MDI SERIES MODULAR DISK SUBSYSTEM

USER'S MANUAL

Micro Technology

520039-001 Rev. B
September 27, 1991

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PREFACE

Intent of This Document

This manual is intended to provide the user with detailed information sufficient for the understanding, installation and operation of the Micro Technology MDI Series of Modular Disk Subsystems (hereafter referred to as the MDIF Series). Also provided with this manual are reference materials to familiarize the first-time user with the operation and configuration of the MDIF Series.

Section 1 OVERVIEW

Briefly describes the MDIF Series including a review of the configurations, compatibility issues and a summary of product specifications.

Section 2 INSTALLATION

Describes the installation procedure for the MDIF Series.

Section 3 OPERATION

Defines and illustrates the functions and operation of the MDIF Series front panel.

Section 4 SOFTWARE CONSIDERATIONS

Provides a description of software requirements and product limitations, if any.

Appendix Provides any additional information about the MDIF Series that could be beneficial to the user.

Document Conventions

For clarity, this manual uses different fonts to identify text used in specific ways. The fonts are used as follows:

Times Roman font is the standard font for normal text. This sentence is written in the Times Roman font.

Helvetica bold is used to show front panel displays, terminal display screens and what must be typed into the computer.

Notes, Cautions and Warnings within text have the following meanings:

NOTE Notes contain important information set off from text.

CAUTION Caution messages appear before procedures which, if not observed, could result in loss of data or in damage to equipment.

WARNING Warning messages alert the user to a specific procedure or practice which, if not followed correctly, could cause personal injury.

General Knowledge Level

It is assumed that the user is familiar with installing equipment and configuring systems. If no on-site expertise is available, call Micro Technology Field Service Technical Support at 800-FON-4MTI for assistance.

1. OVERVIEW

The MDI Series of Modular Disk Subsystems (hereafter referred to as the MDIF Series) manufactured by Micro Technology is the latest innovation in subsystem packaging design. The MDIF Series is packaged in an industry-standard 19-inch by 5-1/4 inch rack-mount sleeve containing up to two slide-in trays. Each tray can be configured with up to two fixed disk drives.

The MDIF Series interfaces to the DEC Standard Disk Interface (SDI) and emulates functions of a DEC RA series disk drive. Dual porting and automatic failover are supported.

The MDIF Series includes all the components required for installation and operation with a host system. The basic MDIF Series includes the following:

- Power supply and internal cable assemblies
- Up to two 5-1/4 inch disk drives per tray
- External 25 foot SDI cable
- Front control panel
- Accessory Kit with mounting hardware

1.1 Configuration

The MDIF Series is available in two rack-mount sleeve configurations. The first configuration comes equipped with one tray containing up to two disk drives and a filler panel in place of the second tray. The second configuration comes equipped with two trays containing up to two disk drives per tray. Figure 1-1 shows the front view of an MDIF Series.

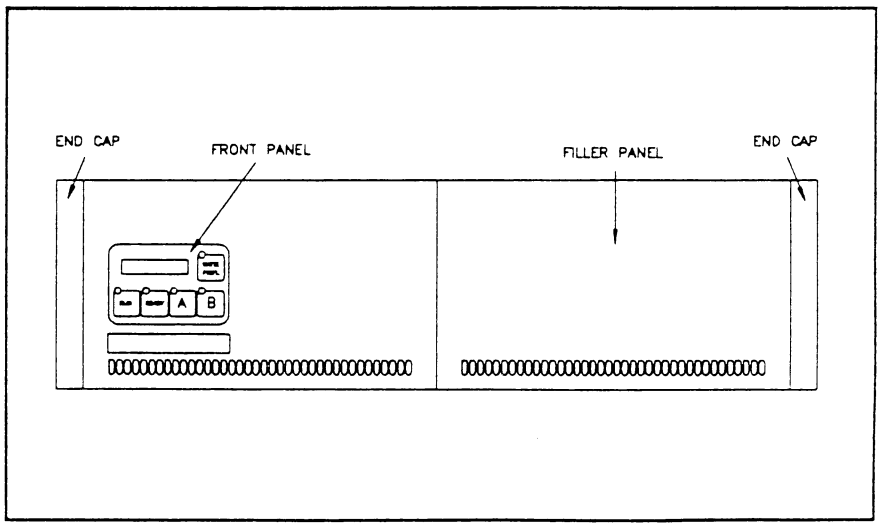

Figure 1-1. MDIF Series (Typical)

1.2 Compatibility

Each MDIF Series is compatible with Digital Equipment's SDI interface. Digital Equipment products using this interface include the following:

HSC40, HSC50, HSC70, KDA50, KDB50, KDM70, UDA50

Each subsystem in the MDIF Series emulates the functions of a Digital Equipment RA series disk drive. All Digital supplied software designed to operate with the RA series of drives will operate with the MDIF Series without modification at both the controller and host level.

1.3 Specifications

The following paragraphs provide the basic MDIF Series specifications for a single tray unit. Disk Drive performance specifications for the MDIF Series are included in the appendix.

Mechanical Dimensions

Height	5.20 inches
Width	8.75 inches
Depth	26.62 inches
Weight (2-drive configuration)	40 lbs. (approximately)

Power Requirements

Power Consumption (2-drive configuration)	120V @ 1.2A, 96 watts; 328 BTU per hr. 240V @ 0.6A, 96 watts; 328 BTU per hr.

Temperature

Operating	+50°F to +86°F (+5°C to +30°C)
Non-Operating (Storage)	-40°F to +140°F (-40°C to +60°C)

Relative Humidity

Operating	8% to 80%, non-condensing
Non-Operating	8% to 80%, non-condensing

Reliability

Mean-Time-Between-Failure (MTBF)	150,000 hours
Mean-Time-To-Repair (MTTR)	30 minutes

NOTE

Reliability is specified as power-on time between failures and is defined for mature production volumes. Reliability predictions are based on individual electronic component data (similar to MIL SPEC 217) and accelerated testing of electronic and mechanical components.

Micro Technology does not warrant that the predicted MTBF or the historical field failure rate are representative of any particular product installed for customer use. Failure rates are derived from a large data base of statistical samples. The actual failure rate will vary from unit to unit.

1.4 Regulatory Agency Standards

The MDIF Series complies with the following:

- The Standard for Information Technology Equipment, Underwriters Laboratories, Inc. (UL) 1950, First Edition, dated March 15, 1989.

2. INSTALLATION

The MDIF Series is shipped complete with all the necessary hardware for mounting in an industry-standard 19-inch RETMA rack. An SDI cable is supplied to connect port A to the host controller.

Figure 2-1 gives the location of each switch and connector discussed in this section.

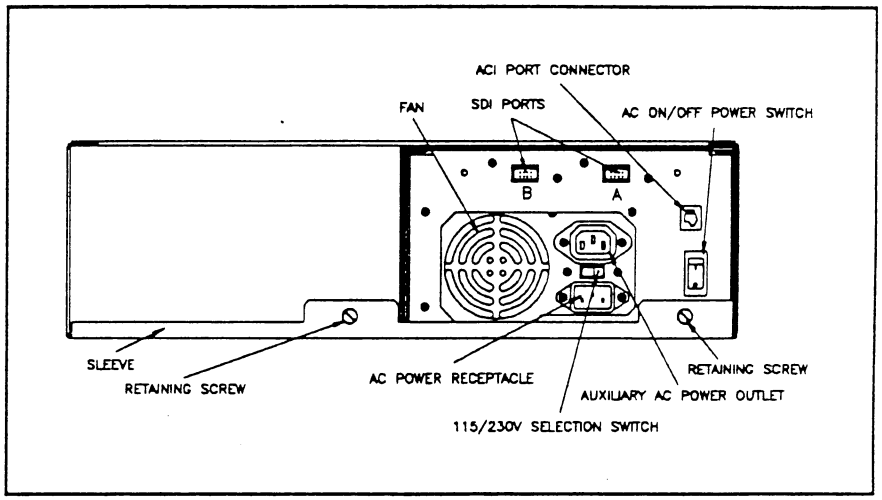

Figure 2-1. Rear Panel (Single Tray Shown)

2.1 Installation Instructions

This section will explain to the user how to prepare the MDIF Series for cabinet installation.

WARNING

Make sure that AC power to both the MDIF Series cabinet and host system are turned OFF before proceeding with these instructions.

2.1.1 Cabinet Preparation

Proceed with the following steps for cabinet preparation.

1. Remove the vented filler panel from the bottom front of the cabinet.

2. Turn off the circuit breaker on the power controller directly behind the vented filler panel.

3. Using the 5/32 Allen wrench supplied with the cabinet, unlock and remove the rear door of the cabinet. The Voltage Select and Fan Control switches are accessed from the rear of the cabinet.

4. Using a flat blade screwdriver, turn the Voltage Select switch on the power controller so that it is set to the appropriate voltage (United States/Canada = 120; Europe = 240). The Voltage Select switch is shown in Figure 2-2.

5. In the same manner, set the appropriate voltage on the fan control box on the ceiling (located in center) of the cabinet as shown in Figure 2-2.

NOTE

To get to the fan control box, the MDIF Series sleeve must be removed, if present. Follow the instructions in Section 2.1.2 to remove the sleeve.

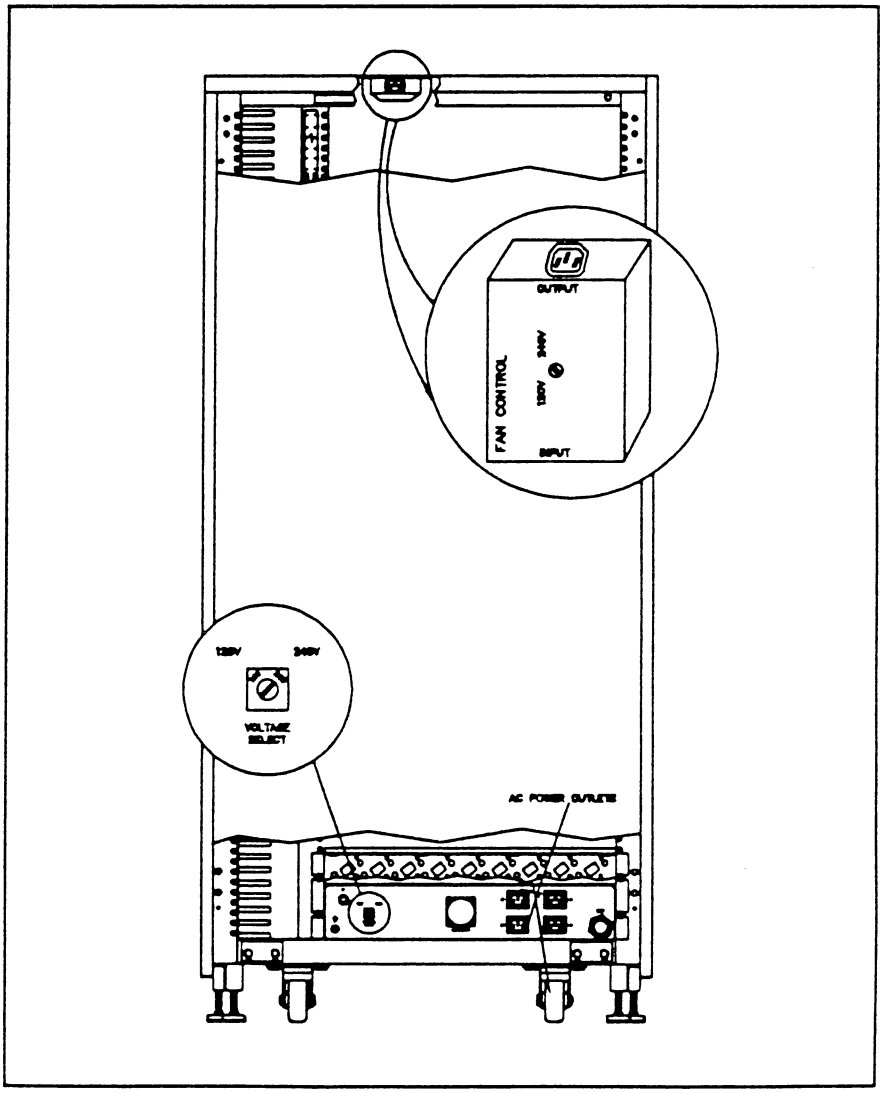

Figure 2-2. MDIF Series Fan Control and Voltage Select Switches

6. To connect the correct AC power cord to the cabinet, the following paragraphs give the user the necessary information.

WARNING

Micro Technology products are designed to work with single-phase power systems having a grounded neutral conductor. To reduce the risk of electrical shock, always plug the power cord into a grounded power outlet. The MDIF Series cabinet is shipped with a grounding type (3-wire) power cord.

Contact the facilities manager or a qualified electrician if unsure what type of power is supplied to the facility.

a. **120 VAC** - Use cabinet power supply cord with twist lock grounding type attachment plug (NEMA type L5-30P) as shown in Figure 2-3.

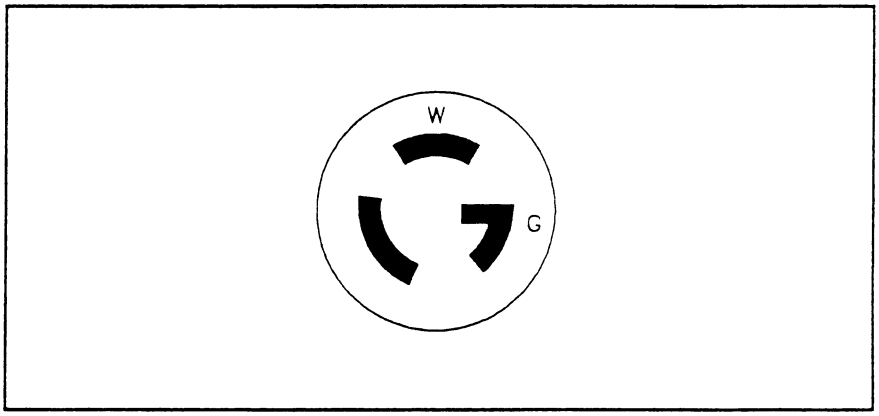

Figure 2-3. NEMA L5-30P

b. **240 VAC** - Use cabinet power supply cord with twist lock grounding type attachment plug (NEMA type L6-30P) as shown in Figure 2-4.

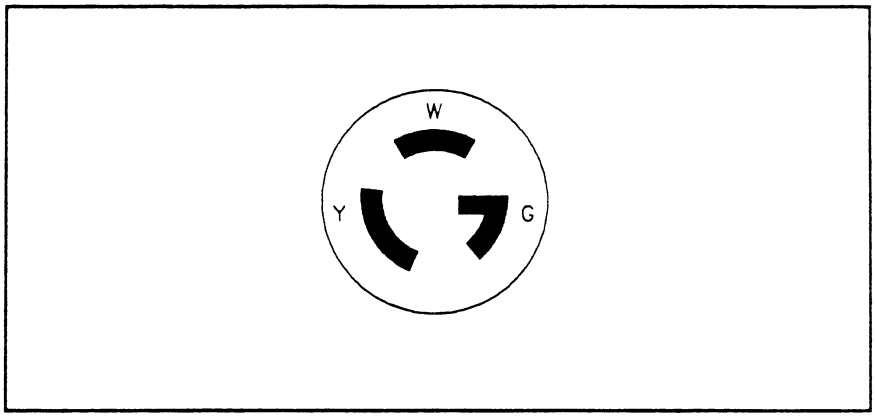

Figure 2-4. NEMA L6-30P

2.1.2 Sleeve/Tray Installation Procedure

The following procedure explains how to mount the MDIF Series sleeve into the cabinet RETMA rack as shown in Figure 2-5. All the mounting hardware can be found in the Accessory Kit supplied with the unit.

1. Mount the sleeve mounting brackets (one on each side) to the RETMA hole pattern of the rear rails of the cabinet using two #10 panhead screws for each bracket.

2. Remove the trays from the sleeve by unscrewing the rear retainer screw using a flat blade screwdriver.

3. Remove the front retainer screws located on the outside (front) of the sleeve with a phillips screwdriver. (NOTE: These screws are for shipping purposes only, DO NOT re-install and do not discard.)

NOTE

When performing the following steps, refer to Figure 2-5.

4. Slide the sleeve into the cabinet.

5. Mount the sleeve to the front of the cabinet rails using two #10 panhead screws on each side. The front mounting ears will line up with the factory installed clip nuts in the RETMA hole pattern of the rail.

6. Mount the sleeve to the rear of the cabinet sleeve mounting brackets (attached to the RETMA hole pattern on the rear rails) using three 6-32 flathead screws on each side.

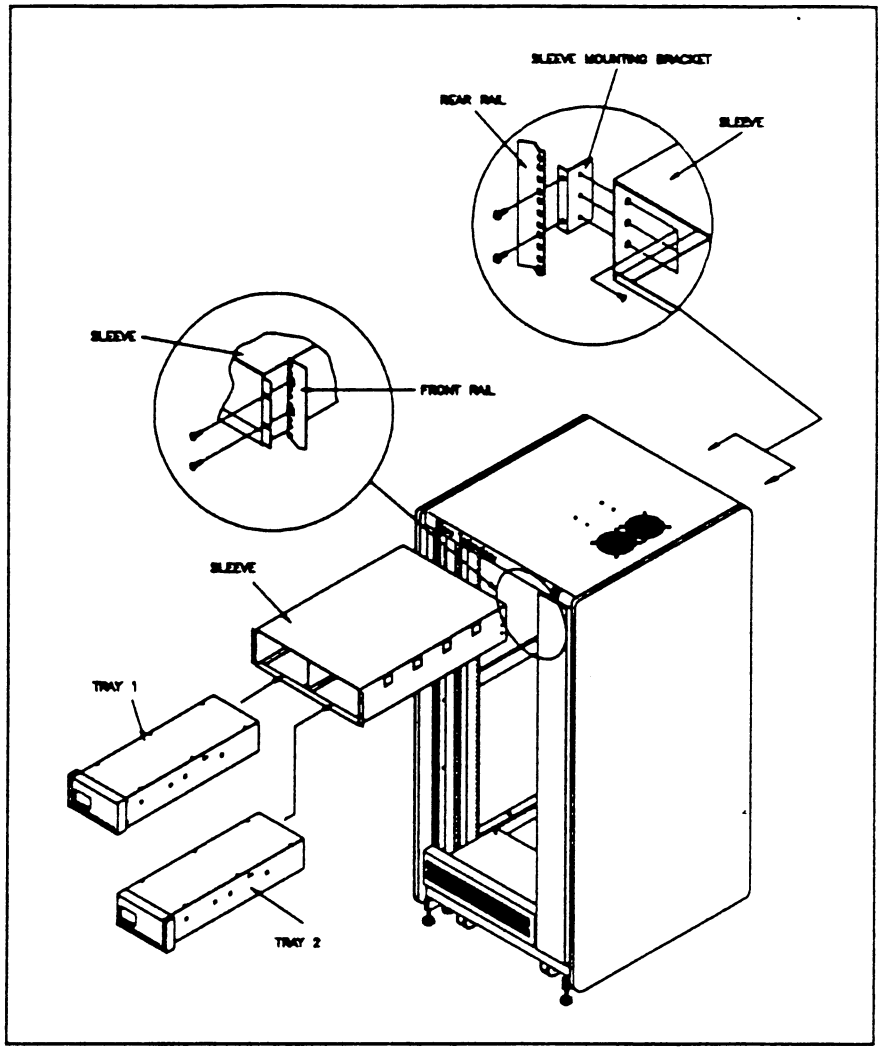

Figure 2-5. Mounting MDIF Series Sleeve and Trays

7. Slide each tray into the sleeve in the same position they were when removed.

8. Locate the tray end cap(s) and 6-32 panhead screws in the Accessory Kit. Slide the cap(s) onto the screws located on the side of the front bezel. Place a screwdriver into the hole on the side of the end cap and screw into place. The end cap(s) is placed to the outside of the tray(s).

9. When trays are in place, tighten rear retaining screw into the back of each tray and lock into place.

10. Locate the SDI cable(s) in the Accessory Kit. Install the cable(s) between the MDIF Series and the host controller.

CAUTION

Check that the 115/230V Selection switch is set correctly **before** turning on power to the unit.

11. Set the 115/230V Selection switch located on the rear panel as shown in Figure 2-1. This switch must be set to the proper input voltage before turning on power to the unit.

    For 115 volt installations ensure that the 115/230V Selection switch is set at "115." For 230 volt installations ensure that the 115/230V Selection switch is set at "230."

WARNING

Micro Technology products are designed to work with single-phase power systems having a grounded neutral conductor. To reduce the risk of electrical shock, always plug the power cord into a grounded power outlet. The MDIF Series tray is shipped with a grounding type (3-wire) power cord.

Contact the facilities manager or a qualified electrician if unsure what type of power is supplied to the facility.

12. Plug the ac power cords supplied with the cabinet ac power strip into the ac power receptacle (refer to Figure 2-1 for location) on the rear of each tray.

    For **120/230 VAC**, use the Micro Technology ac power cord or a power cord that has a grounding type attachment plug with a "Reverse" IEC 320 style connector as shown in Figure 2-6.

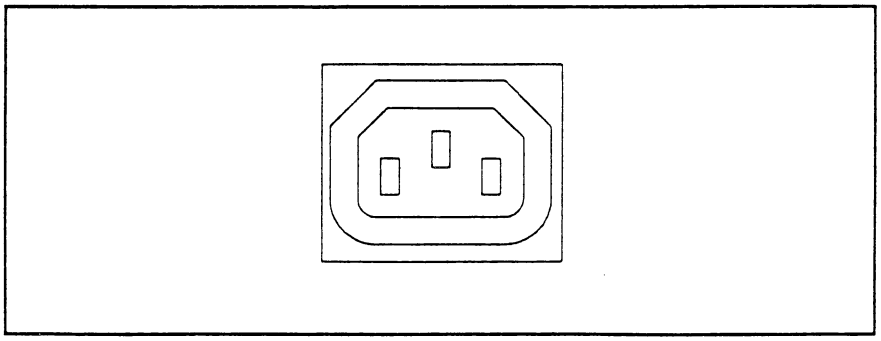

Figure 2-6. "Reverse" IEC 320 Power Plug

13. Turn the AC ON/OFF Power switch to the ON position on each tray (located on rear panel as shown in Figure 2-1) in the cabinet. Press the side of the Rocker switch labeled "1" as shown in Figure 2-7.

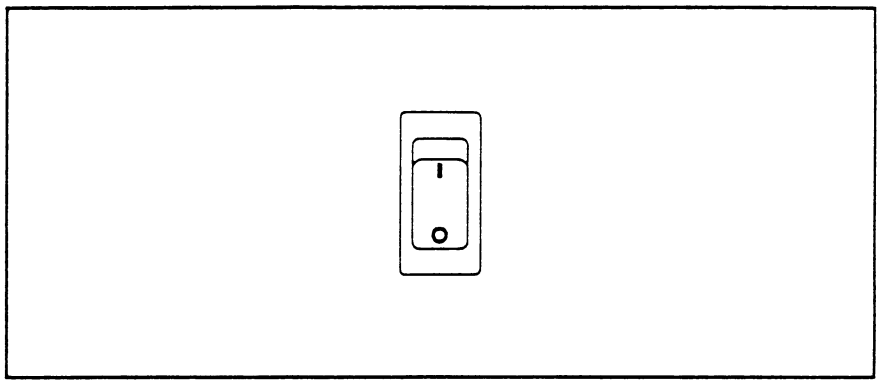

Figure 2-7. AC ON/OFF Power Switch

14. Proceed to Section 2.2 to continue with installation.

2.2 Power-On Procedure

Use the following procedure to apply power to the MDIF Series.

CAUTION

In order to maintain proper air exhaust and keep the equipment from overheating, ensure that there is a minimum of two feet of clearance at the rear of the cabinet.

1. Turn on the cabinet circuit breaker on the front of the power control unit.
2. Replace the vented filler panel on the front of the cabinet.
3. Replace the rear cabinet cover.

2.3 Asynchronous Communications Interface Port

The MDIF Series provides one Asynchronous Communications Interface (ACI) port, as shown in Figure 2-8, located on the back of the tray. This port allows the MDIF Series to connect to any RS-232-C device.

Micro Technology provides an optional ACI port installation kit (P/N 800460-128) that contains a set of specialized cable components that will enable the Micro Technology customer service representative to attach the MDIF Series to a serial monitoring device. For further information contact a Micro Technology customer service representative.

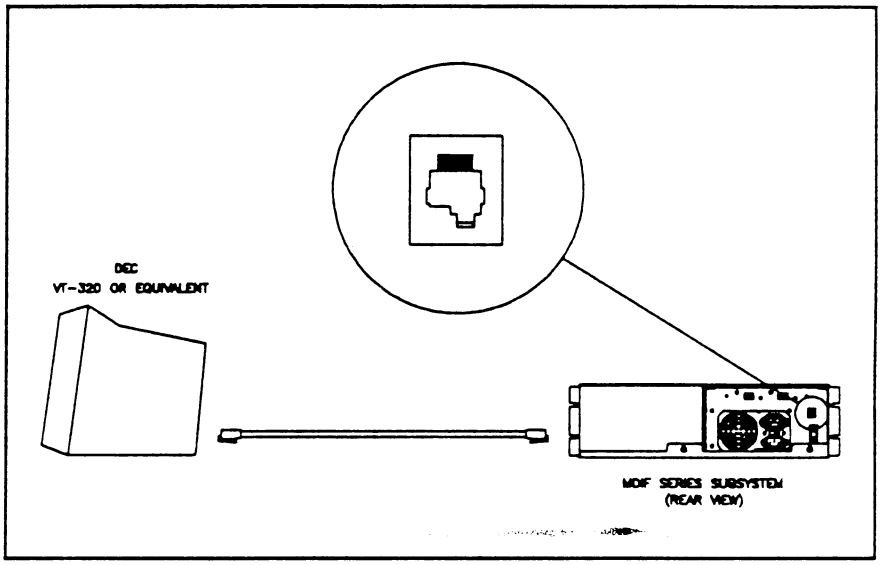

Figure 2-8. Connecting an MTI ACI Port to an RS-232-C Device

2.4 Software Compatibility

The MDIF Series is compatible with DEC SDI protocol. For additional information contact a Micro Technology customer service representative.

2.5 Equipment Considerations

The MDIF Series does not require any special equipment considerations. If there are any problems, contact a Micro Technology customer service representative.

3. OPERATION

This section provides information and instructions for operating the MDIF Series front panel. The front panel contains five switches, five LED status indicators and an eight-position LED display as shown in Figure 3-1. By pressing different sequences of switches, different information about the disk drives is displayed. Use the five switches to move through the options, select the status display or select a function.

There is a separate front panel for each logical disk drive (a logical disk drive is one to two drives connected to a single controller board). When there are two logical disk drives in the system, there are two front panels. The front panels are completely independent. At power-up, the unit number for each logical disk drive is displayed. The first drive is unit 0; the second drive in a dual logical unit configuration is unit 1.

Critical MDIF Series status and setup parameters are stored in nonvolatile RAM. On power up or recovery from a power fail, a load sequence is automatically initiated. The state of the WRITE PROT., A, and B switches is remembered and restored. The unit number and options are also stored.

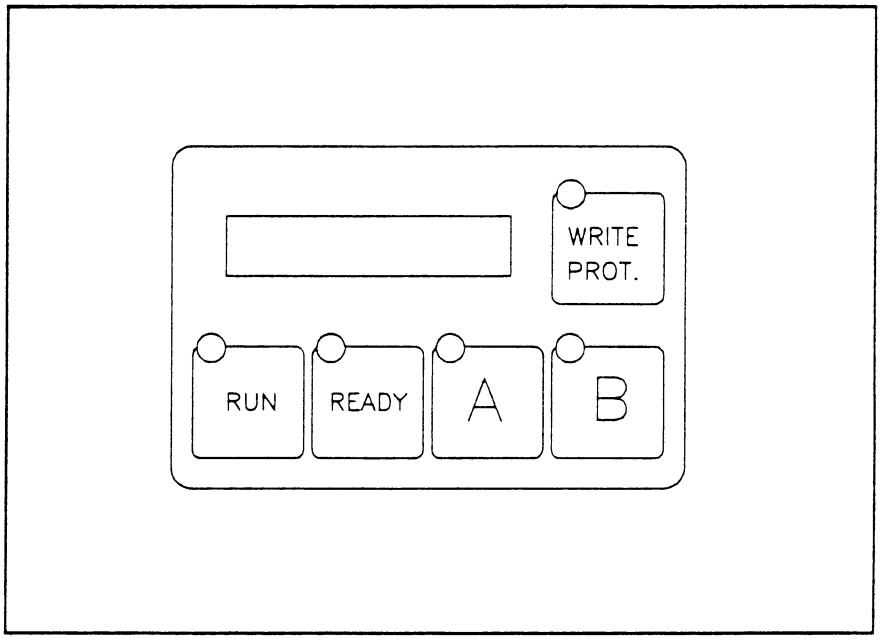

Figure 3-1. MDIF Series Front Panel

3.1 Status Indicators

The front panel LED status indicators are summarized below:

- **RUN Switch**

  Lit to indicate that the disk drive is in operation. Blinks to indicate that the disk drive is in transition.

- **READY Switch**

  Lit to indicate that the disk drive is ready. Blinks to show disk drive activity.

- **A Switch**

  Blinks to indicate A port has been enabled (refer to Section 3.2 for port selection procedure). On continuously when the host controller establishes a connection.

- **B Switch**

  Blinks to indicate B port has been enabled (refer to Section 3.2 for port selection procedure). On continuously when the host controller establishes a connection.

- **WRITE PROT. Switch**

  Lit continuously when the WRITE PROT. switch has been activated (refer to Section 3.5) or if the software has requested write protection.

3.2 Enabling the Ports

Press the A switch on the front panel to enable the A port for communication with the host controller. The A LED indicator blinks to indicate that the A port has been enabled by the switch. To disable the A port, press the A switch again.

Press the B switch on the front panel to enable the B port for communication with the host controller. The B LED indicator blinks to indicate that the B port has been enabled by the switch. To disable the B port, press the B switch again.

3.3 Spinning Up the Disk Drive

To spin up the disk drive, press the RUN switch. The RUN light will blink and the left display character will show up-arrows. The SDI adapter is notified of the run request. If run is not received from the SDI adapter within two minutes, the display will show SPINERR, indicating that the SDI adapter or the disk drive is not functioning correctly. When run is received from the adapter, the RUN light is turned on and the READY light is lit. The arrows are removed from the display.

3.4 Spinning Down the Disk Drive

Before a disk drive is spun down it should be software dismounted and the A and B ports disabled. Press the RUN switch. The RUN light will blink and the left display character will show down-arrows. The SDI adapter will be notified of the spin-down request. In the event that the request is not honored within 30 seconds, the message SPINERR will be displayed. When run is negated by the SDI adapter, there is a 10 second delay to ensure that the drive has stopped. The RUN light is turned off and the display arrows are removed.

3.5 Initiating Write Protection

The WRITE PROT. switch, when activated, inhibits write operations for the disk drive. This is an alternate action switch that toggles between active and inactive conditions. The WRITE PROT. light is lit continuously when the switch has been activated or if the software has requested write protection.

3.6 Using the Function Menu

The front panel includes a menu for selecting certain functions. There are four choices on the menu:

UNIT SEL	Selecting Unit Number
DISP BRIT	Changing Display Brightness
OPTIONS	Changing Options
DIAG/FOR	Formatting and Testing

Press the READY switch to show the menu choices. Pressing the A switch selects a menu choice. The WRIT PROT. or B switch is used to increment values. The following sections contain detailed information on each menu choice.

3.6.1 Selecting the Unit Number

The front panel is used to set the SDI unit number for the disk drive. Before beginning, ensure that both the A and B ports are disabled. Repeat the steps for the front panel of each disk drive. The steps for selecting the unit number are as follows:

1. Press and hold the READY switch for three seconds. The display shows:

2. Press the A switch to specify this as the menu choice to be selected. The display will show:

UNIT nnn

3. The right-most digit will be flashing. Press the WRITE PROT. switch to increment this digit.

4. Press the A switch to accept the digit.

5. The ten's digit will now be flashing. Press the WRITE PROT. switch until the proper value is displayed.

6. Press the A switch to accept the tens digit.

7. Press the WRITE PROT. switch to select the value for the hundreds digit.

8. Press the READY switch to store the new number and return to normal operation. (Pressing the A switch instead of the READY switch returns the display to the ones digit.)

3.6.2 Changing the Display Brightness

To change the brightness of the front panel display, follow these steps:

1. Press and hold the READY switch for three seconds. The UNIT SEL display will appear.

2. Press the READY switch again and the display will read:

DISPBRIT

3. Press the A switch to specify that display brightness is the menu choice to be selected. The display will show:

BRIGHT n

4. Press the WRITE PROT. switch to increment the brightness value, with level 7 being the brightest and level 1 the dimmest.

5. To store the selected brightness level, press the READY switch.

3.6.3 Changing Options

There are four choices available in this sub-menu. The following instructions tell the user how to change the options.

Bar Graph Display — The bar graph option causes a bar graph to be displayed indicating drive activity.

Drive Type — The user has the ability to change the disk drive type reported to the host using the drive type option. The possible values are: RA60, RA70, RA80, RA81, RA82, RA90 and RA92. The default disk drive type is RA90. To change the disk drive type, the ports must be disabled and the drive must be spun down.

Format Mode — Two different format modes are supported for the disk drives. CMPTMODE format is compatible with first generation Micro Technology subsystems and is lower capacity. CMPTMODE allows compatibility with existing disk drives for the purpose of disk shadowing. MTI MODE format increases usable storage and is the default format. Reformatting of existing subsystems should be done by a Micro Technology customer service representative. Note that if the format mode is changed, a format must be performed.

% of Disk to Use — The percentage of disk to use is the last option. The choices are 10%, 25% and 100%. The normal value is 100%. This value is normally changed only by a Micro Technology customer service representative to increase the speed of the formatting process for diagnostic purposes. If this value is changed, the system will be unusable until a format is performed.

To change any of the options, perform the following steps. Press READY at any time to exit from the option menu.

1. Press and hold the READY switch for three seconds. The UNIT SEL display will appear.

2. Press the READY switch again and the DISPBRIT display will appear.

3. Press the READY switch again and the display will read:

OPTION

4. Press the A switch to select this menu choice. The display will read:

GRAPHON

5. Press the B switch to toggle between GRAPHON and GRAPHOFF.

6. Press the A switch to move to the next option. The display will show the disk drive type currently selected, such as:

TYP RA90

7. The number (in this case, 90) will be flashing to indicate it can be changed. If the number is not flashing, the disk drive is spun up and the drive type can not be changed. Press the B switch to increment through the possible values.

8. Press the A switch to move to the next option. The display will show one of the following:

MTI MODE

OR

CMPTMODE

9. Press the B switch to toggle between the two format modes.

10. Press the A switch and the following display appears:

% USE=100

11. Press the B switch to toggle between the percentage values.

12. Press READY to exit from the option menu.

3.6.4 Formatting and Write-Testing

The last menu choice is for formatting and performing a write-verify test on the disk drive.

Q FORMAT Quick format does a physical disk drive format using the manufacturer's defect table with bad block/sector information with the system replacing those blocks.

F FORMAT Full format does a physical disk drive format using the manufacturer's defect table, then writes and verifies all sectors to establish bad sector information. Full format writes and reads a test pattern to check blocks. Because full format performs a double pass, it takes almost twice as long as a quick format.

W/V TEST Write/Verify test writes a test pattern on a diagnostic cylinder and read/verifies it. This is not a destructive operation since it uses a cylinder that is not available during normal disk drive operation.

CAUTION

The format options are destructive operations. All user data will be destroyed.

To select write-verify test or format perform the following steps:

1. Press and hold the READY switch for three seconds. The UNIT SEL display will appear.

2. Press the READY switch three times, scrolling past the DISPBRIT and OPTION choices until the display reads:

DIAG/FOR

3. Press the A switch to select this menu choice. The display will read:

4. To execute a quick format, press the B switch. Press the B switch again to confirm formatting. The display will show FCY FCT and FCY nnn during formatting and FMT PASS or FMT FAIL when done.

   To **abort** the format operation before it has begun, press the READY switch.

5. To move to the next choice, press the A switch. The display will show:

6. To execute a full format, press the B switch. Press the B switch again to confirm formatting. The display will show FCY FCT and FCY nnn during formatting and FMT PASS or FMT FAIL when done.

   To **abort** the format operation before it has begun, press the READY switch.

7. To move to the next choice, press the A switch. The display will show:

8. Press the B switch to execute this function. The display will show FMT PASS when done.

9. Press the READY switch to exit from the menu.

4. SOFTWARE CONSIDERATIONS

For software considerations for the various host environments, the user should consult the host system User's Manual or contact a Micro Technology customer service representative.

APPENDIX A

The MDIF Series is comprised of several models. Each model is shipped with one 25 foot SDI cable for each logical unit.

The MDIF Series models and configurations are summarized in Table A-1. MTI Mode performance specifications for the 19.7 MHz disk drives are in Table A-2; Table A-3 contains the performance specifications for the 22 MHz disk drives; Table A-4 contains the compatible (CMPT) mode performance specifications for the 19.7 MHz disk drives.

Table A-1. Models and Configurations

Model	Disk Drive	Logical Units
MDI-76F	1	1
MDI-79F	1	1
MDI-120F	1	1
MDI-230F	2	1
MDI-276F	2	1
MDI-279F	2	1

Table A-2. MTI Mode Performance Specifications (19.7 MHz Disk Drives)

Parameters	MDI-76F	MDI-276F
Transfer rate	19.7 MHz	19.7 MHz
Unformatted capacity	780.5 MB	1561 MB
Formatted capacity (MTI)	611.0 MB	1224.7 MB
Cylinders (unformatted)	1361	2722
Cylinders (formatted)	1353	2712
Heads	14	14
User sectors/track	63	63
Average latency	8.33 ms	8.33 ms
Average seek time	16 ms	16 ms
Average access time	24.33 ms	24.33 ms
Usable blocks	1193346	2391984

Table A-3. Performance Specifications (22 MHz Disk Drives)

Parameters	MDI-79F	MDI-120F	MDI-230F	MDI-279F
Transfer rate	22 MHz	22 MHz	22 MHz	22 MHz
Formatted capacity (MTI)	616.6 MB	1197.2 MB	2347.2 MB	1235.6 MB
Cylinders (unformatted)	1552	2235	4470	3104
Cylinders (formatted)	1544	2227	4366	3094
Heads	15	15	15	15
User sectors/track	52	70	70	52
Average latency	6.25 ms	8.3 ms	8.3 ms	6.25 ms
Average seek time	14.4 ms	14 ms	14 ms	14.4 ms
Average access time	20.29 ms	22.3 ms	22.3 ms	20.29 ms
Usable blocks	1204320	2238350	4584300	2413320

Table A-4. CMPT Mode Performance Specifications (19.7 MHz Disk Drives)

Parameters	MDI-76F	MDI-276F
Transfer rate	19.7 MHz	19.7 MHz
Unformatted capacity	780.5 MB	1561 MB
Formatted capacity (CMPT)	580.2 MB	1162.9 MB
Cylinders (unformatted)	1361	2722
Cylinders (formatted)	1349	2704
Heads	14	14
User sectors/track	60	60
Average latency	8.33 ms	8.33 ms
Average seek time	16 ms	16 ms
Average access time	24.33 ms	24.33 ms
Usable blocks	1133160	2271360

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Micro Technology

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