Update Instruction Sheet

Update Package for:

DDM-Plus
User/Service Manual

This package contains a History-of-Revisions Sheet and updated pages for the above document.

This Update Instructions Sheet may be disposed of after placing the added or revised pages in the document or it may be retained. If the sheet is retained, file it in the ring binder immediately following the title page.

Remove Old Pages	Insert New Pages
1-3, 1-4	1-3, 1-4
3-1, 3-2	3-1, 3-2
3-13, 3-14	3-13, 3-14
3-21, 3-22	3-21, 3-22
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History-of-Revisions Sheet

Revisions to:

DDM-Plus
User/Service Manual

Always retain the latest History-of-Revisions Sheet. File it in the ring binder immediately following the Update Instruction Sheet (if retained) or immediately following the title page.

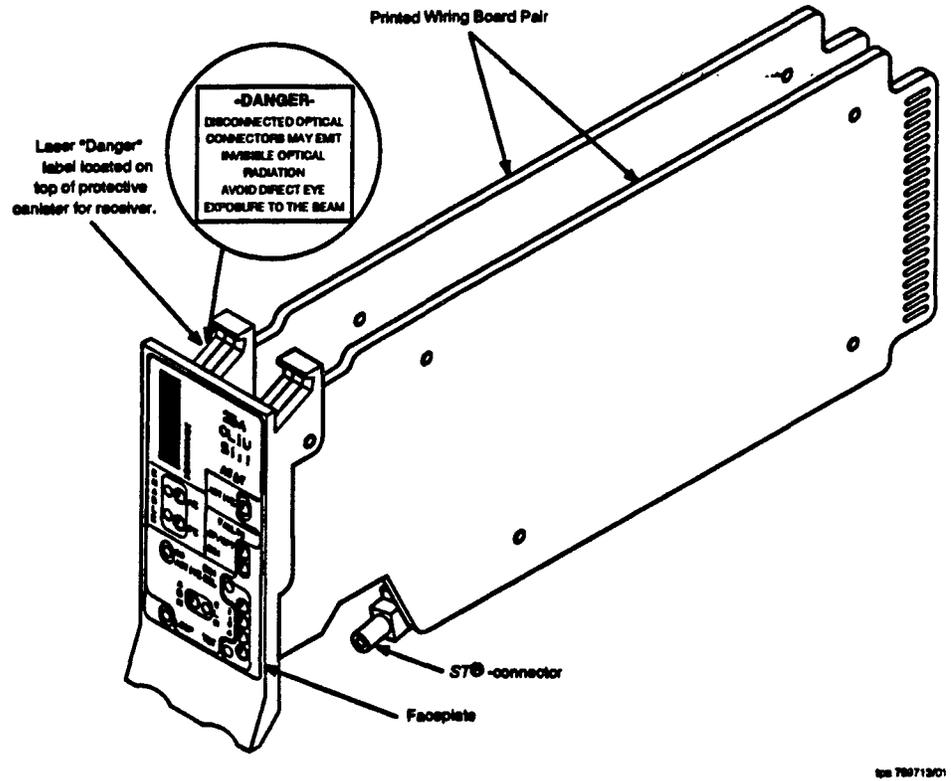| Revised Item	Revision Date	Reason for Revision
Page 1-3	August 1993	Add Danger Label to Figure
Page 3-2	August 1993	Add Danger Label to Figure
Page 3-14	August 1993	Add Danger Label to Figure
Page 3-21	August 1993	Add Danger Label to Figure
Page 8-7	August 1993	Add Table Entries
Page 8-8	August 1993	Change Minimum Wavelength
Page 8-10	August 1993	Add Table Entries

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 of 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.

Physical Design

3

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 (OLIU) 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.
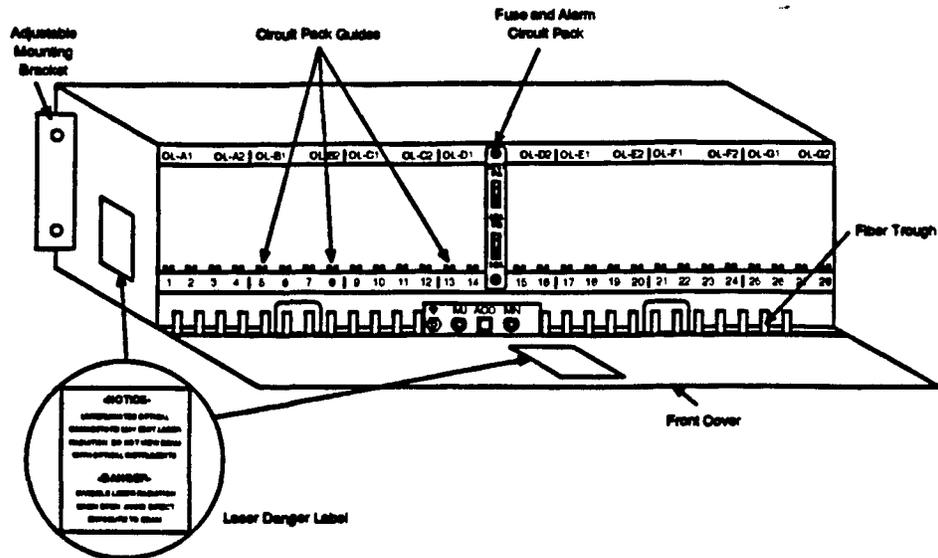
Figure 3-1. DDM-Plus Extension Shelf

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.
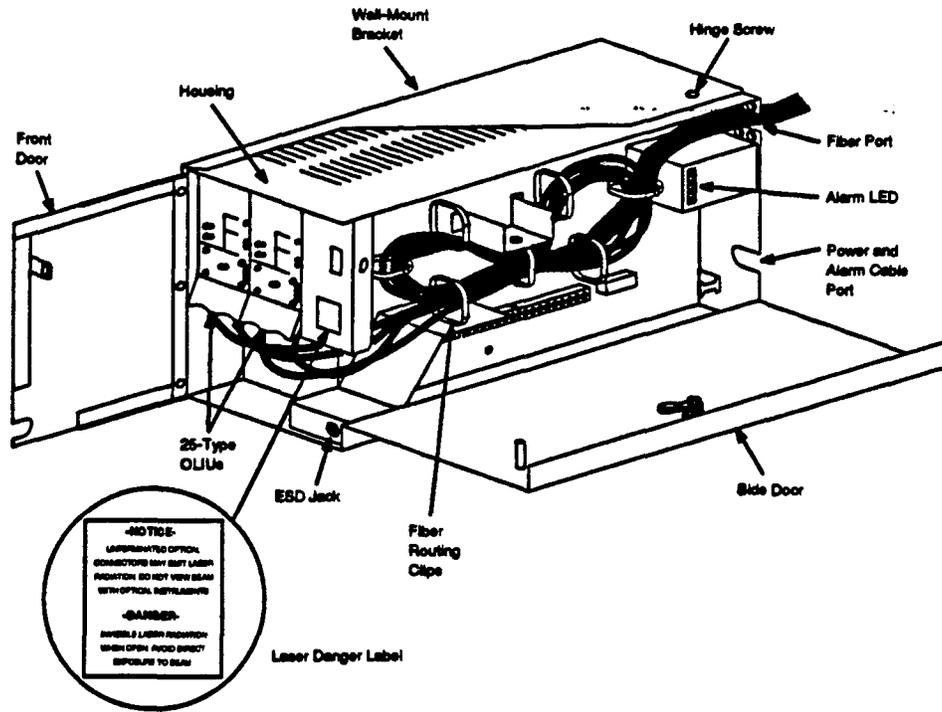
DDM-Plus Wall Distant Terminal

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.

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.

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.
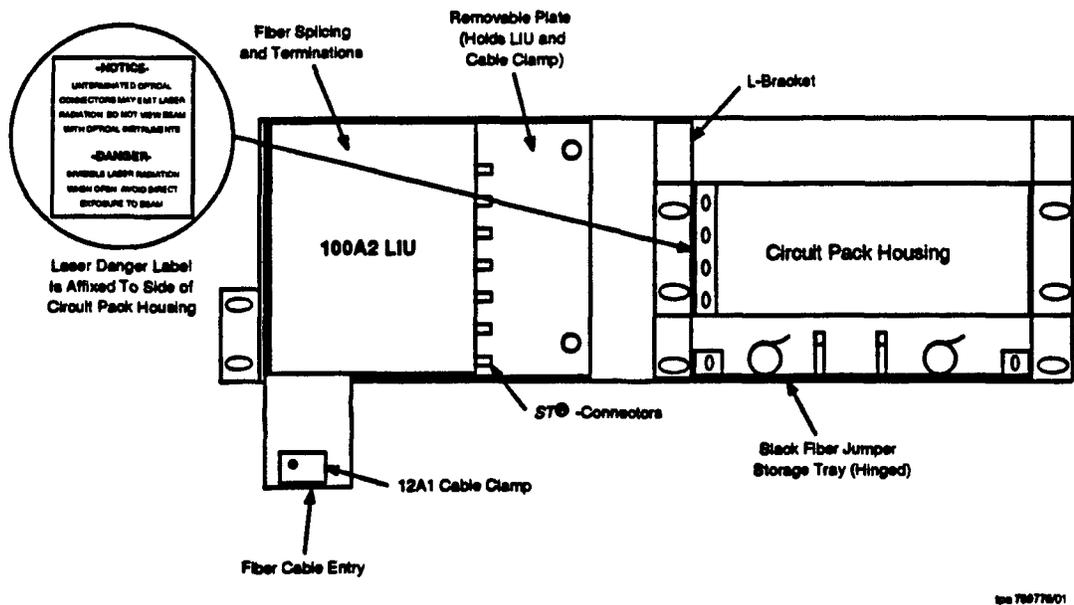

Figure 3-14. DDM-Plus Cabinet Distant Terminal

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.

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 IIIb*
Optical Source	AlGaAs Laser
Faceplate Connector	AT&T ST® R2000A-2, Single- or Multimode
Power at Connector	5mW (maximum)
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

* The Class IIIb rating applies when fiber is disconnected for servicing; otherwise, Class I under normal operating conditions.

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

Parameter	Single-Mode Fiber*		Multimode Fiber†		See Note
	Tx High‡	Tx Low	Tx High	Tx Low	
Minimum Wavelength (λ_{min}) (nm)	760	760	760	760	
Maximum Wavelength (λ_{max}) (nm)	800	800	800	800	
Spectral Width ($\delta\lambda_{rms}$) (nm)	10	10	10	10	
Maximum TX Power (P_{Tmax}) (dBm)	-3.3	-7.9	0.0	-2.5	1
Minimum TX Power (P_{Tmin}) (dBm)	-7.4	-9.6	-5.0	-7.5	
Maximum RX Power (P_{Rmax}) (dBm)	-7.0	-7.0	-7.0	-7.0	
Minimum RX Power (P_{Rmin}) (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).
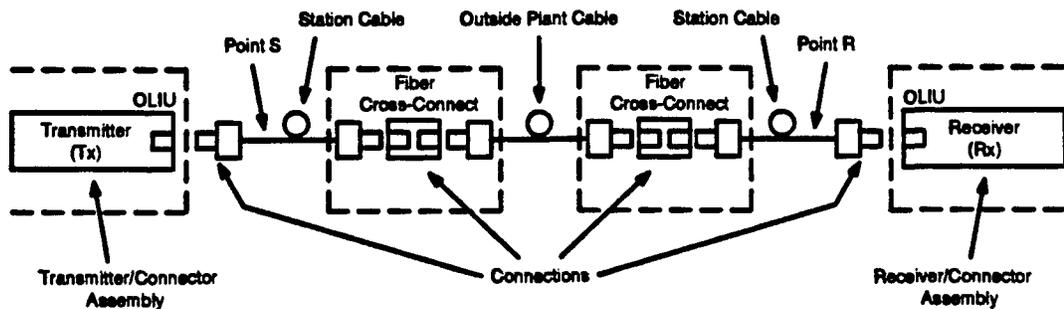

Figure 8-1. Optical System Interfaces (Point S and R)

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
Power at Connector	5mW (maximum)
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