MYCRO 385

LOOP OPERATOR'S STATION
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>SECTION</th>
<th>TITLE</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>INTRODUCTION</td>
<td>1-1</td>
</tr>
<tr>
<td>1.1</td>
<td>PRODUCT DESCRIPTION</td>
<td>1-1</td>
</tr>
<tr>
<td>1.2</td>
<td>MODEL DESIGNATION</td>
<td>1-2</td>
</tr>
<tr>
<td>1.2.1</td>
<td>ACCESSORIES</td>
<td>1-4</td>
</tr>
<tr>
<td>1.3</td>
<td>SPECIFICATIONS</td>
<td>1-4</td>
</tr>
<tr>
<td>1.3.1</td>
<td>MECHANICAL</td>
<td>1-4</td>
</tr>
<tr>
<td>1.3.2</td>
<td>ELECTRICAL</td>
<td>1-6</td>
</tr>
<tr>
<td>1.3.2.1</td>
<td>Power Requirements</td>
<td>1-6</td>
</tr>
<tr>
<td>1.3.2.2</td>
<td>2-Wire Transmitter And Digital Logic Power</td>
<td>1-6</td>
</tr>
<tr>
<td>1.3.2.3</td>
<td>Input/Output Ports</td>
<td>1-7</td>
</tr>
<tr>
<td>1.3.3</td>
<td>ENVIRONMENTAL</td>
<td>1-8</td>
</tr>
<tr>
<td>1.3.4</td>
<td>HAZARDOUS AREA CLASSIFICATION</td>
<td>1-8</td>
</tr>
<tr>
<td>2.0</td>
<td>INSTALLATION</td>
<td>2-1</td>
</tr>
<tr>
<td>2.1</td>
<td>INSTALLATION CONSIDERATIONS</td>
<td>2-1</td>
</tr>
<tr>
<td>2.2</td>
<td>ENVIRONMENTAL CONSIDERATIONS</td>
<td>2-1</td>
</tr>
<tr>
<td>2.3</td>
<td>MECHANICAL INSTALLATION</td>
<td>2-4</td>
</tr>
<tr>
<td>2.3.1</td>
<td>PANEL AND RACK GUIDELINES</td>
<td>2-4</td>
</tr>
<tr>
<td>2.3.2</td>
<td>STATION MOUNTING</td>
<td>2-5</td>
</tr>
<tr>
<td>2.3.2.1</td>
<td>Single Station Mounting</td>
<td>2-5</td>
</tr>
<tr>
<td>2.3.2.2</td>
<td>Multiple Station Row Mounting</td>
<td>2-5</td>
</tr>
<tr>
<td>2.4</td>
<td>ELECTRICAL INSTALLATION</td>
<td>2-6</td>
</tr>
<tr>
<td>2.4.1</td>
<td>WIRING GUIDELINES</td>
<td>2-6</td>
</tr>
<tr>
<td>2.4.2</td>
<td>REAR TERMINAL CONNECTIONS</td>
<td>2-8</td>
</tr>
<tr>
<td>2.4.2.1</td>
<td>Power Connections</td>
<td>2-8</td>
</tr>
<tr>
<td>2.4.2.2</td>
<td>Signal Inputs And Outputs</td>
<td>2-10</td>
</tr>
<tr>
<td>2.5</td>
<td>CIRCUIT BOARD INSTALLATION</td>
<td>2-15</td>
</tr>
<tr>
<td>2.5.1</td>
<td>CIRCUIT BOARD HANDLING GUIDELINES</td>
<td>2-15</td>
</tr>
<tr>
<td>2.5.2</td>
<td>MPU BASEBOARD AND DISPLAY ASSEMBLY</td>
<td>2-15</td>
</tr>
<tr>
<td>2.5.3</td>
<td>SMART TRANSMITTER INTERFACE BOARD</td>
<td>2-17</td>
</tr>
<tr>
<td>2.5.4</td>
<td>LINK INTERFACE BOARD</td>
<td>2-18</td>
</tr>
<tr>
<td>2.5.4.1</td>
<td>Setting Link Address</td>
<td>2-20</td>
</tr>
<tr>
<td>2.6</td>
<td>FACTORY CALIBRATION</td>
<td>2-22</td>
</tr>
<tr>
<td>2.7</td>
<td>CONFIGURATION</td>
<td>2-22</td>
</tr>
<tr>
<td>3.0</td>
<td>OPERATION</td>
<td>3-1</td>
</tr>
<tr>
<td>3.1</td>
<td>5 DIGIT DISPLAY</td>
<td>3-1</td>
</tr>
<tr>
<td>3.2</td>
<td>ALPHANUMERIC DISPLAY</td>
<td>3-2</td>
</tr>
<tr>
<td>3.3</td>
<td>BARGRAPH DISPLAYS</td>
<td>3-2</td>
</tr>
<tr>
<td>3.4</td>
<td>PULSER KNOB</td>
<td>3-4</td>
</tr>
<tr>
<td>3.5</td>
<td>OPERATING MODES</td>
<td>3-4</td>
</tr>
<tr>
<td>3.6</td>
<td>DISPLAY TEST</td>
<td>3-5</td>
</tr>
<tr>
<td>3.7</td>
<td>PUSHBUTTON CARE</td>
<td>3-5</td>
</tr>
<tr>
<td>4.0</td>
<td>CALIBRATION</td>
<td>4-1</td>
</tr>
<tr>
<td>4.1</td>
<td>CONSIDERATIONS</td>
<td>4-1</td>
</tr>
<tr>
<td>4.2</td>
<td>REQUIRED EQUIPMENT</td>
<td>4-2</td>
</tr>
<tr>
<td>4.3</td>
<td>LOCKOUT SWITCHES</td>
<td>4-2</td>
</tr>
<tr>
<td>4.4</td>
<td>ANALOG INPUTS AND OUTPUTS (FB01, FB02, FB03)</td>
<td>4-3</td>
</tr>
<tr>
<td>4.5</td>
<td>LOOP INPUTS (FB11 TO FB20)</td>
<td>4-6</td>
</tr>
</tbody>
</table>
FIGURE

3-1  Operator Controls and Signal Displays ...................................... 3-3
5-1  LOS Hardware Architecture (Model 3B5H) ................................. 5-2
5-2  MPU Baseboard, Hardware Block Diagram ................................. 5-3
5-3  MPU Baseboard, Physical Layout ........................................... 5-5
5-4  Smart Transmitter Interface Board Block Diagram ..................... 5-7
5-5  Smart Transmitter Interface Board, Physical Layout ................. 5-9
5-6  Display Assembly, Hardware Block Diagram ............................. 5-10
5-7  Pulse Train Phase Relationship ............................................ 5-11
5-8  Link Interface Board, Hardware Block Diagram ....................... 5-14
5-9  Link Interface Board, Physical Layout .................................. 5-15

LIST OF TABLES

TABLE

1.1  LOS Function Blocks ....................................................... 1-4
1.2  Model Designation ......................................................... 1-5
1.3  Accessories for the LOS ................................................ 1-6
2.1  Rear Terminal Assignments A ............................................ 2-10
2.2  Rear Terminal Assignments B ............................................ 2-11
4.1  Analog I/O Calibration Parameters ..................................... 4-5
4.2  Loop Input Calibration Parameters .................................... 4-7
6.1  Troubleshooting Guide .................................................... 6-4
6.2  Factory Configured Options (FCOs) .................................... 6-4
6.3  Power-Up Error Codes .................................................... 6-6
6.4  On-Line Error Codes ....................................................... 6-7
6.5  E110 Through E124 - Power-Up Error Codes ............................ 6-8
6.6  E213 - Power-Up Database Error Codes ................................ 6-8
6.7  E214 Through E217 - Power-Up Database CRC Error Codes .......... 6-9
6.8  E1 Through E7 - On-Line Error Codes ................................ 6-10
6.9  MPU Baseboard Connectors .............................................. 6-14

TRADEMARK ACKNOWLEDGEMENT

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1.0 INTRODUCTION

This Installation And Service Instruction for the MYCRO™ Model Series 385 Loop Operator’s Station (LOS) is divided into six sections as follows:

Section 1, INTRODUCTION, gives general information pertaining to product description, model designation, and specifications.

Section 2, INSTALLATION, provides general installation considerations, mounting and wiring guidelines, and specific mounting procedures.

Section 3, OPERATION, defines the controls, signal displays, and operating modes.

Section 4, CALIBRATION, provides field calibration procedures for analog inputs and outputs.

Section 5, CIRCUIT DESCRIPTION, supplies general circuit descriptions of the MPU Baseboard, the Smart Transmitter Interface Board, the Display Assembly, and the Link Interface Board.

Section 6, MAINTENANCE, furnishes preventive maintenance guidelines, troubleshooting, and subassembly replacement procedures. A Parts List is at the end of this section.

Configuration procedures are given in the MYCRO 385 Configuration Guide CG385-2.

IMPORTANT

Save this Instruction and make it available for installation and maintenance of the Operator Station.

1.1 PRODUCT DESCRIPTION

The MYCRO 385 Loop Operator’s Station (LOS) is a microprocessor-based, self-contained, stand alone industrial operator station. Its design provides for user configuration of the desired station type and control strategy via software interconnection of function blocks.

The LOS is available in two versions: the Model 385B (basic version) and the Model 385H, equipped with the Smart Transmitter Interface. The basic Model 385B LOS is a data display station. It accepts data from transmitters or other stations connected via the optional Link Interface Board to a Local Instrument Link control system.
The Model 385H LOS, in addition to functioning as a data display station, is also capable of interacting with Mycro XTC™ Transmitter-Controllers and Transmitters located in remote areas. It displays and provides access to all loop data, including the auto/manual status, alarms, and tuning parameters, as well as transmitter parameters such as range and damping.

The Model 385H LOS can display the process, setpoint, and valve in bargraph form for any one of the up to ten XTC loops. The desired loop is selected by pressing the LOOP pushbutton. Other pushbuttons on the faceplate and the configuration keypad are used to make operating changes to the selected loop.

A Link Interface Board option provides communication with other stations over the Local Instrument Link and, with the addition of a Model 321 Expansion Satellite, the Hi-Level Link.

The Loop Operator's Station is shown in Figure 1-1. Front Panel dimensions conform to DIN standards. The Display Assembly contains the controls, mode switches, and signal displays required for local operation and configuration. Hardware and software for a basic Operator's Station and extra connectors for options and expansion are located on the MPU Baseboard. All user electrical connections are made to terminals on the rear of the case.

Station configuration is performed by the user and consists of interconnecting user selected function blocks (FBs) and entering the various required parameters to build the needed station configuration. A list of available function blocks is given in Table 1.1. The station's configuration is stored in a nonvolatile memory to prevent loss of data should an electrical power interruption occur. Factory Configured Options (FCOs) may be used to speed up the configuration procedure (see Configuration Guide CG385-2).

The keyboard, displays, and controls for configuration are located on the front of the LOS Display Assembly. A link interface equipped LOS may be configured from the front panel or from a personal computer via an Instrument Link Interface.

Refer to the LOS Configuration Guide for specific details and procedures.

1.2 MODEL DESIGNATION

A nameplate is located on the MPU Baseboard. The nameplate shows the complete model number, bill of material number, and hazardous area certifications. Refer to Table 1.2 to interpret the model number.

IMPORTANT

Before installing, applying power, or servicing the station, check the model designation.
FIGURE 1-1 Loop Operator's Station
TABLE 1.1 LOS Function Blocks

<table>
<thead>
<tr>
<th>FB</th>
<th>Description</th>
<th>FB</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Analog Input #1</td>
<td>31</td>
<td>Digital Output #3</td>
</tr>
<tr>
<td>02</td>
<td>Analog Input #2</td>
<td>32</td>
<td>Digital Output #4</td>
</tr>
<tr>
<td>03</td>
<td>Analog Output</td>
<td>33</td>
<td>Digital Output #5</td>
</tr>
<tr>
<td>04</td>
<td>Digital Output #1</td>
<td>34</td>
<td>Digital Output #6</td>
</tr>
<tr>
<td>05</td>
<td>Digital Output #2</td>
<td>35</td>
<td>Math Block #1</td>
</tr>
<tr>
<td>06</td>
<td>Digital Input</td>
<td>36</td>
<td>Math Block #2</td>
</tr>
<tr>
<td>11</td>
<td>Display &amp; Alarm #1</td>
<td>37</td>
<td>Math Block #3</td>
</tr>
<tr>
<td>12</td>
<td>Display &amp; Alarm #2</td>
<td>40</td>
<td>Quad Logic Block #1</td>
</tr>
<tr>
<td>13</td>
<td>Display &amp; Alarm #3</td>
<td>41</td>
<td>Quad Logic Block #2</td>
</tr>
<tr>
<td>14</td>
<td>Display &amp; Alarm #4</td>
<td>42</td>
<td>Quad Logic Block #3</td>
</tr>
<tr>
<td>15</td>
<td>Display &amp; Alarm #5</td>
<td>45</td>
<td>Quad Flip/Flop #1</td>
</tr>
<tr>
<td>16</td>
<td>Display &amp; Alarm #6</td>
<td>46</td>
<td>Quad Flip/Flop #2</td>
</tr>
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<td>17</td>
<td>Display &amp; Alarm #7</td>
<td>47</td>
<td>Quad Flip/Flop #3</td>
</tr>
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<td>18</td>
<td>Display &amp; Alarm #8</td>
<td>51</td>
<td>10-Segment Characterizer #1</td>
</tr>
<tr>
<td>19</td>
<td>Display &amp; Alarm #9</td>
<td>52</td>
<td>10-Segment Characterizer #2</td>
</tr>
<tr>
<td>20</td>
<td>Display &amp; Alarm #10</td>
<td>53</td>
<td>10-Segment Characterizer #3</td>
</tr>
<tr>
<td>24</td>
<td>Square Root Extractor #1</td>
<td>54</td>
<td>General Purpose Transfer #1</td>
</tr>
<tr>
<td>25</td>
<td>Square Root Extractor #2</td>
<td>55</td>
<td>General Purpose Transfer #2</td>
</tr>
<tr>
<td>26</td>
<td>Square Root Extractor #3</td>
<td>56</td>
<td>General Purpose Transfer #3</td>
</tr>
<tr>
<td>30</td>
<td>Station Control/S Display</td>
<td>98</td>
<td>Local Instr. Link Interface</td>
</tr>
</tbody>
</table>

1.2.1 ACCESSORIES

Table 1.3 lists some accessories that are available for use with the MYCRO 385 Loop Operator’s Station.

1.3 SPECIFICATIONS

1.3.1 MECHANICAL

DIMENSIONS
- Panel Cutout: See Figure 2-1
- LOS: See Figure 2-2
- Front: German standard-Deutsch Industrie Normen - DIN 43831 - 72mm W X 144mm H

MOUNTING: Single station or row mounting

NET WEIGHT
- Model 385B_11N1AN: 7 lbs. (3.2 Kg)
- Model 385H_21N1AN: 9 lbs. (4.1 Kg)

March 1993
### TABLE 1.2 Model Designation

<table>
<thead>
<tr>
<th>SAMPLE MODEL NUMBER</th>
<th>385</th>
</tr>
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<tbody>
<tr>
<td>MODEL SERIES</td>
<td></td>
</tr>
<tr>
<td>TYPE</td>
<td></td>
</tr>
<tr>
<td>B - Basic</td>
<td></td>
</tr>
<tr>
<td>H - With Smart Transmitter Interface</td>
<td></td>
</tr>
<tr>
<td>POWER REQUIREMENT</td>
<td></td>
</tr>
<tr>
<td>A - 120/240 Vac</td>
<td></td>
</tr>
<tr>
<td>B - 24 Vac</td>
<td></td>
</tr>
<tr>
<td>C - 24 Vdc</td>
<td></td>
</tr>
<tr>
<td>MOUNTING CASE</td>
<td></td>
</tr>
<tr>
<td>1 - Standard 20 Screw Terminals</td>
<td></td>
</tr>
<tr>
<td>2 - Standard 40 Screw Terminals (Required with Model 385H)</td>
<td></td>
</tr>
<tr>
<td>N - Not Required</td>
<td></td>
</tr>
<tr>
<td>OPERATOR’S PANEL</td>
<td></td>
</tr>
<tr>
<td>1 - Digital Display (Standard)</td>
<td></td>
</tr>
<tr>
<td>N - Not Required (Includes Blank Panel)</td>
<td></td>
</tr>
<tr>
<td>D - Delete - Panel not included (furnished only with Mounting Case option N)</td>
<td></td>
</tr>
<tr>
<td>RESERVED FOR FACTORY USE</td>
<td></td>
</tr>
<tr>
<td>N - Not Applicable</td>
<td></td>
</tr>
<tr>
<td>DATA COMMUNICATIONS OPTION</td>
<td></td>
</tr>
<tr>
<td>1 - Local Instrument Link (RS-422, Half Duplex)</td>
<td></td>
</tr>
<tr>
<td>N - Not Required</td>
<td></td>
</tr>
<tr>
<td>DESIGN LEVEL</td>
<td></td>
</tr>
<tr>
<td>A - Current Design</td>
<td></td>
</tr>
<tr>
<td>HAZARDOUS AREA CLASSIFICATION (See Note)</td>
<td></td>
</tr>
<tr>
<td>N - Not Required</td>
<td></td>
</tr>
<tr>
<td>F - FM approved</td>
<td></td>
</tr>
<tr>
<td>C - CSA certified</td>
<td></td>
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**NOTE**

Hazardous area certifications pending. Contact Moore Products Co. for latest certifications.

March 1993
TABLE 1.3 Accessories for the LOS

<table>
<thead>
<tr>
<th>PRODUCT</th>
<th>PART NO.</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configuration Software</td>
<td>15939-47</td>
<td>IBM® personal computer based package to configure an LOS through a Model 320 ICI* or a MYCRO 3932 (ICI-2.5); requires Link Interface Board.</td>
</tr>
<tr>
<td>Transmitter Power Supply</td>
<td>15124-1</td>
<td>Acopian Model B24G210M 24 Vdc, 2A power supply.</td>
</tr>
<tr>
<td>Adapter Bezel</td>
<td>15738-123</td>
<td>Adapter for mounting an LOS in a 3&quot; x 6&quot; panel cutout.</td>
</tr>
<tr>
<td>Blank Filler Panel</td>
<td>15738-168</td>
<td>Used to cover an LOS panel cutout or an empty case.</td>
</tr>
<tr>
<td>Rear Terminal Enclosure Kit</td>
<td>15738-179</td>
<td>Used to enclose the rear terminals on LOS case.</td>
</tr>
<tr>
<td>Coded Loop Identification Card</td>
<td>- - - - -</td>
<td>Custom printed card for flip down door. Max. of 5 lines and up to 24 characters per line.</td>
</tr>
<tr>
<td>Permanent Instrument Tag</td>
<td>- - - -</td>
<td>Stainless steel tag permanently attached to LOS case. Max. of 1 line with 26 characters max.</td>
</tr>
</tbody>
</table>

* ICI - Independent Computer Interface

1.3.2 ELECTRICAL

1.3.2.1 Power Requirements

Model 385 A .......................... 120/240 Vac (85 to 264 Vac) 47 to 63 Hz
Model 385 B .......................... 24 Vac (+10%, -15%) 47 to 63 Hz
Model 385 C .......................... 24 Vdc (+20%, -15%)

Typical Power Consumption ............ 25 Watts, 45 VA

1.3.2.2 2-Wire Transmitter And Digital Logic Power

Voltage .................................. +26 Vdc +/-7.5%
Current .................................. 80 mA at 26 Vdc (maximum)

March 1993
### 1.3.2.3 Input/Output Ports

#### ANALOG INPUTS
- **Input Channels**: 2 (Models 385B & 385H)
- **Input Range**: 0 to 5 Vdc
- **Standard Calibration**: 1 to 5 Vdc
- **Zero**: 0 to 1 Vdc
- **Span**: 4 to 5 Vdc
- **Input Type**: Single-ended
- **Normal Mode Rejection**: 6 dB @ 2 Hz, 60 dB @ 60 Hz (2-pole filter with breakpoint frequency @ 2 Hz)
- **Digital Filter Range**: 0.001 to 10 Hz (breakpoint frequency)
- **Input Impedance**: Greater than 1 Megohm
- **Calibration Accuracy**: +/-0.05% of span
- **A/D Resolution**: 12 bits
- **A/D Linearity**: +/-1 LSB
- **Maximum Continuous Input**: +/-30 Vdc
- **Ambient Temperature Effect**: Less than +/-0.5% of span for a 100°F ambient temperature change

#### DIGITAL INPUT
- **Input Channels**: 1 (Models 385B & 385H)
- **Input Type**: Opto-coupler
- **Logic "1" Range**: 15 to 30 Vdc
- **Logic "0" Range**: 0 to 1 Vdc
- **Overvoltage**: +/-30 Vdc
- **Current Draw at 24 Vdc**: 10 mA maximum
- **Isolation**: 100 Vdc
- **Minimum "On Time"**: 500 msec
- **Minimum "Off Time"**: 500 msec

#### ANALOG OUTPUT
- **Output Channels**: 1 (Models 385B & 385H)
- **Standard Calibration**: 4 to 20 mA dc
- **Zero**: 4 mA dc +/- trim
- **Span**: 16 mA dc +/- trim
- **Signal Reference**: Negative (-) output terminal is station common
- **Accuracy**: +/-0.1% of span
- **Current Limit**: 20.5 mA, +/-0.1 mA
- **Output Load**: 0-800 Ohms
- **Ambient Temperature Effect**: Less than +/-0.5% of span for a 100°F temperature change

#### DIGITAL OUTPUTS
- **Output Channels**: 2 (Model 385B) 6 (Model 385H)
- **Output Type**: NPN open collector transistor (emitter tied to station common)
- **Load Voltage**: 30 Vdc maximum
- **Load Current**: 100 mA maximum
- **Transistor "ON" Voltage**: 0.3V @ 0 mA load
  0.6V @ 100 mA load

*March 1993*
INTRODUCTION

LOOP INPUTS
Loop Input Channels .............. 10 (Model 385H)
Analog Input Range .............. 0 to 5 Vdc
Standard Calibration .......... 1 to 5 Vdc
Zero ......................... 0 to 1 Vdc
Span .......................... 4 to 5 Vdc
Input Type ..................... Single-ended (non-isolated)
Normal Mode Rejection ......... 6 dB @ 2 Hz, 60 dB @ 60 Hz
Input Impedance ............... Greater than 1 Megohm
Maximum Continuous Input ...... +/-30 Vdc
Accuracy ...................... 0.05 % of span
Update Rate ................... 100 msec
Digital Communication Protocol HART
Communication Topology .......... Point-to-Point only
Ambient Temperature Effect .... Less than +/-0.5% of span for a 100°F ambient temperature change

1.3.3 ENVIRONMENTAL

IEC Location Classification .... B (IEC 654-1)
Operating Temperature Limits .... 0°C to +50°C (+32°F to +122°F); see section 2.2 for forced air ventilation statement
Operating Humidity and Maximum Moisture Content .............. 5 to 95% RH; 0.028 pounds water/pound dry air
Transportation and Storage Temperature Limits .............. -40°C to +85°C (-40°F to +185°F)
Transportation and Storage Humidity Limits .............. 0 to 100% RH, Non-Condensing

1.3.4 HAZARDOUS AREA CLASSIFICATION (See Note)

FM approved, Class I, Division 2, Groups A, B, C, & D
CSA certified, Class I, Division 2, Groups A, B, C, & D

IMPORTANT

Certifications pending. Before installing, applying power to, or servicing a station, see the station’s nameplate and Table 1.2 for electrical classification.

March 1993
2.0 INSTALLATION

This section provides general information such as installation considerations and mounting and wiring guidelines. It also provides specific information on the Loop Operator's Station (LOS) mounting and electrical connections.

2.1 INSTALLATION CONSIDERATIONS

The LOS is intended for flush panel mounting in a vibration-free instrument panel or rack. Install the LOS in an indoor or sheltered location, either mounted singly or row mounted in a single panel cutout. Panel cutout dimensions are shown in Figure 2-1; Station dimensions are shown in Figure 2-2.

Do not mount the LOS where direct sunlight can strike the Display Assembly or case. Direct sunlight can make the displays difficult to read and will interfere with heat dissipation.

The LOS should be mounted either horizontally or with a backward tilt (i.e., the front of the case higher than the rear). If it is to be mounted with electronic recorders, pneumatic recorders, or pneumatic stations, tilt back restrictions for these units may have a bearing on panel design or layout.

An LOS is usually shipped with the circuit board cluster installed in the case and a Display Assembly attached to the front of the case. In some instances, the case is shipped separately and the cluster and Display Assembly are cartoned together for installation by the user.

2.2 ENVIRONMENTAL CONSIDERATIONS

See section 1.3.3 for LOS operating temperature limits and operating humidity and maximum moisture content. The air surrounding any operating LOS must be kept below 50°C (122°F). The temperature of the air should be checked to ensure that this specification is not being exceeded.

CAUTION

Exceeding specified operating temperature limits can adversely affect performance and may cause damage.

Forced air ventilation is recommended when LOSs are mounted in a partially or completely enclosed panel or cabinet (e.g., NEMA1); see Figure 2-3. When clean air is present, exhaust fans are often mounted across the top of a panel and louvers formed in the panel bottom. Air is drawn upward between the station cases. When air contains particulate matter, fans and filters are often located at the panel bottom and louvers at the top. Filtered air is now forced upward between the station cases. Filters must be serviced periodically.
FIGURE 2-1 Panel Cutout Dimensions

NOTE: 15" (381MM) MINIMUM FRONT OF PANEL CLEARANCE REQUIRED FOR BOARD ASSEMBLY REMOVAL

NOTE: ALTERNATE CUTOUT DOES NOT ALLOW FOR POSSIBLE FUTURE SUBSTITUTION OF 2 MODEL 351 OR SIMILAR STATIONS DUE TO WIDTH LIMITATIONS.

FIGURE 2-2 Station Dimensions
GUIDELINES

FAN: PAMOTOR TYPE 4600X SHADED POLE FAN WITH 5504 FINGER GUARD OR EQUIVALENT.

NO. OF FANS: ONE FOR EACH 16 STATIONS OR 3 FT. (0.9 METERS) OF PANEL WIDTH.

AIR INLET: 30 IN² FOR EACH FAN. IF FILTERS ARE USED, THEY MUST BE CHANGED PERIODICALLY (INCREASE INLET TO 50 IN²).

PA-2389-1

FIGURE 2-3 Forced Air Ventilation for Enclosed Panels
INSTALLATION

Only high quality, quiet running fans should be used. Also, the fans should not generate electrical noise which could interfere with electronic instruments.

A sealed cabinet (e.g., NEMA12) containing equipment that does not generate significant heat should contain a recirculating fan for forcing air flow around equipment and throughout the cabinet preventing hot spots from developing.

Forced air conditioning may be needed in panels and cabinets with high equipment density or significant heat generating capability. Periodically change or clean air filters.

Industrial environments often contain particulate, liquid, and gaseous contaminants. Particulate matter, usually dust and dirt, is abrasive and can cause intermittent connections. A layer of dust on circuit boards can interfere with semiconductor heat dissipation. Liquid and gaseous contaminants can have a corrosive effect on metal, rubber, plastic and circuit board components. Extended exposure to these contaminants may result in malfunctions.

To reduce contaminant related equipment malfunctions:

1. Identify contaminants and implement methods to reduce their presence.

2. 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 recirculates dust and dirt.

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

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

2.3 MECHANICAL INSTALLATION

The following sections provide guidelines and procedures for mounting LOSs in a panel or rack. The installation should be structurally rigid and the stations should be squared in the panel or rack.

2.3.1 PANEL AND RACK GUIDELINES

The panel face should provide a flat and rigid mounting surface. Stiffeners should be welded to the back of the panel if there is a possibility that the panel face will bow. Rear support is recommended where panel cutout density is high, and where panel face distortion may occur. Rear supports can be square stock, angle iron, metal channel, etc. The panel cutout should be square and level, especially the bottom edge. Uneven cutting of the bottom edge can cause the station case(s) to tilt and detract from front panel appearance.

March 1993
Industrial Module Racks (IMRs) can be used to mount up to six stations (19" wide) or seven stations (24" wide) without cases. An IMR accepts circuit board clusters and can be mounted either within or outside an enclosure. Screw terminals like those on the standard case are located at the rear of the IMR for electrical connections. Alternatively, the installer can fabricate a rack to support stations mounted in cases.

Raceways, conduit, and wiring should not interfere with the removal or accessibility of the instruments, control devices, alarms, and related equipment.

2.3.2 STATION MOUNTING

This section provides procedures for single station mounting and multiple station row mounting of the LOS.

2.3.2.1 SINGLE STATION MOUNTING

Single station mounting consists of mounting one LOS in a single panel cutout.

1. Loosen and remove mounting brackets. See Figure 2-2.
2. Insert LOS into panel cutout.
3. Install and partially tighten mounting brackets.
4. Square LOS with panel.
5. Square mounting brackets with panel.
6. Alternately tighten mounting brackets until LOS is secured to panel. Do not over tighten.

2.3.2.2 MULTIPLE STATION ROW MOUNTING

Multiple station row mounting consists of grouping a number of LOSs side by side within a single panel cutout.

1. Loosen and remove mounting brackets from all LOSs. See Figure 2-2.
2. Insert an end of row LOS into panel cutout; install and partially tighten mounting brackets.
3. Insert remaining LOSs into panel cutout; install and partially tighten mounting brackets.
4. Square and space the LOSs in cutout.
5. Alternately tighten mounting brackets on each LOS until all are secured to panel. Do not over tighten.

March 1993
2.4 ELECTRICAL INSTALLATION

The following sections describe wiring guidelines that should be followed when wiring an LOS installation and define the purpose of each station rear terminal.

WARNING

Remove power from all involved wires and terminals to eliminate electrical shock hazard.

2.4.1 WIRING GUIDELINES

All wiring must conform to the National Electrical Code and 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. Carefully select the wire size, conductor material, and insulation. Some 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 the 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 at a screw terminal and tighten the screw. When preparing wires and making connections, refer to Figure 2-4 and the following:

- Stranded Conductor: Strip wire end 1/4" to 5/16" or as recommended by the crimp-on terminal manufacturer

- Solid Conductor: Strip wire 3/8" to 7/16" and form a gradual bend that will hook behind the terminal screw.

- Do not nick conductor or cut away conductor strands when stripping insulation

- Crimp-on terminals must have insulated barrels; use a high quality crimping tool recommended by the terminal manufacturer
- Carefully inspect the crimped connection for mechanical strength and stray strands of wire that could short to an adjacent screw terminal; conductor should not be visible outside the crimp-on terminal body.

- Insert the stripped wire end or crimp-on terminal under the pressure plate and tighten the terminal screw for a reliable electrical connection. If a crimp-on terminal is not used, wire insulation should butt against the pressure plate and the conductor should not be visible; it is not necessary to wrap wire conductor around terminal screw.

- Inspect each connection completed for strands of wire that could short to an adjacent terminal, for connection to the correct terminal, and for tightness of the terminal screw. Pay particular attention to the braided shield on twinaxial cable for the Local Instrument Link.

---

**FIGURE 2-4 Conductor Installation on Rear Terminals**

March 1993
2.4.2 REAR TERMINAL CONNECTIONS

All electrical connections are made to the terminals located at the rear of the LOS case. Rear terminals are designated by a column letter and a row number (e.g., A1, D8); see Figure 2-5 and Tables 2.1 and 2.2. Recommended wire size for signal wiring is 18 gauge (AWG); power wiring, 14 gauge (AWG).

WARNING

Remove power from all involved wires and terminals to eliminate electrical shock hazard.

Rear terminals have #6 screws and pressure plates. They accept stranded wire, solid wire, and spring spade tongue or ring tongue crimp-on terminals with insulated barrels. See Figure 2-4. For an electrical connection to be made, a terminal screw must be tightened, clamping the wire or crimp-on connector between the pressure plate and spring plate on the terminal strip body to insure a good electrical contact.

Station common is at rear terminal A5. It should be connected to the user’s instrument bus common. Within the LOS, station common is connected to:

- A common reference point which in turn is connected to the two-wire power supply common
- Digital output common
- All analog input and analog output commons

Station common is isolated from case ground, terminal AG. Digital input commons are isolated from the station common and case ground.

Analog inputs must be voltage inputs. When a current input (e.g., 4 to 20 mA) is to be applied to the LOS, a precision range resistor must be placed across the input terminals. A range resistor may not be required if the input is wired in parallel with other 1 to 5 Vdc receiving instruments. Refer to loop diagrams and determine if a range resistor is required. Supplied range resistors are 250 ohms for 4 to 20 mA inputs.

2.4.2.1 Power Connections

A. POWER INPUT CONNECTIONS

Terminal AH - AC supply (120/240 or 24 Vac) HOT or DC supply POSITIVE (+).

Terminal AN - AC supply NEUTRAL or DC supply NEGATIVE (-).

Terminal AG - SAFETY GROUND, strapped to LOS case. It is usually connected to earth ground or to the power distribution safety ground (Green wire). Power input wires should be 14 gauge (AWG) or heavier.
ASSIGNMENTS

COLUMN A
AH - AC SUPPLY HOT OR DC (+)
AN - AC NEUTRAL OR DC (-)
AG - CASE SAFETY GROUND
A6 - ANALOG INPUT 1 (+)
A5 - ANALOG INPUT COMMON (-)
A6 - ANALOG INPUT 2 (+)
A7 - ANALOG OUTPUT (+)
A8 - ANALOG OUTPUT COMMON (-)
A9 - DIGITAL OUTPUT 6 (+)
A10 - DIGITAL OUTPUT COMMON (-)

COLUMN C
C1 - LOOP INPUT 1 (+)
C2 - LOOP INPUT COMMON (-)
C3 - LOOP INPUT 2 (+)
C4 - LOOP INPUT 3 (+)
C5 - LOOP INPUT COMMON (-)
C6 - LOOP INPUT 4 (+)
C7 - LOOP INPUT 5 (+)
C8 - LOOP INPUT COMMON (-)
C9 - DIGITAL OUTPUT 4 (+)
C10 - DIGITAL OUTPUT COMMON (-)

COLUMN B
B1 - LINK (+)
B2 - LINK (-)
B3 - NO CONNECTION
B4 - DIGITAL OUTPUT 1 (+)
B5 - 26V DC 80 MA MAX SUPPLY
B6 - DIGITAL OUTPUT 2 (+)
B7 - DIGITAL OUTPUT COMMON (-)
B8 - DIGITAL INPUT (+)
B9 - DIGITAL INPUT (-)
B10 - DIGITAL OUTPUT 5 (+)

COLUMN D
D1 - LOOP INPUT 6 (+)
D2 - LOOP INPUT COMMON (-)
D3 - LOOP INPUT 7 (+)
D4 - LOOP INPUT 8 (+)
D5 - LOOP INPUT COMMON (-)
D6 - LOOP INPUT 9 (+)
D7 - LOOP INPUT 10 (+)
D8 - LOOP INPUT COMMON (-)
D9 - DIGITAL OUTPUT 3 (+)
D10 - DIGITAL OUTPUT COMMON (-)

NOTES:
1. ALL COMMON(-)'S INTERNALLY CONNECTED.
2. CASE SAFETY GROUND NOT TIED TO COMMON(-)'S.
3. DIGITAL INPUT(-) ISOLATED FROM STATION COMMON.
4. TERMINALS ACTIVE ONLY ON MODEL 355H:
   COLUMN A TERMINALS 9 AND 10,
   COLUMN B TERMINAL 10,
   COLUMN C TERMINALS 1-10,
   COLUMN D TERMINALS 1-10.
<table>
<thead>
<tr>
<th>TERMINAL</th>
<th>ASSIGNMENT</th>
<th>COMMENT/REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>AB</td>
<td>AC Hot or DC (+)</td>
<td>See Model Designation section and</td>
</tr>
<tr>
<td></td>
<td></td>
<td>station nameplate for input voltage</td>
</tr>
<tr>
<td>AN</td>
<td>AC Neutral or DC (-)</td>
<td>specification.</td>
</tr>
<tr>
<td>AG</td>
<td>Case Safety Ground</td>
<td></td>
</tr>
<tr>
<td>B5</td>
<td>+26V Transmitter Supply, 80 mA</td>
<td>See section 2.4.2.1 B</td>
</tr>
<tr>
<td></td>
<td>(max)</td>
<td></td>
</tr>
<tr>
<td>B1</td>
<td>Link (+)</td>
<td>See Figure 2-7 and SD15492 for LIL</td>
</tr>
<tr>
<td></td>
<td></td>
<td>installation details.</td>
</tr>
<tr>
<td>B2</td>
<td>Link (-)</td>
<td></td>
</tr>
<tr>
<td>B3</td>
<td>DO NOT CONNECT</td>
<td></td>
</tr>
<tr>
<td>A4</td>
<td>Analog Input 1 (+)</td>
<td>See section 2.4.2.2 A</td>
</tr>
<tr>
<td>A5</td>
<td>Analog Input Common (-)</td>
<td>Station Common</td>
</tr>
<tr>
<td>A6</td>
<td>Analog Input 2 (+)</td>
<td>See section 2.4.2.2 A</td>
</tr>
<tr>
<td>A7</td>
<td>Analog Output (+)</td>
<td>See section 2.4.2.2 B</td>
</tr>
<tr>
<td>A8</td>
<td>Analog Output Common (-)</td>
<td>Station Common</td>
</tr>
</tbody>
</table>

B. +26 VDC TRANSMITTER SUPPLY OUTPUT

Terminal B5 can be used to power up to four two-wire transmitters. An inductive load, such as the relay shown in Figure 2-6B, may cause a momentary drop in transmitter output or an unexpected reset of the Smart Transmitter.

2.4.2.2 Signal Inputs And Outputs

A. ANALOG INPUTS

Each analog input is connected between an Analog Input (+) terminal and the Analog Input Common (-) terminal A5. Note that the Analog Input Common (-) terminal A5 is internally connected to other station commons (analog output, digital output, and loop input common terminals) and should be connected to the user’s instrument bus common.

All analog inputs are factory calibrated 1 to 5 Vdc. For mA inputs, a range resistor must be connected across the analog input terminals. This precision (0.1%) resistor should be wire wound, 1/2 watt. Supplied range resistors are 250 ohms; quantity 2.
<table>
<thead>
<tr>
<th>TERMINAL</th>
<th>ASSIGNMENT</th>
<th>COMMENT/REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIGITAL I/O</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B8</td>
<td>Digital Input (+)</td>
<td>See section 2.4.2.2 C</td>
</tr>
<tr>
<td>B9</td>
<td>Digital Input (-)</td>
<td>Isolated</td>
</tr>
<tr>
<td>B4</td>
<td>Digital Output 1 (+)</td>
<td>See section 2.4.2.2 D</td>
</tr>
<tr>
<td>B6</td>
<td>Digital Output 2 (+)</td>
<td>See section 2.4.2.2 D</td>
</tr>
<tr>
<td>B7</td>
<td>Digital Output Common (-)</td>
<td>Station Common</td>
</tr>
<tr>
<td>D9</td>
<td>Digital Output 3 (+)</td>
<td>See section 2.4.2.2 D</td>
</tr>
<tr>
<td>D10</td>
<td>Digital Output Common (-)</td>
<td>Station Common</td>
</tr>
<tr>
<td>C9</td>
<td>Digital Output 4 (+)</td>
<td>See section 2.4.2.2 D</td>
</tr>
<tr>
<td>C10</td>
<td>Digital Output Common (-)</td>
<td>Station Common</td>
</tr>
<tr>
<td>B10</td>
<td>Digital Output 5 (+)</td>
<td>See section 2.4.2.2 D</td>
</tr>
<tr>
<td>A9</td>
<td>Digital Output 6 (+)</td>
<td>See section 2.4.2.2 D</td>
</tr>
<tr>
<td>A10</td>
<td>Digital Output Common (-)</td>
<td>Station Common</td>
</tr>
<tr>
<td>LOOP INPUT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C1</td>
<td>Loop Input 1 (+)</td>
<td>See section 2.4.2.2 E</td>
</tr>
<tr>
<td>C2</td>
<td>Loop Input Common (-)</td>
<td>Station Common</td>
</tr>
<tr>
<td>C3</td>
<td>Loop Input 2 (+)</td>
<td>See section 2.4.2.2 E</td>
</tr>
<tr>
<td>C4</td>
<td>Loop Input 3 (+)</td>
<td>See section 2.4.2.2 E</td>
</tr>
<tr>
<td>C5</td>
<td>Loop Input Common (-)</td>
<td>Station Common</td>
</tr>
<tr>
<td>C6</td>
<td>Loop Input 4 (+)</td>
<td>See section 2.4.2.2 E</td>
</tr>
<tr>
<td>C7</td>
<td>Loop Input 5 (+)</td>
<td>See section 2.4.2.2 E</td>
</tr>
<tr>
<td>C8</td>
<td>Loop Input Common (-)</td>
<td>Station Common</td>
</tr>
<tr>
<td>D1</td>
<td>Loop Input 6 (+)</td>
<td>See section 2.4.2.2 E</td>
</tr>
<tr>
<td>D2</td>
<td>Loop Input Common (-)</td>
<td>Station Common</td>
</tr>
<tr>
<td>D3</td>
<td>Loop Input 7 (+)</td>
<td>See section 2.4.2.2 E</td>
</tr>
<tr>
<td>D4</td>
<td>Loop Input 8 (+)</td>
<td>See section 2.4.2.2 E</td>
</tr>
<tr>
<td>D5</td>
<td>Loop Input Common (-)</td>
<td>Station Common</td>
</tr>
<tr>
<td>D6</td>
<td>Loop Input 9 (+)</td>
<td>See section 2.4.2.2 E</td>
</tr>
<tr>
<td>D7</td>
<td>Loop Input 10 (+)</td>
<td>See section 2.4.2.2 E</td>
</tr>
<tr>
<td>D8</td>
<td>Loop Input Common (-)</td>
<td>Station Common</td>
</tr>
</tbody>
</table>
A. RELAY LOAD AND USER SUPPLIED POWER SUPPLY

B. RELAY LOAD AND STATION +26V POWER SUPPLY

C. SOLID STATE LOADS (E.G., ALARM ANNUNCIATOR)

FIGURE 2-6 Digital Outputs to Typical Loads
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. A SHORT JUMPER OF 16 AWG, INSULATED WIRE GROUNDS SHIELD TO TERMINAL AG.
2. DRAIN WIRE OF SHIELD IS CUT BACK AND INSULATED.
3. \( p \) DENOTES 18 AWG TWISTED PAIR CONDUCTORS.
4. TWISTED PAIR WIRING IS USED TO INTERCONNECT STATIONS SEPARATED BY UP TO 2 FT. (0.6 M). EITHER WITHIN A ROW OR ROW-TO-ROW. TWINAXIAL CABLE IS USED FOR DISTANCES GREATER THAN 2 FT. THE MAXIMUM TWISTED PAIR LENGTH IS 10 FT (2.9 METERS).

SEE SD15492 FOR COMPLETE INFORMATION ON LOCAL INSTRUMENT LINK WIRING.

PA-2393-2
B. ANALOG OUTPUT

The analog output is connected between the Analog Output(+) terminal A7 and the Analog Output Common(-) terminal A8. Note that Analog Output Common(-) terminal A8 is internally connected to other station commons (analog input, loop input, and digital output common terminals) and should be connected to the user’s instrument bus common.

Standard analog output is factory calibrated 4 to 20 mA d.c referenced to station common.

C. DIGITAL INPUT

A digital input is connected between Digital Input(+) terminal B8 and Digital Input(-) terminal B9. Digital Input(-) terminal B9 is isolated from other station commons and from station safety ground terminal AG.

An inductive source, such as a relay coil, must be shunted by either a transient suppression diode or resistor/capacitor suppression network to prevent damage to the LOS digital input circuit. The protection required is similar to that shown in Figure 2-6 for digital outputs.

D. DIGITAL OUTPUTS

The Model 385H LOS is equipped with six digital outputs, the Model 385B has two digital outputs. Each digital output is connected between a Digital Output(+) terminal and a Digital Output Common(-) terminal. Note that each Digital Output Common(-) terminal is internally connected to other station commons (analog input, analog output, and loop input common terminals) and should be connected to the user’s instrument bus common.

Digital output circuits use open collector NPN transistors referenced to station common (see section 1.3 for specifications). The voltage source to an external load can be the +26 V d.c available at rear terminal B5 or a separate power supply. The load must limit current to 100 mA or less. An inductive load must be shunted by either a transient suppression diode or resistor/capacitor suppression network to prevent damage to an LOS output circuit. Refer to Figure 2-6.

E. LOOP INPUTS

The Model 385H LOS is equipped with ten loop inputs, the Model 385B has no loop inputs. Each loop input can accept one Mycro XTC Smart Transmitter/Controller.

Connect a Smart Transmitter/Controller between Loop Input(+) terminal and Loop Input Common(-) terminal. Note that each Loop Input Common(-) terminal is internally connected to other station commons (analog input, analog output, and digital output common terminals) and should be connected to the user’s instrument bus common. Refer to the appropriate Mycro XTC Installation And Service Instruction for detailed wiring instructions.

2-14

March 1993
Tables 2.1 and 2.2 list rear terminal designations, assignments, and comments. Input/output specifications are contained in section 1.3. Figure 2-5 shows the case rear terminals.

2.5 CIRCUIT BOARD INSTALLATION

This section describes field installation of circuit boards and the Display Assembly. Some shipments are made with the board cluster and Display Assembly separated from the case. They are installed in the case by the user. Also, the user can add circuit boards to a previously acquired station to increase its usefulness. Added boards must be software compatible with those previously installed; see section 6.7. Station calibration and configuration may be needed when circuit boards are added.

The MPU Baseboard, the Smart Transmitter Interface Board, the Link Interface Board, and the Display Assembly contain integrated circuits which can be damaged by electrostatic discharge, therefore, special handling is required. Handling guidelines and installation procedures are provided in the following sections.

2.5.1 CIRCUIT BOARD HANDLING GUIDELINES

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

2. A grounding wrist strap must be used when handling a circuit board and is highly recommended when handling the Display Assembly. The display assembly bezel is made of plastic so the Display Assembly can be installed without touching the boards inside.

Moore Products Co. part numbers for a Service Kit containing a grounding wrist strap and mat and for Static Shielding Bags are given in the Maintenance section of this Instruction.

2.5.2 MPU BASEBOARD AND DISPLAY ASSEMBLY

The following procedure describes the installation of the basic LOS model consisting of only the MPU Baseboard and the Display Assembly. A procedure to install a Smart Transmitter Interface Board is given in section 2.5.3; installation of a Link Interface Board is given in section 2.5.4. Refer to Figure 2-8 during the following steps.

1. Remove board retainer.
2. Snap grounding wrist strap around wrist and attach ground clip to case.
3. Remove MPU Baseboard from static shielding bag and insert Baseboard into card guides.

March 1993
FIGURE 2-8 Assembly Installation

COLOR | SUPPLY  
-------|--------
RED    | 120/220 VAC  
BLUE   | 24 VDC  
YELLOW | 24 VAC  

COLOR CODED EXTRACTOR TAB (SEE TABLE)

BOARD RETAINER SCREW

MPU BASEBOARD

SMART TRANSMITTER INTERFACE BOARD

GROUNDING WRIST STRAP

DISPLAY ASSEMBLY

CAPTIVE SCREW

ID PLATE

PA-2356-2
4. Check the color coded extractor tab on the MPU Baseboard (see Figure 2-8). The colors indicate the power requirements for the Assembly.

5. Push on top and bottom of Board with equal force to slide Board into case.

6. Install board retainer.

**IMPORTANT**

The board retainer must be in place whenever the MPU Baseboard is installed in the case.

7. Remove Display Assembly from static shielding bag. Handle Assembly by its bezel.

8. Connect MPU Baseboard ribbon cable to Display Assembly.

9. Detach ground clip from case.


11. Secure Assembly by tightening captive screw behind ID plate.

This completes the installation of the MPU Baseboard and the Display Assembly in a case. Calibration of the station is not necessary if the factory default settings are acceptable (see section 2.6).

**2.5.3 SMART TRANSMITTER INTERFACE BOARD**

This section covers the installation of a Smart Transmitter Interface Board in a Model 385B Station to make it a Model 385H Station. The addition of the Interface Board requires a case with a rear plate having 40 screw terminals. A case with 20 screw terminals will require modification. A case conversion kit (Part No. 15738-300) is available; consult the factory for information.

The Smart Transmitter Interface Board must be mounted on the component side of the MPU Baseboard with four spacers and secured by 8 screws and washers, as shown in the Parts List at back of this Instruction. The following procedure describes the installation of the Interface Board (see Figure 2-8).

1. If the MPU Baseboard is installed in the case, reverse the procedure in section 2.5.2 and remove the Display Assembly and MPU Baseboard; otherwise, continue with this procedure.

**IMPORTANT**

Follow the circuit board handling guidelines (see section 2.5.1) when performing the following steps.

March 1993
2. Prepare a work area equipped with a grounded conductive mat. Snap grounding wrist strap around wrist and attach ground clip to mat.

3. Place the MPU Baseboard on grounded conductive mat, component side up.

4. Remove the Interface Board from its static shielding bag and temporarily hold it (with the component side down) over the MPU Baseboard to identify the screw holes that will be used to attach it by means of four spacers to the MPU Baseboard.

4. Mount the four spacers on the MPU Baseboard with No. 8-32 x 3/8" long round head screws and washers.

5. Refer to Figure 2-9 for the following procedure: Hold the Interface Board over the MPU Baseboard as in step 3 and connect the two ribbon cables from the Interface Board to the MPU Baseboard. Dress the two ribbon cables as shown and place Interface Board on the four spacers.

6. Secure the Interface Board to the four spacers with four No. 8-32 x 3/8" long round head screws and washers.

7. Modify the case by adding terminal blocks C and D (each with 10 screw terminals) to the rear of case for a total of 40 terminals. Consult the factory for information on case modification. Skip this step if your case is already a 40 terminal case.

8. Reinstall MPU Baseboard and Display Assembly in the 40 terminal case according to instructions in section 2.5.2.

This completes the installation of the Smart Transmitter Interface Board. Addition of the Smart Transmitter Interface Board requires station calibration (see section 4.0).

2.5.4 LINK INTERFACE BOARD

Figure 5-2 and the Parts List at the back of this Instruction indicate that the Link Interface Board must be connected to J3 of the MPU Baseboard and secured with four spacers and eight screws. Follow the procedure below to install a Link Interface Board.

1. Refer to Handling Guidelines, section 2.5.1, prior to removing a Link Interface Board from its static shielding bag or removing MPU Baseboard from case.

2. If MPU Baseboard is installed in case, reverse procedure in section 2.5.2 and remove Display Assembly and MPU Baseboard; otherwise, continue this procedure.

3. Place MPU Baseboard on a grounded conductive mat - component side up.
4. See Figure 1-1 for Link Interface Board orientation. Line-up P1 of Link Interface Board with J3 of MPU Baseboard and note positions which the 4 spacers will occupy - directly under the 4 corner screw holes in the Link Interface Board. Do not plug Link Interface Board into MPU Baseboard at this time.

5. Mount 4 spacers on MPU Baseboard and secure with four No. 4-40 x 3/8” pan head screws.

6. Plug P1 of Link Interface Board into J3 of MPU Baseboard. Secure Link Interface Board to 4 spacers with four No. 4-40 x 3/8” pan head screws.

7. Reinstall MPU Baseboard and Display Assembly in case according to instructions in section 2.5.2.

This completes the installation of the Link Interface Board. The Link Interface Board requires no jumper-plug settings or calibration.

NOTE

Set the Station’s link address and configure FB98 prior to placing it in operation. Refer to MYCRO 385 Configuration Guide CG385-2 for details.

2.5.4.1 Setting Link Address

An LOS equipped with a Link Interface Board can communicate with other link-connected stations and/or devices providing that FB98 has been configured and the assigned station address set into the Station by the user.

IMPORTANT

A Station connected to the LIL must have the station address set to communicate on the LIL.

The following information will be needed prior to setting a Station’s address:

1. The user assigned Station address. Refer to System Drawing or other applicable documentation.

2. Execution Sequence Number (ESN) assigned to FB98. Refer to CG385-3, MYCRO 385 Configuration Documentation Booklet.

Use the following procedure to set the address of a Loop Operator’s Station.

1. With power off at Station, verify that ‘H/T/F/M’ lockout switch is enabled. Refer to Figure 5-3 for switch location.

2. Verify Station’s model number and input power requirement. The Stations’s nameplate is on the MPU Baseboard; refer to section 1.2, Model Designation, to interpret the model number. Figure 2-8 shows the
location of the nameplate and the color coded extractor tab that indicates the power input requirement. Reseat MPU Baseboard and install Display Assembly. Apply power to Station.

3. Open flip-down ID plate shown in Figure 3-1. Press ENTER CONF to enter configuration mode at MENU level. Refer to section 3.5. Refer to Figure 5-6 for location of buttons.

4. Rotate Pulser Knob to select 'T' (table) on left digit position of alphanumeric display. If 'TX' appears in the display, the lockout switch on the Controller Board must be enabled.

5. Press STEP DOWN to enter FUNCTION BLOCK level.

6. Rotate Pulser Knob to select function block '98'.

7. Press STEP DOWN to enter PARAMETER level. 'TESN' appears in alphanumeric display.

8. Rotate Pulser Knob to show in the 5 digit display the ESN assigned to FB98 in user's Configuration Documentation Booklet CG385-3. If specified ESN is unavailable, set ESN to any available value close to the specified ESN in order to continue with this procedure.

9. Press STORE to lock-in value.

10. Press EXIT.

11. Press ENTER CONF to enter configuration mode at MENU level.

12. Rotate Pulser Knob to select 'H' (hard configuration) mode on left digit position of alphanumeric display.

13. Press STEP DOWN to enter FUNCTION BLOCK level.

14. Rotate Pulser Knob to select function block '98' on right side digits of alphanumeric display. FB '98' will not be available if ESN is set to 00 or is not stored in accordance with steps 9 and 10.

15. Press STEP DOWN. 'HLSA' appears in alphanumeric display.

16. Press STEP DOWN. Station address 0 to 64 appears in 5 digit display.

17. Rotate Pulser Knob to assigned Station address. Refer to Configuration Booklet CG385-3.

18. Press STORE to lock-in desired value.

19. Press EXIT and close flip-down ID plate.

This completes the procedure. Refer to SD15492, Installation and Service Instruction, Local Instrument Link, for additional information.

March 1993
2.6 FACTORY CALIBRATION

Unless a special calibration is ordered, the factory calibration is as follows:

- Analog input function blocks...0 to 5 Vdc
- Analog output function blocks...4 to 20 mA

Section 4 provides analog calibration procedures which may be used to check or change factory calibration. Digital inputs and output ports do not require calibration.

2.7 CONFIGURATION

The station must be configured before it can be placed on-line. For configuration information, refer to either MYCRO 385 Configuration Guide CG385-2 or the pocket size MYCRO 385 Configuration Guide CG385-1.
3.0 OPERATION

This section describes the various displays and controls of the Loop Operator's Station (LOS). Some displays and controls are used for both operation and configuration. Here, only the displays and controls for station operation are discussed. For information about displays and controls used for configuring the LOS, refer to the LOS Configuration Guide, CG385-2.

Figure 3-1 identifies the displays and controls explained in the following subsections.

3.1 5 DIGIT DISPLAY

The 5 digit display is used to show one of three variables from the display select group. Any configured variable in this group, (P) process, (S) setpoint, (V) valve, can be selected for display. The process and setpoint can be configured for display in scaled process units (such as pressure, temperature, GPM) or for 0 to 100%. A positive range value is not signed, however, a (-) sign indicates a negative range value.

The D pushbutton is used to select the desired variable. Pressing this button steps the display one position in the sequence P, S, and V from any starting point within the display select group. This button is inactive during configuration modes and all variables in the display select group are off.

At any given time, the above variables pertain to one specific loop. That loop is identified by a backlit number arranged in a column of ten numbers situated to the right of the 64-segment vertical bargraph.

The LOOP pushbutton is used to select the desired loop. Each time the button is pressed, the station will advance to the next configured loop or to station status 'S'. If the button is held down, the station will scroll through all configured loops and station status until the button is released. Once the desired loop has been selected, the station will display 'P', the process value. At the same time, the alphanumeric display will show (if configured) the engineering units if no alarm is active. If an alarm occurs, the alphanumeric display will show the alarm status.

The 'S' display point provides station status information. Its LED will flash whenever a station status condition (such as one or more on-line errors in the Loop Operator's Station) is detected.

The ACK button is used to acknowledge an alarm condition of an active display point. When pressed, it will stop the point's alarm LED from flashing if the point is visible in the 5 digit display.

The ACK button also acknowledges alarms occurring under the station status ('S') display point. The 'S' point must be selected as the current display before the alarm can be acknowledged.

March 1993
If multiple error codes are present under the station status display, use the ACK pushbutton to step through these error codes.

Any display point (except for the station status display point) can be configured to include a 'common acknowledge' feature. If this option is being used and the point's alarm begins to flash, the alarm can be acknowledged by pressing the ACK pushbutton even if another display point is being viewed.

3.2 ALPHANUMERIC DISPLAY

The 4-character alphanumeric display is situated at the bottom of the left side of the Display Assembly faceplate. It is used to display point tags, digital display units, alarm types, error codes, and configuration data.

Point tags may include up to 12 alphanumeric characters, although the last four characters are normally visible at the display. The display will scroll through the entire point tag when the TAG switch is toggled or when the operator changes the point currently being displayed.

3.3 BARGRAPH DISPLAYS

The red 64-segment LED bargraph display is situated vertically in the center of the Display Assembly faceplate. It displays the selected loop's process signal or its setpoint signal in a 0 to 100% range.

The red 40-segment LED bargraph display is situated horizontally at the bottom of the Display Assembly faceplate. It displays the valve signal of the selected loop. The valve bargraph indicates the valve signal with respect to percent of valve opening from 0% to 100%. Note that the valve bargraph has the words CLOSE at 0% and OPEN at 100%. If a valve signal increases to move the valve in the open direction, the valve bargraph is configured so that a 0% valve signal is shown as 0% (CLOSE) and a 100% valve signal is shown as 100% (OPEN). If a valve signal decreases to move the valve in the open direction, the valve bargraph is configured so that a 0% valve signal is shown as 100% (OPEN) and a 100% valve signal is shown as 0% (CLOSE).

All signals must be configured by the user unless a Factory Configured Option is used. Typically, loop inputs configured with a control function have the setpoint displayed as "S" on the vertical bargraph, the process displayed as "P" on the vertical bargraph, and the valve signal on the valve (horizontal) bargraph. Loop inputs configured without a control function typically have the station input displayed on the vertical bargraph and the valve signal on the valve bargraph.

In addition, the process and setpoint bargraph can be configured to flash on and off in response to an activated status condition.
3.4 PULSER KNOB

The pulser knob is used to adjust the local setpoint and manual output. The setpoint is adjusted during automatic modes and the manual output is adjusted during manual modes.

The pulser knob action for manual operation is determined during configuration. It can be set for either direct action (i.e., clockwise turning increases the manual output) or for reverse action (i.e., clockwise turning decreases the manual output). Note that the pulser knob action applies only to manual output adjustment and is typically configured so that clockwise turning increases the process signal.

During configuration, the pulser knob is used to change the function block number selection or parameter value.

3.5 OPERATING MODES

The operating mode capability of the LOS is dependent upon its model (385B or 385H) and the user’s configuration of the station’s functions and controls. The Model 385B LOS is basically a display and alarm station. The Model 385H LOS can also access up to ten HART protocol devices. When connected to Moore Products Co. Mycro XTC Transmitter-Controllers, the Model 385H LOS is capable of providing full control of the PID parameters.

Refer to the LOS Configuration Guide CG385-2 for detailed information on LOS functions and configuration.

The A/M (Automatic/Manual) and C/L (Console/Local) pushbutton mode switches are used to establish the operating modes locally. Any combination of these switches can be configured for use. Each mode switch has a corresponding function block from which the switch function or functions are selected. The following paragraphs describe the typical function selections of the two mode switches.

The A/M switch is used to select either automatic or manual control (switch active in Model 385H only). Each mode has an LED indicator: green for Automatic, red for Manual. The A/M pushbutton switches only the loop that is currently selected; it does NOT switch all connected loops simultaneously.

The C/L switch is used to establish the origin of loop control for a link interface equipped LOS. Console control can be accomplished by a MYCRO Operator Console or an independent computer via an Independent Computer Interface. Local control is maintained by an operator locally. Each mode has an LED indicator: green for Console control, red for Local control.

When the C/L switch is not configured for use, local control is assumed and no LED indication is shown. Also, if the Link Interface Board is not installed, the Station automatically defaults to local control and no LED indicator is lit.

March 1993
The functions of the two mode switches can be combined to accommodate the desired station function.

For most functions, the A/M switch used alone provides control with a local operator adjusted setpoint in automatic or valve signal in manual. A link interface equipped LOS can use the C/L switch in conjunction with the A/M switch to allow for either non-local or local control. Non-local control (Console mode) allows a MYCRO Operator Console or independent computer via an Independent Computer Interface to adjust the controller setpoint or valve signal and to switch between non-local and local control.

3.6 DISPLAY TEST

Pushing the EXIT configuration button will light all display segments and LEDs. A three-step test is automatically performed on the alphanumeric display to light all its segments. The Station must be in an operating mode for the display test to function. If the Station is in a configuration mode when the EXIT button is pressed, the Station will exit configuration without performing a display test.

3.7 PUSHBUTTON CARE

Pushbuttons should be pressed by a finger, an unused eraser on a pencil, or a stick eraser. Use of a hard implement, such as the cap end of a pen, a blunt tool, or a fingernail, may deform the dome switch and result in pushbutton failure.
4.0 CALIBRATION

This section describes calibration and calibration verification of the following function blocks (FBs).

- **FB01** Analog Input 1
- **FB02** Analog Input 2
- **FB03** Analog Output
- **FB11** Display & Alarm #1 (Loop Input 1)
- **FB12** Display & Alarm #2 (Loop Input 2)
- **FB13** Display & Alarm #3 (Loop Input 3)
- **FB14** Display & Alarm #4 (Loop Input 4)
- **FB15** Display & Alarm #5 (Loop Input 5)
- **FB16** Display & Alarm #6 (Loop Input 6)
- **FB17** Display & Alarm #7 (Loop Input 7)
- **FB18** Display & Alarm #8 (Loop Input 8)
- **FB19** Display & Alarm #9 (Loop Input 9)
- **FB20** Display & Alarm #10 (Loop Input 10)

Function blocks dealing with digital I/O do not have to be calibrated.

4.1 GENERAL CONSIDERATIONS

Stations calibrated at the factory will not need to be recalibrated for most applications. However, for critical applications, consider the following.

- If a current to voltage conversion resistor (typically 250 ohm +/-0.1%) is used at a particular analog or loop input, that precision resistor should remain with the Station, installed across those particular terminals, to eliminate the voltage drop variation due to resistor tolerance. Use a precision current source for calibration.

- Allow the Station to warm-up for one hour prior to calibrating. The ambient temperature should be close to normal operating conditions.

Periodic calibration is not necessary. However, calibration and verification should be performed under any of the following circumstances.

- To check or change the calibration of a new or in-service LOS

- When a Smart Transmitter Interface Board is added by the user (configuration will be needed)

- Upon replacing one of the following Boards: MPU Baseboard or Smart Transmitter Interface Board.

- As part of a troubleshooting or failure confirmation routine

Factory calibrations are listed in section 2.6. Function blocks that are not configured can also be calibrated. In this way, calibration will not be

March 1993
required in the event configuration is changed at a future date to include these blocks. The Station must be off-line during calibration.

The bargraphs on the Display Assembly are not used during the calibration procedure. Ignore any bargraph indications during calibration.

Verify the Station's model number and power input requirement before applying power.

During calibration, refer to section 1.3 Specifications for calibration accuracy.

4.2 REQUIRED EQUIPMENT

Calibration of the LOS requires the use of the following test equipment:

1. A precision voltage source capable of supplying 0.000 to 5.000 Vdc for calibrating analog input and loop input function blocks.

2. A precision current source capable of supplying 0.000 to 20.00 mA dc for calibrating analog inputs and loop inputs with precision resistors connected across input terminals.

3. A precision milliammeter capable of displaying 4.000 to 20.00 mA dc for calibrating the analog output function block.

   OR

4. An electronic calibrator that combines the needed functions of the three instruments above.

4.3 LOCKOUT SWITCHES

Lockout Switches are located on the front edge of the MPU Baseboard as shown in Figure 5-3. The 'C' (calibration) lockout switch is factory set to lockout (disable) the calibration mode. This prevents inadvertent changing of calibration parameters from the front panel Keyboard. However, the calibration mode may be left in an enabled condition, if desired. To gain access to and set the lockout switch:

1. Flip down the front panel ID plate to reveal the captive bezel retaining screw.

2. Loosen the screw and separate the Display Assembly from the case. Support the Assembly so it doesn't hang by the ribbon cable.

3. Refer to Figure 5-3 to locate and set the 'C' configuration lockout switch to 'enable'.

4. After setting the lockout switch, reinstall the Display Assembly.

March 1993
4.4 ANALOG INPUTS AND OUTPUTS (FB01, FB02, FB03)

LOS analog input and analog output function blocks are factory calibrated: inputs, 1 to 5 Vdc; output, 4-20 mA dc. If calibration is necessary, use the following procedures.

1. If applicable, place the 'C' (calibration) lockout switch in the 'enable' position. This enables the Station's calibration mode. See section 4.3 and Figure 5-3.

2. Press ENTER CONF button to enter configuration mode at the MENU level.

3. Rotate Pulser Knob to select 'C' (calibration) on left digit position of alphanumeric display. (If 'CX' appears in the display, the lockout switch on the MPU Baseboard must be enabled, see section 4.3).

4. Press STEP DOWN to enter FUNCTION BLOCK level.

5. Rotate Pulser Knob to select desired analog input or analog output function block number on the right side digits of alphanumeric display. Refer to Table 4.1.

6. Connect test equipment to Station's rear terminals.

   A. Analog Input: Connect voltage source (or current source and range resistor) to the desired analog input terminals. Ensure that terminal screws are tight.

   B. Analog Output: Connect milliampmeter to the desired analog output terminals. Ensure that terminal screws are tight.

   Turn on test equipment and allow time for it to warm up and stabilize.

7. Press STEP DOWN to enter PARAMETER level.

8. Rotate Pulser Knob to select desired parameter (e.g., 'CZ' for zero input 1, zero input 2, or zero output). Parameter is indicated on alphanumeric display. See Table 4.1.

9. Press STEP DOWN to enter VALUE level ('CAL' appears on 5 digit display).

10. For calibration, perform either A or B depending upon function block selected in step 5.

    A. Analog Input:

       1) Set precision voltage source to zero input value (0.000 to 1.000 Vdc).

       2) Wait at least 15 seconds, then press STORE to lock-in value.
3) Press STEP UP.

4) Rotate Pulser Knob to select full scale parameter (CF).

5) Press STEP DOWN.

6) Set voltage source to full scale input value (4.000 to 5.000 Vdc).

7) Wait at least 15 seconds, then press STORE.

8) Proceed to step 11.

B. Analog Output

1) Rotate Pulser Knob to set zero output to 4.000 mA on digital multimeter or electronic calibrator.

2) Wait at least 15 seconds, then press STORE to lock-in value.

3) Press STEP UP.

4) Rotate Pulser Knob to select full scale parameter (CF).

5) Press STEP DOWN to enter Value level (‘CAL’ appears on 5 digit display).

6) Rotate Pulser Knob to set full scale output to 20.00 mA on digital multimeter or electronic calibrator.

7) Wait at least 15 seconds, then press STORE.

11. To verify calibration, proceed to step 12. If verification is not needed, proceed to step 13.

12. For verification, perform either A or B depending upon function selected in step 5.

A. Analog Input

1) Press STEP UP.

2) Rotate Pulser Knob to select verification parameter (e.g., ‘CV’ to verify input 1 or input 2). Parameter is shown on alphanumeric display. See Table 4.1.

3) Press STEP DOWN to enter VALUE level.

4) Set precision voltage source to zero input voltage. The 5 digit display should read 0.0% of input.
5) Set source to full scale voltage. The 5 digit display should read 100.0% of input.

6) Proceed to step 13.

**TABLE 4.1 Analog I/O Calibration Parameters**

<table>
<thead>
<tr>
<th>FUNCTION BLOCK</th>
<th>ANALOG CHANNEL</th>
<th>CALIBRATION PARAMETERS</th>
<th>REAR TERMINALS</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Input 1</td>
<td>CZ - Zero, Input #1</td>
<td>A4(+), A5(-)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CF - Full Scale, Input #1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>CV - Verify Input #1</td>
<td></td>
</tr>
<tr>
<td>02</td>
<td>Input 2</td>
<td>CZ - Zero, Input #1</td>
<td>A6(+), A5(-)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CF - Full Scale, Input #2</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>CV - Verify Input #2</td>
<td></td>
</tr>
<tr>
<td>03</td>
<td>Output</td>
<td>CZ - Zero, Output</td>
<td>A7(+), A8(-)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CF - Full Scale, Output</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>CV - Verify Output</td>
<td></td>
</tr>
</tbody>
</table>

B. Analog Output

1) Press STEP UP.

2) Rotate Pulser Knob to select verification parameter (e.g., 'CV' verify analog output). See Table 4.1.

3) Press STEP DOWN to enter VALUE level.

4) Rotate Pulser Knob to set 5 digit display to 0.0%. Output current should be 4.00 mA.

5) Rotate Pulser Knob to set 100.0%. Output current should be 20.00 mA.

6) Proceed to step 13.

13. Select one of the following:

If all points have been calibrated and verified, press EXIT to leave the calibration mode and enter operation mode.

If additional function blocks are to be calibrated and verified, press STEP UP twice to enter FUNCTION BLOCK level. Perform steps 5 through 13 for each function block.

14. Lock out the Station's calibration mode via the MPU Baseboard's 'C' lockout switch.

This step is recommended.

March 1993
4.5 LOOP INPUTS (FB11 TO FB20)

The LOS loop input function blocks have been factory calibrated for 1.000 to 5.000 Vdc. For most applications recalibration will not be necessary.

If calibration of any of the above listed loop input function blocks is necessary, use the following procedures.

1. Enable 'C' (Calibration) and 'H/T/F/M' (transMitter) lockout switches. See section 4.3 and Figure 5-3.

2. Press ENTER CONF to enter configuration mode at the MENU level.

3. Rotate Pulser Knob to select 'C' in left digit position of alphanumeric display. (If 'CX' appears in the display, perform step 1).

4. Press STEP DOWN to enter FUNCTION BLOCK level.

5. Rotate Pulser Knob to select the function block to be calibrated (FB11 to FB20) in the right-side digits of the alphanumeric display.

6. At Station's rear terminals, connect a precision voltage source. Refer to Table 4.2 for rear terminal assignments for each loop input function block. Ensure that terminal screws are tight.

7. Press STEP DOWN to enter PARAMETER level.

8. Rotate Pulser Knob to select desired parameter (e.g., 'CZ' zero input). Parameter is indicated on alphanumeric display.

9. Press STEP DOWN to enter VALUE level. 'CAL' should appear on the 5 digit display.

10. Set precision voltage source to zero input value (0.000 to 1.000 Vdc).

11. Wait at least 15 seconds, then press STORE to lock-in the desired value.

12. Press STEP UP.

13. Rotate Pulser Knob to select full scale parameter ('CF').

14. Press STEP DOWN.

15. Set the precision voltage source to full scale input value (4.000 to 5.000 Vdc).

16. Wait at least 15 seconds, then press STORE to lock-in the desired value.
### TABLE 4.2 Loop Input Calibration Parameters

<table>
<thead>
<tr>
<th>FUNCTION BLOCK</th>
<th>LOOP INPUT</th>
<th>CALIBRATION PARAMETERS</th>
<th>REAR TERMINALS</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>1</td>
<td>CZ - Zero</td>
<td>C1(+) C2(-)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CF - Full Scale</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>CV - Verify</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>2</td>
<td>CZ - Zero</td>
<td>C3(+) C2(-)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CF - Full Scale</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>CV - Verify</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>3</td>
<td>CZ - Zero</td>
<td>C4(+) C5(-)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CF - Full Scale</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>CV - Verify</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>4</td>
<td>CZ - Zero</td>
<td>C6(+) C5(-)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CF - Full Scale</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>CV - Verify</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>5</td>
<td>CZ - Zero</td>
<td>C7(+) C8(-)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CF - Full Scale</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>CV - Verify</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>6</td>
<td>CZ - Zero</td>
<td>D1(+) D2(-)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CF - Full Scale</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>CV - Verify</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>7</td>
<td>CZ - Zero</td>
<td>D3(+) D2(-)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CF - Full Scale</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>CV - Verify</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>8</td>
<td>CZ - Zero</td>
<td>D4(+) D5(-)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CF - Full Scale</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>CV - Verify</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>9</td>
<td>CZ - Zero</td>
<td>D6(+) D5(-)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CF - Full Scale</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>CV - Verify</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>10</td>
<td>CZ - Zero</td>
<td>D7(+) D8(-)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CF - Full Scale</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>CV - Verify</td>
<td></td>
</tr>
</tbody>
</table>

17. To verify the calibration:

A) Press STEP UP.

B) Rotate Pulser Knob to select verification parameter (e.g., ‘CV’) shown on the alphanumeric display.

C) Press STEP DOWN to enter VALUE level.
D) Set precision voltage source to zero input voltage. The 5 digit display should read 0.0 % of input.

E. Set precision voltage source to full scale voltage. The 5 digit display should read 100.0 % of input.

18. Select one of the following:

If another loop input is to be calibrated, press STEP UP once to enter the FUNCTION BLOCK level. Turn the Pulser Knob to select the desired function block. Perform steps 6 through 17 for each loop input to be calibrated.

If all loop inputs have been calibrated and verified, press EXIT to leave calibration mode and enter operation mode.

19. Lock out the Station's Calibration and transMitter modes via the MPU Baseboard's 'C' and 'H/T/F/M' lockout switches.

This completes the calibration of the loop input function blocks.
5.0 CIRCUIT DESCRIPTION

The hardware architecture of the Loop Operator's Station is shown in Figure 5-1. Notice that all plug-in assemblies interact with the MPU Baseboard.

The MPU Baseboard oversees all of the Station's internal operations. It controls the Smart Transmitter Interface Board, the Link Interface Board, and the Display Assembly. It also performs many of the Station's signal processing operations. The Baseboard's on-board power supply furnishes DC operating voltages to all plug-in assemblies and to external process transmitters (4 maximum) connected to the rear terminal block.

The Smart Transmitter Interface Board contains hardware which provides the interface circuitry for ten smart transmitters and four digital outputs.

The Display Assembly provides LED indication of process related signals, station operating mode, and configuration parameters. It also accepts operator entered commands and data via the Assembly's front panel controls.

A functional description, a hardware block diagram and a physical layout drawing are provided for each of the following circuit areas:

- MPU Baseboard
- Smart Transmitter Interface Board
- Link Interface Board
- Display Assembly

An MPU Baseboard and a Smart Transmitter Interface Board are installed in a Model 385H LOS. The three-letter software compatibility codes (e.g., BBA) must be the same on all ROMs (Read Only Memory) on these two boards (see section 6.7).

5.1 MPU BASEBOARD

The Baseboard's hardware is supported by a large array of software based function blocks. During Station configuration, a group of function blocks are linked together to meet the control requirements of the Station's application.

As shown in Figure 5-2, the MPU Baseboard has two analog inputs, one digital input, and one optional bidirectional serial port which passes Local Instrument Link signals. The Baseboard also has one analog output and two digital outputs. The actual inputs and outputs which are active during station operation depend on its configuration. To determine the actual I/O arrangement, refer to the appropriate configuration documentation.
NOTE: MODEL 385B DOES NOT INCLUDE THE SMART TRANSMITTER INTERFACE BOARD.
CIRCUIT DESCRIPTION

The MPU Baseboard contains both analog and digital circuits. Analog circuitry operates in real time, the microprocessor-based digital circuitry operates at high speed under program control. Figure 5-3 shows the physical layout of the Baseboard.

The MPU (microprocessor unit) is a single integrated circuit capable of arithmetical, logical, and support circuit control functions. It directly or indirectly interacts with surrounding on-board and off-board circuitry to control the internal operation of the LOS. To operate under program control, the MPU systematically fetches instructions from the PROM area and executes them to control data flow and organize support circuit activities.

The Clock circuit contains a precision square wave oscillator which operates at 8 MHz. It also contains a flip-flop type of frequency divider network to down count the oscillator frequency to the value required by the MPU. Timing pulses from the Clock are used to synchronize the MPU’s computing activities.

The Watchdog Timer circuit is a dual "one-shot" interval timer that will automatically reset the MPU in the event it does not complete executing its programs within a predetermined time.

On-board memory consists of PROM (programmable read only memory) and NVRAM (non-volatile random access memory). The PROM stores the operating programs for the function blocks and Factory Configured Options (FCOs) associated with a Model 385. It also stores the general operating programs for the on-board microprocessor. The NVRAM stores hard configuration, the table of function blocks, soft configuration, calibration data, and transient data.

During configuration and calibration, data is entered into NVRAM when the STORE button is pressed. Transient data (process, station status, alarm, and error code data) is also stored in NVRAM.

The MPU’s three bus lines are the address bus, the data bus, and the control bus. They interconnect the MPU, the NVRAM, the PROM, and other support circuits. The address bus is unidirectional while the control and data buses are bidirectional.

The Signal Selector circuit operates under MPU control to select an analog signal and feed it to the A/D Converter. It is essentially a solid state switch.

The A/D Converter circuit converts an analog input signal into a digital value. Once digitized, the signal value can easily be manipulated and stored in memory by the MPU.

The D/A Converter circuit converts a digital value into an analog signal.

The Reference Voltage Source circuit provides a precision analog reference for the D/A Converter.
CIRCUIT DESCRIPTION

The Amplifier circuit provides gain and drive capability to the analog signal output of the D/A Converter.

The Opto-Coupler circuit provides signal isolation for the digital input signal.

The on-board Power Supply is a plug-in (removable) assembly in a Model 385_A LOS. Models 385_B and C have a non-removable Power Supply. The Power Supply provides DC operating voltages to LOS circuits. It also provides a +26 Vdc output to power up to four smart transmitters.

Lockout switches are located at the front of the Baseboard and can be set to prevent unauthorized changes to selected configuration modes. The station power fuse is located at the rear of the board near rear connector J5. J5 mates with the case-mounted connector when the board cluster is inserted into the case.

5.2 SMART TRANSMITTER INTERFACE BOARD

The Smart Transmitter Interface (STI) Board’s hardware is supported by a large array of software-based function blocks. As with the MPU Baseboard, during station configuration, a group of function blocks are linked together to meet the requirements of the Station’s application.

The STI Board has ten loop input channels that can accept up to ten Mycro XTC Transmitter/Controllers operating in the analog Point-to-Point mode. The Board also has four digital outputs. The actual STI Board inputs and outputs which are active during station operation depend upon station configuration.

The STI Board’s circuitry operates under the control of the MPU Baseboard. The STI Board, like the Baseboard, is a hybrid assembly. The analog circuitry operates in real time while the microprocessor controlled digital circuitry operates at high speed under program control.

Figure 5-4 shows a block diagram of the Smart Transmitter Interface Board. Ten loop inputs are accessible via the rear terminal blocks C and D. Each loop input is fed into two circuits: the directly coupled analog input circuit and the ac coupled bi-directional HART digital circuit.

The analog circuit accepts a 0-5 Vdc input signal that is passed through a 2 Hz low-pass filter, buffer, and a gain/offset stage. This conditioned signal is next polled by the multiplexer and sent to an A/D converter. The digitized signal appearing at the output of the A/D converter then becomes available for processing by the MPU located on the MPU Baseboard.

The bi-directional HART digital circuit consists of a 500 Hz to 10 KHz bandpass filter, a half-duplex modem, and a universal asynchronous receiver transmitter (UART). The HART protocol uses 1.2 and 2.2 KHz tones to communicate between devices. These tones are superimposed on the 4 to 20 mA dc analog signal.

March 1993
CIRCUIT DESCRIPTION

Typically, an arriving HART signal is passed through the bandpass filter and fed to the modem. The modem demodulates the tones into TTL level pulses which are sent to the UART. The UART serves as an interface between the MPU’s data bus and the modem.

Conversely, an outgoing HART signal is initiated by the MPU by sending data to the UART. The UART presents TTL level data to the modem. The modem generates a corresponding two-tone HART protocol signal which is superimposed on the analog signal appearing on the loop input line. A remote transmitter/controller then receives the two-tone signal and processes it as needed.

The on-board PROM stores operating programs for the function blocks associated with the STI Board and is addressable by the MPU located on the MPU Baseboard. Similarly, the NVRAM stores the STI Board’s configuration and transient data and is also addressable by the MPU.

The circuits on the STI Board are linked to circuits on the MPU Baseboard via bus lines. Address and data bus lines are fed through buffers before being connected to the MPU Baseboard bus lines. The address bus is unidirectional while the data and control buses are bidirectional.

Four digital output circuits are also included on the STI Board. These outputs are of the "open collector" type and are provided with a common digital return line. Refer to section 1.3 for detailed electrical specifications. Digital outputs 3 and 4 are accessible at rear terminal blocks C and D, digital outputs 5 and 6 are routed via JP2 back to the MPU Baseboard and are accessible at rear terminal block B.

The physical layout of the STI Board is shown in Figure 5-5. There are no user adjustments on the STI Board.

5.3 DISPLAY ASSEMBLY

The Display Assembly consists of four interconnected subassemblies:

- Display Interface Board
- Display Driver Board
- Display Board
- Keyboard

The Display Assembly functions under the direction of the MPU located on the Baseboard. It provides LED indication (both analog and digital) of various process signals, accepts operator entered data during hard and soft configuration procedures, and supports the front panel operator controls. Refer to the hardware block diagram in Figure 5-6.
FIGURE 5-6 Display Assembly, Hardware Block Diagram
5.3.1 DISPLAY INTERFACE BOARD

The Display Interface Board performs several functions. It interfaces the Display Assembly to the MPU Baseboard, supports operation of the front panel Pulser Knob, scans the Keyboard for operator initiated keystrokes, and forwards display data to the Display Driver Board.

The Dual Optical Switch functions in conjunction with the front panel Pulser Knob to produce two pulse trains whenever the knob is rotated. 'Direction' pulses will either lead or lag 'step' pulses by 90° depending upon the direction in which the Pulser Knob is rotated. Since their lead-lag relationship is dependent on the direction of knob rotation, as illustrated in Figure 5-7, the Digital Up/Down Counter knows whether to increment or decrement (direction pulses) and by how much (step pulses).

![Figure 5-7 Pulse Train Phase Relationship](PA-2401-2)

The number of pulses generated is counted by the Digital Up-Down Counter which places binary pulse counts on the data bus where they can be retrieved and used by the MPU Baseboard to adjust process signals (e.g., setpoint or valve) or adjust configuration selections.

The Keyboard Scanner circuit has a built-in oscillator and scans the Keyboard at regular time intervals to sense a complete keystroke. If a keystroke is
detected, data identifying that key is placed on the data bus where it can be interpreted by the Baseboard's MPU. The Display Interface Board also acts as a bus feed-through by connecting the address and data buses of the MPU Baseboard to the Display Driver Board.

5.3.2 DISPLAY DRIVER BOARD

The Display Driver Board performs two main functions. It decodes display data received from the MPU-based Controller Board (via the Display Interface Board) and forwards decoded display data to the Display Board.

The Segment And Digit Driver circuitry uses standard digital decoding and latching techniques. The circuit accepts encoded display data from the Display Interface Board and forwards decoded segment and digit/bar graph signals to the Display Board. It also decodes display data for the ten loop input indicator LEDs.

5.3.3 DISPLAY BOARD

The Display Board contains the various LED devices used to display process and configuration information. It accepts decoded display drive signals from the Display Driver Board. Section 3 describes each display’s purpose.

All on-board LED devices are red, except for the C and A LEDs which are green. At the top of the Board is a 5 digit numeric readout; at the center is a vertically positioned 64 segment LED bargraph; at the lower left is a 4-character alphanumeric readout; and at the bottom center is a horizontally positioned 40-segment bargraph.

LEDs indicate the active states for C/L and A/M front panel mode selector switches. These four LEDs are arranged in two vertical pairs with each pair consisting of one green (top) and one red (bottom) LED. Only one LED in each pair can be lit when the associated mode selector switch has been either configured or activated by a station option. The C/L switch is active when the optional Link Interface is present and the A/M switch allows manipulation of the XCT Auto/Manual function (Model 385H only). Switches that have not been configured or do not have an associated option will have the corresponding LEDs off at all times.

5.3.4 KEYBOARD

The Keyboard is a membrane keypad that contains 14 switches. The layout of these switches is shown in the Keyboard section of Figure 5-6. Each switch has tactile feedback. The nine configuration switches, located at the bottom of the keypad, are accessible by opening the front panel flip-down door. Operator initiated keystrokes are sensed by circuitry on the Display Interface Board. The Keyboard has a built-in shield to prevent false triggering from static or EMI (electromagnetic interference). The switch contacts (1k ohm closed resistance) are arranged in a matrix.

March 1993
5.4 LINK INTERFACE BOARD

The Link Interface Board provides communications over the Local Instrument Link (LIL) between LOSs and various other link-connected devices such as a Model 320 Independent Computer Interface or a Model 321 Expansion Satellite to the Hi-Level Link (HLL).

Refer to the block diagram of the Link Interface Board shown in Figure 5-8 while reading the following circuit description. The physical layout of the Board is shown in Figure 5-9.

Operating programs stored in the UV EPROM permit the Link Interface Board to communicate on the LIL. These programs perform the following functions:

- Receive messages containing commands or data from other Stations and devices on the LIL
- Send commands or data to other Stations and devices on the LIL
- Perform error checking on the messages
- Handle link protocol (token-passing)

When the Link Interface Board is receiving a message from the LIL, encoded data (Manchester II) is received by the LIL Modem and separated into clock and data for the Data-Link Controller. The Link Status Receiver recognizes the presence of link data and sends status signals to the Link MPU. The Data-Link Controller converts serial data into parallel and calculates an error code check [Cyclic Redundancy Check (CRC)] on the message.

The Link MPU transfers, via Data Transceiver U3, data from the Data-Link Controller to a temporary receive message buffer located in the Dual Port RAM. After the message is verified and found to be error free, data is transferred to another area in the Dual Port RAM and made available, via Data Transceiver U1, for the Controller Board MPU to read and process. The Link MPU executes an EPROM-stored program that sends an acknowledge message to the sending station indicating that the message was received. This message is routed by the Link MPU to the LIL through the Data-Link Controller and the LIL Modem. If the original incoming message contained an error, the Link MPU would not acknowledge but would wait for the sending station to retry sending the message.

Data to be transmitted is placed in the Dual Port RAM by the Controller Board's MPU. When the MPU addresses the RAM through the Multiplexer And Decoder, data is transferred from the MPU to the RAM over the data bus and Data Transceiver U1. The Link MPU then executes an EPROM-stored program that reads the data from the Dual Port RAM. The Address Decoder enables the Data-Link Controller allowing the data to be stored by the MPU in the Controller. The Data-Link Controller converts the parallel data to serial form and sends it to the LIL Modem.

March 1993
DRAWING REF. 15853-40, ISSUE 2

NOTE:
UVEPROM (ULTRAVIOLET ERASEABLE ELECTRICALLY PROGRAMMABLE READ-ONLY MEMORY)
MPS (MULTI-PROCESSING UNIT)

PA-2404-1

FIGURE 5-9 Link Interface Board, Physical Layout
The LIL Modem combines the transmit clock and data to produce encoded data (Manchester II). Within the Modem, the encoded data is sent to a differential driver producing RS-422 signals. These signals pass through a station isolation transformer and a station disconnect relay, operated by the Relay Latch, also contained in the LIL Modem. After transmitting a message on the LIL, the Link MPU waits for an acknowledge from the receiving station. If one is not received, the Link MPU will try to transmit the message up to three times.
6.0 MAINTENANCE

Loop Operator’s Station (LOS) maintenance requirements are minimal. Preventive maintenance steps are presented first. These activities, such as cleaning and visual inspection, should be performed at regular intervals. The severity of the LOS’s operating environment will determine the frequency of maintenance. Additional topics including troubleshooting, assembly replacement, and software compatibility are then discussed.

6.1 TOOL AND EQUIPMENT REQUIREMENTS

The following tools and equipment are necessary for servicing:

A. Common electronic hand tools

B. Digital Multimeter (DMM)

Volmeter section
Accuracy ............ +/-0.01% of reading
Resolution .......... 1.0 millivolt
Input impedance ... 10 Megohms

Ammeter section
Accuracy ............ +/-0.1% of reading
Resolution .......... 100 microamperes

C. Maintenance Kit, P/N 15545-110, containing wrist strap and conductive mat. This kit, or an equivalent, is required whenever a circuit board is handled.

6.2 PREVENTIVE MAINTENANCE

The objective for establishing a preventive maintenance program is to provide maximum operating efficiency. Every preventive maintenance operation should assist in realizing this objective. Unless a preventive measure reduces a Station’s down time, it is unnecessary.

6.2.1 ENVIRONMENTAL CONSIDERATIONS

The LOS has been designed to operate within specified environmental parameters (temperature and humidity). These parameters are listed in the Specification section of this Instruction. Additional information concerning environmental contaminants is presented in the Installation section.

6.2.2 VISUAL INSPECTION

As part of a periodic maintenance program the LOS must be visually inspected. When viewing the assembly, scan for abnormalities such as loose, broken or stressed ribbon cables. Look for damaged circuitry and heat stressed parts.

March 1993
Check for excessive dirt or dust build-up which may impede air flow and inhibit proper heat dissipation.

6.2.3 CLEANING

Circuit boards should not be cleaned unless accumulated foreign material is causing a problem. The enclosed station design should prevent particulate material from building up. If cleaning becomes necessary, remove debris with either a soft brush or low velocity deionized air.

The bezel is cleaned with a mild, nonabrasive liquid cleaner and a soft, lint-free cloth. Do not use a paper towel.

6.2.4 CIRCUIT BOARD HANDLING

Anti-static procedures are required whenever a circuit board assembly is handled. These procedures are needed to prevent component damage from the electrostatic discharge hazard to which most semiconductors are vulnerable. When handling an assembly, follow the procedures outlined in the Assembly Replacement section of this Instruction.

6.3 FUSE LOCATION

The LOS's main power fuse is located at the rear of the MPU Baseboard as shown in Figure 5.3. A replacement fuse may be obtained from a local electronics supplier or may be ordered from the factory. See the Parts List at the back of this instruction for fuse part number and description.

To replace the fuse, refer to section 6.5 for removal and installation of the Display Assembly and MPU Baseboard. While the Station is disassembled, visually inspect the assemblies. After inserting a new fuse and assembling the Station, apply power. Operate the Station off-line for several minutes to be sure that a condition does not exist which will cause the replacement fuse to fail.

6.4 TROUBLESHOOTING

If a problem develops upon initial installation, check the following:

- Station's nameplate for input power requirements and installed options - refer to section 1
- Installation wiring - refer to section 2
- Station's hard and soft configuration parameters - refer to Configuration Guide
- Wiring of any associated external devices such as process transmitters - refer to P & I drawings

March 1993
Field servicing experience indicates that most initial service incidents involve one or more of the above items. A troubleshooting guide is provided in Table 6.1 as a service reference.

Troubleshooting the LOS is primarily done by error codes. Refer to Tables 6.3 through 6.8 for information on a particular error code.

Error codes appear on the alphanumeric display in response to a failed power-up diagnostic test or to an on-line station error. Section 6.4.1 provides a quick reference to the identification of these codes. Section 6.4.2 discusses each code with respect to the type of test or error check, station response, problem confirmation, and corrective action.

In the event that a malfunction within the LOS is suspected, troubleshooting by assembly substitution is recommended to get the Station back on-line in the shortest possible time. The plug-in design of station assemblies permits rapid removal and replacement to isolate a defect.

NOTE

When replacing an MPU Baseboard, the Display Station’s configuration and calibration parameters must be re-entered. Factory repaired Stations must be configured before being placed on-line. Refer to the Configuration Guide and to the calibration section of this Instruction.

Additional troubleshooting avenues are also possible. For example, a series of test configurations may be generated and implemented to ‘exercise’ various function blocks within the Station. This type of troubleshooting is intended to be implemented in an off-line bench test situation. Table 1-1 lists the function blocks available with the LOS. The Factory Configured Options (FCOs) for the LOS are given in Table 6.2.

The FCOs listed in Table 6.2 are for a Model 385H LOS. A Model 385B LOS will have block inputs in place of HART signals in FCO 01 and FCO 11.

On-line checks of the Station’s input and output signals, both analog and digital, can be performed without affecting station operation. However, this type of signal tracing is usually carried out behind an instrument panel. Refer to Figure 2-4 of this Instruction for rear terminal assignments.

While troubleshooting, it may be necessary to temporarily connect a test instrument, such as a digital multimeter, to a rear terminal. To make a temporary connection, either tighten the terminal screw before performing the measurement, or be sure to contact the connector spring plate with the test instrument probe. Alternatively, use a short length of wire clamped at one end between the screw/pressure plate assembly and the spring plate, and connect the test instrument to the free end of the wire.

March 1993
## TABLE 6.1 Troubleshooting Guide

<table>
<thead>
<tr>
<th>SYMPTOM</th>
<th>COMMENT</th>
<th>POSSIBLE CAUSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>No station output signal</td>
<td>Completely inoperative station</td>
<td>Station fuse (FI)</td>
</tr>
<tr>
<td>No bargraph indication</td>
<td></td>
<td>Power not applied</td>
</tr>
<tr>
<td>No alphanumeric indications</td>
<td></td>
<td>MPU Baseboard unseated from rear connector</td>
</tr>
<tr>
<td>No pulser knob response</td>
<td></td>
<td>MPU Baseboard failure</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Plug-in Power Supply</td>
</tr>
<tr>
<td>No front panel displays</td>
<td>Station operates normally otherwise</td>
<td>Display Assembly unplugged or failed</td>
</tr>
<tr>
<td>No switch action</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No pulser knob response</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Missing segments from one or more front panel display</td>
<td>Station operates normally otherwise</td>
<td>Display Assembly failure</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No pulser knob response</td>
<td>---</td>
<td>Display Assembly failure</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fluctuating station output signal</td>
<td>Seemingly normal process</td>
<td>Faulty process signal from external transmitter</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Turbulent process condition</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MPU Baseboard</td>
</tr>
<tr>
<td>Certain soft/hard configuration</td>
<td>&quot;X&quot; appears on alphanumeric display when trying to make adjustments</td>
<td>Lockout switch on MPU Baseboard is set to prevent changes</td>
</tr>
<tr>
<td>and/or calibration parameters can not be adjusted or reset</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Station will not operate properly after editing existing hard or soft configuration</td>
<td>Conditions depend upon application</td>
<td>Configuration error - refer to Configuration Guide</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No response from &quot;A/M&quot; switch on front panel</td>
<td>Both associated LEDs off</td>
<td>Auto/Manual Transfer Block not configured</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Display Assembly failure</td>
</tr>
<tr>
<td>Erratic station operation</td>
<td>Fluctuating displays on output signals</td>
<td>MPU Baseboard failure</td>
</tr>
<tr>
<td></td>
<td></td>
<td>STI Board</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Very low supply voltage</td>
</tr>
<tr>
<td>Digital outputs 1-6 do not operate</td>
<td>Station operates normally otherwise</td>
<td>STI Board</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

STI Board - Smart Transmitter Interface Board

## TABLE 6.2 Factory Configured Options (FCOs)

<table>
<thead>
<tr>
<th>FCO</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FCO 00</td>
<td>ESN Reset (ESN=00)</td>
</tr>
<tr>
<td>FCO 01</td>
<td>HART Signal Station with HI/LO Alarms</td>
</tr>
<tr>
<td>FCO 10</td>
<td>Default Configuration</td>
</tr>
<tr>
<td>FCO 11</td>
<td>HART Signal Station with HI/LO Alarms and LINK Interface.</td>
</tr>
</tbody>
</table>
After replacing a MPU Baseboard, configuration and calibration parameters must be re-entered. See the Configuration Guide, Configuration Documentation Booklet, and Calibration section of this Instruction.

Factory repaired Stations must also be configured.

6.4.1 ERROR CODE QUICK REFERENCE

An error code is indicated on the alphanumeric display in response to a power-up test failure or an on-line error. This section serves as a quick reference for error code identification.

6.4.1.1 Power-Up Error Code Designation

Sample Error Code ......................... E 1 1 0

Error Indicator

Error Type
1 - Hardware
2 - Database

Board Type
1 - MPU Baseboard
2 - Smart Transmitter Interface Board
4 - Link Interface Board

Test Type
0 - NVRAM
1 - PROM CRC
2 - Software ID
3 - Database ID
4 - Transient Data CRC
5 - Hard Data CRC
6 - Calibration Data CRC
8 - Soft Data CRC

6.4.1.2 Power-Up Error Codes

Table 6.3 gives the definition and affected board for each power-up error code. The codes are grouped by error type and listed in the sequence in which diagnostic tests are run.

Multiple database errors can occur. Pressing ENTER CONF button will display additional errors before configuration mode can be entered.

March 1993
### TABLE 6.3 Power-Up Error Codes

<table>
<thead>
<tr>
<th>ERROR CODE</th>
<th>DEFINITION/TEST</th>
<th>AFFECTED BOARD</th>
</tr>
</thead>
<tbody>
<tr>
<td>E110</td>
<td>RAM</td>
<td>MPU Baseboard</td>
</tr>
<tr>
<td>E111</td>
<td>ROM CRC</td>
<td>MPU Baseboard</td>
</tr>
<tr>
<td>E120</td>
<td>RAM</td>
<td>STI</td>
</tr>
<tr>
<td>E121</td>
<td>ROM CRC</td>
<td>STI</td>
</tr>
<tr>
<td>E124</td>
<td>Board Type</td>
<td>STI</td>
</tr>
<tr>
<td>E213</td>
<td>Database ID</td>
<td>MPU Baseboard</td>
</tr>
<tr>
<td>E214</td>
<td>NVRAM Transient Data CRC</td>
<td>MPU Baseboard</td>
</tr>
<tr>
<td>E215</td>
<td>NVRAM Hard Data CRC</td>
<td>MPU Baseboard</td>
</tr>
<tr>
<td>E216</td>
<td>NVRAM Calibration Data CRC</td>
<td>MPU Baseboard</td>
</tr>
<tr>
<td>E217</td>
<td>Power Down</td>
<td>MPU Baseboard</td>
</tr>
<tr>
<td>E218</td>
<td>NVRAM Soft Data CRC</td>
<td>MPU Baseboard</td>
</tr>
<tr>
<td>E225</td>
<td>NVRAM Constant Data</td>
<td>STI</td>
</tr>
<tr>
<td>E226</td>
<td>NVRAM Calibration CRC</td>
<td>STI</td>
</tr>
</tbody>
</table>

#### 6.4.1.3 On-Line Error Code Designation

An on-line error code is treated as a status change incrementing the alphanumeric display's right-most digit.

Sample Error Code ......................... E 1 * 3

Error Indicator

Error Type
1 - MPU Baseboard A/D
2 - Smart Xmtr Interface Board A/D
4 - Link Interface Board
5 - Watch Dog Time Out - MPU Baseboard
7 - HART Communication Error
8 - Incompatible Link Board

Alarm (Configured through FB11-FB20)
* - Uncleared
Blank - Cleared

Number of Statuses On Stack
6.4.1.4 On-Line Error Codes

Table 6.4 gives the definition and affected board for each on-line error code.

**TABLE 6.4 On-Line Error Codes**

<table>
<thead>
<tr>
<th>LINK CODE</th>
<th>DISPLAY ERROR CODE</th>
<th>DEFINITION</th>
<th>AFFECTED BOARD</th>
</tr>
</thead>
<tbody>
<tr>
<td>$01</td>
<td>E1</td>
<td>A/D Error</td>
<td>MPU Baseboard</td>
</tr>
<tr>
<td>$02</td>
<td>E2</td>
<td>A/D Error</td>
<td>STI</td>
</tr>
<tr>
<td>$04</td>
<td>E4</td>
<td>Board Error</td>
<td>Link Interface</td>
</tr>
<tr>
<td>$05</td>
<td>E5</td>
<td>Watchdog Timeout</td>
<td>All Boards</td>
</tr>
<tr>
<td>$07</td>
<td>E7</td>
<td>HART Error</td>
<td>STI</td>
</tr>
<tr>
<td>$08</td>
<td>E8</td>
<td>Software Compatibility</td>
<td>Link Interface</td>
</tr>
<tr>
<td>$64</td>
<td>NU</td>
<td>Non-Updating Input</td>
<td>Link Interface</td>
</tr>
<tr>
<td>$65</td>
<td>NU</td>
<td>Non-Updating Input</td>
<td>Link Interface</td>
</tr>
<tr>
<td>$66</td>
<td>NU</td>
<td>Non-Updating Input</td>
<td>Link Interface</td>
</tr>
<tr>
<td>$67</td>
<td>NU</td>
<td>Non-Updating Input</td>
<td>Link Interface</td>
</tr>
<tr>
<td>$68</td>
<td>NU</td>
<td>Non-Updating Input</td>
<td>Link Interface</td>
</tr>
<tr>
<td>$69</td>
<td>NU</td>
<td>Non-Updating Input</td>
<td>Link Interface</td>
</tr>
<tr>
<td>$6A</td>
<td>NU</td>
<td>Non-Updating Input</td>
<td>Link Interface</td>
</tr>
<tr>
<td>$6B</td>
<td>NU</td>
<td>Non-Updating Input</td>
<td>Link Interface</td>
</tr>
<tr>
<td>$6C</td>
<td>NU</td>
<td>Non-Updating Input</td>
<td>Link Interface</td>
</tr>
<tr>
<td>$6D</td>
<td>NU</td>
<td>Non-Updating Input</td>
<td>Link Interface</td>
</tr>
</tbody>
</table>

6.4.2 ERROR CODE DISCUSSION

This section discusses the diagnostic test or error check, station response, problem confirmation, and corrective action for each error code. Tables 6.5, 6.6, and 6.7 are for power-up codes; Table 6.8 is for on-line codes.
### TABLE 6.5 E110 Through E124 - Power-Up Error Codes

<table>
<thead>
<tr>
<th>ERROR CODE</th>
<th>DIAGNOSTIC TEST</th>
<th>STATION RESPONSE*</th>
<th>CORRECTIVE ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>E110</td>
<td>RAM - Verifies that memory location can be written to and read from</td>
<td>1. Display blank except for alphanumeric display&lt;br&gt;2. Operator controls inoperative&lt;br&gt;3. Outputs failsafed&lt;br&gt; A. Analog set to -3.3%&lt;br&gt; B. Digital nonconducting&lt;br&gt; C. Relays de-energized</td>
<td>Replace: E110 - MPU Baseboard&lt;br&gt; E120 - STI Board</td>
</tr>
<tr>
<td>E111</td>
<td>ROM CRC - Verifies factory entered data and that it can be read</td>
<td>1. Display blank except for alphanumeric display&lt;br&gt;2. Operator controls inoperative&lt;br&gt;3. Outputs failsafed&lt;br&gt; A. Analog set to -3.3%&lt;br&gt; B. Digital nonconducting&lt;br&gt; C. Relays de-energized</td>
<td>Replace Board: E111 - MPU Baseboard&lt;br&gt; E121 - STI Board</td>
</tr>
<tr>
<td>E121</td>
<td>Compatibility - Checks for hardware compatibility between boards</td>
<td>1. Display blank except for alphanumeric display&lt;br&gt;2. Operator controls inoperative&lt;br&gt;3. Outputs failsafed&lt;br&gt; A. Analog set to -3.3%&lt;br&gt; B. Digital nonconducting&lt;br&gt; C. Relays de-energized</td>
<td>Install hardware compatible board(s).</td>
</tr>
</tbody>
</table>

* Problem Confirmation - remove and reapply station power

STI Board - Smart Transmitter Interface Board

### TABLE 6.6 E213 - Power-Up Database Error Codes

<table>
<thead>
<tr>
<th>ERROR CODE</th>
<th>LINK CODE</th>
<th>DIAGNOSTIC TEST</th>
<th>STATION RESPONSE*</th>
<th>CORRECTIVE ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>E213</td>
<td>D5</td>
<td>ID - Checks for correctness of configuration for boards installed</td>
<td>1. Display blank except for alphanumeric display&lt;br&gt;2. Operator controls inoperative&lt;br&gt;3. Outputs failsafed&lt;br&gt; A. Analog set to -3.3%&lt;br&gt; B. Digital nonconducting&lt;br&gt; C. Relays de-energized</td>
<td>Before pressing a keyboard button, check that the STI Board is plugged-in.&lt;br&gt; If the correct boards are installed, press ENTER CONFIG and re-enter configuration or download new database via LIL.</td>
</tr>
</tbody>
</table>

* Problem Confirmation - remove and reapply station power

6-8 March 1993
# TABLE 6.7 E214 Through E217 - Power-Up Database CRC Error Codes

<table>
<thead>
<tr>
<th>ERROR CODE</th>
<th>LINK CODE</th>
<th>DIAGNOSTIC TEST</th>
<th>STATION RESPONSE*</th>
<th>CORRECTIVE ACTION</th>
</tr>
</thead>
</table>
| E214       | D6        | NVRAM CRC - Verifies transient data | 1. Display active for configuration only  
2. Operator controls operative for configuration only  
3. Outputs failsafed: A. Analog to -3.3% B. Digital nonconducting C. Relays de-energized | Press ENTER CONF button. Re-enter configuration or download database via Local Instrument Link. |
| E215       | D7        | NVRAM CRC - Verifies hard data | 1. Display blank except for alphanumeric; displays active for configuration only  
2. Operator controls operative for configuration only  
3. Outputs failsafed: A. Analog to -3.3% B. Digital nonconducting C. Relays de-energized | If correct Boards are installed, press ENTER CONF button and re-enter configuration or download database via Local Instrument Link. |
| E216       | D8        | NVRAM CRC - Verifies calibration data | 1. Display active for configuration only  
2. Operator controls operative for configuration only  
3. Outputs failsafed: A. Analog to -3.3% B. Digital nonconducting C. Relays de-energized | Press ENTER CONF button. (Station enters normal mode.) At earliest convenience, re-calibrate all inputs and outputs. |
| E226       | E1        |                 |                   |                   |
| E217       | D9        | MPU Baseboard power down | 1. Display active for configuration only  
2. Operator controls operative for configuration only  
3. Outputs failsafed: A. Analog to -3.3% B. Digital nonconducting C. Relays de-energized | Press ENTER CONF button. Re-enter configuration or download new database via Local Instrument Link. |

* Problem Confirmation - remove and reapply station power
### TABLE 6.8 E1 Through E7 - On-Line Error Codes

<table>
<thead>
<tr>
<th>LINK CODE</th>
<th>DISPLAY CODE</th>
<th>DIAGNOSTIC TEST</th>
<th>STATION RESPONSE*</th>
<th>CORRECTIVE ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>E1</td>
<td>A/O Converter - Tests for conversion in required time</td>
<td>Apparent normal operation. Since A/O converter is not functioning properly, some displays may not change even though process is changing.</td>
<td>Replace Board: E1 - MPU Baseboard</td>
</tr>
<tr>
<td>02</td>
<td>E2</td>
<td></td>
<td></td>
<td>E2 - STI Board</td>
</tr>
<tr>
<td>---</td>
<td>E4</td>
<td>Link Interface Bd. - Dual Port RAM (Off-Line) power up</td>
<td>Extended power-up condition, then apparent normal operation. Since Link Interface Board is not operating, some displays may not change.</td>
<td>Replace Link Interface Board</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dual Port RAM (On-Line) operation</td>
<td>Apparent normal operation. Since Link Interface Board is not operating, some displays may not change.</td>
<td></td>
</tr>
<tr>
<td>05</td>
<td>E5</td>
<td>MPU - Check to see if program has been executed in required time</td>
<td>Station executes power-up diagnostic test routines (4 seconds) 1. Display bland except for alphanumeric display (4 seconds) 2. Controls inoperative (4 seconds)</td>
<td>Replace MPU Baseboard</td>
</tr>
<tr>
<td>07</td>
<td>E7</td>
<td>HART communication error</td>
<td>Normal operation</td>
<td>1. Replace MPU Baseboard at next convenient periodic maintenance check. If not replaced, next power cycle will result in a 200 series error and the Station will go off-line. 2. Check power supply for erratic output (can be indicated by momentary display blanking).</td>
</tr>
</tbody>
</table>

* Problem Confirmation:
1. Enable H/T/F lockout switch.
2. Enter configuration mode (T) or (H)
3. Step to value level
4. Push STORE, then exit configuration

If error code remains or reappears, proceed to corrective action column.

If error code does not reappear, an environmental problem (e.g., excessive power input voltage excursion or out-of-specification operating temperature) can exist or an intermittent electrical problem can be present, see corrective action column.
6.5 ASSEMBLY REPLACEMENT

The MPU Baseboard, the Smart Transmitter Interface Board, and the Link Interface Board contain software. The software on a replacement board must be compatible with the software on the other boards in an LOS. Refer to section 6.7 for software compatibility guidelines.

As is the case with most electronic assemblies populated with semiconductor components, precautions must be observed to prevent component damage from ESD (i.e., electrostatic discharge). Accordingly, a maintenance kit containing a wrist strap and a conductive mat must be used whenever an assembly, such as the MPU Baseboard, is removed from or installed in the station case. Refer to Figure 2-8, notice how a wrist strap can be conveniently grounded by clipping it to the bezel screw retainer block.

Whenever an assembly is not installed in a Station, it must be stored in a static shielding bag. These bags are 8" x 12" (20.3cm x 45.7cm) and are available from the factory under material code X6080. The MPU Baseboard requires a larger bag (30.4cm x 45.7 cm) under material code Z74A.

When unplugging ribbon cable from an assembly be sure to grip the connector, not the ribbon wire. Do not let the Display Assembly hang by the connecting ribbon cable. Care should be exercised when seating and unseating circuit boards.

Station calibration will be necessary after replacing any of the following circuit boards: the MPU Baseboard or the Smart Transmitter Interface Board.

6.5.1 DISPLAY ASSEMBLY

To replace the Display Assembly use the following procedure:

REMOVAL:

1. Connect a wrist strap to a good ground.
2. Flip down bezel ID plate and loosen captive bezel retaining screw.
3. Separate Assembly from station case by five inches (12.7 cm); support the Assembly so it doesn’t hang by the ribbon cable.
4. Disconnect ribbon cable from Assembly.
5. Place Assembly in static shielding bag.
6. Disconnect wrist strap.
MAINTENANCE

INSTALLATION

1. Connect a wrist strap to a good ground.
2. Remove Assembly from static shielding bag.
3. Connect ribbon cable to Assembly.

NOTE
When changing a Display Assembly with the Station powered-up and an error code present, the displays will light in a random pattern except for the alphanumeric display which will show the error code. Clear the error to clear displays.

4. Disconnect wrist strap.
5. Position Assembly in front of case and line up captive bezel screw.
6. Make sure ribbon cable is not pinched.
7. Tighten screw and flip up ID plate.

6.5.2 MPU BASEBOARD

To replace the MPU Baseboard or the station fuse use the following procedure:

REMOVAL:

1. In a hazardous area, remove input power from Station.
2. Remove Display Assembly as described in section 6.5.1.
3. Remove the board retainer by extracting board retainer screw (see Figure 2-8).
4. Connect a wrist strap to a good ground.
5. Pivot the MPU Baseboard’s extractor tab to unseat the Board from the rear terminal connection block (refer to Figure 5-3).
6. Slide the Board from the Station case.
7. Place the Board in a static shielding bag.
8. Disconnect wrist strap.
INSTALLATION:

1. Connect a wrist strap to a good ground.
2. Remove the Board from static shielding bag.
3. Set lockout switches as on removed Board (see Figure 5-3).
4. Position end of Board into top and bottom card guide channels.
5. Push top and bottom of Board with equal force and slide it into case.
6. Disconnect wrist strap.
7. Install board retainer (see Figure 2-8).
8. Install Display Assembly as described in section 6.5.1.

 NOTE
Station must be configured when MPU Baseboard is replaced.

6.5.3 SMART TRANSMITTER INTERFACE AND LINK INTERFACE BOARDS

These option boards are removed and installed in a similar manner. Refer to the Parts List at the back of this Instruction for location of boards and mounting hardware.

REMOVAL:

1. Remove Display Assembly as described in section 6.5.1.
2. Remove MPU Baseboard Assembly as described in section 6.5.2.
3. Ground the wrist strap to a grounded conductive mat.
4. Place the MPU Baseboard Assembly on the grounded conductive mat.
5. Remove retaining screws and washers which hold the option board to the MPU Baseboard.
6. Carefully disconnect the option board from the MPU Baseboard. The Smart Transmitter Interface Board is connected via two ribbon cables (see Figure 2-9). The Link Interface Board is plugged directly into the MPU Baseboard. Be sure not to bend any connector pins.
7. Remove the option board and place it in a static shielding bag.
8. Repeat steps 5, 6, and 7 for the second option board if necessary.
MAINTENANCE

INSTALLATION:

1. Ground the wrist strap to the grounded conductive mat.

2. Position the option board over the MPU Baseboard as shown in Parts List drawing.

3. Carefully connect the option board to the MPU Baseboard using the method given in Table 6.9.

   **TABLE 6.9 MPU Baseboard Connections**

<table>
<thead>
<tr>
<th>OPTION BOARD</th>
<th>INTERCONNECTING CABLE</th>
<th>MPU BASEBOARD</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMART TRANSMITTER INTERFACE BOARD</td>
<td>&lt; RIBBON CABLE &gt;</td>
<td>J1</td>
</tr>
<tr>
<td>JP1</td>
<td></td>
<td>J2</td>
</tr>
<tr>
<td>JP2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LINK INTERFACE BOARD</td>
<td>DIRECT PLUG-IN</td>
<td>J3</td>
</tr>
<tr>
<td>P1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. Install retaining screws and washers (and spacers, if necessary) to secure the option board to the MPU Baseboard.

4. Repeat steps 2 and 3 for the second option board to be installed.

5. Perform sections 6.5.2 and 6.5.1 to install the MPU Baseboard and the Display Assembly.

**6.6 RECOMMENDED SPARE AND REPLACEMENT PARTS**

It is recommended that one spare of each of the following items be stocked for every 1 to 10 units in service:

- Fuse
- Display Assembly
- MPU Baseboard
- Smart Transmitter Interface Board
- Link Interface Board

Replacement circuit boards, assemblies and recommended spare parts are available from the factory. Part numbers are provided in the Parts List at the back of this Instruction.

**IMPORTANT**

When ordering a replacement or spare circuit board, provide the following data from the board to be replaced or spared: part number, software compatibility code, and serial number.
An item being returned to the factory should be packaged in its original shipping container. Otherwise, package for safe shipment or contact the factory for shipping recommendation. Send package to one of the addresses given in the Warranty Statement.

**IMPORTANT**

A circuit board must be placed in a static shielding bag before it is packaged for shipment.

### 6.7 SOFTWARE COMPATIBILITY IDENTIFICATION

When adding or changing a circuit board, consideration must be given to the software compatibility of the boards. A three level, alphanumeric, software compatibility code is used to signify the compatibility and identity of LOS software. This code is added to the end of an PROM part number. Each PROM carries a label with the PROM part number and a code as follows:

```
Sample: 14728-3000- B B A
PROM Part Number
System
Station
PROM Revision
```

The System code letter applies to software which defines and formats communications between LOSs (and other stations) connected to the Local Instrument Link. This letter must be the same on all boards within a LOS, whether or not it is connected to a Local Instrument Link.

The Station code letter applies to software which defines communications between boards within a LOS. This letter must be the same on the MPU Baseboard and the Smart Transmitter Interface Board within a LOS. The Link Interface Board’s station code letter does not need to be the same.

**IMPORTANT**

All Local Instrument Link connected LOSs must have Link Interface Boards with the same System code letter and the same Station code letter.

The PROM Revision Code letter indicates the software version. All PROMs on a board must have the same code letter. This letter (and all letters) must be the same on the MPU Baseboard and the Smart Transmitter Interface Board.

March 1993
6.8 MAINTENANCE RECORDS

An accurate record keeping system for maintenance operations should be established and kept up to date. Data extracted from the record can serve as a basis for ordering supplies such as spare parts. In addition, it is useful as a troubleshooting tool by providing historical maintenance data. Scheduled and unscheduled maintenance should be recorded.

WARRANTY

The Company warrants all equipment manufactured by it and bearing its name plate, 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 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.
   Sumneytown Pike
   Spring House, PA 19477

Equipment manufactured or sold by MOORE INSTRUMENT CO.:
   MOORE INSTRUMENTS LTD/LTEE
   2KM West of Mississauga Rd. Hwy. 7
   Brampton, Ontario, Canada

Equipment manufactured or sold by MOORE PRODUCTS CO. (U.K.) LTD.:
   MOORE PRODUCTS CO. (U.K.) LTD.
   Copse Road,
   Lufton, Yeovil,
   Somerset, BA22 8RN
   England

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

March 1993
## PARTS LIST

### MODEL 385
LOOP OPERATOR'S STATION

**Drawing No. 16100-6APL**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>PART NO.</th>
<th>DESCRIPTION</th>
<th>QTY.</th>
</tr>
</thead>
<tbody>
<tr>
<td>'201A 16151-4 Display Assy. (See Parts Dwg. 15738-69PPL)</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>201B 15918-16 Blank Panel</td>
<td>1</td>
<td></td>
<td></td>
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<tr>
<td>'202 15738-242 Board Retainer (Incl. next 4 items)</td>
<td>1</td>
<td></td>
<td></td>
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<tr>
<td>15738-111 Board Retainer (Incl. with item 202)</td>
<td>2</td>
<td></td>
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<tr>
<td>3175-149 Captive Screw (Incl. with item 202)</td>
<td>1</td>
<td></td>
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<tr>
<td>15738-240 Washer (Incl. with item 202)</td>
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<tr>
<td>12351-4 Tnuc Ring (Incl. with item 202)</td>
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<tr>
<td>Mounting Case (See Parts Dwg. 15738-79PPL)</td>
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<td>15738-119 Mounting Case 40 Terminals</td>
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<tr>
<td>15738-120 Mounting Case 20 Terminals (See PL Dwg. 15738-79)</td>
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<td>16151-15 MPU Baseboard 120/240VAC</td>
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<tr>
<td>16151-16 MPU Baseboard 24VAC</td>
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<td></td>
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<tr>
<td>16151-17 MPU Baseboard 24 VDC</td>
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<tr>
<td>16151-18 MPU Baseboard &amp; Expander 120/240VAC</td>
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<td>16151-19 HART Expander Board Kit</td>
<td>1</td>
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<td></td>
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<tr>
<td>14755-123 Plug-In Power Supply (120/240 Vac)</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7447-123 Fuse 2A, 3AG, Slo-Blo (24VCC and 24VAC Stations)</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7447-52 Fuse 0.25A, 3AG, Slo-Blo (220/240VAC Stations)</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7447-54 Fuse 0.5A, 3AG, Slo-Blo 120 VAC Stations</td>
<td>1</td>
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<td></td>
</tr>
<tr>
<td>15853-31 Link Interface Board Kit</td>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Recommended on-hand spare parts. Always specify range, serial no., or other nameplate information when ordering Spare Parts.*

### IMPORTANT

When ordering a replacement or spare circuit board, provide the following data to ensure a compatible assembly:
- part number
- three-letter software compatibility code
- serial number

REF: SD385-1
CONNECT KEYBOARD CABLE TO P2 ON INTERFACE BD.
CONNECT TO J1 ON INTERFACE BD.

<table>
<thead>
<tr>
<th>ITEM</th>
<th>PART NO.</th>
<th>DESCRIPTION</th>
<th>QTY.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6773-9</td>
<td>Retaining Ring</td>
<td>1</td>
</tr>
<tr>
<td>2A</td>
<td>16040-7</td>
<td>Keyboard/Bezel (Model 383)</td>
<td>1</td>
</tr>
<tr>
<td>2B</td>
<td>16100-27</td>
<td>Keyboard/Bezel (Model 381)</td>
<td>1</td>
</tr>
<tr>
<td>2C</td>
<td>15738-330</td>
<td>Keyboard/Bezel (Model 382)</td>
<td>1</td>
</tr>
<tr>
<td>2D</td>
<td>16151-5</td>
<td>Keyboard/Bezel (Model 385)</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>15738-96</td>
<td>Non-Metallic Washer</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>15738-45</td>
<td>Bezel Screw</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>15738-44</td>
<td>Bracket</td>
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</tr>
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<td>6</td>
<td>15738-66</td>
<td>Shaft Bearing</td>
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<td>7</td>
<td>See Note</td>
<td>Display Board</td>
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<td>8</td>
<td>See Note</td>
<td>Display Driven Board</td>
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<td>9</td>
<td>See Note</td>
<td>Display Interface Board</td>
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<td>10</td>
<td>15738-58</td>
<td>Keeper Spring</td>
<td>1</td>
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<tr>
<td>11</td>
<td>15738-69</td>
<td>Cylinder &amp; Shaft Assembly</td>
<td>1</td>
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<tr>
<td>12</td>
<td>15738-57</td>
<td>Keyboard Cover</td>
<td>1</td>
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<tr>
<td>13</td>
<td>15738-280</td>
<td>Knob</td>
<td>1</td>
</tr>
<tr>
<td>14</td>
<td>15738-207</td>
<td>Knob Cap</td>
<td>1</td>
</tr>
<tr>
<td>15</td>
<td>15738-88</td>
<td>I.D. Card</td>
<td>1</td>
</tr>
<tr>
<td>16</td>
<td>1-0390</td>
<td>2-56 x 1.88 Pan Hd</td>
<td>2</td>
</tr>
<tr>
<td>17</td>
<td>1-7216</td>
<td>2 Medium Lockwasher</td>
<td>2</td>
</tr>
<tr>
<td>18</td>
<td>1-0848</td>
<td>4-40 x 1.13 Bd.</td>
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</tr>
<tr>
<td>19</td>
<td>1-7238</td>
<td>4 Medium Lockwasher</td>
<td>2</td>
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</table>

NOTE: Shown for reference only.
### PARTS LIST

**MOUNTING CASE**
(20 TERMINALS & 40 TERMINALS)

**MODELS**: 32C, 351, 352, 372, 362, 383, 385

**Drawing No. 15738-79PL**

**INSTALL ITEM 7 AT A3 WITH "G" EXPOSED.**

<table>
<thead>
<tr>
<th>Item</th>
<th>Part No.</th>
<th>Description</th>
<th>Req'd</th>
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<tbody>
<tr>
<td>1</td>
<td>7419-339</td>
<td>Receptacle</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>15738-49</td>
<td>Case</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>15738-50</td>
<td>Card Guide Midg.</td>
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<tr>
<td>4</td>
<td>15738-52</td>
<td>Mounting Bracket Assy. (Incl. the following 2 items)</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>12740-262</td>
<td>Mounting Screw</td>
<td>2</td>
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<tr>
<td></td>
<td>12740-263</td>
<td>Mounting Stud</td>
<td>2</td>
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<tr>
<td>5A</td>
<td>15738-54</td>
<td>Rear Plate (40 Terminal Case)</td>
<td>1</td>
</tr>
<tr>
<td>5B</td>
<td>15738-55</td>
<td>Rear Plate (20 Terminal Case)</td>
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<tr>
<td>6</td>
<td>15738-56</td>
<td>Power Terminal Cover</td>
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<td>7</td>
<td>15738-60</td>
<td>Ground Strap</td>
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<td>8</td>
<td>15738-61</td>
<td>Terminal Block Barrier (40 Term. Case)</td>
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<td>11</td>
<td>7418-341</td>
<td>Cover Plate</td>
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<tr>
<td>20A</td>
<td>15738-125</td>
<td>Range Resistor Kit</td>
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<tr>
<td></td>
<td>15738-126</td>
<td>Range Resistor Kit (40 Terminal Case)(Not Shown)</td>
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<tr>
<td></td>
<td>15738-127</td>
<td>Range Resistor Kit (20 Terminal Case)(Not Shown)</td>
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<tr>
<td>9</td>
<td>15738-62</td>
<td>Alignment Screw</td>
<td>4</td>
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<td>12</td>
<td>3175-146</td>
<td>Coated Screw</td>
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<td>13</td>
<td>1-0832</td>
<td>4-40 x 0.875 Fill Hd</td>
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<td>14</td>
<td>3603-79</td>
<td>Flt Screw 4-20</td>
<td>6</td>
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<td>15</td>
<td>1-7260</td>
<td>6 Intl Tooth Lwr</td>
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<td>16</td>
<td>1-1174</td>
<td>6-32 x 1/4 Rd</td>
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</tbody>
</table>

**2/93 Supersedes 6/90**

REF: SD351, SD352, SD372, SD382, SD383, SD385-1
INTRODUCTION

Cet addendum indique les précautions, relatives aux emplacements dangereux définis par la CSA, que doit prendre l'utilisateur lors de l'installation ou du dépannage de l'appareil décrit dans la notice ci-jointe. Ces directives complètent celles qui sont données dans la notice ci-jointe.

AVERTISSEMENT

Si les précautions suivantes ne sont pas prises, il pourrait résulter un danger d'explosion.

PRÉCAUTIONS

Emplacements dangereux de classe 1, division 1 et classe 1, 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.

Emplacements 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.
— remplacement d'un fusible, d'une carte de circuit imprimé ou de tout autre élément connecté au circuit électrique.

Ceci termine la section Précautions.
INTRODUCTION

This addendum provides CSA hazardous location precautions that should be observed by the user when installing or servicing the equipment described in the accompanying instruction. These statements supplement those given in the accompanying instruction.

WARNING

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

PRECAUTIONS

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 the accompanying 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.

This completes the precautions.

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