
AT&T 363-206-100, Issue 6B DDM-1000 User/Service Manual

Reason for Reissue

The attached document is a revision (Issue 6B) to AT&T 363-206-100, Issue 6/6A, *DDM-1000 User/Service Manual*. Issue 6B consists of both new and replacement pages to replace the corresponding pages in Issue 6/6A. This revision is issued for the following reasons:

- Provide information on a new AEK36C pack which is a functional replacement for the existing AEK36-type packs.
- Provide information on the new 16E2 and 16F2 OLIUs that replace the 16E, 16F, and 16G-type OLIUs.
- Provide other minor updates and changes.

Both revisions, Issue 6A and 6B, can be ordered together or separately. For new orders of the base Issue 6, both revisions, Issue 6A and 6B, are included and do not require manual insertion. When inserting the revisions into the base Issue 6, insert Issue 6A first and then Issue 6B.

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Reason for Reissue (Issue 6B)

Issue 6B of this document is released as new and replacement pages to introduce the following:

- Information on a new AEK36C DS1 INTFC2 low-speed pack that is a functional replacement for the preceding AEK36-type packs. The AEK36C pack is the newest of the AEK36 series of packs which incorporates the latest technology for improved performance. The AEK36C offers improved initial clock recovery from low density DS1 signals, such as a 3-in-24 pattern. The new pack is more tolerant of transients at the DSX-1 cross-connection than the preceding AEK36B-type packs.
- A new AEK36B S1:4 DS1 INTFC2 pack is introduced. The AEK36B S1:4 offers improved initial clock recovery from low density DS1 signals, such as a 3-in-24 pattern. The new pack is more tolerant of transients at the DSX-1 cross-connection than the preceding AEK36B-type packs.
- Two new 16-type OLIUs are introduced that replace the 16E, 16F, and 16G-type OLIUs. The 16E2 OLIU replaces the 16E and 16F in maintenance applications. The 16F2 OLIU replaces the 16G-type OLIU in maintenance applications and is recommended for new installations. Both the 16E2 and 16F2 will endure the -40C° to 75C° extended temperature range.
- Other minor text and procedural changes and corrections.

How to Use This Manual

This manual is organized as follows:

- **Table of Contents**

This section is a complete table of contents for this manual. Each of the following three sections has an individual Table of Contents: Description, Planning Guidelines, and Specifications.
- **About This Document**

This section describes the purpose, audience, reason for reissue, and safety considerations. It also lists related documentation and training, explains how to comment on this document, and provides ordering information.
- **Description**

This section provides a functional description of the DDM-1000 and a detailed description of its maintenance features. It is expected that this section will be read in its entirety by all users for general background information.

- Planning Guidelines

This section describes typical applications of the DDM-1000. It provides detailed information to support the engineering of a DDM-1000 system and the ordering of the required system components. It is expected that this section will be used by planners and engineers.

- Specifications

This section provides detailed maintenance and interconnection specifications. It is expected that this section will be used as a reference by all users.

- Commands and Reports

This is a reference section that supports the use of an ASCII terminal for installation and maintenance of the DDM-1000. It is provided with a permuted index to aid the user in locating the desired command or report pages. Also included with this manual is a removable Job Aid which can be used as a quick reference to the commands used with DDM-1000.

- Report Descriptions

This section contains examples of report commands and the reports they generate under normal and failure conditions. System responses and their meaning are given in a tabular format. The examples were generated by a system configured for end-to-end 90 Mb/s optical operation.

- Installation and Maintenance Procedures

This section employs a task-oriented format. The user finds the job to be done in the Task Index, TI-001, then goes to the procedure shown and performs the listed items in order. An introduction tells the user, in detail, how to use this section.

Safety Instructions

Product Safety Labels

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

Other important safety instructions that you should read are in the "Installation and Maintenance" section of this manual. Only trained personnel should perform the procedures of that section.

DDM-1000 Description

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The high-speed interface for DDM-1000 consists of either one electrical or up to two optical line interface units. The electrical line interface unit (ELIU) pack (AKM3 ELIU1) terminates two bidirectional DS3 lines. It has no active electrical components so it is not protected. The ELIU1 pack is used when the interface to DDM-1000 is through a DSX-3. The optical OLIU packs [all 16-types (90 Mb/s)] terminate one SRV and one PROTN 90 Mb/s optical line in the transmit and receive directions. The OLIU packs [20E, 20G and 20K (180 Mb/s)] terminate one SRV and one PROTN 180 Mb/s optical line in the transmit and receive directions. The OLIU packs provide a 1:1 protected optical transmission system. The use of the PROTN pack is optional.

The controller for DDM-1000 consists of up to two packs [PROCR (PROCR1 or PROCR2) and TLM pack]. The PROCR pack provides the control for all monitoring, protection switching, alarming, and display within the assembly. In addition, it contains interfaces for an ASCII terminal, office alarms, serial telemetry, and a limited parallel telemetry set. The optional TLM1 pack (AKM4) provides maintenance interfaces. These consist of an extensive parallel telemetry set, additional office alarms, and a 15-port bidirectional overhead telemetry capability. An optional MC90191A1 TLM2 performance-monitoring circuit pack provides performance monitoring [a telemetry asynchronous block serial (TABS) interface] and a 6-port bidirectional overhead telemetry capability.

Power for DDM-1000 is provided by one service and one optional protection pack. Each pack generates both +5 volts and -5 volts from the office power. The PWR1 pack (547A PU) is used with -48 volt office power. The PWR2 pack (547B PU) is used with -24 volt office power. Each unit has a separate primary power input and is capable of supplying power for the entire shelf.

Each muldem in DDM-1000 (Figure 1-4) can be equipped with a maximum of nine low-speed interface packs and two function unit packs. Of the nine low-speed interface packs, seven are equipped as needed to carry traffic. The remaining two are equipped as needed to provide up to 1:7 protection for the service packs. Both protection packs (PROTN 8 and PROTN 9) are equipped when mixing low speed rates within the same muldem. The DS1 INTFC pack (all AEK36-types) terminates up to four bidirectional DS1 lines. The DS1C INTFC1 pack (AEK37) terminates up to two bidirectional DS1C lines. The DS2 INTFC1 pack (AEK38) terminates one bidirectional DS2 line. The BP1 pack (AEK39) protects the low-speed interface switching bus for service positions not filled by packs.

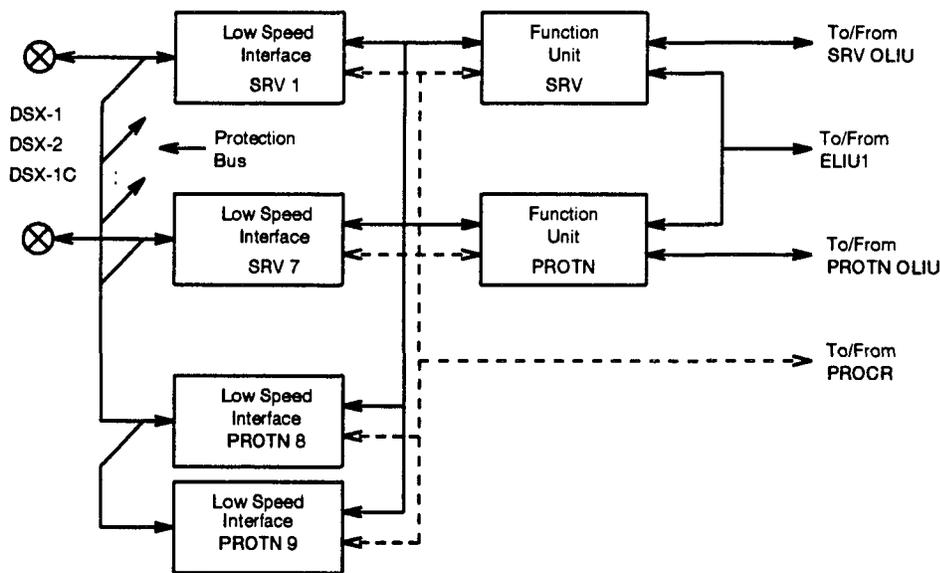


Figure 1-4. DDM-1000 Single Muldem Block Diagram

The function unit pack defines the characteristics of the muldem. The MXR pack (AKM2 MXR1, AKM2B MXR2, or AKM2C MXR3) provides a complete multiplexer from the DS1 rate to the DS3 rate for connection to either the ELIU1 or OLIU. The DS3U2 pack (AKM6) provides a DSX-3 compatible interface to the OLIU for M13 compatible DS3 signals only. **(M13 compatible signals are DSX-3 signals that can be demultiplexed by an M13 multiplexer)**. This allows the optical system to carry two externally generated M13 compatible DS3 signals or an externally generated M13 compatible DS3 signal and an internally generated DS3 signal from a MXR pack. The externally generated DS3 signal path cannot be tested with a conventional DS3 test set. The DS3U1 pack (AKM5) provides an interface for an electrical DS3 signal from an ELIU on one side to an OLIU on the other side and can be used in applications requiring non-M13 formatted DS3 transport. It allows a single, bidirectional DS3 clear channel capability for the DDM-1000 multiplexer in the optical transmission mode. This

channel can be tested with a conventional DS3 test set. Only one muldem can be equipped with DS3U1 packs. The function unit pack is duplicated to provide 1:1 protection. The use of the PROTN pack is optional.

The DDM-1000 can be configured to operate in the add/drop mode for applications where access is required for only part of the DS3 stream. In this mode, DS2 bit streams associated with unequipped low-speed interface positions are looped on the MXR circuit pack from the demultiplexer to the multiplexer (Figure 1-5) This digital loop saves the costs of back-to-back low-speed interface circuits. In addition, it avoids the insertion of stuffing jitter. When the DDM-1000 is in this mode, one muldem carries the east-to-west traffic while the other muldem carries the west-to-east traffic. For convenience when connecting the low-speed inputs and outputs at the add/drop site DSX, muldem A inputs should be located next to muldem B outputs and muldem A outputs should be located next to muldem B inputs.

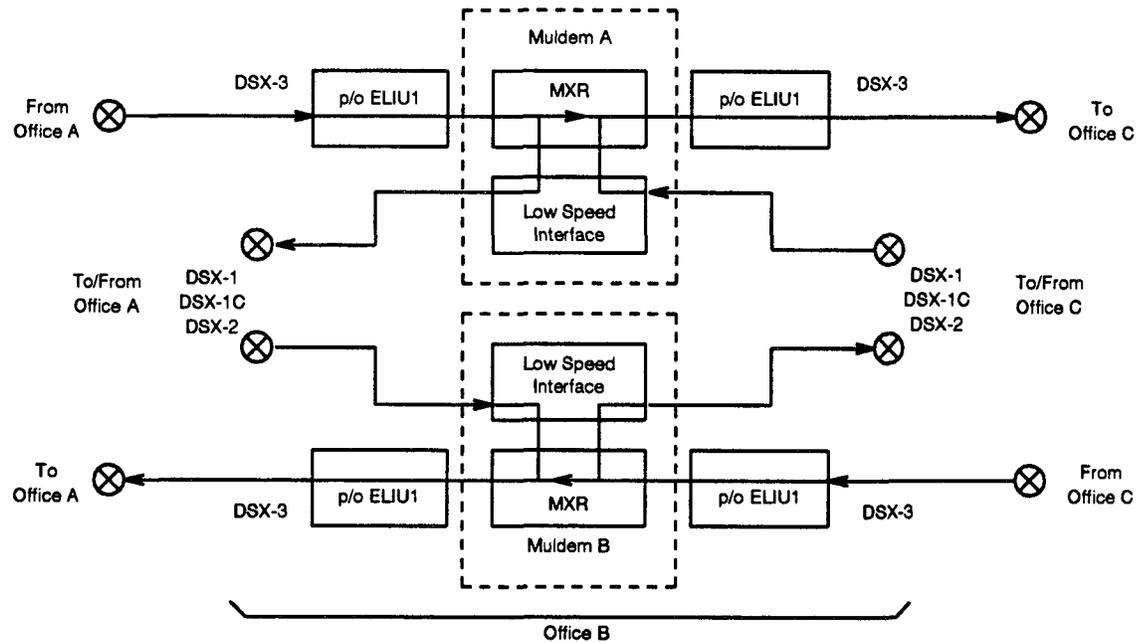


Figure 1-5. DDM-1000 Add/Drop Block Diagram

Low-Speed Interface Circuits

Three low-speed interface packs are available to terminate DS1, DS1C, and DS2 lines. Several combinations of the low-speed packs in the same muldem are possible. Low-speed protection can be provided for two different low-speed packs but only one low-speed pack can be switched to protection at one time. If all three types of low-speed packs are in the same muldem, transmission will be supported for all packs but only two can be protected. If both protection packs

(PROTN 8 and PROTN 9) are equipped when mixing low-speed rates within the same muldem, the lowest rate protection pack must be installed in the PROTN 8 slot. For example, if DS1 and DS2 packs are in the same muldem, then the DS1 protection pack must be installed in the PROTN 8 slot and the DS2 protection pack installed in the PROTN 9 slot.

DS1 INTFC Pack (All AEK36-Types)

The DS1 INTFC pack (all AEK36-types) terminates four bidirectional DS1 lines and is compatible with standard DSX-1 signal specifications, including extended super frame (ESF). The pack also provides a control interface that terminates the internal communications bus. A red LED on the front of the pack indicates alarm conditions.

In the multiplexing direction, the balanced DS1 bipolar receive signal passes through a relay switch (Figure 1-6) Clock is extracted and the data is converted from the bipolar format to a unipolar nonreturn to zero (NRZ) format. The incoming data code can be either alternate mark inversion (AMI) or bipolar 8 zero substitution (B8ZS). If a loss-of-signal condition is detected, an alarm indication signal (AIS) (all ones data) is inserted. Bipolar violations or B8ZS coding violations in the incoming signal do not cause an AIS signal to be inserted. The data errors propagate and result in data errors at the far end. With an AMI formatted signal, bipolar violations are removed but the data errors (also called bit errors) are not removed. If the violations exceed the monitor threshold, appropriate indicators will be raised, but an AIS will not be inserted.

In addition, a test signal can be inserted in the circuit under the control of the PROCR pack. This feature is used during installation for testing and during maintenance activities to eliminate the need for external test sets. The unipolar NRZ data and 1.544-MHz clock are sent to both the SRV and PROTN function unit positions.

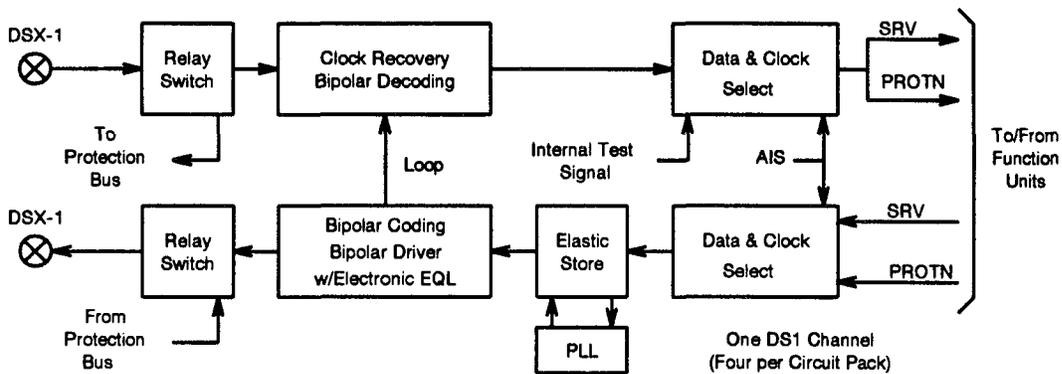


Figure 1-6. DDM-1000 DS1 INTFC (All AEK36-Types)

In the demultiplexing direction, unipolar NRZ data and 1.544-MHz gapped clock are received from both the SRV and PROTN function unit positions. Under control of the PROCR pack, the appropriate signal is selected and checked for integrity. If loss of clock occurs or AMI coding is being used and excessive zeros are detected, an AIS signal is inserted. The circuit attenuates jitter on the signal by using an elastic store and phase-locked loop. This smoothed signal is converted to the bipolar format (AMI or B8ZS), and the driver circuit provides selected line equalization to the signal to meet the DSX-1 signal specifications. The balanced DS1 bipolar signal passes through a relay switch and is then sent to the DSX-1.

To simplify maintenance activities, each DS1 can be looped back toward the high-speed facility under control of the PROCR pack. The looped signal is electronically bridged inside the low speed pack allowing the DS1 signal to remain connected to the low speed facility while the loop is active.

An individual dual in-line package (DIP) switch is provided for each DS1 to select AMI or B8ZS coding of its bipolar input and output. The line equalization (EQL) is selected using DIP switches. The AEK36 differs from the AEK36B and AEK36C in three ways that affect the user:

- The power consumption of the AEK36B and AEK36C packs is substantially lower than that of the AEK36. This allows more flexibility in planning and engineering.
- The PROCR2 pack can override the setting of the DIP switches to control the DS1 code selection (AMI or B8ZS) for the AEK36B and AEK36C packs but not for the AEK36. This means that AEK36B and AEK36C packs in the low-speed protection slot can automatically change code format to agree with the channel it is protecting.
- The arrangement of DIP switch segments that define the line build-out (LBO) settings and the code type is different for the various low-speed packs. This information is provided in the "Specifications" section and in the affected procedures in the "Installation and Maintenance" section.

The MC90083A1D, Iss 4 and later PROCR2 eliminates a problem that sometimes occurs when testing a DS1 channel that is looped at the far end. With prior PROCR versions, when a DS1 channel was tested with the "3 in 24" test pattern, the channel would sometimes make errors until the pattern was changed to something else (such as QRSS or all ones) and then back again. The MC90083A1D, Issue 4 and later PROCR2 packs eliminates this problem when testing with the DS1 channel looped at the far end (single ended testing). The loop must be put up at the far end before the test signal is applied. The problem may still occur if the loop is put up after the signal is applied or if testing end-to-end using a test set at each end.

DS1C INTFC1 Pack (AEK37)

The DS1C INTFC1 pack terminates two bidirectional DS1C mode 2 lines and is compatible with standard DSX-1C mode 2 signal specifications. The pack also provides a control interface that terminates the internal communications bus. A red LED on the front of the pack indicates alarm conditions.

In the multiplexing direction, the balanced DS1C bipolar receive signal passes through a relay switch (Figure 1-7) Clock is extracted and the data is converted from the bipolar format to a unipolar NRZ format. The incoming data code can be either AMI or B8ZS. This signal is demultiplexed to two individual DS1 rate unipolar NRZ signals. If a loss of signal or loss of DS1C frame condition is detected, an AIS signal (all one's data) is inserted on both signals. Bipolar violations or B8ZS coding violations in the incoming signal do not cause an AIS signal to be inserted. The data errors propagate and result in data errors at the far end. If the violations exceed the monitor threshold, appropriate indicators will be raised, but an AIS will not be inserted.

In addition, a test signal can be inserted on either signal in the circuit under the control of the PROCR pack. This feature is used during installation for testing and during maintenance activities to eliminate the need for external test sets. The two unipolar NRZ data and gapped 1.544-MHz clocks are sent to both the SRV and PROTN function unit positions.

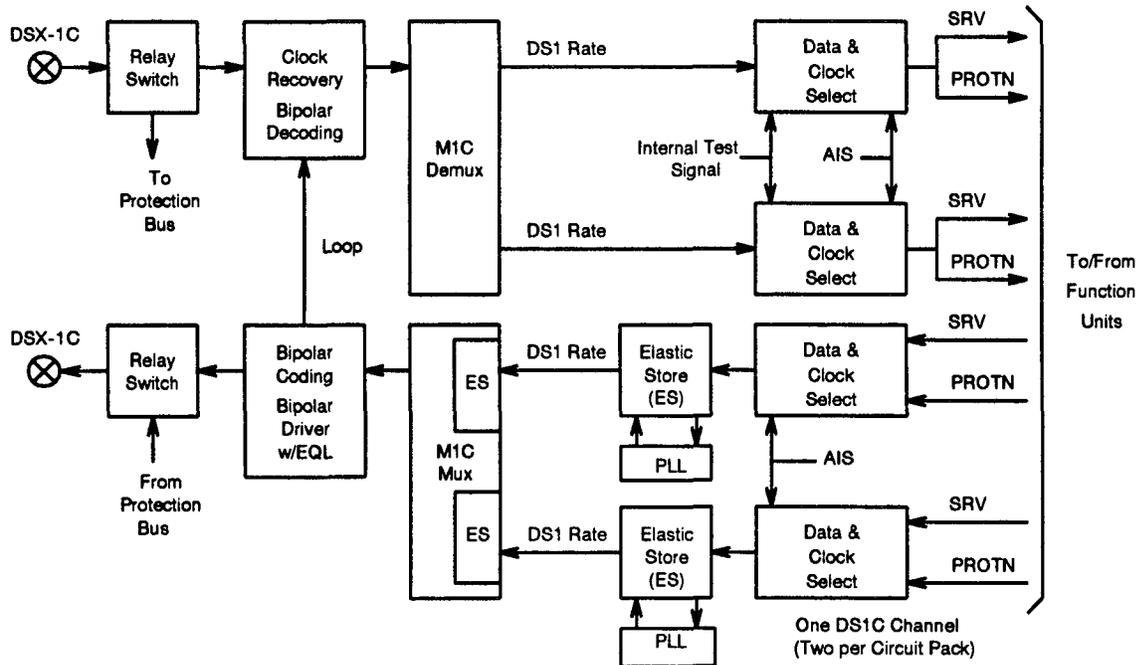


Figure 1-7. DDM-1000 DS1C INTFC1 (AEK37)

In the optical receiving direction, scrambled NRZ data and 44.736-MHz clock are received from the OLIU pack. The data is descrambled and monitored for violations. Any violations are removed. If loss of clock or DS3 frame is detected, a DS3 AIS signal is inserted. The unipolar NRZ data and 44.736-MHz clock are converted to a B3ZS bipolar signal. This signal passes through a relay switch before being sent to the ELIU1 pack.

MC90083A1E PROCR2 packs provide detection of incoming DS3 AIS (good DS3 frame and loss of all 7 DS2 frames) and set TBOS scan points 31 and/or 32. The ASCII terminal commands "rept-fail:" and "rept-fail-16mb:" will show the DS2 failure status. No other alarms or indicators will be raised in an optical configuration. In an electrical configuration office alarms may be provisioned with the `set-dsx-16mb:` command to indicate incoming DS3 AIS. Earlier firmware versions produced unpredictable indications.

BP2 Pack (AKM86)

The AKM86 BP2 pack is required in an optical shelf if only one muldem is equipped in the shelf. In a 180 Mb/s system, an AKM86 pack is required in each shelf if only one muldem is equipped in each shelf.

The BP2 pack prevents a service-affecting condition from occurring. Without the BP2 pack, a failure of the protection fiber or removal of a protection function unit or OLIU will cause a high-speed protection switch to occur. The switch will last for about 10 seconds and then return to the service channel, thus restoring service.

The BP2 pack must be installed in the function unit SRV slot of the unequipped muldem. The pack contains a short, printed path that grounds a lead to prevent the false protection switch.

High Speed Interface Circuits

ELIU1 Pack (AKM3)

The ELIU1 pack terminates two bidirectional DS3 lines. It is used when the interface to DDM-1000 is at a DSX-3. The cables to and from the DSX-3 are terminated in male BNC connectors that mate with female BNC connectors mounted on the ELIU1 pack. The ELIU1 has no active electrical components so it is not protected. A red LED is not provided on the front of the pack since there are no active components to fail.

In the direction to the DSX-3, four unbalanced bipolar DS3 data signals are received from the function units (Figure 1-12). The SRV and PROTN signals for muldem A are wired together and the SRV and PROTN signals for muldem B are wired together. The relays on the function unit packs allow only the SRV or PROTN (but not both) signal to be transmitted. The two unbalanced bipolar DS3 data signals are sent through selectable passive 225-foot line build outs (LBOs) to the DSX-3.

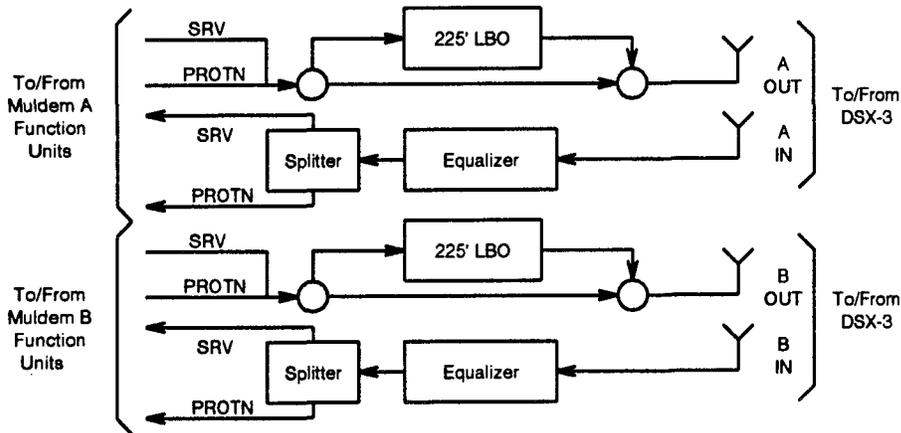


Figure 1-12. DDM-1000 ELIU1 (AKM3)

In the direction from the DSX-3, two unbalanced bipolar DS3 data signals are received from the DSX-3. Each of these signals is equalized and split into SRV and PROTN signals using passive components. Four unbalanced bipolar DS3 data signals are sent to the function units.

OLIUI Pack (All 16-Types)

The OLIUI packs each terminate one service (SRV) or one protection (PROTN) 90 Mb/s optical line in both the transmit and receive directions. A red LED is provided on the front of the pack to indicate alarm conditions.

A new generation of 16-type OLIUI packs has been developed, consisting of OLIUI9 (16F2) and OLIUI10 (16E2), which supersedes the existing OLIUI1, OLIUI2, and OLIUI3 (16E, 16F, and 16G). The OLIUI6 (16K) is not involved in this change.

The OLIUI1 pack (16E) can only be used in a controlled environment for short-to-moderate length spans. The OLIUI2 pack (16F) can be used in an uncontrolled environment for short-to-moderate length spans. The OLIUI10 pack (16E2) can be used in an uncontrolled environment and is backward compatible with all OLIUI1 (16E) and OLIUI2 (16F) installations. Its primary recommended function is as a maintenance replacement for OLIUI1 (16E) and OLIUI2 (16F).

The OLIU3 (16G) pack can be used in an uncontrolled environment for moderate-to-long length spans. The OLIU9 pack (16F2) can be used in an uncontrolled environment for moderate-to-long length spans. It is backward compatible with all OLIU3 (16G) installations and is therefore recommended as a maintenance replacement for OLIU3 (16G). The OLIU9 (16F2) is recommended for new installations up to 60.8 km (37.7 miles). The OLIU6 (16K) is recommended for long-span installations up to 73.2km (45.3 miles).

The OLIU specifications are presented in Chapter 2. Manual.

In the optical transmitting direction, an 89.472-MHz clock is received from the function unit (SRV or PROTN as appropriate) in muldem A and muldem B (Figure 1-13). One is selected to be used by the OLIU pack as the clock source. This clock is divided by two and the resulting 44.736-MHz clock is sent to the function units. The 44.736-MHz clock is used by the function units to return synchronous data to the OLIU. The OLIU also receives unipolar scrambled NRZ data and 44.736-MHz clock from each function unit. These synchronized DS3 signals are combined to form the 89.472-Mb/s NRZ data signal. The DS3 signal from muldem B is marked to allow the separator at the far end of the system identify muldem B's signal. The laser transmitter (single mode, 1.3 micron) converts this electrical signal into pulses of light. These pulses of light are coupled into a single mode fiber pigtail for connection to the transmitting single-mode or multimode fiber.

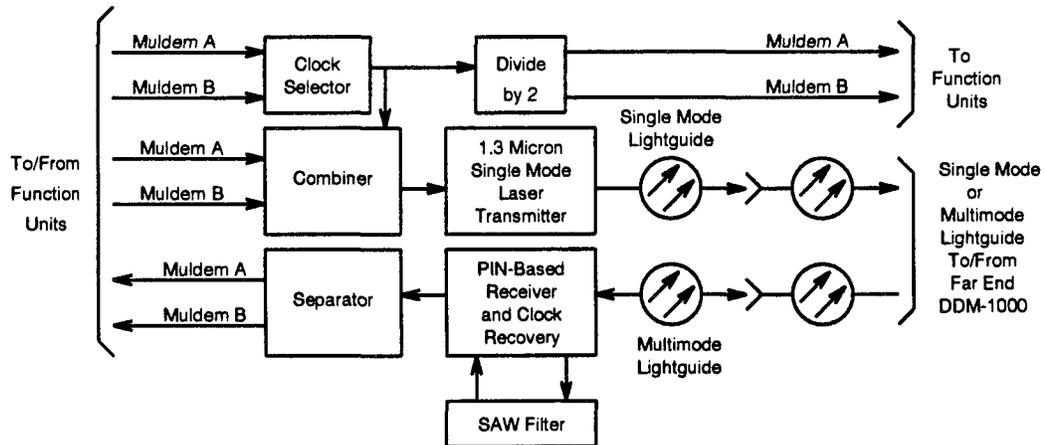


Figure 1-13. DDM-1000 OLIU (All 16-Types)

In the optical receiving direction, the receiving single-mode or multimode fiber is connected to a multimode fiber pigtail. The PIN-based optical receiver converts the pulses of light into electrical pulses. Clock is recovered from this 89.472-Mb/s unipolar NRZ data stream using a surface acoustic wave (SAW) filter. The signal is separated into two unipolar scrambled NRZ data and 44.736-MHz clock streams that are then sent to the appropriate function units.

OLIU Pack (20E, 20G or 20K)

The 180 Mb/s OLIU pack (20E OLIU4, 20G OLIU5 or 20K OLIU7) terminates one service (SRV) or one protection (PROTN) 180 Mb/s optical line in both the transmit and the receive direction. Two OLIUs (one service and one protection) are installed in one of the two connected DDM-1000 assemblies, called the OLIU assembly. Two red LEDs on the front of the OLIU indicate alarm conditions in the two shelves. The OLIU4 pack can be used only in a controlled environment for short-to-moderate span lengths. The OLIU5 and OLIU7 packs can be used in an uncontrolled environment for longer span lengths.

In the optical transmitting direction, an 89.472-MHz clock is received from the function unit (SRV or PROTN as appropriate) in muldem A and muldem B of the OLIU assembly (Figure 1-14). Therefore, at least one function unit must be installed in the OLIU assembly. One clock is selected to be used by the OLIU pack. The frequency is doubled to 178.944-MHz for use as the high-speed clock source. The 89.472-MHz clock from the function unit is also divided by two and the resulting 44.736-MHz clock is sent to the function units in both assemblies. This 44.736-MHz clock is used by the function units to return synchronous data to the OLIU.

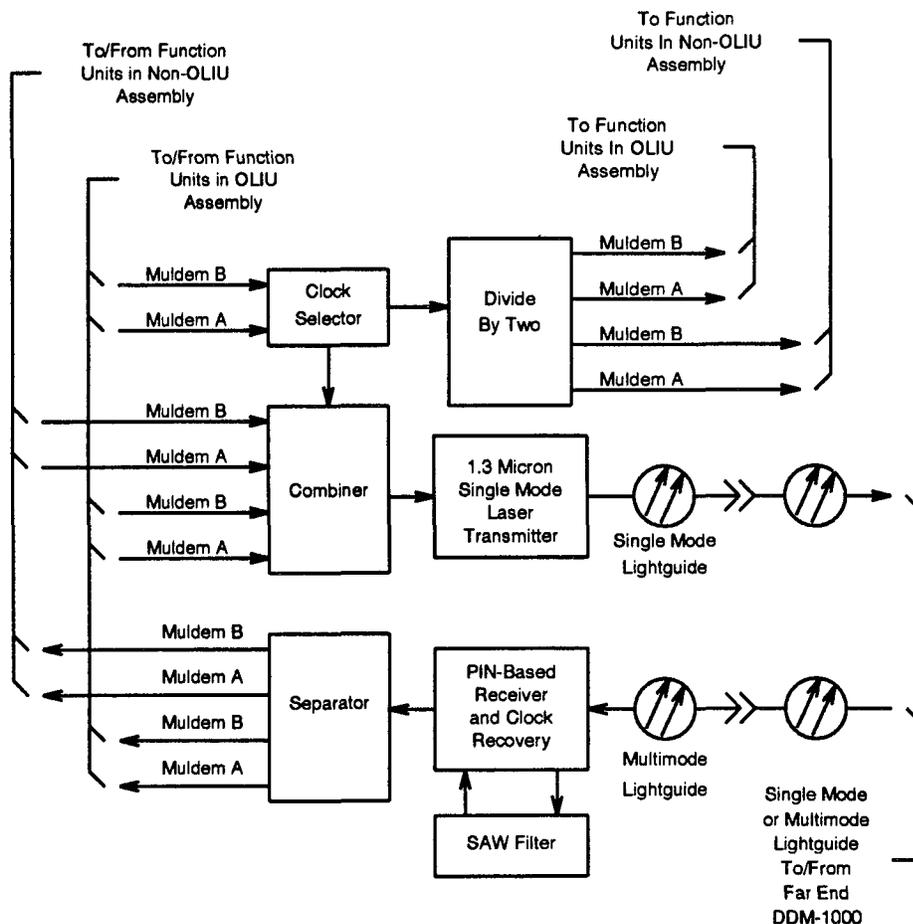


Figure 1-14. DDM-1000 OLIU (20E, 20G, or 20K)

The OLIU receives unipolar scrambled NRZ data and 44.736-MHz clock from each function unit. These synchronized DS3 rate signals are combined to form the 178.944-Mb/s NRZ data signal. The individual DS3 rate signals are marked to allow the separator at the far end of the system to identify the particular DS3 rate signals. The laser transmitter (single mode, 1.3 micron) converts this electrical signal into pulses of light. These pulses of light are coupled into a single-mode optical pigtail for connection to the transmitting single-mode fiber.

In the optical receiving direction, the receiving single-mode fiber is connected to a multimode fiber pigtail. The PIN-based optical receiver converts the pulses of light into electrical pulses. Clock is recovered from this 178.944-Mb/s unipolar NRZ data stream using a surface acoustic wave (SAW) filter. The signal is separated into four unipolar scrambled NRZ data and 44.736-MHz clock streams that are sent to the appropriate function units.

A DDM-1000 optical system can be initially installed with 180 Mb/s OLIU packs in a single shelf configuration and be used to carry two DS3s for 90 Mb/s service. Later, a second shelf can be added (without OLIU packs) and cabled to the first shelf to upgrade easily to four DS3s for 180 Mb/s service. The 20-type 180 Mb/s OLIUs cannot be used with the AKM5 DS3U1 pack.

In 180 Mb/s systems, channels originating in an OLIU shelf in one office terminate in the OLIU shelf in the other office. Channels originating in a non-OLIU shelf in one office terminate in the non-OLIU shelf in the other office. For example, if the OLIU shelf is on the bottom of the 2-shelf pair in one office and on the top of the 2-shelf pair in the other office, channel assignments follow the shelf configuration, not the physical position in the bay.

Controller Circuits

PROCR Pack

The PROCR pack provides the control for all monitoring, protection switching, alarming, and display within the assembly. In addition, it contains interfaces for an ASCII terminal, office alarms, serial telemetry, and limited parallel telemetry set.

The heart of the PROCR pack is a sophisticated microcomputer (Figure 1-15). It is composed of a 16-bit microprocessor with read only memory (ROM) for program storage, random access memory (RAM) for variable storage, electrically erasable programmable read-only memory (EEPROM) for assembly configuration and state information, interrupt controllers, interval timers, intelligent sanity timer, and an operating system designed for real time applications.

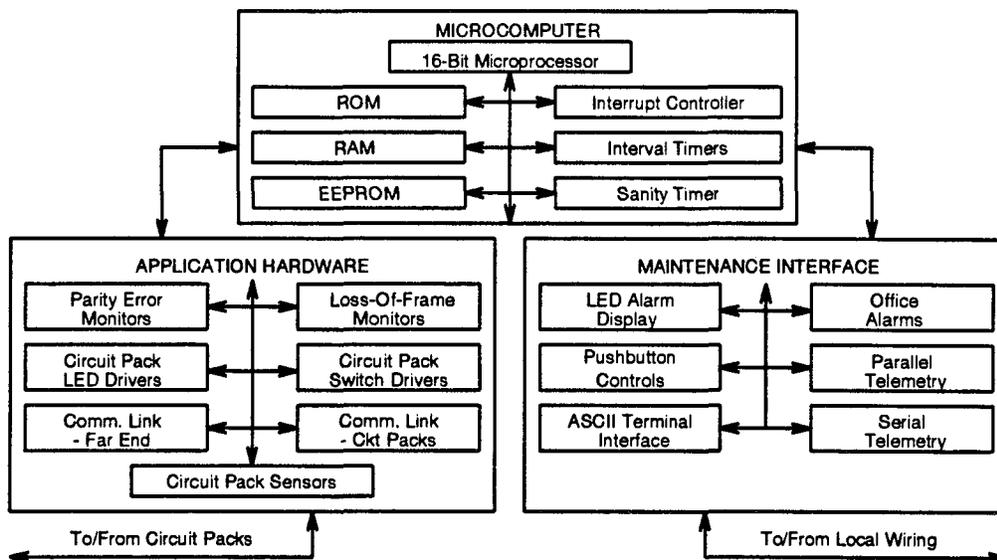


Figure 1-15. DDM-1000 PROCR

Application specific hardware links this microcomputer with the transmission hardware. A high-speed communication link that gives the processor complete status and control of the assembly is provided to each circuit pack. A high-speed communication link embedded in the high-speed bit stream is also provided for each muldem. This link allows access to and control of the far end DDM-1000 terminal for many different features. Dedicated parity error and loss of clock/frame monitors insure quick line switching for the optical option. LED drivers can turn on any LED to provide easy identification of failures. Primary pack switch drivers provide control of the protection switching on all packs. Pack equipped sensors identify new packs as they are added to the assembly.

Two LEDs and two switches are mounted on the faceplate of the TLM2. The RST switch, which is recessed to prevent accidental operation, restarts the operation of the circuit pack. It starts a self-diagnostic test routine to determine the health of the pack, and clears all performance-monitoring data and re-establishes communication with the TABS serial telemetry link. During the restart procedure, the RST/TST LED will blink on and off. When this LED remains off, the restart procedure is completed. The TEST switch will cause the self-diagnostic routine to be executed. This switch can be operated at any time and will not cause the loss of any performance data. This switch will also momentarily turn the RST/TST LED on and off to test its operation. The ALM LED indicates a failed MC90191A1 TLM2 pack. This LED is illuminated if the self-diagnostic routine determines that there is a problem or if the MC90191A1 TLM2 fails to communicate properly with the PROCR pack over the communication bus. The TLM2 does not have a CR LED; therefore 3-level alarm (CR, MJ, MN) option selection cannot be used in the PROCR. If the 3-level alarm option is set and a TLM2 pack is installed, then there will not be any MJ or CR alarm indication when a critical alarm does occur.

Power Circuits

PWR Pack (547A or 547B)

The PWR pack generates +5 volts and -5 volts DC from the primary office power. A service (SRV) and a protection (PROTN) pack are provided for redundancy with each pack having a separate primary power input. The SRV pack is powered from the "A" feeder and the PROTN pack is powered from the "B" feeder. Each pack is capable of supplying power for the entire shelf. The PWR1 (547A PU) pack operates from -48 volt primary power. The PWR2 (547B PU) pack operates from -24 volt primary power. A red LED is provided on the front of the pack to indicate alarm conditions.

The PWR pack is a high-efficiency DC-to-DC power converter (Figure 1-18). The primary office power is fused on board the PWR pack and feeds two DC-to-DC converter sections, one for +5 volts and the other for -5 volts. Remote sensing insures tight control of the voltages generated to power the low-voltage circuitry on the other packs. The PWR packs are designed to share the load since their outputs are diode "ORed." The degree of "sharing" depends on the balance or matching of the DC output voltages. The outputs from the two packs are connected in parallel by the backplane and are equipped with current-limiting circuitry that protects against faults in the backplane while providing enough output current to blow fuses on damaged load packs that may be grounding one or both of the low voltage buses. In addition, each PWR pack contains circuitry to shut itself down if it is generating a high voltage condition. The PWR packs contain a latching shutdown circuit to prevent damage to the system during periods of overvoltage. They must be removed and reseated or repowered to clear the latch. On rare occasions, the latch shutdown has occurred during electrical storms.

To prevent damage to the PWR pack, it should be unseated before applying external power. For example, if a feeder fuse blows, the PWR pack should be unseated first, the fuse replaced, and then the PWR pack seated.

Usually when a converter fails, it turns on its LED and closes an alarm contact. Some converter failures may not light the LED. If series 2 PWR packs are installed and power dissipation is a concern in a particular application, then only series 2 packs should be used as a replacement.

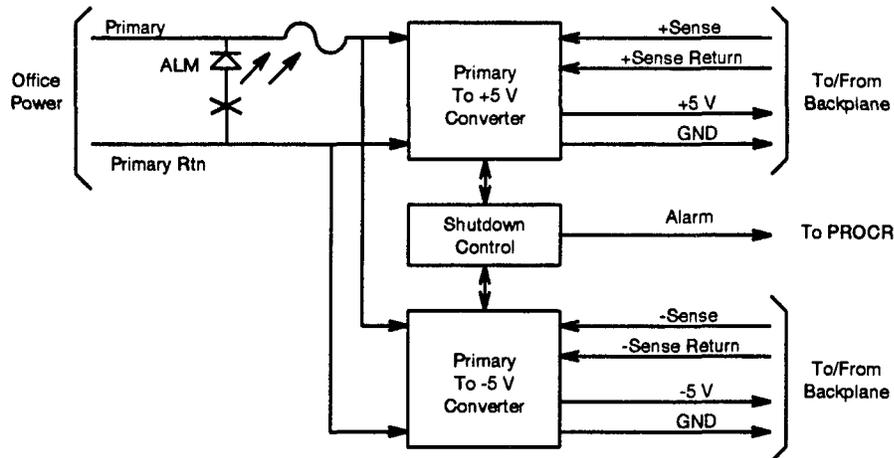


Figure 1-18. DDM-1000 PWR (547A or 547B)

Maintenance Description

Reliability

Past generations of multiplexers with discrete logic designs for multiplexing and demultiplexing use high- and low-speed bit-by-bit checking to verify error-free operation of the equipment. This is necessary because there are many failure modes that cannot be detected easily by other means. These bit-by-bit checks typically detect 90 to 95 percent of the total failures (FITs). Since the circuitry to do the bit-by-bit checking represents a significant portion of the cost of a multiplexer, it is usually time-shared over many inputs.

In DDM-1000, the M13 multiplexing and demultiplexing function is now contained on a single circuit pack that can be 1:1 protected. The earlier assumptions that lead to bit-by-bit checking as the optimum choice for monitoring are no longer valid. The application of very large scale integration (VLSI) circuitry in DDM-1000 leads to the use of new approaches for verifying error-free performance of the equipment.

DDM-1000 Planning Guidelines

2

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J108F and then connected to J108G. This allows the power alarms to reach the CO by a direct backplane connection (J35) to the DDM-1000 overhead telemetry (if provided).

Since the J108A-2 cable is powering the DDM-1000, the second 40D bank fuse unit (BFU) fuses the A and B battery feeds. The fuse marked Blue (Yellow bead) feeds the A battery, and the fuse marked White (Yellow bead) feeds the B battery of the DDM-1000. The CMN and WHX fuses are used to power the SXSS and the 111A, respectively. The BLX fuses are not used for the DDM-1000. Removing these unused fuses will not cause any alarms. The fan A (Green bead) and fan B (Green bead) fuses feed the 2A fan assembly plugged into the J114-2 socket. The fan A fuse feeds the center fan, while the fan B fuse feeds the two outer fans.

DS1 Code

The DS1 code options on the Series 5 AUA61 LIU and the DDM-1000 DS1 INTFC (all AEK36 types) must agree—both AMI (ZCS) or both B8ZS. Until B8ZS capability is required, it is recommended that both be set for AMI (ZCS). Equalizer switch settings for the AUA61 are given in appropriate DLPs in AT&T 363-205-400 (COT) and AT&T 363-205-401 (RT); switch settings for the DS1 INTFC are in DP-425 in the Installation and Maintenance Procedures section of this User's Manual. Also, refer to the description of the "set - dsx - code:" command in the Commands and Reports section of this manual.

Protection Switching

Most applications of SLC Series 5 collocated with DDM-1000 will *not* include a DS1 protection line. For this no-protection case it should be verified that the Series 5 alarm display unit (ADU) at both the COT (AUB1) and RT (AUB21) have been optioned for no protection: switch S2 position 1 closed (switch toward the number 1).

Pulling the DDM-1000 DS1 INTFC carrying the Series 5 traffic will cause a switch to the protection DS1 INTFC and will not cause any Series 5 alarms. Reinserting the DS1 INTFC may cause temporary Series 5 carrier line failure indications, especially when reinserting the DS1 INTFC at the RT end. Removing or reinserting the DS1 INTFC does not drop established calls. However, removing the DS1 INTFC at the RT during the ring cycle trips ringing, but does not drop the call. But since ringing stops, the called customer may not pick up the phone.

Equipping the DDM-1000

The electrical line interface unit [ELIU1 (AKM3)], OLIU (16-type or 20-type), and MXR (AKM2, AKM2B, or AKM2C) slots must be equally equipped at both ends of the system. If a slot is equipped with one of these packs at one end of the system, the corresponding slot should be equipped at the other end of the system. Having an extra slot equipped at one end will give an ambiguous alarm. This rule applies whether the circuit pack in the slot has a signal applied or does not have a signal applied.

An alternative is to operate DDM-1000 in the "add/drop" mode (Figure 2-10). In this mode, one muldem receives from office A and transmits to office C while the other muldem receives from office C and transmits to office A. Low-speed interface packs are provided only for those signals being added and dropped. The choice between these two methods is made by considering the total quantity of add/drop signals and the balance of add/drop signals between office A and office C. When the add/drop traffic approaches one half the total shelf capacity in both directions or the add/drop traffic is significantly unbalanced, the use of dedicated muldemers is recommended for economic and administrative reasons.

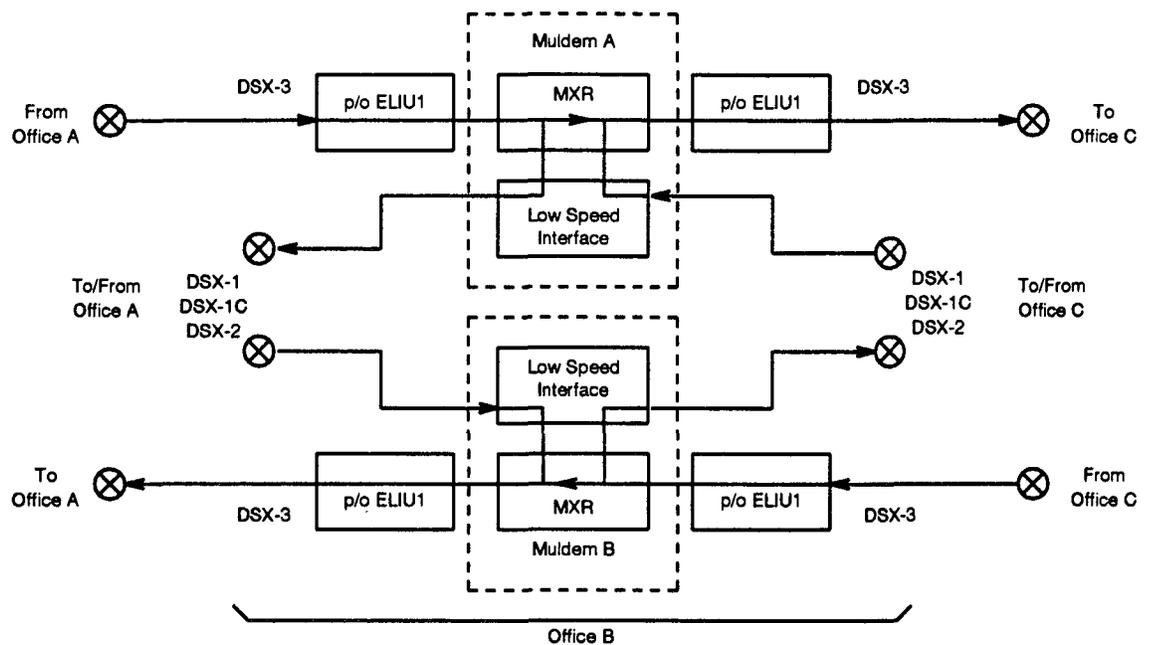


Figure 2-10. DDM-1000 Add/Drop Block Diagram

DDM-1000 is also suitable for use with the DR6-20-45 digital radio terminal for industrial applications. In this application, a partially equipped DDM-1000 mounted below the radio in a 7-foot bay provides a total capacity of 28 DS1 signals.

M1C Multiplexer

A single DDM-1000 shelf can be configured as an M1C multiplexer by equipping one muldem with DS1 INTFC (all AEK36-types) DS1 packs and the other muldem with AEK37 DS1C packs. The function unit slots associated with the DS1 packs may be equipped with AKM2 (or later) MXR packs, but the function unit slots associated with the DS1C packs must be equipped with AKM2B (or later) MXR packs. Any version of PROCR2 may be used and an AKM3 ELIU is required.

The two muldemers are connected at the DS3 rate by connecting muldem B output to muldem A input, and muldem A output to muldem B input. The DS3 connections are made at the ELIU using ED-2C833-20, G33 cable assemblies. The DS1 and DS1C connections are made in a conventional manner.

When initially provisioning the shelf, the packs may be tested using the "test-auto-turnup:local" and "test-auto-turnup:lsdsx" commands described in the Commands and Reports section of this manual. These tests require that the muldemers be looped on themselves with muldem A output connected to muldem A input, and muldem B output connected to muldem B input. The ED-2C833-20, G33 cables may also be used for these loopbacks.

After successful completion of the loopback tests, the muldemers must be reconnected from A to B. In this configuration the shelf is protected in a normal way against circuit pack failures, and appropriate office alarms and telemetry byte-oriented serial (TBOS) scan points will be raised.

Open Network

Open Network vs. Closed Network - Electrical Mode

Figure 2-11 is an example of a traditional DDM-1000 closed network. Muldemers A and B of a NE (near-end) shelf terminate in muldemers A and B of a FE (far-end) shelf. All PROCR packs are designed to function in this configuration and support far-end communication (fecom) between the two shelves.

The MC90083A1E PROCR2 supports all existing configurations of DDM-1000 including open network. This firmware is compatible with all previous firmware releases.

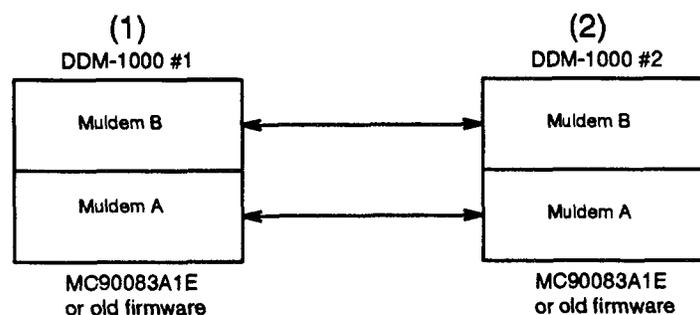


Figure 2-11. DDM-1000 Traditional Closed Network

Figure 2-12 shows examples of open networks. For DDM-1000, an open network exists when fecom is utilized between muldemers of a near-end shelf that terminate in different far-end muldemers. Prior to the MC90083A1E PROCR2,

Engineering

DDM-1000 Facility Selection

A major planning consideration when using DDM-1000 is the required initial and final capacity of the system and the type of the facility. In its 90 Mb/s optical mode, a single DDM-1000 assembly provides a 1:1 protected 90 Mb/s optical signal containing one or two DS3 signals. In its 180 Mb/s optical mode, the dual DDM-1000 assembly provides a 1:1 protected 180 Mb/s optical signal containing up to four DS3 signals. In its electrical mode, DDM-1000 provides up to two 45 Mb/s DS3 electrical signals.

If initial transmission requirements are for more than four DS3s and steady growth is projected, it is advisable to use DDM-1000 as an electrical multiplexer with its DS3 electrical outputs interfaced to a high-capacity lightwave system such as FT Series G or digital radio system such as DR6 or DR11. If the required method of transmission is optical, the initial traffic requirement is less than four DS3s, and the projection for growth is slow or unknown, then it is advisable to use DDM-1000 as an optical multiplexer equipped with 90 or 180 Mb/s optical line interface units (OLIUs). Parallel optical DDM-1000 systems can prove more economical than growth to high-capacity transmission systems in many loop applications where span distances are short and traffic capacity is greater than four DS3s. This occurs because the cost of additional fibers for parallel systems is often less than that of adding separate high-capacity lightwave terminals.

New 180 Mb/s Installations

When a new 180 Mb/s optical DDM-1000 system is to be installed, engineering considerations are the same as if two independent 90 Mb/s systems were to be installed, one above the other, separated by no more than the height of a DDM-1000 heat baffle plus a fan unit (6 inches total). Note that AKM5 DS3U1 packs cannot be used with 180 Mb/s systems.

In 180 Mb/s systems, channels originating in an OLIU shelf in one office terminate in the OLIU shelf in the other office. Channels originating in a non-OLIU shelf in one office terminate in the non-OLIU shelf in the other office. For example, if the OLIU shelf is on the bottom of the 2-shelf pair in one office and on the top of the 2-shelf pair in the other office, channel assignments follow the shelf configuration not the physical position in the bay.

When reconfiguring a bay as described here, shelf addresses must be updated as described under "Shelf Addresses" in the SPECIFICATION section of this manual.

90 Mb/s to 180 Mb/s Upgrades

When an optical DDM-1000 system is to be installed initially as a 90 Mb/s system with an upgrade to 180 Mb/s optical operation planned for the future, an initial bay arrangement consisting of odd-numbered shelves is recommended. The upgrade is done by installing the even-numbered shelves and converting the resulting pairs of shelves to 180 Mb/s operation over the existing fibers. Note that AKM5 DS3U1 packs cannot be used with 180 Mb/s systems.

The shelf-to-shelf cables for the ASCII terminal, alarms and telemetry can be used to interconnect the four assemblies as if they were shelves 1 through 4. The ED-2C833-20, G9 serial telemetry and multishelf bus cable is not long enough to connect the shelves in the odd-number shelf arrangement. The longer ED-2C833-20, G901 cable must be used.

Other equipment arrangements to support an upgrade are possible. For example, shelves 1 through 4 could be installed, operating at 90 Mb/s, with locations 5 through 8 left empty. The upgrade would be done by rolling traffic from a lower shelf to a new shelf installed in locations 5 through 8 and then converting the now unused shelf and its neighbor to 180 Mb/s operation.

OLIU Selection

When a decision has been made to order an optical DDM-1000, a particular type of OLIU must be specified. This selection is initially based on consideration of the capacity (in DS3s), the operating environment, and the span length. Table 2-2 provides the operating environment, typical system gain, and span length associated with each 16- and 20-type OLIU on single-mode fiber. Table 2-3 and Table 2-4 provide more detailed information on these OLIUs.

Table 2-2. OLIU Selection

OLIU	Capacity	Outside Plant Environment	Maximum Budget (dB)	Span Length
16E	2 DS3s	Controlled	16.5	29.9 km (18.0 miles)
16F	2 DS3s	Uncontrolled	21.0	46.8 km (29.0 miles)
16E2	2 DS3s	Uncontrolled	21.0	46.8 km (29.0 miles)
16F2	2 DS3s	Uncontrolled	27.4	60.8 km (37.7 miles)
16G	2 DS3s	Uncontrolled	27.0	59.9 km (37.0 miles)
16K	2 DS3s	Uncontrolled	33.0	73.2 km (45.3 miles)
20E	4 DS3s	Controlled	13.5	30.0 km (18.6 miles)
20G	4 DS3s	Uncontrolled	25.0	55.5 km (34.5 miles)
20K	4 DS3s	Uncontrolled	28.3	62.8 km (39.0 miles)

Once the DS3 capacity, operating environment, and approximate span distances have been determined, more detailed consideration must be given to the loss budget. Table 2-3 lists the parameters associated with systems using the 16-type OLIUs. Table 2-4 lists the parameters associated with systems using the 20E, 20G and 20K OLIUs. Calculations in Table 2-3 and Table 2-4 assume nominal TX output power.

All OLIUs have the capability of operating over 1300 nm single-mode or multimode fiber. In addition, the 16E, 16E2, 16F, 16F2, and 20E are capable of being looped back-to-back without the use of attenuators. Systems using the 16G OLIU3, 16K OLIU6, 20G OLIU5, or 20K OLIU7 require a line build-out (LBO) for system acceptance testing and may require an LBO to meet the minimum facility loss parameter. See DP-424 in the "Installation and Maintenance" section of this manual for details on minimum and maximum facility losses with various combinations of OLIUs.

Table 2-3. DDM-1000 16-Type OLIU Loss Budget Parameters

Parameter	16E OLIU	16F OLIU	16G OLIU	16K OLIU
Wavelength	1305 ±20 nm	1305 ±20 nm	1305 ±20 nm	1305 ±20 nm
Type of TX	Single Mode	Single Mode	Single Mode	Single Mode
TX Output Power-HI*	-10.0 dBm ±1dB	-10.0 dBm ±1dB	-4.0 dBm ±1dB	+2.0 dBm ±1dB
TX Output Power-LW*	-16.0 dBm ±1dB	-16.0 dBm ±1dB	-10.0 dBm ±1dB	-4.0 dBm ±1dB
RX Sensitivity for BER=10 ⁻⁹ †	-34.5 dBm	-39.0 dBm	-39.0 dBm	-39.0 dBm
Max. RX Input Power	-14.5 dBm	-14.5 dBm	-14.5 dBm	-14.5 dBm
Available System Gain‡	24.5 dB	29.0 dB	35.0 dB	41.0 dB
Eye Margin	3.5 dB	3.5 dB	3.5 dB	3.5 dB
Equipment Margin	3.0 dB	3.0 dB	3.0 dB	3.0 dB
Maximum Facility Loss	18.0 dB	22.5 dB	28.5 dB	34.5 dB
Minimum Facility Loss	0 dB	0 dB	7.0 dB	13.7 dB
Max. Connector Loss (Two)	1.5 dB	1.5 dB	1.5 dB	1.5 dB
Operating Temp. Range	0°C to +50°C	-40°C to +75°C	-40°C to +75°C	-40°C to +75°C
Single-Mode Fiber				
Outside Plant Budget (1305 ±30 nm)	16.5 dB	21.0 dB	27.0 dB	33.0 dB
Span Length§	29.9 km (18 mi)	45.5 km (28.3 mi)	58.9 km (36.6 mi)	73.2 km (45.3 mi)
Multimode Fiber				
Dispersion and Modal Noise Allocation¶	3 dB	3 dB	3 dB	3 dB
Outside Plant Budget (1305 ±30 nm)	13.5 dB	18.0 dB	24.0 dB	30.0 dB
Span Length**	13.5 km (8.37 mi)	18.0 km (11.0 mi)	24.0 km (14.8 mi)	30.0 km (18.6 mi)

Table 2-3. DDM-1000 16-Type OLIU Loss Budget Parameters (Contd)

Parameter	16E2 OLIU	16F2 OLIU
Wavelength	1305 ±20 nm	1305 ±20 nm
Type of TX	Single Mode	Single Mode
TX Output Power-HI*	-10.5 dBm ±1dB	-4.1 dBm ±1dB
TX Output Power-LW*	-15.5 dBm ±1dB	-9.1 dBm ±1dB
RX Sensitivity for BER=10 ⁻⁹ †	-39.5 dBm	-39.5 dBm
Max. RX Input Power	-7.0 dBm	-7.0 dBm
Available System Gain‡	29.0 dB	35.4 dB
Eye Margin	3.5 dB	3.5 dB
Equipment Margin	3.0 dB	3.0 dB
Maximum Facility Loss	22.5 dB	28.9 dB
Minimum Facility Loss	0 dB	0 dB
Max. Connector Loss (Two)	1.5 dB	1.5 dB
Operating Temp. Range	-40°C to +75°C	-40°C to +75°C
Single-Mode Fiber		
Outside Plant Budget (1305 ±30 nm)	21.0 dB	27.4 dB
Span Length§	46.8 km (29 mi)	60.8 km (37.7 mi)
Multimode Fiber		
Dispersion and Modal Noise Allocation¶	3 dB	3 dB
Outside Plant Budget (1305 ±30 nm)	18.0 dB	24.4 dB
Span Length**	18.0 km (11.0 mi)	24.4 km (15.0 mi)

* The output power of the optical transmitter (TX) should be measured at the biconic connector at the end of the transmitter pigtail. The power outputs shown in this table are guaranteed values when the transmitter is new. The numbers are based on measurements with a power meter calibrated against the AT&T-TS-RD standard power meter, which can be traced to the National Bureau of Standards. The DDM-1000 TX has a 6 dB switch; power output may be selected as HI or LW based on the installed cable loss.

† To obtain receiver (RX) sensitivity for other BER, use the following corrections:

- From 10⁻⁷ to 10⁻⁸, increase signal level 0.32 dB
- From 10⁻⁸ to 10⁻⁹, increase signal level 0.31 dB
- From 10⁻⁹ to 10⁻¹⁰, increase signal level 0.23 dB

Table 2-3. DDM-1000 16-Type OLIU Loss Budget Parameters (Contd)

- ‡ The available system gain is the transmitter power minus the receiver sensitivity. The facility loss includes 3.5 dB for eye degradation (optical receiver variation from ideal) and 3.0 dB for OLIU equipment degradation. Temperature and aging degradations have been included in the OLIU equipment margin of 3.0 dB. The equipment margin for the transmitter is 2.0 dB. The equipment margin for the receiver is 1.0 dB. The loss of two optical connectors is 1.5 dB. This is usually referenced out in a fiber insertion loss measurement; therefore, a span that meets the "Outside Plant Budget" measurement should meet the "Facility Loss" requirement. DP-424 in the "Installation and Maintenance" section contains details on minimum and maximum facility losses with combinations of OLIUs.
- § Assumes 0.55 dB/km cable plus splice loss (medium loss single-mode fiber) for the 16E and 16E2 and 0.45 dB/km cable plus splice loss (low loss single-mode fiber) for the 16F, 16F2, 16G, and 16K.
- ¶ Assumes 90 MHz end-to-end fiber bandwidth. For 70 MHz bandwidth, increase dispersion and modal noise allocation to 4 dB, decrease outside plant budget 1 dB, and reduce span length by 1 km.
- ** Assumes 1.0 dB/km average cable plus splice loss (medium loss multimode fiber).

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Table 2-4. DDM-1000 20-Type OLIU Loss Budget Parameters

Parameter	20E OLIU	20G OLIU	20K OLIU
Wavelength	1305 ±20 nm	1305 ±20 nm	1305 ±20 nm
Type of TX	Single Mode	Single Mode	Single Mode
TX Output Power-HI*	-7 dBm ±1 dB	-1.3 dBm ±1 dB	+2.0 dBm ±1 dB
TX Output Power-LW*	-13 dBm ±1 dB	-7.3 dBm ±1 dB	-4.0 dBm ±1 dB
RX Sensitivity for BER=10 ⁻⁹ †	-29.0 dBm	-34.8 dBm	-34.8 dBm
Max. RX Input Power	-12.3 dBm	-15.3 dBm	-15.3 dBm
Available System Gain‡	22.0 dB	33.5 dB	36.8 dB
Eye Margin	3.5 dB	3.5 dB	3.5 dB
Equipment Margin	3.5 dB	3.5 dB	3.5 dB
Maximum Facility Loss	15.0 dB	26.5 dB	29.8 dB
Minimum Facility Loss	0 dB	10.0 dB	13.3 dB
Max. Connector Loss (Two)	1.5 dB	1.5 dB	1.5 dB
Operating Temp. Range	0°C to +50°C	-40°C to +75°C	-40°C to +75°C
Single-Mode Fiber			
Outside Plant Budget (1305 ±30 nm)	13.5 dB	25.0 dB	28.3 dB
Span Length§	30.0 km (18.6 mi)	55.5 km (34.5 mi)	62.8 km (39 mi)
Multimode Fiber¶			

* The output power of the optical transmitter (TX) should be measured at the biconic connector at the end of the transmitter pigtail. The power outputs shown in this table are guaranteed values when the transmitter is new. The numbers are based on measurements with a power meter calibrated against the AT&T-TS-RD standard power meter, which can be traced to the National Bureau of Standards. The DDM-1000 TX has a 6 dB switch; power output may be selected as HI or LW based on the installed cable loss.

† To obtain receiver (RX) sensitivity for other BER, use the following corrections:

- From 10⁻⁷ to 10⁻⁸, increase signal level 0.32 dB
- From 10⁻⁸ to 10⁻⁹, increase signal level 0.31 dB
- From 10⁻⁹ to 10⁻¹⁰, increase signal level 0.23 dB

AEK36B S1:2, 1:3, and 1:4 DS1 INTFC2

The AEK36B S1:2, 1:3, and 1:4 DS1 INTFC2 packs:

- are backward compatible with the AEK36 and the AEK36B DS1 INTFC1 pack
- have the same features as the AEK36B DS1 pack
- have the DIP switch located different from the AEK36B DS1 pack.

The AEK36B S1:4 DS1 pack is more tolerant of transients at the DSX-1 cross-connection than the preceding AEK36B-type packs. The AEK36B S1:4 offers improved initial clock recovery from low density DS1 signals, such as a 3-in-24 pattern.

AEK36C DS1 INTFC2

The AEK36C is backward compatible with all previous AEK36-type DS1 INTFC packs. The AEK36C pack is the newest of the AEK36 series of packs which incorporates the latest technology for improved performance. The AEK36C offers improved initial clock recovery from low density DS1 signals, such as a 3-in-24 pattern. The new pack is more tolerant of transients at the DSX-1 cross-connection than the preceding AEK36B-type packs.

AKM2B MXR2

The AKM2B MXR2 is backward compatible with the AKM2 MXR1 and differs as follows:

- The AKM2 cannot be used in the same muldem as an AEK37 DS1C INTFC1. The AKM2B is compatible with all DDM-1000 circuit packs.
- The power consumption of the AKM2B is lower than that of the AKM2. When combined with the power reductions in the other second generation circuit packs, this allows more flexibility in planning and engineering.
- Jumper plugs have been added to the AKM2B to control various operating modes. These jumpers are described in the Specifications section and in the affected procedures in the Installation and Maintenance section of this manual.
- The AKM2B provides C-bit framing format but cannot provide performance monitoring data to a TLM2 pack.

AKM2C MXR3

The AKM2C MXR3 is compatible with the AKM2 MXR1 if the AKM2C MXR3 is optioned for M13 mode. It is compatible with the AKM2B MXR2 if each MXR is optioned the same (C-bit or M13 mode).

The AKM2C MXR3 pack differs from the AKM2B MXR2 in two ways that affect the user:

- The AKM2C MXR3 provides performance monitoring data over a telemetry asynchronous block serial (TABS) interface when used with the MC90191A1 TLM2 and MC90083A1C, or later, PROCR2.
- The AKM2C provides DS3 AIS (16mb) detection when used with the MC90083A1C, or later, PROCR2.

AKM5 DS3U1

A class A change replaced all issues of the AKM5 packs prior to S3:3. The previous issues of the AKM5 pack could cause a loss of service if the PROCR pack is removed. The AKM5 S3:3, or later, pack will maintain service if the PROCR is removed.

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MC90083A1B PROCR2

The following description is provided as a reference only since all MC90083A1D, Issue 3 and *earlier* PROCR packs have been replaced with MC90083A1D, Issue 4 packs, and all MC90083A1E, Issue 1 packs have been replaced with MC90083A1E, Issue 2 packs.

The MC90083A1B PROCR2 differed from the MC90083A1 PROCR1 as follows:

- The PROCR2 supports the AKM6 DS3U2 and AEK37 DS1C INTFC1 circuit packs; the PROCR1 does not.
- The PROCR2 supports an in-service conversion from optical to electrical and from electrical to optical operation; the PROCR1 does not.
- The PROCR2 includes the ASCII terminal command `rept-hsty;`; the PROCR1 does not.
- The PROCR2 includes an enhanced version of the ASCII terminal command `test-procr:`
- The PROCR2 supports add/drop operation; the PROCR1 does not.
- The PROCR2 allows the end-to-end maintenance communication (fecom/S-bit signalling) to be explicitly enabled or disabled; the PROCR1 does not. The default states for PROCR2 are "on" for an optical system and "off" for a DS3 electrical system. Fecom is always "on" for PROCR1.
- The PROCR2 indicates an automatic protection switch lock by lighting only the MN and NE LEDs. The PROCR1 indicates an automatic lock by lighting the ABN LED.
- Several other ASCII terminal commands and reports are enhanced in the PROCR2.

See the heading "Incompatible Combinations" for a discussion of some basic guidelines for mixing PROCR packs in a bay.

MC90083A1C PROCR2

The following description is provided as a reference only. All MC90083A1D, Issue 3 and *earlier* PROCR packs have been replaced with MC90083A1D, Issue 4 packs. All MC90083A1E, Issue 1 packs have been replaced with MC90083A1E, Issue 2 packs.

The MC90083A1C PROCR2 supports all the features of the MC90083A1B PROCR2. The MC90083A1C PROCR2 supports PM and DS3 AIS detection; the MC90083A1B PROCR2 and the PROCR1 do not.

See the heading "Incompatible Combinations" for a discussion of some basic guidelines for mixing PROCR packs in a bay.

Table 2-5. DDM-1000 Circuit Pack Compatibility (Contd)

Circuit Pack	May Not Be Used With:
AKM6 DS3U2§§	MC90083A1 PROCR1 any LS INTFC§§§
AEK36 DS1 INTFC1¶¶,***	20-Type OLIUs
AEK36B DS1 INTFC2†††	(no restrictions)
AEK36B S1:2 DS1 INTFC2†††	(no restrictions)
AEK36C DS1 INTFC2†††	(no restrictions)
AEK37 DS1C INTFC1‡‡‡	MC90083A1 PROCR1 AKM2 MXR1
AEK38 DS2 INTFC1†,§§§	MC90083A1 PROCR1 MC90083A1B PROCR2 MC90083A1C PROCR2 MC90083A1C Issue 2 PROCR2 AKM2 MXR1
20-Type OLIU***	AEK36 DS1 INTFC1 AKM5 DS3U1‡‡

* All PROCR2 packs prior to MC90083A1D, Issue 4 should be upgraded to MC90083A1D, Issue 4 or later to eliminate potential service-affecting conditions.

All PROCRs are end-to-end compatible. The MC90083A1C PROCR2 and earlier PROCR packs may be mixed in a bay without any restrictions. See the heading "Incompatible Combinations" for basic guidelines in mixing PROCR packs in a bay.

† When you are using the option of C-bit performance monitoring (PM), you must have an MC90083A1C (or later) PROCR2, MC90191A1 TLM2, and AKM2C MXR3 circuit pack installed. **AEK38 DS2 INTFC1 packs cannot be used in a muldem provisioned for C-bit parity framing format (performance monitoring).**

‡ The MC90083A1D PROCR2 pack has been replaced with the MC90083A1D, Issue 2 PROCR2. If MC90083A1D, Issue 2 PROCR2 packs are installed anywhere in the bay, then for proper execution of new commands within those PROCRs, it is necessary that the last PROCR in the bay be an MC90083A1D, Issue 2 or later. See the heading "Incompatible Combinations" for basic guidelines in mixing PROCR packs in a bay.

§ The MC90083A1D, Issue 2 PROCR2 may be used conditionally with the DS3U1 to support DS3 clear channel. If a DS3 channel is equipped with DS3U1 packs and the channel is looped at the DSX-3 at both ends, jitter on the signal in the other muldem might be increased. Therefore, if DS3 loopbacks are never applied at both ends of the channel, the MC90083A1D, Issue 2 PROCR2 may be used to support DS3 clear channel.

¶ The MC90083A1E PROCR2 has a feature that requires a shelf entry for commands. To fully benefit from this feature, both the first and last shelf in a bay must be equipped with the MC90083A1E PROCR2. Then, if the shelf number entry is omitted, the command will be aborted with the response "syntax error." Any PROCR version can be in the other shelf positions and the required shelf entry feature will be in effect.

** The AKM2 MXR1 is compatible with the AKM2B MXR2 or AKM2C MXR3 if the MXR2 or MXR3 is optioned for M13 mode.

Table 2-5. DDM-1000 Circuit Pack Compatibility (Contd)

- †† The AKM2B MXR2 and AKM2C MXR3 are end-to-end compatible if each pack is optioned the same. An AKM2C MXR3 in a SRV slot must be protected by another AKM2C MXR3 in the PROTN slot.
- ‡‡ A class A change replaced all previous AKM5s with AKM5, Issue 3 packs. Only one AKM5 DS3U1 service/protection pair may be used in a shelf, in either muldem A or muldem B of a 90 Mb/s system. The AKM5 cannot be used in a 180 Mb/s system.
- §§ With an AKM5 DS3U1 or AKM6 DS3U2 in the function unit slot of a muldem, no LS INTFC circuit packs should be installed in that muldem.
- ¶¶ An AEK36 DS1 INTFC1 in a SRV slot can be protected by another AEK36 DS1 INTFC1 in a PROTN slot of the same muldem *if the EQL and DS1 code settings on the two circuit packs are identical*. An AEK36 DS1 INTFC1 in a SRV slot can also be protected by an AEK36B-type or an AEK36C DS1 INTFC2 in a PROTN slot of the same muldem *regardless of the DS1 code settings of the SRV or PROTN DS1 packs*. The EQL settings must still be identical and a PROCR2 must be used.
- *** The 20-type OLIUs cannot be installed in an assembly equipped with AEK36 INTFC1 circuit packs because of excessive power consumption. If AEK36 DS1 INTFC1 plug-ins are installed in the OLIU assembly of the 180 Mb/s arrangement, they must be replaced with AEK36B-type or AEK36C DS1 INTFC2 plug-ins. The replacement is done in service using the procedures given in DP-441 in the Installation and Maintenance Procedures section of this manual.
- ††† An AEK36B-type or AEK36C DS1 INTFC2 in a SRV slot can be protected by an AEK36 DS1 INTFC1 in a PROTN slot of the same muldem *if the EQL and DS1 code settings on the PROTN AEK36 DS1 INTFC1 agree with the PROCR's equipment list on the DS1 code settings of the AEK36B-type or AEK36C DS1 INTFC2 being protected*. An AEK36B-type or AEK36C DS1 INTFC2 in a SRV slot can also be protected by another AEK36B-type or AEK36C DS1 INTFC2 in a PROTN slot of the same muldem *regardless of the DS1 code settings of the PROTN AEK36B-type (or AEK36C) DS1 INTFC2*, but the EQL settings must be identical and a PROCR2 must be used.
- ‡‡‡ An AEK37 DS1C INTFC1 in a SRV slot can be protected by another AEK37 DS1C INTFC1 in a PROTN slot of the same muldem *if the EQL and DS1C code settings on the two circuit packs are identical*.
- §§§ An AEK38 DS2 INTFC1 in a SRV slot can be protected by another AEK38 DS2 INTFC1 in a PROTN slot of the same muldem *if the EQL settings on the two circuit packs are identical*.
- ¶¶¶ An AKM86 BP2 pack is required in an optical shelf with only one muldem equipped if the PROCR2 pack is an MC90083A1D, Issue 3 or Issue 4, or an MC90083A1E, Issue 1 or Issue 2.

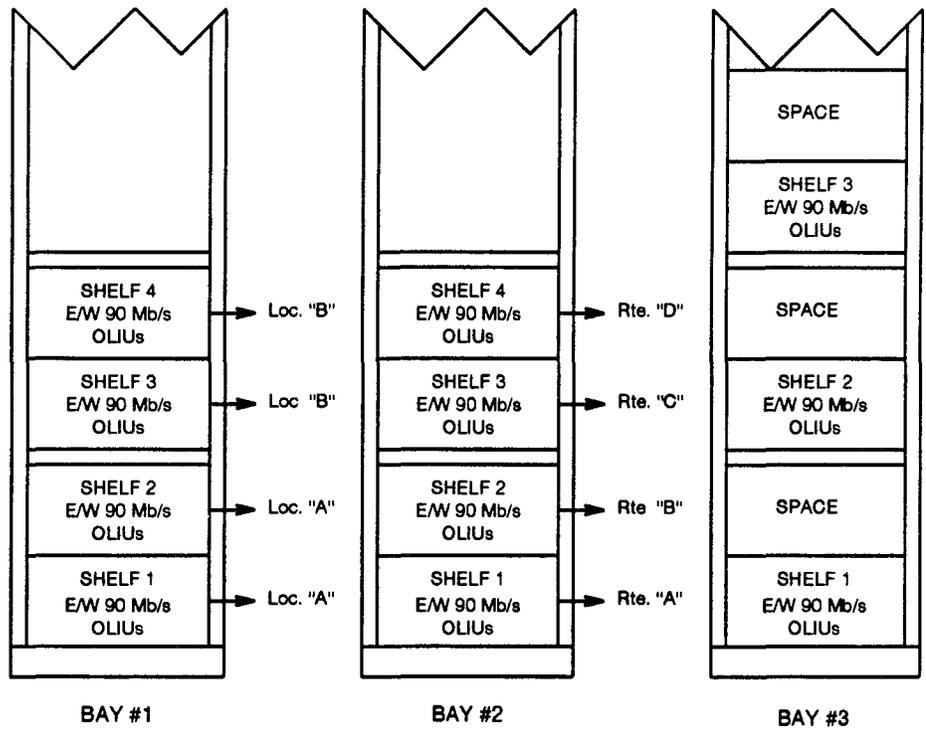


Figure 2-19. 180 Mb/s Applications - Upgrade of Existing 90 Mb/s Shelves

Power

Table 2-6 lists the typical power consumption under nominal operating conditions of various DDM-1000 optical and electrical configurations assuming 1:7 DS1 operation and 1:1 MXR operation. Each assembly is equipped with 2 PWR packs and 1 PROCR pack but no TLM pack. Note that the second generation circuit packs [AEK36B (AEK36B S1:2) DS1 INTFC2, AKM2B MXR2, and MC90083A1B (or later) PROCR2] as described earlier under Circuit Pack Compatibility, resulted in substantially reduced power consumption. The newer AKM2C MXR3 and MC90083A1C (or later) PROCR2s do not result in any further power consumption. Note the increase in power consumption when using the 20-type 180 Mb/s OLIUs.

Table 2-6. DDM-1000 Power Consumption

DDM-1000 Configuration	Capacity (DS3s)	Circuit Packs	
		First Generation	Second Generation (Note 1)
Electrical	1	92W (1.9A @ -48V, 3.8A @ -24V)	50W (1.0A @ -48V, 2.1A @ -24V)
	2	168W (3.5A @ -48V, 7.0A @ -24V)	80W (1.6A @ -48V, 3.3A @ -24V)
Optical 16E, 16E2, or 16F2	1	111W (2.3A @ -48V, 4.6A @ -24V)	67W (1.4A @ -48V, 2.8A @ -24V)
	2	187W (3.9A @ -48V, 7.8A @ -24V)	99W (2.0A @ -48V, 4.1A @ -24V)
Optical 16F, 16G, or 16K	1	116W (2.4A @ -48V, 4.8A @ -24V)	70W (1.4A @ -48V, 2.9A @ -24V)
	2	192W (4.0A @ -48V, 8.0A @ -24V)	102W (2.1A @ -48V, 4.3A @ -24V)
Optical 20E	1	See Note 2	91W (1.8A @ -48V, 3.6 @ -24V)
	2	See Note 2	125W (2.6A @ -48V, 5.2A @ -24V)
	3	See Note 2, 3	172W (3.6A @ -48V, 7.2A @ -24V)
	4	See Note 2, 3	216W (4.5A @ -48V, 9.0A @ -24V)
Optical 20G or 20K	1	See Note 2	87W (1.8A @ -48V, 3.6A @ -24V)
	2	See Note 2	116W (2.4A @ -48V, 4.8A @ -24V)
	3	See Note 2, 3	181W (3.7A @ -48V, 7.4A @ -24V)
	4	See Note 2, 3	207W (4.3A @ -48V, 8.6A @ -24V)

Notes:

1. The values shown for the second generation circuits are contingent on the use of the Series 2 power units. These power units may be identified by the designation "Series 2" stamped on the unit (the location of the stamping may vary).
2. The 20E, 20G, or 20K OLIUs cannot be installed in an assembly equipped with AEK36 DS1 INTFC1 plug-ins because of excessive power consumption. Therefore, the power consumption is not specified for a system employing first generation plug-ins. Note that any other combination of 20-type OLIUs and first and second generation plug-ins is permissible. It is only necessary that AEK36B or AEK36C DS1 INTFC2 plug-ins are installed in the OLIU assembly.
3. Note that the power shown in the table is distributed over the two assemblies required for operation with three or four DS3s.

Table 2-7 shows emergency current drain limits (List 2) for a single shelf. The maximum current drain (List 2) shown assumes typical current values under worst case temperature, minimum office battery voltage, and with the shelf configuration that yields the maximum load. Consult drawing T82046-30 for additional power distribution requirements.

Table 2-7. DDM-1000 Power Requirements for a Single Shelf

	First Generation		Second Generation			
			Optical		Electrical	
Nominal Voltage	-48.0V	-24.0V	-48.0V	-24.0V	-48.0V	-24.0V
Voltage	-42.5V	-20.0V	-42.5V	-20.0V	-42.5V	-20.0V
Maximum DC Current Drain	4.7A	9.4A	4.5A*	9.0A	1.6A†	3.3A
Minimum Feeder Fuse‡	15.0A	15.0A	15.0A	15.0A	15.0A	15.0A

* Maximum case (List 2 bay drains) is for a double-shelf 180 Mb/s optical configuration; i.e., maximum 4 (double shelves) X 4.5A = 18A per bay at -48V.

† Maximum case (List 2 bay drains) is for a single-shelf electrical configuration; i.e., maximum 8 (single shelves) X 1.6A = 12.8A per bay at -48V.

‡ Primary office power is fused at 10.0A on board the 547A PWR1 pack and at 20.0A on board the 547B PWR2 pack.

Controlled Environment Operation

The DDM-1000 is designed to operate in a NEBS-type environment without the need for fan assemblies. To allow for proper cooling of the DDM-1000, enough airflow must be available. If mounted above an airflow restriction, a 1-inch air space must be provided below DDM-1000. If mounted above heat generating equipment, a heat baffle must be mounted below the DDM-1000. If mounted below an airflow restriction, a heat baffle must be mounted above the DDM-1000. When mounting multiple DDM-1000s in a bay, a heat baffle is only required between every other DDM-1000 (Figure 2-20). The heat baffle assembly (COMCODE 846012581) is 3 inches high. If ED-2C841-30, G3 EMC shelves are mounted in the bay, a 0.5-inch space must be provided below each shelf to allow room for installing the front metal cover.

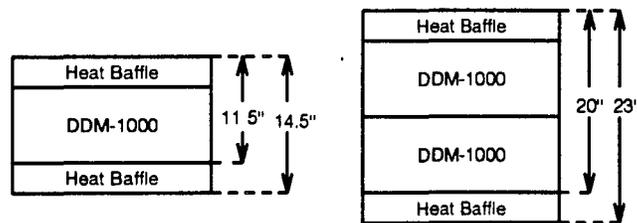
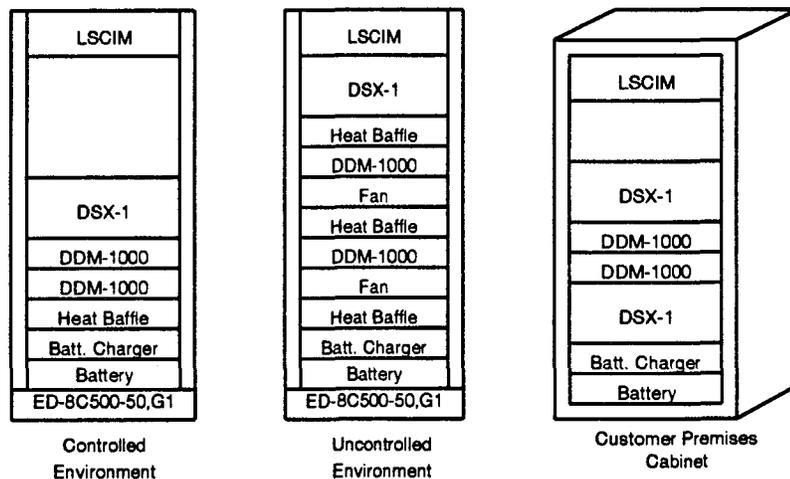


Figure 2-20. DDM-1000 Controlled Environment

Uncontrolled Environment Operation

The DDM-1000 is designed to operate as a line-terminal in an uncontrolled environment [for example, 80-type cabinet: -40°F to +120°F (-40°C to +50°C) outside the cabinet] with the addition of a fan assembly. All plug-in units except the 16E and 20E optical line interface units (OLIU1 and OLIU4) are suitable for operation in this environment. When using DDM-1000 in an extended environment, the 16E2 (OLIU10), 16F (OLIU2), 16F2 (OLIU9), 16G (OLIU3), 16K (OLIU6), 20G (OLIU5), or 20K (OLIU7) must be used. A fan assembly (ED-2C834-30 DDM-1000 fan assembly, 2A fan unit, or equivalent) must be mounted below the DDM-1000. The ED-2C834-30 fan assembly is 2.5 inches high. The 2A fan unit is 3 inches high (Figure 2-21). If DDM-1000 is mounted above an airflow restriction, a 1-inch air space must be provided below the fan assembly. If mounted above heat generating equipment, a heat baffle must be mounted below the fan assembly. If mounted below an airflow restriction, a heat baffle must be mounted above the DDM-1000. If ED-2C841-30, G3 EMC shelves are mounted in the bay, a 0.5-inch space must be provided below each shelf to allow room for installing the front metal cover.

In addition to these arrangements that concentrate DDM-1000s and power in a bay, there are arrangements that provide a Lightguide Stranded Cable Interconnect Module (LSCIM), DDM-1000s, DSX-1s, and power in a single bay (Figure 2-26). DDM-1000 also fits well into customer premises applications where self-contained, single cabinet arrangements are required. The customer premises cabinet shown consists of an electromagnetic interference (EMI) shielded cabinet with fans containing an LSCIM, two fully loaded DDM-1000 dual multiplexers, DS1 cross-connect points, a power shelf (AC rectifier), and battery back-up. The total capacity is 112 DS1 signals. Other cabinet arrangements can be obtained through your AT&T account representative.



Front Access - 710-SD1-25 or KS-16690L12 Connector

Figure 2-26. Single Frame Arrangements

Ordering

Standard Configurations

The DDM-1000 may be ordered in standard configurations or by individual units. The standard DDM-1000 configurations offer 28 or 56 DS1 capacity per shelf, DS3 electrical, 90 Mb/s or 180 Mb/s lightwave interface, and -48 volt power. These standard configurations can be ordered by either the J98769A-1 list numbers or by COMCODE. Each standard configuration is equipped with 1:7 protected DS1 low-speed interface packs, 1:1 protected -48 volt power units,

1:1 protected MXR cards, and the appropriate high-speed interface packs (1 ELIU1 or 1:1 protected OLIU). Table 2-8 lists items that have been rated discontinued availability (DA). The following tables list the standard configurations:

- Table 2-9 provides a list of the DDM-1000 90 Mb/s standard configurations that can be ordered with the ED-2C841-30, G2 shelves and Table 2-10 provides a list of the items included in each standard configuration.
- Table 2-11 provides a list of the DDM-1000 90 Mb/s standard configurations that can be ordered with the ED-2C841-30, G3 EMC shelves and Table 2-12 provides a list of the items included in each standard configuration.
- Table 2-13 provides a list of the DDM-1000 180 Mb/s standard configurations can be ordered with the ED-2C841-30, G2 shelves and Table 2-14 provides a list of the items included in each standard configuration.
- Table 2-15 provides a list of the DDM-1000 180 Mb/s standard configurations that can be ordered with the ED-2C841-30, G3 shelves and Table 2-16 provides a list of the items included in each standard configuration.

Table 2-8. Components Rated DA (Discontinued Availability) or Unavailable

<u>Comcode</u>	<u>App., MC or Eqpt. Code</u>	<u>Unit Description</u>
601048127	ED-2C841-30,G1	Shelf Assembly
104172333	AKM2	MXR1
104376280	AKM2B	MXR2
105008718	MC90083A1	PROCR1
105179345	MC90083A1B	PROCR2
105524748	MC90083A1C	PROCR2
105639819	MC90083A1C Issue 2	PROCR2
105581482	MC90083A1D Issue 1	PROCR2
106046238	MC90083A1D Issue 2	PROCR2
106393770	MC90083A1D Issue 3	PROCR2
106073091	MC90083A1E Issue 1	PROCR2
104172275	AEK36	DS1 INTFC1
104171509	16E	OLIU1
104171517	16F	OLIU2
104369525	16G	OLIU3
104375936	AEK36B	DS1 INTFC2

Table 2-9. 90 Mb/s Optical and DS3 Electrical Standard Configuration Using G2 Shelves

J98769B-1	Description
List 47	DS3 Electrical Termination - One Muldem (28 DS1s)
List 48	DS3 Electrical Termination - Two Muldems (56 DS1s)
List 76	Lightwave Termination - 16E2 - One Muldem (28 DS1s)
List 77	Lightwave Termination - 16E2 - Two Muldems (56 DS1s)
List 72	Lightwave Termination - 16F2 - One Muldem (28 DS1s)
List 73	Lightwave Termination - 16F2 - Two Muldems (56 DS1s)
List 51	Second Muldem Growth Group (28 DS1s)

Table 2-10. 90 Mb/s Optical and DS3 Electrical Standard Configuration Components Using G2 Shelves

J98769B-1 (Kits)			List Number						
			47	48	76	77	72	73	51
COMCODE	App., MC or	Unit	DS3 Electrical		Lightwave 16E2		Lightwave 16F2		Second Muldem
	Eqpt. Code	Description	1 DS3	2 DS3	1 DS3	2 DS3	1 DS3	2 DS3	Growth
601124159	ED-2C841-30,G2	Shelf Assy	1	1	1	1	1	1	—
104187794	547A	PWR1	2	2	2	2	2	2	—
104440474	AKM2C	MXR3	2	4	2	4	2	4	2
106455884	MC90083A1E Issue 2	PROCR2	1	1	1	1	1	1	—
105510895	AEK36C	DS1 INTFC2	8	16	8	16	8	16	8
104172341	AKM3	ELIU1	1	1	—	—	—	—	—
106901101	16E2	OLIU10	—	—	2	2	—	—	—
106849029	16F2	OLIU9	—	—	—	—	2	2	—
106691629	AKM86	BP2	—	—	1	—	1	—	—

Table 2-11. 90 Mb/s Optical and DS3 Electrical Standard Configuration Using G3 EMC Shelves

J98769B-1	Description
List 52	EMC, DS3 Electrical Termination - One Muldem (28 DS1s)
List 53	EMC, DS3 Electrical Termination - Two Muldem (56 DS1s)
List 78	EMC, Lightwave Termination - 16E2 - One Muldem (28 DS1s)
List 79	EMC, Lightwave Termination - 16E2 - Two Muldem (56 DS1s)
List 74	EMC, Lightwave Termination - 16F2 - One Muldem (28 DS1s)
List 75	EMC, Lightwave Termination - 16F2 - Two Muldem (56 DS1s)

Table 2-12. 90 Mb/s Optical and DS3 Electrical Standard Configuration Components Using G3 EMC Shelves

J98769B-1 (Kits)			List Number					
			52	53	78	79	74	75
COMCODE	App., MC or Eqpt. Code	Unit Description	EMC DS3 Electrical		EMC Lightwave 16E2		EMC Lightwave 16F2	
			1 DS3	2 DS3	1 DS3	2 DS3	1 DS3	2 DS3
601223332	ED-2C841-30,G3	EMC Shelf Assy	1	1	1	1	1	1
104187794	547A	PWR1	2	2	2	2	2	2
104440474	AKM2C	MXR3	2	4	2	4	2	4
106455884	MC90083A1E Issue 2	PROCR2	1	1	1	1	1	1
105510895	AEK36C	DS1 INTFC2	8	16	8	16	8	16
104172341	AKM3	ELIU1	1	1	—	—	—	—
106901101	16E2	OLIU1	—	—	2	2	—	—
106849029	16F2	OLIU2	—	—	—	—	2	2
	ED-2C833-20, G32	G32 Cable	2	4	—	—	—	—
106691629	AKM86	BP2	—	—	1	—	1	—

Table 2-13. 180 Mb/s Optical Standard Configuration Using G2 Shelves

J98769B-1	Description
List 56	Lightwave Termination - 20E - One Muldem (28 DS1s)
List 57	Lightwave Termination - 20E - Two Muldems (56 DS1s)
List 58	Lightwave Termination - 20E - Three Muldems (84 DS1s)
List 59	Lightwave Termination - 20E - Four Muldems (112 DS1s)
List 60	Lightwave Termination - 20G - One Muldem (28 DS1s)
List 61	Lightwave Termination - 20G - Two Muldems (56 DS1s)
List 62	Lightwave Termination - 20G - Three Muldems (84 DS1s)
List 63	Lightwave Termination - 20G - Four Muldems (112 DS1s)

Table 2-14. 180 Mb/s Optical Standard Configuration Components Using G2 Shelves

J98769B-1 (180 Mb/s Kits)			List Number							
			56	57	58	59	60	61	62	63
COMCODE	APP., MC or Eqpt. Code	Unit Description	180 Mb/s Lightwave 20E OLIU				180 Mb/s Lightwave 20G OLIU			
			1 DS3	2 DS3	3 DS3	4 DS3	1 DS3	2 DS3	3 DS3	4 DS3
601124159	ED-2C841-30, G2	Shelf Assy	2	2	2	2	2	2	2	2
104187794	547A	PWR1	2	2	4	4	2	2	4	4
104440474	AKM2C	MXR3	2	4	6	8	2	4	6	8
106455884	MC90083A1E Issue 2	PROCR2	1	1	2	2	1	1	2	2
105510895	AEK36C	DS1 INTFC2	8	16	24	32	8	16	24	32
105576896	20E	OLIU4	2	2	2	2	—	—	—	—
106548357	20G	OLIU5	—	—	—	—	2	2	2	2
	ED-2C833-20, G17	G17 CABLE	1	1	1	1	1	1	1	1
106691629	AKM86	BP2	1	—	1	—	1	—	1	—

Table 2-15. 180 Mb/s Optical Standard Configuration Using G3 EMC Shelves

J98769B-1	Description
List 64	EMC, Lightwave Termination - 20E - One Muldem (28 DS1s)
List 65	EMC, Lightwave Termination - 20E - Two Muldems (56 DS1s)
List 66	EMC, Lightwave Termination - 20E - Three Muldems (84 DS1s)
List 67	EMC, Lightwave Termination - 20E - Four Muldems (112 DS1s)
List 68	EMC, Lightwave Termination - 20G - One Muldem (28 DS1s)
List 69	EMC, Lightwave Termination - 20G - Two Muldems (56 DS1s)
List 70	EMC, Lightwave Termination - 20G - Three Muldems (84 DS1s)
List 71	EMC, Lightwave Termination - 20G - Four Muldems (112 DS1s)

Table 2-16. 180 Mb/s Optical Standard Configuration Components Using G3 Shelves

J98769B-1 (180 Mb/s Kits)			List Number							
			64	65	66	67	68	69	70	71
COMCODE	APP., MC or Eqpt. Code	Unit Description	180 Mb/s Lightwave 20E OLIU				180 Mb/s Lightwave 20G OLIU			
			1 DS3	2 DS3	3 DS3	4 DS3	1 DS3	2 DS3	3 DS3	4 DS3
601124159	ED-2C841-30, G3	Shelf Assy	2	2	2	2	2	2	2	2
104187794	547A	PWR1	2	2	4	4	2	2	4	4
104440474	AKM2C	MXR3	2	4	6	8	2	4	6	8
106455884	MC90083A1E Issue 2	PROCR2	1	1	2	2	1	1	2	2
105510895	AEK36C	DS1 INTFC2	8	16	24	32	8	16	24	32
105576896	20E	OLIU4	2	2	2	2	—	—	—	—
106548357	20G	OLIU5	—	—	—	—	2	2	2	2
	ED-2C833-20, G17	G17 CABLE	1	1	1	1	1	1	1	1
106691629	AKM86	BP2	1	—	1	—	1	—	1	—

Individual Units

In addition to the standard configurations, any DDM-1000 configuration may be obtained by specifying the individual shelf and plug-in COMCODE numbers. Table 2-17 lists the DDM-1000 shelf assembly and circuit packs by the corresponding COMCODES. It is used to order individual circuit packs for partially equipped systems, -24 volt powering, or other packs such as the TLM1 or DS3U2 packs. This ordering method is also used to order unequipped DDM-1000 shelf assemblies for delivery to a specific site while ordering packs separately from a product inventory control system (PICS) center.

Table 2-17. DDM-1000 Codes

COMCODE	GLEI Code (Note)	App., MC, or Eqpt. Code	Description	Maximum Per Shelf	Notes
601048127	DMM14A0H	ED-2C841-30,G1	DDM-1000 Shelf Assembly	—	(DA)
601124159	DMM14A4J	ED-2C841-30,G2	DDM-1000 Shelf Assembly*	—	—
601223332	DMM14A7J	ED-2C841-30,G3	DDM-1000 Shelf Assembly*	—	—
104187794	PWPQ96AAXX	547A PU	PWR1 Power Unit (-48V)	2	1 SRV, 1 PROTN
104208400	PWPQ96CAXX	547B PU	PWR2 Power Unit (-24V)	2	1 SRV, 1 PROTN
105008718	DMCBAL2GXX	MC90083A1	PROCR1 Circuit Pack†	—	(DA)
105179345	DMCBAN0GXX	MC90083A1B	PROCR2 Circuit Pack†	1	(DA)
105524748	DMCBAN3GXX	MC90083A1C	PROCR2 Circuit Pack†	1	(DA)
105639819	DMCBAN5GXX	MC90083A1C Issue 2	PROCR2 Circuit Pack†	1	(DA)
105581482	DMCBAN4GXX	MC90083A1D Issue 1	PROCR2 Circuit Pack†	1	(DA)
106046238	DMCBANDGAA	MC90083A1D Issue 2	PROCR2 Circuit Pack†	1	(DA)
106393770	DMCBANSGAA	MC90083A1D Issue 3	PROCR2 Circuit Pack†	1	(DA)
106073091	DMPQ04XAAA	MC90083A1E Issue 1	PROCR2 Circuit Pack†	1	(DA)
106455900	DMCBANLGAA	MC90083A1D Issue 4	PROCR2 Circuit Pack†	1	—
106455884	DMPQ041AAA	MC90083A1E Issue 2	PROCR2 Circuit Pack†	1	—
105424469	DMCBACAEXX	AKM4	TLM1 Circuit Pack	1	—
105364509	DMCBAF0EXX	MC90191A1	TLM2 Circuit Pack†	1	—
104172341	DMCBAB0EXX	AKM3	ELIU1 Circuit Pack	1	DS3 Electrical Only
106901101	M3RGZ2TDAA	16E2	OLIU10 (90 Mb/s)	2	1 SRV, 1 PROTN
106849029	M3RGZ0TDAA	16F2	OLIU9 (90 Mb/s)	2	1 SRV, 1 PROTN
104369525	M3RG320DXX	16G	OLIU3 (90 Mb/s)	2	1 SRV, 1 PROTN
105588453	M3RG330DXX	16K	OLIU6 (90 Mb/s)	2	1 SRV, 1 PROTN
105576896	M3RG400EXX	20E	OLIU4 (180 Mb/s)§	2	
106548357	M3RG414EAA	20G	OLIU5 (180 Mb/s)§	2	
106548340	M3RG415EAA	20K	OLIU7 (180 Mb/s)§	2	
104172333	DMCBAM0EXX	AKM2	MXR1 Circuit Pack	—	(DA)
104376280	DMCBAP0GXX	AKM2B	MXR2 Circuit Pack¶	4	(DA)
104440474	DMCBAS0EXX	AKM2C	MXR3 Circuit Pack¶	4	2 SRV, 2 PROTN
106258429	DMCBADDEAB	AKM5	DS3U1 Circuit Pack	2	1 SRV, 1 PROTN**
104188941	DMCBAE0EXX	AKM6	DS3U2 Circuit Pack	4	2 SRV, 2 PROTN

See Note and footnotes at the end of the Table.

Table 2-17. DDM-1000 Codes (Contd)

COMCODE	CLEI Code (Note)	App., MC, or Eqpt. Code	Description	Maximum Per Shelf	Notes
104172275	DMCBAG0FXX	AEK36	DS1 INTFC1 Circuit Pack	—	(DA)
105510895	DMCBARCGXX	AEK36C	DS1 INTFC2 Circuit Pack††	18	14 SRV, 4 PROTN
106548324	DMCBAHUFAA	AEK37	DS1C INTFC1 Circuit Pack	18	14 SRV, 4 PROTN
104172291	DMCBAJ0FXX	AEK38	DS2 INTFC1 Circuit Pack	18	14 SRV, 4 PROTN
104172309	DMCBAK0FXX	AEK39	BP1 Circuit Pack††	12	
106691629	DMPQ004AAA	AKM86	BP2 Circuit Pack§§	1	

Note:

COMMON LANGUAGE is a registered trademark and CLEI,CLLI, CLCI, and CLFI are trademarks of Bell communication Research, Inc.

- * The G2 shelf assembly differs from the G1 shelf assembly [rated Discontinued Availability (DA)] in having gold pins in the backplane behind the OLIU locations. The G3 shelf assembly is used in applications requiring compliance with FCC electromagnetic interference (EMI) regulations Part 15, Subpart J, Class A.
- † The MC90083A1B, MC90083A1C, or MC90083A1D PROCR2 provided extended memory for using DS1C and DS3U2 features. An MC90083A1C or later PROCR2 is required for performance monitoring (PM). An MC90083A1D or later PROCR2 is required to support the functions of the AEK38 DS2 INTFC1 and AKM5 DS3U1 packs. A Class A change replaced all MC90083A1D, Issue 3 and previous PROCR2 packs with MC90083A1D, Issue 4 PROCR2 packs. A Class A change replaced all MC90083A1E, Issue 1 PROCR2 packs with MC90083A1E, Issue 2 PROCR2 packs. An MC90083A1E or later PROCR2 is required for open network configurations using electrically configured shelves. MC90083A1D, Issue 4 and earlier PROCR2 packs can be upgraded to MC90083A1E, Issue 2 PROCR2 packs with an EPROM upgrade kit [ED-8C719-30, G4 (COMCODE 601324908)].
- ‡ The TLM2 circuit pack is required to implement the PM option.
- § 180 Mb/s operation requires two 20E OLIU4s or 20G OLIU5s or 20K OLIU7s in one shelf with both shelves cabled together.
- ¶ The AKM2B MXR2 is a lower power version of the AKM2 MXR1 with enhanced maintenance capabilities. An AKM2B or later MXR is required for DS1C operation with the AEK37 DS1C INTFC1. An AKM2C or later circuit pack is required to implement the PM option using a TLM2 pack.
- ** Only one DS3 channel per system may be equipped with AKM5 packs. (AKM5s are no longer used in 180 Mb/s systems.) A Class A change replaced all previous AKM5s with an AKM5 S3:3.
- †† The AEK36B-type and AEK36C DS1 INTFC2 packs are lower power versions of the AEK36 DS1 INTFC1. The PROCR2 can control the DS1 code settings on the AEK36B-type and AEK36C DS1 INTFC2 packs.
- ‡‡ The AEK39 BP1 provides a method of preventing crosstalk and reflections from entering the protection bus. Another method is to disconnect the cabling to unequipped slots. If this card is chosen, the sum of service low-speed circuit packs plus BP1 circuit packs should total seven per muldem.
- §§ An AKM86 BP2 pack is required in an optical shelf if only one muldem is equipped and the shelf contains MC90083A1D, Issue 3 or Issue 4, or MC90083A1E, Issue 1 or Issue 2, PROCR2 packs. In a 180 Mb/s system, an AKM86 BP2 pack is required in each shelf if only one muldem is equipped in each shelf.

Miscellaneous Equipment

DDM-1000 can be configured in many ways. Some of these configurations require miscellaneous equipment to complete the installation. Table 2-18 provides a list of this miscellaneous equipment.

Table 2-18. Miscellaneous Equipment

Item	Equipment Code or Commercial Code			COMCODE
	Height	Rear Access	Front Access	
Network Bay Frame	7 feet	ED-8C501-50,G1	ED-8C500-50,G1	—
	9 feet	ED-8C501-50,G2	ED-8C500-50,G2	
	11.5 feet	ED-8C501-50,G3	ED-8C500-50,G3	
Stile Cover Assemblies*	—			846108843
Stile Cover Brackets*	—			846170017
DDM-1000 Fan Assembly†	Complete Unit (ED-2C834-30, G1)			601065642
	Replacement Fan (WP-90798L1)			—
	Replacement Controller (WP-90798L2)			—
2A Fan Unit‡	—			104028758
111A Control Unit§	—			104409776
Fuse Alarm Adapter Board (FAAB)¶	—			105350839
Backplane Cover**	Cover			845763267
Heat Baffle Assembly	—			846012581
DDM-1000 Wire-Wrap Assembly	ED-2C843-30, G1			—
ESD Wrist Strap	EN 5616B from Semtronics or equivalent			093101970
TLM Slot Edge Protector††	—			405986670
EPROM Kits to Upgrade PROCR2 packs	ED-8C719-30, G4 Upgrade to MC90083A1E Iss 2			601324908
Alarm Isolation Unit (AIU)	Kit with AIU, cable, screws, retainers, and instruction sheet			406389528
Lightguide Connector Coupling	Multimode 1002A			103239836
	Multimode 1002AK			105264592
	Single-Mode 1012A			103878310
	Single-Mode 1012AK			105264642
Lightguide Cable Jumper	Multimode LA1A-()			—
	Multimode LA1K-K-()			—
	Single-Mode LS1A-()			—
	Single-Mode LS1K-K-()			—

See footnotes at end of Table.

Table 2-23. ED-2C833-20 180 Mb/s Cable Assemblies

Description	Rear Access	Front Access		DDM-1000 Backplane Connections
	963P1-16 and Unterminated	963P1-16 and 710-SD1-25	963P1-16 and KS-16690, L12	
180 Mb/s Intershelf Cable*	G17†, G18‡, G19‡ or G20‡	—	—	P39-P44

* Intershelf cables connecting two shelf assemblies for 180 Mb/s operation are 2 feet 11 inches long.

† The ED-2C833-20, G17 cable assembly consists of two shelf-to-shelf cables, one SRV and one PROTN. It is to be used for all 180 Mb/s DDM-1000 systems using the second generation ED-2C841-30, G2 or G3 shelf assemblies. These shelf assemblies have gold-plated pins and retainers, for use with the shelf-to-shelf cable assemblies, and have the corresponding plug numbers printed on the backplane.

‡ The earlier ED-2C841-30, G1 shelf assemblies may also be used for 180 Mb/s optical operation. They require different metalization in the shelf-to-shelf cable connectors. The intershelf cable assembly is selected according to the types of shelf assemblies to be interconnected and the location of the 180 Mb/s OLIUs. Each group number ordered includes two cable assemblies — one to connect the service OLIU slots on the backplane and the other for the protection OLIU slots. The cable assemblies are packed with installation templates and cable retainers as appropriate — no additional hardware is required. The following shows the cable assemblies to be used for the various possible configurations:

OLIU Assembly	Non-OLIU Assembly	Cable Code
ED-2C841-30, G2	ED-2C841-30, G2	ED-2C833-20, G17
ED-2C841-30, G3	ED-2C841-30, G3	ED-2C833-20, G17
ED-2C841-30, G1	ED-2C841-30, G1	ED-2C833-20, G18
ED-2C841-30, G1	ED-2C841-30, G2	ED-2C833-20, G19
ED-2C841-30, G2	ED-2C841-30, G1	ED-2C833-20, G20

Installation Kit

An installation kit is included with each DDM-1000 Shelf Assembly. Table 2-24 lists the items included in the kit.

Table 2-24. Installation Kit Contents

Qty.	Description	Function	COMCODE
1	Label	Office Records Label	845452259
1	Label	ESD (Warning) Label	845694983
1	KKL-8 Kwik Klip, Richco Plastics, Inc.	Clip to Secure Fiber Pigtales to Shelf	901005223
2	Plug	Spare Suitcase Plugs Cambridge Thermionics 461-2872-01-03-16	402200687
2	Berg Mini-Jump 65966-001	Jumper for Add/Drop Mode Selection	403763618
1	Berg 65771-001 Connector	Spare Jumpers	403574783
8	SPL HM SCR 0.216-24x1/4	Screws to Mount Shelf and Heat Baffle to Frame	801486341
5	T&B RB14-250A Flag Receptacle	Receptacle for Battery and Return Lugs	403062789
1	Cable Assembly	Rear Access Frame Ground	840456792
2	12-24x1/2 Pan Head Taptit Screws	Screws for Frame Ground	900020041
2	E.T.T. .475 Lockwasher	Washer for Frame Ground	801831496
1	I.T.T. .475 Lockwasher	Alternative Washer for Frame Ground	803881440
7	Cable Tie Mounting Pad	Backplane Cable Tie Pads for G3 EMC Shelf	403434830
7	Cable Tie	Backplane Cable Ties for G3 EMC Shelf	400718284

Test Equipment

No external test equipment is required for installation, maintenance, or operation of the DDM-1000. The DDM-1000 is equipped with built-in test signal generators and receivers that complete both shelf and system tests in a matter of minutes under control of the assembly processor. See Table 2-18 in this section for recommended LBOs for testing.

User's Manual

This DDM-1000 User's Manual is shipped with each DDM-1000 shelf assembly. Additional manuals may be ordered as AT&T 363-206-100. See the Ordering section at the front of this Manual.

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DS1 INTFC1 (AEK36)

Several option switches are provided on the DS1 INTFC1 pack to control the electronic line build-out (LBO) function and the pulse format (Figure 3-3). The LBO switches are set based on the length of cable from the DDM-1000 to the DSX-1 (Table 3-4). The pulse format switches are set to either alternate mark inversion (AMI) or B8ZS on a per channel basis (Table 3-5).

Table 3-4. DS1 INTFC1 (AEK36) LBO DIP Switch Settings

LBO Selection

Cable Length (ft)	Sec. 1	Sec. 2	Sec. 3	Sec. 4	Sec. 5
0 to 133	Closed	Open	Open	Open	Open
>133 to 267	Open	Closed	Open	Open	Open
>267 to 400	Open	Open	Closed	Open	Open
>400 to 533	Open	Open	Open	Closed	Open
>533 to 655	Open	Open	Open	Open	Closed

Table 3-5. DS1 INTFC1 (AEK36) Pulse Format DIP Switch Settings

Pulse Format Selection

Pulse Format	Sec. 6 Chan. 1	Sec. 7 Chan. 2	Sec. 8 Chan. 3	Sec. 9 Chan. 4
AMI	Closed	Closed	Closed	Closed
B8ZS	Open	Open	Open	Open

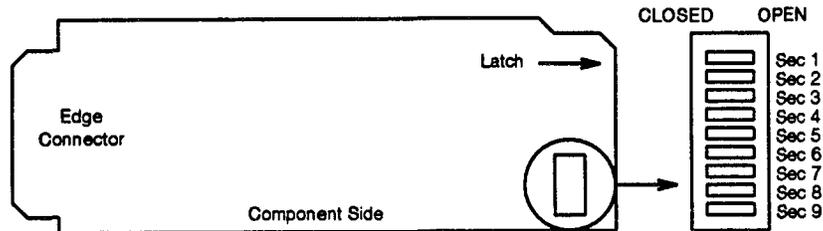


Figure 3-3. DS1 INTFC1 (AEK36) Option Switches

The switches are set by depressing the rocker or moving the slide toward the desired side. For example, to set Chan 1 to AMI code, depress Sec 6 toward the side labeled "CLOSED" in the figure above.

DS1 INTFC2 (AEK36B-Types and AEK36C)

Several option switches are provided on the DS1 INTFC2 packs to control the electronic line build-out function and the pulse format (see Figure 3-4 and) Figure 3-5. The LBO switches are set based on the length of cable from the DDM-1000 to the DSX-1 (Table 3-6). The pulse format switches are set to either AMI or B8ZS on a per channel basis (Table 3-7). Note that switch section 8 is not used. The pulse format on the DS1 INTFC2 packs may also be selected using an ASCII terminal. See description of the "set-dsx-code:" command in the "Commands and Reports" section of this manual.

Table 3-6. DS1 INTFC2 (AEK36B-Types and AEK36C) LBO DIP Switch Settings — LBO Selection

Cable Length (ft)	Sec. 1	Sec. 2	Sec. 3
0 to 133	Open	Open	Open
>133 to 267	Open	Open	Closed
>267 to 400	Open	Closed	Open
>400 to 533	Open	Closed	Closed
>533 to 655	Closed	Open	Open

Table 3-7. DS1 INTFC2 (AEK36B-Types and AEK36C) Pulse Format DIP Switch Settings — Pulse Format Selection

Pulse Format	Sec. 4 Chan. 1	Sec. 5 Chan. 2	Sec. 6 Chan. 3	Sec. 7 Chan. 4
AMI	Closed	Closed	Closed	Closed
B8ZS	Open	Open	Open	Open

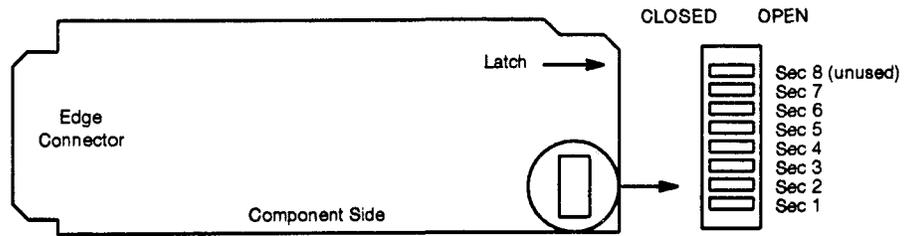


Figure 3-4. DS1 INTFC2 (AEK36B) Option Switches with Option Switch Location

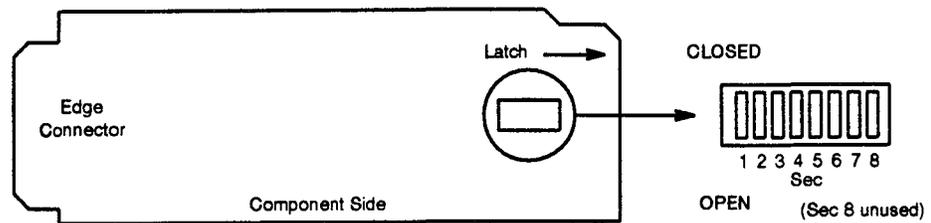


Figure 3-5. DS1 INTFC2 (AEK36B S1:2, S1:3, S1:4 and AEK36C) Option Switches with Option Switch Location

The switches are set by moving the slide toward the desired side. For example, to set Chan 1 to AMI code, slide Sec 4 toward the side labeled "CLOSED" in the figure above.

DS1C INTFC1 (AEK37)

Several option switches are provided on the DS1C INTFC1 pack to control the electronic line build-out function and the pulse format (Figure 3-6). The LBO switches are set based on the length of cable from the DDM-1000 to the DSX-1C (Table 3-8). The pulse format switches are set to either AMI or B8ZS on a per channel basis (Table 3-9). Note that switch section 8 is not used.

Table 3-8. DS1C INTFC1 (AEK37) LBO DIP Switch Settings

LBO Selection

Cable Length (ft)	Sec. 1	Sec. 2	Sec. 3	Sec. 4	Sec. 5
0 to 133	Closed	Open	Open	Open	Open
>133 to 267	Open	Closed	Open	Open	Open
>267 to 400	Open	Open	Closed	Open	Open
>400 to 533	Open	Open	Open	Closed	Open
>533 to 655	Open	Open	Open	Open	Closed

OLIU (All 16-Type OLIUs)

Each OLIU pack has an option switch to adjust the output power of the laser (Figure 3-12). This switch is set based on the optical signal loss from the transmit plug to the receive plug (optical facility loss). Table 3-17 lists the switch points for the various combinations of transmitters and receivers. Table 3-18 specifies attenuators that can be used to insert at the receive end of the fiber to build out facility losses between 0 dB and the minimum losses specified under the LW switch settings.

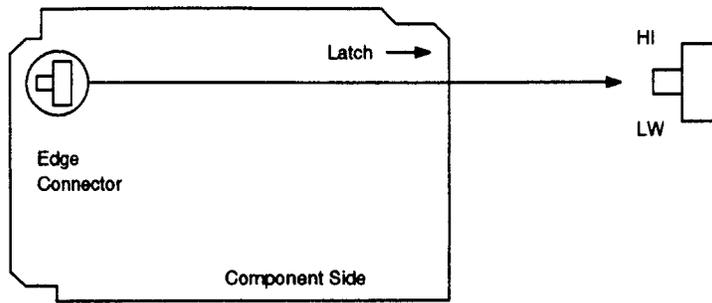
Table 3-17. OLIU (16-Type) Output Level Setting Option Switch

Transmitter	Receiver	Transmitter Switch	
		LW	HI
		Facility Loss	
16E or 16F	16E	0 to 9 dB	9 to 18.0 dB
16E or 16F	16E2, or 16F2	0 to 11 dB	11 to 23.0 dB
16E or 16F	16F, 16G or 16K	0 to 11 dB	11 to 22.5 dB
16E2	16E	0 to 9 dB	9 to 17.5 dB
16E2	16E2 or 16F2	0 to 11 dB	11 to 22.5 dB
16E2	16F, 16G, or 16K	0 to 11 dB	11 to 22.0 dB
16F2	16E	8 to 15 dB	15 to 23.9 dB
16F2	16E2 or 16F2	0 to 15 dB	15 to 28.9 dB
16F2	16F, 16G, or 16K	8 to 15 dB	15 to 28.4 dB
16G	16E	7 to 15 dB	15 to 24.0 dB
16G	16E2 or 16F2	0 to 11 dB	11 to 29.0 dB
16G	16F, 16G or 16K	7 to 15 dB	15 to 28.5 dB
16K	16E	13 to 21 dB	21 to 30.0 dB
16K	16E2 or 16F2	7 to 15 dB	15 to 35.0 dB
16K	16F, 16G, or 16K	13 to 22 dB	22 to 34.5 dB

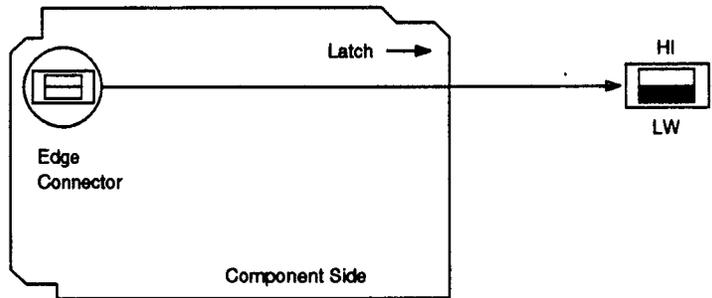
Table 3-18. Attenuators

In-Line Type		Barrel Build-Outs	
SM to MM (Note)	MM to MM	SM to MM	MM to MM
602A 3 dB	502A 5 dB	601A1 3 dB	501A1 5dB
602B 5 dB	502B 7 dB	601B1 5 dB	501B1 7dB
602C 7 dB	502C 9 dB	601C1 7 dB	501C1 9dB
602D 9 dB	502D 11 dB	601D1 9 dB	501D1 11dB
602E 11 dB	502E 13 dB	601E1 11 dB	501E1 13dB
602F 14.5 dB	502F 15 dB	601F1 14.5 dB	501F1 15dB

Note: SM - single-mode MM - multimode



A. OLIU 16E, 16F, 16G or 16K



B. OLIU 16E2 or 16F2

Figure 3-12. OLIU (All 16-Type) Option Switches

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OLIU (20E, 20G or 20K)

Each 20-type OLIU is equipped with an option switch to adjust the output power of the laser (Figure 3-13). This switch is set based on the optical signal loss from the transmit plug to the receive plug (optical facility loss). Table 3-19 lists the OLIU switch settings for the indicated facility loss. Table 3-20 specifies attenuators that can be used to insert at the receive end of the fiber to build out facility losses between 0 dB and the minimum losses specified under the LW switch settings.

Each 20-type OLIU is also equipped with a toggle switch, located under the ejector lever, to permit each of the two DDM-1000 assemblies to control the appropriate LED on the faceplate of the OLIU (Figure 3-14). The switch is in the "up" position if the upper assembly is the OLIU assembly and in the "down" position if the lower assembly is the OLIU assembly.

Table 3-19. OLIU (20-Type) Output Level Setting Option Switch

Transmitter	Receiver	Transmitter Switch	
		LW	HI
		Facility Loss	
20E	20E	0 to 9.0 dB	9 to 15.0 dB
20E	20G or 20K	4.3 to 14.8 dB	14.8 to 20.8 dB
20G	20E	7 to 14.5 dB	14.5 to 20.7 dB
20G	20G or 20K	10 to 20.5 dB	20.5 to 26.5 dB
20K	20E	10 to 17.5 dB	17.5 to 24.0 dB
20K	20G or 20K	13 to 23.5 dB	23.5 to 29.8 dB
20E	20G or 20K	4.3 to 14.8 dB	14.8 to 20.8

Table 3-20. Attenuators

In-line type		Barrel Build-outs	
SM to MM (Note)	MM to MM	SM to MM	MM to MM
602A 3 dB	502A 5 dB	601A1 3 dB	501A1 5dB
602B 5 dB	502B 7 dB	601B1 5 dB	501B1 7dB
602C 7 dB	502C 9 dB	601C1 7 dB	501C1 9dB
602D 9 dB	502D 11 dB	601D1 9 dB	501D1 11dB
602E 11 dB	502E 13 dB	601E1 11 dB	501E1 13dB
602F 14.5 dB	502F 15 dB	601F1 14.5 dB	501F1 15dB

Note: SM - single-mode MM - multimode

Specification Summary

The DS1, DS1C, DS2, and DS3 interfaces of DDM-1000 conform to the North American standards for the digital hierarchy and specifically to Bell Communications Research Technical Advisory TR-TSY-000009.

DS1 Interface

Number of LinesUp to 56 per shelf
Data Rate1.544 Mb/s \pm 130 ppm asynchronous
Line Code (#1)Bipolar (Alternate Mark Inversion)
Line Code (#2)Bipolar 8 Zero Substitution (B8ZS)
Line Impedance100 ohms \pm 5% balanced
JitterThe multiplexer will add not more than 0.3 time slot
of rms jitter (<1 unit interval p/p) to a
DS1 signal when looped at the DS3 point.
Maximum Distance to Cross-Connect.....200 m (655 ft)

DS1C Interface

Number of LinesUp to 28 per shelf
Data Rate3.152 Mb/s \pm 30 ppm
FormatDS1C Mode 2
Line Code (#1)Scrambled Bipolar (Alternate Mark Inversion)
Line Code (#2)Bipolar 8 Zero Substitution (B8ZS)
Line Impedance100 ohms \pm 5% balanced
Maximum Distance to Cross-Connect.....200 m (655 ft)

DS2 Interface

Number of LinesUp to 14 per shelf
Data Rate6.312 Mb/s \pm 30 ppm
Line CodeBipolar 6 Zero Substitution (B6ZS)
Line Impedance110 ohms \pm 5% balanced
Maximum Distance to Cross-Connect.....320 m (1050 ft)

DS3 Interface

Number of Lines2 per shelf
Data Rate44.736 Mb/s \pm 20 ppm asynchronous
Line CodeBipolar 3 Zero Substitution (B3ZS)
Line Impedance75 ohms \pm 5% unbalanced
Maximum Distance to Cross-Connect with 728B or 734A cable....137.2 m (450 ft)
Maximum Distance to Cross-Connect with mini-coax cable45.7 m (150 ft)

90 Mb/s Optical Interface

Bit Rate.....89.472 Mb/s
Line CodeScrambled NRZ

Table 3-45 lists the 16-type OLIU loss budget parameters.

Table 3-45. DDM-1000 16-Type OLIU Loss Budget Parameters

Parameter	16E OLIU	16F OLIU	16G OLIU	16K OLIU
Wavelength	1305 ±20 nm	1305 ±20 nm	1305 ±20 nm	1305 ±20 nm
Type of TX	Single Mode	Single Mode	Single Mode	Single Mode
TX Output Power-HI*	-10.0 dBm ±1dB	-10.0 dBm ±1dB	-4.0 dBm ±1dB	+2.0 dBm ±1dB
TX Output Power-LW*	-16.0 dBm ±1dB	-16.0 dBm ±1dB	-10.0 dBm ±1dB	-4.0 dBm ±1dB
RX Sensitivity for BER=10 ⁻⁹ †	-34.5 dBm	-39.0 dBm	-39.0 dBm	-39.0 dBm
Max. RX Input Power	-14.5 dBm	-14.5 dBm	-14.5 dBm	-14.5 dBm
Available System Gain‡	24.5 dB	29.0 dB	35.0 dB	41.0 dB
Eye Margin	3.5 dB	3.5 dB	3.5 dB	3.5 dB
Equipment Margin	3.0 dB	3.0 dB	3.0 dB	3.0 dB
Maximum Facility Loss	18.0 dB	22.5 dB	28.5 dB	34.5 dB
Minimum Facility Loss	0 dB	0 dB	7.0 dB	13.7 dB
Max. Connector Loss (Two)	1.5 dB	1.5 dB	1.5 dB	1.5 dB
Operating Temp. Range	0°C to +50°C	-40°C to +75°C	-40°C to +75°C	-40°C to +75°C
Single-Mode Fiber				
Outside Plant Budget (1305 ±30 nm)	16.5 dB	21.0 dB	27.0 dB	33.0 dB
Span Length§	29.9 km (18 mi)	45.5 km (28.3 mi)	58.9 km (36.6 mi)	73.2 km (45.3 mi)
Multimode Fiber				
Dispersion and Modal Noise Allocation¶	3 dB	3 dB	3 dB	3 dB
Outside Plant Budget (1305 ±30 nm)	13.5 dB	18.0 dB	24.0 dB	30.0 dB
Span Length**	13.5 km (8.37 mi)	18.0 km (11.0 mi)	24.0 km (14.8 mi)	30.0 km (18.6 mi)

See footnotes at end of table.

Table 3-45. DDM-1000 16-Type OLIU Loss Budget Parameters (Contd)

Parameter	16E2 OLIU	16F2 OLIU
Wavelength	1305 ±20 nm	1305 ±20 nm
Type of TX	Single Mode	Single Mode
TX Output Power-HI*	-10.5 dBm ±1dB	-4.1 dBm ±1dB
TX Output Power-LW*	-15.5 dBm ±1dB	-9.1 dBm ±1dB
RX Sensitivity for BER=10 ⁻⁹ †	-39.5 dBm	-39.5 dBm
Max. RX Input Power	-7.0 dBm	-7.0 dBm
Available System Gain‡	29.0 dB	35.4 dB
Eye Margin	3.5 dB	3.5 dB
Equipment Margin	3.0 dB	3.0 dB
Maximum Facility Loss	22.5 dB	28.9 dB
Minimum Facility Loss	0 dB	0 dB
Max. Connector Loss (Two)	1.5 dB	1.5 dB
Operating Temp. Range	-40°C to +75°C	-40°C to +75°C
Single-Mode Fiber		
Outside Plant Budget (1305 ±30 nm)	21.0 dB	27.4 dB
Span Length§	46.8 km (29 mi)	60.8 km (37.7 mi)
Multimode Fiber		
Dispersion and Modal Noise Allocation¶	3 dB	3 dB
Outside Plant Budget (1305 ±30 nm)	18.0 dB	24.4 dB
Span Length**	18.0 km (11.0 mi)	24.4 km (15.0 mi)

* The output power of the optical transmitter (TX) should be measured at the biconic connector at the end of the transmitter pigtail. The power outputs shown in this table are guaranteed values when the transmitter is new. The numbers are based on measurements with a power meter calibrated against the AT&T-TS-RD standard power meter, which can be traced to the National Bureau of Standards. The DDM-1000 TX has a 6 dB switch; power output may be selected as HI or LW based on the installed cable loss.

† To obtain receiver (RX) sensitivity for other BER, use the following corrections:

- From 10⁻⁷ to 10⁻⁸, increase signal level 0.32 dB
- From 10⁻⁸ to 10⁻⁹, increase signal level 0.31 dB
- From 10⁻⁹ to 10⁻¹⁰, increase signal level 0.23 dB

Table 3-45. DDM-1000 16-Type OLIU Loss Budget Parameters (Contd)

- ‡ The available system gain is the transmitter power minus the receiver sensitivity. The facility loss includes 3.5 dB for eye degradation (optical receiver variation from ideal) and 3.0 dB for OLIU equipment degradation. Temperature and aging degradations have been included in the OLIU equipment margin of 3.0 dB. The equipment margin for the transmitter is 2.0 dB. The equipment margin for the receiver is 1.0 dB. The loss of two optical connectors is 1.5 dB. This is usually referenced out in a fiber insertion loss measurement; therefore, a span that meets the "Outside Plant Budget" measurement should meet the "Facility Loss" requirement. DP-424 in the "Installation and Maintenance" section contains details on minimum and maximum facility losses with combinations of OLIUs.
- § Assumes 0.55 dB/km cable plus splice loss (medium loss single-mode fiber) for the 16E and 16E2 and 0.45 dB/km cable plus splice loss (low loss single-mode fiber) for the 16F, 16F2, 16G, and 16K.
- ¶ Assumes 90 MHz end-to-end fiber bandwidth. For 70 MHz bandwidth, increase dispersion and modal noise allocation to 4 dB, decrease outside plant budget 1 dB, and reduce span length by 1 km.
- ** Assumes 1.0 dB/km average cable plus splice loss (medium loss multimode fiber).

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180 Mb/s Optical Interface

Bit Rate178.944
Line CodeScrambled NRZ

Table 3-46 lists the 20-type OLIU loss budget parameters.

Table 3-46. DDM-1000 20-Type OLIU Loss Budget Parameters

Parameter	20E OLIU	20G OLIU	20K OLIU
Wavelength	1305 ±20 nm	1305 ±20 nm	1305 ±20 nm
Type of TX	Single-Mode	Single-Mode	Single-Mode
TX Output Power-HI*	-7 dBm ±1 dB	-1.3 dBm ±1 dB	+2.0 dBm ±1 dB
TX Output Power-LW*	-13 dBm ±1 dB	-7.3 dBm ±1 dB	-4.0 dBm ±1 dB
RX Sensitivity for BER=10 ⁻⁹ †	-29.0 dBm	-34.8 dBm	-34.8 dBm
Max. RX Input Power	-12.3 dBm	-15.3 dBm	-15.3 dBm
Available System Gain‡	22.0 dB	33.5 dB	36.8 dB
Eye Margin	3.5 dB	3.5 dB	3.5 dB
Equipment Margin	3.5 dB	3.5 dB	3.5 dB
Maximum Facility Loss	15.0 dB	26.5 dB	29.8 dB
Minimum Facility Loss	0 dB	10.0 dB	13.3 dB
Max. Connector Loss (Two)	1.5 dB	1.5 dB	1.5 dB
Operating Temp. Range	0° C to +50° C	-40° C to +75° C	-40° C to +75° C
Single-Mode Fiber			
Outside Plant Budget (1305 ±30 nm)	13.5 dB	25.0 dB	28.3 dB
Span Length§	30.0 km (18.6 mi)	55.5 km (34.5 mi)	62.8 km (39 mi)
Multimode Fiber¶			

* The output power of the optical transmitter (TX) should be measured at the biconic connector at the end of the transmitter pigtail. The power outputs shown in this table are guaranteed values when the transmitter is new. The numbers are based on measurements with a power meter calibrated against the AT&T-TS-RD standard power meter, which can be traced to the National Bureau of Standards. The DDM-1000 TX has a 6 dB switch; power output may be selected as HI or LW based on the installed cable loss.

† To obtain receiver (RX) sensitivity for other BER, use the following corrections:

- From 10⁻⁷ to 10⁻⁸, increase signal level 0.32 dB
- From 10⁻⁸ to 10⁻⁹, increase signal level 0.31 dB
- From 10⁻⁹ to 10⁻¹⁰, increase signal level 0.23 dB

NAME

rept-stat-protn: list the current protection status

SYNOPSIS

rept-stat-protn:[m=c] {[s=x]} [e=y]

DESCRIPTION

REPT-STAT-PROTN gives the protection status of the DDM-1000. If the information does not fit in the display window, then it is scrolled out as described in the generic description.

The report lists specific information about the high-speed (on SRV or on PROTN, no lock or locked) and low-speed (no switch or switched to PROTN, no locks or individual locks, no loops or individual loops) switch status for both muldem A and B. In addition, if a switch or lock exists, the origin of the request (AUTO or NE or FE or TLM) is given. In 180 Mb/s configurations, the optical line protection status (switched/unswitched, locked/unlocked) will be reported individually for each of the two assemblies.

The parameters are defined below:

- | | |
|------------|---|
| m=c | Identifies the muldem within a shelf for this command. The value of <i>c</i> is either a for muldem A, b for muldem B, or ab (default) for both muldems A and B. |
| s=x | Identifies the shelf for this command. If there is only one shelf in the bay, this entry is optional and the default value is 1. If there is more than one shelf in the bay, then the value of <i>x</i> is from 1 to 8 and is required. |
| e=y | Identifies the system end for this command. The value of <i>y</i> is either n for the near end (default) or f for the far end. |

NAME

set-dsx: set cross-connect options

SYNOPSIS

set-dsx-alm:[m=c] {[s=x]} [e=y] {no | mn | mj | cr} {ds3} for framed DS3

set-dsx-alm:[m=c] {[s=x]} [e=y] {no | mn | mj | cr} [ls=r-rl]

set-dsx-code:[m=c] {[s=x]} [e=y] {no | ami | b8zs} [ls=r-rl]

set-dsx-l6mb:[m=c] {[s=x]} [e=y] {led lno | mn | mj | cr} for DS3 AIS

set-dsx-16mb:[m=c] {[s=x]} [e=y] {led lno | mn | mj | cr}

set-dsx-mon:[m=c] {[s=x]} [e=y] {no | yes-high | yes-low} {ds3}

set-dsx-mon:[m=c] {[s=x]} [e=y] {no | yes-high | yes-low} [ls=r-rl]

DESCRIPTION

SET-DSX is used to specify characteristics of the cross-connect inputs and outputs. The alarm and switch algorithms for the circuit packs associated with these signals are determined from this list of characteristics. Either an l6mb or 16mb entry is acceptable since an "l" (el) and 1 (one) are easily mistaken for each other.

This series of "set" commands allows the shelf to be provisioned (soft set) via an ASCII terminal. In some cases the settings will be affected by a "reset." In all PROCR2 versions, "set-dsx-code:" parameters are not affected by a "reset." In all PROCR versions prior to MC90083A1E, all other non service-affecting "set" parameters will be returned to default values by a reset. In MC90083A1E PROCR2 packs, an option is provided to save the soft set parameters during a "reset." See the "exct-reset:" command description in this section and DP-404 in the Installation and Maintenance section of this manual.

set-dsx-alm: specifies whether a low-speed input is to be alarmed (default is no), and if a DS3 input is to be alarmed other than MJ (default).



CAUTION:

This command may be service affecting. If optional parameters are not set properly, the default value may cause service interruption.

set-dsx-code: specifies the coding type (AMI/B8ZS) to be selected on AEK36B-type and AEK36C DS1 INTFC2 circuit packs. If specified for first generation (AEK36 DS1 INTFC1) circuit packs while using a PROCR2, the command is rejected and a diagnostic message appears on the ASCII terminal

screen. If a PROCR1 and either an AEK36, AEK36B-type, or an AEK36C is used, no diagnostic message will appear. **In both cases, the "rept-opt-dsx:" command will show the code format changed but the format did not actually change.** The coding type command operates on inputs even if they are not monitored or are not present. This command is not applicable to the DS3 signal.

Channel formats may be determined in two ways: manual switch setting and using this command from an ASCII terminal. When the channel formats are determined solely by the switch option on the low-speed packs, the format is unaffected by "reset", "rst", processor replacement, low-speed pack replacement, or loss of power to the shelf. But when the channel formats are set using this ASCII terminal command (soft set) the system relies on electronic memory instead of hardware (switch) memory to determine the channel formats.

MC90083A1C and later PROCR2

In MC90083A1C and later, PROCR2s, soft set channel formats will remain unchanged for the following:

- If a PROCR2 is "reset" or restarted ("rst").
- If a low-speed pack is replaced and the same PROCR2 is used.
- If a new PROCR2 is installed and a "reset" is done, which causes the PROCR to learn the current channel line code settings.
- If power is lost to the shelf, the PROCR2 stores channel provisioning in nonvolatile memory and restores the contents to the pack when power is restored.

Manually setting the channel formats requires the circuit pack to be switched to protection, removed, switches set, the pack reinserted, and then switched back to service. Each switch to protection causes a "hit" on all four channels. Soft setting the channel formats does not cause any "hits" on the other service channels within the DS1 pack.

When using manual switch settings to determine channel formats, as each low-speed pack is installed the PROCR2 learns the code format from the switch settings and adds them to its inventory list. Later, if you decide to change the format, you must remove the pack, reset the switches, reinsert the pack, and do a "rst" to update the processor inventory. If you don't do a "rst", then the transmission format *will* be changed but the PROCR2 won't know it. If the processor doesn't know the format, the low-speed protection pack cannot be automatically formatted when a protection switch is required, and the response from the command "rept-opt-dsx:" will be wrong.

If you prefer to soft set channel formats using "**set-dsx-code:**", it is recommended that they always be set this way to avoid confusion, because the channel formats may be provisioned opposite to the switch setting. **Once the channel is "soft set", future switch setting changes will have no effect.**

In MC90083A1C and MC90083A1D PROCR2 versions, soft sets may be cleared in three ways:

1. The preferred way to clear soft sets is to use the command "**set-dsx-code:no.**" The "**set-dsx-code:no.**" command will override channel code format soft sets and restore the channel transmission to the code format switch settings. However, on the MC90083A1C and MC90083A1D PROCR2 packs, subsequent switch changes will not be effective unless the soft set history is removed from the low-speed pack with the "**exct-reset:**" command.

2.



CAUTION:

The "reset" will cause some previously soft-set shelf parameters to be erased and restored to their default values. Check office records and use other commands (for example, rept-opt-shelf:) to determine other shelf parameters that may be set.

Use the command "**rept-opt-dsx:**" to determine the code format setting. Remove the low-speed pack and set the code format switches to agree with the setting shown on the terminal. Reseat the pack and execute the command "**exct-reset:**". This action will remove the soft set history from that pack and allow the switches to control the code format.

3.



CAUTION:

Service must be removed from the pack, not protection switched. If switched to protection and "rst" is done with the service pack removed, the PROCR2 will drop the service pack from its inventory and the protection switch will be dropped.

The least preferred way to clear "soft sets" is to remove service from the low-speed pack, remove the pack, do an "rst" to remove the pack from the PROCR2 inventory, and then reseat the pack. The PROCR2 learns the switch settings and the soft-set history is gone.

Introduction

This section presents examples of the DDM-1000 report commands and the reports they generate under normal and failure conditions. All the examples were generated by a system configured for end-to-end 90-Mb/s optical operation. Some of the reports generated by add/drop configurations and by electrical and 180-Mb/s optical systems will differ in some areas. However, the examples given here represent most of the messages encountered in normal operations.

For each example, a synopsis of the command is given listing optional arguments in square brackets ([]). Where an argument is used to pass a parameter, a prototype name for the parameter is given in italics. The examples are arranged in alphabetical order by command name. In some cases, several examples of the same command have been included to show the use of optional arguments.

The configuration selected for the examples illustrates a mixture of DS1, DS1C, and DS2 interfaces, as well as the optional telemetry circuit pack. The example system was equipped as follows:

- **Muldem A**
 - **Low-Speed Interfaces**
AEK36, AEK36B-type, or AEK36C packs in slots 1 through 5 and slot 8 (protection)
AEK39 BP1 packs in slots 6 and 7; slot 9 unequipped
 - **Function Units**
AKM2B MXR2 or AKM2C MXR3 packs in both SRV(A) and PROTN(A) slots

- **Muldem B**
 - **Low-Speed Interfaces**
AEK37 DS1C INTFC1 packs in slots 1 through 3 and slot 8 (protection)
AEK38 DS2 INTFC1 packs in slots 4 and 9 (protection)
AEK39 BP1 packs in slots 5, 6, and 7
 - **Function Units**
AKM2B MXR2 or AKM2C MXR3 packs in both SRV(B) and PROTN(B) slots

- **Common**
 - **Controller**
MC90083A1D PROCR2 pack
 - **Telemetry Unit**
AKM4 TLM1 pack

- **Optical Line Interfaces**
16G OLIU packs in SRV and PROTN Optical Line Interface Unit slots

- **Power Units**
547A PWR1 units (-48 volts) in SRV and PROTN

Clear MJ (MAJOR) or CR (Critical) Alarm

1. **Caution:** *Whenever working with the DDM-1000 you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.*
2. Is the **MJ** LED on the **PROCR** or the **CR** LED on the **AKM4 TLM1** lighted?
If **YES**, then continue with **Step 3**.
If **NO**, then proceed to **Step 19**.
3. On the **PROCR** momentarily depress the **ACO/TEST** pushbutton.
Response: The audible alarm is silenced.
4. On the **PROCR** is the **NE** LED lighted?
If **YES**, then continue with **Step 5**.
If **NO**, then proceed to **Step 11**.
5. Is the **ALM** LED on the faceplate of one or more plug-ins flashing?
If **YES**, then continue with **Step 6**.
If **NO**, then proceed to **Step 17**.
6. Find the plug-in(s) with the flashing LED(s) in **Table A** below and go to the indicated step.

Table A. Plug-in With Flashing LED

Plug-in With Flashing LED	Go To
AEK36-type DS1 INTFC1	Step 7
AEK37 DS1C INTFC1	Step 7
AEK38 DS2 INTFC1	Step 7
AKM2 MXR1 (SRV or PROTN)	Step 9
AKM2B MXR2 (SRV or PROTN)	Step 9
AKM2C MXR3 (SRV or PROTN)	Step 9
AKM5 DS3U1 (SRV or PROTN)	Step 9
AKM6 DS3U2 (SRV or PROTN)	Step 9
OLIU	Step 17

7. Issue a trouble report of a bad incoming signal at the input to the **LS INTFC(s)** with the flashing LED(s).
8. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
9. Issue a trouble report of a bad incoming DS3 signal from the DSX-3 cross-connect.

If using an MC90083A1E PROCR2 or later, the flashing LED could be caused by an incoming DS3 AIS (I6mb) signal. This may be verified by using an ASCII terminal and the **rept-fail:** command.

10. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
11. On the **PROCR**, is the **FE** LED lighted?
If **YES**, then continue with **Step 12**.
If **NO**, then proceed to **Step 19**.
12. Is an ASCII terminal (extended craft interface) available?
If **YES**, then continue with **Step 13**.
If **NO**, then proceed to **Step 15**.
13. Refer to **TP-107** and use the ASCII terminal to further isolate and clear the alarm condition.
14. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
15. Issue a trouble report of a major or critical alarm condition at the far-end DDM-1000 terminal.
16. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
17. **Note:** There is a multiple failure condition.

Refer to **TP-103** to clear the multiple failure.
18. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
19. **Note:** There is an inconsistent combination of alarms and diagnostic indications.

Refer to **TP-108** and determine the true status of the system.
20. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Clear MN (Minor) Alarm

1. **Caution 1:** *Whenever working with the DDM-1000 you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.*

Caution 2: *When removing service function unit and service OLIU circuit packs, if an ASCII terminal is available, use the command "exct-sw-hs:s=() make" to switch service to the protection pack not being removed, then use the command "exct-lock-hs:s=() make" to lock service onto protection pack. To remove the lock use the command "exct-lock-hs:s=() break".*

2. On the **PROCR**, is the **MN** LED lighted?
If **YES**, then continue to **Step 3**.
If **NO**, then proceed to **Step 58**.
3. On the **PROCR**, momentarily depress the **ACO/TEST** pushbutton.
Response: The audible alarm is silenced.
4. On the **PROCR**, is the **NE** LED lighted?
If **YES**, then continue to **Step 5**.
If **NO**, then do **Step 27**.
5. Is the **ALM** LED on the faceplate of one and only one plug-in of the **DDM-1000** lighted (not flashing)?
If **YES**, then continue to **Step 6**.
If **NO**, then do **Step 10**.
6. **Caution:** *Replacement plug-ins may have option switches which must be properly set before the plug-in is installed.*

Refer to **DP-417** and replace the plug-in with the lighted **ALM** LED.
7. On the **PROCR**, is the **MN** LED off?
If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE**.
If **NO**, then continue to **Step 8**.

8. Is the **ALM** LED lighted on the faceplate of the replacement plug-in just installed?
If **YES**, then continue to **Step 9**.
If **NO**, then return to **Step 4**.
9. The failure is not in the plug-in just replaced. Refer to **TP-106** to isolate and clear the failure. Do **NOT** return to this procedure.
10. Is the **ALM** LED on the faceplate of one or more plug-ins flashing?
If **YES**, then continue to **Step 11**.
If **NO**, then do **Step 33**.
11. Find the plug-in(s) with the flashing LED(s) in **Table A** below and go to the indicated step.

Table A. Plug-in With Flashing LED

Plug-in With Flashing LED	Go To
AEK36-type DS1 INTFC1	Step 12
AEK37 DS1C INTFC1	Step 12
AEK38 DS2 INTFC1	Step 12
AKM2 MXR1 (SRV or PROTN)	Step 16
AKM2B MXR2 (SRV or PROTN)	Step 16
AKM2C MXR3 (SRV or PROTN)	Step 16
AKM5 DS3U1 (SRV or PROTN)	Step 16
AKM6 DS3U2 (SRV or PROTN)	Step 16
OLIU	Step 18

12. There is an incoming LS signal failure. This failure can be further isolated using an ASCII terminal.

Is an ASCII terminal (extended craft interface) available?
If **YES**, then continue to **Step 13**.
If **NO**, then do **Step 14**.
13. Refer to the "Commands and Reports" section of this manual under REPT-FAIL and use the command **rept-fail-dsx:** to isolate the particular incoming signal failure.

Clear Trouble Report

1. **Caution:** *Whenever working with the DDM-1000, you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.*
2. Is the **MJ** LED on the **PROCR** or the **CR** LED on the **AKM4 TLM1** (if installed) lighted?
 If **YES**, then continue to **Step 3**.
 If **NO**, then do **Step 5**.
3. Refer to **TP-101** and clear the Major or Critical Alarm condition.
4. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
5. Is the **MN** LED on the **PROCR** lighted?
 If **YES**, then continue to **Step 6**.
 If **NO**, then do **Step 8**.
6. Refer to **TP-102** and clear the Minor Alarm condition.
7. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
8. Is the **ALM** LED on the faceplate of an **LS INTFC** plug-in (**AEK36-type DS1 INTFC**, **AEK37 DS1C INTFC1**, or **AEK38 DS2 INTFC1**) flashing?
 If **YES**, then continue to **Step 9**.
 If **NO**, then do **Step 11**.
9. There appears to be an incoming low speed signal failure. Refer to **TP-110** and clear the condition.
10. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
11. Is the **ALM** LED on the faceplate of any plug-in in the **DDM-1000** lighted (not flashing)?
 If **YES**, then continue to **Step 12**.
 If **NO**, then do **Step 14**.

12. **Note:** There is an inconsistent combination of alarms and diagnostic indications.

Refer to **TP-108** and determine the true status of the system.

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

14. Refer to **DP-403** and perform an LED test.

15. Did all the plug-ins pass the LED test?

If **YES**, then continue to **Step 16**.

If **NO**, then do **Step 18**.

16. **Note:** The DDM-1000 appears to be operating correctly with no failures present.

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

18. Refer to **DP-417** and replace the plug-in that failed the LED test.

19. Repeat the LED test.

20. Did all the plug-ins pass the LED test?

If **YES**, then continue to **Step 21**.

If **NO**, then do **Step 22**.

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

22. **Note:** The failure is not in the plug-in just replaced.

Refer to **TP-106** to isolate and clear the failure.

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

Isolate and Clear Failure

1. **Caution:** *Whenever working with the DDM-1000, you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.*
2. **Note:** It is assumed that the ALM LED on a plug-in is lighted or that the plug-in has failed an LED test. It is further assumed that replacing the plug-in did not clear the problem.
3. Is the plug-in with the lighted LED an LS INTFC (AEK36-type DS1 INTFC, AEK37 DS1C INTFC1, or AEK38 DS2 INTFC1)?
If YES, then continue to **Step 4**.
If NO, then do **Step 6**.
4. Refer to **DP-417** and replace the **MXR()** in the **SRV** location for the muldem (**A** or **B**) containing the LS INTFC with the lighted LED.
5. Is the **ALM** LED on the affected LS INTFC plug-in still lighted?
If YES, then continue to **Step 6**.
If NO, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
6. **Caution:** *Replacing the PROCR involves updating the internal memory on the plug-in. DP-404 describes this procedure.*

Refer to **DP-404** and replace the **PROCR**.
7. Is the **ALM** LED on the affected plug-in still lighted?
If YES, then continue to **Step 8**.
If NO, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
8. **Note:** The problem appears to be in the backplane of the DDM-1000. One way to verify this is to swap the PROCR and the plug-in with the lighted ALM LED with the corresponding plug-ins in another DDM-1000 assembly. If the problem moves with the plug-ins, it means that one or both of the plug-ins is defective. If the problem stays with the assembly, inspect the backplane for bent pins. If no defects are found, the entire assembly must be replaced — it has a printed backplane and cannot be repaired in the field.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

14. **Caution:** *Ensure the PROCR is installed in the correct slot (PROCR). Inserting the PROCR in the TLM slot will damage the PROCR.*

Install the **PROCR2** plug-in. **DP-404**

Note: The **MC90083A1 PROCR1** plug-in has been rated **DA**.

15. **Caution:** *Inserting an AKM4 TLM1 in a DDM-1000 shelf that is cabled for MC90191A1 TLM2 performance monitoring may damage any TLM2 plug-ins that are installed in other DDM-1000 shelves in the same bay. It may also damage the telemetry remote monitoring system (such as the GTP).*

Remove the TLM slot edge protector, then install the **AKM4 TLM1** **DP-412**
or **MC90191A1 TLM2** plug-in (if applicable).

16. Install the **AKM3 ELIU1** plug-in. **DP-412**

17. **Note:** As additional plug-ins are installed, office alarms may be activated, accompanied by flashing LEDs on some of the plug-ins. This is a normal condition at this stage of the procedure. You should ACO the office alarms as appropriate.

18. Install the **AKM2B MXR2** or **AKM2C MXR3** plug-ins. **DP-412**

Note: The **AKM2 MXR1** plug-in has been rated **DA**.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

19. Install the low speed interface plug-ins (**AEK36-type DS1 INTFC**, **DP-412**
AEK37 DS1C INTFC1, or **AEK38 DS2 INTFC1**).

20. Make connections to the **DSX-3** cross-connect. **DP-406**

21. Perform automatic looped-back installation test. **DP-413**

22. Perform automatic cross-connect wiring test. **DP-414**

23. Test protection switch function, if required. **DP-442**

24. **Note:** An ASCII terminal is required to access the optional features of the DDM-1000.

 Activate optional features as required. **DP-418**

25. The **DDM-1000** is now ready for end-to-end testing.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

22. **Caution:** *Inserting an AKM4 TLM1 in a DDM-1000 shelf that is cabled for MC90191A1 TLM2 performance monitoring may damage any TLM2 plug-ins that are installed in other DDM-1000 shelves in the same bay. It may also damage the telemetry remote monitoring system (such as the GTP).*

Remove the TLM slot edge protector, then install the **AKM4 TLM1** **DP-412**
or **MC90191A1 TLM2** plug-in (if applicable).

23. **Note:** As additional plug-ins are installed, office alarms may be activated, accompanied by flashing ALM LEDs on some of the plug-ins. This is a normal condition at this stage of the procedure. You should ACO the office alarms as appropriate.

24. Install **OLIU** plug-ins [16-Type (90 Mb/s) or 20-Type (180 Mb/s)].

- A. 16-Type OLIUs **DP-412**
 - B. 20-Type OLIUs **DP-438**
-

25. If the **DDM-1000** is to be equipped with **AKM5 DS3U1s** or **AKM6 DS3U2s**, install the **AKM3 ELIU1** plug-in. Note that **AKM5 DS3U1** packs cannot be used with 20-type OLIUs. **DP-412**

26. If the **DDM-1000** is to be equipped with an **AKM5 DS3U1** or **AKM6 DS3U2s**, make connections to the **DSX-3** cross-connect. **DP-406**

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

27. Install the function units (**AKM2B MXR2** or **AKM2C MXR3**, **AKM5 DS3U1** or **AKM6 DS3U2**). **DP-412**

Note: The **AKM2 MXR1** plug-in has been rated **DA**.

28. **Note:** One **AKM86 BP2** pack is required in an optical shelf if only one muldem is equipped in that shelf. In a 180 Mb/s system, an **AKM86** is required in each shelf if only one muldem is equipped in each shelf. **DP-412**

Install **AKM86 BP2** pack(s), if required. (Follow instructions printed on the **AKM86** pack.)

29. Install the low-speed interface plug-ins (**AEK36-type DS1 INTFC**, **AEK37 DS1C INTFC1** or **AEK38 DS2 INTFC1**) (no low speed interface plug-ins are installed in a muldem equipped with an **AKM5 DS3U1** or **AKM6 DS3U2**). **DP-412**

Note: The **AEK36 DS1 INTFC1** plug-in has been rated **DA**.

30. Install the optical loops. **DP-415**

31. Perform a looped-back transmission test for each muldem as appropriate:

A. Perform the automatic looped-back test if the muldem is equipped with **MXR()** function units. **DP-413**

B. Perform the **DS3U2** looped-back test if the muldem is equipped with **AKM6 DS3U2** function units. **DP-432**

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

C. Perform the DS3U1 looped-back test if the muldem is equipped with **AKM5 DS3U1** function units. **DP-444**

32. Perform automatic cross-connect wiring test for each muldem that is equipped with **MXR()** function units. **DP-414**

33. **Note:** An ASCII terminal is required to access the optional features of the DDM-1000.

Activate optional features as required. **DP-418**

34. The **DDM-1000** is now ready for end-to-end testing.

Discontinue End-to-End Service

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

1. **Caution 1:** *Whenever working with the DDM-1000 you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.*

2. **Note:** If, at any point in this procedure, the DDM-1000 fails to respond in the indicated manner, you should refer to **TP-105** and clear the trouble.

3. Determine which channel(s) is to be discontinued.

4. **Note:** The following operation will activate the office minor alarm. The audible alarm may be suppressed by momentarily depressing the ACO/TEST pushbutton.

Remove the **LS INTFC** plug-in(s) associated with the channel(s) being discontinued.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

5. **Caution: No service LS INTFC locations should be left empty or they should be disconnected from the external cross-connect wiring.**

Note: BP1 plug-ins are used to disconnect the cross-connect wiring associated with unused service LS INTFC locations from the DDM-1000's internal protection bus. As an alternative to installing the BP1s, it is also possible to disconnect the wiring by unplugging the appropriate connectors on the backplane.

Install **BP1** plug-in(s) as required in the location(s) for the **LS INTFC** plug-in(s) just removed, **OR** unplug the **963P** connectors associated with those **LS INTFC** locations being removed from service.

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6. **Caution: If removing function units from an optical system equipped with a PROCR 2 pack MC90083A1D, Issue 3 or 4, or MC90083A1E, Issue 1 or 2, be sure to add an AKM86 BP2 pack to the service slot and momentarily depress the RST button.**

If an entire muldem is being removed from service, remove function unit plug-ins (**AKM-2** types, **AKM-5**, or **AKM-6**) associated with that muldem, if required.

-
7. **Note:** After removing any plug-ins, the DDM-1000 equipment list must be updated using the **RST** button.

Use the **RST** button to update the **DDM-1000's** internal equipment list. **DP-402**

Transfer Service From 90 Mb/s Optical Facility to DS3 Facility

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

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

2. **Warning 1:** *Open optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam.*

3. **Warning 2:** *Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.*

4. **Caution 1:** *Whenever working with the DDM-1000 you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.*

5. **Caution 2:** *The PROCR1 pack, MC90083A1, will not support an in-service conversion from optical to DS3 electrical mode. The PROCR1 pack will work in either optical or electrical mode, but a conversion must be made out of service.*

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

6. Note: If, at any point in this procedure, the DDM-1000 fails to respond in the indicated manner, you should refer to **TP-105** and clear the trouble.

7. Note: This transfer will require coordination between personnel at the two ends of the system. Reference will be made to the "near end" and the "far end". These designations are completely arbitrary. The only distinction is that the transfer activity will be directed by personnel at the near end.

8. At the far end **DSX-3** cross-connect, connect a jumper cable from the **OUT** jack to the **IN** jack of each of the DS3 facilities to be placed into service.

9. At the near end **DSX-3** cross-connect, use a DS3 test set to verify good end-to-end DS3 facilities.

Note: This type of looped-back test can fail to detect some types of system problems such as an **IN** and **OUT** jack reversal at the far-end **DSX-3** cross-connect. A more thorough test procedure would be to use a DS3 test set transmitter at one end of the DS3 facility and a DS3 test set receiver at the other end of the facility. After error-free transmission is verified in one direction, the test sets would be moved to the other ends, respectively, of the system and the test repeated.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

10. Install **AKM3 ELIU1** plug-ins in the **DDM-1000** assemblies at both ends of the system. **DP-412**

11. Connect each **DDM-1000** assembly to the DS3 facility at its respective **DSX-3** cross-connect. **DP-406**

12. If an ASCII terminal is available, use the command **exct-sw-hs:s=() make** to switch service to protection. Use the command **exct-lock-hs:s=() make** to lock service to protection.

13. At the **DDM-1000** at each end of the system, remove the **MXR** from the **Muldem A SRV** location and from the **Muldem B SRV** location. Carefully note where each plug-in was installed.

14. The **MN** office alarm will be activated and the **MN, NE** and possibly the **FE** LEDs on the **PROCR** will be lighted at both ends of the system. Verify that no other LEDs are lighted on either **DDM-1000**.

15. Set the option switches (and plugs if working with an **AKM2B** or **AKM2C**) on each of the **SRV MXR** plug-ins just removed for electrical operation, and reinstall the plug-ins. Be careful to put each plug-in back where it was previously installed. Take care to avoid damaging the LEDs protruding through the openings in the faceplates of the **MXRs**. **DP-417**

16. The **ALM** LED on each of the **SRV MXR** plug-ins in both **DDM-1000s** will be lighted in addition to the **MN, NE** and possibly the **FE** LEDs.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

17. Remove any AKM86 BP2 plug-ins.

18. At the near end only, momentarily depress the **RST** button on the **DP-402 PROCR**.

Note: In this step the **RST** is automatically sent to the far end and automatically releases the manual lock and switch if both muldems are equipped with **MXR** plug-ins. If only one muldem is equipped, the **RST** button must be pressed at the near end and the far end. The **ALM** LEDs on the **SRV MXR** plug-ins will go off. The **ALM** LEDs on the **PROTN MXR** plug-ins will be lighted.

19. Traffic is now being carried over the DS3 facilities.

20. At the **DDM-1000** at each end of the system remove the **MXR** from the **Muldem A PROTN** location and from the **Muldem B PROTN** location. Carefully note where each plug-in was installed.

21. The **MN** office alarm will be activated and the **MN, NE** and possibly the **FE** LEDs on the **PROCR** will be lighted at both ends of the system. Verify that no other LEDs are lighted on either **DDM-1000**.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

22. Set the option switches (and plugs if working with an **AKM2B** or **AKM2C**) on each of the **PROTN MXR** plug-ins just removed for electrical operation, and replace the plug-ins. Be careful to put each plug-in back where it was previously installed. Take care to avoid damaging the LEDs protruding through the openings in the faceplates of the **MXRs**. **DP-417**

23. All office alarms and LEDs will be extinguished. You have completed the transfer of service from the optical to the electrical facility.

24. At the **DDM-1000** at each end of the system disconnect and remove the **16-Type OLIUs**.

25. At each **DDM-1000**, momentarily depress the **RST** control on the **PROCR**. This will delete the OLIUs from the **PROCR's** internal equipment list. **DP-402**

Transfer Service From DS3 Facility to Optical Facility

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

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

2. **Warning 1:** *Open optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam.*

3. **Warning 2:** *Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.*

4. **Caution 1:** *Whenever working with the DDM-1000 you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.*

5. **Caution 2:** *The PROCR1 pack, MC90083A1, will not support an in-service conversion from optical to DS3 electrical mode. The PROCR1 pack will work in either optical or electrical mode, but a conversion must be made out of service.*

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

6. **Note:** If, at any point in this procedure, the DDM-1000 fails to respond in the indicated manner, you should refer to **TP-105** and clear the trouble.

7. **Note:** This transfer will require coordination between personnel at the two ends of the system. Reference will be made to the "near end" and the "far end". These designations are completely arbitrary. The only distinction is that the transfer activity will be directed by personnel at the near end.

8. **Note:** This transfer requires that far-end maintenance be enabled between the DDM-1000 assemblies at the two ends of the DS3 facility. This can only be done with an ASCII terminal using the command **set-shelf-fecom:yes**.

9. Use the ASCII terminal command **set-shelf-fecom:yes** to enable far-end maintenance at each end of the DS3 facility. This command must be directly entered into the **DDM-1000** at each end of the DS3 facility.

10. At the near end, use the ASCII terminal command **test-led:e=f** to verify that the far-end maintenance is working. (All of the LEDs on the far end **DDM-1000** will be lighted for 10 seconds and then extinguished for 10 seconds.)

11. Verify that the **SRV** and **PROTN** optical facilities are good.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

12. Determine the optical loss of the optical facilities from office records or by making the required measurements.

13. Set the option switches on the **OLIU** plug-ins to agree with the loss of the optical facilities, and install the **SRV** and the **PROTN OLIU** plug-ins in the **DDM-1000** assemblies at both ends of the system. Take care to avoid damaging the LED that protrudes through the opening in the faceplate of the plug-in. **DP-424**

14. Connect each **DDM-1000** assembly to the optical facility. **DP-429**

15. At the **DDM-1000** at each end of the system, remove the **muldem A SRV MXR** and **muldem B SRV MXR**. Carefully note where each plug-in was installed.

16. The **MN** office alarm will be activated and the **MN, NE** and possibly the **FE** LEDs on the **PROCR** will be lighted at both ends of the system. Verify no other LEDs are lighted on either **DDM-1000**.

17. Set the option switches (and plugs if working with an **AKM2B** or **AKM2C**) on each of the **SRV MXR** plug-ins just removed for optical operation, and replace the plug-ins. Be careful to put each plug-in back where it was previously installed. Take care to avoid damaging the LEDs that protrude through the openings in the faceplates of the **MXRs**. **DP-417**

18. The **ALM** LED on each **SRV MXR** plug-in in both **DDM-1000s** will be lighted in addition to the **MN, NE** and possibly the **FE** LEDs.

19. If only one muldem is equipped with **MXR** plug-ins, install an **AKM86 BP2** plug-in into the **SRV MXR** slot of the unequipped muldem.

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DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

20. At the near end, momentarily depress the **PROCR RST** button. **DP-402**

Note: In this step the **RST** is automatically sent to the far end and automatically releases the manual lock and switch if both muldem are equipped with **MXR** plug-ins. If only one muldem is equipped, the **RST** button must be pressed at the near end and the far end.

The **ALM** LEDs on the **SRV MXR** plug-ins will go off. The **ALM** LEDs on the **PROTN MXR** plug-ins will be lighted.

21. Traffic is now being carried over the optical facilities.

22. At the **DDM-1000** at each end of the system remove the **MXR** from the **Muldem A PROTN** location and from the **Muldem B PROTN** location. Carefully note where each plug-in was installed.

23. The **MN** office alarm will be activated and the **MN, NE** and possibly the **FE** LEDs on the **PROCR** will be lighted at both ends of the system. Verify that no other LEDs are lighted on either **DDM-1000**.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

24. Set the option switches (and plugs if working with an **AKM2B** or **AKM2C**) on each of the **PROTN MXR** plug-ins just removed for optical operation, and replace the plug-ins. Be careful to put each plug-in back where it was previously installed. Take care to avoid damaging the LEDs that protrude through the openings in the faceplates of the **MXRs**. **DP-417**

25. All office alarms and LEDs will be extinguished. You have completed the transfer of service from the DS3 to the optical facility.

26. At the **DDM-1000** at each end of the system disconnect and remove the **AKM3 ELIU1**.

27. At each **DDM-1000** momentarily depress the **RST** pushbutton on the **PROCR**. This will delete the **ELIU1** from the **PROCR's** internal equipment list. **DP-402**

Transfer Service From 180 Mb/s Optical to DS3 Facility

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

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

2. **Warning 1:** *Open optical connectors may emit invisible laser radiation. Avoid direct exposure to beam.*

3. **Warning 2:** *Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.*

4. **Caution 1:** *Whenever working with the DDM-1000 you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.*

5. **Caution 2:** *The PROCR1 pack, MC90083A1, will not support an in-service conversion from optical to DS3 electrical mode. The PROCR1 pack will work in either optical or electrical mode, but a conversion must be made out of service.*

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

6. **Note:** If, at any point in this procedure, the DDM-1000 fails to respond in the indicated manner, refer to **TP-105** and clear the trouble.

7. **Note:** This transfer will require coordination between personnel at the two ends of the 180 Mb/s optical system. Reference will be made to the "near end" and to the "far end". These designations are completely arbitrary. The only distinction is that the transfer activity will be directed by personnel at the near end.

8. **Note:** It is assumed that the same muldem-to-muldem association is to be maintained after the conversion. That is, **Muldem A** in the **Non-OLI Assembly** at one end of the 180 Mb/s optical system will still be communicating with **Muldem A** in the **Non-OLI Assembly** at the other end of the system, and so forth.

9. Install an **AKM3 ELIU1** in each of the **DDM-1000** assemblies at each end of the 180 Mb/s optical system (four **ELIU1s** in all). **DP-412**

10. Connect each **DDM-1000** assembly to the appropriate DS3 facility at its respective **DSX-3** cross-connect. **DP-406**

11. If an ASCII terminal is available, perform the following on both shelf assemblies: Use the command **exct-sw-hs:s=() make** to switch service to protection. Use the command **exct-lock-hs:s=() make** to lock service to protection.

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DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

12. At each **DDM-1000** at each end of the 180 Mb/s optical system remove the **Muldem A SRV MXR** and the **Muldem B SRV MXR** (eight **MXRs** in all). Carefully note where each plug-in was installed.

13. The **MN** office alarm will be activated and the **MN, NE** and, possibly, the **FE** LEDs on all four of the **PROCRs** will be lighted. Verify that no other LEDs are lighted on any of the **DDM-1000s**.

14. **Caution: To prevent service interruption, be very careful to remove the SRV and not the PROTN cable.**

Refer to **Figure 1** and remove the **SRV ED-2C833-20, G17-G20** cable assembly from the **DDM-1000** backplanes at each end of the system.

15. Set the option switches (and plugs if working with an **AKM2B** or **AKM2C**) on each of the **SRV MXR** plug-ins just removed for electrical operation, and replace the plug-ins. Be careful to put each plug-in back where it was previously installed. Take care to avoid damaging the LEDs protruding through the openings in the faceplates of the **MXRs**. **DP-417**

Response: The **ALM** LED on each of the **SRV MXR** plug-ins in both assemblies at each end of the system will be lighted. In addition, the **MN, NE** and **FE** LEDs indicated in **Step 12** will still be lighted.

16. If either muldem is equipped with an **AKM86 BP2** plug-in, remove the **AKM86 BP2** plug-in at this time.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

17. **Note:** In this step the **RST** is automatically sent to the far end and automatically releases the manual lock and switch if both muldem are equipped with **MXR** plug-ins. If only one muldem is equipped, the **RST** button must be momentarily depressed at the near end and the far end. The **RST** button must be momentarily depressed at the near end and the far end on the non-OLIU shelves.

At the near end, momentarily depress the **RST** pushbutton on both **DP-402 PROCRs**.

Response: The **ALM** LEDs on the **SRV MXR** plug-ins will go off. The **ALM** LEDs on the **PROTN MXR** plug-ins will be lighted.

Traffic is now being carried over the DS3 facilities.

18. At each **DDM-1000** at each end of the 180 Mb/s optical system remove the **MXR** from the **Muldem A PROTN** location and from the **Muldem B PROTN** location (eight **MXRs** in all). Carefully note where each plug-in was installed.

19. The **MN** office alarm will be activated and the **MN** and **NE** LEDs on all four of the **PROCRs** will be lighted.

Verify that no other LEDs are lighted on any of the **DDM-1000s**.

20. Refer to **Figure 1** and remove the **PROTN ED-2C833-20, G17-G20** cable assembly from the **DDM-1000** backplanes at each end of the system.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

21. Set the option switches (and plugs if working with an **AKM2B** or **AKM2C**) on each of the **PROTN MXR** plug-ins just removed for electrical operation, and replace the plug-ins. Be careful to put each plug-in back where it was previously installed. Take care to avoid damaging the LEDs protruding through the openings in the faceplates of the **MXRs**. **DP-417**

Response: All office alarms and LEDs will be extinguished. You have completed the transfer of service from the 180 Mb/s optical facility to the DS3 electrical facility.

22. At each end of the system, disconnect and remove the **20-Type OLIUs** (four **OLIUs** in all).

23. At both assemblies at each end of the system, momentarily depress the **RST** pushbutton on the **PROCR**. This will delete the **OLIUs** from the **PROCR**'s internal equipment list.

DO ITEMS BELOW IN ORDER LISTED FOR DETAILS, GO TO

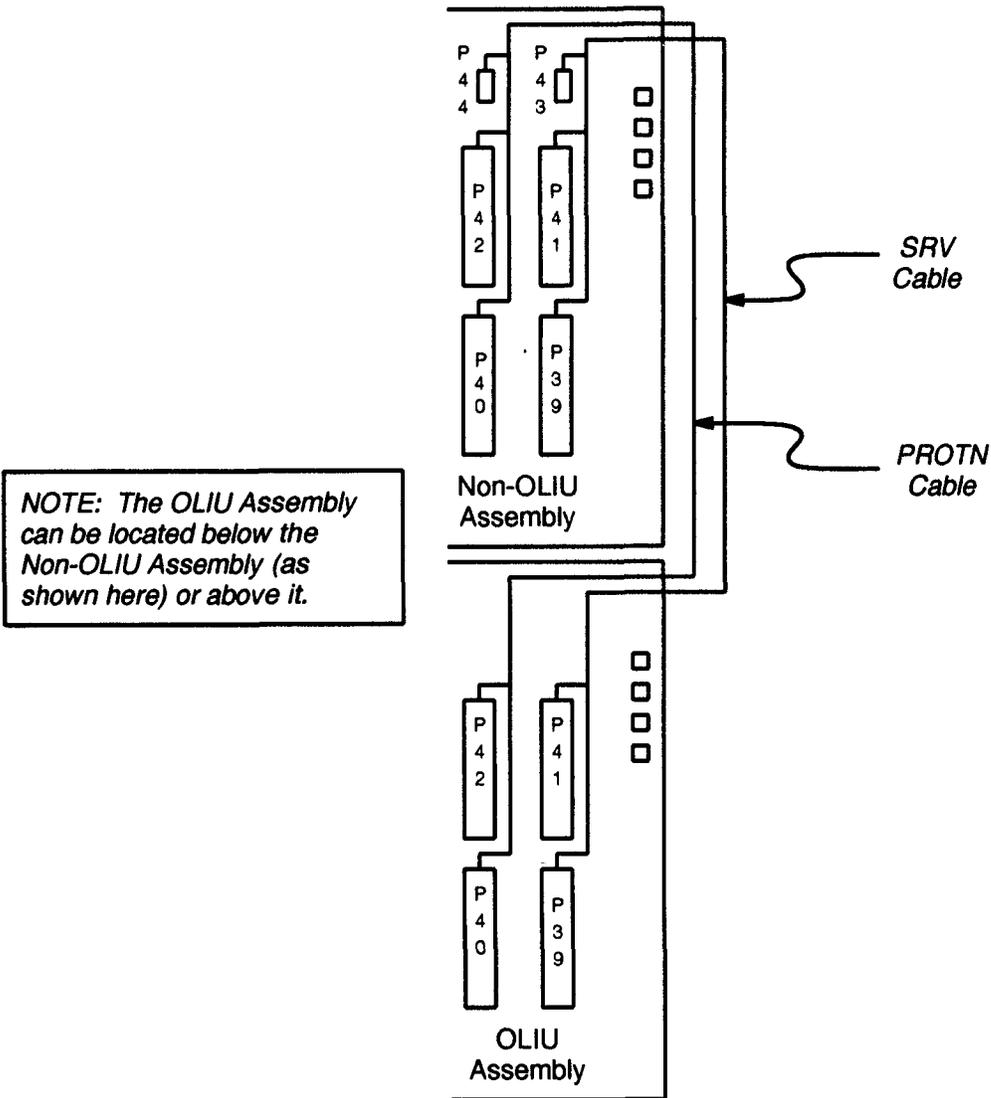


Figure 1. Location of ED-2C833-20, G17-G20 Cables

Connect TBOS Serial Telemetry

1. **Note:** Refer to the Specifications section of this user's manual for a description of serial telemetry. Serial telemetry is intended to be used in applications with either rear cable access for the DDM-1000 or with the ED-2C843-30 wire-wrap panel. There is no provision for connecting to the serial telemetry points if the ED-2C833-20 front access cable assemblies are installed.
2. **Note:** When more than one DDM-1000 in a framework is to be connected to a serial telemetry system, the bottom DDM-1000 is connected to the telemetry system and the other DDM-1000s are connected to this first DDM-1000 in a bottom-to-top daisy chain arrangement.
3. Refer to the **SPECIFICATIONS** section of this user's manual under INTERCONNECTION SPECIFICATIONS for the listing of the serial telemetry connections.
4. Is the **DDM-1000** equipped with the **ED-2C843-30** wire-wrap assembly?
If **YES**, then continue to **Step 5**.
If **NO**, then do **Step 11**.
5. Connect the first (bottom) **DDM-1000** to the serial telemetry system by wire wrapping to each of the pins on the right side of the **ED-2C843-30** wire-wrap assembly as listed in **Table 3-44** in the SPECIFICATIONS section of this manual.
6. Are there other **DDM-1000s** in the same framework to be connected to the serial telemetry system?
If **YES**, then continue to **Step 7**.
If **NO**, then proceed to **Step 9**.
7. Wire wrap from each of the pins just connected on the first DDM-1000 to the same pin on the next DDM-1000.
8. Repeat **Step 7** for any additional **DDM-1000s** in the same framework to be connected to the serial telemetry system.
9. **Note:** After adding the last DDM-1000 in the daisy chain, you must press the **RST** button on the **PROCR** on each new shelf added to the daisy chain. This is necessary for each new shelf to recognize its unique identity (address). The sequence in which the **RST** buttons are pressed is not important.

Momentarily depress the **RST** button on the **PROCR** plug-in on each new shelf added to the telemetry daisy chain.

10. STOP. YOU HAVE COMPLETED THIS PROCEDURE.

- 11. Note:** A 9822C connector assembly (COMCODE 105775936) is recommended between the **ED-2C833-20, G8, G801 or G802** cable assembly and **P29** on the first shelf to reduce the TBOS output level for compliance with RS-422 specifications. The TBOS level is 6 dB higher than recommended in RS-422 specifications. AT&T GTP, ATP, and ACORN® systems will tolerate the increased level. Some non-AT&T telemetry equipment may not perform correctly with the higher level and the attenuator may be necessary.

Connect jack **J29** of the **ED-2C833-20, G8, G801 or G802** cable to plug **P29** of the 9822C TBOS connector assembly (Comcode 105775936) and then connect jack **J29** of the connector assembly to plug **P29** on the backplane of the first **DDM-1000**.

- 12.** Referring to **Figure 1**, dress and tie the cabling along the horizontal and vertical protecting bars attached to the backplane.
- 13.** Refer to **DP-431** and route the cables along the back of the frame upright to the top of the bay.
- 14.** Are there other **DDM-1000s** in the same framework to be connected to the serial telemetry system?
If **YES**, then continue to **Step 15**.
If **NO**, then do **Step 18**.
- 15.** Connect the **ED-2C833-20, G9 or G901** cable between the first and second **DDM-1000s** as follows: **J32** on the cable is connected to **P32** on the backplane of the lower (first) **DDM-1000**. **J29** on the cable is connected to **P29** on the backplane of the upper (second) **DDM-1000**.

16. Refer to **Figure 1**. Dress and tie the cable to the horizontal and vertical protecting bars attached to the backplane.
17. Repeat **Steps 15 and 16** for any further **DDM-1000s** in the same framework to be connected to the serial telemetry system.
18. **Note:** After adding the last DDM-1000 in the daisy chain, you must press the **RST** button on the **PROCR** on each new shelf added to the daisy chain. Pressing the **RST** button allows each new shelf to recognize its unique identity (address). Adding new shelves without pressing the **RST** button will result in two or more shelves on the common address bus with the same address. The sequence in which the **RST** buttons are pressed is not important.

Momentarily depress the **RST** button on the **PROCR** plug-in on each new shelf added to the telemetry daisy chain.

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

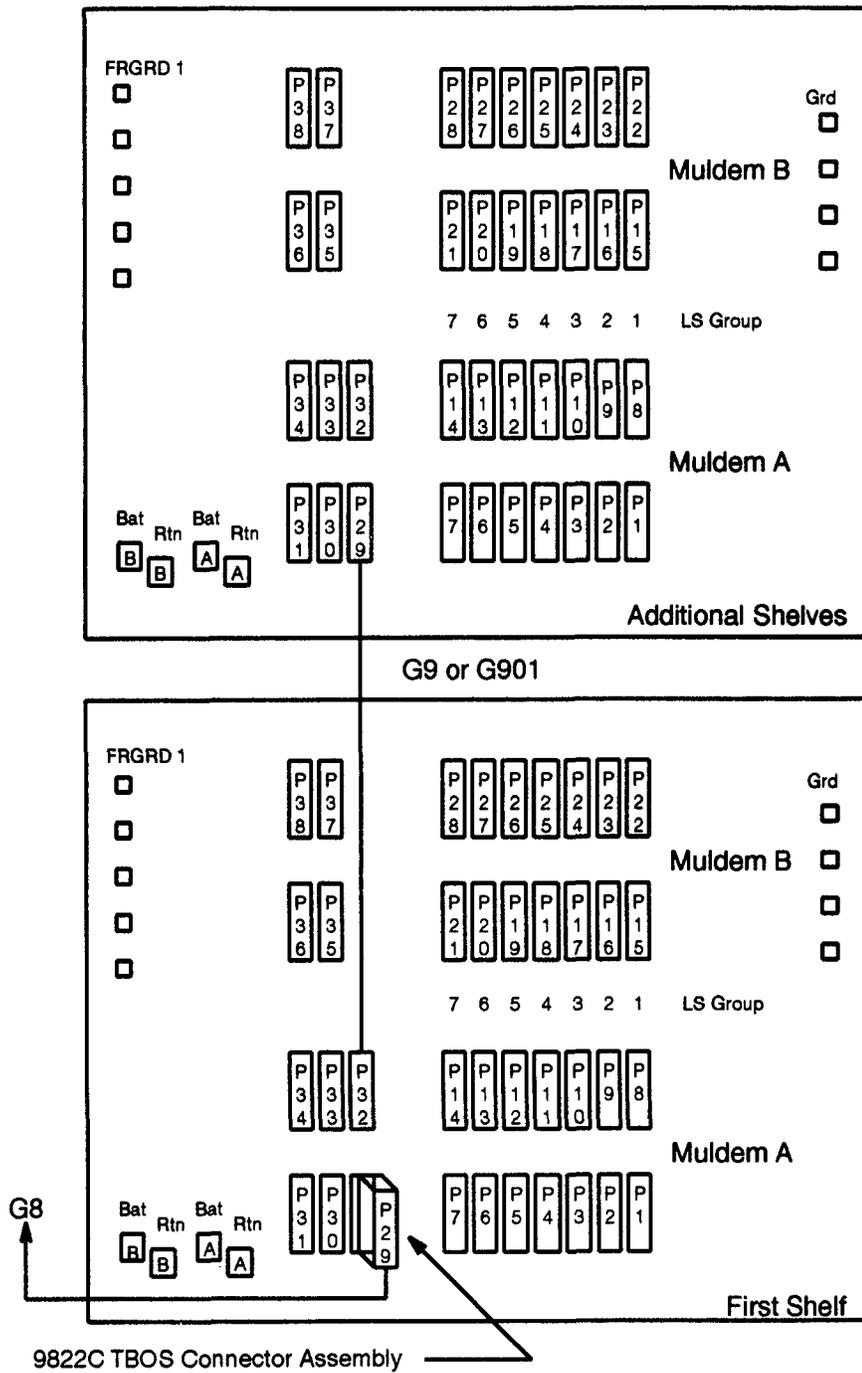


Figure 1. Serial Telemetry Cabling

Install Plug-Ins

1. **Caution:** *Whenever working with the DDM-1000 you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.*
2. **Note:** It is assumed that you have been sent here by another procedure with instructions to install a plug-in in the DDM-1000. This procedure provides instructions for installing that plug-in. It does not tell you which plug-in to install. You should install the plug-in indicated by the procedure that sent you here.
3. Find the plug-in to be installed in **Table A** and go to the indicated step.

Table A. Plug-ins Being Installed

Plug-in To Be Installed	Go To
MC90083A1() PROCR	Step 6
AKM2 MXR1 (rated DA)	Step 9
AKM2B MXR2	Step 15
AKM2C MXR3	Step 15
AKM3 ELIU1	Step 23
AKM4 TLM1	Step 4
MC90191A1 TLM2	Step 46
AKM5 DS3U1	Step 57
AKM6 DS3U2	Step 41
AEK36-type DS1 INTFC1	Step 29
AEK37 DS1C INTFC1	Step 29
AEK38 DS2 INTFC1	Step 29
16- and 20-Type OLIU	Step 34
AKM86 BP2	Step 59

4. **Caution:** Inserting an AKM4 TLM1 in a DDM-1000 shelf that is cabled for MC90191A1 TLM2 performance monitoring may damage any TLM2 plug-ins that are installed in other DDM-1000 shelves in the same bay. It may also damage the telemetry remote monitoring system (such as the GTP).

Note 1: To utilize the remote capabilities of the TLM() pack, far-end communications (fecom) must be enabled (DP-435).

There are no options to be set on this plug-in. Remove and discard the TLM slot edge protector, then seat the plug-in.

5. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
6. **Note:** When the PROCR is installed, it is necessary to update the DDM-1000's internal equipment list. This equipment list determines which plug-ins will be monitored.
7. Refer to DP-404 and install the PROCR.
8. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
9. **Note:** The option switches on the AKM2 MXR1 must be set correctly when the plug-in is installed.
10. Determine from office records the desired settings of the option switches on the AKM2 MXR1.
11. **Table B** indicates the option switch settings for the AKM2 MXR1.

Table B. AKM2 MXR1 Option Switches

Switch	Electrical Operation		Optical Operation	
	S1	S2	S1	S2
Sec 1	Open	Open	Closed	Closed
Sec 2	Open	Open	Closed	Open
Sec 3	Open	Open	Open	Closed
Sec 4	Closed	Closed	Open	Open

12. Refer to **Figure 1** and set the option switches on the **AKM2 MXR1**.

Note: To set the switch to "open" depress the rocker toward the side labeled **OPEN** in the figure. To set the switch to "closed" depress the rocker toward the side labeled **CLOSED** in the figure.

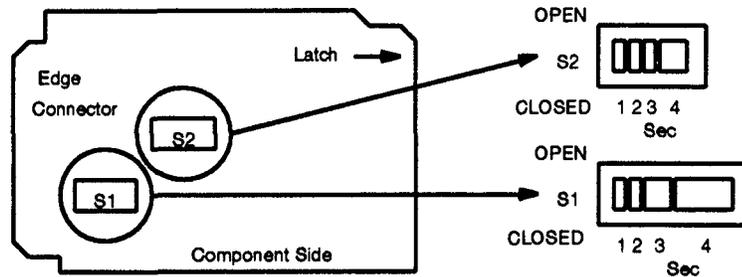


Figure 1. AKM2 MXR1 Option Settings

13. **Caution:** *Damage to the shelf and plug-ins will occur if an MXR pack is inserted in an OLIU slot. Ensure the MXR pack is inserted in the correct slot.*

Seat the **AKM2 MXR1**. Take care to avoid damaging the LED that protrudes through the opening in the faceplate of the plug-in.

14. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
15. **Note:** The option switches on the **AKM2B MXR2** or **AKM2C MXR3** must be set correctly when the plug-in is installed.
16. Determine from office records the desired settings of the option switches on the **AKM2B MXR2** or **AKM2C MXR3**.

Note: If an **MC90191A1 TLM2** is being installed and PM is being used, the **AKM2C MXR3** must be used and option plugs **P3** and **P4** must be set for **C-Bit Mode**.

17. **Table C** indicates the option switch settings for the **AKM2B MXR2** or **AKM2C MXR3**.

Table C. MXR2 (AKM2B)/MXR3 (AKM2C) Option Switches

Switch	Electrical Operation		Optical Operation	
	S1	S2	S1	S2
Sec 1	Open	Open	Closed	Closed
Sec 2	Open	Open	Closed	Open
Sec 3	Open	Open	Open	Closed
Sec 4	Closed	Closed	Open	Open

18. Refer to **Figure 2** and set the option switches on the **AKM2B MXR2** or **AKM2C MXR3**.

Note: To set the switch to "open" depress the rocker or slide the switch toward the side labeled **OPEN** in the figure. To set the switch to "closed" depress the rocker or slide the switch toward the side labeled **CLOSED** in the figure.

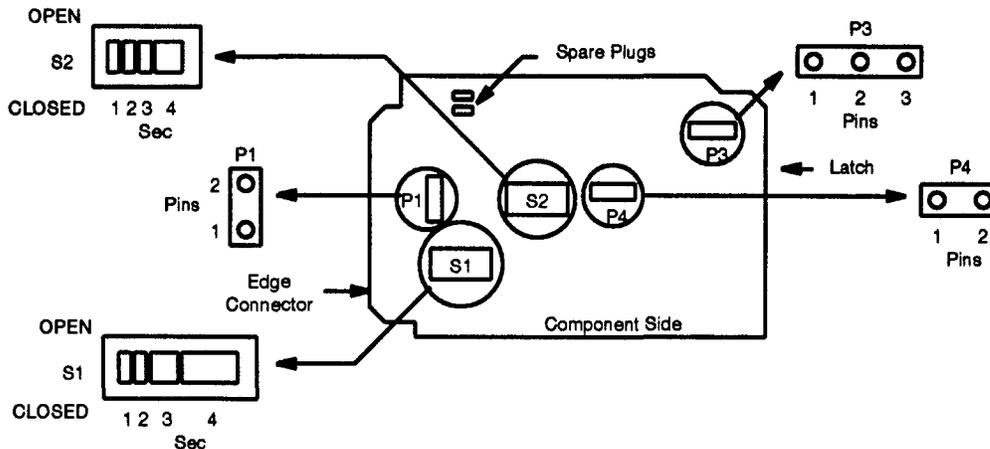


Figure 2. MXR2 (AKM2B)/MXR3 (AKM2C) OPTION SETTINGS

19. **Table D** and **Table E** indicate the option plug settings for the **AKM2B MXR2** or **AKM2C MXR3**.

Table D. MXR2 (AKM2B)/MXR3 (AKM2C) Option Plugs

Plug	Install a Jumper Between Pins	
	Electrical	Optical
P1	(none)	1 and 2

Table E. MXR2 (AKM2B)/MXR3 (AKM2C) Option Plugs

Plug	Install a Jumper Between Pins	
	C-BIT Mode	M13 Mode
P3	2 and 3	1 and 2
P4	1 and 2	(none)

20. Refer to **Figure 2** and install the option plugs on the **AKM2B MXR2** or **AKM2C MXR3**.
21. **Caution: Damage to the shelf and plug-ins will occur if an MXR pack is inserted in an OLIU slot. Ensure the MXR pack is inserted in the correct slot.**

Seat the **AKM2B MXR2** or **AKM2C MXR3**. Take care to avoid damaging the LED that protrudes through the opening in the faceplate of the plug-in.

22. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
23. **Note:** The option plugs must be set correctly when the **AKM3 ELIU1** is installed.
24. Determine from office records the length of the DS3 cabling between the **DDM-1000** and the **DSX-3** cross-connect point.

25. **Table F** indicates the required LBO settings for the **AKM3 ELIU1**

Table F. ELIU1 (AKM3) LBO Selection

Cable Length (ft.)			Plug Settings
728B, 734A	KS-19224, L2 Mini-coax	735A	
0 to 225	0 to 75	0 to 125	LBO
>225	>75	>125	NO LBO

26. Refer to **Figure 3** and set the option plugs according to the table above.

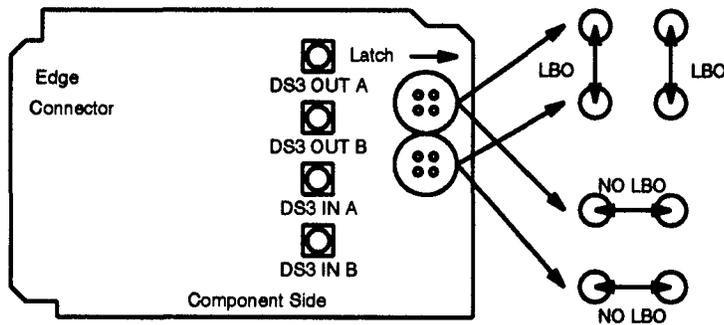


Figure 3. AKM3 ELIU1 Option Settings

27. Seat the **AKM3 ELIU1**.
28. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
29. **Note:** When an **LS INTFC** is installed, the option switches on the plug-in must be set correctly.
30. Refer to **DP-425** and set the option switches on the **LS INTFC**.
31. **Caution 1:** If a mix of **DS1, DS1C and DS2 LS INTFC plug-ins** are installed in one muldem of the **DDM-1000**, the lowest rate protection pack must be installed in the **PROTN 8** slot.

Caution 2: **AEK38 DS2 LS INTFC packs cannot be used in a muldem provisioned for C-bit performance monitoring.**

32. Seat the **LS INTFC**. Take care to avoid damaging the LED that protrudes through the opening in the faceplate of the plug-in.
33. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
34. **NOTICE:** Unterminated optical connectors may emit laser radiation. Do not view beam with optical instruments.
35. **Warning 1: Open optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam.**
36. **Warning 2: Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.**
37. **Note:** When an **OLIU** is installed, the option switch on the plug-in must be set correctly.
38. Refer to **DP-424** and set the option switch on the **OLIU**.
39. Seat the **OLIU**. Take care to avoid damaging the optical cable and the LED that protrudes through the opening in the faceplate of the plug-in.
40. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
41. **Note:** The option switches on the **AKM6 DS3U2** must be set correctly when the plug-in is installed. All current applications of the **DS3U2** use the same option switch settings.
42. **Table G** indicates the option switch settings for the **AKM6 DS3U2**.

Table G. AKM6 DS3U2 Option Switches

Switch	Setting
Sec 1	Closed
Sec 2	Closed
Sec 3	Open
Sec 4	Open
Sec 5	Open
Sec 6	Open
Sec 7	Closed
Sec 8	Closed

43. Refer to **Figure 4** and set the option switches on the **AKM6 DS3U2**.

Note: To set the switch to "open" depress the rocker toward the side labeled **OPEN** in the figure. To set the switch to "closed" depress the rocker toward the side labeled **CLOSED** in the figure.

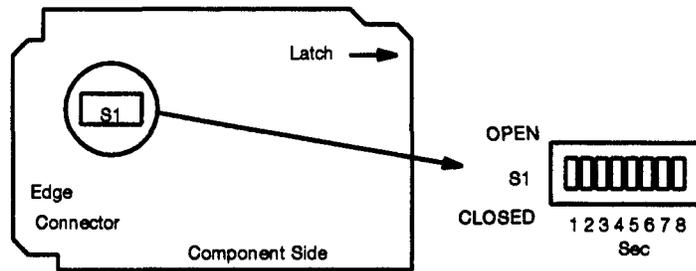


Figure 4. AKM6 DS3U2 Option Settings

44. Seat the **AKM6 DS3U2**. Take care to avoid damaging the LED that protrudes through the opening in the faceplate of the plug-in.
45. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
46. **Caution:** Inserting an **AKM4 TLM1** in a **DDM-1000** shelf that is cabled for **MC90191A1 TLM2** performance monitoring may damage any **TLM2** plug-ins that are installed in other **DDM-1000** shelves in the same bay. It may also damage the telemetry remote monitoring system (such as the **GTP**).

Note: The option switches on the **MC90191A1 TLM2** must be set correctly before the plug-in is installed.

47. From office records, determine the **TABS** address of the **MC90191A1 TLM2** on the **TABS** serial telemetry link.

Note: The addresses should be assigned in the order that the shelves appear in the bay (i.e., shelf 1, **TABS** address 1; shelf 2 **TABS** address 2; etc.).

48. **Table H** indicates the address selection switch settings for the **MC90191A1 TLM2**.

Table H. TLM2 (MC90191A1) Shelf (TABS) Address Selection

Shelf	TABS Address	Switch S3		
		1	2	3
Shelf 1	1	Closed	Closed	Closed
Shelf 2	2	Open	Closed	Closed
Shelf 3	3	Closed	Open	Closed
Shelf 4	4	Open	Open	Closed
Shelf 5	5	Closed	Closed	Open
Shelf 6	6	Open	Closed	Open
Shelf 7	7	Closed	Open	Open
Shelf 8	8	Open	Open	Open

49. Refer to **Figure 5** and set the address selection switches on the **MC90191A1 TLM2**.

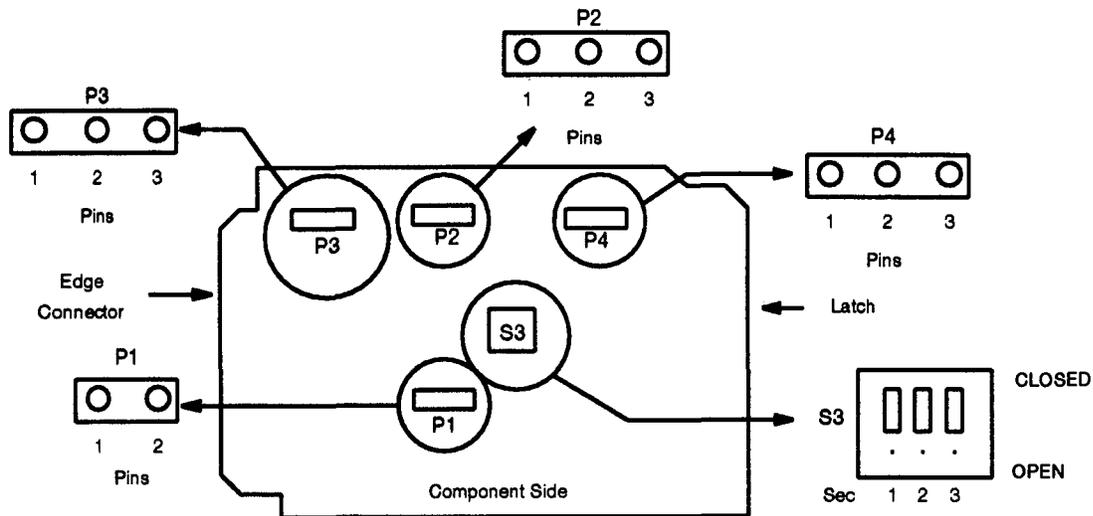


Figure 5. TLM2 (MC90191A1) Option Switches

50. **Note:** The TABS serial telemetry link must be terminated by the TLM2 with the highest (or only) TABS address in the bay. The remaining TLM2s in the bay must not terminate the link. For example, if the bay contains three TLM2s with shelf 1 having TABS address 1, shelf 2 having TABS address 2, and shelf 3 having TABS address 3, then the TLM2 in shelves 1 and 2 would be optioned not to terminate the link (not highest TABS address) and the TLM2 in shelf 3 would be optioned to terminate the link (highest TABS address).

Note: If a fourth TLM2 is later added to the bay in the example above, the TLM2 option settings in shelf 3 must be changed to remove the termination (no longer the highest TABS address). The TLM2 in shelf 4 must then be optioned to terminate the link (highest TABS address).

Table I indicates the option plug settings for the **TLM2** address in the TABS link.

Table I. TLM2 (MC90191A1) Option Plugs

Plug	Install a Jumper Between Pins	
	TLM2 (Highest TABS Address)	TLM2 (Not Highest TABS Address)
P2	2 and 3	1 and 2
P4	2 and 3	1 and 2

51. Refer to **Figure 5** and set **P2** and **P4** option plugs on the **MC90191A1 TLM2**.

52. **Note:** Option plug **P1** always has a jumper connected between pins 1 and 2. Option plug **P3** always has a jumper connected between pins 1 and 2 which causes **TLM2** failures to be reported to the local **PROCR**.

Refer to **Figure 5**. Install jumper between pins 1 and 2 on **P1**. Install jumper between pins 1 and 2 on **P3**.

53. **Caution: Take care to avoid damaging the LEDs that protrude through the opening in the faceplate of the plug-in.**

Remove and discard the TLM slot edge protector, then seat the **MC90191A1 TLM2**.

Response: The **RST/TEST** LED flashes on and off approximately five times and the **ALM** LED lights momentarily.

54. Momentarily depress the **RST** button on the TLM2 pack.
Response: The **RST/TEST** LED flashes on and off approximately 7 seconds and then goes off.
55. Momentarily depress the **TEST** button on the TLM2 pack.
Response: The **RST/TEST** LED flashes once and then goes off.
56. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
57. **Note 1:** One factory-installed option plug is on the DS3U1. This plug must be installed in the socket holes nearest the gold fingers. Two other options for setting parity and framing parameters are available through the ASCII terminal using the commands "**set-vmr-ds3u1:**" and "**set-frm-ds3u1:**".

Note 2: The DS3U1 plug-in cannot be used with 180 Mb/s optical systems.

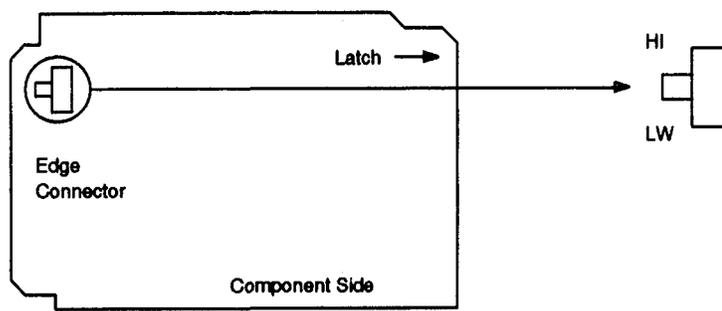
There are no other option plugs to be set on this plug-in. Seat the plug-in.
58. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
59. **Note:** The **AKM86 BP2** pack is required in an optical shelf if only one muldem is equipped in that shelf. In a 180 Mb/s system, one **AKM86 BP2** pack is required in each shelf that has only one muldem equipped.

Insert the **AKM86 BP2** pack into the **SRV** slot of the empty muldem.
60. Momentarily depress the **RST** button on the PROCR2 pack.
61. When the **AKM86 BP2** pack is to be replaced by a function unit, remove the **BP2** pack, insert the function units, then momentarily depress the **RST** button on the PROCR2 pack.
62. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

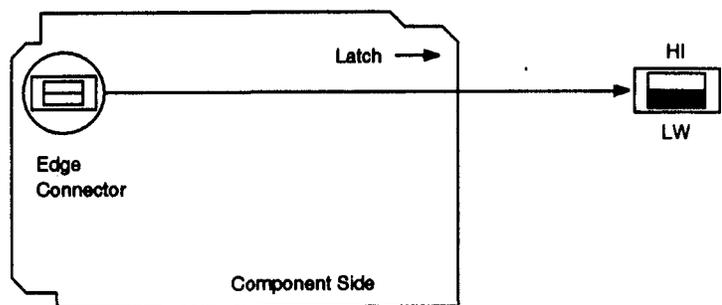
Connect Optical Loop

1. **NOTICE:** Unterminated optical connectors may emit laser radiation. Do not view beam with optical instruments.
2. **Warning 1:** *Open optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam.*
3. **Warning 2:** *Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.*
4. **Caution:** *Whenever working with the DDM-1000 you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.*
5. What type of OLIU is to be looped on itself?
 If **16E OLIU1, 16E2 OLIU10, 16F OLIU2, 16F2 OLIU9, or 20E OLIU4**, then continue to **Step 6**.

 If **16G OLIU3, 20G OLIU5, 16K OLIU6 or 20K OLIU7**, then do **Step 11**.
6. **Note:** The level control on the **16E OLIU1, 16E2 OLIU10, 16F OLIU2, 16F2 OLIU9, and 20E OLIU4** must be set to the **LW** position when it is looped on itself.
7. Refer to **Figure 1** and set the option switch on the **16E OLIU1, 16E2 OLIU10, 16F OLIU2, 16F2 OLIU9, or 20E OLIU4** to the **LW** position.
8. **Caution:** *When handling the optical pigtails take care to minimize the bending radius.*
9. Use a **1002A** or **1012A** coupling to connect the **IN** and **OUT** leads of the OLIU to each other.
10. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**



A. OLIU 16E, 16F, 16G or 16K



B. OLIU 16E2 or 16F2

Figure 1. OLIU (All 16-Type) Option Switches

11. **Note:** The 16G OLIU3, 20G OLIU5, 16K OLIU6 and 20K OLIU7 must be looped with an attenuator coupling. See Table A. In addition, the level control on these OLIUs must be set to the LW position when it is looped on itself.
12. Refer to **Figure 1** and set the option switch on the OLIU to the LW position.
13. **Caution:** When handling the optical pigtails take care to minimize the bending radius.

- 14. See **Table A**. Use recommended attenuator coupling (or a 602G) to connect the **IN** and **OUT** leads of the OLIUs.
- 15. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Table A. Recommended OLIU Attenuators

	OLIU	Min. Atten. Req'd.	Attenuator	Attenuation
Lightguide Build Out	16G	7.0 dB	602D	9.0 ±1.0dB
	16K	13.7 dB	602G	17.5 ±1.5 dB
	20G	10.0 dB	602F	14.5 ±1.5 dB
	20K	13.3 dB	602G*	17.5 ±1.5 dB

* The 602G may be used on all OLIUs, if desired.

Replace Plug-In

1. **Caution:** *Whenever working with the DDM-1000 you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.*
2. **Note 1:** It is assumed that you have been sent here by another procedure with instructions to replace a particular plug-in, or that you are experienced with the system.

Note 2: When a replacement pack (except for PROCR packs) is configured the same as the original pack, it may be inserted with no further action. When a replacement pack is different (different code or different switch options) from the original, the **PROCR RST** button must be pressed to update the inventory. (See **DP-402** for RST details.)
3. Find the plug-in to be replaced in **Table A** and go to the indicated step.

Table A. Plug-ins Being Replaced

Plug-in To Be Replaced	Go To
MC90083A1 () PROCR	Step 6
AKM2 MXR1 (rated DA)	Step 9
AKM2B MXR2	Step 15
AKM2C MXR3	Step 15
AKM3 ELIU1	Step 23
AKM4 TLM1	Step 4
MC90191A1 TLM2	Step 48
AKM5 DS3U1	Step 59
AKM6 DS3U2	Step 43
AEK36-type DS1 INTFC	Step 29
AEK37 DS1C INTFC1	Step 29
AEK38 DS2 INTFC1	Step 29
547 TYPE PWR	Step 4
16- and 20-Type OLIU	Step 34

- 4. **Caution:** To prevent damage to the PWR pack, it should be unseated before applying external power.

There are no options to be set on this plug-in. Seat the plug-in.

- 5. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
- 6. **Caution:** When the PROCR is installed, it is necessary to RESET the PROCR.
- 7. Refer to DP-404 to replace and "reset" the PROCR.
- 8. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
- 9. **Note 1:** These steps apply only if the installed AKM2 MXR1 is to be replaced by another AKM2 MXR1. If the installed MXR1 is to be replaced by an AKM2B (MXR2) or AKM2C (MXR3), find the plug-in to be used in Table A and go to the indicated step.

Note 2: The option switches on the replacement AKM2 MXR1 must be set correctly when the plug-in is installed.

- 10. Determine from office records the desired settings of the option switches on the AKM2 MXR1.
- 11. Table B indicates the option switch settings for the AKM2 MXR1.

Table B. AKM2 MXR1 Option Switches

Switch	Electrical Operation		Optical Operation	
	S1	S2	S1	S2
Sec 1	Open	Open	Closed	Closed
Sec 2	Open	Open	Closed	Open
Sec 3	Open	Open	Open	Closed
Sec 4	Closed	Closed	Open	Open

12. Refer to **Figure 1** and set the option switches on the **AKM2 MXR1**.

Note: To set the switch to "open" depress the rocker toward the side labeled **OPEN** in the figure. To set the switch to "closed" depress the rocker toward the side labeled **CLOSED** in the figure.

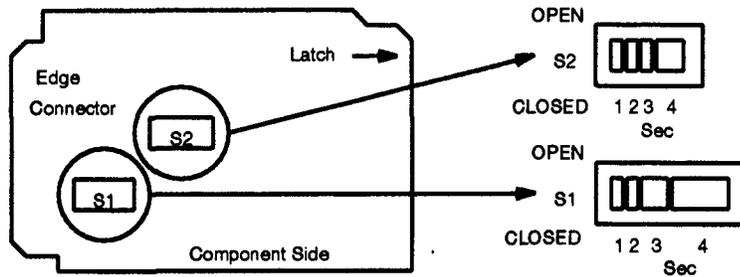


Figure 1. AKM2 MXR1 Option Settings

13. Remove the **AKM2 MXR1** to be replaced and install the replacement plug-in. Take care to avoid damaging the LED that protrudes through the opening in the faceplate of the plug-in.
14. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
15. **Note:** The option switches on the replacement **AKM2B MXR2** or **AKM2C MXR3** must be set correctly when the plug-in is installed.
16. Determine from office records the desired settings of the option switches on the **AKM2B MXR2** or **AKM2C MXR3**.

Note: If an **MC90191A1 TLM2** is installed and PM is being used, an **AKM2C MXR3** must be installed and option plugs **P3** and **P4** must be set for **C-Bit Mode**.

17. **Table C** indicates the option switch settings for the **AKM2B MXR2** or **AKM2C MXR3**.

Table C. MXR2 (AKM2B)/MXR3 (AKM2C) Option Switches

Switch	Electrical Operation		Optical Operation	
	S1	S2	S1	S2
Sec 1	Open	Open	Closed	Closed
Sec 2	Open	Open	Closed	Open
Sec 3	Open	Open	Open	Closed
Sec 4	Closed	Closed	Open	Open

18. Refer to **Figure 2** and set the option switches on the **AKM2B MXR2** or **AKM2C MXR3** as indicated in **Table C**.

Note: To set the switch to "open" depress the rocker or slide the switch toward the side labeled **OPEN** in the figure. To set the switch to "closed" depress the rocker or slide the switch toward the side labeled **CLOSED** in the figure.

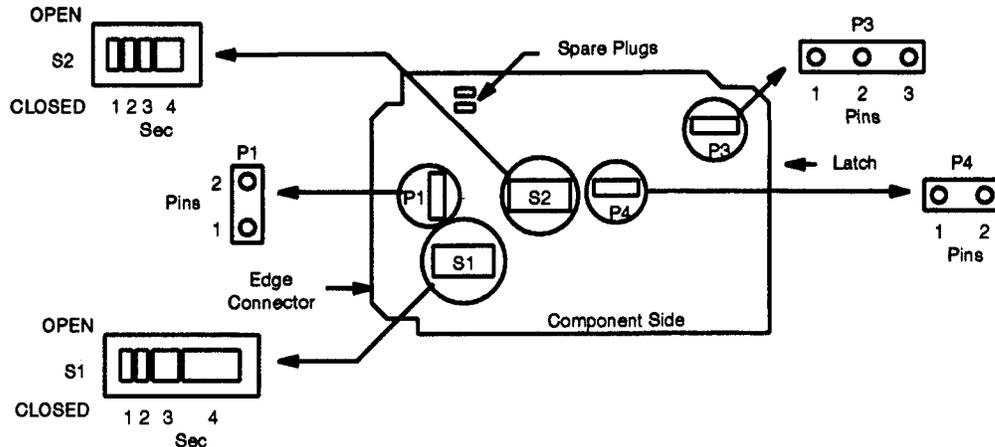


Figure 2. MXR2 (AKM2B)/MXR3 (AKM2C) OPTION SETTINGS

19. **Table D** and **Table E** indicate the option plug settings for the **AKM2B MXR2** or **AKM2C MXR3**.

Table D. MXR2 (AKM2B)/MXR3 (AKM2C) Option Plugs

Plug	Install a Jumper Between Pins	
	Electrical	Optical
P1	(none)	1 and 2

Table E. MXR2 (AKM2B)/MXR3 (AKM2C) Option Plugs

Plug	Install a Jumper Between Pins	
	C-BIT Mode	M13 Mode
P3	2 and 3	1 and 2
P4	1 and 2	(none)

20. Refer to **Figure 2** and install the option plugs on the **AKM2B MXR2** or **AKM2C MXR3**.
21. Remove the **AKM2B MXR2** or **AKM2C MXR3** to be replaced and install the replacement plug-in. Take care to avoid damaging the LED that protrudes through the opening in the faceplate of the plug-in.
22. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
23. **Note:** The option plugs on the replacement **AKM3 ELIU1** must be set correctly when the plug-in is installed.
24. Determine from office records the length of the DS3 cabling between the **DDM-1000** and the **DSX-3** cross-connect point.
25. **Table F** indicates the required LBO settings for the **AKM3 ELIU1**

Table F. ELIU1 (AKM3) LBO Selection

Cable Length (ft.)			Plug Settings
728B, 734A	KS-19224, L2 Mini-coax	735A	
0 to 225	0 to 75	0 to 125	LBO
>225	>75	>125	NO LBO

26. Refer to **Figure 3** and set the option plugs according to **Table F**.

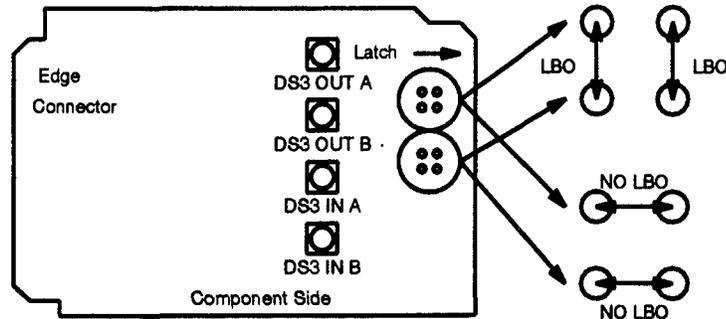


Figure 3. AKM3 ELIU1 Option Settings

27. **Note:** If **ELIU** is installed in an ED-2C841-30, G3 EMC shelf, the side cover must be removed, and the G32 mini-coax jumper cables must be disconnected from the **ELIU** before the **ELIU** is removed. Install the replacement **ELIU** in the reverse order. Ensure the G32 cables are connected to the proper connectors on the **ELIU**.

Remove the **AKM3 ELIU1** to be replaced and install the replacement plug-in.

28. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
29. **Note:** The option switches on the replacement **LS INTFC** plug-in must be set correctly when the plug-in is installed.
30. Refer to **DP-425** and set the option switches on the **LS INTFC**.
31. **Caution:** *It is important that you remove the **LS INTFC** to be replaced in one quick continuous motion to avoid an excessive interruption of the transmission path. The replacement plug-in should also be seated in one quick continuous motion for the same reason.*

Remove the **LS INTFC** to be replaced.

32. Seat the replacement **LS INTFC**. Take care to avoid damaging the LED that protrudes through the opening in the faceplate of the plug-in.
33. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
34. **NOTICE:** Unterminated optical connectors may emit laser radiation. Do not view beam with optical instruments.

35. **Warning 1:** *Open optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam.*
36. **Warning 2:** *Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.*
37. **Note 1:** When an OLIU is installed, the option switch(es) on the plug-in must be set correctly.

Note 2: The 16E2 (OLIU10) can be used as a direct replacement for the 16E (OLIU1) and the 16F (OLIU2) providing the option switch is set the same as the OLIU being replaced. The 16F2 (OLIU9) can be used as a direct replacement for the 16G (OLIU3) providing the laser option switch is set the same as the OLIU being replaced.
38. Refer to **DP-424** and set the option switch(es) on the **OLIU**.
39. Disconnect the optical cables from the **OLIU** to be replaced.
40. Remove the **OLIU** to be replaced and install the replacement plug-in. Take care to avoid damaging the optical cable and the LED that protrudes through the opening in the faceplate of the plug-in.
41. Connect the optical cables to the replacement **OLIU**.
42. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
43. **Note:** The option switches on the replacement **AKM6 DS3U2** must be set correctly when the plug-in is installed. All current applications of the **DS3U2** use the same option switch settings.
44. **Table G** indicates the option switch settings for the **AKM6 DS3U2**.

Table G. AKM6 DS3U2 Option Switches

Switch	Setting
Sec 1	Closed
Sec 2	Closed
Sec 3	Open
Sec 4	Open
Sec 5	Open
Sec 6	Open
Sec 7	Closed
Sec 8	Closed

45. Refer to **Figure 4** and set the option switches on the replacement **AKM6 DS3U2**.

Note: To set the switch to "open" depress the rocker toward the side labeled **OPEN** in the figure. To set the switch to "closed" depress the rocker toward the side labeled **CLOSED** in the figure.

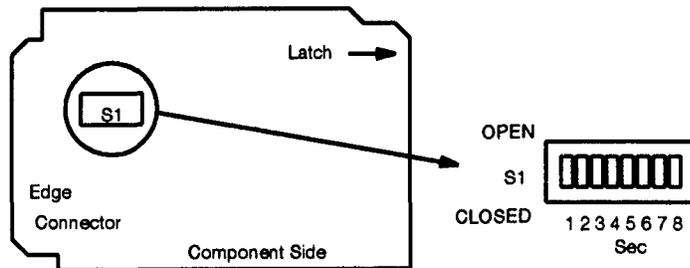


Figure 4. AKM6 DS3U2 Option Settings

46. Remove the **AKM6 DS3U2** and install the replacement **AKM6 DS3U2**. Take care to avoid damaging the LED that protrudes through the opening in the faceplate of the plug-in.
47. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
48. **Caution:** *Inserting an AKM4 TLM1 in a DDM-1000 shelf that is cabled for MC90191A1 TLM2 performance monitoring may damage any TLM2 plug-ins that are installed in other DDM-1000 shelves in the same bay. It may also damage the telemetry remote monitoring system (such as the GTP).*

Note: The option switches on the replacement **MC90191A1 TLM2** must be set correctly before the plug-in is installed.

49. From office records, determine the TABS address of the MC90191A1 TLM2 on the TABS serial telemetry link.

Note: The addresses should be assigned in the order that the shelves appear in the bay (i.e., shelf 1, TABS address 1; shelf 2 TABS address 2; etc.).

50. **Table H** indicates the address selection switch settings for the MC90191A1 TLM2.

Table H. TLM2 (MC90191A1) Shelf (TABS) Address Selection

Shelf	TABS Address	Switch S3		
		Switch Section		
		1	2	3
Shelf 1	1	Closed	Closed	Closed
Shelf 2	2	Open	Closed	Closed
Shelf 3	3	Closed	Open	Closed
Shelf 4	4	Open	Open	Closed
Shelf 5	5	Closed	Closed	Open
Shelf 6	6	Open	Closed	Open
Shelf 7	7	Closed	Open	Open
Shelf 8	8	Open	Open	Open

51. Refer to **Figure 5** and set the address selection switches on the replacement **MC90191A1 TLM2**.

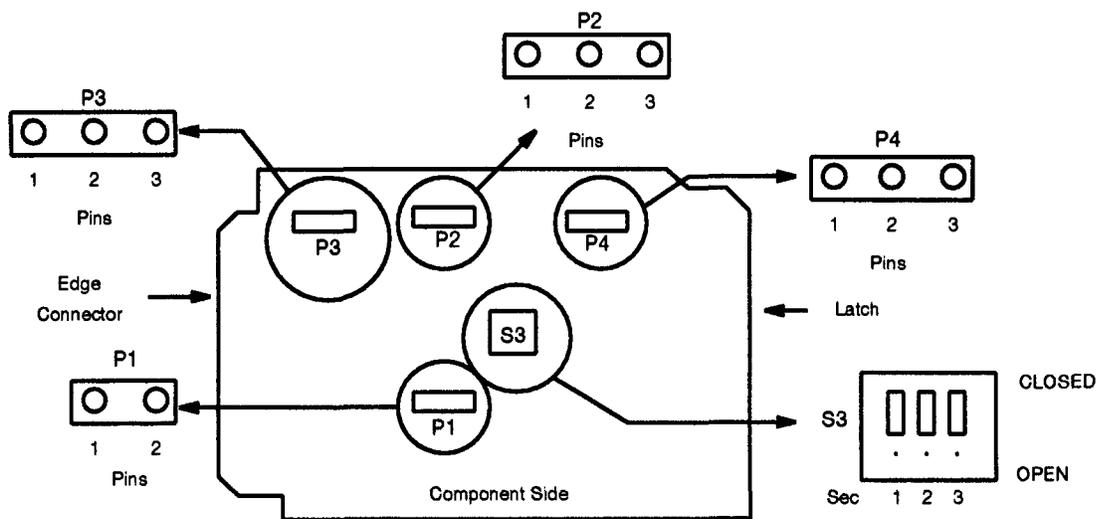


Figure 5. TLM2 (MC90191A1) Option Switches

52. **Note:** The TABS serial telemetry link must be terminated by the TLM2 with the highest (or only) TABS address in the bay. The remaining TLM2s in the bay must not terminate the link. For example, if the bay contains three TLM2s with shelf 1 having TABS address 1, shelf 2 having TABS address 2, and shelf 3 having TABS address 3, then the TLM2 in shelves 1 and 2 would be optioned not to terminate the link (not highest TABS address) and the TLM2 in shelf 3 would be optioned to terminate the link (highest TABS address).

Note: If a fourth TLM2 is later added to the bay in the above example, the TLM2 option settings in shelf 3 must be changed to remove the termination (no longer the highest TABS address). The TLM2 in shelf 4 must then be optioned to terminate the link (highest TABS address).

Table I indicates the option plug settings for the TLM2 address in the TABS link.

Table I. TLM2 (MC90191A1) Option Plugs

Plug	Install a Jumper Between Pins	
	TLM2 (Highest TABS Address)	TLM2 (<i>Not</i> Highest TABS Address)
P2	2 and 3	1 and 2
P4	2 and 3	1 and 2

53. Refer to **Figure 5** and set **P2** and **P4** option plugs on the **MC90191A1 TLM2**.

54. **Note:** Plugs P1 and P3 must always have the factory-installed jumpers connected between pins 1 and 2.

Refer to **Figure 5**. Install jumper between pins 1 and 2 on **P1**. Install jumper between pins 1 and 2 on **P3**.

55. **Caution:** *Take care to avoid damaging the LEDs that protrude through the opening in the faceplate of the plug-in.*

Remove **MC90191A1 TLM2** and install replacement **MC90191A1 TLM2**.

Response: The **RST/TEST** LED flashes on and off approximately five times and the **ALM** LED lights momentarily.

56. Momentarily depress the **RST** button on the TLM2 pack.

Response: The **RST/TEST** LED flashes on and off approximately 7 seconds and then goes off.

57. Momentarily depress the **TEST** button on the TLM2 pack.
Response: The **RST/TEST** LED flashes once and then goes off.

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

59. **Note:** One factory-installed option plug is on the DS3U1. This plug must be installed to cover the white portion of the socket. Two other options for setting parity and framing parameters are available through the ASCII terminal using the commands "**set-vmr-ds3u1:**" and "**set-frm-ds3u1:**".

There are no other option plugs to be set on this plug-in. Seat the plug-in.

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

Set OLIU Attenuation

1. **NOTICE:** Unterminated optical connectors may emit laser radiation. Do not view beam with optical instruments.
2. **Warning 1:** *Open optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam.*
3. **Warning 2:** *Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.*
4. **Note 1:** It is assumed that the loss of the optical facility is known from office records or that a measurement has been made.
5. From office records, or by measurement, determine the loss of the optical facility.
6. Determine the code of OLIU installed at each end of the facility.
7. Determine setting of the option switch for the OLIU. **Table A** and **Table B** specify the setting of the option switch for the 16-Type and 20-Type OLIU at the **HEAD END** of the facility. **Table C** specifies attenuators that can be used to insert at the receive end of the fiber to build out facility losses between 0 dB and the minimum losses specified under the **LW** switch settings.

Table A. 16-Type OLIU Option Switch Settings

Transmitter	Receiver	Transmitter Switch	
		LW	HI
		Facility Loss	
16E or 16F	16E	0 to 9 dB	9 to 18.0 dB
16E or 16F	16E2, or 16F2	0 to 11 dB	11 to 23.0 dB
16E or 16F	16F,16G or 16K	0 to 11 dB	11 to 22.5 dB
16E2	16E	0 to 9 dB	9 to 17.5 dB
16E2	16E2 or 16F2	0 to 11 dB	11 to 22.5 dB
16E2	16F, 16G, or 16K	0 to 11 dB	11 to 22.0 dB
16F2	16E	8 to 15 dB	15 to 23.9 dB
16F2	16E2 or 16F2	0 to 15 dB	15 to 28.9 dB
16F2	16F, 16G, or 16K	8 to 15 dB	15 to 28.4 dB
16G	16E	7 to 15 dB	15 to 24.0 dB
16G	16E2 or 16F2	0 to 11 dB	11 to 29.0 dB
16G	16F, 16G or 16K	7 to 15 dB	15 to 28.5 dB
16K	16E	13 to 21 dB	21 to 30.0 dB
16K	16E2 or 16F2	7 to 15 dB	15 to 35.0 dB
16K	16F, 16G, or 16K	13 to 22 dB	22 to 34.5 dB

Table B. 20-Type OLIU Output Level Switch Settings

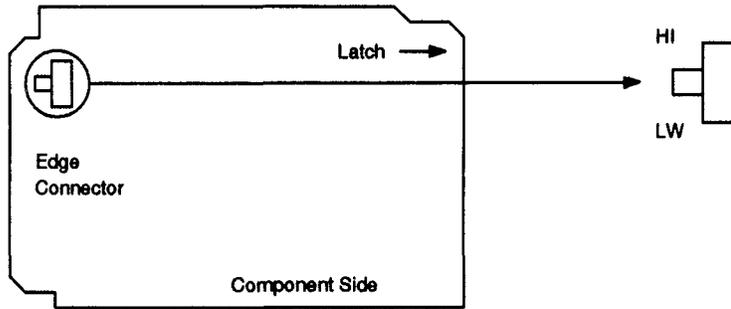
Transmitter	Receiver	Transmitter Switch	
		LW	HI
		Facility Loss	
20E	20E	0 to 9.0 dB	9 to 15.0 dB
20G	20E	7 to 14.5 dB	14.5 to 20.7 dB
20G	20G or 20K	10 to 20.5 dB	20.5 to 26.5 dB
20K	20E	10 to 17.5 dB	17.5 to 24.0 dB
20K	20G or 20K	13 to 23.5 dB	23.5 to 29.8 dB
20E	20G or 20K	4.3 to 14.8	14.8 to 20.8

Table C. Attenuators

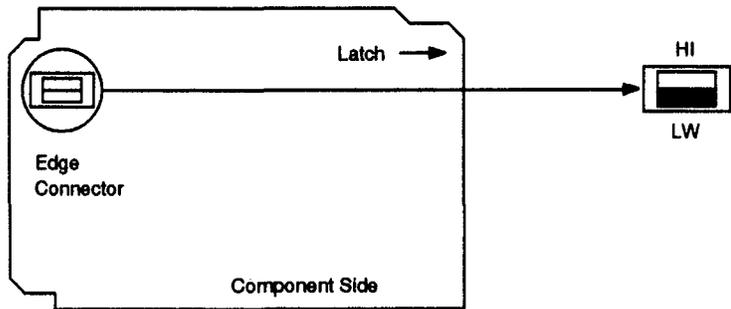
In-line Build-outs (Note)		Barrel Build-outs (Note)	
SM to MM	MM to MM	SM to MM	MM to MM
602A 3 dB	502A 5 dB	601A1 3 dB	501A1 5dB
602B 5 dB	502B 7 dB	601B1 5 dB	501B1 7dB
602C 7 dB	502C 9 dB	601C1 7 dB	501C1 9dB
602D 9 dB	502D 11 dB	601D1 9 dB	501D1 11dB
602E 11 dB	502E 13 dB	601E1 11 dB	501E1 13dB
602F 14.5 dB	502F 15 dB	601F1 14.5 dB	501F1 15dB

Note: SM-single mode MM-multimode

8. Refer to **Figure 1** and set the option switch as indicated in **Table A** or **Table B**.



A. OLIU 16E, 16F, 16G or 16K



B. OLIU 16E2 or 16F2

Figure 1. OLIU (All 16-Type) Option Switches

9. Is OLIU a 20-Type OLIU?

If **YES**, then continue with **Step 10**.

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

10. **Figure 2** is a cutaway illustration showing the LED option switch in the **20-Type OLIU**. Access to the switch is gained by raising the ejector lever. The switch is illustrated in the **UP** position.
11. Is the **OLIU** to be installed in the upper or the lower **DDM-1000** assembly?
- If **UPPER**, then set the LED option switch on the replacement **20-Type OLIU** to the **UP** position.
- If **LOWER**, then set the LED option switch on the replacement **20-Type OLIU** to the **DOWN** position.

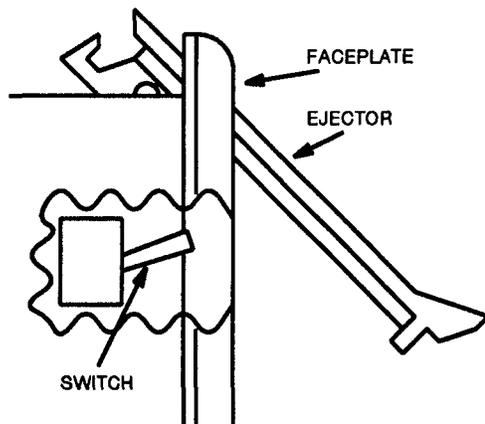


Figure 2. 20-Type OLIU LED Option Switch

12. STOP. YOU HAVE COMPLETED THIS PROCEDURE.

Set LS INTFC Options

1. **Note:** It is assumed that you have been sent here by another procedure with instructions to set the option switches on an LS INTFC plug-in **AEK36-type, AEK37, or AEK38.**
2. What type of LS INTFC plug-in are you working with?
 - If **AEK36 DS1 INTFC1**, then continue with **Step 3.**
 - If **AEK36B-type or AEK36C DS1 INTFC2**, then proceed to **Step 6.**
 - If **AEK37 DS1C INTFC1**, then proceed to **Step 9.**
 - If **AEK38 DS2 INTFC1**, then proceed to **Step 12.**
3. **Note:** The **AEK36 and AEK36B-type DS1 INTFC1** are rated DA.

The settings for the option switches on the **AEK36 DS1 INTFC1** are indicated in **Tables A and B.** Sections 1 through 5 are set according to the length of DS1 cabling between the **DDM-1000** and the **DSX-1** cross-connect. Sections 6 through 9 are set for the type of coding of the DS1 signal required (B8ZS or AMI).

Table A. AEK36-type LBO Settings

Cable Length (ft)	DIP Switch Settings				
	Sec 1	Sec 2	Sec 3	Sec 4	Sec 5
0 to 133	Closed	Open	Open	Open	Open
>133 to 267	Open	Closed	Open	Open	Open
>267 to 400	Open	Open	Closed	Open	Open
>400 to 533	Open	Open	Open	Closed	Open
>533 to 655	Open	Open	Open	Open	Closed

Table B. AEK36 Code Settings

Format	DIP Switch Settings			
	Sec 6 (Chan 1)	Sec 7 (Chan 2)	Sec 8 (Chan 3)	Sec 9 (Chan 4)
B8ZS	Open	Open	Open	Open
AMI	Closed	Closed	Closed	Closed

4. Refer to **Figure 1** and set the option switches according to **Tables A and B**.

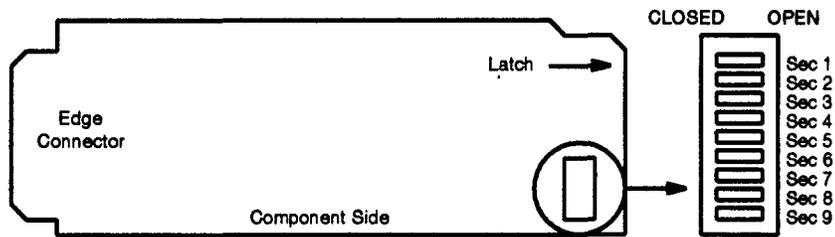


Figure 1. AEK36 DS1 INTFC1 Option Settings

Note: To set the switch to "open" depress the rocker toward the side labeled **OPEN** in the figure. To set the switch to "closed" depress the rocker toward the side labeled **CLOSED** in the figure.

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

6. The settings for the option switches on the **AEK36B**-type and **AEK36C DS1 INTFC2** are indicated in **Tables C** and **D**. Sections 1 through 3 are set according to the length-of DS1 cabling between the **DDM-1000** and the **DSX-1** cross-connect. Sections 4 through 7 are set for the type of coding of the DS1 signal required (B8ZS or AMI). Switch section 8 is unused.

Table C. AEK36B-types and AEK36C LBO Settings

Cable Length (ft)	DIP Switch Settings		
	Sec 1	Sec 2	Sec 3
0 to 133	Open	Open	Open
>133 to 267	Open	Open	Closed
>267 to 400	Open	Closed	Open
>400 to 533	Open	Closed	Closed
>533 to 655	Closed	Open	Open

Table D. AEK36B-types and AEK36C Code Settings

Format	DIP Switch Settings			
	Sec 4 (Chan 1)	Sec 5 (Chan 2)	Sec 6 (Chan 3)	Sec 7 (Chan 4)
B8ZS	Open	Open	Open	Open
AMI	Closed	Closed	Closed	Closed

7. Refer to **Figure 2** for the **AEK36B** or **Figure 3** for the **AEK36B S1:2, S1:3, S1:4**, or the **AEK36C** and set the option switches according to **Tables C and D**. Note that the eighth switch section is unused.

Note: To set the switch to "open" move the slide toward the side labeled **OPEN** in the figure. To set the switch to "closed" move the slide toward the side labeled **CLOSED** in the figure.

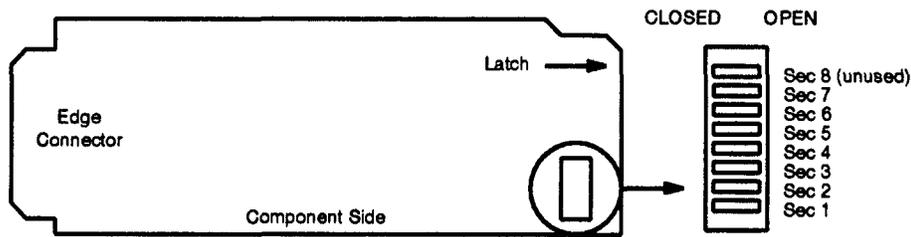


Figure 2. AEK36B DS1 INTFC2 Option Switch Location

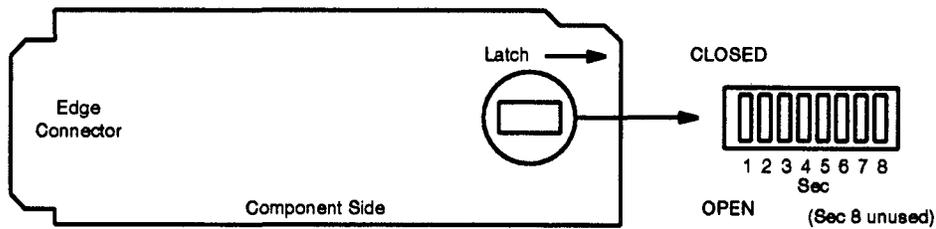


Figure 3. DS1 INTFC2 (AEK36B S1:2, S1:3, S1:4 and AEK36C) Option Switch Location

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

9. The settings for the option switches on the **AEK37 DS1C INTFC1** are indicated in **Tables E** and **F** below. Sections 1 through 5 are set according to the length of DS1C cabling between the **DDM-1000** and the **DSX-1C** cross-connect. Sections 6 and 7 are set for the type of coding of the DS1C signal required (B8ZS or AMI). Switch section 8 is unused.

Table E. AEK37 LBO Settings

Cable Length (ft)	DIP Switch Settings				
	Sec 1	Sec 2	Sec 3	Sec 4	Sec 5
0 to 133	Closed	Open	Open	Open	Open
>133 to 267	Open	Closed	Open	Open	Open
>267 to 400	Open	Open	Closed	Open	Open
>400 to 533	Open	Open	Open	Closed	Open
>533 to 655	Open	Open	Open	Open	Closed

Table F. AEK37 Code Settings

Format	DIP Switch Settings	
	Sec 6 (Chan 1)	Sec 7 (Chan 2)
B8ZS	Open	Open
AMI	Closed	Closed

10. Refer to **Figure 4** and set the option switches according to **Tables E** and **F**. Note that switch section 8 is unused.

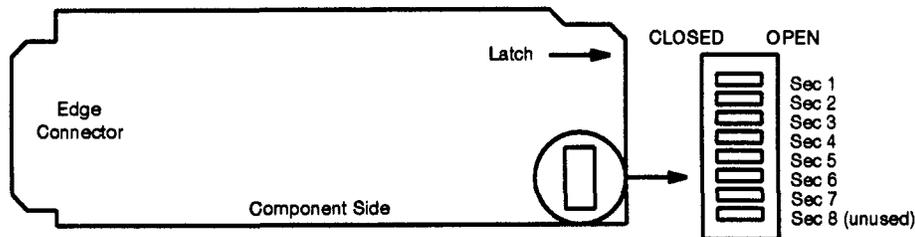


Figure 4. AEK37 DS1C INTFC1 Option Settings

Note: To set the switch to "open" depress the rocker toward the side labeled **OPEN** in the figure. To set the switch to "closed" depress the rocker toward the side labeled **CLOSED** in the figure.

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

12. The settings for the option switches on the **AEK38 DS2 INTFC1** are indicated in **Table G**. Sections 1 through 3 are set according to the length of DS2 cabling between the **DDM-1000** and the **DSX-2** cross-connect.

Table G. AEK38 LBO Settings

LBO Selection			
Cable Length (ft)	Sec. 1	Sec. 2	Sec. 3
0 to 150	Closed	Closed	Closed
>150 to 300	Open	Closed	Closed
>300 to 450	Closed	Open	Closed
>450 to 600	Open	Open	Closed
>600 to 750	Closed	Closed	Open
>750 to 900	Open	Closed	Open
>900 to 1050	Closed	Open	Open

13. Refer to **Figure 5** and set the option switches according to **Table G**.

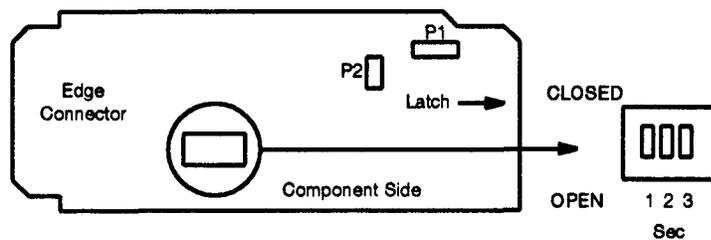


Figure 5. AEK38 DS2 INTFC1 Option Settings

Note: Factory installed plugs **P1** and **P2** should be present.

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

Perform DS3U2 Looped-Back Test (Optical)

1. **NOTICE:** Unterminated optical connectors may emit laser radiation. Do not view beam with optical instruments.
2. **Warning 1:** *Open optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam.*
3. **Warning 2:** *Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.*
4. **Caution:** *Whenever working with the DDM-1000 you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly. Note:* In a DDM-1000 optical system, to make a high speed switch properly, both a **SRV** and **PROTN** function unit must be present in a muldem. A high speed switch will not occur if one muldem contains only a **SRV** function unit.
5. **IMPORTANT:** The **AKM6 DS3U2** pack will only accept a DS3 input signal that has M13 formatting. This means that the signal must be of the type generated by an M13 multiplexer which contains DS2 framing bits. DS3 test sets are now available that generate an M13 formatted signal. The following test can be performed if one of the following is available:
 - Another **DDM-1000** assembly (with at least one muldem out of service) operating in the DS3 (rather than optical) mode and equipped with at least one **547-type PWR**, one **PROCR**, one **AKM3 ELIU1**, one **MXR** (optioned for M13 mode), and one **LS INTFC (AEK36-type DS1 INTFC1, AEK37 DS1C INTFC1 or AEK38 DS2 INTFC1)**
 - An out-of-service M13-type multiplexer and an appropriate low speed test set (such as a **KS-20775,L1 Error Rate Test Set**).
 - DS3 test set which can produce an M13 formatted signal.
6. Will the test be performed with a test **DDM-1000** muldem, with an M13-type multiplexer and a DS1 test set, or with a DS3 test set?
 - If with a test **DDM-1000** muldem, then continue to **Step 7**.
 - If with an M13-type multiplexer and a DS1 test set, then proceed to **Step 26**.
 - If with a DS3 test set, then proceed to **Step 46**.

7. **Note:** The following test (**Steps 8 through 20**) will be performed for one muldem of the DDM-1000 under test. This means only one muldem in the test DDM-1000 is required. Either muldem may be used. The MXR must be optioned for M13 mode.
8. At the **DSX-3** cross-connect appearances for the test muldem (not the **DDM-1000** under test), install a temporary loop from the **DS3 OUT** jack to the **DS3 IN** jack.
9. Refer to **DP-413** and perform an automatic looped transmission test for the test muldem.
10. Did the test muldem pass the automatic looped transmission test?
If **YES**, then continue to **Step 11**.
If **NO**, then refer to **TI-001** and repair the test **DDM-1000** as required.
11. Connect the system as shown in **Figure 1**. Connect only one DS3 path in each direction. Loop both the **SRV** and **PROTN OLIUS** back on themselves.

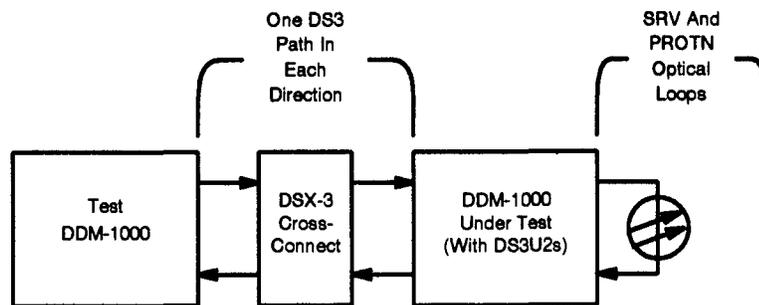


Figure 1. Test Setup with Test DDM-1000

12. Wait approximately 1 minute to give the LED indicators and alarms a chance to retire.
Are any LED indicators lighted or alarms activated on the **DDM-1000** under test?
If **YES**, then continue to **Step 13**.
If **NO**, then do **Step 14**.

Perform End-to-End Low Speed Transmission Test

1. **Caution:** *Whenever working with the DDM-1000 you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.*
2. **Note:** It is assumed that you were sent here by another procedure to perform an end-to-end low speed transmission test. It is further assumed that the complete end-to-end system has already been tested and that only a particular low speed circuit is to be tested at this time.
3. This test can be performed only if you have one of the following available:
An ASCII terminal (extended craft interface)
OR
A suitable low speed test set (such as a **KS-20775, L1 DS1 Error Rate Test Set** or a **KS22331, L1/KS-22332, L2 DS1/1C/2 Error Rate Test Set**)
4. Is an ASCII terminal (extended craft interface) available?
If **YES**, then continue to **Step 5**.
If **NO**, then do **Step 28**.
5. **Note:** This procedure will refer to one DDM-1000 assembly as the near end and the other assembly as the far end. These designations are completely arbitrary, either assembly can be the near end or the far end assembly.
6. At the **DSX-1, DSX-1C, or DSX-2** cross-connects associated with both the near end and the far end **DDM-1000**, connect a patch cord from the **OUT** jack to the **IN** jack for the low speed channel to be tested.
7. At the near end **DDM-1000** connect the ASCII terminal to the jack on the faceplate of the **PROCR**.
8. Refer to the "Commands and Reports" section of this manual, under **TEST-INS+MON**, and use the command **test-ins+mon:s=() d=mux** to perform a test of the complete DS1 loop.
9. Was the test successful (error free)?
If **YES**, then continue to **Step 10**.
If **NO**, then do **Step 25**.

10. At the **DDM-1000** at each end of the system, unseat the **SRV LS INTFC (AEK36-type, AEK37, or AEK38)** plug-in associated with the circuit under test.
11. Repeat the test using the command **test-ins+mon:s=() d=mux**
12. Was the test successful (error free)?
 If **YES**, then continue to **Step 13**.
 If **NO**, then do **Step 25**.
13. At the **DDM-1000** at each end of the system, unseat the **SRV LS INTFC (AEK36-type, AEK37, or AEK38)** plug-in associated with the circuit under test.
14. Repeat the test using the command **test-ins+mon: d=mux**
15. Was the test successful (error free)?
 If **YES**, then continue to **Step 16**.
 If **NO**, then do **Step 25**.
16. At the **DDM-1000** at each end of the system, reseal the **SRV LS INTFC** plug-in associated with the circuit under test.
17. Repeat the test using the command **test-ins+mon:s=() d=mux**
18. Was the test successful (error free)?
 If **YES**, then continue to **Step 19**.
 If **NO**, then do **Step 25**.
19. The low speed circuit under test has passed the end-to-end low speed transmission test.
20. At the **DDM-1000** at each end of the system, reseal the **SRV MXR** plug-in associated with the circuit under test.
21. Remove the looping patch cords from the **cross-connects**.
22. At both the near-end and the far-end **DDM-1000**, momentarily depress the **RST** button on the **PROCR** to update the **PROCR's** internal equipment list. Refer to **DP-402** for details.
23. Repeat **Steps 6** through **22** for any additional low speed circuits to be tested.
24. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

25. The low speed circuit under test has **failed** the end-to-end low speed transmission test.
26. Since the high speed circuits are, presumably, operating error-free, the problem is probably in the **LS INTFC** circuits. The failed plug-in may be isolated by replacing the suspect units, one at a time, with spare circuits and repeating test **Steps 6** through **22**. (There is a slight chance that the failure is in the **MXR** plug-ins in the **SRV** locations.)
27. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
28. **Note:** This procedure will refer to one DDM-1000 assembly as the near end and the other assembly as the far end. These designations are completely arbitrary, either assembly can be the near end or the far end assembly.
29. At the **DSX-1, DSX-1C** or **DSX-2 Cross-Connect** associated with the far end **DDM-1000**, connect a patch cord from the **OUT** jack to the **IN** jack for the low speed channel to be tested.
30. At the **Cross-Connect** associated with the near end **DDM-1000** connect the low speed test set to the **IN** and **OUT** jacks associated with the circuit under test.
31. Use the low speed test set to test for error-free transmission.
32. Was the test successful (error free)?
 If **YES**, then continue to **Step 33**.
 If **NO**, then do **Step 48**.
33. At the **DDM-1000** at each end of the system, unseat the **SRV LS INTFC** (**AEK36**-type **DS1 INTFC1**, **AEK37 DS1C INTFC1** or **AEK38 DS2 INTFC1**) plug-in associated with the circuit under test.
34. Repeat the low speed transmission test with the low speed test set.
35. Was the test successful (error free)?
 If **YES**, then continue to **Step 36**.
 If **NO**, then do **Step 48**.

36. At the **DDM-1000** at each end of the system, unseat the **SRV MXR** plug-in associated with the circuit under test.
37. Repeat the low speed transmission test with the low speed test set.
38. Was the test successful (error free)?
 - If **YES**, then continue to **Step 39**.
 - If **NO**, then do **Step 48**.
39. At the **DDM-1000** at each end of the system, reseat the **SRV LS INTFC** plug-in associated with the circuit under test.
40. Repeat the low speed transmission test with the low speed test set.
41. Was the test successful (error free)?
 - If **YES**, then continue to **Step 42**.
 - If **NO**, then do **Step 48**.
42. The low speed circuit under test has passed the end-to-end low speed transmission test.
43. At the **DDM-1000** at each end of the system, reseat the **SRV MXR** plug-in associated with the circuit under test.
44. Remove the looping patch cords from the **cross-connects**.
45. Refer to **DP-402** and update the **PROCR's** internal equipment list at both the near-end and the far-end **DDM-1000**.
46. Repeat **Steps 29** through **44** for any additional low speed circuits to be tested.
47. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
48. The low speed circuit under test has **failed** the end-to-end low speed transmission test.
49. Since the high speed circuits are, presumably, operating error-free, the problem is probably in the **LS INTFC** circuits. The failed plug-in may be isolated by replacing the suspect units, one at a time, with spare circuits and repeating test **steps 29** through **44**. (There is a slight chance that the failure is in the **MXR** plug-ins in the **SRV** locations.)
50. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Install 20-Type OLIUs and Associated Cables

1. **NOTICE:** Unterminated optical connectors may emit laser radiation. Do not view beam with optical instruments.
2. **Warning 1:** *Open optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam.*
3. **Warning 2:** *Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.*
4. **Caution:** *Whenever working with the DDM-1000 you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.*
5. **Note:** It is assumed that the installation procedure **IP-203** has been completed up to the point of installing the OLIUs in **Step 21**. If not, refer to **IP-203**, and perform the installation procedure.
6. Will the 180 Mb/s optical system have two **DDM-1000** assemblies or one **DDM-1000** assembly at this end?
 If **TWO assemblies**, then continue to **Step 7**.
 If **ONE assembly**, then do **Step 15**.
7. **Note:** It is assumed that neither of the two DDM-1000 assemblies is in service. It is further assumed that the two assemblies are installed one above the other separated by no more than the height of a heat baffle.
8. **Note:** The two OLIUs will be installed in one of the two assemblies. The assembly with the OLIUs will be referred to here as the "OLIU assembly". The assembly without the OLIUs will be referred to here as the "Non-OLIU Assembly".
9. Determine which is to be the **OLIU Assembly**. Either assembly can be used. Make sure that the optical cables to be used for 180 Mb/s operation are long enough to reach the assembly selected.

10. Refer to **Figure 1** and install the **SRV ED-2C833-20, G(17-20)** cable assembly on the backplane as follows:

Note: The "J" numbers stamped on the cable connectors **must always face to the right** where the "P" numbers are stamped on the backplane.

The end of the cable with three connectors (two large and one small) is connected to locations **P39, P41** and **P43** on the **Non-OLIU Assembly**. The mating connectors on the cable are labeled **J39, J41** and **J43**, respectively.

The end of the cable with two large connectors is connected to locations **P39** and **P41** on the **OLIU Assembly**. The mating connectors on the cable are labeled **J39** and **J41**, respectively.

11. Refer to **Figure 1** and install the **PROTN ED-2C833-20, G(17-20)** cable assembly on the backplane as follows:

Note: The "J" numbers stamped on the cable connectors **must always face to the right** where the "P" numbers are stamped on the backplane.

The end of the cable with three connectors (two large and one small) is connected to locations **P40, P42** and **P44** on the **Non-OLIU Assembly**. The mating connectors on the cable are labeled **J40, J42** and **J44**, respectively.

The end of the cable with two large connectors is connected to locations **P40** and **P42** on the **OLIU Assembly**. The mating connectors on the cable are labeled **J40** and **J42**, respectively.

Upgrade End-to-End 90 Mb/s Optical System to 180 Mb/s (One DDM-1000 Assembly at Each End)

1. **NOTICE:** Unterminated optical connectors may emit laser radiation. Do not view beam with optical instruments.
2. **Warning 1:** *Open optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam.*

Warning 2: *Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.*

3. **Caution:** *Whenever working with the DDM-1000 you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.*

Note 1: AKM5 DS3U1 circuit packs cannot be used with 180 Mb/s systems.

Note 2: In 180 Mb/s systems, channels originating in an **OLIU** shelf in one office terminate in the **OLIU** shelf in the other office. Channels originating in a non **OLIU** shelf in one office terminate in the non **OLIU** shelf in the other office. For example, if the **OLIU** shelf is on the bottom of the two-shelf pair in one office and on the top of the two-shelf pair in the other office, channel assignments follow the shelf configuration, not the physical position in a bay.

4. Are **AEK36B-type** or **AEK36C DS1 INTFC2** plug-ins installed in the **DDM-1000** assembly?

If **YES**, then continue to **Step 5**.

If **NO**, then do **Step 6**.

5. Refer to **DP-441** and replace the **AEK36 DS1 INTFC1** plug-ins with **AEK36B-type** or **AEK36C DS1 INTFC2** plug-ins. **THEN RETURN TO THIS PROCEDURE.**
6. Temporarily label the **SRV** and **PROTN IN** and **OUT** optical cables to be used for 180 Mb/s operation near the end where they will connect to the optical pigtails of the **20-Type OLIUs**. They should be labeled **SRV IN**, **SRV OUT**, **PROTN IN** and **PROTN OUT**, respectively. This will prevent errors in connecting them later.

7. At each end of the system, disconnect the **PROTN** optical cables from the **IN** and **OUT** optical pigtails on the **PROTN 16-Type OLIU**. Wait 20 seconds.

Response: At each end of the system, the **MN** alarm will be activated and the **ALM LED** will be flashing on the **PROTN 16-Type OLIU**.

8. At each end of the system, unseat and remove the **PROTN 16-Type OLIU**.

Response: At each end of the system, the **MN** alarm will remain activated.

9. **Figure 1** is a cutaway illustration showing the LED option switch in the **20-Type OLIU**. Access to the switch is gained by raising the ejector lever. The switch is illustrated in the **UP** position.

10. At each end of the system, set the LED option switches on both the **SRV** and **PROTN 20-Type OLIUs** to the **UP** position.

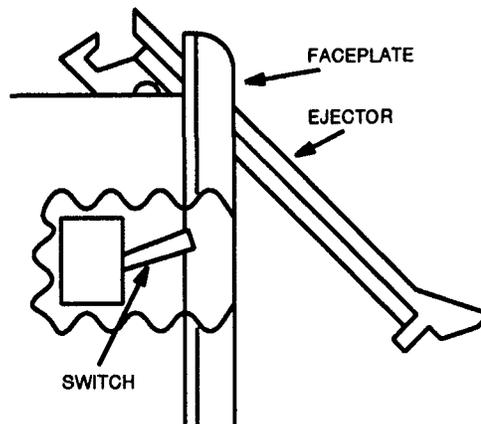


Figure 1. 20-Type OLIU LED Option Switch

11. **Note:** It is assumed that the loss of the optical facility is known from office records or that a measurement has been made.
12. From office records, or by measurement, determine the loss of the optical facility.

13. **Table A** specifies the setting of the output level option switch on the **20-Type OLIU**.

Table A. 20-Type OLIU Output Level Switch Settings

Transmitter	Receiver	Transmitter Switch	
		LW	HI
		Facility Loss	
20E	20E	0 to 9.0 dB	9 to 15.0 dB
20G	20E	7 to 14.5 dB	14.5 to 20.7 dB
20G	20G or 20K	10 to 20.5 dB	20.5 to 26.5 dB
20K	20E	10 to 17.5 dB	17.5 to 24.0 dB
20K	20G or 20K	13 to 23.5 dB	23.5 to 29.8 dB
20E	20G or 20K	4.3 to 14.8 dB	14.8 to 20.8 dB

14. Refer to **Figure 2** and, at each end of the system, set the output level option switch on both the **SRV** and **PROTN 20-Type OLIUs** as indicated in **Table A**.

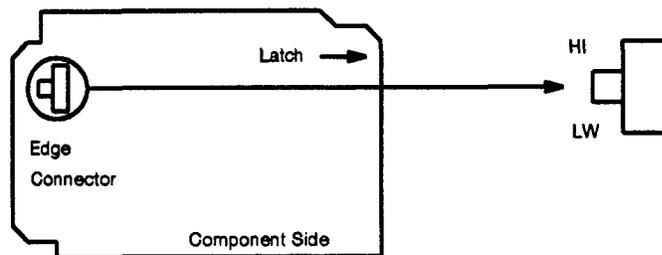


Figure 2. 20-Type OLIU Output Level Option Switch

15. At each end of the system, install a **20-Type OLIU** in the **PROTN OLIU** location.
- After several seconds, the upper **ALM** LED will be flashing on the **PROTN 20-Type OLIU** at each end of the system.
16. At each end of the system, reconnect the **PROTN** optical cables to the **IN** and **OUT** optical pigtails on the **PROTN 20-Type OLIU**.
- Response: At each end of the system, the **MN** alarm and all LEDs are extinguished.
17. At each end of the system, are all alarms and LEDs extinguished?
- If **YES**, then continue to **Step 18**.
If **NO**, then refer to **TI-001** and clear the indicated condition.

18. Is an **ASCII terminal** available?

If **YES**, then continue to **Step 19**.

If **NO**, then do **Step 28**.

19. At the near end use the **ASCII terminal** to make a high speed switch to protection using the command **exct-sw-hs:s=() make**. Use the command **exct-lock-hs:s=() make** to lock to the protection line.

Response: The **ASCII terminal** will report that the switch and lock were executed. The **ABN LED** will be lighted on the **PROCR** at each end of the system.

20. At each end of the system, are all LEDs and alarms extinguished except for the **ABN LEDs**?

If **YES**, then continue with **Step 21**.

If **NO**, then refer to **TI-001** and clear the indicated condition.

21. At each end of the system, disconnect the **SRV** optical cables from the **IN** and **OUT** optical pigtails on the **SRV 16-Type OLIU**. Wait 20 seconds.

Response: At each end of the system, the **MN** alarm will be activated and the **ALM LED** will be flashing on the **SRV 16-Type OLIU**. The **ABN LEDs** will remain lighted.

22. At each end of the system, unseat and remove the **SRV 16-Type OLIU**.

Response: At each end of the system, the **MN** alarm will remain activated. The **ABN LEDs** will remain lighted.

23. At each end of the system, install a **20-Type OLIU** in the **SRV OLIU** location.

After several seconds, the upper **ALM LED** will be flashing on the **20-Type OLIU** at each end of the system.

24. At each end of the system, reconnect the **SRV** optical cables to the **IN** and **OUT** optical pigtails on the **SRV 20-Type OLIU**.

After several seconds, the **MN** alarm and all indicators except for the **ABN LEDs** will be extinguished at each end of the system.

25. At each end of the system, are all LEDs and alarms extinguished except for the **ABN LEDs**?

If **YES**, then continue to **Step 26**.

If **NO**, then refer to **TI-001** and clear the indicated condition.

26. At the near end, use the **ASCII terminal** command **exct-lock-hs:s=() break** to break the lock. Use the command **exct-sw-hs:s=() break** to break the high speed switch.

Response: The **ASCII terminal** will report that the lock and switch were taken down. At each end of the system, the **ABN** LEDs will be extinguished.
27. At each end of the system, are all LEDs and alarms extinguished?

If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
If **NO**, then refer to **TI-001** and clear the indicated condition.
28. At each end of the system, disconnect the **SRV** optical cables from the **IN** and **OUT** optical pigtails on the **SRV 16-Type OLIU**. Wait 20 seconds.

Response: At each end of the system, the **MN** alarm will be activated and the **ALM** LED will be flashing on the **SRV 16-Type OLIU**.
29. At each end of the system, unseat and remove the **SRV 16-Type OLIU**.

Response: At each end of the system, the **MN** alarm will remain activated.
30. At each end of the system, install a **20-Type OLIU** in the **SRV OLIU** location.

After several seconds, the upper **ALM** LED will be flashing on the **20-Type OLIU** at each end of the system.
31. At each end of the system, reconnect the **SRV** optical cables to the **IN** and **OUT** optical pigtails on the **SRV 20-Type OLIU**.

After several seconds, the **MN** alarm and all indicators will be extinguished at each end of the system.
32. At each end of the system, are all LEDs and alarms extinguished?

If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE**
If **NO**, then refer to **TI-001** and clear the indicated condition.

Upgrade End-to-End 90 Mb/s Optical System to 180 Mb/s (Two DDM-1000 Assemblies at Each End)

1. **NOTICE:** Unterminated optical connectors may emit laser radiation. Do not view beam with optical instruments.
2. **Warning 1:** *Open optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam.*

Warning 2: *Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.*

3. **Caution:** *Whenever working with the DDM-1000 you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.*

Note 1: AKM5 DS3U1 circuit packs cannot be used with 180 Mb/s systems.

Note 2: In 180 Mb/s systems, channels originating in an **OLIU** shelf in one office terminate in the **OLIU** shelf in the other office. Channels originating in a non **OLIU** shelf in one office terminate in the non **OLIU** shelf in the other office. For example, if the **OLIU** shelf is on the bottom of the two-shelf pair in one office and on the top of the two-shelf pair in the other office, channel assignments follow the shelf configuration, not the physical position in a bay.

4. Are **AEK36 DS1 INTFC1** plug-ins installed in the assembly in which the **20-Type OLIU** plug-ins are to be installed (the **OLIU** Assembly)?

If **YES**, then continue to **Step 5**.

If **NO**, then do **Step 6**.

5. Refer to **DP-441** and replace the **AEK36 DS1 INTFC1** plug-ins with **AEK36B**-type or **AEK36C INTFC2** plug-ins. **THEN RETURN TO THIS PROCEDURE.**
6. Temporarily label the **SRV** and **PROTN IN** and **OUT** optical cables to be used for 180 Mb/s operation near the end where they will connect to the optical pigtails of the **20-Type OLIUs**. They should be labeled **SRV IN**, **SRV OUT**, **PROTN IN** and **PROTN OUT**, respectively. This will prevent errors in connecting them later.

7. **Note:** It is assumed that both DDM-1000 assemblies at each end of the system are powered, equipped with plug-ins, and running. If not, refer to the Task Index, **TI-001**, and complete the appropriate installation procedure.
8. **Note:** It is assumed that at least one of the two DDM-1000 assemblies at each end of the system is in service. It is further assumed that the two assemblies at each end of the system are installed one above the other separated by no more than the height of a heat baffle plus a fan unit.
9. **Note:** At each end of the system, the two 20-Type OLIUs will be installed in one of the two assemblies. The assembly with the OLIUs will be referred to here as the "OLIU assembly". The assembly without the OLIUs will be referred to here as the "Non-OLIU Assembly".
10. At each end of the system, determine which is to be the **OLIU Assembly**. Either assembly can be used. Make sure that the optical cables to be used for 180 Mb/s operation are long enough to reach the assembly selected.
11. At each end of the system, disconnect the **PROTN** optical cables from the **IN** and **OUT** optical pigtailed on each of the **PROTN 16-Type OLIUs**. Wait 20 seconds.

Response: At each end of the system, the **MN** alarm will be activated by each **DDM-1000** assembly and the **ALM** LED will be flashing on each of the **PROTN 16-Type OLIUs**.

12. At each end of the system, unseat and remove each of the **PROTN 16-Type OLIUs**.

Response: At each end of the system, the **MN** alarm will remain activated by each assembly.

13. Refer to **Figure 1** and, at each end of the system, install the **PROTN ED-2C833-20, G(17-20)** cable assembly on the backplane as follows:

Note: The "J" numbers stamped on the cable connectors **must always face to the right** where the "P" numbers are stamped on the backplane. |

The end of the cable with three connectors (two large and one small) is connected to locations **P40**, **P42** and **P44** on the **Non-OLIU Assembly**. The mating connectors on the cable are labeled **J40**, **J42** and **J44**, respectively. |

The end of the cable with two large connectors is connected to locations **P40** and **P42** on the **OLIU Assembly**. The mating connectors on the cable are labeled **J40** and **J42**, respectively. |

28. Refer to **Figure 1** and, at each end of the system, install the **SRV ED-2C833-20, G(17-20)** cable assembly on the backplane as follows:

Note: The "J" numbers stamped on the cable connectors **must always face to the right** where the "P" numbers are stamped on the backplane.

The end of the cable with three connectors (two large and one small) is connected to locations **P39, P41** and **P43** on the **Non-OLI Assembly**. The mating connectors on the cable are labeled **J39, J41** and **J43**, respectively.

The end of the cable with two large connectors is connected to locations **P39** and **P41** on the **OLI Assembly**. The mating connectors on the cable are labeled **J39** and **J41**, respectively.

29. At each end of the system, install a **20-Type OLI** in the **SRV OLI** location of the **OLI Assembly**.

After several seconds, both **ALM** LEDs will be flashing on the **20-Type OLI** at each end of the system.

30. At each end of the system, connect the **SRV** optical cables to the **IN** and **OUT** optical pigtails on the **SRV 20-Type OLI**.

After several seconds, the **MN** alarm and all indicators except for the **ABN** LEDs will be extinguished at each end of the system.

31. At each end of the system, are all LEDs and alarms except for the **ABN** LEDs extinguished?

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

If **NO**, then refer to **TI-001** and clear the indicated condition.

32. At each assembly at the near end use the **ASCII terminal** to **exct-lock-hs:s=() break** to break the lock. Use the command **exct-sw-hs:s=() break** break the high speed switch.

Response: The **ASCII terminal** will report that the lock and switches were taken down. At each end of the system, the **ABN** LEDs will be extinguished.

33. At each end of the system, are all LEDs and alarms extinguished?

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

If **NO**, then refer to **TI-001** and clear the indicated condition.

34. At each end of the system, disconnect the **SRV** optical cables from the **IN** and **OUT** optical pigtails on each of the **SRV 16-Type OLIUs**. Wait 20 seconds.

Response: The **MN** alarm will be activated and the **ALM** LED will be flashing on both **SRV 16-Type OLIUs** at each end of the system.

35. At each end of the system, unseat and remove each of the **SRV 16-Type OLIUs**.

Response: At each end of the system, the **MN** alarms will remain activated.

36. Refer to **Figure 1** and, at each end of the system, install the **SRV ED-2C833-20, G(17-20)** cable assembly on the backplane as follows:

Note: The "J" numbers stamped on the cable connectors must always face to the right where the "P" numbers are stamped on the backplane.

The end of the cable with three connectors (two large and one small) is connected to locations **P39**, **P41** and **P43** on the **Non-OLIU Assembly**. The mating connectors on the cable are labeled **J39**, **J41** and **J43**, respectively.

The end of the cable with two large connectors is connected to locations **P39** and **P41** on the **OLIU Assembly**. The mating connectors on the cable are labeled **J39** and **J41**, respectively.

37. At each end of the system, install a **20-Type OLIU** in the **SRV OLIU** location of the **OLIU Assembly**.

After several seconds, both **ALM** LEDs will be flashing on the **20-Type OLIU** at each end of the system.

38. At each end of the system, connect the **SRV** optical cables to the **IN** and **OUT** optical pigtails on the **SRV 20-Type OLIU**.

After several seconds, the **MN** alarm and all indicators will be extinguished on each assembly at each end of the system.

39. At each end of the system, are all LEDs and alarms extinguished?

If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE**
If **NO**, then refer to **TI-001** and clear the indicated condition.

Replace AEK36 DS1 INTFC1 With AEK36B-type or AEK36C DS1 INTFC2

1. **Caution:** *Whenever working with the DDM-1000 you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.*

Note: The **AEK36 DS1 INTFC1** plug-in has been rated DA.

2. Is an **AEK36 DS1 INTFC1** plug-in installed in the **PROTN 8** location?

If **YES**, then continue to **Step 3**.

If **NO**, then do **Step 6**.

3. Unseat and remove the **AEK36 DS1 INTFC1** in the **PROTN 8** location. Carefully note the settings of the option switches on the plug-in.

4. **Note:** The option switches on the **AEK36B-type DS1 INTFC1** and **AEK36C DS1 INTFC2** plug-ins are set differently to provide the same function.

Refer to **DP-425** and set the option switches on the replacement **AEK36B-type** or **AEK36C DS1 INTFC2** plug-in *to provide the same function* as the option settings on the **AEK36 DS1 INTFC1** being replaced.

5. Install and seat the replacement **AEK36B-type** or **AEK36C DS1 INTFC2** plug-in in the **PROTN 8** location.

6. Is an **AEK36B-type** or **AEK36C DS1 INTFC2** plug-in installed in the **PROTN 9** location?

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

If **NO**, then do **Step 10**.

7. Unseat and remove the **AEK36 DS1 INTFC1** in the **PROTN 9** location. Carefully note the settings of the option switches on the plug-in.

8. **Note:** The option switches on the **AEK36B-type** or **AEK36C DS1 INTFC2** and plug-ins are set differently to provide the same function.

Refer to **DP-425** and set the option switches on the replacement **AEK36B-type** or **AEK36C DS1 INTFC2** plug-ins *to provide the same function* as the option settings on the **AEK36 DS1 INTFC1** being replaced.

9. Install and seat the replacement **AEK36B-type** or **AEK36C DS1 INTFC2** plug-in in the **PROTN 9** location.

10. Unseat and remove the first **SRV AEK36 DS1 INTFC1** plug-in. Carefully note the settings of the option switches on the plug-in.
11. **Note:** The option switches on the **AEK36 DS1 INTFC1** and **AEK36B**-type and **AEK36C DS1 INTFC2** plug-ins are set differently to provide the same function.
Refer to **DP-425** and set the option switches on the replacement **AEK36B**-type or **AEK36C DS1 INTFC2** plug-in *to provide the same function* as the option settings on the **AEK36 DS1 INTFC1** being replaced.
12. Install and seat the replacement **SRV AEK36B**-type and **AEK36C DS1 INTFC2** plug-in.
13. Repeat **Steps 10** through **12** for the remaining **SRV AEK36 DS1 INTFC1** plug-ins.
14. At both the near-end and far-end **DDM-1000**, momentarily depress the **RST** button on the **PROCR** to update the **PROCR**'s internal equipment list. Refer to **DP-402** for details.

Test Protection Switching Function

1. **Caution: Whenever working with the DDM-1000 you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.**

Note 1: If far-end communication (fecom) is enabled and if the far-end alarm reporting option is enabled in the PROCR pack, the following tests will cause alarms in the far-end office.

Note 2: Sometimes, when testing a low speed protection switch, one or both muldems may completely fail. This problem may be caused by bent pins associated with the low speed DS1 connectors. If a failure occurs, carefully check that all backplane pins associated with the low speed connectors are contained within the connectors and that none are bent and touching adjacent pins.

2. To test a low speed switch to protection, unplug one of the low speed plug-ins (AEK36, AEK36B (AEK36B S1:2), AEK37 or AEK38).
Response: **MN** and **NE** LEDs on PROCR light after approximately 20 seconds.
3. **Caution: If system is in service, unplugging a second service plug-in in the same muldem will cause a service interruption on both low speed plug-ins.**

To test for a Major Alarm, unplug another low speed plug-in. After about 20 seconds the PROCR **MJ** (or **CR**) light will be turned ON, the **NE** light will remain ON and the **MN** light will go OFF.

Response: After approximately 20 seconds, PROCR **MJ** (or **CR**) LED lights; **MN** LED goes OFF; **NE** LED remains ON.

4. Reseat the plug-ins that were removed.
Response: All LEDs go OFF after approximately 20 seconds.
5. Repeat **Steps 2, 3** and **4** for each muldem.

6. In a DDM-1000 optical system, to make a high speed switch properly, both a **SRV** and **PROTN** function unit must be present in a muldem. A high speed switch will not occur if one muldem contains only a **SRV** function unit. If only one muldem is equipped, install an **AKM86 BP2** pack if required. See DP-412. |

To test a high speed switch to protect, unplug one of the service function units [**MXR()** or **DS3U()**].

Response: After approximately 20 seconds, **MN** and **NE** LEDs on PROCR light. In a DDM-1000 optical system, the **FE** LED will also light.

7. **Caution: If system is in service, unplugging the protection plug-in associated with the removed service plug-in will cause a service interruption.**

To test a Major or Critical Alarm, unplug the protection plug-in associated with the removed service function unit.

Response: After approximately 20 seconds, **MJ** (or **CR**) LED on PROCR lights; **MN** LED goes OFF, and **NE** LED remains lighted.

8. Reseat the plug-ins that were removed.

Response: After approximately 20 seconds, all LEDs go OFF.

9. To test for a switch to protection using an ASCII terminal, connect the terminal, if necessary, to the connector on the **PROCR**. Enter the command: "**rept-stat-protn:**". The terminal will display the current protection status.

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

Perform DS3U1 Looped-Back Test (Optical)

1. **NOTICE:** Unterminated optical connectors may emit laser radiation. Do not view beam with optical instruments.
2. **Warning 1:** *Open optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam.*
3. **Warning 2:** *Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.*
4. **Caution:** *Whenever working with the DDM-1000 you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.*
- 5.

IMPORTANT: The **AKM5 DS3U1** will accept a "standard" DS3 input or a DS3 input with M13-Type framing. Currently available DS3 test sets can be used to produce a "standard" DS3 output or the following test can be performed if one of the following is available:

Another **DDM-1000** assembly (with at least one muldem out-of-service) operating in the DS3 (rather than optical) mode and equipped with at least one **547-Type PWR**, one **PROCR**, one **AKM3 ELIU1**, one **MXR** (optioned for M13 mode or C-bit parity), and one **LS INTFC (AEK36-type DS1 INTFC, AEK37 DS1C INTFC1 or AEK38 DS2 INTFC1)**

OR

An out-of-service M13-Type multiplexer and an appropriate low speed test set (such as a **KS-20775, L1 Error Rate Test Set**).

6. Will the test be performed with a test **DDM-1000** muldem, an M13-Type multiplexer and a DS1 test set, or with a "standard" DS3 test set?
If with a test **DDM-1000** muldem, then continue with **Step 7**.
If with **M13-Type multiplexer and DS1 test set**, then proceed to **Step 26**.
If with a "standard" **DS3 test set**, then proceed to **Step 46**.

7. **Note:** The following test (**Steps 8 through 20**) will be performed for one muldem of the DDM-1000 under test. This means only one muldem in the test DDM-1000 is required. Either muldem may be used. The MXR may be optioned for either M13 mode or C-bit parity mode.
8. At the **DSX-3** cross-connect appearances for the test muldem (not the **DDM-1000** under test), install a temporary loop from the **DS3 OUT** jack to the **DS3 IN** jack.
9. Refer to **DP-413** and perform an automatic looped transmission test for the test muldem.
10. Did the test muldem pass the automatic looped transmission test?
If **YES**, then continue to **Step 11**.
If **NO**, then refer to **TI-001** and repair the test **DDM-1000** as required.
11. Connect the system as shown in **Figure 1**. Connect only one DS3 path in each direction. Loop both the **SRV** and **PROTN OLIUs** back on themselves.

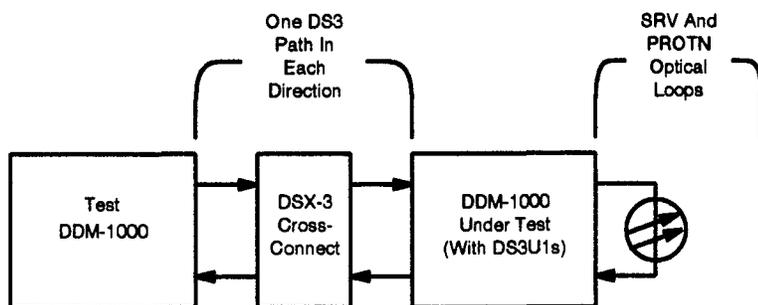


Figure 1. Test Setup With Test DDM-1000

12. Wait approximately 1 minute to give the LED indicators and alarms a chance to retire.
Are any LED indicators lighted or alarms activated on the **DDM-1000** under test?
If **YES**, then continue to **Step 13**.
If **NO**, then do **Step 14**.

Change Low Speed Channel Code Format

1. **Caution:** *Whenever working with the DDM-1000 you must wear an ESD wrist strap plugged into the grounding jack on the right side of the equipment.*

Note 1: This procedure contains two ways to change low speed channel code formats: (1) by changing option switches, and (2) by using an ASCII terminal and appropriate commands. It also includes a section on how to restore channel code formats to the switch settings after the code formats have been "soft set" using the ASCII terminal. Channel code format may be changed only on DS1 and DS1C packs. There are no code options on the DS2 packs.

Note 2: The ASCII terminal may be used to change the channel code format on a single channel, one muldem, or both muldems depending on the command options selected. This procedure is called "soft setting" a channel. Soft sets can be done only on **AEK36B**-type or **AEK36C DS1** packs using any version of **PROCR2** pack. Service on the other channels within a pack is not affected if the ASCII terminal is used for single channel code format changes.

Note 3: If you prefer to "soft set" the code format by using the ASCII terminal command "**set-dsx-code:**", it is recommended that you adopt an office policy to always change the channel code formats using the ASCII terminal. Because the channel format may be provisioned opposite to the physical switch setting, confusion may result if both the ASCII terminal and option switches are used. Once a channel is "soft set", the switch setting for that channel no longer has any effect. Even if the channel is "soft set" opposite to the switch setting and then "soft set" back to the same as the switch setting, a later manual switch change may not work depending on the PROCR2 version. (See the procedure in this DP for restoring channel code formats to the switch settings.)

Note 4: One way to determine if a channel is "soft set" is to compare the output from the "**rept-opt-dsx:**" command with the actual switch setting. If they are opposite, then the channel(s) are "soft set". In MC90083A1E PROCR2 firmware, the "**rept-opt-dsx:**" display shows DS1 channels that are soft set by an "*" following the code format type.

2. **Note:** If a muldem contains a mixture of channel code formats, the following rules apply:
 - If you are using a **PROCR1** pack and **AEK36 DS1 INTFC1** packs, or a **PROCR2** pack and **AEK37 DS1C INTFC1** packs, the code formats within a muldem are restricted to two groups of settings. This is because there are only two protection packs and each pack will be automatically selected to protect a low speed service pack that matches the code format switch settings on the protection pack. For example, if service slots 1-3 in muldem A are set to AMI and slots 4-7 are set to B8ZS, then protection slot 8 (if set to AMI) will protect slots 1-3 and protection slot 9 (if set to B8ZS) will protect slots 4-7. Any combination of code formats may be selected within the DS1() packs in the service slots if the protection packs match those settings and the combinations do not exceed two. The **PROCR** pack will automatically select the matching protection pack.
 - If you are using a **PROCR2** pack and any **AEK36-type DS1 INTFC** pack in the service slots, there are no restrictions to the channel code format combinations within a muldem if the protection pack (only one required) is an **AEK36B-type** or **AEK36C DS1 INTFC2** pack. The **PROCR2** pack will automatically provision the protection **AEK36B-type** or **AEK36C** to match the channel code format of the service pack that it is protecting.
3. Are you changing low speed channel code formats or restoring "soft-set" channel code formats to switch settings?
 - If **CHANGING**, continue with **Step 4**.
 - If **RESTORING**, proceed to **Step 23**.
4. Are you using the DIP switches or an ASCII terminal to change the code formats?
 - If **DIP SWITCHES**, continue with **Step 5**.
 - If **ASCII TERMINAL**, proceed to **Step 15**.
5. Identify the working pack and low speed slot to be optioned.
6. Ensure that service is removed from the channel to be changed.

7. Is an ASCII terminal available?

If **YES**, continue with **Step 8**.

If **NO**, proceed to **Step 9**.

8. Perform a low speed switch to protection using the ASCII terminal and the command "**exct-sw-ls:m=() s=() make=()**".

9. **Caution: Some errors will be produced when the pack is removed from the slot because of interruption of the shorting contacts on the backplane. The errors may be minimized by removing the pack quickly.**

Note: If an ASCII terminal was not used to perform a low speed switch to protection, removing the low speed pack will cause a switch to protection. This switch may produce more errors than if the ASCII terminal was used to perform the switch.

Remove the low speed pack. Refer to **DP-425** and option the pack as required.

10. **Caution: Some errors will be produced when the pack is reinserted in the slot because of interruption of the shorting contacts on the backplane. The errors may be minimized by reinserting the pack quickly and carefully.**

Reinsert the low speed pack.

11. Momentarily depress the **RST** button on the **PROCR**. Refer to **DP-402** for details.

12. **Note:** If the protection switch was done automatically by removing the low speed pack, it will take several seconds for the switch to release. If the protection switch was done with the ASCII terminal, use the command "**exct-sw-ls:m=() s=() break=()**" to release the switch.

13. **Caution: The channel code format should be verified. The channel code format may not have changed if the channel was previously "soft set" using an ASCII terminal.**

Is an ASCII terminal available?

If **YES**, then use the **rept-opt-dsx:** command to verify the channel format.

If **NO**, then it is recommended to use a DS1 test set to verify the channel code format.

14. Did the channel code format change?

If **YES**, then **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**
If **NO**, then proceed to **Step 23.**

15. **Note 1:** This procedure applies only to **AEK36B**-type or **AEK36C DS1 INTFC2** packs and shelves equipped with a **PROCR2** pack. (For a detailed discussion of the "**set-dsx-code:**" command, see the "Commands and Reports" section of this manual.) If the pack receiving the command is not an **AEK36B**-type or **AEK36C**, the message "request denied on 1 or more boards" will result.

Note 2: The protection slot of each muldem being changed must be equipped with an **AEK36B**-type or an **AEK36C DS1 INTFC2** pack.

Note 3: The "**rept-opt-dsx:**" command may be used to review the channel code format settings. With **MC90083A1B PROCR2** packs, if a "reset" is done after channel code formats are changed with the "**set-dsx-code:**" command, the channel formats will be set as commanded but the "**rept-opt-dsx:**" command will show that the channels are provisioned per the switch setting. If you reenter the "**set-dsx-code:**" command, the "**rept-opt-dsx:**" command will show the correct settings. In **MC90083A1E PROCR2** firmware, the "**rept-opt-dsx:**" display indicates DS1 channels that are soft set by an asterisk (*) following the code format type.

Note 4: These procedures may be performed from one end of the system using the "**e=y**" command parameter to identify the system end. The value of *y* is either **n** for the near end (default) or **f** for the far end.

Caution: *When using MC90083A1D, and earlier, PROCR2 packs, the "set-dsx-code:" command will execute without warning when you hit the "return" key. The MC90083A1E PROCR2 pack will prompt with a warning message requiring a "Y/N" entry to complete the command.*

Are you changing the channel code formats on one channel, one muldem, or both muldems (shelf)?

If **ONE CHANNEL**, continue with **Step 16.**
If **ONE MULDEM**, proceed to **Step 19.**
If **BOTH MULDEMS**, proceed to **Step 21.**

Equip DDM-1000 Second Muldem

1. **Caution:** *Whenever working with the DDM-1000 you must wear an ESD wrist strap plugged into the grounding jack on the right side of the equipment.*

Note: If, at any point in this procedure, the DDM-1000 fails to respond in the indicated manner, you should refer to **TP-105** to clear the trouble.

2. Verify that no alarms, locks, loops, or switches are present. Refer to **TP-106/107** if alarms are present. No alarm LEDs should be lighted on any circuit pack. Be sure to check both ends of the system.
3. **Note:** Either end may be designated as the NEAR END or FAR END.

Designate one end of the system as the NEAR END.

4. Refer to **DP-412**. At the NEAR END, verify that the new function units (SERVICE AND PROTECTION) are optioned properly (optical or electrical, M13 or C-bit, etc).
5. At the **NEAR END** only, insert the function unit plug-ins into the proper slots. In an optical system, if only one muldem is to be equipped, install an **AKM86 BP2** pack into the **SRV MXR** slot of the empty muldem.

Response (**Optical Systems**):

The alarm LEDs are flashing on the SERVICE and PROTECTION OLIUs. After several seconds, the processor will report a NEAR END and MAJOR alarm. If you have a TLM1 card and the 3-level alarm option is set in the processor, the CRITICAL alarm will be active instead of the MAJOR. Also, with far end communication enabled and the far end alarm option set in the processor, the far end DDM will report a FAR END and MAJOR alarm.

Response (Electrical Systems):

If there is no incoming DS3 signal, the alarm LED on the SERVICE function unit will be flashing. After several seconds, the processor will report a NEAR END and MAJOR alarm. If you have a TLM1 card and the 3-level alarm option is set in the processor, the CRITICAL alarm will be active instead of the MAJOR. Also, with far end communication enabled and the far end alarm option set in the processor, the far end DDM will report a FAR END and MAJOR alarm. If far end communication is disabled, no alarms will be present at the FAR END of the system.

6. Refer to **DP-412** and verify that the Low Speed cards are optioned properly (pulse format and LBO).
7. Insert the Low Speed cards into their slots at the NEAR END of the system.
8. Refer to **DP-412**. At the FAR END, verify that the new function units (SERVICE AND PROTECTION) are optioned properly (optical or electrical, M13 or C-bit, etc).
9. At the **FAR END**, insert the new function unit cards into their proper slots. In an optical system, if only one muldem is to be equipped, install an **AKM86 BP2** pack into the **SRV MXR** slot of the empty muldem.

Response (Optical Systems):

After about 20 seconds, all ALM LEDs will extinguish and the system will be running ERROR FREE.

Response (Electrical Systems):

After about 20 seconds, if installing AKM2, 2B, 2C function units, all ALM LEDs will extinguish. If installing AKM5 or AKM6 function units, all ALM LEDs will extinguish when a DS3 input is supplied to the system.

10. At the FAR END of the system, verify that the Low Speed cards are optioned properly (pulse format and LBO)
11. Insert the Low Speed cards into their slots at the FAR END of the system.
12. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Install DDM-1000 Second Shelf for 180 Mb/s System

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

Warning: *Open optical connectors may emit invisible laser radiation. Avoid direct exposure to the beam.*

Caution 1: *Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.*

Caution 2: *Whenever working with the DDM-1000 you must wear an ESD wrist strap plugged into the grounding jack on the right side of the assembly.*

Note 1: It is assumed that one shelf is installed and in service.

Note 2: In a 180 Mb/s optical system, an **AKM86 BP2** pack is required in each shelf that only has one muldem equipped. |

2. **Note:** It is recommended that the new shelf be fully tested using the procedures of **IP-203** before placing in service. This may require additional plug-ins, such as **OLIUs**, to complete the tests. After the tests are completed, the plug-ins may be removed.

Install second shelf either just above or just below the existing shelf per **IP-203**.

3. Remove all plug-ins from added shelf.
4. Is in-service shelf operating at 90 Mb/s or 180 Mb/s.
 If **90 Mb/s**, continue with **Step 5**.
 If **180 Mb/s**, proceed to **Step 6**.
5. Use the procedures of **DP-439** to upgrade the single 90 Mb/s shelf to 180 Mb/s.

6. **Note:** It is assumed that the existing shelf contains 20-type **OLIUs** and that the LED Option Switches have been set.

Ensure the optical cables to be used for 180 Mb/s operation are long enough to reach the added shelf.

7. Refer to **Figure 1** and install the **SRV ED-2C833-20, G(17-20)** cable assembly on backplane as follows:

Note: The "J" numbers stamped on the cable connectors **must always face to the right** where the "P" numbers are stamped on the backplane. |

The end of the cable with three connectors (two large and one small) is connected to locations **P39, P41** and **P43** on the added (**Non-OLIU**) Assembly. The mating connectors on the cable are labeled **J39, J41** and **J43**, respectively.

The end of the cable with two large connectors is connected to locations **P39** and **P41** on the existing (**OLIU**) Assembly. The mating connectors on the cable are labeled **J39** and **J41**, respectively.

8. Refer to **Figure 1** and install the **PROTN ED-2C833-20, G(17-20)** cable assembly on backplane as follows:

The end of the cable with three connectors (two large and one small) is connected to locations **P40, P42** and **P44** on the added (**Non-OLIU**) Assembly. The mating connectors on the cable are labeled **J40, J42** and **J44**, respectively.

The end of the cable with two large connectors is connected to locations **P40** and **P42** on the existing (**OLIU**) Assembly. The mating connectors on the cable are labeled **J40** and **J42**, respectively.

9. Add required plug-ins to second shelf per **DP-412**.
10. The end-to-end system is now ready for service to be established.
11. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

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