

D-100

Flow Display with Network Interface Installation and Operation Guide



SAFETY INFORMATION

The D-100 Flow Display was calibrated at the factory before shipment. To ensure correct use of the system, please read this manual thoroughly.

Regarding this manual:

- This manual should be passed on to the end user.
- Before use, read this manual thoroughly to comprehend its contents.
- The contents of this manual may be changed without prior notice.
- All rights reserved. No part of this manual may be reproduced in any form without ONICON Incorporated's written permission.
- ONICON Incorporated makes no warranty of any kind with regard to this material, including, but not limited to, implied warranties of merchantability and suitability for a particular purpose.
- All reasonable effort has been made to ensure the accuracy of the contents of this manual. However, if any errors are found, please inform ONICON Incorporated.
- ONICON Incorporated assumes no responsibilities for this product except as stated in the warranty.
- If the customer or any third party is harmed by the use of this product, ONICON Incorporated assumes no responsibility for any such harm owing to any defects in the product which were not predictable, or for any indirect damages.

SAFETY PRECAUTIONS:

The following general safety precautions must be observed during all phases of installation, operation, service, and repair of this product. Failure to comply with these precautions or with specific WARNINGS given elsewhere in this manual violates safety standards of design, manufacture, and intended use of the product. ONICON Incorporated assumes no liability for the customer's failure to comply with these requirements. If this product is used in a manner not specified in this manual, the protection provided by this product may be impaired.

The following messages are used in this manual:

WARNING

Messages identified as "WARNING" contain information regarding the personal safety of individuals involved in the installation, operation or service of this product.

CAUTION

Messages identified as "CAUTION" contain information regarding potential damage to the product or other ancillary products.

IMPORTANT NOTE

Messages identified as "IMPORTANT NOTE" contain information critical to the proper operation of the product.

TABLE OF CONTENTS

| | | |
|---------|--|----|
| 1.0 | INTRODUCTION..... | 5 |
| 1.1 | Purpose of this guide..... | 5 |
| 1.2 | Typical D-100 Network Interface Module..... | 5 |
| 1.3 | Standard Features and Specifications | 5 |
| 1.4 | Additional Hardware Required..... | 7 |
| 1.5 | Working Environment..... | 7 |
| 1.6 | Serial Number..... | 7 |
| 2.0 | UNPACKING | 7 |
| 2.1 | Checking that you have received everything..... | 7 |
| 3.0 | INSTALLATION..... | 8 |
| 3.1 | Site Selection..... | 8 |
| 3.2 | Mechanical Installation | 9 |
| 3.3 | Electrical Installation | 10 |
| 3.3.1 | Input Signal Connections from Flow Meter | 10 |
| 3.3.1.1 | ONICON F-1000 Series Flow Meters | 10 |
| 3.3.1.2 | ONICON F-2000 Series Flow Meters (Loop Powered)..... | 12 |
| 3.3.1.3 | ONICON FT-3100/3200 Series Flow Meters | 13 |
| 3.3.1.4 | ONICON FT-3400 Series Flow Meters..... | 14 |
| 3.3.1.5 | ONICON FSM-3 Series Flow Meters | 15 |
| 3.3.1.6 | ONICON F-4300 Series Flow Meters | 16 |
| 3.3.1.7 | ONICON FT-4600 Series Flow Meters..... | 17 |
| 3.3.1.8 | ONICON F-5400 Series Flow Meters | 18 |
| 3.3.1.9 | ONICON F-5500 Series Flow Meters | 19 |
| 3.3.2 | Frequency Pulse Flow Input (Di2)..... | 20 |
| 3.3.3 | Analog Flow Input (Ai2) | 20 |
| 3.3.4 | Directional Contacts..... | 20 |
| 3.3.5 | Analog Inputs (Ai3 & Ai4) | 20 |
| 3.3.6 | Digital Pulse Input (Di3)..... | 20 |
| 3.3.7 | Totalizer Outputs and Mode Status..... | 21 |
| 3.3.8 | Isolated Analog Outputs | 21 |
| 3.3.9 | Input Power..... | 22 |
| 4.0 | D-100 START-UP AND COMMISSIONING..... | 24 |
| 4.1 | Display and Keypad..... | 24 |
| 4.2 | Processor Start-up | 24 |
| 4.3 | Units and Multipliers..... | 25 |
| 4.4 | Analog Outputs..... | 25 |
| 4.5 | Enabling / Disabling Front Panel Reset..... | 25 |
| 4.6 | Commissioning | 26 |
| 5.0 | DIAGNOSTICS..... | 28 |
| 5.1 | Diagnostics | 28 |
| 5.1.1 | Diagnostic Lights | 28 |
| 5.1.2 | Flow Test Signals..... | 28 |
| 5.1.3 | Ai3 & Ai4 Test Signals..... | 28 |
| 5.2 | Troubleshooting..... | 29 |

APPENDIX

- A-1 D-100 DISPLAY MOTHER BOARD
- A-2 D-100 PROCESSOR BOARD
- A-3 D-100 POWER SUPPLY BOARD
- A-4 D-100 ANALOG OUTPUT BOARD
- A-5 D-100 ANALOG OUTPUT BOARD With 4 Analog Outputs

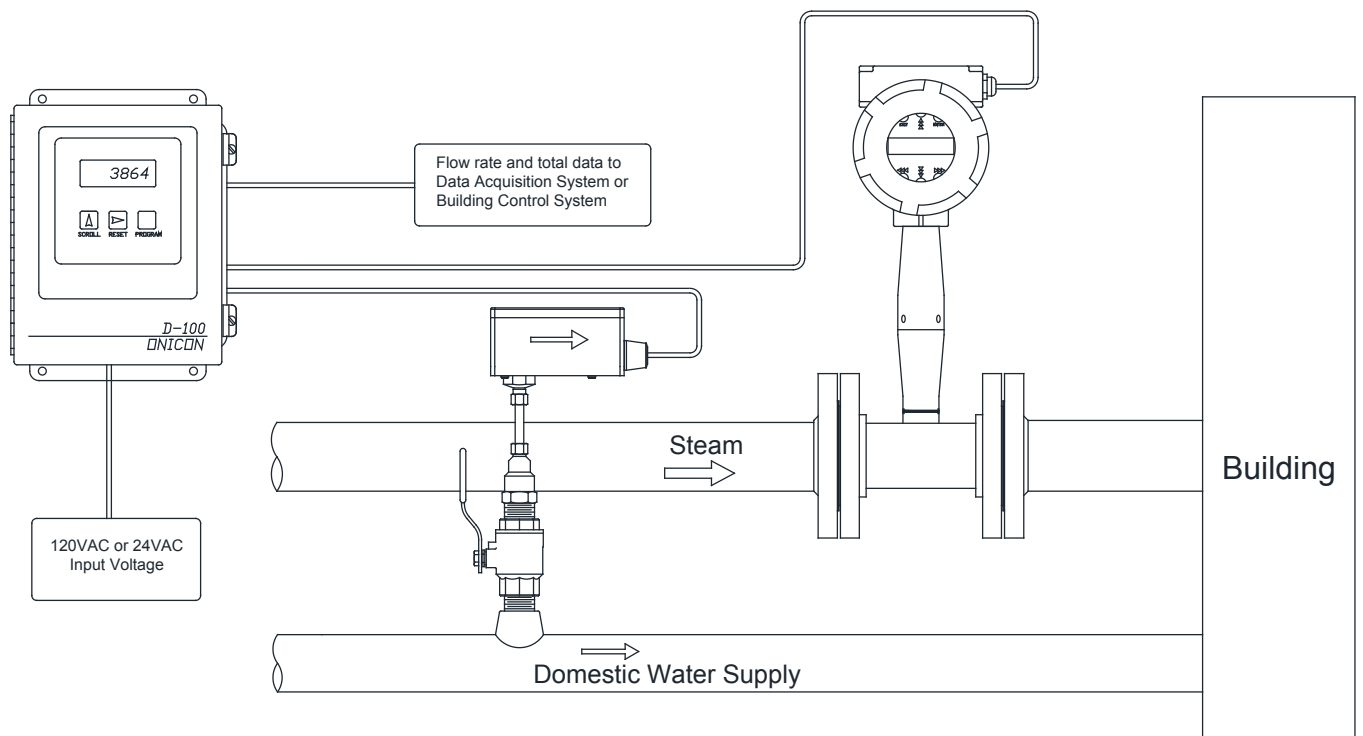
SECTION 1: INTRODUCTION

1.1 PURPOSE OF THIS GUIDE

The purpose of this guide is to provide installation and commissioning procedures and basic operating and servicing instructions for the ONICON D-100 Flow Display and Network Interface Module.

1.2 TYPICAL D-100 NETWORK INTERFACE MODULE

The D-100 is a totalizing display module that provides a local indication of liquid, gas or steam flow rate and total data. It can also be configured with an optional network interface to communicate data to the building control network. It is housed in a steel wall mounted enclosure with a built-in user interface/display.



1.3 STANDARD FEATURES AND SPECIFICATIONS

- Wall mounted NEMA 13 steel enclosure with 2-line alphanumeric user interface/display
- One configurable pulse/analog rate input with totalizing function
- Internal 24 VDC power supply capable of powering most flow meters
- Scaled pulse (contact closure) outputs for remotely totalizing forward and reverse flow
- Contact closure output to provide an indication of flow direction

GENERAL SPECIFICATIONS

ACCURACY

Analog Inputs: 0.1% of full scale
Analog Outputs: 0.1% of full scale

PROGRAMMING

Factory programmed for specific application.

MEMORY

Nonvolatile EEPROM memory retains all program parameters and totalized values in the event of power loss.

DISPLAY

Standard: 2-line Alphanumeric LCD displays flow rate and flow total for the standard flow input
Alpha: 16 character, 0.2" high
Numeric: 7 digit, 0.4" high
Rate Display Range: 0 - 9,999,999
Totalizer Display Range: 0 - ,999,999
The totalizers will roll over to zero when maximum count is exceeded.

OUTPUT SIGNALS

Pulse Outputs:

Two isolated contact closure outputs for separately totalizing forward and reverse flow from the standard flow input. Contact duration: 0.5, 1, 2 or 6 seconds (factory selectable). Default: 0.5 seconds

Maximum contact ratings: 100 mA, 50 VDC

Isolated contact closure output for indicating flow direction

Maximum contact ratings: 100 mA, 50 VDC

Analog Outputs Options:

Single isolated analog output:

4-20 mA, 0-10 V or 0-5 V

Multiple (4) isolated analog outputs: 4-20 mA, 0-10 V or 0-5 V outputs

Network Interface Options

MODBUS RTU RS485

MODBUS RTU TCP/IP

BACnet MS/TP

BACnet UDP/IP

JCI Metasys - N2

Siemens Apogee - P1 FLN

INPUT SIGNALS

Standard: One totalizing flow input:
4-20 mA, contact closure or pulse
One contact closure input for flow direction

Optional: Two auxiliary analog rate inputs:
4-20 mA
One digital totalizer input: pulse or contact closure
Totalizer Range: 0-9,999,999 counts.
Total will rollover to zero when maximum count is exceeded.

TEMPERATURE RANGE

Ambient temperature range: -20° F to 140° F
Do not install in direct sunlight.

MAINTENANCE

ONICON recommends periodic inspection and recalibration for sensors connected to the D-100.
No other periodic maintenance is required for the main unit.

MECHANICAL

Electronics Enclosure:

Standard: Steel NEMA 13, wall mount, 8"x 10"x 4"

Optional: NEMA 4

ELECTRICAL

WARNING

All electrical connections must be made in accordance with the information provided here. Failure to do so will result in an increases risk of injury.

This equipment is intended for INSTALLATION CATEGORY (OVERVOLTAGE CATEGORY) II applications.

INPUT POWER:

Factory Selectable:

24 VAC: 20 - 28V, 50/60 Hz, 500 mA

120 VAC: 108 - 132V, 50/60 Hz, 250 mA

240 VAC: 207 - 253V, 50 Hz, 250 mA

INTERNAL FUSE RATING:

24 VAC - 1 Amp Slo-Blo, 3AG Fuse

120 VAC - 1/4 Amp Slo-Blo, 3AG Fuse

240 VAC - 1/8 Amp Slo-Blo, 3AG Fuse

OUTPUT:

24 VDC, 250 mA maximum

OVERCURRENT PROTECTIVE DEVICE RATINGS:

Supply mains overcurrent protective devices with the following ratings:

120 VAC 50/60 Hz – 15 A

240 VAC 50 Hz – 6 A

WIRING:

Flow signals: Use 18-22 ga shielded cable – see flow meter specification sheet or flow meter manual for the correct number of conductors.

24 VAC input power: Use PVC jacketed copper cable with a wire gauge suitable for the length of run and required maximum current carrying capacity. The installation must comply with all local, state and federal building codes.

120/240 VAC input power: Use a three wire service with one wire a protective earth ground. The installation must comply with all local, state and federal building codes.

Note: Specifications are subject to change without notice.

1.4 ADDITIONAL REQUIRED HARDWARE

Flow Meter

ONICON offers a wide variety of flow meters to satisfy most liquid, gas and steam metering applications. Please refer to ONICON's flow meter literature, or consult ONICON or your local representative for help in selecting the flow meter that will best fit your requirements.

1.5 WORKING ENVIRONMENT

The D-100 was designed for installation and use in typical industrial environments that are free of corrosive liquids and fumes, direct liquid exposure, heavy condensation, temperature extremes, and vibrations. Do not expose the display to direct sunlight.

The operating ambient air temperature range is - 20° F to 140° F. Electrical power should be relatively clean, free of high frequency noise, large voltage transients, and protected from power surges and brown-outs.

1.6 WARRANTY & SERIAL NUMBER

Serial Number

The serial number of your D-100 is located outside and inside the enclosure. Also located inside the enclosure is a label with the serial number of the associated ONICON flow meter or sensor your D-100 was intended to be used with. The serial numbers are unique identifiers that you should have available when contacting ONICON for assistance regarding the installation or use of this product.

SECTION: 2.0 UNPACKING

The D-100 is shipped in one package unless optional hardware or equipment is ordered. Notify the freight carrier and ONICON if any items are damaged in transit.

2.1 CHECKING THAT YOU HAVE RECEIVED EVERYTHING

- **Standard Documentation**
Enclosed with each D-100 is a comprehensive documentation package that includes the following items:

The D-100 Installation and Operation Guide
The D-100 Configuration Data Sheet

IMPORTANT NOTE

The ONICON D-100 is delivered fully programmed and ready to use with a specific flow meter. The serial number of the flow meter and any other sensor used with this D-100 will be found on a label located inside the enclosure. Do not attempt to use the D-100 with any other flow meter or sensor. Doing so will result in significant errors in the flow reading.

Please notify ONICON if any of these items are missing.

- **The D-100**
Remove the D-100 from the shipping carton and inspect it for physical damage. When you complete the external inspection, open the enclosure and inspect the interior for signs of damage in transit. Also, confirm that the circuit boards and connectors are all securely seated in their sockets. Please notify ONICON immediately if you find any discrepancies.
- **The Flow Meter**
The flow meter intended for use with this display came complete with an instruction manual. Please refer to the flow meter instruction manual for detailed information regarding the installation, commissioning and operation of the flow meter. Each D-100 is calibrated to a specific flow meter, the two must be used together as a system. If the flow meter and display were purchased together, the serial number on the flow meter will be located on a label inside the D-100.

SECTION 3.0: INSTALLATION

The D-100 should be installed by qualified individuals with knowledge and experience in the heating, cooling, and fluid metering fields. ONICON will be happy to assist with technical recommendations and to provide guidance by telephone and/or e-mail. On-site field engineering, installation and service are also available at an additional cost. The installer should use good trade practices and must adhere to all state, federal and local building codes.

3.1 SITE SELECTION

Careful attention to the site selection for the system components will help the installers with the initial installation, reduce start-up problems and make future maintenance easier. For example, do not install the flow meter where it will be difficult for personnel to perform periodic maintenance and calibration. When selecting a site for mounting the system components, consider the criteria under Section 1.5 WORKING ENVIRONMENT, as well as the following:

The D-100

Find an easily accessible location where wire connections can be made and meter readings can be taken from floor level. Mount the D-100 on a vibration free surface. Avoid locations such as the plenum of a fan coil, heat exchanger or any housing that may contain electric motors or other strong sources of electrical interference.

The Flow Meter

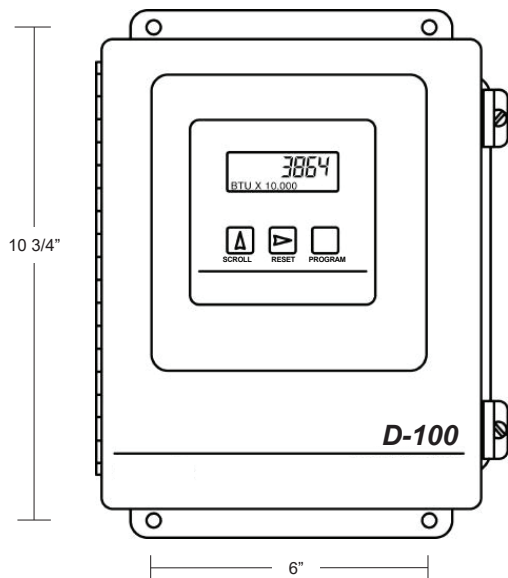
Choose the location with the longest straight run of unobstructed pipe. Please refer to the flow meter installation manual for specific information regarding the straight run requirements for the flow meter used with this display.

3.2 MECHANICAL INSTALLATION

IMPORTANT NOTE

The ONICON D-100 Display is a custom calibrated system. Unless specifically noted in writing by ONICON, ALL COMPONENTS (Display and flow meter) share the same serial number and must be installed together as a system. Mixing components from different systems will result in significant errors in calibration.

3.2.1 Main Unit Installation



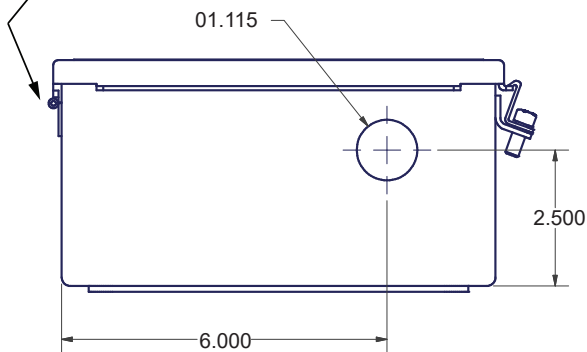
- Find an easily accessible location where electrical connections can be made and meter readings can be taken from the floor level.
- Mount the display on a vibration-free surface. Avoid sites such as the plenum of a fan coil, heat exchanger, or other housings containing motors. Do not install the display in direct sunlight.

Use four screws for mounting the display. The mounting surface must be structurally sound and capable of withstanding a minimum weight of 40 lbs (18 kg). Use the following screws for mounting.

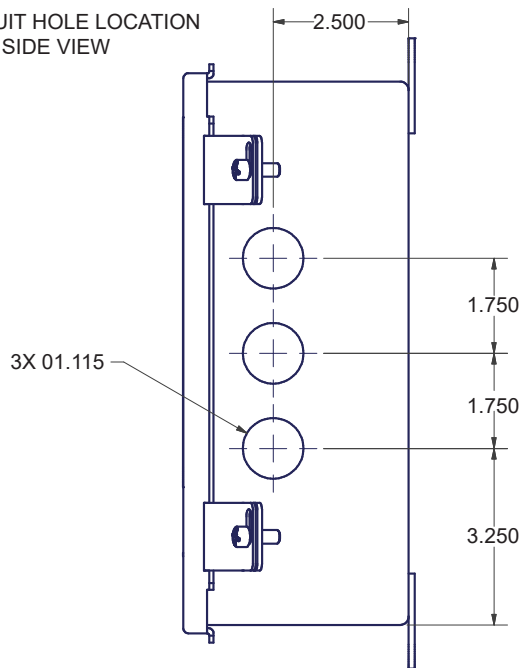
- (4) Machine screws - HHMS .25-20 x 1.5"
- (4) Wood screws - FHLS .25 x 1.5"
- (4) Concrete screws - HHCS .25 x 1.5"

CONDUIT HOLE LOCATION
BOTTOM VIEW

HINGE SIDE
SOWN FOR REFERENCE.



CONDUIT HOLE LOCATION
RIGHT SIDE VIEW



CAUTION

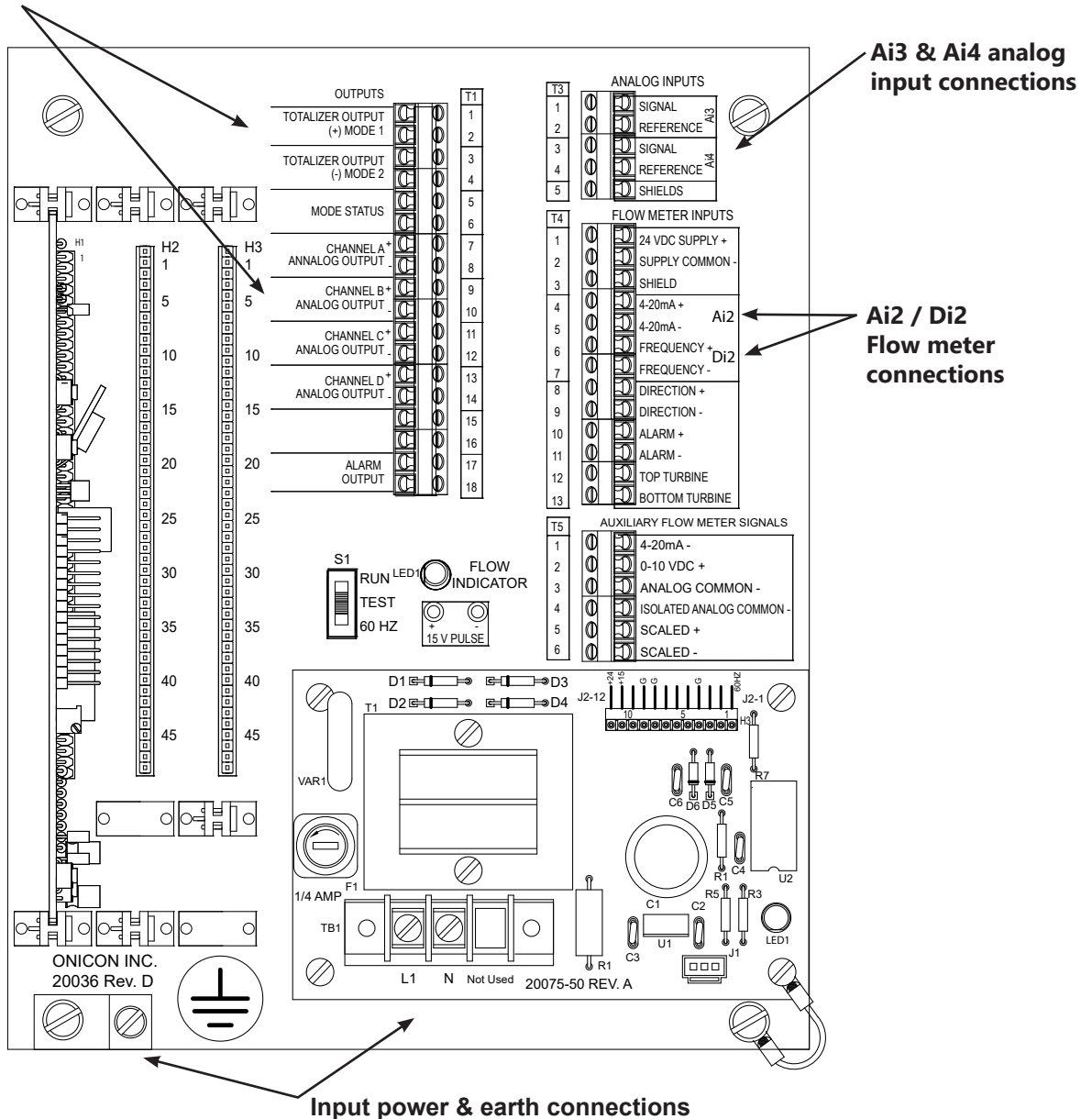
Do not drill additional holes in this enclosure. Doing so may damage the electronic circuitry contained within and will void all warranties.

3.3 ELECTRICAL INSTALLATION

The electrical installation of this product must comply with all federal, state and local building codes. Connect and re-verify all input, output, network interface and safety earth wiring connections prior to connecting power.

The drawing below shows where signal, power and earth connections are made on the mother board located inside the D-100 enclosure. Network and digital pulse input connections are made on the network interface board (not shown). Refer to section 3.3.1 for detailed information on connecting flow meters, sensors, output signal and power connections.

Pulse and analog output connections

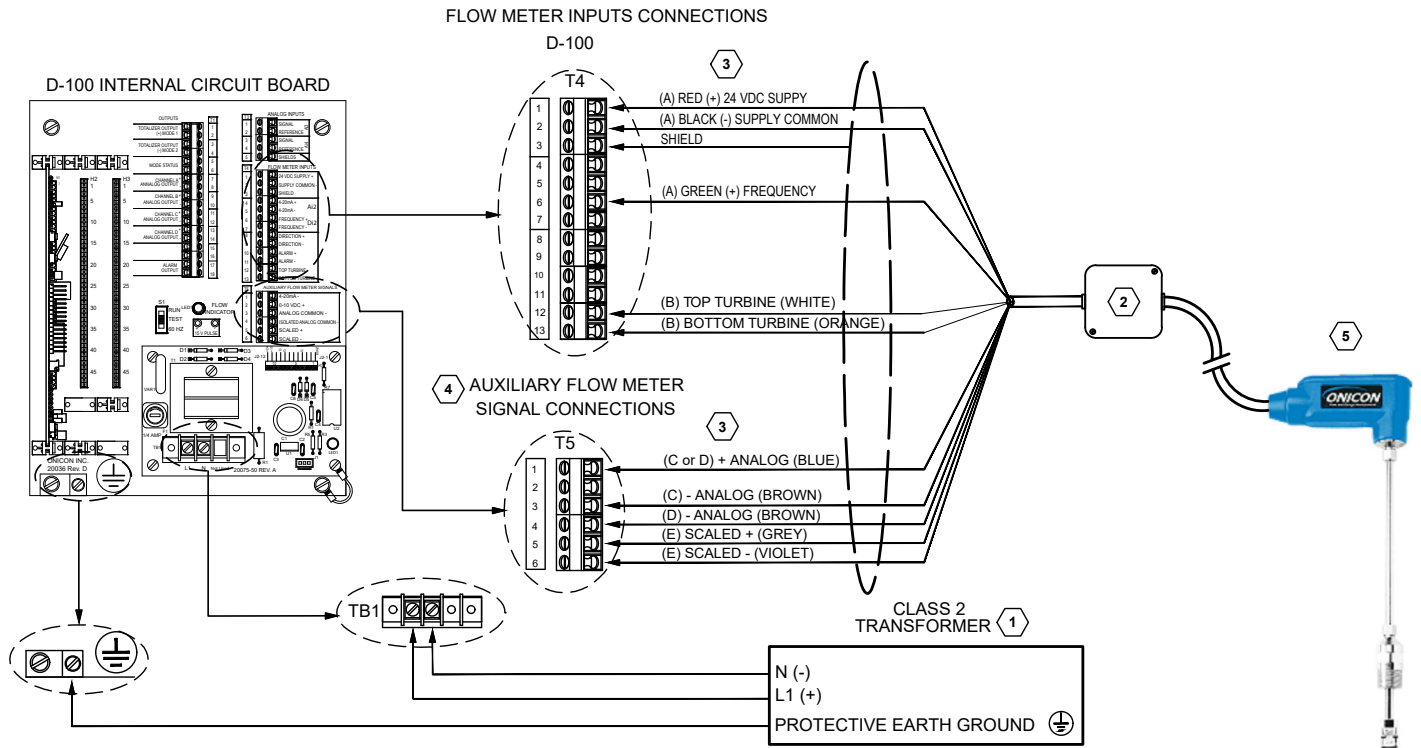


3.3.1 Input Signal Connections from Flow Meter

Make connections on the mother board, located inside the enclosure, at terminal strip T4. Analog (4-20 mA) signals connect to terminals 4 and 5. Pulse (frequency) signals connect to terminals 6 and 7. Do not exceed 4.5 in-lb (0.5 Nm) of torque when tightening.

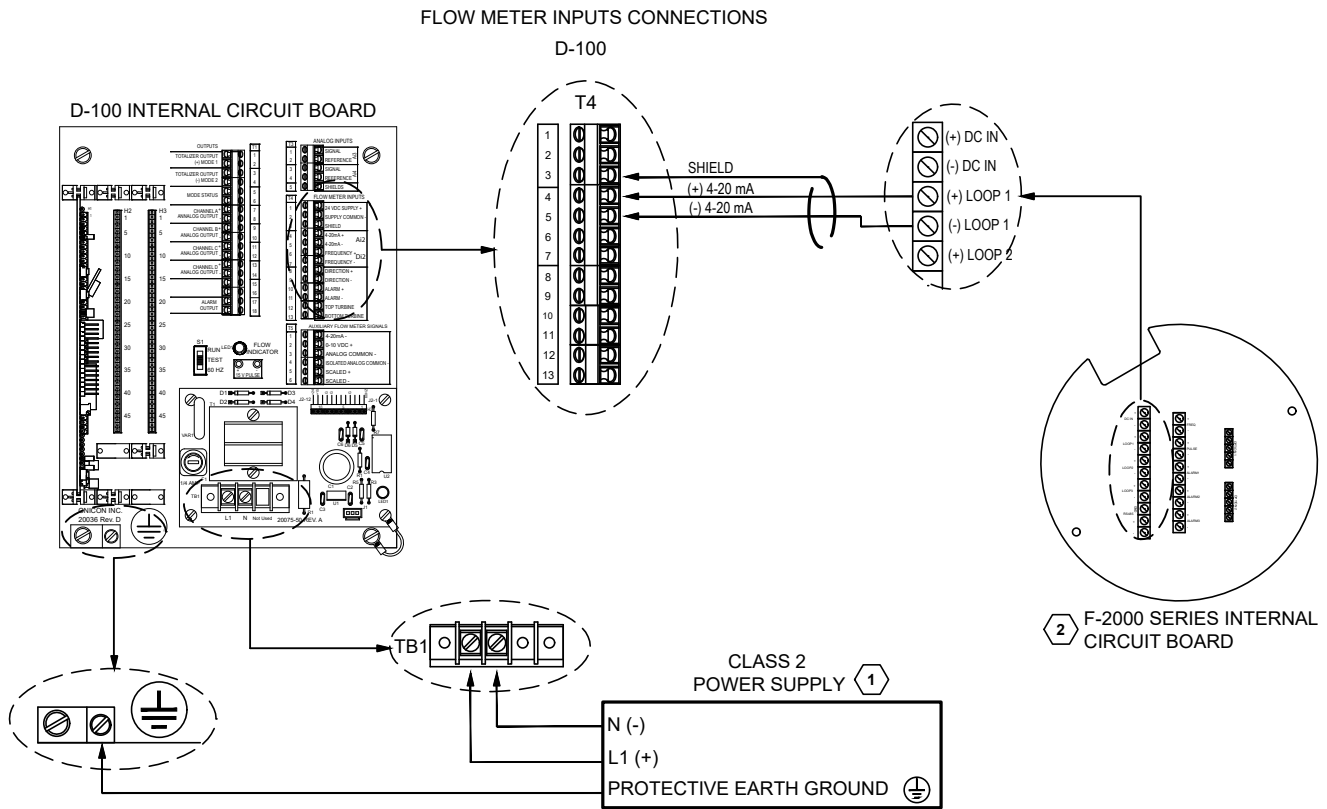
3.3.1.1 Input Signal Connections - F-1000 Series Flow Meters

ONICON turbine flow meters are provided with a number of different output configurations. These affect the number of wires contained in the cable attached to the flow meter. Refer to the diagram below and the laminated tag attached to the flow meter for specific details.



1. Provide a Class 2 power supply with sufficient power for the connected flow meter:
 - 24 VAC: 20-28 VAC, 50/60 Hz, 12 VA (22 VAC minimum for versions with IP COMMS + 4 channel analog card)
 - 120 VAC: 108-132 VAC, 50/60 Hz, 15 VA (112 VAC minimum for versions with IP COMMS + 4 channel analog card)
 - 240 VAC: 207-253 VAC, 50/60 Hz, 15 VA (220 VAC minimum for versions with IP COMMS + 4 channel analog card)
2. Connect factory wires to field wires in appropriate junction box. Do not remove factory wires.
3. Connections shown with (A) are required for all models.
Connections shown with (B) are used with F-1XXX-10 models.
Connections shown with (C) are used with F-1XXX-11 models.
Factory wire colors are shown from flow meter cable or additional cable provided by ONICON, field wire colors may change from junction box.
4. Auxiliary flow meter connections are not used by the display. Both incoming and outgoing connections are made to the same terminal.
5. Refer to F-1000 Series IOM for additional wiring information.

3.3.1.2 Input Signal Connections - F-2000 Series Flow Meters (Loop Powered Versions)

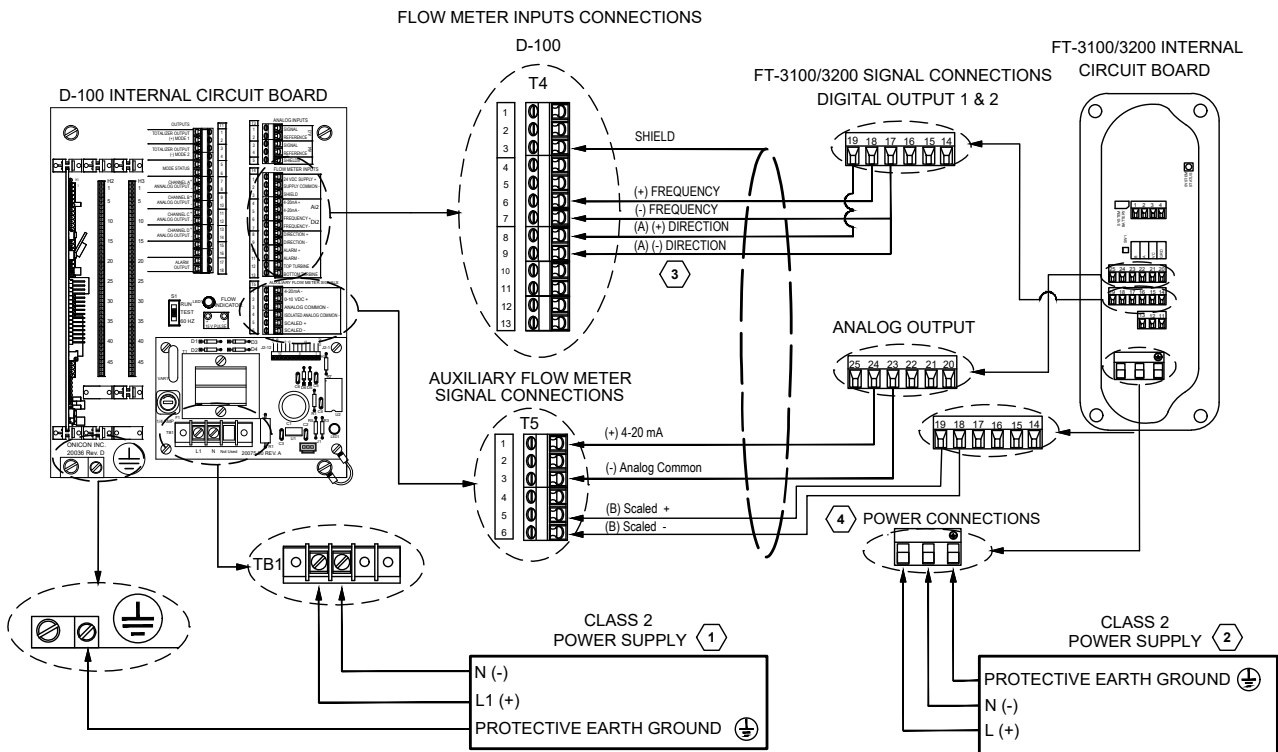


1. Class 2 power supply requirement (input voltage is not field selectable):

- 24 VAC: 20-28 VAC, 50/60 Hz, 12 VA
- 120 VAC: 108-132 VAC, 50/60 Hz, 15 VA
- 240 VAC: 207-253 VAC, 50/60 Hz, 15 VA

2. Refer to F-2000 series IOM for additional wiring information.

3.3.1.3 Input Signal Connections - FT-3100/3200 Series Flow Meters

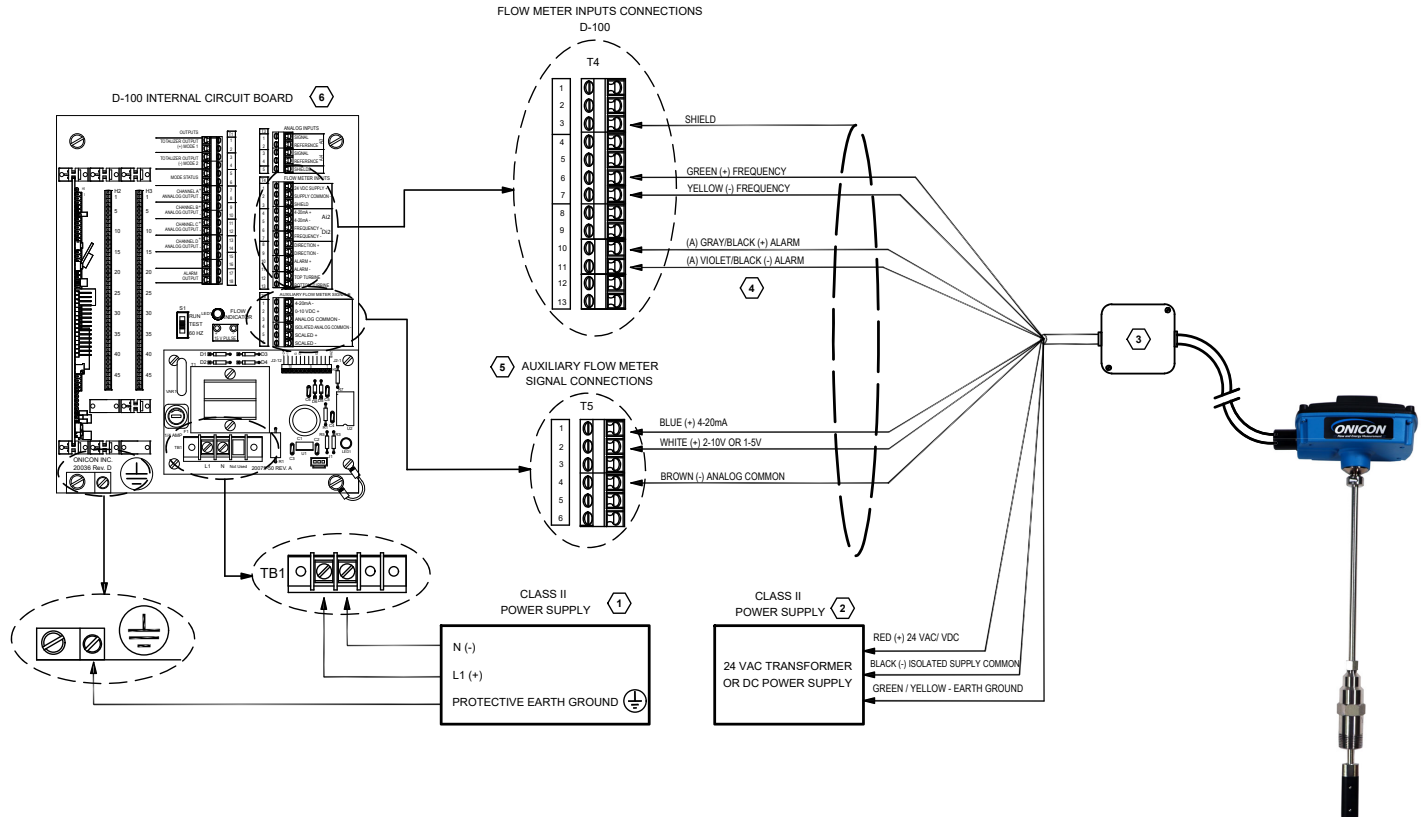


1. Class 2 power supply requirement (input voltage is not field selectable):
 - 24 VAC: 20-28 VAC, 50/60 Hz, 12 VA
 - 120 VAC: 108-132 VAC, 50/60 Hz, 15 VA
 - 240 VAC: 207-253 VAC, 50/60 Hz, 15 VA
2. The System-10 does not provide power to the FT-3100/3200 Series flow meters. Input power for the flow meters must be provided separately. Refer to FT-3100/3200 Series IOM for additional wiring information.

For 24 VAC version, it is acceptable to power the FT-3100/3200 Series flow meter from the System-10 mains terminals (TB1).

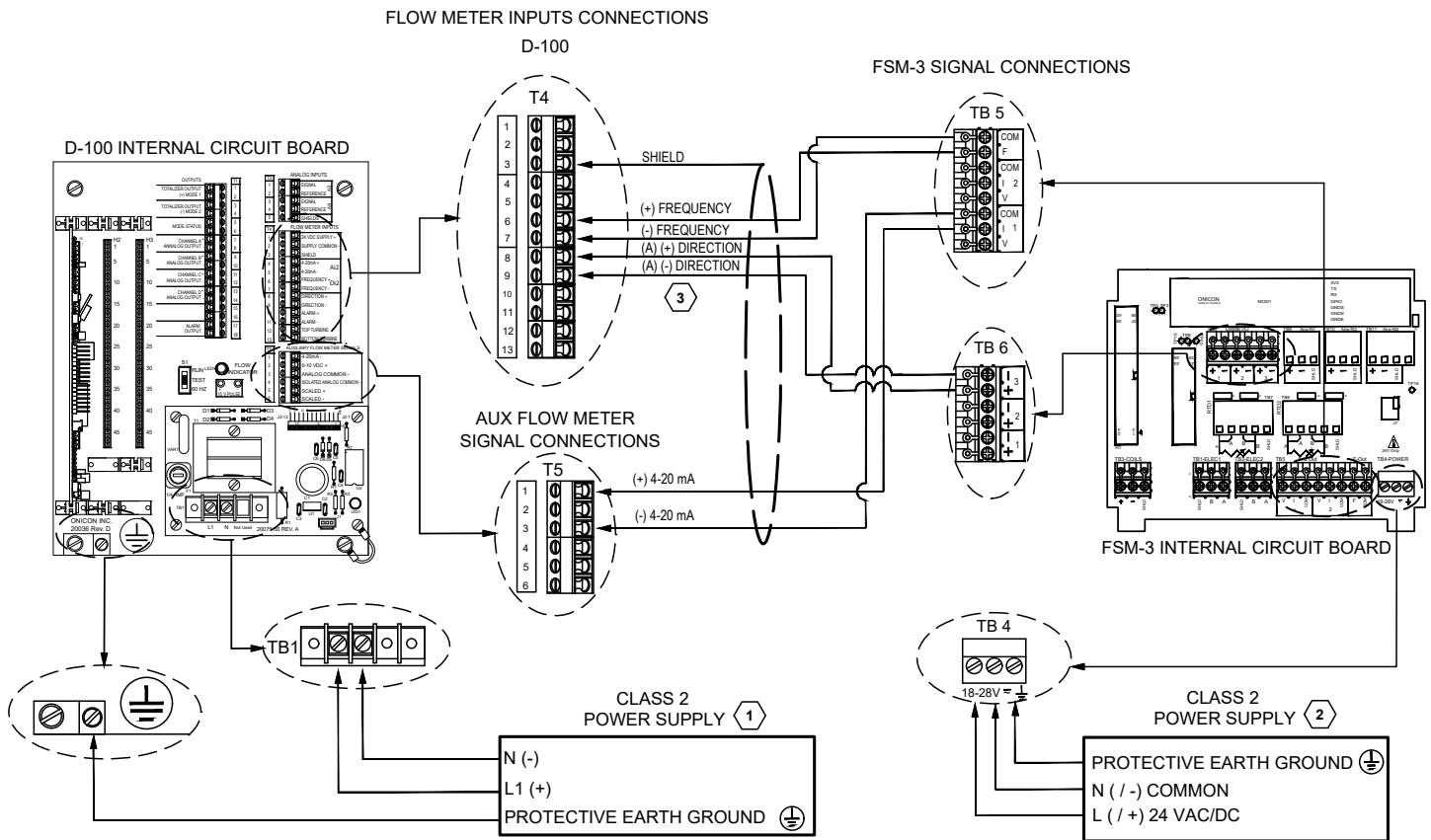
 - 24 VAC: 20-28 VAC, 50/60 Hz, 19 VA
3. Connections shown with (A) are used with bi-directional models only.
4. FT-3100/3200 Series input power is not field selectable. Please confirm the flow meter input voltage type. Contact the factory if you need to change the input voltage rating.

3.3.1.4 Input Signal Connections - FT-3400 Series Flow Meters



- Power Supply (Class 2 Power Supply for 24 VAC) Requirement (Input voltage is not field selectable):
 - 24 VAC: 20-28 VAC, 50/60 Hz, 12 VA
 - 120 VAC: 108-132 VAC, 50/60 Hz, 15 VA (112 VAC minimum for versions with IP COMMS + 4 Channel Analog Card)
 - 240 VAC: 207-253 VAC, 50/60 Hz, 15 VA (220 VAC minimum for versions with IP COMMS + 4 Channel Analog Card)
- The D-100 does not provide power to the FT-3400 Flow Meters. Input power for the flow meters must be provided separately. Refer to FT-3400 IOM for additional wiring information. For 24 VAC version, it is acceptable to power the FT-3400 Flow Meters from the D-100 Mains Terminals (TB1).
 - 24 VAC: 20-28 VAC, 50/60 Hz, 30 VA to power both FT-3400 and D-100.
- Connect FT-3400 factory wires to field wires in appropriate junction box. Do not remove factory wires.
- Connections shown with (A) are used with bi-directional (FT-3400-2) models only. Factory wire colors are shown from flow meter cable or additional cable provided by ONICON. Field wire colors may change from junction box.
- Auxiliary flow meter connections are not used by the display. Both incoming and outgoing connections are made to the same terminal.
- Refer to D-100 IOM for additional wiring information.

3.3.1.5 Input Signal Connections - FSM-3 Series Flow Meters



1. Class 2 power supply requirement (input voltage is not field selectable):

- 24 VAC: 20-28 VAC, 50/60 Hz, 12 VA
- 120 VAC: 108-132 VAC, 50/60 Hz, 15 VA
- 240 VAC: 207-253 VAC, 50/60 Hz, 15 VA

2. The D-100 does not provide power to the FSM-3 Series flow meters. Input power for the flow meters must be provided separately. Refer to FSM-3 Series IOM for additional wiring information.

For 24 VAC version, it is acceptable to power the FSM-3 Series flow meters from the System-10 mains terminals (TB1).

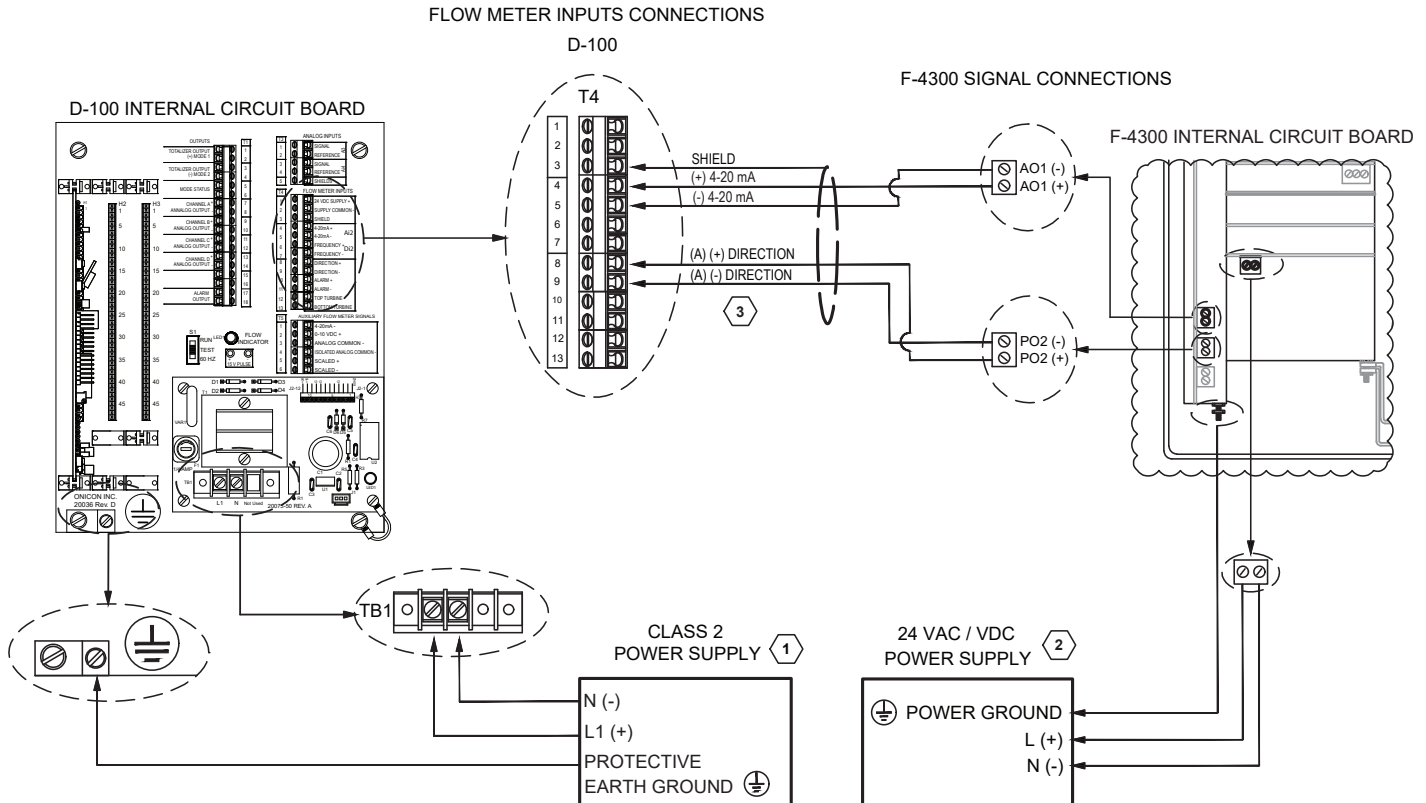
- 24 VAC: 20-28 VAC, 50/60 Hz, 52 VA

3. Connections shown with (A) are used with bi-directional models only.

3.3.1.6 Input Signal Connections - F-4300 Series Flow Meters

WARNING

Turn off mains power at the source prior to making power connections to the F-4300. Contact with exposed live wiring may result in electric shock, burns and/or serious injury.



1. Class 2 power supply requirement (input voltage is not field selectable):

- 24 VAC: 20-28 VAC, 50/60 Hz, 12 VA
- 120 VAC: 108-132 VAC, 50/60 Hz, 15 VA
- 240 VAC: 207-253 VAC, 50/60 Hz, 15 VA

2. The D-100 does not provide power to the F-4300 flow meters. Input power for the flow meters must be provided separately. Refer to F-4300 IOM for additional wiring information.

For 24 VAC version, it is acceptable to power the F-4300 flow meters from the D-100 mains terminals (TB1).

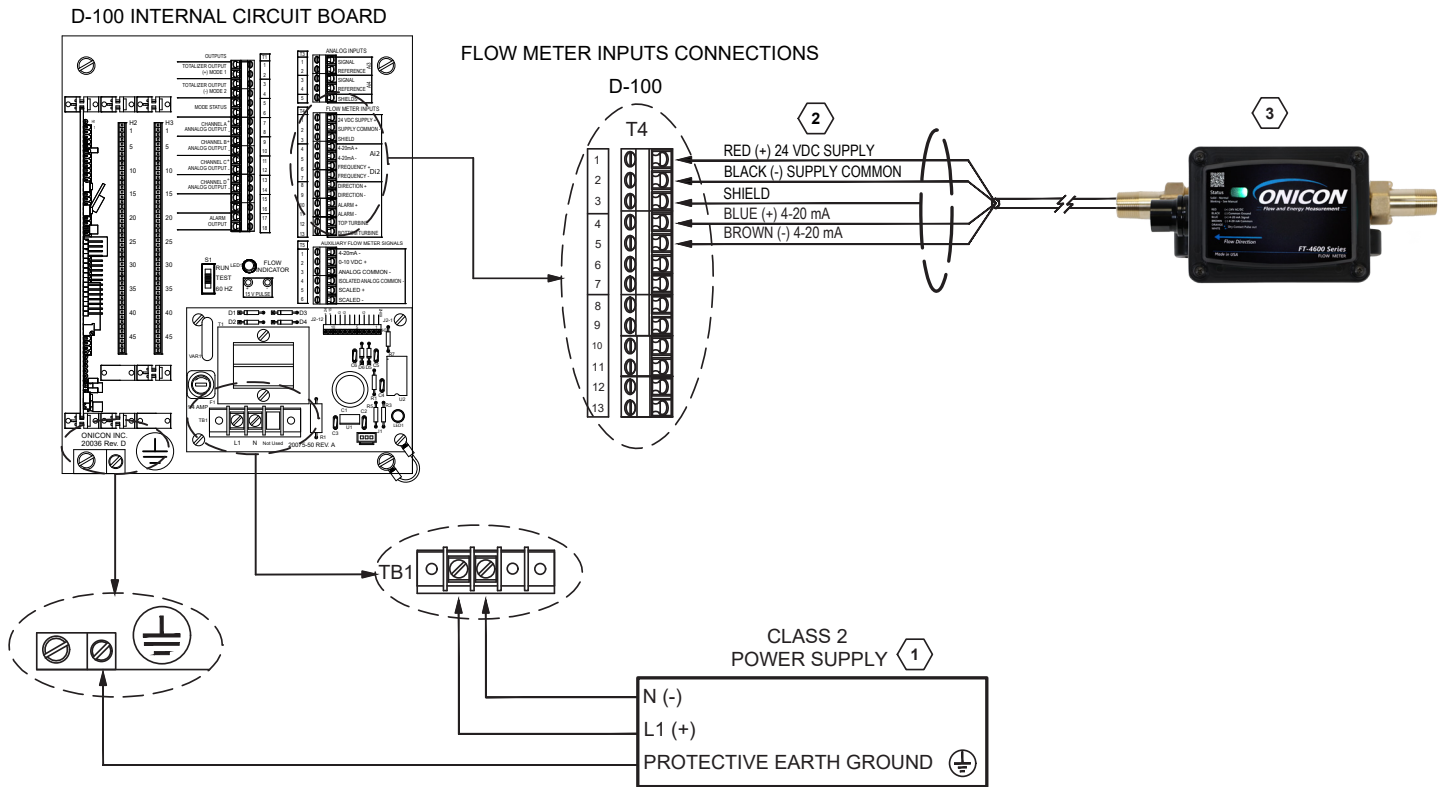
- 24 VAC: 20-28 VAC, 50/60 Hz, 18 VA

3. Connections shown with (A) are used with bi-directional models only.

CAUTION

Shield and earth connections are required for proper operation. Failure to use shielded cable or to connect earth to both the flow meter and D-100 may result in erratic operation. Shields should be terminated at the D-100 shield terminals and left unterminated at the flow meter.

3.3.1.7 Input Signal Connections - FT-4600 Series Flow Meters



1. Class 2 power supply requirement (input voltage is not field selectable):

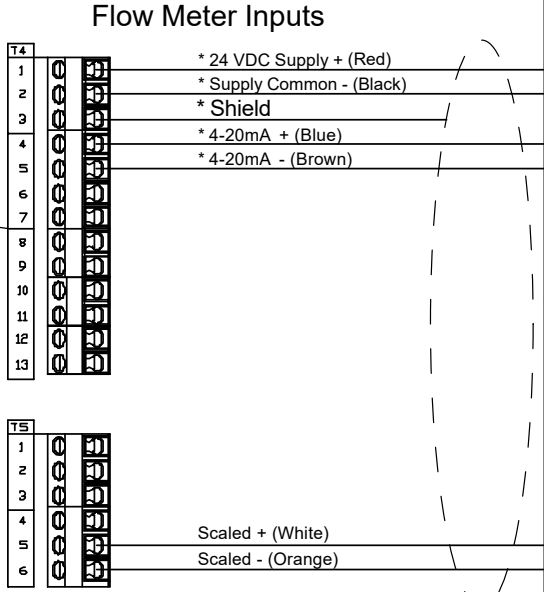
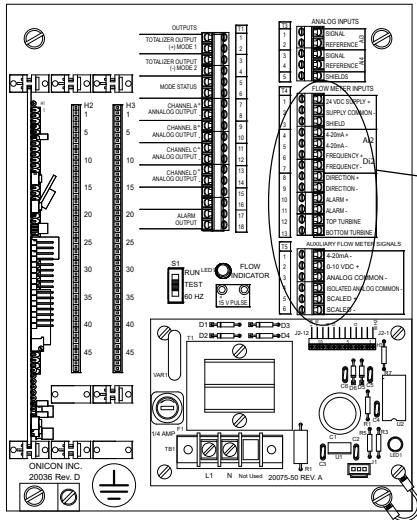
- 24 VAC: 20-28 VAC, 50/60 Hz, 12 VA
- 120 VAC: 108-132 VAC, 50/60 Hz, 15 VA
- 240 VAC: 207-253 VAC, 50/60 Hz, 15 VA

2. Factory FT-4600 wire colors are identified from the flow meter. Do not remove factory cable.

3. Refer to FT-4600 Series IOM for additional wiring information.

3.3.1.8 Input Signal Connections - F-5400 Series Flow Meters

F-5400 Flow Meter
Factory Installed Cable



Connections shown with * are required for all models

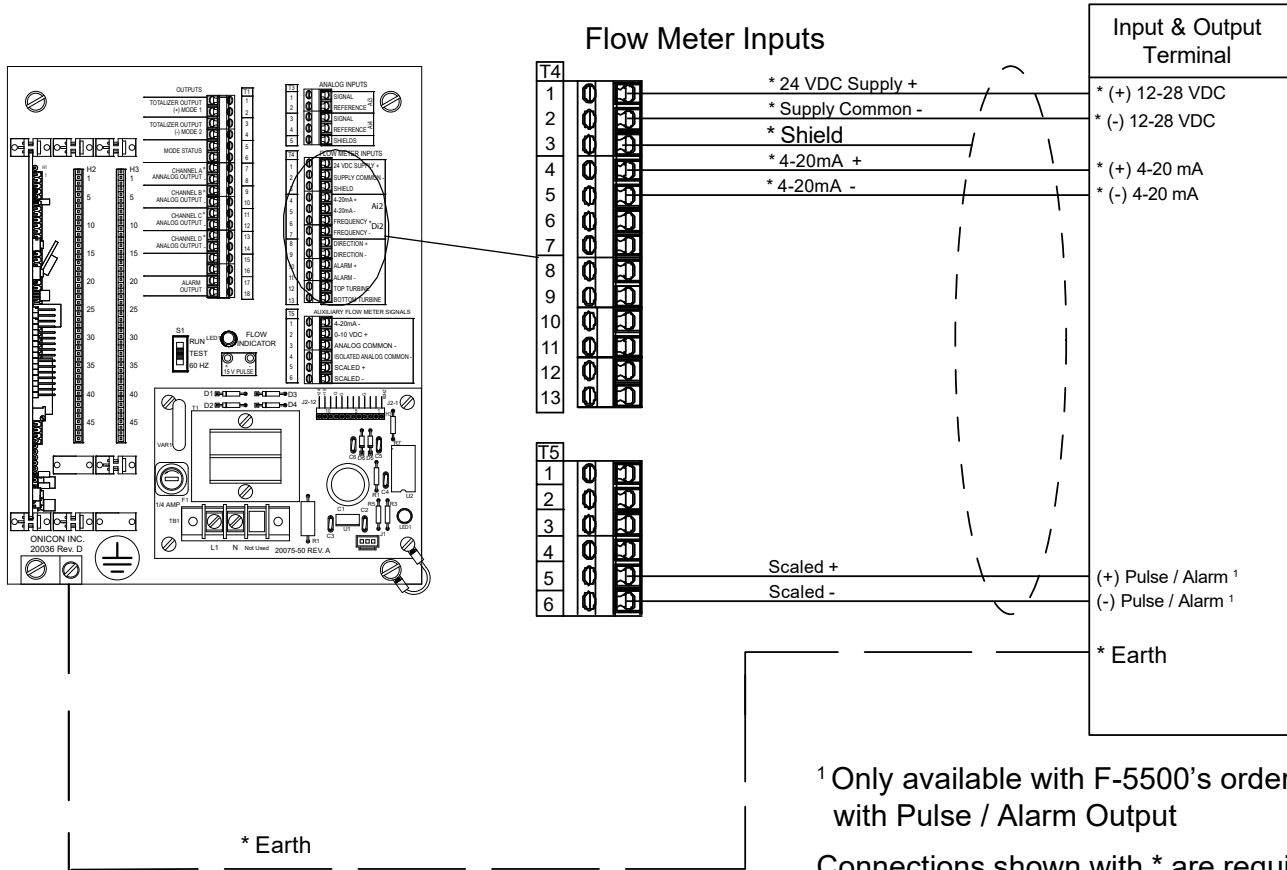
Connections shown are for flow meter output signals not used by the display. Both incoming and outgoing connections are made to the same terminal.

CAUTION

Shield connections are required for proper operation. Failure to use shielded cable or to properly terminate shield connections may result in erratic operation. Shields should be terminated in the D-100 at the terminals provided. The shield connection at the flow meter should be left unterminated.

3.3.1.9 Input Signal Connections - F-5500 Series Flow Meters

F-5500 Flow Meter Connections



¹ Only available with F-5500's ordered with Pulse / Alarm Output

Connections shown with * are required for all installations.

CAUTION

Shield and earth connections are required for proper operation. Failure to use shielded cable or to connect earth to both the flow meter and D-100 may result in erratic operation. Shields should be terminated at the D-100 shield terminals and left unterminated at the flow meter.

3.3.2 Frequency / Pulse Flow Input (Di2)

The D-100 is provided with a separate input for frequency or scaled pulse flow signals, (T4, terminals 6 and 7). This input can be configured to accept an active, positive going pulse (5-24 VDC) output signal, an open collector output signal or a contact closure (dry contact) output. The maximum input frequency is 500 Hz. Contact ONICON for technical assistance in configuring and programming this input. When this flow input is used the display menu pages will indicate Di2 on the rate and total(s) pages.

3.3.3 Analog Flow Input (Ai2)

The D-100 is provided with a separate input for analog flow signals (T4 terminals 4 and 5). This input can be configured to accept active or passive (loop powered) 4-20 mA signals. Contact ONICON for technical assistance in configuring and programming this input. When this flow input is used the display menu pages will indicate Ai2 on the rate and total(s) pages.

3.3.4 Directional Contacts

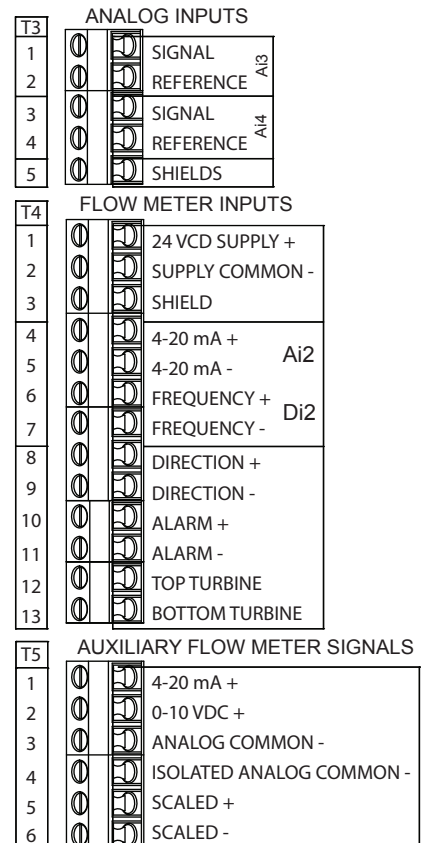
The D-100 is provided with a separate input for determining flow direction. Connections for this input are made at T4 terminals 8 (+) and 9 (-). This input can be connected to a non-polarized contact closure relay or an open connector output. Note that the input is polarized for sinking (NPN) open collector outputs. Totals will accumulate in the (+) Mode 1 registers whenever the contacts are closed.

3.3.5 Ai3 and Ai4 Analog Inputs

The D-100 can be provided with two optional analog inputs capable of powering any standard 4-20 mA loop powered sensor. The inputs can also be configured from the factory to accept an active (powered) 4-20 mA signal. Rate data from the two sensors is available via the network interface and the analog 4-20 mA signals can be replicated via the optional multi-analog output board. Analog input Ai3 is connected to T3 terminals 1 (+) and 2 (-). Analog input Ai4 is connected to T3 terminals 3 (+) and 4 (-). Do not exceed 4.5 in-lb (0.5 Nm) of torque, when tightening the terminals.

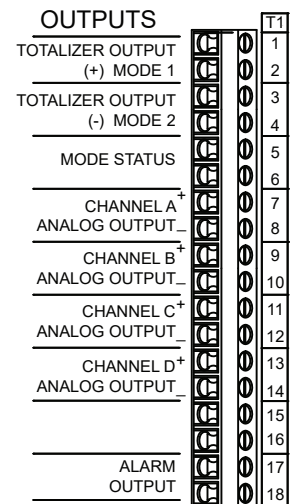
3.3.6 Digital Pulse Input (Di3)

The D-100 can be provided with an optional digital pulse input. This option is only available on displays provided with serial communications. It allows the D-100 to receive a pulse input from an external device such as a power meter or gas meter. The pulses are totaled in an internal register and are available via the serial communications network. This register can be zeroed on demand via the front panel or over the network. When this pulse input is used the display menu page will indicate Di3 on the total page. Contact ONICON for more information.



3.3.7 Totalizer Outputs and Mode Status

For unidirectional flow applications, the output relay for flow total is located on the mother board at T1, terminals 1 and (+) 2 mode 1. The value of each "closure" is listed on the configuration data sheet and is the same as the flow total multiplier displayed on the LCD (example: each closure = 100 Gallons). This information is also included on a label inside the D-100. For bidirectional flow applications, connections for the (+) mode 1 flow total output relay are at T1 terminals 1 and 2. The (-) mode 2 flow total output relay connections are at T1 terminals 3 and 4. Flow direction is indicated by the mode status output (T1 pins 5 and 6). The table below describes the relationship between (+) mode 1 and (-) mode 2 totals and forward and reverse flow for ONICON insertion turbine and inline electromagnetic flow meters. Do not exceed 4.5 in-lb (0.5 Nm) of torque, when tightening the terminals.



| Flow Meter Model | Flow Direction Relative to Direction Arrow on Meter | Flow Meter Output Condition (T4-Pins 8 & 9) | D-100 Mode Status Indicator (T1 - Pins 5 & 6) | D-100 Register Accumulating Totals |
|--------------------------|---|---|---|------------------------------------|
| FT-3400-2 | Flow in the direction of arrow | Closed contact | Open contact | (+) Mode 1 |
| | Flow reversed from direction arrow | Open contact | Closed contact | (-) Mode 2 |
| FT-3100 & FT-3200 Series | Flow towards (+) sign | Not energized (open) | Closed contact | (-) Mode 2 |
| | Flow towards (-) sign | Energized (closed) | Open contact | (+) Mode 1 |
| F-4300 | Flow towards the downstream transducer | Open Contact | Closed contact | (-) Mode 1 |
| | Flow towards the upstream transducer | Closed Contact | Open contact | (+) Mode 2 |

3.3.8 Isolated Analog Outputs

The D-100 can be configured to provide up to four isolated analog outputs. These outputs can be used to replicate the incoming analog signals. The output signal type can be 4-20 mA, 0-10 VDC or 0-5 VDC and is field configurable. Contact ONICON for assistance in reconfiguring or reprogramming the analog inputs. See the configuration data sheet provided or the label located inside the D-100 for output specific configuration information. Analog output signal connections are made at T1 terminals 7 through 14. Do not exceed 4.5 in-lb (0.5 Nm) of torque, when tightening the terminals.

3.3.9 Input Power

The D-100 can be ordered from the factory with input voltages of 24V AC 50/60 Hz, 120 VAC 50/60 Hz or 240 VAC 50 Hz. Please note that these are not field selectable options. Confirm that the correct input voltage configuration has been provided prior to making any connections.

WARNING

Conduit openings in the D-100 enclosure must be closed with UL listed fittings applicable to NEMA 13 enclosures, and mains voltage connections must be made through the pre-drilled conduit/strain relief opening located at the bottom of the enclosure. Failure to do so will result in an increased risk of injury.

WARNING / CAUTION

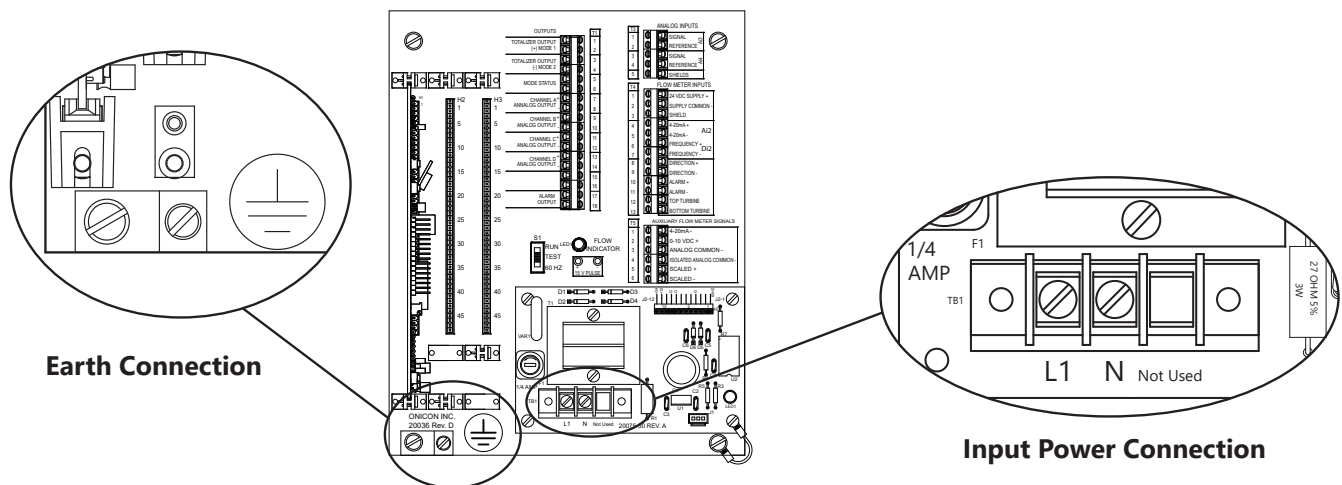
The protective earth connection must be made as shown. Failure to do so will result in an increased risk of injury and erratic operation.

Connect the power source to the D-100 through the conduit opening located on the bottom of the enclosure. Attach the wires to the appropriate screw terminals as shown. Connect the protective earth wire to the earth lug shown. Do not exceed 12 in-lb (1.4 Nm) of torque when tightening.

As power is initially applied to the D-100, immediately confirm that the "power" light is illuminated and the display is scrolling throughout the character diagnostic test. The test will begin by indicating the letter P in every position followed by a countdown from 9 to 0 for each digit. If this does not occur, disconnect power immediately and re-verify all wiring connections. Contact ONICON if the problem persists.

Operating from 120 or 240 VAC mains power

Utilize an electrically clean power line, free of electrical noise and protected from high voltage spikes, power surges, and brownouts. The power source should be a separate line with its own circuit protection device. Refer to Section 1.3 of this manual for the appropriate overcurrent device ratings. Use a 3-wire service in which one wire is a protective earth ground.



SECTION 4.0: D-100 START-UP AND COMMISSIONING

4.1 DISPLAY AND KEYPAD

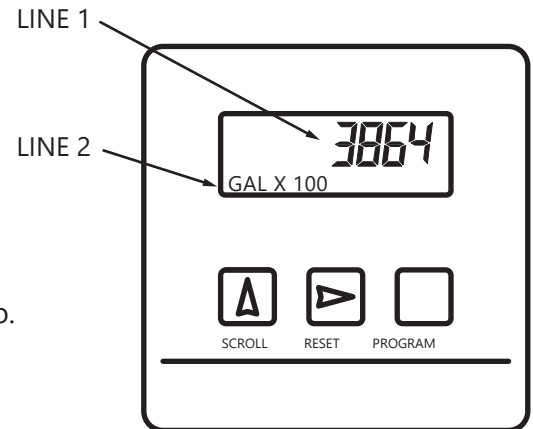
The display contains two lines of alphanumeric characters. The first line displays the numerical value of the quantity described by the second line of the display. The second line contains the engineering units and a multiplier, which can range from 1 to 1,000,000. The multiplier is the value which the number on the top line must be multiplied by to achieve the correct value.

Three membrane keys are provided to operate the display and program the meter.

When operating in the RUN mode, the SCROLL button advances the display from one page to the next. A total of up to eight different pages may be available for display depending on whether the flow meter is unidirectional or bidirectional.

The RESET button, if enabled, allows totals to be reset to zero.

The PROGRAM button is not active when operating in the RUN mode.



4.2 PROCESSOR START-UP

When power is applied to the display, alphanumeric characters appear on the two lines of the display indicating the display is operating. Press and release the SCROLL button on the front panel. Observe the display cycle to the next page.

Successively pressing the SCROLL button will cycle the display through the run mode pages summarized in the tables below.

Select the FLOW RATE page. Note the displayed flow rate. Confirm that the flow rate value is in the correct range.

Unidirectional Flow

| Page No. | Display Name | Selectable Units |
|----------|--------------------|---|
| 1 | Flow Total Ai2/Di2 | Gal, Liter, M ³ , lb mass, kg mass, Ft ³ , SCF, NCM |
| 2 | Flow Rate Ai2/Di2 | GPM, GPH, MGD, l/s, l/min, l/hr, M ³ /hr, Ft ³ /m, lb/hr, kg/hr, SCFH, SCFM, NCMH |
| 3 | Analog Input Ai3 | DEG F, DEG C, PSI, BAR, KPASCL, GPM, L/S, M3/H, CFS, CFM, KBTU/H, KW, TON, %RH, SCFM, SCFH, NCMH, None |
| 4 | Analog Input Ai4 | DEG F, DEG C, PSI, BAR, KPASCL, GPM, L/S, M3/H, CFS, CFM, KBTU/H, KW, TON, %RH, SCFM, SCFH, NCMH, None |
| 5 | Digital Input Di3 | PULSE COUNT ONLY (Engineering units entered as text) |
| 6 | Alarm Status | None |
| 7 | Serial Number | None |

Bi-directional Flow

| Page No. | Display Name | Selectable Units |
|----------|-------------------|---|
| 1 | (+) Mode 1 Total | Gal, Liter, M ³ , Ft ³ , lb mass, kg mass, SCF, NCM |
| 2 | (-) Mode 2 Total | Gal, Liter, M ³ , Ft ³ , lb mass, kg mass, SCF, NCM |
| 3 | Flow Rate Ai2/Di2 | GPM, GPH, MGD, l/s, l/min, l/hr, M ³ /hr, Ft ³ /m, lb/hr, kg/hr, SCFH, SCFM, NCMH |
| 4 | Analog Input Ai3 | DEG F, DEG C, PSI, BAR, KPASCL, GPM, L/S, M3/H, CFS, CFM, KBTU/H, KW, TON, %RH, SCFM, SCFH, NCMH, None |
| 5 | Analog Input Ai4 | DEG F, DEG C, PSI, BAR, KPASCL, GPM, L/S, M3/H, CFS, CFM, KBTU/H, KW, TON, %RH, SCFM, SCFH, NCMH, None |
| 6 | Digital Input Di3 | PULSE COUNT ONLY (Engineering units entered as text) |
| 7 | Alarm Status | None |
| 8 | Serial Number | None |

4.3 UNITS AND MULTIPLIERS

The operating mode, engineering units and multipliers are programmed into the D-100 at the factory. These settings may be re-programmed in the field. Please contact ONICON for assistance if changes are required.

4.4 ANALOG OUTPUTS

The D-100 is capable of providing up to four analog outputs (optional). Changing any of the displayed units or multipliers will affect the analog outputs. If any unit or multiplier values are changed at the D-100, the analog output value(s) will also be changed. If you are unsure of the ramifications of any changes you are contemplating, please contact ONICON for assistance.

4.5 ENABLING / DISABLING FRONT PANEL RESET

The table below explains how to enable or disable the FRONT PANEL RESET.

| STEP | ACTION | REACTION | COMMENT |
|------|---|--|--|
| 1 | With the display running, open the front panel and locate DEV ADD/PROG ENAB. Press DEV ADD/PROG ENAB and then release it. | None | DEV ADD/PROG ENAB is located in the lower left corner of the processor board. (see appendix page A-2.) |
| 2 | Close the front panel. | | |
| 3 | Press the PROGRAM button. (If you do not press the PROGRAM button, the meter will revert to the run mode after five minutes.) | The display changes to program mode and the DEVICE ID page will appear with the first digit of the address flashing. | The PROGRAM button is on the front panel. |
| 4 | Press the PROGRAM button. | The FRONT PANEL RESET page appears with the N or Y flashing. | |
| 5 | Press the SCROLL button. | The setting will toggle between N and Y. | Enable or disable the FRONT PANEL RESET as necessary. |
| 6 | Press the PROGRAM button. | The SAVE CHANGES page appears with the N flashing. | The new FRONT PANEL RESET setting must be saved to take effect. |
| 7 | Press the SCROLL button. | The N changes to Y. | The Y must be selected for the change to take effect. |
| 8 | Press the PROGRAM button. | The new setting is saved and the display reverts to the run mode. | |

4.6 COMMISSIONING

Upon initial installation, it is strongly recommended that both the D-100 and its associated flow meter be commissioned to ensure that they are properly installed and functioning correctly. This process involves verifying the mechanical installation, measuring flow signals and then comparing these measurements to the specified installation and operating parameters listed on the certificate of calibration provided with the display. The data collected during this initial commissioning process will then serve as baseline data for periodic revalidation of the meter operation.

COMMISSIONING PROCEDURE

Please read all installation instructions carefully before proceeding. Wiring diagrams are located in this manual. Use the display Certificate of Calibration to verify that the specified installation & operating parameters match the actual conditions at the location where the display is installed. A worksheet for checking these steps and recording measured values is located on the following page.



| | | |
|---|--|--|
| 1. | Confirm that the D-100 is being installed with the correct flow meter and any optional sensors. | Check the label inside the front cover of the D-100 and confirm that the serial numbers match the serial numbers of the flow meter and any optional sensors being used. |
| 2. | Confirm that the D-100 is being installed in accordance with Sections 1.5 and 3.1 of this manual. | Confirm that the installation location is not in direct sunlight and is removed from sources of strong electrical interference. The display should be mounted on a vibration-free surface where it will be protected against spraying, splashing and the seepage of water. |
| 3. | Confirm the pipe diameter and pipe material. | Confirm that the flow meter is tagged for the pipe diameter and material in which it is to be installed and that this information matches the information provided on the display certificate of calibration. When in doubt, measure the circumference of the pipe. Pipe O.D. = (circumference / 3.14) – (insulation thickness x 2) |
| 4. | Confirm that the flow meter installation conforms to the requirements specified in the flow meter installation manual. | Verify that the flow meter is installed in a location with enough straight unobstructed run upstream and downstream of the pipe. Also verify that the flow meter is properly oriented with respect to flow direction, and for insertion meters ensure that the meter is installed to the correct insertion depth. |
| 5. | Confirm that any optional sensors are properly installed. | Verify that any optional sensors connected to the D-100 are installed in accordance with the manufacturer’s installation instructions. Also confirm that the sensor output matches the information shown on the D-100 C of C. |
| 6. | Confirm that the correct supply voltage has been provided. | Verify and measure the AC input voltage to the display. Input voltages should be within the following ranges. 24 VAC: 20 – 28 VAC 24 VAC when connected to an F-3500 and the D-100 is equipped with a multi-analog board: 21.6 – 28 VAC 120 VAC: 108 - 132 VAC 230 VAC: 207 - 253 VAC |
| In order to proceed with the following steps, the display, flow meter and optional sensors must be operating and there must be flow in the pipes. Flow signal readings should be taken while holding the flow rate constant, if possible. | | |
| 7. | Select the flow rate page on the D-100 front panel display. | Scroll through the D-100 display pages and select the flow rate page. Verify that the engineering units and multiplier shown match those on the C of C. |
| 8. | Note and record the flow reading. | Note the displayed flow rate and confirm that it is within the expected range. For D-100 displays connected to flow meters with integral displays, confirm that the flow readings shown on the two displays agree. Record the flow rates. |

| | | |
|---|---|--|
| 9. | <p>For flow meters that provide a frequency output, measure and record output(s). Compare calculated vs. displayed flow rates.</p> <p>(F-1200 only). Confirm both turbines produce pulses</p> | <p>The average frequency output signal is a 0-15 VDC pulsed output ranging up to 200 Hz and must be measured with a frequency counter or oscilloscope. Measure DC Frequency (Hz) at T4 from terminal 6(+) to 7(-).</p> <p>$GPM = (\text{Frequency in Hz} \times 60) \div \text{Meter Factor in ppg (refer to calibration tag for meter factor)}$</p> <p>For the F-1200 or FB-1200 Dual Turbine model, also measure and record the top and bottom turbine signals. Top Turbine: T4-12(+) to T4-2(-) Bottom Turbine: T4-13(+) to T4-2(-)</p> <p>Also measure DC volts on same terminals. 5 to 7 VDC is normal for a spinning turbine, 0 or 14+ VDC indicates a stopped turbine. (1 to 4 VDC could indicate a problem.)</p> |
| 10. | <p>Compare and record the displayed values with those shown on the building control system.</p> | <p>Scroll through the D-100 menu pages and confirm that the rate and total current values and engineering units shown agree with the information shown on the building control system display. Record the results.</p> |
| <p>End of standard commissioning. Please contact ONICON if any questions arise.</p> | | |

COMMISSIONING WORKSHEET

Please read all installation instructions carefully prior to proceeding with these steps. Wiring diagrams are located in this manual. Use the following worksheet for checking off the commissioning steps and recording measured values.

| Step | Test/Measurement | D-100 S/N: | D-100 S/N: | D-100 S/N: |
|------|---|--|--|--|
| 1. | Confirm and record serial number(s) | Flow meter: Sensor(s): | Flow meter: Sensor(s): | Flow meter: Sensor(s): |
| 2. | Proper installation site selection (Y / N) | | | |
| 3. | Record pipe diameter | | | |
| 4. | Record number of unobstructed upstream/ downstream pipe diameters | | | |
| 5. | Sensor(s) properly installed (Y / N) | | | |
| 6. | Record supply voltages | | | |
| 7. | Verify that engineering units & multipliers match (Y/N) | | | |
| 8. | Record flow rate and total(s) | Flow rate: Mode 1 total: Mode 2 total: | Flow rate: Mode 1 total: Mode 2 total: | Flow rate: Mode 1 total: Mode 2 total: |
| 9. | Record actual and calculated values | Actual: Calculated: | Actual: Calculated: | Actual: Calculated: |
| 10. | Record displayed values | D-100: System: | D-100: System: | D-100: System: |

SECTION 5.0: DIAGNOSTICS

5.1 DIAGNOSTICS

The ONICON D-100 display is programmable. Factory programmed settings provide rate and total values in accordance with the customer's application data. Refer to the D-100 calibration sheet for a complete listing of factory settings. These settings may be reviewed and changed with assistance from ONICON factory service personnel. The display is also equipped with diagnostic indicator lights and self diagnostic test signals that confirm the operation of the microprocessor and its input circuitry. Please contact the ONICON factory service personnel if any of the diagnostic lights or test signals listed below indicates a potential problem with the operation of the Btu meter.

5.1.1 Diagnostic Lights

Low Voltage Power Supply

Located on the power supply board inside the System-10 BTU Meter (refer to page A-3), these two LEDs will be illuminated when the positive and negative five volt supplies are present.

Liquid Flow

Located just above the power supply on the motherboard (refer to page A-1) is the flow indicator LED. The LED will flash at a rate that is proportional to the liquid flow rate. An unlit LED indicates no flow signal.

5.1.2 Flow Test Signals

Located on the right side of the motherboard (refer to A-1) immediately above the power supply board is a three position slide switch used to test the flow input. When the switch is in the top position, the input is connected to the flow meter. When the switch is in the middle position, the input is connected to two test terminals used to apply a variable frequency to simulate flow. When the switch is in the bottom position, the input is connected to a 50/60 Hz signal that simulates a fixed flow rate. Refer to the calibration certificate to determine the correct display reading when operating in the 50/60 Hz test mode.

IMPORTANT NOTE

The second line of the display will alternate between TEST MODE and the normal display of engineering units and multipliers whenever the flow test switch is in the TEST or 60 Hz positions.

IMPORTANT NOTE

After operating for five minutes in either the TEST or 60 Hz mode, the displayed flow and energy rate will be disabled, and the meter will report a zero flow rate and a zero energy rate to the network. The meter will remain in this state until the switch is set to RUN.

5.1.3 Ai3 & Ai4 Test Signals

As you are facing the component side of the processor board, the Ai3/Ai4 Test push button is along the top edge of the board just to the left of the flat ribbon cable. It is labeled TEMP TEST. When pressed, a fixed current will be applied to each sensor input. Both Ai3 and Ai4 will produce an output equal to 37.5% of their programmed full scale output. This test confirms the operation of the D-100 processor board input circuitry for Ai3 and Ai4.

5.2 TROUBLESHOOTING GUIDE FOR D-100 DISPLAY

NOTE: Also refer to the COMMISSIONING GUIDE located on the preceding pages.

| Reported Problem | Possible Solutions |
|--|--|
| Flow rate is indication zero flow. (When fluid is flowing in the pipe.) | <ul style="list-style-type: none"> • Verify that the correct supply voltage is present at the flow meter power input. • Verify that the flow meter signal outputs are properly wired to the display. • For insertion meters, verify that the meter is correctly inserted and parallel with the pipe. • For turbine meters, verify that the turbines are not clogged with debris. • Re-confirm that there is really flow in the pipe. |
| Displayed flow rate is too high or too low. | <ul style="list-style-type: none"> • Verify that the serial number of the flow meter matches the serial number shown on the label inside the D-100 front cover. • Verify that the correct supply voltage is present at the flow meter power input. • Verify that the pipe diameter matches the diameter shown on the calibration certificate and on the flow meter tag. • For insertion meters, verify that the meter is correctly inserted and parallel with the pipe. • For turbine meters, verify that the turbines are not clogged with debris. |
| Ai3 and/or Ai4 sensor values are too high or too low. | <ul style="list-style-type: none"> • Verify that the sensor scaling matches that programmed values shown on the label inside the D-100 front cover and on the calibration certificate. • Confirm that the control system is correctly scaled. |
| Data is not available at the control system. | <ul style="list-style-type: none"> • Verify network addresses are properly programmed into the D-100. • If applicable, verify the Baud rate. • Check the polarity of the network connections. |

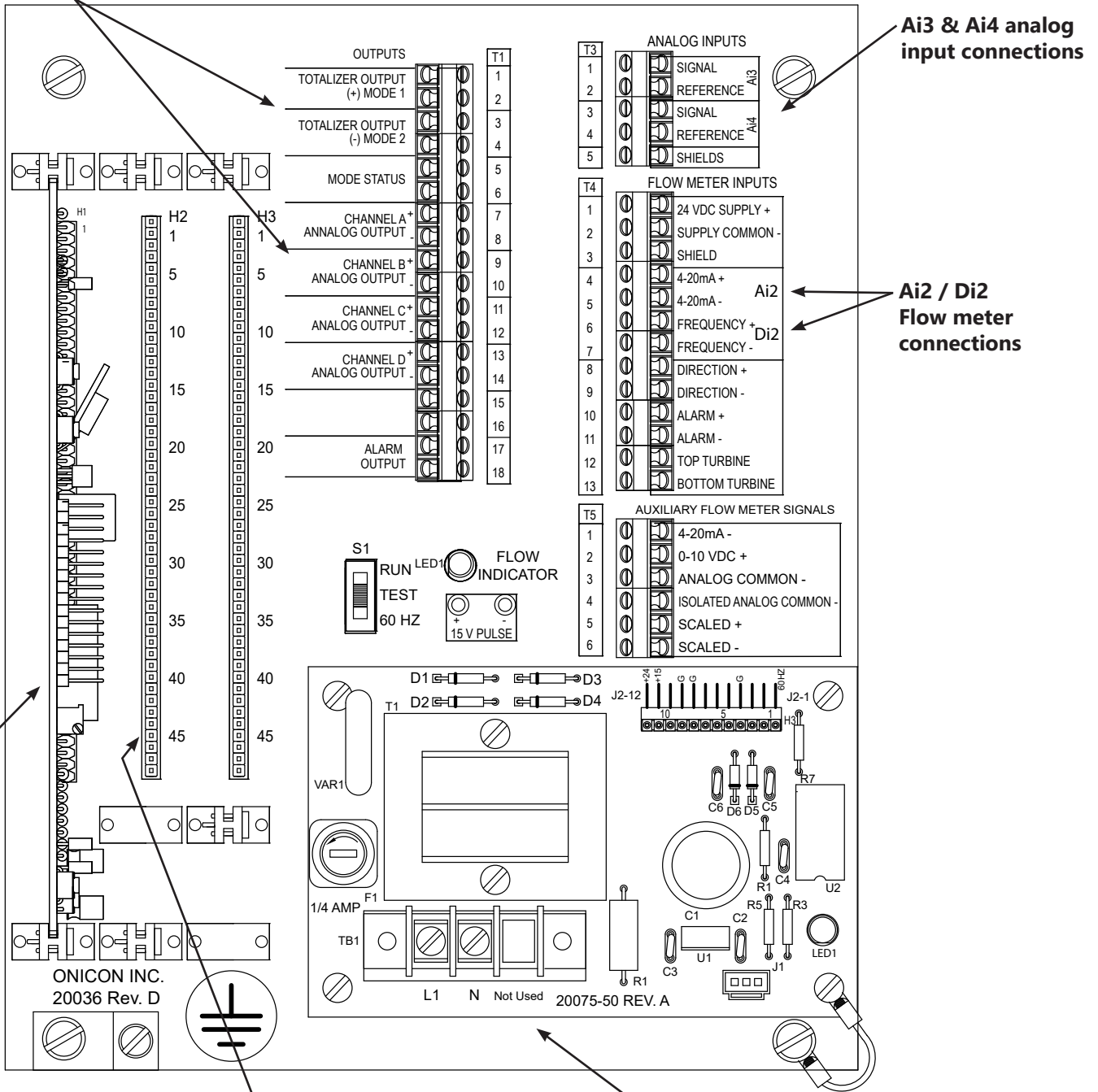
For technical assistance, contact ONICON Incorporated at (727) 447-6140.

APPENDIX

- A-1 D-100 DISPLAY MOTHER BOARD
- A-2 D-100 PROCESSOR BOARD
- A-3 D-100 POWER SUPPLY BOARD
- A-4 D-100 ANALOG OUTPUT BOARD
- A-5 D-100 ANALOG OUTPUT BOARD With 4 Analog Outputs

D-100 DISPLAY MOTHER BOARD

Pulse and analog output connections



Ai3 & Ai4 analog input connections

Ai2 / Di2 Flow meter connections

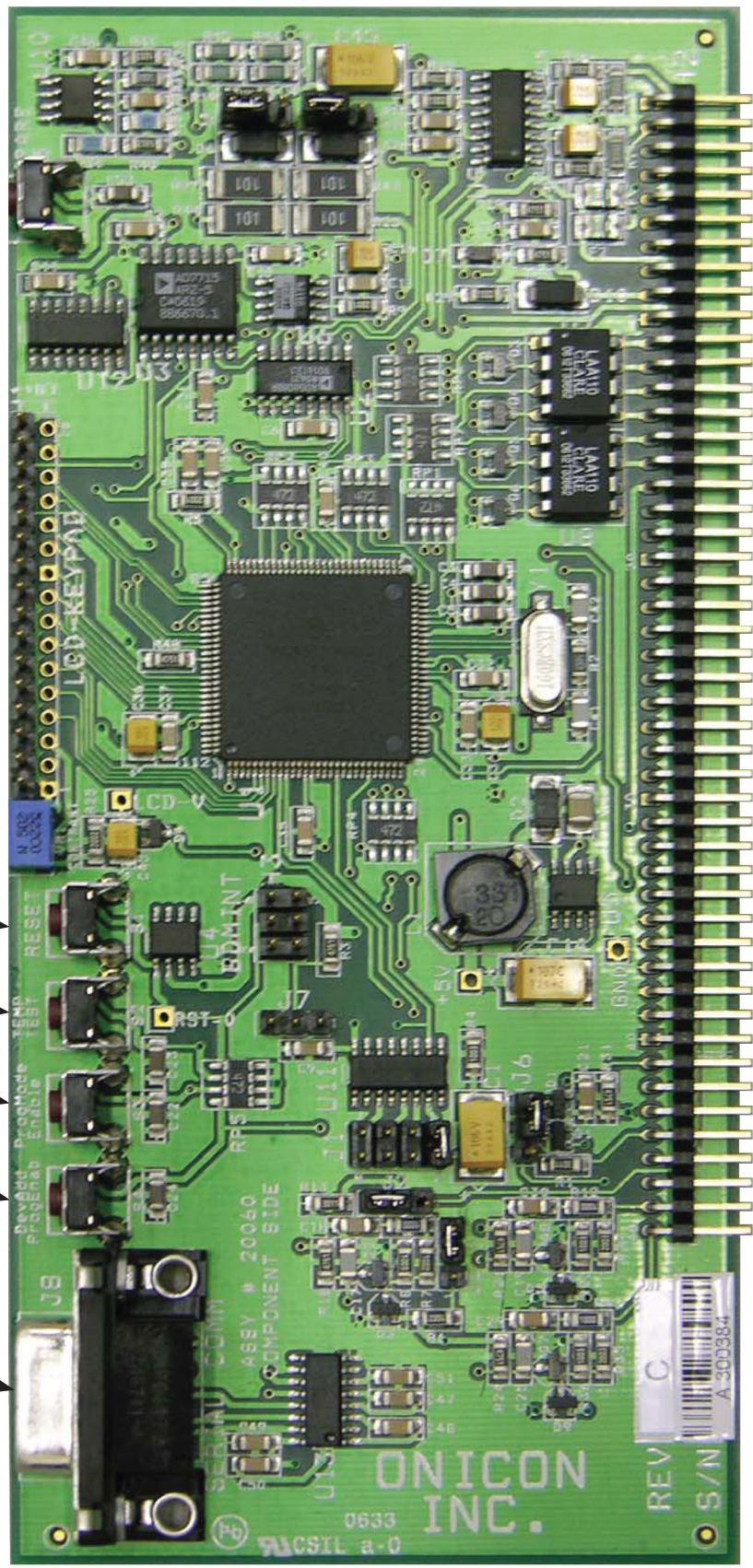
PROCESSOR BOARD

EXPANSION SLOTS FOR:
 1. COMMUNICATIONS BOARD
 2. ANALOG OUTPUT BOARD

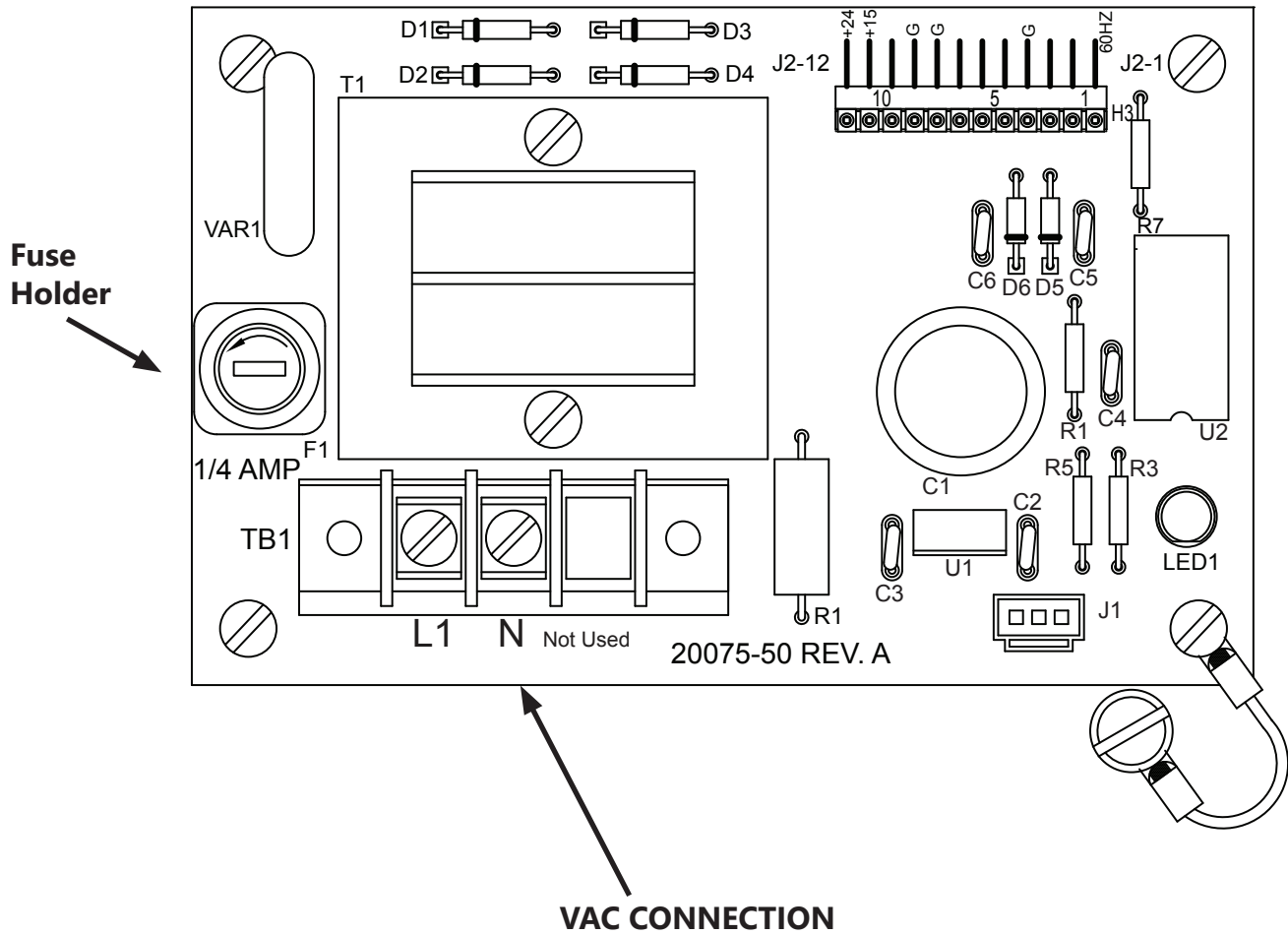
POWER SUPPLY
 *Standard: 24 VAC
 Optional: 120 or 230 VAC

D-100 FLOW DISPLAY PROCESSOR BOARD

- Reset
- Temp Test
- Prog Mode Enable
- Device Address Program Enable
- Serial Comm

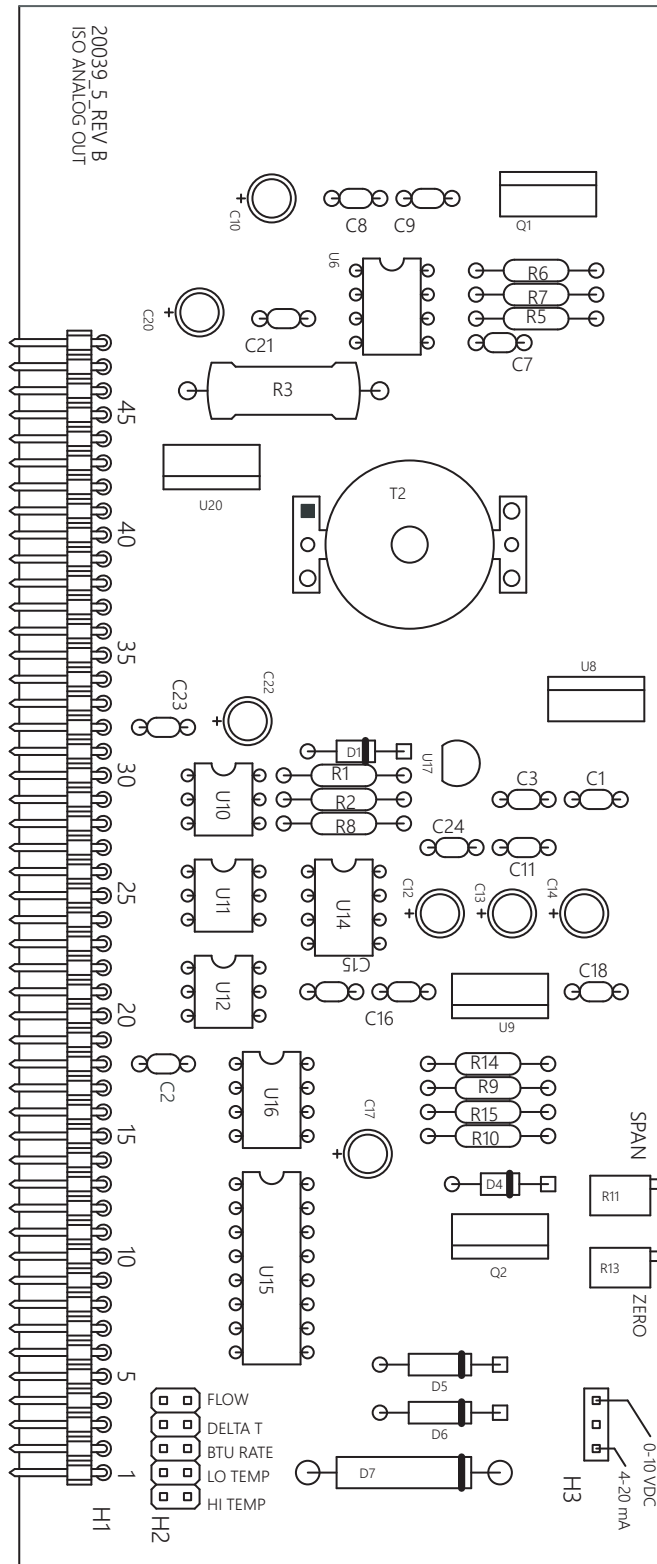


D-100 POWER SUPPLY BOARD



| FUSES | | |
|----------|----------|----------|
| 24 VAC | 120 VAC | 230 VAC |
| 3AG | 3AG | 3AG |
| 1 AMP | 1/4 AMP | 1/8 AMP |
| 250 VOLT | 250 VOLT | 250 VOLT |
| SLO-BLO | SLO-BLO | SLO-BLO |

D-100 ANALOG OUTPUT BOARD



D-100 ANALOG OUTPUT BOARD with 4 analog outputs

