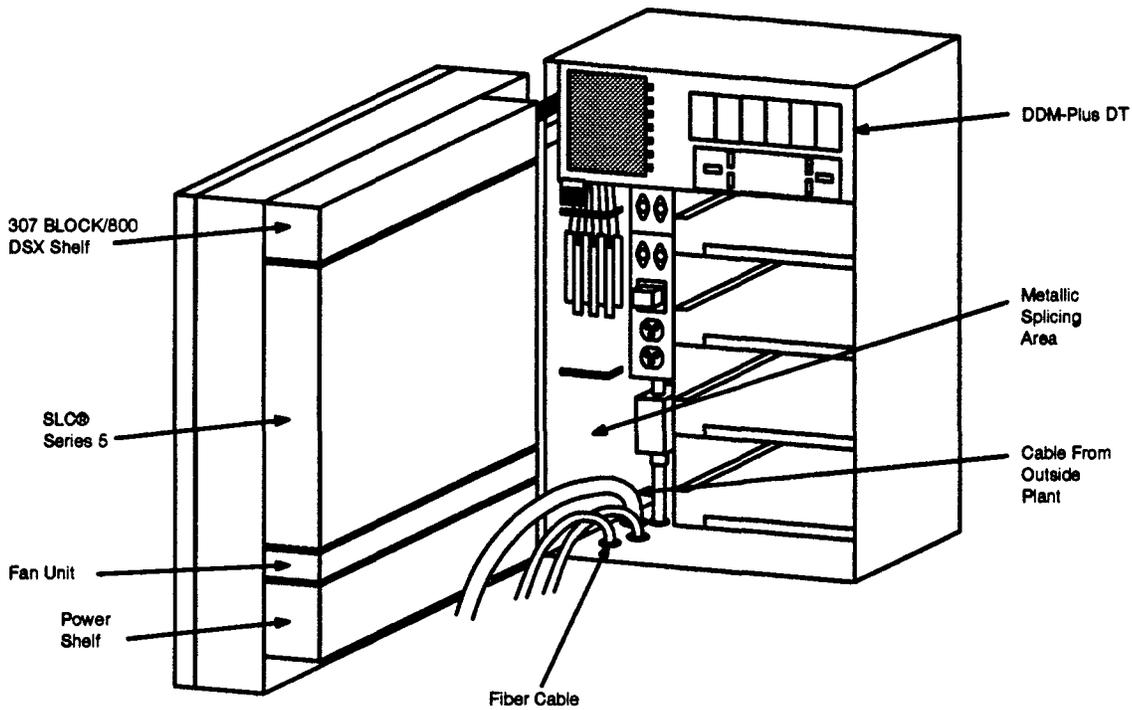


Figure 3-15. Cabinet Distant Terminal in 51A Cabinet

Functional Description

4

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Functional Description

4

Optical Transmission Overview

This chapter contains a functional description of the DDM-Plus System and is intended to provide a general knowledge of how it works. Also included in this chapter is a functional description of the DDM-Plus 1+1 protection switching.

The optical line interface unit (OLIU) circuit pack is the primary component of the DDM-Plus System. This circuit pack can be divided into the following four basic functions. Refer to Figure 4-1.

- DS1 interface
 - Multiplexing/demultiplexing
 - Optical line encoding/decoding
 - Optical interface.
-

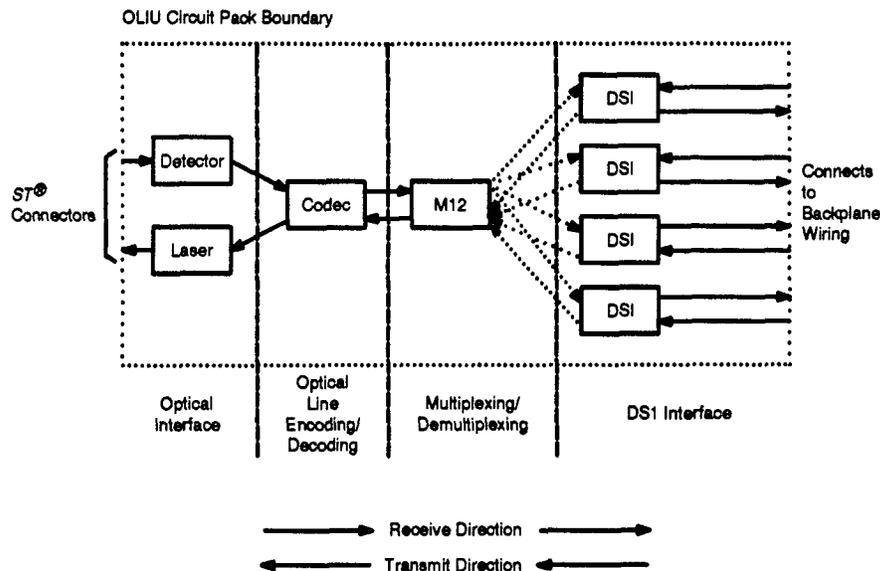


Figure 4-1. DDM-Plus OLIU Simplified Block Diagram

Transmit Direction

The DS1 signals enter the OLIU DS1 interface through the housing backplane wiring and accept either framed or unframed DS1 signals. The four DS1 signals are multiplexed by the M12 multiplexer into a DS2 electrical signal. The DS2 electrical signal is internal to the circuit pack. There is no external interface to the DS2 signal. The DS2 electrical signal is then passed to the optical line coder circuitry where the codec encodes the DS2 electrical signal to provide an overhead channel and data redundancy for BER monitoring that brings the optical line rate to 9.468 Mb/s. This overhead channel allows the near- and far-end DDM-Plus to communicate, thereby, providing protection switching, far-end loopback, and far-end alarms. The resulting signal from the codec is passed to the optical interface for conversion to an optical signal. The output signal is an optical signal that leaves the transmit *ST*[®] connector located behind the faceplate on the right printed wiring board. The fiber connecting the OLIU can be either a single-mode or multimode fiber.

Receive Direction

The optical signal enters the connecting OLIU receive *ST* connector located behind the faceplate on the left printed wiring board. The optical signal is converted to an electrical signal by the optical interface. Next, the electrical signal is decoded; the overhead channel information is extracted; and BER processing is performed. The remaining DS2 electrical signal is passed to the M12 for demultiplexing into four DS1 signals.

DS1 Interface

Each of the four DS1 interfaces meets the DSX-1 interconnection standards as specified in *ANSI T1.102-1987*, Section 2.

The DS1 interfaces maintain complete individuality. Each DS1 interface has an individual line build-out setting and individual AMI/B8ZS selection. The DIP switches for provisioning the DS1 interface options are consistent with the functions of the switches on the DDM-2000 OC-3 DS1 circuit pack.

When a DS1 interface detects an incoming DS1 loss of signal (LOS), it inserts a DS1 alarm indication signal (AIS) into the DS1 signal for transmission over the fiber. The OLIU can be provisioned to generate either a minor alarm or no alarm for loss of incoming DS1 signals. Refer to *Operation and Maintenance*, for procedures to set option switches.

The four DS1s are not required to be synchronized with one another. The DDM-Plus timing is derived from its incoming DS1 signals and cannot be used as a timing source. It operates in an asynchronous timing mode based on the incoming DS1 signals.

Optical Interface

The optical interface of the OLIU transports the high-speed data stream obtained from multiplexing the four DS1 signals and the overhead channel. Two models of the OLIU are available: the 25A OLIU (equipped with a 780 nm laser) and the 25F OLIU (equipped with a 1300 nm laser). The only difference between these two models is in the optical interface circuitry.

The 1300 nm laser of the 25F OLIU takes advantage of the lower losses of the single-mode fiber at that wavelength and extends the length of the fiber span beyond that provided by the 780 nm wavelength of the 25A OLIU. The optical interface uses a PIN diode as its detector. The 25A OLIU detector is optimized for the 780 nm laser, and the 25F OLIU detector is optimized for the 1300 nm laser. Thus, the 25A OLIU cannot be connected optically to a 25F OLIU at the far-end. The same type of OLIU must be at each end of the fiber; however, the two types of OLIUs can be used together as protected partners.

Both the 25A OLIU and 25F OLIU are equipped with a high/low laser power switch for adjusting the output power of the laser. In the high-power position, the laser operates at full power supporting the specified spans. In the low-power position, the laser output power is attenuated by approximately 3 dB, which reduces the span of both models of OLIU.

A minimum span length of 0 km is supported for low-power modes of the laser using *single-mode* fiber loop to be placed from the transmit *ST* connector directly to the receive *ST* connector for testing. The high-power laser mode or a multimode fiber jumper cannot be used for direct loopback. However, if they are used, the receiver will not be damaged.

Any optical signal failure causes the OLIU to insert AIS into each outgoing DS1 signal.

Protection Switching

The DDM-Plus has a 1+1 protection switching architecture to guard against both fiber and electronic failure. The protection switching algorithm is bidirectional.

Figure 4-2 shows high-level views of both unprotected and protected deployments of the DDM-Plus. Unprotected deployment calls for one OLIU circuit pack at each location connected with two fibers. Protected deployment requires two identical OLIU circuit packs at each location connected with four fibers.

An initially unprotected system can be upgraded to a 1+1 fully protected system simply by adding one OLIU circuit pack at each location and connecting these two new circuit packs with two fibers. Each location automatically recognizes the newly added circuit pack and enters the auto 1+1 protection switching mode. After this upgrade, there is a total of two circuit packs at each location and a total of four fibers connecting them (Figure 4-2). The communication link between the two collocated OLIUs is automatically established by the housing backplane wiring when the second OLIU is added.

A protected system can be downgraded to an unprotected system by removing the current standby OLIU circuit pack at each location and by disconnecting the fiber. After the downgrade, there is a total of one circuit pack at each location with two interconnecting fibers (Figure 4-2).

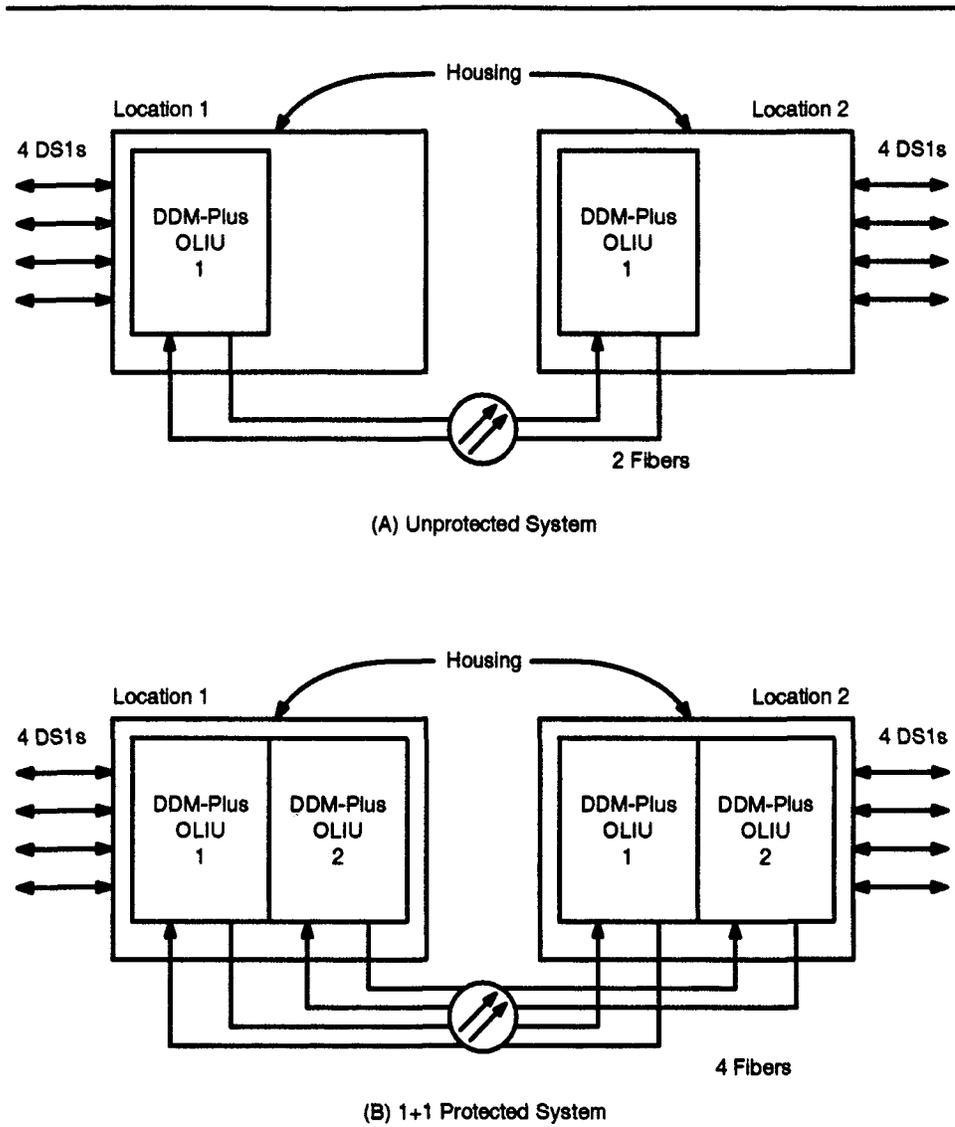


Figure 4-2. Unprotected and Protected System

1+1 Protection Switching Architecture

The 1+1 protection switching architecture is shown in Figure 4-3. Here the DS1 signals are dual-fed onto both outgoing fibers. The receiver, however, passes only one of these lines at a time and passes that line's four DS1s through the system outgoing DS1 lines. The line that is currently being listened to is called the active line. The other line is called the standby line. The receiving optical interface of the OLIU monitors the integrity of the active line and automatically switches to the standby line if the active line integrity drops into an unacceptable range. A manual switch can also be performed by pressing the appropriate pushbuttons on the OLIU faceplate.

An automatic protection switch takes place if the active line integrity becomes unacceptable. Protection switching is based on switching away from a bad line rather than switching to the best line. Protection switching is done within 60 ms.

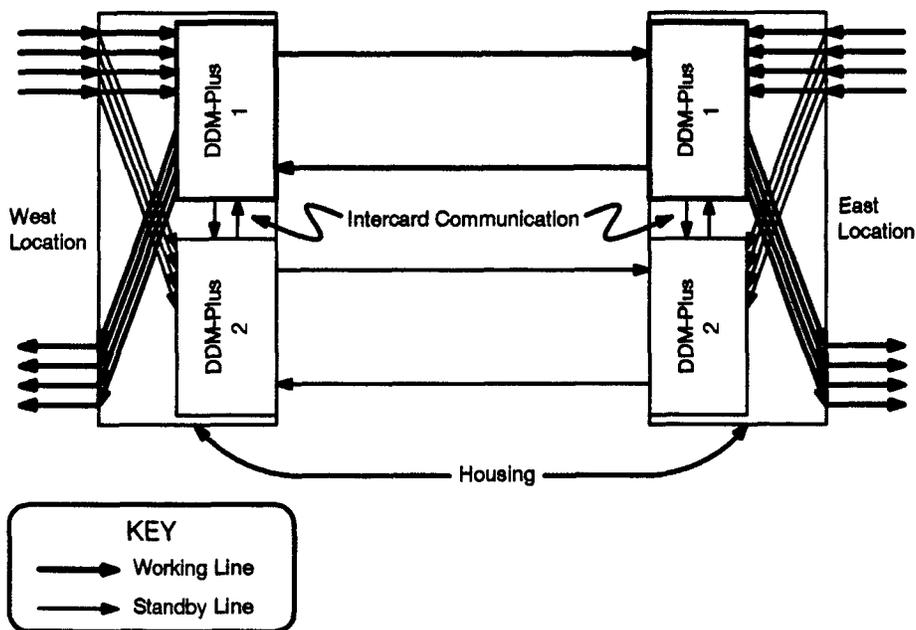


Figure 4-3. 1+1 Protection Switching Architecture

All faults that cause an automatic protection switch are alarmed by the OLIU circuit pack. If protection is available and can be successfully completed so service is not affected, a minor alarm is produced. Otherwise, a major alarm is produced.

Both directions of traffic are always carried using the same pair of OLIUs. The east location and the west location communicate using the overhead channel provided by the codec. It is through this overhead channel that the OLIUs agree on which line is standby and active. The active line is indicated by an LED labeled **ACTIVE** on the faceplate of the active OLIU. In this way, both directions of service are either traveling by the "1" OLIU or the "2" OLIU. Both directions are always carried by the same OLIU pair.

When a protection switch occurs, both directions of transmission switch from the current active OLIU pair to the standby pair. After the switch has taken place, the two links have traded roles. The previously standby pair is now active and the previously active pair is now standby.

Figure 4-4 shows an example of the protection switch taking place as follows.

- Step 1** The failure is detected by the receiving east location. See Figure 4-4A.
- Step 2** The DDM-Plus at the east location checks the integrity of its standby line. If the standby line has acceptable integrity for the level of the switch request, a switch will be requested. If the standby line integrity is not acceptable, the sequence stops and the east location returns to the state existing just before the failure detection. See Figure 4-4B.
- Step 3** The west location accepts or rejects the switch request depending on the current integrity of its standby line, using the same switch hierarchy that the east location used. If the west location accepts the switch request, the west DDM-Plus location goes ahead and makes the protection switch and sends a positive acknowledgment to the east DDM-Plus location. If the west location rejects the switch request, a negative acknowledgment is sent to the east location. See Figure 4-4C.
- Step 4** The east location acts on the switch acknowledgment from the west location. If the acknowledgment is positive, the east location makes the protection switch, completing the sequence. If the acknowledgment is negative, no switch is made and the east location returns to the state existing just before the failure detection and initiates a major alarm. See Figure 4-4D.

⇒ NOTE:

For negative responses, the condition that originally caused the switch request will probably not have cleared. The east DDM-Plus location will try again to reinitiate the switch request.

The DDM-Plus protection switch is nonreverting. After a switch has been made and the failure has been repaired, the system does not switch back to the link it was using before the failure. It maintains the active line that resulted from the protection switch.

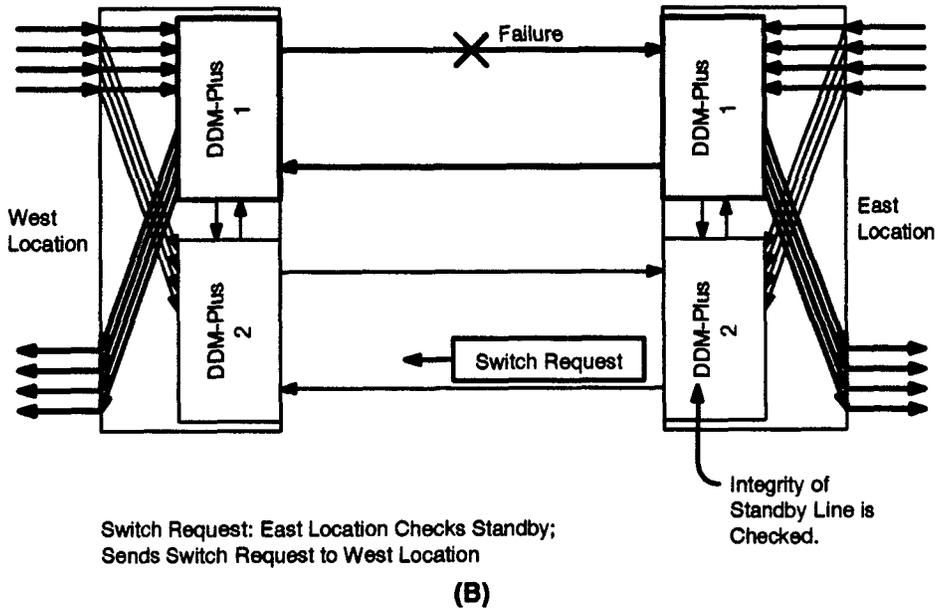
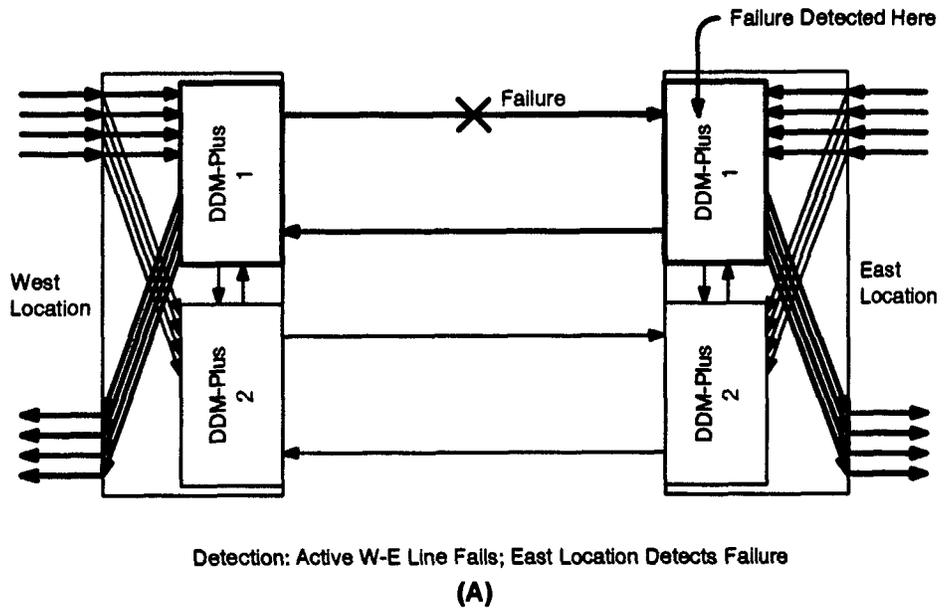
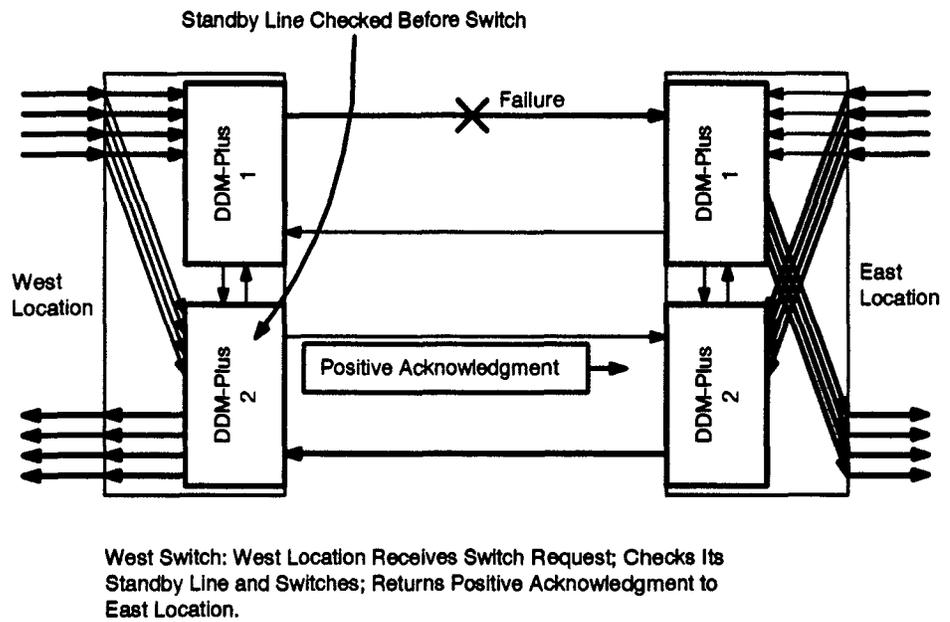
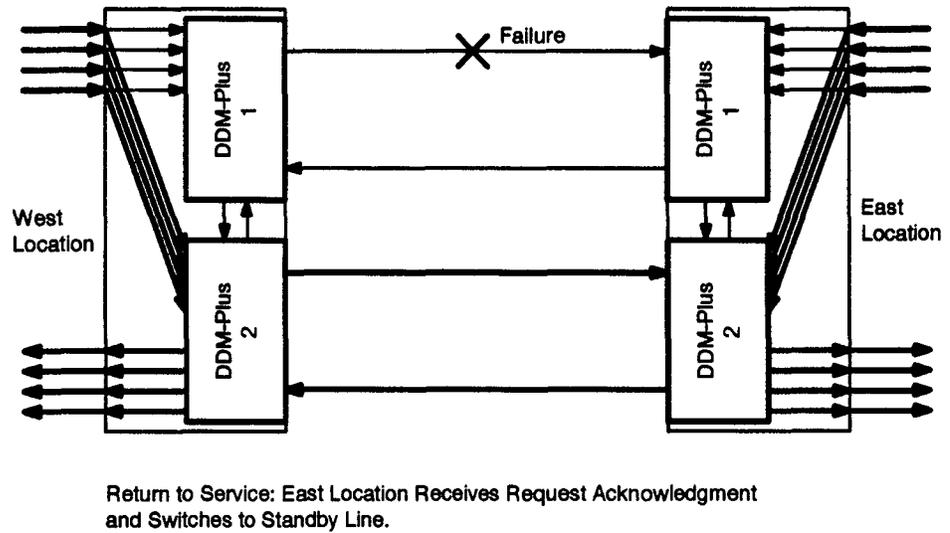


Figure 4-4. Protection Switch (Sheet 1 of 2)



(C)



(D)

Figure 4-4. Protection Switch (Sheet 2 of 2)

Figure 4-5 shows the simplified interconnections of a DDM-Plus System equipped with a standby OLIU.

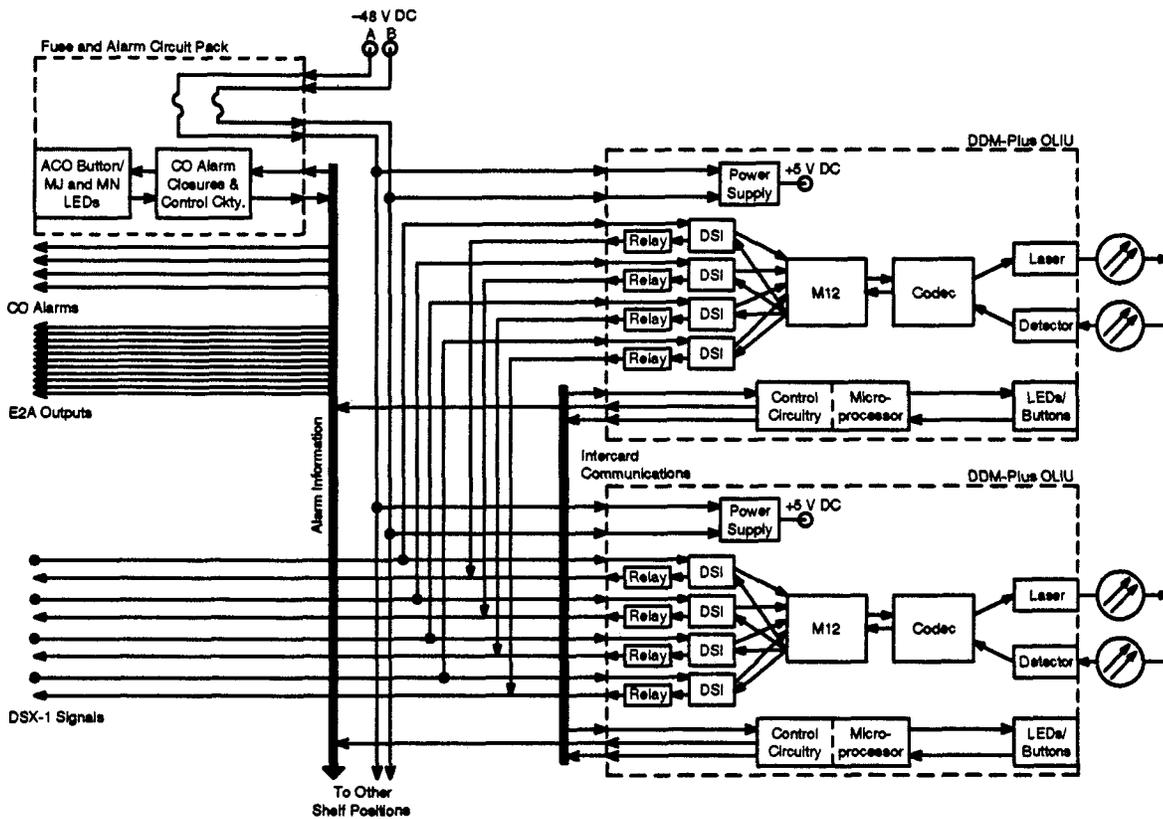


Figure 4-5. DDM-Plus System Interconnections

T1 (Metallic) Transmission Overview

In the line-receive direction the AEK-type T1 repeaters provide secondary surge protection, automatic line buildout, and signal regeneration. The equipment output provides a 3.0 volt peak output pulse at the DSX-1 and a fault-locating signal. All repeaters except the AEK90 provide an equalized equipment output signal for a maximum distance of 85 feet to the DSX-1. The AEK90 provides a 5 range equalized equipment output signal for a maximum cabling distance of 655 feet to the DSX-1. All DSX-1 cabling is with 22 AWG shielded cable.

In the line-transmit direction, the AEK-type T1 repeaters provide secondary surge protection. The transmit path, from equipment to line, is passive with an insertion loss of 1.4 dB at 772 kHz. The AEK88 provides an insertion loss option of an additional 3 dB.

All AEK-type T1 repeaters are capable of supplying a 60 mA constant current to the line. This current is the simplex power loop current. The simplex power loop current provides line equipment (for example, line repeaters) with power necessary for signal regeneration. The maximum load that a repeater is able to power is designated *maximum loop resistance*. The maximum resistance includes both the load presented by the line as well as the load of the powering office repeater. The load of the powering office repeater is designated *effective resistance*.

AEK86B T1 Office Repeater

The simplex power loop current is supplied by a DC-DC converter module powered by -48 volt nominal office battery. The DC-DC converter automatically adjusts the simplex loop voltage in order to maintain a constant simplex loop current of 60 mA. The AEK86B can supply a maximum loop voltage of -130 volts with a *maximum loop resistance* of 2100 ohms. The positive output side of the DC-DC converter is referenced to ground through 33 kilohms that provides electrolysis protection for the T1 line.

The AEK86B repeater also has monitoring circuitry that initiates an MJ alarm and lights a faceplate **FAULT** indicator when the simplex loop current fails due to an open power loop or a DC-DC converter failure. The faceplate also contains jacks for monitoring a voltage proportional to the line current.

AEK88 T1 Office Repeater

The simplex power loop current is supplied by a current regulator circuit on the -48 volt battery (-BATT). The current regulator maintains a 60 mA loop current with a maximum loop voltage equal to the nominal 48 volt battery. The maximum loop resistance is 508 ohms.

The AEK88 repeater also monitoring circuitry that initiates an MJ alarm and lights a faceplate FAULT indicator when the simplex loop current fails due to an open power loop or DC regulator failure. The faceplate also contains test jacks for monitoring a voltage proportional to the line current.

The AEK88 regenerator is normally energized by -48 volt nominal office battery. This powering mode is designated N *normal*. The AEK88 may also be optioned to be energized from a 60 mA powered line. This powering mode is designated L *looped*. The AEK88 presents an effective resistance of 208 while in the *loop* powering mode. Only the *loop* powering mode will not allow the FAULT indicator or the ALM output to operate. These functions require the application of -48 V office battery.

AEK90 T1 Office Repeater

The simplex power loop current is supplied by a DC-DC converter module powered by -48 volt nominal office battery. The DC-DC converter automatically adjusts the simplex loop voltage in order to maintain a constant simplex loop current of 60 mA. The AEK90 can supply a maximum loop voltage of -130 volts with a *maximum* loop resistance of 2100 ohms. The positive output side of the DC-DC converter is referenced to ground through 33 kilohms that provides electrolysis protection for the T1 line.

The AEK90 repeater also has monitoring circuitry that initiates an MJ alarm and lights a faceplate FAULT indicator when the simplex loop current fails due to an open power loop or DC-DC converter failure. The faceplate also contains test jacks for monitoring a voltage proportional to the line current.

Engineering Rules for T1 Extensions

To ensure that the simplex power loop line current requirements are met for the expected temperature range of the power loop, the *maximum power loop resistance* must be calculated using the procedure given in *T1 Digital Line — Transmission and Outside Plant Design Procedure*, AT&T 855-351-101. The power loop resistance ranges are shown in Table 4-1. In a typical application, the AEK86B and AEK90 are capable of powering a span of 8 line repeaters and 50 kft of 22 AWG PIC cable; the AEK88 can power 1 repeater and 9,000 feet of 22 AWG PIC cable.

Table 4-1. Maximum Loop Resistance Range

<u>Repeater Type</u>	<u>Minimum Ohms</u>	<u>Maximum Ohms</u>
AEK86B	0	2100
AEK88	0	508
AEK90	0	2100

The DDM-Plus shelf is designed for the maximum current requirements of 28 AEK86B or AEK90 T1 repeaters with maximum loop resistances of 2100 ohms. If the DDM-Plus shelf is powered with a battery backup, it may be necessary to limit the number of repeaters to satisfy the minimum holdover time. Specific current drain information for the AEK88, AEK86B, and AEK90 is presented in AT&T 365-200-107. Refer to Chapter 7, *Powering*, for detailed power requirements.

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Optical Interface

This chapter describes the faceplate of the DDM-Plus optical line interface unit (OLIU) circuit pack, which is the primary user interface. The faceplate supplies access to provision, operate, administrate, and maintain the DDM-Plus System. Figure 5-1 shows the 25A OLIU faceplate. The 25F OLIU faceplate is identical to the 25A OLIU but is labeled 25F OLIU. Table 5-1 gives a summary of the pushbuttons, indicators, and their uses. All the information in this chapter applies to both the 25A OLIU and 25F OLIU.

Any maintenance operation that can affect service requires pressing an **ENABLE** pushbutton with the desired operation pushbutton. This is done to prevent accidental interruption of service. When this operation is referenced in the following descriptions, the user performs the dual-button sequence by first pressing and holding an **ENABLE** pushbutton, and then pressing the pushbutton corresponding to the desired operation.

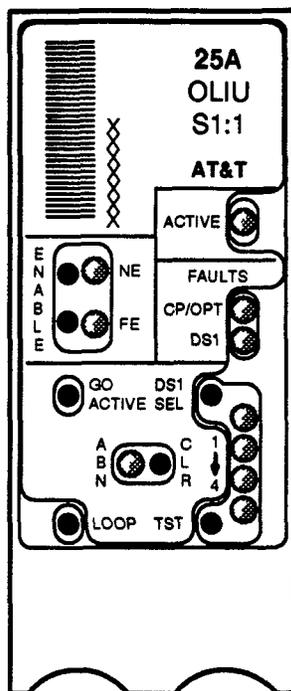


Figure 5-1. User Interface — OLIU Faceplate

ACTIVE Indicator

The **ACTIVE** indicator is a green LED that lights whenever that circuit pack is active. The OLIUs deployed in an unprotected configuration will always have their **ACTIVE** indicators lighted, unless there is a failure affecting the traffic carried by the circuit pack.

In a protected configuration, only the circuit pack that is actually carrying service has its **ACTIVE** indicator lighted. The **ACTIVE** indicator is not lighted on the standby OLIU.

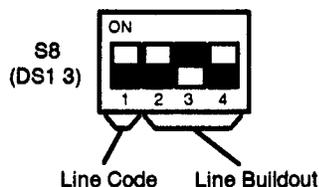
NE Indicator and ENABLE Pushbutton

The **NE** indicator is a yellow LED that depicts the presence of faults at the near-end. Whenever there is a fault at the near-end OLIU whether it is major, minor, or not reported, the **NE** indicator is continuously lighted. When the **NE** indicator is not lighted, there are no faults detected at the near-end OLIU.

Near-end OLIU status is displayed by pushing and holding the **ENABLE** pushbutton adjacent to the **NE** indicator. The convention **NE/ENABLE** will be used to represent pressing the **ENABLE** pushbutton adjacent to the **NE** indicator. While the **NE/ENABLE** pushbutton is depressed, the faceplate displays faults existing at the near-end of the optical link and equipped DS1s. The DS1s equipage is shown by the corresponding information indicators (1→4). The information indicators light for equipped DS1s and are not lighted for unequipped DS1s. When the pushbutton is released, the indicators return to their normal state and show both near- and far-end faults.

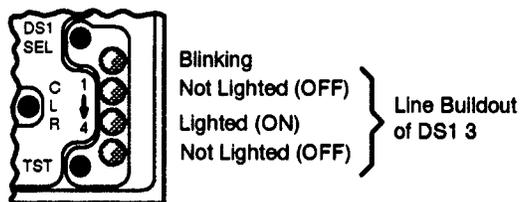
The line build-out provisioning of a specific near-end DS1 can be displayed by selecting the DS1 (see *DS1 SEL* Pushbutton) and then pressing and holding the **NE/ENABLE** pushbutton. After the **NE/ENABLE** has been depressed for 3 seconds, the information indicators display the option switch setting (S6, S7, S8, or S9) that provisions the line buildout of the selected DS1. The first information indicator blinks indicating that the line buildout of the selected DS1 is being displayed, while information indicators two, three, and four display the DS1 option switch settings. An ON setting is represented by a lighted indicator and an OFF setting is represented by an indicator not lighted. For detailed information on the option switches and their settings refer to Chapter 6, *Maintenance Description*, under *DS1 Port Provisioning*.

For example, to verify the line build-out setting of DS1 3, the **DS1 SEL** pushbutton is repeatedly pressed until the third information indicator lights. With DS1 3 now selected, press and hold the **NE/ENABLE** pushbutton. After 3 seconds, the first information indicator blinks and information indicators two, three, and four display the option switch setting for switch S8, switch positions 2, 3, and 4, respectively. Figure 5-2 shows how the information indicators would display DS1 3 line buildout when set for 181 to 270 feet for 1249C cable or 268 to 400 feet for 613C cable.



Switch Position 1 - Not Displayed
Switch Position 2 - OFF
Switch Position 3 - ON
Switch Position 4 - OFF

Partial View of OLIU Faceplate



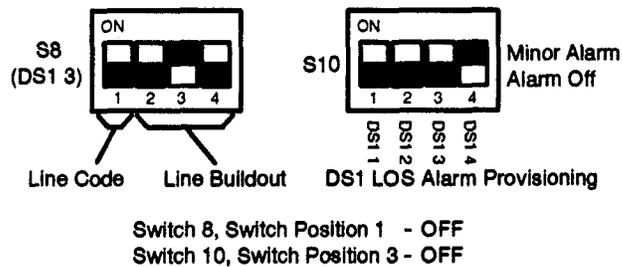
DS1 3 provisioned for line buildout 181 to 270 feet for 1249C cable and 268 to 400 feet for 613C cable.

Figure 5-2. Information Indicators Showing Line Buildout

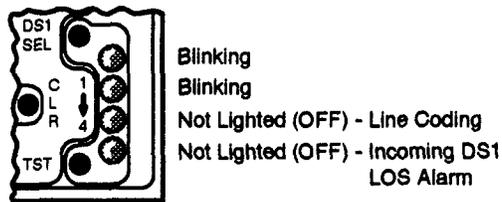
Line coding and loss of signal (LOS) alarm provisioning of a specific near-end DS1 can be displayed by selecting the DS1 (see *DS1 SEL Pushbutton*) and then pressing twice and holding the **NE/ENABLE** pushbutton. After the **NE/ENABLE** has been depressed for 3 seconds following the second push, the information indicators display the option switch setting that provisions the line coding (S6, S7, S8, and S9) and LOS alarm (S10) of the selected DS1. The first and second information indicators blink indicating that the line coding and LOS alarm provisioning of the selected DS1 are being displayed. Information indicator three displays the line coding option switch setting, and information indicator four displays the LOS alarm provisioning option switch settings.

Line coding provisioned for alternate mark inversion (AMI), the ON setting, is represented by a lighted indicator; and line coding provisioned for bipolar eight-zero substitution (B8ZS), the OFF setting, is represented by the third information indicator not lighted. When the LOS alarm provisioning is set to generate a minor alarm upon detection of an incoming DS1 LOS, the ON setting, the fourth information indicator is lighted. When the LOS alarm provisioning is set not to generate an alarm upon detection of an incoming DS1 LOS, the OFF setting, the fourth information indicator is not lighted. For detailed information on the option switches and their settings refer to Chapter 6, *Maintenance Description*, under *DS1 Port Provisioning*.

For example, to verify the line coding and LOS alarm provisioning of DS1 3, the **DS1 SEL** pushbutton is repeatedly pressed until the third information indicator lights. With DS1 3 now selected, press twice and hold the **NE/ENABLE** pushbutton. After 3 seconds, the first and second information indicators blink and information indicator three displays the option switch setting for switch S8, switch position 1. Information indicator four displays option switch S10, switch position 3. Figure 5-3 shows how the information indicators would display DS1 3 line coding when set for B8ZS, and LOS alarm is set not to generate an alarm for incoming DS1 LOS.



Partial View of OLIU Faceplate



DS1 3 provisioned for B8ZS line coding and no alarm for incoming DS1 LOS.

Figure 5-3. Information Indicators Showing Line Coding and LOS Provisioning

Service-affecting maintenance operations on the near-end unit are enabled by pressing and holding the **NE/ENABLE** pushbutton and then depressing the pushbutton for the desired maintenance function. If the **NE/ENABLE** pushbutton is not depressed along with the desired maintenance pushbutton, the OLIU does not initiate the desired maintenance activity.

FE Indicator and ENABLE Pushbutton

The **FE** indicator is a yellow LED that depicts the presence of faults at the far-end of the optical link. Whenever there is a fault at the far-end OLIU whether it is major, minor, or not reported, the **FE** indicator is continuously lighted. The **FE** indicator is not lighted when there are no faults detected at the far-end OLIU.

Far-end OLIU status is displayed by pushing and holding the **ENABLE** pushbutton adjacent to the **FE** indicator. The convention **FE/ENABLE** will be used to represent pressing the **ENABLE** pushbutton adjacent to the **FE** indicator. While the **FE/ENABLE** pushbutton is depressed, the faceplate displays faults existing at the far-end of the optical link and equipped DS1s. The DS1s equipage is shown by the corresponding information indicators (1→4). The information indicators light for equipped DS1s and are not lighted for unequipped DS1s. When the pushbutton is released, the indicators return to their normal state and show both near- and far-end faults.

The line build-out provisioning of a specific far-end DS1 can be displayed by selecting the DS1 (see *DS1 SEL Pushbutton*) and then pressing and holding the **FE/ENABLE** pushbutton. After the **FE/ENABLE** has been depressed for 3 seconds, the information indicators display the option switch setting (S6, S7, S8, or S9) that provisions the line buildout of the selected DS1. The first information indicator blinks indicating that the line buildout of the selected DS1 is being displayed, while information indicators two, three, and four display the DS1 option switch settings. An ON setting is represented by a lighted indicator and an OFF setting is represented by an indicator not lighted. For detailed information on the option switches and their settings refer to Chapter 6, *Maintenance Description*, under *DS1 Port Provisioning*.

For example, to verify the line build-out setting of DS1 3, the **DS1 SEL** pushbutton is repeatedly pressed until the third information indicator lights. With DS1 3 now selected, press and hold the **FE/ENABLE** pushbutton. After 3 seconds, the first information indicator blinks and information indicators two, three, and four display the option switch setting for switch S8, switch positions 2, 3, and 4, respectively. Figure 5-2 shows how the information indicators would display DS1 3 line buildout when set for 181 to 270 feet for 1249C cable or 268 to 400 feet for 613C cable.

Line coding and LOS alarm provisioning of a specific far-end DS1 can be displayed by selecting the DS1 (see *DS1 SEL Pushbutton*) and then pressing twice and holding the **FE/ENABLE** pushbutton. After the **FE/ENABLE** has been depressed for 3 seconds following the second push, the information indicators display the option switch setting that provisions the line coding (S6, S7, S8, and S9) and LOS alarm (S10) of the selected DS1. The first and second information indicators blink indicating that the line coding and LOS alarm provisioning of the selected DS1 are being displayed. Information indicator three displays the line coding option switch setting, and information indicator four displays the LOS alarm provisioning option switch settings.

Line coding provisioned for alternate mark inversion (AMI), the ON setting, is represented by a lighted indicator; and line coding provisioned for bipolar eight-zero substitution (B8ZS), the OFF setting, is represented by the third information indicator not lighted. When the LOS alarm provisioning is set to generate a minor alarm upon detection of an incoming DS1 LOS, the ON setting, the fourth information indicator is lighted. When the LOS alarm provisioning is set not to generate an alarm upon detection of an incoming DS1 LOS, the OFF setting, the fourth information indicator is not lighted. For detailed information on the option switches and their settings refer to Chapter 6, *Maintenance Description*, under *DS1 Port Provisioning*.

For example, to verify the line coding and LOS alarm provisioning of DS1 3, the **DS1 SEL** pushbutton is repeatedly pressed until the third information indicator lights. With DS1 3 now selected, press twice and hold the **FE/ENABLE** pushbutton. After 3 seconds, the first and second information indicators blink and information indicator three displays the option switch setting for switch S8, switch position 1. Information indicator four displays option switch S10, switch position 3. Figure 5-3 shows how the information indicators would display DS1 3 line coding when set for B8ZS, and LOS alarm is not set to generate an alarm for incoming DS1 LOS.

Service-affecting maintenance operations on the far-end unit can be enabled by pressing and holding the **FE/ENABLE** pushbutton and then depressing the pushbutton for the desired maintenance function. If the **FE/ENABLE** pushbutton is not depressed along with the desired maintenance pushbutton, the OLIU does not initiate the desired maintenance activity.

Information Indicators — 1→4

The information indicators are four green LEDs that show miscellaneous information about the OLIU, the DS1 ports, and other maintenance activities. The meaning of these LEDs is dependent on the current state of the system. The information indicator LEDs provide the following supportive information:

- Fault indication
- Maintenance activities
- Port provisioning of selected DS1 port.

The specific meanings are described at appropriate points in the description of the faceplate.

ABN Indicator

The **ABN** indicator is a yellow LED used to indicate that user-initiated maintenance activity is underway. The **ABN** indicator lights for the following maintenance activity:

- Loopbacks
- Tests
- Protection switching lockout.

CLR Pushbutton

The **CLR** pushbutton is used to clear the maintenance condition and to return the OLIU to its normal operating mode. Pressing the **CLR** pushbutton when the **ABN** indicator is lighted will clear the maintenance condition, extinguish the **ABN** indicator, and return the OLIU to its normal operating mode. Pressing the **CLR** when the OLIU is in its normal operating condition has no effect and is ignored by the OLIU.

CP/OPT Fault Indicator

The **CP/OPT** fault indicator is a red LED that is continuously lighted for circuit pack failures and is blinking for optical line failures. The circuit pack is considered to have failed if a fault is detected at any of the health checkpoints in the circuit pack. The optical line is considered to have failed if a loss of optical signal or a signal degrade condition is detected on the line.

In normal conditions when neither the far- nor near-end **ENABLE** pushbutton is depressed, this indicator shows the faults existing at both the near- and far-end. For instance, if either the near- or far-end has a circuit pack failure, this indicator will be continuously lighted. When either **ENABLE** pushbuttons are depressed, this indicator shows the status existing at the selected location. While displaying a summary of both locations or while displaying status at one location only and if both a circuit pack failure and an optical failure exist, the circuit pack failure takes precedence and the indicator is continuously lighted.

DS1 Fault Indicator

The **DS1** fault indicator is a red LED that is continuously lighted when a mismatch occurs between the provisioning of any DS1 ports on the active pack and the provisioning of the corresponding DS1 port on the standby circuit pack, and when a line buildout option switch is set to an invalid setting. The **DS1** indicator blinks when an incoming loss of signal (LOS) is detected.

The provisioning of two DS1 ports is considered to be mismatched or invalid for the following settings:

1. Line code selection (either AMI or B8ZS)
2. Line buildout (equalization distance)
3. Alarm selection on LOS (either minor alarm or no alarm)
4. BER selection
5. Illegal line equalization setting
6. Illegal BER setting.

In addition to lighting the **DS1** fault indicator, the OLIU also shows the particular DS1s that are affected by blinking the corresponding information indicators (labeled 1→4).

In normal operation, this indicator displays faults at both the near- and far-end. When either **ENABLE** pushbutton is depressed, this indicator shows only the faults existing at the selected location. While displaying a summary of both locations or while displaying status at one location only, and if both a provisioning mismatch and a DS1 LOS failure exist, the DS1 LOS takes precedence and the indicator blinks.

GO ACTIVE Pushbutton

The **GO ACTIVE** pushbutton is used with the **NE/ENABLE** pushbutton to alter the current protection switching status. Since a protection switch is potentially service affecting, this is a 2-button activation sequence. If not pressed along with the **NE/ENABLE** pushbutton, the **GO ACTIVE** pushbutton has no meaning and is ignored.

The effect of the **GO ACTIVE** and **NE/ENABLE** 2-button activation sequence depends on whether the circuit pack is active or standby at the time of activation. If standby, service is switched to the standby OLIU, automatic protection switching is inhibited, and the **ABN** indicators light. The previously active OLIU is now standby and automatic protection switching is inhibited. As long as the **ABN** indicators are lighted, protection switching is inhibited. Press the **CLR** (clear) pushbutton to enable protection switching and to extinguish the **ABN** indicators.

If active, the OLIU toggles between inhibited and automatic protection switching modes allowing users to inhibit or enable automatic protection switching. Whenever protection switching is inhibited, the **ABN** indicators are lighted. Press the **CLR** (clear) pushbutton to enable protection switching and extinguish the **ABN** indicators.

DS1 SEL Pushbutton

The **DS1 SEL** pushbutton is used to select a DS1 and to update DS1 port equipage both at the near- and far-end locations.

To select a desired DS1, repeatedly press the **DS1 SEL** pushbutton. With each push of the pushbutton, the information indicator (1→4) moves one step through the following cycle going back to Step 1 after completing Step 5. Stop when the desired DS1 is shown:

1. DS1 1 LED lights; other LEDs off.
2. DS1 2 LED lights; other LEDs off.
3. DS1 3 LED lights; other LEDs off.
4. DS1 4 LED lights; other LEDs off.
5. All LEDs off. (Cycle back to Step 1 following Step 5.)

Before displaying a DS1 port provisioning, setting a loopback, or inserting a test signal, a DS1 must first be selected.

The DS1 port equipage at the near-end can be updated by pressing the **NE/ENABLE** pushbutton along with the **DS1 SEL** pushbutton. By pressing the **NE/ENABLE** and **DS1 SEL** pushbuttons, the near-end OLIU updates its list of equipped DS1 ports. Any near-end port with a valid DS1 signal is considered equipped, and any port without a valid DS1 signal is considered unequipped. A DS1 port update should be done any time DS1 service is added to or deleted from the DDM-Plus System.

The DS1 port equipage at the far-end can be updated from the near-end by pressing the **FE/ENABLE** pushbutton along with the **DS1 SEL** pushbutton. By pressing the **FE/ENABLE** and **DS1 SEL** pushbuttons, the far-end OLIU updates its list of equipped DS1 ports. Any far-end port with a valid DS1 signal is considered equipped, and any port without a valid DS1 signal is considered unequipped. A DS1 port update should be done any time DS1 service is added to or deleted from the DDM-Plus System.

LOOP Pushbutton

The **LOOP** pushbutton is used to set near- and far-end loopbacks on any of the four DS1s carried by the OLIU. Loopbacks are described in detail in Chapter 6, *Maintenance Description*. To set a loopback on a specific DS1, first select the desired DS1 by repeatedly pressing the **DS1 SEL** pushbutton (see *DS1 SEL Pushbutton*).

To establish a far-end loopback on the selected DS1, press the **FE/ENABLE** and **LOOP** pushbuttons simultaneously. This causes the near-end OLIU to inhibit protection switching, thereby lighting all circuit pack **ABN** indicators. This prevents protection switching from occurring during a loopback test. A loopback message is sent to the far-end OLIU for the selected DS1. The remote OLIU then loops the desired DS1 back toward the fiber, lights its **NE** indicator, and begins blinking the information indicator corresponding to the looped DS1. The remote OLIU sends an acknowledgment back to the local OLIU. On receipt of this acknowledgment, the near-end OLIU lights its **FE** indicator and begins to blink the information indicator corresponding to the looped DS1.

To establish a near-end loopback on the selected DS1, press the **NE/ENABLE** and **LOOP** pushbuttons simultaneously. This causes the near-end OLIU to inhibit protection switching, thereby lighting all **ABN** indicators. This prevents protection switching from occurring during a loopback test. A loopback is then placed on the specified DS1 towards the fiber. Once the loopback has been successfully established, the near-end circuit pack lights its **NE** indicator and begins blinking the information indicator corresponding to the looped DS1.

Once the loopback is successfully completed, an internal test signal can be inserted using the **TST** pushbutton or by using external test equipment. By using the various loopbacks, a problem can be quickly isolated in a DDM-Plus System.

To remove the loopback, press the **LOOP** pushbutton and either **ENABLE** pushbutton simultaneously or press the **CLR** pushbutton. On removal of the loopback, both near- and far-end systems return to the normal operating state.

TST Pushbutton

The **TST** pushbutton provides access to the various testing features of the OLIU circuit pack. These tests are described in detail in Chapter 6, *Maintenance Description*. These tests include the following:

- Local Test
- Cross-Connect Test
- Optical Span Test
- Test Signal Insertion.

During the test, the information indicators (1→4) cycle indicating that the test is running. The first information indicator lights and extinguishes; the second information indicator lights and extinguishes; the third information indicator lights and extinguishes; the fourth information indicator lights and extinguishes; and then the cycle is repeated. The test runs continuously until stopped by pressing the **CLR** pushbutton. If no failures occurred during the tests, all indicators on the OLIU faceplate will blink twice. If a failure is detected, the information indicator cycling stops; the **CP/OPT** indicator lights, and the appropriate information indicators light.

Local Test

The Local Test is initiated by pressing and holding the **NE/ENABLE** pushbutton and pressing the **TST** pushbutton once. Ten seconds after this the OLIU begins the test.

Cross-Connect Test

The Cross-Connect Test is initiated by pressing and holding the **NE/ENABLE** pushbutton and pressing the **TST** pushbutton twice with no more than 10 seconds between depressions. Ten seconds after the second depression of the **TST** pushbutton, the OLIU begins the test.

Optical Span Test

The Optical Span Test is initiated by pressing and holding the **NE/ENABLE** pushbutton and pressing the **TST** pushbutton three times with no more than 10 seconds between depressions. Ten seconds after the third depression of the **TST** pushbutton, the OLIU begins the test.

Test Signal Insertion

Test signal insertion and monitoring for a specific DS1 stream is initiated using the **TST** pushbutton as follows:

1. Select the DS1 to be tested by repeatedly pressing the **DS1 SEL** pushbutton until the desired information indicator lights.

2. If desired, a loopback can be set using the loop procedures previously described.
3. Insert the test signal by pressing the **NE/ENABLE** and **TST** pushbuttons simultaneously. The OLIU responds by inserting a test signal into the selected DS1 stream towards the fiber and monitors for the return of the test signals on the same DS1 stream. During the test the information indicators cycle indicating the test signals are being returned from the loopback.

To stop the test signal insertion and remove the loopback (if looped back), press the **CLR** pushbutton.

A summary of the indicators and pushbuttons is given in Table 5-1.

Table 5-1. Faceplate Pushbuttons and Indicators

Label	Description	Action	Meaning/Cause
ACTIVE	Green LED	Lighted	Pack selected to carry service
		Off	Pack not selected to carry service
NE	Yellow LED	Lighted	Fault or maintenance activity at near-end OLIU
		Off	No faults or activity at near-end OLIU
ENABLE (near-end)	Pushbutton	Push and hold	Shows status (faults and equipped DS1s) of near-end OLIU. Also, enables service-affecting maintenance activities at near-end OLIU.
		Push and hold with FE/ENABLE	LED test. All OLIU indicators light while both ENABLE pushbuttons are depressed.
		Push and hold, with DS1 selected	After the NE/ENABLE pushbutton has been depressed for 3 seconds, the information indicators (1→4) display the line equalization (line buildout) of the selected near-end DS1. The first information indicator blinks indicating that the line equalization of the selected DS1 is being displayed, while information indicators two, three, and four indicate the DS1 switch position setting. An ON setting is represented by a lighted indicator and an OFF setting is represented by an indicator not lighted. See Figure 5-2.
		Push twice and hold, with DS1 selected	After the NE/ENABLE pushbutton has been depressed for 3 seconds following the second push, the information indicators (1→4) display the line coding and LOS alarm provisioning of the selected near-end DS1. The first and second information indicators blink indicating that the line coding and alarm provisioning of the selected DS1 is being displayed, while information indicators three and four indicate the DS1 switch position setting. An ON setting is represented by a lighted indicator and an OFF setting is represented by an indicator not lighted. See Figure 5-3.

Continued on next page

Table 5-1. Faceplate Pushbuttons and Indicators (contd)

Label	Description	Action	Meaning/Cause
FE	Yellow LED	Lighted	Fault or maintenance activity at far-end OLIU
		Off	No faults or activity at far-end OLIU
ENABLE (far-end)	Pushbutton	Push and hold	Shows status (faults and equipped DS1s) of far-end OLIU. Also, enables service-affecting maintenance activities at far-end OLIU.
		Push and hold with NE/ENABLE	LED test. All OLIU indicators light while both ENABLE pushbuttons are depressed.
		Push and hold, with DS1 selected	After the FE/ENABLE pushbutton has been depressed for 3 seconds, the information indicators (1→4) display the line equalization (line buildout) of the selected far-end DS1. The first information indicator blinks indicating that the line equalization of the selected DS1 is being displayed, while information indicators two, three, and four indicate the DS1 switch position setting. An ON setting is represented by a lighted indicator and an OFF setting is represented by an indicator not lighted. See Figure 5-2.
		Push twice and hold, with DS1 selected	After the FE/ENABLE pushbutton has been depressed for 3 seconds following the second push, the information indicators (1→4) display the line coding and LOS alarm provisioning of the selected far-end DS1. The first and second information indicators blink indicating that the line coding and alarm provisioning of the selected DS1 is being displayed, while information indicators three and four indicate the DS1 switch position setting. An ON setting is represented by a lighted indicator and an OFF setting is represented by an indicator not lighted. See Figure 5-3.

Continued on next page

Table 5-1. Faceplate Pushbuttons and Indicators (contd)

Label	Description	Action	Meaning/Cause
GO ACTIVE	Pushbutton	Push with NE/ENABLE	If the circuit pack is standby, it becomes active with protection switching inhibited. If the circuit pack is active, the protection switching mode is toggled between automatic and inhibit. Whenever switching is inhibited, the ABN indicator lights.
DS1 SEL	Pushbutton	Push	Used to select a DS1. The selected DS1 is shown by a lighted information indicator. Each push advances the lighted indicator; thus cycling through all information indicators. The information indicators represent DS1 1 through 4.
		Push with NE/ENABLE	Update DS1 port equipage at near-end OLIU. Each DS1 port with a valid DS1 signal is considered equipped. Update must be performed at both active and standby OLIU for protected systems.
		Push with FE/ENABLE	Update DS1 port equipage at far-end OLIU. Each DS1 port with a valid DS1 signal is considered equipped. Update must be performed at both active and standby OLIU for protected systems.
LOOP	Pushbutton	Push with either ENABLE , no DS1 selected	No action. A DS1 must be selected first.
		Push with NE/ENABLE , DS1 is selected	Sets a loopback at the near-end on the selected DS1 towards the fiber. ABN indicator is lighted, NE indicator is lighted, and corresponding information indicator is blinking on the successful completion of the loop.
		Push with FE/ENABLE , DS1 is selected	Sets a loopback at the far-end on the selected DS1 towards the fiber. ABN indicator is lighted, FE indicator is lighted, and corresponding information indicator is blinking on the successful completion of the loop.

Continued on next page

Table 5-1. Faceplate Pushbuttons and Indicators (contd)

Label	Description	Action	Meaning/Cause
TST	Pushbutton	Push NE/ENABLE not pressed, no DS1 selected	No action
		Push with NE/ENABLE , DS1 is selected or loopback is set	Initiates the signal insertion test. A test signal is inserted towards the fiber on the selected DS1 and monitored for the return of the signal. Failures during the test cause the CP/OPT and the appropriate information indicator to light. To end the test and return to the normal operating status, press the CLR pushbutton. If the test passes, all faceplate indicators blink twice.
		Push once with NE/ENABLE	Initiates local test. The first information indicator (1→4) lights, then after 10 seconds the local test is initiated. Failures during the test cause the CP/OPT and the appropriate information indicators to light. To end the test and return to the normal operating status, press the CLR pushbutton. If the test passes, all faceplate indicators blink twice.
		Push twice with NE/ENABLE	Initiates cross-connect test. The first and second information indicator (1→4) lights, then after 10 seconds the cross-connect test is initiated. Failures during the test cause the CP/OPT and the appropriate information indicators to light. To end the test and return to the normal operating status, press the CLR pushbutton. If the test passes, all faceplate indicators blink twice.
		Push thrice with NE/ENABLE	Initiates optical span test. The first, second, and third information indicator (1→4) lights, then after 10 seconds the optical span test is initiated. Failures during the test cause the CP/OPT and the appropriate information indicators to light. To end the test and return to the normal operating status, press the CLR pushbutton. If the test passes, all faceplate indicators blink twice.

Continued on next page

Table 5-1. Faceplate Pushbuttons and Indicators (contd)

Label	Description	Action	Meaning/Cause
1→4	4 green LEDs Information Indicators		Used to provide supporting information about the status and/or maintenance activity.
ABN	Yellow LED	Lighted	Indicates user initiated maintenance activity is underway. This includes protection switching lockout, loopback active, or test active. When the ABN indicator is lighted, protection switching is inhibited.
		Off	OLIU is in normal operating status.
CLR	Pushbutton	Push	Clears the maintenance condition and returns the OLIU to its normal operating status.
CP/OPT*	Red LED	Lighted	Circuit pack fault
		Blinking	Optical line fault
		Off	No faults on circuit pack or optical line
DS1†	Red LED	Lighted	Provisioning mismatch between active and standby OLIU circuit pack or invalid line build-out setting
		Blinking	DS1 incoming LOS on an equipped DS1. Affected information indicator is blinking.
		Off	No provisioning mismatch or DS1 LOS

* In normal operation, this indicator displays both near- and far-end status. When either the near- or far-end **ENABLE** pushbutton is pressed, it shows only the faults at the location corresponding to the depressed pushbutton. When a circuit pack fault and an optical line fault occur simultaneously, the circuit pack fault has precedence.

† In normal operation, this indicator displays both near- and far-end status. When either the near- or far-end **ENABLE** pushbutton is pressed, it shows only the faults at the location corresponding to the depressed pushbutton. When a provisioning mismatch and a DS1 LOS occur simultaneously, the DS1 LOS fault has precedence.

T1 Repeater Interface

The AEK86B repeater circuit packs do not require any adjustment or options, thus allowing immediate installation. Both the AEK88 and AEK90 may require the selection of options before installation. A summary of these options is given in Table 5-2. A summary of the faceplate indicators and test jacks is given in Table 5-3. Additional information on the AEK88 and AEK90 is available in AT&T 356-200-004 and AT&T 356-200-005.

Table 5-2. AEK Repeater Option Settings

Repeater	Option	Settings	Meaning
AEK88	PWR	N	Normal setting allows the repeater to be powered from -48 V office battery.
		L	Looped setting allows the repeater to be powered from a 60 mA line.
AEK88	OUT	0	Does not put additional attenuation on the line transmit path.
		3	Puts an additional 3 dB of attenuation on the transmit path.
AEK90	EQL	0≤133	Equalization for 0 - 133 feet to DSX-1
		133≤267	Equalization for 133 - 267 feet to DSX-1
		267≤400	Equalization for 267 - 400 feet to DSX-1
		400≤533	Equalization for 400 - 533 feet to DSX-1
		533≤655	Equalization for 533 - 655 feet to DSX-1

Table 5-3. Faceplate Indicators and Test Jacks

Label	Description	Action	Meaning/Cause
FAULT	Indicator		Lights when the simplex loop current fails, due to an open power loop, DC-DC converter failure, or DC regulator failure.
-V	Test jack		Simplex power loop voltage measurements are made between frame ground and this jack.
-I	Test jack		Simplex power loop current measurements are made between this jack and the -V jack.

Maintenance Description

6

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Maintenance Description

6

Optical Circuit Pack

The optical line interface unit (OLIU) circuit pack maintenance features are used to diagnose and locate faults in a DDM-Plus System. These maintenance features include the following:

- OLIU faceplate indicators
- Automatic turnup and health monitoring
- Turn-up testing
- Testing using the DDM-1000 or DDM-2000 OC-3
- Test signal insertion
- DS1 port monitoring
- DS1 port provisioning
- Protection switching
- Protection switching lockout
- DS1 loopback
- Alarms
- Parallel telemetry
- Miscellaneous discrete.

Faceplate Indicators

The OLIU automatically detects and isolates faults to the failed circuit pack, optical signal, incoming DS1 loss of signal (LOS), and locates the faults to either the near- or far-end location. When a fault occurs, the OLIU circuit pack associated with that facility identifies the fault using the indicators on its faceplate. Pushbuttons and indicators on the OLIU faceplate allow users to run maintenance procedures. For more information on the faceplate refer to Chapter 5, *User Interface*.

Automatic Turnup and Health Monitoring

When the OLIU is turned up, it determines if it is in a protected or unprotected configuration. Protected OLIU pairs will negotiate with each other to determine which OLIU is standby, which is active, and then light the **ACTIVE** indicator on the active OLIU. Unprotected OLIUs default to active.

When the OLIU is installed or power is applied after a loss of power, all faceplate indicators light for 1/4 second, then are off 3/4 second. The OLIU then enters its normal operating state with its indicators displaying the status of the OLIU.

Upon turnup, the OLIU also automatically begins monitoring its health checkpoints and lights the appropriate faceplate indicators depending on the status of the checkpoints. If any health checkpoint fails, the **CP/OPT** indicator lights solidly. These health checkpoints are the same checkpoints used to determine circuit pack failure for protection switching and are continuously monitored.

Turn-Up Testing

The OLIU has three tests designed to make installation quick, easy, and test equipment free. These three tests duplicate the three turn-up tests that the DDM-1000 and DDM-2000 OC-3 use. The following tests are initiated from the DDM-Plus OLIU faceplate:

- a. The Local Test verifies all the electronics and optics on the circuit pack.
- b. The Cross-Connect Test verifies the DS1 wiring that feeds the DDM-Plus.
- c. The Optical Span Test verifies the end-to-end performance of the DDM-Plus Systems and their facility.

Local Test — Test 1

The Local Test begins with the user unplugging the OLIU circuit pack and placing a short single-mode fiber test jumper between the laser (*ST*[®] connector transmit) and the detector (*ST* connector receive). After the test jumper is connected, reinsert the OLIU circuit pack and initiate the Local Test using pushbuttons on the faceplate. As Figure 6-1 shows, the Local Test loops back each DS1 at the DS1 device and inserts a test signal into each DS1 stream at the M12 device. These test signals travel through their corresponding DS1 back through the M12, the codec, and the laser; through the manually placed test jumper back into the detector; and through the codec to the M12 device where the integrity of the test signal is checked. Alarm indication signal (AIS) is inserted in the outgoing DS1 signal.

During the test, the information indicators (1→4) cycle indicating that the test is running. The test runs continuously until stopped by pressing the CLR. If any of the test signals fail, the CP/OPT indicator lights along with the specific information indicators that failed. If the test passes without fault, all faceplate indicators blink twice and the OLIU returns to the normal operating mode. Failure of this test indicates a circuit pack failure. The results of this test with those of the Cross-Connect Test can be used to isolate problems between the circuit pack or the DSX-1 wiring.

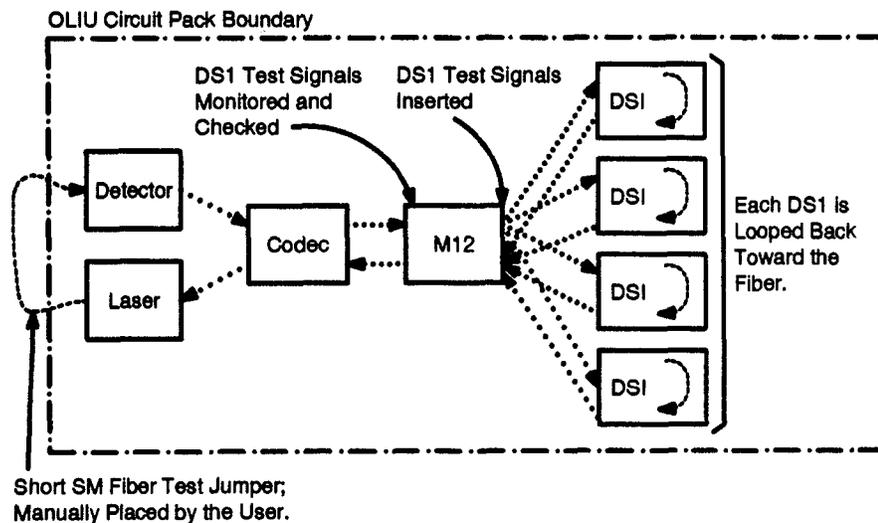


Figure 6-1. Local Test

⇒ NOTE 1:

The fiber between the OLIU and the LGX® Fiber Optic Distributing System panel can also be tested by placing a jumper at the LGX panel and then starting the Local Test.

⇒ NOTE 2:

If a multimode fiber test jumper or the high-power laser mode is accidentally used, the OLIU will not be harmed. The test will probably fail because of an overload of the detector but will not harm the OLIU circuit pack.

Cross-Connect Test — Test 2

The Cross-Connect Test is similar to the Local Test. The only difference is that the user places a manual loopback on each of the four DS1 signals at the DSX panel rather than the OLIU placing loopbacks in the DSI devices. If the test jumper is not connected, remove the OLIU circuit pack and place a single-mode fiber loop from the laser (*ST* connector transmit) to detector (*ST* connector receive). If the fiber between the OLIU and the LGX panel is good, then the fiber jumper can be placed at the LGX panel. Manually loop back each of the four DS1s, reinsert the circuit pack, and initiate the Cross-Connect Test using the pushbutton on the faceplate. As Figure 6-2 shows, the OLIU inserts test signals in each of the DS1 streams, which travels through their corresponding DSI device, off the circuit pack, around the loop at the DSX panel, back onto the circuit pack, through the circuit pack, around the fiber loop, and back into the M12 device for evaluation. The results of this test are reported on the faceplate in exactly the same fashion as for the Local Test.

During the test, the information indicators (1→4) cycle indicating that the test is running. The test runs continuously until stopped by pressing the **CLR**. If any of the test signals fail, the **CP/OPT** indicator lights along with the specific information indicators that failed. If the test passes without fault, all faceplate indicators blink twice and the OLIU returns to the normal operating mode. The results of this test with those of the Local Test can be used to isolate any problems to either the circuit pack or the DSX-1 wiring.

This test will fail if initiated on the standby OLIU.

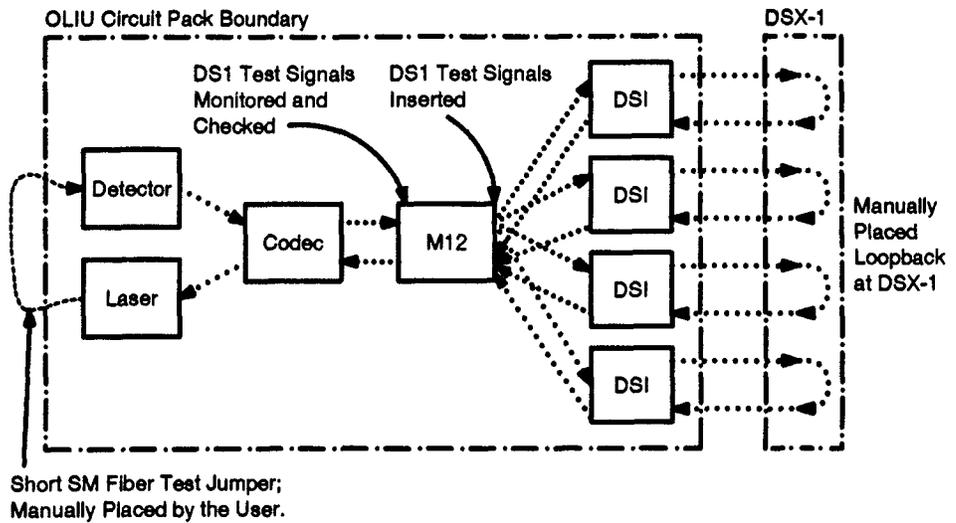


Figure 6-2. Cross-Connect Test



NOTE:

If a multimode fiber test jumper or the high-power laser mode is accidentally used, the OLIU will not be harmed. The test will probably fail because of an overload of the detector but will not harm the OLIU circuit pack.

Optical Span Test — Test 3

The Optical Span Test is used to check the end-to-end health of a pair of OLIU circuit packs that have been fully connected. Once the two circuit packs have been connected with fiber, the Optical Span Test can be initiated. As Figure 6-3 shows, the local OLIU (the circuit pack at which the test is initiated) instructs the remote OLIU to loopback each of its DS1s. Once all the loopbacks have been successfully completed, the local OLIU inserts a test signal into each DS1 stream and inserts AIS in the outgoing DS1 signal. The test signals make the complete loop through the local circuit pack to the remote circuit pack, then loop back through the remote circuit pack to the local circuit pack where the test signal integrity is checked by the M12 device. The results of this test are reported exactly the same as the Local Test and the Cross-Connect Test.

During the test, the information indicators (1→4) cycle indicating that the test is running. The test runs continuously until stopped by pressing the CLR. If any of the test signals fail, the CP/OPT indicator lights along with the specific information indicators that failed. If the test passes without fault, the cycling of the information indicators stops, all faceplate indicators blink twice, and the OLIU returns to the normal operating mode. The result of this test with the results of the Local Test (on both local and remote circuit packs) can be used to isolate problems to either the local circuit pack, the remote circuit pack, or the optical fiber link.

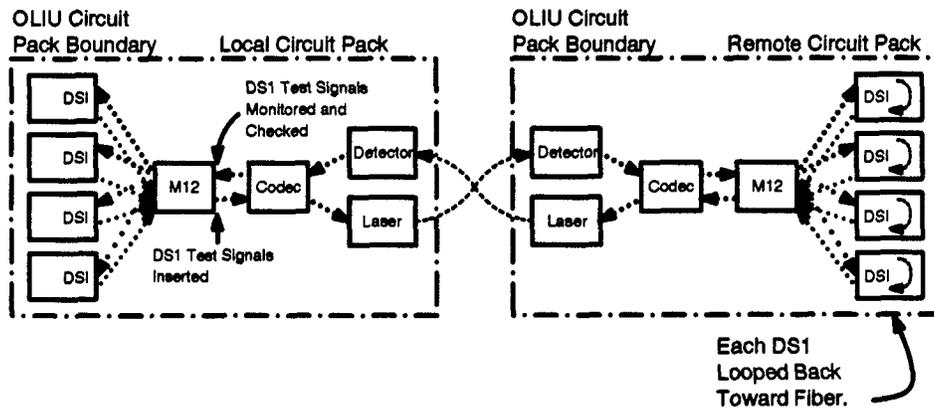


Figure 6-3. Optical Span Test

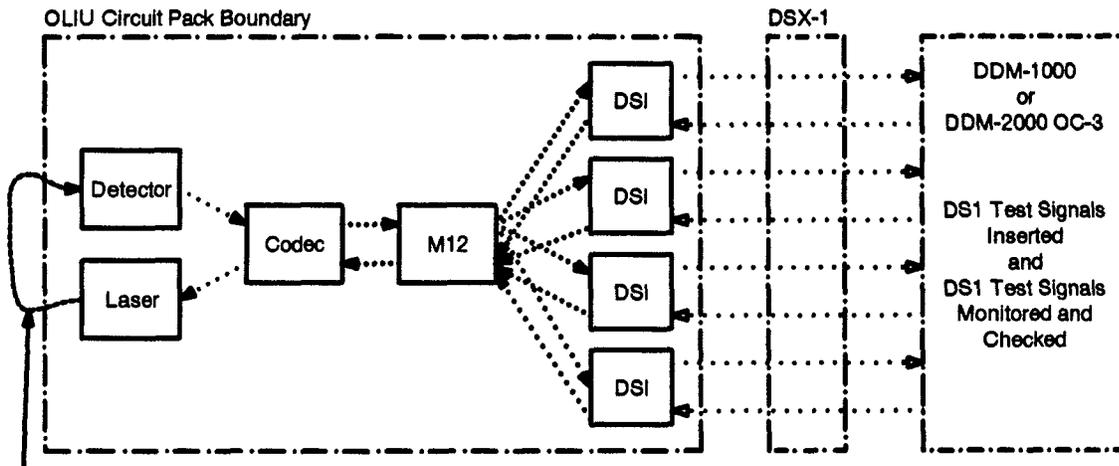
LED Testing

The LED test lights all indicators on the OLIU faceplate. The LED test is initiated by pressing and holding both **NE/ENABLE** and **FE/ENABLE** pushbuttons simultaneously. When the pushbuttons are released, the LED test terminates. If any of the faceplate indicators fail to light, return the OLIU for service.

Testing Using the DDM-1000 or DDM-2000 OC-3

The OLIU can be conveniently tested from a DDM-1000 or DDM-2000 OC-3 multiplexer. If the OLIU is connected to either a DDM-1000 or DDM-2000 OC-3, the OLIU and the interconnecting wiring can be tested by simply placing a fiber loop on the DDM-Plus OLIU, and then initiating a Cross-Connect Test from the DDM-1000 or DDM-2000 OC-3. As Figure 6-4 shows, the DDM-1000 or DDM-2000 OC-3 inserts a test signal toward the DSX in each DS1 stream and enters the DDM-Plus OLIU. The test signal is looped through the OLIU and is returned to the DDM-1000 or DDM-2000 OC-3 where it is monitored just as it is in a standard DSX-1 wiring test. If a fault occurs, further testing using the DDM-Plus OLIU test will help isolate the problem. Refer to the appropriate document for performing tests from either the DDM-1000 or DDM-2000 OC-3:

- AT&T 363-206-100, *DDM-1000 Dual DS3 Multiplexer for Both Loop and Trunk User/Service Manual*
- AT&T 363-206-202, *DDM-2000 OC-3 Multiplexer User/Service Manual.*



Short SM Fiber Test Jumper;
Manually Placed by the User.

Figure 6-4. OLIU Testing Using DDM-1000 or DDM-2000 OC-3

Test Signal Insertion

The OLIU can insert a test signal into any DS1 line toward the high-speed optical side of the OLIU and monitor the returning DS1 signal for the presence of the test signal. The DS1 to be tested must be selected before initiating the test signal insertion. Test signal insertion in conjunction with far-end loopback capability allows testing of each individual DS1 circuit from the OLIU faceplate without external test equipment.

DS1 Port Monitoring

The OLIU maintains an internal record of the four DS1 ports that are currently equipped. Upon turn-up, the OLIU initially assumes that no DS1 ports are equipped and begins monitoring each port for a valid DS1 signal. As DS1s are added, the OLIU updates its memory to include those DS1 ports in its list of equipped DS1s.

When an equipped DS1 port experiences an incoming LOS, the local OLIU **NE** indicator lights, the **DS1** fault indicator blinks, and the information indicator corresponding to the DS1 port blinks. The remote OLIU **FE** indicator lights, the **DS1** fault indicator blinks, and the information indicator corresponding to the DS1 port blinks.

The DS1 LOS must be detected by both the active and standby OLIU in a protected DDM-Plus System. If only one OLIU detects a DS1 LOS, then that OLIU circuit pack has failed, a protection switch is initiated, and the **CP/OPT** indicator is lighted on the failed OLIU.

A DS1 LOS can be provisioned, using DIP switches, to generate either a minor alarm or no alarm. The ability to provision a minor alarm on a DS1 LOS is important for many applications. When the DDM-Plus is being used in the feeder plant for transport purposes such as with a *SLC*[®] bank, it is important to detect a DS1 LOS since that indicates a problem with the *SLC* equipment. For a DDM-Plus being used in a distribution plant to deliver DS1 pipes to end-users, it is often prudent to turn off the LOS alarm because of the frequency with which many end-users alter their DS1 based communication equipment.

DS1 Port Provisioning

Option switches allow the OLIU to be customized for various customer requirements. Refer to Figures 6-5 and 6-6 for option switches locations. The option switches on the OLIU provision the following:

- DS1 line coding (Refer to Table 6-1.)
- DS1 line buildout (Refer to Table 6-2.)
- DS1 LOS alarm provisioning (Refer to Table 6-3.)
- Bit error ratio (BER) threshold (Refer to Table 6-4.)
- Laser power mode (Refer to Table 6-5.)

The OLIU option switches must be correctly set for proper operations. To verify an installed OLIU DS1 line coding, DS1 line buildout, and DS1 LOS alarm provisioning from the OLIU faceplate refer to Chapter 5, *User Interface*.

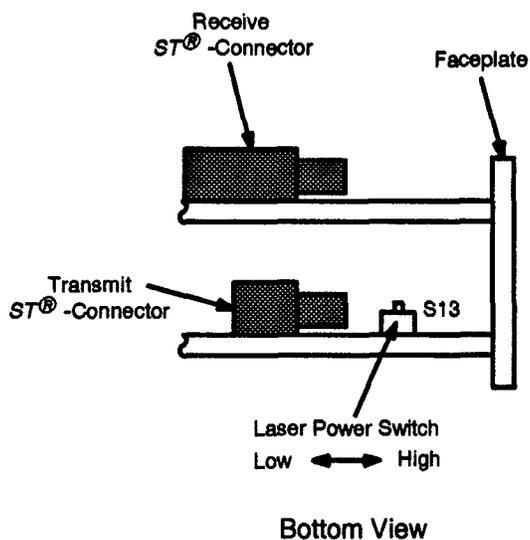


Figure 6-5. Laser Power Mode Switch

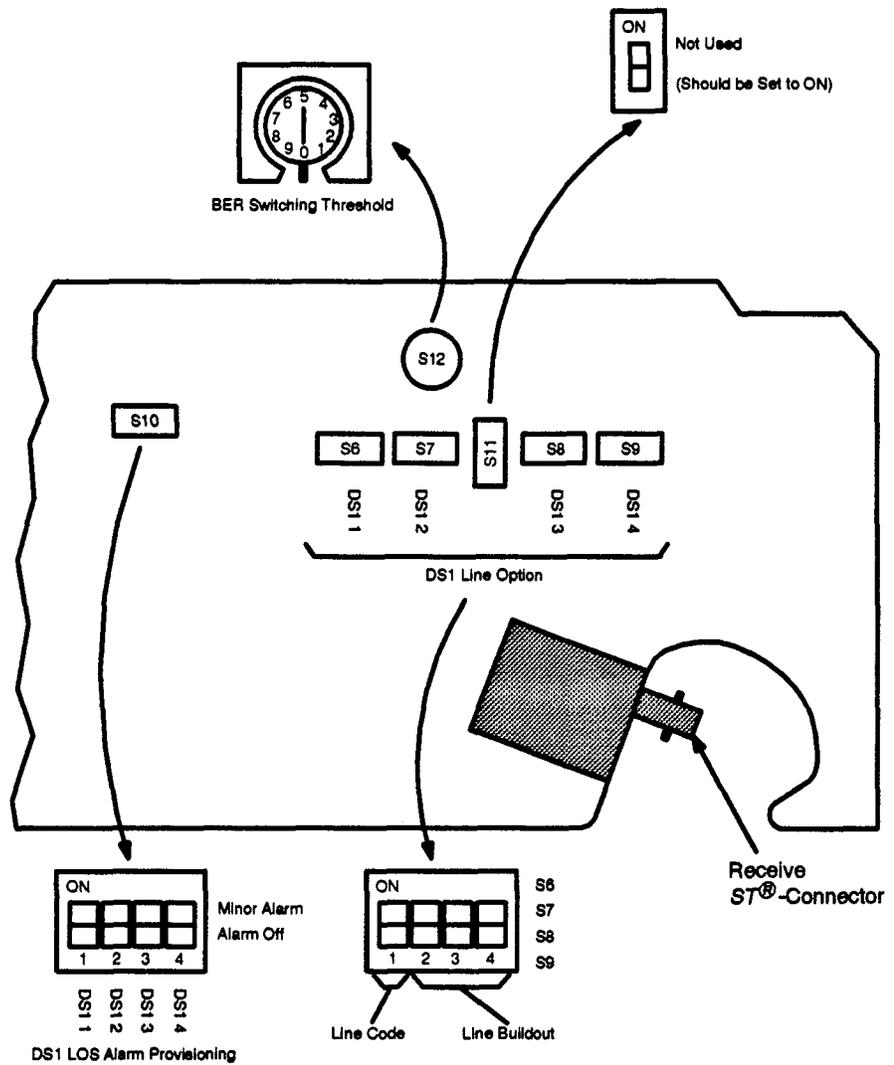


Figure 6-6. OLIU Option Switches

Option switches S6, S7, S8, and S9 provide individual line coding and line buildout for DS1 1, DS1 2, DS1 3, and DS1 4, respectively. Refer to Table 6-1 for line coding option settings, and refer to Table 6-2 for line buildout option switch settings.

Table 6-1. DS1 Line Coding

<u>Coding</u>	<u>Switches S6, S7, S8, and S9</u>	
	<u>Switch Position 1</u>	
AMI	ON	
B8ZS	OFF	

Table 6-2. OLIU DS1 Line Buildout

<u>Distance to DSX-1 in Feet</u>		<u>Switches S6, S7, S8, and S9</u>		
<u>1249C Cable (26 Gauge)</u>	<u>613C Cable (22 Gauge)</u>	<u>Switch Position 2</u>	<u>Switch Position 3</u>	<u>Switch Position 4</u>
0 to 90	0 to 133	OFF	OFF	OFF
91 to 180	134 to 267	OFF	OFF	ON
181 to 270	268 to 400	OFF	ON	OFF
271 to 360	401 to 533	OFF	ON	ON
<u>361 to 450</u>	<u>534 to 655</u>	<u>ON</u>	<u>OFF</u>	<u>OFF</u>
Invalid*	Invalid*	ON	OFF	ON
Invalid*	Invalid*	ON	ON	OFF
<u>Invalid*</u>	<u>Invalid*</u>	<u>ON</u>	<u>ON</u>	<u>ON</u>

* Invalid option setting. Invalid settings will cause the NE and DS1 indicators to light.

Option switch S10 provisions the DS1 LOS alarms with switch positions S10-1, S10-2, S10-3, and S10-4 controlling provisioning for DS1 1, DS1 2, DS1 3, and DS1 4, respectively. Table 6-3 shows the DS1 LOS alarm provisioning option settings.

Table 6-3. DS1 LOS Alarm Provisioning

<u>Alarm Provisioning</u>	<u>Option Switch</u>			
	<u>S10-1</u> <u>(DS1 1)</u>	<u>S10-2</u> <u>(DS1 2)</u>	<u>S10-3</u> <u>(DS1 3)</u>	<u>S10-4</u> <u>(DS1 4)</u>
Minor Alarm	ON	ON	ON	ON
No Alarm	OFF	OFF	OFF	OFF

Table 6-4. BER Threshold Setting

<u>Option Switch S12</u> <u>Position</u>	<u>BER Threshold</u>
1	Invalid
2	Invalid
3	Invalid
4	10^{-4}
5	10^{-5}
6	10^{-6}
7	10^{-7}
8	10^{-8}
9	10^{-9}
0	10^{-10}

Table 6-5. Laser Power Mode

<u>Power Mode Selection</u>	<u>Switch Position</u>
High	Switch position closest to OLIU faceplate
Low	Switch position farthest from OLIU faceplate

Refer to the OLIU link budgets tables in Chapter 8, *Technical Specifications*, for the system gain for the laser power.

Protection Switching

The DDM-Plus can be optically equipped to provide protection for the optical fiber and the OLIU circuit pack. Protection switching occurs in response to detected faults in the optical fiber and the OLIU circuit pack, as well as manually activated at the OLIU faceplate. The protection switching is bidirectional and nonrevertive.

Protection switching is completed within 60 ms, including detection and initialization.

Any of the following conditions will initiate a protection switch from the active OLIU to the standby OLIU:

- A pulled active OLIU circuit pack
- Fault detected in microprocessor
- Fault detected in M12 device
- Fault detected in DSI device
- Fault detected in laser backface current
- Fault detected in on-board power supply
- Loss of codec frame
- Loss of DS2 frame
- Loss of optical signal
- Optical link BER is exceeding threshold setting.



NOTE:

The BER threshold is provisionable using a rotary switch and the threshold may range from 10^{-4} to 10^{-10} .

A protection switch is forced by pressing the **GO ACTIVE** and **NE/ENABLE** pushbuttons simultaneously on the standby OLIU circuit pack. When a protection switch occurs, the newly activated OLIU circuit pack lights its **ACTIVE** indicator, and the new standby OLIU extinguishes its **ACTIVE** indicator.

A manual protection switch is completed within 50 ms.

Refer to Chapter 4, *Functional Description*, for additional additional information on protection switching.

Protection Switching Lockout

To perform maintenance activity without activating a protection switch, the OLIU can inhibit the protection switching. Once protection switching is locked out, it will remain inhibited until it is enabled. There is no automatic time-out period for returning to the automatic protection switch mode; however, as a reminder, the **ABN** indicator remains lighted. Use the **CLR** pushbutton to clear the protection switching lockout.

Pressing the **GO ACTIVE** and **NE/ENABLE** pushbuttons simultaneously on the in-service OLIU inhibits protection switching and lights the **ABN** indicator. Pressing the **GO ACTIVE** and **NE/ENABLE** pushbuttons simultaneously a second time enables protection switching and extinguishes the **ABN** indicator.

Pressing the **CLR** pushbutton also clears the inhibited protection switching and returns the OLIU to automatic protection switch mode.

DS1 Loopback

The OLIU can provide loopbacks at both the far- and near-end DDM-Plus for any of the four DS1s using faceplate pushbuttons and indicators. A far-end loopback is shown in Figure 6-7. The far-end loopback is initiated at the local (near-end) OLIU, and the specified DS1 signal is internally looped back towards the fiber by the DSI device at the remote (far-end) OLIU. When looped, automatic protection switching is inhibited. The far-end OLIU inserts DS1 AIS indication into the outgoing DS1 signal. A successful loopback is shown on the front panel of both the far- and near-end faceplates by blinking the corresponding information indicator. Once the loopback is successfully completed, an internal test signal can be inserted by pressing the **NE/ENABLE** and the **TST** pushbuttons simultaneously or by using external test equipment.

A near-end loopback is shown in Figure 6-8. The near-end loopback is initiated at the local (near-end) OLIU, and the specified DS1 signal is internally looped back towards the fiber by the DSI device at the local (near-end) OLIU. When looped, automatic protection switching is inhibited. The near-end OLIU inserts DS1 AIS indication into the outgoing DS1 signal. A successful loopback is shown on the front panel of both the far- and near-end faceplate by blinking the corresponding information indicator.

Loopbacks can be performed on both the active and standby OLIUs. However, loopbacks on a standby OLIU can only be tested by using internal test signals.

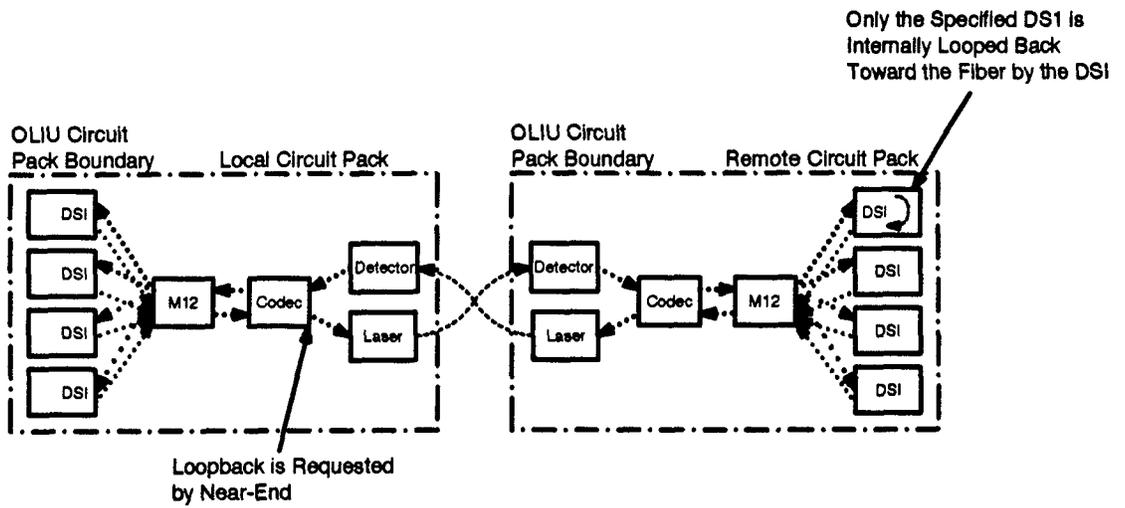


Figure 6-7. Far-End DS1 Loopback

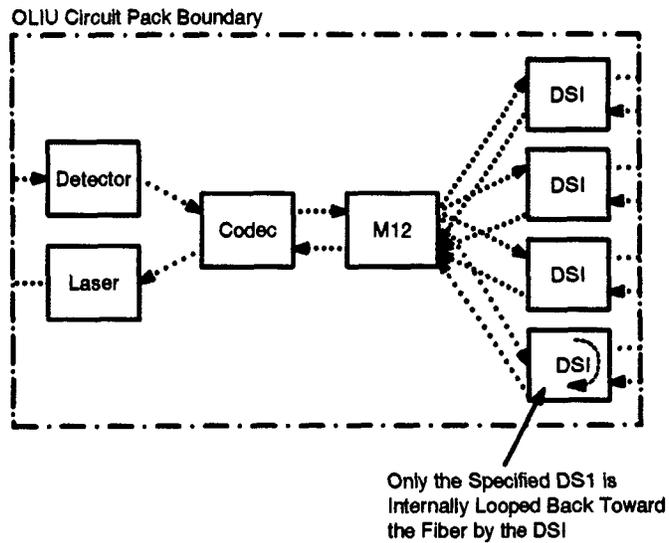


Figure 6-8. Near-End DS1 Loopback

Alarms

The OLIU generates a major alarm whenever a service-affecting fault occurs and generates a minor alarm whenever a non-service-affecting fault occurs. The DS1 LOS alarm is provisionable using a DIP switch. Every detected fault (except for the LOS alarm when provisioned for nonalarmed) is reported as either a major or minor alarm. The alarm closures are part of the DDM-Plus not housing the OLIU circuit pack. However, the individual circuit packs supply the necessary signal to the housing so that the appropriate alarm closure is activated. The faults and their associated alarm conditions are shown in Table 6-6.

Table 6-6. OLIU Circuit Pack Fault and Alarm Indicators

Fault	Unprotected	Protected
Local OLIU fault (near-end)	Major	Minor
Remote OLIU fault (far-end)	Major	Minor
Optical signal fault (causes include loss of optical signal and loss of optical frame)	Major	Minor
Optical signal degrade (line BER exceeds the provisionable threshold)	Minor	Minor
Local DS1 LOS — near-end (provisionable alarm)	Minor or no alarm	Minor or no alarm
Remote DS1 LOS — far-end (provisionable alarm)	Minor or no alarm	Minor or no alarm

Parallel Telemetry

Parallel telemetry is provided as an option to remote alarm information to an operations center. The housing provides the following parallel telemetry output points:

1. Major alarm (OR'd across all OLIU groups)
2. Minor alarm (OR'd across all OLIU groups)
3. Failure at near-end (OR'd across all OLIU groups)
4. Failure at far-end (OR'd across all OLIU groups)
5. System ID (One for each OLIU group).

The parallel telemetry closures are designed for a maximum open circuit output voltage of 60 volts, a transient voltage of up to 135 volts for a maximum of 1 ms, and maximum steady-state current of 35 mA.

The AEK-type T1 repeater circuit packs do not provide parallel telemetry output.

Miscellaneous Discrete

The DDM-Plus OLIU provides one miscellaneous discrete input. When this input is operated, the miscellaneous discrete output at the far-end OLIU is also operated; otherwise, the far-end miscellaneous discrete output is not operated. The miscellaneous discrete output of any OLIU always matches the condition of the miscellaneous discrete input at the far-end. Using these miscellaneous inputs and outputs, a user can communicate a remote contact closure back to a central location.

To operate the miscellaneous discrete input, a low-impedance connection such as a switch or relay is connected between the two pins associated with the input.

The AEK-type T1 repeater circuit packs do not provide miscellaneous discrete inputs or outputs.

T1 Repeater Circuit Pack

For those locations where a centralized DSX cross-connect panel is available [for example, central offices or controlled environment vaults (CEVs)], all maintenance and troubleshooting of T1 carrier lines can be performed at the DSX cross-connect panel. The routine maintenance procedure for the AEK-type repeaters is similar to that for the standard T1 office repeaters, which is given in AT&T 365-800-002, *T1 Digital Line — Acceptance and Maintenance Task — Digital Transmission Tasks*.

The AEK-type T1 repeater faceplate contains test jacks **-V** and **-I** for monitoring the simplex voltage and current, respectively. Simplex loop voltage is measured between the **-V** test jack and shelf frame ground. Simplex loop current is measured between test jacks **-I** and **-V**. A simplex loop current reading of 0.6 V would indicate a loop current of 60 mA, since test jacks **-I** and **-V** bridge a precision 10-ohm resistor.

The AEK-type T1 repeater internally monitors the simplex loop current, lights the **FAULT** indicator on its faceplate, and initiates a major alarm whenever the simplex loop current fails. Simplex current can fail due to an open power loop or a DC-DC converter failure. Repeater circuit packs do not generate minor alarms.

When the T1 extensions are repeaterless, no fault locating is required. Where fault-locating capability is required, use the *SLC* Carrier System fault-locating and order-wire panel. The fault-locating lines should be engineered according to AT&T 855-350-104, *T1, T1 Outstate, T1C and T1D — Fault-Locate System Engineering Design*. The procedure for fault-locating a T1 line is given in AT&T 365-227-500, *T1 Digital Line — Trouble Locating Procedures*. For fiber hubs in 80-type cabinets, fault location of the T1 carrier lines can be performed by the procedure described in AT&T 363-205-500, *SLC® Series 5 Carrier System — Maintenance and Troubleclearing (TOP)*.

The buildout for AEK-type repeaters is listed in Table 6-7.

Table 6-7. Electrical DS1 Buildout

<u>AEK-Type</u>	<u>Distance to DSX-1 in Feet</u>	<u>Maximum Effective Loop Resistance Range</u>
AEK86B	0 - 85	0 - 2100 ohms
AEK88	0 - 85	0 - 508 ohms
AEK90	0 - 655	0 - 2100 ohms

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DDM-Plus Power Requirements

The DDM-Plus is powered by two independent –48 V office power feeders (A and B), through connectorized dangles. Power is distributed through fuses to the circuit packs. The voltage required to power the circuit packs within the DDM-Plus is generated by DC-to-DC converters mounted on the circuit packs.

Typical power and current drain for the circuit packs are given in Chapter 8, *Technical Specifications*.

Figure 7-1 shows a typical battery feeder interface for a single shelf in a central office or controlled environment vault (CEV)-like environment. Figure 7-2 shows the fusing of the DDM-Plus. Battery feeders for loop cabinet applications are covered in individual cabinet drawings.



CAUTION:

This information is for a typical application only. Consult FPD 801-525-169 and T-82046-30 for proper engineering of battery and feeders.

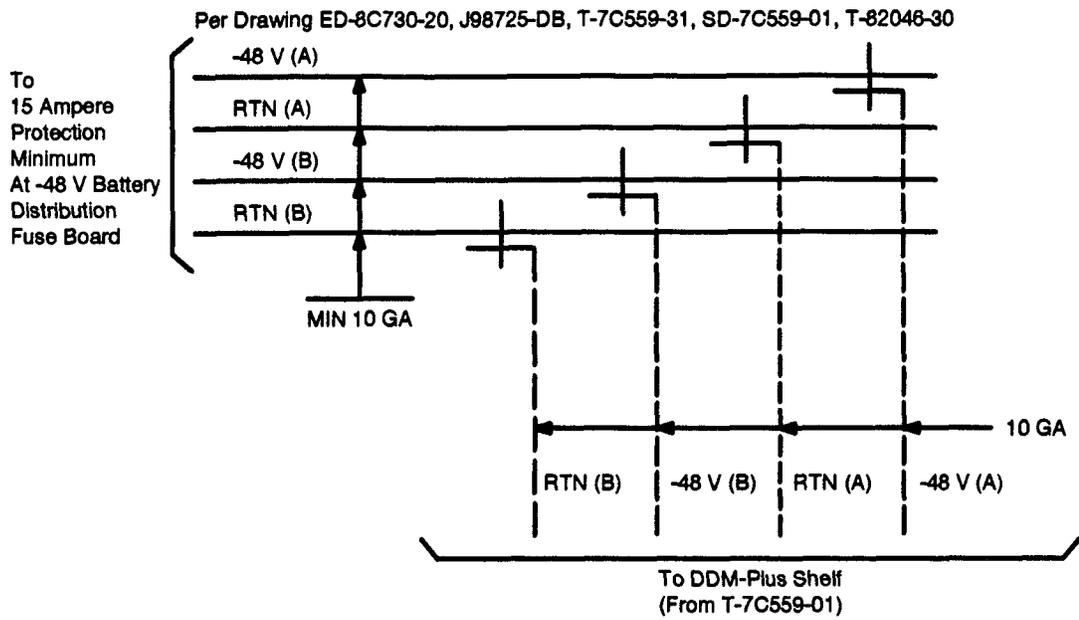


Figure 7-1. Typical -48 Volt Power Supply for DDM-Plus Single Shelf in Central Office or CEV-Like Environments

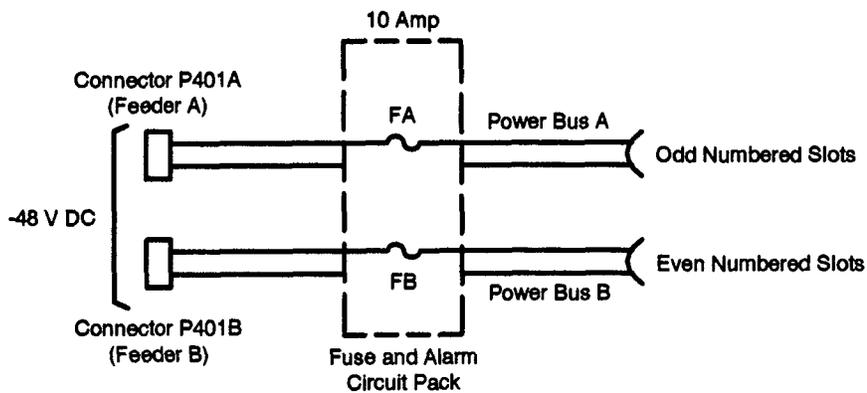


Figure 7-2. DDM-Plus Fusing

Extension Shelf

Shelf Fuses

The two -48 volt feeders (A and B) required for each DDM-Plus shelf are protected by 10-amp fuses that ship with the shelf. Fuse FA powers the odd numbered slots through power bus A. Fuse FB powers the even numbered slots through power bus B. These fuses are located on the fuse and alarm circuit pack. When a fuse operates (blows), a red indicator pops up and initiates a major alarm.

Shelf Power Dissipation

The Extension Shelf maximum power dissipation is 72 watts. The quoted maximum dissipation power occurs when the Extension Shelf is fully equipped with AEK86B T1 repeater circuit packs. The maximum power dissipation occurs when the Extension Shelf is fully equipped with AEK86B or AEK90 T1 repeater circuit packs and all T1 lines have maximum loop resistance. Power dissipation of the Extension Shelf varies with equipage. Refer to FPD 801-525-169 (Chapter 8, *Technical Specifications*) for detailed power dissipation information.

- The optical line interface unit (OLIU) occupies both odd and even numbered slots, selects either bus A or B, and switches to the alternate if one bus fails.
- The T1 repeater occupies only one slot, therefore, connecting to either bus A or B. If the bus supplying the T1 repeater loses power, then the T1 repeater drops service.
- All supply voltages other than -48 V required by DDM-Plus are generated by DC-to-DC converters on each circuit pack.
- DDM-Plus meets all performance requirements with DC input voltages between -40.0 V and -60.0 V without damage.
- DDM-Plus complies with electrical noise tolerance requirements in Section 13.2 of TR-TSY-000499*.

Cooling

In the Network Equipment Building System (NEBS) environment, DDM-Plus shelves use free air convection cooling; that is, no fans are required, assuming that heat baffles or open bay space is provided as necessary. Refer to ED-8C730-10 for detailed equipment arrangements.

* Bell Communications Research, TR-TSY-000499 Issue 3, December 1989, *Transport Systems Generic Requirements (TSGR): Common Requirements*.

Wall Distant Terminal Housing Power

Shelf Fuses

The two -48 volt feeders (A and B) required for each DDM-Plus shelf are protected by 0.5-amp fuses that ship with the shelf. **FUSE A** powers the odd numbered slots through power bus A. **FUSE B** powers the even numbered slots through power bus B. The fuses are located behind the side door of the housing. When a fuse operates (blows), a red indicator pops up and initiates a major alarm and the appropriate LED extinguishes. On the side of the Wall DT there are two green LEDs, **PWR A** and **PWR B**, that indicate the power is on buses A and B, respectively, when lighted.

Shelf Power Dissipation

The Wall DT power dissipation is 10.0 watts, which is a DDM-Plus System equipped for 1+1 protection (two OLIUs).

Power connections to the Wall DT buses are available through screw terminal block **TB 1** located behind the side door of the housing. The -48 V DC can be supplied by any -48 V DC power source found in telephone equipment rooms. Alternate methods of providing power from 120 V AC are listed in AT&T 363-206-156, *DDM-Plus Equipment Engineering and Ordering Guide*. Power dissipation of the Wall DT varies with equipage. Refer to FPD 801-525-169 (Chapter 8, *Technical Specifications*) for detailed power dissipation information.

- The OLIU occupies both odd and even numbered slots, selects either bus A or B, and switches to the alternate if one bus fails.
- All supply voltages other than -48 V required by DDM-Plus are generated by DC-to-DC converters on each circuit pack.
- DDM-Plus meets all performance requirements with DC input voltages between -40.0 V and -60.0 V without damage.
- DDM-Plus complies with electrical noise tolerance requirements in Section 13.2 of TR-TSY-000499.

Cooling

In the NEBS environment, DDM-Plus Wall DT uses free air convection cooling; that is, no fans are required, assuming open space is provided as necessary.

Cabinet Distant Terminal Power

Shelf Fuses

The two -48 volt feeders (A and B) required for each DDM-Plus shelf are protected by fuses that ship with the shelf. Fuse **FA** powers the odd numbered slots through power bus A. Fuse **FB** powers the even numbered slots through power bus B. The fuses are located on the fuse and alarm circuit pack. When a fuse operates (blows), a red indicator pops up and initiates a major alarm.

Shelf Power Dissipation

The buses are accessed by a screw terminal block located on the housing's backplane. Power dissipation of the Cabinet DT varies with equipage.

- The OLIU occupies both odd and even numbered slots, selects either bus A or B, and switches to the alternate if one bus fails.
- All supply voltages other than -48 V required by DDM-Plus are generated by DC-to-DC converters on each circuit pack.
- DDM-Plus meets all performance requirements with DC input voltages between -40.0 V and -60.0 V without damage.
- DDM-Plus complies with electrical noise tolerance requirements in Section 13.2 of TR-TSY-000499.

Cooling

Cooling is required when deployed in cabinets. The 51A cabinets come equipped with thermostatically controlled fans.

T1 Repeater Power

The maximum battery current drains per circuit pack and shelf are given in Table 7-1. These conditions assume a minimum battery voltage of -40 volts and a maximum loop resistance of 2100 ohms for the AEK86B/AEK90. The AEK88 conditions assume a maximum battery voltage of -60 volts and a loop resistance of 0 ohms.

The DDM-Plus shelf is designed for the maximum current requirements of 28 AEK86B or AEK90 T1 repeaters with maximum loop resistances of 2100 ohms. If the DDM-Plus is powered with a battery backup, it may be necessary to limit the number of repeaters to satisfy the minimum holdover time. Specific current drain information for the AEK88, AEK86B, and AEK90 is presented in AT&T 365-200-107.

Table 7-1. Maximum Current Drains at -40.0 Volts

<u>Amperes</u>	<u>Equipment</u>
0.27	Per AEK86B or AEK90 repeaters
7.60	Per Shelf (3.8 amperes per A or B feeder)

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General System Specifications

The DDM-Plus System consists of one or more optical line interface unit (OLIU) circuit packs and/or T1 repeater circuit packs housed in either the DDM-Plus Extension Shelf, the DDM-Plus Cabinet DT, or the DDM-Plus Wall DT. The DDM-Plus System meets all the following physical and environmental specifications. Note that the following specifications apply to each piece of a system (that is, individual circuit packs and individual housings) as well as to the system as a whole.

Central Office Environment

The DDM-Plus complies with the following parts of Section 4, TR-63*:

- Thermal.
- Handling and transportation.
- Earthquake and office vibration.
- Airborne contaminants.
- Grounding.
- Acoustic noise.

* Bell Communications Research, TR-TSY-063, Issue 3, March 1988, *NEBS Generic Equipment Requirements*.

- Illumination (for example, surface reflectance).
- Electromagnetic compliance (EMC).

DDM-Plus has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in commercial environment. This equipment generates, uses, and can radiate radio-frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residence is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

- Electrical safety (ESD).



NOTE:

Flammability of the DDM-Plus meets the *UL* 1459, Edition 2 requirement.

Controlled Environment

The DDM-Plus complies with TR-26* and TR-43† for operation in controlled environment vaults.

Uncontrolled Environment

Temperature/Humidity

The DDM-Plus meets all its operating characteristics when operating under the following conditions:

- a. A shelf air inlet temperature of -40°C to $+75^{\circ}\text{C}$ (-40°F to $+167^{\circ}\text{F}$)
- b. A relative humidity range from 5 to 95 percent, noncondensing.

UL Listing for Customer Premises Installations

The DDM-Plus System meets the requirements of *UL* 1459, Edition 2 for operation of telephone equipment located in dedicated equipment rooms.

* Bell Communications Research, TR-TSY-026, Draft, Issue 1, September 1985, *Below Ground Electronic Enclosures*.

† Bell Communications Research, TR-TSY-043, Draft, Issue 1, December 1985, *Above Ground Electronic Enclosures*.

The DDM-Plus Wall DT system is *UL* Listed according to the requirements of *UL* 1459, Edition 2 for operation of telephone equipment located in a customer premises.

Interface to Public Network

To be compliant with FCC rules, part 68, which governs privately owned equipment that interfaces directly with the public telephone network, a standard channel service unit (CSU) is required to couple the DDM-Plus with the public telephone network.

Shelf Specifications

Extension Shelf

Shelf Dimensions

The Extension Shelf is 23 inches wide, 12.0 inches deep and 5.0 inches high. These dimensions include the fiber routing trough that extends down and forward from the front edge of the shelf bottom plate.

Shelf Weight

A fully equipped Extension Shelf weighs less than 24 pounds without the hinged front cover.

Wall DT

Shelf Dimensions

The Wall DT is 5.75 inches wide, 15.5 inches deep, and 7.3 inches high. These dimensions include the wall mounting brackets.

Shelf Weight

A fully equipped Wall DT Shelf weighs 16 pounds.

Cabinet DT

Shelf Dimensions

The Cabinet DT is 23 inches wide, 12.0 inches deep, and 9.0 inches high. These dimensions include all fiber management equipment and the circuit pack cage.

Shelf Weight

Information is not available for this issue.

Circuit Pack Specifications

The 25A OLIU, 25F OLIU, and AEK-type office repeater circuit packs adhere to all the AT&T circuit pack design standards, including AT&T standard physical appearance, and operate in the Network Equipment Building System (NEBS) (controlled) and uncontrolled environments.

DDM-Plus OLIU Circuit Packs

The following specification applies to both the 25A OLIU and the 25F OLIU circuit packs.

Dimensions

The OLIU circuit packs are 3.513 inches high, 10.214 inches long, and 1.435 inches wide.

Weight

The OLIU circuit packs weigh less than 1 pound.

DS1 Interfaces

The four DS1 low-speed interfaces meet the *ANSI* standard T1.102-1987, Section 2 (1.544 Mb/s normal rate, DSX-1 interconnections specification.) Line coding is provisionable to alternate mark inversion (AMI) or bipolar eight-zero substitution (B8ZS). Line buildout is provisionable as follows:

- 613C (22 gauge): 0 to 655 ft.
- 1249C (26 gauge): 0 to 450 ft.

Loss of incoming DS1 signal is provisionable to either generate a minor alarm or not to generate an alarm.

Fiber Connections

The OLIU connects to the transmission fiber using two *ST*[®] receptacles mounted on the bottom front of the printed wiring boards. When viewed from the faceplate, the transmit (OUT) *ST* receptacle is mounted on the right board and the receiver (IN) *ST* receptacle is mounted on the left board. Both *ST* receptacles are angled down slightly to allow proper bend radii of the fiber. When connected, the fibers are routed down from the printed wiring board under the bottom edge of the faceplate to the fiber trough.

Power

The OLIU circuit pack operates properly on any DC voltage in the range from -40.0 to -60 V DC. Nominal operating voltage is -48 V DC.

The OLIU has an on-board regulated switching power supply that provides +5 V DC source for all components on the circuit pack. Refer to Chapter 7, *Powering*, for additional power information.

The OLIU circuit pack accesses both the A and B -48 V DC power buses from the housing backplane. The OLIU monitors these two buses in such a way that if either one fails all power is taken from the other bus. The OLIU accesses power from these buses in such a way that a short on one bus does not cause outage on the other bus. The AEK-type T1 repeaters do not access both power buses. Only the OLIUs access both buses.

Table 8-1 describes the nominal power and current drain characteristics of the OLIU for both a protected and unprotected deployment. An unprotected deployment consists of a single active circuit pack, while a protected deployment is made up of an active and standby circuit pack pair. The power consumption of the protected pair is less than twice the power consumption of an unprotected circuit pack, because a standby circuit pack requires less current than an active circuit pack.

Table 8-1. OLIU Power and Current

<u>Unit</u>	<u>Conditions</u>	<u>Unprotected Single OLIU</u>	<u>Protected Double OLIUs</u>
Nominal Power Consumption (at -48 V DC)	QRSS payloads in all four DS1s, unframed	5.3 Watts	10.0 Watts
Nominal Current Drain (at -48 V DC)	QRSS payloads in all four DS1s, unframed	110 mA	210 mA

Optical Specifications

The 25A OLIU operates at a nominal line rate of 9.468 Mb/s, at a nominal wavelength of 780 nm, and has a system gain that supports spans over 10.1 kft (3.1 km). Tables 8-2 and 8-3 provide detailed specifications and link budget information for the 25A OLIU.

Table 8-2. 25A OLIU (780 nm) General Optical Specifications

System Information	
Terminal Equipment Identification	25A OLIU
Revision	Series 6:6 and 7:7
Optical Line Rate (Mb/s)	9.468 Mb/s
Information Payload Capacity	4 X 1.544 Mb/s = 6.176 Mb/s
Optical Line Coding	4B6B Proprietary Line Code
Optical Wavelength	780 nm
Transmitter Information	
Optical Device Temperature Controller	None
FDA Classification	Class I
Optical Source	AlGaAs Laser
Faceplate Connector	AT&T ST® R2000A-2, Single- or Multimode
Pigtail	None
Receiver Information	
Optical Device Temperature Controller	None
Optical Detector	Si PIN
Faceplate Connector	AT&T ST R2000A-2, Single- or Multimode
Pigtail	None
WDM Device Information	Not applicable
Attenuator Device Information	Not applicable
Station Cable Information	Not applicable (customer group)
Station Cable Connector Information	
Single-Mode Operation	AT&T ST P3020A-C-125 Single-Mode or equivalent
Multimode Operation	AT&T ST P2020C-C-125 Multimode or equivalent
Type of Fiber Connection	Physical Contact

Table 8-3. 25A OLIU (780 nm) Link Budgets

<u>Parameter</u>	<u>Single-Mode Fiber*</u>		<u>Multimode Fibert</u>		<u>See Note</u>
	<u>Tx High†</u>	<u>Tx Low</u>	<u>Tx High</u>	<u>Tx Low</u>	
Minimum Wavelength (λ_{\min}) (nm)	765	765	765	765	
Maximum Wavelength (λ_{\max}) (nm)	800	800	800	800	
Spectral Width ($\delta\lambda_{\text{rms}}$) (nm)	10	10	10	10	
Maximum TX Power ($P_{T\max}$) (dBm)	-3.3	-7.9	0.0	-2.5	1
Minimum TX Power ($P_{T\min}$) (dBm)	-7.4	-9.6	-5.0	-7.5	
Maximum RX Power ($P_{R\max}$) (dBm)	-7.0	-7.0	-7.0	-7.0	
Minimum RX Power ($P_{R\min}$) (dBm)	-21.0	-21.0	-21.0	-21.0	2
Available System Gain (S-R) (dB)	13.6	11.4	16.0	13.5	
System Margins					
Optical Path Penalty (dB)	1.0	1.0	1.0	1.0	3
Connector Loss (dB)	1.5	1.5	1.5	1.5	4
Unallocated Margin (dB)	1.5	1.5	1.5	1.5	5
Total Margin (dB)	4.0	4.0	4.0	4.0	
Minimum Link Budget (dB)	3.7	0.0	7.0	4.5	
Maximum Link Budget (dB)	9.6	7.4	12.0	9.5	6
Maximum Span Length (km)	3.1	2.4	2.2	1.7	7,8

* Based on 8.3 μm inner core single-mode fiber.

† Based on 62.5 μm inner core multimode fiber.

‡ The high/low transmitted power switch on the 25A OLIU allows for loopbacks or small outside plant (SOP) loss budgets without external attenuators.

Table 8-3 25A OLIU (780nm) Link Budgets (Contd)

Notes:

1. Transmit and receive powers are references to points S and R as shown in Figure 8-1.
2. Minimum RX Power (P_{Rmin}) is measured at 10^{-9} BER.
3. Optical path penalty includes effects of dispersion, reflection, and jitter that occur on the optical path.
4. One connector (0.75 dB) on each end is assumed to connect station cable to outside plant.
5. Unallocated margin, or safety margin, is typically specified from 0 to 3 dB.
6. Budget available for both station and transmission cable and splices.
7. Attenuation and dispersion can be limiting factors in span length. For the 25A OLIU, where the optical line rate is 9.468 Mb/s, dispersion is not a factor and all applications are attenuation limited.
8. An attenuation of 3.1 dB/km is used for single mode fiber at 780 nm. An attenuation of 5.5 dB/km is used for multimode fiber at 780 nm. Both of these attenuation factors include the effects of splices at the rate of approximately 1 splice every 2 km (0.1 dB/km).

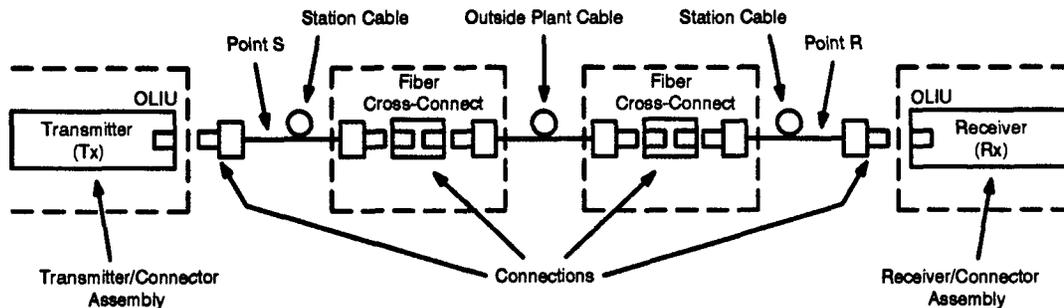


Figure 8-1. Optical System Interfaces (Point S and R)

The 25F OLIU operates at a nominal line rate of 9.468 Mb/s, at a nominal wavelength of 1300 nm, and has a system gain that supports spans over 75.5 kft (23 km). Tables 8-4 and 8-5 provide detailed specifications and link budget information for the 25F OLIU.

Table 8-4. 25F OLIU (1300 nm) General Optical Specifications

System Information	
Terminal Equipment Identification	25F OLIU
Revision	Series 6:6 and 7:7
Optical Line Rate (Mb/s)	9.468 Mb/s
Information Payload Capacity	4 X 1.544 Mb/s = 6.176 Mb/s
Optical Line Coding	4B6B Proprietary Line Code
Optical Wavelength	1300 nm
Transmitter Information	
Optical Device Temperature Controller	None
FDA Classification	Class I
Optical Source	InGaAsP Laser
Faceplate Connector	AT&T ST® R2000A-2, Single- or Multimode
Pigtail	None
Receiver Information	
Optical Device Temperature Controller	None
Optical Detector	InGaAs PIN
Faceplate Connector	AT&T ST R2000A-2, Single- or Multimode
Pigtail	None
WDM Device Information	Not applicable
Attenuator Device Information	Not applicable
Station Cable Information	Not applicable (customer group)
Station Cable Connector Information	
Single-Mode Operation	AT&T ST P3020A-C-125 Single-Mode or equivalent
Multimode Operation	AT&T ST P2020C-C-125 Multimode or equivalent
Type of Fiber Connection	Physical Contact

Table 8-5. 25F OLIU (1300 nm) Link Budgets

<u>Parameter</u>	<u>Single-Mode Fiber*</u>		<u>Multimode Fibert</u>		<u>See Note</u>
	<u>Tx High†</u>	<u>Tx Low</u>	<u>Tx High</u>	<u>Tx Low</u>	
Minimum Wavelength (λ_{min}) (nm)	1280	1280	1280	1280	
Maximum Wavelength (λ_{max}) (nm)	1330	1330	1330	1330	
Spectral Width ($\delta\lambda_{rms}$) (nm)	10	10	10	10	
Maximum TX Power (P_{Tmax}) (dBm)	-4.3	-10.9	+0.5	-4.9	1
Minimum TX Power (P_{Tmin}) (dBm)	-8.4	-12.6	-4.5	-9.9	
Maximum RX Power (P_{Rmax}) (dBm)	-10.0	-10.0	-10.0	-10.0	
Minimum RX Power (P_{Rmin}) (dBm)	-23.0	-23.0	-23.0	-23.0	2
Available System Gain (S-R) (dB)	14.6	10.4	18.5	13.1	
System Margins					
Optical Path Penalty (dB)	1.0	1.0	1.0	1.0	3
Connector Loss (dB)	1.5	1.5	1.5	1.5	4
Unallocated Margin (dB)	1.5	1.5	1.5	1.5	5
Total Margin (dB)	4.0	4.0	4.0	4.0	
Minimum Link Budget (dB)	5.7	0.0	10.5	5.1	
Maximum Link Budget (dB)	10.6	6.4	14.5	9.1	6
Maximum Span Length (km)	23	13.9	14.5	9.1	7,8

* Based on 8.3 μ m inner core single-mode fiber.

† Based on 62.5 μ m inner core multimode fiber.

‡ The high/low transmitted power switch on the 25F OLIU allows for loopbacks or small outside plant (SOP) loss budgets without external attenuators.

Table 8-5 25F OLIU (1300nm) Link Budgets (Contd)

Notes:

1. Transmit and receive powers are references to points S and R as shown in Figure 8-1.
2. Minimum RX Power (P_{Rmin}) is measured at 10^{-9} BER.
3. Optical path penalty includes effects of dispersion, reflection, and jitter that occur on the optical path.
4. One connector (0.75 dB) on each end is assumed to connect station cable to outside plant.
5. Unallocated margin, or safety margin, is typically specified from 0 to 3 dB.
6. Budget available for both station and transmission cable and splices.
7. Attenuation and dispersion can be limiting factors in span length. For the 25F OLIU, where the optical line rate is 9.468 Mb/s, dispersion is not a factor and all applications are attenuation limited.
8. An attenuation of 0.45 dB/km is used for single mode fiber at 1300 nm. An attenuation of 1.0 dB/km is used for multimode fiber at 1300 nm. Both of these attenuation factors include the effects of splices at the rate of approximately 1 splice every 4 km (0.05 dB/km).

AEK-Type Office Repeater Circuit Packs

The following specification applies to both the AEK86B and AEK88 T1 office repeater circuit packs.

Dimensions

The T1 repeater circuit packs are 3.513 inches high and 10.214 inches long.

Weight

The AEK-type circuit packs weigh less than 1 pound.

Distance to DSX-1 Cross-Connection

The 3.0 volt peak DS1 output level capability of the AEK-type repeater allows a maximum distance of 85 feet between the DDM-Plus and the DSX-1 cross-connect panel. No DS1 output equalization is required. Future releases of the AEK-type repeaters are planned with cable buildout to 655 feet.

Automatic Line Build-Out Range

The AEK-type repeater contains an automatic line buildout (ALBO) circuit that operates over the range of 0 to 35 dB of line at 0.772 MHz. Thus the loss of the repeater section adjacent to the DDM-Plus can range between 0 and 35 dB. The effective loop resistance range (R_{Lmax}) for the AEK-type repeaters is shown in Table 8-6.

Table 8-6. Effective Loop Resistance Range — R_{Lmax}

<u>AEK-type</u>	<u>R_{Lmax}</u>
AEK86B	2100 ohms
AEK88	300 ohms
AEK90	2100

For additional technical specifications on the AEK-type T1 office repeater circuit packs, refer to AT&T 365-200-107, *DS1 Extension Shelf Description, Installation, and Maintenance*.

Power

The AEK-type office repeater circuit packs operate properly on any DC voltage in the range from -40.0 to -60 V DC. Nominal operating voltage is -48 V DC. Table 8-7 describes the dissipation characteristics for the AEK-type repeaters.

The AEK-type T1 repeaters access either bus A (even numbered slots) or bus B (odd numbered slots) but not both power buses as do the OLIU circuit packs. If the bus supplying the T1 repeater loses power, the T1 repeater will drop service.

Table 8-7. AEK-Type Repeater Power

<u>Circuit Pack</u>	<u>Dissipation (Note)</u>
AEK86B	2.6 Watts
AEK88	2.6 Watts
AEK90	2.6 Watts

Note: Does not include loop (copper) dissipation.

Refer to FPD 801-525-169 for additional power information.

DDM-Plus Reliability

The worst case estimated failure rate of the DDM-Plus is given in Table 8-8. As the table shows, the FIT rate is dependent on the operating power of the laser, with the low-power mode of the circuit pack having an advantage in lifespan. These failure rates apply to both the 25A OLIU and the 25F OLIU.

Table 8-8. DDM-Plus Estimated Failure Rate

<u>Circuit Pack</u>	<u>FITs (Note 1)</u>	<u>MTBF (Note 2)</u>
25A	10,489	10.85 years
25F	11,086	10.25 years
AEK86B	1268.45	89.93 years
AEK88	957	119 years
AEK90	1438.15	79.3 years

Notes:

1. Number of failures in 10^9 hours of operation.
2. Mean time between failures.

Using these estimated failure rates, the application that requires 1+1 protection and those that do not can be determined. In applications where the DDM-Plus does not meet Bellcore specification, the DDM-Plus can be deployed protected to meet the specification. Note that the failure rate calculated for the DDM-Plus in Table 8-8 is worst case in terms of unavailability. Many of the failures counted will not cause a loss of service. Therefore, the unavailability time for the DDM-Plus will be substantially smaller than shown in Table 8-8.

Unavailability is defined, for this and all other outage requirements, as any 1-second interval with a bit error ratio of 10^{-3} or worse.

Silent Failure

The DDM-Plus has a mean time between failures (MTBFs) for silent failures of 50 years. A silent failure is any equipment failure that results in a loss of service or a loss of protection that does not trigger an audible office alarm.

Infant Mortality

The ratio of first year failures to failures in later years is known as the infant mortality factor (IMF). The requirement is to have an IMF of less than 2.5. The failure rate for an individual DDM-Plus circuit pack does not exceed 2.5 times the predicted steady state failure rate during the first year of service.

Floor Plan Data Sheet — FPD 801-525-169

The following figure is a copy of the *Floor Plan Data Sheet*, FPD 801-525-169.

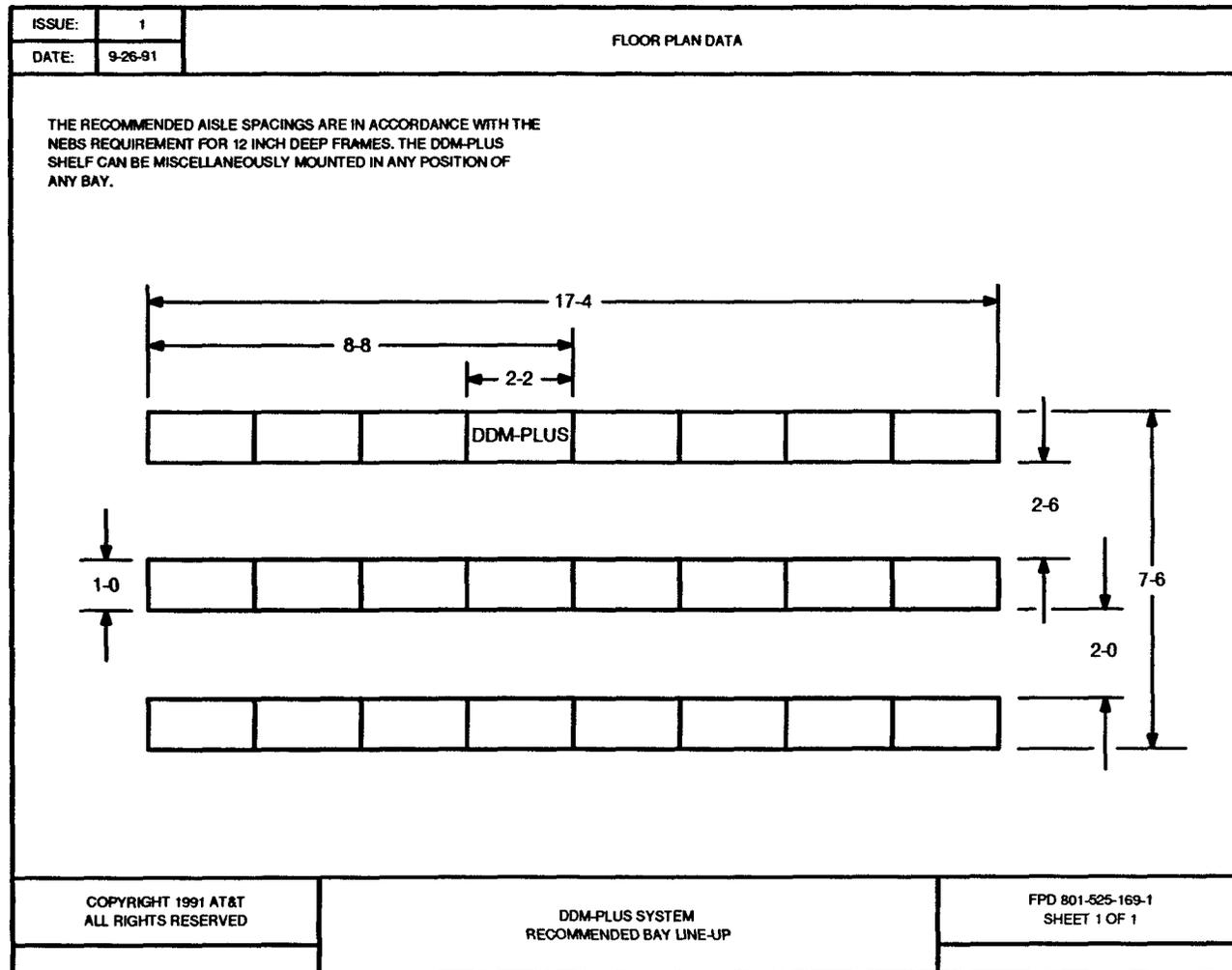


Figure 8-2. Floor Plan Data (Sheet 1 of 9)

ISSUE:	4	FLOOR PLAN DATA				SNMA 5					
DATE:											
EQUIPMENT IDENTIFICATION			PHYSICAL DATA			CABLING DATA		HEAT RELEASE, WATTS			
MFR'S NAME: AT&T N. S. MFR'S CODE: ED8C730-10 RATING: GENERAL AVAIL. FLOOR PLAN DESIGNATION: SNMA MEGS SUFFIX: 5 CATEGORY: COMMON SYSTEMS			NEBS COMPATIBLE: YES HEIGHT: 0-10 DEPTH: 1-0 EFFECT WIDTH: 1-11 WEIGHT LBS. 24 FRWK TYPE: UNEQUAL FLNG MIN FRONT AISLE: 2-6 MIN REAR AISLE: 2-0 FRAMES/FUNCTION: 1 UNITS/FRAME: 1			SHIELD OR CLASS	EFFECTIVE CABLE AREA (SQ. IN.)	BUSY	IDLE	PLANNING VALUE	
								MAX	72	72	72
						MIN	70	70	DIMENSIONS 12 INCHES AND OVER ARE IN FEET AND INCHES. ALL OTHER DIMENSIONS ARE IN INCHES. * DENOTES ESTIMATED VALUE. FOR GENERAL INFORMATION, -SEE THE SECTIONS SECTIONS OF FPD 800-000-000		
DC CURRENT DRAINS					<p style="text-align: center;">FRONT TOP VIEW</p>						
VOLTAGE	LIST NO.	BUS	MAX AMPS	MIN AMPS							
-48	1		1.8 *	0.2 *							
-40	2		4.0 *	1.1 *							
AC CURRENT DRAINS											
VOLTAGE	CATE-GORY	RUNNING CURR. AMPS	INRUSH		NOTES: 1. THE LIST 1 & LIST 2 DRAINS GIVEN ARE FOR T1 (METALLIC) OPERATION. THE LIST 1 & LIST 2 DRAINS FOR OPTICAL ONLY OPERATION ARE 1.5 AMPS AND 1.8 AMPS RESPECTIVELY. 2. FOR RECOMMENDED BAY CONFIGURATIONS, PLEASE REFER TO FPD 801-525-169-3, -4, AND -5. FOR CABLING REFER TO ED8C730-20. 3. A BAFFLE IS TO BE INSTALLED OVER EVERY STAND-ALONE DDM-PLUS IN THE BAY. THE BAFFLE IS 4.00 INCHES IN HEIGHT AND THE SHELF HEIGHT IS 5.50 INCHES. 4. A 1.00 INCH (MINIMUM) SPACE MUST BE PRODUCED BENEATH THE DDM-PLUS. IF THE DDM-PLUS IS MOUNTED ABOVE HEAT GENERATING EQUIPMENT A BAFFLE MUST BE MOUNTED ONE INCH BELOW THE SHELF.						
			CURR. AMPS	DURATION SECS							
COPYRIGHT 1991 AT&T ALL RIGHTS RESERVED			DDM-PLUS SYSTEM MISCELLANEOUSLY MOUNTED SHELF			FPD 801-525-169-2 SHEET 1 OF 2					

Figure 8-2. Floor Plan Data (Sheet 2 of 9)

ISSUE:	2	FLOOR PLAN DATA	SNMA 5
DATE:	10-3-91		
NOTES (CONT.) 5. THE MAXIMUM AND MINIMUM VALUES FOR LIST 1 REFLECT LOOP RESISTANCES OF 1000 AND 300 OHMS RESPECTIVELY. THE MAXIMUM AND MINIMUM VALUES FOR LIST 2 REFLECT LOOP RESISTANCES OF 2100 AND 300 OHMS RESPECTIVELY.			
COPYRIGHT 1991 AT&T ALL RIGHTS RESERVED		DDM-PLUS SYSTEM MISCELLANEOUSLY MOUNTED SHELF	FPD 801-525-169-2 SHEET 2 OF 2

Figure 8-2. Floor Plan Data (Sheet 3 of 9)

ISSUE:	3		FLOOR PLAN DATA				SNMA 6			
DATE:										
EQUIPMENT IDENTIFICATION			PHYSICAL DATA		CABLING DATE		HEAT RELEASE, WATTS			
MFR'S NAME: AT&T N. S. MFR'S CODE: ED8C730-10 RATING: GENERAL AVAIL FLOOR PLAN DESIGNATION: SNMA MEGS SUFFIX: 6 CATEGORY: COMMON SYSTEMS			NEBS COMPATIBLE: YES HEIGHT: 7-0 DEPTH: 1-0 EFFECT WIDTH: 2-2 WEIGHT LBS. 270 FRWK TYPE: UNEQUAL FLNG MIN FRONT AISLE: 2-6 MIN REAR AISLE: 2-0 FRAMES/FUNCTION: 1 UNITS/FRAME:		SHIELD OR CLASS	EFFECTIVE CABLE AREA (SQ. IN.)	BUSY		IDLE	PLANNING VALUE
							MAX	432		
							MIN	419	419	
DIMENSIONS 12 INCHES AND OVER ARE IN FEET AND INCHES. ALL OTHER DIMENSIONS ARE IN INCHES. * DENOTES ESTIMATED VALUE. FOR GENERAL INFORMATION, -SEE THE SECTIONS SECTIONS OF FPD 800-000-000										
DC CURRENT DRAINS					<p style="text-align: center;">FRONT TOP VIEW</p>					
VOLTAGE	LIST NO.	BUS	MAX AMPS	MIN AMPS						
-48	1		10.8 *	4.8 *						
-40	2		23.8 *	6.3 *						
AC CURRENT DRAINS					NOTES: 1. THE LIST 1 & LIST 2 DRAINS GIVEN ARE FOR T1 (METALLIC) OPERATION. THE LIST 1 & LIST 2 DRAINS FOR OPTICAL ONLY OPERATION ARE 9.0 AMPS AND 10.8 AMPS RESPECTIVELY. 2. FOR CABLING REFER TO ED8C730-20. 3. FOR TYPICAL BAY ARRANGEMENTS REFER TO ED8C730-10. 4. THE 7" FRAME IS ED8C500-50,G1. 5. THE MAXIMUM AND MINIMUM VALUES FOR LIST 1 REFLECT LOOP RESISTANCES OF 1000 AND 300 OHMS RESPECTIVELY. THE MAXIMUM AND MINIMUM VALUES FOR LIST 2 REFLECT LOOP RESISTANCES OF 2100 AND 300 OHMS RESPECTIVELY.					
VOLTAGE	CATE-GORY	RUNNING CURR. AMPS	INRUSH							
			CURR. AMPS	DURATION SECS						
COPYRIGHT 1991 AT&T ALL RIGHTS RESERVED			DDM-PLUS SYSTEM REAR ACCESS BAY 7" FRAME				FPD 801-525-169-3 SHEET 1 OF 1			

Figure 8-2. Floor Plan Data (Sheet 4 of 9)

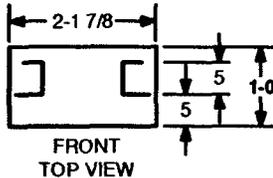
ISSUE:	3		FLOOR PLAN DATA				SNMA 7				
DATE:											
EQUIPMENT IDENTIFICATION			PHYSICAL DATA			CABLING DATE		HEAT RELEASE, WATTS			
MFR'S NAME: AT&T N. S. MFR'S CODE: ED8C730-10 RATING: GENERAL AVAIL FLOOR PLAN DESIGNATION: SNMA MEGS SUFFIX: 7 CATEGORY: COMMON SYSTEMS			NEBS COMPATIBLE: YES HEIGHT: 7-0 DEPTH: 1-0 EFFECT WIDTH: 2-2 WEIGHT LBS. 270 FRWK TYPE: UNEQUAL FLNG MIN FRONT AISLE: 2-6 MIN REAR AISLE: 2-0 FRAMES/FUNCTION: 1 UNITS/FRAME:			SHIELD OR CLASS	EFFECTIVE CABLE AREA (SQ. IN.)		BUSY	IDLE	PLANNING VALUE
								MAX	432	432	432
						MIN	419	419	DIMENSIONS 12 INCHES AND OVER ARE IN FEET AND INCHES. ALL OTHER DIMENSIONS ARE IN INCHES. * DENOTES ESTIMATED VALUE. FOR GENERAL INFORMATION, -SEE THE SECTIONS SECTIONS OF FPD 800-000-000		
DC CURRENT DRAINS					 <p>FRONT TOP VIEW</p>						
VOLTAGE	LIST NO.	BUS	MAX AMPS	MIN AMPS							
-48	1		10.8 *	4.8 *							
-40	2		23.8 *	6.3 *							
AC CURRENT DRAINS					NOTES: 1. THE LIST 1 & LIST 2 DRAINS GIVEN ARE FOR T1 (METALLIC) OPERATION. THE LIST 1 & LIST 2 DRAINS FOR OPTICAL ONLY OPERATION ARE 9.0 AMPS AND 10.8 AMPS RESPECTIVELY. 2. FOR CABLING REFER TO ED8C730-20. 3. FOR TYPICAL BAY ARRANGEMENTS REFER TO ED8C730-10. 4. THE 7" FRAME IS ED8C501-50.G1. 5. THE MAXIMUM AND MINIMUM VALUES FOR LIST 1 REFLECT LOOP RESISTANCES OF 1000 AND 300 OHMS RESPECTIVELY. THE MAXIMUM AND MINIMUM VALUES FOR LIST 2 REFLECT LOOP RESISTANCES OF 2100 AND 300 OHMS RESPECTIVELY.						
VOLTAGE	CATE-GORY	RUNNING CURR. AMPS	INRUSH								
			CURR. AMPS	DURATION SECS							
COPYRIGHT 1991 AT&T ALL RIGHTS RESERVED			DDM-PLUS SYSTEM REAR ACCESS BAY 7" FRAME				FPD 801-525-169-4 SHEET 1 OF 1				

Figure 8-2. Floor Plan Data (Sheet 5 of 9)

ISSUE:	4		FLOOR PLAN DATA				SNMA 8		
DATE:									
EQUIPMENT IDENTIFICATION			PHYSICAL DATA		CABLING DATE		HEAT RELEASE, WATTS		
MFR'S NAME: AT&T N. S. MFR'S CODE: ED8C730-10 RATING: GENERAL AVAIL. FLOOR PLAN DESIGNATION: SNMA MEGS SUFFIX: 8 CATEGORY: COMMON SYSTEMS			NEBS COMPATIBLE: YES HEIGHT: 7-0 DEPTH: 1-0 EFFECT WIDTH: 2-2 WEIGHT LBS. 270 FRWK TYPE: UNEQUAL FLNG MIN FRONT AISLE: 2-6 MIN REAR AISLE: 2-0 FRAMES/FUNCTION: 1 1 UNITS/FRAME:		SHIELD OR CLASS	EFFECTIVE CABLE AREA (SQ. IN.)	BUSY	IDLE	PLANNING VALUE
							MAX	432	
					MIN	419	419	432	
							DIMENSIONS 12 INCHES AND OVER ARE IN FEET AND INCHES. ALL OTHER DIMENSIONS ARE IN INCHES. * DENOTES ESTIMATED VALUE. FOR GENERAL INFORMATION, -SEE THE SECTIONS SECTIONS OF FPD 800-000-000		
DC CURRENT DRAINS					<p style="text-align: center;">FRONT TOP VIEW</p>				
VOLTAGE	LIST NO.	BUS	MAX AMPS	MIN AMPS					
-48	1		10.8 *	4.8 *					
-40	2		23.8 *	6.3 *					
AC CURRENT DRAINS					NOTES: 1. THE LIST 1 & LIST 2 DRAINS GIVEN ARE FOR T1 (METALLIC) OPERATION. THE LIST 1 & LIST 2 DRAINS FOR OPTICAL ONLY OPERATION ARE 9.0 AMPS AND 10.8 AMPS RESPECTIVELY. 2. FOR CABLING REFER TO ED8C730-20. 3. FOR TYPICAL BAY ARRANGEMENTS REFER TO ED8C730-10. 4. THE 7' FRAME IS ED8C500-50,G1. 5. THE MAXIMUM AND MINIMUM VALUES FOR LIST 1 REFLECT LOOP RESISTANCES OF 1000 AND 300 OHMS RESPECTIVELY. THE MAXIMUM AND MINIMUM VALUES FOR LIST 2 REFLECT LOOP RESISTANCES OF 2100 AND 300 OHMS RESPECTIVELY.				
VOLTAGE	CATE-GORY	RUNNING CURR. AMPS	INRUSH						
			CURR. AMPS	DURATION SECS					
COPYRIGHT 1991 AT&T ALL RIGHTS RESERVED			DDM-PLUS SYSTEM FRONT ACCESS BAY 7' FRAME			FPD 801-525-169-5 SHEET 1 OF 2			

Figure 8-2. Floor Plan Data (Sheet 6 of 9)

ISSUE:	2	FLOOR PLAN DATA	SNMA 8
DATE:	10-3-91		
NOTES (CONT.) 5. THE MAXIMUM AND MINIMUM VALUES FOR LIST 1 REFLECT LOOP RESISTANCES OF 1000 AND 300 OHMS RESPECTIVELY. THE MAXIMUM AND MINIMUM VALUES FOR LIST 2 REFLECT LOOP RESISTANCES OF 2100 AND 300 OHMS RESPECTIVELY.			
COPYRIGHT 1991 AT&T ALL RIGHTS RESERVED		DDM-PLUS SYSTEM FRONT ACCESS BAY 7' FRAME	FPD 801-525-169-5 SHEET 2 OF 2

Figure 8-2. Floor Plan Data (Sheet 7 of 9)

ISSUE:	2		FLOOR PLAN DATA				SNMA 12					
DATE:												
EQUIPMENT IDENTIFICATION			PHYSICAL DATA			CABLING DATE		HEAT RELEASE, WATTS				
MFR'S NAME: AT&T N. S. MFR'S CODE: ED8C730-30G1 RATING: GENERAL AVAIL FLOOR PLAN DESIGNATION: SNMA MEGS SUFFIX: 12 CATEGORY: COMMOM SYSTEMS			NEBS COMPATIBLE: CONDITIONAL HEIGHT: 0-7 DEPTH: 0-6 1/2 EFFECT WIDTH: 1-3 WEIGHT LBS. 15 FRWK TYPE: NA MIN FRONT AISLE: 3-0 MIN REAR AISLE: NA FRAMES/FUNCTION: 1 UNITS/FRAME: 1			SHIELD OR CLASS	EFFECTIVE CABLE AREA (SQ. IN.)	BUSY		IDLE		PLANNING VALUE
								MAX	10	10	10	
						MIN	10	10	DIMENSIONS 12 INCHES AND OVER ARE IN FEET AND INCHES. ALL OTHER DIMENSIONS ARE IN INCHES. * DENOTES ESTIMATED VALUE. FOR GENERAL INFORMATION, -SEE THE SECTIONS SECTIONS OF FPD 800-000-000			
DC CURRENT DRAINS												
VOLTAGE	LIST NO.	BUS	MAX AMPS	MIN AMPS								
-48	1		.21	.21								
-40	2		.27	.27								
AC CURRENT DRAINS					NOTES: 1. FOR DETAILED MOUNTING DESCRIPTION REFER TO WALL DT INSTALLATION MANUAL 363-206-154. 2. FOR CABLING REFER TO ED8C730-20. 3. DASHED FIGURE SHOWS WALL DT SWING CLEARANCE REQUIRED.							
VOLTAGE	CATE-GORY	RUNNING CURR. AMPS	INRUSH									
			CURR. AMPS	DURATION SECS								
COPYRIGHT 1991 AT&T ALL RIGHTS RESERVED			DDM-PLUS SYSTEM WALL DISTANCE TERMINAL				FPD 801-525-169-6 SHEET 1 OF 1					

Figure 8-2. Floor Plan Data (Sheet 8 of 9)

ISSUE:	1	FLOOR PLAN DATA				SNMA 14		
DATE:	11-2-92							
EQUIPMENT IDENTIFICATION		PHYSICAL DATA		CABLING DATA		HEAT RELEASE, WATTS		
MFR'S NAME: AT&T N. S. MFR'S CODE: ED8C730-33G1 RATING: GENERAL AVAIL FLOOR PLAN DESIGNATION: SNMA MEGS SUFFIX: 14 CATEGORY: COMMON SYSTEMS		NEBS COMPATIBLE: CONDITIONAL HEIGHT: 0-7 DEPTH: 0-6 1/2 EFFECT WIDTH: 1-4 WEIGHT LBS. 16 FRWK TYPE: SPECIAL MIN FRONT AISLE: 3-0 MIN REAR AISLE: FRAMES/FUNCTION: 1 UNITS/FRAME: 1		SHIELD OR CLASS	EFFECTIVE CABLE AREA (SQ. IN.)	BUSY	IDLE	PLANNING VALUE
						MAX	10	
						MIN	10	10
DIMENSIONS 12 INCHES AND OVER ARE IN FEET AND INCHES. ALL OTHER DIMENSIONS ARE IN INCHES. * DENOTES ESTIMATED VALUE. FOR GENERAL INFORMATION, -SEE THE SECTIONS OF FPD 800-000-000								
DC CURRENT DRAINS								
VOLTAGE	LIST NO.	BUS	MAX AMPS	MIN AMPS				
-48	1		.21	.21				
-40	2		.27	.27				
AC CURRENT DRAINS					NOTES: 1. FOR DETAILED MOUNTING DESCRIPTION REFER TO WALL DT INSTALLATION MANUAL 363-206-157. 2. FOR CABLING REFER TO ED8C730-20. 3. DASHED FIGURE SHOWS WALL DT SWING CLEARANCE REQUIRED.			
VOLTAGE	CATE-GORY	RUNNING CURR. AMPS	INRUSH					
			CURR. AMPS	DURATION SECS				
COPYRIGHT 1992 AT&T ALL RIGHTS RESERVED		DDM-PLUS SYSTEM WALL DISTANCE TERMINAL				FPD 801-525-169-7 SHEET 1 OF 1		

Figure 8-2. Floor Plan Data (Sheet 9 of 9)

Operation and Maintenance — TOP

How to Use This Chapter

This chapter [Task Oriented Practice (TOP)] provides procedures for the following types of tasks:

- Acceptance
- System Turnup
- Circuit Order
- Trouble Clearing

The Acceptance procedures check either the shelf and cable installation before circuit packs are installed or after the shelf has been equipped and/or the system has been established.

The System Turnup procedures include the following:

- a. Equipping (turning up) a shelf in a looped back condition for the first time.
- b. Establishing an end-to-end system after both ends have been equipped.
- c. Establishing initial end-to-end service.

The Circuit Order procedures cover operating the system such as adding new service, deleting service, displaying alarms, equipment, and facility status.

The Trouble-Clearing procedures cover alarms and customer trouble reports.

To find the instructions for performing acceptance, system turnup, and circuit order trouble-clearing tasks, proceed as follows:

1. Find your task in the Task Index List (**IXL-001**).
2. Turn to the indicated director level, detail level, or trouble-clearing procedure. All procedures in each section are in numerical order, regardless of type. (See Tables 1, 2, 3, and 4.) Procedures in this TOP are of three types as follows:
 - a. **Non-Trouble-Clearing Procedure (NTP)** - A director-level procedure lists normal work items to perform other than trouble clearing.
 - b. **Trouble Analysis Procedure (TAP)** - A director-level procedure that contains step-by-step trouble-clearing instructions to locate and/or fix troubles.
 - c. **Detailed Level Procedure (DLP)** - Detailed step-by-step instructions.
3. Perform all the items in the director-level procedure in the indicated order unless it sends you to another director-level procedure. When you complete a director-level procedure, you have finished the task. Where more detailed information is required, you will be sent to a Detailed Level Procedure **DLP-()**. You may also be sent to a Detailed Level Procedure by another Detailed Level Procedure.
4. **IMPORTANT:** When you complete a Detailed Level Procedure, you **MUST** return to the procedure that sent you there.
5. **IMPORTANT:** In most cases, if one director-level procedure sends you to another director-level procedure, you should not return to the first director-level procedure after you complete the second.
6. Sometimes you will be asked to verify that things have occurred. This may take the form of a formal statement of the expected response. At other times, the instructions will merely state *verify that ...* .

If the expected response is not observed and a specific trouble-clearing reference is not made, you should reference the trouble analysis procedures.

7. If you need assistance in clearing a trouble after completing all the applicable trouble-clearing procedures in this section, call the AT&T Regional Technical Assistance Center (RTAC). The telephone number is **1-800-225-RTAC**.

For more detailed information on how to use this Task Oriented Practice (TOP), refer to the tab *How to Use TOP*.

Circuit packs being returned for repair should be sent to the following address:

AT&T Network Systems
Returned Goods Dept.
Dept. 11MV287122
1600 Osgood Street
North Andover, Massachusetts 01845

Safety Labels: The following safety labels are used in the procedures in this manual:

- **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.

Table 1. Acceptance Procedures

IXL-001	Task Index List
NTP-002	Test (Accept) DDM-Plus Installation
NTP-004	Test (Accept) End-to-End DDM-Plus System
DLP-500	Perform Visual Inspection
DLP-501	Check -48 V DC Supply
DLP-502	Set OLIU Option Switches
DLP-503	Perform OLIU Local Test
DLP-504	Perform OLIU Cross-Connect Test
DLP-505	Test Minor Alarm, Telemetry, and Protection Switching
DLP-506	Test Major Alarm and Telemetry
DLP-508	Perform OLIU Optical Span Test
DLP-510	Clean Optical Fibers and Connectors

Table 2. System Turnup Procedures

IXL-001	Task Index List
NTP-003	Equip DDM-Plus
NTP-005	Establish Initial End-to-End DS1 Service
NTP-006	Add New DS1 Service
DLP-502	Set OLIU Option Switches
DLP-507	Connect DDM-Plus to Optical Facility
DLP-509	Provisioning OLIU DS1 Ports
DLP-510	Clean Optical Fibers and Connectors
DLP-511	Display DS1 Line Buildout
DLP-512	Display DS1 Line Coding and LOS Provisioning
DLP-514	Loop Back Far-End OLIU and Insert Test Signal
DLP-515	Loop Back Near-End OLIU

Table 3. Circuit Order Procedures

IXL-001	Task Index List
NTP-006	Add New DS1 Service
DLP-502	Set OLIU Option Switches
DLP-503	Perform OLIU Local Test
DLP-508	Perform OLIU Optical Span Test
DLP-509	Provisioning OLIU DS1 Ports
DLP-510	Clean Optical Fibers and Connectors
DLP-511	Display DS1 Line Buildout
DLP-512	Display DS1 Line Coding and LOS Provisioning

Table 4. Trouble-Clearing Procedures

IXL-001	Task Index List
TAD-100	Maintenance Philosophy
TAP-101	Clear Major Alarm
TAP-102	Clear Minor Alarm
DLP-501	Check -48 V DC Supply
DLP-502	Set OLIU Option Switches
DLP-503	Perform OLIU Local Test
DLP-504	Perform OLIU Cross-Connect Test
DLP-505	Test Minor Alarm, Telemetry, and Protection Switching
DLP-506	Test Major Alarm and Telemetry
DLP-508	Perform OLIU Optical Span Test
DLP-510	Clean Optical Fibers and Connectors
DLP-511	Display DS1 Line Buildout
DLP-512	Display DS1 Line Coding and LOS Provisioning
DLP-513	Replace Failed Circuit Pack
DLP-514	Loop Back Far-End OLIU and Insert Test Signal
DLP-515	Loop Back Near-End OLIU

Task Index List

Find Your Job In The List Below

Then Go To

Trouble Analysis Procedures

Maintenance Philosophy	TAD-100
Clear Major Alarm	TAP-101
Clear Minor Alarm	TAP-102
Check -48 V DC Supply	DLP-501
Clean Optical Fibers and Connectors	DLP-510
Display DS1 Line Buildout	DLP-511
Display DS1 Line Coding and LOS Provisioning	DLP-512
Loop Back Far-End OLIU and Insert Test Signal.....	DLP-514
Loop Back Near-End OLIU.....	DLP-515
Perform OLIU Cross-Connect Test.....	DLP-504
Perform OLIU Local Test.....	DLP-503
Perform OLIU Optical Span Test.....	DLP-508
Set OLIU Option Switches.....	DLP-502
Test Major Alarm and Telemetry	DLP-506
Test Minor Alarm, Telemetry, and Protection Switching	DLP-505

Find Your Job In The List Below

Then Go To

Acceptance Procedures

Test (Accept) DDM-Plus Installation	NTP-002
Test (Accept) End-to-End DDM-Plus System	NTP-004
Check -48 V DC Supply	DLP-501
Clean Optical Fibers and Connectors	DLP-510
Perform OLIU Cross-Connect Test.....	DLP-504
Perform OLIU Local Test.....	DLP-503
Perform OLIU Optical Span Test.....	DLP-508
Perform Visual Inspection	DLP-500
Set OLIU Option Switches.....	DLP-502
Test Major Alarm and Telemetry	DLP-506
Test Minor Alarm, Telemetry, and Protection Switching	DLP-505

Find Your Job In The List Below

Then Go To

System Turnup Procedures

Add New DS1 Service.....	NTP-006
Establish Initial End-to-End DS1 Service.....	NTP-005
Equip DDM-Plus.....	NTP-003
Connect DDM-Plus to Optical Facility.....	DLP-507
Clean Optical Fibers and Connectors.....	DLP-510
Display DS1 Line Buildout.....	DLP-511
Display DS1 Line Coding and LOS Provisioning	DLP-512
Loop Back Far-End OLIU and Insert Test Signal.....	DLP-514
Loop Back Near-End OLIU.....	DLP-515
Provisioning OLIU DS1 Ports	DLP-509
Set OLIU Option Switches.....	DLP-502

Find Your Job In The List Below

Then Go To

Circuit Order

Add New DS1 Service.....	NTP-006
Clean Optical Fibers and Connectors.....	DLP-510
Display DS1 Line Buildout.....	DLP-511
Display DS1 Line Coding and LOS Provisioning	DLP-512
Perform OLIU Local Test.....	DLP-503
Perform OLIU Optical Span Test.....	DLP-508
Provisioning OLIU DS1 Ports	DLP-509
Set OLIU Option Switches.....	DLP-502

Test (Accept) DDM-Plus Installation

Do The Items Below In The Order Listed

For Details, Go To

1.



WARNING:

Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with improper optical instruments. Avoid direct exposure to the beam.



CAUTION:

DDM-Plus circuit packs contain static sensitive components that can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in TAD-100.



NOTE 1:

This procedure assumes that the DDM-Plus has been installed and circuit packs are not installed. It also assumes that the system is being tested (accepted) by an organization that did not install it.



NOTE 2:

This procedure must be performed at each DDM-Plus location.

Visually inspect DDM-Plus shelf.

DLP-500

Do The Items Below In The Order Listed	For Details, Go To
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2. Verify – 48 V DC is applied to the shelf.	DLP-501
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3.  **NOTE 1:**
There are no option settings on the AEK-type T1 repeater circuit packs.

 **NOTE 2:**
Active and standby optical line interface unit (OLIU) circuit pack option settings must match. Mismatches between the option setting or invalid option setting will cause the **DS1** and appropriate information indicator (**1→4**) to blink and the **NE** indicator to light.

Set (check) OLIU circuit pack option settings, DS1 line options, bit error ratio (BER), and set the laser power mode switch (S13) to low.	DLP-502
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4. Clean optical fiber connectors at the OLIU and optical jumper connectors that will be used to loopback the OLIU.	DLP-510
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5. Place an optical loopback on the OLIU by placing an optical jumper from the transmit connector (OUT) to the receive connector (IN).	
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Do The Items Below In The Order Listed **For Details, Go To**

6.  **NOTE 1:**
An OLIU and AEK-type T1 repeater circuit packs cannot be mixed in a group.
-  **NOTE 2:**
For mixed shelves, it is recommended that OLIU grow from left to right and AEK-type repeaters grow from right to left.
-  **NOTE 3:**
When the OLIU is installed or power is applied after a loss of power, all faceplate indicators light for 1/4 second; then are off for 3/4 second. The OLIU then enters its normal operating state with its indicators displaying the status of the OLIU.
-  **NOTE 4:**
Acceptance and routine maintenance procedures for the AEK-type T1 repeaters are similar to that for the standard T1 office repeater, which is given in AT&T 365-800-002, *T1 Digital Line — Acceptance and Maintenance Tasks Digital Transmission Tasks*. Refer to AT&T 855-351-101, *T1 Digital Line — Transmission and Outside Plant Design Procedure*, for engineering information.

Verify that the circuit packs are installed according to office records or install circuit packs according to office records.

Do The Items Below In The Order Listed	For Details, Go To
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7. Verify that the **ACTIVE** indicator is lighted on one OLIU and is not lighted on the other OLIU for each group (A—G) of the DDM-Plus equipped with 1+1 protection.

8. Test OLIU faceplate indicators by pressing both **NE/ENABLE** and **FE/ENABLE** pushbuttons simultaneously.

If all indicators did not light, replace the OLIU.

9. Test (accept) local equipment.	DLP-503
10. Test (accept) cross-connect wiring.	DLP-504
11. Test (accept) minor alarm, telemetry, and protection switching	DLP-505
12. Test (accept) major alarm and telemetry.	DLP-506
13. Remove optical jumpers providing optical loopbacks from OLIUs.	
14. The DDM-Plus is now ready for end-to-end testing.	NTP-004

Equip DDM-Plus

Do The Items Below In The Order Listed

For Details, Go To

1. Determine from office records or work order the equipage of the DDM-Plus shelf and the option setting for each optical line interface unit (OLIU) being installed.
-

2.



NOTE 1:

Each end of the optical facility must have the same coded OLIU.



NOTE 2:

Active and standby OLIU circuit pack option settings must match. Mismatches between the option setting or invalid option setting will cause the **DS1** and appropriate information indicator (**1→4**) to blink and **NE** indicators to light.



NOTE 3:

There are no option settings on the AEK-type T1 repeater circuit packs.

Set the OLIU circuit pack option settings (DS1 line options, bit error ratio, and laser power mode) according to office records.

DLP-502

Do The Items Below In The Order Listed

For Details, Go To

3. 

NOTE 1:

DDM-Plus Systems providing protection switching require two OLIUs to be installed in a group. Each group location in the shelf is known as a DDM-Plus System.



NOTE 2:

In protection configurations, neither of the OLIUs are designated as "*service*" or "*protection*".



NOTE 3:

An OLIU and AEK-type T1 repeater circuit pack cannot be mixed in a group.



NOTE 4:

For mixed shelves, OLIU should grow from left to right and AEK-type repeaters grow from right to left.

Install OLIUs in the DDM-Plus shelf according to office records.

Do The Items Below In The Order Listed	For Details, Go To
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4. Test OLIU faceplate indicators by pressing both **NE/ENABLE** and **FE/ENABLE** pushbuttons simultaneously.

If all indicators did not light, replace the OLIU.

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- | | |
|--------------------------------|---------|
| 5. Test newly installed OLIUs. | DLP-503 |
|--------------------------------|---------|
-

6. Install AEK-type T1 repeaters according to office records.

-
- | | |
|--|---------|
| 7. You are now ready to establish an end-to-end DDM-Plus System. | NTP-004 |
|--|---------|
-

Test (Accept) End-to-End DDM-Plus System

Do The Items Below In The Order Listed

For Details, Go To

1.



WARNING:

Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with improper optical instruments. Avoid direct exposure to the beam.



CAUTION:

DDM-Plus circuit packs contain static sensitive components that can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in TAD-100.



NOTE 1:

This procedure assumes that the DDM-Plus has been installed and equipped with circuit packs. It also assumes that the system is tested (accepted) by an organization that did not install it.



NOTE 2:

This procedure assumes that both locations of the DDM-Plus are installed, powered, running, and have been tested in a loopback configuration. NTP-002 has been performed at each DDM-Plus location. If this has not been done, refer to NTP-002 and test (accept) each optical line interface unit (OLIU).

Do The Items Below In The Order Listed **For Details, Go To**



NOTE 3:

For new installations at any point in this procedure if DDM-Plus fails to respond in the indicated manner, you should refer the trouble to the organization that installed the DDM-Plus.

Determine the optical loss of the optical facility from office records or make required measurements.

-
- | | |
|---|---------|
| 2. Verify and set the laser power mode option switch (S13) on the OLIUs to agree with the loss of the optical facility. | DLP-502 |
| 3. Clean optical fiber connectors at the OLIU and optical facility (LGX [®] panel). | DLP-510 |
| 4. Verify or connect each end of the DDM-Plus System to the optical facility (LGX panel). | DLP-507 |
| 5. Perform Optical Span Test. | DLP-508 |
| 6. The DDM-Plus System is now ready for service to be established. | NTP-005 |
-

Establish Initial End-to-End DS1 Service

Do The Items Below In The Order Listed **For Details, Go To**

1. Determine at both near- and far-end locations which DS1 port(s) is to be put into service, and the line buildout and line coding for the DS1 port being established.

 2. Verify the line buildout provisioning for the near-end optical line interface unit (OLIU) DS1 port(s). DLP-511

 3. Verify the line coding and loss of signal (LOS) alarm provisioning for the near-end OLIU DS1 port(s). DLP-512

 4.  **CAUTION:**
DDM-Plus circuit packs contain static sensitive components which can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in TAD-100.

 - If the near-end line buildout, line coding, or LOS provisioning is not set according to office records, remove OLIU and set option switches. DLP-502

 5. Verify the line build-out provisioning for the far-end OLIU DS1 port(s). DLP-511

 6. Verify the line coding and LOS alarm provisioning for the far-end OLIU DS1 port(s). DLP-512

 7. If the far-end line buildout, line coding, or LOS provisioning is not set according to office records, have the OLIU option switches set.
-

Do The Items Below In The Order Listed

For Details, Go To

8. 

NOTE:

When a DS1 signal is detected, the OLIU automatically activates the DS1 port associated with the DS1 signal and updates its list of equipped ports. Once an active DS1 port detects an incoming DS1 LOS, the OLIU generates an alarm, if provisioned.

Make appropriate connection(s) to the DS1 cross-connect point(s) or equivalent point(s) for the DS1(s) being added.

9. 

NOTE:

When a DS1 signal is detected, the OLIU automatically activates the DS1 port associated with the DS1 signal and updates its list of equipped ports. Once an active DS1 port detects an incoming DS1 LOS, the OLIU generates an alarm, if provisioned.

At the far-end location, have the appropriate connection(s) to the DS1 cross-connect point(s) or equivalent point(s) for the DS1(s) made.

10. Verify that the near-end OLIU has activated the DS1 port(s) for equipped DS1(s) by pressing and holding the **NE/ENABLE** pushbutton.

11. Verify that the far-end OLIU has activated the DS1 port(s) for equipped DS1(s) by pressing and holding the **FE/ENABLE** pushbutton.

Add New DS1 Service

Do The Items Below In The Order Listed

For Details, Go To

1. 

NOTE:

This procedure assumes that the DDM-Plus System is already in service and that a DS1 is being added to service.

Determine which DS1 port will be used for the new DS1 service and verify that the DS1 is equipped.

2. Determine the line build-out provisioning for the DS1 port at both the near- and far-end optical line interface unit (OLIU).	DLP-511
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3. Determine the line coding and loss of signal (LOS) alarm provisioning for the DS1 port at both the near- and far-end OLIU.	DLP-512
---	---------

4.



CAUTION:

DDM-Plus circuit packs contain static sensitive components that can be damaged by electrostatic discharge. A static ground wrist strap must be worn when handling the circuit packs. See electrostatic discharge considerations in TAD-100.



CAUTION:

If the active OLIU is removed from the shelf and a standby OLIU is not equipped, service will be interrupted.

Do The Items Below In The Order Listed

For Details, Go To



DLP-502

NOTE:

In-service provisioning changes can only be performed by OLIUs that are equipped with 1+1 protection. Provision the standby OLIU DS1 line options at both near- and far-end location. Then perform a manual protection switch (simultaneously pressing **NE/ENABLE** and **GO ACTIVE** pushbuttons on the standby OLIU, and then pressing the **CLR** pushbutton). Next provision the DS1 line options on the OLIU that is now standby. While reprovisioning the OLIUs, the **DS1** indicator will blink.

If either near- or far-end OLIU DS1 port is not provisioned correctly for the DS1 service, set the DS1 port options (line coding, line buildout, and DS1 LOS alarm).

-
5. If the line buildout provisioning for either the near- or far-end DS1 port was changed, verify the new provisioning.

DLP-511

-
6. If the line coding or LOS alarm provisioning for either the near- or far-end DS1 port was changed, verify the new provisioning.
-

DLP-512

Do The Items Below In The Order Listed

For Details, Go To

7. 

NOTE:

When a DS1 signal is detected, the OLIU automatically activates the DS1 port associated with the DS1 signal and updates its list of equipped ports. Once an active DS1 port detects an incoming DS1 LOS, the OLIU generates a minor alarm, if provisioned.

At the near-end location, make the appropriate connection(s) to the DS1 cross-connect point(s) or equivalent connection point(s) for the DS1(s) being added.

8. 

NOTE:

When a DS1 signal is detected, the OLIU automatically activates the DS1 port associated with the DS1 signal and updates its list of equipped ports. Once an active DS1 port detects an incoming DS1 LOS, the OLIU generates a minor alarm, if provisioned.

At the far-end location, have the appropriate connection(s) to the DS1 cross-connect point(s) or equivalent connection point(s) for the DS1(s) made.

9. Verify that the near-end OLIU has activated the DS1 port(s) for equipped DS1(s) by pressing and holding the **NE/ENABLE** pushbutton.

10. Verify that the far-end OLIU has activated the DS1 port(s) for equipped DS1(s) by pressing and holding the **FE/ENABLE** pushbutton.

Maintenance Philosophy

Overview: The maintenance philosophy is built on gathering system information through inspection of the shelf, optical line interface unit (OLIU), and AEK-type T1 repeater indicators. The shelf LEDs show a composite of near- and far-end alarms for the OLIU and only near-end alarms for the T1 repeaters. By using the near- and far-end **ENABLE** pushbutton on the OLIU, the alarm conditions at either end may be displayed.

Trouble Analysis Procedures

The trouble analysis procedures in this document involve replacing faulty circuit packs and obtaining performance reports and/or alarm and status reports for analysis to determine proper system operation and/or trouble. If the trouble cannot be corrected or identified, the procedures direct the technician to obtain assistance because no more step-action procedural data is known for the specific trouble.

RTAC Assistance

The technician must make the decision regarding trouble analysis, corrective action, and obtaining assistance. The technician and the local technical support staff may choose to continue trouble analysis based on their knowledge or experience on the DDM-Plus System, or may elect to obtain assistance by calling the Regional Technical Assistance Center **1-800-225-RTAC**.

COACH Assistance

Various customer computer-support tools are on-line and available using customized on-line aid for customer help (COACH). A log-in identification and password must be obtained to gain access to the COACH tools. Contact your regional DDM-Plus coordinator for information on obtaining a COACH log-in.

Diagnostic Dictionary

The Diagnostic Dictionary tool gives the user access to previously detected symptoms, problems, temporary fixes, cautions, and solutions. These may be usable in diagnosing, correcting, or avoiding a system problem.

Compatibility Data

The Compatibility Data tool gives the user access to hardware configuration data that is compatible to a user-specified software generic.

News and Bulletin

The News and Bulletin tool allows the user to process News and Bulletin information. News consists of messages that may be of general interest to the user. Bulletin contains information of a more urgent nature.

Circuit Pack Failures

The OLIU and AEK-type T1 repeater circuit pack failures are identified by indicators and reported by system alarms. When this occurs, a determination must be made as to why a circuit pack has failed. One recommendation as a first step for determining the cause of a failure is to unseat and then reseat the suspected circuit pack. For example, if an OLIU circuit pack is reported faulty, that pack should be unseated and then resealed before being returned as defective. This will cause an automatic recovery and diagnostic operation to be performed on that circuit pack. If there is a contact problem such as dirt, oil, or lack of total contact connection, then this may be corrected by reseating and thus avoid the return of a good unit for repair. Use caution when unseating circuit packs. For example, ensure protection switching is available for pack being removed.

When circuit packs are replaced in some sequence to clear a trouble, they should be replaced one at a time by installing the original circuit packs if they were found to be operational.

Electrostatic Discharge (ESD) Considerations

Any integrated circuit on a circuit pack can be damaged by static electricity that builds up within a work area, particularly in areas with low relative humidity. This static buildup on work surfaces, personnel, and their clothing is produced by the various charging effects of even simple movements and by contact between various objects.

As a rule, the greatest potential for electrostatic damage occurs in areas with the lowest relative humidity. Because such damage can occur anywhere, all personnel handling circuit packs should take the following precautions:

1. Keep materials that tend to generate static electricity such as food wrappers, plastics, and plastic foam insulated containers away from all circuit packs.
2. Read all warning labels on bags and cartons before opening any packaging.
3. If possible, open all circuit packs at a static-safe work position using properly grounded wrist straps and table mats that can dissipate static electricity.
4. Whenever possible, wait to remove circuit packs from their protective antistatic packaging until it is time to insert them into a bay.
5. Never touch a circuit pack's components, conductors, or connector pins. Handle all circuit packs only by the faceplate, latch, or by the top and bottom outermost edges.
6. When opening and handling circuit packs or when working on backplanes, always wear a grounded wrist strap or wear a heel strap, and stand on a grounded floor mat that can dissipate static electricity.
7. Always store and transport circuit packs in static-safe packages. (Shielding is not required unless specified.)
8. Whenever you remove circuit packs from a shelf, immediately put them into static-safe packages.
9. Try to keep relative humidity above 20 percent.
10. DDM-Plus shelves are equipped with grounding jacks for connecting static ground wrist straps. The jacks are located on the bottoms of the user panels.

Clear Major Alarm



NOTE 1:

This procedure assumes that protection is not available for the DDM-Plus System due to either not being equipped or protecting optical line interface unit (OLIU), fiber facility has failed preventing a protection switch. Table 1 lists conditions that can cause a major alarm.



NOTE 2:

If clearing a major alarm results in the alarm being downgraded into a minor alarm, clear the minor alarm using the "*Clear Minor Alarm*" **TAP-102** procedure.



NOTE 3:

There is a 2-amp fuse mounted on the OLIU circuit pack. Should this fuse operate (blow), a major alarm is generated and the **CP/OPT** indicator lights even if protection switching occurred. This fuse is hardwired to generate a major alarm. The fuse is not field serviceable and the OLIU circuit pack should be returned for repairs.

1. Press the **ACO** pushbutton on the alarming shelf.
2. Has fuse **FA** or **FB** operated (blown)?
 - If **NO**, then proceed to **Step 5**.
 - If **YES**, then continue with **Step 3**.
3. Replace blown fuse.
4. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Table 1. Major (MJ) Alarm Conditions

Indicators Lighted	Possible Causes	Possible Solutions
MJ	<ul style="list-style-type: none"> • FA Fuse open (blown) • FB Fuse open (blown) 	Replace fuse
MJ and T1 repeater FAULT indicator	<ul style="list-style-type: none"> • T1 repeater circuit pack failure • T1 repeater circuit pack loss of power (can be related to a blown fuse) • T1 repeater simplex current failure (facility failure) 	Replace T1 repeater circuit pack Check shelf fuse Follow local procedures to clear facility trouble. Refer to AT&T 365-227-500 or AT&T 363-205-500.
MJ and OLIU CP/OPT and NE indicators	<ul style="list-style-type: none"> • Near-end OLIU circuit pack failure no protection available 	Replace near-end OLIU
MJ and OLIU CP/OPT and FE indicators	<ul style="list-style-type: none"> • Far-end OLIU circuit pack failure no protection available 	Replace far-end OLIU
MJ and OLIU NE indicators lighted and CP/OPT indicator blinking	Detected by near-end OLIU: <ul style="list-style-type: none"> • Optical signal fault (receive fiber failure) • Loss of optical frame 	Repair receive fiber Replace far-end OLIU
MJ and OLIU FE indicators lighted and CP/OPT indicator blinking	Detected by far-end OLIU: <ul style="list-style-type: none"> • Optical signal fault (transmit fiber failure) • Loss of optical frame 	Repair transmit fiber Replace near-end OLIU

5.



NOTE:

The OLIU has two fault indicators, **CP/OPT** and **DS1**. Faults that initiate the **DS1** fault indicator generate only a minor alarm.

Determine which type of circuit pack, OLIU or T1 repeater, has a fault indicator lighted or blinking.

6. What type of circuit pack has its fault indicator lighted or blinking?

If **OLIU**, then proceed to **Step 15**.

If **T1 repeater**, then continue with **Step 7**.

7. Replace T1 repeater circuit pack.

8. Is the **FAULT** indicator lighted on the replacement T1 repeater circuit pack?

If **NO**, then proceed to **Step 13**.

If **YES**, then continue with **Step 9**.

9. If replacement T1 repeater circuit pack did not clear fault, reinstall the original T1 repeater circuit pack.

10. Measure loop simplex voltage and current. Measure loop simplex voltage between test jack **-V** and chassis ground. Measure loop simplex current between test jacks **-V** and **-I**. A precision 10-ohm resistor is bridged between test jacks **-V** and **-I**. A measurement of 0.6 V indicates a loop current of 60 mA.

11. Compare loop simplex measurement with office records.

12. Problem with T1 facility. Follow local procedures to clear facility trouble. Refer to AT&T 365-227-500, *T1 Digital Line — Trouble Locating Procedures*, for fault-locating procedures. For fiber hubs in 80-type cabinets, fault location should be performed as described in AT&T 363-205-500, **SLC**® *Series 5 Carrier System Maintenance Tasks (TOP)*.

Possible problems:

- Zero current measurement indicates bad T1 line power loop.
- High-voltage measurement indicates an open T1 pair.
- Low-voltage measurement indicates short between transmit and receive pairs.

13. Does the **MJ** alarm clear?

If **NO**, continue with **Step 14**.

If **YES**, **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

14. Another major fault exists. Repeat procedure from **Step 6**.

- 15.



NOTE:

The OLIU has two fault indicators, **CP/OPT** and **DS1**. Faults that initiate the **DS1** fault indicator generate only a minor alarm.

On the OLIU, observe the **CP/OPT** indicator, lighted or blinking?

CP/OPT lighted — OLIU is bad at either the near- and/or far-end location. Continue with **Step 16**.

CP/OPT blinking — Optical fiber failure or loss of optical signal frame. Continue with **Step 34**.

16. Are both **NE** and **FE** indicators lighted?

If **NO**, then continue with **Step 17**.

If **YES**, then proceed to **Step 20**.

17. Is the **NE** indicator lighted?

If **NO**, then proceed to **Step 27**.

If **YES**, then continue with **Step 18**.

18. The near-end OLIU has failed. Replace near-end OLIU.

19. Is the **CP/OPT** indicator on the replacement OLIU lighted?

If **NO**, then proceed to **Step 25**.

If **YES**, contact your local or regional maintenance assistance center.

20. Determine the location of the OLIU failure. Press the **NE/ENABLE** pushbutton and observe the **CP/OPT** indicator.

21. Does the **CP/OPT** indicator remain continuously lighted while the **NE/ENABLE** pushbutton is depressed?

If **NO**, then proceed to **Step 27**.

If **YES**, then continue with **Step 22**.

22. The near-end OLIU has failed. Replace near-end OLIU.

23. Once the near-end OLIU replacement is installed, press the **NE/ENABLE** pushbutton and observe the **CP/OPT** indicator.

24. Does the **CP/OPT** indicator continuously light while the **NE/ENABLE** pushbutton is depressed?

If **NO**, then continue with **Step 25**.

If **YES**, contact your local or regional maintenance assistance center.

25. Has the **MJ** alarm cleared?

If **NO**, then continue with **Step 26**.

If **YES**, **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

26. Another major fault exists. Repeat procedure from **Step 6**.
27. Press the **FE/ENABLE** pushbutton and observe the **CP/OPT** indicator.
28. Does the **CP/OPT** indicator remain continuously lighted while the **FE/ENABLE** pushbutton is depressed?
If **NO**, contact your local or regional maintenance assistance center.
If **YES**, then continue with **Step 29**.
29. The far-end OLIU has failed. Have far-end OLIU replaced.
30. Once the replacement OLIU is installed at the far-end, press the **FE/ENABLE** pushbutton and observe the **CP/OPT** indicator.
31. Did the **CP/OPT** indicator fault clear?
If **NO**, contact your local or regional maintenance assistance center.
If **YES**, then continue with **Step 32**.
32. Has the **MJ** alarm cleared?
If **NO**, then continue with **Step 33**.
If **YES**, **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
33. Another major fault exists, repeat procedure from **Step 6**.
34. Are both **NE** and **FE** indicators lighted?
If **NO**, then continue with **Step 35**.
If **YES**, then proceed to **Step 36**.
35. Is the **NE** indicator lighted?
If **NO**, then proceed to **Step 41**.
If **YES**, then continue with **Step 38**.

36. Determine the location of the failure. Press the **NE/ENABLE** pushbutton and observe the **CP/OPT** indicator.

37. Does the **CP/OPT** indicator blink while the **NE/ENABLE** pushbutton is depressed?
 - If **NO**, then proceed to **Step 41**.
 - If **YES**, then continue with **Step 38**.

38. Possible failure on the near-end receive fiber. Follow local procedures to verify fiber facility. If major alarm does not clear after facility is repaired or if no problem is found with facility, have far-end OLIU replaced.

39. Has the **MJ** alarm cleared?
 - If **NO**, then continue with **Step 40**.
 - If **YES**, **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

40. Another major fault exists. Repeat procedure from **Step 6**.

41. Press the **FE/ENABLE** pushbutton and observe the **CP/OPT** indicator.

42. Does the **CP/OPT** indicator blink while the **FE/ENABLE** pushbutton is depressed?
 - If **NO**, contact your local or regional maintenance assistance center.
 - If **YES**, then continue with **Step 43**.

43. Possible failure on the near-end transmit fiber. Follow local procedures to verify fiber facility. If major alarm does not clear after facility is repaired or if no problem is found with facility, replace near-end OLIU.

44. Has the **MJ** alarm cleared?

If **NO**, then continue with **Step 45**.

If **YES**, **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

45. Another major fault exists. Repeat procedure from **Step 6**.

Clear Minor Alarm

⇒ **NOTE 1:**
This procedure assumes that protection switching is available and traffic has been switched to the standby system. Table 1 lists conditions that can cause a minor alarm.

⇒ **NOTE 2:**
This procedure assumes that the optical line interface unit (OLIU) option switch settings are provided to initiate a minor alarm when an incoming DS1 loss of signal (LOS) is detected.

⇒ **NOTE 3:**
AEK-type T1 repeaters generate only major alarms.

1. Press the **ACO** pushbutton on the alarming shelf.
- 2.

⇒ **NOTE:**
The OLIU has two fault indicators, **CP/OPT** and **DS1**.

Determine which OLIU circuit pack has a fault indicator, **CP/OPT** and/or **DS1**, lighted or blinking.

3. Which fault indicator is lighted or blinking on the alarming OLIU?
If **CP/OPT**, then continue with **Step 4**.
If **DS1**, then proceed to **Step 35**.

Table 1. Minor (MN) Alarm Conditions

Indicators Lighted	Possible Causes	Possible Solutions
MN and OLIU CP/OPT and NE indicators	<ul style="list-style-type: none"> Near-end OLIU circuit pack failure 	Replace near-end OLIU
MN and OLIU CP/OPT and FE indicators	<ul style="list-style-type: none"> Far-end OLIU circuit pack failure 	Replace far-end OLIU
MN and OLIU NE indicators lighted and CP/OPT indicator blinking	Detected by near-end OLIU: <ul style="list-style-type: none"> Optical signal fault (receive fiber failure) Loss of optical frame BER threshold exceeded 	Repair receive fiber Replace far-end OLIU Measure fiber facility loss and set laser power mode accordingly
MN and OLIU FE indicators lighted and CP/OPT indicator blinking	Detected by far-end OLIU: <ul style="list-style-type: none"> Optical signal fault (transmit fiber failure) Loss of optical frame BER threshold exceeded 	Repair transmit fiber Replace near-end OLIU Measure fiber facility loss and set laser power mode accordingly
MN and OLIU DS1 , NE indicators lighted, and affected information indicators (1→4) blinking	<ul style="list-style-type: none"> At near-end OLIU provisioning mismatch between active and standby OLIU circuit packs, or invalid option setting 	Correct option switch mismatch, or invalid setting
MN and OLIU DS1 , FE indicators lighted, and affected information indicators (1→4) blinking	<ul style="list-style-type: none"> At far-end OLIU provisioning mismatch between active and standby OLIU circuit packs, or invalid option setting 	Correct option switch mismatch, or invalid setting

Table 1. Minor (MN) Alarm Conditions (Contd)

Indicators Lighted	Possible Causes	Possible Solutions
MN and OLIU NE indicators lighted and DS1 and affected information indicators (1→4) blinking	<ul style="list-style-type: none">Incoming DS1 LOS at indicated near-end DS1 port. (DS1 LOS provisioned to initiate minor alarm.)	Follow local procedures to determine why DS1 was lost
MN and OLIU FE indicators lighted and DS1 and affected information indicators (1→4) blinking.	<ul style="list-style-type: none">Incoming DS1 LOS at indicated far-end DS1 port. (DS1 LOS provisioned to initiate minor alarm.)	Follow local procedures to determine why DS1 was lost

4. Is the **CP/OPT** indicator lighted or blinking?

CP/OPT lighted — OLIU is bad at either the near- and/or far-end location. Continue with **Step 5**.

CP/OPT blinking — Optical fiber failure or loss of optical signal frame. Proceed to **Step 23**.

5. Are both **NE** and **FE** indicators lighted?

If **NO**, then continue with **Step 6**.

If **YES**, then proceed to **Step 9**.

6. Is the **NE** indicator lighted?

If **NO**, then proceed to **Step 16**.

If **YES**, then continue with **Step 7**.

7. The near-end OLIU has failed. Replace near-end OLIU.

8. Is the **CP/OPT** indicator on the replacement OLIU lighted?

If **NO**, then proceed to **Step 14**.

If **YES**, contact your local or regional maintenance assistance center.

9. Determine the location of the OLIU failure. Press the **NE/ENABLE** pushbutton and observe the **CP/OPT** indicator.

10. Does the **CP/OPT** indicator remain continuously lighted while the **NE/ENABLE** pushbutton is depressed?
If **NO**, then proceed to **Step 16**.
If **YES**, then continue with **Step 11**.

11. The near-end OLIU has failed. Replace near-end OLIU.

12. Once the near-end OLIU replacement is installed, press the **NE/ENABLE** pushbutton and observe the **CP/OPT** indicator.

13. Does the **CP/OPT** indicator continuously light while the **NE/ENABLE** pushbutton is depressed?
If **NO**, then continue with **Step 14**.
If **YES**, contact your local or regional maintenance assistance center.

14. Has the **MN** alarm cleared?
If **NO**, then continue with **Step 15**.
If **YES**, **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

15. Another minor fault exists. Repeat procedure from **Step 2**.

16. Press the **FE/ENABLE** pushbutton and observe the **CP/OPT** indicator.

17. Does the **CP/OPT** indicator remain continuously lighted while the **FE/ENABLE** pushbutton is depressed?
If **NO**, contact your local or regional maintenance assistance center.
If **YES**, then continue with **Step 18**.

18. The far-end OLIU has failed. Have far-end OLIU replaced.

19. Once the replacement OLIU is installed at the far-end, press the **FE/ENABLE** pushbutton and observe the **CP/OPT** indicator.
20. Did the **CP/OPT** indicator fault clear?
 - If **NO**, then contact your local or regional maintenance assistance center.
 - If **YES**, then continue with **Step 21**.
21. Has the **MN** alarm cleared?
 - If **NO**, then continue with **Step 22**.
 - If **YES**, **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
22. Another minor fault exists. Repeat procedure from **Step 2**.
23. Are both **NE** and **FE** indicators lighted?
 - If **NO**, then continue with **Step 24**.
 - If **YES**, then proceed to **Step 25**.
24. Is the **NE** indicator lighted?
 - If **NO**, then proceed to **Step 30**.
 - If **YES**, then proceed to **Step 27**.
25. Determine the location of the failure. Press the **NE/ENABLE** pushbutton and observe the **CP/OPT** indicator.
26. Does the **CP/OPT** indicator blink while the **NE/ENABLE** pushbutton is depressed?
 - If **NO**, then proceed to **Step 30**.
 - If **YES**, then continue with **Step 27**.
27. Possible failure on the near-end receive fiber. Follow local procedures to verify fiber facility. If minor alarm does not clear after facility is repaired or if no problem is found with facility, have far-end OLIU replaced.

28. Has the **MN** alarm cleared?

If **NO**, then continue with **Step 29**.

If **YES**, **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

29. Another minor fault exists. Repeat procedure from **Step 2**.

30. Press the **FE/ENABLE** pushbutton and observe the **CP/OPT** indicator.

31. Does the **CP/OPT** indicator blink while the **FE/ENABLE** pushbutton is depressed?

If **NO**, contact your local or regional maintenance assistance center.

If **YES**, then continue with **Step 32**.

32. Possible failure on the near-end transmit fiber. Follow local procedures to verify fiber facility. If minor alarm does not clear after facility is repaired or if no problem is found with facility, replace near-end OLIU.

33. Has the **MN** alarm cleared?

If **NO**, then continue with **Step 34**.

If **YES**, **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

34. Another minor fault exists. Repeat procedure from **Step 2**.

35. Is the **DS1** indicator lighted or blinking?

DS1 lighted — **DS1** port provisioning is mismatched between the active and standby OLIU or invalid option switch setting. Continue with **Step 36**.

DS1 blinking — Incoming **DS1** LOS detected. Proceed to **Step 51**.

36. Are both **NE** and **FE** indicators lighted?

If **NO**, then continue with **Step 37**.

If **YES**, then proceed to **Step 41**.

37. Is the **NE** indicator lighted?

If **NO**, then proceed to **Step 46**.

If **YES**, then continue with **Step 38**.

38. The near-end system has at least one provisioning mismatch between the active and standby DS1 port or invalid option switch setting. DS1 ports with provisioning mismatches or invalid option switch settings are indicated by the information indicator (1→4). Check office records for correct OLIU option switch setting and provision DS1 port correctly. Refer to **DLP-502** for procedure to set OLIU option setting.

39. Has the **MN** alarm cleared?

If **NO**, then continue with **Step 40**.

If **YES**, **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

40. Another minor fault exists. Repeat procedure from **Step 2**.

41. Determine the location of the fault. Press the **NE/ENABLE** pushbutton and observe the **DS1** indicator.

42. Does the **DS1** indicator remain continuously lighted while the **NE/ENABLE** pushbutton is depressed?

If **NO**, then proceed to **Step 46**.

If **YES**, then continue with **Step 43**.

43. The near-end system has at least one provisioning mismatch between the active and standby DS1 port or invalid option switch setting. DS1 ports with provisioning mismatches or invalid option switch settings are indicated by the information indicator (1→4). Check office records for correct OLIU option switch setting and provision DS1 port correctly. Refer to **DLP-502** for procedure to set OLIU option setting.

44. Has the **MN** alarm cleared?

If **NO**, then continue with **Step 45**.

If **YES**, **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

45. Another minor fault exists. Repeat procedure from **Step 2**.
46. Press the **FE/ENABLE** pushbutton and observe the **DS1** indicator.
47. Does the **DS1** indicator remain continuously lighted while the **FE/ENABLE** pushbutton is depressed?
- If **NO**, contact your local or regional maintenance assistance center.
If **YES**, then continue with **Step 48**.
48. The far-end system has at least one provisioning mismatch between the active and standby DS1 port or invalid option switch setting. DS1 ports with provisioning mismatches or invalid option switch settings are indicated by the information indicator (1→4). Check office records for correct OLIU option switch setting and have the far-end DS1 port provisioned correctly. Refer to **DLP-502** for procedure to set OLIU option setting.
49. Has the **MN** alarm cleared?
- If **NO**, then continue with **Step 50**.
If **YES**, **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
50. Another minor fault exists. Repeat procedure from **Step 2**.
51. Are both **NE** and **FE** indicators lighted?
- If **NO**, then continue with **Step 52**.
If **YES**, then proceed to **Step 56**.
52. Is the **NE** indicator lighted?
- If **NO**, then proceed to **Step 61**.
If **YES**, then continue with **Step 53**.
53. The near-end system has at least one incoming DS1 LOS. DS1 ports with LOS are indicated by the information indicator (1→4). Follow local procedures and clear LOS fault.

54. Has the **MN** alarm cleared?

If **NO**, then continue with **Step 55**.

If **YES**, **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

55. Another minor fault exists. Repeat procedure from **Step 2**.

56. Determine the location of the failure. Press the **NE/ENABLE** pushbutton and observe the **DS1** indicator.

57. Does the **DS1** indicator blink while the **NE/ENABLE** pushbutton is depressed?

If **NO**, then proceed to **Step 61**.

If **YES**, then continue with **Step 58**.

58. The near-end system has at least one incoming DS1 LOS. DS1 ports with LOS are indicated by the information indicator (1→4). Follow local procedures and clear LOS fault.

59. Has the **MN** alarm cleared?

If **NO**, then continue with **Step 60**.

If **YES**, **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

60. Another minor fault exists. Repeat procedure from **Step 2**.

61. Press the **FE/ENABLE** pushbutton and observe the **DS1** indicator.

62. Does the **DS1** indicator blink while the **FE/ENABLE** pushbutton is depressed?

If **NO**, contact your local or regional maintenance assistance center.

If **YES**, then continue with **Step 63**.

63. The far-end system has at least one incoming DS1 LOS. DS1 ports with LOS are indicated by the information indicator (1→4). Follow local procedures and clear LOS fault.

64. Has the **MN** alarm cleared?

If **NO**, then continue with **Step 65**.

If **YES**, **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

65. Another minor fault exists. Repeat procedure from **Step 2**.

Perform Visual Inspection

IMPORTANT: Refer troubles found in this procedure that are not easily corrected to the installation group.

1. Check front and back of the shelf for damage (dents, broken mountings, etc.) resulting from transportation and mounting of equipment.

At front of shelf, do the following:

2. Look over shelf mountings to verify that shelves are properly aligned, securely mounted, and within the allowed footprint.
3. Verify that all plug-ins are completely engaged.
4. Look over the cable connectors to verify that connectors are neatly terminated and securely mated. For detailed cabling information, refer to AT&T 363-206-151, *DDM-Plus Installation Manual*, for the Extension Shelf or AT&T 363-206-154, *DDM-Plus Wall Distant Terminal Installation Manual*, for the Wall DT.

At back of shelf, do the following:

5. Look for broken or bent pins near the edges of each printed backplane panel.
6. Verify that bays have been stamped with office relay rack identification per office drawings.
7. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Check -48 V DC Supply

1. Obtain multimeter capable of measuring DC voltage in the 40- to 60-volt range.

2.

⚠ WARNING:
-48 V DC is present in the fuse holders in the power connections.

⚠ CAUTION:
If system is in service, T1 carrier service interruption may occur when a fuse is removed or power feeder is disconnected.

⇒ NOTE 1:
Fuse **FA** powers the odd numbered slots through bus A. Fuse **FB** powers the even numbered slots through bus B. See Figure 1.

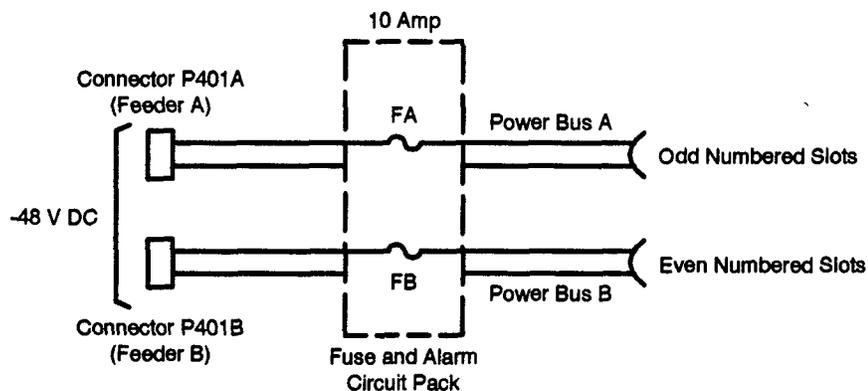


Figure 1 DDM-Plus Extension Shelf Fusing

 **NOTE 2:**
The optical line interface unit (OLIU) occupies both odd and even numbered slots, selects either bus A or B, and switches to the alternate if one fails.

Are fuses installed?

If **NO**, then continue with **Step 3**.
If **YES**, then proceed to **Step 4**.

3.

 **NOTE:**
The Extension Shelf uses 10-amp indicator type fuses and the Wall DT uses 0.5-amp indicator type fuses.

Install -48 V DC fuses in fuse holders.

4. Are any of the fuses operated (blown)?

If **NO**, then proceed to **Step 9**.
If **YES**, then continue with **Step 5**.

5.

 **NOTE:**
The Extension Shelf uses 10-amp indicator type fuses and the Wall DT uses 0.5-amp indicator type fuses.

Replace blown fuse.

6. Did fuse operate (blow) again?

If **YES**, then continue with **Step 7**.
If **NO**, then proceed to **Step 9**.

7. Trouble is in backplane connector or Extension Shelf Fuse and Alarm circuit pack.

8. STOP. YOU HAVE COMPLETED THIS PROCEDURE.

9.



CAUTION:

If system is in service, T1 carrier service interruption may occur when a fuse is removed or power feeder is disconnected.

Measure shelf DC voltages using a multimeter.

A. Measure Extension Shelf voltage by removing the -48 V fuse associated with power bus A. Measure bus voltage at the top rear of the fuse holder placing the positive probe on the fuse contact and the other probe to a solid chassis ground. Replace fuse and record voltage measurement. Repeat this step for power bus B.

B. Measure Wall Distant voltage at terminal block **TB 1** for power buses A and B. Measure between the power bus -48 V terminal screw and power bus ground screw.

10. Was requirement met?

Requirement: Voltage must be between -40.0 and -60.0 V DC.

If YES, STOP. YOU HAVE COMPLETED THIS PROCEDURE.

If NO, then continue with Step 11.

11. Trouble in power feeder, -48 V DC supply, or Extension Shelf Fuse and Alarm circuit pack.

12. STOP. YOU HAVE COMPLETED THIS PROCEDURE.

Set OLIU Option Switches

Important: Active and standby optical line interface unit (OLIU) circuit pack option settings must match. Mismatches between the option setting or invalid option setting will cause the **DS1** and the corresponding information indicator (1→4) to blink and the **NE** indicators to light.

In the absence of office records, use the following setting:

<u>Option</u>	<u>Available Options (Factory Setting is Shown in Brackets)</u>
DS1 Line Code	[AMI], B8ZS
DS1 Line Buildout	Cable Length 613C: 0 to 655 ft. [0 to 90 ft.] 1249C: 0 to 450 ft. [0 to 133 ft.]
LOS Indication	[Minor Alarm], No Alarm
BER Threshold	[10^{-4}] through 10^{-10}
OLIU Output Power	[Low], High

1. Determine, from office records or work order, the desired DS1 line coding and line buildout.

2.



NOTE:

Switches S6, S7, S8, and S9 provide individual line coding, and line buildout for DS1 1, DS1 2, DS1 3, and DS1 4, respectively. See Figure 1. Table 1 shows the line coding option settings, and Table 2 shows the line build-out option settings.

Refer to Tables 1 and 2 and set DS1 line options.

Table 1. DS1 Line Coding

<u>Coding</u>	<u>Switches S6, S7, S8, and S9</u>	
	<u>Switch Position 1</u>	
AMI	ON	
B8ZS	OFF	

Table 2. OLIU DS1 Line Buildout

<u>Distance to DSX-1 in Feet</u>		<u>Switches S6, S7, S8, and S9</u>		
<u>1249C Cable</u>	<u>613C Cable</u>	<u>Switch Position</u>	<u>Switch Position</u>	<u>Switch Position</u>
<u>(26 Gauge)</u>	<u>(22 Gauge)</u>	<u>2</u>	<u>3</u>	<u>4</u>
0 to 90	0 to 133	OFF	OFF	OFF
91 to 180	134 to 267	OFF	OFF	ON
181 to 270	268 to 400	OFF	ON	OFF
271 to 360	401 to 533	OFF	ON	ON
<u>361 to 450</u>	<u>534 to 655</u>	<u>ON</u>	<u>OFF</u>	<u>OFF</u>
Invalid*	Invalid*	ON	OFF	ON
Invalid*	Invalid*	ON	ON	OFF
<u>Invalid*</u>	<u>Invalid*</u>	<u>ON</u>	<u>ON</u>	<u>ON</u>

* Invalid option setting. Invalid settings will cause the NE and DS1 indicators to light.

- Determine, from office records or work order, the desired setting for DS1 loss of signaling (LOS) indication.

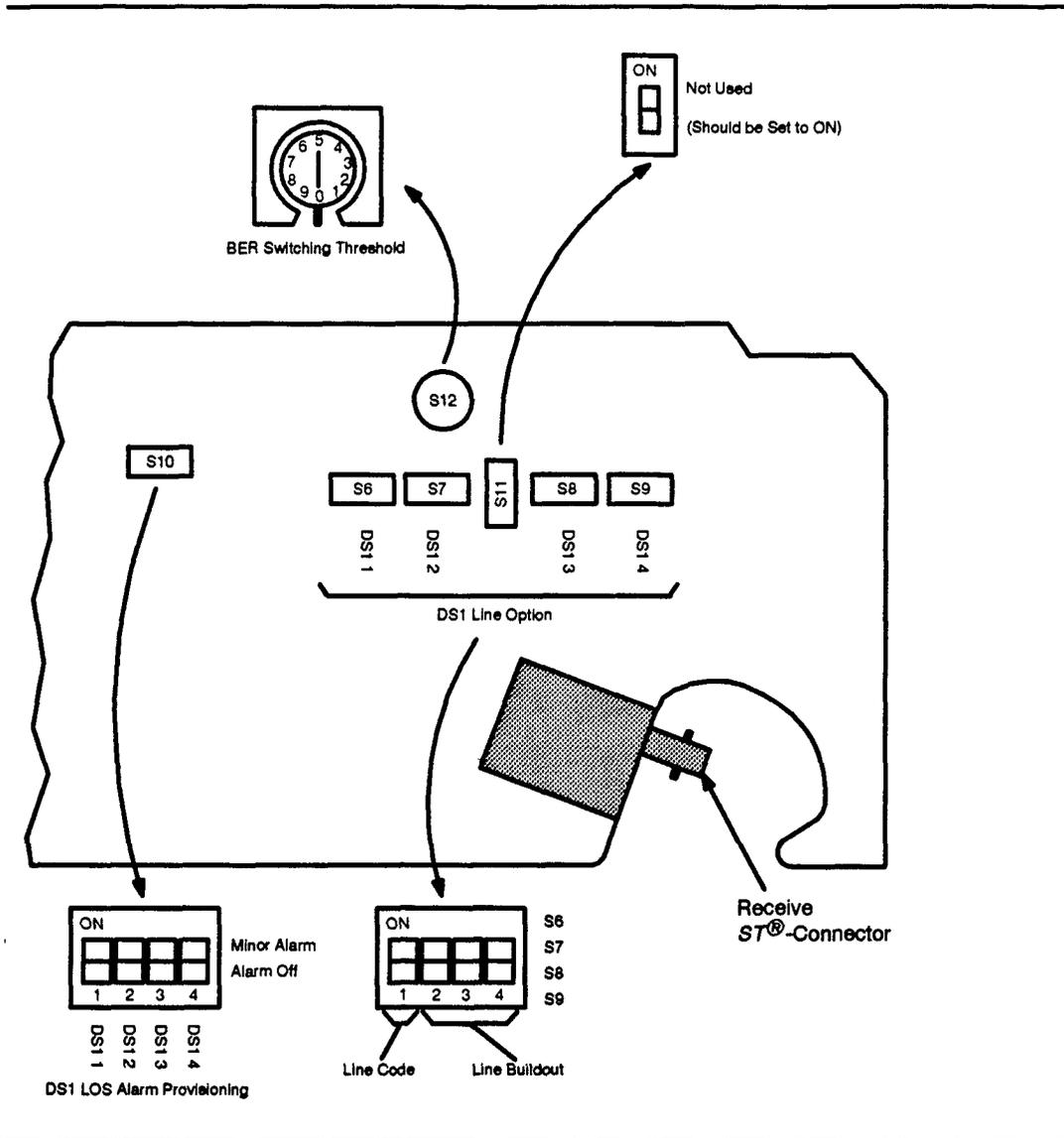


Figure 1 OLIU Option Switches

4.



NOTE:

Switch S10 provisions the DS1 LOS indication. S10-1, S10-2, S10-3, and S10-4 control DS1 LOS indication provisioning for DS1 1, DS1 2, DS1 3, and DS1 4, respectively. See Figure 1.

Table 3 shows the DS1 LOS indication provisioning option settings.

Refer to Table 3 and set DS1 LOS alarm options.

Table 3. DS1 LOS Indication Provisioning

<u>LOS Indication</u>	<u>Option Switch</u>			
	<u>S10-1</u> <u>(DS1 1)</u>	<u>S10-2</u> <u>(DS1 2)</u>	<u>S10-3</u> <u>(DS1 3)</u>	<u>S10-4</u> <u>(DS1 4)</u>
Minor Alarm	ON	ON	ON	ON
No Alarm	OFF	OFF	OFF	OFF

5. Set switch S11 to ON. S11 is unused.

6. Determine, from office records or work order, the desired setting for the bit error ratio (BER) threshold.

7. Switch S12 provisions the BER threshold. Refer to Table 4 and set the BER threshold. See Figure 1.

Table 4. BER Threshold Setting

Option Switch (S12)	
<u>Position</u>	<u>BER Threshold</u>
1	Invalid
2	Invalid
3	Invalid
4	10^{-4}
5	10^{-5}
6	10^{-6}
7	10^{-7}
8	10^{-8}
9	10^{-9}
0	10^{-10}

- Determine, from office records or work order, the desired setting for the laser power mode.
- Switch 13 provisions the laser power. Refer to Table 5 and Figure 2 to locate S13 and set High/Low switch position. Refer to OLIU link budget Tables 8-3 and 8-5 in Chapter 8, *Technical Specifications*, for the system gain for the laser power.

Table 5. Power Mode Switch

Laser Power	
<u>Mode Selection</u>	<u>Switch Position</u>
High	Switch position closest to OLIU faceplate
Low	Switch position farthest from OLIU faceplate

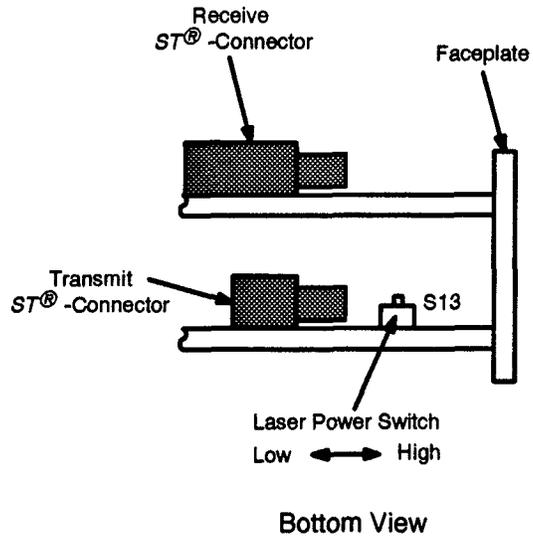


Figure 2 Laser Power Mode Switch

10. STOP. YOU HAVE COMPLETED THIS PROCEDURE.

Perform OLIU Local Test

Overview: This procedure verifies proper operation of all the electronics and optics on the circuit pack. If the optical loop is placed on the *LGX*[®] panel, the fiber between the optical line interface unit (OLIU) and the *LGX* panel can be verified. See Figure 1.

This procedure can be performed on both active and standby OLIUs. If the DDM-Plus installation is being accepted and the shelf is not fully equipped, move the OLIU circuit and repeat this procedure until all positions have been tested.



NOTE 1:

The laser power mode switch, S13, must be set to low before running the OLIU Test. Refer to **DLP-502**.



NOTE 2:

Always clean *ST*[®] connector and coupling before making connections. Refer to **DLP-510**.

1. Place an optical loopback on the OLIU to be tested.
2. Initiate the Local Test by pressing and holding the **NE/ENABLE** pushbutton and then pressing the **TST** pushbutton once. The first information indicators (1→4) light. After 10 seconds, the **ABN** indicator on both the active and standby OLIUs light and the Local Test begins. During the test, information indicators cycle indicating that the test is continuing to run fault free.

Any failures detected will cause the information indicators to stop cycling, and light the **CP/OPT** and **NE** indicators and the information indicators (1→4) associated with the failure.
3. When the test is to be stopped, press the **CLR** pushbutton, and the OLIU is returned to its normal operating state.

If no failures occurred, all indicators on the OLIU faceplate blink twice showing that the test passed.

4. Did the OLIU pass the Local Test?

If **YES**, then proceed to **Step 6**.

If **NO**, then continue with **Step 5**.

5. OLIU circuit pack is bad or optical path is bad.

Isolate and clear trouble or refer troubles to the installation group for new installations. Once trouble is cleared repeat this procedure.

6. Remove the OLIU optical loopback.

7. Are other OLIUs to be tested?

If **YES**, then proceed to **Step 1**.

If **NO**, **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

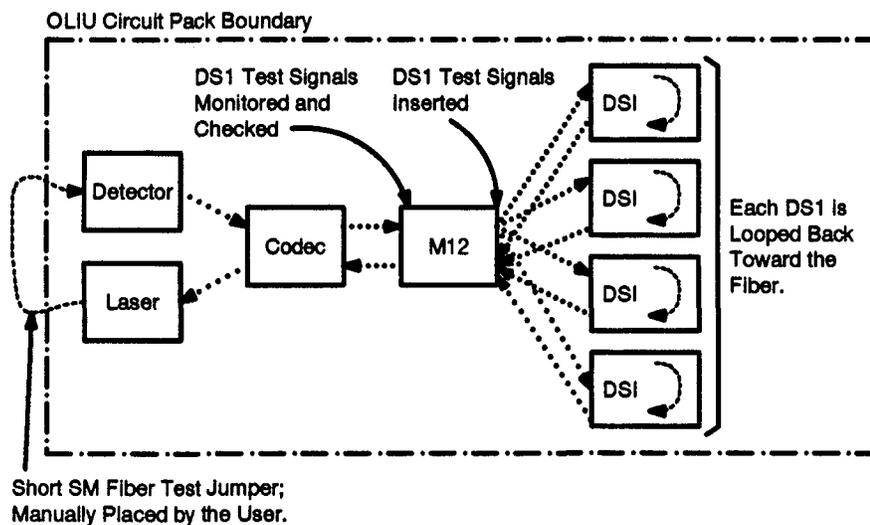


Figure 1 OLIU Local Test

Perform OLIU Cross-Connect Test

Overview: The purpose of this procedure is to verify the wiring of the cabling between the DDM-Plus and the DSX-1. This procedure assumes all electronics on the circuit pack and optical span to the point of the optical loop are operating properly and have passed the optical line interface unit (OLIU) Local Test. If this has not been done, refer to **DLP-503**. See Figure 1.

This procedure can only be performed on an active OLIU; if performed on a standby OLIU, the test will fail. If the DDM-Plus installation is being accepted and the shelf is not fully equipped, move the OLIU circuit and repeat this procedure until all positions have been tested.



NOTE 1:

The laser power mode switch, S13, must be set to low before running the OLIU Test. Refer to **DLP-502**.



NOTE 2:

Always clean *ST*[®] connector and coupling before making connections. Refer to **DLP-510**.

1. Place an optical loopback on the OLIU to be tested.
2. Place DS1 loopbacks, at the DSX-1 panel, for the OLIU to be tested.
3. Verify that the **ACTIVE** indicator is lighted on the OLIU to be tested.

4. Initiate the Cross-Connect Test by pressing and holding the **NE/ENABLE** pushbutton and then pressing the **TST** pushbutton twice. The first and second information indicators (1→4) light. After 10 seconds, the **ABN** indicator on both the active and standby OLIUs light and the Cross-Connect Test begins. During the test, information indicators cycle indicating that the test is continuing to run fault free.

Any failures detected will cause the information indicators to stop cycling, and light the **CP/OPT** and **NE** indicators and the information indicators (1→4) associated with the failure.

5. When the test is to be stopped, press the **CLR** pushbutton, and the OLIU is returned to its normal operating state.
If no failures occurred, all indicators on the OLIU faceplate blink twice showing that the test passed.

6. Did the Cross-Connect Test pass?

If **YES**, then proceed to **Step 8**.
If **NO**, then continue with **Step 7**.

7. Isolate and clear wiring troubles or refer troubles to the installation group for new installations. Once trouble is cleared repeat this procedure.

8. Remove the optical and DS1 loopbacks.

9. Is other DSX-1 wiring to be tested?

If **YES**, then proceed to **Step 1**.
If **NO**, **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

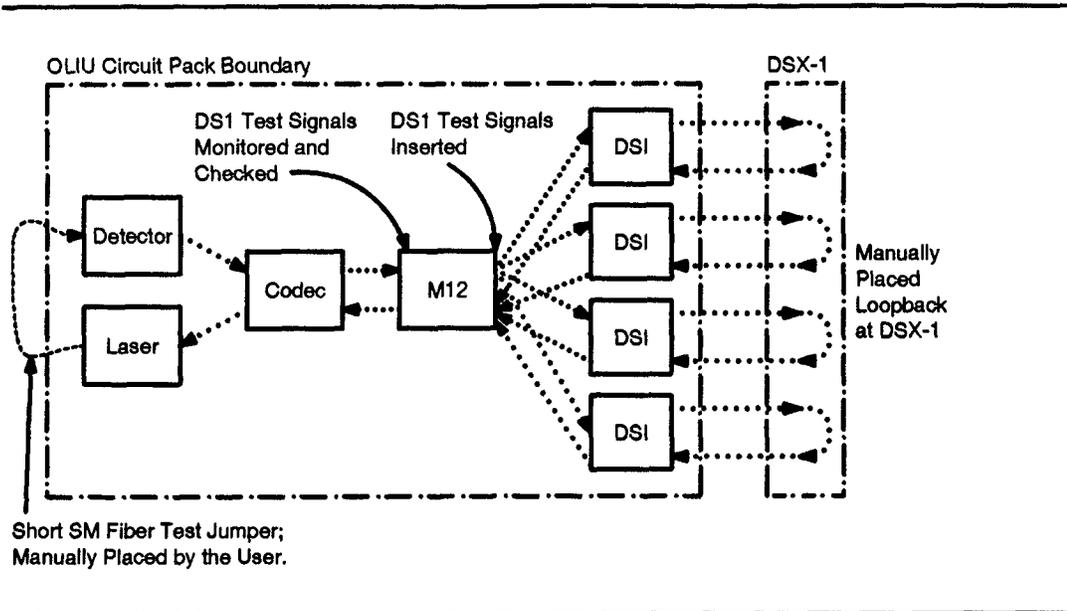


Figure 1 OLIU Cross-Connect Test

Test Minor Alarm, Telemetry, and Protection Switching

Overview: This procedure verifies that a minor alarm is generated, that telemetry is generated and received, that automatic protection switching has occurred, and that alarm cut-off (ACO) pushbutton has silenced the minor audible alarm. The optical line interface unit (OLIU) to be tested will need a standby OLIU.

1. Place an optical loopback on the active and standby OLIUs to be tested.
2. Verify that the **ACTIVE** indicator is lighted on the OLIU and that the standby OLIU **ACTIVE** indicator is not lighted.
3. Verify that no alarms are present on the shelf and that the alarm cables are securely connected. Refer to Tables 1 and 2.

Table 1. Extension Shelf Alarm Connectors

<u>Cable</u>	<u>Connector Designation</u>
Office Alarm	P06
Parallel Telemetry	P07, P09, and P10
Shelf Alarm	P08

Table 2. Wall Distant Terminal Alarm Connectors

<u>Cable</u>	<u>Connector Designation</u>
Office Alarm	TB 2
Parallel Telemetry	J1

4. Remove the optical loopback from the active OLIU.

5. Verify all of the following:

- **CP/OPT** indicator blinks on unlooped OLIU.
- **NE** indicator lights on unlooped OLIU.
- **ACTIVE** indicator on unlooped OLIU is not lighted.
- **ACTIVE** indicator lights on previously standby OLIU and is now the active OLIU (automatic protection switching occurred).
- **MN** indicator on shelf lights.
- Minor audible and visual office alarms are generated. The Wall DT generates one minor office alarm which can be used as either a minor visual or minor audible alarm.
- Minor, near-end, and system ID alarms are set by the telemetry.

6. Press the **ACO** pushbutton (Extension Shelf only).

7. Verify that the minor audible alarm is silenced and that the **ACO** pushbutton is lighted (Extension Shelf only).

8. Place the optical loopback on the OLIU previously unlooped.

After 10 seconds, alarms should extinguish.

9. Verify the following:

- **CP/OPT** indicator stops blinking.
- **NE** indicator extinguishes.
- Minor visual, near-end, and system ID alarms are clear.
- **ACTIVE** indicator on active OLIU remains lighted.
- **ACTIVE** indicator on previously active OLIU is not lighted.

10. If any of the items that were to be verified did not occur, isolate the trouble or refer troubles to the installation group for new installations. Once trouble is cleared repeat this procedure.

11. Remove the OLIU optical loopbacks.

12. If the DDM-Plus installation is being accepted, repeat this procedure for each OLIU position.

13. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Test Major Alarm and Telemetry

Overview: This procedure verifies that a major alarm is generated, that the parallel telemetry is generated and received, and that the alarm cut-off (ACO) pushbutton has silenced the major audible alarm. The optical line interface unit (OLIU) to be tested must be active, and if equipped with a standby, protection switching must be inhibited.

1. Does the OLIU have a standby OLIU?

If **YES**, continue with **Step 2**.

If **NO**, proceed to **Step 4**.

2. Inhibit protection switching by simultaneously pressing the **NE/ENABLE** and **GO ACTIVE** pushbuttons on the active OLIU.
3. Verify that the **ABN** indicator lights on both OLIUs.
4. Place an optical loopback on the active OLIU to be tested.
5. Verify that the **ACTIVE** indicator is lighted on the OLIU.
6. Verify that no alarms are present on the shelf and that the alarm cables are securely connected. Refer to Tables 1 and 2.

Table 1. Extension Shelf Alarm Connectors

<u>Cable</u>	<u>Connector Designation</u>
Office Alarm	P06
Parallel Telemetry	P07, P09, and P10
Shelf Alarm	P08

Table 2. Wall DT Alarm Connectors

<u>Cable</u>	<u>Connector Designation</u>
Office Alarm	TB 2
Parallel Telemetry	J1

7. Remove the optical loopback from the active OLIU.

8. Verify all of the following:
 - **CP/OPT** indicator blinks on unlooped OLIU.
 - **NE** indicator lights on unlooped OLIU.
 - **ACTIVE** indicator on unlooped OLIU remains lighted.
 - **MJ** indicator on shelf lights.
 - Major audible and visual office alarms are generated. The Wall DT generates one major office alarm that can be used as either a major visual or major audible alarm.
 - Major, near-end, and system ID alarms are set by the telemetry.

9. Press the **ACO** pushbutton (Extension Shelf only).

10. Verify that the major audible alarm is silenced and that the **ACO** pushbutton is lighted (Extension Shelf only).

11. Place an optical loopback on the OLIU being tested.

After 10 seconds, alarms should extinguish.

12. Verify the following:

- **CP/OPT** indicator stops flashing.
- **NE** indicator extinguishes.
- Major visual, near-end, and system ID alarms are clear.
- **ACTIVE** indicator on OLIU remains lighted.

13. If any of the items that were to be verified did not occur, isolate the trouble or refer troubles to the installation group for new installations. Once trouble is cleared repeat this procedure.

14. Remove the OLIU optical loopback.

15. If protection switching was inhibited, simultaneously press the **NE/ENABLE** and **GO ACTIVE** pushbuttons or press the **CLR** pushbutton to enable automatic protection switching.

16. If the DDM-Plus installation is being accepted, repeat this procedure from **Step 1** for each OLIU position.

17. STOP. YOU HAVE COMPLETED THIS PROCEDURE.

Connect DDM-Plus to Optical Facility

1.

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

 **WARNING:**
Use of control or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

 **CAUTION:**
When handling the optical pigtails or jumpers, take care to keep the bending radius as large as possible.

 **NOTE 1:**
It is assumed that the optical jumpers used to connect the DDM-Plus to an optical interconnection point are equipped with *ST*[®] lightguide cable connectors. These connectors are spring loaded and have notches that must be aligned with the optical line interface unit (OLIU) optical connector tabs before pushing on and turning the connector.

 **NOTE 2:**
The fiber connecting the OLIU to the optical interconnection point should be the same type used between the optical interconnection point location.

 **NOTE 3:**
Optical fibers connecting to OLIUs in the left side of the Extension Shelf (slots 1 through 14) are routed out the left side of the fiber trough. Optical fibers connecting to OLIUs in the right side of the Extension Shelf (slots 15 through 28) are routed out the right side of the fiber trough.

Route the optical cables between the *LGX*[®] panel and the DDM-Plus.

2. Remove the protective covers from the optical jumper cables. Clean the fiber with optical quality lint-free tissue or with a compressed air duster. Refer to **DLP-510** for procedure to clean optical connectors.

3.



NOTE:

The *ST* receptacle on the left printed circuit board of the OLIU is the receiver (IN). The *ST* receptacle on the right printed circuit board of the OLIU is the transmit (OUT).

Connect the optical jumpers to the OLIU.

4. Connect and label optical jumpers to the optical interconnection point.
5. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Perform OLIU Optical Span Test

Overview: This procedure verifies the DDM-Plus System performance and the optical facility. If equipped with a standby DDM-Plus System pair, verify manual protection switching. See Figure 1.

This procedure can be performed on both active and standby optical line interface unit (OLIU) pairs.

1. Verify that both locations of the DDM-Plus are installed and are connected to the optical facility.
2. Initiate the test from the standby OLIU, if equipped, or from the active OLIU when not equipped with a standby. Initiate the Optical Span Test at the near-end OLIU by pressing and holding the **NE/ENABLE** pushbutton and pressing the **TST** pushbutton three times. The first, second, and third information indicators (1→4) on the OLIU light. After 10 seconds, the **ABN** indicator lights on all OLIUs at both the near- and far-end, and the Optical Span Test begins. During the test, at both near- and far-end, information indicators cycle indicating that the test is continuing to run fault free.

Any failures detected will cause the information indicators to stop cycling. The near-end OLIU lights its **CP/OPT** indicator and the information indicators (1→4) associated with the failure.

3. When the test is to be stopped, press the **CLR** pushbutton, and the OLIUs are returned to their normal operating state.

If no failures occurred, all indicators on the OLIU faceplate blink twice showing that the test passed.

4. Did the Optical Span Test pass?

If **YES**, then proceed to **Step 6**.

If **NO**, then continue with **Step 5**.

5. Isolate and clear wiring troubles or refer troubles to the installation group for new installations. Once the trouble is cleared repeat this procedure.
6. Is the DDM-Plus System equipped with a standby?

 If **YES**, then proceed to **Step 7**.
 If **NO**, then continue with **Step 12**.
7. Perform a manual protection switch by simultaneously pressing the **NE/ENABLE** and **GO ACTIVE** pushbuttons on the standby OLIU.
8. Verify that the standby end-to-end pair becomes active and that the active pair becomes standby. The **ABN** lights on all four OLIUs showing that automatic protection switching is inhibited.
9. Enable protection switching by simultaneously pressing the **NE/ENABLE** and **GO ACTIVE** pushbuttons or by pressing the **CLR** pushbutton.
10. Verify that the **ABN** indicators are no longer lighted, and that the only indicator lighted is the **ACTIVE** indicator on the active OLIU.
11. Has the Optical Span Test been performed on both OLIU pairs?

 If **NO**, repeat this procedure from **Step 2**.
 If **YES**, then proceed to **Step 12**.
12. If the DDM-Plus installation is being accepted, repeat this procedure from **Step 1** for each OLIU pair being end-to-end tested.
13. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

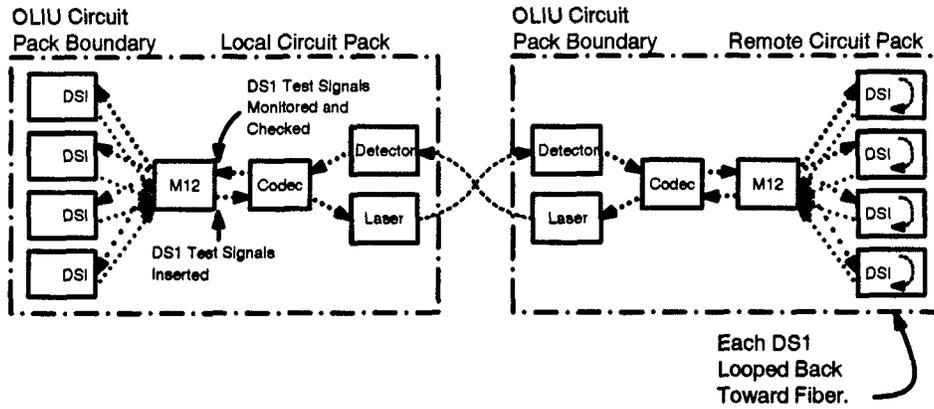


Figure 1 OLIU Optical Span Test

Provisioning OLIU DS1 Ports

Overview: This procedure activates and deactivates the optical line interface unit (OLIU) DS1 ports based on the presence of equipped DS1s. Equipped DS1 ports are activated, and unequipped DS1 ports are deactivated. Both ends of the DDM-Plus System can be provisioned from the near-end OLIU. Both active and standby OLIU pairs must be provisioned using this procedure.



NOTE:

When a DS1 signal is detected, the OLIU automatically activates the DS1 port associated with the DS1 signal and updates its list of equipped ports. Once an active DS1 port detects an incoming DS1 loss of signal (LOS), the OLIU generates an alarm, if provisioned.

1. Update DS1 ports provisioning at the near-end OLIU by simultaneously pressing the **NE/ENABLE** and the **DS1 SEL** pushbuttons.
2. Verify that the near-end equipped DS1 ports are now active and that the unequipped DS1 ports are now inactive by pressing and holding the **NE/ENABLE** pushbutton.

Response: The information indicators (1→4) correspond to the DS1 ports. The information indicators light for active DS1 ports and are not lighted for inactive DS1 ports.
3. Update DS1 ports provisioning at the far-end OLIU by simultaneously pressing the **FE/ENABLE** and the **DS1 SEL** pushbuttons.
4. Verify that the far-end equipped DS1 ports are now active and that the unequipped DS1 ports are now inactive by pressing and holding the **FE/ENABLE** pushbutton.

Response: The information indicators (1→4) correspond to the DS1 ports. The information indicators light for active DS1 ports and are not lighted for inactive DS1 ports.

Clean Optical Fibers and Connectors

1.



WARNING:

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



NOTE 1:

Always clean all *ST*[®] connectors and couplings before doing initial connections or reconnections per the following instructions.



NOTE 2:

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.

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

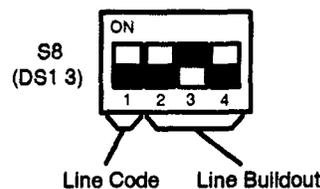
6. Install the *ST* connectors onto the coupling by aligning the mark on the rim of the connector body with the slot in the coupling. Push the connector onto the coupling with a clockwise twist-locking motion.

7. STOP. YOU HAVE COMPLETED THIS PROCEDURE.

Display DS1 Line Buildout

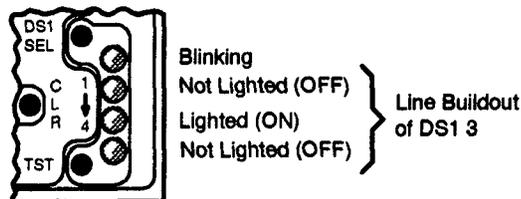
Overview: This procedure displays the line build-out option switch setting at either the near- or far-end OLIU for a select DS1. The line build-out option switch settings are displayed through the information indicators (1→4). The first information indicator blinks, indicating that line buildout of the selected DS1 port is being displayed. The second, third, and fourth information indicators display the switch setting for switch positions 2, 3, and 4, respectively, for the selected DS1. An ON setting is represented by a lighted indicator and an OFF setting is represented by an indicator not lighted.

Figure 1 shows how the information indicators display DS1 3 line buildout when set for 181 to 270 feet for 1249C cable and 268 to 400 feet for 613C cable.



Switch Position 1 - Not Displayed
Switch Position 2 - OFF
Switch Position 3 - ON
Switch Position 4 - OFF

Partial View of OLIU Faceplate



DS1 3 provisioned for line buildout 181 to 270 feet for 1249C cable and 268 to 400 feet for 613C cable.

Figure 1 Information Indicators Displaying Line Buildout

1. Select the DS1 line buildout display by repeatedly pressing the **DS1 SEL** pushbutton until the corresponding information indicator (1→4) lights. The DS1 line build-out option switches are as follows:

<u>DS1</u>	<u>Option Switch</u>
DS1 1	S6
DS1 2	S7
DS1 3	S8
DS1 4	S9

2. Display line buildout at selected DS1 for either near- or far-end location.
 - A. To display near-end line buildout for the selected DS1, press and hold the **NE/ENABLE** pushbutton. After 3 seconds, the first information indicator blinks and information indicators two, three, and four display switch positions 2, 3, and 4, respectively, for the selected DS1 option switch.
 - B. To display far-end line buildout for the selected DS1, press and hold the **FE/ENABLE** pushbutton. After 3 seconds, the first information indicator blinks and information indicators two, three, and four display switch positions 2, 3, and 4, respectively, for the selected DS1 option switch.
3. Record the information indicators display.

A lighted information indicator represents ON and an unlighted information indicator represents OFF.

4. Release the **ENABLE** pushbutton and the OLIU faceplate returns to its normal operating state.

5. Determine if the line buildout is set correctly by referring to Table 1 and comparing the line buildout with office records.

Table 1. OLIU DS1 Line Buildout

<u>Distance to DSX-1 in Feet</u>		<u>Switches S6, S7, S8, and S9</u>		
<u>1249C Cable (26 Gauge)</u>	<u>613C Cable (22 Gauge)</u>	<u>Switch Position 2</u>	<u>Switch Position 3</u>	<u>Switch Position 4</u>
0 to 90	0 to 133	OFF	OFF	OFF
91 to 180	134 to 267	OFF	OFF	ON
181 to 270	268 to 400	OFF	ON	OFF
271 to 360	401 to 533	OFF	ON	ON
<u>361 to 450</u>	<u>534 to 655</u>	<u>ON</u>	<u>OFF</u>	<u>OFF</u>
Invalid*	Invalid*	ON	OFF	ON
Invalid*	Invalid*	ON	ON	OFF
<u>Invalid*</u>	<u>Invalid*</u>	<u>ON</u>	<u>ON</u>	<u>ON</u>

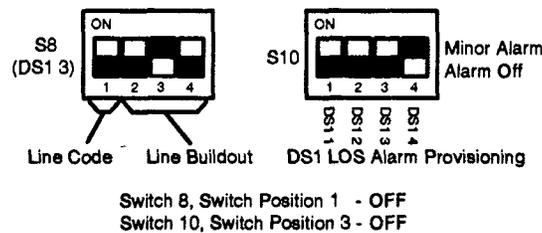
* Invalid option setting. Invalid settings will cause the NE and DS1 indicators to light.

6. STOP. YOU HAVE COMPLETED THIS PROCEDURE.

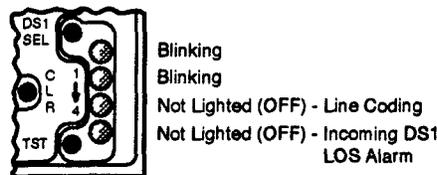
Display DS1 Line Coding and LOS Provisioning

Overview: This procedure displays the line coding and loss of signal (LOS) option switch setting at either the near- or far-end optical line interface unit (OLIU) for a selected DS1. The line coding and LOS provisioning is displayed through the information indicators (1→4). The first and second information indicators blink, indicating that line coding and LOS provisioning of the selected DS1 port is being displayed. The third information indicator displays the setting of switch position 1 on either S6, S7, S8, or S9 corresponding to the selected DS1. The fourth information indicator displays option switch S10 either switch position 1, 2, 3, or 4 corresponding to the selected DS1. An ON setting is represented by a lighted indicator and an OFF setting is represented by an indicator not lighted.

Figure 1 shows how the information indicators display DS1 3 with line coding set for B8ZS and LOS alarm set not to generate an LOS alarm.



Partial View of OLIU Faceplate



DS1 3 provisioned for B8ZS line coding and no alarm for incoming DS1 LOS.

Figure 1 Information Indicators Displaying Line Coding and LOS Provisioning

1. Select the DS1 line coding and LOS provisioning display by repeatedly pressing the **DS1 SEL** pushbutton until the corresponding information indicator (1→4) lights. The DS1 line coding and LOS provisioning option switches and switch positions are as follows:

<u>DS1</u>	<u>Line Coding</u> <u>(Switch Position 1)</u>	<u>LOS</u> <u>(Option Switch S10)</u>
DS1 1	Option switch S6	Switch position 1
DS1 2	Option switch S7	Switch position 2
DS1 3	Option switch S8	Switch position 3
DS1 4	Option switch S9	Switch position 4

2. Display line coding and LOS provisioning at selected DS1 for either near- or far-end location.

- A. To display near-end line coding and LOS provisioning for the selected DS1, press the **NE/ENABLE** pushbutton twice and hold. After 3 seconds following the second push, the first and second information indicators blink; information indicator three displays the line coding setting (switch position 1 of the appropriate option switch S6, S7, S8, or S9); and information indicator four displays the LOS provisioning (appropriate switch position 1, 2, 3, or 4 on option switch S10) for the selected DS1.

- B. To display far-end line coding and LOS provisioning for the selected DS1, press the **FE/ENABLE** pushbutton twice and hold. After 3 seconds following the second push, the first and second information indicators blink; information indicator three displays the line coding setting (switch position 1 of the appropriate option switch S6, S7, S8, or S9); and information indicator four displays the LOS provisioning (appropriate switch position 1, 2, 3, or 4 on option switch S10) for the selected DS1.

3. Record the information indicators display.

A lighted information indicator represents ON and an unlighted information indicator represents OFF.

4. Release the **ENABLE** pushbutton and the OLIU faceplate returns to its normal operating state.
5. Determine if the line coding and LOS provisioning is set correctly by referring to Tables 1 and 2, respectively. Compare these settings with the office records.

Table 1. DS1 Line Coding

<u>Coding</u>	<u>Switches S6, S7, S8, and S9</u>	
	<u>Switch Position 1</u>	
AMI	ON	
B8ZS	OFF	

Table 2. DS1 LOS Indication Provisioning

<u>LOS Indication</u>	<u>Option Switch</u>			
	<u>S10-1</u> <u>(DS1 1)</u>	<u>S10-2</u> <u>(DS1 2)</u>	<u>S10-3</u> <u>(DS1 3)</u>	<u>S10-4</u> <u>(DS1 4)</u>
Minor Alarm	ON	ON	ON	ON
No Alarm	OFF	OFF	OFF	OFF

6. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Replace Failed Circuit Pack

1.



NOTE 1:

Each end of the optical facility must have the same coded optical line interface unit (OLIU).

Obtain replacement circuit pack.

2.



CAUTION:

If an active OLIU is removed from the shelf and a standby OLIU is not equipped, service will be interrupted.

Unlatch failing circuit pack and remove it from the shelf. Optical fibers must be removed from failing OLIU circuit packs, and record option switch (S6, S7, S8, S9, S10, S12, and S13) settings.

3. If an OLIU circuit pack is being replaced, set option switch setting on replacement circuit pack to match failing circuit pack. Refer to **DLP-502** for OLIU option switch settings.
4. If an OLIU circuit pack is being replaced, clean optical connectors before reconnecting fibers. Refer to **DLP-510** to clean optical connectors.
5. Install replacement circuit pack.
6. Does alarm clear?
 - If **NO**, refer to either **TAP-101** for a major alarm or **TAP-102** for a minor alarm.
 - If **YES**, **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Loop Back Far-End OLIU and Insert Test Signal

Overview: This procedure loops a selected DS1 on either an active or standby optical line interface unit (OLIU) pair at the far-end OLIU. If the loopback is established on an active OLIU pair, either external or internal test signals can be inserted into the looped back DS1. The DS1 looped back sends an alarm insertion signal (AIS) on its outgoing DS1 signal. Looping an in-service DS1 on an active OLIU pair will interrupt service. If the loopback is established on a standby OLIU pair, only an internal test signal can be inserted and service will not be interrupted.

A loopback can be established without inserting a test signal. A far-end loopback is shown in Figure 1.

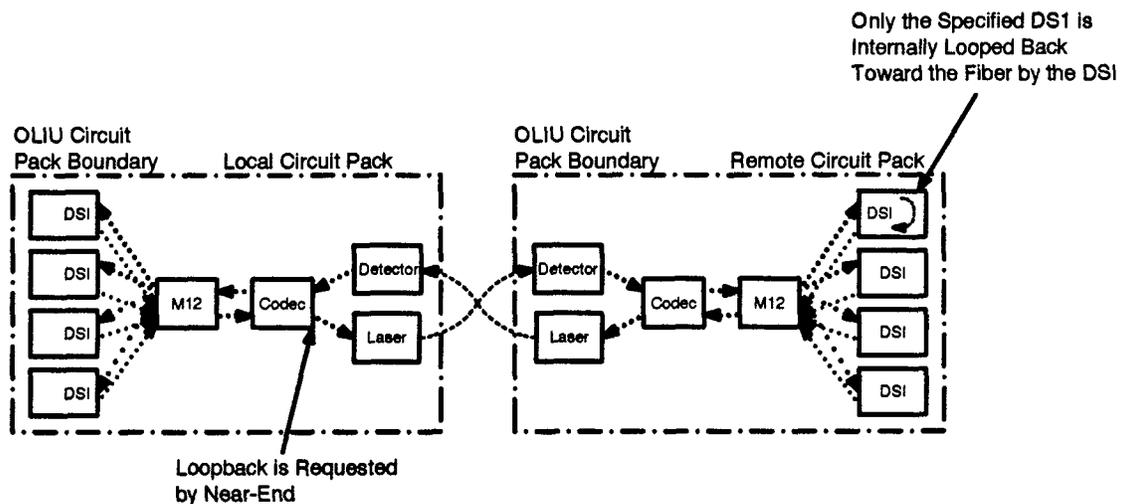


Figure 1 Far-End DS1 Loopback

1. Is the DS1 to be looped back in-service?
If **NO**, then proceed to **Step 8**.
If **YES**, then continue with **Step 2**.

2. Is the loopback to be placed on an active OLIU pair?
If **NO**, then continue with **Step 3**.
If **YES**, then proceed to **Step 8**.

3. Does the DS1 to be looped have a standby OLIU pair?
If **NO**, then continue with **Step 4**.
If **YES**, then proceed to **Step 6**.

4. The DS1 to be looped back is in-service and does not have a standby OLIU available. If this DS1 is looped back, service will be interrupted.

DS1 should be rerouted or a standby OLIU should be equipped.

5. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

6. Press **GO ACTIVE** and **NE/ENABLE** pushbuttons simultaneously on the standby OLIU to perform a manual protection switch.

Response: Standby OLIU becomes active, and previous OLIU is now standby. **ABN** indicators light on OLIUs, and automatic protection switching is inhibited.

7. Press the **CLR** pushbutton to extinguish the **ABN** indicators and enable automatic protection switching.

8. Select DS1 to be looped back by pressing the **DS1 SEL** pushbutton until the corresponding information indicator (1→4) of the desired DS1 lights.

- 9.



CAUTION:

Looping back a DS1 that is in-service will interrupt service.

Press **FE/ENABLE** and **LOOP** pushbuttons simultaneously.

10. Verify that the following occurs at the near-end OLIU:

- Selected/looped DS1 corresponding information indicator (1→4) blinks.
- **FE** indicator lights — indicating the loop is placed at the far-end OLIU.
- **ABN** indicators light.

At the far-end the following occurs:

- Selected/looped DS1 corresponding information indicator (1→4) blinks.
- **NE** indicator lights — indicating the loop is placed at the near-end OLIU.
- **ABN** indicators light.

Far-end loopback is established.

11. Is only a far-end loopback desired?

If **NO**, then proceed to **Step 14**.

If **YES**, continue with **Step 12**.

12. When the far-end loopback is to be removed, press the **CLR** pushbutton.
The OLIU is returned to its normal operating state.

13. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

14.



NOTE:

Active OLIU pairs can use either external or internal test signals.
Standby OLIU pairs can only use internal test signals.

Is external test signal to be inserted?

If **NO**, then proceed to **Step 18**.

If **YES**, then continue with **Step 15**.

15. Make appropriate connections and follow local procedures for external test signal testing.
16. Once external testing is complete, press the **CLR** pushbutton to remove far-end loopback. The OLIU is returned to its normal operating state.
17. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
18. Press **NE/ENABLE** and **TST** pushbuttons simultaneously to insert test signal into the looped DS1.
19. Verify that the following occurs at the near-end OLIU:
 - Information indicators (1→4) cycle — indicating that a valid test signal is being returned to the near-end OLIU.
 - **FE** indicator remains lighted — indicating the loop is placed at the far-end OLIU.
 - **ABN** indicators remain lighted.

At the far-end the following occurs:

- Information indicator (1→4) corresponding to the DS1 being tested remains lighted.
- **NE** indicator remains lighted.
- **ABN** indicators remain lighted.

If any time during the test a valid test signal is not returned, the **CP/OPT** indicator lights.

20. When testing is to be stopped, press the **CLR** pushbutton, and the OLIU is returned to its normal operating state.

If no failures occurred during the test, the near-end OLIU faceplate indicators blink twice.

21. STOP. YOU HAVE COMPLETED THIS PROCEDURE.

Loop Back Near-End OLIU

Overview: This procedure loops a selected DS1 on either an active or standby optical line interface unit (OLIU) pair on the near-end OLIU. The DS1 looped back sends an alarm insertion signal (AIS) on its outgoing DS1 signal. Looping an in-service DS1 on an active OLIU pair will interrupt service. A far-end loopback is shown in Figure 1.

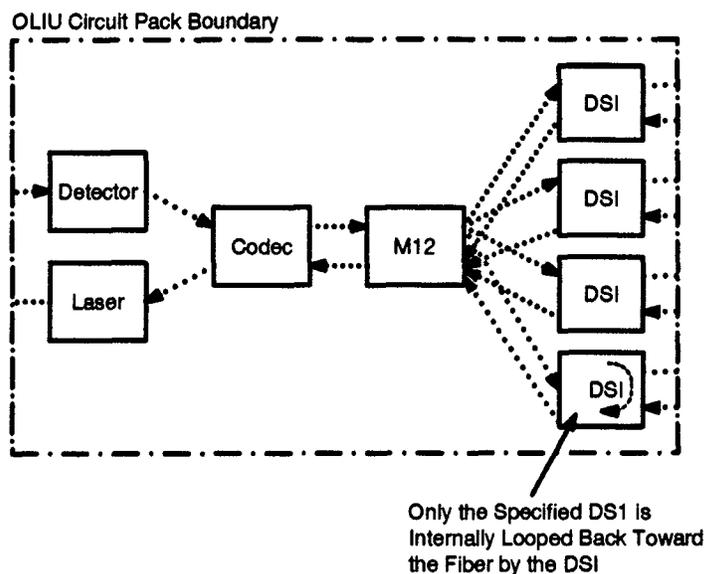


Figure 1 Near-End DS1 Loopback

1. Is the DS1 to be looped back in-service?
If **NO**, then proceed to **Step 8**.
If **YES**, then continue with **Step 2**.
2. Is the loopback to be placed on an active OLIU pair?
If **NO**, then continue with **Step 3**.
If **YES**, then proceed to **Step 8**.

3. Does the DS1 to be looped have a standby OLIU pair?

If **NO**, then continue with **Step 4**.

If **YES**, then proceed to **Step 6**.

4. The DS1 to be looped back is in-service and does not have a standby OLIU available. If this DS1 is looped back, service will be interrupted.

DS1 should be rerouted or a standby OLIU should be equipped.

5. STOP. YOU HAVE COMPLETED THIS PROCEDURE.

6. Press **GO ACTIVE** and **NE/ENABLE** pushbuttons simultaneously on the standby OLIU to perform a manual protection switch.

Response: Standby OLIU becomes active, and the previous OLIU is now standby. **ABN** indicators light on OLIUs, and automatic protection switching is inhibited.

7. Press the **CLR** pushbutton to extinguish the **ABN** indicators and enable automatic protection switching.

8. Select DS1 to be looped back by pressing the **DS1 SEL** pushbutton until the corresponding information indicator (**1→4**) of the desired DS1 lights.

9. Press **NE/ENABLE** and **LOOP** pushbuttons simultaneously.

10. Verify that the following occurs at the near-end OLIU:

- Selected/looped DS1 corresponding information indicator (**1→4**) blinks.
- **NE** indicator lights — indicating the loop is placed at the near-end OLIU.
- **ABN** indicators light.

Near-end loopback is established.

11. When the near-end loopback is to be removed, press the **CLR** pushbutton.
The OLIU is returned to its normal operating state.

12. STOP. YOU HAVE COMPLETED THIS PROCEDURE.

How to Use TOP

The PROCEDURES section gives you all the step-by-step instructions you need to do your job (task). These instructions are given in the order that they *must* be done. Failure to follow the instructions in the order given may cause service interruptions.

The work that you do can be divided into two broad job functions - work to clear troubles and work other than to clear troubles.

Work to Clear Troubles: This is the work you do to fix troubles in the equipment. You may be doing this work in response to a customer's complaint, an office alarm, a trouble report, an abnormal printout, or any other equipment fault indication.

Work Other Than to Clear Troubles: This is the work you do to install equipment, to test equipment after it is installed, to place equipment in service, to operate and maintain equipment, or anything else required to establish, to change, or to discontinue service to the customer.

The Operation and Maintenance — TOP tab is divided into parts called procedures. Each procedure is given a 3-digit number. These numbers range from 001 through 893. Procedures are arranged in this manual in numerical order beginning with 001.

Figure 1 is a typical IXL-001 procedure and is titled *Task Index List*. It is an alphabetical listing of the jobs that you may have to do. To use an IXL-001 procedure, just find the job you need to do in the Find Your Job In The List Below column. Next, follow the dotted line to the procedure number and begin the task. For example, suppose you are given the job of doing a system test. On the IXL-001 procedure, as shown in Figure 1, notice that it is listed in the Then Go To column as NTP-016. It could have been any other 3-digit number.

Figure 2 is an example of specific instructions for doing a job. It consists of numbered items (or steps) listed in the order that you must do them to complete your job. To use this procedure, you must start with item 1 in the Do Items Below In Order Listed column and continue until all items have been done. When you get to an item that you do not know how to do, look for the procedure number for that item under the For Details, Go To column. This is the number of the procedure that will give you detailed step-by-step instructions to do that item. Note that item 2 in Figure 2 uses lettered (A, B) entries. This means that there are alternate ways of doing item 2 depending on equipment options or equipment conditions. You do only the one that fits your equipment options or equipment conditions.

For example, suppose you are doing a System Test. The IXL-001 as shown in Figure 1 has directed you to NTP-016 as shown in Figure 2, and you are on item 8 Mount Tape in the Do Items Below In Order Listed column. Mount the tape if you know how. If you do not know how to mount the tape, go to the procedure number listed in the For Details, Go To column for the detailed step-by-step instructions. In this case, it happens to be DLP-500. In either case, you must continue with the next item listed in NTP-016 until you complete the job.

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Task Index List	
Find Your Job In The List Below	Then Go To
Alert; External - Horn, Ringer, Etc. - Remove.....	NTP-028
Amplifiers; Channel - Recorded Announcement Frame - Test....	NTP-009
BRDG LED - Does Not Light - Correct.....	TAP-117
Bridging Controller; Trunk - J1C015MB - Replace	DLP-572
Channel Amplifiers - Recorded Announcement Frame - Test.....	NTP-009
Extended Station Capability - Nonkey Set Only - Reported Failure	TAP-123
External Alert - Horn, Ringer, Etc. - Remove	NTP-028
Interchange Two Working Station Numbers	NTP-081
LED: BRDG - Does Not Light - Correct.....	TAP-117
Loudspeaker Paging - Add.....	NTP-059
New International Trunk, R1 Signaling - Incoming - Establish	NTP-010
New Tandem Trunk - T-Carrier and Digroup Terminal - Establish	NTP-008
Station Capability; Extended - Nonkey Set Only - Reported Failure	TAP-123
System Test - Perform	NTP-016
Trunk Bridging Controller - J1C015MB - Replace	DLP-572

Figure 1 Typical List of Jobs To Be Done

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Perform System Test	
Do Items Below in Order Listed	For Details, Go To
1 Test Local Maintenance Terminal	DLP-531
2 Place SEC/SEB in Off-Line Mode	
A. If in On-Line Mode, Change System From On-Line to Off-Line	DLP-509
B. If Powered Down, Condition System for Off-Line Operation as Follows	
1. Power up Minicomputer	DLP-503
2. Power up Line Printer	DLP-503
3. Power up Maintenance Terminal	DLP-510
7 Run Computer Display Terminal Test For All Positions	DLP-513
8 Mount Tape	DLP-500
9 Test Computer Display	DLP-522

Figure 2 Typical List of Specific Instructions for Doing a Job

Figure 3 is a typical page of a DLP-500 (Detailed Level Procedure - 500) that gives numbered step-by-step instructions. To use this procedure, you must start with Step 1 and proceed as directed by the instructions until you complete this procedure. Note that Step 1 of this procedure is preceded by a statement called an OVERVIEW. An overview is used as a memory jogger and briefly tells you how to do the procedure and what measurements or results you can observe. If you can do the procedure after reading the OVERVIEW, go ahead and do it without reading any further.

Now, look at Step 6 of DLP-500 as shown in Figure 3. Note that following the action statement there is the word Reference followed by DLP-563. When you see a reference like this, it means that additional step-by-step instructions for doing just that step are given in the referenced procedure. In this case, DLP-563 gives you the details on how to Ensure that the write-enable ring is not installed on the file reel. If you, in this case, cannot do Step 6, then go to DLP-563. In either case, you must continue with Step 7 until you have completed the procedure. In some cases, you may be directed to a procedure where the procedure number is preceded by the letters TAP (Trouble Analysis Procedure); for example, TAP-109. This means that you have trouble in the equipment, and in this case TAP-109 will give you step-by-step instructions to fix the trouble. After you have fixed the trouble, you must return to Step 1 of the procedure that sent you to TAP-109. However, if you came directly from IXL-001 to TAP-109, then your job is completed when you have fixed the trouble.

Safety Labels: Three safety labels are used in PROCEDURES as follows:

- **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.

Important Items: Table A lists the more important items used in the PROCEDURES section.

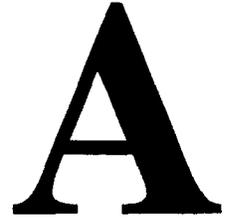
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Mount Tape	
<p>OVERVIEW: Install tape with or without write enable ring, as required. Thread tape and position tape at beginning of tape (BOT) marker.</p>	
<ol style="list-style-type: none">1. Get file reel and empty take-up reel.2. Set START/STOP switch to STOP.3. Set ON LINE/OFF LINE switch to OFF LINE.4. Set LOAD/BR REL switch to center position.5. Is data to be written on tape? If YES, then install write enable ring on file reel and go to Step 7. If NO, then do Step 6.6. Ensure that write enable ring is not installed on file reel. Reference: DLP-5637. Open tape transport door.	

Figure 3 Typical List of Detailed Instructions for Doing a Job

Table 1. Important Procedural Items and Definitions

Item	Definition
Acceptance (NTP-002)	Provides information and identifies jobs to be done to accept equipment after it is installed.
Maintenance Philosophy	The maintenance philosophy, when provided, gives an overview of the considerations designed into the trouble-clearing procedures.
DLP (Detailed Level Procedure)	Detailed step-by-step instructions.
TAP (Trouble Analysis Procedure)	Step-by-step trouble-clearing instructions to locate and/or fix troubles.
NTP (Non-Trouble-Clearing Procedure)	A list of items to perform normal work other than trouble-clearing.

Connectors Pin Assignment



Contents

■ Extension Shelf Connectors	A-1
DSX-1 Facility Connectors — P01 and P03	A-1
DSX-1 Equipment Connector — P02	A-6
Fault Locate Connectors — P04 and P05	A-10
Office Alarms Connector — P06	A-11
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Alarm and ACO Connector — P08	A-13
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Power Connectors	A-14
■ Wall Distant Terminal Connectors	A-15

Connectors Pin Assignment



Extension Shelf Connectors

All interfaces to the DDM-Plus Extension Shelf are connectized. The connector panel is shown in Figure A-1. Refer to AT&T 363-206-151, *DDM-Plus Installation Manual*, SD-7C559-01 and ED-7C530-15 for detailed cabling information. Tables A-1 through A-22 list the pin assignment for each connector of the Extension Shelf.

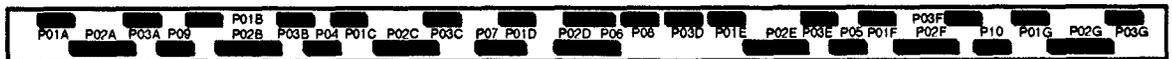


Figure A-1. Connector Panel - Front View

DSX-1 Facility Connectors — P01 and P03

The facility receive connections are terminated on the DDM-Plus Extension Shelf connector panel by P01(), and the facility transmit connections are terminated by P03(). Each connector, P01() and P03(), consists of 7 connectors corresponding to the 7 groups (A through G). For example, connector **P01D** terminates the facility receive connections of group D (DS1s 13, 14, 15, and 16), and connector **P03D** terminates the facility transmit connections of group D.

Connectors P01() and P03() provide connection when T1 carrier service is installed in the corresponding group and is not used when equipped for optical service. Tables A-1 through A-7 list the pin assignments of DSX-1 facility connectors for groups A through G, respectively. The tables list pin number, pin designation, DS1 designation, and the slot location of the T1 repeater circuit pack for each group.

Table A-1. Pin Assignments for Group A DSX-1 Facility Connectors

Pin	P01A (Receive)	P03A (Transmit)	DS1	T1 Repeater Slot Number
A1 B1	T1-1 R1-1	T-1 R-1	1	1
A2 B2	T1-2 R1-2	T-2 R-2	2	2
A3 B3	T1-3 R1-3	T-3 R-3	3	3
A4 B4	T1-4 R1-4	T-4 R-4	4	4

Table A-2. Pin Assignments for Group B DSX-1 Facility Connectors

Pin	P01B (Receive)	P03B (Transmit)	DS1	T1 Repeater Slot Number
A1 B1	T1-5 R1-5	T-5 R-5	5	5
A2 B2	T1-6 R1-6	T-6 R-6	6	6
A3 B3	T1-7 R1-7	T-7 R-7	7	7
A4 B4	T1-8 R1-8	T-8 R-8	8	8

Table A-3. Pin Assignments for Group C DSX-1 Facility Connectors

Pin	P01C (Receive)	P03C (Transmit)	DS1	T1 Repeater Slot Number
A1 B1	T1-9 R1-9	T-9 R-9	9	9
A2 B2	T1-10 R1-10	T-10 R-10	10	10
A3 B3	T1-11 R1-11	T-11 R-11	11	11
A4 B4	T1-12 R1-12	T-12 R-12	12	12

Table A-4. Pin Assignments for Group D DSX-1 Facility Connectors

Pin	P01D (Receive)	P03D (Transmit)	DS1	T1 Repeater Slot Number
A1 B1	T1-13 R1-13	T-13 R-13	13	13
A2 B2	T1-14 R1-14	T-14 R-14	14	14
A3 B3	T1-15 R1-15	T-15 R-15	15	15
A4 B4	T1-16 R1-16	T-16 R-16	16	16

Table A-5. Pin Assignments for Group E DSX-1 Facility Connectors

Pin	P01E (Receive)	P03E (Transmit)	DS1	T1 Repeater Slot Number
A1 B1	T1-17 R1-17	T-17 R-17	17	17
A2 B2	T1-18 R1-18	T-18 R-18	18	18
A3 B3	T1-19 R1-19	T-19 R-19	19	19
A4 B4	T1-20 R1-20	T-20 R-20	20	20

Table A-6. Pin Assignments for Group F DSX-1 Facility Connectors

Pin	P01F (Receive)	P03F (Transmit)	DS1	T1 Repeater Slot Number
A1 B1	T1-21 R1-21	T-21 R-21	21	21
A2 B2	T1-22 R1-22	T-22 R-22	22	22
A3 B3	T1-23 R1-23	T-23 R-23	23	23
A4 B4	T1-24 R1-24	T-24 R-24	24	24

Table A-7. Pin Assignments for Group G DSX-1 Facility Connectors

Pin	P01G (Receive)	P03G (Transmit)	DS1	T1 Repeater Slot Number
A1 B1	T1-25 R1-25	T-25 R-25	25	25
A2 B2	T1-26 R1-26	T-26 R-26	26	26
A3 B3	T1-27 R1-27	T-27 R-27	27	27
A4 B4	T1-28 R1-28	T-28 R-28	28	28

DSX-1 Equipment Connector — P02

The equipment transmit and receive connections are terminated on the DDM-Plus Extension Shelf connector panel by P02(). Both T1 repeater (metallic) service and optical service use connector P02(). P02() consists of 7 connectors corresponding to the 7 groups (A through G). For example, connector P02E terminates the equipment transmit and receive connections of group E (DS1s 17, 18, 19, and 20).

Tables A-8 through A-14 list the pin assignments of the DSX-1 equipment connectors for groups A through G, respectively. The tables list pin number, pin designation for type of service, pin function, and DS1 designation. Pins designations are dependent on the type service being provided (metallic or optical). Odd numbered pins transmit to the DSX and even numbered pins receive from the DSX.

Table A-8. Pin Assignments for Group A DSX-1 Equipment Connector

Pin	P02A		Function	DS1
	Metallic	Optical		
A1	T1.0-1	A1T	Transmit	1
B1	R1.0-1	A1R		
A2	T.0-1	A1T	Receive	
B2	R.0-1	A1R		
A3	T1.0-2	A2T	Transmit	2
B3	R1.0-2	A2R		
A4	T.0-2	A2T	Receive	
B4	R.0-2	A2R		
A5	T1.0-3	A3T	Transmit	3
B5	R1.0-3	A3R		
A6	T.0-3	A3T	Receive	
B6	R.0-3	A3R		
A7	T1.0-4	A4T	Transmit	4
B7	R1.0-4	A4R		
A8	T.0-4	A4T	Receive	
B8	R.0-4	A4R		

Table A-9. Pin Assignments for Group B DSX-1 Equipment Connector

Pin	P02B		Function	DS1
	Metallic	Optical		
A1	T1.0-5	B1T	Transmit	5
B1	R1.0-5	B1R		
A2	T.0-5	B1T	Receive	
B2	R.0-5	B1R		
A3	T1.0-6	B2T	Transmit	6
B3	R1.0-6	B2R		
A4	T.0-6	B2T	Receive	
B4	R.0-6	B2R		
A5	T1.0-7	B3T	Transmit	7
B5	R1.0-7	B3R		
A6	T.0-7	B3T	Receive	
B6	R.0-7	B3R		
A7	T1.0-8	B4T	Transmit	8
B7	R1.0-8	B4R		
A8	T.0-8	B4T	Receive	
B8	R.0-8	B4R		

Table A-10. Pin Assignments for Group C DSX-1 Equipment Connector

Pin	P02C		Function	DS1
	Metallic	Optical		
A1	T1.0-9	C1T	Transmit	9
B1	R1.0-9	C1R		
A2	T.0-9	C1T	Receive	
B2	R.0-9	C1R		
A3	T1.0-10	C2T	Transmit	10
B3	R1.0-10	C2R		
A4	T.0-10	C2T	Receive	
B4	R.0-10	C2R		
A5	T1.0-11	C3T	Transmit	11
B5	R1.0-11	C3R		
A6	T.0-11	C3T	Receive	
B6	R.0-11	C3R		
A7	T1.0-12	C4T	Transmit	12
B7	R1.0-12	C4R		
A8	T.0-12	C4T	Receive	
B8	R.0-12	C4R		

Table A-11. Pin Assignments for Group D DSX-1 Equipment Connector

Pin	P02D		Function	DS1
	Metallic	Optical		
A1	T1.0-13	D1T	Transmit	13
B1	R1.0-13	D1R		
A2	T.0-13	D1T	Receive	
B2	R.0-13	D1R		
A3	T1.0-14	D2T	Transmit	14
B3	R1.0-14	D2R		
A4	T.0-14	D2T	Receive	
B4	R.0-14	D2R		
A5	T1.0-15	D3T	Transmit	15
B5	R1.0-15	D3R		
A6	T.0-15	D3T	Receive	
B6	R.0-15	D3R		
A7	T1.0-16	D4T	Transmit	16
B7	R1.0-16	D4R		
A8	T.0-16	D4T	Receive	
B8	R.0-16	D4R		

Table A-12. Pin Assignments for Group E DSX-1 Equipment Connector

Pin	P02E		Function	DS1
	Metallic	Optical		
A1	T1.0-17	E1T	Transmit	17
B1	R1.0-17	E1R		
A2	T.0-17	E1T	Receive	
B2	R.0-17	E1R		
A3	T1.0-18	E2T	Transmit	18
B3	R1.0-18	E2R		
A4	T.0-18	E2T	Receive	
B4	R.0-18	E2R		
A5	T1.0-19	E3T	Transmit	19
B5	R1.0-19	E3R		
A6	T.0-19	E3T	Receive	
B6	R.0-19	E3R		
A7	T1.0-20	E4T	Transmit	20
B7	R1.0-20	E4R		
A8	T.0-20	E4T	Receive	
B8	R.0-20	E4R		

Table A-13. Pin Assignments for Group F DSX-1 Equipment Connector

Pin	P02F		Function	DS1
	Metallic	Optical		
A1	T1.0-21	F1T	Transmit	21
B1	R1.0-21	F1R		
A2	T.0-21	F1T	Receive	
B2	R.0-21	F1R		
A3	T1.0-22	F2T	Transmit	22
B3	R1.0-22	F2R		
A4	T.0-22	F2T	Receive	
B4	R.0-22	F2R		
A5	T1.0-23	F3T	Transmit	23
B5	R1.0-23	F3R		
A6	T.0-23	F3T	Receive	
B6	R.0-23	F3R		
A7	T1.0-24	F4T	Transmit	24
B7	R1.0-24	F4R		
A8	T.0-24	F4T	Receive	
B8	R.0-24	F4R		

Table A-14. Pin Assignments for Group G DSX-1 Equipment Connector

Pin	P02G		Function	DS1
	Metallic	Optical		
A1	T1.0-25	G1T	Transmit	25
B1	R1.0-25	G1R		
A2	T.0-25	G1T	Receive	
B2	R.0-25	G1R		
A3	T1.0-26	G2T	Transmit	26
B3	R1.0-26	G2R		
A4	T.0-26	G2T	Receive	
B4	R.0-26	G2R		
A5	T1.0-27	G3T	Transmit	27
B5	R1.0-27	G3R		
A6	T.0-27	G3T	Receive	
B6	R.0-27	G3R		
A7	T1.0-28	G4T	Transmit	28
B7	R1.0-28	G4R		
A8	T.0-28	G4T	Receive	
B8	R.0-28	G4R		

Fault Locate Connectors — P04 and P05

The fault locate connections are terminated on the DDM-Plus Extension Shelf connector panel by P04 and P05. These connections are used only by the T1 carrier systems. Tables A-15 and A-16 list the pin assignments for the fault locate connectors P04 and P05, respectively.

Table A-15. Fault Locate Connector — P04

Pin	Designation	Function
A1	No Connection	
B1	No Connection	
A2	FL2A	Fault-locating pair for slots 1 thru 7
B2	FL1A	
A3	FL2B	Fault-locating pair for slots 8 thru 14
B3	FL1B	
A4	No Connection	
B4	No Connection	

Table A-16. Fault Locate Connector — P05

Pin	Designation	Function
A1	No Connection	
B1	No Connection	
A2	FL2C	Fault-locating pair for slots 15 thru 21
B2	FL1C	
A3	FL2D	Fault-locating pair for slots 22 thru 28
B3	FL1D	
A4	No Connection	
B4	No Connection	

Office Alarms Connector — P06

The office alarms generated by the DDM-Plus are available on the Extension Shelf connector panel by P06. All relay contacts are normally opened. The ACO remote input requires a momentary short (ground) to operate.

Table A-17 lists the pin assignments for the office alarm connector P06.

Table A-17. Pin Assignments for Office Alarms — P06

Pin	Designation	Function
A1	MNR	Minor Alarm Visible Return
A2	MN	Minor Alarm Visible
B1	MNAR	Minor Alarm Audible Return
B2	MNA	Minor Alarm Audible
A3	RACO	ACO Remote Input
A4	RACOR	ACO Control Return
B3	RACO	ACO Remote Input
B4	RACOR	ACO Control Return
A5	MJR	Major Alarm Visible Return
A6	MJ	Major Alarm Visible
B5	MJAR	Major Alarm Audible Return
B6	MJA	Major Alarm Audible

Parallel Telemetry Connector — P07

The parallel (E2A) telemetry generated by the DDM-Plus and a few miscellaneous discrete connections are available on the Extension Shelf connector panel through P07. Table A-18 lists the pin assignments for connector P07.

Table A-18. Pin Assignments for Parallel Telemetry Connector — P07

Pin	Designation	Function
A1	No Connection	
A2	RMTIAC	Remote Input A for Group C
A3	RMTOD	Remote Output for Group D
A4	RMTIAD	Remote Input A for Group D
A5	E2SYSIDA	Optical Group A System ID
A6	E2SYSIDC	Optical Group C System ID
A7	E2SYSIDE	Optical Group E System ID
A8	E2SYSIDG	Optical Group G System ID
A9	E2MN	Minor Alarm
A10	E2NF	Near-End Failure
B1	No Connection	
B2	RMTIBC	Remote Input B for Group C
B3	RMTOC	Remote Output for Group C
B4	RMTIBD	Remote Input B for Group D
B5	E2SYSIDB	Optical Group B System ID
B6	E2SYSIDD	Optical Group D System ID
B7	E2SYSIDF	Optical Group F System ID
B8	E2R	Ground Return
B9	E2MJ	Major Alarm
B10	E2FE	Far-End Failure

Alarm and ACO Connector — P08

Table A-19 lists the pin assignments for the alarm and ACO connector P08.

Table A-19. Pin Assignments for Alarm and ACO Connector — P08

Pin	Designation	Function
A1	No Connection	
A2	No Connection	
A3	MJLMP	Major Lamp
A4	No Connection	
B1	GND	Ground
B2	RACO	ACO Return
B3	MNLMP	Minor Lamp
B4	ACO	ACO Input

Miscellaneous Discrete Connectors — P07, P09, and P10

The miscellaneous discrete generated by the DDM-Plus is available on the Extension Shelf connector panel through P07, P09 and P10. Tables A-18, A-20 and A-21 list the pin assignments for the miscellaneous discrete connects P07, P09, and P10, respectively.

Table A-20. Pin Assignments for Miscellaneous Discrete — P09

Pin	Designation	Function
A1	RMTIBA	Remote Input B for Group A
A2	RMTOB	Remote Output for Group B
A3	RMTIBB	Remote Input B for Group B
A4	No Connection	
B1	RMTIAA	Remote Input A for Group A
B2	RMTOA	Remote Output for Group A
B3	RMTIAB	Remote Input A for Group B
B4	No Connection	

Table A-21. Pin Assignments for Miscellaneous Discrete Connector — P10

Pin	Designation	Function
A1	No Connection	
A2	RMTOE	Remote Output for Group E
A3	RMTIAE	Remote Input A for Group E
A4	RMTOF	Remote Output for Group F
A5	RMTOG	Remote Output for Group G
A6	RMTIAG	Remote Input A for Group G
B1	No Connection	
B2	No Connection	
B3	RMTIBE	Remote Input B for Group E
B4	RMTIBF	Remote Input B for Group F
B5	RMTIAF	Remote Input A for Group F
B6	RMTIBG	Remote Input B for Group G

Power Connectors

Table A-22 lists the power connection of the Extension Shelf. The cable containing connectors P401A and P401B is shipped with the Extension Shelf. Connectors P401A and P401B provide -48 V DC and ground for buses A and B, respectively.

Table A-22. Extension Shelf Power Connectors

Connector	Wire Color	Function
P401A	Red White	E2 — Feeder A -48 V DC E1 — Ground
P401B	Red White	E3 — Feeder B -48 V DC E1 — Ground

Wall Distant Terminal Connectors

The parallel telemetry generated by the DDM-Plus is available on the Wall DT connector panel through J1. Table A-23 lists the pin assignments for the parallel telemetry connect J1. Refer to AT&T 363-206-157, *DDM-Plus Wall Distant Terminal Installation Manual*, SD-7C514-01 and ED-8C730-20 for detailed cabling information.

Table A-23. Wall DT Pin Assignments for Parallel Telemetry Connector — J1

Pin	Designation	Function
1	No Connection	
2	SYSID	System ID
3	FF	Far-End Failure
4	MJ	Major Alarm
5	R	Return
6	RMTO	Remote Output (Miscellaneous Discrete)
7	No Connection	
8	No Connection	
9	No Connection	
10	No Connection	
11	No Connection	
12	NF	Near-End Failure
13	MN	Minor Alarm
14	No Connection	
15	No Connection	

Glossary

1+1

The 1+1 protection switching is bidirectional. The transmitting DDM-Plus OLIU transmits the same signal on both fibers. The receiving DDM-Plus OLIU passes only one of the lines at a time through the housing to outgoing DS1 lines.

1→4

Information indicators — The meaning of these LEDs is dependent on the current state of the OLIU. The LEDs provide information for fault locating, maintenance activities, and DS1 port provisioning.

A

ABN

A yellow indicator on the OLIU faceplate that lights when user-initiated maintenance is active.

ACO

Alarm Cutoff — A pushbutton switch available that can be used to retire an audible office alarm.

ACTIVE

A green indicator on the OLIU faceplate that lights when the circuit pack is carrying service.

AEK86

T1 repeater circuit pack.

AEK86B

T1 repeater circuit pack.

AEK88

T1 repeater circuit pack.

AIS

Alarm Indication Signal — A code transmitted downstream in a digital network that shows an upstream failure has been detected and alarmed.

ALBO

Automatic Line Buildout

AMI

Alternate Mark Inversion — A line code that employs a ternary signal to convey binary digits, in which successive binary ones are represented by signal elements that are normally of alternating, positive and negative polarity but equal in amplitude, and in

which binary zeros are represented by signal elements that have zero amplitude.

B

B8ZS

Bipolar Eight Zero Substitution — A line coding method that replaces a string of eight zeros with a sequence of symbols having some special characteristic.

BER

Bit Error Ratio — The ratio of bits received in error to the total bits sent.

BRT

Business Remote Terminal

C

CEV

Controlled Environment Vault

CLR

Clear — Pushbutton that returns the DDM-Plus to its normal operating conditions.

CO

Central Office

COACH

Customized On-Line Aid for Customer Help

CP/OPT

Circuit Pack/Optical Indicator — A red LED that is solidly lighted for circuit pack failures and blinks when the optical signal is loss or degrades.

CSA

Carrier Serving Area

CSU

Channel Service Unit

D

DACS II-2000

Digital Cross-Connect System that provides electronic DS1/DS1, DS1/DS0, or DS1/VT1.5 cross-connect capability, eliminating the need for manual DSXs.

DACS IV-2000

Digital Cross-Connect System that provides electronic DS3/STS-1 or DS1/VT1.5 cross-connect capability, eliminating the need for manual DSXs.

DCMS

Design Change Management System

DDM-1000

AT&T's Dual DS3 Multiplexer — A digital multiplexer that multiplexes DS1, DS1C, or DS2 signals into a DS3 signal or optical signal.

DDM-2000

AT&T's next generation network multiplexer that multiplexes DS1, DS3, or STS-1E streams into an STS-1E, OC-3, or OC-12 stream.

Default Provisioning

The parameter values that are preprogrammed as shipped from the factory.

Demultiplexing

A process applied to a multiplexed signal for recovering signals combined within it and for restoring the distinct individual channels of these signals.

DEMUX

Demultiplexer - "The DEMUX direction" is from the fiber toward the DSX.

Digital Multiplexer

Equipment that combines by time-division multiplexing several digital signals into a single composite digital signal.

DS1

Digital Signal Level 1 (1.544 M/bs)

DS1

DS1 Indicator — A red LED that is lighted for a mismatch between active and standby OLIU circuit packs and blinks for an incoming LOS on equipped DS1s.

DS1 SEL

DS1 Select — A pushbutton used to light a desired DS1 information indicator, 1→4, LED.

DS2

Digital Signal Level 2 (6.12 M/bs)

DSX

Digital Cross-Connect Panel — A panel designed to interconnect equipment that operates at a designated rate. For example, a DSX-3 interconnects equipment operating at the DS3 rate.

DT
Distant Terminal

E

ECI
Equipment Catalog Item — The bar code number on the faceplate of each circuit pack used by some inventory systems.

EIA
Electronic Industries Association

EMC
Electromagnetic Compliance

EMI
Electromagnetic Interference

ENABLE
Pushbutton associated with the near- and far-end DDM-Plus. Shows the fault indicators that apply to the specified enable pushbutton and allows service-affecting maintenance activity to be initiated.

ESD
Electrostatic Discharge

F

FE
Far End

FE/ENABLE
A convention used in this manual to represent pressing the ENABLE pushbutton adjacent to the FE indicator.

FIT
Failures/10⁹ hours

G

GO ACTIVE

Pushbutton that manually forces a protection switch from the standby circuit and toggles between inhibit and enable protection switching from the active circuit pack.

I

IMF

Infant Mortality Factor

J

Jitter

Timing jitter is defined as short-term variations of the significant instance of a digital signal from their ideal positions in time.

L

LBO

Line Build Out — An equalizer network between the DDM-Plus and the DSX-1 panel. It guarantees the proper signals level and the shape at the DSX panel.

LED

Light-Emitting Diode — Used on a circuit pack faceplate to show failure (red) or service state. It is also used to show the alarm and status condition of the system.

LOOP

Pushbutton used to place loopback on any of the DS1s.

LOS

Loss of Signal

M

MTBF

Mean Time Between Failures

Multiplexing

The process of combining several distinct digital signals into a single composite digital signal.

MUX

Multiplex

N

NE

Near End

NE/ENABLE

A convention used in this manual to represent pressing the ENABLE pushbutton adjacent to the NE indicator.

NEBS

Network Equipment-Building System

NTF

No-Trouble-Found

O

O&M

Operation and Maintenance

OLIU

Optical Line Interface Unit

R

RT

Remote Terminal — An unstaffed equipment enclosure that may have a controlled or uncontrolled environment.

RTAC

AT&T Regional Technical Assistance Center (1-800-225-RTAC)

S

SAO

Spare Availability Objective

SOP

Small Outside Plant

SONET

Synchronous Optical Network

T

TEO

Telephone Equipment Order

TOP

Task Oriented Practice

TST

Pushbutton that provides access to various testing capabilities and test signal insertion capabilities.

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Equipment Engineering and Ordering Guide

Purpose

This tab is provided as a holding place for AT&T 363-206-156, *DDM-Plus Equipment Engineering and Ordering Guide*. The DDM-Plus Equipment Engineering and Ordering Guide can be placed in this document or it can be used independently.

Software Release Description

Purpose

This tab is provided as a holding place for the Software Release Description (SWRD) document. The SWRD will be reissued with each new generic of firmware.

