MultiLoad II, RCU II
ExplosionProof Lite (EXL)

Installation Guide

Part # 6070
April 19, 2016
**EC Declaration Of Conformity (Valid until April 20, 2016)**

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:

- **94/9/EC**: The Potentially Explosive Atmospheres Directive (and its amending directives)

**Product:**
- Operator Interface/Process Control Equipment intended for use in potentially explosive atmospheres

**Model name/number:**
- MultiLoad II EXL (MID, YES), RCU II EXL (MID, NO)

**Protective Systems:**
- Flameproof ‘d’, Intrinsic Safety ‘ib’

**Notified Body(ies):**
- Det Norske Veritas Certification AS, Number 0575
- NMi Certin B.V., Number 0122
- Veritasveien 1
- Hugo de Grootplein 1
- 1322 Havik, Norway
- 3314 EG Dordrecht
- The Netherlands

**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: Electrical apparatus for explosive gas atmospheres—General requirements
- EN 60079-1: 2007: Electrical apparatus for explosive gas atmospheres—Flameproof enclosures ‘d’
- EN 60079-11: 2012: Electrical apparatus for potentially explosive atmospheres—Intrinsic safety ‘i’

**Year of CE Marking:** 2007
**Name:** William J. Porthouse  **Position:** Director of Engineering & Production  **Date:** 31-Dec-2012

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**EC Declaration Of Conformity (Valid after April 20, 2016)**

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 EXL (MID, YES), RCU II EXL (MID, NO)

**Protective Systems:**
- Flameproof ‘d’, Intrinsic Safety ‘ib’

**Notified Body(ies):**
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- EN 61000-6-2: 2005: Generic immunity for industrial operating environments
- EN 60079-0: 2012: Electrical apparatus for explosive gas atmospheres—General requirements
- EN 60079-1: 2007: Electrical apparatus for explosive gas atmospheres—Flameproof enclosures ‘d’
- EN 60079-11: 2012: Electrical apparatus for potentially explosive atmospheres—Intrinsic safety ‘i’

**Year of CE Marking:** 2007
**Name:** William J. Porthouse  **Position:** Director of Engineering & Production  **Date:** 19-Apr-2016

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MultiLoad II/ RCU II EXL Installation Guide: 20160419 - Part # 6070
SAFETY WARNINGS (AVERTISSEMENTS DE SÉCURITÉ)

⚠ NORTH AMERICAN INSTALLATIONS:
- This equipment is suitable for use in Class I, Division 1, Groups C and D locations or non-hazardous locations only.
- **WARNING:** TO REDUCE THE RISK OF IGNITION OF HAZARDOUS ATMOSPHERES, conduit runs must have a sealing fitting connected within 18 inches of the enclosure.
- **WARNING:** TO REDUCE THE RISK OF IGNITION OF HAZARDOUS ATMOSPHERES, disconnect from the supply circuit before opening enclosure. Keep tightly closed when circuits are live.
- **WARNING:** Substitution of components may impair intrinsic safety.
- **WARNING:** Do not open when an explosive gas atmosphere is present.
- **WARNING:** All unused conduit entries must be sealed with a conduit plug which satisfies the flameproof “d" method of protection.
- **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.
- **CAUTION:** Consult installation manual for required cable entry size and thread.
- 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 1, Groupes C & D ou les emplacements non dangereux.
- **AVERTISSEMENT:** RISQUE D'EXPLOSION Les scellements des conduits doit être installé à moins de 18 pouces du boîtier.
- **AVERTISSEMENT:** RISQUE D'EXPLOSION Couper le courant avant d'enlever le couvercle. Garder le couvercle bien fermé tant que les circuits sont sous tension.
- **AVERTISSEMENT:** La substitution de composants peut compromettre la sécurité intrinsèque.
- **AVERTISSEMENT:** Ne pas ouvrir si une atmosphère explosive peut être présente.
- **AVERTISSEMENT:** Toutes les entrées du boîtier inutilisées doivent être scellées avec un bouchon de conduit.
- **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.
- Consultez le manuel d'installation pour le filetage de forme et la taille du presse-étoupe.
- 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 NFPA 70 ou CSA C22.1 comme appropriée.
ATEX, IECEx, and BR Installations:

▲ This equipment is suitable for use in Ex Zone I Group IIB locations or non-hazardous locations.

THE LETTER “X” TO THE RIGHT OF THE CERTIFICATE NUMBER INDICATES THE FOLLOWING SPECIAL CONDITIONS FOR SAFE USE:

▲ CERTAIN FLAMEPROOF JOINTS ARE OTHER THAN THE MINIMUM OR MAXIMUM DIMENSIONS GIVEN IN IEC/EN/BR 60079-1, CLAUSE 5. PLEASE CONSULT TOPTECH SYSTEMS IF DIMENSIONAL INFORMATION IS REQUIRED.

▲ MAXIMUM SPECIFIED GAP OF FLANGE JOINT IS 0.08mm.

▲ AMBIENT TEMPERATURE RANGE IS BETWEEN -40°C AND +60°C.

▲ CAUTION: COVER BOLTS MUST HAVE A YIELD STRESS OF AT LEAST 700 N/mm².

▲ WARNING: TO REDUCE THE RISK OF IGNITION OF HAZARDOUS ATMOSPHERES, disconnect from the supply circuit before opening enclosure. Keep tightly closed when circuits are live.

▲ WARNING: Substitution of components may impair intrinsic safety.

▲ WARNING: Do not open when an explosive gas atmosphere is present.

▲ WARNING: All unused conduit entries must be sealed with a conduit plug which satisfies the flameproof “d” method of protection. Blanking elements must be removable with the aid of a tool, ATEX certified, suitable for Gas Group IIB and suitable for an ambient temperature range of -40 C to +60 C.

▲ 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. It must also have a temperature rating for the lowest expected minimum ambient temperature.

▲ Consult installation manual for required cable entry size and thread.

▲ 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/BR 60079-14.
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CHAPTER 1 GENERAL

1.1 WHO SHOULD USE THIS GUIDE
This guide is intended for individuals installing MultiLoad II/RCU II equipment, engineering firms developing site electrical drawings, and users troubleshooting system operation such as managers, system administrators, technicians, and meter proving personnel.

1.2 INFORMATION ALERTS:

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<tr>
<th></th>
<th>Important information to enhance understanding and make better use of the product.</th>
</tr>
</thead>
<tbody>
<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 you see this symbol.</td>
</tr>
</tbody>
</table>

1.2.1 TYPOGRAPHICAL CONVENTIONS:

**Boldface:** Indicates what you are to press 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.

1.2.2 RECEIVING AND/OR RETURNING EQUIPMENT:
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 Account Management to initiate timely repair or replacement of the unit.

Account Management will issue a Return Materials Authorization (RMA) to return the product or parts requiring repair. Do not return any material to Toptech without an RMA.

Account Management contact information:

Account Management
Toptech Systems
1124 Florida Central Pkwy
Longwood, FL
+1 (407) 332-1774

Account Management
Toptech Systems
Nieuwe Weg 1
Zwijndrecht 2070
Belgium
+3232506060

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.
1.3 OPERATING CHARACTERISTICS:
For product outline and dimensions see Appendix Figures 7.1 to 7.4.

Operating voltage: 85 - 250 Vac, 47-63 Hz, 300 – 150 mA OR
Voltage Option: 18 - 36 Vdc, 600mA

Operating temperature: -22°F to 140°F (-25°C to 60°C).
with Optional Heater: -40°F to 140°F (-40°C to 60°C).

Explosion proof enclosure:
Type 4, IP65
ETL Listed (US, Canada) Class 1, Division 1, Groups C & D
ATEX Certified Group IIB, T4, Category 2G: DNV-2007-OSL-ATEX-4076X
IECEx Scheme Certified: IIB, T4, Category 2G: DNV 09.0002X
Brazil InMetro Certified: IIB, T4, Gb: NCC 5249/09X

Weight: 33 lbs (15 kg)
Display: Color 5.7” Diagonal VGA
Prox Card Reader: Captive or Non-captive

Optional Lockable External Switches: Program Access, Weights & Measures Parameter Access
Keypad: 22 Key Alpha/ Numeric Membrane Switch Keypad
Keypad Option: 22 Key Alpha/ Numeric Capacitive Keypad

Communications:
3 serial ports (1 RS-232, 1 RS-485, 1 User Selectable RS-232 or RS-485)
1 Ethernet port 10/100 Mbps

Internal I/O Options: Two versions of an optional internal I/O boards are available: the Digital/ Analog I/O board, and the 2 Meter I/O board. The quantity and electrical ratings of the 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>
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<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>
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<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>
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<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 pulsers 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>
</tr>
</tbody>
</table>
1.4 **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 to include:

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.

1.5 **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 his own expense.

Modifications not expressly approved by the manufacturer could void the user’s authority to operate the equipment under FCC rules.
CHAPTER 2  INSTALLING THE MULTILOAD II/ RCU II EXL

2.1  TOOLS REQUIRED

2.1.1  INSTALLATION
- 8 mm hex wrench required for tightening cover bolts

2.1.2  SERVICING AND REPAIR
- #2 Philips screwdriver for circuit board removal
- ¼” socket wrench for CPU circuit board removal, 5/16” socket wrench for display board removal
- Torx T10 for removal of keypad bezel security screws

2.2  COVER CLOSURE AND BOLT REPLACEMENT
The enclosure cover is secured to the housing by twenty 10mm hex cap screws. An 8mm Allen head wrench is required to remove the screws. After the bolts are removed, the front cover will swing left and hang from its hinges. To close the cover, gently lift on the bottom right corner when in position and start one or two of the lower right corner bolts. This is done to assist in alignment of the cover and base holes for starting the bolts. Dry stainless steel fasteners can gall or seize in aluminum, so please be sure to use a petrolatum or similar lubricant.

| ! | Be sure to keep the flanges clean and free of scratches and nicks so as not to compromise the quenching ability of the flame path |
| ! | All cover bolts must be tightened to maintain the explosion proof capability of the enclosure |

2.3  MOUNTING THE MULTILOAD II/ RCU II EXL ENCLOSURE:
The EXL 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 Explosion Proof Lite (EXL) enclosure are shown in Figures 7.1 — 7.4. There is only one mounting orientation possible as shown in Figure 7.2. Five M20x 1.5 mm cable entries are located at the bottom of the unit.
Appropriate fasteners must be selected to support the minimum weight of 33 lbs (15 kg). Toptech offers the following mounting suggestions for three typical surfaces: metal, wood, or concrete/solid, block.

2.3.1  METAL PLATE OR RAIL
Use four hex head 3/8” OD (M10) bolts with a 3/8” flat washer, 3/4” OD (M10, 20mm OD) under the head of the bolt. Tighten with four 3/8” (M10) hex nuts.

2.3.2  WOOD
Use four hex head 2” x 3/8” OD (M10 x 50 mm) lag bolts with a 3/8” flat washer, 3/4” OD (M10, 20 mm OD) under the head of the bolt. Or, you may drill through holes in the wood and assemble as with the metal plate using four hex head 3/8” OD (M10) bolts with a 3/8” flat washer, 3/4” OD (M10, 20 mm OD) under the head of the bolt. Tighten with four 3/8” (M10) hex nuts.
2.3.3 **CONCRETE, SOLID BLOCK, OR BRICK WALLS**

Use four Sleeve, Bolt and Stud Anchors, Hex Nut 3/8" OD, 2 1/4" long or a metric equivalent.

2.3.4 **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 2.1 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 2.2 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 2.1 Suggested Mounting Position](image)

![Figure 2.2 Screen Visible Area](image)

2.4 **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). All sizes, orientations, and manufacturer brands have different torque and wire size specifications. Please follow the
recommendations in Figure 2.1 below. The manufacturer may be determined by looking for the logo molded into the terminal block, usually on the side.

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Logo</th>
<th>Terminal Block Pitch [mm]</th>
<th>Orientation</th>
<th>Allowable Wire Size [AWG]</th>
<th>Recommended Screw Torque [Nm]</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phoenix</td>
<td><img src="image" alt="Phoenix Logo" /></td>
<td>7.62</td>
<td>Straight</td>
<td>30 - 12</td>
<td>.6 - .8</td>
<td>5 - 7 TB1, Power Supply Board</td>
</tr>
<tr>
<td>On-Shore Technology</td>
<td><img src="image" alt="On-Shore Logo" /></td>
<td>7.62</td>
<td>Straight</td>
<td>24 - 12</td>
<td>.40</td>
<td>3.5 TB1, I/O Board</td>
</tr>
<tr>
<td>Sauro</td>
<td><img src="image" alt="Sauro Logo" /></td>
<td>7.62</td>
<td>Straight</td>
<td>30 - 12</td>
<td>0.8</td>
<td>7 TB1, I/O Board</td>
</tr>
<tr>
<td>Phoenix</td>
<td><img src="image" alt="Phoenix Logo" /></td>
<td>5.08</td>
<td>Straight</td>
<td>30 - 12</td>
<td>.6 - .8</td>
<td>5 - 7 TB1, I/O Board</td>
</tr>
<tr>
<td>On-Shore Technology</td>
<td><img src="image" alt="On-Shore Logo" /></td>
<td>5.08</td>
<td>Straight</td>
<td>24 - 12</td>
<td>.40</td>
<td>3.5 TB1, I/O Board</td>
</tr>
<tr>
<td>Sauro</td>
<td><img src="image" alt="Sauro Logo" /></td>
<td>5.08</td>
<td>Straight</td>
<td>30 - 12</td>
<td>0.8</td>
<td>7 TB1, I/O Board</td>
</tr>
<tr>
<td>Phoenix</td>
<td><img src="image" alt="Phoenix Logo" /></td>
<td>3.81</td>
<td>Straight</td>
<td>30 - 14</td>
<td>0.5</td>
<td>4 TB2 - TB5, Power Supply Board</td>
</tr>
<tr>
<td>On-Shore Technology</td>
<td><img src="image" alt="On-Shore Logo" /></td>
<td>3.81</td>
<td>Straight</td>
<td>28 - 16</td>
<td>0.19</td>
<td>1.7 TB2 - TB5, Power Supply Board; TB3 - TB6, I/O Board</td>
</tr>
<tr>
<td>Sauro</td>
<td><img src="image" alt="Sauro Logo" /></td>
<td>3.81</td>
<td>90°</td>
<td>30 - 14</td>
<td>0.31</td>
<td>2.7 TB2A, TB2B, I/O Board</td>
</tr>
<tr>
<td>Phoenix</td>
<td><img src="image" alt="Phoenix Logo" /></td>
<td>3.81</td>
<td>90°</td>
<td>26 - 16</td>
<td>0.3</td>
<td>3 TB2A, TB2B, I/O Board</td>
</tr>
<tr>
<td>On-Shore Technology</td>
<td><img src="image" alt="On-Shore Logo" /></td>
<td>3.81</td>
<td>90°</td>
<td>30 - 14</td>
<td>0.31</td>
<td>2.7 TB2A, TB2B, I/O Board</td>
</tr>
</tbody>
</table>

**Figure 2.3** MultiLoad II/ RCU II Terminal Block Recommended Wire Size and Screw Torque
2.5 **Electrical Supply Connections**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>![electricity symbol]</td>
<td>The MultiLoad II/RCU II may be equipped for either 85-250Vac or 24Vdc operation. Verify the power type before making any connections.</td>
</tr>
<tr>
<td>![warning]</td>
<td>To reduce the risk of ignition in hazardous atmospheres, conduit runs must have seals installed within 18 inches (45 cm) of the enclosure.</td>
</tr>
<tr>
<td>![warning]</td>
<td>Field wiring must have a temperature rating of 75°C or greater.</td>
</tr>
</tbody>
</table>

### 2.5.1 Cable Gland Entries

Five M20 x 1.5 mm apertures in the enclosure bottom are provided for the installation of cable glands. A gland with the correct corresponding thread must be installed in the opening.

| ![warning] | **WARNING:** If there are unused holes, blanking elements satisfying the flameproof “d” method of protection must be used. Blanking elements must be removable with the aid of a tool, ATEX certified, suitable for Gas Group IIB and suitable for an ambient temperature range of -40°C to +60°C. |

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. The terminal blocks are designed to accept wires sizes 12 AWG (3.31 mm²) through 24 AWG (0.205 mm²). The recommended tightening torque is 0.5 Nm [4.4 inch-pound force] to 0.6 Nm [5.3 inch-pound-force].

Both ac and dc input models require a safety ground connection as described in section 2.3.3 below.

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

| ![electricity symbol] | **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.
2.5.2 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/IEC 61010-1 and CAN/CSA-C22.2 No. 61010-1. The disconnect 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 corner of the Power Supply/Communication board as shown in Figure 2.1. Select supply wire rated 300V or better with a flammability rating of at least VW-1.
2.5.3 DC Powered Models

The MultiLoad II/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 18 – 36 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.

![Diagram of TB1 with labels: V+, V, GND, COM](image)

**Figure 2.5 DC Power Connections**

<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>

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

2.5.4 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 2.5. The required tightening torque is shown in Figure 2.3.

Canadian standards require a dedicated Intrinsic Safety ground wire to be attached to the internal I.S. barrier. Attach as show in Figure 2.9 inside the lower left of the enclosure.

Note that 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).

![Image of Canadian I.S. Ground Connection](image)

**Figure 2.6 Canadian I.S. Ground Connection**

Do not connect the power supply dc common to earth ground.
CHAPTER 3  DATA COMMUNICATIONS INTERFACE

The MultiLoad II/RCU II has four communications ports (see Figure 2.4) 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 2.4)</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)</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 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.
3.1 **COMMUNICATIONS PROTOCOL SELECTION AND CONNECTION:**

3.1.1 **RS-422/485:**

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 transmit and receive.

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 TB 3, 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.

3.1.2 **RS-232**

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:

- 24 AWG.
- 3 conductor with overall shield (data only) or 8 conductor with overall shield (full handshaking).
- 30 pF maximum between conductors.
3.1.3 FCM I / FCM II / PCM COMMUNICATIONS (COM 0 - RS-485, MultiLoad II PRODUCT ONLY)

FCM I, FCM II and PCM modules are all connected on a RS-485 bus connected to COM 0 on the MultiLoad II. 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.

![Diagram of FCM / PCM Connections](image)

Figure 3.1 FCM / PCM Connections
3.1.4 Host/TMS Communications (COM 1 - RS-485 4-Wire)

The 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.

![Diagram of Host/TMS RS485 to MultiLoad II/RCU II](image)

**Figure 3.2** RS485 4-Wire, Host to a Single MultiLoad II/RCU II (recommended)

![Diagram of Host/TMS RS485 to Multiple MultiLoad II/RCU II](image)

**Figure 3.3** RS485 4-Wire, Host to Multiple MultiLoad II/RCU IIs
3.1.5 Host/TMS Communications (COM 1 - RS-485 2-Wire)

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.

![Diagram of Host/TMS RS485 to MultiLoad II/RCU II](image1)

**Figure 3.4** RS485 2-Wire, Host to a Single MultiLoad II/RCU II

![Diagram of Host/TMS RS485 to Multiple MultiLoad II/RCU IIs](image2)

**Figure 3.5** RS485 4-Wire, Host to Multiple MultiLoad II/RCU IIs
3.1.6 **HOST/TMS COMMUNICATIONS (COM 1 - RS-232)**

The Host/TMS Computer System can be connected to the MultiLoad 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.

**Figure 3.6** RS232, Host to a Single MultiLoad II/RCU II

**Figure 3.7** RS232, Host to Multiple MultiLoad II/RCU IIs
3.1.7 **HOST TICKET PRINTER/DATA LOGGER (COM 2 - RS-232)**

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.

![Diagram of Ticket Printer / Data Logger Connections with Handshake](image1)

![Diagram of Ticket Printer / Data Logger Connections without Handshake](image2)
3.1.8 **ETHERNET**

Ethernet wiring standard T568B - Cat5 cable (or greater).

Figure 3.10 illustrates the required connections for 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.

![Twisted Pairs Diagram](image-url)
CHAPTER 4  I/O CONFIGURATION

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 4.1 and 4.2 show the boards’ 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.

4.1 CONNECTING FIELD DEVICES TO THE 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 bottom side of the I/O board.

Disconnect from the supply circuit before opening enclosure.
Keep tightly closed when circuits are live.

The quantity and electrical ratings of the 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)</td>
<td>6 (TB7, TB8)</td>
<td>5 - 30Vdc, TB2B Dual Channel flow meter inputs (1-5000Hz)</td>
</tr>
<tr>
<td></td>
<td>(2 High Speed)</td>
<td>(4 High Speed)</td>
<td>miscellaneous signal inputs</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 preamps</td>
</tr>
<tr>
<td></td>
<td>(TB2-Left)</td>
<td>(TB6)</td>
<td></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>
</tr>
</tbody>
</table>
Figure 4.1 Digital/Analog I/O Board Terminal Block Assignments

Figure 4.2 2 Meter I/O Board Terminal Block Assignments
4.1.1 **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 failsafe shutdown of the product flow.

**Figure 4.3** MultiLoad II Digital/Analog I/O Board Field Wiring: Flow Meter and Control Valve
Figure 4.4  MultiLoad II 2 Meter I/O Board, FCM #0 Field Wiring: Flow Meter and Control Valve

**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 failsafe shutdown of the product flow.
Chapter 4 - I/O Configuration

MultiLoad II 2 Meter I/O Board, FCM #1 Field Wiring: Flow Meter and Control Valve

**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 failsafe shutdown of the product flow.
### 4.1.2 MultiLoad II Additive Wiring

**Figure 4.6 MultiLoad II Digital/ Analog I/O Board Field Wiring: Additive Meters and Injection Valves**

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: 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: 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.
4.1.3 MultiLoad II RTD Temperature Probe Wiring

4-Wire
100 Ohm Platinum RTD
Alpha = 0.0385

2-Wire RTD Connection

3-Wire RTD Connection

Figure 4.9 MultiLoad II Digital/Analog I/O Board Field Wiring: RTD

**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).
Figure 4.10  MultiLoad II 2 Meter I/O Board, FCM #0 Field Wiring: RTD

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).
**Figure 4.11**  MultiLoad II 2 Meter I/O Board, FCM #1 Field Wiring: RTD

**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).
4.1.4 **Multiload II 4-20mA Input Wiring: Loop Current Provided by External Power Supply**

NOTE: The 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.

Figure 4.12  Multiload II Digital/ Analog I/O Board Field Wiring: 4-20mA Input
4.1.5 **MultiLoad II 4-20mA Input Wiring: Loop Current Provided by Transmitter**

NOTE: The 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.

**Figure 4.13** MultiLoad II Digital/ Analog I/O Board Field Wiring: 4-20mA Input
4.1.6 **MultiLoad II 4-20mA Output Wiring**

Figure 4.14  MultiLoad II Digital/ Analog I/O Board Field Wiring: 4-20mA Output

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

Figure 4.15 MultiLoad II Digital/Analog I/O Board Field Wiring: AC Pump and Valve Control

**Note:** This shows a typical configuration. AC outputs can be assigned to any unused AC output.
Figure 4.16  MultiLoad II 2 Meter I/O Board, FCM #0 Field Wiring: AC Pump and Valve Control

Note: This shows a typical configuration. AC outputs can be assigned to any unused AC output.
Figure 4.17  MultiLoad II 2 Meter I/O Board, FCM #1 Field Wiring: AC Pump and Valve Control

Note: This shows a typical configuration. AC outputs can be assigned to any unused AC output.
4.1.8 **MULTILOAD II AC INPUT WIRING**

![Diagram of MultiLoad II AC Input Wiring](image)

**Figure 4.18** MultiLoad II 2 Meter I/O Board, FCM #0 Field Wiring: AC Permissive Input
Figure 4.19  MultiLoad II 2 Meter I/O Board, FCM #1 Field Wiring: AC Permissive Input
4.1.9 **MultiLoad II DC Permissive/Status Wiring**

![MultiLoad II DC Permissive/Status Wiring Diagram](image)

**Figure 4.20** MultiLoad II Digital/Analog I/O Board Field Wiring: DC Permissive/Status

**Note:** This shows a typical configuration. DC Permissive/Status inputs can be assigned to any unused DC input.

**Note:** The Digital/Analog I/O board lacks AC inputs.
Figure 4.21  MultiLoad II 2 Meter I/O Board, FCM #0 Field Wiring: DC Permissive/Status

**Note:** This shows a typical configuration. DC Permissive/Status inputs can be assigned to any unused DC input.
Figure 4.22 MultiLoad II 2 Meter I/O Board, FCM #1 Field Wiring: DC Permissive/Status

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

Figure 4.23 MultiLoad II Digital/ Analog I/O Board Field Wiring: DC Output

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.
Figure 4.24  MultiLoad II 2 Meter, FCM #0 I/O Board Field Wiring: DC Output

**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.
**Figure 4.25** MultiLoad II 2 Meter, FCM #1 I/O Board Field Wiring: DC Output

**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.
4.1.11 **MULTILOAD II 2 OUTPUT AIR ELIMINATOR WIRING**

![Diagram of MultiLoad II 2 Output Air Eliminator Wiring](image)

**Figure 4.26** MultiLoad II Digital/Analog I/O Board Field Wiring: 2 Output Air Eliminator

**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.
Figure 4.27  MultiLoad II 2 Meter I/O Board, FCM #0 Field Wiring: 2 Output Air Eliminator

**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.
Figure 4.28  MultiLoad II 2 Meter I/O Board, FCM #1 Field Wiring: 2 Output Air Eliminator

**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.
4.1.12 MultiLoad II Lectro Count Remote Display Wiring

Figure 4.29  MultiLoad II Digital/Analog I/O Board Field Wiring: Lectro Count

Note: Use only model E1613. The Lectro Count +12Vdc, 12V common can be supplied by an external source.

Note: Connect Port 10 to Lectro Count output pulse. Connect Port 11 to Lectro Count reset pulse.
Figure 4.30  MultiLoad II 2 Meter I/O Board Field Wiring: Lectro Count

**Note:** Use only model E1613. The Lectro Count +12Vdc, 12V common can be supplied by an external source.

**Note:** Connect Port 0.10 to Lectro Count output pulse. Connect Port 1.10 to Lectro Count reset pulse.
4.1.13 RCU II DC INPUT WIRING

Figure 4.31 RCU II Digital/Analog I/O Board Field Wiring: DC Inputs
4.1.14 **RCU II AC/DC Output Wiring**

![Diagram of RCU II AC/DC Output Wiring]

**Figure 4.32** RCU II Digital/Analog I/O Board Field Wiring: AC/DC Outputs

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

**Note:** This shows a typical configuration. AC outputs can be assigned to any unused AC output.
4.2 I/O BOARD SIMULATOR (MultiLoad II Only)

The I/O Board simulator is a special version of an I/O board intended for demo and lab systems. The simulator merely has different firmware that allows configuration entirely from MultiLoad without requiring field signals.

4.2.1 Meter Simulation

Product flow control loops can be run in a demonstration mode by imitating a “virtual” flow meter (single or quadrature) and its associated “virtual” Digital Control Valve. Product flow simulation is automatically enabled when a meter is assigned to the simulator. Ports 2 and 3 will be automatically assigned and actuated to simulate the upstream and downstream solenoids of an associated Digital Control valve. Port 4 will be assigned as the primary meter pulser and the module will behave as if pulses were actually received on Port 4. A quadrature meter will be simulated if the ‘Quad Check Enable’ parameter is set in MultiLoad and the secondary meter channel will be assigned to Port 5.

When ports 2 & 3 are both activated product flow will ramp up. When port 2 is active and port 3 is inactive, flow will remain constant. When both ports are inactive, flow rate will ramp down to zero.

4.2.2 Additive Simulation

Up to 4 channels of additive control (Solenoid or Piston type) may also be simulated. If an additive meter is selected, it will be simulated with a 100 Hz pulser input.

4.2.3 Analog Simulation

If analog functions are enabled in MultiLoad such as RTD temperature input, or 4-20mA current input, the simulator places fixed analog values into these input registers. For the RTD, the fixed temperature is 28.5°C. For the 4-20mA current input the value is fixed at 12.800mA. The later input provides simulation of a density or pressure sensor input.

4.2.4 Generic I/O Simulation

I/O lines not used for Product or Additive simulation are available as general purpose DC inputs or AC outputs.

WARNING: Do not make connections to field terminals. UNEXPECTED OPERATION MAY RESULT. The I/O is close looped in logic.
CHAPTER 5  CONFIGURATION

The following describes how to navigate the system, select field values, perform data entry, and toggle options on and off.

5.1  SWITCH ACCESS CONTROL

The MultiLoad II contains switches which limit menu and configuration access. These switches limit users from accessing Program Mode and 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.

5.1.1  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.
5.1.2 **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 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 function.

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

Figure 5.1   Type 1 Program / W&M Switches

5.1.3 **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
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.

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

Figure 5.2   Type 2 Program / W&M Switches
5.1.4 **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 Switches](image)

**Figure 5.3** Type 3 Program / W&M Switches

---

**WARNING**

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

**HAND TIGHTEN ONLY!**
5.1.5 **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 toward the back of the enclosure (bottom of the picture).

When switch is in the ON position, the switch is in the active state, allowing access. A switch is ON when it moved 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 5.4 below, the Program Mode switch is currently Active, while the W&M Switch is not active. Figure 5.5 shows the location of the DIP switch on revision 2.0 CPU boards.

| ![Switch Diagram] |
| A switch input is active when either the DIP switch OR the external switch is active (ON). |
| ![Switch Diagram] |
| Your Weights and Measures inspector may wish to verify that DIP switch 4 (bottom switch) is in the off position (moved left) prior to sealing the MultiLoad II enclosure. This will ensure that W&M parameters are secure. |

**Figure 5.4** CPU DIP Switches for Program and W&M Access (rev 1.0)  
**Figure 5.5** CPU DIP Switches for Program and W&M Access (rev 2.0)

5.1.6 **FIELD SWITCH ACCESS CONTROL (MULTILOAD II ONLY)**

The MultiLoad II also has the ability to accept field inputs for the Program Mode and W&M Access switches. See the “MultiLoad II User Guide” for more information.

| ![Note Diagram] |
| 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. |
5.2 MultiLoad II/RCU II EXL Keypad

The MultiLoad II/RCU II EXL keypad has 22 keys, including alpha/numeric and function keys, 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 decimal point (.) is used to enter numeric field data with a decimal point. CLR key is used to clear data entered in error. The CLR key is a backspace key erasing characters as the cursor moves backward.

5.3 Menus and Screens

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

```
MAIN MENU
  Configuration
  Diagnostics
  Views and Inquiries
  SD Card
```

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
  Card Reader  Meters
  COM Loopback Components
  Serial Ports  Additives
  Network Test  Custom Logic
  Keypad
  Display
  Unicode
  FCM Com
  PCM Com
  FCM Health
  PCM Health
  RCU
  Bay
  Preset
```

Next Prev Exit Enter
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.

### 5.4 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.

```
<table>
<thead>
<tr>
<th>RCU GENERAL SETUP</th>
</tr>
</thead>
<tbody>
<tr>
<td>RCU Address:                     001</td>
</tr>
<tr>
<td>Card Reader:                     DISABLD</td>
</tr>
<tr>
<td>Remote Processing:               DISABLD</td>
</tr>
<tr>
<td>Swing Arm Secondary:             DISABLD</td>
</tr>
<tr>
<td>Password #1:                     *******</td>
</tr>
<tr>
<td>Password #2:                     *******</td>
</tr>
<tr>
<td>Password #3:                     *******</td>
</tr>
<tr>
<td>Password #4:                     *******</td>
</tr>
<tr>
<td>Password #5:                     *******</td>
</tr>
<tr>
<td>Modem Dial:                      Modem Login: RCU TE TOPECH</td>
</tr>
<tr>
<td>Terminal Name: Toptech Terminal</td>
</tr>
</tbody>
</table>

Next Prev Exit Enter
```

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

```
<table>
<thead>
<tr>
<th>RCU GENERAL SETUP</th>
</tr>
</thead>
<tbody>
<tr>
<td>RCU Address:                     █</td>
</tr>
<tr>
<td>Card Reader:                     DISABLD</td>
</tr>
<tr>
<td>Remote Processing:               DISABLD</td>
</tr>
<tr>
<td>Swing Arm Secondary:             DISABLD</td>
</tr>
<tr>
<td>Password #1:                     *******</td>
</tr>
<tr>
<td>Password #2:                     *******</td>
</tr>
<tr>
<td>Password #3:                     *******</td>
</tr>
<tr>
<td>Password #4:                     *******</td>
</tr>
<tr>
<td>Password #5:                     *******</td>
</tr>
<tr>
<td>Modem Dial:                      Modem Login: RCU TE TOPECH</td>
</tr>
<tr>
<td>Terminal Name: Toptech Terminal</td>
</tr>
</tbody>
</table>

Enter Exit
Type in the new value (e.g. 123) and press **ENTER**. The new value displays on the screen.

![RCU GENERAL SETUP](image)

Using this same screen as an example, the Remote Processing line is selected and **ENTER** is pressed, use the **NEXT** or **PREV** keys to toggle between the values **ENABLED** and **DISABLD**, as shown below. You must then press **ENTER** to accept the desired choice.

![RCU GENERAL SETUP](image)
5.5 **MultiLoad II/RCU II Preliminary Configuration:**

1) Energize the MultiLoad II/RCU II.

2) When the MultiLoad II is first energized 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 5.1).

   **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.

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

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

8) Press **Exit** to return to the Configuration Menu.

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

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

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

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 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.
5.7 **Using I/O Diagnostics**

**MultiLoad II:** Consult 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 should 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.
CHAPTER 6  SERVICE AND REPAIR

6.1 MODULAR DESIGN:
The MultiLoad II/ RCU II EXL has been constructed with replaceable modules or sub-assemblies that are available from Toptech (see Appendix for part numbers). These include:

- CPU Subassembly (CPU Chassis, CPU Board, Power Supply / COM Board, I/O Board).
- Display Subassembly (Active Matrix Display and Display Board)
- Keypad
- Keypad Barrier Circuit
- Prox Reader

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

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

6.1.1 OPERATING THE FLAT DISPLAY CABLE CONNECTORS:

Removal:
1. To remove the Display Cable rotate the cam to the open (up) position (see Figure 6.1).
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 6.2). When inserting the cable make sure that it is not tilted to one side or the other and that the bottom of the cable is completely seating in the connector.
3. Rotate the cam to the closed (down) position to lock in place (see Figure 6.3).

Figure 6.1 Cam lock in the Open (Up) position
Figure 6.2 Display Cable Insertion

Figure 6.3 Cam lock in the closed (down) position
6.1.2 **CPU Subassembly Removal and Replacement:**

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

**Removal:**
1. Disconnect all field wiring from the I/O board.
2. Disconnect all Serial Communications 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 mounting 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 Mains 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.

6.1.3 **Display Subassembly Removal and Replacement:**

**Removal:**
1. Disconnect the flat display cable (after releasing the cam lock), 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.
6.1.4 Keypad Removal and Replacement:

Removal:
1. Using a security screwdriver bit (available from Toptech), remove all security screws holding on the Keypad bezel.
2. Remove the bezel.
3. Using a flat screwdriver, carefully pry out the keypad.
4. Disconnect the keypad cable from the back of the keypad.

Installation:
1. Connect the keypad cable to the back of the keypad.
2. Carefully install the keypad into the cover.
3. Install the keypad bezel.
4. Using a security screwdriver bit, install all the bezel holding security screws.

6.1.5 Keypad Barrier Circuit Removal and Replacement:

Removal:
1. Disconnect the keypad cable from the display subassembly.
2. Remove the four screws holding barrier circuit box.
3. One by one, move over the keypad wires to a new barrier circuit.

Installation:
1. Reinstall the barrier circuit box with the four holding screws.
2. Connect the keypad cable to the display subassembly.

6.1.6 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:
1. Reinstall the prox reader with the two nuts.
2. Connect the prox reader cable to the display subassembly.
Figure 7.1  Unit Outline Drawing – Front View

Figure 7.2  Unit Outline Drawing – Back View
Figure 7.3  Unit Outline Drawing – Bottom View

Figure 7.4  Unit Outline Drawing – Side View
Figure 7.5 Replacement Parts MultiLoad II/ RCU II EXL Unit Assembly

Figure 7.6 Exploded View Front Cover Assembly
Figure 7.7  Power Supply / Comm Board & I/O Board Chassis

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>EXL Display Assembly (1)</td>
<td>1667</td>
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<td>EXL Barrier Assembly (2)</td>
<td>1668</td>
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<tr>
<td>Prox Reader Assembly (3)</td>
<td>1669</td>
</tr>
<tr>
<td>CPU-Display Ribbon Cable (4)</td>
<td>1250</td>
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<tr>
<td>EXL Keypad (5)</td>
<td>1638</td>
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<tr>
<td>AC Power Supply Board (6):</td>
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<tr>
<td>Revision 1.0</td>
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<td>Revision 1.1</td>
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<tr>
<td>Revision 1.1</td>
<td>4729</td>
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<tr>
<td>I/O Board (8):</td>
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<td>Digital/ Analog I/O, revision 1.1</td>
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<tr>
<td>2 Meter I/O Board, revision 1.0</td>
<td>4723</td>
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<tr>
<td>CPU Board (9):</td>
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</tr>
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</tr>
<tr>
<td>Revision 2.0</td>
<td>4723</td>
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## CHAPTER 8 HARDWARE REVISION HISTORY

<table>
<thead>
<tr>
<th>Date</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>07/20/2008</td>
<td>Initial product release with ATEX certification.</td>
</tr>
<tr>
<td>12/19/2008</td>
<td>C/US UL Listing issued..</td>
</tr>
<tr>
<td>08/25/2009</td>
<td>Added display heater option.</td>
</tr>
<tr>
<td>08/25/2009</td>
<td>Alternate cast enclosure with alternate cement.</td>
</tr>
<tr>
<td>01/09/2009</td>
<td>Released magnetic switches for configuration &amp; weights and measures.</td>
</tr>
<tr>
<td>03/25/2010</td>
<td>Changed regulatory agency from UL to CSA.</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>
<tr>
<td>02/08/2011</td>
<td>Released 2 Meter I/O board option (IO_2M rev 1.0).</td>
</tr>
<tr>
<td>03/08/2011</td>
<td>Changed regulatory agency from CSA to Intertek.</td>
</tr>
<tr>
<td>04/08/2011</td>
<td>IECEx certificate issued.</td>
</tr>
<tr>
<td>01/17/2012</td>
<td>Replaced relay assemblies on I/O board with discrete triacs (IO_DA rev 1.2, IO_2M rev 1.1).</td>
</tr>
<tr>
<td>06/07/2013</td>
<td>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)</td>
</tr>
<tr>
<td>10/01/2014</td>
<td>Improved RTD filtering (IO_DA rev 1.3, IO_2M rev 1.2)</td>
</tr>
<tr>
<td>09/24/2015</td>
<td>Released SCS_IO board (rev 1.0)</td>
</tr>
</tbody>
</table>
# Chapter 9 Manual Revision History

<table>
<thead>
<tr>
<th>Revision</th>
<th>Date</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0 (ML)</td>
<td>07/31/2007</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 (ML)</td>
<td>04/18/2008</td>
<td>Removed FCM diagrams from chapter 4 and placed them in separate FCM manual.</td>
</tr>
<tr>
<td>1.3 (ML)</td>
<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>
</tr>
<tr>
<td>1.0 (RCU)</td>
<td>02/26/2009</td>
<td>Release of RCU II EXL Installation Guide.</td>
</tr>
<tr>
<td>1.4 (ML)</td>
<td>10/02/2009</td>
<td>Added operating characteristics summary; changed format to mirror the new MultiLoad II format in the I/O section.</td>
</tr>
<tr>
<td>1.5</td>
<td>02/18/2011</td>
<td>Added wiring diagrams for 2 Meter I/O board; added wiring diagrams for Lectro Count; added Intertek requirements including Canadian required French bilingual warnings; combined RCU II EXL and ML II EXL into common manual; added Canadian IS ground wiring instructions.</td>
</tr>
<tr>
<td>1.5</td>
<td>03/11/2011</td>
<td>Editorial: pp. 3, 28, 70, 72, 73; noted SD Card menu in Chapter 5.</td>
</tr>
<tr>
<td>1.5</td>
<td>10/29/2012</td>
<td>Corrected additive input mistake, updated mechanical drawings showing slotted card holder.</td>
</tr>
<tr>
<td>10/31/2012</td>
<td>Removed revision number—control by date.</td>
<td></td>
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<tr>
<td>10/31/2012</td>
<td>Added Hardware revision table.</td>
<td></td>
</tr>
<tr>
<td>10/31/2012</td>
<td>Clarified 4-20mA input wiring. Corrected COM2 label errors in diagram.</td>
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</tr>
<tr>
<td>10/31/2012</td>
<td>Updated label, updated warnings, updated European DOC.</td>
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</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)</td>
<td></td>
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