MultiLoad II & RCU II DIVISION 2 (DIV2) Installation Guide

(Part # 6074)
EU Declaration of Conformity

The signatory, representing the manufacturer, declares that the products listed below are in conformity with the essential requirements of the following EC Directive(s) when installed in accordance with the product installation instructions:

- 2014/30/EU: The Electromagnetic Compatibility Directive (and its amending directives)

Product: Operator Interface/Process Control Equipment intended for use in potentially explosive atmospheres
Model name/number: MultiLoad II DIV2 (MID, YES), RCU II DIV2 (MID, NO)
Protective Systems: Nonincendive 'ec ic'

Notified Body(ies): NMI Certin B.V., Number 0122
Hugo de Grootplein 1
3314 EG Dordrecht
The Netherlands

Conformity has been demonstrated with reference to the following documentation:
(ATEX) EC test report for Project 06NK12831, Dated 2007-01-31
(MID) EC type-examination certificate TC7311

Compliance with the Essential Health and Safety Requirements has been assessed by reference to the following standards:
WELMEC guide 8.8: General and Administrative Aspects of the Voluntary System of Modular Evaluation of Measuring Instruments under MID
OIML R117-1:2007(E): Dynamic measuring systems for liquids other than water
EN 61000-6-4: 2007: Generic emissions for industrial operating environments
EN 61000-6-2: 2005: Generic immunity for industrial operating environments
EN 60079-0: 2012: Explosive atmospheres Part 0: Equipment—General requirements
EN60079-7-2015: Explosive atmospheres – Part 7: Equipment protection by increased safety «e»

Year of CE Marking: 2007
Name: William J. Porthouse
Position: Director of Engineering & Production
Date: 20-December-2018

Name Plate
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Overview

This document is designed to guide individuals installing MultiLoad II/RCU II DIV2 equipment, engineering firms developing site electrical drawings, and users troubleshooting system operations such as managers, system administrators, technicians, and meter proving personnel.

The following table provides an informative summary of the material available in this guide:

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<thead>
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<th>Chapter</th>
<th>Topics Covered</th>
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<td>1. General Information and Warnings</td>
<td>This chapter reviews safety and compliance information, as well as instructions for receiving and returning products.</td>
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<tr>
<td>2. Operating Conditions &amp; Components</td>
<td>This chapter covers product outline and dimensions, as well as operating characteristics of the unit.</td>
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<tr>
<td>3. Installing the MultiLoad II/RCU II – DIV2</td>
<td>This chapter covers installation considerations and instructions for the Division 2 (DIV2) Model.</td>
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<td>4. Data Communication Interface</td>
<td>This chapter reviews hardware connections and communication processes.</td>
</tr>
<tr>
<td>5. Connecting Field Devices to the Internal I/O Board</td>
<td>This chapter covers the available I/O points per board, the terminal arrangements per board, and then describes in detail how to connect different field devices to the internal I/O Boards.</td>
</tr>
<tr>
<td>6. Configurations</td>
<td>This chapter describes how to navigate the system, select field values, perform data entry, and toggle options on and off.</td>
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<tr>
<td>7. Service and Repair</td>
<td>This chapter describes how to service and repair the MultiLoad/RCU II DIV-2 subassemblies and parts.</td>
</tr>
<tr>
<td>8. Hardware Revision History &amp; Compatibility</td>
<td>This chapter provides changes, modifications, and updates to the hardware.</td>
</tr>
<tr>
<td>9. Revision History</td>
<td>This chapter provides further hardware revisions as well as revisions made to this document.</td>
</tr>
</tbody>
</table>
The following keys allow the user to locate information needed in this guide:

<table>
<thead>
<tr>
<th>ICON KEY</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>i</td>
<td>Important information to enhance understanding and make better use of the product.</td>
</tr>
<tr>
<td>!</td>
<td>Indicates potential damage to hardware or loss of data.</td>
</tr>
<tr>
<td>⚠️</td>
<td>Potential for property damage or that personal injury may occur. Pay close attention and follow instructions when this symbol is displayed.</td>
</tr>
</tbody>
</table>

**Typographical Conventions:**

**Boldface:** Indicates what is pressed on the keypad. Example: Key in **00000**.

**Italics:** Emphasizes a key product or industry term. Example: the display features a pick-list style of item selection.

This guide covers RCU/MultiLoad DIV2 installation information only. For information about base MultiLoad firmware, please consult the MultiLoad II User Guide. For information about wiring other models, please consult the respective installation guides. For information about the MultiLoad register interface and Modbus communication, please reference the MultiLoad II Communication Guide. Updated versions of all manuals, including this one, are available on our website at [http://www.toptech.com](http://www.toptech.com).
Chapter 1  General Information & Warnings

1.1  Receiving and/or Returning Equipment

At receipt, the MultiLoad II/RCU II should be immediately inspected after opening the packaging case. If any damage is visible, notify the carrier at once to establish liability.

Contact Toptech’s Return Materials Department to initiate timely repair or replacement of the unit.

A Return Materials Authorization (RMA) will be for the purpose of returning the product or parts requiring repair. Do not return any material to Toptech without an RMA.

Contact Information for Americas:

Return Materials Department
Toptech Systems, Inc.
1124 Florida Central Pkwy
Longwood, FL 32750  USA
+1 (407) 332-1774

Contact Information for EMEA and Asia:

Return Materials Department
Toptech Systems NVs
Nieuwe weg 1- haven 1053
2070 Zwijndrecht, BELGIUM
+32 (0)3 250 60 60

Prior to installation, the MultiLoad II/RCU II should be stored in its packing case and be protected from damage due to handling and adverse weather conditions.
1.2 Safety Warnings

**NORTH AMERICAN INSTALLATIONS:**

▲ This equipment is suitable for use in Class I, Division 2, Groups C and D locations, OR non-hazardous locations.

▲ **WARNING: EXPLOSION HAZARD.** Do not disconnect equipment unless power has been removed or the area is known to be non-hazardous.

▲ **WARNING: EXPLOSION HAZARD.** Substitution of components may impair suitability for Class I, Division 2.

▲ **WARNING: EXPLOSION HAZARD.** The area must be known to be non-hazardous before servicing/replacing the unit and before installing.

▲ **CAUTION: Battery may explode if mistreated.** DO NOT RECHARGE, DISASSEMBLE, OR DISPOSE OF IN FIRE.

▲ **CAUTION: Field wiring must have a temperature rating of 75 °C or greater.**

▲ A battery is soldered to the processor board for retention of data, time, and date. This battery should last more than ten years. Please return the board to Toptech Systems for battery replacement. **This battery must be replaced with Matsushita Electric, model BR2477A only. Use of another battery may present a risk of fire or explosion.**

▲ The installation of this product must be in conformity with NFPA 70 (US National Electric Code) or CSA C22.1 (Canadian Electrical Code) as appropriate.

**INSTALLATIONS NORD-AMÉRICAINES (FRANÇAIS)**

▲ Cet équipement est compatible pour une installation en Classe I, Division 2, Groupes C & D ou les emplacements non dangereux..

▲ **AVERTISSEMENT: RISQUE D'EXPLOSION.** Avant de déconnecter l’équipement, couper le courant ou s’assurer que l’emplacement est designé non dangereux.

▲ **AVERTISSEMENT: RISQUE D'EXPLOSION.** La substitution de composants peut rendre ce matériel inacceptable pour les emplacements de Classe I, Division 2.

▲ **AVERTISSEMENT: RISQUE D'EXPLOSION.** Avant réparer ou remplacer l’équipement et avant d’installer s’assurer que l'emplacement est designé non dangereux.

▲ **PRUDENCE: La pile peut exploser si elle est maltraitée.** NE PAS RECHARGER, NE PAS DÉMONTER, ET NE PAS JETER DANS LE FEU.

▲ **PRUDENCE: Câblage de terrain doit avoir un classement de température de +75 °C ou plus.**

▲ Une pile est soudée à la carte processeur pour la conservation des données, de l’heure, et de la date. Cette pile devrait durer pendant plus que dix ans. Veuillez retourner la carte processeur à Toptech Systems pour le remplacement de la pile. **Remplacez la pile avec Matsushita Electric, modèle BR2477A seulement. Utiliser une autre pile peut présenter un risque d'incendie ou d'explosion.**

▲ L’installation de ce produit doit se conformer avec le Code National d’Électricité, NFPA 70 ou le Code Canadien d’Électricité, CSA C22.1 comme appropriée.
ATEX AND IECex INSTALLATIONS:

▲ This equipment is suitable for use in EX Zone 2 Group IIB Locations, OR non-hazardous locations.

▲ WARNING: Do not open when an explosive atmosphere may be present.

▲ WARNING: Do not disconnect equipment unless power has been removed or the area is known to be non-hazardous.

▲ WARNING: EXPLOSION HAZARD. The area must be known to be non-hazardous before servicing/replacing the unit and before installing.

▲ CAUTION: Battery may explode if mistreated. DO NOT RECHARGE, DISASSEMBLE, OR DISPOSE OF IN FIRE.

▲ CAUTION: Field wiring must have a temperature rating of 75 °C or greater.

▲ A battery is soldered to the processor board for retention of data, time, and date. This battery should last more than ten years. Please return the board to Toptech Systems for battery replacement. This battery must be replaced with Matsushita Electric, Model BR2477A only. Use of another battery may present a risk of fire or explosion.

▲ The installation of this product must be in conformity with IEC/EN 60079-14.

1.3 Electrostatic Discharge (ESD) Protection

The MultiLoad II/ RCU II contains electronic components and assemblies subject to damage by ESD. The MultiLoad II/ RCU II was designed to protect against ESD while the unit is closed and in normal operation. Proper handling procedures must be observed during the removal, installation, repair and other handling of printed circuit board assemblies, electronic devices and components. This includes:

1) Service to be performed by authorized personnel only.
2) The person performing the service must be grounded by an ESD grounding strap and connected to ground.
3) While performing maintenance or repair, touch an unpainted metal of the MultiLoad II/ RCU II surface prior to touching or handling any printed circuit boards or electronic components.
4) Printed circuit board assemblies must be placed in and transported in conductive bags or other conductive containers.
5) Printed circuit boards must not be removed from the conductive container until time of use.
6) All other “best” practices for protecting devices from ESD must be observed.
1.4  **FCC Note**

This equipment complies with the limits for a Class A Digital Device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at their own expense.

Modifications not approved by the manufacturer could void the user's authority to operate the equipment under FCC rules.
Chapter 2  Operating Conditions and Components

2.1  Product Outline and dimensions

2.1.1  MultiLoad II/RCU II – DIV2 Model - Picture

Figure 2.1  MultiLoad II (ML II) / Remote Control Unit II (RCU II) Division 2 Unit
2.1.2 MultiLoad II/ RCU II – DIV2 Model – Dimensions

The dimensions in this section are indicated in inches and millimeters (in parenthesis).

2.1.2.1 Front View

![Diagram of MultiLoad II/ RCU II – DIV2 Model – Front View]

Figure 2.2 Unit Outline Drawing – Front View
2.1.2.2 Back View

RCUll/ ML II Div 2
MOUNTING TEMPLATE

Figure 2.3 Unit Outline Drawing – Back View
2.1.2.3  **Bottom View**

### 2.1.2.3.1  **2- Hole Base**

2 x 1" NTP Aluminum HUBS

![Diagram of 2 Hole Base](image1)

**Figure 2.4**  Unit Outline Drawing – Bottom View - 2 Hole Base

### 2.1.2.3.2  **5- Hole Base (Europe)**

3xM20 and 2xM25

![Diagram of 5 Hole Base](image2)

**Figure 2.5**  Unit Outline Drawing – Bottom View - 5 Hole Base
2.1.2.4 Side View

Figure 2.6 Unit Outline Drawing – Side View
2.2 Operating Characteristics

The Remote Control Unit – Division 2 (DIV2) Model has the following characteristics:

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Description</th>
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<tbody>
<tr>
<td>Operating Voltage Voltage Option</td>
<td>85 - 250 Vac, 47-63 Hz, 300 – 150 mA</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>40°F to 140°F: -40°C to 60°C</td>
</tr>
<tr>
<td>Enclosure</td>
<td>Type 4, IP65 ETL Listed (US, Canada) Class 1, Division 2, Groups C &amp; D, T4</td>
</tr>
<tr>
<td>Weight</td>
<td>24 lbs : 11 kg</td>
</tr>
<tr>
<td>Display</td>
<td>Color 8.4” Diagonal VGA</td>
</tr>
<tr>
<td>Prox Card Reader</td>
<td>Captive or Non-captive: supports TWIC</td>
</tr>
<tr>
<td>Lockable External W&amp;M Bolts</td>
<td>Program Access, Weights &amp; Measures Parameter Access (on MultiLoad only)</td>
</tr>
<tr>
<td>Keypad</td>
<td>47 Key Alpha/ Numeric Membrane Switch Keypad</td>
</tr>
<tr>
<td>Communications</td>
<td>3 serial ports (1 RS-485, 2 User Selectable RS-232 or RS-485)</td>
</tr>
<tr>
<td></td>
<td>1 Ethernet port 10/100 Mbps</td>
</tr>
</tbody>
</table>

**Internal I/O Options:** Two versions of an optional internal I/O board are available:
- the Digital/ Analog I/O board.
- the 2 Meter I/O board.

The quantity and electrical ratings of each I/O are described in the table below:

<table>
<thead>
<tr>
<th>Type I/O</th>
<th>Digital/ Analog I/O Quantity, Location</th>
<th>2 Meter I/O Quantity, Location</th>
<th>Electrical Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC Outputs:</td>
<td>5 (TB1)</td>
<td>8 (TB2, TB3)</td>
<td>12 - 250 Vac rms, 500 mA (per point), TB1</td>
</tr>
<tr>
<td>AC Inputs:</td>
<td>0</td>
<td>2 (TB1)</td>
<td>90 - 250Vac</td>
</tr>
<tr>
<td>DC Outputs:</td>
<td>3 (TB3)</td>
<td>2 (TB9)</td>
<td>0 - 30 Vdc, 600 mA (per point), TB3</td>
</tr>
<tr>
<td>DC Inputs:</td>
<td>5 (TB2-Right) (2 High Speed)</td>
<td>6 (TB7, TB8) (4 High Speed)</td>
<td>5 - 30Vdc, TB2B Dual Channel flow meter inputs (1-5000Hz) Miscellaneous signal inputs</td>
</tr>
<tr>
<td>12Vdc Source:</td>
<td>167mA Max Load (TB2-Left)</td>
<td>250mA Max Load (TB6)</td>
<td>Isolated Power Supply Power for flow meter pulser or preamps</td>
</tr>
<tr>
<td>RTD Input:</td>
<td>1 (TB4)</td>
<td>2 (TB4, TB5)</td>
<td>100-ohm platinum, four wire Coefficient 0.00385 Ohm/Ohm/°C</td>
</tr>
<tr>
<td>Analog Input</td>
<td>1 (TB5)</td>
<td>0</td>
<td>4 - 20mA, 1.5V maximum burden</td>
</tr>
<tr>
<td>Analog Output</td>
<td>1 (TB6)</td>
<td>0</td>
<td>4 - 20mA, Requires 12Vdc – 30Vdc Supply</td>
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### Internal I/O Heat Dissipation:

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<td>Acout</td>
<td>230</td>
<td>50</td>
<td>0.36</td>
<td>5</td>
<td>1.78</td>
<td>8</td>
<td>2.85</td>
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<td>120</td>
<td>60</td>
<td>0.32</td>
<td>5</td>
<td>1.62</td>
<td>8</td>
<td>2.60</td>
</tr>
<tr>
<td>Acin</td>
<td>230</td>
<td>50</td>
<td>0.73</td>
<td>0</td>
<td></td>
<td>2</td>
<td>1.46</td>
</tr>
<tr>
<td></td>
<td>120</td>
<td>60</td>
<td>0.44</td>
<td>0</td>
<td></td>
<td>2</td>
<td>0.89</td>
</tr>
<tr>
<td>Dcout</td>
<td>5</td>
<td>--</td>
<td>0.02</td>
<td>3</td>
<td>0.07</td>
<td>2</td>
<td>0.05</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>--</td>
<td>0.02</td>
<td>3</td>
<td>0.07</td>
<td>2</td>
<td>0.05</td>
</tr>
<tr>
<td></td>
<td>24</td>
<td>--</td>
<td>0.02</td>
<td>3</td>
<td>0.07</td>
<td>2</td>
<td>0.05</td>
</tr>
<tr>
<td></td>
<td>30</td>
<td>--</td>
<td>0.02</td>
<td>3</td>
<td>0.07</td>
<td>2</td>
<td>0.05</td>
</tr>
<tr>
<td>Dcin</td>
<td>5</td>
<td>--</td>
<td>0.00</td>
<td>6</td>
<td>0.03</td>
<td>6</td>
<td>0.03</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>--</td>
<td>0.06</td>
<td>6</td>
<td>0.33</td>
<td>6</td>
<td>0.33</td>
</tr>
<tr>
<td></td>
<td>24</td>
<td>--</td>
<td>0.16</td>
<td>6</td>
<td>0.97</td>
<td>6</td>
<td>0.97</td>
</tr>
<tr>
<td></td>
<td>30</td>
<td>--</td>
<td>0.23</td>
<td>6</td>
<td>1.41</td>
<td>6</td>
<td>1.41</td>
</tr>
<tr>
<td>4-20 mA Input</td>
<td>--</td>
<td>--</td>
<td>0.03</td>
<td>1</td>
<td>0.03</td>
<td>0</td>
<td>--</td>
</tr>
</tbody>
</table>

*I/O points dissipating 1 mW or less are not reported*
Chapter 3  Installing the MultiLoad II/RCU II DIV2

3.1  Tools Required

3.1.1  Installation
- ¼" Flat Head screw driver is required for tightening cover screws.

3.1.2  Servicing and Repair
- #2 Philips screwdriver for circuit board removal.
- ¼" socket wrench for CPU circuit board removal and a 5/16" socket wrench for display board removal.
- #2 Philips screwdriver for removal of keypad plat screws.

3.2  Cover Closure and Bolt Replacement
When closing the cover, gently lift on the bottom of the cover when in position for starting one or two of the right corner screws. This is done to assist the alignment of the cover and base holes for starting the screws. The enclosure cover is secured to the housing by four 6mm slotted/Philips screws. When the screws are removed, the front cover will swing left and hang from its hinges. The screws are captive and will remain with the cover.

3.3  Cable Entries
Two 1” NPT conduit hubs are provided for the installation of conduit and cables.
No hubs are provided with the 5 hole base.

3.4  Mounting the MultiLoad II/RCU II DIV-2 Enclosure
The DIV-2 enclosure should be located in a shaded area. Direct sunlight can increase internal temperature to greater than 140°F or 60°C.
Exterior dimensions of the standard MultiLoad II/ RCU II DIV-2 enclosure are shown in Figures 2.2 – 2.6. There is only one mounting orientation possible; reference Figure 2.2 for the MultiLoad II/ RCU II DIV-2 Mounting Template. The cable entries are located at the bottom of the unit.

Appropriate fasteners must be selected to support the minimum weight of 24 lbs (11 kg). Toptech offers the following mounting suggestions for three typical surfaces: drywall, wood, or concrete/cinder block.

### 3.4.1 Drywall

Insert four fasteners through the corner mounting holes, shown in Figure 2.2. For the fasteners, use #14 x 1 ¾” (M6 x 40 mm) Phillips pan head sheet metal screws inserted in #14 (M6) self-tapping nylon anchors.

Place one #14, 3/8” OD (M6, 10 mm OD) flat washer under the head of the screw before inserting the screw into the mounting hole.

### 3.4.2 Wood

Follow the instructions above for Drywall installation, substituting the #14 x 1 ¾” (M6 x 40 mm) wood screws for the four sheet metal screws. Do not use the self-tapping nylon inserts.

### 3.4.3 Concrete or Cinder Block Walls

Follow the instructions above for Drywall installation, substituting the a 1/4 ” x1 3/4” Tapcon masonry fastener for the four sheet metal screws. Do not use the self-tapping nylon inserts.

Drill pilot holes for the Tapcons using a 3/16” x 3 ½” masonry drill bit.

### 3.4.4 Mounting Height Considerations

When mounting the enclosure, be aware of the limitations that the cover places on screen visibility. Because the display is inset about an inch [25mm] from the surface of Div-2 and SMP units and the screen is inset an inch-and-one-half [39mm] in the EXL unit, the enclosure should be mounted so that top of the screen’s visible area is at eye level of the tallest operator. Figure 3.1 shows the visible area at arm’s length and the distance from the ground to the top mounting hole location for a six-foot [1.8m] tall user. Figure 3.2 shows the offset of the top of the screen’s visible area from the top mounting bolt and the depth of the screen within the unit.
Figure 3.1  Suggested Mounting Position

Figure 3.2  Screen Visible Area
3.5 Recommended Wire Sizes and Torque for All Terminal Blocks

Three sizes of terminal blocks are used in the MultiLoad II/RCU II products: 7.62 mm pitch (supply power), 5.08 mm pitch (line voltage switching), and 3.81 mm pitch (serial communication, analog or dc voltages). The 7.62 and 5.08 mm terminal blocks have an allowable wire size of 24 AWG – 12 AWG and should be tightened to 0.55 Nm +/- 0.05 Nm (5 lb in +/- 0.4 lb in).

The 3.81 mm terminal blocks have an allowable wire size of 28 AWG – 16 AWG and should be tightened to 0.23 Nm +/- 0.02 Nm (2 lb in +/- 0.2 lb in).

3.6 Electrical Supply Connections

The MultiLoad II/RCU II may be equipped for either 85 -250Vac or 24Vdc operation. Verify the power type before making any connections.

Wiring must be rated 75°C or greater.

**WARNING:** If there are unused holes, blanking elements appropriate for the type enclosure must be used.

Do not route AC and DC wiring in the same conduit.

All wiring must enter the MultiLoad II/RCU II enclosure through conduit via entries in the bottom of the enclosure. All conduits must be terminated at the enclosure by use of appropriately-rated conduit hubs or glands.

Wires must be stripped ¼” and fully inserted into terminal block with no bare conductor exposed. Review section 3.5 for recommended wire size and torque values.

Both ac and dc input models require a safety ground connection as described in section 3.6.3 below.

A service loop is recommended for all wires and cables entering the enclosure.

Do not allow service loop cables to overlap the circuit boards. Coil any cable length in the bottom of the enclosure. Keep AC wiring separated from all other wiring in the enclosure by use of the supplied partitions (see wire partition instructions below).

Wiring must comply with all local electrical codes.
### 3.6.1 AC Powered Models

Provide over current protection using a 15 Amp circuit breaker or equivalent. The breaker also serves as a means of disconnection from the operating supply as required by UL/ISA/IEC 61010-1 and CAN/CSA-C22.2 NO. 61010-1. The disconnected device may not be blocked or be made difficult to operate by the MultiLoad II/RCU II or any other device. Note that installation of disconnects are typically prohibited in Class I, Division 2 locations.

Power required: 85 – 250 Vac, 47 – 63 Hz, 300 mA @ 85Vac/150 mA @250Vac. The power connector is located in the right hand, bottom corner of the Power Supply/Communication board as shown in figure 3.3. Select supply wire rated 300V or better with a flammability rating of at least VW-1.

![MultiLoad II/RCU II AC Power Supply/Comm Board](image)

### 3.6.2 DC Powered Models

The MultiLoad II/ and RCU II is optionally available with a 24 Vdc power supply. The power source used to supply the MultiLoad II/RCU II must be rated 9 – 30 Vdc SELV, Limited Energy (Class 2). The rated supply input current is 600mA. The supply should be protected by a 1.5 Amp fuse.
The 3-position terminal block is located in the right hand corner of the power supply/communication board.

### Wiring guidelines for using 24 Vdc power supply:

<table>
<thead>
<tr>
<th>Wire gauge (AWG)</th>
<th>Distance (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>24</td>
<td>50</td>
</tr>
<tr>
<td>22</td>
<td>100</td>
</tr>
<tr>
<td>20</td>
<td>150</td>
</tr>
<tr>
<td>18</td>
<td>250</td>
</tr>
<tr>
<td>16</td>
<td>400</td>
</tr>
</tbody>
</table>

**Figure 3.4** DC Power Connections

#### 3.6.3 Equipment Grounding

A safety ground should be attached to terminal block TB1 (on both ac and dc input power models) to maintain electrical safety in the event of a fault condition. Follow the terminal block wiring instructions in section 3.6. Keep the required tightening torque in mind (section 3.5).

The external ground connection is not provided for the attachment of the protective conductor (the safety ground). Rather, it is provided only as a supplemental bonding connection where local authorities permit or require such a connection: for example, as a means of equipotentiality. The wire connection is on the bottom right exterior surface. The following wire sizes may be used: 10 AWG (5.26 mm²) or 11 AWG (4.17 mm²).

**⚠️** Do not connect the power supply dc common to earth ground.
The MultiLoad II/RCU II has four (4) communications ports (see Figure 3.3), each with a specific purpose. The following section provides the information required to select and make the wiring connections to the ports:

<table>
<thead>
<tr>
<th>Communication Port</th>
<th>Interface Type</th>
<th>Typical Function</th>
<th>Terminal (Figure 3.3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comm. Port 0</td>
<td>RS-485</td>
<td>Internal I/O board / FCM I / FCM II / PCM Communication</td>
<td>TB2</td>
</tr>
<tr>
<td>Comm. Port 1</td>
<td>RS-232 or RS-485</td>
<td>Host Communication (TMS) / Printer</td>
<td>TB3  RS-232 TB4  RS-485</td>
</tr>
<tr>
<td>Comm. Port 2</td>
<td>RS-232 or RS-485 (2 wire)</td>
<td>Ticket Printer/Data Logger</td>
<td>TB5</td>
</tr>
<tr>
<td>Ethernet</td>
<td>10/100MBPS</td>
<td>Host Communication (TMS)</td>
<td>J3 Cat 5 (or higher)Cable</td>
</tr>
</tbody>
</table>

- If a service loop is used, the maximum wire length in the service loop should not exceed 3 inches [75mm].
- Separate AC and DC wiring by at least 3 inches [75mm]. Do not allow excess wire in the service loop to overhang printed circuit board.
- Default settings in MultiLoad are: COM O – FCM ; COM 1- HOST , and COM2 – NA. See the user guide for more details
- Only one port may be defined as an FCM, Print or Alibi Log, otherwise, a ‘Port Usage Conflict(s)’ message will display upon re-boot. See the user guide for more details
4.1 Available Communications Protocol Selection and Wire Spec

This section describes the available communication protocols for MultiLoad II/RCU II.

4.1.1 RS-422/485

The RS-422/485 communications protocol is designed for multi-point (i.e. computer to multiple devices, also called multi-dropped) communications up to 4,000 feet (1,220 Meters).

RS-422 requires 4-wires (2 twisted pair) for full duplex communications and utilizes a transmit pair of wires (TDA & TDB) and a receive pair of wires (RDA & RDB).

RS-485 requires 2-wires (1 twisted pair) for half duplex communications and utilizes a single pair of wires (TDA/RDA & TDB/RDB) for transmittal and receiveal.

This manual will typically refer to both RS-422 and RS-485 as simply RS485 2 Wire or RS485 4 Wire.

Although a ground wire is not required, the common mode voltage between the MultiLoad II/RCU II and the field device must be within -7Vdc to 12Vdc. To correct situations where this is not the case, the DC common is available on COM 0 and COM 1 by using TB2, pin five (revision 1.1 Power Supply/Comm boards only) and TB3, pin three.

Connect the MultiLoad II/RCU II DC common to the signal ground of the field device.

Wire used must meet the following characteristics:

- 24 AWG stranded.
- 4-wire, two twisted pair with overall shield.
- 2-wire, one twisted pair with overall shield.
- 30 pF maximum between conductors.
- 1,000 ohm impedance.
- Maximum length: 4,000 feet (1,220 Meters).
- Maximum stub length: 15 feet.

All exposed shields must be properly insulated to prevent short circuits.

All shields must be continuous, soldered, and properly insulated.

4.1.2 RS-232

The RS-232 protocol is designed for point-to-point (i.e., computer to a single device) communications limited to 50 feet requiring a minimum of 3 wires: transmit, receive and ground.

Additional wires are required for hardware handshaking when using printers and data loggers.

Wire used must meet the following characteristics:

- 24 AWG.
- 3 conductor with overall shield (data only) or 8 conductor with overall shield (full handshaking).
- 30 pF maximum between conductors.

### 4.1.3 Ethernet

The Ethernet controller on revision 2.0 CPU boards uses HP Auto-MDIX technology. By automatically detecting the signaling on the connected device, the transceiver will configure the port settings automatically. Thus, the choice of a straight through or cross over cable no longer has to be made—either will work.

Ethernet is available on MultiLoad II/RCUII with revision 2.0 or higher CPU boards.

Wire used must meet the following characteristics:
- Ethernet wiring standard T568B - Cat5 cable (or greater).

### 4.2 Communication Connection Wiring

This section describes the wiring connections for each of the communication ports in order to function for a specific communication protocol.

#### 4.2.1 FCM I / FCM II Communications (MultiLoad II Product Only) - COM 0 –Port – RS485

FCM I, FCM II and PCM modules communicate with the MultiLoad II using the COM0. This is a dedicated communication line.

The FCMII modules linked to a specific MultiLoad II are all on a RS-485 bus connected this COM 0 port.

The TD and RD pairs are swapped at the MultiLoad II.

If an internal I/O board is installed, this board is already connected to COM 0 and is addressed as FCM #0.

All FCMs must be uniquely addressed.
4.2.2 Host/TMS Communications

A host/ TMS computer system can be connected to the MultiLoad II/ RCU II in various ways:
- RS485 4-wire on COM 1
- RS485 2-wire on COM1
- RS232 on COM1
- Ethernet on the ethernet port

4.2.2.1 COM 1 - RS-485 4-wire - Host/TMS Communications

A host/ TMS computer system can be connected to the MultiLoad II/ RCU II via RS485 4-wire on COM 1.

The TD and RD pairs are swapped at the Host/TMS.

MultiLoad II/RCU can be middropped on the same communication line using a RS485 – 4 Wire on COM 1 to communicate to a host system.
4.2.2.2 COM 1 - RS-485 2-Wire: Host/TMS Communications

The Host/TMS Computer System can be connected to the MultiLoad II/RCU II via RS485 2-Wire on COM 1.

The TD and RD pairs tied together at the Host/TMS and all MultiLoad II/RCU IIs.

---

Figure 4.3  RS485 4-Wire, Host to Multiple MultiLoad II/ RCU IIs

Figure 4.4  RS485 2-Wire, Host to a Single MultiLoad II/ RCU II
MultLoad II / RCU II can be multidropped on the same communication line using RS485 – 2 Wire on COM 1:

4.2.2.3 COM 1 - RS-232 - Host/TMS Communications

The Host/TMS Computer System can be connected to the MultLoad II/ RCU II via RS232 on COM 1.

The TX and RX are swapped at the Host/TMS.
MultiLoad II/RCU II has the ability to multi-drop onto a RS232 line on COM 1:

![Diagram](attachment:image.png)

Figure 4.7 RS232, Host to Multiple MultiLoad II/RCU IIs

### 4.2.2.4 Ethernet – Host/TMS Communications

The Host/TMS Computer System can be connected to the MultiLoad II/RCU II using Ethernet.

The Ethernet controller on revision 2.0 CPU boards uses HP Auto-MDIX technology. By automatically detecting the signaling on the connected device, the transceiver will configure the port settings automatically. Thus, the choice of a straight through or cross over cable no longer has to be made—either will work.

- Ethernet is available on MultiLoad II/RCU II with revision 2.0 or higher CPU boards.

![Diagram](attachment:image.png)

Figure 4.8 Ethernet Connections
4.2.3 Host Ticket Printer/Data Logger

Ticket Printers or alilibog printers can be connected to the MultiLoad II/RCU II in the following ways:
- RS 232 on COM1
- RS 232 on COM2
- Ethernet on the ethernet port

4.2.3.1 COM2 – RS232 - Host Ticket Printer/Data Logger

A Ticket Printer or Data Logger can be connected to the MultiLoad II/RCU II via RS232 on COM 2.

The TX and RX are swapped at the MultiLoad II/RCU II.
Handshake lines MUST be connected or terminated, or a printer error will be reported.
MultiLoad II/RCU II will monitor CTS, DSR and DCD for active signals.

Figure 4.9   Ticket Printer / Data Logger Connections with Handshake
When Print or Alibi Log is configured to be on COM 2, the CTS handshake line MUST be connected or a printer error will occur, preventing loading.

A Special variant of the ticket printing uses the **PTB protocol**.

A PTB printer can be connected to the MultiLoad II/ RCU II via RS232 on COM 2 or COM1:
COMMUNICATION SETUP COM (1)

Baud Rate: 9600
Parity: Even
Data Bits: 7 Data
Stop Bits: 1 Stop
Multidrop: Single
Type: PTB
Two I/O board options are offered for use with the MultiLoad II. They are the Digital/ Analog I/O Board and the 2 Meter I/O Board. They primarily differ in the number of I/O points, although the latter can control two meters as its name implies. The RCU II only supports the Digital/ Analog I/O Board. Figures 5.1 and 5.2 show the board’s terminal arrangements.

The 2 Meter I/O board treats its I/O in two groups corresponding to two different meters. In the 2 Meter I/O wiring diagrams that follow, FCM 0 ports correspond to the first meter and FCM 1 ports correspond to the second meter. For more information, please consult the MultiLoad II Users Guide.

5.1 Where to Find the Internal I/O Board

The I/O board is mounted above the Power Supply/Comm board. The I/O board is connected to the Power Supply/Comm board at J4 & J5. Corresponding connections are on the bottom side of the I/O board.

Caution: Disconnect from the supply circuit before opening the enclosure. Keep this tightly closed when circuits are live.
### 5.2 Available I/O Points per Board

The quantity and electrical ratings of the available I/O points per board are described in the table below.

For easy recognition and use, a circuit symbol corresponding to its’ board is located in the last column:

<table>
<thead>
<tr>
<th>TYPE I/O</th>
<th>DIGITAL/ ANALOG I/O BOARD QUANTITY</th>
<th>2 METER I/O BOARD QUANTITY</th>
<th>ELECTRICAL RATING</th>
<th>CIRCUIT SYMBOL</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC Outputs</td>
<td>5</td>
<td>8</td>
<td>12 - 250 Vac rms, 500 mA (per point), TB1</td>
<td></td>
</tr>
<tr>
<td>AC Inputs</td>
<td>0</td>
<td>2</td>
<td>90 - 250Vac</td>
<td></td>
</tr>
<tr>
<td>DC Outputs</td>
<td>3</td>
<td>2</td>
<td>0 - 30 Vdc, 600 mA (per point), TB3</td>
<td></td>
</tr>
<tr>
<td>DC Inputs</td>
<td>5</td>
<td>6</td>
<td>5 - 30Vdc, TB2B Dual Channel flow meter inputs (1-5000Hz) Miscellaneous signal inputs</td>
<td></td>
</tr>
<tr>
<td>12Vdc Source</td>
<td>167mA Max Load</td>
<td>250mA Max Load</td>
<td>Isolated Power Supply Power for flow meter pulsers or preamp</td>
<td></td>
</tr>
<tr>
<td>RTD Input</td>
<td>1</td>
<td>2</td>
<td>100-ohm platinum, four wire Coefficient 0.00385 Ohm/Ohm/°C</td>
<td></td>
</tr>
<tr>
<td>Analog Input</td>
<td>1</td>
<td>0</td>
<td>4 - 20mA, 1.5V maximum burden</td>
<td></td>
</tr>
<tr>
<td>Analog Output</td>
<td>1</td>
<td>0</td>
<td>4 - 20mA, Requires 12Vdc – 30Vdc Supply</td>
<td></td>
</tr>
</tbody>
</table>
Certain I/O circuit symbols have dedicated functions, which are described in the table below. This list is not exhaustive, but contains those most frequently used:

<table>
<thead>
<tr>
<th>TYPE I/O</th>
<th>CIRCUIT SYMBOL</th>
<th>FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC Output</td>
<td></td>
<td>All AC outputs may be used as line voltage ON/ OFF control.</td>
</tr>
<tr>
<td>AC Output</td>
<td></td>
<td>If a digital valve control is used, PORT 2 is dedicated to control the (N.O.) upstream solenoid.</td>
</tr>
<tr>
<td>AC Output</td>
<td></td>
<td>If a digital valve control is used, PORT 3 is dedicated to control the (N.C.) downstream solenoid.</td>
</tr>
<tr>
<td>AC Output</td>
<td></td>
<td>If an additive injection control is used, the numbered AC output must be paired with the corresponding numbered DC input.</td>
</tr>
<tr>
<td>DC Input</td>
<td></td>
<td>All DC inputs may be used as general digital signal inputs.</td>
</tr>
<tr>
<td>DC Input</td>
<td></td>
<td>If a product meter pulser is used, PORT 4 is dedicated to the A channel (single or optional quadrature).</td>
</tr>
<tr>
<td>DC Input</td>
<td></td>
<td>If a product meter pulser is used, PORT 5 is dedicated to the B channel (of optional quadrature).</td>
</tr>
<tr>
<td>DC Input</td>
<td></td>
<td>If an additive injection control is used, the numbered DC input must be paired with the corresponding numbered AC output.</td>
</tr>
<tr>
<td>AC Input</td>
<td></td>
<td>All AC inputs may be used as line voltage digital inputs (typically permissives).</td>
</tr>
<tr>
<td>DC Output</td>
<td></td>
<td>All DC outputs may be used as general digital outputs.</td>
</tr>
<tr>
<td>RTD Input</td>
<td></td>
<td>The RTD input is reserved for MultiLoad temperature compensation.</td>
</tr>
<tr>
<td>4-20 mA Analog Input</td>
<td></td>
<td>The analog input can be used with configurable MultiLoad inputs such as density, pressure, or temperature.</td>
</tr>
<tr>
<td>4-20 mA Analog Output</td>
<td></td>
<td>The analog output can be used with configurable MultiLoad outputs such as Analog Control Valve or Analog Pump.</td>
</tr>
</tbody>
</table>
5.3 Terminal arrangements per Board

5.3.1 Digital Analog I/O Board (IO_DA)

Figure 5.1 Digital/ Analog I/O Board Terminal Block Assignments
5.3.2 2 Meter I/O Board (IO-2M)

Figure 5.2 2 Meter I/O Board Terminal Block Assignments
5.4 How to Connect and Wire Field Devices to the I/O Boards

In this section of the chapter we will provide examples of commonly used devices that can get wired to the I/O boards. This is not an exhaustive listing, but intended to provide you an example of how certain types of I/O need to get wired into the various boards.

MultiLoad II Wiring Examples:

- Flow Meter and Control Valve
- Additive
- RTD
- Analog In & Analog Out
- AC Output Wiring
- AC Input Wiring
- DC Input Wiring: Permissives/Status
- DC Output Wiring
- 2 Output Air Eliminator Wiring
- Remote Display Wiring

RCUII Wiring Examples:

- DC Input Wiring
- AC: DC Output wiring

Typical Example:

- Typical single meter example
5.4.1 MultiLoad II Flow Meter and Control Valve Wiring

Caution: Line voltage used to drive the Digital Valve Solenoids MUST be controlled by the Ground or Overfill monitor. In the event of a Ground loss or Overfill detection, this voltage must be switched off to ensure a fail-safe shutdown of the product flow.
5.4.2 MultiLoad II Additive Wiring: Outputs

Note: The output port that is selected will dictate which port is used for the additive input. For example, if Port 0 is selected as the FCM Port#, the output will be on port 0 and the corresponding input will be at port 7. See Table above for possible port assignments.
### 5.4.3 MultiLoad II Additive Wiring: Inputs

<table>
<thead>
<tr>
<th>I/O DIGITAL/ANALOG</th>
<th>I/O 2 METER</th>
<th>METER 0</th>
<th>METER 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>IO_DA TB2B</td>
<td>IO_2M TB7</td>
<td>IO_2M TB8</td>
<td></td>
</tr>
<tr>
<td>PORT 4</td>
<td>+ 1</td>
<td>+ 1</td>
<td></td>
</tr>
<tr>
<td>PORT 5</td>
<td>+ 2</td>
<td>- 2</td>
<td></td>
</tr>
<tr>
<td>PORT 6</td>
<td>+ 3</td>
<td>+ 4</td>
<td></td>
</tr>
<tr>
<td>PORT 7</td>
<td>+ 5</td>
<td>- 6</td>
<td></td>
</tr>
<tr>
<td>PORT 8</td>
<td>+ 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PORT 9</td>
<td>+ 8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PORT 10</td>
<td>+ 9</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note:** Most additive injection meters only provide an Open-Collector (pull down) type output. Typically a 1,000 Ohm, ¼ watt pull-up resistor needs to be added in the pulser junction box to pull this output to 12V+ when the output is off.

**Note (I/O 2 METER Only):** TB7 pins 3 and 4 can be configured as Port 5 or Port 6. It is only 1 port, but because of the logic in the firmware, it may be necessary to address it as Port 5 or Port 6 in the configuration.

---

*Note: Most additive injection meters only provide an Open-Collector (pull down) type output. Typically a 1,000 Ohm, ¼ watt pull-up resistor needs to be added in the pulser junction box to pull this output to 12V+ when the output is off.*
## 5.4.4 MultiLoad II Analog Wiring

### 5.4.4.1 RTD Wiring

<table>
<thead>
<tr>
<th>I/O DIGITAL/ANALOG</th>
<th>I/O 2 METER</th>
<th>METER 0</th>
<th>METER 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>IO_DA TB4</td>
<td>IO_2M TB4</td>
<td>IO_2M TB5</td>
<td></td>
</tr>
<tr>
<td>RTD</td>
<td>RTD</td>
<td>RTD</td>
<td></td>
</tr>
<tr>
<td>V+ 1</td>
<td>V+ 1</td>
<td>V+ 1</td>
<td></td>
</tr>
<tr>
<td>R+ 2</td>
<td>R+ 2</td>
<td>R+ 2</td>
<td></td>
</tr>
<tr>
<td>R- 3</td>
<td>R- 3</td>
<td>R- 3</td>
<td></td>
</tr>
<tr>
<td>COM 4</td>
<td>COM 4</td>
<td>COM 4</td>
<td></td>
</tr>
</tbody>
</table>

Note: All 4 wires MUST be run to the sensor. Do not simply jumper REF- to COM or REF+ to V+ at the FCM II. For 3-wire and 2 wire probes, the connection of REF- to COM and REF+ to V+ should be as close as possible to the probe (within inches).
5.4.4.2 MultiLoad II 4–20 mA Wiring

- **Note:** The 4-20 mA receiver does not contain a voltage source. The loop must be powered either by the transmitter or by an external power supply. The I/O Board adds 75 Ohms to the loop.

- **‡Note:** The 4-20mA output requires a power source (12-30vdc). The 12vdc output can be used as shown here.
**5.4.5 MultiLoad II AC Output Wiring**

<table>
<thead>
<tr>
<th>I/O DIGITAL/ ANALOG</th>
<th>I/O 2 METER METER 0</th>
<th>METER 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>PORT 0 IN 10</td>
<td>PORT 0 OUT 5</td>
<td>PORT 0 OUT 5</td>
</tr>
<tr>
<td>PORT 0 OUT 9</td>
<td>PORT 1 OUT 4</td>
<td>PORT 1 OUT 4</td>
</tr>
<tr>
<td>PORT 8 IN 5</td>
<td>PORT 2 OUT 3</td>
<td>PORT 2 OUT 3</td>
</tr>
<tr>
<td>PORT 8 OUT 1</td>
<td>LINE IN 1</td>
<td>LINE IN 1</td>
</tr>
</tbody>
</table>

**Note:** This shows a typical configuration. AC outputs can be assigned to any unused AC output.
5.4.6  MultiLoad II AC Input Wiring

Note: This shows a typical configuration. AC Permissive/Status inputs can be assigned to any unused AC input.
### 5.4.7 MultiLoad II DC Permissive/Status Wiring

<table>
<thead>
<tr>
<th>I/O DIGITAL/ANALOG</th>
<th>I/O 2 METER</th>
<th>METER 0</th>
<th>METER 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>IO_DA TB2B</td>
<td>IO_2M TB7</td>
<td>(PORT 4</td>
<td>PORT 4</td>
</tr>
<tr>
<td>PORT 4</td>
<td>+ 1</td>
<td>+ 1</td>
<td>+ 1</td>
</tr>
<tr>
<td>PORT 4</td>
<td>+ 2</td>
<td>+ 2</td>
<td>+ 2</td>
</tr>
<tr>
<td>PORT 5</td>
<td>+ 3</td>
<td>+ 3</td>
<td>+ 3</td>
</tr>
<tr>
<td>PORT 5</td>
<td>+ 4</td>
<td>+ 4</td>
<td>+ 4</td>
</tr>
<tr>
<td>PORT 5</td>
<td>+ 5</td>
<td>+ 5</td>
<td>+ 5</td>
</tr>
<tr>
<td>PORT 5</td>
<td>- 6</td>
<td>- 6</td>
<td>- 6</td>
</tr>
</tbody>
</table>

Note: This shows a typical configuration. DC Permissive/Status inputs can be assigned to any unused DC input.
5.4.8 MultiLoad II DC Output Wiring

<table>
<thead>
<tr>
<th>I/O DIGITAL/ANALOG</th>
<th>I/O 2 METER METER 0</th>
<th>METER 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>IO_DA TB3</td>
<td>PORT 10 IN 1</td>
<td>OUT 0.10</td>
</tr>
<tr>
<td></td>
<td>PORT 11 IN 3</td>
<td>OUT 4</td>
</tr>
<tr>
<td></td>
<td>PORT 12 IN 5</td>
<td>OUT 6</td>
</tr>
<tr>
<td>IO_2M TB9</td>
<td>PORT 10 IN 1</td>
<td>OUT 2</td>
</tr>
<tr>
<td></td>
<td>PORT 11 IN 3</td>
<td>OUT 4</td>
</tr>
<tr>
<td></td>
<td>PORT 12 IN 5</td>
<td>OUT 6</td>
</tr>
</tbody>
</table>

PORT 10/PORT 0.10
PORT 10/PORT 1.10
PORT 11
PORT 12

IO_DA ONLY!

Note: This shows a typical configuration. DC outputs can be assigned to any unused DC output.

*Note: For I/O Board firmware v036 or greater, any DC output port can be configured as an output pulse.
5.4.9 MultiLoad II 2 Output Air Eliminator Wiring

Note: With only two states returned from the air eliminator, flow must be completely stopped to purge air. To purge air by only slowing the rate, a 3 output air eliminator head must be used.

Note: When the level drops below Low, the power will be removed from the digital valves, stopping flow before the air eliminator is completely drained.
### 5.4.10 MultiLoad II Lectro Count Remote Display Wiring

#### I/O DIGITAL/ANALOG

<table>
<thead>
<tr>
<th>I/O_DA TB3</th>
<th>I/O 2M TB9</th>
<th>I/O 2M TB9</th>
</tr>
</thead>
<tbody>
<tr>
<td>PORT 10</td>
<td>PORT 10</td>
<td>PORT 10</td>
</tr>
<tr>
<td>IN 1</td>
<td>IN 1</td>
<td>IN 1</td>
</tr>
<tr>
<td>OUT 2</td>
<td>OUT 2</td>
<td>OUT 2</td>
</tr>
<tr>
<td>PORT 11</td>
<td>PORT 11</td>
<td>PORT 11</td>
</tr>
<tr>
<td>IN 3</td>
<td>IN 3</td>
<td>IN 3</td>
</tr>
<tr>
<td>OUT 4</td>
<td>OUT 4</td>
<td>OUT 4</td>
</tr>
<tr>
<td>PORT 12</td>
<td>PORT 12</td>
<td>PORT 12</td>
</tr>
<tr>
<td>IN 5</td>
<td>OUT 4</td>
<td>OUT 4</td>
</tr>
</tbody>
</table>

#### I/O 2 METER

<table>
<thead>
<tr>
<th>METER 0</th>
<th>METER 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>PORT 11</td>
<td>PORT 11</td>
</tr>
<tr>
<td>OUT 11</td>
<td>OUT 11</td>
</tr>
<tr>
<td>IN 11</td>
<td>IN 11</td>
</tr>
<tr>
<td>PORT 10</td>
<td>PORT 10</td>
</tr>
<tr>
<td>OUT 10</td>
<td>OUT 10</td>
</tr>
<tr>
<td>IN 10</td>
<td>IN 10</td>
</tr>
</tbody>
</table>

- **PORT 10/PORT 0.10**: Connect Port 10 IN to Lectro Count output pulse. Connect Port 10 OUT to Lectro Count reset pulse.
- **PORT 11/PORT 1.10**: Connect Port 11 IN to Lectro Count output pulse. Connect Port 11 OUT to Lectro Count reset pulse.

### Notes:

- **Note**: Use only model E1613. The Lectro Count +12Vdc, 12V common can be supplied by an external source.
- **Note (I/O DIGITAL/ANALOG Only)**: Connect Port 10 to Lectro Count output pulse. Connect Port 11 to Lectro Count reset pulse.
- **Note (I/O 2 METER Only)**: Connect Port 0.10 to Lectro Count output pulse. Connect Port 1.10 to Lectro Count reset pulse.
5.4.12 RCU II AC Output Wiring

<table>
<thead>
<tr>
<th>I/O DIGITAL/ ANALOG</th>
<th>I/O 2 METER METER 0</th>
<th>METER 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>IO_DA TB1</td>
<td>IO_2M TB1</td>
<td>IO_2M TB2</td>
</tr>
<tr>
<td>PORT 0</td>
<td>PORT 0 OUT 5</td>
<td>PORT 0 OUT 5</td>
</tr>
<tr>
<td>IN 10</td>
<td>OUT 9</td>
<td></td>
</tr>
<tr>
<td>PORT 1</td>
<td>PORT 1 OUT 4</td>
<td>PORT 1 OUT 4</td>
</tr>
<tr>
<td>IN 8</td>
<td>OUT 7</td>
<td>PORT 2 OUT 3</td>
</tr>
<tr>
<td>PORT 2</td>
<td>PORT 2 OUT 3</td>
<td>PORT 3 OUT 2</td>
</tr>
<tr>
<td>IN 6</td>
<td>OUT 5</td>
<td>LINE IN 1</td>
</tr>
<tr>
<td>PORT 3</td>
<td>PORT 3 OUT 2</td>
<td>LINE IN 1</td>
</tr>
<tr>
<td>IN 4</td>
<td>OUT 5</td>
<td></td>
</tr>
<tr>
<td>PORT 4</td>
<td>PORT 4 OUT 3</td>
<td></td>
</tr>
<tr>
<td>IN 2</td>
<td>OUT 1</td>
<td></td>
</tr>
</tbody>
</table>

Note: This shows a typical configuration. AC outputs can be assigned to any unused AC output.
5.4.13 RCU II DC Output Wiring

Note: This shows a typical configuration. DC outputs can be assigned to any unused DC output.
5.4.14 Typical 1 Meter Application Wiring Example: IP&E Drawing (Electrical Wiring Schedule)
Chapter 6  Configurations

6.1  Switch Access Control

The MultiLoad II contains switches which limit menu and configuration access. These switches limit users from accessing Program Mode, as well as from changing Weights and Measures controlled parameters.

In Program Mode, the operator has access to the following:

- The Configuration Menu parameters.
- The Diagnostics Menu and its functions.
- Other administrative procedures, such as clearing high-level alarms.

To access Program Mode, the MultiLoad II/RCU II terminal operator must:

1. Move the Program Mode switch into the active position.
2. At the idle card-in screen, enter the security code (default security code is 000000) and press the <Next> key.

6.1.1  External Switch Access Control (MultiLoad II Only)

One access control switch option is a pair of external access control switches. These switches limit access to Program Mode and changes to Weights and Measures controlled parameters.

**External switches serve no function on the RCU II since password access always overrides the program switch setting. Weights and measures functionality is undefined for the RCU II.**

**Your local Weights and Measures office may need to be contacted after breaking the seal and changing parameters. This is typically done only during meter proving or temperature calibration.**
Depending on the date of manufacture, the MultiLoad II may have one of three types of external switch design. All can be sealed and locked to prevent access to Program Mode and to prevent changes of Weights and Measures controlled parameters.

6.1.2 External Type 1 Program / W&M Switches

This design consists of two separate external rotary switches: one for Program Mode Access, and one for W&M Change Access. Each switch has an external fold-down cover that can be locked or sealed with a wire and lead seal to prevent moving the switch into the active state. Each cover will also be stamped as “W&M” or “Program” to indicate their respective function.

![Type 1 Program / W&M Switches](image)

Figure 6.1 Type 1 Program / W&M Switches

6.1.3 External Type 2 Program / W&M Switches

This design consists of a single 3-position external rotary switch with two individual covers which may be locked and sealed with a wire and lead seal. The covers limit the switch rotation to three positions:

A - Two covers closed: Program access denied and Weights and Measures access denied.

![Type 2 Program / W&M Switches](image)

Figure 6.2 Type 2 Program / W&M Switches
B - First cover open: Program access allowed and Weights and Measures access denied.

C - Both covers open: Program access allowed and Weights and Measures access allowed.
6.1.4 External Type 3 Program / W&M Switches

The third design consists of two separate external magnetic bolts, one for program mode access, and one for W&M change access. Program or W&M access is achieved by removing the corresponding bolt. Each bolt has a small hole that can be sealed with a wire and lead seal to detect unauthorized access. A single fold--down cover can be locked to prevent bolt removal. The cover is marked “W&M” or “Program” adjacent to each bolt to indicate the bolt function.

![Type 3 Program / W&M Switch with Magnetic Bolts](image)

**Figure 6.3** Type 3 Program / W&M Switch with Magnetic Bolts

Do not use a wrench to tighten the bolts. Insert the bolts and hand tighten only. Over-tightening will damage the bolt assembly.

6.1.5 Internal Switch Access Control

Two DIP switches on the CPU board also provide the closure of the program mode / W&M switch contacts. When the MultiLoad II/RCU II does not have the external Program Mode / W&M switch installed, it is necessary to use these DIP switches on the CPU board to enable program mode and W&M access.

The switches are numbered 1 through 4, with 1 being closest to the front of the enclosure (top of the picture), and 4 being towards the back of the enclosure (bottom of the picture).

When the switch is in the ON position, the switch is in the active state, allowing access. A switch is ON when it moves right, and OFF when moved to the left.

Switch #3 is the program mode switch. Switch #4 is the W&M access switch. In the example in Figure 6.4 below, the program mode switch is currently active, while the W&M switch is not active. Figure 6.5 shows the location of the DIP switch on revision 2.0 CPU boards.

A switch input is active when either the DIP switch OR the external switch is active (ON).
The MultiLoad II also has the ability to accept field inputs for the program mode and W&M access switches. Review the “MultiLoad II User Guide” for more information.

RCU II inputs received from external field devices cannot be configured to control program mode access. Weights and measures functionality is undefined for RCU II

6.2 MultiLoad II/RCU II DIV-2 Keypad

The MultiLoad II/RCU II DIV-2 keypad has 47 keys, including alpha, numeric, and function keys, which are used to:

- Select menu items and fields
- Enter data in fields
- Initiate actions
- Return to previous screens
Numeric keys (1 through 9 and 0) are used to enter numeric data. Alpha keys are used to enter text, and also to select/deselect alpha character entry. The CLR key is used to clear data entered in error; this is a backspace key erasing characters as the cursor moves backwards.

6.3 Menus and Screens

The MultiLoad II Main Menu is shown below. From this menu, you select submenus:

![Main Menu Diagram]

The reverse video highlight bar indicates the current selection. Press Next to select Diagnostics, and then press the Enter key to go to the Diagnostics Menu.

![Diagnostics Menu Diagram]

For menu options and function screen items, pressing the Next key moves the selection bar down, and pressing the Prev (Previous) key moves the selection bar up.
To return to the Main Menu, press **EXIT**. To return to any previous screen, press the **EXIT** key.

### 6.4 Field Modification and Data Entry

MultiLoad II/RCU II will have all fields populated with default values. There are two types of fields, toggle or data entry. Toggle fields contain a number of choices. Scroll through the choices by pressing the **Enter** key. Data entry fields require that a value be entered into the field within a given, applicable range. In the example below, RCU Address field is highlighted:

```
RCU GENERAL SETUP
RCU Address: 001
Card Reader: DISABLD
Processing Mode: Remote
Swing Arm Secondary: DISABLD
Terminal Name: Toptech Terminal
Security Accounts
```

Press **ENTER** to choose the field. A blinking cursor indicates that data can be entered.

```
RCU GENERAL SETUP
RCU Address: 001
Card Reader: DISABLD
Processing Mode: Remote
Swing Arm Secondary: DISABLD
Terminal Name: Toptech Terminal
Security Accounts
```

Type in the new value (e.g. 123) and press **ENTER**. The new value displays on the screen.
Using this same screen as an example, the Processing Mode line is selected and ENTER is pressed; use the NEXT or PREV keys to toggle between the values ENABLED and DISABLED, as shown below. You must then press ENTER to accept the desired choice.

### MultiLoad II/ RCU II Preliminary Configuration

1) Power-on the MultiLoad II/ RCU II.

2) When the MultiLoad II is first powered-on, the card—in screen appears, indicating Operating Mode. An RCU II may initially display “System Unavailable” because it is unconnected to a host system.
3) Go to program mode by entering 00000 on the keypad, then press **Next**.

   - A MultiLoad II must have the Program switch set to allow access to Program Mode (See section 6.1).
   - 00000 is the factory default access code. See the “MultiLoad II User Guide,” RCU General Setup section for changing or adding new access codes.
   - Note that unlike MultiLoad II, Program switches or CPU DIP switches never deny access to RCU II Program Mode.

4) The program mode main menu displays (**MultiLoad II/RCU II**):

5) Press **Enter** to access the Configuration menu:
6) Press **Enter** to access RCU General Setup/ RCU Setup:

```
CONFIGURATION MENU
Communication
Network
RCU General Setup
RCU Setup
Security Setup
Equipment Setup
FCm Type Setup
Alarm Setup
Products
Additive Cal.
Remote Adtv Cal.
Access ID's
Custom Logic
Customer Logo Setup
Next Prev Exit Enter
```

```
CONFIGURATION MENU
Communication
Network
RCU Setup
Customer Logo Setup
Date & Time
Next Prev Exit Enter
```

```
CONFIGURATION MENU
Date & Time
Printing
Trace
Reports
Next Prev Exit Enter
```

RCU General Setup:

```
MultiLoad II
```

RCU II:

```
 MultiLoad II
 RCU II
```

7) Press **Enter** and key in **RCU address** (001) of MultiLoad II/ RCU II:

```
RCU GENERAL SETUP
RCU Address: 001
Card Reader: DISABLD
Processing Mode: Remote
Swing Arm Secondary: DISABLD
Terminal Name: Toptech Terminal
Security Accounts
Next Prev Exit Enter
```

```
RCU GENERAL SETUP
RCU Address: 001
Card Reader: Slot CAPTIVE
Password: *****
Security: DISABLED
RCUOP Protocol
Next Prev Exit Enter
```
8) Press **Exit** to return to the Configuration Menu.

9) Select and press **Enter** to return to the Main Menu.

10) If the MultiLoad II/RCU II has a Program/Weights and Measures switch, return the switch to Operating Mode.

### 6.6 Verifying Communications between MultiLoad II/RCU II and I/O Board

1) Enter program mode by pressing **00000** on the keypad, then press **Next** key.

2) Select diagnostics from main menu:

   **MultiLoad II**

   3) For MultiLoad II, select FCM COM. For RCU II, select RCU:

   ```
   MultiLoad II
   000  FCM COM DIAGNOSTICS
   00-Ok
   ```

   **RCU II**

   ```
   RCU I/O DIAGNOSTICS
   I/O Board Com: Ok  F/W Rev: 033
   Timeouts: 000000003  Com Lost: 000000001
   [1]AC Output 0 - OFF DC Input 4 - OFF
   [2]AC Output 1 - OFF DC Input 5 - OFF
   [3]AC Output 2 - OFF DC Input 6 - OFF
   [4]AC Output 3 - OFF DC Input 7 - OFF
   [5]AC Output 8 - OFF DC Input 9 - OFF
   [6]DC Output 10 - OFF Counter 4 - 00000
   [6]DC Output 11 - OFF Counter 5 - 00000
   [6]DC Output 12 - OFF Program Key- OFF
   W&M Key - OFF
   Battery @ 36C 3.24V
   Battery 100%
   ```

   ```
   Exit Clear
   ```

4) If screen displays “00-OK” (or “I/O Board Com: OK” for the RCU II), the I/O board is communicating with the MultiLoad II or RCU II.

5) If the I/O board is not communicating the message “00-ERR” appears (or “I/O Board Com: ERR” for the RCU II).
6) If .00-ERR (or “I/O Board Com: ERR”) appears, verify the communication parameters for Com0 within the Communication Setup Menu. This menu is located under the Configuration Menu. The Com0 communication settings required for the I/O board are .57.6 (K Baud), None (Parity), 8 Data (bits), 1 Stop (bit), Single, and I/O Board (type of serial device). This is correctly set in the factory when an RCU II is assembled, but it is possible for the settings to be updated by the installer.

### 6.7 Using I/O Diagnostics

**MultiLoad II**: Consult the MultiLoad II User Manual for diagnostics functions.

**RCU II**: Each output is listed on the screen, adjacent to a number. Press a number on the keypad that corresponds to the output under test. If the connection has been made properly, the field device will actuate.

*NOTE*: If numbers do not appear next to the outputs, enter Configurations → RCU Setup and change the password from the default “00000”.

**Inputs**: Each input is listed on the screen adjacent to its status. Each input will be in either the ON or OFF state. Activate each input from the field. If the circuit is connected properly, the state change can be observed.

For the counter inputs, the totals will accrue as long as they are receiving pulses (**MultiLoad II**/**RCU II**):
Chapter 7 Service and Repair

Do not service MultiLoad II/RCU II without disconnecting the supply circuit. Keep the enclosure tightly closed while circuits are live.

Using a magnetic screwdriver is very helpful in retaining the screws during removal and installation.

7.1 Overview and Subassemblies

Figure 7.1 MultiLoad II (ML II) / Remote Control Unit II (RCU II) Division 2 Unit
The MultiLoad II/RCU II DIV-2 has been constructed with replaceable modules or sub-assemblies that are available from Toptech. These include:

- CPU Subassembly (CPU Chassis, CPU Board, Power Supply/COM Board, I/O Board)
- Display Subassembly (Active Matrix Display and Display Board)
- Keypad
- Prox Reader
- W&MS Subassembly
- Iceshield

The following sections describe how to remove and replace each subassembly and, when applicable, how to further disassemble the subassembly.

Figure 7.2  ML II/RCU II Div2 Unit Assembly Slotted Card Holder with MT11
7.2 CPU Subassembly Removal and Replacement

The CPU subassembly exists out of the CPU chassis with the power supply/communications board and the CPU mounted. Optionally, an I/O board can be added to this subassembly. The CPU subassembly is comprised of different Toptech Parts.

![Diagram of CPU subassembly](image)

**Figure 7.3** CPU Board, Power Supply / Comm Board, I/O Board with Chassis

**Part numbers:**

**Power Supply & Communication board**

- AC – Power Supply Board: 4728
- DC – Power Supply Board: 4729

**CPU Board:** 4727

**I/O Boards:**

- Digital/Analog I/O Board: 4718
- 2 Meter I/O Board: 4723
Removal:

1. Disconnect all field wiring from the I/O board.
2. Disconnect all Serial Communications from the Power Supply/COM board.
3. Disconnect Main Power from the Power Supply/COM board.
4. Disconnect the flat display cable (after releasing the cam lock) and display power cable.
5. Disconnect the W&M Access/Program Mode switch cable from the CPU board.
6. Remove the four chassis mounting screws (not the mounting screws for the I/O board or Power Supply / COM board).
7. Carefully remove the CPU chassis from inside the base by removing the CPU board side of the chassis first.

Installation:

1. Carefully insert the CPU chassis back into the enclosure.
2. Install the chassis mounding screws.
3. Connect the W&M Access/Program Mode switch cable to the CPU board.
4. Reconnect the display power cable and the flat display cable (remember to secure the cam lock).
5. Connect the Main Power to the Power Supply/COM board.
6. Connect all Serial Communications to the Power Supply/COM board.
7. Connect all field wiring to the I/O board.
7.3 Display Subassembly Removal and Replacement

Part Number: DIV-2- Display Subassembly: 4720
Backlight power cable: 2224

Removal:
1. Disconnect the flat display cable (after releasing the cam lock –see 7.3.1), display power cable and the keypad cable.
2. While supporting the display subassembly, remove the four mounting screws.
3. **Do not attempt to disassemble the display subassembly.** Return entire subassembly to Toptech for repair after receiving an RMA number.

Installation:
1. While supporting the display subassembly, install the four mounting screws.
2. Connect the keypad cable, display power cable and the flat display cable.
3. Verify routing and clearance of the cable

Figure 7.4 ML II/ RCU II Div2 Unit Cover Display Assembly

7.3.1 Flat Display Cable Connector: Remove and Connect

Part Number: Display Interface Cable: 1250
Removal:
1. To remove the display cable, rotate the cam to the open (up) position (see Figure 7.5).
2. Gently pull the cable straight out free of the connector.

Installation:
1. To install the display cable, make sure the cam is in the open (up) position.
2. Gently insert the cable with the dark insulated side towards the cam (see Figure 7.6). When inserting the cable, ensure that it is not tilted to one side and that the bottom of the cable is completely seated in the connector.
3. Rotate the cam to the closed (down) position to lock in place (see Figure 7.7).

Figure 7-5 Cam lock in the Open (Up) position
Figure 7-6 Cam lock in the closed (down) position
Figure 7-7 Display Cable Insertion

7.4 Keypad Removal and Replacement

Part Number: DIV-2-Keypad: 1257
Removal:
1. Disconnect the keypad cable from the back of the keypad.
2. Using a #2 screwdriver, remove all screws holding on the keypad plate.
3. Remove the plate.
4. Using a flat screwdriver, carefully pry out the keypad.

Installation:
1. Carefully install the keypad into the cover.
2. Install the keypad plate and retaining screws.
3. Reconnect the keypad cable to the keypad.

Figure 7.8 ML II/RCU II Div2 Unit Cover Keypad Assembly

7.5 Card Reader Removal and Replacement

7.5.1 Slotted Card Holder Mounted Prox Reader Removal and Replacement: (Current Model)
Part Number: 4726

Removal:
1. Disconnect the prox reader cable from the display subassembly.
2. Remove the 4 screws from the card holder back.
3. Remove the screw at the top of the card reader.
4. Lift the card reader off the card reader backplate. It is not necessary to remove the card reader back plate.

Installation:
1. Replace the card reader.
2. Reattach the card reader to the back plate. Hook the bottom of the card reader onto the bottom of the back plate. Align the top hole of the reader with the threaded insert on the back plate. Reinstall the flat head screw and tighten.
3. Align the assembly back with the card holder. Insert the 4 screws. Start by hand and tighten.
4. Connect the prox reader cable to the display subassembly.

Figure 7.9 Exploded View Front Cover Assembly: Slotted Card Holder with MT11

7.5.2 Bracket Mounted (Obsolete) Prox Reader Removal and Replacement:

Removal:
1. Disconnect the prox reader cable from the display subassembly.
2. Remove the two nuts holding prox reader.
3. Remove the prox reader.

**Installation with Older Part:**
1. Reinstall the prox reader with the two nuts.
2. Connect the prox reader cable to the display subassembly.

![Figure 7.10 ML II/RCU II Div2 Cover Assembly Prox Bracket Mount Thinline II (Obsolete)](image)

**7.5.3 Slotted Card Holder Mounted Prox Reader HID (Obsolete) Removal and Replacement:**
Replacement part number: 4726

**Removal:**
1. Disconnect the prox reader cable from the display subassembly.
2. Remove the 2 screws attaching the card reader.
3. Remove the prox reader.

1. **Installation with Older Part:** Replace the card reader. Orient the LED toward the top.
2. Reinstall the screws and lockwasher.
3. Connect the prox reader cable to the display subassembly.

---

**Figure 7.11**  ML II/ RCU II Div2 Cover with Slotted Card Holder Thinline II (Obsolete)

---

**7.5.4 Slotted Card Holder Mounted TWIC Reader (Obsolete) Removal and Replacement:**

Replacement part number: 4726

**Removal:**
1. Disconnect the prox reader cable from the display subassembly.
2. Remove the 2 screws attaching the card reader.
3. Remove the prox reader.

**Installation with Older Part:**
1. Replace the card reader. Orient the LED toward the top.
2. Reinstall the screws and lockwasher.
3. Connect the prox reader cable to the display subassembly.

Figure 7.12 ML II/RCU II Div2 Unit Assembly Prox/TWIC Slotted Card Holder RP15 (Obsole)te

7.6 W&M Switch Assembly Removal and Replacement

Part Number: W&M Assembly Board: 1900
W&M Bolt: 1901

This assembly is only found for MultiLoad II DIV2 devices.

Removal:
1. Unplug the cable from the CPU board. Carefully depress the locking mechanism on the connector and gently pull.
2. Remove the two screws securing the switch board assembly.
3. Remove the board.
Installation:
1. Install the new switch assembly using the same screws. Install with the cut corners facing outward. DO NOT over-tighten and simply secure gently. Over-tightening will crack the ferrite rings, damaging the switch.
2. Reinstall the connector.
3. Installation complete.

Figure 7.13  ML II/RCU II DIV2 W&M Assembly

7.7 Ice Shield Removal and Replacement

Part Number: Ice Shield: 2443

The ice shield is a current standard on MultiLoad II and RCUII slotted card readers. For installations having freezing temperatures with precipitation for extended periods of time, an ice shield prevents ice from forming on the proximity card reader slot. Older construction with the proximity card reader mounted behind glass does not have the ice shield.

Removal:
1. Remove the four prox ring screws using a T10 Torx driver bit with a center pin.
2. Remove the metal prox ring.
3. The rubber ice shield may be removed.
Installation:

1. Insert a new Ice shield and align with holes.
2. Replace prox ring and align holes.
3. Replace the four screws holding the prox ring and tighten using the T10 torx bit.

![Image of Ice Shield Assembly Installation Slotted Card Holder](image)

**Figure 7.14** Ice Shield Assembly Installation Slotted Card Holder

### 7.8 Overview Parts List and Part Numbers

The Toptech replacement part numbers are shown in the table below:

<table>
<thead>
<tr>
<th>Part</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIV-2 Display Assembly</td>
<td>4720</td>
</tr>
<tr>
<td>Card reader (current) Prox Non Captive, captive, TWIC (RCU II)</td>
<td>4726</td>
</tr>
<tr>
<td>DIV-2 Keypad</td>
<td>1257</td>
</tr>
<tr>
<td>Magnetic Switch Assembly</td>
<td>1900</td>
</tr>
<tr>
<td>Magnetic Bolt</td>
<td>1901</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Part</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AC Power Supply Board</strong></td>
<td></td>
</tr>
<tr>
<td>Revision 1.0</td>
<td>obsolete</td>
</tr>
<tr>
<td>Revision 1.1</td>
<td>4728</td>
</tr>
<tr>
<td><strong>DC Power Supply Board</strong></td>
<td></td>
</tr>
<tr>
<td>Revision 1.0</td>
<td>obsolete</td>
</tr>
<tr>
<td>Part Description</td>
<td>Revision 1.1</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>--------------</td>
</tr>
<tr>
<td>Display Interface Cable</td>
<td>1250</td>
</tr>
<tr>
<td>Backlight power cable</td>
<td>2224</td>
</tr>
<tr>
<td>Ice Shield</td>
<td>2443</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>I/O Board</td>
<td></td>
</tr>
<tr>
<td>Digital/ Analog I/O, revision 1.1</td>
<td>4718</td>
</tr>
<tr>
<td>2 Meter I/O Board, revision 1.0</td>
<td>4723</td>
</tr>
<tr>
<td></td>
<td></td>
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<tr>
<td>CPU Board</td>
<td></td>
</tr>
<tr>
<td>Revision 1.0</td>
<td></td>
</tr>
<tr>
<td>Revision 2.0</td>
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</table>
## Chapter 8  Hardware Revision History & Compatibility

### Active Parts

<table>
<thead>
<tr>
<th>Part</th>
<th>Part#</th>
<th>Rev#</th>
<th>Description</th>
<th>In-Production</th>
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</thead>
<tbody>
<tr>
<td>MultiLoad II CPU-Board</td>
<td>4723</td>
<td>1.0</td>
<td>Initial board</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>2.0</td>
<td>Additions of new CPU, SD card slot, Ethernet circuit now supports auto-cross function</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.1</td>
<td>Addition of battery voltage monitoring, added ambient temperature monitoring</td>
<td></td>
</tr>
<tr>
<td>MultiLoad II AC Power Supply and Communications Board</td>
<td>4729</td>
<td>1.0</td>
<td>Initial board</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.1</td>
<td>Ethernet circuit now supports auto-cross function (used by CPU 2.3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.2</td>
<td>Added 2-wire 485 to COM1, added power on reset logic, resetable handshake signals of COM1, pluggable 9V inter-board header</td>
<td></td>
</tr>
<tr>
<td>MultiLoad II DC Power Supply and Communications Board</td>
<td>4729</td>
<td>1.0</td>
<td>Initial board</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.1</td>
<td>Ethernet circuit now supports auto-cross function (used by CPU 2.3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.2</td>
<td>Added 2-wire 485 to COM1, added power on reset logic, resetable handshake signals of COM1, pluggable 9V inter-board header</td>
<td></td>
</tr>
</tbody>
</table>

### Compatibility Chart

<table>
<thead>
<tr>
<th>CPU Board</th>
<th>Power Supply / Communications Board</th>
<th>Firmware Version</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.0</td>
<td>3.xx.yy</td>
</tr>
<tr>
<td></td>
<td>1.1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.2</td>
<td></td>
</tr>
<tr>
<td>1.0</td>
<td></td>
<td></td>
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<tr>
<td>2.0</td>
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<tr>
<td>2.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CPU Board</td>
<td></td>
<td>4.xx.yy</td>
</tr>
<tr>
<td></td>
<td>1.x</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.x</td>
<td></td>
</tr>
</tbody>
</table>
## 9.1 Hardware Revision

<table>
<thead>
<tr>
<th>Date</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>09/08/2006</td>
<td>Initial product release with C/US UL Listing.</td>
</tr>
<tr>
<td>12/19/2008</td>
<td>Added display heater option.</td>
</tr>
<tr>
<td>06/12/2007</td>
<td>Moved board mounting chassis to the upper left of enclosure, from upper center.</td>
</tr>
<tr>
<td>07/09/2007</td>
<td>Replaced Samsung SRAM with Cypress.</td>
</tr>
<tr>
<td>08/20/2007</td>
<td>New firmware released for I/O board because of PIC18F die revision.</td>
</tr>
<tr>
<td>02/01/2008</td>
<td>Released DC power supply option (DC-INT rev 1.0).</td>
</tr>
<tr>
<td>07/03/2008</td>
<td>Added alternate LTC cross for AD reference and changed capacitors on I/O board.</td>
</tr>
<tr>
<td>12/19/2008</td>
<td>Began casting enclosure.</td>
</tr>
<tr>
<td>12/19/2008</td>
<td>Released magnetic switches for configuration &amp; weights and measures.</td>
</tr>
<tr>
<td>12/19/2008</td>
<td>Prox mounting cup changed from inside mount to outside mount.</td>
</tr>
<tr>
<td>07/24/2009</td>
<td>Changed display to double the brightness and updated interface board (DISP_INT rev 1.1).</td>
</tr>
<tr>
<td>07/24/2009</td>
<td>Added TWIC prox reader option.</td>
</tr>
<tr>
<td>03/25/2010</td>
<td>Changed regulatory agency from UL to CSA.</td>
</tr>
<tr>
<td>08/30/2010</td>
<td>Ice shield option added to card reader slot.</td>
</tr>
<tr>
<td>12/17/2010</td>
<td>Updated prox reader card holder to internal plastic slotted assembly.</td>
</tr>
<tr>
<td>02/08/2011</td>
<td>Released new CPU board (CPU rev 2.0), and Ethernet update on power supply/com boards (AC-INT rev 1.1, DC-INT rev 1.1).</td>
</tr>
</tbody>
</table>
02/08/2011  Released 2 Meter I/O board option (IO_2M rev 1.0).
02/08/2011  Capacitive keypad option released (RCUII_DIVII_SOLID_STATE_KP rev 1.0).
03/08/2011  Changed regulatory agency from CSA to Intertek.
01/17/2012  Replaced relay assemblies on I/O board with discrete triacs (IO_DA rev 1.2, IO_2M rev 1.1).
06/07/2013  Added 2-wire 485 to COM2, thru hole ethernet socket, pluggable 5V inter-board header, new DC supply not transformer isolated (AC-INT rev 1.2; DC-INT rev 1.2).
10/01/2014  Improved RTD filtering (IO_DA rev 1.3, IO_2M rev 1.2).
09/24/2015  Released SCS_IO board (rev 1.0).

<table>
<thead>
<tr>
<th>Revision</th>
<th>Date</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>(RCU)</td>
<td>07/18/2006</td>
<td>Original release; mostly a port of RCU I but with pictures of RCU II components.</td>
</tr>
<tr>
<td>1.0 (ML)</td>
<td>08/03/2007</td>
<td>Release.</td>
</tr>
<tr>
<td>1.1 (ML)</td>
<td>02/21/2008</td>
<td>Expanded I/O section to show FCM I and FCM II wiring connections; described FCM comm. wiring in chapter 4; reorganized serial comm description by function not port.</td>
</tr>
<tr>
<td>1.2 (RCU)</td>
<td>08/21/2008</td>
<td>Added European Declaration of conformity and all international warnings;</td>
</tr>
<tr>
<td>1.2 (ML)</td>
<td>04/18/2008</td>
<td>Formatting change. No content change.</td>
</tr>
<tr>
<td>Date</td>
<td>Action</td>
<td></td>
</tr>
<tr>
<td>------------</td>
<td>-------------------------------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>07/25/2008</td>
<td>Added FCM I and II simulator description.</td>
<td></td>
</tr>
<tr>
<td>12/19/2008</td>
<td>Added instructions required by update from UL508 to UL61010-1 that customer is required to use a Class 2 power source when using the DC power supply; described wiring partitions; described three types of PGM W&amp;M switches: shaft and magnetic bolts; first release of magnetic switch construction; added table of torque requirements for all terminal block plugs used to section 2.3 as required by UL.</td>
<td></td>
</tr>
<tr>
<td>12/19/2009</td>
<td>Added instructions required by update from UL508 to UL61010-1 that customer is required to use a Class 2 power source when using the DC power supply; described wiring partitions; described three types of PGM W&amp;M switches: shaft and magnetic bolts; first release of magnetic switch construction; added table of torque requirements for all terminal block plugs used to section 2.3 as required by UL; changed format to mirror the new MultiLoad II format.</td>
<td></td>
</tr>
<tr>
<td>10/02/2009</td>
<td>Removed FCM diagrams from chapter 4 and placed them in separate FCM manual.</td>
<td></td>
</tr>
<tr>
<td>2/18/2011</td>
<td>Added wiring diagrams for 2 Meter I/O board; added wiring diagrams for Lectro Count; added exploded drawing views for slotted card reader construction; added Intertek requirements including Canadian required French bilingual warnings; combined RCU II DIV-2 and ML II DIV-2 into common manual; added ice shield maintenance.</td>
<td></td>
</tr>
<tr>
<td>10/29/2012</td>
<td>Corrected additive input mistake, updated mechanical drawings showing slotted card holder</td>
<td></td>
</tr>
<tr>
<td>10/29/2012</td>
<td>Removed revision number—control by date.</td>
<td></td>
</tr>
<tr>
<td>10/29/2012</td>
<td>Added Hardware revision table.</td>
<td></td>
</tr>
<tr>
<td>10/29/2012</td>
<td>Clarified 4-20mA input wiring. Corrected COM2 label errors in diagram.</td>
<td></td>
</tr>
<tr>
<td>10/29/2012</td>
<td>Updated label, updated warnings, updated European DOC.</td>
<td></td>
</tr>
<tr>
<td>10/29/2012</td>
<td>Updated AC-PS board: COM0 5 pin, prerelease COM2 2wire 485 addition.</td>
<td></td>
</tr>
<tr>
<td>10/18/2013</td>
<td>Removed the wiring partition (figures 2.5 – 2.7).</td>
<td></td>
</tr>
<tr>
<td>10/18/2013</td>
<td>Updated EN standards to latest editions.</td>
<td></td>
</tr>
<tr>
<td>04/19/2016</td>
<td>Revised Declaration of Conformity (new directive dates in effect 4/20/2016). EC DOC became EU DOC.</td>
<td></td>
</tr>
<tr>
<td>12/20/2018</td>
<td>Updated Chapter 5 I/O wiring figures to support multilingual support, improved mechanical drawings, updated Declaration of Conformity, and included I/O heat dissipation.</td>
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</tr>
</tbody>
</table>