Smith Meter®
AccuLoad IV
Installation & Maintenance Manual

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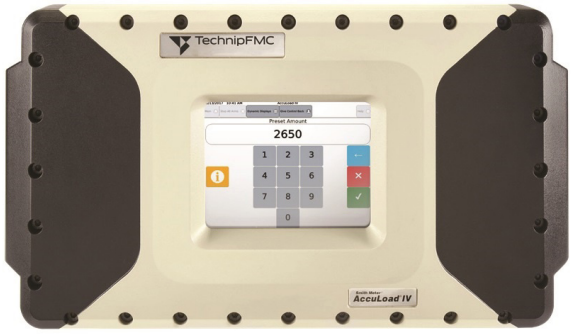

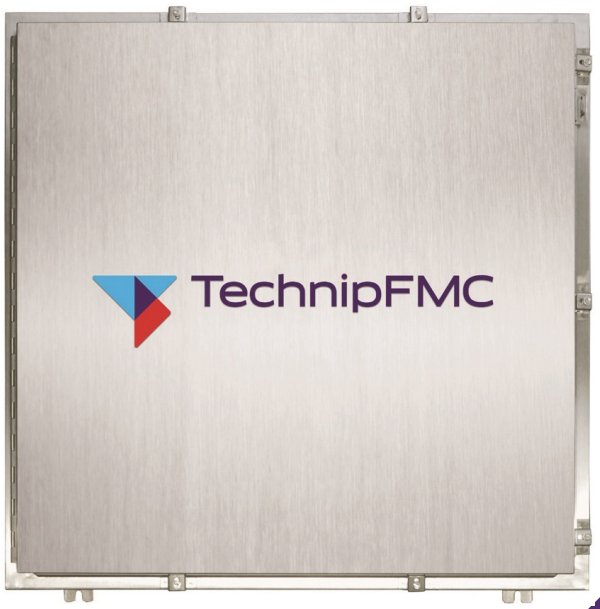

Important

All information and technical specifications in this document have been carefully checked and compiled by the author; however, we cannot completely exclude the possibility of errors. TechnipFMC is always grateful to be informed of any errors; contact us at TechnipFMC.com.

Caution

The default or operating values used in this document and in the configuration parameters of the AccuLoad IV 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 configuration parameter must be reviewed and programmed for that specific metering system application.

Disclaimer

TechnipFMC hereby disclaims 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 AccuLoad IV.

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Literature Library
http://info.smithmeter.com/literature/

Contents

1 Introduction

This manual provides guidance for the electrical installation and general maintenance of the Smith Meter AccuLoad IV. When installed following the guidelines contained in this manual, the AccuLoad should provide many years of safe, accurate, and reliable use.

This manual addresses the requirements specific to the AccuLoad IV and it is assumed that the installation designers and fabricators are familiar with the applicable industrial facility construction standards specific to the particular facility. The ST and QT models are designed for use in Class 1, Division 1 and Zone 1 hazardous locations, while the N4 and SA models are designed for North American Class 1, Division 2 environments only. If questions arise, please contact our Field Service Response Center or Customer Support.

1.1 Product Description

The AccuLoad provides accurate, reliable control and measurement of liquid petroleum blending and transfer operations. While primarily intended for use in refined petroleum distribution terminals, it can be easily configured for a wide variety of liquid transfer applications.

Operators can select an amount of product to transfer and the AccuLoad monitors and controls the configured pumps, valves, and additive injectors to safely and efficiently transfer the precise recipe and amount. During the transfer, all processing parameters are monitored to provide operators with an accurate amount of each component of the recipe delivered.

In addition to real-time control of the loading process, the AccuLoad also calculates averages and live quantities of all products and additives delivered. This information is stored in a runtime database that can be monitored by a supervisory host system. Whenever a transaction is completed, the AccuLoad stores a detailed record in an internal transaction log for subsequent retrieval or printing.

1.1.1 AccuLoad IV Models

The AccuLoad IV is available in several hardware configurations and with multiple standard and optional modules.

1.1.1.1 AccuLoad IV ST

The Single Touch Screen (ST) model has the following specifications:

- Explosion-proof enclosure
- Two-arm operation
- Up to four single- or dual-pulse product meter inputs
- Up to four additive meter inputs or, with the optional A4I module, up to 24 additive meter inputs
- AccuLoad III to IV upgrade kit (UG3)

Figure 1: AccuLoad IV ST

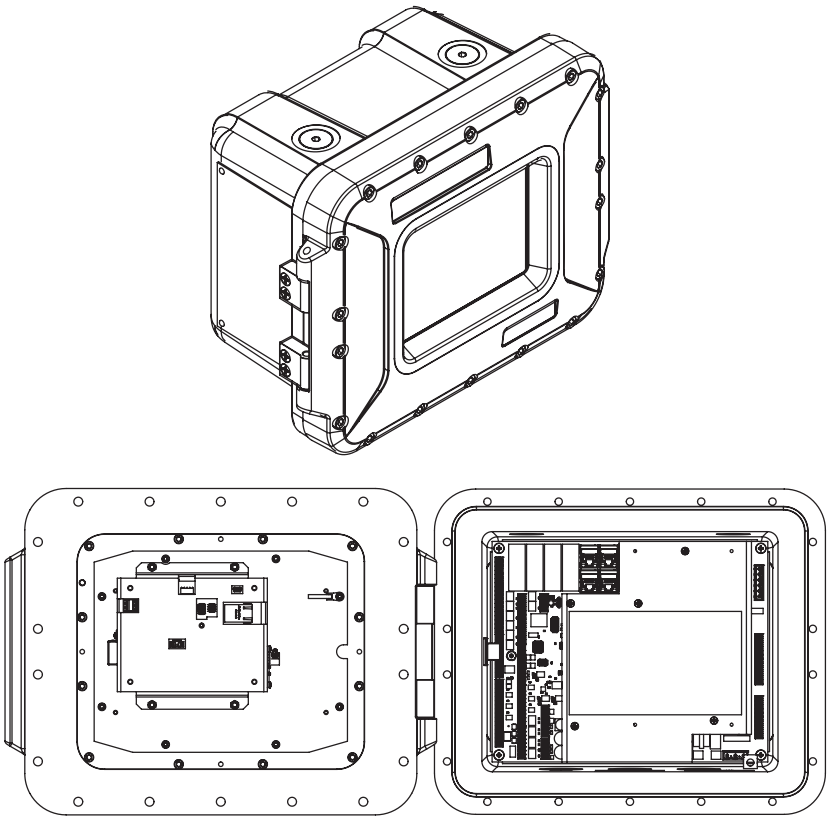
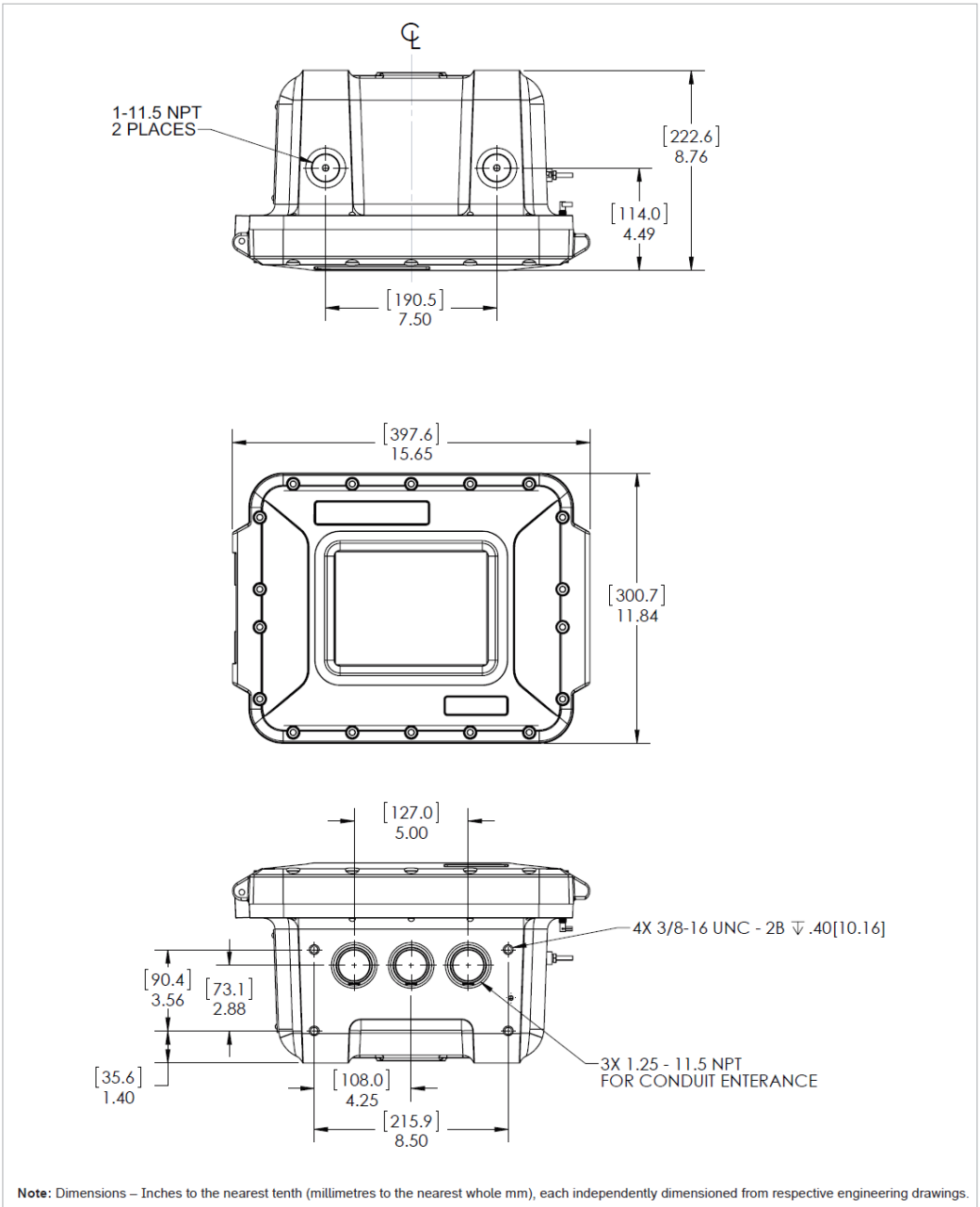


Figure 2: AccuLoad IV ST Dimensions



Note: Dimensions – Inches to the nearest tenth (millimetres to the nearest whole mm), each independently dimensioned from respective engineering drawings.

1.1.1.2 AccuLoad IV QT

The Quad Touch Screen (QT) model has the following specifications:

- Explosion-proof enclosure
- Up to six-arm operation
- Up to six single- or dual-pulse product meter inputs
- Up to four additive meter inputs or, with the optional A4I module, up to 24 additive meter inputs
- AccuLoad III to IV upgrade kit (UG3)

Figure 3: AccuLoad IV QT

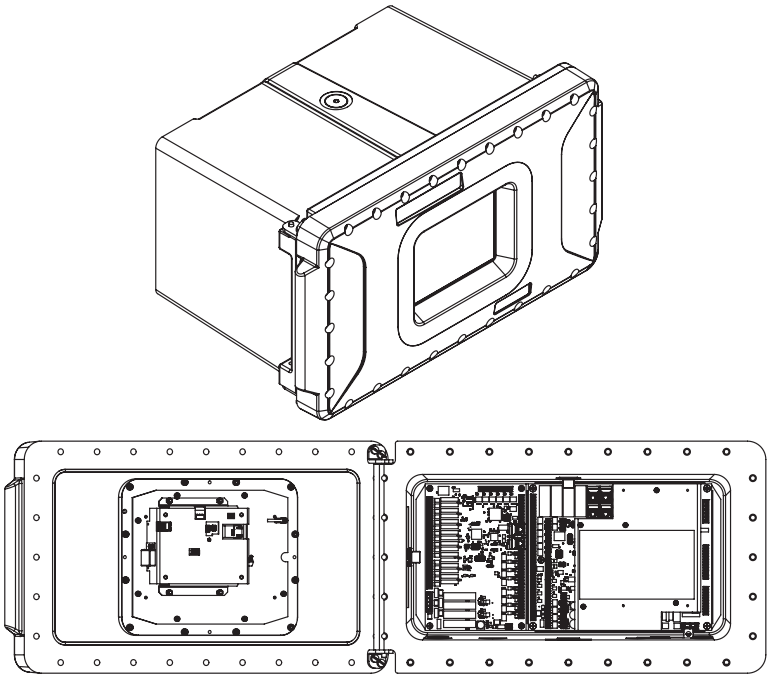
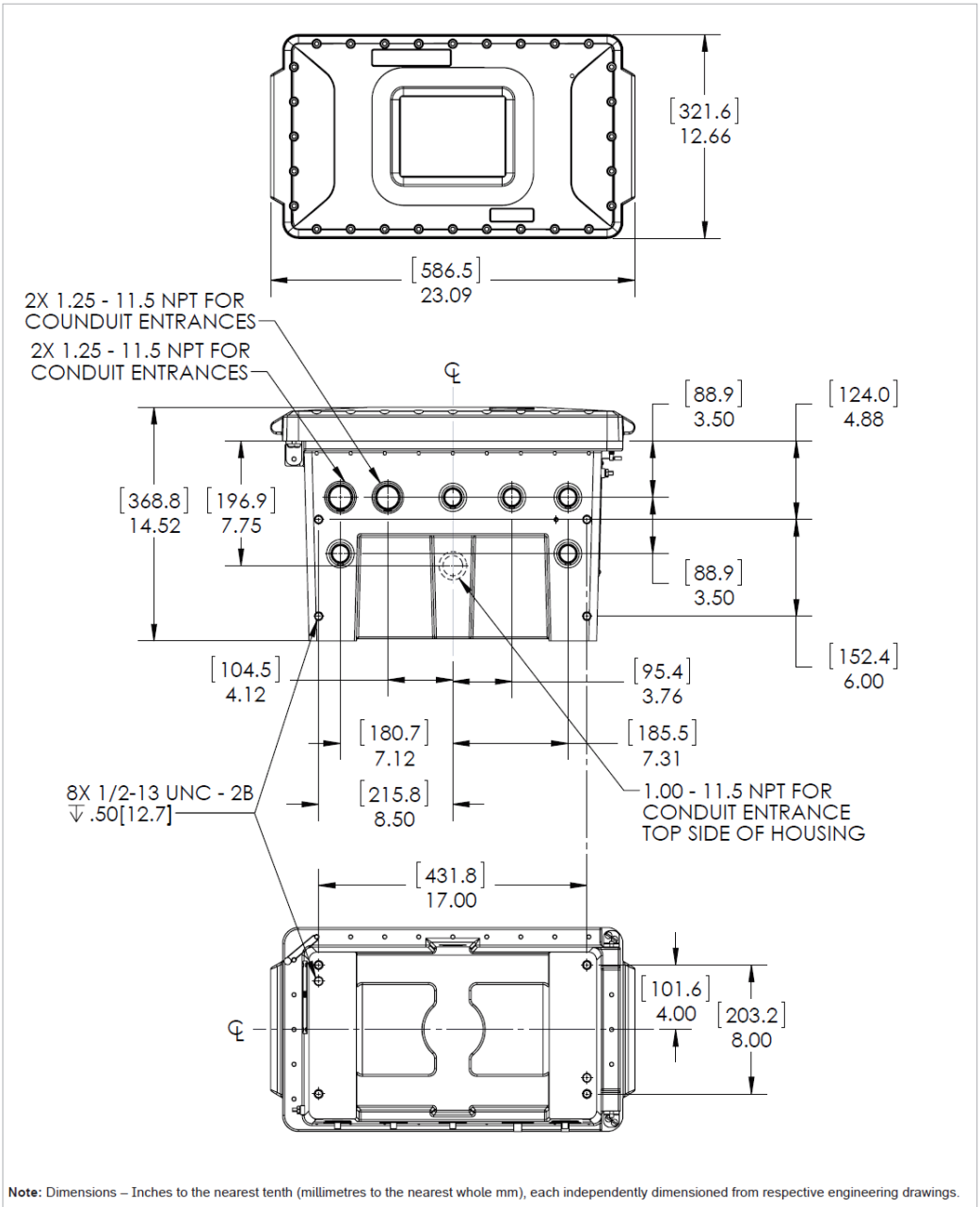


Figure 4: AccuLoad IV QT Dimensions



Note: Dimensions – Inches to the nearest tenth (millimetres to the nearest whole mm), each independently dimensioned from respective engineering drawings.

1.1.1.3 AccuLoad IV N4

The NEMA 4 (N4) model has the following specifications:

- 304 stainless steel, NEMA 4X-rated enclosure
- One-or two-arm operation
- Up to four single- or dual-pulse product meter inputs
- Up to four additive meter inputs with local input/output (I/O)
- Optional integrated card reader, indicator lights, and stop button

Figure 5: AccuLoad IV N4

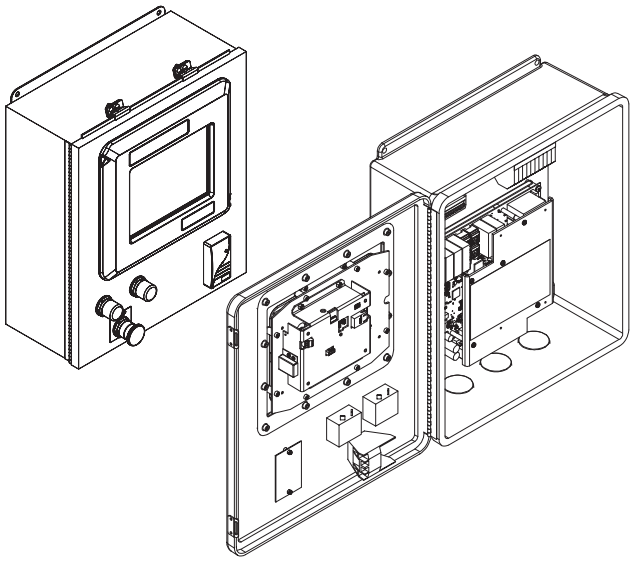
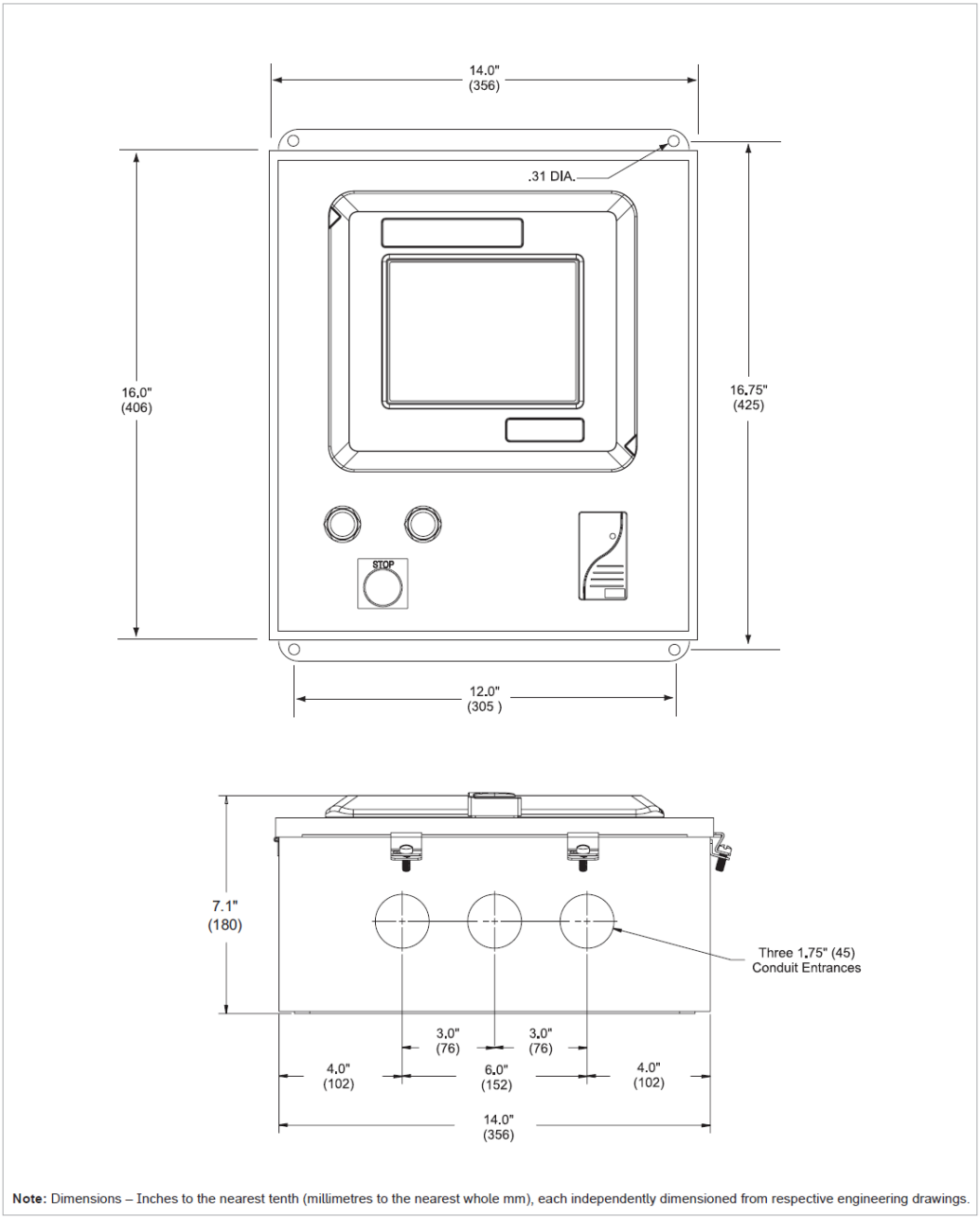


Figure 6: AccuLoad IV N4 and MMI Dimensions



Note: Dimensions – Inches to the nearest tenth (millimetres to the nearest whole mm), each independently dimensioned from respective engineering drawings.

1.1.1.4 AccuLoad IV SA

The Split Architecture (SA) model is comprised of one field control module (FCM) and one or two man-machine interfaces (MMI). The FCM contains the I/O control electronics that are connected to meters, valves, permissives, and other hardware; it can be located for convenient access by service personnel. The MMI components are the operator control panels and can be located for convenient access by drivers.

The SA model has the following specifications:

- 304 stainless steel, NEMA 4X-rated enclosure
- Up to 18-arm operation

- Up to 24 single- or dual-pulse product meter inputs
- Up to 56 additive meter inputs with the A4I I/O module or, with the remote A4I module, up to 96 additive meter inputs

The MMI has an optional integrated card reader, indicator lights, and stop button.

Figure 7: AccuLoad IV SA

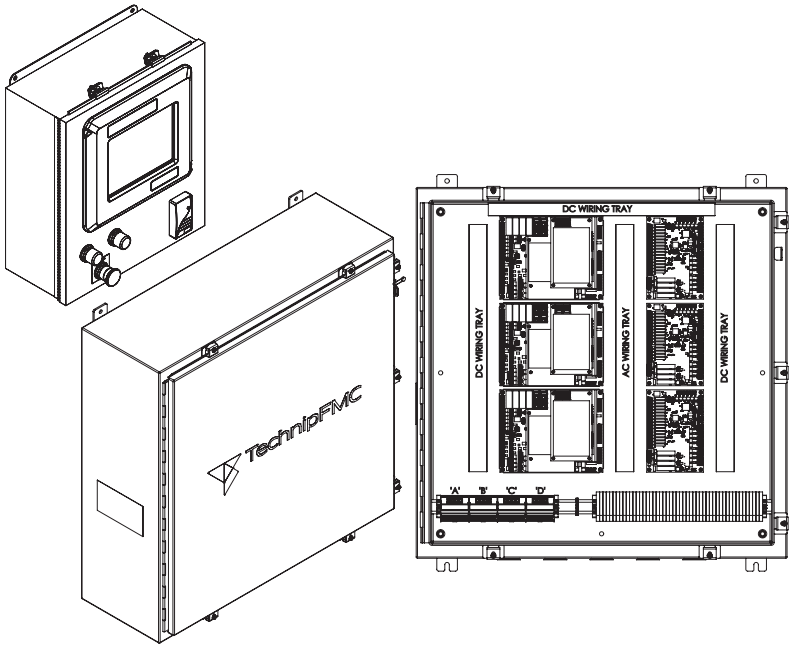
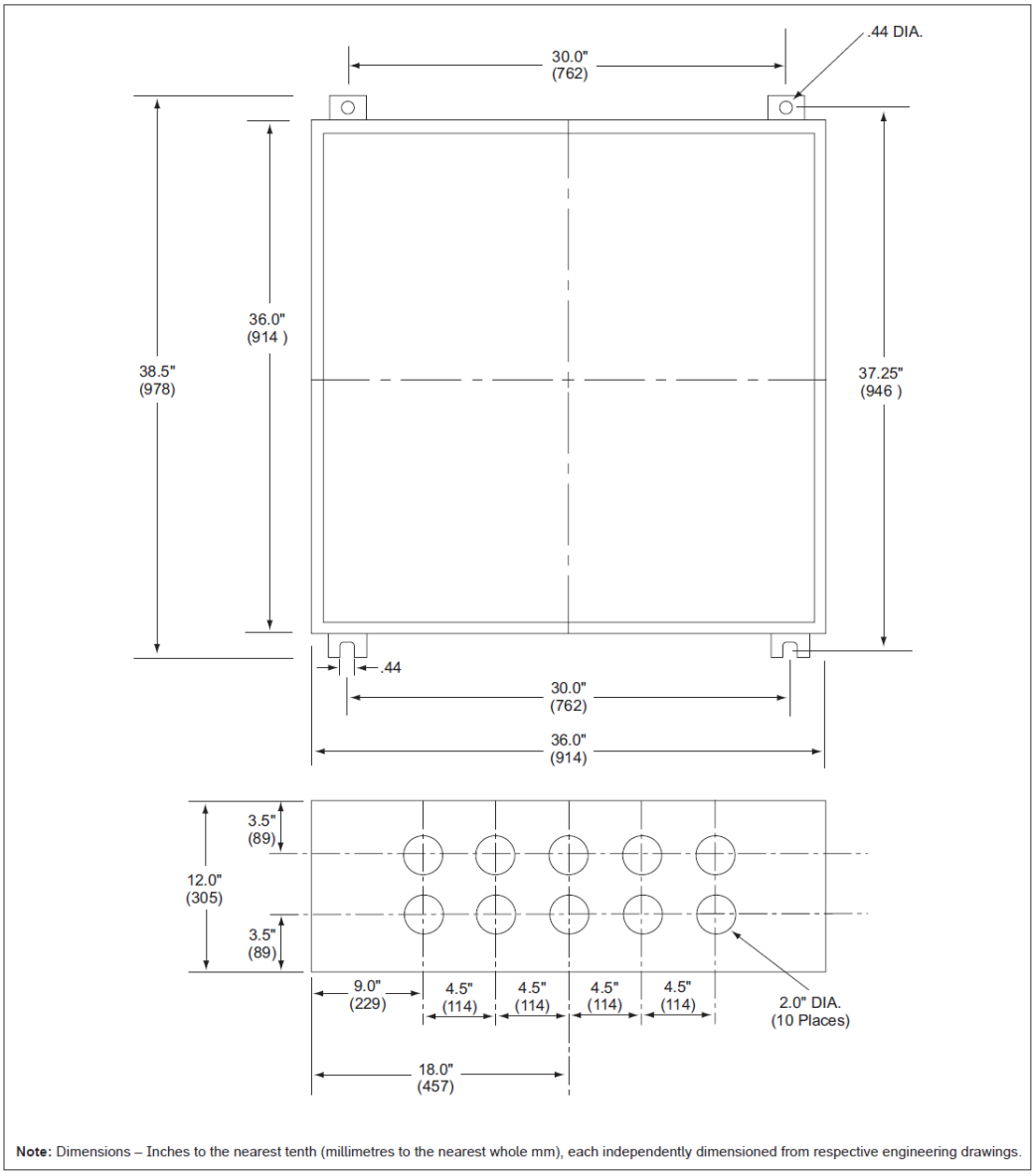


Figure 8: AccuLoad IV SA FCM



Note: Dimensions – Inches to the nearest tenth (millimetres to the nearest whole mm), each independently dimensioned from respective engineering drawings.

1.1.2 Electronic Modules

The AccuLoad IV has the following standard and optional electronic modules. Table 1: Electronic Modules by Model explains which modules are standard or optional for each AccuLoad model; Table 2: Model Functions and Capacities provides details about each module.

Table 1: Electronic Modules by Model

Model	Standard Modules	Optional Modules
ST	THMI A4M	A4I (up to two; only one may be installed internally)
QT	THMI A4M A4B	A4I (up to two external or internal)
N4	THMI A4M	Card reader
SA MMI component	THMI	Card reader
SA FCM component	A4M A4B	A4I (up to one per board set) A4M and A4B (up to three board sets)

Table 2: Model Functions and Capacities

Module	Description	Interfaces	Power	Model & Location
THMI	Touch-screen user interface; connects to the A4M via Ethernet	Ethernet Serial	24 volts direct current (VDC)	ST (front cover) QT (front cover) N4 SA MMI
A4M	Main I/O board that provides up to six dual-channel product meter pulse inputs; pulse inputs not used for product meters can be used for up to four metered injector pulse inputs	Meter pulse input Pulse outputs Digital I/O alternating current/direct current (AC/DC) Analog I/O Ethernet	93 to 230 volts alternating current (VAC)	ST QT N4 SA FCM
A4B	I/O expansion for the QT and SA models	Meter pulse input Digital I/O AC/DC Ethernet	24 VDC	QT SA FCM
A4I	Optional I/O expansion module generally used for metered injector interfaces	Additive meter pulse input Digital input DC Digital output AC	24 VDC	ST QT SA FCM (may be mounted internally or in separate enclosure)
Card reader	Proximity card reader for access control	Serial communication	24 VDC	N4 SA MMI (may be mounted in front cover or in separate enclosure)

1.2 Warnings and Precautions

Before you begin installing the AccuLoad, please read all of the following warnings and cautions to the reduce the risk of injury, equipment damage, or malfunction.

WARNING: The AccuLoad should never be relied upon to act as the primary safety system control for the flow valve and pump controls (such as emergency stop, overfill, and ground protection). These should always be handled by separate systems specifically designed for that application; for example, safety systems specifically to meet safety integrity level (SIL) requirements. Any power control circuits from these external systems should be wired in series ahead of the AccuLoad to remove power to ancillary devices.

1.2.1 Hazardous Voltages

Hazardous voltages are involved in the installation and maintenance of the AccuLoad. Only qualified individuals should perform this installation.

1.2.2 Hazardous Locations

The ST and QT models are approved for use in an explosive environment (Class I, Division 1, Groups C and D and Zone 1 Ex d ia, IIB Gb), but specific installation methods are required to produce a comprehensive explosion-proof system. This manual only provides guidance for the installation of the AccuLoad. In general, keeping the front cover bolted closed in accordance with the instructions in Section 5: Closing and Sealing the Enclosure is the key to maintaining explosion protection.

Any modification to the housing invalidates the hazardous location rating of the AccuLoad. For example:

- Do not replace the bolts in the front cover except with those supplied by the manufacturer. Using unapproved bolts invalidates the explosion-proof rating of the enclosure.
- Do not drill or machine the housing.
- Do not attempt to replace the touch screen or glass except as part of a factory-supplied assembly.

1.2.3 Electrostatic Discharge Precautions

The electronic components in the AccuLoad are susceptible to damage by electrostatic discharge (ESD). To minimize the risk of damage, the following precautions should be followed:

- Before touching a circuit board with hands or tools, personnel and tools should be grounded using a wrist strap.
- Avoid touching components or traces on the circuit boards and handle by the edges or mounting holes.
- Keep circuit boards in static-control packaging (such as static-shielding bags) when not installed.
- Protect against ESD in workspaces when handling circuit boards.

1.2.3.1 Electrostatic Discharge Precautions in Hazardous Locations

Note the following additional precautions when operating the AccuLoad in hazardous locations:

- The touch screen features a plastic screen protector (installed at the factory) with a surface area exceeding the area specified in IEC/EN 60079-0, and as such requires the following statement:

"Warning: Clean display with a damp cloth only." This is to ensure that stray static charges are not built up on the surface that could lead to a static discharge.

- Special care must be taken with shielding termination to ensure signal integrity. See Section 3.1: General Electrical Installation Requirements for more information.
- The AC and DC wiring should be physically separated (do not use the same conduit or entry) to avoid induced noise.

ATEX- and IEC-approved installations have special requirements; see Section 3.2: ATEX- and IECEx-Approved Installations for details.

To ensure the correct operation, Section 3.6.7: Typical Wiring Diagrams for wiring diagrams.

1.2.4 RF Radiation

The AccuLoad generates, uses, and can radiate radio frequency (RF) energy and, if not installed and used in accordance with this manual, may cause interference to radio communications. It has not been tested to comply with the limits pursuant to Federal Communications Commission's FCC Code of Federal Regulations, Title 47, Part 15 (CFR 47), as electronic control equipment used by an industrial complex is exempt from the rules.

Operation of this equipment in a residential area may cause interference, in which case the user, at their own expense, will be required to take whatever measures that may be necessary to correct the interference. The explosion-proof version of the AccuLoad has been evaluated against international standard IEC 61326-1: Electrical Equipment for Measurement, Control and Laboratory Use and has been found to comply with European Community Electromagnetic Compatibility (EMC) Directive 2014/30/EU.

1.2.5 Site-Specific Configuration

The AccuLoad is shipped from the factory in a completely initialized state and must be properly configured for the specific installation prior to operation. The unit will not operate due to alarm conditions until the configuration is completed. Using a personal computer (PC) running the AccuMate application is the best method to set the initial configuration, but if AccuMate is not available, all configuration parameters are accessible using the AccuLoad's touch screen. See the AccuLoad IV Operator Reference Manual (MN06200) for information about parameter settings.

1.2.6 Weights and Measures Requirements

The AccuLoad is used by a global market. Requirements regarding weights and measures may vary depending on the region. Users are required to verify that the AccuLoad is configured and operated in a manner consistent with local codes and that proper notification (permit for use) or registration has been filed with the local authority or jurisdiction.

Weights and measures authorities rely on either physical sealing or electronic sealing with password protection to secure metrological parameters for use in legal trade. See Section 5.2: Sealing the Enclosure in this manual for information about physically sealing the AccuLoad or the AccuLoad IV Operator Reference Manual (MN06200) for instructions on setting a password.

2 Pre-Installation Considerations

2.1 Environmental Considerations

In areas where the ambient temperature is very high, it is recommended that the AccuLoad be installed under a canopy or sun shield to limit direct sunlight radiation.

In areas of high humidity (tropical) or with varying temperature swings, it is recommended to place desiccant packs (TechnipFMC part number 647001443) inside of the enclosures, and to maintain these while in service.

2.2 ST and QT Models

The enclosures of the ST and QT explosion- and flame-proof models are manufactured from aluminum alloy and are designed to be operated in normal environmental conditions free of corrosive agents.

In areas including but not limited to environmentally corrosive atmospheres, special considerations for additional environmental protection shall be made if installing into near shore areas that are subject to wind-borne seawater spray and subject to possible continuous accumulations of saltwater on the equipment. The recommended protection is exclusion of the environment by placing the equipment into a secondary protected environment, such as a kiosk or a control room. If exclusion of the environment is not possible, then extra means must be taken to maintain the equipment's integrity, including frequent cleaning and inspection intervals. See Section 6: Maintenance for additional information.

2.3 N4 and SA Models

The enclosures of the N4 and SA models, as well as the MMI and FCM modules, are manufactured from 304 stainless steel (which offers a higher resistance to corrosive environmental atmospheres) and are designed to be operated in normal environmental conditions free of corrosive agents.

In areas with environmentally corrosive atmospheres—such as near shore areas that are subject to wind-borne saltwater spray and possible accumulation of saltwater on AccuLoad equipment—special considerations for additional environmental protections should be made. We recommend placing the AccuLoad equipment in a secondary, protected environment, such as a kiosk or control room; if this is not possible, extra means must be taken to maintain the equipment's integrity, including frequent cleaning and inspections. See Section 6: Maintenance for additional information.

2.4 Mechanical Installation Considerations

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

- A solid bracket (rear- or bottom-mount) should be used to support the AccuLoad. Refer to the AccuLoad IV specifications (SS06200) for the weight and mounting dimensions.
- The location and the height of the AccuLoad should easily permit operation of the front touch screen and allow for a near-perpendicular viewing angle to minimize parallax effects.
- Leave room for the front panel of the AccuLoad to open at least 90 degrees to provide access for servicing the AccuLoad. Note that the covers are hinged on the left.
- See the following table regarding cable access for each AccuLoad IV model. Refer to the AccuLoad IV specifications (SS06200) for additional details about the location and size of the wiring access openings in the enclosures.

Table 3: Cable Access

Model	Top Cable Access	Bottom Cable Access
ST	Two 1-inch 11.5 NPT	Three 1.25-inch 11.5 NPT
QT	One 1-inch 11.5 NPT	Two 1.25-inch 11.5 NPT Five 1-inch 11.5 NPT
N4		Three 1.75 inch
SA MMI		Three 1.75 inch
SA FCM		Ten 2 inch

2.5 Electrical Installation Considerations

Although the AccuLoad is rated to operate in ambient temperatures up to 60 °Celsius (C), it is advisable to keep all electronics as cool as possible to reduce thermal stress on the electronic components. In hot, sunny areas, the AccuLoad should be mounted in shade to prevent the housing from exceeding the rated temperature.

In addition to this manual's installation instructions, the following electrical warnings and precautions should be reviewed before installation.

> The following recommendations are based on our knowledge of electrical codes. The local electrical codes should be reviewed to ensure that these recommendations follow the local code. Additionally, installation manuals of all the equipment being wired into the AccuLoad should be reviewed for transmission distances and wire recommendations.

- All wiring must be routed into AccuLoad through the cable entries. Do not route DC and AC wiring through the same conduit entry.
- The DC signal wires must be shielded multi-conductor cable of 18 to 24 American Wire Gauge (AWG) minimum stranded copper.
- For Ethernet connections, a minimum of Cat 5-rated cable should be used and the Ethernet wiring practices described in the ISO/IEC 11801 should be followed for cable lengths, etc.
- Connectors are sized for a maximum of 14-gauge wire. Consult your local electrical codes for the minimum wire size required for your application.
- All AC wiring should be stranded copper and must comply with federal, state, and local codes and specifications.

- Two separate AC circuits must be provided from the breaker panel. One circuit should supply isolated power to the AccuLoad's electronics (instrument power). The second circuit should supply power to external devices (Section 3.6.1: AC Input Power).
- For proper operation, the AccuLoad must be earth grounded. The grounding point should be as close to the unit as possible.
- To ensure proper earth grounding, the resistance between the ground lug in the AccuLoad and the grounding point must not exceed 2 Ω. The proper grounding point is a ½- to ¾-inch diameter copper stake that extends into the water table. Where this is not practical, a ground plane may be used.

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

2.5.1 Typical Wire Sizes and Cable Lengths

See the following tables for typical wire sizes, cable lengths, and baud rates.

Table 4: Typical Wire Sizes

Equipment	Number and Gauge of Wire	Belden Number or Equivalent
Transmitters	4/18 gauge 4/20 gauge	9418 8404
Temperature probes Density and pressure transmitters	4/22 gauge	8729 or 9940
EIA-232	3/24 gauge	9533
EIA-485 Communications	4/24 gauge	9842
Ethernet	Cat 5 or Cat 6	1584A or 2412

Table 5: Serial Communications (EIA-232) Maximum Cable Length and Baud Rate

Baud Rate	Feet	Meters
115,200	62.5	18.25
57,600	125	37.5
38,400	250	75
19,200	500	150
9,600	1,000	305

Table 6: Serial Communications (EIA-485) Maximum Cable Length and Baud Rate

Baud Rate	Feet	Meters
9,600 to 115,200	4,000	1,220

3 Installation

The general steps in the installation process are to physically mount the AccuLoad, electronically connect it to work with associated equipment, and then configure it to suit its specific operational and measurement environment. This manual provides information about the electrical installation of the AccuLoad IV.

For dimensional drawings and basic requirements for mounting the AccuLoad IV, see the AccuLoad IV specifications (SS06200). For information about configuring the AccuLoad IV, refer to the AccuLoad IV Operator Reference Manual (MN06200).

3.1 General Electrical Installation Requirements

It is imperative that the electrical installation be performed by a qualified individual who is familiar with associated risks involved with the installation, operation, and maintenance of electrical equipment in hazardous (classified) locations. This individual must possess knowledge of local and national electrical codes, in addition to ordinances concerned with hazardous location safety requirements. It is recommended (may be required in some jurisdictions) that the final installation be verified and inspected by the authority having jurisdiction before placing the equipment into service.

Electrical installations in hazardous areas have features specifically designed to make them suitable for use in such locations and it is the operator's responsibility to maintain the integrity of those special features.

The operator must ensure that electrical equipment is:

- Installed and operated correctly
- Monitored on a regular basis
- Maintained with due regard to safety

Additionally, the following guidelines should be followed:

- AC Circuits must be isolated from DC circuits and brought into the unit through their respective conduit openings.
- Be sure all connections on the terminal blocks are tight.
- All shields must be connected to terminals 3, 13, 14, or 15 on terminal block TBE4 on the A4M Board or terminals 9 and 10 on TB14 on the A4B Board.
- All exposed shields must be properly insulated to prevent short circuits to other terminals or to the chassis. The shield at the device (such as a temperature device or transmitter) 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 AccuLoad, refer to the manual for that unit for shielding information. Shields for other communicating equipment should not be terminated in the AccuLoad.

> Shields must not be terminated at the ground lugs.

- Sufficient slack should be provided for the wiring in the AccuLoad to permit easy removal of the boards. With sufficient slack, the terminal blocks can be removed and laid out of the way so that the boards can be replaced without removing individual wires.
- A ground lug is provided in the unit; the wire from the lug should be connected to the proper grounding point (see Section 2.5: Electrical Installation Considerations for more information).
- Typical installation diagrams are provided in the following sections to show the electronic connections between the AccuLoad and compatible electronic modules. Before wiring any ancillary equipment, refer to its product-specific installation manual.

3.2 ATEX- and IECEx-Approved Installations

The following sections contain information about installing models ST and QT, which have explosion-proof enclosures.

3.2.1 Installation

General Installation should be in accordance with IEC 60079-14; the wiring system should be in accordance with Section 9 of IEC 60079-14.

3.2.2 Hazard Warnings

To prevent the ignition of hazardous atmospheres, disconnect from the power supply before opening the enclosure. Keep the enclosure tightly closed when circuits are alive.

The AccuLoad contains internal battery-powered circuits; to prevent the ignition of hazardous atmospheres, do not open its enclosure unless the 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.

> The maximum ambient temperature for the enclosure is 60 °C for ATEX and IECEx applications and 55 °C for North American Zone applications.

3.2.3 Special Conditions for Safe Use

Special conditions for safe use include:

- Wiring and cable glands should be suitable for operation at 81 °C.
- Flame path dimensions for flanged joint widths must be a minimum of 19.05 mm. The clearance between flat joint surfaces must be less than 0.05 mm (0.002 inch) or such that a (0.002 inch) feeler gauge cannot enter the joint more than 3.2 mm (0.125 inch) at any point. Flame-proof joints should be maintained as outlined in Section 10.4 of IEC 60079-14.

3.2.4 Cable Entries

Cable entries must be in accordance with IEC 60079-1 section 13, as follows:

- For wiring systems using cable glands, the gland or thread adaptor must be Ex d certified. The cable ends must be securely installed and, depending on the cable type, be properly protected from mechanical damage. Requirements outlined in Section 10.4 of IEC 60079-14 should be followed.
- For wiring systems using conduit, an Ex d certified sealing device must be immediately at the entrance of the enclosure. Any unused entry must be suitably blocked with an Ex d IIB IP 65 certified plug for ATEX and IECEx applications. For North American Zone applications, the plug must be listed close up type. Requirements outlined in Section 10.5 of IEC 60079-14 shall be followed.

3.2.5 Cover Fasteners

Cover bolts are required to be M8 x 1.25-6g, DIN 912, steel grade 12.9.

3.2.6 Grounding

The touch-screen user interface (if provided) is protected by an intrinsic safety barrier; the enclosure must be grounded in accordance with national electrical code regulations; for example National Electrical Code (NEC) or Canadian Electrical Code (CEC).

Equipment bonding should be provided at the external grounding facility terminal; an external connection is not required when using metallic conduit or armored cable.

The external grounding facility terminal wire range is 10 to 12 AWG (5.26 mm^2 to 3.31 mm^2 wire).

3.3 UL Brazil INMETRO-Approved Installations

The following information is specific to AccuLoad models ST and QT to be installed in Brazil, which requires INMETRO standards to be followed.

3.3.1 Hazard Warnings

To prevent the ignition of explosive atmospheres and to avoid electric shock, disconnect the power circuits before opening the Ex d enclosure. Keep the enclosure tightly closed when circuits are alive.

The AccuLoad contains internal battery-powered internal circuits; to prevent the ignition of an explosive atmosphere, do not open the enclosure unless the area is known to be non-hazardous. Substitution of components may impair intrinsic safety.

> The maximum ambient temperature for the enclosure is 60 °C for INMETRO-approved applications.

3.3.2 Special Conditions for Safe Use

Special conditions for safe use include:

- Cables and cable glands should be suitable for operation at 81 °C.
- For information about the dimensions of flame-proof joints, contact TechnipFMC at the address provided on the back page this manual.

3.3.3 Cable Entries

All cable entries must meet the requirements of ABNT NBR IEC 60079-1, summarized as follows:

- Any installation accessories used in the cable entries (such as cable glands, adapters, or bushings) must be Ex d certified. The cable ends must be properly installed and adequately protected against mechanical damage.
- For wiring systems using conduits, a certified sealing unit must be used immediately at the entrance of the enclosure. Any unused input must be correctly closed with a certified device that guarantees the type and degree of protection (IP65).

3.3.4 Cover Fasteners

The EX d enclosure requires cover mounting bolts to be M8 x 1.25-6g, DIN 912, steel grade 12.9.

3.3.5 Grounding

The touch-screen user interface (if provided) is protected by an intrinsic safety barrier, the Ex d enclosure must be grounded in accordance with national electrical code regulations.

The ground connection must be made through the external ground terminal of the Ex d enclosure. An external connection is not necessary when using metal conduits or shielded cables.

The cross section of the external ground wiring must be 10 to 12 AWG (5.26 mm^2 to 3.31 mm^2 wire).

3.4 ALIV SA Installations

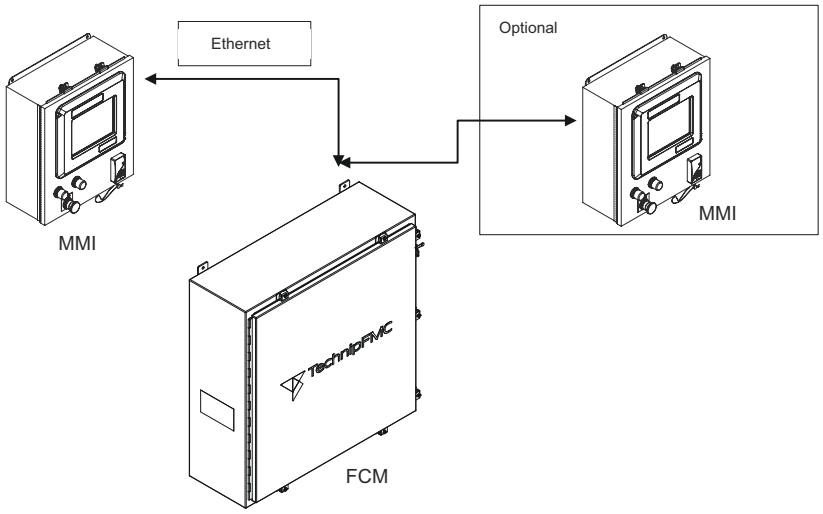
> North American Division 2 and Zone 2 installation requirements must be followed for the installation of the AccuLoad IV N4 and SA equipment; substitution of components may void safety certifications. Compliance with local codes is mandatory.

The AccuLoad IV SA model is comprised of the following units:

- One FCM unit that contains all of the I/O control electronics connected to peripheral hardware, such as meters, valves, and permissives
- One or two MMI units that act as the operator control panels

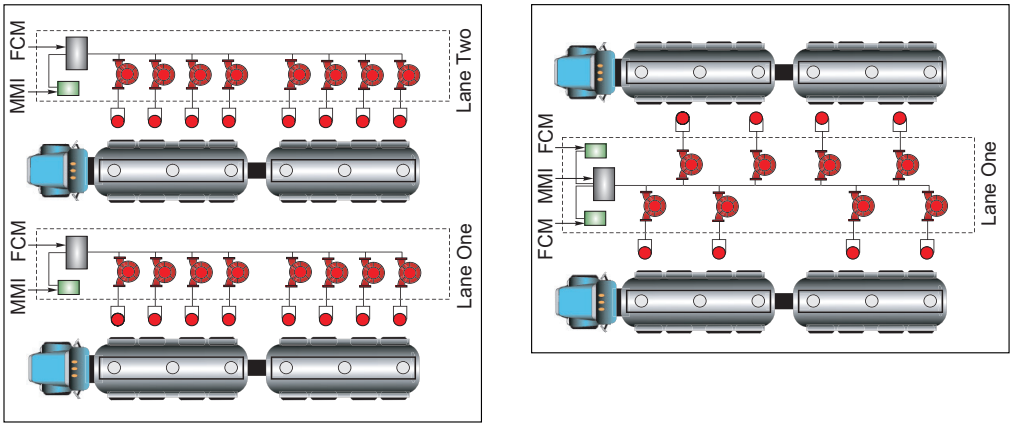
Each MMI is connected to its MMIs by Ethernet or serial cables.

Figure 9: AccuLoad IV Split Architecture Units



The FCM unit can be installed at a location that is convenient to service personnel. The MMI units can be installed for convenient access by drivers. Typical installation approaches are shown below.

Figure 10: Typical Installations for AccuLoad IV SA



3.5 Electronic Layouts and Connections

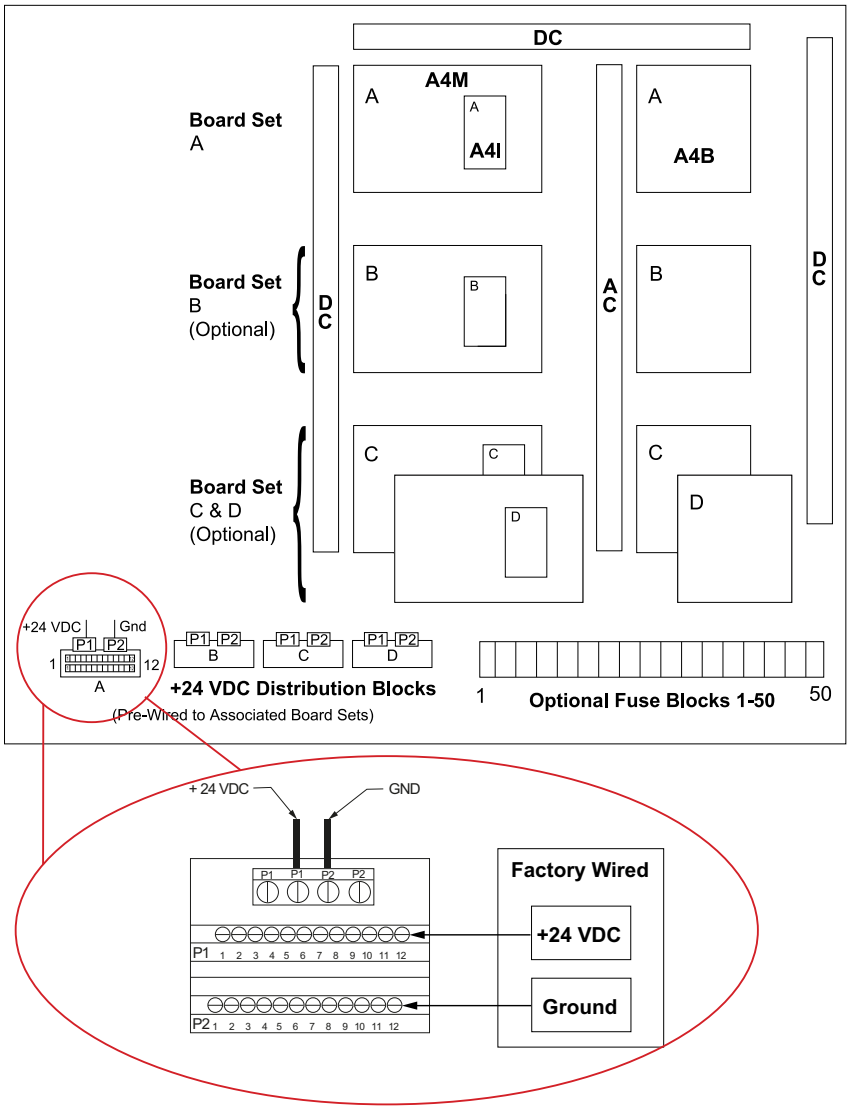
This section provides wiring information and drawings for the SA model's units, as well as all of the AccuLoad's electronic modules.

3.5.1 FCM Unit

The FCM unit contains between one and four board sets to provide control of up to 24 loading arms. Each board set consists of an A4M module, an A4B module, and an optional A4I module. These board sets are mounted in the FCM enclosure, as shown below in Figure 11: SA Model FCM components.

Additionally, a factory-wired DC distribution block is located on the bottom left corner of the FCM. One distribution terminal block is provided for each A4M board in the FCM. The input to this terminal block is factory wired to its associated board set and provides 12 separate slots to supply 24 VDC to external equipment, such as MMI units, external meter transmitters, and DC digital inputs.

Figure 11: SA Model FCM components



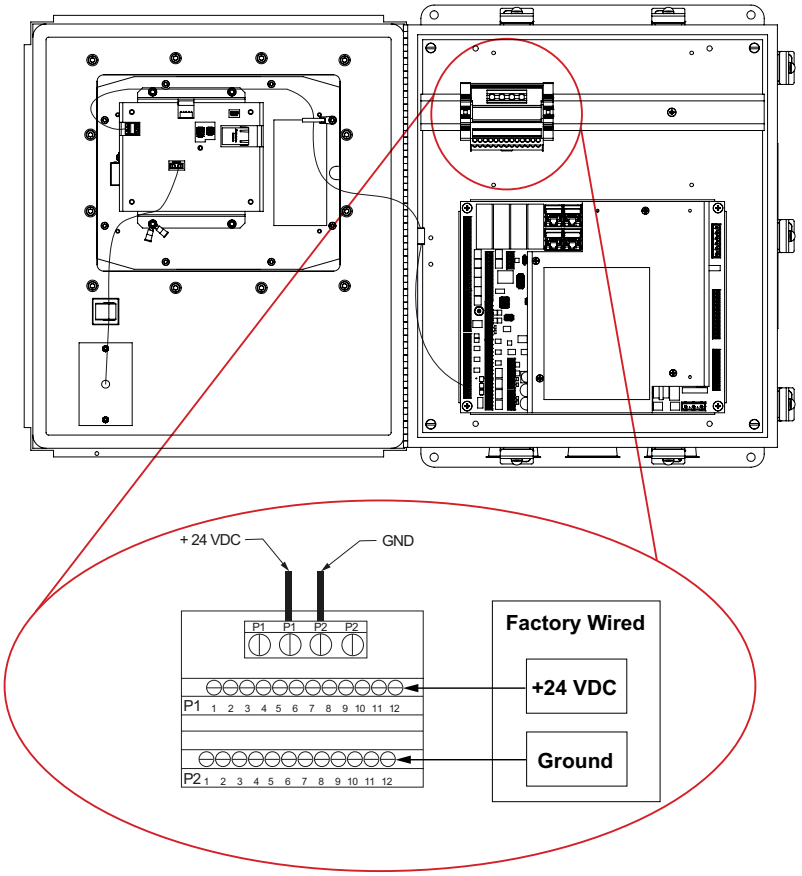
3.5.2 MMI Units

The basic MMI unit contains a THMI module and, optionally, any of the following items:

- Proximity card reader
- One or two indicator lights
- Pushbutton switch
- 24-VDC power supply

The MMI requires power and Ethernet communications from the FCM. The power connections can be made with AC or DC supplies when made to the appropriate terminals. The Ethernet connection is made between the THMI module and the configured board set in the FCM enclosure.

Figure 12: Model SA MMI components

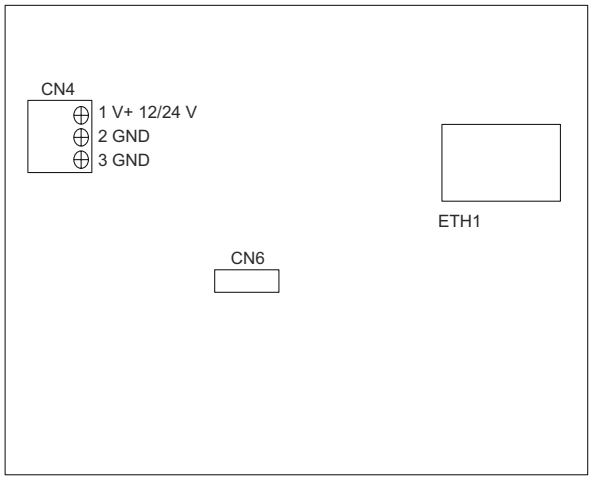


3.5.3 THMI Module

The THMI module's touch-screen user interface is standard on the ST, N4, and QT models of the AccuLoad IV. It connects to the A4M board using an Ethernet cable.

The following figure identifies the wiring connections on the THMI electronic module.

Figure 13: THMI Module Connections

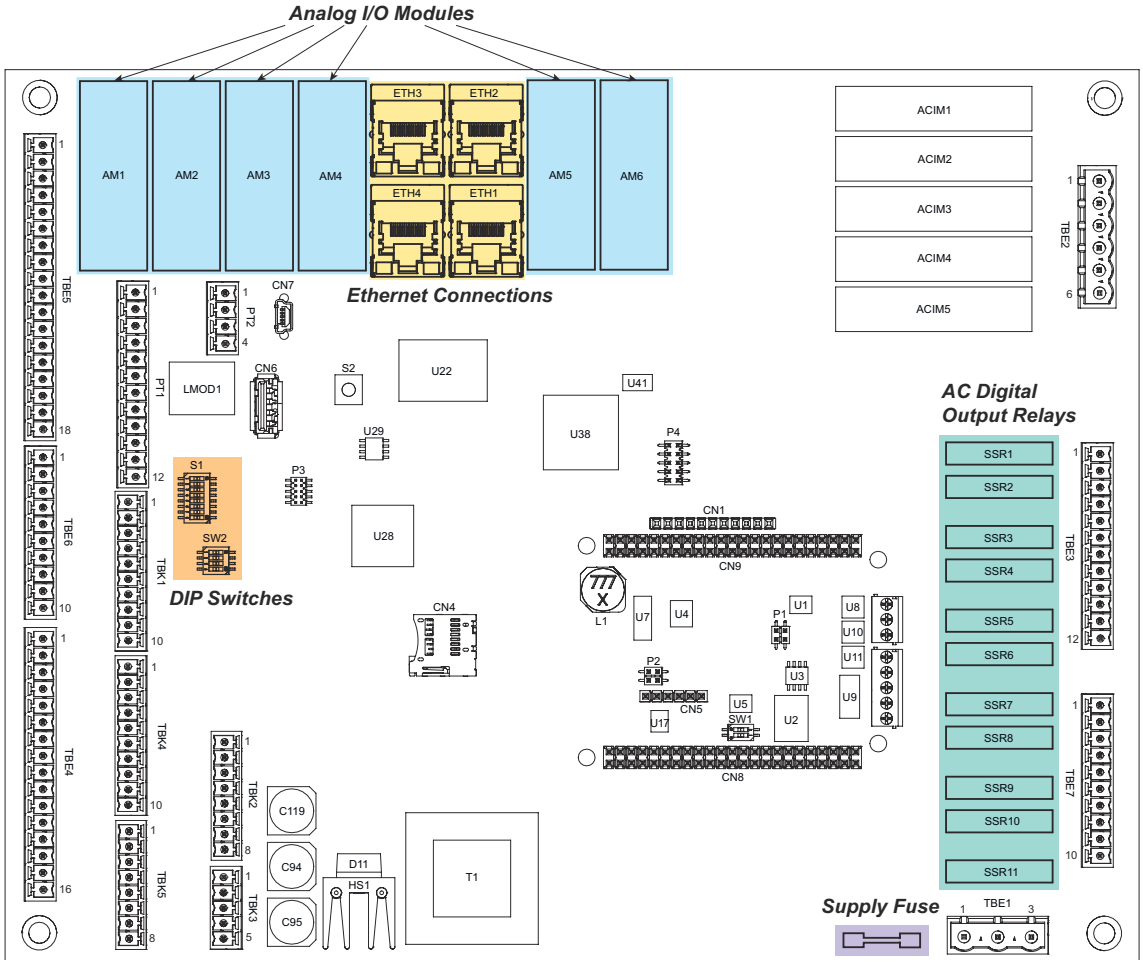


3.5.4 A4M Board

The main input/output board for the AccuLoad IV is an A4M board available for the ST, QT, and N4 models, as well as the SA model's MMI component. This board provides up to six dual-channel product meter pulse inputs; any pulse inputs that are not used for product meters can be used for up to four metered injector pulse inputs.

The replaceable parts on the A4M board are the power fuse, AC digital output relays, and the analog I/O modules. Refer to the AccuLoad IV parts list (PO06200) for details.

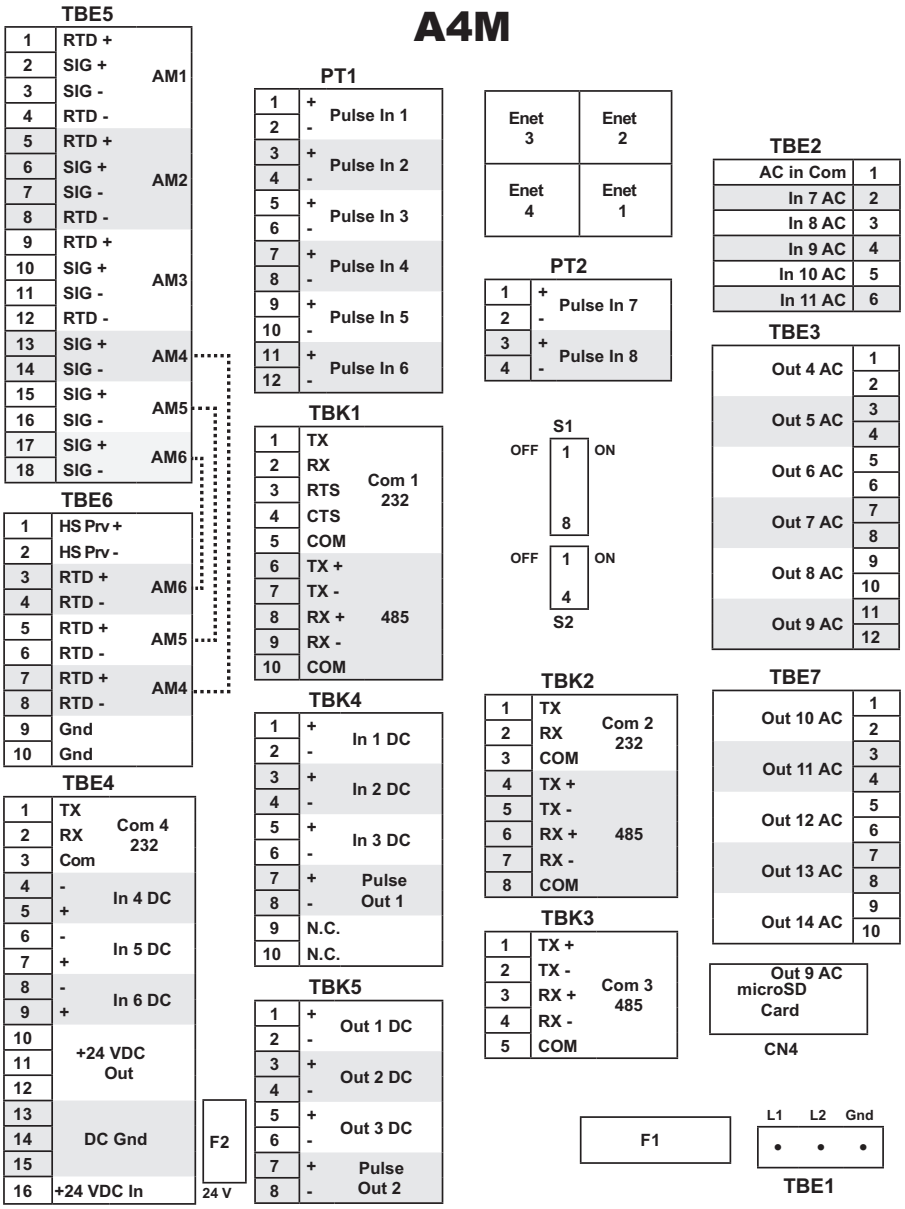
Figure 14: A4M Board Layout



3.5.4.1 A4M I/O Connections

The following drawing details the A4M board's I/O connections.

Figure 15: A4M Board Connections



3.5.4.2 A4M I/O Index Numbering

The following table provides details about configuring the A4M board's I/Os.

Table 7: A4M I/O Index Numbering

Terminals	Type of I/O	AccuLoad Configuration Index Number
TBK1	Serial communication port RS232/485	Comm 1
TBK2	Serial communication port RS232/485	Comm 2
TBK3	Serial communication port RS485	Comm 3

Table 7: A4M I/O Index Numbering

Terminals	Type of I/O	AccuLoad Configuration Index Number
TBK4	DC digital input	Digital inputs 1 through 3
TBK4	Pulse output	Pulse output 1
TBK5	DC digital output	Digital outputs 1 through 3 or pulse outputs 3 through 5
TBK5	Pulse output	Pulse output 2
TBE1	AC power input (115 to 230)	Not applicable
TBE2	AC digital input	Digital inputs 7 through 11
TBE3	AC digital output	Digital Outputs 4 through 9
TBE4	Serial communication port RS232	Comm 4
TBE4	DC digital input	Digital inputs 4 through 6
TBE4	24 VDC power - 1 amp maximum	Not applicable
TBE4	DC electronic ground	Not applicable
TBE5	Analog I/O	Analog I/O 1 through 6
TBE6	High-speed prover pulse output	Not applicable
TBE6	Analog I/O	Analog I/O 4 through 6
TBE7	AC digital input	Digital outputs 10 through 14
PT 1	Meter pulse inputs	Pulse inputs 1 through 6
PT 2	Meter pulse inputs	Pulse Inputs 7 through 8

3.5.4.3 A4M Special I/O Considerations

The DC digital output terminals on TBK5 can be configured as low-speed pulse outputs, as follows:

Table 8: Low-Speed Pulse Outputs

Terminals	Outputs
Terminals 1 and 2	Digital output 1 or pulse output 3
Terminals 3 and 4	Digital output 2 or pulse output 4
Terminals 5 and 6	Digital output 3 or pulse output 5

If digital valve control is used for any product- or flow-controlled additive meters connected to pulse inputs located on the A4M or A4B board, the digital outputs controlling the flow control valve must also be located on the A4M or A4B, respectively.

3.5.4.4 A4M S1 DIP Switch Settings

The following table provides information about S1 dual in-line package (DIP) switch settings on the A4M board.

Table 9: A4M S1 DIP Switch Settings

Switch	Setting
S1-1	Factory use
S1-2	Factory use
S1-3	Reserved
S1-4	Reserved
S1-5	Reserved

Table 9: A4M S1 DIP Switch Settings

Switch	Setting
S1-6	Clear pairing information
S1-7	Off for ST, QT, and N4 models Board set selector for SA model board set (see Section 3.7.1.4: SA Board Set IP Addresses)
S1-8	Off for ST, QT, and N4 models Board set selector for SA model board set

3.5.4.5 A4M SW2 DIP Switch Settings

For the ST, QT, and N4 models, all four DIP switches in SW2 should be in the OFF position during normal operation.

For the SA model, DIP switches SW2-3 and SW2-4 should be used to select the board set with which the A4M module is associated.

Special functions can be activated on all of the AccuLoad models when switch SW2-1 is set to ON. To activate the special functions, first disconnect the power supply from the AccuLoad and then set the switches to the special function. When finished, re-connect the power supply to the AccuLoad. After the special function is complete, you should re-set the DIP switches as follows:

- For the ST, QT, and N4 models, all switches should be set to OFF.
- For the SA model, switches SW2-1 and SW2-2 should be set to OFF and switches SW2-3 and SW2-4 should be set according to the board set.

Table 10: A4M Board SW2 DIP Switch Settings

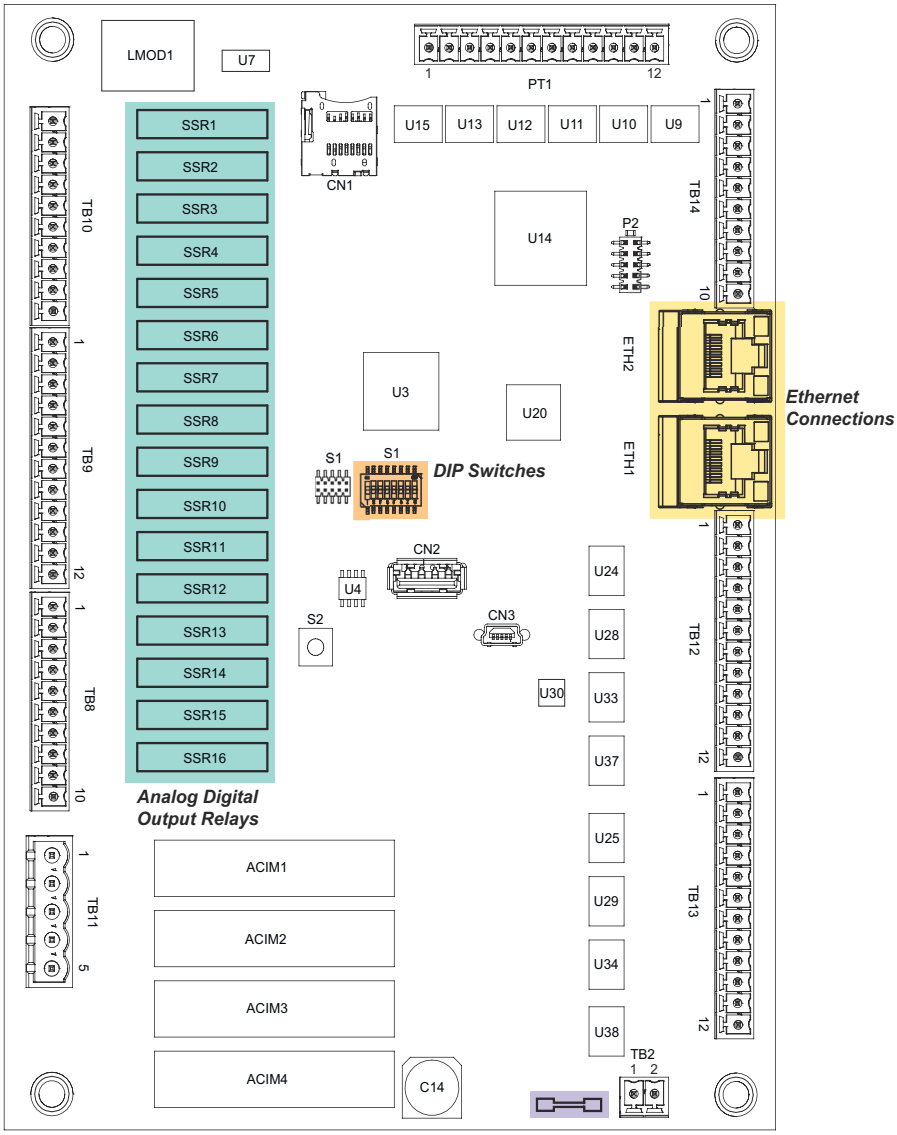
SW2-1	SW2-2	SW2-3	SW2-4	Setting Action
0	0	0	0	Normal operation for models ST, QT, N4, and SA board set A
0	0	0	1	Normal operation for model SA board set B
0	0	1	0	Normal operation for model SA board set C
0	0	1	1	Normal operation for model SA board set D
0	1	0	0	Reserved
0	1	0	1	Reserved
0	1	1	0	Reserved
0	1	1	1	Reserved
1	0	0	0	Forces default IP address of 192.168.0.1
1	0	0	1	Erases configuration database
1	0	1	0	Erases all databases (configuration, transaction, event, and driver)
1	0	1	1	Clears security passcodes
1	1	0	0	Forces touch screen recalibration
1	1	0	1	Reserved
1	1	1	0	Reserved
1	1	1	1	Reserved

3.5.5 A4B Board

The A4B board is a standard electronic module that provides I/O expansion for the QT model and the SA model's FCM component.

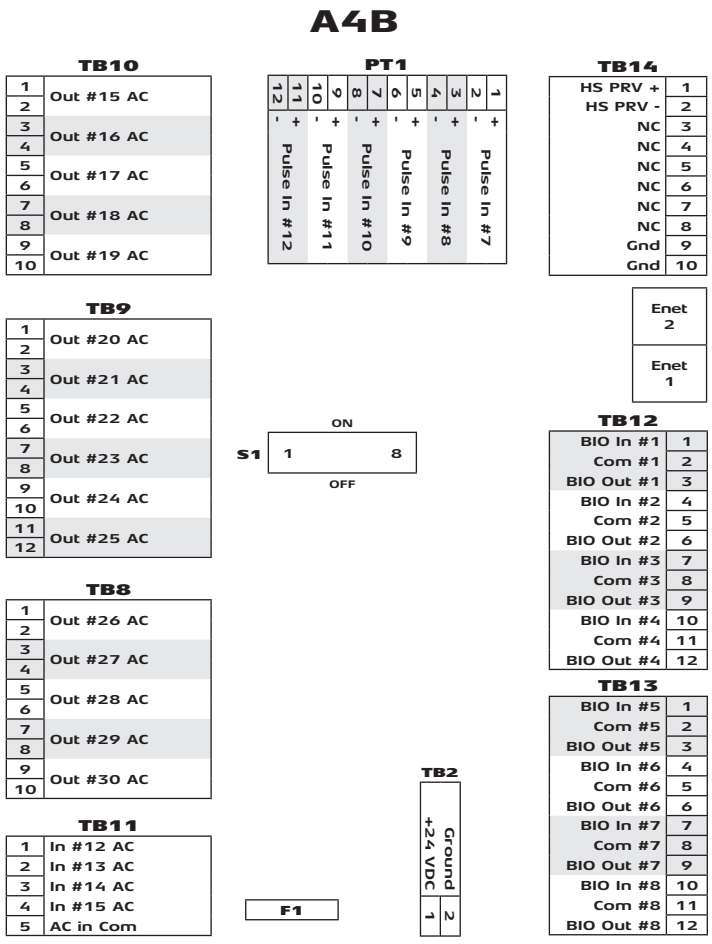
The replaceable parts on the A4B board are the power fuse and the AC digital output relays. Refer to the AccuLoad IV parts list (PO06200) for details.

Figure 16: A4B Board Layout



If digital valve control is used for any product- or flow-controlled additive meters connected to pulse inputs located on the A4M or A4B board, the digital outputs controlling the flow control valve must also be located on the A4M or A4B board, respectively.

Figure 17: A4B Board Connections



Refer to the installation manual for wiring details

3.5.5.1 A4B I/O Index Numbering

The following table provides details about configuring the A4B board's I/Os.

Table 11: A4B I/O Index Numbering

Terminals	Type of I/O	AccuLoad Configuration Index Number
TB8	AC digital output	Digital outputs 26 through 30
TB9	AC digital output	Digital outputs 20 through 25
TB10	AC digital output	Digital outputs 15 through 19
TB11	AC digital input	Digital inputs 12 through 15
TB12	DC digital input or output	Digital Inputs 16 through 19 or digital outputs 31 through 34
TB13	DC digital input or output	Digital inputs 20 through 23 or digital outputs 35 through 38
PT1	Meter pulse inputs	Meter pulse inputs 9 through 14

3.5.5.2 A4B DIP Switch Settings

The following table provides information about S1 DIP switch settings on the A4B board.

Table 12: A4B DIP Switch Settings

Switch	Setting
S1-1	Factory use
S1-2	Reserved
S1-3	Reserved
S1-4	Reserved
S1-5	Reserved
S1-6	Clear pairing information
S1-7	Off for ST, QT, and N4 models Board set selector for SA model
S1-8	Off for ST, QT, and N4 models Board set selector for SA model

3.5.6 A4I Board

The A4I board is an optional electronic module for the ST, QT, and N4 models, as well as the SA model's FCM component. It provides 20 AC digital outputs and 10 inputs that can be used in the following ways:

- Additive meter pulse inputs
- General purpose DC digital inputs
- Interface with up to 10 metered injectors

You can use multiple A4I boards on the AccuLoad, as follows:

Table 13: Maximum Number of A4I Boards

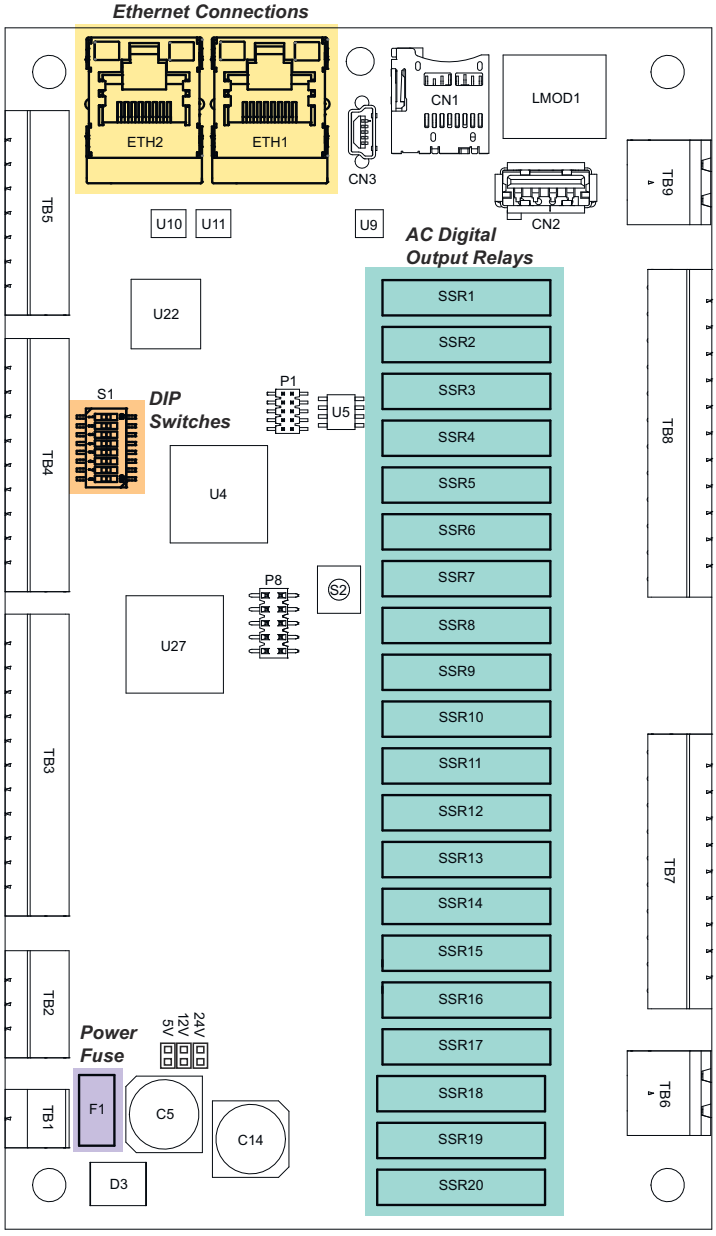
Model	A4I Boards
ST	Up to two externally
QT	Up to two externally or internally
N4	Up to two, but only one may be installed internally
SA (FCM component)	Up to four externally or internally

Up to two A4I modules can be connected to an A4M board and can either be mounted inside the AccuLoad enclosure or in a separate external enclosure.

> For any additive meters connected to pulse inputs located on the A4I, the digital outputs controlling the associated pump and solenoid valve must be located on the same A4I module.

The replaceable parts on the A4I board are the power fuse and the AC digital output relays.

Figure 18: A4I Board Layout



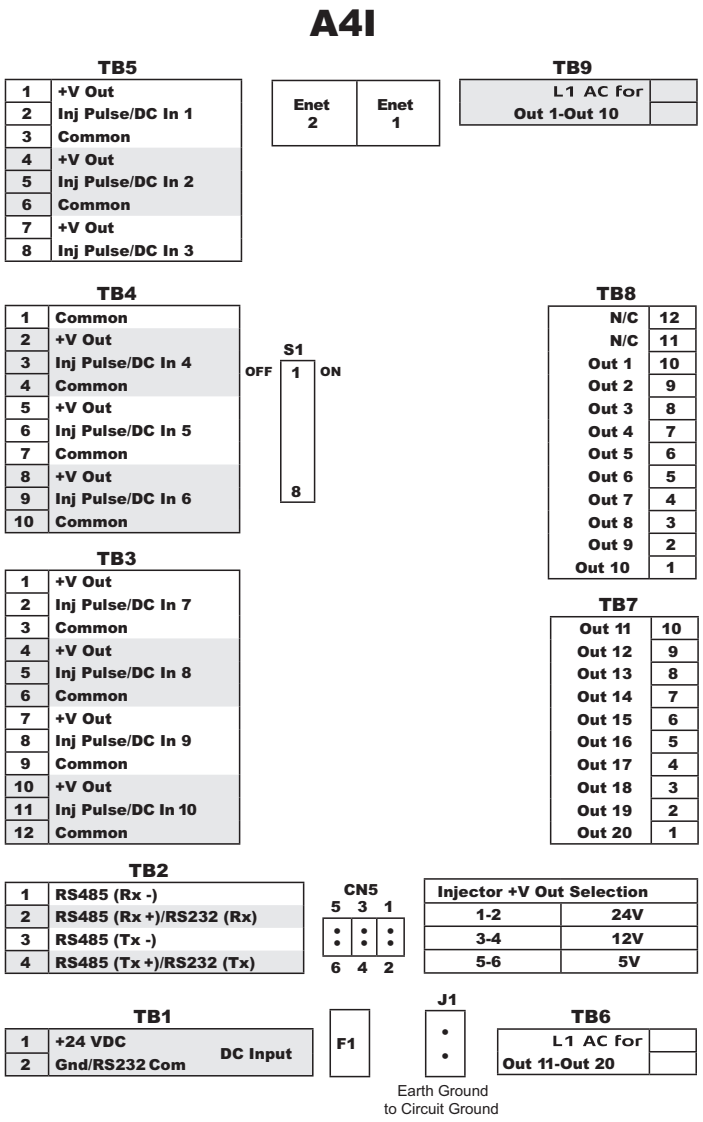
3.5.6.1 A4I I/O Connections

The A4I board requires 24 VDC power and either serial or Ethernet communications connections to the A4M board to operate. Ethernet communications should be used whenever possible, but the serial communication option is provided to facilitate upgrades and maintain backward compatibility.

> Firmware updates are not available over serial connections in the A4I.

The following drawing shows the A4I board's I/O connections.

Figure 20: A4I Connections



The A4I board has jumpers that allow customization. If the A4I board is connected to additive meters for which the transmitters require DC power, the voltage select jumpers (see Table 14: A4I Jumper Settings) are used to set the meter power supply voltage to 5, 12, or 24 VDC.

Table 14: A4I Jumper Settings

Designation	Jumpers	Description
5V	1 and 2	24 V – +V Out
12V	3 and 4	12 V – +V Out
24V	5 and 6	5 V – +V Out

Table 15: A4I Switch Settings

Switch	Setting
S1-1	Factory Use
S1-2	OFF = Address 100 ON = Address 200
S1-3	OFF = Band 9600 ON = Band 38,400
S1-4	OFF = RS 232 ON = RS 485
S1-5	OFF = Address 100 ON = Address 200
S1-6	Reserved
S1-7	Model SA Board Set Selector - see section 6, Off for all other models
S1-8	Model SA Board Set Selector - see section 6, Off for all other models

3.5.6.2 A4I I/O Index Numbering

The following tables provide details about configuring the A41 board's I/Os.

Table 16: First Optional A4I I/O Index Numbering

Terminal Block	Type of I/O	AccuLoad Configuration Index Number
TB3	Injector pulse or digital input	Inj 11 in or DC In 30 – Pin 2 Inj 12 in or DC In 31 – Pin 5 Inj 13 in or DC In 32 – Pin 8 Inj 14 in or DC In 33 – Pin 11
TB4	Serial communication port RS232/485	Inj 8 in or DC In 27 – Pin 3 Inj 9 in or DC In 28 – Pin 6 Inj 10 in or DC In 29 – Pin 9

Table 16: First Optional A4I I/O Index Numbering

Terminal Block	Type of I/O	AccuLoad Configuration Index Number
TB5	Serial communication port RS485	Inj 5 in or DC In 24 – Pin 2 Inj 6 in or DC In 25 – Pin 5 Inj 7 in or DC In 26 – Pin 8
TB7	AC digital output	AC Out 49 – Pin 10 AC Out 50 – Pin 9 AC Out 51 – Pin 8 AC Out 52 – Pin 7 AC Out 53 – Pin 6 AC Out 54 – Pin 5 AC Out 55 – Pin 4 AC Out 56 – Pin 3 AC Out 57 – Pin 2 AC Out 58 – Pin 1
TB8	AC digital output	AC Out 39 – Pin 10 AC Out 40 – Pin 9 AC Out 41 – Pin 8 AC Out 42 – Pin 7 AC Out 43 – Pin 6 AC Out 44 – Pin 5 AC Out 45 – Pin 4 AC Out 46 – Pin 3 AC Out 47 – Pin 2 AC Out 48 – Pin 1

Table 17: Second Optional A4I I/O Index Numbering

Terminal Block	Type of I/O	AccuLoad Configuration Index Number
TB3	Injector pulse or digital input	Inj 21 in or DC In 40 – Pin 2 Inj 22 in or DC In 41 – Pin 5 Inj 23 in or DC In 42 – Pin 8 Inj 24 in or DC In 43 – Pin 11
TB4	Serial communication port RS232/485	Inj 18 in or DC In 37 – Pin 3 Inj 19 in or DC In 38 – Pin 6 Inj 20 in or DC In 39 – Pin 9

Table 17: Second Optional A4I I/O Index Numbering

Terminal Block	Type of I/O	AccuLoad Configuration Index Number
TB5	Serial communication port RS485	Inj 15 in or DC In 34 – Pin 2 Inj 16 in or DC In 35 – Pin 5 Inj 17 in or DC In 36 – Pin 8
TB7	AC digital outputs	AC Out 69 – Pin 10 AC Out 70 – Pin 9 AC Out 71 – Pin 8 AC Out 72 – Pin 7 AC Out 73 – Pin 6 AC Out 74 – Pin 5 AC Out 75 – Pin 4 AC Out 76 – Pin 3 AC Out 77 – Pin 2 AC Out 78 – Pin 1
TB8	AC digital outputs	AC Out 59 – Pin 10 AC Out 60 – Pin 9 AC Out 61 – Pin 8 AC Out 62 – Pin 7 AC Out 63 – Pin 6 AC Out 64 – Pin 5 AC Out 65 – Pin 4 AC Out 66 – Pin 3 AC Out 67 – Pin 2 AC Out 68 – Pin 1

3.5.6.3 A4I DIP Switch Settings

The following table provides information about S1 DIP switch settings on the A4I board.

Table 18: A4I Switch Settings

Switch	Setting
S1-1	Factory use (always OFF)
S1-2	Module address (OFF = 100, ON = 200)
S1-3	Serial baud rate (OFF = 9600, ON = 38400)
S1-4	Serial mode (OFF = RS232, ON = RS485)
S1-5	Serial termination resistors (OFF = disable, ON = enable)
S1-6	Clear pairing information
S1-7	Off for ST, QT, and N4 models Board set selector for SA model (see Section 3.7.1.4: SA Board Set IP Addresses)
S1-8	Off for ST, QT, and N4 models Board set selector for SA model

3.6 General Wiring Information

During initial installation of the AccuLoad and anytime an electronic module is installed, the two calibration numbers (Cal 1 and Cal 2) written on the top of the module should be configured in AccuMate for AccuLoad IV to ensure optimum accuracy.

3.6.1 AC Input Power

The AccuLoad A4M board has two AC power inputs, as follows:

- The first AC power input is for instrument power, which powers the AccuLoad's electronics and is connected to the A4M board at TB1 (see Figure 22: AC Power Inputs to AccuLoad A4M Board). The instrument power should be clean and must meet the requirements listed in the AccuLoad IV specifications (SS06200).
- The second AC power input is used to drive external AC equipment (such as solenoids) and should be supplied to the AccuLoad by a separate circuit from the power panel.

Figure 22: AC Power Inputs to AccuLoad A4M Board

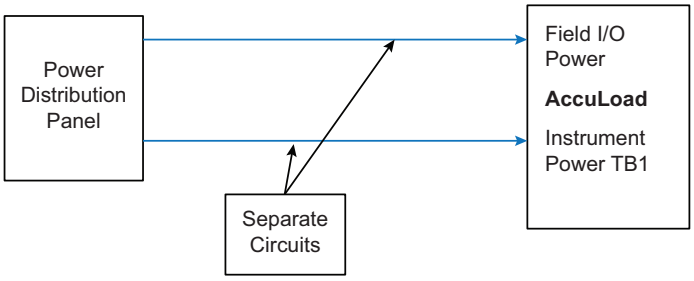
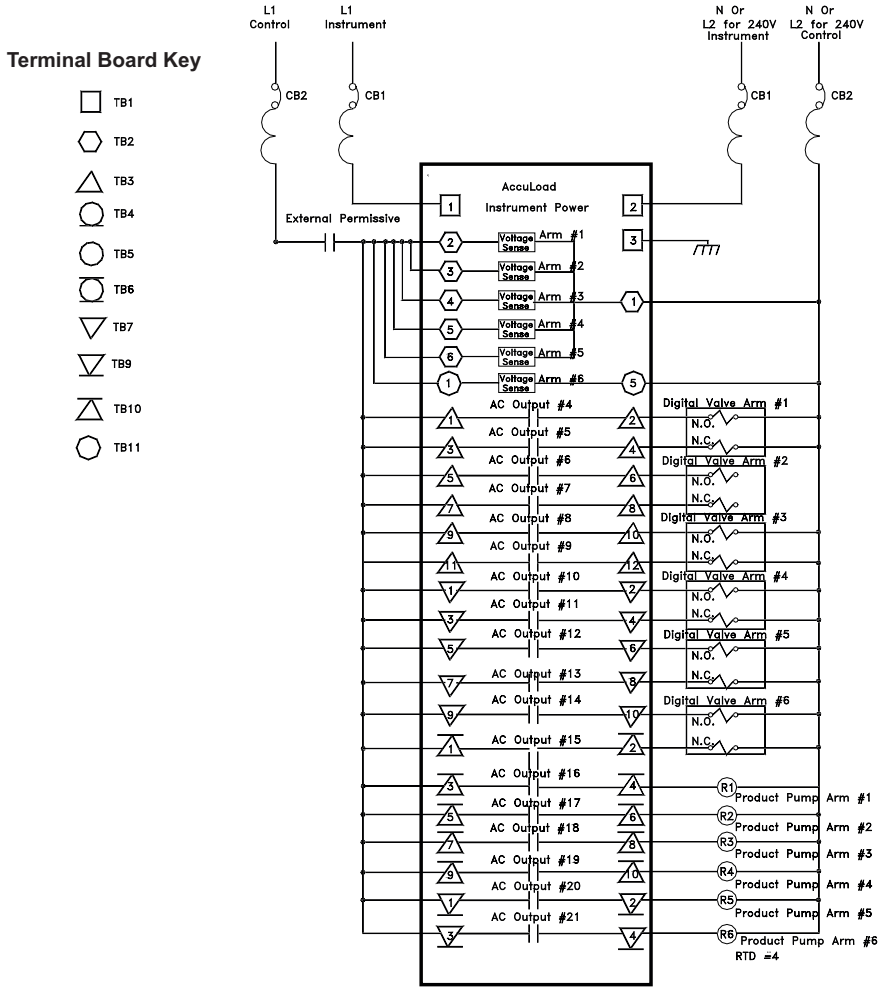


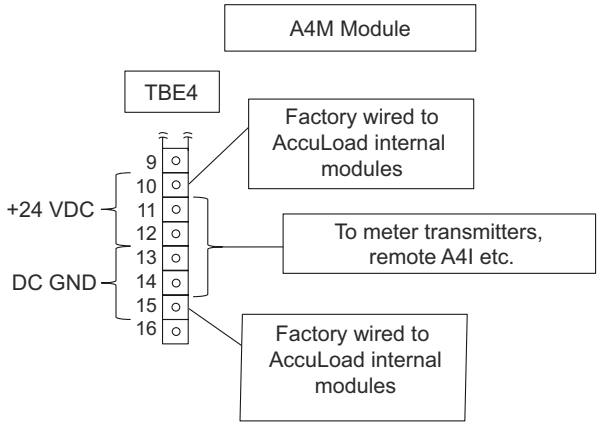
Figure 23: Example of AC Wiring for a Typical AccuLoad



3.6.2 DC Instrument Power

The AC instrument power is connected to the A4M module, which produces 24 VDC power for the standard modules in the AccuLoad (THMI and A4B). The A4M board's DC power supply is also capable of supplying up to a maximum of 1 amp of regulated DC power, which can be used to power optional A4I modules, card readers, meter pulse transmitters, and other external DC circuits.

Figure 24: DC Power Wiring on ST, QT, and N4 Models



3.6.3 Grounding

The AccuLoad must be properly grounded to ensure safe and reliable operation.

The AccuLoad requires a single-point earth ground dedicated to the AccuLoad provided by a grounding rod. Less than 2 ohms must be measured between the ground lug of the AccuLoad's enclosure and the grounding rod.

Any ground wires or shields in the cables connected to devices external to the AccuLoad (such as printers or analog sensors) should only be connected to TBE4 terminals 13, 14, or 15 at the AccuLoad end of the cable. It is very important to ensure this is the only grounding point.

3.6.4 I/O Connections

From the factory, none of the AccuLoad's I/O connections or functions are defined. You must configure your AccuLoad's I/O points based on the equipment at your facility and the operations you want to be performed. For example, if a digital flow control valve should to be interfaced with the AccuLoad as part of a loading rack installation, you must configure the AccuLoad with digital outputs for the upstream and downstream solenoids. You also must assign the upstream solenoid function to a digital output to be used for the solenoid's control and then do the same for the downstream solenoids.

The only I/O points that are automatically assigned by the AccuLoad are meter pulse inputs (both product meters and additive meters). The AccuLoad assigns the pulse inputs based on the number of meters and injectors defined in your configuration. Any pulse input which is not automatically assigned a function by the AccuLoad is available for user-selectable functions.The pulse input assignments for various meter configurations are provided in Section 4.3: Meter Input Wiring.

3.6.5 Meter Pulses

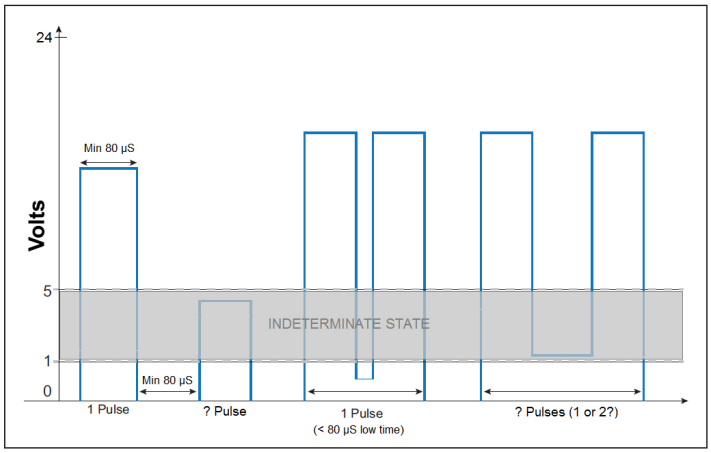
The AccuLoad counts pulses from the meters to determine the volume or mass that has flowed through the meter. The AccuLoad can be configured to receive pulses in one of three modes:

- Single Channel—One pulse input receives a single stream of pulses from the meter.
- Dual Channel—Two pulse inputs receive two separate pulse streams from the meter. This enables the AccuLoad to detect the direction of flow and meter connection problems with one of the channels so an alarm can be raised. This also enables the AccuLoad to determine the direction of flow through the meter.

- Dual Channel with Integrity—Four pulse inputs receive two pulses streams and two inverted pulse streams from the meter. This enables the AccuLoad to detect the direction of flow and meter connection problems, including when both pulse streams are inactive.

For each of the above meter pulse modes, the signal on the input to the AccuLoad must be less than 1 volt for a minimum of 80 microseconds and then transition to greater than 5 volts and remain above 5 volts for a minimum of 80 microseconds to qualify as a valid pulse (as shown in the following graph).

Figure 25: Meter Pulse Requirements



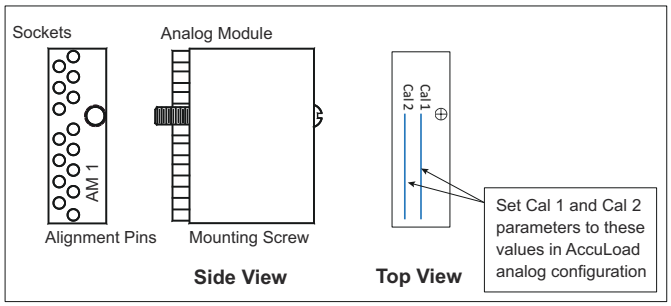
3.6.6 Analog I/O Modules

The A4M board has six slots into which modules can be inserted to interface to analog sensors or actuators (such as a pressure sensor or valve). Typically, these modules are installed at the factory, but changes and replacements of these modules may be done in the field. The analog I/O points are fully configurable and can be inputs (such as temperature or pressure) or outputs (such as analog valve control). Five types of analog interface modules are available, which are inserted into a socket on the A4M board as described in the following table.

Table 19: Types of Analog I/O Modules

Analog Module Type	Electrical Connection	Functions
Resistive temperature device (RTD)	Four-wire, 100-ohm RTD	Temperature input
CRI	4-20 mA input	Temperature, pressure, and density General purpose input
CRO	4 to 20 mA output	Analog valve control Flow rate output General purpose output
VTI	1 to 5 VDC input	Temperature, pressure, and density General purpose input
VTO	1 to 5 VDC output	Analog valve control Flow rate output General purpose output

Figure 27: Analog I/O Modules



CAUTION: Before inserting or removing any analog module, first ensure that all associated circuits are de-energized. Use proper ESD practices.To remove a module, loosen the captive retaining screw and then gently pull the module out of the socket while slightly rocking the module.

To insert a module, line up the pins with the socket holes, push the module in until it is seated against the circuit board, and then tightening the retaining screw.

3.6.7 Typical Wiring Diagrams

The following diagrams provide details for wiring the AccuLoad IV.

Figure 29: AC Digital Input

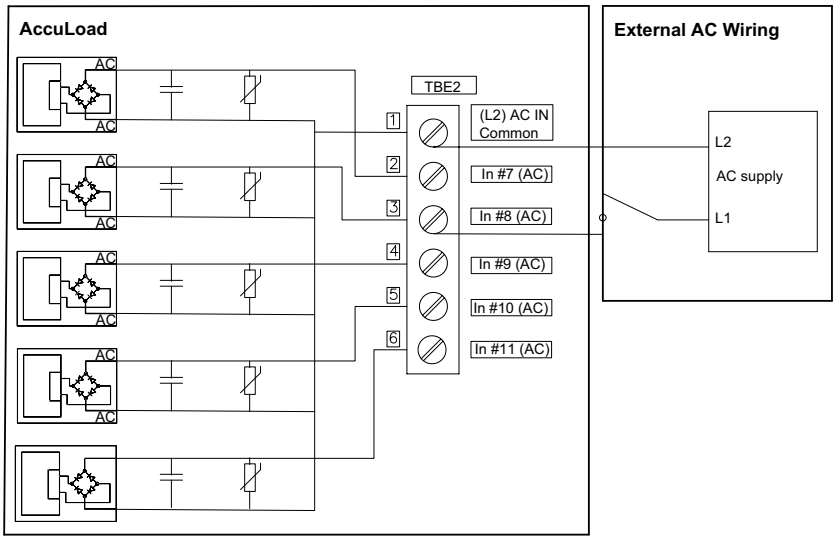


Figure 30: AC Digital Output

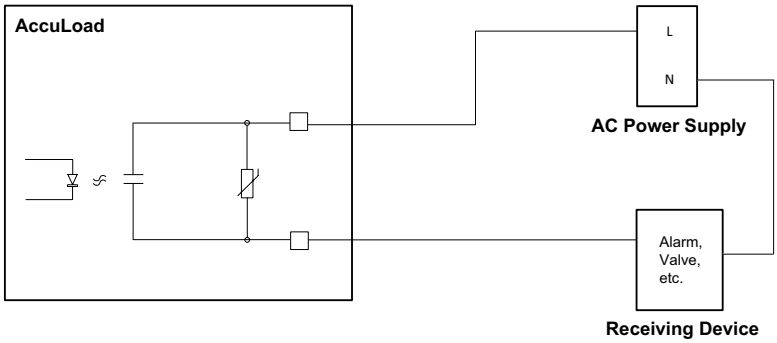


Figure 31: DC Digital Input

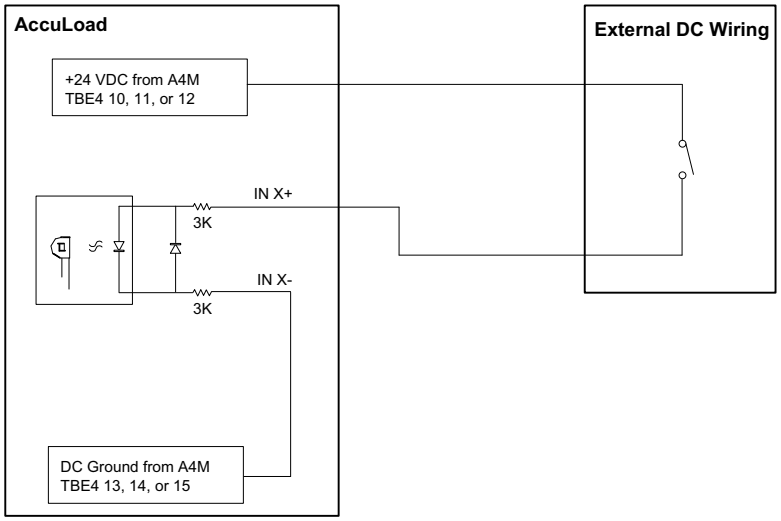


Figure 32: DC Digital Output

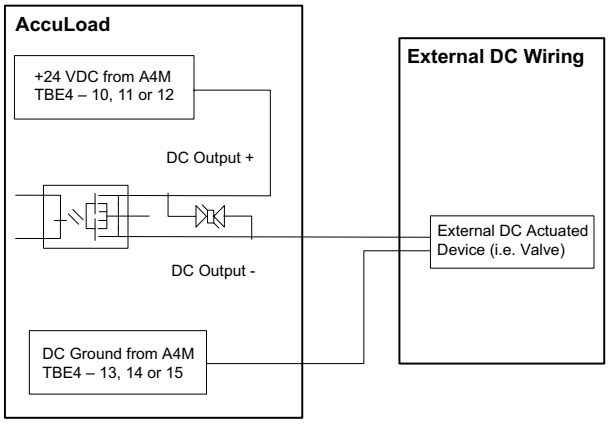


Figure 33: RTD Temperature Probe Analog Inputs

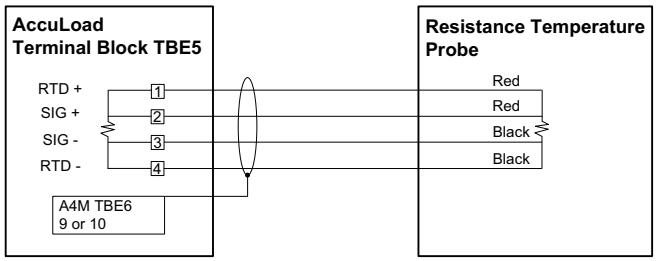


Figure 34: Active 4-20 mA Analog Inputs

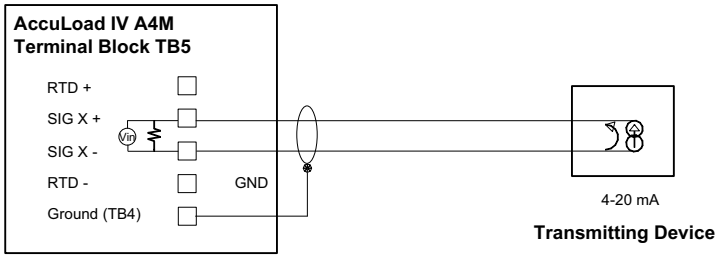


Figure 35: Passive 4-20 mA Analog Inputs

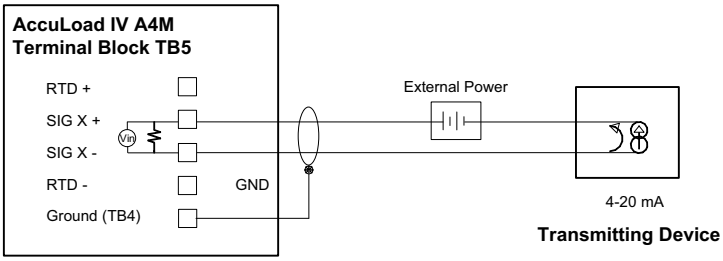


Figure 36: Analog Outputs

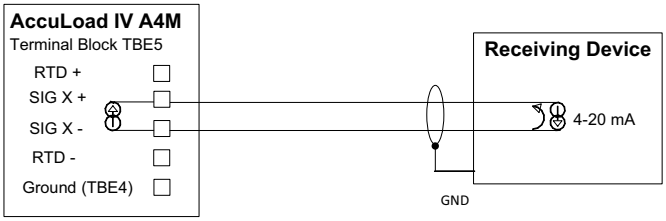
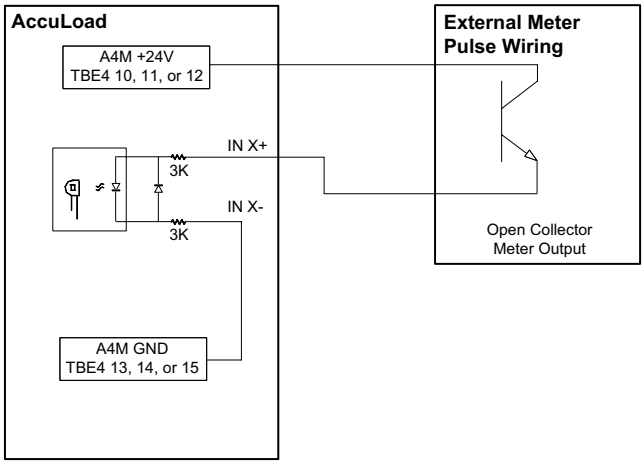
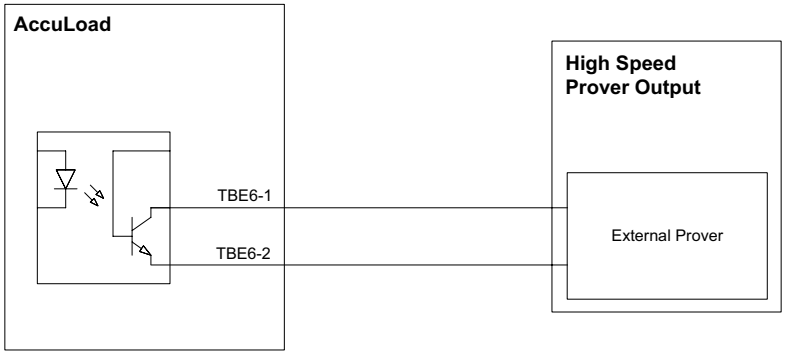


Figure 37: External Counter Wiring



For pulse transmitters requiring 12 VDC (such as GPST), install the P2412 converter. See the AccuLoad Preset Accessory P2412 Converter Installation manual (MN06117) for details.

Figure 38: High-Speed Prover Output Wiring



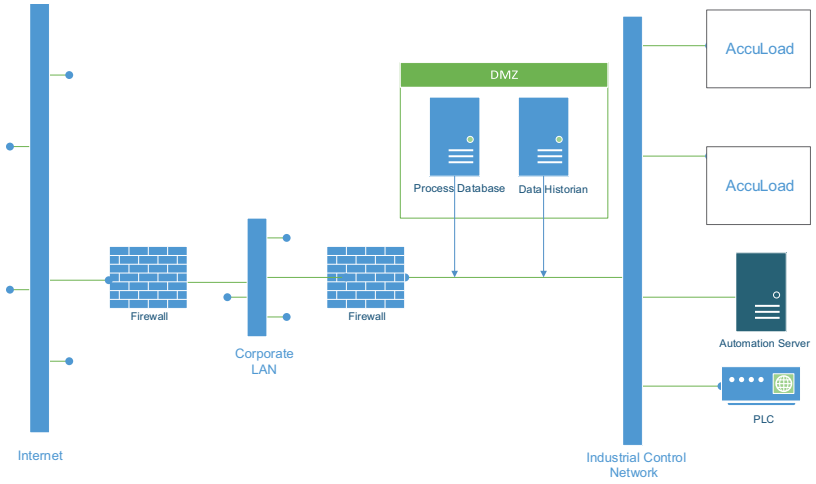
3.7 Communications Wiring

3.7.1 Ethernet Communications

The recommended networking strategy is to place the AccuLoad on a segmented network, which isolates the industrial control network traffic from the broader general purpose network traffic associated with corporate LANs and the Internet. This strategy enhances the security and throughput on the critical control portion of the network. The following figure illustrates this networking strategy.

If the AccuLoad IV must be directly installed on a Class A network, the AccuLoad's internal IP addressing scheme must be changed to avoid address conflicts. For instructions on configuring internal IP addresses for the ST, QT, and N4 models using the AccuLoad's touch screen, refer to the AccuLoad IV Operator Reference Manual (MN06200). For details about changing internal IP addresses for the SA model using DIP switches, see Section 3.7.1.4: SA Board Set IP Addresses.

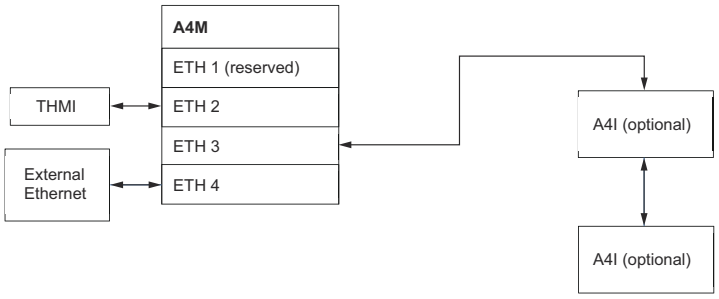
Figure 39: Recommended Network Strategy



3.7.1.1 ST and N4 Model Ethernet Connections

Ethernet connections for the ST and N4 models are shown in the following diagram.

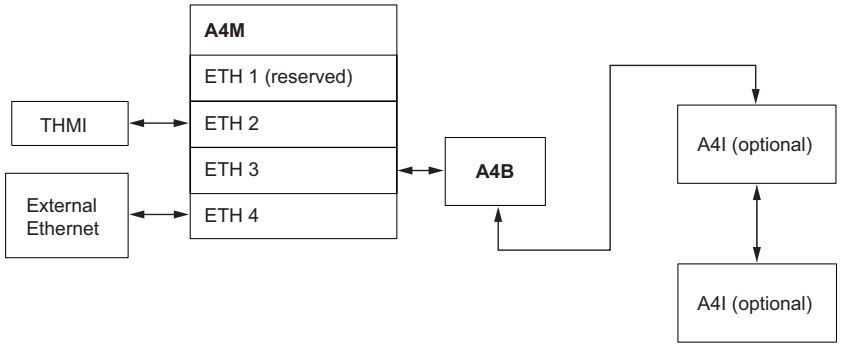
Figure 40: Ethernet Connections in AccuLoad ST and N4 Models



3.7.1.2 QT Model Ethernet Connections

Ethernet connections for the QT model are shown in the following diagram.

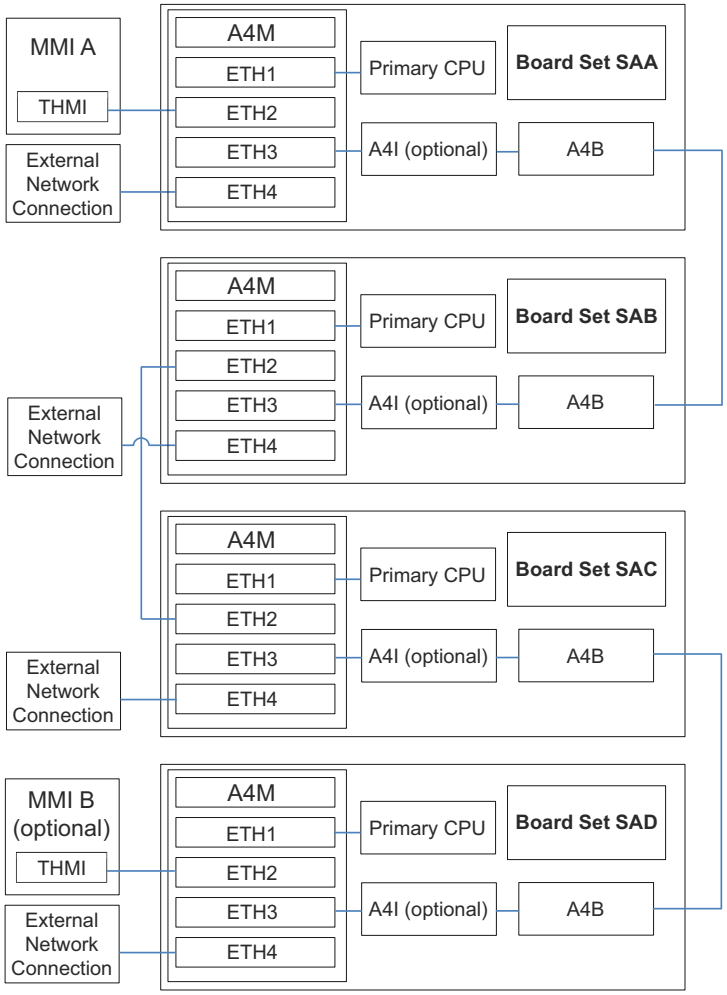
Figure 41: Ethernet Connections in AccuLoad QT Model



3.7.1.3 SA Model Ethernet Connections

Ethernet is used for communication between the SA model's FCM and MMI units, as shown in the following diagram. On each MMI's THMI board, the Ethernet cable connects the ETH1 RJ45 jack to a board set in the FCM.

Figure 42: Ethernet Connections for SA Model



3.7.1.4 SA Board Set IP Addresses

The addresses of the MMI's board sets are assigned using DIP switches on each board in the set. The DIP switches must be set based on the board set (A, B, C, or D) with which the board is associated, as detailed in the table below. The A4M module has two DIP switches (SW1 and SW2) and the A4B and A4I boards each have a single DIP switch (SW1). (See section x to find these DIP switches on each board's layout).

For new equipment, these DIP switches are set at the factory and should not need adjustment during installation. However, any time a module is moved or replaced, the IP address must be reset according to the table below.

Table 20: MMI IP Address DIP Switch Settings

Board Set	SW-1 on A4M, A4B, and A4I Boards	SW-2 on A4M Board
A	Switch 7: OFF Switch 8: OFF	Switch 3: OFF Switch 4: OFF
B (optional)	Switch 7: OFF Switch 8: ON	Switch 3: OFF Switch 4: ON
C (optional)	Switch 7: ON Switch 8: OFF	Switch 3: ON Switch 4: OFF
D (optional)	Switch 7: ON Switch 8: ON	Switch 3: ON Switch 4: ON

3.8 Serial Communications

The AccuLoad provides four serial ports, as described in the following table and diagrams:

Table 21: Serial Communication Ports

Communication Port Name	Terminal Locations	Description
Comm 1	A4M-TBK1	RS-232 or RS-485 with flow control
Comm 2	A4M-TBK2	RS-232 or RS-485
Comm 3	A4M-TBK3	RS-485
Comm 4	A4M-TBE4	RS-232

Figure 43: Four-Wire RS-485 Serial Wiring

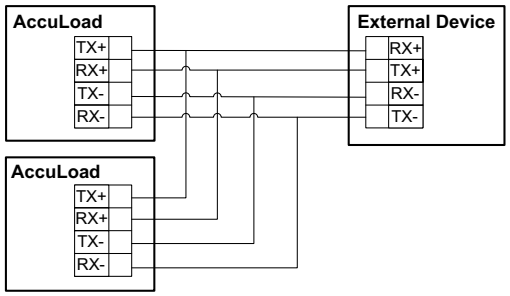


Figure 44: Two-Wire RS-485 Serial Wiring

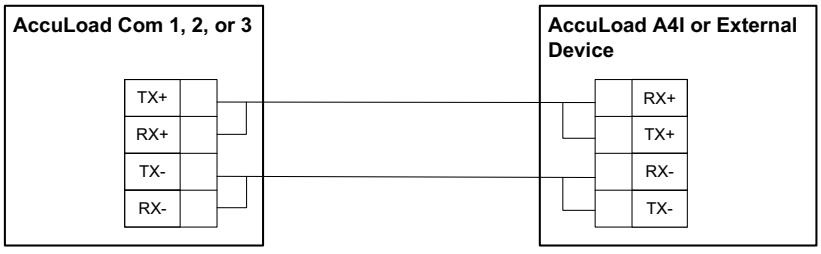


Figure 45: RS-232 Serial Wiring

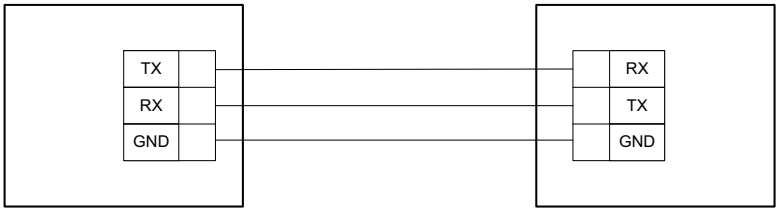
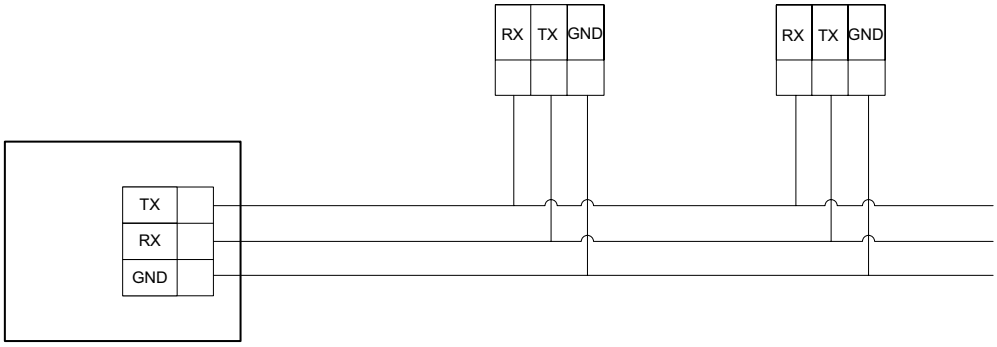


Figure 46: Multi-Drop RS-232 Serial Wiring



3.9 Pulse Outputs

The AccuLoad can be configured to provide up to five pulse outputs, as detailed in the following table.

Table 22: Pulse Output Configurations

Pulse Outputs	Configurations
1 and 2	Frequency range of 0 to 3,000 Hz Open-collector connection A4M terminals: TBK4 7 and 8; TBK5 7 and 8 (dedicated)
3, 4, and 5	Frequency range of 0 to 125 Hz Digital-output connection A4M terminals: TBK5 1 through 6 (shared with DC outputs 1 through 3)

4 Meter I/O Connections

4.1 I/O Index Numbering

When configuring the AccuLoad, I/O points are referred to by their index number.

4.2 Meter Connection Details

4.2.1 PRIME 4 Meter

The AccuLoad uses the I/O connection points in the following table to connect to Smith Meter PRIME 4 meters.

Table 23: Prime 4 Connections

AccuLoad Connections	Prime 4 Connections
Pulse input A plus	White (signal A output)
Pulse input B plus (dual-pulse only)	Yellow (signal B output); no connection for single-channel meters
Pulse input A and B minus connect to DC ground	
+ 24 VDC	Red (input power)
DC ground	Black (common)

4.2.2 Genesis

The AccuLoad uses the I/O connection points in the following table to connect to Smith Meter Genesis meters.

Table 24: Genesis Connections

AccuLoad Connections	Genesis Connections
Pulse input A plus	Terminal 2 (signal A output)
Pulse input B plus (dual-pulse only)	Terminal 3 (signal B output); not used for single-channel connection
Pulse input A and B minus connect to DC ground	
+ 24 VDC	Terminal 1 (input power)
DC ground	Terminal 4 (electronics ground)
	Terminals 5 through 8 are not used

4.2.3 Universal Pulse Transmitter

The AccuLoad uses the I/O connection points in the following table to connect to the Smith Meter Universal Pulse Transmitter (UPT).

Table 25: UPT Connections

AccuLoad Connections	UPT Connections
Pulse input A plus	Terminal 5 (signal A output)
Pulse input B plus (dual-pulse only)	Terminal 3 (signal B output); not used for single-channel connection
Pulse input A and B minus connect to DC ground	
+ 24 VDC	Terminal 2 (input power)
DC ground	Terminal 1 (electronics ground)
Pulse input A integrityplus	Terminals 6 (signal A integrity output); not used for non-integrity connection
Pulse input B integrity plus	Terminals 4 (signal A integrity output); not used for non-integrity connection
	Terminal 7 (shield); no connection
	Terminal 8 (verification pulse output); connect to optional verification device
	Terminal 9 (inverted verification pulse output); connect to optional verification device
	Terminal 10; no connection

4.2.4 PPS Transmitter

The AccuLoad uses the I/O connection points in the following table to connect to the Smith Meter Photoelectric Pulse Security (PPS) Transmitter.

Table 26: PPS Transmitter Connections

AccuLoad Connections	PPS Transmitter Connections
Pulse input A plus	Terminal 5 (signal A output)
Pulse input B plus (dual-pulse only)	Terminal 3 (signal B output); not used for single-channel connection
Pulse input A and B minus connect to DC Ground	
+ 24 VDC	Terminal 2 (input power)
DC ground	Terminal 1 (common)
Pulse input A integrity plus	Terminals 6 (signal A integrity output); not used for non-integrity connection
Pulse input B integrity plus	Terminals 4 (signal A integrity output); not used for non-integrity connection

4.2.5 PA-6 Preamplifier

The AccuLoad uses the I/O connection points in the following table to connect to the Smith Meter PA-6 Preamplifier.

Table 27: PA-6 Preamplifier Connections

AccuLoad Connections	PA-6 Connections
Pulse input A plus	Terminal 3 (signal A output)
Pulse input minus – DC ground	
+ 24 VDC	Red (input power)
DC ground	White (common)

For dual-pulse turbine meter connections, one PA-6 Preamp on Boss #1 and a second PA-6 Preamp on Boss #2 are available. In this case, the wiring to the B pulse input of the AccuLoad is done the same as the wiring to the A pulse input as shown above.

4.2.6 Promass 80, 83, and 84 Coriolis Meters

The AccuLoad uses the I/O connection points in the following table to connect to the Promass 80, 83, and 84 Coriolis meters.

Table 28: Promass 80, 83, and 84 Coriolis Meter Single-Channel Connections

AccuLoad Connections	Promass 80, 83, and 84 Connections
Pulse Input A Plus	+24 VDC
Pulse Input A Minus	Terminal 24 (Signal A output) for Promass output options Model 80: A, D, S, and T Model 83: A, B, S, T, C, D, 2, 4, and 5 Model 84: S, T, D and 2 Terminal 22 (Signal A output) for Promass output options Model 80: 8 Model 83: N and P Model 84: N
DC Ground	Terminal 25 (Signal A Negative) for Promass output options Model 80: A, D, S, and T Model 83: A, B, S, T, C, D, 2, 4, and 5 Model 84: S, T, D, and 2 Terminal 23 (Signal A ground) for Promass output options Model 80: 8 Model 83: N and P Model 84: N

> The Promass output option is defined by the last character of the Promass model code.

4.2.7 Promass 83 and 84 Coriolis Meters

The AccuLoad uses the I/O connection points in the following table to connect to the Promass 83 and 84 Coriolis meters.

Because the pulse input circuitry of the AccuLoad requires the input pulse OFF voltage to be less than 1 volt (and the ON voltage to be more than 5 volts), it is important that the Line Monitoring function on the Promass 84 be disabled when connecting the Promass 84 to the AccuLoad. If the Line Monitoring function on the Promass 84 is enabled, the OFF voltage of the pulses will be more than 1 volt and thus will not be counted by the AccuLoad. Three jumpers on each frequency output submodule on the I/O board enable and disable the Line Monitoring function. The factory default is to enable line monitoring. See the Proline Promass 84 Operating Instructions (MN0M032) to enable and disable this functionality.

Table 29: Promass 83 and 84 Coriolis Meter Dual-Channel Connections

AccuLoad Connections	Promass 83 and 84 Connections
Pulse Input A Plus	+24 VDC
Pulse Input A Minus	Promass Terminal 24 (Signal A output) for Promass output options Model 83: M Model 84: M and 1
AccuLoad DC Ground	Promass Terminal 25 (Signal A negative) for Promass output options Model 83: M Model 84: M and 1
Pulse Input B Plus	+24 VDC
Pulse Input B Minus	Promass Terminal 22 (Signal B Output) for Promass output options Model 83: M Model 84: M and 1
DC Ground	Promass Terminal 23 (Signal A Negative) for Promass output options Model 83: M Model 84: M and 1

The Promass output option is defined by the last character of the Promass model code.

4.3 Meter Input Wiring

The AccuLoad totals volume or mass in response to pulses received at the pulse input terminals of the A4M, A4B, or A4I modules. The pulse input connections to use for each meter is dependent on the configuration of the AccuLoad. For product meters, the AccuLoad automatically assigns the pulse inputs based on the products defined in the configuration database. The number of pulse inputs required for each meter varies based on the type of meter specified in the configuration database, as follows:

Table 30: Meter Pulse Input Connections

Meter Type	Required Pulse Inputs
Single-channel	One pulse input per meter
Dual-channel	Two pulse inputs per meter
Dual-channel with integrity	Four pulse inputs per meter

The tables in the following sections detail the pulse input assignments made by the AccuLoad for each of the possible number of product meters. Any pulse inputs not required for connection of the product meters are available to be configured for use as an additive meter or pulse densitometer.

> In the AccuLoad IV, the valve control solenoid outputs or metered injector solenoid outputs must be configured or landed on the same board as the associated meter pulse input.

The following conventions are used in the tables below:

- ***Bold, italicized*** text is used to indicate a different between AccuLoad III and AccuLoad IV connections.
- The product meter naming convention used is:
  - M = meter
  - Number = meter number
  - Letter = channel

  For example, M2A.
- "Pgm" means that the pulse output is programmable so it can function as a metered injector or a densitometer pulse input.
- "n/a" means that the pulse input is not applicable.

4.3.1 Meter Inputs for ST and N4 Models

Refer to the following tables regarding meter inputs for the ST and N4 models.

Table 31: Six-Product Meters (AccuLoad IV Models ST and N4)

	In #1	In #2	In #3	In #4	In #5	In #6	In #7	In #8
Single pulse	M1A	M2A	M3A	M4A	M5A	M6A	Pgm	Pgm
Dual pulse	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Dual pulse with integrity	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Table 32: Five-Product Meters (AccuLoad Models ST and N4)

	In #1	In #2	In #3	In #4	In #5	In #6	In #7	In #8
Single Pulse	M1A	M2A	M3A	M4A	M5A	Pgm	Pgm	Pgm
Dual Pulse	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Dual pulse with integrity	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Table 33: Four-Product Meters (AccuLoad Models ST and N4)

	In #1	In #2	In #3	In #4	In #5	In #6	In #7	In #8
Single Pulse	M1A	M2A	M3A	M4A	Pgm	Pgm	Pgm	Pgm
Dual Pulse	M1A	M1B	M2A	M2B	M3A	M3B	M4A	M4B
Dual pulse with integrity	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Table 34: Three-Product Meters (AccuLoad Models ST and N4)

	In #1	In #2	In #3	In #4	In #5	In #6	In #7	In #8
Single Pulse	M1A	M2A	M3A	Pgm	Pgm	Pgm	Pgm	Pgm
Dual Pulse	M1A	M1B	M2A	M2B	M3A	M3B	Pgm	Pgm
Dual pulse with integrity	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Table 35: Two-Product Meters (AccuLoad Models ST and N4)

	In #1	In #2	In #3	In #4	In #5	In #6	In #7	In #8
Single Pulse	M1A	M2A	Pgm	M4A	Pgm	Pgm	Pgm	Pgm
Dual Pulse	M1A	M1B	M2A	M2B	Pgm	Pgm	Pgm	Pgm
Dual pulse with integrity	M1A	M1B	M1A	M1B	M2B	M2B	M2A	M2B

Table 36: One-Product Meters (AccuLoad Models ST and N4)

	In #1	In #2	In #3	In #4	In #5	In #6	In #7	In #8
Single Pulse	M1A	Pgm	Pgm	Pgm	Pgm	Pgm	Pgm	Pgm
Dual Pulse	M1A	M1B	Pgm	Pgm	Pgm	Pgm	Pgm	Pgm
Dual pulse with integrity	M1A	M1B	M1A	M1B	Pgm	Pgm	Pgm	Pgm

4.3.2 Meter Inputs for QT and SA Models

Refer to the following tables regarding meter inputs for the QT and SA models.

Table 37: Six-Product Meters (AccuLoad IV QT and SA Models)

	In #1	In #2	In #3	In #4	In #5	In #6	In #7	In #8	In #9	In #10	In #11	In #12	In #13	In #14
Single pulse	M1A	M2A	M3A	Pgm	Pgm	Pgm	Pgm	Pgm	M4A	M5A	M6A	Pgm	Pgm	Pgm
Dual pulse	M1A	M1B	M2A	M2B	M3A	M3B	Pgm	Pgm	M4A	M4B	M5A	M5B	M6A	M6B
Dual/ integrity	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Table 38: Five-Product Meters (AccuLoad IV QT and SA Models)

	In #1	In #2	In #3	In #4	In #5	In #6	In #7	In #8	In #9	In #10	In #11	In #12	In #13	In #14
Single pulse	M1A	M2A	M3A	Pgm	Pgm	Pgm	Pgm	Pgm	M4A	M5A	M6A	Pgm	Pgm	Pgm
Dual pulse	M1A	M1B	M2A	M2B	M3A	M3B	Pgm	Pgm	M4A	M4B	M5A	M5B	Pgm	Pgm
Dual/ integrity	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Table 39: Four-Product Meters (AccuLoad IV QT and SA Models)

	In #1	In #2	In #3	In #4	In #5	In #6	In #7	In #8	In #9	In #10	In #11	In #12	In #13	In #14
Single pulse	M1A	M2A	Pgm	Pgm	Pgm	Pgm	Pgm	Pgm	M3A	M4A	Pgm	Pgm	Pgm	Pgm
Dual pulse	M1A	M1B	M2A	M2B	Pgm	Pgm	Pgm	Pgm	M3A	M3B	M4A	M4B	Pgm	Pgm
Dual/ integrity	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Table 40: Three-Product Meters (AccuLoad IV QT and SA Models)

	In #1	In #2	In #3	In #4	In #5	In #6	In #7	In #8	In #9	In #10	In #11	In #12	In #13	In #14
Single pulse	M1A	M2A	Pgm	Pgm	Pgm	Pgm	Pgm	Pgm	M3A	Pgm	Pgm	Pgm	Pgm	Pgm
Dual pulse	M1A	M1B	M2A	M2B	Pgm	Pgm	Pgm	Pgm	M3A	M3B	Pgm	Pgm	Pgm	Pgm
Dual/ integrity	M1A	M1B	M1A	M1B	M2A	M2B	M2A	M2B	M3A	M3B	M3A	M3B	Pgm	Pgm

Table 41: Two-Product Meters (AccuLoad IV QT and SA Models)

	In #1	In #2	In #3	In #4	In #5	In #6	In #7	In #8	In #9	In #10	In #11	In #12	In #13	In #14
Single pulse	M1A	M2A	Pgm	Pgm	Pgm	Pgm	Pgm	Pgm	M3A	Pgm	Pgm	Pgm	Pgm	Pgm
Dual pulse	M1A	M1B	M2A	M2B	Pgm	Pgm	Pgm	Pgm	Pgm	Pgm	Pgm	Pgm	Pgm	Pgm
Dual/ integrity	M1A	M1B	M1A	M1B	M2A	M2B	M2A	M2B	Pgm	Pgm	Pgm	Pgm	Pgm	Pgm

Table 42: One-Product Meters (AccuLoad IV QT and SA Models)

	In #1	In #2	In #3	In #4	In #5	In #6	In #7	In #8	In #9	In #10	In #11	In #12	In #13	In #14
Single pulse	M1A	Pgm	Pgm	Pgm	Pgm	Pgm	Pgm	Pgm	M3A	Pgm	Pgm	Pgm	Pgm	Pgm
Dual pulse	M1A	M1B	Pgm	Pgm	Pgm	Pgm	Pgm	Pgm	Pgm	Pgm	Pgm	Pgm	Pgm	Pgm
Dual/ integrity	M1A	M1B	M1A	M1B	Pgm	Pgm	Pgm	Pgm	Pgm	Pgm	Pgm	Pgm	Pgm	Pgm

4.4 Additive Meters and Digital Inputs

The A4I module provides 10 inputs that can be used for either additive meter pulse inputs or as DC digital inputs and 20 AC digital outputs. The AC digital outputs are wired using the same method shown for the A4M and A4B modules. However, the meter pulse and DC digital inputs are wired differently on the A4I module, as illustrated in the following diagrams.

The A4I module provides outputs to supply power to the additive meter. The voltage supplied is selectable (5, 12, or 24 VDC) using jumpers on the module.

Figure 47: A4I Additive Meter Wiring

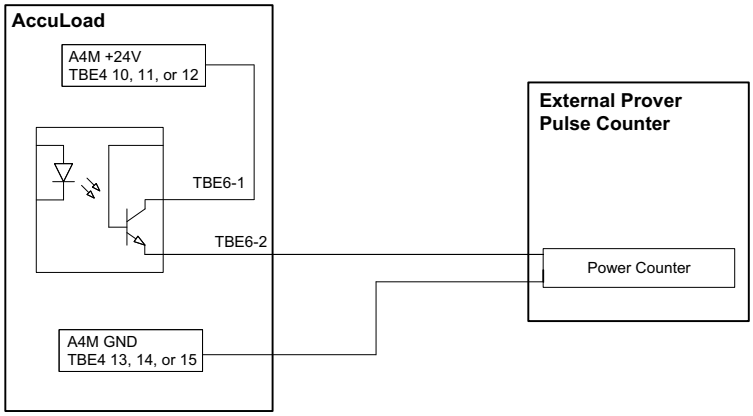
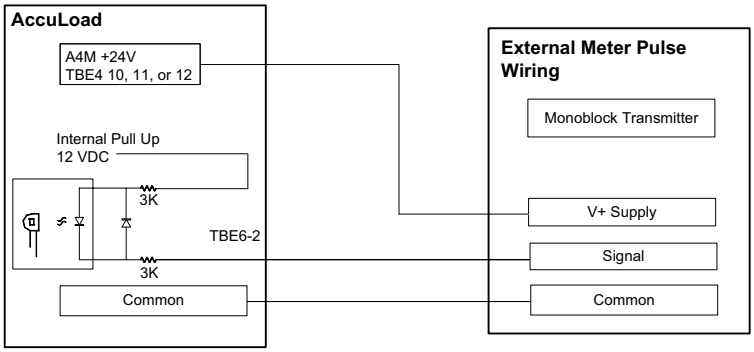


Figure 48: A4I Digital Input Wiring



4.5 A4I Kit Retrofit Installation

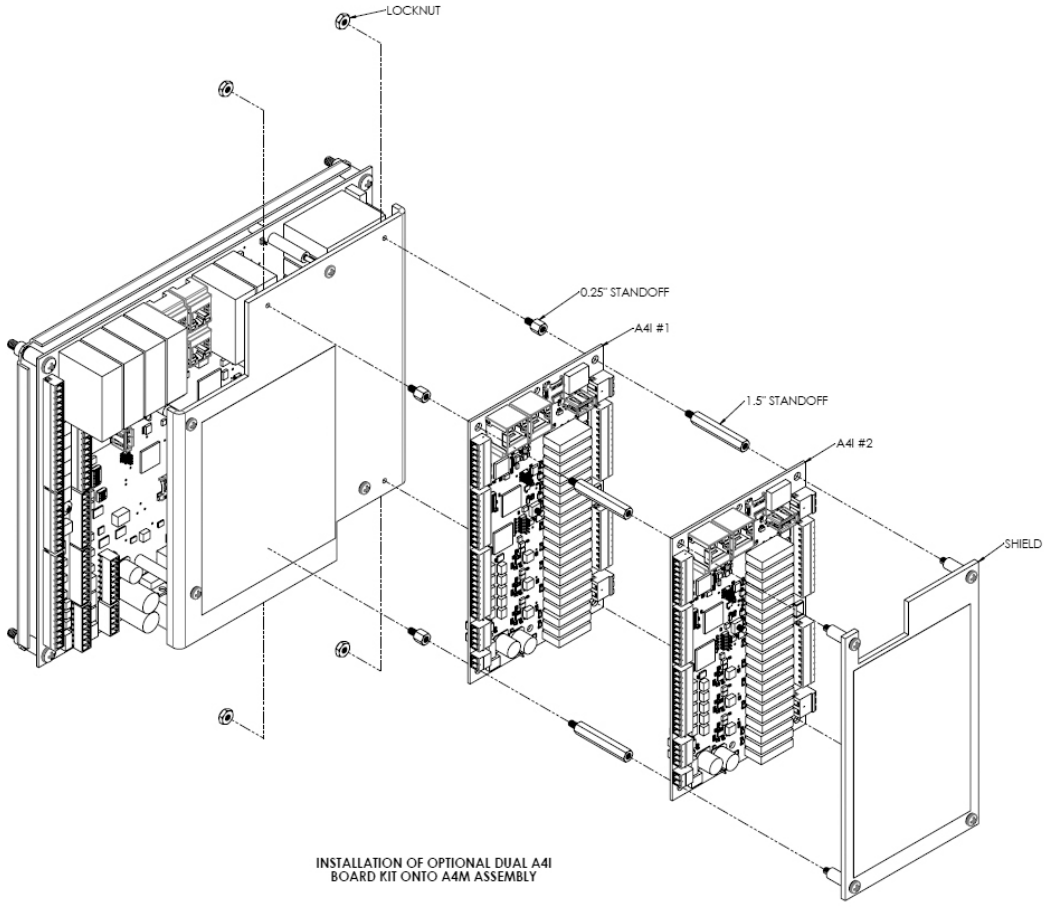
Use the following process to retrofit an A4I board onto an A4M board assembly using the Single A4I Retrofit Kit (part number P8000018993) or Dual A4I Retrofit kit (P8000018994).

The following process does not include steps needed to authorize entry into the housing in an Ex environment or closing the housing. For instructions on securing the housing, see Section 5.1: Closing the Explosion-Proof Housing.

The tools needed for this installation include a #2 Phillips-head screwdriver, a 5/16-inch wrench, and a 1/4-inch wrench. The necessary installation hardware is included in the retrofit kits.

The following drawing shows the installation of the dual A4I board kit.

Figure 49: Dual A4I Boards on A4M Board



Complete the following steps to install one or two A4I boards onto the AccuLoad IV's A4M board:

1. Remove the power supply from the AccuLoad IV.
2. On the ST and QT models, remove the cover bolts. On the N4 or SA models, loosen the latches to open the door.
3. Remove the four captive screws from the A4M board's polycarbonate shield using a Phillips head screwdriver.
4. Remove the captive mounting fastener from the A4M board that is closest to AC input terminal block TBE1.

> Due to the risk of cross-threading standoff, remove the captive mounting fastener by hand.

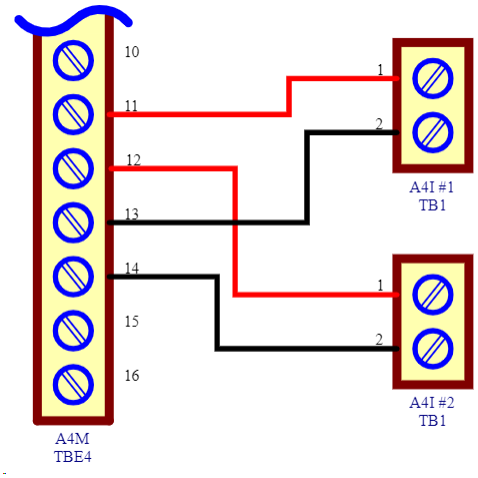
5. Install the kit's four 0.25-inch hex standoffs and nylon insert locknuts onto the A4Ms board's polycarbonate shield.
6. Re-install the A4M board's shield on the A4M board.
7. Align the 0.25-inch standoffs on the A4M board with the first A4I board (A4I #1). The Ethernet jacks on the A4I board should be near the Ethernet jacks on the A4M board.
8. On the first A4I board, ensure that DIP switch S1-2 is OFF to designate it as A4I #1.

9. Connect an Ethernet cable as follows:
    - On QT models, connect an Ethernet cable from ETH2 on the A4I #1 board to ETH2 on the A4B board.
    - On ST and N4 models, connect an Ethernet cable from ETH2 on the A4I board to ETH3 on the A4M board.
    - On SA models, complete the following steps:
        a. Disconnect the Ethernet cable between ETH3 on the A4M board and ETH1 on the A4B board.
        b. Connect the Ethernet cable from ETH2 on the A4I board to ETH3 on the A4M board.
        c. Reconnect the Ethernet cable from ETH1 on the A4B board to ETH1 on the A4I board.
10. If your kit includes a second A4I board, complete the following steps:
    a. Install four 1.5-inch hex standoffs to secure the A4I #1 board to the A4M board and provide space between the two A4I boards.
    b. On the A4I #1 board, connect of the second Ethernet cable to ETH1. (You'll connect the other end later.)
    c. On the second A4I board, ensure that DIP switch S1-2 is ON to designate it as A4I #2.
    d. Align the 1.5-inch standoffs with the A4I #2 board. The Ethernet jacks on the A4I #2 board should be near the Ethernet jacks on the A4M board.
11. Attach the A4I board polycarbonate shield using the supplied screws to secure the A4I #2 board to the assembly and protect it.
12. If you installed an A4I #2 board, connect the Ethernet cable from ETH2 on the A4I #2 board to ETH1 on the A4I #1 board.
13. Install ground wires for the installed A4I boards using the captive mounting fastener nearest to TBE1 on the A4M board.

> Due to the risk of cross-threading standoff, remove the captive mounting fastener by hand.

14. Connect the DC power supply wiring (red and black twisted pair) as shown below in Figure 50: A4M to A4I Wiring:

Figure 50: A4M to A4I Wiring



5 Closing and Sealing the Enclosure

5.1 Closing the Explosion-Proof Housing

When securing the front cover of the AccuLoad models ST or QT, complete the following steps to ensure the unit is properly sealed and is safe to operate in a Division 1, Zone 1 environment:

1. Inspect the door seal O-ring for damage and replace if damaged. The O-ring is not required to maintain the explosion-proof rating; however, it is required to maintain the IP 65 ingress protection rating.

2. Grease cover flange with petroleum jelly or TechnipFMC grease (part number 644886401) before attaching the cover to the housing.

3. Verify that the mating areas between the front cover and the main housing are not scratched, corroded, or otherwise damaged such that the surface contact between them would be compromised.

4. Close the cover and tighten the cap screws around the perimeter of the front cover using the sequence shown below. The final torque should be 20 ft·lb/240 in·lb (27.1 N·m/276.4 Kg.cm). Be sure to note the locations for the two longer bolts used for the security seal wire.

5. Check that the enclosure is properly sealed by verifying the cover-to-enclosure joint gap with a 0.0015-inch (0.0381-mm) feeler gauge. The feeler gauge must not enter the joint more than a ¼ inch (6 mm) at any point around the perimeter of the cover to the housing joint (see Figure 53: Flame Path Verification for an example).

Figure 51: Cover Bolt Torque Pattern for AccuLoad IV Model ST

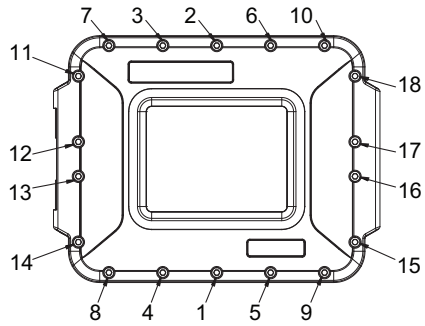


Figure 52: Cover Bolt Torque Pattern for AccuLoad IV Model QT

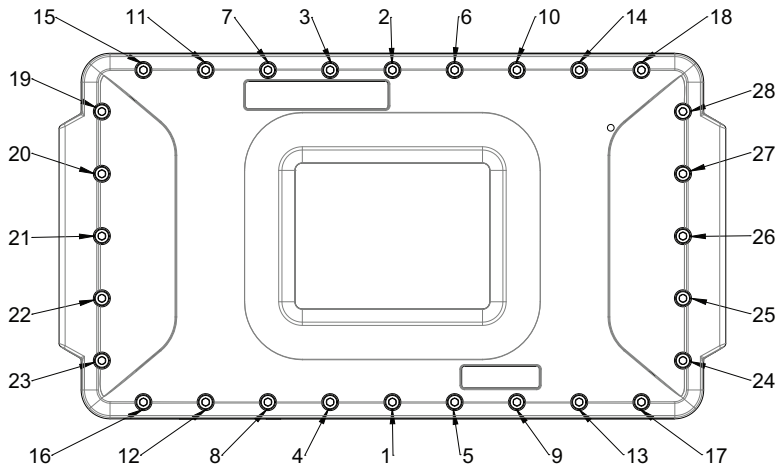
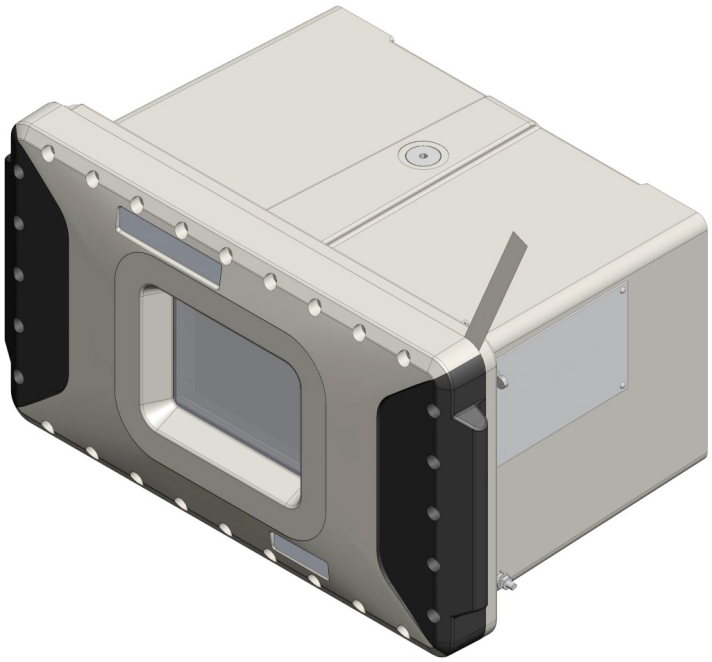


Figure 53: Flame Path Verification



5.2 Sealing the Enclosure

All AccuLoad enclosures can be sealed using standard seal wires.

5.2.1 Sealing ST and QT Models

On the ST and QT models, the sealing wire is threaded through holes in two cover bolts, as shown in the following drawings.

Figure 54: AccuLoad Model ST Sealing

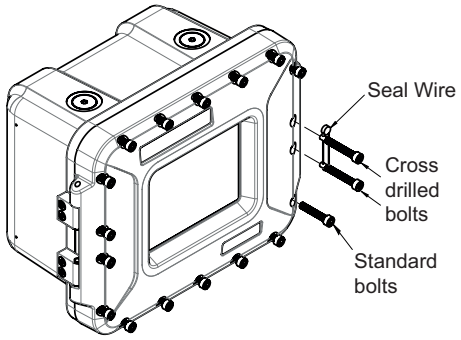
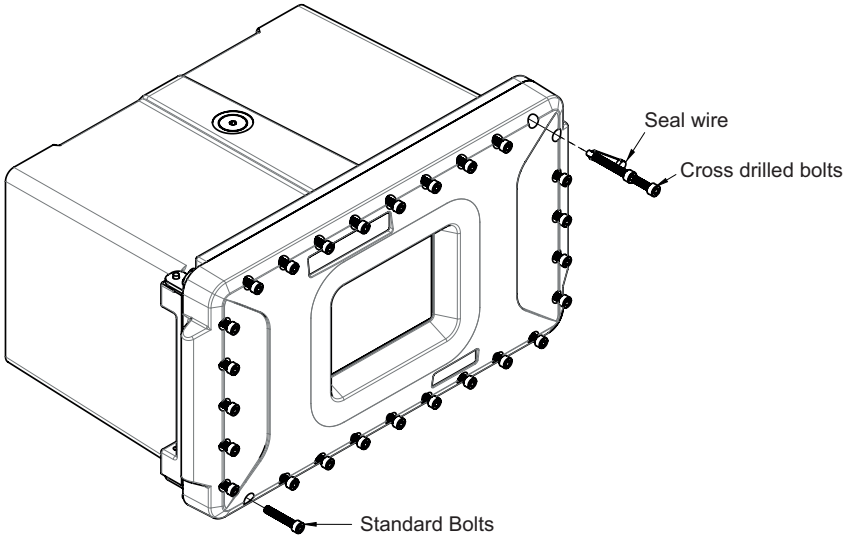


Figure 55: AccuLoad Model QT Sealing



5.2.2 Sealing N4 Models

To seal NEMA 4 enclosures, thread the sealing wire through any of the cover-locking clamps opposite the hinge.

6 Maintenance

The following sections provide information about maintaining your AccuLoad IV to ensure optimal functionality.

6.1 Explosion-Proof Enclosure Maintenance

AccuLoad ST and QT models with explosion-proof enclosures (with XP in the model code) should be maintained using the following flame-path inspection criteria.

> **WARNING:** To prevent the ignition of hazardous atmospheres, disconnect the AccuLoad from its main power supply before opening the cover.

- Installation, inspections, maintenance. repairs, overhauls, and reclamation of AccuLoads in the European Union (EU) must be performed by qualified personnel in accordance with the applicable requirements of EN 60079-14, EN 60079-17, and EN 60079-19, in addition to all local codes and regulations.
- Installation, inspections, maintenance, repairs, overhauls, and reclamation of AccuLoads relying on IECEx certification must be performed by qualified personnel in accordance with the applicable requirements of IEC 60079-14, IEC 60079-17, and IEC 60079-19, as required by local codes and regulations.
- Guidance for equipment inspection and maintenance is provided by EN/IEC 60079-17: Electrical Apparatus for Explosive Gas Atmospheres, Inspection and Maintenance of Electrical Installations in Hazardous Areas, and should be used for the inspection and maintenance process.
- When performing maintenance that requires opening the enclosure cover, all flame paths (defined as the machined-flanged surface between the housing and the cover), should be inspected to ensure that they are clean, undamaged, and have no scratches, nicks, corrosion, or other defects that could affect the integrity of the flame path. If defects are detected, the equipment should not be placed back into service until the issues are resolved.
- Verify that all tapped cover bolt threaded locations in the enclosure are clean and intact with no missing or stripped threads.
- Verify that the cover bolts are the required M8 x 1.25-6g, DIN 912, steel grade 12.9. Prior to reassembly, apply a light coating of nickel-based anti-seize lubricant, such as Loctite Anti-Seize Lubricant (TechnipFMC part number 646002-401) to all bolt threads.
- Verify that any blind-threaded cover bolt holes do not have excessive grease or anti-seize lubricant packed into them, as this could cause hydraulic fractures of the enclosure when the bolts are tightened.
- Inspect to ensure that the environmental O-ring is correctly installed (seated into the groove) and in good condition (no cracks, etc.). If the O-ring is defective, replace it to maintain environmental protection. Grease the cover flange with petroleum jelly or Super Lube Multi-Purpose Synthetic Grease with Syncolon (TechnipFMC part number 644886-401) before reattaching the cover to the housing.
- Follow the cover bolt torquing procedure as outlined in Section 5.1: Closing the Explosion-Proof Housing. When complete, verify the flame path gaps according to the procedure.

6.1.1 ST and QT Models in Special Environments

The ST and QT models have aluminum, explosion-proof enclosures. In corrosive environments, such as near salt water, it is the user's responsibility to increase the inspection intervals for verification of the flame-path integrity. Inspection intervals vary with local conditions, and it is the user's responsibility to determine appropriate intervals. The most effective preventive maintenance is periodic washing of the enclosure to remove any salt buildup on exterior surfaces. It is recommended to wash using a mild soap applied with a sponge or cloth, followed by a low-pressure, non-saline water rinse.

It also is very important to maintain the painted exterior finish of the equipment. If exterior corrosion is detected, the following steps should be taken on the exterior surface:

1. The finish should be cleaned.
2. Any corrosion should be removed by mechanical means.
3. Prepare the exterior for painting.
4. The affected area should be repainted with a corrosion-inhibiting paint. The factory paint is two-component, polyurethane-acrylic enamel Polane T manufactured by Sherwin Williams in Precision Tan and Carbon Black.

Enclosures located in corrosive environments are required to have a coating of petroleum jelly or TechnipFMC grease (part number 644886401) to flanged metal surfaces (including the flame path between the window and cover and the keypad cover) to offer a protective barrier and reduce the effects of exposure to wet, salty air. The surface should be cleaned and new grease applied each time the enclosure cover is opened for inspections or maintenance.

6.1.2 N4 and SA Models in Special Environments

The N4 and SA models have 304 stainless steel enclosures. In corrosive environments, such as near salt water, it is the user's responsibility to prevent degradation of the stainless steel finish. The most effective preventive maintenance is periodic washing of the enclosure to remove any salt buildup on exterior surfaces. It is recommended to wash using a mild soap applied with a sponge or cloth, followed by a low-pressure, non-saline water rinse.

In severe conditions, segregation from the environment or an application of a protective coating is recommended.

6.2 Touch-Screen Screen-Protector Maintenance

The touch screen for the AccuLoad IV is a resistive element that uses a thin layer of glass as the top-most layer to enable the sensor to work when wet, when you are wearing gloves, and to avoid damage from exposure to hydrocarbons and other chemicals. To protect this thin layer of glass, a plastic screen protector is applied to it.

> The touch screen and screen protector should only be cleaned with a clean, damp cloth.

Over time, the screen protector may become scratched, marred, clouded, or otherwise damaged and should be replaced. To do so, complete the following steps:

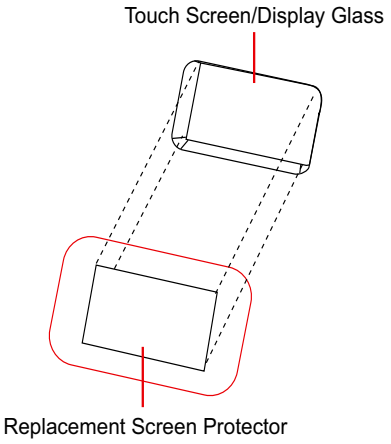
1. Carefully remove the existing screen protector by finding the edge of the plastic and, using a nylon screwdriver or similar tool, peeling back a corner of the screen protector until you can grasp and remove it.

   > Avoid using metal screwdrivers, knife blades, or sharp tools that could scratch or crack the underlying glass.

2. Clean the glass using a clean, damp cloth and allow to dry.

3. Peel the backing off the replacement screen protector and apply it to the screen, working from one edge to the other, taking care to avoid trapping air bubbles.

Figure 56: Touch-Screen Screen Protector



6.3 Replacing the Clock Battery

The AccuLoad IV's backup clock battery should be replaced every five years. Use the following steps to replace the clock battery:

> **WARNING:** Do not replace the clock battery in a hazardous area.

1. Disconnect the AccuLoad from its main power supply before opening the cover.

2. On the A4M and A4I boards, remove wiring connections and Ethernet cables.

3. Remove the A4M board from the AccuLoad's enclosure using the four captive fasteners on the corners of the board.

4. Locate the hole in the A4M board's mounting tray that enables access to the real-time clock (RTC) battery.

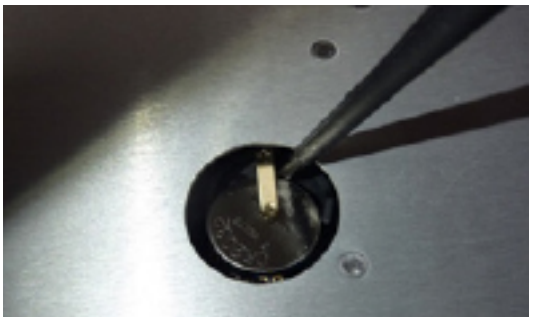
5. Remove the battery using the following steps:

a. Position the A4M board so the gold tab on the RTC battery socket is pointing toward you.

b. Using the flathead screwdriver supplied with your AccuLoad, press down on the battery on the right side of the gold tab and then gently pull it toward you.

c. After the battery is unseated, use ESD-safe technical tweezers or needle-nose pliers to remove the battery from the board.

Figure 57: Removing the Battery



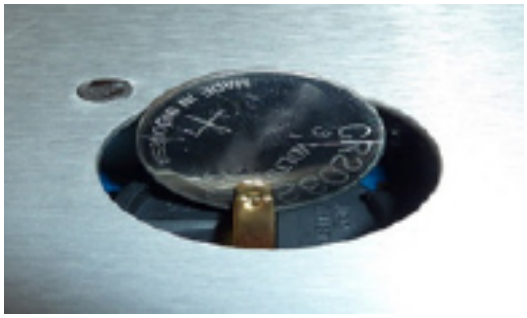
6. Install new replacement battery using the following steps:

a. Position the A4M board so the gold tab on the RTC battery socket faces away from you.

b. Place the new RTC battery under the edge of the gold tab and in the hole.

c. Using the flathead screwdriver, guide the RTC battery into the socket.

Figure 58: Replacing the Battery



7. Re-install the A4M board into the AccuLoad's housing using the four captive fasteners on the corners of the board and then restore all necessary connections.

8. Close the AccuLoad's housing according to the information in Section 5: Closing and Sealing the Enclosure.

6.4 Diagnostic Troubleshooting on A4M, A4B, and A4I Boards

The A4M, A4B, and A4I circuit boards for the AccuLoad IV contain a seven-segment light-emitting diode (LED) display capable of providing information about the status of the board. See the following table for diagnostic codes.

Table 43: A4M, A4B, and A4I Diagnostic Codes

Function	Diagnostic Code	Description
Bootloader Status	Bb	The Bootloader has an active error
	UU	The processor's firmware is currently updating
	FF	A hardware failure has occurred and the processor is unable to read memory; the board must be replaced
	E1	A TCP timeout has occurred; check the connection between BBB and the Ethernet port and replace the hardware

Table 43: A4M, A4B, and A4I Diagnostic Codes

Function	Diagnostic Code	Description
Bootloader Errors	E2	A hardware failure has occurred in the Bootloader; the board must be replaced
	E3	An upgrade error has occurred; retry the firmware update
	E4	A firmware error has occurred; retry the firmware update
	E5	A firmware cyclic redundancy check (CRC) error has occurred; retry the firmware update
	E6	A hardware failure involving a Bootloader CRC error has occurred; the board must be replaced
	E7	A hardware failure involving an unprogrammed media access control (MAC) address has occurred; the board must be replaced

6.5 Returning a Circuit Board Using a Return Merchandise Authorization (RMA)

If you need to return a circuit board, use the guidelines in the following sections.

> All electronic materials must be returned using proper ESD protective packaging; for example, in a static-shielding bag.

6.5.1 A4M Boards

Use the following guidelines when returning an A4M board:

- Remove and retain the license key (dongle); these are not included with replacement A4M boards and will be needed.
- Retain any functioning analog modules. Return non-working modules that need to be replaced.

  > Do not hot-swap analog modules when diagnosing problems—they require initialization that is performed during the power-up process to work properly.

- Disconnect and retain the long Ethernet patch cable. Leave the short Ethernet cable connected to the COM module in place.
- All terminal blocks (connectors) should be removed and retained; they are not included with replacement boards.

6.5.2 THMI Module

If your AccuLoad has a display-related issue and the problem cannot be narrowed down to a specific component (such as the touch sensor or LCD), it is recommended that you return the THMI display module and touch screen assembly as a unit.

7 Related Publications

The following literature can be obtained from TechnipFMC Measurement Solutions Literature Fulfillment at Measurement.Fulfillment@TechnipFMC.com or online at info.smithmeter.com/literature/online_index.html.

When requesting literature, please reference the appropriate title and document number, as follows:

- AccuLoad IV Operator Reference Manual (MN06200)
- AccuLoad IV parts list (PO06200)
- AccuLoad IV specifications (SS06200)
- AccuLoad Calculations technical paper (TP06004)

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