GUIDANT

MANUAL

Electronic Preset Delivery System

Smith Meter® microLoad.net™

Installation Manual

Bulletin MN06150 Issue/Rev 0.7 (9/18)

Caution

The default or operating values used in this manual and in the program of the Smith Meter® microLoad.net™ are for factory testing only and should not be construed as default or operating values for your metering system. Each metering system is unique and each program parameter must be reviewed and programmed for that specific metering system application.

Disclaimer

Guidant hereby disclaims any and all responsibility for damages, including but not limited to consequential damages, arising out of or related to the inputting of incorrect or improper program or default values entered in connection with the microLoad.net.

Receipt of Equipment

When the equipment is received the outside packing case should be checked immediately for any shipping damage. If the packing case has been damaged, the local carrier should be notified at once regarding his liability. Carefully remove the unit from its packing case and inspect for damaged or missing parts.

If damage has occurred during shipment or parts are missing, a written report should be submitted to the Customer Service Department, Guidant, 1602 Wagner Avenue, Erie, Pennsylvania 16510.

Prior to installation, the unit should be stored in its original packing case and protected from adverse weather conditions and abuse.

Caution

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with this Instruction Manual, may cause interference to radio communications. It has not been tested to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user, at his own expense, will be required to take whatever measures may be required to correct the interference.

Warning

These preset devices must be used with fail-safe backup equipment to prevent accidental runaway delivery of product. Failure to provide backup equipment could result in personal injury, property loss and equipment damage.

Warning

On initial power-up of a new unit or after installation of a new computer board, there are several alarms that will be triggered, which cannot be cleared until the microLoad.net is programmed.

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Introduction

This manual is to be used for the installation of the Smith Meter® microLoad.net™ Electronic Preset Controller with microLoad.net firmware. The manual is divided into six sections: Introduction, Pre-Installation Considerations, Installation, Diagrams, Specifications, and Related Publications.

“Pre-Installation Considerations” describes the areas that must be considered prior to the installation of the microLoad.net.

“Installation” describes the areas that have to be considered when installing the microLoad.net.

“Diagrams” covers dimensional outline drawings, wiring schematics, typical interconnect diagrams etc.

“Specifications” describes the specifications of the microLoad.net Electronic Preset.

“Related Publications” lists the literature that is associated with the microLoad.net.

The Smith Meter® microLoad.net™ is a micro-processor based single arm, single product electronic preset instrument that supports up to 12 recipes. It is configurable to support a variety of user applications.

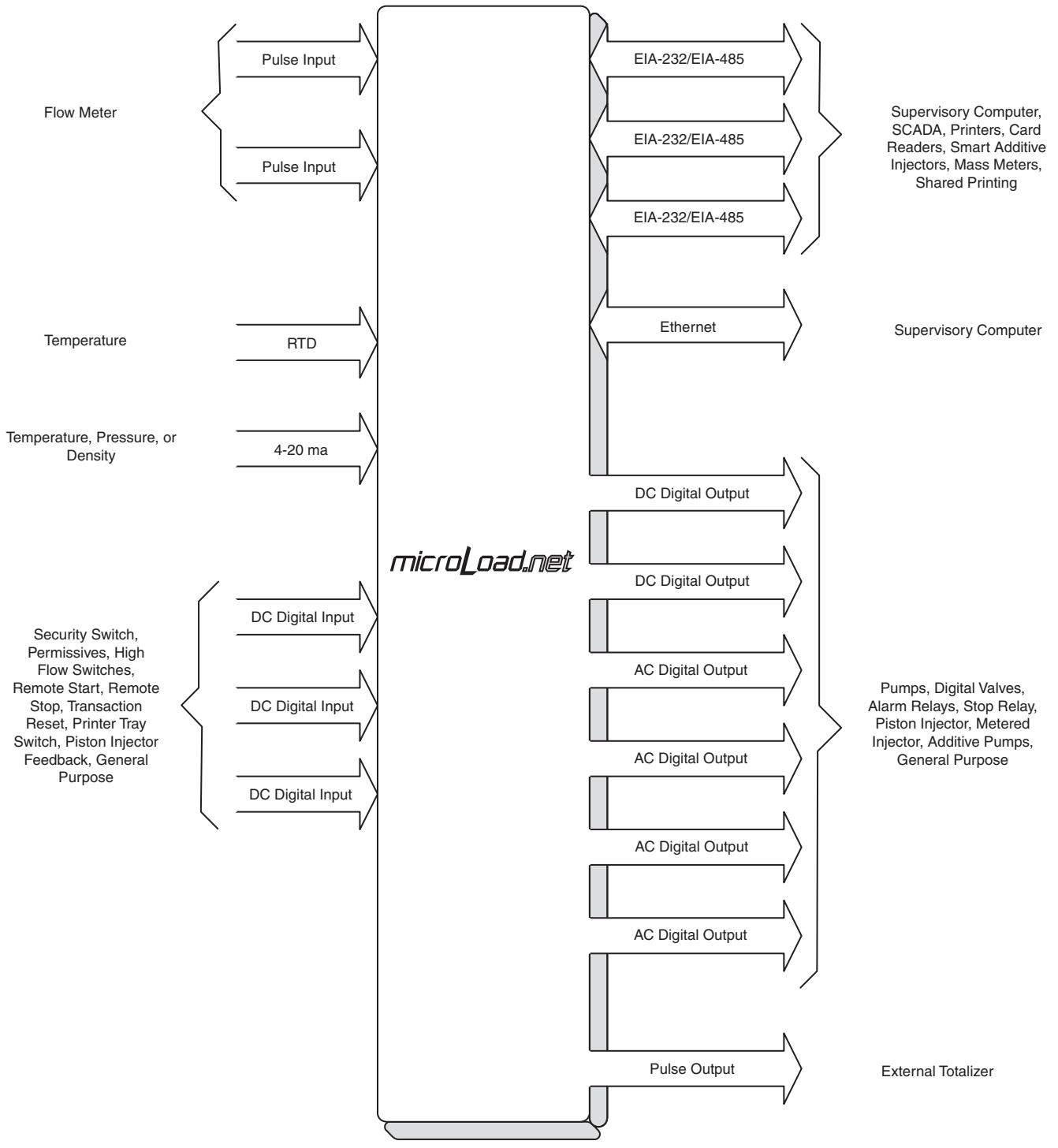


Figure 1. I/O Block Diagram

An important pre-installation consideration is the selection of the ancillary equipment to be used with the microLoad.net and how that equipment is interfaced. This manual contains an I/O Configuration Worksheet (Table 6, page 16) which will assist in the assignment of devices to the microLoad.net's various I/O positions. The Worksheet lists the available I/O points versus possible devices or functions which may be applied. By checking the appropriate boxes on the Worksheet I/O map of your application is established. A sample application starts on page 40.

Mechanical

In addition to the following, all previous warnings and cautions should be reviewed before installation.

1. A solid vertical or slanted surface should be used for mounting the explosion-proof microLoad.net housing.

   Weight: = 15 lb. (2.3 kg)
2. The location and the height of microLoad.net should be selected to permit easy viewing of the display and to provide convenient access to the keypad by all users. See Figure 2 for dimensions of the microLoad.net.
3. Access for servicing microLoad.net is through the front cover. For service, wiring and removal of parts the cover must removed.
4. Conduit entry to the explosion-proof microLoad.net is both through the bottom and sides. There are two 3/4" NPT conduit entrances in the bottom of the unit and one 1/2" NPT conduit entrances in each side of the unit.
5. In warm climates, microLoad.net should be shaded from direct sunlight. The maximum external temperature of the microLoad.net housing must not exceed 140°F (60°C) to ensure that the internal temperature limit is not exceeded.

Electrical

Note: *See Appendix A for information regarding ATEX electrical installation.*

1. All DC wiring must be routed into microLoad.net through the conduit entries located in the bottom of the housing. Do not route DC and AC wiring through the same conduit entry.
2. The DC signal wires must be multi-conductor shielded cable of 18 to 24 AWG minimum stranded copper.
3. Ethernet cable must meet the requirements of CAT5 at a minimum. Direct Ethernet connections between computer and microLoad.net require a crossover cable configuration. Standard direct cable configuration is used where the microLoad.net units are networked through a hub or switch.

Note: *The following recommendations are based on our knowledge of the electrical codes. The local electrical codes should be reviewed to ensure that these recommendations follow the local code. Also installation manuals of all the equipment being wired into the microLoad.net should be reviewed for transmission distances and wire recommendations.*

Table 1. Typical Wire Sizes

Equipment	Number & Gauge of Wire	Belden Number or Equivalent
Transmitters	4 / 18 Ga. 4 / 20 Ga.	9418 8404
Temp. Probes Density and Pressure ransmitters	4 / 22 Ga.	8729 OR 9940
EIA-232 Comm	3 / 24 Ga.	9533
EIA-485 Comm	4 / 24 Ga.	9842

Table 2. Maximum Cable Length and Baud Rate (EIA-232)

Baud Rate	Feet	Meters
38,400	250	75
19,200	500	150
9,600	1,000	305
4,800	2,000	610
2,400	4,000	1,220
1,200	4,000	1,220

Table 3. Maximum Cable Length and Baud Rate (EIA-485)

Baud Rates	Feet	Meters
1,200 to 38,400	4,000	1,220

4. All AC wiring must be routed into microLoad.net through the conduit entries located in the side of the housing. Connectors sized for a maximum of 14 gauge wire, consult the local electrical codes for the minimum AC wire size required for your application. Do not route AC and DC wiring through the same conduit entry.
5. All AC wiring should be stranded copper and must comply with federal, state and local codes and specifications.
6. Two separate AC circuits must be provided from the breaker panel. One circuit will supply isolated power to the microLoad.net electronics (instrument power). The second circuit will supply power to the external devices.
7. For proper operation, the microLoad.net must be

earth grounded. The grounding point should be as close to the unit as possible. To ensure proper earth ground:

a) The resistance between the earth ground lug in the microLoad.net and the grounding point must not exceed 2 Ω.

b) The proper grounding point is a ½" to ¾" diameter copper stake that extends into the water table. Where this is not practical, a ground plane may be used.

Note: *Electrical conduit, piping, and structural steel are not considered proper grounding points for equipment using electronics.*

c) No other devices, except the microLoad.net and ancillary equipment such as load printers, should be connected to any point in the grounding circuit.

8. All user wiring is terminated at compression-type screw terminal strips. These terminal strips may be removed from the microLoad.net MACF and MNET circuit boards to facilitate ease of wiring. Once wiring is complete, the terminal strips are then "plugged into" their respective positions on the circuit boards.
9. If external relay permissives are used in series with microLoad.net AC digital outputs, an RC network must be placed in parallel with the permissive to prevent a false turn-on of the microLoad.net digital outputs. Recommended RC network = 0.1 UF capacitor and a 680 Ω resistor (Electrocube part number RG 2031-11).
10. Interposing relays must be installed between the pump controller, alarming device, and the microLoad.net permissive sense relays. Permissive sense inputs are DC voltage.

Mechanical

1. Mount the microLoad.net using four (4) 5/16 - 18 bolts. See Figure 2 for mounting hole layout.
2. Attach the required conduit runs to the microLoad.net. Be sure to plug all unused conduit entries.
3. In preparation for wiring, remove microLoad.net cover/keypad/display. This is done by removing six (6) cap screws, which hold the cover to the microLoad.net enclosure. Carefully pull the cover away from the enclosure and unplug factory-installed cables by removing the terminal blocks at the MNET circuit board. Note the position of these connections for reinstallation later.
4. Care must be taken in handling the microLoad.net enclosure and cover to avoid scratching the ground flange where they are assembled.

Electrical

1. AC circuits must be isolated from DC circuits and brought into the unit through their respective conduit openings.

   ATEX / IECEx

   Cable entry must be in accordance to EN/IEC 60079-1 section 13.

   For wiring systems utilizing cable glands, the gland and or thread adaptor must be Ex certified. The cable end must be securely installed and, depending on the cable type, be properly protected from mechanical damage.

   For wiring systems utilizing conduit, an Ex certified sealing device must be used immediately at the entrance of the enclosure.

   Any unused entry must be suitably blocked with an Exd IIB IP65 Certified Plug for ATEX and IECEx applications.

   For North American Zone applications, the plug must be listed metal close up type.

   The maximum ambient temperature for the enclosure is 60°C.

   Equipment bonding shall be provided at the external grounding facility terminal, external connection is not required when using metallic conduit or armored cable. External grounding facility terminal wire range: 10-12 AWG (5.26 sq mm to 3.31 sq mm) wire.

   Cover to body fasteners must be either DIN 912 grade 12.9 (alloy steel), DIN 912-A4-70 (316 stainless steel), or DIN 912-A2-70 (18-8 stainless steel).

   Keypad is protected by an intrinsic safe barrier, the enclosure must be grounded as per national electrical code regulations, for example NEC/CEC etc.

   Battery back-up option (if equipped) use only approved AAA NiMH (1.2V/Cell Nominal) rechargeable batteries meeting IEC 61951-2 requirements, IEC IEC IEC Designation (IEC-HR03), with a maximum capacity of 1.5 Ah at a 1 h discharge rate.

   Caution: To prevent ignition of hazardous atmospheres, disconnect from supply circuit before opening, keep tightly closed when circuits are in operation.

   Warning: Contains internal battery-powered circuit, to prevent ignition of hazardous atmospheres, do not open enclosure unless area is known to be non-hazardous.

   Note: *Refer to page 42 for certification and marking information.*
2. All signal and DC wiring should be connected before connecting AC wiring.
3. Be sure all connections on the terminal blocks are tight.
4. All exposed shields must be properly insulated to prevent short circuits to other terminals or to the chassis. The shield at the device (e.g., temperature device, transmitter, etc.) must be cut back to the insulation and taped off. All shields should be continuous. If splices are required, they must be soldered and properly insulated.

   If other communicating devices are used with the microLoad.net, refer to the manual for that unit for shielding information. Shields for other communicating equipment should not be terminated in the microLoad.net.

   Note: *Shields must not be terminated at the earth ground lugs.*
5. Sufficient slack should be provided for the wiring in the microLoad.net to permit easy removal of the boards. With sufficient slack, the terminal blocks can be removed and laid back out of the way so that the boards can be replaced without removing individual wires.
6. There is an earth ground lug provided in the unit. The wire from the lug should be connected to the proper grounding point. See Pre-Installation Considerations, page 4.

   Note: *CENELEC approved microLoad.nets require that the customer install ferrules (Aderendhulsen) per DIN 46 228 on the grounding wires prior to installation into the grounding lugs.*
7. Typical electrical installation diagrams are provided in the following sections to show the microLoad.net and ancillary equipment. Before wiring the ancillary equipment, refer to its installation manual. Use the installation diagrams in conjunction with the following checklist to make all necessary connections to your microLoad.net.
8. Reconnect all terminal blocks to their respective positions on the MACF and MNET boards. These terminals blocks are not “keyed”, therefore take extreme care to be certain that terminal blocks are returned to the correct position and are in the correct orientation.

Table 4. Wiring Checklist

- Install Pulse Input Wiring (from Meters and Metered Injectors)
- Install Pulse Outputs Wiring
- Install Analog Input Wiring (RTD and 4-20ma)
- Install Communications Wiring
- Install Digital Input Wiring (DC)
- Install Digital Output Wiring (DC)
- Install Digital Output Wiring (AC)
- Install Earth Ground
- Install Instrument Power Wiring

Calculated Accuracy: The gross at standard temperature

Cable entries must be in accordance to EN/IEC 60079-1 section 13 .

For wiring systems utilizing cable glands the gland and/or thread adaptor must be Ex certified.

The cable end must be securely installed and depending on the cable type be properly protected from mechanical damage.

For wiring systems utilizing conduit, an Ex certified sealing device must be used immediately at the entrance of the enclosure. Any unused entry must be suitably blocked with an Ex d IIB IP65 certified plug for ATEX and IECEx applications. For North American Zone applications, the plug must be listed 'metal close-up type.

The maximum ambient temperature for the enclosure is 60˚ degrees celsuis.

Equipment bonding shall be provided at the external grounding facility terminal, external connection is not required when using metallic conduit or armoured cable. External grounding facility terminal wire range: 10-12 AWG (5.26 sq mm to 3.31 sq mm) wire.

Cover to body fasteners must be either DIN 912 grade 12.9 (alloy steel), DIN 912-A4-70 (316 stainless steel), or DIN 912-A2-70 (18-8 stainless steel).

Keypad is protected by an intrinsic safe barrier, the enclosure must be grounded as per national electrical code regulations, for example NEC/CEC etc.

Battery back-up option (if equipped) use only approved AAA NiMH (1.2V/Cell Nominal) rechargeable batteries meeting IEC 61951-2 requirements, IEC IEC Designation (IEC-HR03) with a maximum capacity of 1.5 Ah at a 1 h discharge rate.

Warning: Contains internal battery-powered circuit. To prevent ignition of hazardous atmospheres, do not open enclosure unless area is known to be non-hazardous. To reduce the risk of ignition of hazardous atmospheres, conduit runs must have a sealing fitting connected within 18 inches of the enclosure. Substitution of components may impair intrinsic safety. To prevent ignition of hazardous atmospheres and to prevent electrical shock, disconnect from supply circuits before opening, keep tightly closed when circuits are in operation.

Start-Up

When the wiring is completed and verified, apply only instrument power to the unit. The displays should light, indicating that the microLoad.net is ready for Start-Up. Next, the microLoad.net must be configured internally to match the inputs and outputs to which it has been connected. The Reference Manual (MN06148) provides the procedures for the complete configuration of the microLoad.net. Once configured, check the operation of the inputs to the microLoad.net. Next, apply external device power and check the operation of output devices. The microLoad.net is now ready for use. The Operations Manual (MN06149) describes the procedures used in the day to day use of the instrument.

Inches (mm)

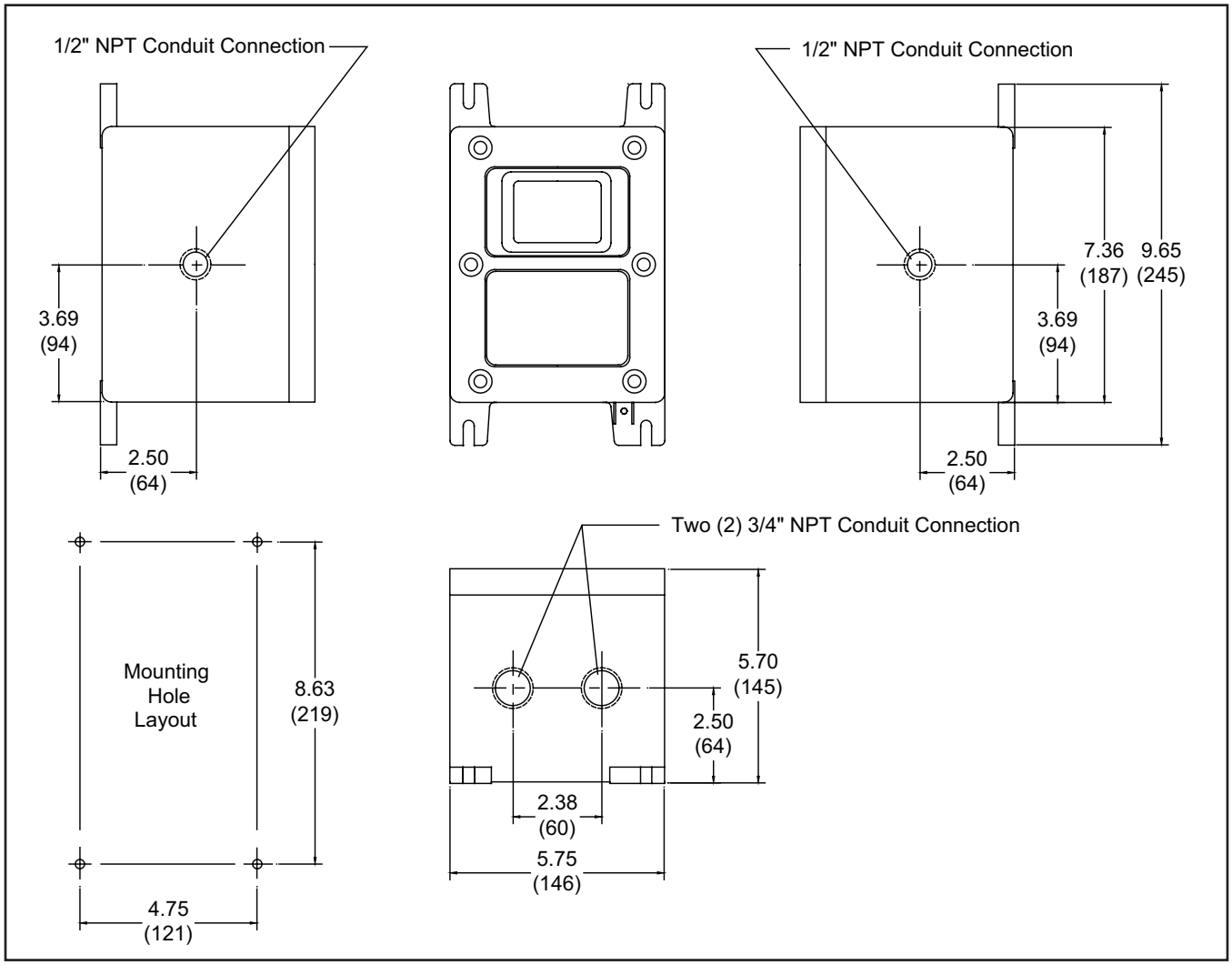


Figure 2. microLoad.net Dimensions

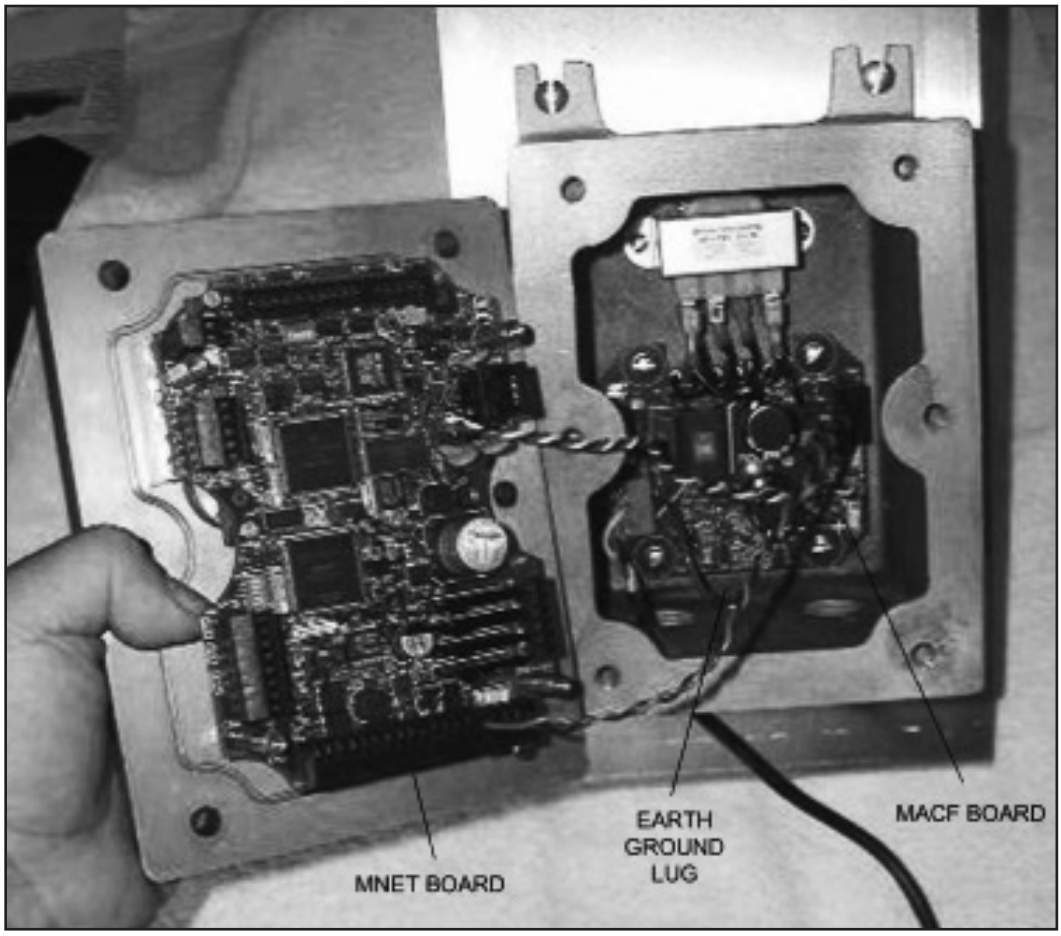


Figure 3. Opening microLoad.net

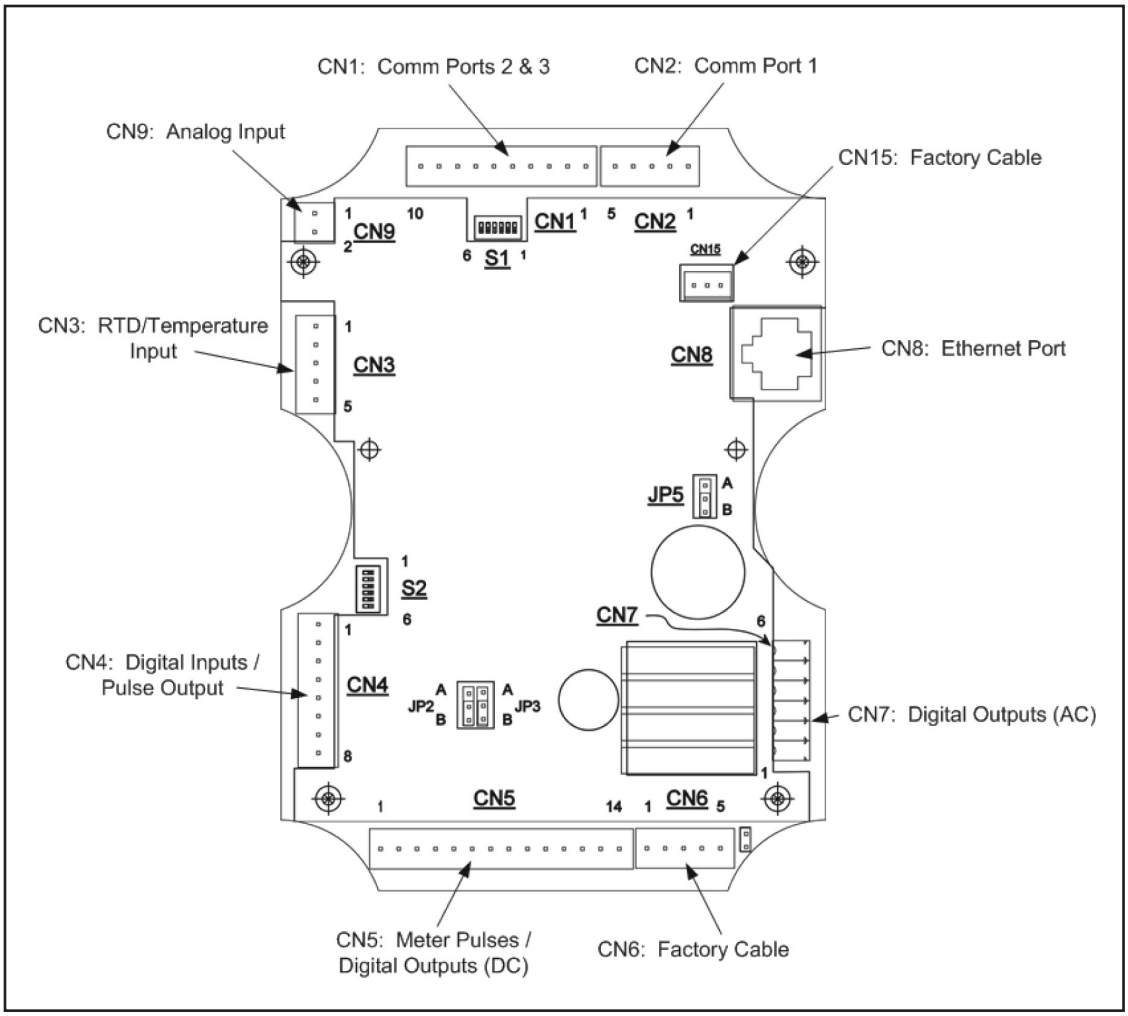


Figure 4. MNET Board

Switch "S2" Functions

Switch 1: Reserved (must be OFF)
Switch 2: ON activates firmware upgrade on power up
Switch 3: See below
Switch 4: See below
Switch 5: ON resets security password on power up
Switch 6: Reserved (must be OFF)

Note: *Factory setting for all S2 switches is OFF*

Switch 3	Switch 4	Function
OFF	OFF	No effect, program values used
ON	OFF	Forces IP address to 192.168.0.1
OFF	ON	Forces IP address to 10.0.0.1
ON	ON	Enables DCHP

Switch "S1" Functions (RS-485 termination)

Position 1	Position 2	Position 3	Position 4	Position 5	Position 6
COM1	COM1	COM2	COM2	COM3	COM3

Setting is OFF for RS-232 and ON for the last unit in the RS-485 communication line.

Note: *Factory settings for all positions of "S1" is OFF*

Table 5. MNET Board Terminal Assignments

Connector: CN1

Terminal #	Description	232	485
1	COM2	232Tx	485Tx-
2	COM2		485Tx+
3	COM2	232Rx	485Rx+
4	COM2		485Rx-
5	Common		
6	COM3	232Tx	485Tx-
7	COM3		485Tx+
8	COM3	232Rx	485Rx+
9	COM3		485Rx-
10	Common		

Connector: CN2

Terminal #	Description	232	485
1	COM1	232Tx	485Tx-
2	COM1		485Tx+
3	COM1	232Rx	485Rx+
4	COM1		485Rx-
5	Common		

Connector: CN3

Terminal #	Description
1	RTD +
2	SIG +
3	SIG -
4	RTD -
5	Shield

Connector: CN4

Terminal #	Description
1	Input (DC) #1 +
2	Input (DC) #1 -
3	Input (DC) #2 +
4	Input (DC) #2 -
5	Input (DC) #3 +
6	Input (DC) #3 -
7	Pulse Out +
8	Pulse Out -

Connector: CN5

Terminal #	Description
1	Meter Pulse Input/Channel A +
2	Meter Pulse Input/Channel A -
3	Factory Use Only - Do not connect
4	Factory Use Only - Do not connect
5	Shield
6	Meter Pulse Input/Channel B/Metered Inj +
7	Meter Pulse Input/Channel B/Metered Inj -
8	Factory Use Only - Do not connect
9	Factory Use Only - Do not connect
10	Shield
11	Output (DC) #1 +
12	Output (DC) #1 -
13	Output (DC) #2 +
14	Output (DC) #2 -

Connector: CN6

Terminal #	Description
1	Factory Cable to MACF (DC PW R +)
2	Factory Cable to MACF (Common)
3	Factory Cable to MACF (+12 Vdc Transmitter) power
4	Factory Cable to MACF (Common)
5	Factory Cable to MACF (Earth/Enclosure Gnd)

Connector: CN7

Terminal #	Description
1	AC Output Common
2	N.C.
3	Output (AC) #6
4	Output (AC) #5
5	Output (AC) #4
6	Output (AC) #3

Connector: CN8

RJ-45 Ethernet Port

Connector: CN9

Terminal #	Description
1	4-20 mA input +
2	Return - (Common)

Note: Electronically connected to common

Connector: CN15

Factory Cable to MACF (CN1)

Table 6. microLoad.net I/O Configuration Worksheet

METER PULSE INPUTS

	Meter Pulse A	Meter Pulse B
Prime 4 Primary		
Prime 4 Secondary		
PEX-P		
PPS Primary		
PPS Secondary		
Apollo Primary		
Apollo Secondary		
UPT Primary		
UPT Secondary		
Open Collector Primary		
Open Collector Secondary		
Metered Injector		
Not Used		

ANALOG INPUTS

	RTD	4-20 ma
Temperature		
Pressure		
Density		

PULSE OUTPUTS

	Pulser
Used	
Not Used	

COMMUNICATIONS TYPE

	COM 1	COM 2	COM 3	ETHERNET
RS-232				
RS-485				
Not Used				

COMMUNICATIONS ASSIGNMENT

	COM 1	COM 2	COM 3	ETHERNET
Terminal Host Communications				
Microcomputer Host Communications				
SLIP (TCP/IP)				
Printer				
Smart Injector Control				
Smith Card Reader				
Mass Meter				
Shared Printer				
Print Server				

DIGITAL INPUTS (DC)

	Input 1	Input 2	Input 3
Security			
Permissive 1			
Permissive 2			
1st/2nd Hi Flow			
Remote Start			
Remote Stop			
Transaction Reset			
General Purpose Input			
Printer Tray Switch			
Piston Injector 1 Feedback			
Piston Injector 2 Feedback			
Piston Injector 3 Feedback			
Piston Injector 4 Feedback			
Not Used			

DIGITAL OUTPUTS (DC & AC)

	Output 1 (DC)	Output 2 (DC)	Output 3 (AC)	Output 4 (AC)	Output 5 (AC)	Output 6 (AC)
Pump						
Upstream Solenoid						
Downstream Solenoid						
Alarm Relay 1						
Alarm Relay 2						
General Purpose Out						
Stop Relay						
Piston Injector 1						
Piston Injector 2						
Piston Injector 3						
Piston Injector 4						
Metered Injector 1						
Additive Pump 1						
Additive Pump 2						
Additive Pump 3						
Additive Pump 4						
Not Used						

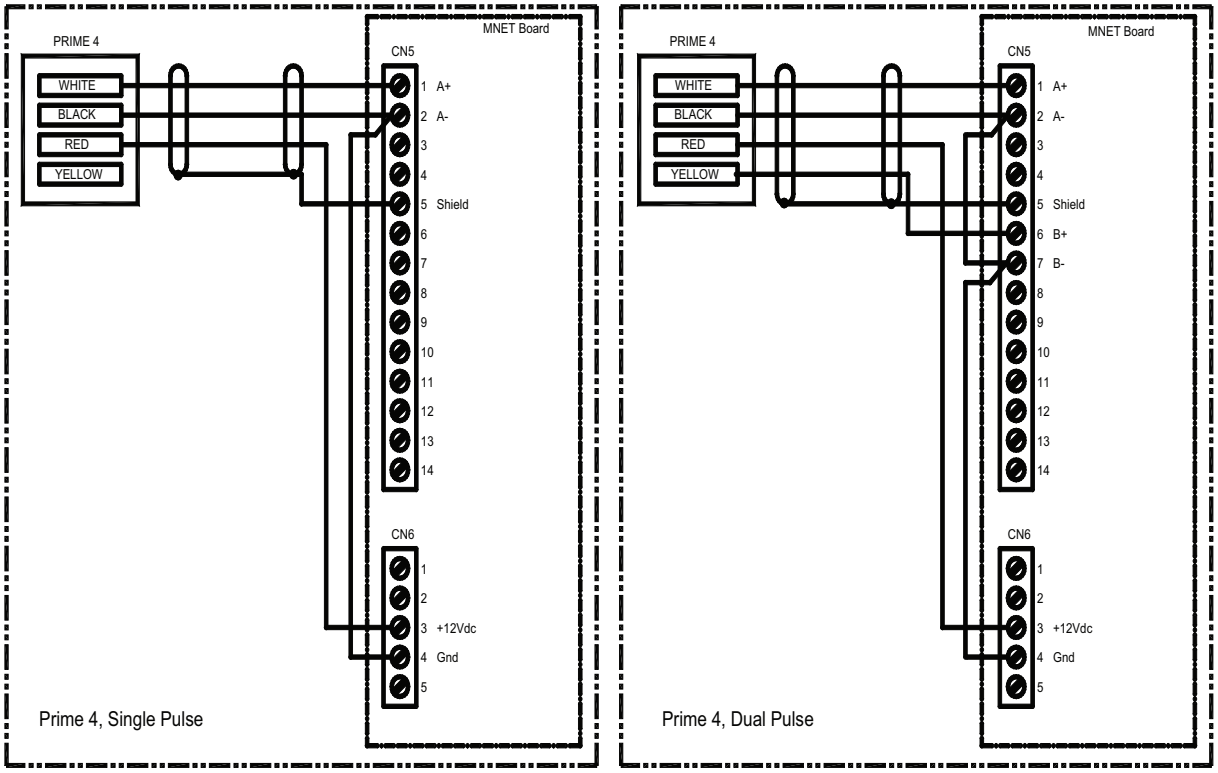


Figure 5. Wiring Diagram PRIME 4

PRIME 4 Wire Codes:

Black: Common
Red: +12 Vdc
White: Signal A
Yellow: Signal B

Note: *Pulse Inputs*

- *If EPLD (U24 chip) is Rev. 0, dual pulse will not function under 25 Hz. Only single pulse will count from 25 Hz down to 3 Hz. Above 25 Hz, dual pulse will function as normal.*
- *If EPLD (U24 chip) is Rev. 1 or higher, dual pulse will function from 3 Hz and higher.*
- *Pulse doubling will not function for input pulses below 25 Hz.*

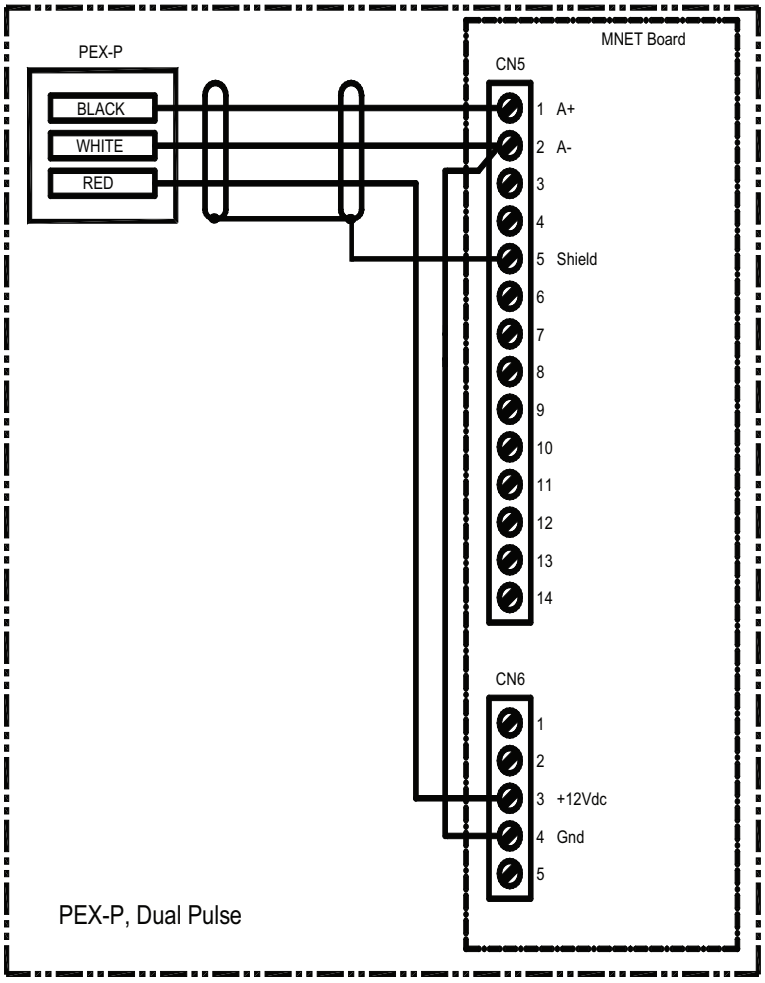


Figure 6. Wiring Diagram, PEX-P Transmitter Single Pulse

PEX-P Wire Codes:

Black: Signal
Red: +12 Vdc
White: Common

Note: *Pulse Inputs*

- *If EPLD (U24 chip) is Rev. 0, dual pulse will not function under 25 Hz. Only single pulse will count from 25 Hz down to 3 Hz. Above 25 Hz, dual pulse will function as normal.*
- *If EPLD (U24 chip) is Rev. 1 or higher, dual pulse will function from 3 Hz and higher.*
- *Pulse doubling will not function for input pulses below 25 Hz.*

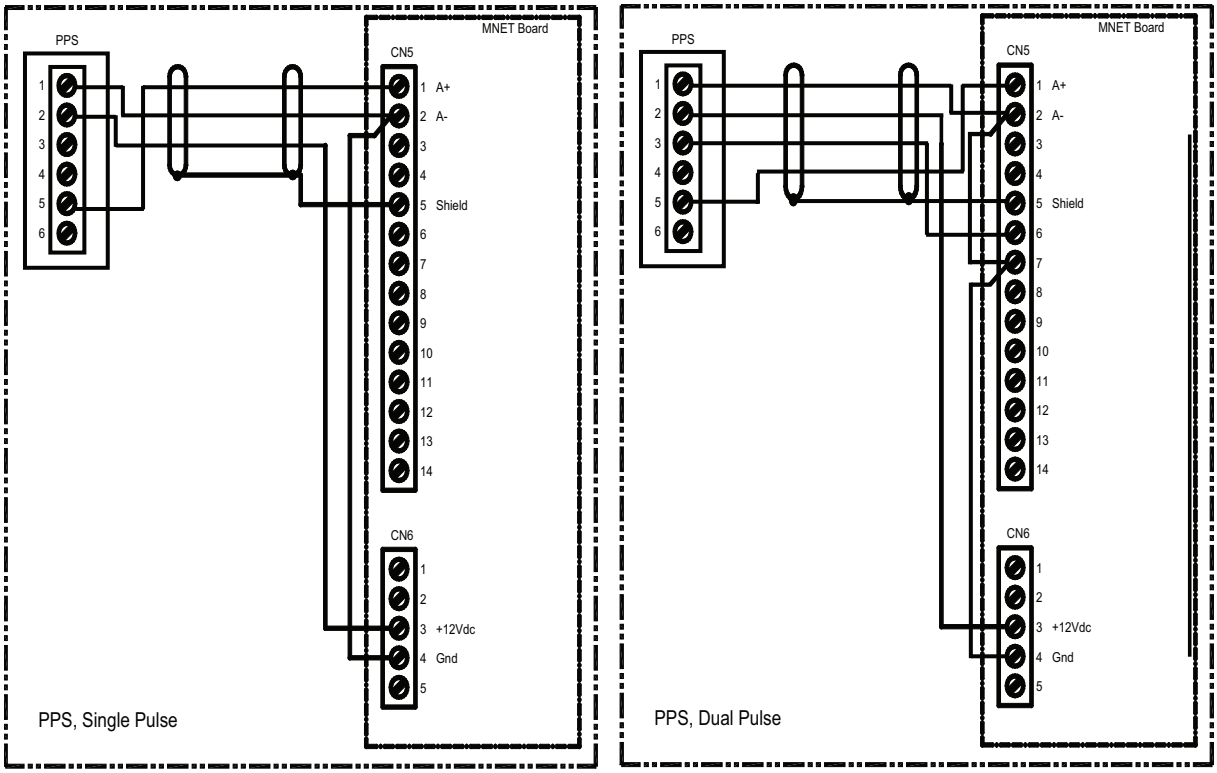


Figure 7. Wiring Diagram, PPS Transmitters

PPS Terminal Connections:

1. Common
2. +12 Vdc
3. Signal B
4. B Bar
5. Signal A
6. A Bar

Note: *Pulse Inputs*

- *If EPLD (U24 chip) is Rev. 0, dual pulse will not function under 25 Hz. Only single pulse will count from 25 Hz down to 3 Hz. Above 25 Hz, dual pulse will function as normal.*
- *If EPLD (U24 chip) is Rev. 1 or higher, dual pulse will function from 3 Hz and higher.*
- *Pulse doubling will not function for input pulses below 25 Hz.*

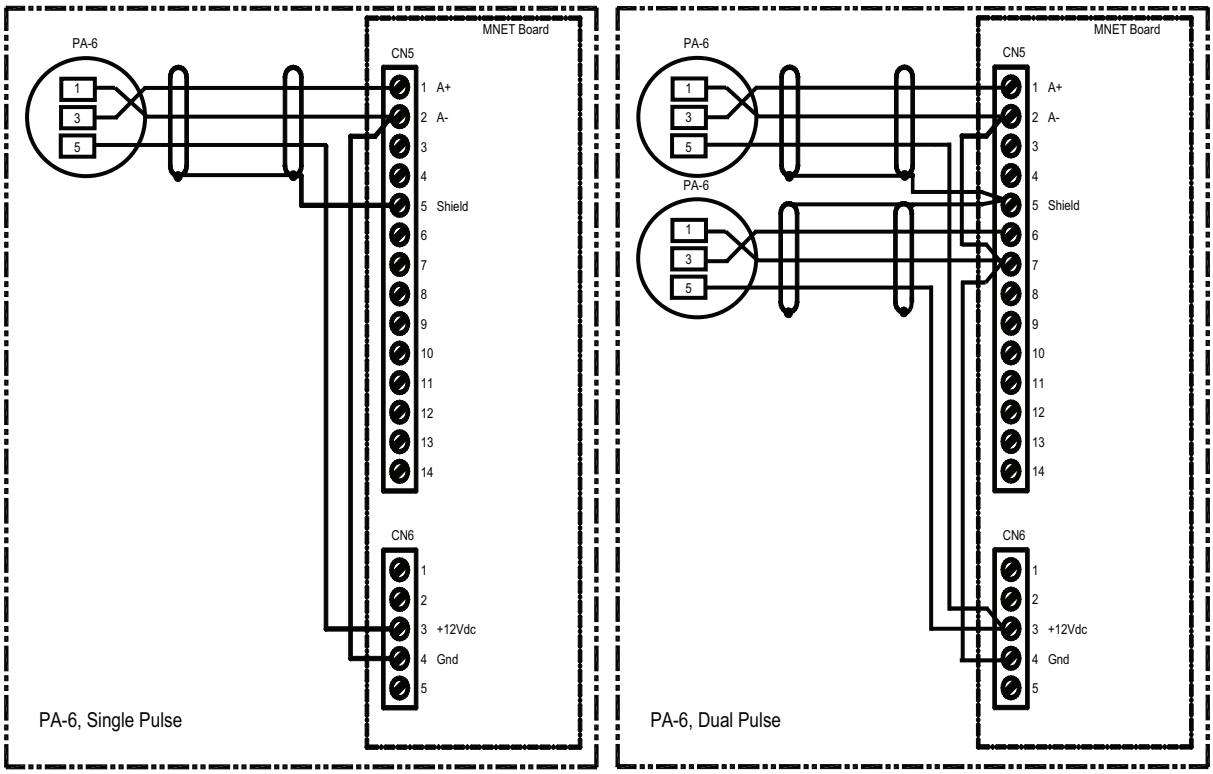


Figure 8. Wiring Diagram, PA-6

PA-6 Terminal Connections

1: Common
3: Signal
5: +12 Vdc

Note: *Pulse Inputs*

- *If EPLD (U24 chip) is Rev. 0, dual pulse will not function under 25 Hz. Only single pulse will count from 25 Hz down to 3 Hz. Above 25 Hz, dual pulse will function as normal.*
- *If EPLD (U24 chip) is Rev. 1 or higher, dual pulse will function from 3 Hz and higher.*
- *Pulse doubling will not function for input pulses below 25 Hz.*

Promass 80, 83, and 84

When connecting the Promass 84 (does not apply to the Promass 80 or 83 models) to a microLoad.net it is important that the “Line Monitoring” function on the Promass 84 be disabled. This is because the pulse input circuitry of the microLoad.net requires the input pulse “off” voltage to be less than one volt (and the “on” voltage to be greater than 5 volts). If the “Line Monitoring” on the Promass 84 is enabled, the “off” voltage of the pulses will be greater than one volt and therefore will not be counted by the microLoad. There are three jumpers on each of the frequency output submodules on the I/O board that enable/disable the “Line Monitoring” function. The factory default is to enable “Line Monitoring”. Follow the steps from section 6.4.2 of the Proline Promass 84 Operating Instruction – Bulletin MN0M032 to enable/disable this function.

Use this table to determine if the Promass can be wired for single or dual pulse output and the terminal number corresponding to each unique model. The wiring diagrams are shown on the following pages.

Transmitter/Sensor	Modeling	+ Terminal	- Terminal
80XXX	-X-XXX-X-X-X-X-X-X-X-A	24	25
80XXX	-X-XXX-X-X-X-X-X-X-X-D	24	25
80XXX	-X-XXX-X-X-X-X-X-X-X-S	24	25
80XXX	-X-XXX-X-X-X-X-X-X-X-T	24	25
80XXX	-X-XXX-X-X-X-X-X-X-X-8	22	23
83XXX	-X-XXX-X-X-X-X-X-X-X-A	24	25
83XXX	-X-XXX-X-X-X-X-X-X-X-B	24	25
83XXX	-X-XXX-X-X-X-X-X-X-X-S	24	25
83XXX	-X-XXX-X-X-X-X-X-X-X-T	24	25
83XXX	-X-XXX-X-X-X-X-X-X-X-C	24	25
83XXX	-X-XXX-X-X-X-X-X-X-X-D	24	25
83XXX	-X-XXX-X-X-X-X-X-X-X-N	22	23
83XXX	-X-XXX-X-X-X-X-X-X-X-P	22	23
83XXX	-X-XXX-X-X-X-X-X-X-X-2	24	25
83XXX	-X-XXX-X-X-X-X-X-X-X-4	24	25
83XXX	-X-XXX-X-X-X-X-X-X-X-5	24	25
84XXX	-X-XXX-X-X-X-X-X-X-X-S	24	25
84XXX	-X-XXX-X-X-X-X-X-X-X-T	24	25
84XXX	-X-XXX-X-X-X-X-X-X-X-N	22	23
84XXX	-X-XXX-X-X-X-X-X-X-X-D	24	25
84XXX	-X-XXX-X-X-X-X-X-X-X-2	24	25

Table 7. Promass Modeling for Single Pulse Wiring

Transmitter/Sensor	Modeling	+ Terminal	- Terminal
83XXX	-X-XXX-X-X-X-X-X-X-X-M	22, 24	23, 25
84XXX	-X-XXX-X-X-X-X-X-X-X-M	22, 24	23, 25
84XXX	-X-XXX-X-X-X-X-X-X-X-1	22, 24	23, 25

Table 8. Promass Modeling for Dual Pulse Wiring

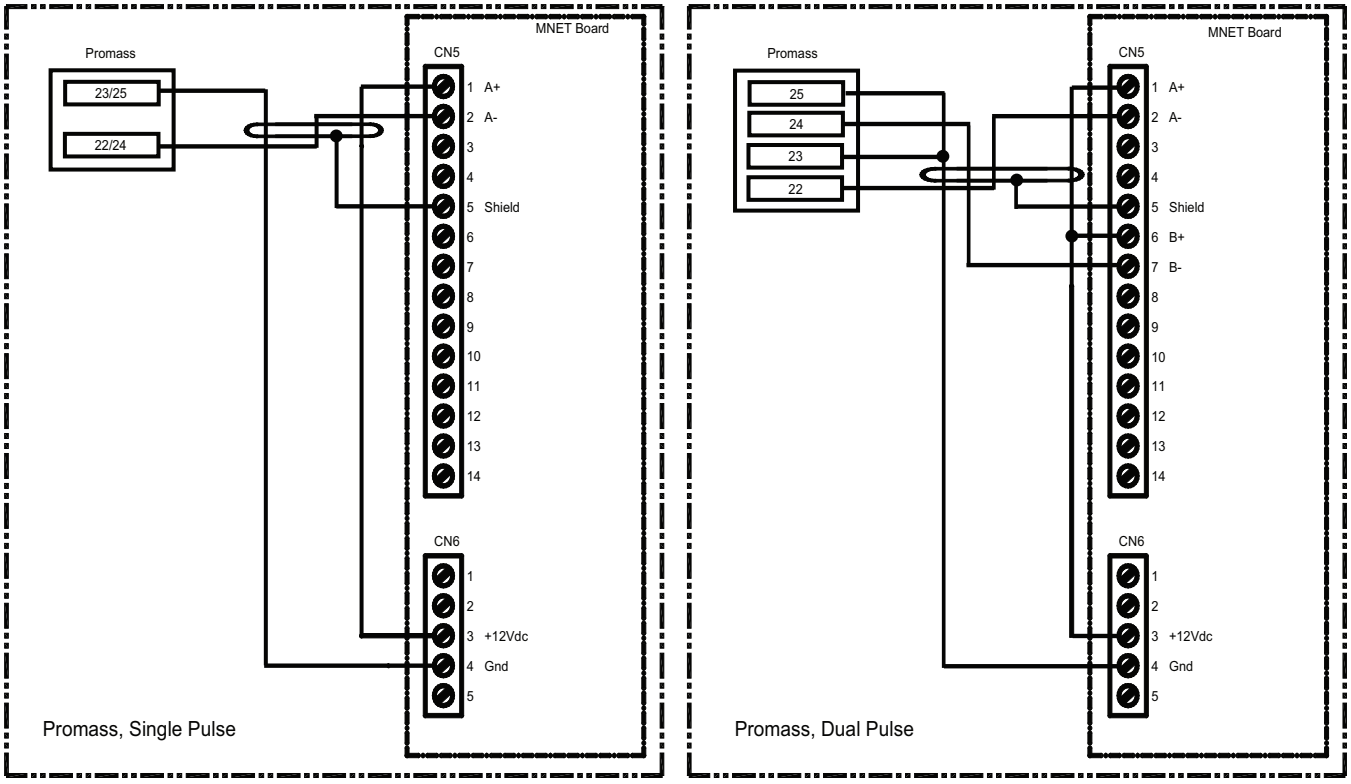


Figure 9. Wiring Diagram, Promass

Promass Wire Codes
Terminal 22: +
Terminal 23: -
Terminal 24: +
Terminal 25: -

Note: *Pulse Inputs*

- *If EPLD (U24 chip) is Rev. 0, dual pulse will not function under 25 Hz. Only single pulse will count from 25 Hz down to 3 Hz. Above 25 Hz, dual pulse will function as normal.*
- *If EPLD (U24 chip) is Rev. 1 or higher, dual pulse will function from 3 Hz and higher.*
- *Pulse doubling will not function for input pulses below 25 Hz.*
- *The pulse input circuitry has 1.6 kΩ of current limiting resistance "built-in" so that an external pull-up resistor is not required when an open collector output device is connected as shown.*

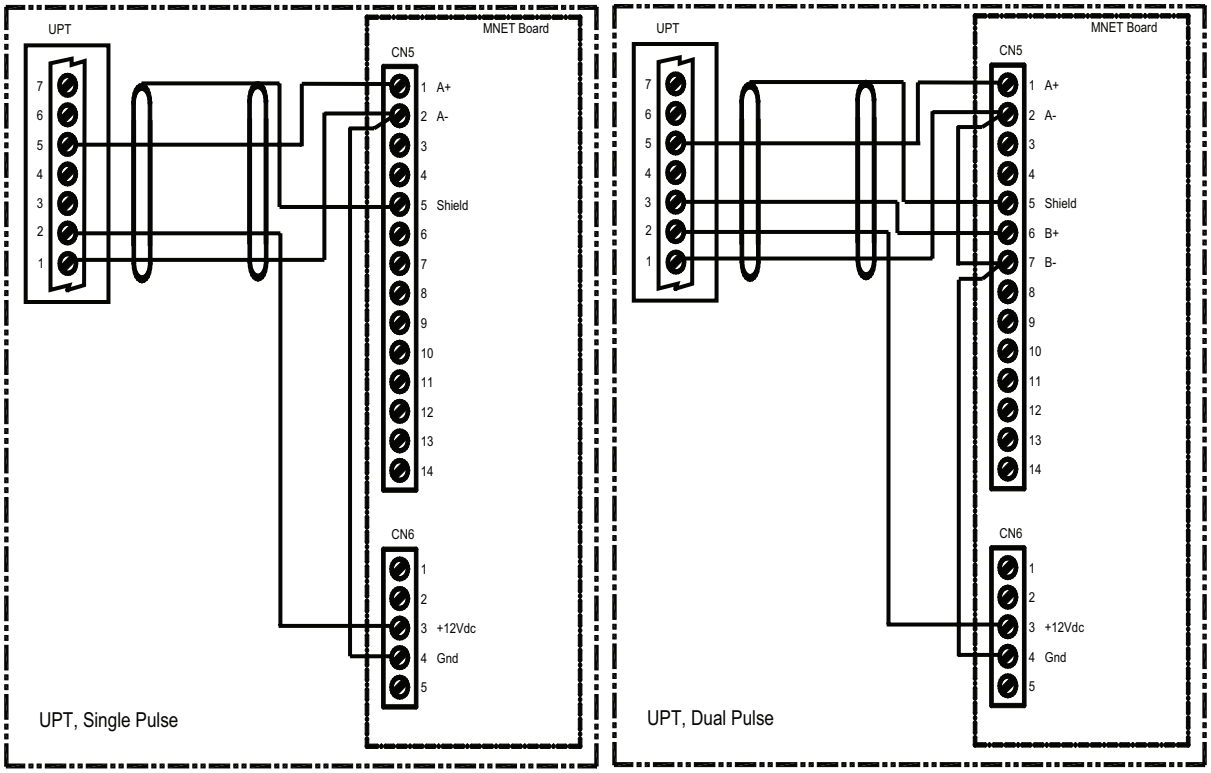


Figure 10. Wiring Diagram, Universal Pulse Transmitter (UPT)

UPT Terminal Connections:

1. Electronics Ground
2. Input Power (12-24 Vdc)
3. Channel “B” Output
4. Channel “B” Inverse Output
5. Channel “A” Output
6. Channel “A” Inverse Output
7. Shield
8. Verification Pulse Output
9. Inverted Verification Pulse
10. Not Used

Note: *Pulse Inputs*

- *If EPLD (U24 chip) is Rev. 0, dual pulse will not function under 25 Hz. Only single pulse will count from 25 Hz down to 3 Hz. Above 25 Hz, dual pulse will function as normal.*
- *If EPLD (U24 chip) is Rev. 1 or higher, dual pulse will function from 3 Hz and higher.*
- *Pulse doubling will not function for input pulses below 25 Hz.*

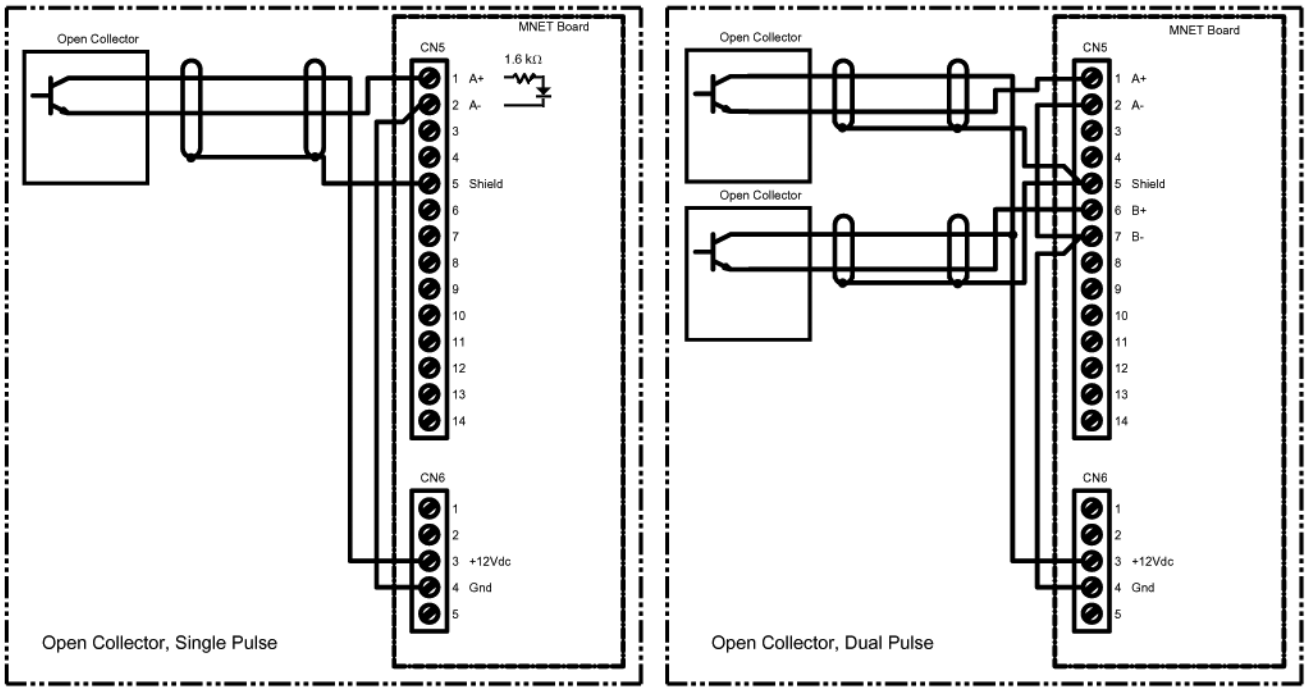


Figure 11. Wiring Diagram, Open Collector Output

The Pulse input circuitry has 1.6 kΩ of correct limiting resistance “built in” so that an external pull-up resistor is not required when an open collector output device is connected as shown.

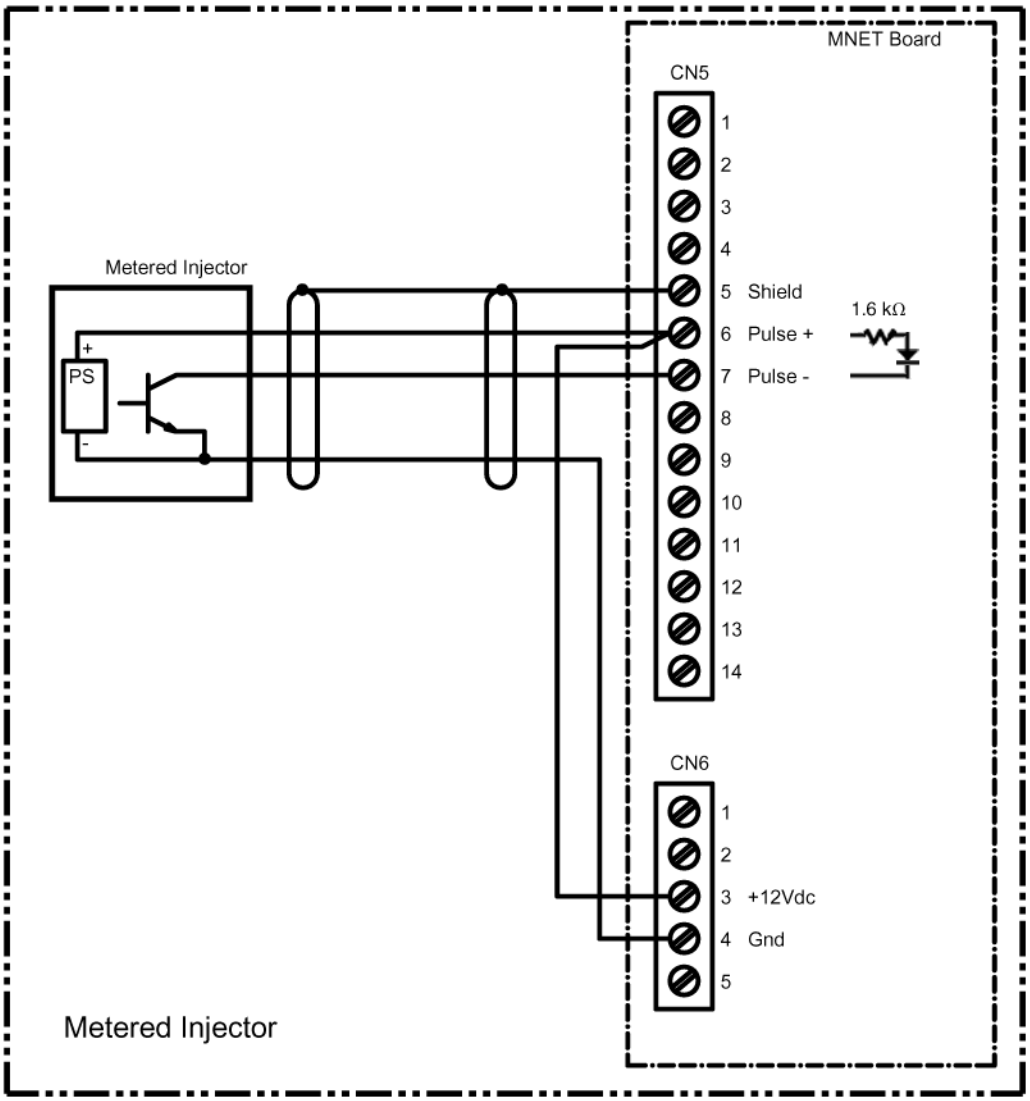


Figure 12. Wiring Diagram, Typical Metered Injector

The Pulse input circuitry has 1.6 kΩ of correct limiting resistance “built in” so that an external pull-up resistor is not required when an open collector output device is connected as shown.

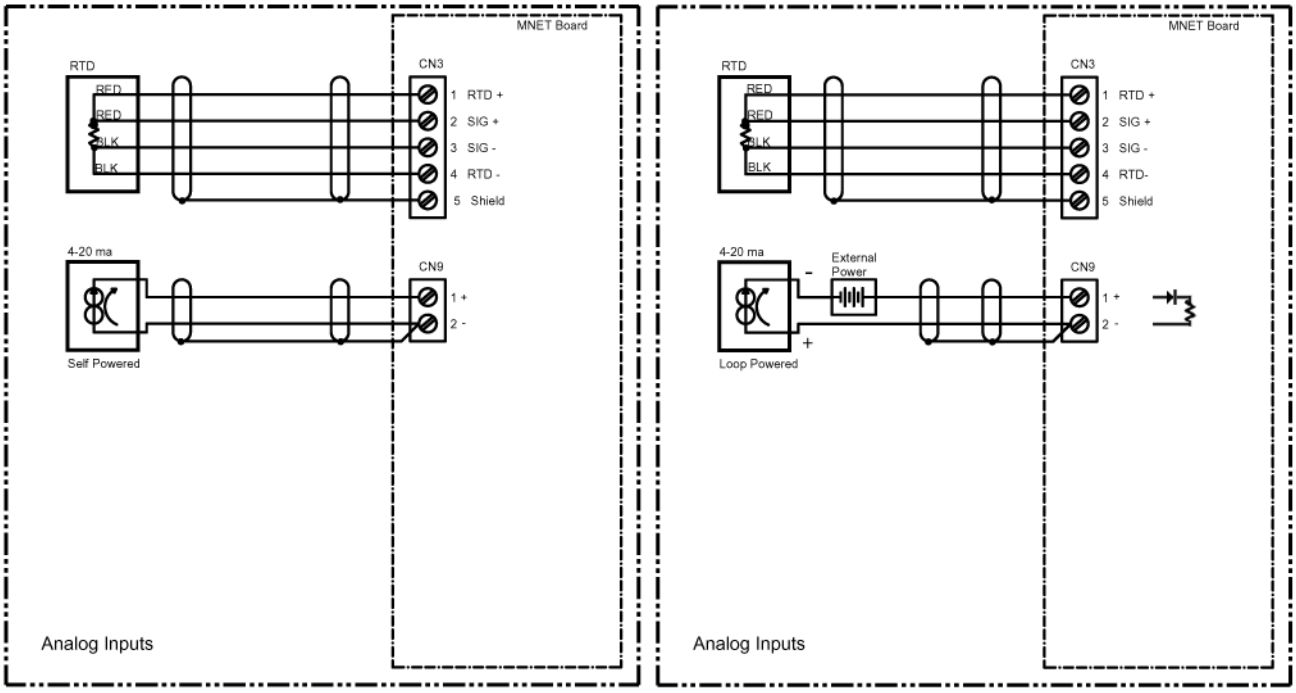


Figure 13. Analog Inputs; Resistance (RTD) / 4-20ma

If using two twisted pairs of wires, RTD+ and RTD- should be wired with one twisted pair. Sig+ and Sig– should be wired with another twisted pair.

This input requires a four-wire connection to a platinum sensor with the following specification:

1. 100 Ω @ 0 Degrees Celsius.
2. 0.00385 Ω / Ω / Deg. C., DIN 43760, BS1904, or IPTS 1948 Temperature Coefficient.

The 4-20mA input is not isolated from the processor and main power (CN9-2 is electrically connected to “common”). The 4-20mA input can be programmed for the function required by the application. The analog inputs are also scaleable through the I/O Configuration Menu of the unit. The inputs should be wired with shielded twisted pairs of wires of 18 to 24 gauge.

Note: *Due to the fact that the common for the 4-20mA input on the microLoad is not isolated, you cannot connect it in series with another microLoad to share the 4-20mA output signal from a single device (i.e. temperature probe, density, pressure transducer). The reason for this is that if the commons for the 4-20mA inputs on the separate microLoads have the same potential and are connected in series, one of the inputs will be by passed and cause it to produce a zero reading. This would then give an appearance that the second 4-20mA input in the series circuit was defective.*

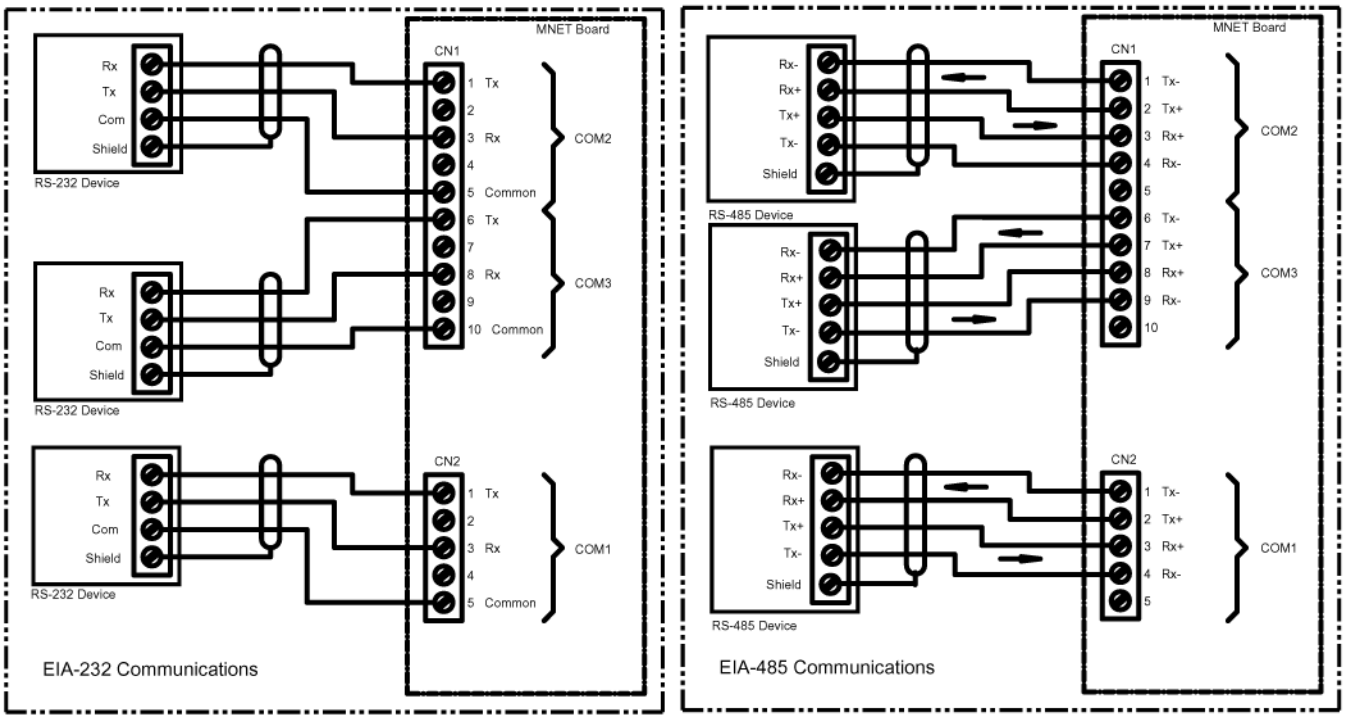


Figure 14. General Wiring for Serial Communications

Note: *The shield is to be terminated at the communications device as shown.*
Note: *If using RS-485, refer to switch termination information on page 14.*

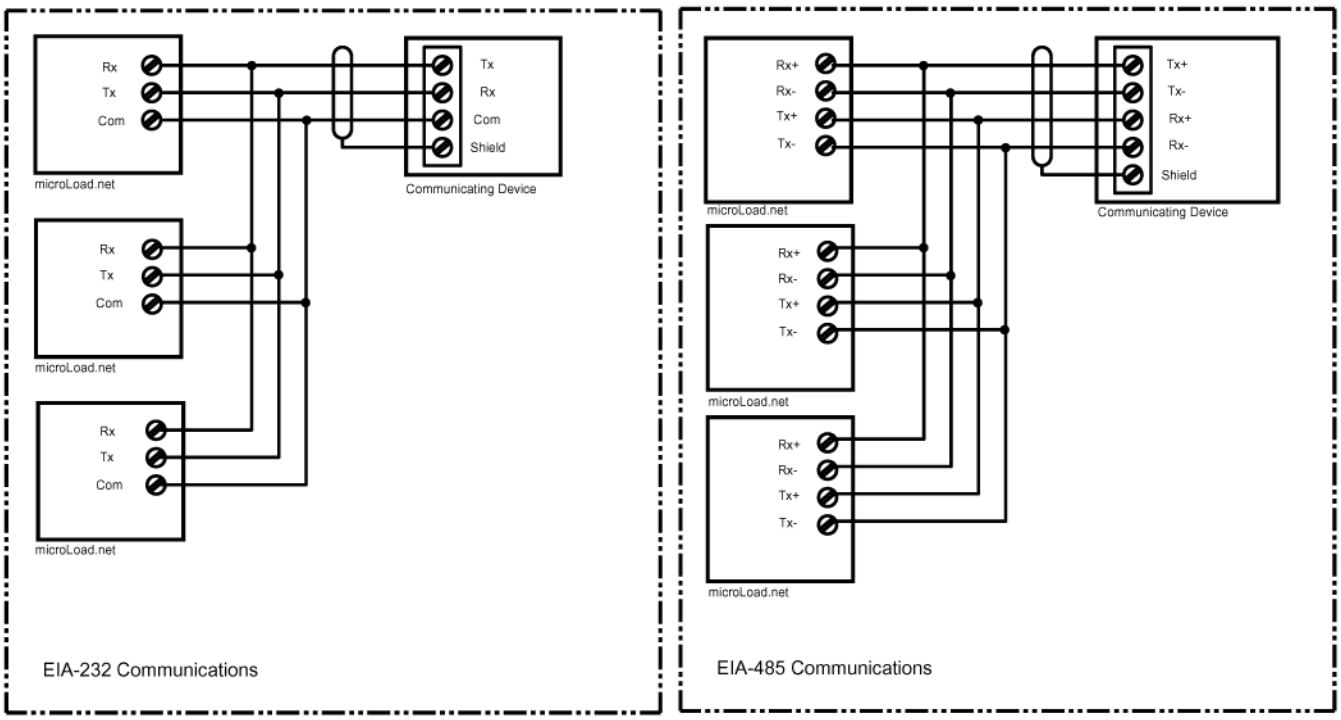


Figure 15. Multiple microLoad.net Serial Communications

The figure shows the typical wiring scheme for multi-drop communications between a communications device and multiple microLoad.nets. The last microLoad.net in a multi-drop scheme must have the Receive Terminators enabled. These terminators are asserted by placing the appropriate switches of “S1” to the “ON” position. See Page 14 for location of “S1” on the MNET board.

- COM 1 Terminators: switches 1 and 2
- COM 2 Terminators: switches 3 and 4
- COM 3 Terminators: switches 5 and 6

Note: *These terminators are for EIA-485 communications only. DO NOT assert terminators for EIA-232 modes.*

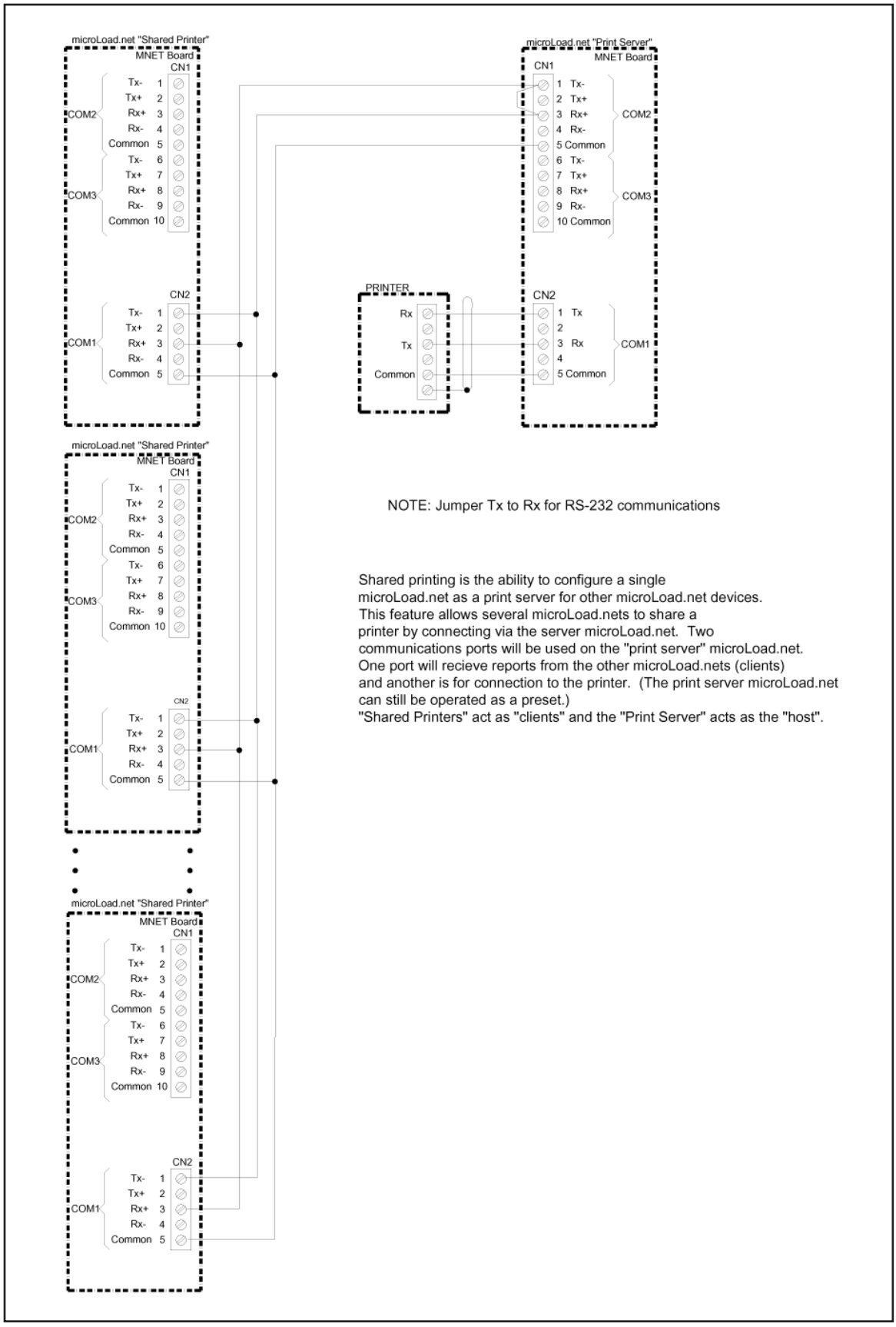


Figure 16. RS-232 Shared Printing

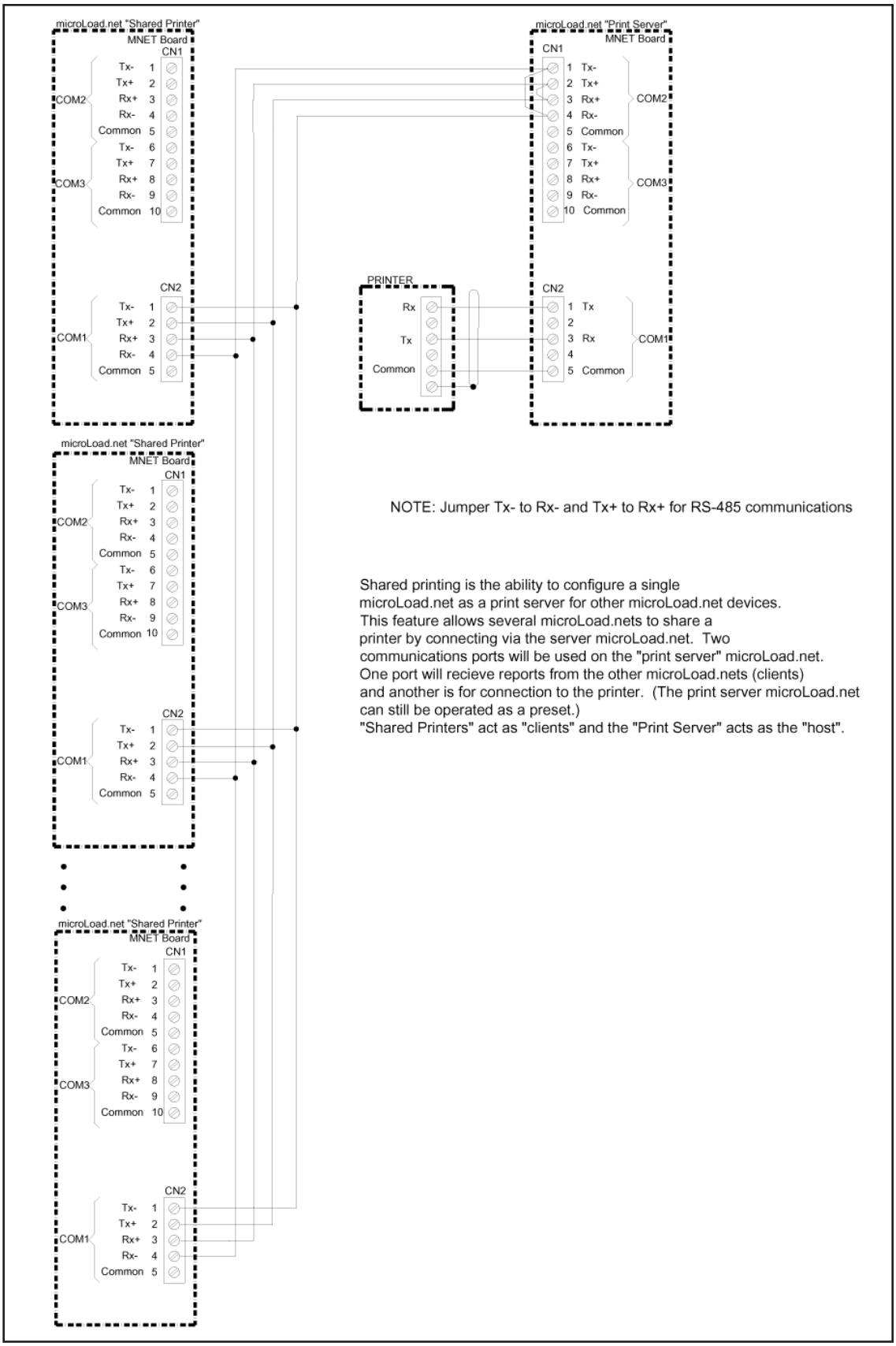


Figure 17. RS-485 Shared Printing

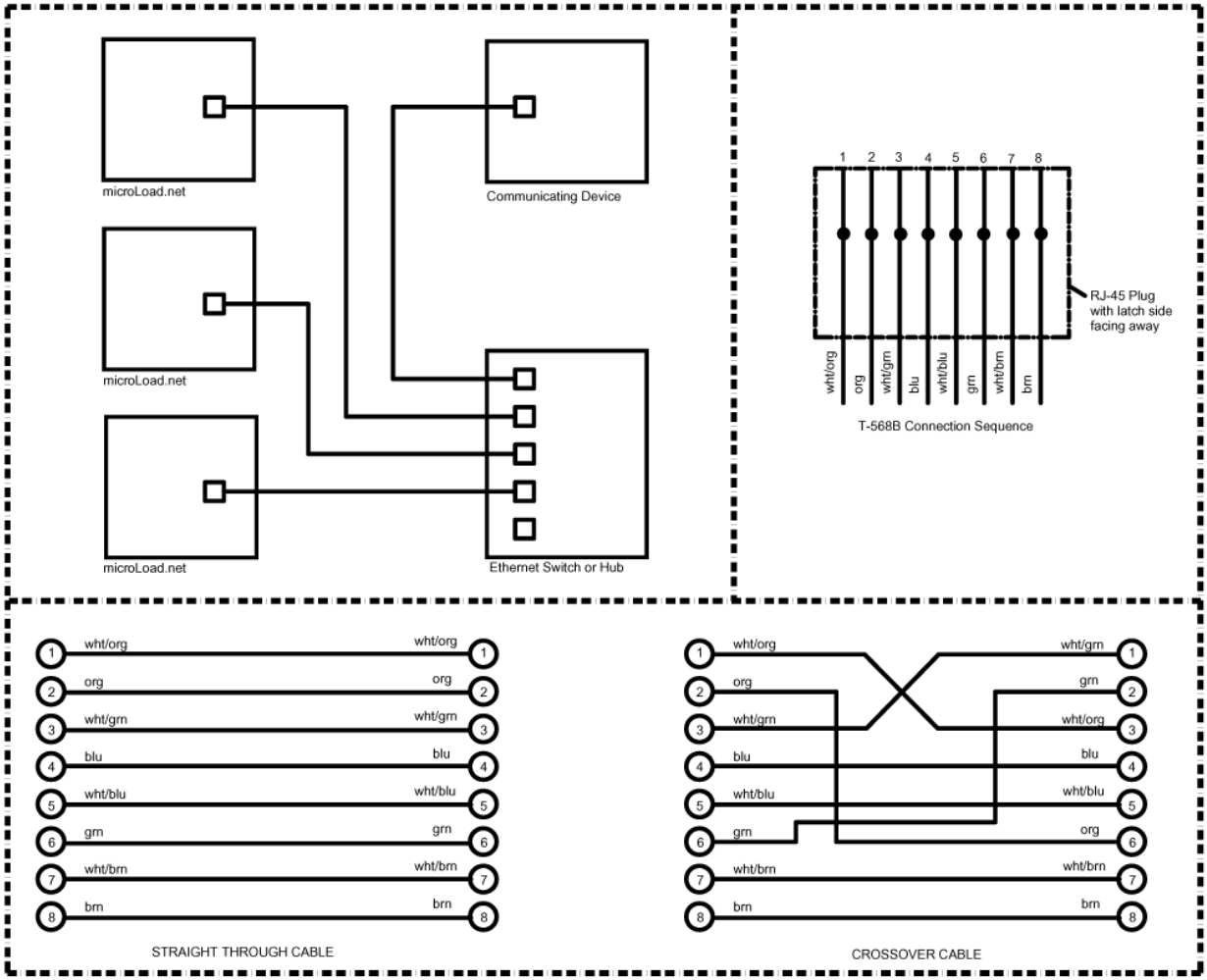


Figure 18. microLoad.net Ethernet Communications

microLoad.net RJ-45 Terminations

The microLoad.net and the associated RJ-45 connector located in the MNET board is designed as an “Ethernet Device”. When connecting to a distributive system through an Ethernet switch/hub or wireless bridge, a straight through T-568B cable is utilized. When interfacing directly to a PC, a crossover cable must be utilized (i.e. a crossover cable is used only when connecting two Ethernet devices together without the use of a hub, switch and/or router).

Eight conductor CAT 5 cable contains (4) four pairs of wires. Each pair consists of a solid (or predominantly) colored wire and a white wire with a stripe of the same color. These pairs are twisted together. When making up a connector, it is best for Ethernet reliability not to untwist the pairs more than ½".

There are two wiring standards for these cables; T-568A and T-568B (refer to table 9 on following page). These standards differ only in the connection sequence. Figure 18 shows a RJ-45 plug configured as a T-568B connection. The orange and green pairs are designated for 10BaseT Ethernet. The brown and blue pairs are not used in the microLoad.net.

Note: *The odd pin numbers are always white with a colored stripe.*

Table 9. Wiring Termination for T-568B and T-568A

Color Code	Abbreviation	T-568B Pin	T-568A Pin
white w/orange stripe	wht/org	1	3
orange	org	2	6
white w/ green stripe	wht/grn	3	1
blue	blu	4	4
white w/ blue stripe	wht/blu	5	5
green	grn	6	2
white w/brown stripe	wht/brn	7	7
brown	brn	8	8

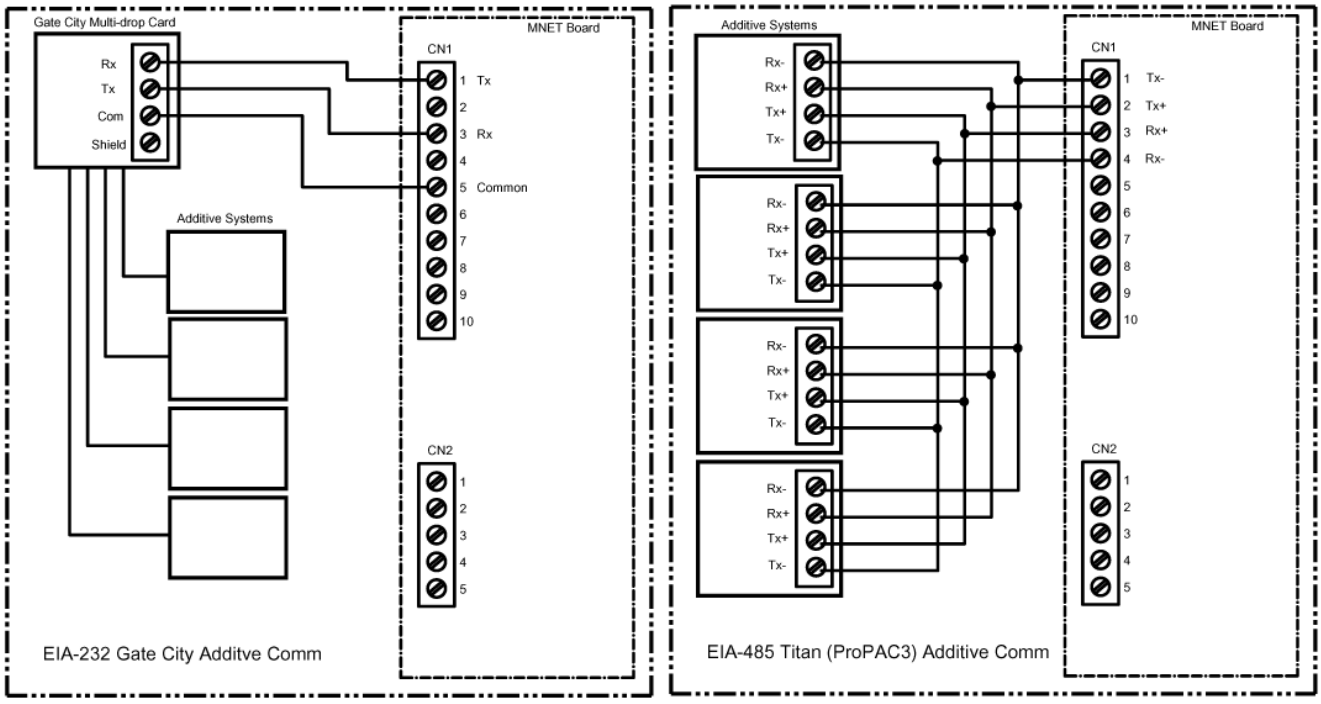


Figure 19. Additive Injector Communications

Note: *For wiring from the Multi-drop Card to the Additive System refer to the manufacturer's manual.*

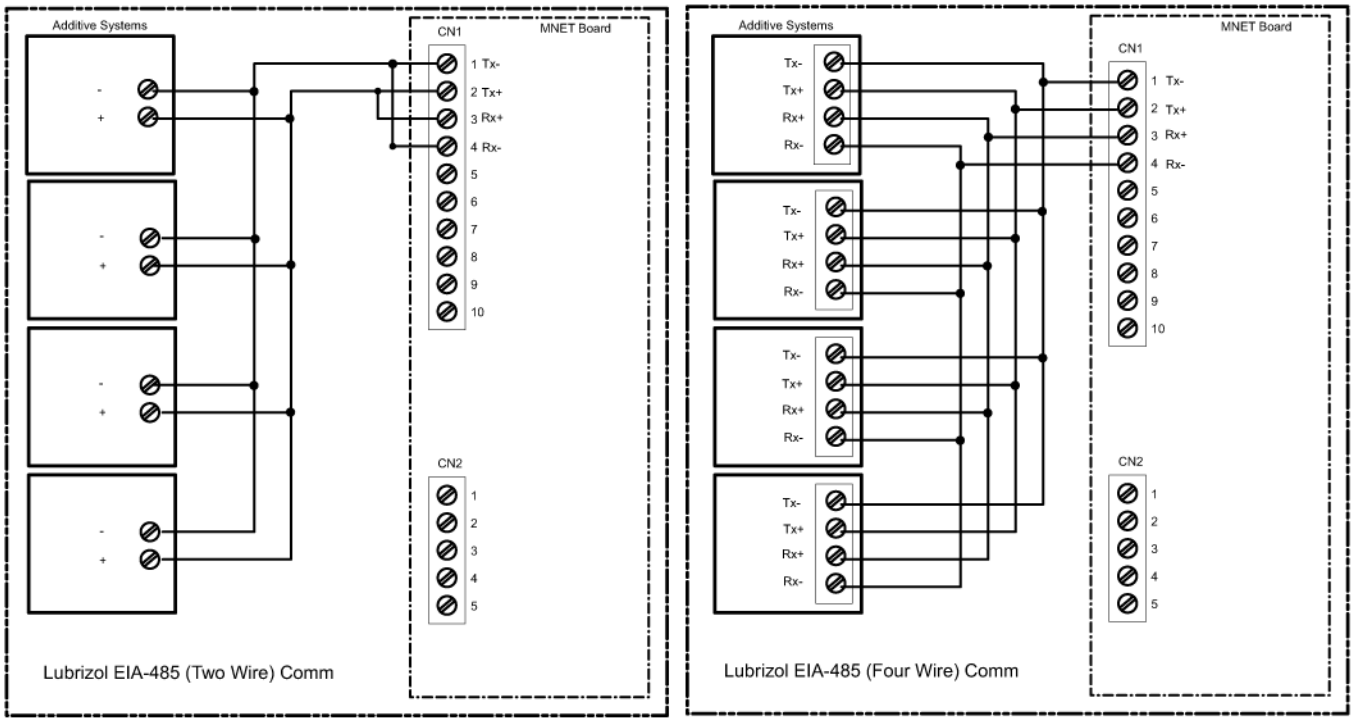


Figure 20. Lubrizol EIA-485 Additive Injector Communications

Note: *Lubrizol labels their EIA-485 communication ports with respect to what needs to be connected to their terminals and not with what the terminal represents. For example, the terminal labeled Tx- on the Lubrizol injector is actually Rx-, but Lubrizol intends for it to represent where you connect Tx- of the communicating device.*

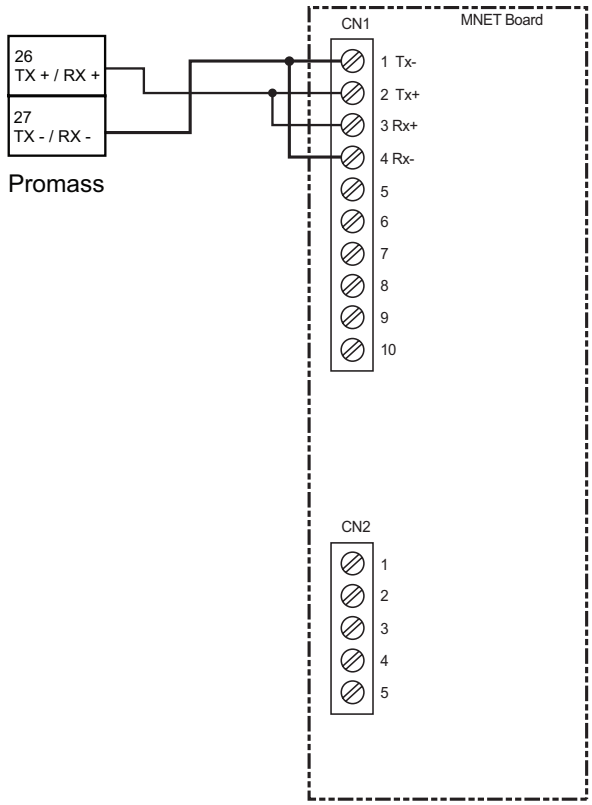


Figure 21. Promass Coriolis Meter Communications (RS485)

Programming

Parameter	microLoad	Promass
Baud Rate	38400	38400
Parity	8/No Parity/2 Stop bits	No Parity, 2 Stop bits
Modbus Endian	Big	Byte order 3-2-1-0
Sequence Number	1	Address 1
Mass Meter Type	E+H Promass	
Timeout	0	
Transmission Mode		RTU
Reply delay		10mS
Mode		

Note: *Wiring example is shown on comm 2: comm 3 can be used as well.*

Digital Inputs

The microLoad.net is capable of providing three DC digital inputs. The inputs can be programmed as to function through the configuration directory.

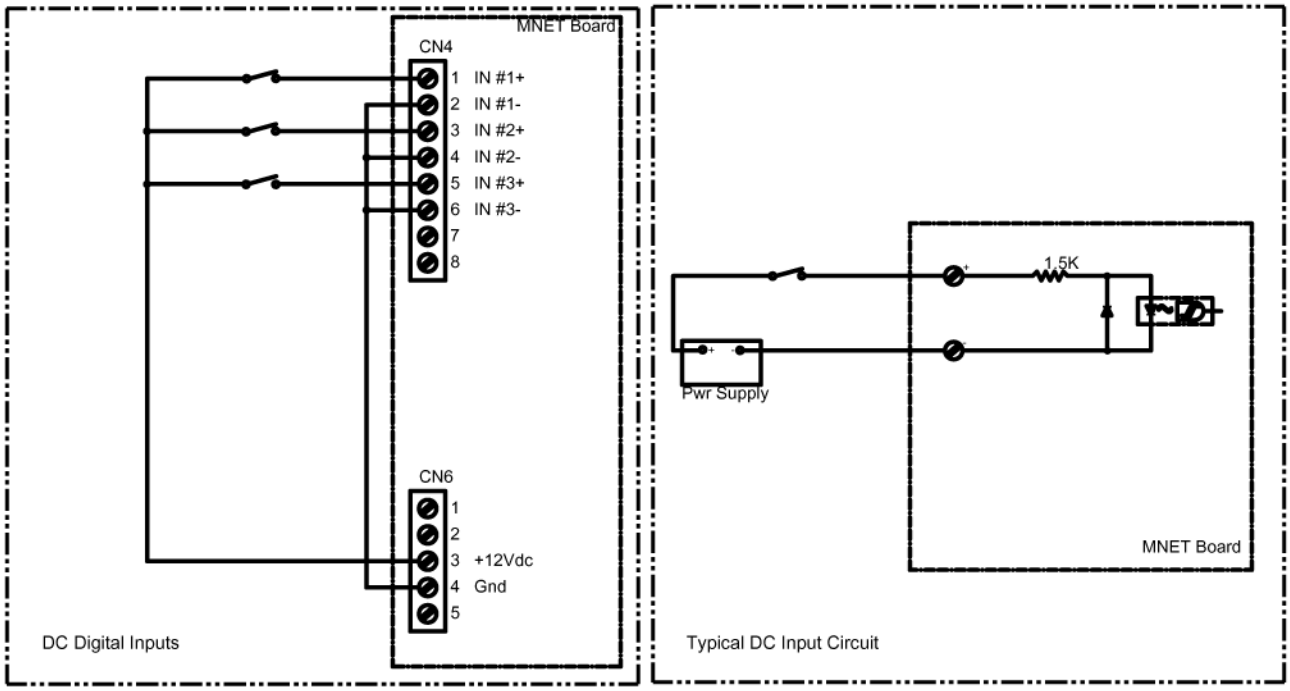


Figure 22. DC Digital Inputs

Digital Outputs

The microLoad.net is capable of providing two DC digital outputs and four AC digital outputs. The outputs can be programmed as to function through the configuration directory.

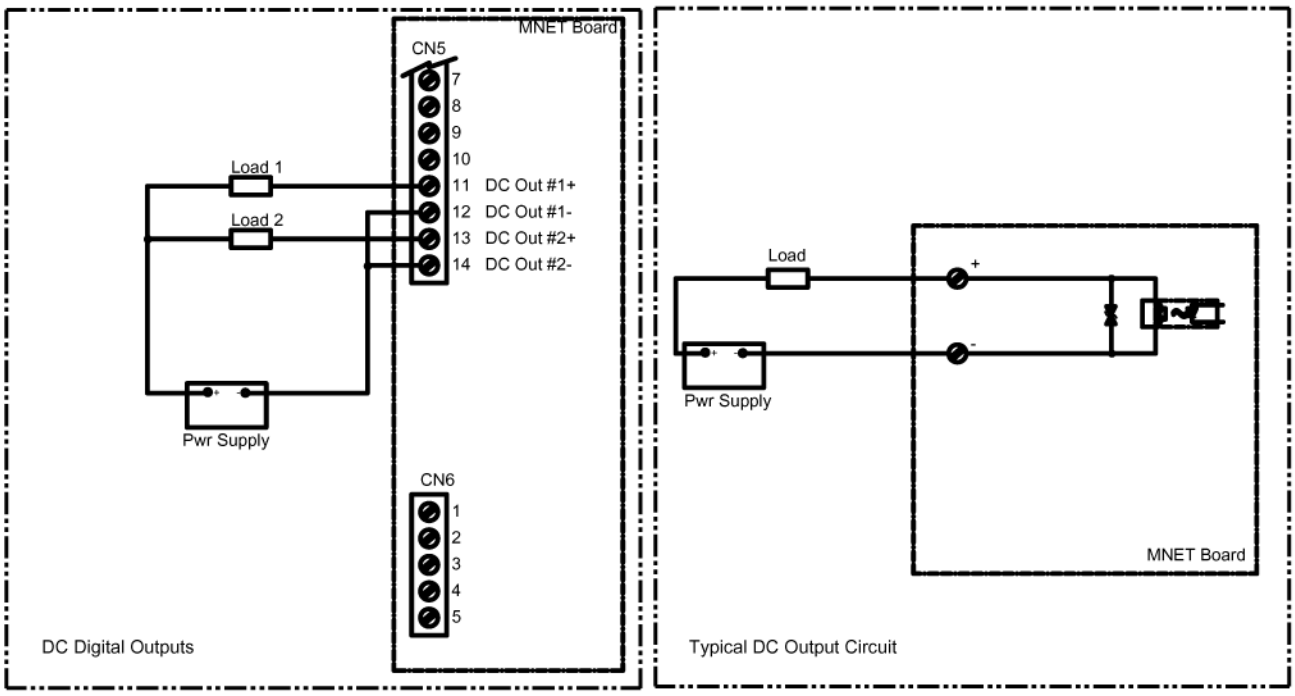


Figure 23. DC Digital Outputs

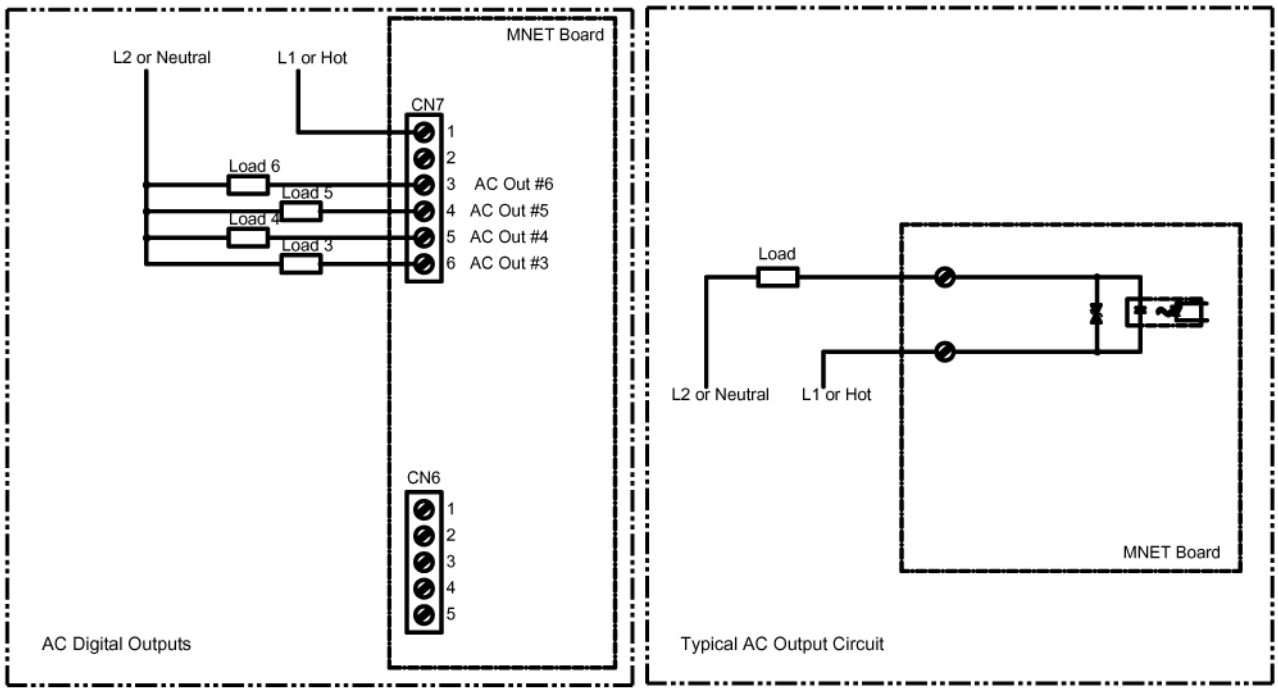


Figure 24. AC Digital Outputs

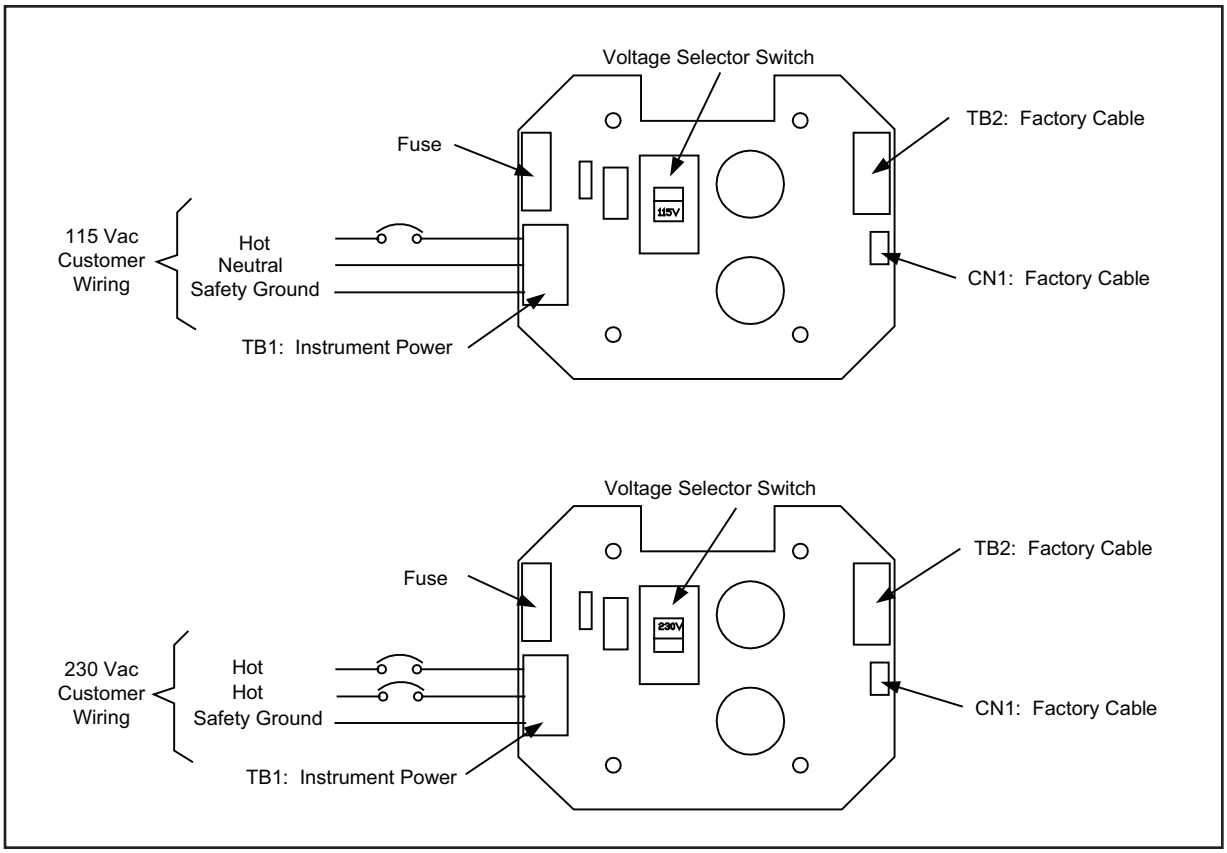


Figure 25. MACF Board / Instrument Power Wiring

Instrument power is connected to the MACF board located inside the microLoad.net enclosure. Be certain to select the appropriate incoming voltage on the Voltage Selector Switch (115/230) before applying power to the unit.

Sample Application Wiring

The following is a sample microLoad.net configuration. Our sample application includes the following equipment:

- Smith Meter® microLoad.net™
- PD meter w/ UPT transmitter
- Smith Meter® Card Reader
- Serial Printer
- RTD temperature sensor
- Pressure Transmitter
- External Totalizer
- Lubrizol Blend Pak Additive Injector
- Generic Ground Monitor
- Generic Overfill Monitor

The sample application assumes 120 Vac Instrument Power, and 460 Vac 3 Phase power for pumps.

Interposing Relays

This sample illustrates the use of interposing relays in a system of this type. Interposing relays are used to interface the ground and overfill monitors in order to provide contacts which may be connected to the microLoad.net's DC Digital Inputs. Interposing relays are also used with the microLoad.net's digital outputs to provide greater load capacity needed to energize the coils of the pump motor starters.

METER PULSE INPUTS

	Meter Pulse A	Meter Pulse B
Prime 4 Primary		
Prime 4 Secondary		
PEX-P		
PPS Primary		
PPS Secondary		
Apollo Primary		
Apollo Secondary		
UPT Primary	X	
UPT Secondary		
Open Collector Primary		
Open Collector Secondary		
Metered Injector		
Not Used		X

ANALOG INPUTS

	RTD	4-20 ma
Temperature	X	
Pressure		X
Density		

PULSE OUTPUTS

	Pulser
Used	X
Not Used	

COMMUNICATIONS TYPE

	COM 1	COM 2	COM 3	ETHERNET
RS-232			X	
RS-485	X	X		
Not Used				

COMMUNICATIONS ASSIGNMENT

	COM 1	COM 2	COM 3	ETHERNET
Terminal Host Communications				
Microcomputer Host Communications				
SLIP (TCP/IP)				
Printer			X	
Smart Injector Control	X			
Smith Card Reader		X		
Mass Meter				
Shared Printer				
Print Server				

DIGITAL INPUTS (DC)

	Input 1	Input 2	Input 3
Security			
Permissive 1	X		
Permissive 2		X	
1st/2nd Hi Flow			
Remote Start			
Remote Stop			
Transaction Reset			
General Purpose Input			
Printer Tray Switch			
Piston Injector 1 Feedback			
Piston Injector 2 Feedback			
Piston Injector 3 Feedback			
Piston Injector 4 Feedback			
Not Used			X

DIGITAL OUTPUTS (DC & AC)

	Output 1 (DC)	Output 2 (DC)	Output 3 (AC)	Output 4 (AC)	Output 5 (AC)	Output 6 (AC)
Pump	X					
Upstream Solenoid			X			
Downstream Solenoid				X		
Alarm Relay 1					X	
Alarm Relay 2						
General Purpose Out						
Stop Relay						
Piston Injector 1						
Piston Injector 2						
Piston Injector 3						
Piston Injector 4						
Metered Injector 1						
Additive Pump 1		X				
Additive Pump 2						
Additive Pump 3						
Additive Pump 4						
Not Used						X

Figure 26. Sample Application Worksheet

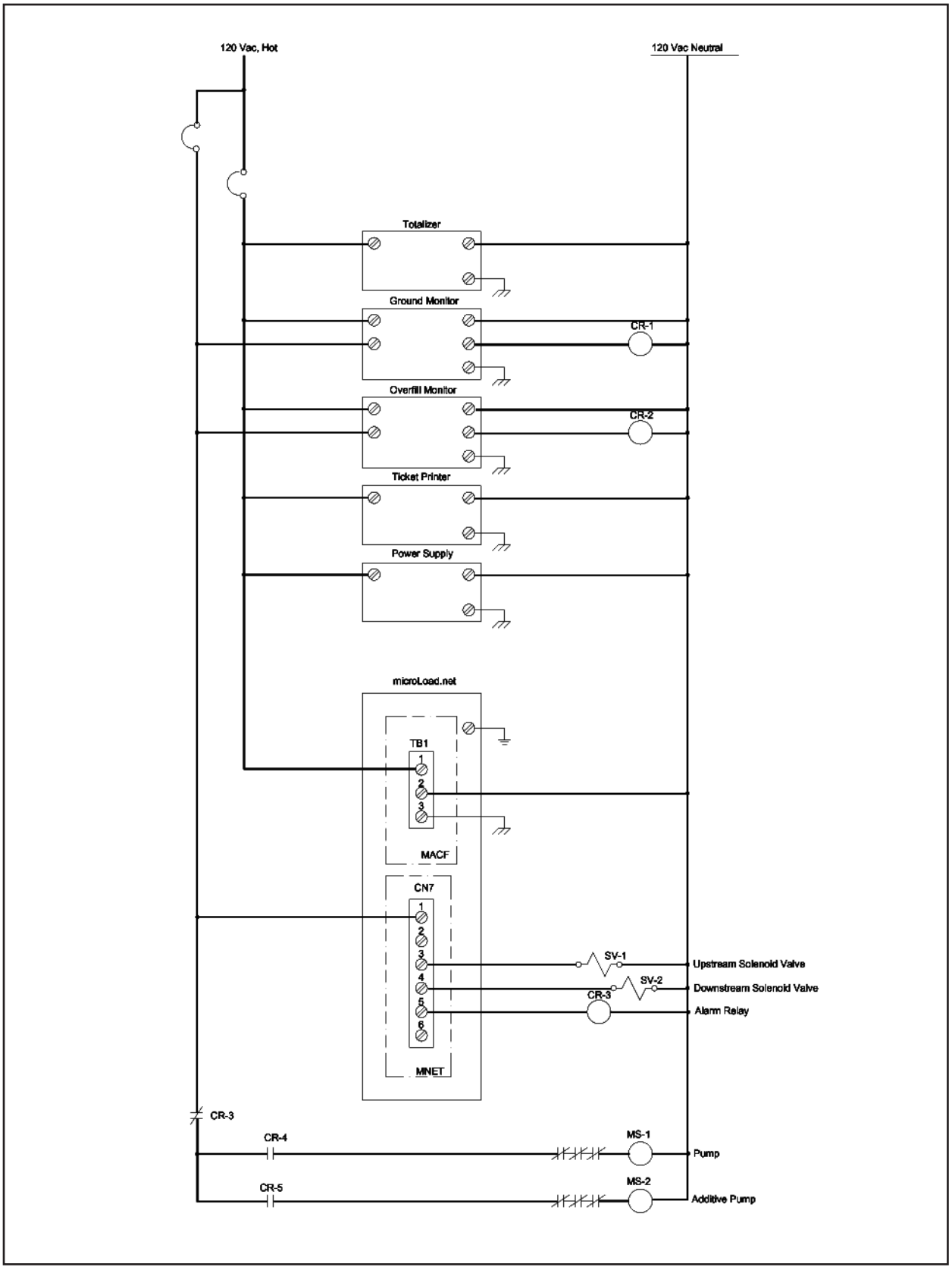
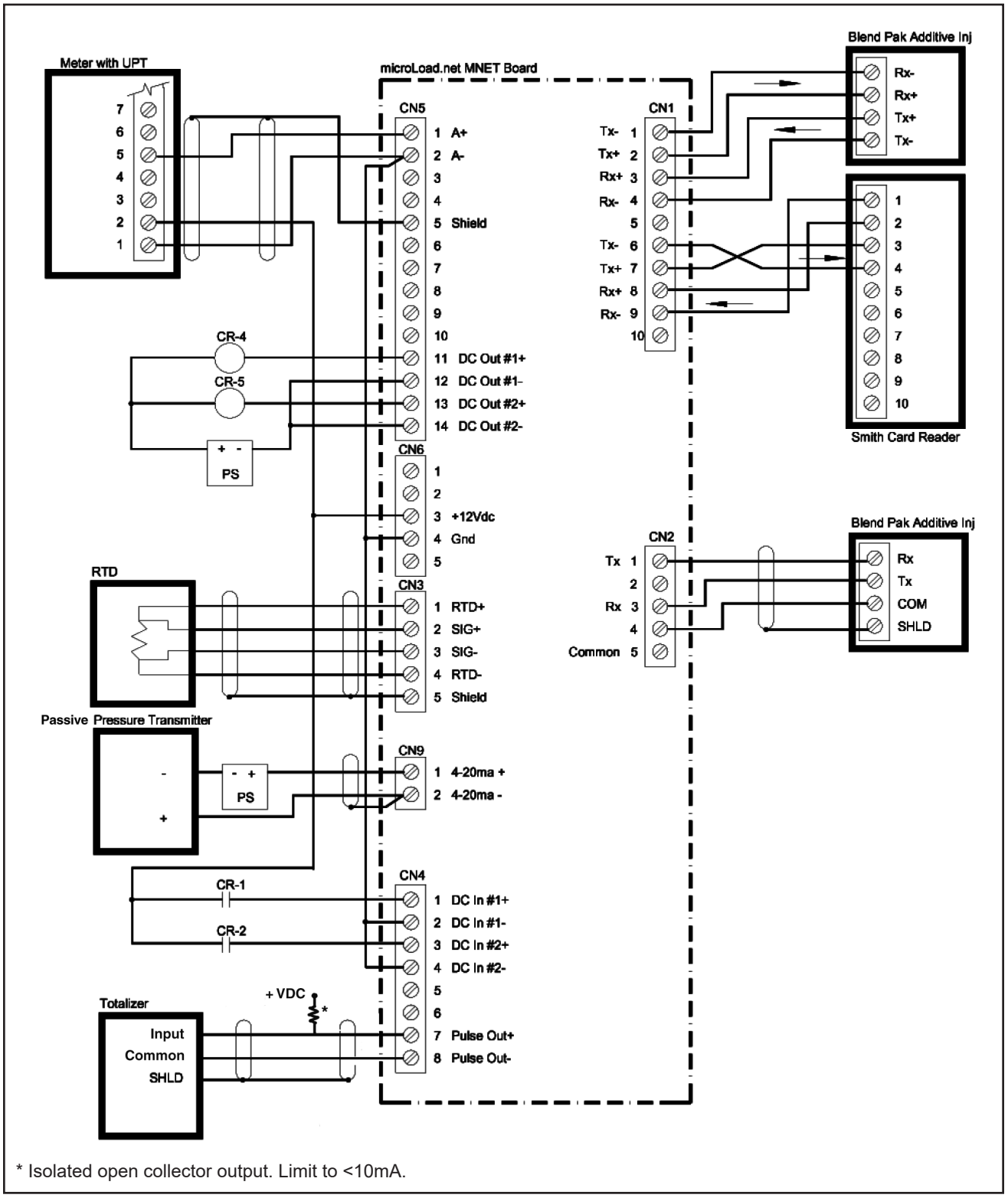


Figure 27. Sample Application AC Wiring



* Isolated open collector output. Limit to <10mA.

Figure 28. Sample Application DC and Signal Wiring

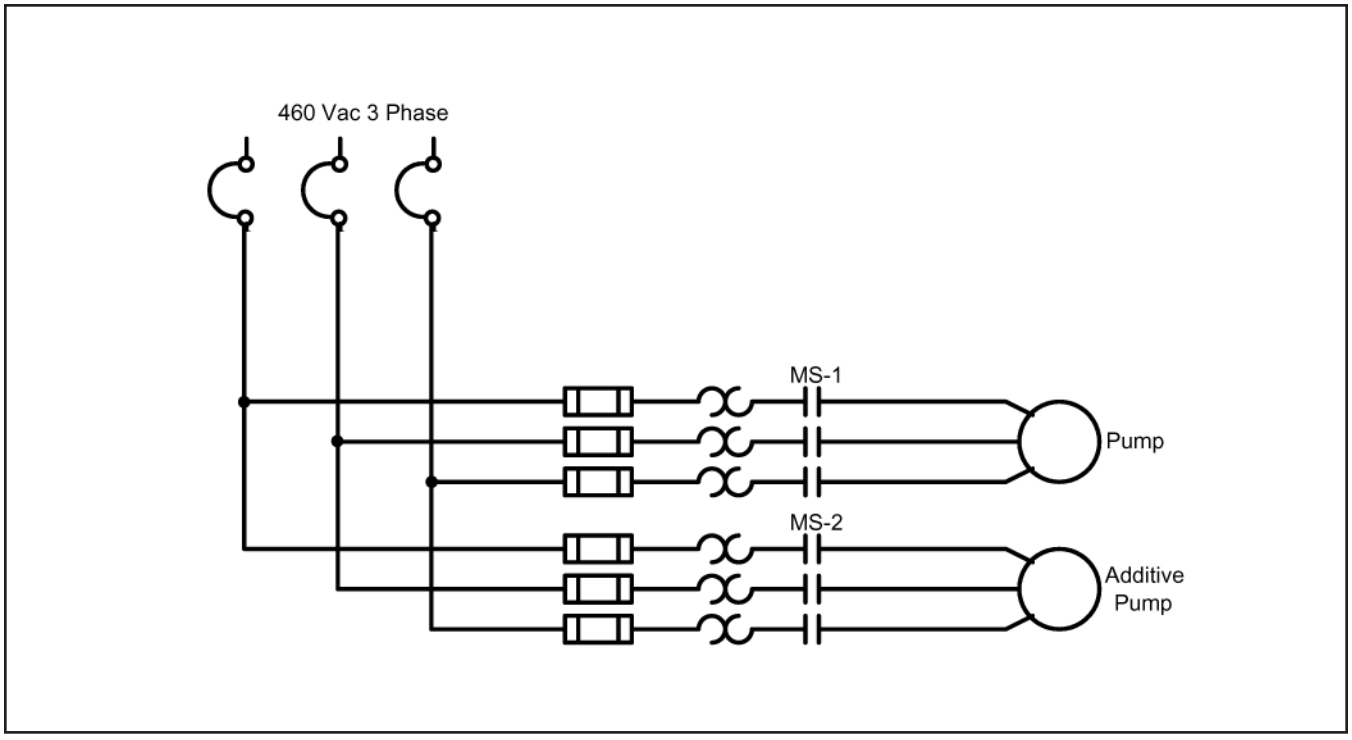


Figure 29. Sample Application Power Wiring

Standards used:

IEC 60079-0 6th Edition, EN 60079-0: 2012 +A11:2013, UL 60079-0 6th Edition, CAN/CSA C22.2 No. 60079-0:11
IEC 60079-1 6th Edition, EN 60079-1: 2007, UL 60079-1 6th Edition, CAN/CSA C22.2 No. 60079-1:11
IEC 60079-11 6th Edition, EN 60079-11: 2012, UL 60079-11 6th Edition, CAN/CSA C22.2 No. 60079-11:11

Section VI – Related Publications

Application Bulletin (LACT/Loading/Unloading).....Bulletin AB06100
Specification ..... Bulletin SS06045
MicroMate for microLoad.net..... Bulletin SS06046
Installation .....Bulletin MN06150
microLoad.net Operator Reference .....Bulletin MN06148
Communications.....Bulletin MN06147
Operations .....Bulletin MN06149
MicroMate for microLoad.net Installation/Operation.....Bulletin MN06152
Modbus and Modbus/TCP Communications .....Bulletin MN06155

Technical Support

Contact Information:
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System Installation Supervision, Start-Up, Training, and Commissioning Services Available

Revisions included in MN06150 Issue/Rev. 0.7 (9/18):
Page 10: Electrical Installation updates.

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