MODEL 363 VIEWPAC™

MULTI-POINT DIGITAL RECORDER
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SIGNIFICANT CHANGES FOR ISSUE 3, November 1996

Significant changes incorporated for Issue 3 are listed below and identified throughout the Instruction by change bars in a page's outer margin, as shown here.

SECTION ADDITION OR REVISION

1.0 Introduction EMC designation added to Section 1.3 and declaration added at back of section. SDA363-1-4 removed. Transmitter power specification added in Section 1.4.2. LIL cable shielding statement added to Section 1.4.2.1.

2.0 Installation Transmitter power information added to Table 2.1 and Section 2.5.2.2; Figure 2-11A added. Electrical power statement added to Section 2.5.2.1.

6.0 Maintenance Table 6.3 Error Messages updated with additional messages and error message numbers.


EFFECTIVE PAGE DATES FOR ISSUE 3

SECTION DATE
1 November 1996
2 November 1996
3 March 1995
4 October 1995
5 March 1995
6 November 1996

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1.0 INTRODUCTION

This Installation And Service Instruction furnishes the information required for the installation, operation, calibration and maintenance of a Model 363 VIEWPAC™ Multi-Point Digital Recorder (MDR).

An MDR is a paperless electronic recorder. It accepts and trends process signals and displays them on a color LCD screen.

This Installation And Service Instruction is arranged in six sections as follows:

Section 1, INTRODUCTION, provides an overview of the MDR covering such topics as specifications, installation, set-up, configuration, operation, calibration, circuit description and maintenance. A reference list of technical documentation is also included.

Section 2, INSTALLATION, details hardware information such as panel cutout dimensions and mounting procedures for a single or multiple recorder installation. It details how to install optional circuit boards and covers power, signal and link wiring connections. Field wiring connections are made at the MDR's rear terminals or at an optional remote terminal plate. Guidelines for the proper handling and storage of recorders are also included.

Section 3, OPERATION, describes operating an MDR, for example: interacting with the Chart Display, choosing menu selections, adjusting the display magnification, setting a split screen view, acknowledging alarms, and reviewing station status.

Section 4, CALIBRATION, contains procedures for calibrating the analog input channels.

Section 5, CIRCUIT DESCRIPTION, provides a block diagram based description of major circuitry.

Section 6, MAINTENANCE, furnishes preventative and routine maintenance procedures, addresses common installation concerns, provides specific troubleshooting techniques, presents part installation or replacement procedures, lists spare parts and addresses software compatibility.

1.1 PRODUCT DESCRIPTION

The Model 363 VIEWPAC Multi-Point Digital Recorder (MDR), shown in Figures 1-1 and 1-2, is a panel-mount, paperless recording station which performs many data acquisition, trending, averaging, alarming, display and signal output functions. It can accept up to 24 inputs and as many as six can be assigned to color pens for display on the LCD.

The MDR can operate as a stand-alone unit or be integrated into a larger process monitoring and control system (e.g., APACSTM or MYCROTM) via the Local Instrument Link (LIL). It is intended to be mounted in an instrument panel, cabinet or console.
The MDR has the following capabilities and features:

- Isolated analog inputs
- Optional multi-channel discrete inputs and outputs
- Optional multi-channel universal inputs
- Easy function block based configuration
- Rear terminal or optional remote field wiring terminal plate
- Real-time trending display on color LCD
- Historical trending displays on color LCD
- Historical trending of up to 6 variables
- Internal real-time clock
- Display of process engineering units
- Battery backed memory
- Internal calculation capability
- Internal integrator/totalizer for up to 24 variables
- Compatible with other LIL products
- Alarm Detection for up to 24 variables
- Up to 4 alarms per variable
- Local configuration at front panel or remote configuration at personal computer
  (MDR Configuration Software required)
- Long trend times
- ZOOM function magnifies display
- Split Screen function displays multiple charts
- Trend inputs from LIL; Link Interface Card required
- Transmit signals over LIL; Link Interface Card required

Optional memory accessories permit historical trend data or configuration information to be transferred from one MDR to another via non-volatile memory cards. An optional memory card reader can read MDR data from a memory card and convert it to a form accepted by popular spreadsheet and word processor programs (requires Trend File Conversion Utility program for an IBM* compatible personal computer).

1.2 ABBREVIATIONS AND ACRONYMS

The following abbreviations and acronyms are used in this Guide.

APACS .............. Advanced Process Automation and Control System
EEPROM ............ Electrically Erasable Programmable Read Only Memory
LCD ................. Liquid Crystal Display
LIL .................. Local Instrument Link
MCU ................. Microcontroller Unit
MDR ................. Model 363 VIEWPAC Multi-Point Digital Recorder
MPU .................. Microprocessor Unit
PC ................. Personal Computer
PCMCIA .............. Personal Computer Memory Card International Association
UVEPROM .......... Ultraviolet Erasable Programmable Read Only Memory
1.3 MODEL DESIGNATION

**Basic Model Number**  363 VIEWPAC Multi-Point Digital Recorder

**Power Supply**
- A  120 Vac/240 Vac
- C  24 Vac/24 Vdc

**Mounting Case**
- 1  Basic Screw Terminals - 15
- 2  Expanded Screw Terminals - 39
- 3  Remote Field Terminal Plate - 39
- N  Not Required

**Operator Display**
- 1  Color LCD (Standard)
- N  Not Required - Blank Panel

**Reserved Designation (Future Use)**

**Memory**
- 1  256K RAM
- 2  512K RAM
- 3  768K RAM
- 4  1024K RAM

**Input Expansion Card #1**
- N  Not Required
- U  Universal (6 inputs)
- D  Digital I/O (8 inputs)

**Input Expansion Card #2**
- N  Not Required
- D  Digital I/O (8 inputs)

**Link Interface Card**
- N  Not Required
- 1  RS-422 (Half-duplex)

**Design Level**
- A

**Hazardous Area Classification**
- N  Not Required
- 4  FM/CSA - Class I, Div. 2, Groups A, B, C, D*
- J  CSA - Class I, Division 2, Groups A, B, C, D*
- E  EMC Compliant**

---

363  A  1  1  N  1  N  N  N  N  Sample Model Number

---

* CSA/FM electrical classification approval as non-incendive for Division 2 service applies to installations in North America and where recognized. Check local approval requirements.

** See declaration at the end of this section.
FIGURE 1-1  Model 363 Digital Recorder
FIGURE 1-2 Keypad Identification
1.3.1 Options and Accessories

Table 1.1 lists the options and accessories available for the MDR.

<table>
<thead>
<tr>
<th>OPTION OR ACCESSORY</th>
<th>PART NUMBER</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adapter Bezel Kit</td>
<td>15747-121</td>
<td>To mount an MDR in a panel cutout originally made for a Model 362 Recorder.</td>
</tr>
<tr>
<td>Rear Terminal Enclosure Kit</td>
<td>15999-217</td>
<td>For conduit wiring connection to MDR to enclose rear terminals. Kit includes mounting hardware, bracket and cover.</td>
</tr>
<tr>
<td><strong>Remote Termination Option</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Remote Termination Plate</td>
<td>15879-117</td>
<td>To extend MDR rear terminals</td>
</tr>
<tr>
<td>Remote Signal Cable</td>
<td>15880-30</td>
<td>30 Feet (9.0 meters)</td>
</tr>
<tr>
<td>Remote Power Cable</td>
<td>15881-30</td>
<td>30 Feet (9.0 meters)</td>
</tr>
<tr>
<td>PC-Based Memory Card Reader</td>
<td>15787-52</td>
<td>To access memory card files via a personal computer. To be used with Trend File Conversion Utility</td>
</tr>
<tr>
<td>Trend File Conversion Utility</td>
<td>15939-49Vn.nn*</td>
<td>PC software converts trend or average files into ASCII format for import into PC application software.</td>
</tr>
<tr>
<td>Memory Cards</td>
<td></td>
<td></td>
</tr>
<tr>
<td>256 KB</td>
<td>15959-4</td>
<td></td>
</tr>
<tr>
<td>512 KB</td>
<td>15959-5</td>
<td></td>
</tr>
<tr>
<td>1.0 MB</td>
<td>15959-6</td>
<td></td>
</tr>
<tr>
<td>2.0 MB</td>
<td>15959-9</td>
<td></td>
</tr>
<tr>
<td>MDR Configuration Software</td>
<td>15939-42Vn.nn*</td>
<td>To configure MDR from PC and manage configuration files.</td>
</tr>
<tr>
<td>Case Conversion Kit</td>
<td>15999-229</td>
<td>Convert case from 15 to 39 Terminals</td>
</tr>
<tr>
<td>Plug for Memory Card Slot</td>
<td>15999-104</td>
<td>To seal memory card slot</td>
</tr>
<tr>
<td>256K RAM Kit</td>
<td>15999-235</td>
<td>To expand recording capacity</td>
</tr>
<tr>
<td>Remote Connector Kit</td>
<td>15999-236</td>
<td>Remote Terminal Plate</td>
</tr>
</tbody>
</table>

* Software version number. Latest version will be supplied.
1.4 SPECIFICATIONS

1.4.1 Mechanical

DIMENSIONS
- Recorder Refer to Figure 2-3
- Panel Cutout Refer to Figure 2-4

MOUNTING
- Panel Single or Row Mounting

WEIGHT (weights are approximate)
- Model 363_1 12 lbs (5.4 kg)
- Model 363_2 14 lbs (6.3 kg)

1.4.2 Electrical

POWER TO MDR
- Input Voltage 85-264 Vac; 47-63 Hz
- 24 Vac, +10%, -15%, 47-63 Hz
- 24 Vdc, +20%, -15%
- See Model Designation, section 1.3
- Power Consumption 30 Watts, 43 VA Max.

TRANSMITTER POWER
- Output Voltage 26Vdc ±7.5%
- Output Current 150 mA

CASE REAR TERMINALS
- Type Screw-type with pressure plate
- Number of Terminals 15 or 39, see section 1.3
- Wire Size (recommended)
  - Power 14 AWG
  - I/O, Wire Size 18 AWG

INPUTS
- Analog Voltage Inputs 1 to 4 (MPU Board):
  - Type Isolated
  - Zero & Span 0.0 to 1.0 Vdc, 4.0 to 5.0 Vdc
  - Standard Calibration 1.0 to 5.0 Vdc
  - Accuracy ±0.05% of span
  - Maximum Continuous Input 30 Vdc
  - Input Impedance >1 megohm
  - Digital Filter (Configurable) 0.001 to 10 Hz
Universal Inputs 1 to 6:

Type ........................................ Isolated
Input Voltage (per channel) .................. Voltage
Wide millivolt: J, K, E, N thermocouple
Narrow millivolt: T, R, S, B thermocouple

Accuracy
Volts ........................................ ± 2.5 mV
Wide Millivolt ................................ ± 30μV
Narrow Millivolt .............................. ± 15μV
Resolution ..................................... 12 bit
Linearization .................................. Automatic, conforms to TC curve within 0.05°C
Common Mode Rejection ...................... 135dB at 50 Hz ±3 Hz and 60 Hz ±3 Hz
Normal Mode Rejection ....................... 60dB at 60 Hz ±3 Hz
Maximum Continuous Input ................... 30 Vdc
Input Impedance .............................. >200,000 ohms
Reference Junction Compensation .......... Automatic
Square Root Extraction ...................... Optional, configurable per channel, for Voltage
                                      input only
Digital Filter (Configurable) .............. 0.001 to 10 Hz
T/C Burnout Protection ...................... Up or Down Scale, configurable
Input Ranges .................................. See Table 1.2
Ambient Temperature Effect
Volts ........................................ 0.5% of span for a 50°C change
Wide Millivolt ................................ 1% of span for a 50°C change
Narrow Millivolt .............................. 1% of span for a 50°C change

Discrete I/O Channels 1 to 16:

Input:
Type ........................................ 5 Vdc non-isolated contact or transistor
Maximum Continuous Input ................... 30 Vdc
On/Off Time .................................. 500 msec minimum

Output:
Type ........................................ Open collector transistor
Voltage ........................................ 30 Vdc Max.
Load ............................................ 100 mA Max
Off State Leakage ............................ 200 μA at 30 Vdc

COMMUNICATION PORTS
Serial Engineering Port ...................... RS-232
LIL ............................................ RS-422
### TABLE 1.2 Universal Input Range Table

<table>
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<th>MINIMUM SPAN</th>
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<tr>
<td>Volts</td>
<td>-0.50 to 5.15 V</td>
<td>-0.40 to 5.25 V</td>
<td>0.1 V</td>
</tr>
<tr>
<td>Wide mV</td>
<td>-10.00 to 69.00 mV</td>
<td>-9.90 to 70.00 mV</td>
<td>0.1 mV</td>
</tr>
<tr>
<td>Narrow mV</td>
<td>-7.50 to 19.90 mV</td>
<td>-7.40 to 20.00 mV</td>
<td>0.1 mV</td>
</tr>
<tr>
<td>J</td>
<td>-185 to 540 °C</td>
<td>-115 to 1095 °C</td>
<td>70 °C</td>
</tr>
<tr>
<td></td>
<td>-300 to 1000 °F</td>
<td>-175 to 2000 °F</td>
<td>125 °F</td>
</tr>
<tr>
<td>K</td>
<td>-185 to 700 °C</td>
<td>-90 to 1370 °C</td>
<td>95 °C</td>
</tr>
<tr>
<td></td>
<td>-300 to 1300 °F</td>
<td>-125 to 2500 °F</td>
<td>175 °F</td>
</tr>
<tr>
<td>E</td>
<td>-185 to 430 °C</td>
<td>-130 to 980 °C</td>
<td>55 °C</td>
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<tr>
<td></td>
<td>-300 to 800 °F</td>
<td>-200 to 1800 °F</td>
<td>100 °F</td>
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<tr>
<td>T</td>
<td>-240 to 315 °C</td>
<td>-100 to 400 °C</td>
<td>140 °C</td>
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<tr>
<td></td>
<td>-400 to 600 °F</td>
<td>-250 to 750 °F</td>
<td>150 °F</td>
</tr>
<tr>
<td>R</td>
<td>-18 to 1430 °C</td>
<td>312 to 1760 °C</td>
<td>330 °C</td>
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<tr>
<td></td>
<td>0 to 2600 °F</td>
<td>600 to 3200 °F</td>
<td>600 °F</td>
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<td>S</td>
<td>-18 to 1320 °C</td>
<td>330 to 1650 °C</td>
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<td>-185 to 700 °C</td>
<td>-90 to 1300 °C</td>
<td>95 °C</td>
</tr>
<tr>
<td></td>
<td>-300 to 1300 °F</td>
<td>-125 to 2350 °F</td>
<td>175 °F</td>
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</tbody>
</table>

### 1.4.2.1 Local Instrument Link

Cable Type ........................................ Twinaxial Cable, Belden 9860 or 9812 See SD15492 for details. Cable must be shielded for EMC compliance.

### 1.4.3 Environmental

IEC Local Classification .................. B (IEC 654-1)

Operating Environment

Temperature Range .................... 0° to 50°C (+32° to +122°F); See section 2.2 for forced air ventilation statement.

Humidity Range and Moisture Content ........ 5 to 95% RH; 0.028 pounds water/pound dry air

Storage Environment

Temperature Range .................. -25° to +60°C (-13° to +140°F)

Humidity Range .................. 0 to 100% RH, non-condensing

November 1996

1-9
1.4.4 Electrical Classification

APPROVALS ........................................................................ See Section 1.3 Model Designation for MDR nameplate information.

1.4.5 CSA Hazardous Locations Precautions

This section provides CSA hazardous location precautions that should be observed by the user when installing or servicing the equipment described in this Instruction. These statements supplement those given in the preceding section.

WARNING

Failure to observe the following precautions could result in an explosion hazard.

Precautions - English

For Class I, Division 1 and Class I, Division 2 hazardous locations,

• Use only factory-authorized replacement parts. Substitution of components can impair the suitability of this equipment for hazardous locations.

For Division 2 hazardous locations:

When the equipment described in this Instruction is installed without safety barriers, the following precautions should be observed. Switch off electrical power at its source (in non-hazardous location) before:

• Connecting or disconnecting power, signal, or other wiring

• Replacing a fuse, circuit board, or any other component connected to the electrical circuit

Précautions - Français

Emplacements dangereux de classe I, division 1 et classe I, division 2:

• Les pièces de rechange doivent être autorisées par l'usine. Les substitutions peuvent rendre cet appareil impropre à l'utilisation dans les emplacements dangereux.

Emplacement dangereux de division 2:

Lorsque l'appareil décrit dans la notice ci-jointe est installé sans barrières de sécurité, on doit couper l'alimentation électrique à la source (hors de l'emplacement dangereux) avant d'effectuer les opérations suivantes:

• Branchement ou débranchement d'un circuit de puissance, de signalisation ou autre

• Rebootement d'un fusible, d'une carte de circuit imprimé ou de tout autre élément connecté au circuit électrique
1.5 REFERENCE LITERATURE

Table 1.3 provides a list of reference literature available from Moore Products Co. Refer to this material as needed or as called for in this Instruction.

<table>
<thead>
<tr>
<th>DOCUMENT</th>
<th>TITLE</th>
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<tbody>
<tr>
<td>SG15939-42</td>
<td>Model 363 VIEWPAC Multi-Point Digital Recorder Configuration, Software User's Guide (included in MDR Configuration Software Package, not available separately)</td>
</tr>
<tr>
<td>SD15492</td>
<td>Local Instrument Link, Installation And Service instruction</td>
</tr>
<tr>
<td>SD320</td>
<td>Model 320 Independent Computer Interface, Installation And Service instruction</td>
</tr>
<tr>
<td>CG363-1</td>
<td>Model 363 VIEWPAC Multi-Point Digital Recorder, Configuration Handbook</td>
</tr>
<tr>
<td>CG363-2</td>
<td>Model 363 VIEWPAC Multi-Point Digital Recorder, Configuration Guide</td>
</tr>
<tr>
<td>CG363-3</td>
<td>Model 363 VIEWPAC Multi-Point Digital Recorder, Configuration Documentation Booklet</td>
</tr>
<tr>
<td>CG363-4</td>
<td>Model 363 VIEWPAC Multi-Point Digital Recorder, Link Interface Communications</td>
</tr>
<tr>
<td>CG363-5</td>
<td>Model 363 VIEWPAC Multi-Point Digital Recorder, Function Block Identification</td>
</tr>
<tr>
<td>CG363-6</td>
<td>Model 363 VIEWPAC Multi-Point Digital Recorder, Common Wiring Diagrams</td>
</tr>
</tbody>
</table>

1.6 PRODUCT SUPPORT

Product support can be obtained from the Moore Products Co. Technical Information Center (TIC). TIC is a customer service center that provides direct phone support on technical issues related to the functionality, application, and integration of all products supplied by Moore Products Co.

To contact TIC for support, either call 215-646-7400, extension 4TIC (4842) or leave a message in the bulletinboard service (BBS) by calling 215-283-4968. The following information should be at hand when contacting TIC for support:

- Caller ID number, or name and company name

When someone calls for support for the first time, a personal caller number is assigned. This number is mailed in the form of a caller card. Having the number available when calling for support will allow the TIC representative taking the call to use the central customer database to quickly identify the caller’s location and past support needs.
• Product part number or model number and version (see section 7.0 for guidelines on identification)

• If there is a problem with product's operation:
  - Is problem intermittent
  - The steps performed before the problem occurred
  - Any error messages displayed
  - Installation environment
DECLARATION OF CONFORMITY

according to EN 45014

We

Moore Products Co.
Sumneytown Pike, Spring House, PA 19477

declare under our sole responsibility that the product,

Model 363, Multi-Point Digital Recorder configured with EMC compliant version of the MPU board,
Rear Plate, Power Supply and Optional Input boards
to which this declaration relates is in conformity with the following standards or other normative documents

EMC: EN50081-2 Emissions
EN50082-1 and EN50082-2 Immunity

following the provisions of the EMC directive

Manufactured in Spring House, PA U. S. A.

Date: 12 Dec. 1995

James O. Moore
General Manager
Measurement and Control Division
2.0 INSTALLATION

This section provides general Model 363 information such as installation considerations, environmental considerations, and guidelines for mounting and wiring. It also provides specific information for panel mounting and making electrical connections. Several installation options are available, therefore, installations from site to site may exhibit some variation.

NOTE

The installation should conform to the National Electrical Code and all local codes.

2.1 SITE PLANNING AND INSTALLATION CONSIDERATIONS

Examples of MDR mounting arrangements are shown in Figure 2-1. Actual installations can vary depending on whether an MDR is to be installed separately or as part of a system. Additional factors such as ordered options, panel design, and special site requirements can influence MDR installation.

Do not mount an MDR where direct sunlight can strike the LCD screen. As is the case with most types of electronic displays, excessive area illumination or intense reflections can reduce display visibility.

An MDR can be mounted in virtually any position with horizontal and tilt-back being the most popular. When mounted with other instruments, any tilt-back restrictions applicable to them may have a bearing on panel design.

NOTE

Use of the equipment in a manner not specified by the manufacturer may impair the protection provided by the equipment.

2.2 ENVIRONMENTAL CONSIDERATIONS

Refer to section 1.4.3 for operating temperature limits and other environmental conditions.

CAUTION

Exceeding the specified operating parameters can degrade performance and may damage the instrument.

Forced air ventilation is not required for most installations. It may be required when MDRs are mounted in a completely enclosed cabinet (e.g., NEMA 1 compliant) or in a panel or rack which has high electronic instrument density. Here, only high quality, quiet running fans should be used. Refer to Figure 2-2 for guidelines and air flow recommendations.
FIGURE 2-1 Sample Model 363 Installations
**Guidelines:**

- **Fan:** Pamotor Type 4600X shaded pole fan or equivalent with 5504 finger guard.
- **No. of Fans:** One for each 16 stations or 3 Ft. (0.9 meters) of panel width.
- **Air Inlet:** 30 in² for each fan without a filter.
  
  50 in² for each fan with a filter. Change or clean filters regularly.

**FIGURE 2-2** Forced Air Ventilation for Enclosed Panels
A sealed cabinet (e.g., NEMA 12 compliant) should be equipped with an internal recirculating fan for forcing air flow around equipment and throughout the cabinet to prevent hot spots from developing.

Industrial environments often contain particulate, liquid and gaseous contaminants. Particulate matter, usually dust and dirt, is abrasive and can cause intermittent contact within circuit board connectors. A layer of dust on circuit boards will interfere with semiconductor heat dissipation. Liquid and gaseous contaminants can have a corrosive effect on metal, rubber, plastic and circuit board components.

To reduce contaminant related equipment malfunctions:

- Identify contaminants and implement methods to eliminate or reduce their presence.

- When cleaning equipment and surrounding area, especially the floor, either vacuum away all dust and dirt or use a dampened rag or mop. Sweeping or dry dusting simply recirculates dust and dirt.

- Clean or replace all air conditioning filters, room air filters and equipment filters regularly.

- Inform all personnel with access to the equipment of the need for cleanliness.

2.3 HANDLING AND STORAGE

2.3.1 Unpacking

An MDR is usually shipped fully assembled. In some instances its major subassemblies may be shipped separately. For example, cases may be shipped to a panel shop while the chassis and display assemblies, enclosed in static shielding bags and protective packaging, are forwarded to the final installation site. The MDR may also be shipped as an integral part of an operator console.

Unpack each MDR carefully. Be careful not to scratch or nick its bezel, keypad membrane, or LCD screen with a carton cutter or other sharp object. Verify the contents of each shipment against its packing list. Mounting brackets and a bag of range resistors are in the carton.

After unpacking, inspect the MDR for possible hidden damage which may or may not have been accompanied by exterior carton damage.

If it is found that some items are damaged or missing, when checked against the packing list, notify Moore Products Co. immediately and provide full details. In addition, damages must be reported to the carrier with a request for their on-site inspection of the damaged item and its shipping container.

2.3.2 Handling and Storage

Handle the MDR carefully. Each circuit board and Display Assembly is shipped in a static shielding bag. Keep each item in its bag until time of installation.

A grounding wrist strap must be used when handling a circuit board and is highly recommended when
handling a Display Assembly. The Display Assembly bezel is made of plastic, therefore, its insulating properties permit the assembly to be installed without wearing a wrist strap.

To transport an MDR prior to installation, place it in its original shipping carton. During transport, protect the MDR from excessive shock and vibration.

The MDR's storage temperature and humidity limits are listed in section 1.4.3.

2.3.3 Return Shipment

To Return Equipment:

- Call the Service Department at (215) 646-7400, ext. 4RMA (4762) weekdays between 8:00 a.m. and 4:45 p.m. Eastern Time to obtain an RMA (Return Material Authorization) number. Mark the RMA number prominently on the outside of the return shipment package!

- When calling for an RMA number, provide the reason for the return. If returning equipment for repair, failure information (e.g., error code, failure symptoms, installation environment) will be requested. A purchase order number will be requested.

Material Safety Data Sheet:

- A Material Safety Data Sheet (MSDS) must be included with each item being returned that was stored or used anywhere hazardous materials were present.

Packaging:

- Package the item in its original shipping materials. Otherwise, package it for safe shipment or contact the factory for shipping recommendations.

   Put each electronic assembly in a static shielding bag to guard against electrostatic discharge.
2.4 MECHANICAL INSTALLATION

This section provides guidelines and practices for mounting one or more MDRs in a panel. The panel can be either open to view or enclosed in a cabinet, rack or console. Sample panel layouts are shown in Figure 2-1. The installation is to be structurally rigid and instruments should be squared in the panel.

2.4.1 Panel and Rack Guidelines

For each MDR mounting location, the panel cutout should be square and flat, especially along the bottom edge. An uneven bottom edge can cause the case(s) to tilt slightly when installed and detract from front panel appearance.

An MDR may be mounted singly or in a row with other MDRs or LIL instruments such as the Model 352 Single-Loop Digital Controller. Panel cutout dimensions are shown in Figures 2-3, 2-4 and 2-5. Refer to these illustrations when designing an instrument panel and when preparing a panel for MDR installation.

The panel face should provide a flat, rigid mounting surface. When many instruments are to be mounted together, rear support (e.g., square stock, angle iron, metal channel) may be needed to prevent panel face distortion.

Avoid back-of-panel obstructions such as wiring raceways or conduit, building or cabinet structural members, or installed equipment.

To mount an MDR in an existing 6" x 6" instrument cutout, such as that used by a Model 362 Recorder, use the optional Adapter Bezel (see section 1.3.1).

A Remote Termination option can be ordered where there may be limited access to the MDR's rear terminals after installation; see Figures 2-6 and 2-7. Panel cutout dimensions for remote termination plates are shown in Figure 2-5. Refer to these figures when designing an instrument panel or for preparing a panel for remote termination plate installation.
User Panel
Up to 1.00 (25.4) Thick

16.5 (419.1)
Minimum Front of Panel
Clearance Required for
Chassis Removal

Display

1.24
(31.5)

0.25 (6.3)

5.42 (137.7)

Clamping Screw

14.67 (372.6)
15.33 (389.3)

Top View

Case Flange

5.67 (144.0)

6.65
(168.9)

5.730
(145.5)

0.62 (15.7)

5.42
(137.7)

Case

15.61 (401.6)
16.75 (425.4)
See Note 1

Front View

Side View

Notes:

1. Add 2.5 (63.5) to the dimension if the Recorder has an optional Terminal Enclosure, which features metal knockout tabs to accommodate conduit connectors.

Add 5.0 (127) to the dimension if the Recorder has an optional Remote Termination Plate, for extending rear terminals via two cables.

As necessary, add to the dimension for wire clearance.

2. Dimensions are in inches (Millimeters).

FIGURE 2-3 Model 363 Dimensions
FIGURE 2-4  Panel Cutout Dimensions, Model 363
2.4.2 Single Station Mounting

Mount one MDR in a single panel cutout using the following procedure.

1. Loosen and remove the mounting brackets from the top and bottom of the MDR case. Reference Figure 2-3.

2. At front of panel, insert case into panel cutout.

3. At back of panel, install and partially tighten mounting brackets.

4. Square mounting brackets with panel.

5. Alternately tighten mounting brackets until case is secured to panel. Do not over tighten.

2.4.3 Multiple Station Row Mounting

Mount two or more stations side-by-side within a single panel cutout using the following procedure.

1. Loosen and remove the top and bottom mounting brackets from the cases of involved stations. If several station models (e.g., Model 352, Model 363) are being installed, note mounting bracket style for each case. Refer to Figure 2-3 for MDR case.

2. From front of panel, insert an end of row case into panel cutout.

3. From back of panel, install and partially tighten mounting brackets.

4. Insert remaining cases in desired sequence into panel cutout; install and partially tighten mounting brackets.

5. Square and space cases in cutout.

6. Alternately tighten mounting brackets on each case until all are secured to panel. Do not over tighten.
Single Mount Remote Termination Panel

Dimensions = \text{Inches (Millimeters)}

Panel Cutout

Height = 6.125 + .05/-0
(156 +1.3/-0)

Width = 2.87 + .05/-0
(73 +1.3/-0)

Row Mount Remote Termination Panel

Dimensions = \text{Inches (Millimeters)}

Panel Cutout

Height = 6.125 + .05/-0
(156 +1.3/-0)

Width = \text{(Inches) = (3.0 x A) - 0.125}
\text{(Millimeters) = (76 x A) - 3.175}

Where:
A = Number of Remote Terminal Plates.

FIGURE 2-5 Panel Cutout Dimensions, Remote Termination Plate
Cable Adapter Plate

* Mounts on back of Recorder

Remote Terminal Plate

* Mounts away from the Recorder and connects to the Cable Adapter Plate via two cables: one for power, the other for signal I/O.

* Refer to tables in text for terminal assignments.

Connector Pin Identification

FIGURE 2-6 Rear Terminals and Pinouts, Remote Termination
FIGURE 2-7  Sample Application, Remote Termination
2.4.4 Remote Termination Plate Mounting

A Remote Termination Plate is typically mounted a distance from an MDR. It is connected to the MDR using two extension cables: power and signal I/O.

Mount the Plate in any orientation. Refer to Figure 2-5 and use the following general procedure to mount a Plate in a panel, or to row mount two or more Plates. If row mounting, simply perform each step to accommodate the number of plates being installed in that row.

1. Check cable routing to ensure that extension cables are sufficiently long to reach MDR.
2. Temporarily fit Remote Termination Plate into panel cutout area.
3. Square plate in cutout, center punch mounting holes in panel, and remove plate.
4. Drill holes in panel and remove all burrs.
5. Insert plate into cutout and secure with user-supplied fasteners.

2.4.5 Circuit Board Installation

The following details installation of MDR circuit boards and the Display Assembly. Shipments may be made with the MPU Board and Display Assembly separated from the case. These are then combined at the installation site.

Optional circuit boards can be added to increase the MDR's usefulness. Note that added boards must be software (i.e., firmware) compatible with the MPU Board. MDR configuration may also be needed.

An MDR case will have either 15 rear terminals or 39 rear terminals as shown in Figure 2-8.

- 15 terminal case - for a basic station which provides four analog input channels on its MPU Board.
- 39 terminal case - for an expanded station which accommodates additional signal boards (e.g., Universal Input Board or Discrete I/O Board).
Refer to tables in text for rear terminal assignments.

**15 Terminals**

**39 Terminals**

FIGURE 2-8 Rear Terminals, Model 363
Circuit boards contain integrated circuits which can be damaged by electrostatic discharge. Follow these handling guidelines:

- Each circuit board (or Display Assembly) is placed in a static shielding bag before it is shipped. Keep each board in its bag until time of installation.

- A grounding wrist strap must be used when handling a circuit board and is highly recommended when handling the Display Assembly. The Display Assembly’s bezel is made of plastic so the Assembly can be handled without touching the circuit boards inside.

Moore Products Co. part numbers for a grounding wrist strap, a grounding workmat kit and static shielding bags are given in the Maintenance section of this Instruction.

2.4.5.1 Display Assembly and MPU Board

Additional circuit boards may be mounted on the MPU Board depending upon model designation. Refer to Figure 2-9 as an installation reference.

CAUTION

Support both ends of the MPU Board whenever it is removed from the case.

1. While supporting the MPU Board to prevent flexing, carefully remove it from the static shielding bag.

IMPORTANT

Do not unplug the RAM backup battery as this will erase calibration and configuration information. Memory IC’s have battery power applied to them. Do not short any connections on the MPU Board as this could erase calibration and configuration information.

2. Install the rear edge of MPU Board into the case by inserting it into the upper grooves of the guide rails then gently sliding it all the way into the case until its edge connector engages the socket in the backplane.

3. Secure MPU Board to case by tightening its captive retainer screw.

4. Remove the Display Assembly from its static shielding bag. Handle the Assembly by its plastic bezel.

5. Connect MPU Board ribbon cable to Display Assembly.

6. Position Display Assembly over front of case and secure it by tightening the captive retainer screw located behind its keypad door.
2.4.5.2 Universal Input Board

An optional Universal Input Board can be field installed in an MDR. Only one Universal Input Board can be added per station.

Refer to Figure 2-9 and note that a Universal Input Board is to be installed as the first board atop the MPU Board.

1. If MPU Board is installed in a case, remove the Board and the Display Assembly from the case by reversing the steps in section 2.4.5.1.

IMPORTANT

When handling the MPU Board, support it so it does not flex.

2. Place MPU Board, component side up on a grounded conductive mat.

3. Position the Universal Input Board over the MPU Board and secure it to the MPU Board using the supplied (6) sets of standoffs, washers and screws.

4. Connect the supplied daisy chain cable between the P1 connectors of the MPU Board and the Universal Input Board.

5. If applicable, set the Universal Input Board's thermocouple reference jumpers as described in section 2.5.2.2 of this Instruction.
Notes:
1. Wear a grounding wrist strap, connected to ground when handling circuit boards.
2. When handling MPU board prevent it from flexing by supporting it at each end.
3. When replacing a back-up battery, always plug in the new one before disconnecting the old one.

FIGURE 2-9 Installing Optional Circuit Boards and Replacement Backup Battery
6. Install the rear edge of MPU Board into the case by inserting it into the upper grooves of the guide rails then gently slide it all the way into the case until its edge connector engages with the socket on the backplane.

7. Secure MPU Board to case by tightening its captive retainer screw.

8. Connect MPU Board ribbon cable to Display Assembly.

9. Position Display Assembly over front of case and secure it in place by tightening the captive retainer screw located behind the keypad door.

2.4.5.3 Discrete I/O Board #1

An optional Discrete I/O Board #1 can be field installed in an MDR. Refer to Figure 2-9 as an installation reference and note that a Discrete I/O Board #1 is to be installed as the first board atop the MPU Board.

1. If MPU Board is installed in a case, remove the Board and the Display Assembly from the case by reversing the steps in section 2.4.5.1.

IMPORTANT

When handling the MPU Board, support it so it does not flex.

2. Place MPU Board, component side up on a grounded conductive mat.

3. Position the Discrete I/O Board #1 over the MPU Board and secure it to the MPU Board using the supplied (6) sets of standoffs, washers and screws.

4. Connect the supplied daisy chain cable between the P1 connectors of the MPU Board and the Discrete Input Board #1.

5. Install the rear edge of MPU Board into the case by inserting it into the upper grooves of the guide rails then gently slide it all the way into the case until its edge connector engages with the socket on the backplane.

6. Secure MPU Board to case by tightening its captive retainer screw.

7. Connect MPU Board ribbon cable to Display Assembly.

8. Position Display Assembly over front of case and secure it in place by tightening the captive retainer screw located behind its keypad door.
2.4.5.4 Discrete I/O Board #2

An optional Discrete I/O Board #2 can be field installed in an MDR. Refer to Figure 2-9 as an installation reference and note that the Discrete I/O Board #2 is to be installed atop either a Discrete I/O Board #1 or a Universal Input Board.

1. If MPU Board is installed in a case, remove the Board and the Display Assembly from the case by reversing the steps in section 2.4.5.1.

   IMPORTANT
   Support the MPU Board so it does not flex.

2. Place MPU Board, component side up on a grounded conductive mat.

3. Position the Discrete I/O Board #2 over the Discrete I/O Board #1 (or the Universal Input Board) MPU Board and secure it in place using the supplied (6) sets of standoffs, washers and screws.

4. Connect the supplied daisy chain cable between the P1 connectors of the MPU Board and the Discrete Input Board #1 (or Universal Input Board) and the Discrete Input Board #2.

5. Install the rear edge of MPU Board into the case by inserting it into the upper grooves of the guide rails then gently slide it all the way into the case until its edge connector engages with the socket on the backplane.

6. Secure MPU Board to case by tightening its captive retainer screw.

7. Connect MPU Board ribbon cable to Display Assembly.

8. Position Display Assembly over front of case and secure it in place by tightening the captive retainer screw located behind its keypad door.

2.4.5.5 Link Interface Card

A Link Interface Card can be field installed in an MDR. See Figure 2-9.

1. If MPU Board is installed in a case, remove the Board and the Display Assembly from the case by reversing the steps in section 2.4.5.1.

   IMPORTANT
   Support the MPU Board so it does not flex.

2. Place MPU Board, component side up on a grounded conductive mat.

3. Position the Link Interface Board Card, with the LEDs facing forward, above the plastic guide rails on the front left side of the MPU Board. Gently slide it into place until its connectors mate with those on MPU Board.
4. Install the rear edge of MPU Board into the case by inserting it into the upper grooves of the guide rails then gently slide it all the way into the case until its edge connector engages with the socket on the backplane.

5. Secure MPU Board to case by tightening its captive retainer screw.

6. Connect MPU Board ribbon cable to Display Assembly.

7. Position Display Assembly over front of case and secure it in place by tightening the captive retainer screw located behind its keypad door.

2.5 ELECTRICAL INSTALLATION

The following subsections describe wiring guidelines applicable to an MDR installation. Rear terminal assignments and wiring details are also covered.

**WARNING**

Electrical shock hazard - Prior to making any rear terminal connection remove power from MDR.

2.5.1 Wiring Guidelines

All wiring should conform to the National Electrical Code and all relevant local codes. DC wiring should be separated from AC wiring and away from AC powered pushbuttons, alarms, annunciators, motors, solenoids and similar devices. Metallic and non-metallic raceway and conduit are commonly used for routing panel wiring. Wiring not installed in raceways or conduit should be clamped or supported approximately every 12 inches.

Stranded wire is recommended, however, solid wire is typically used for thermocouple extension wire. Carefully select the wire size, conductor material, and appropriate insulation. Some wire selection considerations are:

- Current and voltage to be carried
- Total length of each wire run
- Whether wire will be bundled or run singly
- Indoor or outdoor installation
- Temperature extremes
- Exposure to sunlight
- Vibration
- Types of contaminants

Electrical connections are made to screw terminals on the rear of the case. To make a connection, insert a stripped wire end or crimp-on terminal under the pressure plate of a loosened screw terminal then tighten the screw to secure the connection.
When preparing wire ends and making connections refer to Figure 2-10 and the following:

- **Stranded Conductor**: Strip wire end ¼" to ⅛" or as recommended by the crimp-on terminal manufacturer.
- **Solid Conductor**: Strip wire end ⅛" to ¼" and form a gradual bend that will hook behind the terminal screw.
- Do not nick conductor or cutaway conductor strands when stripping insulation.
- Crimp-on terminals must have insulated barrels: use a crimping tool recommended by the manufacturer.
- Some screw terminals may have to accommodate two wires. If crimp-on terminals are used, choose a type so that two can readily fit under one screw terminal. In this case, install wiring so one wire approaches the screw terminal from the top while the other approaches the terminal from the bottom.
- Carefully inspect each wired connection for:
  - connection to the correct terminal
  - tightness of the terminal screw
  - mechanical strength of crimped connection
  - wire insulation that just enters a crimp-on terminal body or ends close to the terminal screw
  - stray strands that could short to an adjacent screw terminal; pay particular attention to twinaxial cable braided shield

![Diagram of Rear Terminal Strip with Spring Plate, Terminal Screw, and Pressure Plate](attachment:image)

**FIGURE 2-10** Conductor Installation on Rear Terminals
2.5.2 Rear Terminal Assignments

Electrical power and signal I/O connections are made to the rear terminals of the MDR (or to an optional remote terminal plate). Most rear terminals are designated by a terminal strip letter (i.e., A, B, or C) and a terminal screw number (i.e., 1 to 12) as shown in Figure 2-8. Remote terminals use a similar alphanumeric arrangement although the physical arrangement differs as shown in Figure 2-6.

Rear terminal assignments are given in Tables 2.1 through 2.3. Assignments can vary depending on the types of installed I/O boards. To determine the I/O boards installed for a specific MDR, compare its full model number to the model designation chart in section 1.3, then read the terminal assignments directly from the Tables.

**IMPORTANT**

Field installed Boards will not be included in the model number on the factory installed nameplate.

To determine the rear terminal assignments for an installed MDR, call the Station Status Display from the Main Menu. The Status display lists which I/O boards, if any, are installed then read terminal assignments directly from Tables 2.1 through 2.3.

For each type of signal input or output channel the associated function block numbers are included in the tables to aid in MDR configuration and testing.

**WARNING**

Electrical shock hazard - Prior to making any rear terminal connection remove power from all involved wires and terminals.
TABLE 2.1 Assignments for 'A' Terminals

<table>
<thead>
<tr>
<th>RECORDER SCREW TERMINAL</th>
<th>DESIGNATION</th>
<th>FUNCTION BLOCK</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>Link +</td>
<td>FB98</td>
</tr>
<tr>
<td>A2</td>
<td>Link -</td>
<td></td>
</tr>
<tr>
<td>A3</td>
<td>Link Shield</td>
<td>x</td>
</tr>
<tr>
<td>A4</td>
<td>+26 Vdc</td>
<td>x</td>
</tr>
<tr>
<td>A5</td>
<td>Analog Input 1 +</td>
<td></td>
</tr>
<tr>
<td>A6</td>
<td>Analog Input 1 -</td>
<td>FB27</td>
</tr>
<tr>
<td>A7</td>
<td>Analog Input 2 +</td>
<td>FB28</td>
</tr>
<tr>
<td>A8</td>
<td>Analog Input 2 -</td>
<td></td>
</tr>
<tr>
<td>A9</td>
<td>Analog Input 3 +</td>
<td>FB29</td>
</tr>
<tr>
<td>A10</td>
<td>Analog Input 3 -</td>
<td></td>
</tr>
<tr>
<td>A11</td>
<td>Analog Input 4 +</td>
<td>FB30</td>
</tr>
<tr>
<td>A12</td>
<td>Analog Input 4 -</td>
<td></td>
</tr>
</tbody>
</table>
### TABLE 2.2 Assignments for 'B' Terminals

<table>
<thead>
<tr>
<th>RECORDER SCREW TERMINAL</th>
<th>DESIGNATION</th>
<th>FUNCTION BLOCK</th>
</tr>
</thead>
<tbody>
<tr>
<td>B1</td>
<td>Discrete I/O 1 +</td>
<td>FB71</td>
</tr>
<tr>
<td>B2</td>
<td>Discrete I/O Common 1 &amp; 2</td>
<td>FB71 and/or FB72</td>
</tr>
<tr>
<td>B3</td>
<td>Discrete I/O 2 +</td>
<td>FB72</td>
</tr>
<tr>
<td>B4</td>
<td>Discrete I/O 3 +</td>
<td>FB73</td>
</tr>
<tr>
<td>B5</td>
<td>Discrete I/O Common 3 &amp; 4</td>
<td>FB73 and/or FB74</td>
</tr>
<tr>
<td>B6</td>
<td>Discrete I/O 4 +</td>
<td>FB74</td>
</tr>
<tr>
<td>B7</td>
<td>Discrete I/O 5 +</td>
<td>FB75</td>
</tr>
<tr>
<td>B8</td>
<td>Discrete I/O Common 5 &amp; 6</td>
<td>FB75 and/or FB76</td>
</tr>
<tr>
<td>B9</td>
<td>Discrete I/O 6 +</td>
<td>FB 76</td>
</tr>
<tr>
<td>B10</td>
<td>Discrete I/O 7 +</td>
<td>FB77</td>
</tr>
<tr>
<td>B11</td>
<td>Discrete I/O Common 7 &amp; 8</td>
<td>FB77 and/or FB78</td>
</tr>
<tr>
<td>B12</td>
<td>Discrete I/O 8 +</td>
<td>FB78</td>
</tr>
</tbody>
</table>

OR

<table>
<thead>
<tr>
<th>RECORDER SCREW TERMINAL</th>
<th>DESIGNATION</th>
<th>FUNCTION BLOCK</th>
</tr>
</thead>
<tbody>
<tr>
<td>B1</td>
<td>Universal Input 1 +</td>
<td>FB51</td>
</tr>
<tr>
<td>B2</td>
<td>Universal Input 1 -</td>
<td>FB51</td>
</tr>
<tr>
<td>B3</td>
<td>Universal Input 2 +</td>
<td>FB52</td>
</tr>
<tr>
<td>B4</td>
<td>Universal Input 2 -</td>
<td>FB52</td>
</tr>
<tr>
<td>B5</td>
<td>Universal Input 3 +</td>
<td>FB53</td>
</tr>
<tr>
<td>B6</td>
<td>Universal Input 3 -</td>
<td>FB53</td>
</tr>
<tr>
<td>B7</td>
<td>Universal Input 4 +</td>
<td>FB54</td>
</tr>
<tr>
<td>B8</td>
<td>Universal Input 4 -</td>
<td>FB54</td>
</tr>
<tr>
<td>B9</td>
<td>Universal Input 5 +</td>
<td>FB55</td>
</tr>
<tr>
<td>B10</td>
<td>Universal Input 5 -</td>
<td>FB55</td>
</tr>
<tr>
<td>*B11</td>
<td>Universal Input 6 +</td>
<td>FB56</td>
</tr>
<tr>
<td>*B12</td>
<td>Universal Input 6 -</td>
<td>FB56</td>
</tr>
</tbody>
</table>

* Also used for external reference sensor for T/C inputs
<table>
<thead>
<tr>
<th>RECORDER SCREW TERMINAL</th>
<th>DESIGNATION</th>
<th>FUNCTION BLOCK</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>Discrete I/O 9</td>
<td>FB79</td>
</tr>
<tr>
<td>C2</td>
<td>Discrete I/O</td>
<td>FB79 and/or FB80</td>
</tr>
<tr>
<td></td>
<td>Common 9 &amp; 10</td>
<td></td>
</tr>
<tr>
<td>C3</td>
<td>Discrete I/O 10</td>
<td>FB80</td>
</tr>
<tr>
<td>C4</td>
<td>Discrete I/O 11</td>
<td>FB81</td>
</tr>
<tr>
<td></td>
<td>Common 11 &amp; 12</td>
<td></td>
</tr>
<tr>
<td>C5</td>
<td>Discrete I/O 12</td>
<td>FB81 and/or FB82</td>
</tr>
<tr>
<td></td>
<td>Common 13 &amp; 14</td>
<td></td>
</tr>
<tr>
<td>C6</td>
<td>Discrete I/O 13</td>
<td>FB83</td>
</tr>
<tr>
<td>C7</td>
<td>Discrete I/O 14</td>
<td>FB84</td>
</tr>
<tr>
<td></td>
<td>Common 15 &amp; 16</td>
<td></td>
</tr>
<tr>
<td>C8</td>
<td>Discrete I/O 15</td>
<td>FB85</td>
</tr>
<tr>
<td>C9</td>
<td>Discrete I/O 16</td>
<td>FB86</td>
</tr>
<tr>
<td></td>
<td>Common 17 &amp; 18</td>
<td></td>
</tr>
</tbody>
</table>

TABLE 2.3 Assignments for 'C' Terminals
2.5.2.1 Power Connections

Electrical power connections are made to specific rear terminals as indicated in Figure 2-8. A plastic safety cover, secured by a captive screw, insulates the power terminals.

**WARNING**

Electrical shock hazard - Prior to making any rear terminal connection, remove power from all involved wires and terminals.

Route electrical power to the MDR through a clearly labeled circuit breaker or on-off switch that is located near the recorder and is accessible by the operator. The breaker or switch should be located in a non-explosive atmosphere unless suitable for use in an explosive atmosphere.

Loosen the screw and swing the safety cover aside to access power terminals. For safety reasons, be sure to swing the cover back to cover power terminals and secure it in place after connecting power wiring.

Table 2.1 lists the power terminal connections needed for differing supply voltages. To determine which supply voltage is needed for a given MDR compare its model number (on the nameplate) to the model designation chart in section 1.3.

**TABLE 2.4 Power Connections**

<table>
<thead>
<tr>
<th>SUPPLY VOLTAGE</th>
<th>TERMINAL H</th>
<th>TERMINAL N/H</th>
<th>TERMINAL GND</th>
</tr>
</thead>
<tbody>
<tr>
<td>120 Vac</td>
<td>Hot</td>
<td>Neutral</td>
<td>Ground (Case)</td>
</tr>
<tr>
<td>240 Vac</td>
<td>Hot</td>
<td>Hot</td>
<td>Ground (Case)</td>
</tr>
<tr>
<td>24 Vac</td>
<td>Hot</td>
<td>Neutral</td>
<td>Ground (Case)</td>
</tr>
<tr>
<td>24 Vdc</td>
<td>DC+</td>
<td>DC-</td>
<td>Case</td>
</tr>
</tbody>
</table>
2.5.2.2 Signal Connections

The MDR can accommodate a variety of input signals and in some cases provide output signals as described in the following paragraphs. The types of I/O signals and their channel capacities depend on the complement of optional I/O boards installed (if any). Several sample wiring diagrams are provided as installation references.

Analog Input:

The MDR’s MPU board has four isolated analog input channels (i.e., 1 to 5 Vdc). Wiring connections to these channels are made to the ‘A’ Terminals as presented in Table 2.1.

An optional Universal Input Board provides six additional isolated input channels. Each channel designated as an analog voltage input must be configured as such. Wiring connections are made to the ‘B’ terminals as presented in the Universal Input side of Table 2.2.

A sample wiring diagram of an analog input channel is shown in Figure 2-11. When a current signal (e.g., 4 to 20 mA), such as that from a 4-wire process transmitter, is to be applied to the MDR, a precision range resistor must be placed across that channel’s rear terminals to convert the current signal to a voltage signal. Note that a range resistor may not be required if that MDR input channel is wired in parallel with the voltage input channel of another instrument and it has a range resistor installed. Refer to loop diagrams and determine if a range resistor is required. Typically range resistors will have the following values:

250 ohms for 4-20 mA signals
100 ohms for 10-50 mA signals
1000 ohms for 1-5 mA signals

MDRs shipped after October 1996 can power up to six 2-wire transmitters or similar devices. Figure 2-11A shows terminal A4 providing +26 Vdc to two XTC™ transmitter-controllers.

Discrete Input:

An MDR can accept discrete input signals when it is equipped with one or two Discrete I/O Boards. Each board has eight discrete I/O channels. Wiring connections to channels 1 through 8 of Discrete I/O Board 1 are made to the ‘B’ Terminals as presented in Table 2.2. Similarly, connections to channels 9 through 16 of Discrete I/O Board 2 are made to the ‘C’ terminals as presented in Table 2.3. A sample wiring diagram of a discrete input channel is shown in Figure 2-12. Note that each Discrete I/O Board channel designated as an input channel must be configured as such.
Notes:
1. Range resistor (not used for 1-5 VDC input)
   (A) 4-20 MA 250 OHMS
   (B) 10-50 MA 100 OHMS
   (C) 1-5 MA 1000 OHMS

2. Refer to table in text for rear terminal assignments.

3. Wiring convention also applies to 'B' terminals if Universal I/O Board is installed and target channel is configured for voltage input.

FIGURE 2-11 Wiring Diagram, Analog Input, 'A' Terminals, Channel 1
Notes:
1. Terminal A4 supplies +26 Vdc to power an external device such as a 2-wire transmitter.
2. Recorder analog inputs are isolated 1-5 Vdc.
3. Range resistors shown are 250 ohms for converting 4-20 mA to 1-5 Vdc. Use other resistor values for other currents.
4. When powering a transmitter or other device from terminal A4, jumper that analog input's common (-) to A8.

FIGURE 2-11A Wiring Diagram, Transmitter Wiring Examples
Notes:
1. Channel is configured as input.
2. Refer to table in text for rear terminal assignments.
3. Recorder must have Discrete I/O Board installed.
4. Wiring convention also applies to 'C' terminals when 2nd Discrete I/O Board is installed.
5. At least one discrete channel COM connection should be connected to ground.

Contact Closure
Also, see Alternative Field Circuits below.

FIGURE 2-12 Wiring Diagram, Discrete Input, 'B' Terminals, Channel 1
Discrete Output:

An MDR can output discrete signals when it is equipped with one or two Discrete I/O Boards. Each board has eight discrete I/O channels. Wiring connections to the channels of Discrete I/O Board 1 are made to the 'B' Terminals as presented in Table 2.2. Similarly, connections to Discrete I/O Board 2 are made to the 'C' terminals as presented in Table 2.3. A sample wiring diagram of a discrete output channel is shown in Figure 2-13. Note that each Discrete I/O Board channel designated as an output channel must be configured as such.

Thermocouple/MV Input:

An MDR can accept thermocouple and millivolt input signals when it is equipped with an optional Universal Input Board which provides six isolated channels. Each channel designated as a thermocouple or millivolt input must be configured as such. Wiring connections to Universal Input Board channels are made to the 'B' terminals as presented in the Universal Input side of Table 2.2.

An internal reference is provided, however, an external (cold junction) reference sensor P/N 15819-21 can be installed. It is to be wired to channel 6, reducing the number of input channels from 6 to 5. Generally the external sensor is mounted on a customer supplied terminal strip or to the optional Remote Termination Plate (terminals B11 and B12) shown in Figure 2-6. When mounting the sensor its component side should face the terminal screws.

A sample wiring diagram of a thermocouple input channel is shown in Figure 2-14.

Two hardware jumpers W3 and W31 must be set on the Universal I/O Board to designate whether an internal or external reference sensor is to be used. To set these jumpers, access the Universal I/O Board as described in section 6.4.8 and refer to Figure 2-15. The default jumper settings are INTernal. Both jumpers must have the same setting, either INTernal or EXTernal.

2.5.2.3 LIL Connections

An MDR can accommodate LIL signals when it is equipped with an optional Link Interface Card. Wiring connections for the LIL are made to the 'A' Terminals as designated in Table 2.1. LIL connections are shown in Figure 2-16. For EMC compliance, the LIL tewinaxial cable is to be shielded.

Note that an MDR connected to a LIL requires that it be configured to accommodate the Link Interface Card. A Link Station Address (LSA) must be set before an MDR can establish link communications. To set this address refer to section 2.6.
Notes:
1. Channel is configured as output.
2. Refer to table in text for rear terminal assignments.
3. Recorder must have Discrete I/O Board installed.
4. Wiring convention also applies to 'C' terminals if 2nd Discrete I/O Board is installed.

**FIGURE 2-13 Wiring Diagram, Discrete Output, 'B' Terminals, Channel 1**
Notes:

1. Channel is configured for thermocouple input.
2. Refer to table in text for rear terminal assignments.
3. Recorder must have Universal I/O Board installed.
4. Channel must be configured to use INTERNAL/EXTERNAL reference sensor. Universal I/O Board must be set to use INTERNAL/EXTERNAL reference sensor via jumpers W3 and W31.
5. External reference junction, if used, is to be wired to Channel #6. This reduces Universal I/O Board channel capacity from 6 to 5.

Universal Input Board Channel (Configured as Thermocouple Input)

FIGURE 2-14 Wiring Diagram, T/C Input, ‘B’ Terminals, Channel 1
Notes:
1. Jumpers W3 and W31: Set both for either INTernal or EXTernal reference on thermocouple inputs.
2. Connect external reference sensor, if used, to universal input channel #6.

FIGURE 2-15 Universal Input Board, T/C Reference Jumper Setting
A. Row to Row Connections, Twinaxial Cable

B. Row Mounted Station Connections, Twisted Pair Wiring

Notes:
1. Drain wire of shield connects to terminal SG. Ground the shield by connecting one 16 AWG jumper between SG and A3 and another between A3 and case ground.

2. Drain wire of Shield is cut back and insulated.

3. Denotes 18 AWG twisted pair conductors.

4. Twisted pair wiring is used to interconnect stations separated by up to 2 ft. (0.5 meters) either within a row or row-to-row, twinaxial cable is used for greater than 2 ft. Maximum twisted pair length is 10 ft. (2.9 meters).

5. Rear terminal strips on the Recorder are mounted horizontally, but shown here vertically.

6. Rear terminal assignments for link connections differ between the Recorder and other LIL station types. See Instruction SD15492 for complete information on Local Instrument Link wiring.

FIGURE 2-16  Link Connections
2.5.3 Remote Terminal Assignments

Remote electrical power and signal I/O connections are made to the rear terminals of the remote terminal plate. The terminals are designated by an alphanumeric arrangement as shown in Figure 2-6.

Rear terminal assignments may vary depending on the types of installed I/O boards. To determine the rear terminal assignments for a specific MDR, compare its full model number to the model designation chart in section 1.3 then read terminal assignments directly from Tables 2.1 through 2.3.

IMPORTANT

Field installed boards will not be included in the model number imprinted on the factory installed nameplate.

To determine the remote terminal assignments for an installed MDR call the Station Status Display from the Main Menu. The Status display will list installed I/O boards, then read terminal assignments directly from Tables 2.1 through 2.3 as needed.

For each type of signal input or output channel, the associated function block numbers have been included in the tables to aid in MDR configuration and testing.

2.5.3.1 Remote Terminal to MDR Connections

A Remote Termination option is usually installed at the factory when ordered with its host MDR. However, if the option is ordered and shipped separately, its Cable Adapter Plate, shown in Figure 2-6, must be wired to the rear terminals of the MDR at the installation site. Table 2.5 lists connections and wire colors. A sample remote termination installation is shown in Figure 2-7.

2.5.3.2 Remote Power Connections

Remote electrical power connections are made to specific rear terminals on the Remote termination Plate as shown in Figure 2-6. A plastic safety cover, secured by a captive screw, insulates the power terminals.

WARNING

Electrical shock hazard - Prior to making any rear terminal connections remove power from all involved wires and terminals.

Loosen the screw and swing the cover aside to access these terminals. For safety reasons, be sure to swing the cover back and secure it in place after connecting power wiring.
### Table 2.5 MDR to Cable Adapter Plate Connections

<table>
<thead>
<tr>
<th>Wire Color</th>
<th>Cable Adapter Plate Signal I/O Pin</th>
<th>353 Recorder Rear Terminal</th>
</tr>
</thead>
<tbody>
<tr>
<td>ORG</td>
<td>E</td>
<td>C1</td>
</tr>
<tr>
<td>BLU</td>
<td>M</td>
<td>C2</td>
</tr>
<tr>
<td>WHT/BLK</td>
<td>L</td>
<td>C3</td>
</tr>
<tr>
<td>RED/BLK</td>
<td>S</td>
<td>C4</td>
</tr>
<tr>
<td>GRN/BLK</td>
<td>R</td>
<td>C5</td>
</tr>
<tr>
<td>ORG/BLK</td>
<td>V</td>
<td>C6</td>
</tr>
<tr>
<td>BLU/BLK</td>
<td>X</td>
<td>C7</td>
</tr>
<tr>
<td>BLK/WHT</td>
<td>AA</td>
<td>C8</td>
</tr>
<tr>
<td>RED/WHT</td>
<td>Z</td>
<td>C9</td>
</tr>
<tr>
<td>GRN/WHT</td>
<td>EE</td>
<td>C10</td>
</tr>
<tr>
<td>BLU/WHT</td>
<td>DD</td>
<td>C11</td>
</tr>
<tr>
<td>BLK/RED</td>
<td>JJ</td>
<td>C12</td>
</tr>
<tr>
<td>WHT/RED</td>
<td>PP</td>
<td>B1</td>
</tr>
<tr>
<td>ORG/RED</td>
<td>KK</td>
<td>B2</td>
</tr>
<tr>
<td>BLU/RED</td>
<td>RR</td>
<td>B3</td>
</tr>
<tr>
<td>RED/GRN</td>
<td>F</td>
<td>B4</td>
</tr>
<tr>
<td>ORG/GRN</td>
<td>B</td>
<td>B5</td>
</tr>
<tr>
<td>BLK/WHT/RED</td>
<td>H</td>
<td>B6</td>
</tr>
<tr>
<td>WHT/BLK/RED</td>
<td>C</td>
<td>B7</td>
</tr>
<tr>
<td>GRN/BLK/ORG</td>
<td>W</td>
<td>A3</td>
</tr>
<tr>
<td>ORG/BLK/GRN</td>
<td>Y</td>
<td>A4</td>
</tr>
<tr>
<td>BLU/WHT/ORG</td>
<td>BB</td>
<td>A5</td>
</tr>
<tr>
<td>BLK/WHT/ORG</td>
<td>CC</td>
<td>A6</td>
</tr>
<tr>
<td>WHT/RED/ORG</td>
<td>FF</td>
<td>A7</td>
</tr>
<tr>
<td>ORG/WHT/BLU</td>
<td>HH</td>
<td>A8</td>
</tr>
<tr>
<td>WHT/RED/BLU</td>
<td>NN</td>
<td>A9</td>
</tr>
<tr>
<td>BLK/WHT/GRN</td>
<td>MM</td>
<td>A10</td>
</tr>
<tr>
<td>WHT/BLK/GRN</td>
<td>TT</td>
<td>A11</td>
</tr>
<tr>
<td>RED/WHT/GRN</td>
<td>SS</td>
<td>A12</td>
</tr>
<tr>
<td>BLK</td>
<td>-</td>
<td>H</td>
</tr>
<tr>
<td>WHT</td>
<td>-</td>
<td>N/H</td>
</tr>
<tr>
<td>GRN</td>
<td>-</td>
<td>GND</td>
</tr>
</tbody>
</table>

Table 2.1 lists the power terminal connections needed for differing supply voltages. To determine the supply voltage for a given MDR, compare its full model number to the model designation chart in section 1.3.

Route the remote power cable between the Remote Termination Plate and the Cable Adapter Plate mounted on the back of the MDR, as shown in the sample application in Figure 2-7. The cable has a three-prong connectors at each end and is available in three lengths. When installing the cable be sure to secure the connection at each end by tightening the threaded retainer ring. Remote power connection information is supplied in Table 2.6.
**TABLE 2.6 Remote Power Connection Assignments**

<table>
<thead>
<tr>
<th>WIRE COLOR</th>
<th>REMOTE POWER CABLE CONNECTOR PINOUT</th>
<th>PIN ASSIGNMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black</td>
<td>1</td>
<td>HOT</td>
</tr>
<tr>
<td>White</td>
<td>2 (Notch)</td>
<td>NEUTRAL</td>
</tr>
<tr>
<td>Green</td>
<td>3</td>
<td>GROUND</td>
</tr>
</tbody>
</table>

**2.5.3.3 Remote Signal Connections**

The MDR can accommodate remotely connected I/O signals in essentially the same manner as locally connected I/O signals. The only difference is the physical arrangement of the terminals. The terminals of the Remote Termination Plate are arranged in two vertical terminal strips instead of three horizontal terminal strips as detailed in Figures 2-6 and 2-8.

In either case, the types of I/O signals and their channel capacities depends on the complement of optional I/O boards installed in the MDR (if any). The sample wiring diagrams and connection information supplied in Figures 2-11 through 2-16 also apply to remote connections by noting the changes needed to accommodate the vertical terminal arrangement.

Note that terminal assignments listed in Tables 2.1 through 2.3 remain the same for local or remote wiring terminals (e.g., terminals A1, A2, and A3 are designated as link terminals whether they're local or remote terminals).

Route the remote I/O signal cable between the Remote Termination Plate and the Cable Adapter Plate (mounted on the back of the MDR) as shown in the sample application in Figure 2-7. The cable has a rectangular connector at each end and is available in three lengths. When connecting the cable be sure to secure each end by tightening the plug-to-socket retainer screw.

**2.5.3.4 Remote LIL Connections**

An MDR can accommodate LIL signals when it is equipped with an optional Link Interface Card. Wiring connections for the LIL are made to the 'A' Terminals as designated in Table 2.1. These terminals are located in the middle of the right-side terminal strip. Detailed LIL connections are shown in Figure 2-16.

The MDR must be configured to accommodate the Link Interface Card. Also, a Link Station Address (LSA) must be set before an MDR can establish link communications. To set this address refer to section 2.6.
2.6 SETTING THE LIL ADDRESS

An MDR equipped with a Link Interface Card can communicate with other link-connected stations and devices providing FB98 (Link Interface) has been entered into the MDR's configuration and a Link Station Address (LSA) has been assigned and set.

Unless another configuration is specified on the order, each MDR is shipped with a factory installed configuration, FCO-01. This is the case whether or not a Link Interface Board is installed. Configuration FCO-01 does not include FB98, therefore, FB98 will have to be added and an LSA will have to be entered at the installation site.

The following information will be required prior to setting the LSA:

- Obtain assigned LSA number for the target MDR; refer to system drawings or other applicable documentation.

  If an LSA has not been assigned, choose an unused LSA number. In the absence of system documentation, monitor the LIL via a PC-BASED LIL station configuration program, such as the Model 363 Configuration Management Software (available separately) to determine which LSA numbers (ranging from 01 to 64, specifically one to 32 for lower LIL; 33 to 64 for upper LIL) have not been assigned and choose from among them.

  In all cases, take care not to assign the same LSA to more than one station on a given LIL.

- If FB98 (Link Interface) is included in the configuration it must have an Execution Sequence Number (ESN) other than 000 (zero) to be active.

- If FB98 is not included it needs to be added. Refer to CG363-2, Model 363 Configuration Guide for details.

Three LSA related procedures are provided.

- The first procedure is for quickly checking the MDR's current LSA setting (if it has one).

- The second, for verifying that FB98 has been entered into the MDR configuration and verifying its ESN is other than 000 (zero).

- The third is for setting/changing the LSA.

Use these procedures as required.
LSA Quick Check Procedure:

1. From a Chart Display, press the MENU/SELECT key to call the Main Menu.

   **MAIN MENU**

   POINT SUMMARY
   ACTIVE ALARMS
   GOTO DATE/TIME
   CHART DRIVE
   ALARM HISTORY
   STATION STATUS
   ADD/DELETE PEN
   SET DATE/TIME

2. From the Main Menu, highlight and select STATION STATUS. This calls a Station Status Display similar to the example.

   **STATION STATUS**

<table>
<thead>
<tr>
<th>SID</th>
<th>REV</th>
<th>LINK STATUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>STATION ID</td>
<td>9</td>
<td>LOCAL</td>
</tr>
</tbody>
</table>

   SOFTWARE LEVEL
   MPU BOARD  BBD
   LINK BOARD  BAA

   LSA    INSTALLED MEMORY
   0      1024K

   NUI STATUS

   RECORDING TIME
   R 20 DAYS    C 20 DAYS
   B 20 DAYS    O 20 DAYS
   G 20 DAYS    M 20 DAYS

   Press SELECT for error list
3. From the Station Status Display view the current LSA setting. Note that:

- Valid LSA settings are 1 to 64
- If there is no LSA setting at all then the MDR does not contain a Link Interface Card
- If the setting is 0 (zero) a Link Interface Card is installed however it is not communicating over the LIL. An LSA must be set within the range of 1 to 64 to commence communications

4. Press CLOSE twice to return to the Chart Display.

FB98 Verification/Setup Procedure:

1. Open the keypad door on the front of the MDR to provide access to the cursor control and configuration keys.

2. Press ENTER CONF (Enter Configuration). This calls the Configuration Menu similar to the following example.

   CONFIGURATION MENU

   PARAMETERS
   IDENTIFICATION
   ESN LISTING
   FBN LISTING
   VIEW
   FCO
   CALIBRATION
   SECURITY
   ERASE ALARM
   HISTORY
3. From the Configuration Menu, highlight and select FBN LISTING. This calls FBN Listing Display similar to the example.

4. Observe FBN (Function Block Number) columns and see if FB98 (shown as 098) is listed and then perform one of the following as appropriate:

A) If 098 is listed, press EXIT to leave Configuration Mode.

B) If 098 is not listed, refer to Configuration Guide CG363-2 for detailed configuration information.

C) Add FB98 and assign an ESN.

- For ENTER NEW FBN: press INC/DEC to set 098 then press STORE.

- For ENTER ESN: press INC/DEC to set any unused ESN number from 001 to 255 press STORE then press EXIT.

LSA Set/Change Procedure:

1. Open the door on the front of the MDR to provide access to the cursor control and configuration keypads.

2. If the LSA is being set for the first time, go to step 3.

If an existing LSA is to be changed press C/L (CONSOLE/LOCAL) to place the MDR in 'L' (Local) mode. C/L status is displayed in the lower right corner of the screen.
3. Press ENTER CONF to call the Configuration Menu similar to the adjacent example.

4. From the Configuration Menu, highlight SECURITY then press SELECT. This calls the Security Options Display similar to the example.

5. Make sure the PARAMETER CHANGES status is ENABLED. If DISABLED, change it by pressing INC then press STORE. Press CLOSE to return to the Configuration Menu.
6. From Configuration Menu, highlight and select IDENTIFICATION. This calls Page 1 of the Identification Display similar to the example.

7. From the Identification Display, cursor to the HLSA (Hard Link Station Address) parameter, use INC/DEC to set an address (01-64) then press STORE.

8. Press EXIT to exit from configuration mode.

2.7 CONFIGURATION OVERVIEW

The MDR uses a function block (FB) approach to configuration. Function blocks are perceived as the software equivalent to traditional process hardware devices (e.g., square root extractor, multiplier) or to modular circuits (e.g., alarm module or voltage input module). Essentially, configuration consists of selecting needed function blocks from a table and arranging them in a desired order by soft-connecting their inputs and outputs in such a way as to meet the needs of a target application.

The MDR must be configured before it can monitor or output process signals or communicate over the LIL (if equipped with a Link Interface Card). It can be configured either from its front panel keypad or via PC-based configuration software which offers the additional flexibility and benefits of configuration file management and configuration maintenance.

To aid in configuration, the MDR is supplied with a library of built-in (ROM-based) configurations called FCOs (Factory Configured Options). The library of FCOs cover the most common MDR applications. Simply loading the appropriate FCO may be all that is necessary for configuration. In other cases, configuration may involve loading an FCO that is similar to the MDR's intended application and modifying it as needed. For highly customized applications the configuration can also be created from scratch.

Unless otherwise specified on the order, each MDR is shipped with FCO-01 loaded. This FCO configures the MDR to accept (4) 1-5 Vdc analog inputs and assigns a separate pen to trend each input. For additional information, including details on each function block, refer to the Model 363 Configuration Guide CG363-2.

For the most effective use of an MDR, an operator should have a general knowledge of its configuration.
3.0 OPERATIONS

This section describes the signal displays and keypad controls used for operating an MDR. Since the MDR is a user configurable device, some of the contents of the displays and the functions of the front panel keypad will vary somewhat from application to application.

To effectively operate the MDR, the user will need to know the general aspects of its current configuration. For example, it would be helpful to know if the auto-archiving function was configured; this function will record signal data on a memory card upon inserting a card into the slot in the front panel.

In this section, it is assumed that the MDR has been installed and configured. For detailed configuration information, refer to Configuration Guide CG363-2.

Generally, operation of the MDR involves viewing and manipulating Chart Displays and selecting specific functions from pop-up menus and windows.

3.1 FRONT PANEL OVERVIEW

Figure 3-1 shows the front panel of an MDR that is displaying a sample Chart Display. This is the most common type of MDR display.

The keypad features 18 keys. Some of the keys have dual usage for configuration and operation. Table 3.1 provides a general guide to key usage. Specific usages will be included in text as needed. Open the Keypad Door beneath the display to access the bottom two rows of keys.
FIGURE 3-1 Model 363, Sample Chart Display
## TABLE 3.1 Key Usage

<table>
<thead>
<tr>
<th>KEY</th>
<th>ON-LINE MODE</th>
<th>CONFIGURATION MODE</th>
</tr>
</thead>
<tbody>
<tr>
<td>C L</td>
<td>Toggles the MDR between CONSOLE and LOCAL modes.</td>
<td>---</td>
</tr>
<tr>
<td>MENU SELECT</td>
<td>Calls the Main Menu and selects any highlighted menu item.</td>
<td>Selects any highlighted menu item.</td>
</tr>
<tr>
<td></td>
<td>This key often shares the same function as the STORE key.</td>
<td>This key often shares the same function as the STORE key.</td>
</tr>
<tr>
<td>LAST or NEXT</td>
<td>Steps cursor to the last or next:</td>
<td>Steps cursor to the last or next Function Block Parameter Pages.</td>
</tr>
<tr>
<td></td>
<td>• Menu Item</td>
<td>These keys often share the same function as the CURSOR UP and CURSOR DOWN keys.</td>
</tr>
<tr>
<td></td>
<td>• Active Point Display</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Chart Display</td>
<td></td>
</tr>
<tr>
<td></td>
<td>These keys often share the same function as the CURSOR UP and CURSOR DOWN keys.</td>
<td></td>
</tr>
<tr>
<td>CLOSE</td>
<td>Closes the current menu display or window.</td>
<td>Closes the current menu or display.</td>
</tr>
<tr>
<td></td>
<td>This key often shares the same function as the EXIT key.</td>
<td></td>
</tr>
<tr>
<td>ACK</td>
<td>Acknowledges active point and station alarms.</td>
<td>---</td>
</tr>
<tr>
<td>ENTER CONF</td>
<td>-</td>
<td>Enters the CONFIGURATION mode and calls the Configuration Menu.</td>
</tr>
<tr>
<td>ALARM TOTAL</td>
<td>This key is only active from a Point Display Window. It calls alarm status and totalizer information for each point.</td>
<td>---</td>
</tr>
<tr>
<td>EXIT</td>
<td>Exits a displayed menu and returns to the current Chart Display.</td>
<td>Used to exit the Configuration Mode.</td>
</tr>
<tr>
<td></td>
<td>Pressing this key when a Chart Display is shown will call the Color LCD Test Pattern Display. Press EXIT or CLOSE to return to the Chart Display.</td>
<td>This key often shares the same function as pressing the CLOSE key several times.</td>
</tr>
<tr>
<td>ZOOM DELETE</td>
<td>Zooms in and magnifies a Chart Display.</td>
<td>Deletes one character at a time when editing certain text strings.</td>
</tr>
<tr>
<td>SPLIT SCREEN</td>
<td>Splits the display screen area into two zones so two Chart Displays can be shown at the same time.</td>
<td>Inserts a space in editable text strings to permit entering additional characters.</td>
</tr>
</tbody>
</table>

*March 1995*
<table>
<thead>
<tr>
<th>KEY</th>
<th>ON-LINE MODE</th>
<th>CONFIGURATION MODE</th>
</tr>
</thead>
<tbody>
<tr>
<td>CURSOR ON/OFF STORE</td>
<td>Cursor function turns the cursor bar on or off. The cursor bar can be scrolled via the CURSOR LEFT, RIGHT keys to any location along a Chart Display's trend line to review exact signal values at specific times.</td>
<td>Store function stores the currently entered value into the configuration.</td>
</tr>
<tr>
<td>CURSOR: LEFT - RIGHT</td>
<td>General cursor or cursor bar manipulation such as scrolling through graph of Chart Display, highlighting menu items and establishing cursor position within a displayed parameter value.</td>
<td>General cursor manipulation such as highlighting menu items and establishing cursor position within a displayed parameter value.</td>
</tr>
<tr>
<td>UP 1 DOWN 1</td>
<td>Some cursor functions require the CURSOR ON/OFF key to be set to ON.</td>
<td>The 1 (CURSOR UP) and 1 (CURSOR DOWN) keys often share the same function as the LAST and NEXT keys.</td>
</tr>
<tr>
<td>INC or DEC</td>
<td>Increment or decrement changeable alphanumerical values.</td>
<td>Increment or decrement changeable alphanumerical parameter values.</td>
</tr>
</tbody>
</table>

3.2 INTERACTING WITH THE CHART DISPLAY

This section describes the most prominent features of the Chart Display. The Chart Display is the MDR's most common display during normal operation. Up to six Chart Displays can be included within a configuration. Note that if no pens have been configured, a "No Pens Configured" message is presented. Figure 3-2 shows a sample Chart Display and identifies its elements. Refer to this Figure when reading the following paragraphs which describe the elements in detail.

Across the top of the Display are the Point Tag Name Identifier, the Active Point Value, and two horn shaped alarm indicator icons. The Point Tag Name Identifier is the Display name.

Alarm indicators are horn shaped icons located in the upper left and right corners. Alarm indicators appear on-screen in response to an alarm condition. The alarm indicator in the upper left corner can represent up to four point alarms while the indicator in the upper right corner represents a station (i.e., system) alarm. Alarm acknowledgement procedures are covered in section 3.2.1.

Center Area of Display

A digital pen is represented as a diamond shaped pointer located just to the right of the digital chart area in the range scale area. It moves vertically along the range scale in proportion to the magnitude of the input signal to which it is configured. The color displayed inside the diamond is the color of that pen's trend line that is drawn on the chart. As many as (6) pens can be assigned to a Chart Display.
FIGURE 3-2  Elements of a Chart Display

* Recorded on chart at regular intervals
Top Line of Display

The digital chart area is the largest portion of the Chart Display. The chart is essentially a graph showing time on the horizontal x-axis and signal magnitude on the vertical y-axis. Major chart divisions (both x and y) are represented as bold black lines while minor divisions are represented as cyan lines.

The recording (i.e., trending) time per major division is determined both by the configuration and by the operator. Two time scales are usually configured for each pen. Select either one by selecting a chart drive speed. As time passes, the chart automatically shifts to the left in precise steps as it trends the signal(s) assigned to the pen(s). Three chart divisions are displayed at any given moment, but the entire chart is stored in non-volatile memory.

The Point Tag Name and a date stamp are recorded across the top of the chart at regular intervals while time stamps are recorded across the bottom. These stamps make it easy to locate any historical area of the chart for review.

Bottom Line of Display

The current date and time are displayed below the chart at the bottom left corner of the Display. The configuration determines whether the time indication is displayed in a 12 or 24 hour format.

The bottom right of the Display is where operating mode and error indicators are displayed. These are:

- L = Local Mode
- Cn = Console Mode
- EL = Emergency Local Mode
- ER = Error Condition
- NU = Non Updating Input
- CM = Computer Mode
- AC = AutoConfigure in process
- HOLD = Config Hold

Some indicators are displayed as a result of an operator action while others respond only to a change in process signal or LIL conditions.

The total recording time of a chart is dependent on:

- The operator chosen chart drive (chart speed) setting
- The amount of memory installed
- The number of pens configured
- Whether the ZOOM feature is enabled

A method for checking total recording time is described in section 3.2.5.
3.2.1 Acknowledging Alarms

Alarm indication and acknowledgement can occur on two levels: the station level and the point level.

Station Alarm

A station alarm is indicated by the horn shaped icon in the upper right corner of the Chart Display as shown in Figure 3-2. A station alarm is usually configured so a flashing icon is displayed when an alarm condition occurs. The flashing icon remains until the alarm is acknowledged or cleared. To acknowledge a station alarm, simply press the ACK (Acknowledge) key.

Point Alarm

Up to four point alarms, A1 to A4, are indicated by the single horn shaped icon in the upper left corner of the Chart Display. The icon also appears in all display windows where tag names are displayed as shown in Figure 3-3.

Point alarms are usually configured so the icon will flash when an alarm condition occurs. The flashing continues until the alarm is acknowledged and the icon will remain on-screen until the alarm condition(s) are cleared. Point alarms can be acknowledged by pressing the ACK key in a Point Summary Window or a Point Display Window. Any alarm configured with common acknowledge turned on will be acknowledged any time ACK is pressed.

To access these windows, refer to Figure 3-3 and the following procedure:

1. From a Chart Display press the MENU key. This calls the Main Menu which has the POINT SUMMARY listing.

2. From the Main Menu press the SELECT key to call the Point Summary Window.

3. From the Point Summary Window, highlight the point which is in alarm then press the SELECT key to advance to the Point Tag Window. A point in alarm is usually indicated by a flashing horn shaped icon preceding its tag name.

4. Press the ACK (Acknowledge) key once to acknowledge up to (4) point alarms (i.e., A1 to A4).

   OR

   Press the SELECT key to advance to the Point Display Window to view additional information about point alarm status as required.

5. Press the EXIT key to return to the Chart Display and complete the procedure.
FIGURE 3-3  Acknowledging Point Alarms

* Point alarms can only be acknowledged from "Point Summary" or "Point Tag" windows

Alphanumeric Point Alarm Status Indicators

Red .................. Acknowledged Alarm
Red Flashing ........ Unacknowledged Alarm
White ................ Normal Condition
White Flashing ...... Unacknowledged Ringback
Not Shown ............ Unconfigured
Grey ................... Configured But Disabled

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3.2.2 Determining Chart Recording Time

The total recording time of a chart is determined by a number of factors including:

- The time/div setting (i.e., chart speed)
- The amount of memory installed
- Whether or not ZOOM is enabled
- The number of pens configured

To determine the approximate recording time for a given chart (pen), press the MENU key then cursor to STATION STATUS and press the SELECT key. Refer to the RECORDING TIME section of the Station Status Display. Total recording times are listed by pen color at the bottom of the Display. Pen color abbreviations are:

\[
\begin{align*}
R &= \text{RED} & C &= \text{CYAN} \\
B &= \text{BLUE} & O &= \text{ORANGE} \\
G &= \text{GREEN} & M &= \text{MAGENTA}
\end{align*}
\]

To access the Station Status Display, refer to section 3.3.1.

3.2.3 Viewing a Chart After a Power Outage

When power is removed from the MDR, it will retain its currently stored trend information. When power is restored, the MDR will resume recording trend information. The resulting time gap is shown on each active chart by a message bar; see Figure 3-4.
FIGURE 3-4  Viewing a Power Outage Time Gap
3.3 MAIN MENU

A variety of functions are accessible via the pop-up Main Menu Display. The Main Menu, shown here, can be called from any Chart Display by pressing the MENU key.

- To highlight one of the Menu's selection, use the ↑↓CURSOR keys.
- To select a function, press the SELECT key.
- To return to the Chart Display, press the CLOSE or EXIT key.

Refer to Configuration Guide CG363-2 for details of other display functions.

3.3.1 Station Status

The Station Status Display lists the MDR's operating status, current error codes and reference information about installed hardware options and chart recording times. Refer to this Display on an as-needed basis. A sample provided here shows the Display's format.

The following status information is provided:

- SID (Station Identification) as entered during configuration
- REV (Revision) number of resident configuration
- LINK STATUS
- SOFTWARE LEVEL of MPU Board and installed option boards
- LSA (Link Station Address)
- INSTALLED MEMORY in increments of 256K
- NUI (Non-updating Input) STATUS of Link Interface Board (if installed)
- RECORDING TIME of each chart by primary pen color
The Error List Display, similar to the following example, may be called by pressing SELECT from the Station Status Display.

The TOP and BOTTOM text markers identify the beginning and end of the listing. Error codes and brief explanations are listed in the order they are detected with the most recent entry at the top. This List is helpful when troubleshooting the MDR's installation, field wiring and configuration. Use the CURSOR keys to scroll through the list if it is larger than the screen's display area. To return to the Main Menu press CLOSE.

<table>
<thead>
<tr>
<th>ERROR LIST</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOP</td>
</tr>
<tr>
<td>DO4: LINK CONFIG'D BUT OFFLINE</td>
</tr>
<tr>
<td>BOTTOM</td>
</tr>
</tbody>
</table>

3.3.2 Set Date/Time

The SET DATE/TIME window, a sample of which is shown here, is used to reset the date and time settings of the internal real-time clock. Depending upon the MDR configuration, the clock uses a 12 or 24 hour format.

To set a date, highlight the date field, make the desired changes using the CURSOR keys and the INC/DEC keys as needed, press STORE then press EXIT to enter the setting.

To set the time, highlight the time field and make entries in the same manner. When finished, press EXIT or CLOSE to effect date and time changes on the Display.

<table>
<thead>
<tr>
<th>SET DATE/TIME</th>
</tr>
</thead>
<tbody>
<tr>
<td>02 NOV 1996</td>
</tr>
<tr>
<td>5:14:56P</td>
</tr>
<tr>
<td>Enter date and press STORE</td>
</tr>
</tbody>
</table>

Changes do not occur until EXIT or CLOSE

3.3.3 Memory Card

A typical plug-in PCMCIA memory card is shown in Figure 3-5. It is used to transport files between the MDR and a PC (via an optional memory card reader) or from one MDR to another. It can also be used for storing MDR data on a intermediate basis.

A Write-Protect switch, usually located on the back edge of the card, must be in the read-write position whenever the card is to accept data files or archive trending signals. Place the switch in the write-protect position to prevent writing to the card and the possibility of overwriting important historical data or configuration files.
Write - Protect Switch
And
Battery Holder Lock Switch
(Switch Locations May Vary By Card Manufacturer)

FIGURE 3-5 Memory Card
The card has a built-in back-up battery to maintain data even when the card is removed from the station or an optional memory card reader. Depending on the manufacturer some cards are shipped with an insulator affixed to one side of the battery to prolong storage life while others include the battery as a separate item. Prior to using a new card for the first time the battery may have to be installed or an insulator may have to be removed. Refer to the instruction sheet shipped with the card for details about preparing it for use. A low battery or a battery with an insulator left in place will cause a station error message to be displayed.

CAUTION

Removing the memory card’s battery, when the card is not plugged into a powered-up MDR, will erase data stored on the card. Do not remove the battery without first unplugging the card into its slot on the MDR or saving important data to other media. Under normal circumstances the battery holder lock, if present, is to be in the ‘locked’ position.

The card plugs into the slot on the front of the station as illustrated in Figures 3-5. Three types of files can be stored on the card: configuration, average and trend. Section 3.5 describes loading and saving configuration files. Average and trend files are set-up within FB100 of the MDR's configuration.

The memory card is analogous to a DOS format floppy disk in its usage (i.e., formatting, loading/saving files, directory tree structure).

The MDR's Main Menu adds MEMORY CARD to its list of selections only upon being called after a memory card has been plugged into the slot. A sample Menu, which includes MEMORY CARD is shown here. If the card is withdrawn while the Menu is displayed the MEMORY CARD selection becomes inoperative. The selection will be removed from the Menu when redisplayed. For details of memory card usage refer to Configuration Guide CG363-2.
3.3.4 Format Card

Selecting FORMAT CARD from the Memory Card Menu calls the FORMAT CARD window as shown here. From this window an operator may format the memory card currently plugged into the front of the station.

1. To format a memory card observe the default DOS convention *Volume Name* (i.e., volume label) up to 11 characters long.

2. Accept or edit the default *Volume Name*:
   - To accept the default *Volume Name* 'MEMORY_CARD' and format the card, press SELECT.
   - To edit the *Volume Name*, use the CURSOR keys, INSERT/DELETE keys and the INC/DEC keys as needed then press SELECT.

3. Respond to WARNING message (if displayed):

   If there is data on the card, a WARNING message is displayed as a safeguard before formatting is initiated.

   - To overwrite the existing data and force a format press SELECT.
   - To abort the format operation, press CLOSE.

After formatting, the Memory Card Menu is displayed.

3.4 LOADING ISAVING CONFIGURATIONS VIA MEMORY CARD

Configuration files stored on a card can be transported between the MDR and a PC (via an optional memory card reader) or from one MDR to another.

The Write-Protect switch, located on the edge of the card, must be in the read-write position whenever a configuration file is to be saved to or erased from the card.
A built-in back-up battery maintains card data when it is removed from the station or a card reader.

IMPORTANT

Removing the memory card's battery will erase any data, including configuration files, currently stored on the card. Do not remove the battery without first saving important data to another medium. Under normal circumstances the card's battery holder lock is to be in the 'locked' position.

Load Configuration Procedure:

To load a configuration from the memory card and make it the current configuration, use the following procedure:

1. Press ENTER CONF (Enter Configuration). This calls a Configuration Menu similar to the adjacent example.

2. From the Configuration Menu, highlight MEMORY CARD FILES then press SELECT. This calls a Config Files Menu similar to the example.
3. From the Config Files Menu, highlight LOAD CONFIGURATION FILES then press SELECT. This calls the Load Configuration Directory Display shown in the example.

4. From the Load Configuration Directory Display, highlight the directory which contains the desired configuration file then press SELECT. This calls a Load Configuration Files Display similar to the example.

5. From the Load Configuration Files Display, highlight the desired configuration file then press SELECT. As a file loads a status message similar to the example.

   **LOADING FILE \REC1\CONF-01.363**

6. After the file is loaded, the Configuration Files Menu is displayed.

   - To return to the Configuration Menu, press CLOSE.

   - To exit configuration mode and go on-line, press EXIT.
Save Configuration Procedure:

To save the current configuration to a memory card, use the following procedure:

1. Press ENTER CONF (Enter Configuration). This calls a Configuration Menu similar to the example.

2. From the Configuration Menu, highlight MEMORY CARD FILES then press SELECT. This calls a Config Files Menu similar to the example.

3. From the Config Files Menu, highlight SAVE CONFIGURATION FILES then press SELECT. This calls a File Entry Display similar to the example.

4. From the File Entry Display, use the INC, DEC INSERT and DELETE keys to enter the name of the current configuration file then press STORE to save it to the memory card. As the file saves, a status message similar to the following is displayed:

   SAVING FILE CONF-01

5. After the file is saved, the Configuration Files Menu is displayed. To return to the Configuration Menu, press CLOSE.
3.5 PEN COLOR PRIORITY

Each of an MDR's six active charts has a primary pen defined by its color. When pens are added to a chart, see section 3.3.7, note the priority of the pen colors. Where a chart has added pens and two or more of them are trending at the same signal value, their trend lines merge into what seems to be a single line. The color of the merged lines will be that of the highest priority pen color. See Table 3.2 for pen color priority.

<table>
<thead>
<tr>
<th>PEN COLOR</th>
<th>DISPLAY PRIORITY</th>
<th>PEN COLOR</th>
<th>DISPLAY PRIORITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Magenta</td>
<td>1 (highest)</td>
<td>Green</td>
<td>4</td>
</tr>
<tr>
<td>Orange</td>
<td>2</td>
<td>Blue</td>
<td>5</td>
</tr>
<tr>
<td>Cyan</td>
<td>3</td>
<td>Red</td>
<td>6 (lowest)</td>
</tr>
</tbody>
</table>
4.0 CALIBRATION

This section describes calibration of the MDR analog inputs. It applies to the four (4) analog input channels of the MPU Board and the six (6) analog input channels of the optional Universal Input Board.

The MPU Board is calibrated at the factory for 1 to 5 Vdc input signals or as specified on the order. Field calibration of the MPU Board is necessary under the following circumstances:

- MPU Board is replaced
- MPU Board must accept non-standard signal range
- RAM chips are installed
- Battery failure or battery disconnection without a back-up connected first

The Universal Input Board is calibrated at the factory to accept three input types. Therefore, each input channel needs three sets of calibration values: 1) Voltage, 2) Narrow millivolt and 3) Wide millivolt. The factory calibration for each input type is:

- Voltage .................. 0 to 5 Vdc
- Narrow millivolt ... 0.00 mV to 20.00 mV
- Wide millivolt ....... 0.00 mV to 70.00 mV

Field calibration is performed in three phases, one for each input range. Calibration of the Universal Input Board is necessary if its EEPROM is replaced.

The following tools and materials are required to perform a calibration.

- ¼" (6 mm) Slotted screwdriver
- Precision voltage source for calibration

Separate calibration procedures are provided here for the MPU Board and the Universal Input Board. Use one or both as needed.

4.1 MPU BOARD CALIBRATION

Individually calibrate each input channel on the MPU Board. The order in which channels are calibrated is not important. Use the following procedure to calibrate the MPU Board.

1. From the Chart Display, press ENTER CONF to enter the configuration mode. This calls a Configuration Menu that is similar to the adjacent example.

```
  CONFIGURATION MENU
PARAMETERS
 IDENTIFICATION
 ESN LISTING
 FBN LISTING
 VIEW
 FCO
 CALIBRATION
 SECURITY
 ERASE ALARM HISTORY
```
2. From the Configuration Menu, highlight and select CALIBRATION. This calls a Calibration Menu that is similar to the example.

3. From the Calibration Menu, highlight and select MPU ANALOG INPUTS. This calls an MPU Analog Input Calibration Display that is similar to the adjacent example.

4. Cursor to the LOW side of the first channel (e.g., INPUT 1) to be calibrated.

5. Connect the precision voltage source to the rear terminals for that channel. Terminal numbers (e.g., A5+ and A6-) are listed on-screen.

6. Adjust the precision voltage source to the desired LOW side (0%) reference value (e.g., 1 volt).

7. Press STORE to initiate the 35-second auto-calibration sequence.

As the sequence counts down, the input is given time to settle then 10 samples of the input signal value are acquired and averaged. It is this averaged value that is stored as the 0% calibration reference. The two messages shown here are displayed during the countdown. The first during settling time, the second during averaging.

```
Beginning low calibration
Letting analog input settle
Remaining time: 35

Beginning low calibration
Averaging 10 inputs (samples)
Remaining time: 5
```
8. Cursor to the HIGH side of the first channel (e.g., INPUT 1) to be calibrated.

9. Adjust the precision voltage source to the desired HIGH side reference value (e.g., 5 volts).

10. Press STORE to initiate the 35 second auto-calibration sequence.

As the sequence counts down, the input is given time to settle then 10 samples of the input signal value are acquired and averaged. It is this averaged value that is stored as the 100% calibration reference. The two messages shown here are displayed during the countdown. The first during settling time the second during averaging.

   Beginning high calibration
   Letting analog input settle
   Remaining time: 35

   Beginning high calibration
   Averaging 10 inputs (samples)
   Remaining time: 5

11. Repeat steps 4 through 10 for each of the remaining input channels, then press EXIT to leave the calibration mode and return to the Chart Display.

4.2 UNIVERSAL INPUT BOARD CALIBRATION

Each input channel on the Universal Input Board is to be calibrated in three phases: voltage calibration, narrow millivolt calibration and wide millivolt calibration. The phases can be calibrated in any order. This procedure first calibrates voltage, then narrow millivolt and finally wide millivolt. For a thermocouple input, a reference junction calibration procedure is provided.

IMPORTANT

Apply power to the Recorder for at least 1 hour before calibrating the Universal Input Board channels.

1. From the Chart Display, press ENTER CONF
to enter the configuration mode. This calls a
Configuration Menu that is similar to the
example.

   CONFIGURATION MENU

   PARAMETERS
   IDENTIFICATION
   ESN LISTING
   FBN LISTING
   VIEW
   FCO
   CALIBRATION
   SECURITY
   ERASE ALARM HISTORY

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2. From the Configuration Menu, highlight and select CALIBRATION. This calls a Calibration Menu that is similar to the example.

3. From the Calibration Menu, highlight and select I/O BOARD 1 INPUTS. This calls an I/O Board 1 Analog Calibration Display that is similar to the example.

4. Cursor to the LOW side of the first (or next) input channel (e.g., INPUT 1) to be calibrated.

5. Use the INC/DEC keys to select the input type 'v' (voltage) and begin the first calibration phase.

6. Connect the precision voltage source to the rear terminals for the selected channel. Terminal numbers for the channel (e.g., B1+ and B2-) are listed on-screen.

7. Adjust the precision voltage source to the desired LOW side value. See Table 4.1.

### TABLE 4.1 Typical Calibration Values

<table>
<thead>
<tr>
<th>CALIBRATION PHASE</th>
<th>INPUT SIGNAL VALUE</th>
<th>VIEW</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LOW</td>
<td>HIGH</td>
</tr>
<tr>
<td>Voltage</td>
<td>0V</td>
<td>5V</td>
</tr>
<tr>
<td>Narrow Millivolt</td>
<td>0 mV</td>
<td>20 mV</td>
</tr>
<tr>
<td>Wide Millivolt</td>
<td>0 mV</td>
<td>70 mV</td>
</tr>
</tbody>
</table>

Calibration Type: Volts
INC or DEC to change cal type.

APPLY 0.00 volts to terminals B1+ and B2-

Use arrows to select.
Press STORE to calibrate.
Press EXIT or CLOSE to exit.
8. Press STORE to calibrate each channel and initiate the 35 second auto-calibration sequence. Text background will change to red then to light blue.

**NOTE**

If MPU Board software is BBD or later, all channels can be calibrated by, at each channel, pressing STORE then the ↓ key -- at the last channel, press only the STORE key.

As the sequence counts down, the input is given time to settle then 10 samples of the input signal value are acquired and averaged. It is this averaged value that is stored as the low side calibration reference. The two messages shown here are displayed during the countdown. The first during settling time the second during averaging.

- Beginning low calibration
- Waiting for I/O board cal mode
- Remaining time: 35

- Beginning low calibration
- I/O board calibrating
- Remaining time: 35

9. Cursor to the HIGH side of the first (or next) input channel (e.g., INPUT 1) to be calibrated.

10. Adjust the precision voltage source to the desired HIGH side value. See Table 4.1.

11. Press STORE to initiate the 35 second auto-calibration sequence. Text background will change to red then to light blue and finally to black.

**NOTE**

If MPU Board software is BBD or later, all channels can be calibrated by, at each channel, pressing STORE then the ↓ key -- at the last channel, press only the STORE key.

As the sequence counts down, the input is given time to settle then 10 samples of the input signal value are acquired and averaged. It is this averaged value that is stored as the high side calibration reference. The two messages shown here are displayed during the countdown. The first during settling time the second during averaging.

- Beginning high calibration
- Waiting for I/O board cal mode
- Remaining time: 35

- Beginning high calibration
- I/O board calibrating
- Remaining time: 35

12. Use the INC/DEC keys to select the input type 'nmV' (narrow millivolt). This begins the second calibration phase.
13. Repeat steps 7 thru 11 for the same input channel(s).

14. Use the INC/DEC keys to select the input type 'wV' (wide millivolt). This begins the third calibration stage.

15. Repeat steps 7 thru 11 for the same input channel(s).

16. Repeat steps 4 thru 15 for each of the remaining input channels to be calibrated.

17. For thermocouple inputs, proceed to calibrate the reference junction. For other inputs, press EXIT to leave the calibration mode.

REFERENCE JUNCTION SENSOR CALIBRATION

Note whether the reference junction is located on the Universal Input Board (internal) or located outside the MDR (external) and perform the appropriate procedure. Most MDRs will have an internal reference junction. During the calibration, messages will be shown at the bottom of the display.

INTERNAL REFERENCE JUNCTION

1. Confirm that Universal Input Board jumpers W3 and W31 are set to the INT position.

2. Measure the temperature at terminal B9 on the rear of the case to within 0.1°C.

3. Highlight the Reference Junction Temperature and use the INC/DEC keys to select Internal Ref. Junction temperature. Set the displayed value to that measured in step 2. Use the left/right arrow keys to move the cursor and select a character to change.

4. Press STORE and wait for DONE to be displayed.

5. Press EXIT to leave the calibration mode.
EXTERNAL REFERENCE JUNCTION

1. Confirm that Universal Input Board jumpers W3 and W31 are set to the EXT position.

2. Measure the temperature at the external reference sensor's isothermal block to within 0.1 °C.

3. Highlight the Reference Junction Temperature and use the INC/DEC keys to select External Ref. Junction temperature. Set the displayed value to that measured in step 2. Use the left/right arrow keys to move the cursor and select a character to change.

4. Press STORE and wait for DONE to be displayed.

5. Press EXIT to leave the calibration mode.

<table>
<thead>
<tr>
<th>I/O BOARD 1 ANALOG CALIBRATION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CAL</strong></td>
</tr>
<tr>
<td>INPUT #1 LOW HIGH</td>
</tr>
<tr>
<td>INPUT #2 LOW HIGH</td>
</tr>
<tr>
<td>INPUT #3 LOW HIGH</td>
</tr>
<tr>
<td>INPUT #4 LOW HIGH</td>
</tr>
<tr>
<td>INPUT #5 LOW HIGH</td>
</tr>
<tr>
<td>INPUT #6 LOW HIGH</td>
</tr>
<tr>
<td><strong>External Ref. Junction</strong></td>
</tr>
</tbody>
</table>

Calibration Type: Volts

Measure temperature +/- 0.1 °C at B9 terminal; Enter temperature in °C.

Use arrows to select.
Press STORE to calibrate.
Press EXIT or CLOSE to exit.
5.0 CIRCUIT DESCRIPTION

This section provides a block diagram level circuit description of the MDR’s hardware. The hardware is arranged into six functional areas, as shown in Figure 5-1, and it works under the control of the MDR's software-based operating system and its function block based configuration.

The operating system controls routine internal operations such as updating screen displays, detecting keystrokes, and handling memory card functions. It also contains the library of FCOs.

The configuration adapts the MDR to a process application while also providing a means to set many of its operating parameters such as chart speed, archiving functions, and alarm setup. While many configurations are possible, the MDR generally accepts process signals from the field and records them on a digital chart.

The configuration of an input channel will affect the way that an incoming signal is recorded. For example, if an input channel has been configured to provide a square root extraction function then the recorded signal will be linearized. To adequately evaluate circuit operation will often require the use of a test configuration.

MPU Board:

The MPU Board is a hybrid assembly in that it contains analog and digital circuitry. The analog circuits operate in real-time while the microprocessor based digital circuits operate at high speed under program control.

The MPU is a single integrated circuit capable of arithmetical, logical and support circuit control functions. It directly or indirectly interacts with surrounding on and off board circuitry to control the internal operations of the MDR. It operates under program control of the operating system and the configuration. The operating system code is stored in a pair of UVEPROMs while the configuration, MPU Board calibration data, and all chart data are stored on the Board’s RAM. The software level of the MPU Board is listed in the MDR’s Status Display.

A real time clock chip is used to provide time base functions for displaying the current on-screen time and date. It also serves as the reference for providing the time and date stamps recorded on charts at regular intervals and for those stamped on memory card files.

The backup battery is a long life replaceable lithium battery which provides backup power to the RAM bank and the real time clock to prevent data loss when the power supplied to the MDR is turned off or there is an outage.

The MPU Board has four analog input channels. Typically, each channel is calibrated to accept a standard 1 to 5 Vdc input signal. It samples the incoming analog voltage signal and converts it to a digital form using an A/D Converter. In this form, the signal is further processed by a Signal Conditioning algorithm (e.g., square root extraction) as determined by the configuration. The signal is then passed to the operating system for use in monitoring and recording functions. Within the configuration function blocks, FB27 through FB30 are associated with these channels. A simplified schematic of an analog input channel is shown in Figure 2-11.
FIGURE 5-1 MDR Block Diagram
Display Assembly:

The Display Assembly contains the operator controls, a color display screen, a background lamp, and a memory card slot.

The color display screen consists of a color LCD display panel and all the scan driver circuitry needed to operate it. Background lighting for the LCD is provided by a lamp circuit which consists of a replaceable florescent bulb and the voltage step-up electronics to light it.

Operator controls consist mainly of a membrane keypad which functions under control of the operating system to sense keystrokes. It has 18 keypads arranged in a matrix. Each one of which has a tactile pressure sensing element.

The memory card slot is a PCMCIA Type 1, 68-pin slot supported by socket-service and card-service software incorporated within the operating system. These services are compatible with Type 1, 68-pin PCMCIA memory cards. They monitor whether or not a card is plugged into the socket, interface the socket to the MDR hardware and handle memory and file management.

Universal Input Board #1:

The Universal Input Board #1 must be mounted as the first board atop the MPU Board. It has six universal analog input channels. Typically, each channel is configured to accept any one of several types of input signal such as 1 to 5 Vdc, millivolt or thermocouple, and is calibrated accordingly. An incoming analog voltage signal is sampled and converted to digital form using an A/D Converter. In this form the signal is further processed (e.g., square root extraction) by a Signal Conditioning algorithm as determined by the configuration. The signal is then passed along to the operating system for use in monitoring and recording functions. Configuration function blocks FB51 through FB56 are associated with these channels.

An internal cold junction reference voltage source for thermocouple inputs is on this board. Use of the internal reference is determined by jumpers and by configuration. Simplified schematics are shown in Figure 2-11 for a universal input configured as an analog input channel and in Figure 2-14 for configuration as a T/C input channel. Locations and settings of jumpers are shown in Figure 2-15.

The EEPROM stores the code the MPU needs to operate this Board and the Board's calibration information. The software level of an installed Universal Input Board is listed in the MDR's Status Display.

Discrete I/O Board #1 & #2:

The Discrete I/O Board is available in two versions. The #1 version must be mounted as the first board atop the MPU Board. The #2 version must be mounted atop the #1 board. In both cases there are eight discrete I/O channels. The configuration determines whether a channel is an input or output channel.

When configured as an input channel, the discrete input signal is sampled and stored in a latch. The signal's discrete state information (i.e., logical 0 or logical 1) is then forwarded to the operating system via the interface logic for monitoring or recording functions. A simplified schematic of a discrete I/O channel configured as an input channel is shown in Figure 2-12.
CIRCUIT DESCRIPTION

When configured as an output channel, the discrete state of the output signal is determined by logical conditions setup within the configuration. This discrete state is passed from the operating system to the interface logic from which point it is held in a latch to provide a continuous logical output. The output will be maintained until the discrete state is toggled. A simplified schematic of a discrete I/O channel configured as an output channel is shown in Figure 2-13.

Within the configuration function blocks FB71 through FB78 are associated with the input channels of #1 version. Similarly, function blocks FB79 through FB86 are associated with the input channels of #2 version.

The UVEPROM stores the code the MPU needs to operate this Board. The software level of an installed Discrete I/O Board is listed in the MDR's Status Display.

Link Interface Board:

The Link Interface MPU Board is mounted vertically on the MPU Board. It is configured under function Block FB98 to provide communications over the Local Instrument Link (LIL) between the MDR and other link-connected stations such as a Model 320 ICI.

Code stored in the UVEPROM permits the Board to communicate over the LIL by sending commands or data to other stations and devices on the LIL, receiving commands or data from other stations and devices on the LIL, performing error checking on communications, and handling link protocol (e.g., token passing). The software level of the Link Interface Board is listed in the MDR's Status Display.

The Communications Interface circuitry contains a modem which converts serial data streams into a parallel format and performs encoding and decoding of message packets.

A relay-based latch actually connects the Board to the LIL under the direction of the configuration.

Power Supply Board:

The Power Supply Board is mounted vertically on the MPU Board. It accepts an AC or DC input, rectifies it (AC only), and uses a switching circuit to feed power to all circuits within the MDR via a voltage divider network. The regulator uses a feedback signal to alter the switching rate so as to supply only the amount of power needed to efficiently handle load conditions. The MDR's power fuse is on this board. Replace only with the same type.
6.0 MAINTENANCE

MDR maintenance requirements are minimal. Maintenance activities such as cleaning and visual inspection should be performed as part of overall system maintenance. The severity of the MDR's operating environment will determine the frequency of maintenance.

6.1 PREVENTIVE MAINTENANCE

The objective for establishing a preventive maintenance program is to provide maximum operating efficiency by reducing down time. Every preventive maintenance operation should assist in realizing this objective, otherwise, it is unnecessary.

6.1.1 Screen and Keypad Care

The LCD Display is covered with a clear protective screen. Take care not to scratch or mar this screen to prevent obstructing the view of Chart Displays.

The MDR has a sealed membrane keypad area. To maintain a long operating life only use fingertips for pressing keypads. To avoid membrane tears or punctures, and damage to the underlying switches, do not press keypads using sharp or pointed objects such as a pen tip.

To clean the Display or keypad:

- Use a soft cloth dampened with a mild cleaning solution. Test clean a small area first to ensure compatibility.
- Do not use a solvent or other harsh cleaning agent.
- Do not use a brush or scrubbing pad.
- Do not flood the display or keypad with the cleaning solution.

6.1.2 Environmental Considerations

The MDR has been designed to operate within the specified operating parameters as listed in Section 1.4.3.

6.1.3 Visual Inspection

As part of a preventative maintenance program the MDR should be visually inspected. Scan for abnormalities such as punctured membrane areas, loose broken or stressed cables.

6.1.4 Circuit Board Cleaning

MDR circuit boards should not be cleaned unless accumulated foreign material is causing a problem. The enclosure design prevents particulate material from building up. If cleaning becomes necessary, remove debris with either a soft brush or low velocity deionized air.
6.1.5 Circuit Board Handling

Electrostatic discharge (ESD) can damage semiconductor devices. Handling procedures that prevent the build up of electrostatic potentials are required whenever MDR circuit boards are handled. An anti-static wrist strap and static dissipative mat, properly grounded, must be used.

6.1.6 Display Test

To test the LCD: call a Chart Display to the screen, then press EXIT. This will display a color bar test pattern on the screen similar to the following:

```
<table>
<thead>
<tr>
<th>BLACK</th>
<th>DARK</th>
<th>DARK</th>
<th>DARK</th>
<th>DARK</th>
<th>DARK</th>
<th>DARK</th>
</tr>
</thead>
<tbody>
<tr>
<td>BLUE</td>
<td>GREEN</td>
<td>CYAN</td>
<td>RED</td>
<td>MAGENTA</td>
<td>YELLOW</td>
<td></td>
</tr>
<tr>
<td>LIGHT</td>
<td>LIGHT</td>
<td>LIGHT</td>
<td>LIGHT</td>
<td>LIGHT</td>
<td>WHITE</td>
<td></td>
</tr>
<tr>
<td>BLUE</td>
<td>GREEN</td>
<td>CYAN</td>
<td>RED</td>
<td>MAGENTA</td>
<td>YELLOW</td>
<td></td>
</tr>
</tbody>
</table>
```

Check the displayed colors against the list shown here. If there any major differences, such as one or more colors missing, it may be indicative of an LCD malfunction or improper display-to-MPU Board cable connections.
6.2 TROUBLESHOOTING

Troubleshooting the MDR is primarily done by interpreting status messages displayed on the LCD. Status messages are listed in section 6.2.1.

If a problem develops upon initial installation, a check should be made of:

- Installation wiring
- Set-up parameters (assigning additional pens to a chart, etc.)
- Configuration parameters
- If applicable, Universal Input Card jumper settings
- If applicable, Memory Card setup (battery installation or insulator removal)

Table 6.1 lists common items to check.

RETURN FOR REPAIR

A failed MDR circuit board or other assembly should be returned for repair to one of the addresses in the Warranty statement at the back of this section. Refer to Section 2.3.3 for the steps needed to return an assembly. The Parts List at the back of this Instruction provides replacement part numbers and an exploded view of the MDR.

6.2.1 Chart-Break Message Bars

The MDR will display a Chart-Break Message Bar whenever an incident, intentional or unintentional, occurs which alters its current recording operations. For example, if a power interruption occurs, a message bar is added to the chart when power is restored to log the time gap that resulted from the outage. An example message bar is shown in Figure 3-5. Table 6.2 lists information for each message bar type.
<table>
<thead>
<tr>
<th>SYMPTOM</th>
<th>DESCRIPTIVE COMMENT</th>
<th>SUGGESTED ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blank Screen</td>
<td>Unit is off or Display Assembly may not be completely fastened to case.</td>
<td>Make sure MDR is connected to live power source.</td>
</tr>
<tr>
<td>MDR won't go online when power is applied</td>
<td>Error message displayed on LCD.</td>
<td>Hardware failure, call Moore Products Company.</td>
</tr>
<tr>
<td>MDR won't recognize one or more I/O boards</td>
<td>Error message or HARDWARE NOT PRESENT message on LCD.</td>
<td>The daisy chain cable which connects between the MPU Board and optional I/O Boards may be loose, open or unplugged. Check all daisy chain cable connections.</td>
</tr>
<tr>
<td>MDR won't auto archive trend signals to a memory card as soon as the card is inserted</td>
<td>There is no on-screen indication that the auto-archive function is not active. MDR operates normally otherwise.</td>
<td>Memory card may not be formatted. Format memory card.</td>
</tr>
<tr>
<td>MDR won't save pen files to a memory card</td>
<td>MDR operates normally otherwise.</td>
<td>Memory card may have dead battery. Replace the battery.</td>
</tr>
<tr>
<td>MDR can't access LIL</td>
<td>LEDs on Link Interface Board are completely off.</td>
<td>Memory card may be write-protected. Put card in read-write mode.</td>
</tr>
</tbody>
</table>
| MDR won't enter Config mode                  | MDR operates normally otherwise                          | Auto-Archive function not configured to ‘YES’.
Reconfigure FB100 to enable this function. |
| MDR can't access LIL                         | LEDs on Link Interface Board flash regularly. MDR makes occasional clicking sound. | FB98 not configured. The MDR is shipped without FB98 configured. Add this block and a companion ESN to the configuration. Link Station Address (LSA) is set to (0) zero. Set LSA to valid address (1 to 64). |

- LIL wiring not connected to MDR.  
- Improper or loose LIL wiring connections to rear terminals.  
- Failed Link Interface Board.  
- Intermittent connection between MPU Board and backplane
<table>
<thead>
<tr>
<th>MESSAGE BAR TYPE</th>
<th>MESSAGE BAR INFORMATION</th>
<th>CAUSAL EVENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>POWER INTERRUPT</td>
<td>Displays previous and next sample date/time.</td>
<td>Power was toggled while station was configured and running.</td>
</tr>
<tr>
<td>RECORD INTERRUPT</td>
<td>Displays previous and next date/time.</td>
<td>Chart speed was changed from stop to either fast or slow by changing either the configuration of FB31 or the CHART DRIVE function of the Main Menu.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The pen trace memory is full and the oldest pen data has been overwritten with new pen data, causing a message bar to appear. At the point the oldest data begins a &quot;START OF TRACE&quot; message displayed instead of previous date/time.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>In cases where the pen trace memory has been erased &quot;START OF TRACE&quot; is displayed instead of previous date/time.</td>
</tr>
<tr>
<td>SPEED CHANGE</td>
<td>Displays next date/time only.</td>
<td>Chart speed was changed from fast to slow (or vice versa) by changing either the configuration of FB31 or the CHART DRIVE function of the Main Menu.</td>
</tr>
<tr>
<td>CONFIG CHANGE</td>
<td>Displays next date/time only.</td>
<td>A change was made to one or more of the configuration parameters.</td>
</tr>
<tr>
<td>TIME/DATE CHANGE</td>
<td>Displays previous and next date/time.</td>
<td>The station date and/or time was changed.</td>
</tr>
<tr>
<td>CALIBRATE CHANGE</td>
<td>Displays next date/time only.</td>
<td>One or more of the MDR's analog inputs were recalibrated.</td>
</tr>
</tbody>
</table>
6.2.2 Error List Messages

One of the functions of the MDR’s Status Display, as described in section 3.3.6, is to display a listing of error messages. These messages may relate to operational, hardware, or link related concerns. To access this list call the Status Display from the Main Menu then press SELECT. Table 6.3 lists information about each message. Within the table each error messages is identified as one of the following types:

AA = (Always Active) Once error occurs, stays active ("ER" indicator comes on)
AI = (Active Indicator) Active only while error condition exists ("ER" indicator)
II = (Inactive Indication) Inactive error condition (no "ER" indicator)
TO = (Text Only) Text message only, message is not stored ("ER" not applicable)
SC = (Self Clearing) Not acknowledgeable ("ER" not applicable)

<table>
<thead>
<tr>
<th>ERROR MESSAGE</th>
<th>TYPE</th>
<th>CAUSE/COMMENTS</th>
<th>CORRECTIVE ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>001 MPU BOARD A/D ERROR</td>
<td>AI</td>
<td>The A/D converter on the named I/O board does not finish converting in the time allotted.</td>
<td>Replace Board.</td>
</tr>
<tr>
<td>002 I/O BOARD 1 A/D ERROR</td>
<td>SC</td>
<td>Loss of LIL communications from probable disconnection. Configuration of FB 98 is OK. This error may occur for several seconds (up to 8) at power up time. This instance should be ignored.</td>
<td>Trace LIL wiring until break point or disconnection is found then reconnect link. Reseat Link Interface Board in its socket.</td>
</tr>
<tr>
<td>003 I/O BOARD 2 A/D ERROR</td>
<td>II</td>
<td>Memory size has changed between power cycles. For example, memory has been added or removed without unplugging the battery. Detected at power up.</td>
<td>Unplug battery to reset recorder.</td>
</tr>
<tr>
<td>004 LINK CONFIG’D BUT OFFLINE</td>
<td>SC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>006 MEMORY SIZE CHANGED</td>
<td>II</td>
<td>Memory size has changed between power cycles. For example, memory has been added or removed without unplugging the battery. Detected at power up.</td>
<td></td>
</tr>
<tr>
<td>007 MPU BATTERY LOW OR DEAD</td>
<td>AI</td>
<td>Battery is low or dead. Detected at power up.</td>
<td>Replace MPU Board battery.</td>
</tr>
<tr>
<td>009 FB CYCLE OVERRUN</td>
<td>AI</td>
<td>Function block cycle time is too long interfering with the next cycle.</td>
<td>Upgrade software.</td>
</tr>
<tr>
<td>010 MPU ROM CHECKSUM ERROR</td>
<td>AA</td>
<td>MPU ROM stored checksum does not match calculated checksum during power up.</td>
<td>Replace ROMs.</td>
</tr>
<tr>
<td>ERROR MESSAGE</td>
<td>TYPE</td>
<td>CAUSE/COMMENTS</td>
<td>CORRECTIVE ACTION</td>
</tr>
<tr>
<td>---------------</td>
<td>------</td>
<td>----------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>012 MPU CONFIGURATION CRC ERROR</td>
<td>II</td>
<td>Damaged configuration. The stored CRC in the configuration does not match the calculated CRC at power up time.</td>
<td>Reload configuration.</td>
</tr>
<tr>
<td>013 MPU CALIB DATA CRC ERROR</td>
<td>II</td>
<td>The stored CRC in the calibration data does not match the calculated CRC at power up time.</td>
<td>Change battery then recalibrate analog inputs of MPU Board.</td>
</tr>
<tr>
<td>014 MPU TRANSIENT DATA CRC ERROR</td>
<td>II</td>
<td>The stored CRC in the transient data does not match the calculated CRC at power up.</td>
<td>Change battery and reload configuration.</td>
</tr>
<tr>
<td>016 MPU PEN DATA ERROR</td>
<td>II</td>
<td>A bad data packet was detected at power up.</td>
<td>Delete pen file.</td>
</tr>
<tr>
<td><strong>MPU DATABASE REVISION ERRORS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>020 I/O BOARD #1 COMM ERROR</td>
<td>Al</td>
<td>Configuration does not match the MDR hardware. These errors usually occur at power-up time or after a configuration download and originate from the I/O board(s).</td>
<td>Reload the configuration.</td>
</tr>
<tr>
<td>021 I/O BOARD #1 ROM CRC ERROR</td>
<td></td>
<td></td>
<td>Configuration may not be compatible with current hardware level - call Moore Products Co.</td>
</tr>
<tr>
<td>022 I/O BD #1 SOFTWARE REV ERROR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>023 I/O BD #1 HARDWARE REV ERROR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>024 I/O BOARD #1 RAM TEST ERROR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>025 I/O BOARD #1 EEPROM ERROR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>026 I/O BD#1 UNUSED INTERRUPT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>027 I/O BD #1 ILLEGAL OPCODE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>028 I/O BD #1 DATABASE ID ERROR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>030 I/O BOARD #2 COMM ERROR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>031 I/O BOARD #2 ROM CRC ERROR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>032 I/O BD #2 SOFTWARE REV ERROR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>033 I/O BD #2 HARDWARE REV ERROR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>034 I/O BOARD #2 RAM TEST ERROR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>035 I/O BOARD #2 EEPROM ERROR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>036 I/O BD#2 UNUSED INTERRUPT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>037 I/O BD #2 ILLEGAL OPCODE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>038 I/O BD #2 DATABASE ID ERROR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>029 I/O BD#1 RESPONSE ERROR</td>
<td>Al</td>
<td>The specified I/O board has failed to respond correctly to a message after five retries</td>
<td>Replace board.</td>
</tr>
<tr>
<td>039 I/O BD#2 RESPONSE ERROR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ERROR MESSAGE</td>
<td>TYPE</td>
<td>CAUSE/COMMENTS</td>
<td>CORRECTIVE ACTION</td>
</tr>
<tr>
<td>-----------------------</td>
<td>------</td>
<td>-------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>040 I/O BOARD #1 NOT ANALOG</td>
<td>II</td>
<td>The configuration requires a certain type of I/O board but either no working board is present, or a board of the wrong type was detected at power up time.</td>
<td>This error shows up at power up time and allows the user to either continue (punch through), power down, or download a new configuration. If the user punches through, the corresponding function blocks are removed from the ESN table before the configuration starts. Either install the correct I/O board or edit the configuration as needed.</td>
</tr>
<tr>
<td>041 I/O BOARD #1 NOT DIGITAL</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>050 I/O BOARD #2 NOT ANALOG</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>051 I/O BOARD #2 NOT DIGITAL</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(DIGITAL = DISCRETE)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>060-069 I/O BOARD #1 CH # ERROR</td>
<td>AI</td>
<td>Internal error of I/O board</td>
<td>Replace I/O Board</td>
</tr>
<tr>
<td>070-079 I/O BOARD #2 CH # ERROR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>082 ROOT DIRECTORY FULL</td>
<td>TO</td>
<td>All memory card root directory entries are used and the MDR tries to create a new file in the root directory</td>
<td>Remove unneeded entries to make room for new entries</td>
</tr>
<tr>
<td>083 FILE ALLOCATION TABLE ERROR</td>
<td>TO</td>
<td>Corrupted memory card file</td>
<td>Erase corrupted file or format card</td>
</tr>
<tr>
<td>084 MEMORY CARD IS FULL</td>
<td>TO</td>
<td>Occurs when writing a file or creating a directory and there is no space left on the memory card</td>
<td>Copy needed files to another medium then erase copied files from card to make more space available</td>
</tr>
<tr>
<td>093 CARD WRITE PROTECTED</td>
<td>TO</td>
<td>Occurs when an attempt to write something to a memory card when the its write protect switch is in the read-only position.</td>
<td>Place write-protect switch in read-write position then repeat file operation</td>
</tr>
<tr>
<td>094 FORMAT VERIFICATION ERROR</td>
<td>TO</td>
<td>Occurs when formatting a bad card</td>
<td>Reseat memory card in slot and retry format operation.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Memory card battery needs replacement</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Replace defective memory card</td>
</tr>
<tr>
<td>095 INVALID CONFIG FILE</td>
<td>TO</td>
<td>The configuration file is invalid. This can be because the file is the wrong size, has an invalid checksum, etc.</td>
<td>Reload configuration file</td>
</tr>
<tr>
<td>096 I/O BOARD NOT PRESENT</td>
<td>II</td>
<td>When loading a configuration off the memory card and the configuration requires an I/O board that is not present (similar to &quot;I/O BOARD #1 NOT ANALOG&quot;).</td>
<td>Either install the correct I/O board or edit the configuration as needed.</td>
</tr>
<tr>
<td>ERROR MESSAGE</td>
<td>TYPE</td>
<td>CAUSE/COMMENTS</td>
<td>CORRECTIVE ACTION</td>
</tr>
<tr>
<td>-----------------------</td>
<td>------</td>
<td>-------------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>057 MEM CARD BATTERY LOW</td>
<td>AI</td>
<td>Memory card has a weak battery. Files on the card may be lost or damaged if not copied to another medium soon.</td>
<td>Copy needed files to another medium for safekeeping then replace battery.</td>
</tr>
<tr>
<td>058 MEM CARD BATTERY DEAD</td>
<td>AI</td>
<td>Memory card battery has not been initially installed or has not had a shipping insulator removed. or Memory card has a dead or missing battery. Any files stored on it will probably be lost as soon as the card is unplugged from MDR.</td>
<td>Install/replace memory card battery or remove shipping insulator. This may be possible while card is plugged into MDR.</td>
</tr>
<tr>
<td>100-123 NUI FOR INPUT #</td>
<td>SC</td>
<td>There are 24 global-data inputs available in FB 98 (LIL). Each one has a “Non-Updating Input” flag; if set to “Yes”, it will cause a NUI error under one of the following conditions: The remote station is not present The remote station does not support the channel requested The MDR has only just established LIL communications but has not had its global data table updated (may happen for a second or two after power up once the “EL” indicator turns off). A NUI condition will light the “NU” indicator</td>
<td></td>
</tr>
<tr>
<td>124-147 A/C ERROR FOR INPUT #</td>
<td>AI</td>
<td>MDR cannot auto-configure. Any of the 24 global-data inputs available in FB98 (LIL) may be configured to use any of these LIL inputs, and in addition, may be configured to obtain auto-configure information (i.e., tag, range, and unit data) from a remote station). If unable to do so this error occurs. Note that this error does not occur if the remote station is offline. The only exception is if an on-line remote station goes offline during an active auto-configuration.</td>
<td></td>
</tr>
<tr>
<td>(A/C = Auto-Configure)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>151 NEED 128K TO TREND</td>
<td></td>
<td>The inserted memory card has less than 128K of memory available for trending.</td>
<td>Delete file from memory card or insert another memory card.</td>
</tr>
</tbody>
</table>

### 6.3 SUBASSEMBLY AND COMPONENT REPLACEMENT

The following subsections provide information needed to access and replace a subassembly or other part within the MDR. When reading each section refer to the exploded view of the MDR in Figure 6-1 for subassembly and part identification. Only common electronic hand tools and a conductive wrist strap and static dissipative mat are needed for maintenance operations. Refer to the Parts List at the back of this Instruction for part numbers.
6.3.1 LCD Backlight

The LCD backlight, located within the Display Assembly, contains a U-shaped fluorescent lamp. To replace the lamp, follow the instructions provided in the Backlight Lamp Assembly Kit.

6.3.2 Fuse

The power fuse is located on the Power Supply Board as shown in Figure 6-1. The fuse can be easily replaced without removing the Power Supply Board from the MPU Board.

1. Remove the Display Assembly and MPU Board from the case as described in section 2.4.5.

2. Use a hand tool or probe to carefully free the fuse from its socket and install the replacement fuse.

3. Install the Boards and Display Assembly and operate the MDR for several minutes to be sure that a condition does not exist that will cause the replacement fuse to fail.

6.3.3 Back-Up Battery

The Back-up Battery powers the MPU Board RAM chips to retain data when the main power source to the MDR is turned off. It is located on the MPU Board, as shown in Figure 6-1. Battery replacement can be performed without removing any optional circuit boards which may be mounted atop the MPU Board.

WARNING

A lithium battery could pose an explosion hazard if installed incorrectly. When replacing this type of battery use only the same or equivalent type recommended by the manufacturer. Discard used batteries in accordance with manufacturer’s instructions.

Lithium Battery Precautions:

- Properly handle replacement and removed batteries
- Properly dispose of a removed battery
- Do not bum a battery
- Do not short circuit battery terminals
- Do not attempt to charge the battery
- If electrolyte is exposed, wear safety glasses and rubber gloves when handling the battery
- For details contact battery manufacturer

Battery Replacement Procedure

1. Plug a fresh battery into the MPU Board before disconnecting the original to prevent losing the data stored in RAM. Two connectors (J7 and J8) provide for a battery switchover.

2. To free the original battery, simply rock it or gently pry it from its socket. It is held in its socket by two tabs of 'hook & loop' tape.

3. Disconnect the original battery from the MPU Board.

November 1996
**Notes:**

1. Wear a grounding wrist strap, connected to ground when handling circuit boards.
2. When handling MPU board prevent it from flexing by supporting it at each end.
3. When replacing a back-up battery, always plug in the new one before disconnecting the old one.

**FIGURE 6-1 Component Identification**
6.3.4 Display Assembly and Major Circuit Boards

To access or replace the Display Assembly and/or major circuit boards, use the procedures provided under section 2.4.5. For the Power Supply Board, use the procedure for the Link Interface Board but place the Board in the adjacent position as shown in Figure 6-1.

6.3.5 Adding RAM

Additional RAM (random access memory) is added in increments of 256K. RAM chips are added in pairs since each chip is 128K.

After RAM installation, the (4) analog input channels of the MPU Board must be calibrated.

Refer to Figure 6-1 and the following procedure to install RAM chips:

SAVE CHART DATA AND CONFIGURATION

1. If the MDR is in service and, if desired, save any wanted chart and configuration files to a plug-in Memory Card. Later these files can be easily restored from the card.

   IMPORTANT

   Stored trend and configuration files will be erased when the back-up battery is disconnected in step 9.

2. If the MDR is providing discrete output signals, be sure discontinuing these signals will not upset an active process.

REMOVE DISPLAY ASSEMBLY

3. Open the keypad door and loosen the captive retaining screw which secures the Display Assembly to the MDR case.

4. Grip the Display by its bezel and carefully move it slightly away from the case to provide access to the ribbon cable connector.

5. Disconnect the cable, free the Display, close the keypad door and then set the Display aside.

REMOVE CIRCUIT BOARDS

6. While wearing a grounding wrist strap, loosen the MPU Board's captive retaining screw which secures the MPU Board to the case, then carefully pull the MPU Board until its rear edge connector unseats from the backplane.

7. Carefully withdraw the MPU Board from the case while supporting it so it does not flex. Set it on a clean, flat, smooth surface.
8. If applicable, remove any optional circuit boards (e.g., Universal Input Board, Discrete I/O Board) mounted atop the MPU Board.

INSTALL CHIPS

9. Unplug the back-up battery from the MPU Board then locate the empty 32-pin IC sockets.

10. The supplied RAM chips are to be installed in pairs beginning with the lowest numbered available socket pair from the list shown here:

   U35 + U36
   U48 + U49
   U55 + U56

   Load a RAM chip into a chip insertion tool, match up the alignment notches between the chip and the socket, carefully insert the chip, then install the next chip in the same manner.

INSTALL CIRCUIT BOARDS AND DISPLAY ASSEMBLY

11. Plug in the back-up battery and, if applicable, mount optional circuit boards atop the MPU board.

12. While carefully supporting the MPU Board to prevent flexing, install the rear edge of the MPU Board into the case by inserting it into the upper grooves of the case guide rails. Gently slide the Board all the way into the case until the its rear edge connector mates with the backplane.

13. Secure the MPU Board to the case by tightening its captive retainer screw.

14. Position Display Assembly over front of case, connect the MPU Board ribbon cable, then secure the Display by tightening the captive retainer screw located behind its keypad door.

PREPARE MDR FOR SERVICE

15. Configure and calibrate the MDR as needed. If applicable, restore configuration files from the memory card.

   IMPORTANT

   After RAM installation, the (4) analog input channels of the MPU Board must be calibrated.

16. Call the MDR's System Status Display and note the amount of installed RAM.

6.4 SOFTWARE COMPATIBILITY

When adding or when replacing an MDR circuit board, be sure the three-letter software code of an added or replacement board is compatible with that already in use. Software codes for installed boards are listed in the System Status Display.
The software code for each circuit board is also printed on the label(s) of its firmware (PROMs). A sample label is shown below.

14728-xxx-BBA  
©1995  
Moore Products

This label information will be needed when ordering a new or replacement board. To access these labels use the procedures in section 2.4.5 for installing optional circuit boards.

6.5 SPARE AND REPLACEMENT PARTS

One spare MDR and battery should be stocked for every 1 to 10 in service. Spare and replacement parts can be ordered from one of the addresses in the Warranty statement or through a local Moore Products Co. representative. Service part numbers are listed in the Parts List at the back of this Instruction.

IMPORTANT

A circuit card must be placed in a static shielding bag to protect it from electrostatic discharge.

When ordering a replacement part or assembly, provide the model number, part number, serial number, and software compatibility identification code from the circuit board or assembly to be replaced or spared. A purchase order number will be needed.

WARNING

Lithium Battery:

- Store battery in original shipping container
- Do not store battery loosely in a metal bin or short circuit battery terminals
- Store a battery in a cool well ventilated area; maximum storage temperature should not exceed 85°C (185°F)

IMPORTANT

When placing an MPU Board for extended storage in spare parts stock, unplug the battery connector from the MPU Board. Refer to Figure 6-1. This will extend battery life but erase the calibration of the analog inputs. Also, a cooler storage temperature extends battery life.

WARRANTY

The Company warrants all equipment manufactured by it and bearing its nameplate, and all repairs made by it, to be free from defects in material and workmanship under normal use and service. If any part of the equipment herein described, and sold by the Company, proves to be defective in material or workmanship and if such part is within twelve months from date of shipment from the Company's factory, returned to such factory, transportation charges prepaid, and if the same is found by the Company to be defective in material
or workmanship, it will be replaced or repaired, free of charge, f.o.b. Company's factory. The Company assumes no liability for the consequence of its use or misuse by Purchaser, his employees or others. A defect in the meaning of this warranty in any part of said equipment shall not, when such part is capable of being renewed, repaired or replaced, operate to condemn such equipment. This warranty is expressly in lieu of all other warranties, guaranties, obligations, or liabilities, expressed or implied by the Company or its representatives. All statutory or implied warranties other than title are hereby expressly negated and excluded.

Warranty repair or replacement requires the equipment to be returned to one of the following addresses.

Equipment manufactured or sold by MOORE PRODUCTS CO.:

MOORE PRODUCTS CO.
Sunnycourt Pike
Spring House, PA 19477

Equipment manufactured or sold by MOORE PRODUCTS CO. (CANADA) INC.:

MOORE PRODUCTS CO. (CANADA) INC.
2KM West of Mississauga Rd. Hwy. 7
Brampton, Ontario, Canada

Equipment manufactured or sold by MOORE PRODUCTS CO. (UK) LTD.:

MOORE PRODUCTS CO. (UK) LTD
Copse Road,
Lufton, Yeovil,
Somerset, BA22 8RN, ENGLAND

The warranty will be null and void if repair is attempted without authorization by a member of the MOORE PRODUCTS CO. Service Department.
## Parts List

**Model 363 Viewpac™ Multi-Point Digital Recorder**

**Drawing No. 363PL**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>PART NUMBER</th>
<th>DESCRIPTION</th>
<th>QUANTITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>15999-262</td>
<td>Display Assembly, complete</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>15999-263</td>
<td>Backlight Lamp Assembly, not shown</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>15999-258</td>
<td>MPU Board (256k RAM supplied)</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>14743-2</td>
<td>RAM Back-Up Battery (3.6V) with Connector</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>15999-260</td>
<td>120/240 Vdc Power Supply Board</td>
<td>1</td>
</tr>
<tr>
<td>6*</td>
<td>7447-209</td>
<td>Fuse, 1 Ampere, for 120/240 Vdc Power Supply Board</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>15999-261</td>
<td>24 Vac/24 Vdc Power Supply Board</td>
<td>1</td>
</tr>
<tr>
<td>8*</td>
<td>7447-214</td>
<td>Fuse, 5 Ampere, for 24 Vac/24 Vdc Power Supply Board</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>15999-212</td>
<td>Digital I/O #1 Board Kit</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>15999-250</td>
<td>Digital I/O #2 Board Kit</td>
<td>1</td>
</tr>
<tr>
<td>11</td>
<td>15999-210</td>
<td>Universal Input Board Kit</td>
<td>1</td>
</tr>
<tr>
<td>12</td>
<td>15999-259</td>
<td>Local Instrument Link Board Kit</td>
<td>1</td>
</tr>
<tr>
<td>13</td>
<td>---</td>
<td>Case; see list for supply voltage and number of terminals</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>15999-230</td>
<td>120/240 Vac, 39 Terminal</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>15999-231</td>
<td>24 Vac/24 Vdc, 39 Terminal</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>15999-232</td>
<td>120/240 Vac, 15 Terminal</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>15999-233</td>
<td>24 Vac/24 Vdc, 15 Terminal</td>
<td>1</td>
</tr>
<tr>
<td>14</td>
<td>15999-112</td>
<td>MPU Board Software Update Kit</td>
<td>1</td>
</tr>
<tr>
<td>15</td>
<td>15999-235</td>
<td>256K RAM Kit</td>
<td>1</td>
</tr>
</tbody>
</table>

**Notes:**
- Refer to Model 363 Installation And Service Instruction SD363-1 before servicing a Recorder.
- See drawing on next page for Recorder disassembly and item number reference.
- An * identifies a recommended on-hand spare part. Always specify: model number, serial number, software level, and other nameplate information when ordering.
INSTRUCTION ADDENDUM

MODEL 363 MULTI-POINT DIGITAL RECORDER
DECLARATION OF CONFORMITY

INVOLVED MANUAL

SD363, Model 363 Multi-Point Digital Recorder Installation And Service Instruction, Issue 2, October 1995 and Issue 3, November 1996; this addendum supersedes SDA363-1-4, Issue 1, January 1996

DISCUSSION

As shown in the table below, the information in each affected section is amended by the statement in the right column.

<table>
<thead>
<tr>
<th>AFFECTED SECTION(S) IN SD</th>
<th>STATEMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.3 MODEL DESIGNATION</td>
<td>Compliant stations will contain an ‘E’ in the Electrical Classification portion of the model designation.</td>
</tr>
<tr>
<td>1.4.4 Electrical Classification</td>
<td>CSA/FM electrical classification approval as non-incentive for Division 2 service applies to installations in North America and where recognized. Check local approval requirements.</td>
</tr>
<tr>
<td>1.4.5 CSA Hazardous Locations Precautions</td>
<td>The next page contains a Declaration of Conformance with the standards or other normative documents stated on the certificate. Environmental Conditions, Per IEC 664: Installation Category II Pollution Degree 2</td>
</tr>
<tr>
<td>1.4 SPECIFICATIONS</td>
<td>Use of the equipment in a manner not specified by the manufacturer may impair the protection provided by the equipment.</td>
</tr>
<tr>
<td>2.0 INSTALLATION</td>
<td>Route electrical power to the station through a clearly labeled circuit breaker or on-off switch that is located near the station and is accessible by the operator. The breaker or switch should be located in a non-explosive atmosphere unless suitable for use in an explosive atmosphere. Local Instrument Link twinaxial cable must be shielded.</td>
</tr>
</tbody>
</table>

MOORE PRODUCTS CO., Spring House, PA 19477-0900
An ISO 9001 registered company.
DECLARATION OF CONFORMITY
according to EN 45014

Moore Products Co.
Sumneytown Pike
Spring House, PA 19477

declares under its sole responsibility that the product:

Model 363xxxxxxxxE Multi-Point Digital Recorder,

to which this declaration relates is in conformity with the following standards or other normative documents listed below,

EN 61010-1, Safety Requirements for electrical equipment for measurement, control and laboratory use
EN 50081-2, Electromagnetic compatibility: Generic emission standard Industrial environment
EN 50082-1, Electromagnetic compatibility: Generic immunity standard, Residential, commercial, and light industrial environment
EN 50082-2, Electromagnetic compatibility: Generic immunity standard Industrial environment

following the provisions of the:

Manufactured in Spring House, PA, U. S. A.

Dated: 12/31/96

Peter F. Schiano
Director of Operations
Measurement and Control Division