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VOLUME 1

SYSTEM ARCHITECTURE AND INSTALLATION

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For Your Information

About Our Company

Measure the Difference!®

OMNI Flow Computers, Inc. is the world's leading manufacturer and supplier of panel-mount custody transfer flow computers and controllers. Our mission is to continue to achieve higher levels of customer and user satisfaction by applying the basic company values: our people, our products and productivity.

***OMNI Flow Computers** – Our products are currently being used world-wide at:*

- ☐ Offshore oil and gas production facilities
- ☐ Crude oil, refined products, LPG, NGL and gas transmission lines
- ☐ Storage, truck, and marine loading/offloading terminals
- ☐ Refineries; petrochemical and cogeneration plants

Our products have become the international flow computing standard. OMNI Flow Computers pursues a policy of product development and continuous improvement. As a result, our flow computers are considered the "brain" and "cash point" of liquid and gas flow metering systems.

Our staff is knowledgeable and professional. They represent the energy, intelligence and strength of our company, adding value to our products and services. With the customer and user in mind, we are committed to quality in everything we do, devoting our efforts to deliver workmanship of high caliber. Teamwork with uncompromising integrity is our lifestyle.

Contacting Our Corporate Headquarters

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World-wide Web Site:

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Getting User Support

Technical and Sales support is available worldwide through our corporate or authorized representative offices. If you require user support, please contact the location nearest you (see insert) or our corporate offices. Our staff and representatives will enthusiastically work with you to ensure the sound operation of your flow computer.

About the Flow Computer Applications

OMNI 6000 and OMNI 3000 Flow Computers are integral into the majority of liquid and gas flow measurement and control systems. The current firmware revisions of OMNI 6000/OMNI 3000 Flow Computers are:

- **20/24:** Turbine/Positive Displacement/Coriolis Liquid Flow Metering Systems with K Factor Linearization (US/metric units)
- **21/25:** Orifice/Differential Pressure Liquid Flow Metering Systems (US/metric units)
- **22/26:** Turbine/Positive Displacement Liquid Flow Metering Systems with Meter Factor Linearization (US/metric units)
- **23/27:** Orifice/Turbine Gas Flow Metering Systems (US/metric units)

About the User Manual

This Volume I System Architecture and installation applies to All.74+ firmware revisions of OMNI 6000 and OMNI 3000 Flow Computers.

Target Audience

As a user's reference guide, this manual is intended for a sophisticated audience with knowledge of liquid and gas flow measurement technology. Different user levels of technical know-how are considered in this manual. You need not be an expert to operate the flow computer or use certain portions of this manual. However, some flow computer features require a certain degree of expertise and/or advanced knowledge of liquid and gas flow instrumentation and electronic measurement. In general, each volume is directed towards the following users:

- Volume 1. System Architecture and Installation
  - Installers
  - System/Project Managers
  - Engineers/Programmers
  - Advanced Operators
  - Operators
- Volume 2. Basic Operation
  - All Users
- Volume 3. Configuration and Advanced Operation
  - Engineers/Programmers
  - Advanced Operators
- Volume 4. Modbus™ Database Addresses and Index Numbers
  - Engineers/Programmers
  - Advanced Operators

Manual Structure

The User Manual comprises 4 volumes; each contained in separate binding for easy manipulation. You will find a detailed table of contents at the beginning of each volume.

NOTE: User Reference Documentation – The User Manual is structured into four volumes. Volumes 1 and 2 are generic to all flow computer application revisions. Volumes 3 and 4 are application specific. These have four versions each, published in separate documents; i.e., one per application revision per volume. You will receive the version that corresponds to your application revision.

Volume 1. System Architecture and Installation

Volume 1 is generic to all applications and considers both US and metric units. This volume describes:

- Basic hardware/software features
- Installation practices
- Calibration procedures
- Flow computer specifications

Volume 2. Basic Operation

Volume 2 is application specific and is available in four separate versions (one for each application revision). It covers the essential and routine tasks and procedures that may be performed by the flow computer operator. Both US and metric units are considered.

General computer-related features are described, such as:

- Overview of keypad functions
- Adjusting the display
- Clearing and viewing alarms
- Computer totalizing
- Printing and customizing reports

The application-related topics may include:

- Batching operations
- Proving functions
- PID control functions
- Audit trail
- Other application specific functions

Depending on your application, some of these topics may not be included in your specific documentation. An index of display variables and corresponding key press sequences that are specific to your application are listed at the end of each version of this volume.

Volume 3. Configuration and Advanced Operation

Volume 3 is intended for the advanced user. It refers to application specific topics and is available in four separate versions (one for each application revision). This volume covers:

- Application overview
- Flow computer configuration data entry
- User-programmable functions
- Modbus™ Protocol implementation

Flow equations and algorithms

Volume 4. Modbus™ Database Addresses and Index Numbers

Volume 4 is intended for the system programmer (advanced user). It comprises a descriptive list of database point assignments in numerical order, within our firmware. This volume is application specific, for which there is one version per application revision.

NOTE: Manual Updates and Technical Bulletins – You can view and print the latest Manuals and Technical Bulletins from our website: **http://www.omniflow.com**

The website provides technical bulletins that contain important complementary information about your flow computer hardware and software. Each bulletin covers a topic that may be generic to all applications or specific to a particular revision. They include product updates, theoretical descriptions, technical specifications, procedures, and other information of interest.

Trademark References

The following are trademarks of OMNI Flow Computers, Inc.:

- OMNI 3000
- OMNI 6000
- OMNICOM®

Other brand, product and company names that appear in this manual are trademarks of their respective owners.

Copyright Information and Modifications Policy

Warranty, Licenses and Product Registration

Product warranty and licenses for use of OMNI Flow Computer firmware and of OMNICOM Configuration PC Software are included in the first pages of each Volume of this manual. We require that you read this information before using your OMNI Flow Computer and the supplied software and documentation.

If you have not done so already, please complete and return to us the product registration form included with your flow computer. We need this information for warranty purposes, to render you technical support and serve you in future upgrades. Registered users will also receive important updates and information about their flow computer and metering system.

Chapter 1

1. Overview of Hardware and Software Features

1.1. Introduction

BASIC FEATURES - OMNI flow computers are applicable to liquid and gas flow measurement, control and communication systems, and custody transfer operations. It's basic features are:

- 32-bit processing, multi-tasking execution
- 500 mSec calculation cycle
- Plug-in, assignable digital, serial and combination I/O modules
- Point-to-point digital transmitter interface
- 14-bit A/Ds, temperature trimmed
- No I/O multiplexers, no potentiometers
- Photo-optical Isolation of each I/O point
- Meter pulse fidelity checking
- Honeywell and Rosemount digital transmitter interface modules
- HART digital transmitter interface modules
- Ethernet communications module
- Dual LEDs indicate active/fused digital I/O
- Selectable digital I/O, individually fused
- Standard, field-proven firmware - no need for custom programming
- User-configurable control logic
- Up to 4 flow/pressure control loops
- User-configurable variables for displays and reports
- Data archive and report storage
- Modbus™ peer-to-peer communications to 38.4kbps for PLC/DCS
- Real-time dial-up for diagnostics
- International testing
- Includes OMNICOM® configuration software

Three year warranty

OMNI 3000™ and OMNI 6000™ Flow Computers are reliable, easy to use, uniquely versatile measurement instruments. They are factory-programmed for single or multiple meter run configurations to measure crude oils, refined products, NGLs, LPGs, Ethylene, Propylene, Natural gas, and Specialty gases. Measurement of other flowing products can also be provided.

Extensive communications capability enables the OMNI 6000 to be used in a variety of Master/Slave configurations for high-speed data transfer applications, and as a large communication sub-master. The flow computer can also be hardware configured as a medium-size Remote Terminal Unit (RTU) with significant digital I/O capability.

Your OMNI Flow Computer connects to various sensors monitoring pipeline flow in your transmission, petrochemical or process measurement application. It calculates, displays, and prints data that will be used for operational or billing functions.

The computer is configured to match your piping system requirements. Its non-restrictive bus design permits any combination of inputs and outputs to meet most metering, flow and valve control, and communication requirements.

Plug-in modules furnish the input and output channels as needed and provide an assurance of maximum product life by higher accuracy measurement technologies such as meter pulse fidelity checking, Rosemount and Honeywell™ digital transmitter interface modules, and HART interface modules. Up to 4-6 serial ports in some models are available for printing reports and other communications tasks along with an Ethernet module that can support up to 8 simultaneous connections. All I/O modules are quality tested and temperature trimmed to optimize the 14-bit analog resolution, and burned-in before shipment for field installation.

1.2. Operator's Panel

The operator's panel shown (Figure. 1) is standard for all applications and is used to display and enter all data. All data can also be accessed via any of the serial ports.

1.2.1. LCD Display

The 4-line by 20-alpha-numeric character, back-lit Liquid Crystal Display is updated every 200 ms. It displays all messages and system variables in English language engineering units. Backlighting and display viewing angle are adjustable from the keypad (press **[Setup]** then **[Display]** and follow the displayed instructions).

1.2.2. Electromechanical Totalizers

Three non-resetable, 6-digit electromechanical counters are included on the front panel for non-volatile backup totalizing. They can be programmed to count gross, net, mass or energy units at any rate up to 10 counts per second.

1.2.3. Diagnostic and Program LEDs

These dual-color LEDs indicate when the user is in the Diagnostic Mode calibrating the I/O modules, or when in the Program Mode changing the configuration of the computer. The LEDs change from green to red after a valid password is requested and entered. The computer is in the normal Display Mode when neither of these LEDs are on.

1.2.4. Active Alarm LED

New unacknowledged alarms cause this LED to glow red. This changes to green as soon as the alarm is acknowledged by pressing the **[Cancel/Ack]** key on the keypad.

1.2.5. Alpha Shift LED

This LED glows green to show that the next key only will be shifted. A red LED indicates that the shift lock is on.

NOTE: Pressing the **[Alpha Shift]** key twice will put the shift lock on. The shift lock is canceled by pressing one more time or automatically after the **[Display/Enter]** key is pressed.

Help System - These computers are equipped with a powerful context-sensitive help system. Press the **[Help]** key (bottom right) twice to activate the help displays. Cancel the help screens by pressing the **[Prog]** key

1.2.6. Operator Keypad

Control of the flow computer is via the 34-button alphanumeric membrane keypad (Figure 1), with tactile domes and audio feedback. Through the keypad you have the capability to configure your system, access and modify calibration data on-line, and view or print process data. Configuration data can also be entered remotely by serial port and is stored in battery backed-up CMOS SRAM memory. Passwords and an internal program inhibit switch provide tamper-proof security.

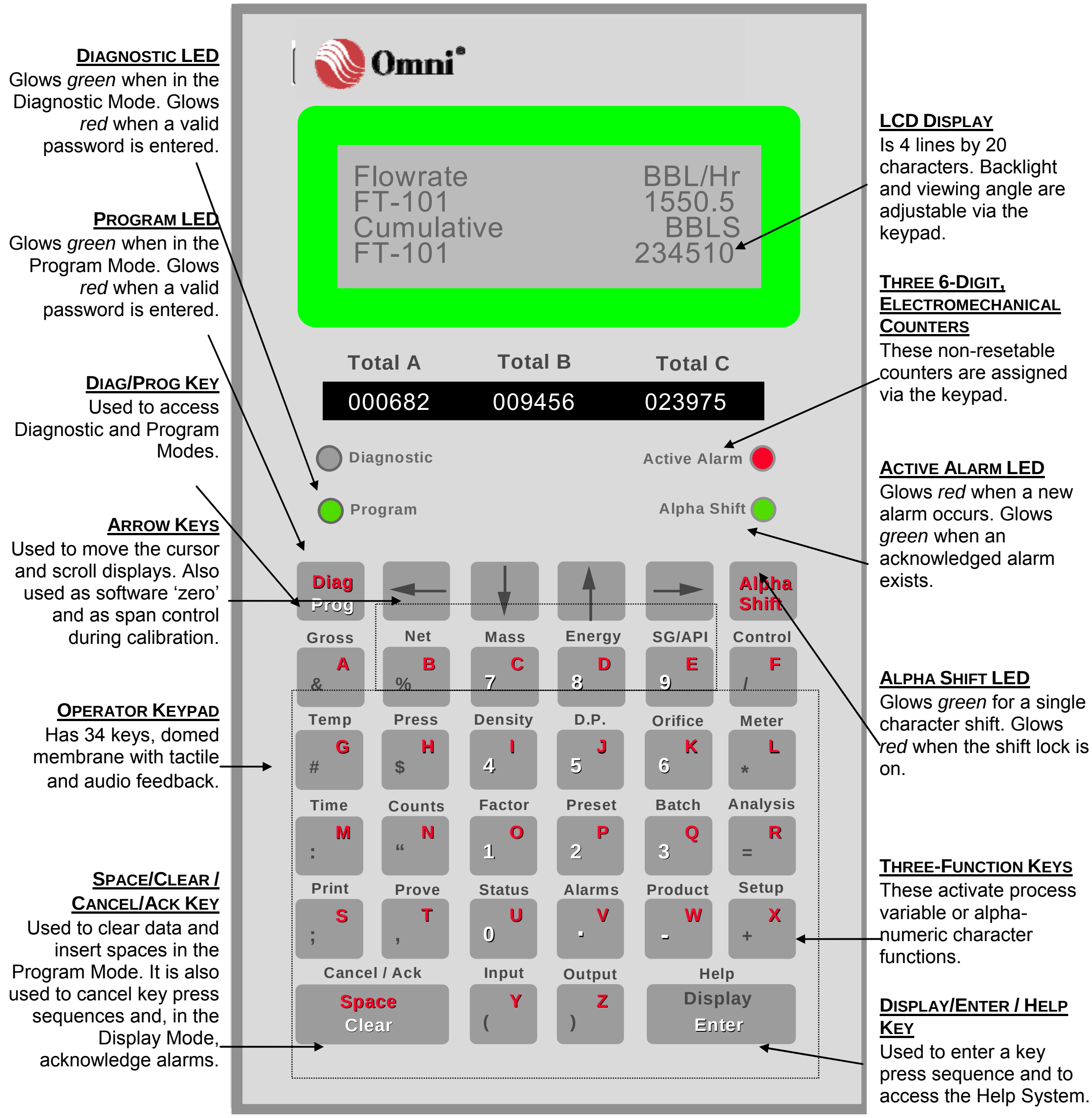


Figure 1. OMNI Front Panel

1.3. Passive Backplane Mother Boards

NOTE: Passive backplane simply means that no active circuitry is contained on it. The active circuitry is contained on the modules that plug into it.

Mounted on the passive backplane are DIN standard connectors which are bussed in two sections. The front section is a high performance, 16-bit bus which accepts the Central Processor Module.

The rear 8-bit I/O bus section comprises 10 connectors on the OMNI 6000 and 4 on the OMNI 3000, which can accept any type of I/O module manufactured by OMNI. The rearmost connector on both computers accepts the system AC/DC power supply module. Dual ribbon cable assemblies (OMNI 6000) and a single ribbon cable (OMNI 3000) connect the I/O connectors on the backplane to the back panel terminals (Figures 2 and 3).

CAUTION: These units have an integral cabinet latching mechanism which first must be disengaged by lifting the bezel upwards, before withdrawing the unit from the case

NOTE: This unit shows a typical 3000-1D-1S-2A model (Figure 2). Users can remove either an I/O or digital module so as to add an extra Serial I/O or a Serial/Ethernet module. When adding an extra serial I/O module, decide which card can be removed and install the new module into that slot. Note: That the back panel terminal wiring changes to accommodate for the addition of the new module.

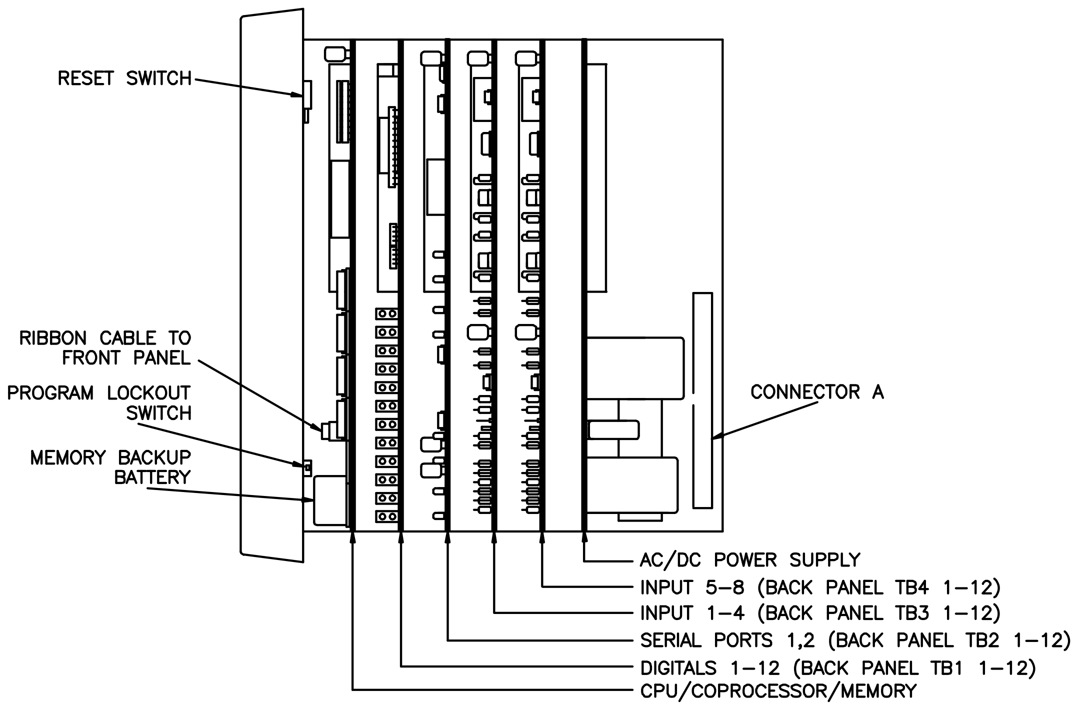


Figure 2. OMNI 3000 Mother Board

Figure 3 shows a typical OMNI 6000-2D-2S-6A model and lists the associated back panel terminal blocks which are associated with the wiring of that I/O module to the back panel. Users can remove or add additional I/O modules by placing the new I/O module into an empty or previously occupied slot, making sure you note the correct back panel wiring required for the new I/O module.

CAUTION: These units have an integral cabinet latching mechanism which first must be disengaged by lifting the bezel upwards, before withdrawing the unit from the case.

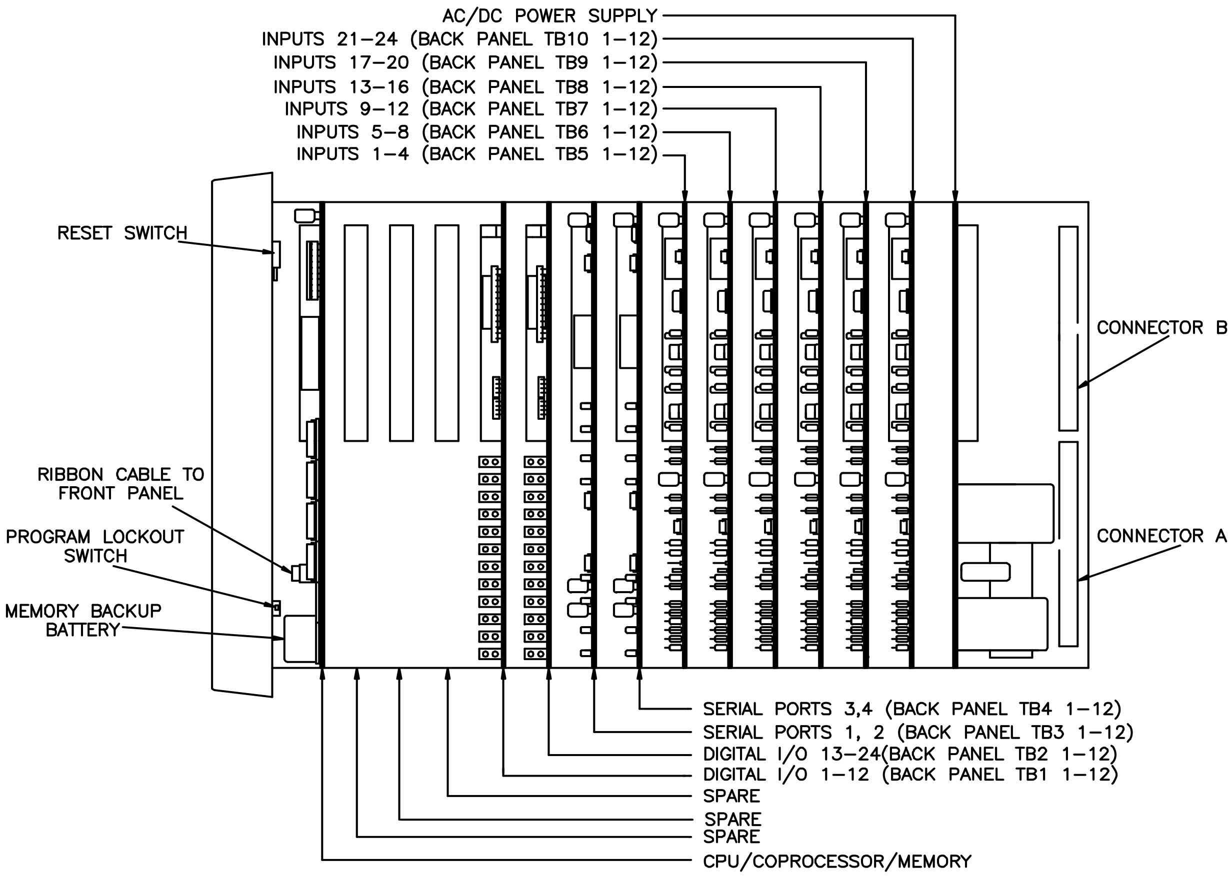


Figure 3. OMNI 6000 Mother Board

1.4. Back Panel Terminal Board

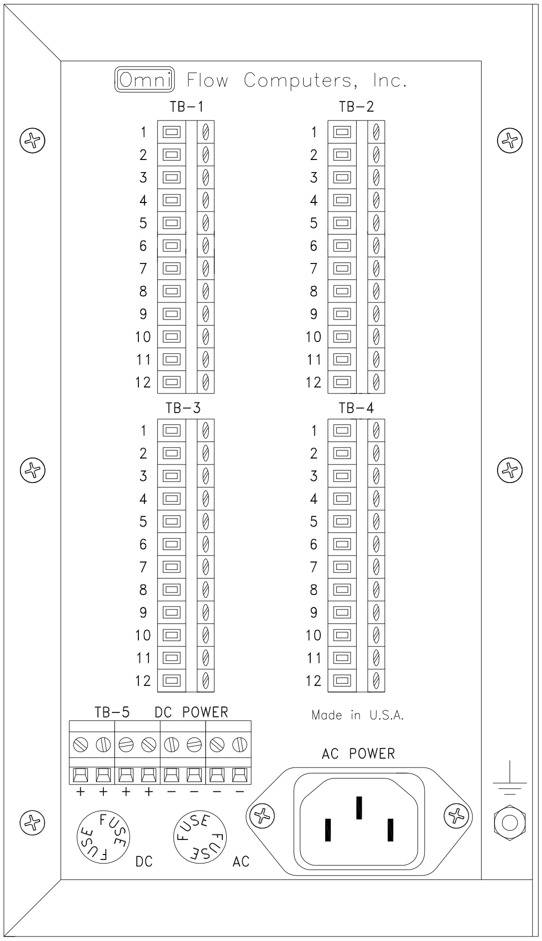
All signal I/O terminals and power connector/terminals are available on the Back Panel. The AC power receptacle of the OMNI 6000 and OMNI 3000 Back Panel is an IEC 60320 C14 power inlet connector assembly with an integral line-filter. The DC power connector is a screw type terminal block. Both AC and DC fuse holders are also mounted on the Back Panel for easy access. For detailed power requirements refer to Input Power (Section 3.2).

1.4.1. Signal I/O Terminations

The OMNI 3000 terminal blocks are identified as TB1 through TB4, with terminals marked 1 through 12 for each block. These provide 48 circuit paths to the passive backplane. Each terminal block corresponds to the I/O module slot on the Mother Board. The DC terminals are on TB5 marked plus (+) and minus (-) (Figure 4).

The OMNI 6000 terminal blocks are identified TB1 through TB10 with terminals marked 1 through 12 for each block. These provide 120 circuit paths to the passive backplane. Each terminal block corresponds to the I/O module slot on the Mother Board. The DC terminals are on TB11 marked plus (+) and minus (-) (Figure 4).

NOTE: For detailed power requirements including fuse type, rating and part numbers, refer to Input Power (Section 3.2).



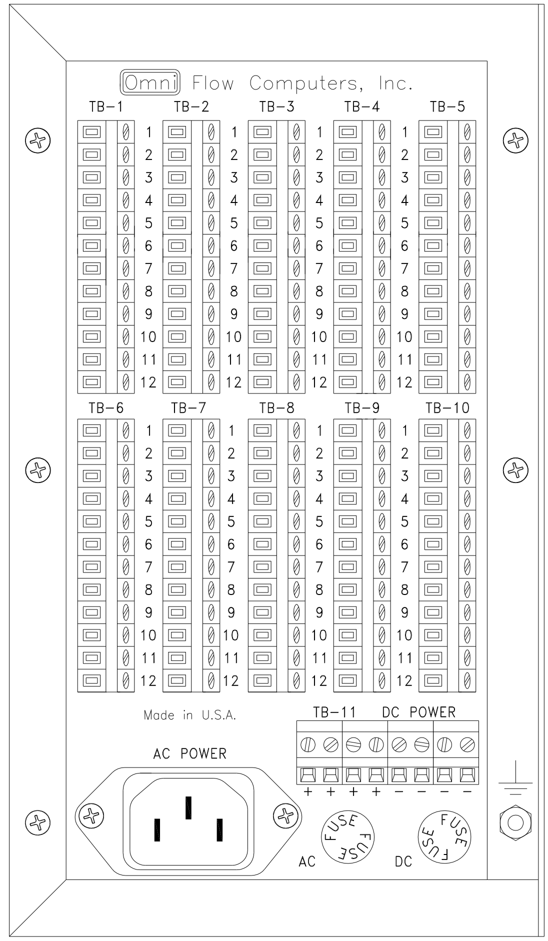


Figure 4. OMNI 3000 and 6000 Back Panel

1.4.2. Extended Back Panel

Several flow computer mounting options are available with the extended back panel. Screw type terminals are provided for AC and DC power. Extended 64-conductor ribbon cables and the AC cables are provided with a standard length of 5 feet.

The OMNI 6000, panel incorporates terminal blocks TB1 through TB10, with terminals marked 1 through 12 and extra DC (fused), return and shield terminals are provided for TB1 through TB8.

NOTE: For detailed power requirements including fuse type, rating and part numbers, refer to Input Power (Section 3.2).

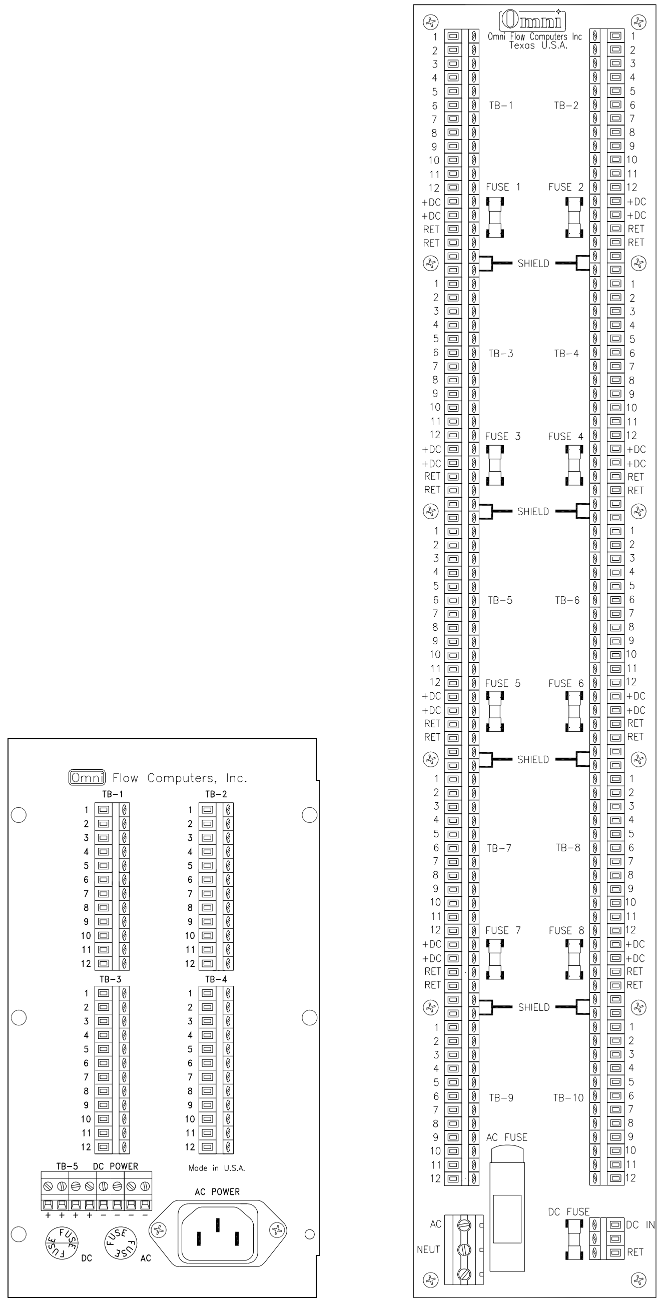


Figure 5. OMNI 3000 and 6000 Extended Back Panel

1.5. 68-6001 CPU Module

This Central Processor Module contains a 16/32-bit microprocessor operating at 16 MHz, a maximum of 512k bytes of SRAM memory, 1M byte of EPROM program memory, math coprocessor and time of day clock (Figure 6). Positions U3 and U4 on the CPU are the EPROMs which contain the application firmware. The hardware real-time clock will continue to operate even when power loss to the computer occurs. Time of power failure is logged and printed when power is restored (Figure 12).

CAUTION Potential for Data Loss! RAM Battery Backup - OMNI Flow Computers leave the factory with a fully charged NiMH battery as RAM power backup. RAM data, including user configuration and I/O calibration data, may be lost if the flow computer is disconnected from external power for more than 30 days. Observe caution when storing the flow computer without power being applied for extended periods of time. The RAM back-up battery is rechargeable and will fully charge after power has been applied for 24 hours.

Operators requiring system RAM reset must go through the Front Panel controls to reset all RAM. Press 'Prog', 'Setup', and 'Enter', keys, Press 'Enter' again, and 'Enter', one more time. This will now place you at the Privileged Password entry. Enter your privileged password. With the Program LED red, use the down arrow key and scroll down in the menu and find the Reset All RAM entry. Place the cursor on this entry and press Alpha Shift, 'Y' and enter. The OMNI will reset and the LCD will display "RAM invalid use OMNI as password…." Proceed to enter OMNI as the password then download your configuration using OMNICOM.

This procedure if followed correctly, will allow the user to protect the calibration points for the I/O and meter totalizers.

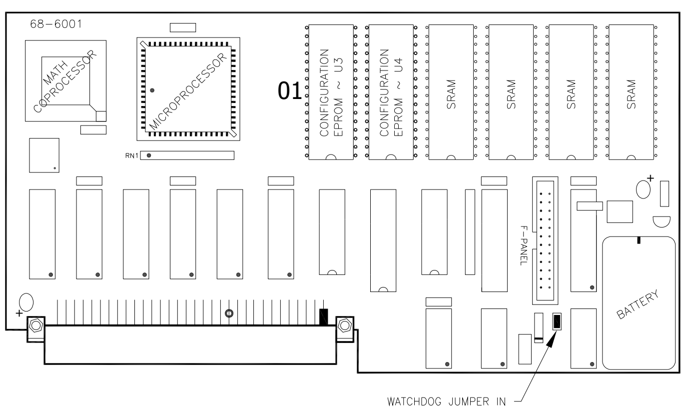


Figure 6. 68-6001 CPU Module

1.6. 68-6001 CPU Module with SMT RAM

CAUTION: Potential for Data Loss! RAM Battery Backup - OMNI flow computers leave the factory with a fully charged NiMH battery as RAM power backup. RAM data, including user configuration and I/O calibration data, may be lost if the flow computer is disconnected from external power for more than 30 days. Observe caution when storing the flow computer without power being applied for extended periods of time. The RAM back-up battery is rechargeable and will fully charge after power has been applied for 24 hours.

These two alternate CPU modules are equipped with Surface Mount Technology for the RAM area. One CPU module with a daughter board containing U3 and U4 EPROM's, along with the surface mount RAM (Figure 7). The second version eliminates the daughter board placing both EPROMs and SRAM directly onto the CPU (Figure 8).

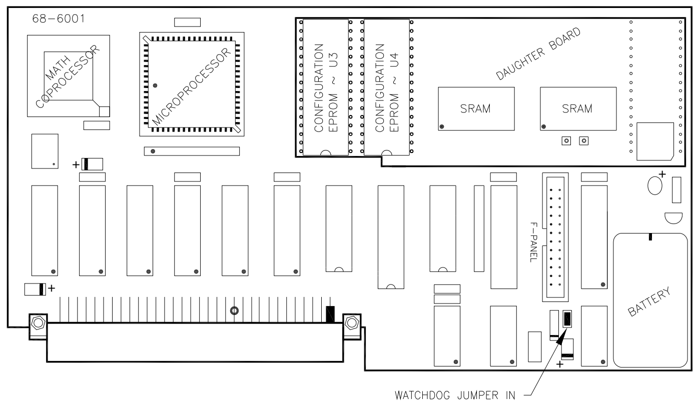


Figure 7. 6001 CPU Module with Daughter Board

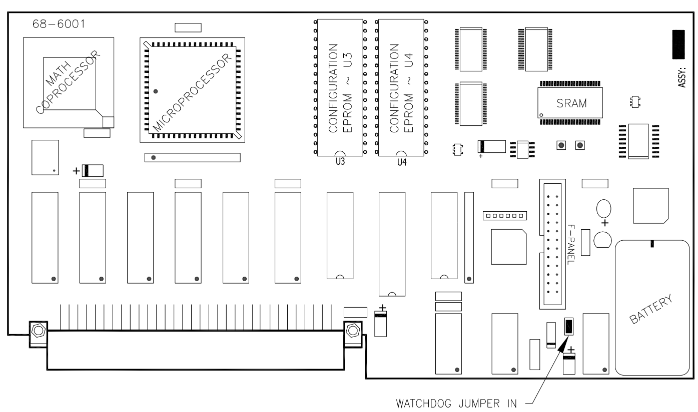


Figure 8. 6001 CPU with SMT RAM

1.7. 68-6201 CPU Module

This CPU Module contains an updated processor, faster clock and additional code and data memory space. The EPROM sockets have been replaced by Flash memory to hold the application firmware (Figure 9).

CAUTION: Potential for Data Loss! RAM Battery Backup - OMNI flow computers leave the factory with a fully charged NiMH battery as RAM power backup. RAM data, including user configuration and I/O calibration data, may be lost if the flow computer is disconnected from external power for more than 30 days. Observe caution when storing the flow computer without power being applied for extended periods of time. The RAM back-up battery is rechargeable and will fully charge after power has been applied for 24 hours.

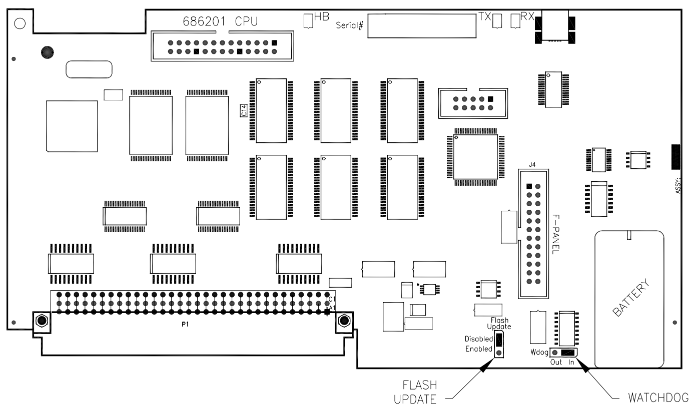


Figure 9. 6201 CPU Module

CPU Jumper Settings:

FLASH UPDATE

Enabled – position for updating the Flash memory

Disabled – position for Normal Operation

WATCHDOG

Out – for Factory use only

In – for Normal Operation

Refer to Technical Bulletins; Reflashing 68-6201 CPU 52-0000-0016 (080002) or OMNI 68-6201 CPU 52-0000-0015 (071201) for additional detail.

Input/Output (I/O) Modules

OMNI Flow Computers utilize an I/O bus system. All I/O is modular and plug-in for easy field maintenance and replacement. I/O circuitry is also photo-optically isolated from all field wiring which makes it relatively immune to electrical noise and prevents damage to the electronics.

Your OMNI Flow Computer has a combination of different types of I/O modules:

- Digital (D) I/O Modules
- Serial (S) Modules
- Ethernet Modules
- A and B Type Combo Modules
- E and E/D Type Combo Modules
- H and HV Type Combo Modules
- HART (HT and HM) Type Combo Modules

- SV Type Combo Modules

Almost any combination of I/O mix can be accommodated in the flow computer. The only limitations are the number of I/O connectors (4 on OMNI 3000, 10 on OMNI 6000) and the number of wires connecting them to the back panel field wiring terminals (48 for OMNI 3000, 120 for OMNI 6000).

The OMNI Flow Computer has a standard order in which the modules are plugged into the Mother Board. Figures 2, 3, and 10 indicate this standard termination layout.

NOTE: Mother board connectors do not have a specific address. These are pre-established at the factory. Each OMNI Flow Computer will be supplied with a termination diagram (Figure 15) indicating these settings.

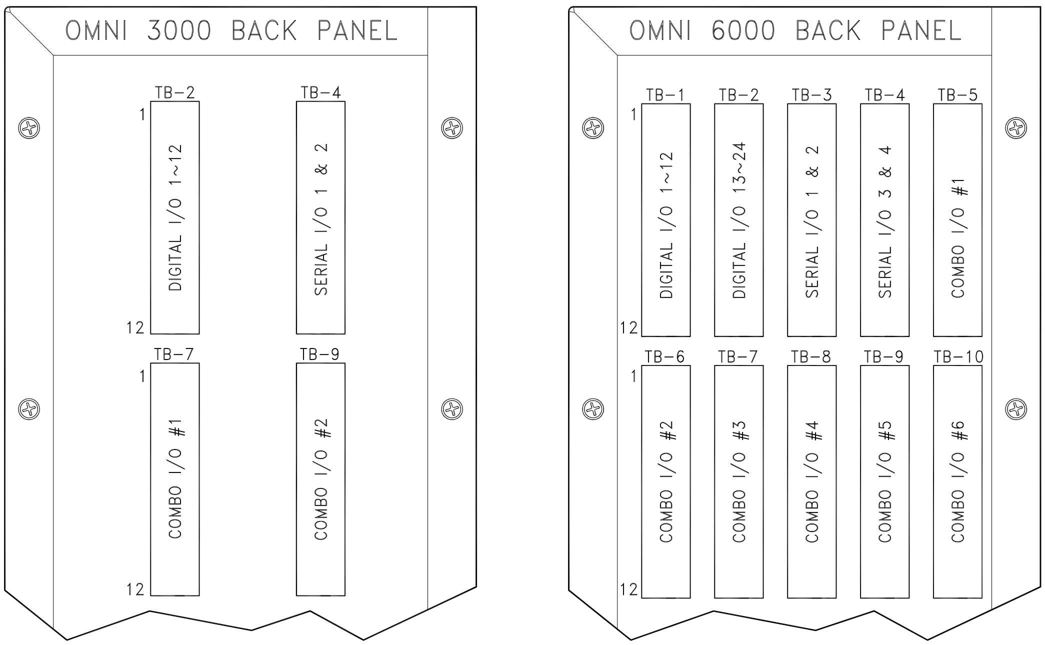


Figure 10. Matching the I/O Modules to the Back Panel Terminations

1.7.1. Photo-Optical Isolation

The microprocessor circuitry is isolated via photo-optical devices (Figure 16) from all field wiring to prevent accidental damage to the electronics, including that caused by static electricity. Photo-optical isolation also inhibits electrical noise from inducing measurement errors. Independent isolation of each process input provides high common-mode rejection, allowing the user greater freedom when wiring transmitter loops. Furthermore, it minimizes ground loop effects and isolates and protects your flow computer from pipeline EMI and transients.

NOTE: Photo-Optical Isolation: Transducer signals are converted by the LED into high frequency pulses of light. These are sensed by the photo-transistor which passes the signal to the flow computer. Note that no electrical connection exists between the transducers and the computer circuits.

1.7.2. Digital I/O Modules

NOTE: Some Digital I/O modules have 12 replaceable fuses; one fuse for each I/O point. Other modules have electronic fuses that are tripped when overloaded. They are automatically reset when the fault condition is removed.

Digital I/O modules provide inputs and outputs to control Provers, Samplers, Injection pumps, and also provide remote totalizing. Each digital module supplies 12 digital I/O points and each point may be configured as an input or output. The OMNI 6000 can have a maximum of two digital modules resulting in 24 digital I/O points. The OMNI 3000 normally has one digital I/O Module. Earlier Digital I/O Modules have twelve ¼ amp fuses; one fuse for each I/O point. Recent SMT (Surface Mount Technology) modules have circuitry for each channel trips if overloaded and automatically resets when the overload is removed (Figure 11).

NOTE: If using a D1 and a D2 module, make sure jumper JP1 is removed from the D2 module.

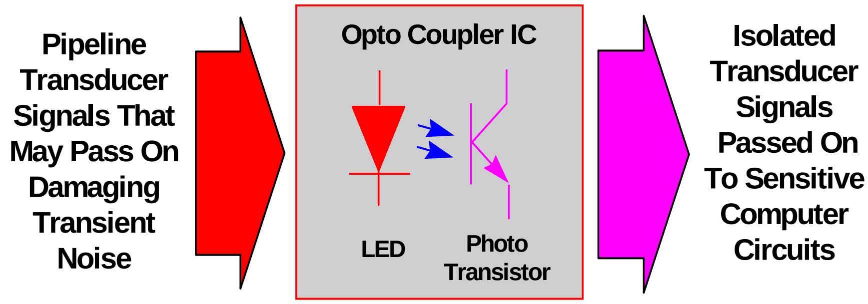


Figure 11. Photo-Optical Isolation

NOTE: **I/O Point LEDs:** Along the edge of the Digital I/O module are 12 pairs of LEDs When a green LED is illuminated, the I/O point is active and either receiving or sending pulses. The other LED is white in appearance but illuminates red. A red LED indicates that either a fuse is blown, on earlier modules or the I/O point is detecting an incorrect input or output.

IRQ, (Interrupt request) jumpers are provided on digital I/O modules for interfacing to pipe prover detector switches. This feature applies only to liquid measurement applications.

These jumpers are only used to configure digital I/O point 1 or digital I/O point 2 on module D1. All IRQ jumpers should be removed from D2 if a D2 module is installed (Figure 17).

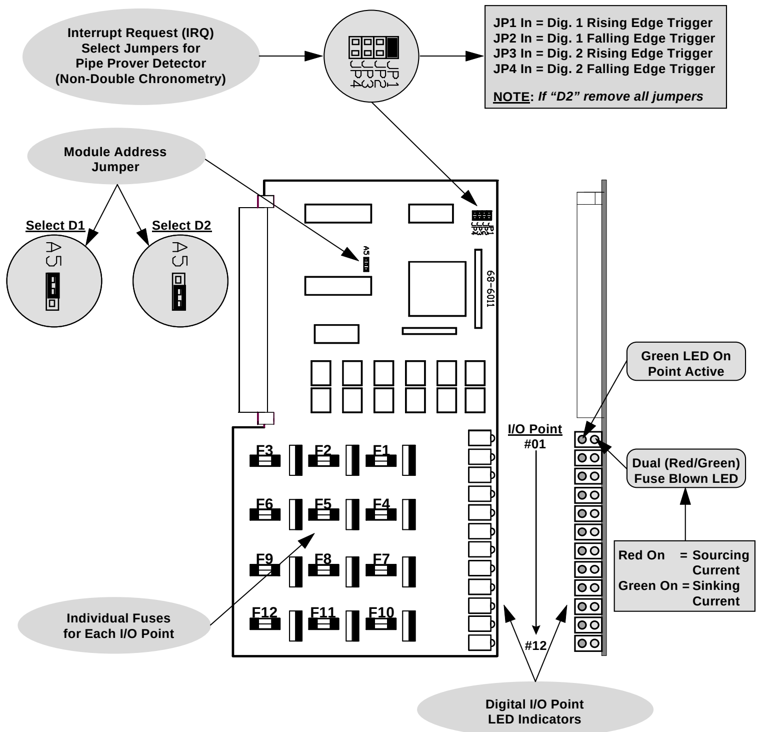


Figure 12. Digital I/O Module Model # 6011

SMT Digital Module (68-6211)

This current version of the Digital Module 68-6211 (Figure 13 and 14) has the same number of digital I/O points available as the 68-6011 module (Figure 18). The only difference is that SMT (Surface Mount Technology) modules have circuitry for each channel that trips when overloaded. They automatically reset when the overload is removed.

An address jumper on the module allows the user to configure as either a D1 or D2 module.

NOTE: If using both a D1 and D2 module make sure the jumpers JP1 and JP2 on the D2 module are removed.

I/O Point LEDs: Along the edge of the digital I/O module are 12 pairs of LEDs When a green LED is illuminated, the I/O point is active and either receiving or sending pulses. The other LED is white in appearance but illuminates red. A red LED indicates that either a fuse is blown, on earlier modules or the I/O point is detecting an incorrect input or output.

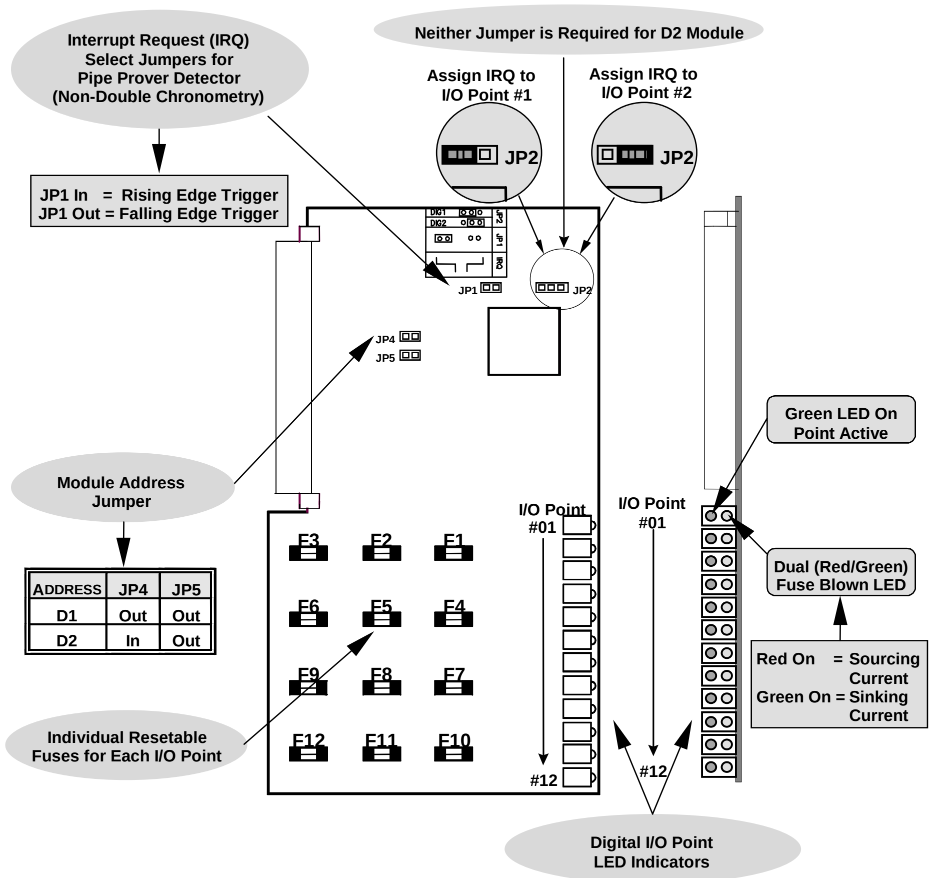


Figure 13. SMT Digital I/O Module # 6211

1.7.3. Serial Communication Modules

NOTE: Up to 12 flow computers and/or other compatible serial devices can be multi-dropped using OMNI's proprietary RS-232-C serial port. Sixteen devices may be connected when using the RS-485 2-wire mode and 32 devices can be connected when using RS-485 4 wire mode. Typically, one serial I/O module is used on the OMNI 3000, providing two ports. A maximum of three serial modules can be installed in the OMNI 6000, providing six ports.

Multivariable Transmitting Devices - In addition to the Serial I/O Module # 68-6205, the flow computer must also have an SV Module to communicate with multivariable transmitters. **This serial module must be jumpered to use IRQ 3 when used in combination with an SV Module. Without an SV Module, the jumper is placed in the IRQ 2 position.** The SV Module can only be used with this serial module (68-6205) and is not compatible with the Serial I/O Module # 68-6005.

RS-232/485 Serial I/O Module Model # 68-6205

Serial I/O Module # 68-6205 is capable of handling two communications ports Each serial communication port is individually optically isolated for maximum common-mode and noise rejection (Figure 19). Although providing RS-232C signal levels, the tri-state output design allows multiple flow computers to share one serial link. Communication parameters such as baud rate, stop bits and parity settings are software selectable.

In addition to RS-232, jumper selections have been provided on each port to allow selection of RS-485 format. With this option, a total of two RS-485 ports are available on each module.

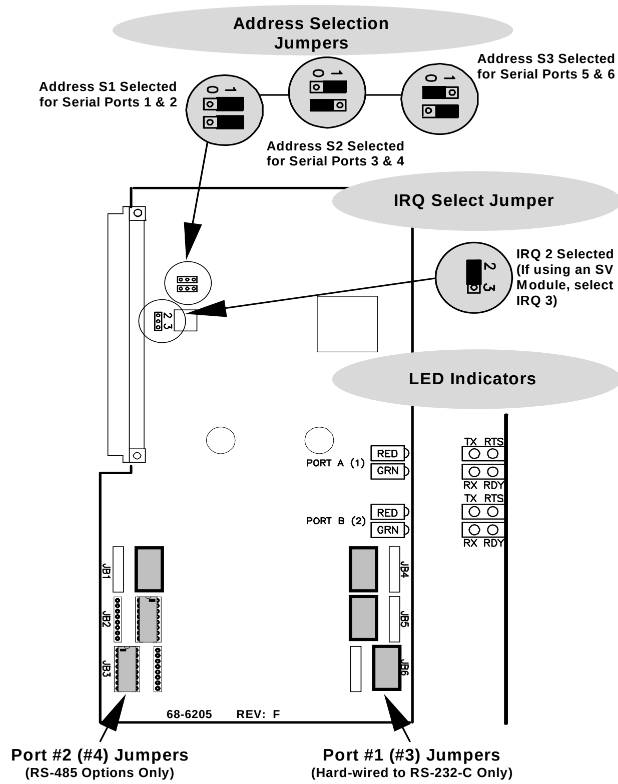


Figure 14. Model 68-6205 Jumper and Termination Resistor Packs

The RS-232/485 Module has been designed so that RS-232 or RS-485 communications standards can be selected by placement of 16-pin resistor networks into the correct blocks. Figure 20 shows the locations of blocks JB4, JB5, JB6 for Port #1, and JB1, JB2, JB3 for Port #2 for each format. Note that the label settings in use are actually covered up by the resistor networks.

NOTE: Terminated/Non-terminated RS-485 - The RS-485 devices located at each extreme end of an RS-485 run should be terminated. Note that the device located at an extreme end may or may not be an OMNI Flow Computer.

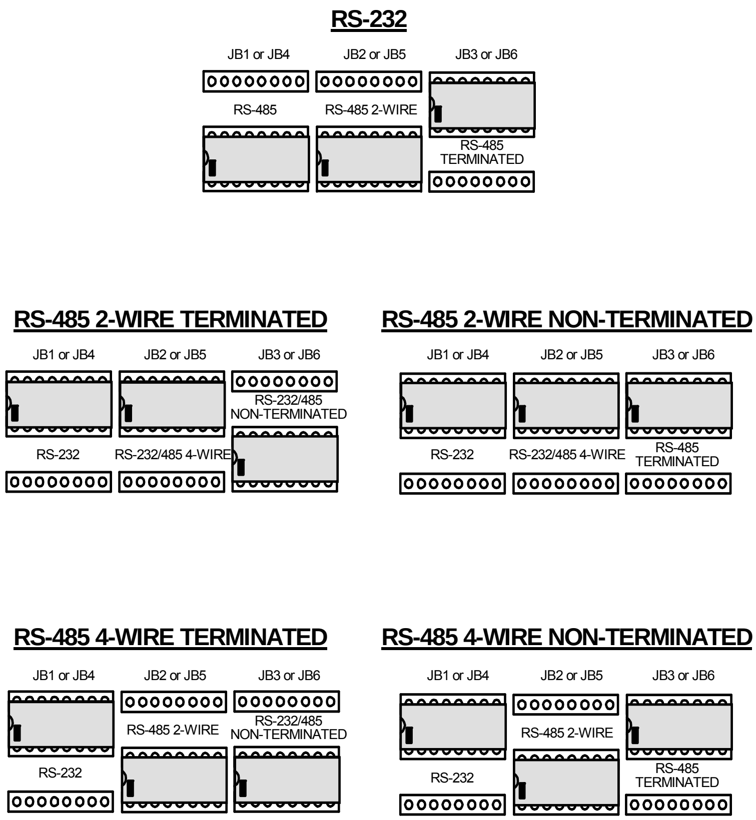


Figure 15. Layout of Jumper Blocks

Table 1. Back Panel Wiring of the RS 232/485 Module # 68-6205

	Back Panel I/O Terminal	RS-232-C	RS-485 2-Wire	RS-485 4-Wire
First Serial Port	1	TX	B	TX-B
	2	TERM	—	—
	3	RX	—	RX-B
	4	GND	GND	GND
	5	RTS	A	TX-A
	6	RDY	—	RX-A
Second Serial Port	7	TX	B	TX-B
	8	TERM	—	—
	9	RX	—	RX-B
	10	GND	GND	GND
	11	RTS	A	TX-A
	12	RDY	—	RX-A

Dual RS-232-Compatible Serial I/O Module Model # 68-6005

This module is no longer manufactured, Information is provided for reference only.

NOTE: Up to 12 flow computers can be multi-dropped to one RS-232C serial device. Typically, one serial I/O module is used on the OMNI 3000, providing two ports. A maximum of three serial modules can be installed in the OMNI 6000, providing up to six ports.

Dual channel serial communication modules can be installed providing two RS-232-C ports. Each serial communication port is individually optically isolated for maximum common-mode and noise rejection. Although providing RS-232C signal levels, the tri-state output design allows multiple flow computers to share one RS-232 device. Communication parameters such as baud rate, stop bits and parity settings are software selectable (Figure 21).

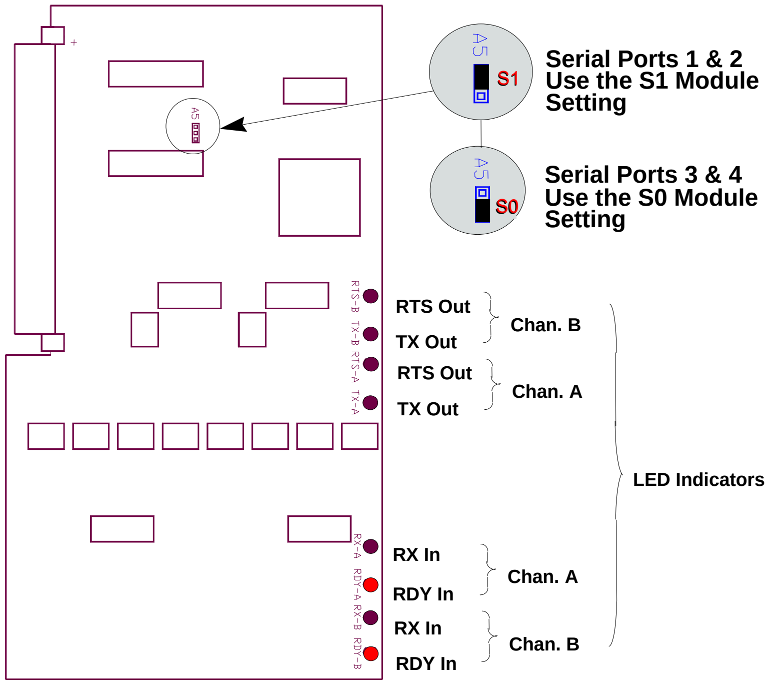


Figure 16. Dual RS-232 Serial I/O

Serial Port Assignments

The first port can be configured as a Modbus protocol port. It can also be configured as a printer port. The printer can be shared between multiple flow computers. Reports can be printed on a daily, batch end, timed interval or on demand basis. A reprint function provides backup should you experience printer problems at any time. Customized report templates are input using the OMNICOM Configuration PC Software.

The second, third, and fourth ports are independent Modbus protocol channels. The complete database of the flow computer is available for upload and download. The OMNICOM configuration program provided by OMNI can use any of these ports.

The fourth RS-232C can also be set up to communicate with Allen-Bradley PLC's.

Single Ethernet I/O Modbus Mux Module Model # 68-6209

The SE Module provides one RS232/RS485 port, one 10BaseT Ethernet port, one 2 wire RS485 Repeater port and one RS232 Configuration port. The board can be installed in place of an OMNI 3000/6000 Serial and Dual Serial Module. Up to two SE Modules can be installed in an OMNI 6000.

Address selection is provided with jumpers to select the correct address for the module. See Technical Bulletin 020101 (52-0001-0006) for additional information.

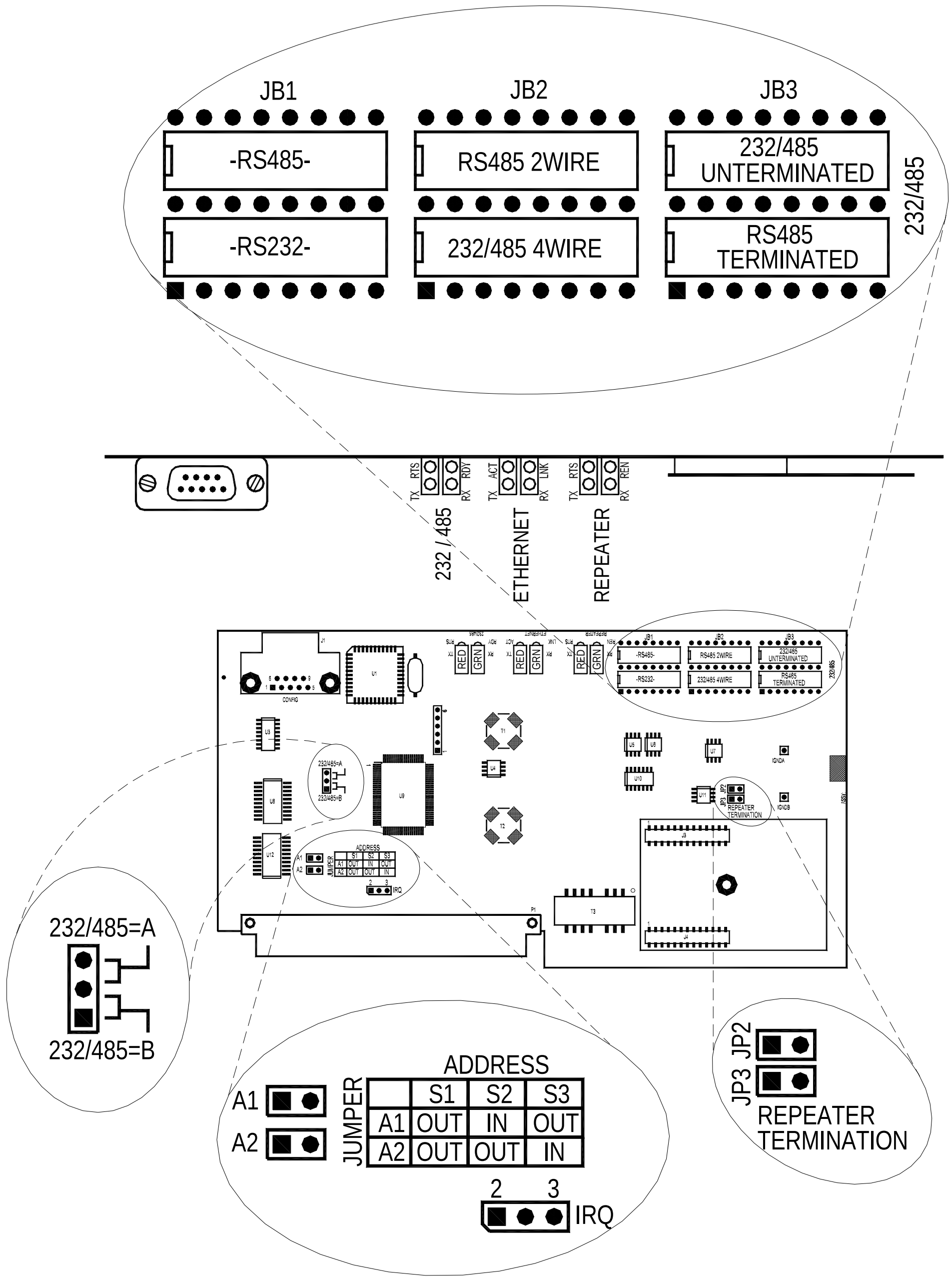


Figure 17. Jumper Settings and Termination Resistor Pack Locations

1.7.4. Process I/O Combination Modules

Meter run instrumentation utilize plug-in process I/O “combo” modules which include all necessary analog/digital (A/D) converters and control circuitry. User selection of process I/O is available with “combo” modules that can be a mix of meter pulse, frequency densitometer, 4-20 mA, 4-wire 100 ohm RTD inputs, and 4-20 mA outputs.

All process measurements such as temperature, pressure, density, and flow are input via these process I/O combo modules. Each module will handle 4 inputs of a variety of signal types and provides one or two 4-20 mA analog outputs (except the SV Module which has six 4-20 mA outputs).

Nine types of combo I/O modules are available: A, B, E, E/D, H, HV, HT, HM and SV. All modules accept analog and pulse frequency type inputs, except for the H and HV modules that interface digitally with Honeywell Smart Transmitters, the HT and HM modules that interface digitally with HART transmitters, and the SV module that interface serially with RS-485 compatible multivariable transmitters.

Except for the position of configuration jumpers that select the type and address of each module, the A and B module types use identical I/O boards, and also the E and E/D modules use identical boards.

NOTE: The flow computer allocates the physical I/O point numbers according to the module ID’s, not the position occupied on the backplane.

Each of the combo modules installed must have a different identity —i.e., you cannot have two or more modules of the same type and address. Valid ID’s are: A1 through A6, B1 through B6, E/D-1 through E/D-6, E1 through E6, H1 through H6, HT1 though HT4, HM1 through HM4 and SV1 through SV2. Only one HV Module can be installed.

Modules are plugged into DIN type connectors on the passive backplane. The OMNI 6000 backplane connector has 12 circuits (OMNI 3000 has 4 circuits) which connect to the back panel terminal strips via ribbon cables. Combo I/O modules are plugged into the backplane starting at I/O Position #5 (OMNI 6000) or I/O Position #3 (OMNI 3000) and working towards Position #10 (OMNI 6000) or Position #4 (OMNI 3000). The preferred order is lowest number A Type to highest number H, HT or HM types, then SV and HV modules.

The following chapter provides detailed information of the process I/O combo modules and includes illustrations and jumper settings. (Chapter 2 “Process I/O Combo Module Setup”)

1.8. Power Supply

The OMNI Flow Computer can be AC or DC powered. Presently OMNI offers the 6218 Universal PSU. The 6218 Power Supply can operate between 90 and 264VAC input without any adjustments. See section 3.2 Input Power for detailed power information.

The maximum system configuration of the OMNI is 24 process inputs, 18 process outputs are possible (if an SV-module is installed), 24 digital I/O points, and 6* serial I/O channels. This Equipment dissipates approximately 24 Watts. This causes an internal temperature of 15ºF (8.33°C) over the ambient. The unit should not be mounted in a cabinet or panel where the ambient inside the cabinet will exceed 125ºF (51.67°C).

***NOTE:** Four serial Ports are achievable with the listed process inputs. Six serial ports can be installed by substituting serial I/O module in place of an analog or digital I/O module.

CAUTION: POTENTIAL FOR DATA LOSS! RAM Battery Backup - OMNI flow computers leave the factory with a fully charged NiMH battery as RAM power backup. RAM data, including user configuration and I/O calibration data, may be lost if the flow computer is disconnected from external power for more than 30 days. Observe caution when storing the flow computer without power being applied for extended periods of time. The RAM back-up battery is rechargeable and will be fully charged after power has been applied for 24 hours.

NOTE: ENVIRONMENTAL: The maximum system configuration of 24 process inputs, 12 process outputs, 24 digital I/O points and 4 serial I/O channels dissipates approximately 24 Watts. This causes an internal temperature rise of 15ºF over the ambient. The unit should not be mounted in a cabinet or panel where the ambient inside the cabinet will exceed 125ºF.

Operating Power - The indicated power is the maximum and includes the power used by transmitter loops, etc. It will vary depending on the number of modules installed, the number of current loops and any digital output loads connected.

1.8.1. Model 68-6118 Power Supply

All analog and digital circuits within the flow computer are powered from a 5-volt switching regulator located on the power supply module. This is located in the rear most connector on the computer backplane. The DC power which supplies the switching regulator either comes directly from the DC terminals on the Back Panel of the flow computer (22-26 VDC) or by rectifying the output of the integral 120 VAC (230 VAC) 36VA transformer. Regulated 5-volt power is monitored by a 3-4 second shutdown circuit located on the 6118 power supply module. When external power is applied to the computer, there will be a delay of 3 to 4 seconds before the unit powers-up. If the 5VDC supply is short-circuited, the supply will be shut-down and will attempt to restart in 3-4 seconds.

CAUTION: Model 68-6118 The Power Low and +5V Adjust are factory adjustments that require the use of special equipment. **DO NOT** attempt to adjust.

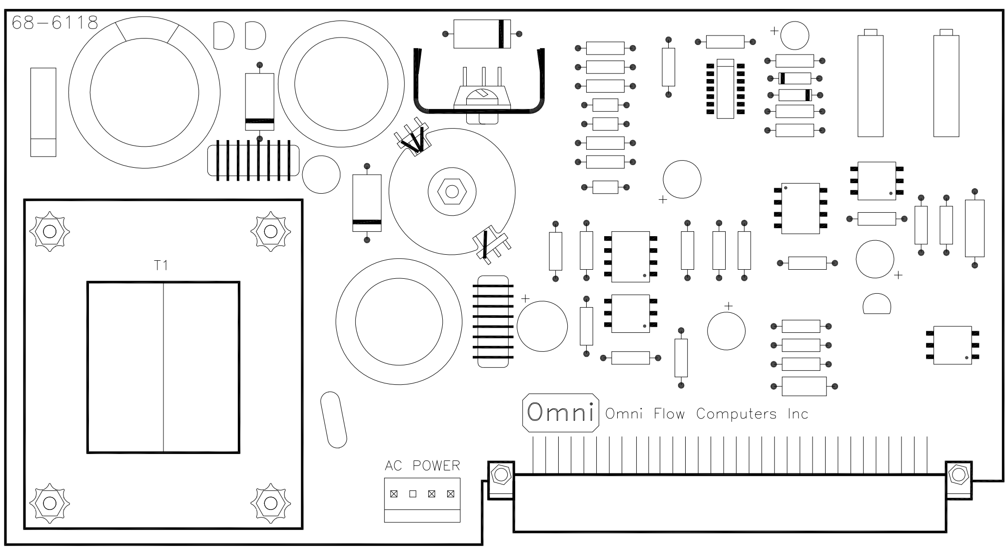


Figure 18. Power Supply Module Model 68-6118

1.8.2. Model 68-6218 Power Supply

All analog and digital circuits within the flow computer are powered from a 5-volt switching regulator module located on the power supply module. This is located in the rear most connector on the computer backplane. The DC power which supplies the switching regulator either comes directly from the DC terminals on the Back Panel of the flow computer (22-26 VDC) or by a voltage converter that changes the 90 – 264 VAC to 24VDC. Regulated 5-volt power has a "soft-start" circuit that allows the 5V to come up in approximately 150 milli-seconds. When external power is applied to the computer there will be a delay of 150 milli-seconds before the unit powers-up. If the 5VDC supply is short-circuited the supply will be shut-down and will attempt to restart when the short circuit no longer exists.

CAUTION: **Model 68-6218** The Power Low and +5V Adjust are factory adjustments that require the use of special equipment. **DO NOT** attempt to adjust.

The maximum common mode offset from DC+ or DC- to Earth ground must be less than 120 VDC

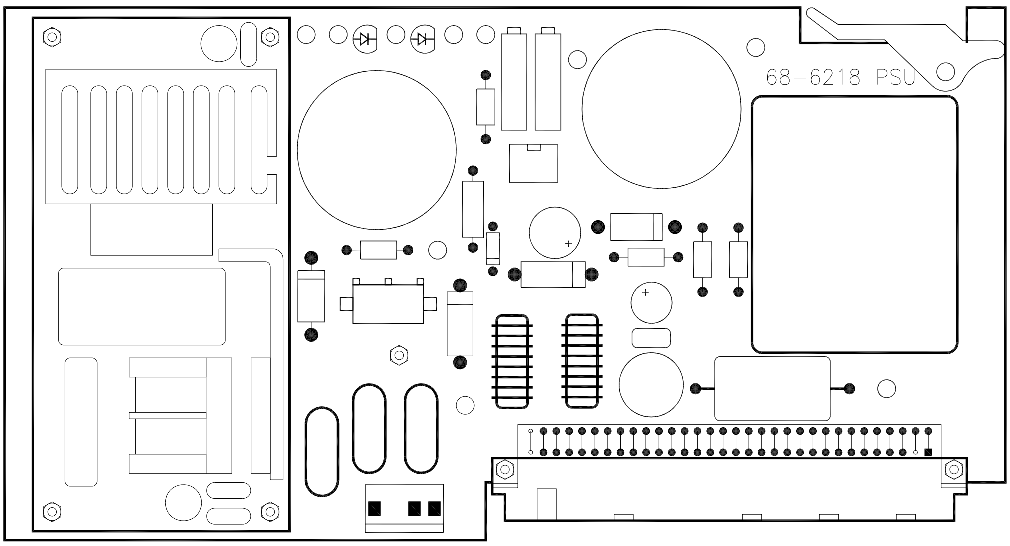


Figure 19. Power Supply Module # 68-6218

1.9. Firmware and Software

OMNI Flow Computers are supplied with pre-programmed firmware and PC configuration software which permit a single unit to perform a great diversity of combined flow measurement tasks, such as:

- Multiple Meter Run Totalizing, Batching, Proving, and Data Archiving
- Flow and Sampler Control
- Direct Interface to Gas Chromatographs and Smart/Multivariable Transmitters
- Selectable Communications Protocols to Directly Interface to DCS, PLC and SCADA Host Systems

The flow computer database numbers thousands of data points and provides the tightest communications coupling yet between SCADA and the metering system.

1.9.1. Interrupt-Driven CPU

This is a very important aspect to firmware. It provides for a multi-tasking environment in which priority tasks can be undertaken concurrently with unrelated activity. This provides for high-speed digital signals to be output at the same time as measurement computations and serial communications to a printer or host computer, without degradation in speed or tasking.

All custody transfer measurement programs are stored in EPROM or Flash Memory. This prevents damage due to electrical noise, or tampering with the integrity of calculation specifications. SRAM programming can also be accommodated.

1.9.2. Cycle Time

All time-critical measurement functions are performed by the flow computer every 500 mSec. This provides greater accuracy of measurement calculations and permits a faster response by pipeline operations in critical control functions, such as opening or closing valves.

1.9.3. On-line Diagnostics and Calibration

Extensive diagnostic software is built into the system which allows the technician to locally or remotely debug a possible problem without interrupting on-line measurement. Calibration of analog signals is performed through the keypad and software. The system has only two potentiometers, both of which are on the power supply and are factory set and need no adjustment.

1.9.4. PC Communications Interface

The wide use of PCs and video display units makes it possible to provide software for off-line/on-line access to measurement, configuration and calibration data. Collection of historical reports, including alarms, interval reports of any time sequence, liquid batch and prove reports, and full remote technical intervention capabilities are also provided.

1.9.5. OMNICOM® Configuration PC Software

NOTE: Full details about the OMNICOM® configuration program are documented in Appendix C.

On-line or off-line configuration of your OMNI Flow Computer is possible using a PC capable of running the OMNICOM® program supplied with your flow computer. This powerful software allows you to copy modify and save to disk entire configurations. The program also allows you to print customized reports by inputting report templates that are uploaded to the flow computer.

1.9.6. Initializing Your Flow Computer

CAUTION: POTENTIAL FOR DATA LOSS! RAM Battery Backup: OMNI flow computers leave the factory with a fully charged NiMH battery as RAM power backup. RAM data, including user configuration and I/O calibration data, may be lost if the flow computer is disconnected from external power for more than 30 days. Observe caution when storing the flow computer without power being applied for extended periods of time. The RAM back-up battery is rechargeable and will be fully charged after power has been applied for 24 hour.

A processor reset signal is automatically generated when:

- Power is applied.
- The processor reset switch at the rear of the front panel is toggled.
- The watchdog timer fails to be reset by firmware every 100 milliseconds.

The flow computer will perform a diagnostic check of all program and random-access memory whenever any of the above events occur.

The program is stored with a checksum in Non-volatile Read-only Memory. The program alarms if the calculated checksum differs from the stored checksum. The most obvious cause of such a problem would be a bent pin on a program memory chip. The validity of all data stored in RAM memory is checked next. This data includes totalizers, configuration data and historical data. Any problems here will cause the computer to initialize the RAM and display the following message:

```
RAM Data Invalid
Reconfigure   System
Using “OMNI” as
Initial Password
```

If due to the RAM area in the computer not agreeing with the checksum area, the computer will display the following message:

```
RAM & Calibrate Data
Invalid, Reconfigure
& Re-calibrate Using
“OMNI” as Password
```

Assuming that the EPROM memory and RAM memory are valid, the flow computer then checks the software configuration against the installed I/O modules and displays a screen similar to the following:

```
Module S-Ware H-Ware
A-1       Y      Y
D-1       Y      Y
SE-1      Y      Y
SE-1 EthV  1.50
Revision No.27.74.21
EPROM Checksum  F0A9
```

NOTE: For information on adjusting module configuration settings (see Volume 3).

A ‘**N**’ in the hardware column indicates that a module has been removed since the software was configured. A ‘**N**’ in the software column indicates that a module has been added. In either case you should make the columns agree by adding or removing modules or re-configuring the software.

NOTE: To comply with applicable EC Directives, certain versions of the flow computer firmware will cause the start-up display screen to be the same as what was active before the system was reset or powered off.

The following screen display may occur during a system initialization or reconfiguration of the system, it shows that a problem occurred in the RAM checking area and that the flow computers physical inputs and outputs circuits will now need to be recalibrated, To clear this screen you will have to enter ‘OMNI’ as the password to allow user access to the system. The flow computer’s configuration ‘may’ have been lost, verify that the configuration is valid before processing further with any measurement tasks.

```
Calibration Data
Invalid All inputs
and D/A outputs need
to be recalibrated
```

.

Chapter 2

2. Process Input/Output Combination Module Setup

2.1. Introduction

NOTE: User selection of process I/O is available with "combo" cards that can be a mix of meter pulse, frequency densitometer, 4-20mA, 4-wire 100 ohm RTD inputs, and fused 4-20mA outputs.

Combo Module Input Features

The input characteristics of each combo module are as follows:

- **A Type:** Each input can be 1-5v; 4-20mA. Inputs #1 and #2 also accept RTD. Inputs #3 and #4 also accept flow pulse signals.
- **B Type:** Inputs #1, #2 & #3 can be 1-5v; 4-20mA. Inputs #1 and #2 also accept RTD. Input #3 also accepts flow pulses and Input #4 is fixed as a frequency density input.
- **E/D Type:** Inputs #1 and #2 can be 1-5v; 4-20mA and RTD. Inputs #3 and #4 are frequency density.
- **E Type:** Inputs #1 and #2 can be 1-5v; 4-20mA and RTD.

  Inputs #3 and #4 accept flow pulses.
- **H Type:** All inputs are Honeywell™ DE Protocol.
- **HV Type:** All inputs are Honeywell™ Multivariable DE Protocol.
- **HT/HM Type:** Four HART FSK Networks.
- **SV Type:** Each port (#1 and #2) is capable of RS-485 multi-drop to various multivariable transmitters.

All process measurement signals are input via the process I/O combination (or "combo") modules plugged into the backplane of the computer. There currently are 9 types of combo modules available: A, B, E, E/D, H, HV, HT, HM and SV types. The 9 types of modules are actually manufactured using only 6 types of printed circuit modules. The first can be configured as either an A or B Module; the second is used for an E or E/D Module; the third is used for an H or HV Module; the fourth for an HT module; the fifth for an HM module and the sixth is an SV module.

2.2. Features of the I/O Combo Modules

Each combo module (except the SV Module) will handle 4 inputs of a variety of signal types and provides one or two 4-20 mA analog outputs. The SV Module has two ports and six 4-20 mA analog outputs. Only the E Combo Module has Level A pulse fidelity checking and double chronometry proving capabilities. The input/output capabilities and some of the features of the combo modules are expressed in Table 2.

Table 2. Input/Output Capabilities and Features of Each I/O Combo Module Type

TYPE	INPUT #1	INPUT #2	INPUT #3	INPUT #4	ANALOG OUTPUTS	LEVEL A FIDELITY	DOUBLE CHRONO-METRY PROVING
A	1-5v; 4-20mA; RTD		1-5v; 4-20mA; Flow Pulses		Two 4-20mA	No	No
B	1-5v; 4-20mA; RTD		1-5v; 4-20mA Flow Pulse	Frequency Density	One 4-20mA	No	No
E/D	1-5v; 4-20mA; RTD		Frequency Density		Two 4-20mA	No	No
E	1-5v; 4-20mA; RTD		Flow Pulses		Two 4-20mA	Yes	Yes
H	Honeywell DE Protocol				Two 4-20mA	No	No
HV	Honeywell Multivariable DE Protocol				Two 4-20mA	No	No
HT/HM	HART FSK Protocol				Two 4-20mA	No	No
	PORT #1		**PORT #2**				
SV	RS-485 Multi-drop to Various Multivariable Transmitters				Six 4-20mA	No	No

2.2.1. Setting the Address of the Combo Modules

Jumpers are provided on each combo module that allows the user to select the address needed to configure the module. Changing the firmware functions of the module is also done by moving the appropriate jumper; i.e., A or B Type, E or E/D,

H or HV Type.

2.2.2. Hardware Analog Configuration Jumpers

Other jumpers are provided on each module that select the correct hardware circuits needed for the type of signal that each input channel will accept. This allows the same basic hardware module to accept signals such as 4-20 mA, 1-5 VDC, or 100ohm RTD probes as well as voltage or current pulses from a turbine, PD meter or digital densitometer.

2.2.3 Process I/O Combo Module Addresses Versus Physical I/O Points

CAUTION: Combo I/O modules are sorted alphabetically and by low- to-high address. Adding or removing cards may change the existing sort if the 'Check I/O' function is executed.

A flow computer will usually have several combo modules installed depending on the number of flowmeter runs to be measured. If for example, two A modules, two B modules, one E/D module and one E modules were installed, they would normally be numbered A1, A2, B1, B2, E/D1 and E1. Other address combinations are acceptable (e.g.: A2, A3, B1, B4, E/D2 & E2) as long as each has a unique identity. In the above example where six modules (A1, A2, B1, B2, E/D1 & E1) are installed, the physical I/O points are mapped as follows. (note that a B module has only one analog output).

NOTE: That E/D modules come before the E modules.

To standardize, OMNI recommends that combo modules should always be physically installed starting with the lowest number A Type Module in I/O Slot #5 (Slot #3 in OMNI 3000) as shown in Table 3, with additional modules being installed in ascending order towards Slot #10 (Slot #4 in OMNI 3000).

Table 3. Process I/O Combo Module Addresses Versus Physical I/O Points

MODULE IDENTITY	INPUTS	OUTPUTS	BACKPLANE POSITION	PHYSICAL TERMINALS
A1	1-4	1 & 2	Slot 5	TB5 1-12
A2	5-8	3 & 4	Slot 6	TB6 1-12
B1	9-12	5	Slot 7	TB7 1-12
B2	13-16	6	Slot 8	TB8 1-12
E/D1	17-20	7 & 8	Slot 9	TB9 1-12
E1	21-24	9 & 10	Slot 10	TB10 1-12

2.2.4 Assigning Specific Signal Inputs

The OMNI factory pre-assigns the physical I/O points of each flow computer based on information supplied at time of order. This configuration information is stored in battery backed-up static CMOS RAM. If you wish to change or add to these assignments, refer to the section **'Program Setup'** in Volume 3, Chapter 2 "Flow Computer Configuration" and follow these basic rules:

- Digital densitometer signals can only be assigned to the fourth channel of each B Type Combo Module, or the third and fourth channel of each E/D Module.
- RTD signals can only be assigned to the first or second channel of each A, B, E/D or E combo module. Whenever possible, avoid using the second RTD excitation current source of an A Type Combo Module as this makes the second 4-20 mA output on that module inaccessible.

  NOTE: The message '**I/O' Type Mismatch**' is displayed if you try to assign the same physical I/O point to more than one type of variable.

- Pulse signals from flowmeters can be assigned to the 3rd channel of each A, B, and E combo module and also to the 4th channel of each A and E Combo Module.
- Pulse signals to be used for 'Pulse Fidelity Checking' must be connected to the 3rd and 4th channel of an E Combo Module. When assigning the flowmeter, select the third channel as the flow input. (The fouth channel is automatically assigned as the second pulse channel needed for pulse fidelity checking).
- When Double Chronometery Proving is a requirement, use the 3rd and 4th input channels of an E Combo Module.
- Physical I/O points may be assigned to more than one variable (i.e., common temperature or pressure sensors) but variable types cannot be mixed (i.e., the same physical point cannot be assigned to temperature and pressure, for example).

2.3. The A and B Combo I/O Modules

NOTE: The A and B combo I/O modules described below use either ‘through-hole technology’ components (P/N 68-6006), or ‘surface mount technology’ (SMT) components (P/N 68-6206). Modules manufactured using either technology have similar performance and functionality.

All I/O signals input to the combo module are converted to the form of high frequency pulse trains (0 to 25 kHz). These pulse trains are passed through opto-couplers providing electrical isolation.

All 4 process inputs can accept analog input voltages which are first buffered with a 1 megohm input buffer, and then converted to pulse frequencies using precision voltage-to-frequency converters. With 2 averaged 500 millisecond samples, analog conversion resolution is 14 binary bits. Linearity is typically ±0.01% and the temperature coefficient is trimmed to better than ±10 PPM/°F. Current inputs such as 4-20 mA are converted to 1-5 VDC by jumpering-in a 250 ohm precision shunt resistor.

The conversion gain of Input Channels 1 and 2 can also be increased by a factor of 10, allowing low level RTD signals (0.20 - 0.55 VDC) to be accepted.

Input Channels 3 and 4 can also be jumpered to accept pulse signals (0-12 kHz). In this case, the input stage is configured as Schmitt Trigger, whose threshold is 3.5 VDC with a hysteresis ±0.5 VDC. The voltage-to-frequency converter is bypassed in this mode. Input Channel 4 can also be configured for AC coupling and a 1.5 volt trigger threshold by removing the INPUT THRESHOLD jumper, making it suitable for interfacing to Solartron type densitometers.

Analog Outputs #1 and #2 are obtained in the reverse fashion. A software-controlled pulse train (100 Hz to 5.0 kHz) is passed through opto-couplers and converted to a current using precision frequency-to-current converters. Resolution of these outputs is approximately 12 binary bits. The second analog output is not available when the module is jumpered as a B Type combo module.

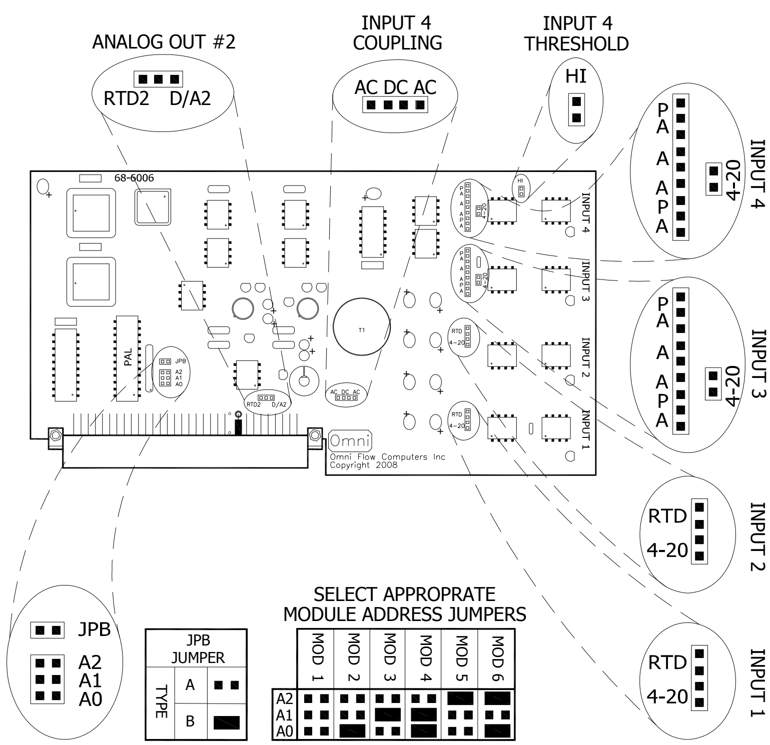


Figure 20. 68-6006 Module - Configuration Jumpers

Two RTD excitation current sources (3.45 mA) are available on the combo module. The second RTD excitation source (RTD2 jumper position) will not be available if the second 4-20 mA analog output is in use (D/A2 jumper position). This is a limitation caused by the number of circuits available from the Back Panel terminal to each combo module. On a B Type module the second analog output is not available therefore this second RTD excitation source is always available.

2.3.1. The A Type Combo I/O Module

NOTE: The second analog output is not available in cases where the ANALOG OUT #2 jumper is in the RTD2 position; selecting the second RTD excitation current source. You may be able to avoid using the second RTD excitation source and save losing an analog output by using an unused excitation source on another combo module (Figure 21, 22, 23, and 24).

The A Type Combo Module is the most common configuration. It accepts 4 process inputs and provides two 4-20 mA analog outputs. Each module is connected to the back panel terminal blocks via 12 wires on the ribbon cables. The actual terminal block used depends upon which backplane connector (?) the module is plugged into (Table 4).

Table 4. A Combo Module Back Panel Terminal Assignments

TB? Terminal 1	**Input Channel #1** (1-5v, 4-20mA, or RTD)
TB? Terminal 2	**Input Channel #1** (Isolated Signal Return)
TB? Terminal 3	**Input Channel #2** (1-5v, 4-20mA, or RTD)
TB? Terminal 4	**Input Channel #2** (Isolated Signal Return)
TB? Terminal 5	**Input Channel #3** (1-5v, 4-20mA, or Flowmeter Pulses)
TB? Terminal 6	**Input Channel #3** (Isolated Signal Return)
TB? Terminal 7	**Input Channel #4** (1-5v, 4-20mA, or Flowmeter Pulses)
TB? Terminal 8	**Input Channel #4** (Isolated Signal Return)
TB? Terminal 9	**RTD Excitation Current Source #1**
TB? Terminal 10	**Signal Return Terminals 9, 11 & 12** (Internally connected to DC Power Return)
TB? Terminal 11	**Analog Output #1** (4-20mA)
TB? Terminal 12	**Analog Output #2** (4-20mA) ***OR*** **RTD Excitation Current Source #2** *(See ANALOG OUT #2 Jumper Setting)*

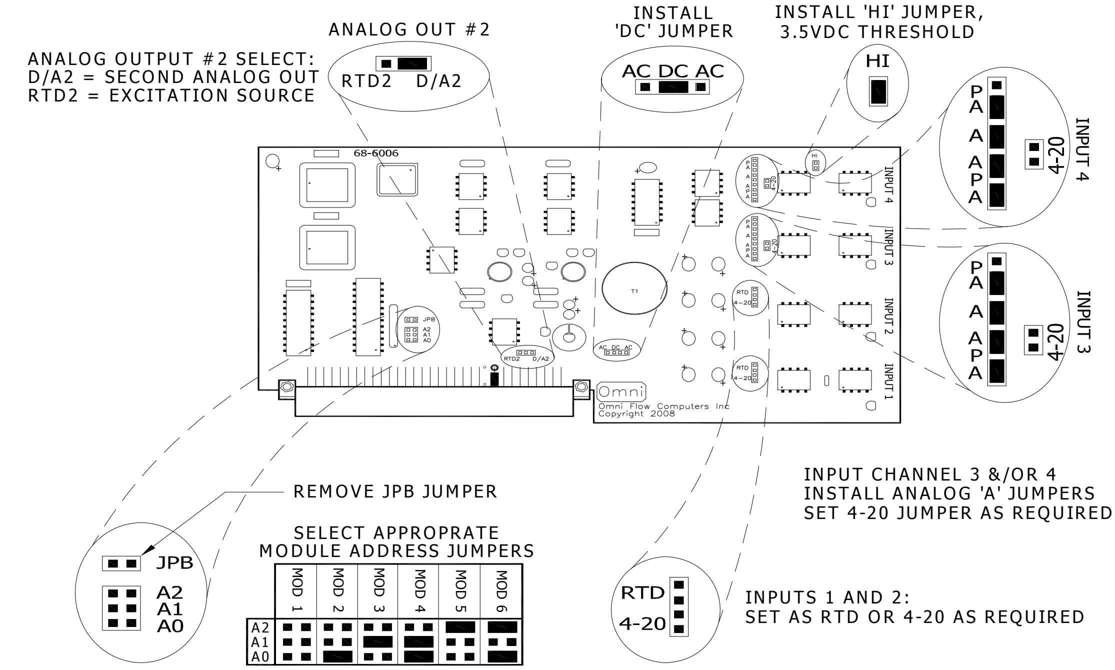


Figure 21. 6006 A-Combo, - Analog Input Jumper Settings

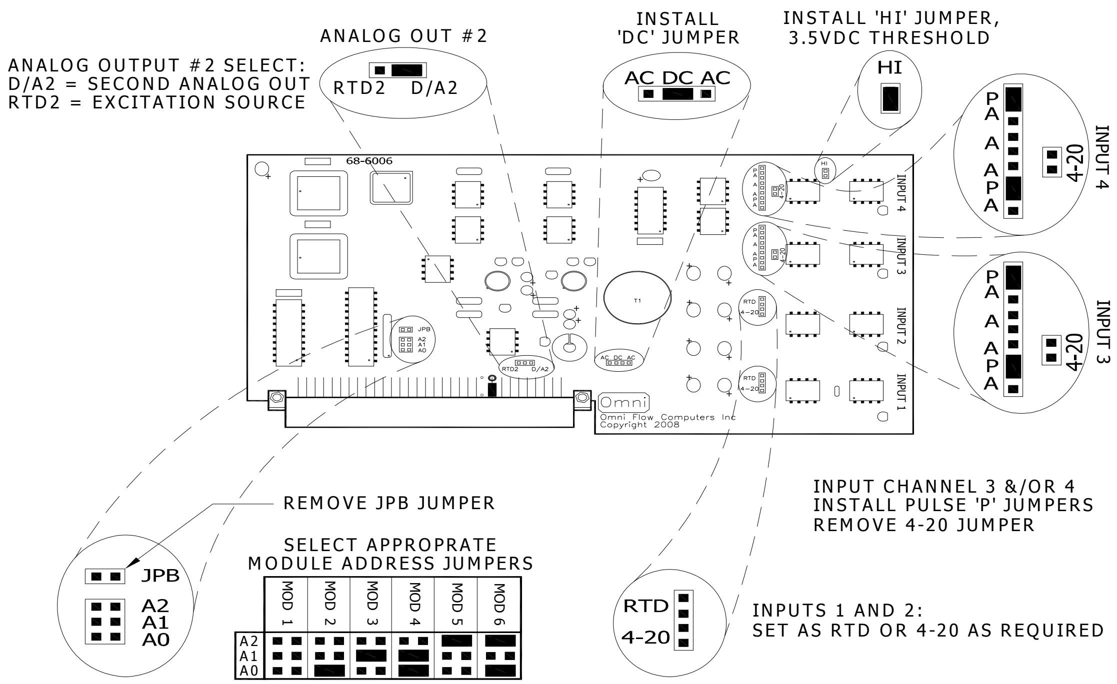


Figure 22. 6006 A-Combo, - Pulse Input Jumper Settings

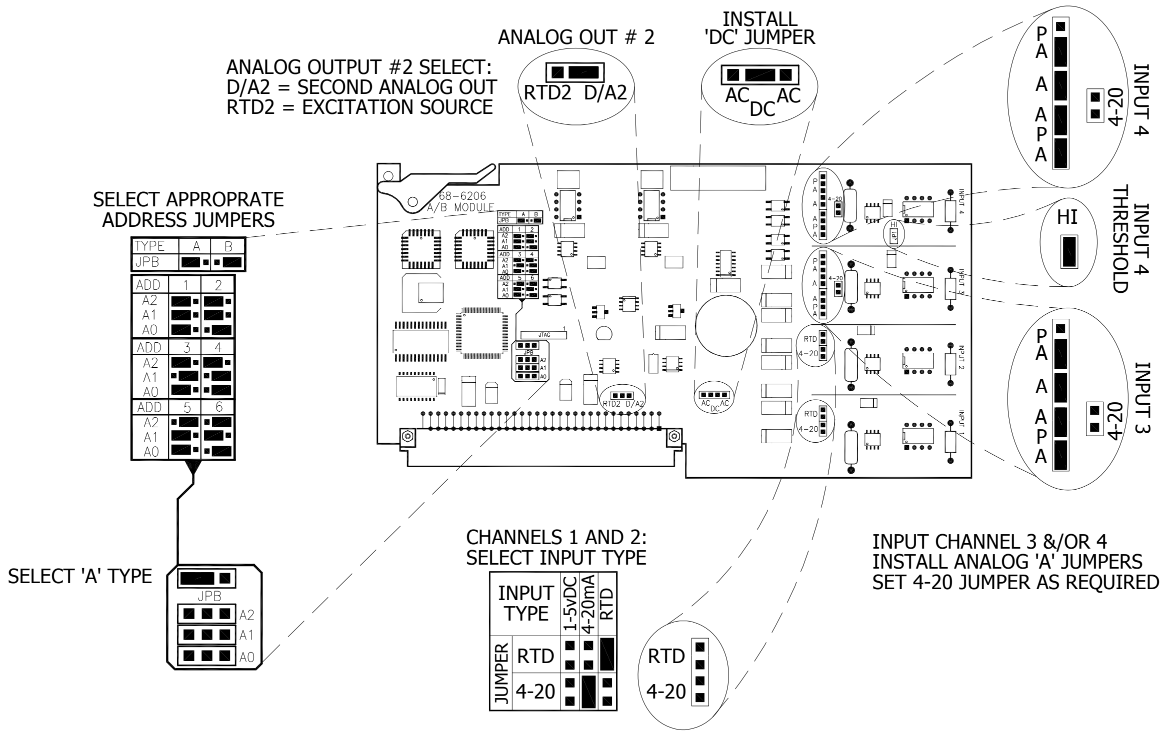


Figure 23. 6206 A-Combo, Analog Input Jumper Settings

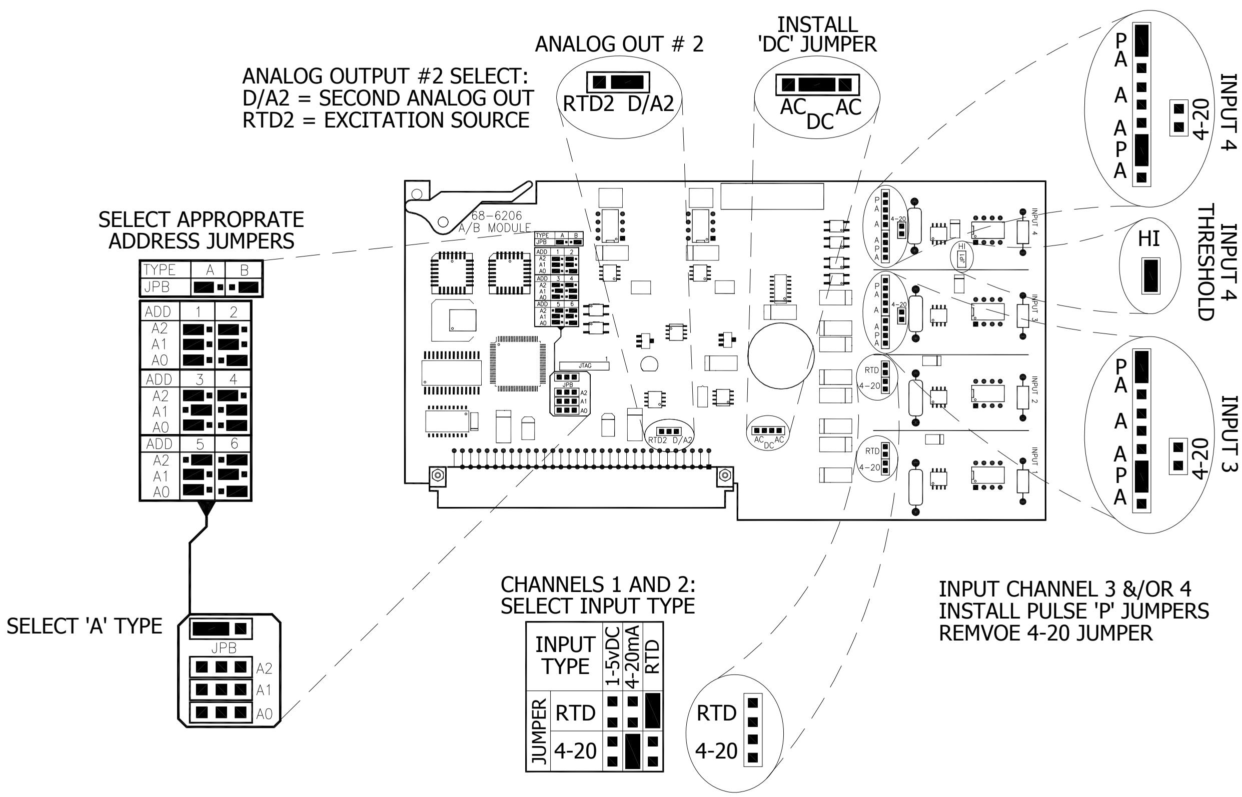


Figure 24. 6206 A-Combo, Pulse Input Jumper Settings

2.3.2. The B Type Combo I/O Module

NOTE: You will need either a B Type Combo Module or E/D Type Combo Module when using digital densitometers connected to the flow computer. With a B Type Combo Module, Analog Output #2 is never available because the periodic time function uses the internal timer counter that is normally used to generate the second analog output.

The B Type Combo Module (Figure 25 and 26) also handles 4 process inputs but Input Channel # 4 is now used to measure the periodic time of a digital densitometer. On the B module, Input Channel # 4 is always jumpered as a frequency input. Signal coupling can be AC or DC with trigger threshold adjustable for 1.6 or 3.5 Vpp sensitivity. Each module is connected to the back panel terminal blocks via 12 wires on the ribbon cables. The actual terminal block used depends upon which backplane connector (?) the module is plugged into (Table 5).

Table 5. B Combo Module Back Panel Terminal Assignments

TB? Terminal 1	**Input Channel #1** (1-5v, 4-20mA, or RTD)
TB? Terminal 2	**Input Channel #1** (Isolated Signal Return)
TB? Terminal 3	**Input Channel #2** (1-5v, 4-20mA, or RTD)
TB? Terminal 4	**Input Channel #2** (Isolated Signal Return)
TB? Terminal 5	**Input Channel #3** (1-5v, 4-20mA, or DC Coupled Flowmeter Pulses)
TB? Terminal 6	**Input Channel #3** (Isolated Signal Return)
TB? Terminal 7	**Input Channel #4** (AC Coupled Densitometer Frequency)
TB? Terminal 8	**Input Channel #4** (Isolated Signal Return)
TB? Terminal 9	**RTD Excitation Current Source #1**
TB? Terminal 10	**Signal Return Terminals 9, 11 & 12** (Internally connected to DC Power Return)
TB? Terminal 11	**Analog Output #1** (4-20mA)
TB? Terminal 12	**RTD Excitation Current Source #2**

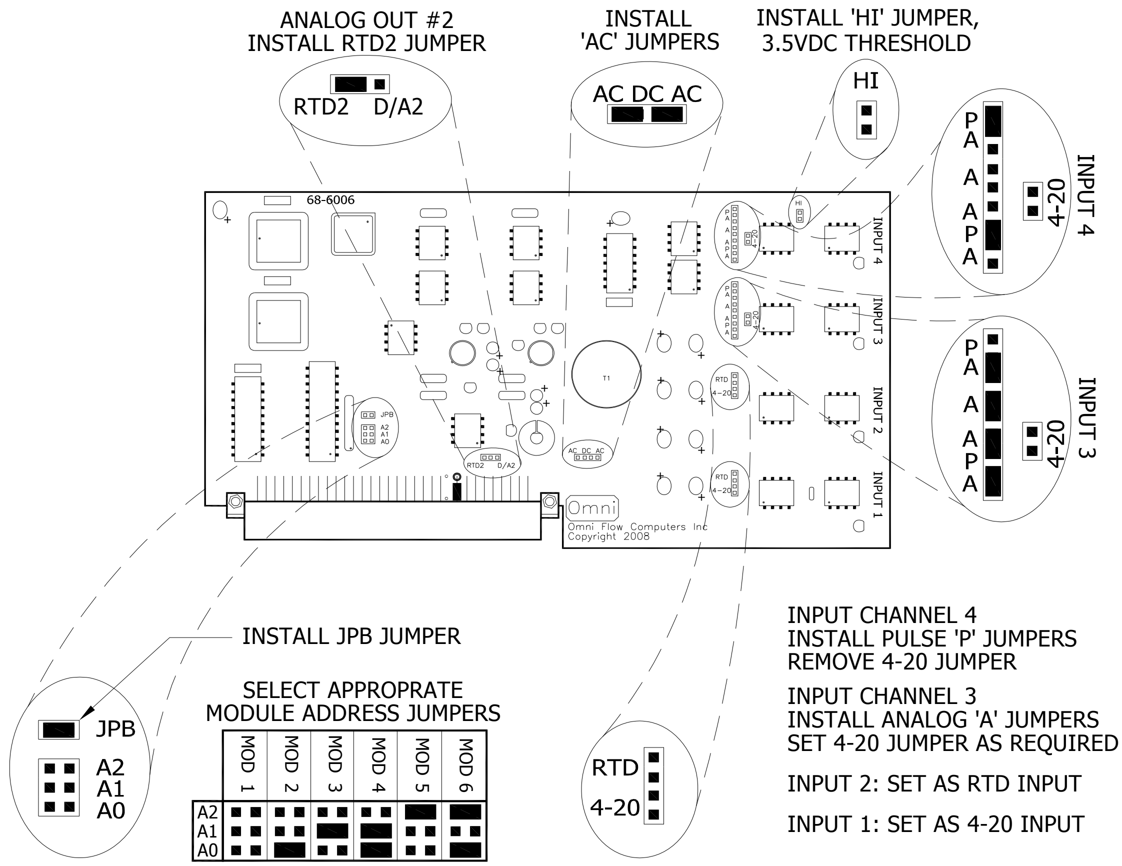


Figure 25. 6006 B-Combo, Jumper Settings

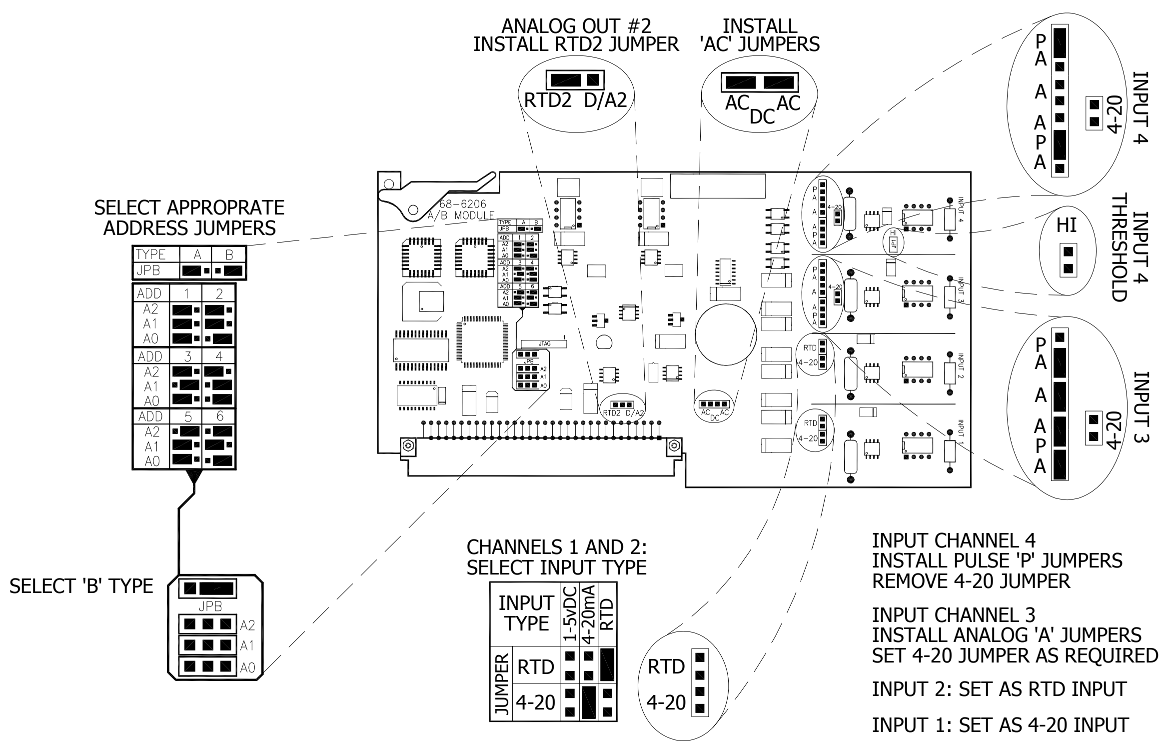


Figure 26. 6206 B-Combo, Jumper Settings

2.4. The E/D and E Combo Modules

NOTE: The E/D and E combo I/O modules described below either use through-hole technology components (P/N 68-6008), or surface mount technology (SMT) components (P/N 68-6208) Modules manufactured using either technology have similar performance and functionality.

The hardware of E/D and E Type Combo Modules are similar to that of the A and B Type Combo Modules (discussed previously) except these modules provide only 2 analog input channels (1 and 2). These inputs can be configured by jumpers for 1-5 volt, 4-20 mA or 4-wire RTDs. The remaining two inputs (channels 3 and 4) are pulse inputs that can be used to input flowmeter pulses or densitometer pulse signals. The module hardware can also be configured by the application software to provide “Level A Pulse Fidelity Checking” on the two pulse input channels. Two 4-20 mA analog outputs are always available on the E/D and E Type Combo Modules.

2.4.1. The E/D Type Combo I/O Module

The E/D Type Combo Module is simply an E Type Combo Module with the JPD jumper IN on the 6008 (in the ‘E/D’ position on the 6208) Figures 27 and 28. Input Channels 1 and 2 are analog input channels that are configured by jumpers for 1-5 volt, 4-20 mA, or 4-wire RTDs. Input Channels 3 and 4 are always configured to measure periodic time. They accept pulse signals from digital densitometers. Each module is connected to the back panel terminal blocks via 12 wires on the ribbon cables. The actual terminal numbers used depend upon which backplane connector (?) the module is plugged into (Table 6).

Table 6. E/D Combo Module Back Panel Terminal Assignments

TB? Terminal 1	**Input Channel #1** (1-5v, 4-20mA, or RTD)
TB? Terminal 2	**Input Channel #1** (Isolated Signal Return)
TB? Terminal 3	**Input Channel #2** (1-5v, 4-20mA, or RTD)
TB? Terminal 4	**Input Channel #2** (Isolated Signal Return)
TB? Terminal 5	**Input Channel #3** (AC or DC Coupled Digital Densitometer Pulses) *
TB? Terminal 6	**Input Channel #4** (AC or DC Coupled Digital Densitometer Pulses) *
TB? Terminal 7	***Not Used***
TB? Terminal 8	**RTD Excitation Current Source #2 ***
TB? Terminal 9	**RTD Excitation Current Source #1 ***
TB? Terminal 10	**Signal Return for signals marked (*)** (Internally connected to DC Power Return)
TB? Terminal 11	**Analog Output #1** (4-20mA) *
TB? Terminal 12	**Analog Output #2** (4-20mA) *

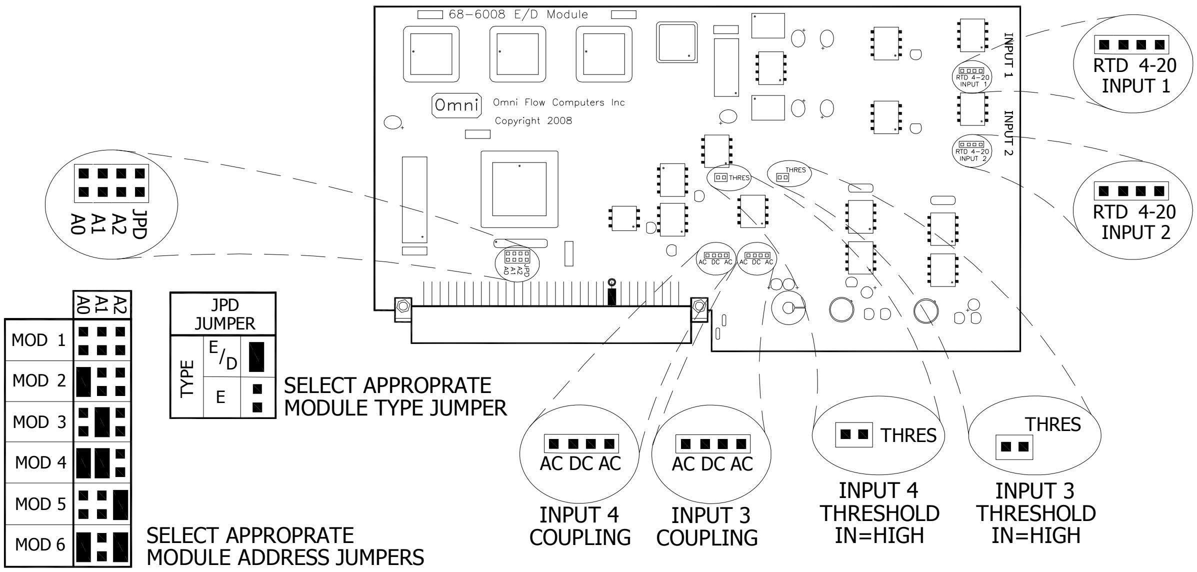


Figure 27. 6008 E/D-Combo, Jumper Settings

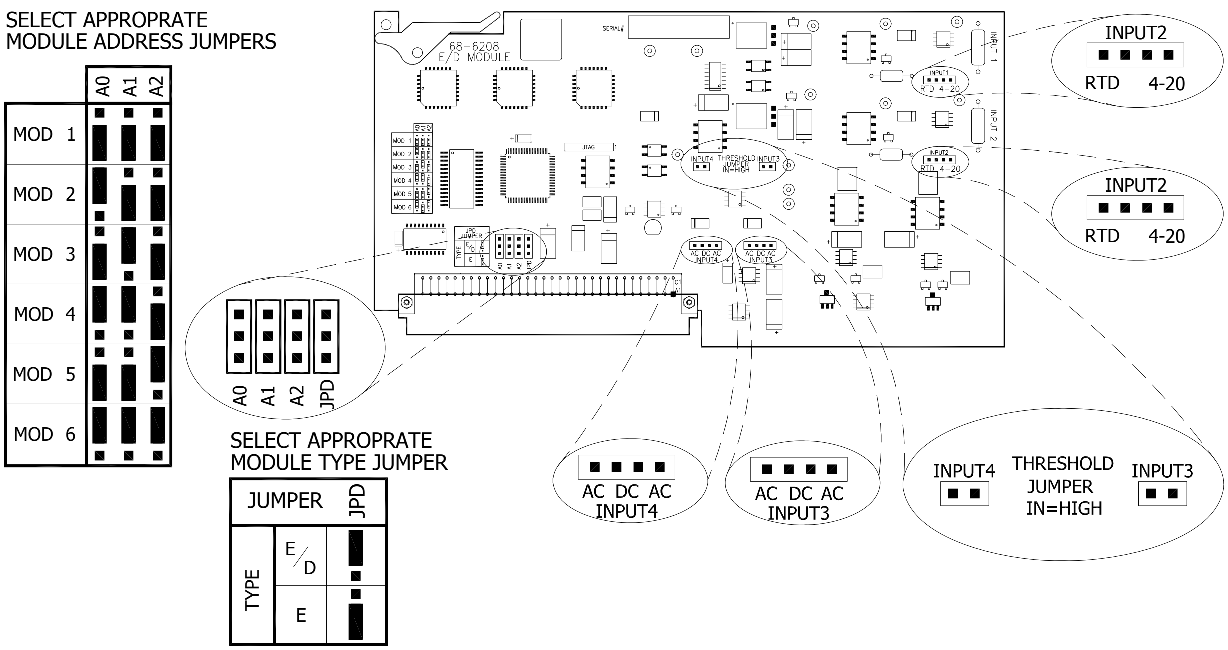


Figure 28. 6208 Combo, Jumper Settings

2.4.2. The E Type Combo I/O Module

The E Type Combo Module uses the same PCB as the E/D Combo Module. Jumper JPD is OUT on the 6008 (in the 'E' position on the 6208). Double chronometry timers are provided in this module configuration, allowing either pulse train (channel 3 or 4 on the module) to be proved. Input Channels 3 and 4 must be used to input flowmeter pulses. Input Channels 1 and 2 are analog input channels that are configured by jumpers for 1-5 volt, 4-20 mA, or 4-wire RTDs. Both RTD excitation current sources are always available. Each module is connected to the back panel terminal blocks via 12 wires on the ribbon cables. The actual terminal numbers used depend upon which backplane connector (?) the module is plugged into (Table 7).

Table 7. E Combo Module Back Panel Terminal Assignments

TB? Terminal 1	**Input Channel #1** (1-5v, 4-20mA, or RTD)
TB? Terminal 2	**Input Channel #1** (Isolated Signal Return)
TB? Terminal 3	**Input Channel #2** (1-5v, 4-20mA, or RTD)
TB? Terminal 4	**Input Channel #2** (Isolated Signal Return)
TB? Terminal 5	**Input Channel #3** (AC or DC Coupled Flowmeter Pulses) *
TB? Terminal 6	**Input Channel #4** (AC or DC Coupled Flowmeter Pulses) *
TB? Terminal 7	**Double Chronometry Detector Switch In** (Active Low) *****
TB? Terminal 8	**RTD Excitation Current Source #2 ***
TB? Terminal 9	**RTD Excitation Current Source #1 ***
TB? Terminal 10	**Signal Return for signals marked (*)** (Internally connected to DC Power Return)
TB? Terminal 11	**Analog Output #1** (4-20mA) *****
TB? Terminal 12	**Analog Output #2** (4-20mA) *****

2.5. The H Type Combo I/O Module

The H Type Combo Module (Figure 29) is a special module that is used to communicate with Honeywell field transmitters using the Honeywell 'DE Protocol'. It can communicate with up to 4 Honeywell Smart Transmitters. It operates on a point-to-point basis. Honeywell Model ST3000 temperature, pressure and differential pressure transmitters are compatible. Transmitters operating in the 'analog mode' are automatically given a 'wake-up pulse' and switched into the 'DE' Mode as soon as they are connected and assigned a meter run function.

Two analog outputs are always available on this module. Each module is connected to the back panel terminal blocks via 12 wires on the ribbon cables. The actual terminal numbers used depend upon which backplane connector (?) the module is plugged into (Table 8).

Table 8. H H/V Combo Module Back Panel Terminal Assignments

TB? Terminal 1	**Input Channel #1** (Transmitter Positive Terminal)
TB? Terminal 2	**Input Channel #1** (Transmitter Negative Terminal)
TB? Terminal 3	**Input Channel #2** (Transmitter Positive Terminal)
TB? Terminal 4	**Input Channel #2** (Transmitter Negative Terminal)
TB? Terminal 5	**Input Channel #3** (Transmitter Positive Terminal)
TB? Terminal 6	**Input Channel #3** (Transmitter Negative Terminal)
TB? Terminal 7	**Input Channel #4** (Transmitter Positive Terminal)
TB? Terminal 8	**Input Channel #4** (Transmitter Negative Terminal)
TB? Terminal 9	***Not Used***
TB? Terminal 10	**Signal Return for signals marked (*)** (Internally connected to DC Power Return)
TB? Terminal 11	**Analog Output #1** (4-20mA) *
TB? Terminal 12	**Analog Output #2** (4-20mA) *

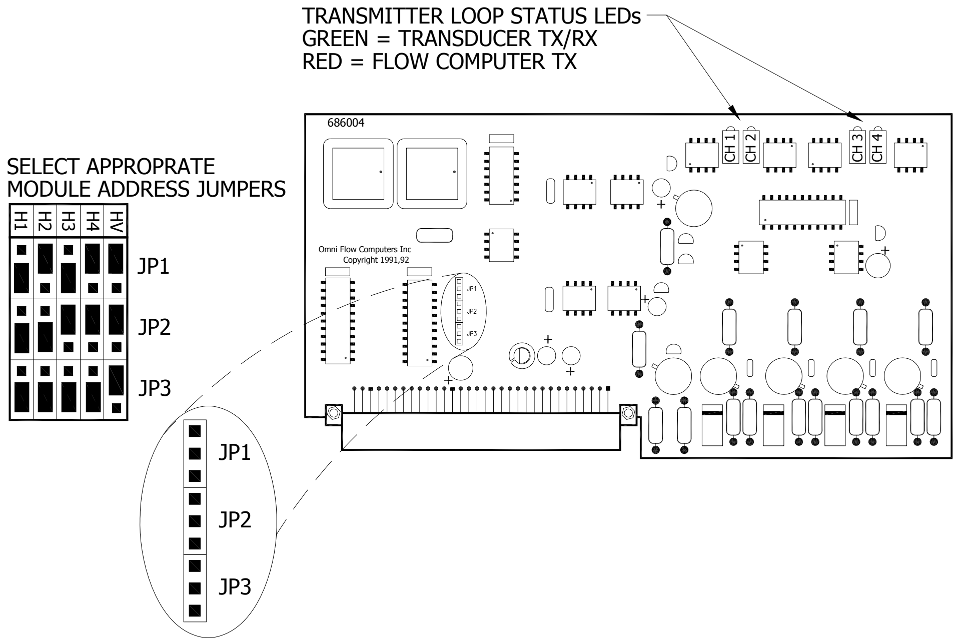


Figure 29. H H/V Type Combo Module - Jumper Settings

Four sets of LED indicators show the status of each transmitter loop. The red LED flashes when the flow computer is transmitting data to the transmitter, such as a change of range, etc. The green LED shows that data is being received by a channel. Note that each communication channel uses 2 wires and operates in the half duplex/simplex mode. This means that the green LED shows the flow computer's transmissions also. Each transducer is operated in the 6-byte broadcast mode. In this mode, the process variable is updated approximately every 300 msec. The database of the transducer is compared against the flow computer's database every 1 or 2 minutes, depending on the type of transducer.

Any changes to the transducer database that will affect the integrity of the measured variable must be made via the flow computer using either the key-pad or the OMNICOM configuration program.

These entries are:

- Transducer Zero (Lower Range Value)
- Transducer Full Scale (Upper Range Value)
- Transducer Damping Code (Filter Time Constant)
- Transducer Tag Name

The flow computer will not allow any other devices to alter these variables. Should they be altered, (by the Honeywell Smart Field Communicator (SFC) for example), they will be restored to their original value as shown in the flow computer (transducer tag name excepted).

2.6. The HV Type Combo I/O Module

The HV Type Combo Module is simply an H Module with the Module Address Jumpers placed in the HV position (Address 15 selected). See Figure 3.

The HV module is used to communicate with Honeywell™ SMV3000 multivariable transmitters via the DE Protocol. Operation of the LEDs is similar to the normal H module. Since only one multivariable transmitter is needed per meter run and since there are a maximum of four meter runs, there will never be a need for more than one HV Combo I/O Module.

Two analog outputs are always available on this module. Each module is connected to the back panel terminal blocks via 12 wires on the ribbon cables. The actual terminal numbers used depend upon which backplane connector (?) the module is plugged into (Table 9).

2.7. The SV Type Combo I/O Module

The SV Type Combo Module (Figure 30) has two RS-485 serial ports that are used to communicate with devices such as Rosemount™ 3095 multivariable transmitters using Modbus Protocol. The module also has six 4-20 mA outputs (Table 9).

Dual LEDs on each port provide status of the communications.

NOTE: **SV Modules and Other Combo Module Types:** The flow computer can handle only two SV Modules and three other A, B, E/D, E or H I/O Combo Modules. An HV module can also be installed in lieu of one of these I/O combo modules. Reference Tech Bulletin # 980501

Table 9. SV Combo Module Back Panel Terminal Assignments

TB? Terminal 1	**Port #1 B** (RS-485)
TB? Terminal 2	**Port #1 A** (RS-485)
TB? Terminal 3	**Port #2 B** (RS-485)
TB? Terminal 4	**Port #2 A** (RS-485)
TB? Terminal 5	**Signal Return for D/A Outputs signals marked (*)**
TB? Terminal 6	**Signal Return for D/A Outputs signals marked (*)**
TB? Terminal 7	**Analog Output #5** (4-20mA) *
TB? Terminal 8	**Analog Output #6** (4-20mA) *
TB? Terminal 9	**Analog Output #3** (4-20mA) *
TB? Terminal 10	**Analog Output #4** (4-20mA) *
TB? Terminal 11	**Analog Output #1** (4-20mA) *
TB? Terminal 12	**Analog Output #2** (4-20mA) *

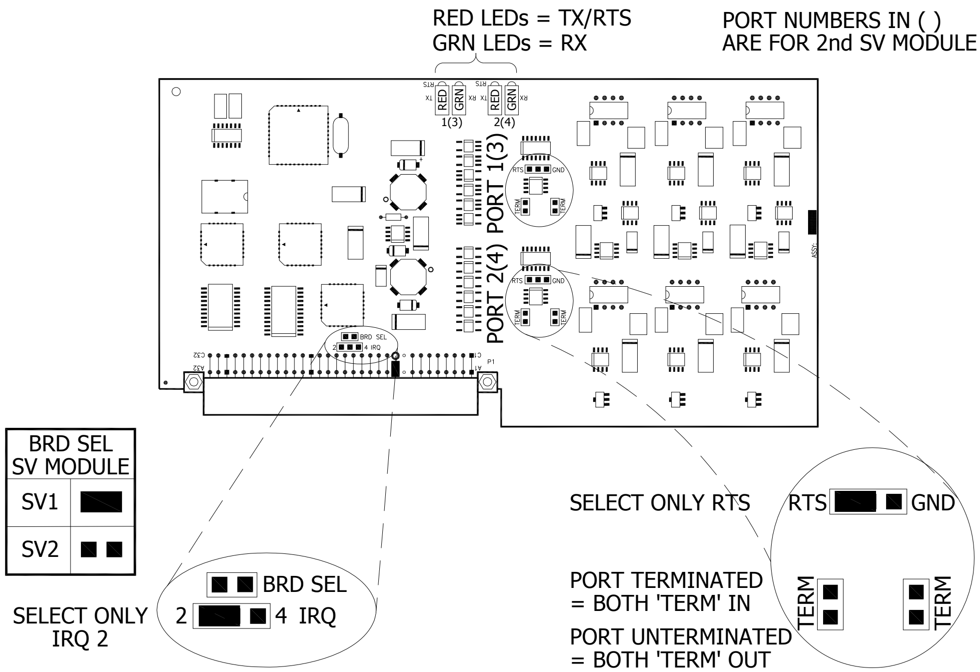


Figure 30. SV Type Combo Jumper Settings

2.8. The HT / HM HART Module

The HT/HM HART Module (Figure 31) is used to interface to HART devices using the HART FSK protocol. The Module has four independent HART FSK networks along with two analog outputs. The HT Module is used for point to point communications and can support four single variable devices per network. The HM Module is used for multi-drop configurations or multi-variable sensors.

NOTE: HT/HM HART Modules Types: The flow computer can handle up to four HT/HM modules and can be installed with any other I/O modules except the H and HV.

See Technical Bulletin 090003 (52-0000-0019) for additional information on the HT/HM Modules.

Two analog outputs are always available on this module. Each module is connected to the back panel terminal blocks via 12 wires on the ribbon cables. The actual terminal numbers used depend upon which backplane connector (?) the module is plugged into (Table 10).

Table 10. HT/HM HART Module Back Panel Terminal Assignments

TB? Terminal 1	**HART Network 1 +**
TB? Terminal 2	**HART Network 1 -**
TB? Terminal 3	**HART Network 2 +**
TB? Terminal 4	**HART Network 2 -**
TB? Terminal 5	**HART Network 3+**
TB? Terminal 6	**HART Network 3 -**
TB? Terminal 7	**HART Network 4 +**
TB? Terminal 8	**HART Network 4 -**
TB? Terminal 9	**Return (DC-) for Analog Outputs 1 & 2**
TB? Terminal 10	**Return (DC-) for Analog Outputs 1 & 2**
TB? Terminal 11	**Analog Output #1** (4-20mA)
TB? Terminal 12	**Analog Output #2** (4-20mA)

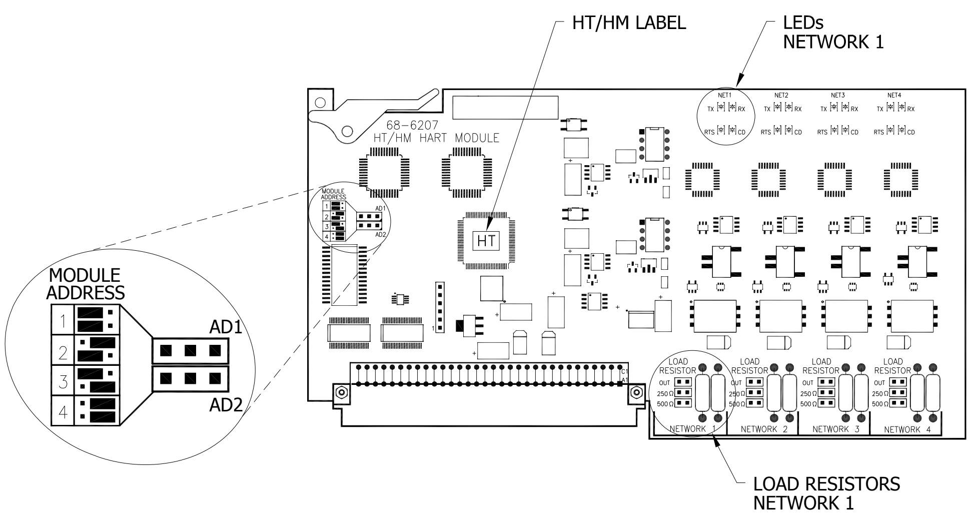


Figure 31. HT/HM HART Module - Configuration Jumpers

Chapter 3

3. Mounting and Power Options

3.1. Mechanical Installation

OMNI offers four chassis mounting options:

- Panel Mount
- Panel Mount - NEMA Option (w/ Extended Back Panel)
- NEMA Mount
- NEMA 4 / 4X Enclosure

Each mounting option is detailed within this section providing mounting dimensions and approximate weight. Also available are downloadable / printable drawing files for each mounting option located at http://www.omniflow.com

3.1.1. Panel Mount

Standard Panel Mount units provide signal I/O directly on the chassis Back Panel. Refer to Figure 32 and Figure 33 for detailed mounting instructions.

NOTE: **Panel Mounting:** Minimum recommended panel thickness 3/16 inch [4.8mm], Panel thickness ≤ 1/8 inch [3.2mm] may be used if rear panel support is provided.

CAUTION: These units have an integral latching mechanism which first must be disengaged by lifting the bezel upwards before sliding the unit from the case.

Follow these installation notes for proper mounting and safe operation:

- Mount chassis to bonded metal surface.
- Bonded metal surface shall be provided with safety earth path.
- Minimum recommended panel thickness 0.188in [4.8mm]
  Panel thickness ≤0.125in [3.2mm] may be used if rear support is provided.

Dimensions shown in inches and [millimeters]

Approximate weight:

3000 Panel Mount Chassis ≈ 11 lbs [5kg]

6000 Panel Mount Chassis ≈ 17 lbs [7.7kg]

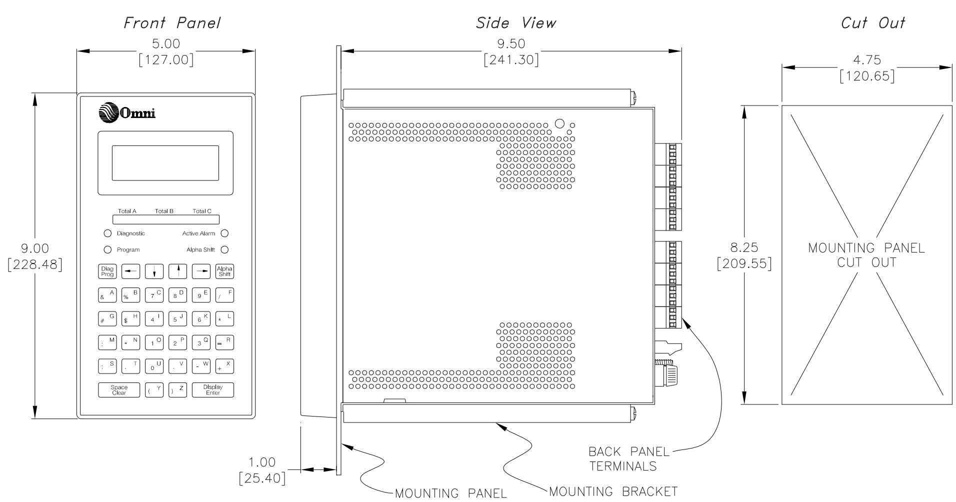


Figure 32. 3000 Panel Mount Chassis

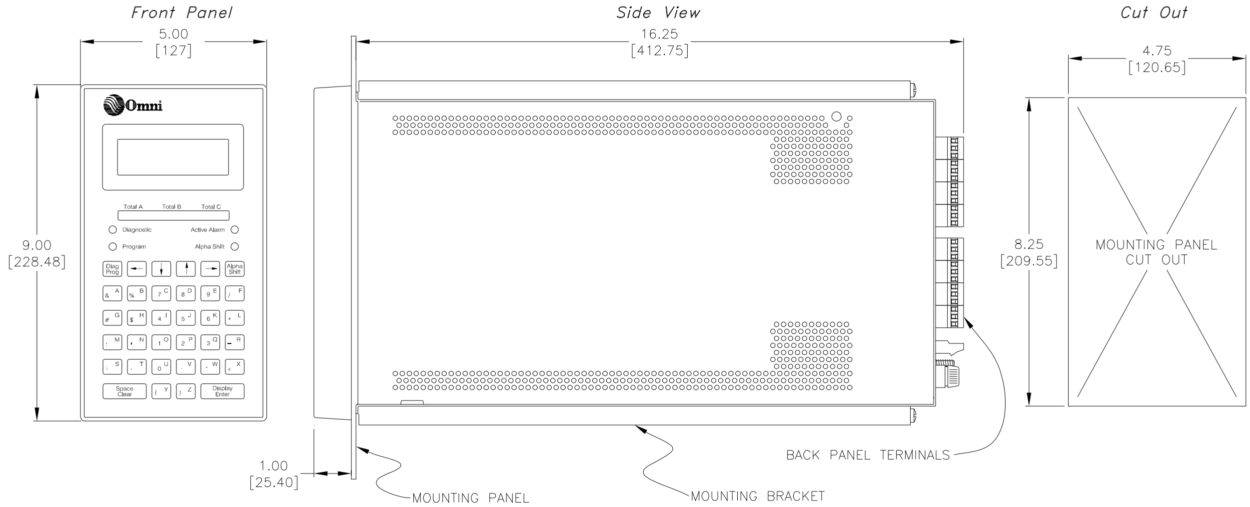


Figure 33. 6000 Panel Mount Chassis

3.1.2 Panel Mount – NEMA Option (w/ Extended Back Panel)

Both the 3000 and 6000 Panel Mount units are offered with an Extended I/O Back Panel. Extended 64-Conductor Ribbon Cables and the AC Power Cable are provided with a standard length of 5 feet (10 and 15 foot cables also available).

Refer to Figure 34 and 35 for detailed mounting instructions.

NOTE: Panel Mounting: Minimum recommended panel thickness 3/16 inch [4.8mm], Panel thickness ≤ 1/8 inch [3.2mm] may be used if rear panel support is provided

CAUTION: These units have an integral latching mechanism which first must be disengaged by lifting the bezel upwards before sliding the unit from the case.

CAUTION: The **maximum** length of the ribbon cable that connects the keypad to the CPU module is 18 inches [457.2 mm]. The operation of the Central Processor Module (CPU) will be significantly affected if this length is exceeded.

Follow these installation notes for proper mounting and safe operation.

- Mount chassis to bonded metal surface.
- Bonded metal surface shall be provided with safety earth path.
- Minimum recommended panel thickness 0.188in [4.8mm]
  Panel thickness ≤0.125in [3.2mm] may be used if rear support is provided.

Dimensions shown in inches and [millimeters]

Approximate weight:

3000 Panel Mount - NEMA Option Chassis ≈ 12 lbs [5.4kg]

6000 Panel Mount - NEMA Option Chassis ≈ 19 lbs [8.6kg]

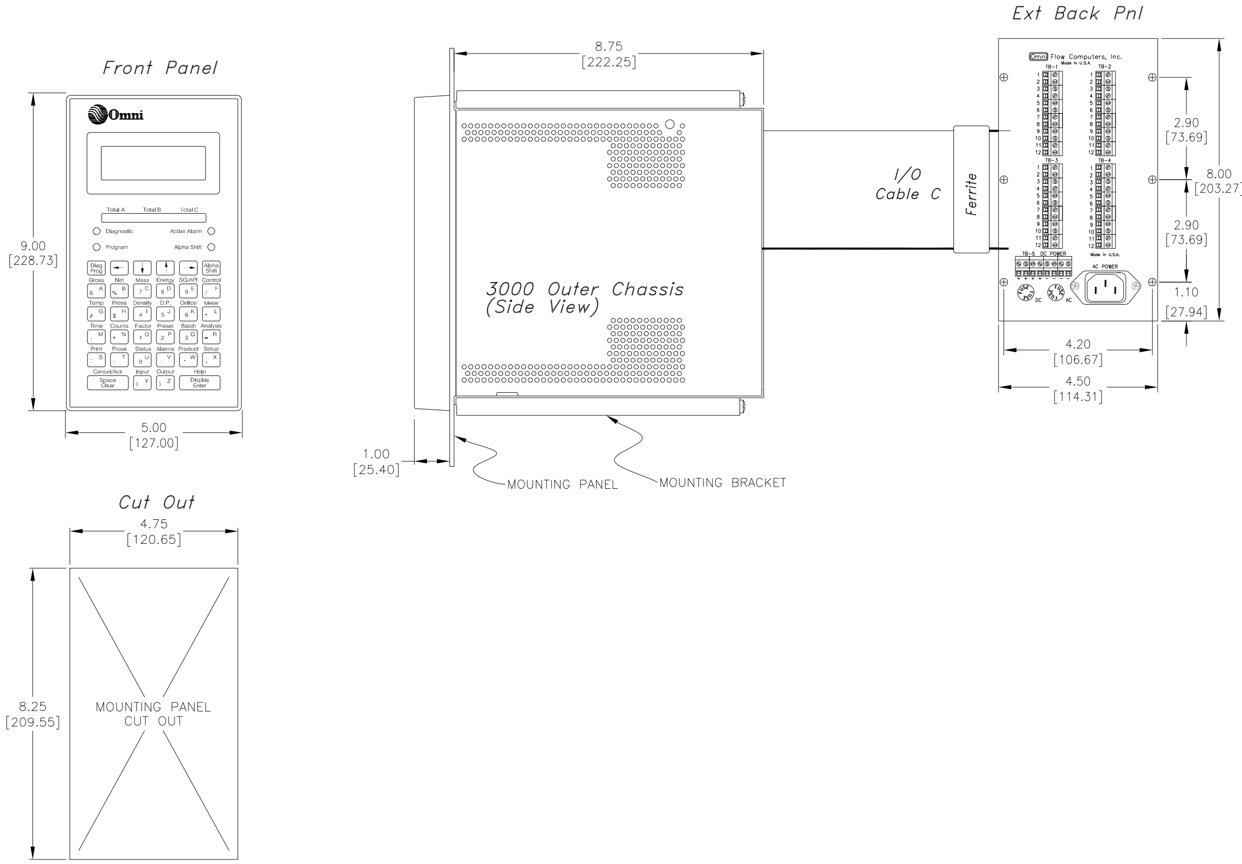


Figure 34. 3000 Panel Mount - NEMA Option (w/ Extended Back Panel)

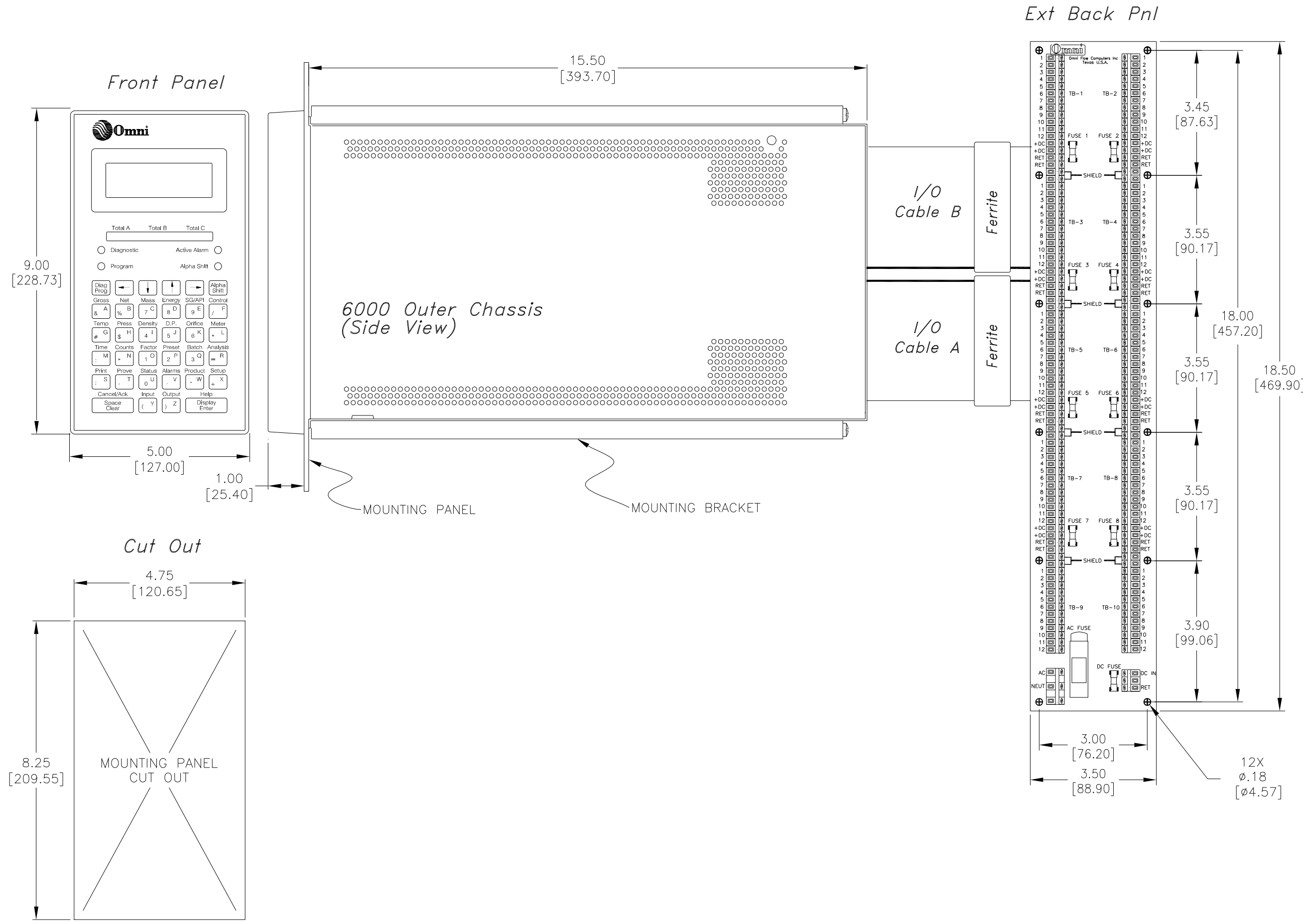


Figure 35. 6000 Panel Mount - NEMA Option (w/ Extended Back Panel)

3.1.3 NEMA Mount Chassis

Both the 3000 and 6000 units are available in an open frame NEMA Mount Chassis with Extended I/O Back Panel. Extended 64-Conductor Ribbon Cables and the AC Power Cable are provided with a standard length of 5 feet (10 and 15 foot cables also available). Refer to Figures 37 and 38 for detailed mounting instructions.

CAUTION: Avoid mounting in drafts that can cause rapid fluctuations in temperature. Mount the NEMA Chassis units horizontally for proper heat transfer (Figure 36**)**

Do NOT mount vertically.

The **maximum** length of the ribbon cable that connects the keypad to the CPU module is 18 inches [457.2 mm]. The operation of the Central Processor Module (CPU) will be significantly affected if this length is exceeded.

Follow these installation notes for proper mounting and safe operation.

- Mount chassis to bonded metal surface.
- Bonded metal surface shall be provided with safety earth path.
- Chassis and Backpanel should be mounted in an area accessible by qualified personnel only.
- For AC powered units, incorporate a readily accessible disconnect device external to the equipment.
- Minimum recommended panel thickness 0.188in [4.8mm]

  Panel thickness ≤0.125in [3.2mm] may be used if rear support is provided.

Dimensions shown in inches and [millimeters].

Approximate weight:

3000 NEMA Mount Chassis ≈ 8 lbs [3.6kg]
6000 NEMA Mount Chassis ≈ 12 lbs [5.4kg]

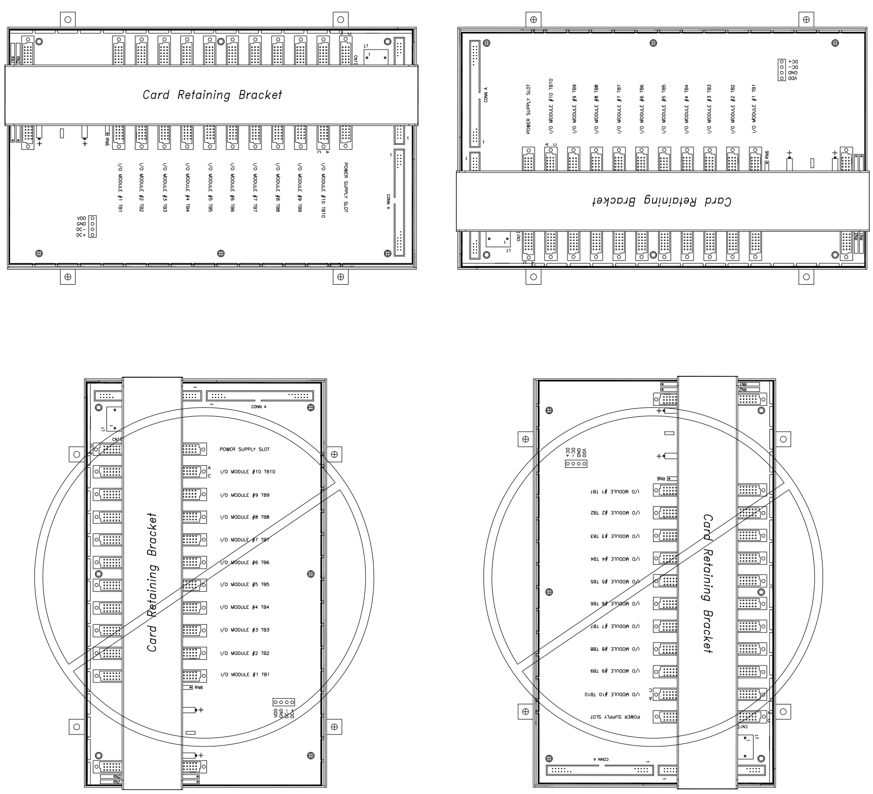


Figure 36. NEMA Chassis Mounting Options

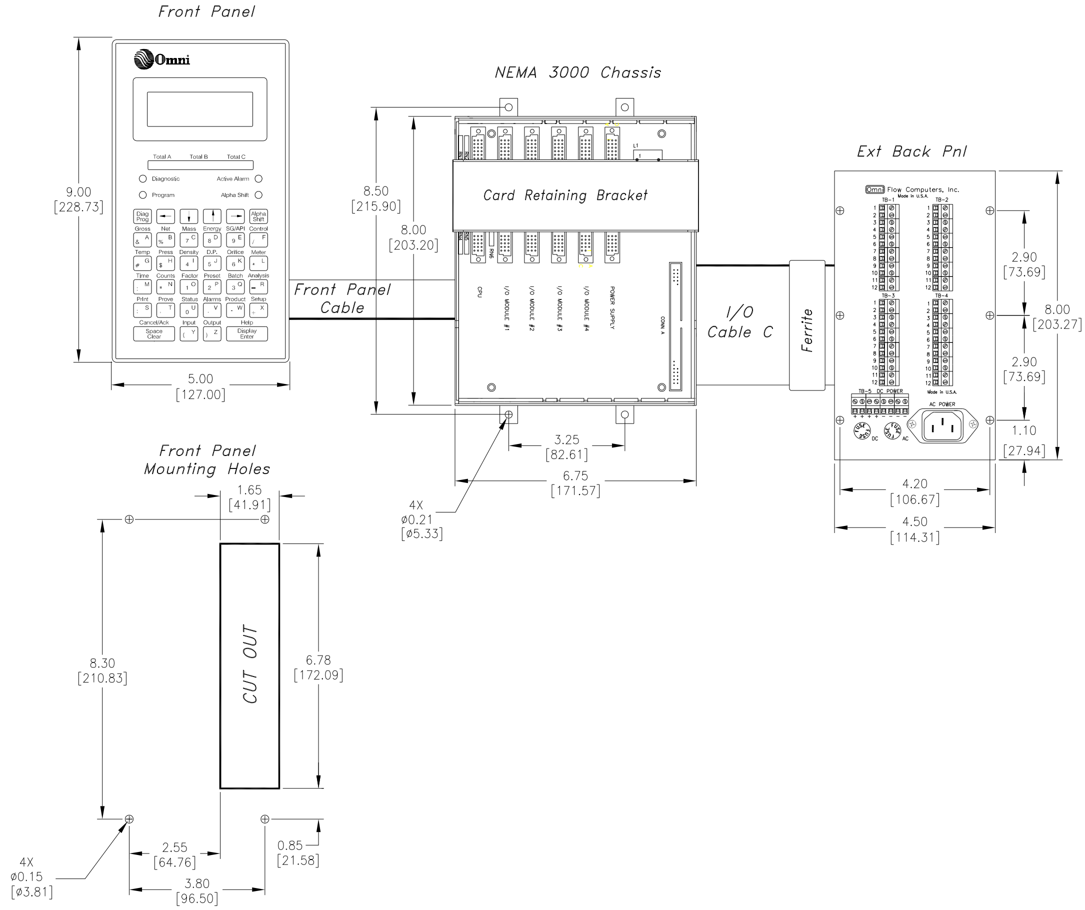


Figure 37. 3000 NEMA Mount Chassis

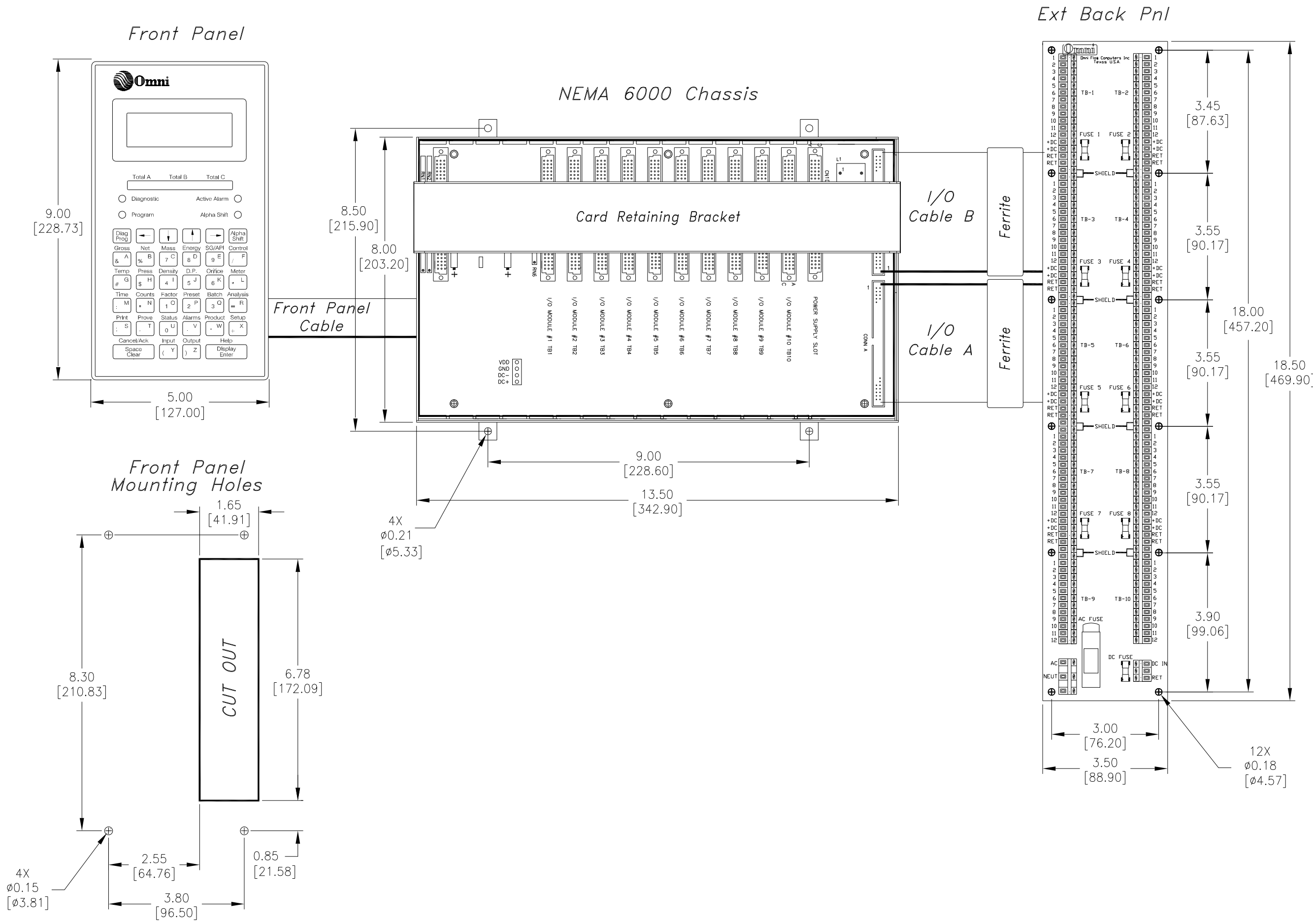


Figure 38. 6000 NEMA Mount Chassis

3.1.4 NEMA 4 / 4X Configurations

Both the NEMA 4 and NEMA 4X are weather-proof enclosures (Figure 39). The NEMA 4 is a carbon steel enclosure, whereas the NEMA 4X is a stainless steel enclosure which offers a degree of protection against corrosive agents. Both OMNI 3000 and OMNI 6000 flow computers are mounted inside the NEMA enclosure on a swing frame. The NEMA enclosure also includes a 5' x 3" x ¼" Lexan viewing window to allow easy viewing of the Front Display. Refer to Figure 37 for overall dimensions.

OMNI offers a variety of NEMA enclosure configurations. Contact OMNI Sales for further information.

Follow these installation notes for proper mounting and safe operation.

- Mount chassis to bonded metal surface.
- Bonded metal surface shall be provided with safety earth path.
- Surface required to support unit weight.

Dimensions shown in inches and [millimeters]

Approximate weight for single 6000 unit configuration:

NEMA Mount Chassis ≈ 70 lbs [32 kg] (Carbon Steel)

NEMA Mount Chassis ≈ 90 lbs [43 kg] (Stainless Steel)

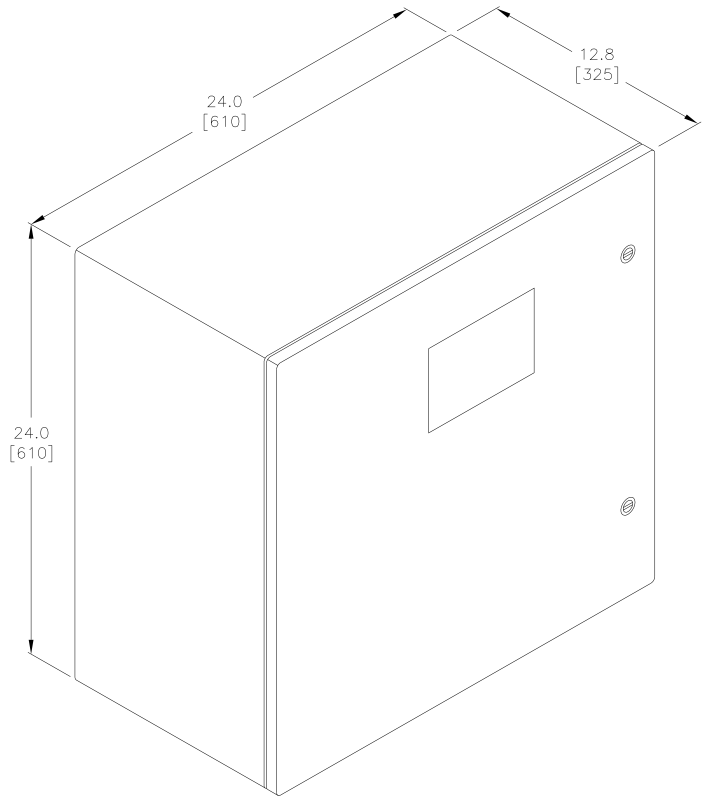


Figure 39. NEMA Enclosure

3.2 Input Power

The OMNI Flow Computer can be AC or DC powered. Presently OMNI offers two power supply modules; the 6118 PSU (which is being phased-out) and the new 6218 Universal PSU. The 6118 Power Supply can be identified by the large transformer and three large capacitors, the 6218 Power Supply can be identified by one AC/DC convertor, a DC/DC convertor and two large capacitors. The following sections address both AC and DC power source requirements as well as unit power and fuse ratings for various configurations.

CAUTION: POTENTIAL FOR DATA LOSS! RAM Battery Backup - OMNI flow computers leave the factory with a fully charged NiMH battery as RAM power backup. RAM data, including user configuration and I/O calibration data, may be lost if the flow computer is disconnected from external power for more than 30 days. Observe caution when storing the flow computer without power being applied for extended periods of time. The RAM back-up battery is rechargeable and will be fully charged after power has been applied for 24 hours.

NOTE: ENVIRONMENTAL: The maximum system configuration of 24 process inputs, 12 process outputs, 24 digital I/O points and 4 serial I/O channels dissipates approximately 24 Watts. This causes an internal temperature rise of 15ºF over the ambient. The unit should not be mounted in a cabinet or panel where the ambient inside the cabinet will exceed 125ºF.

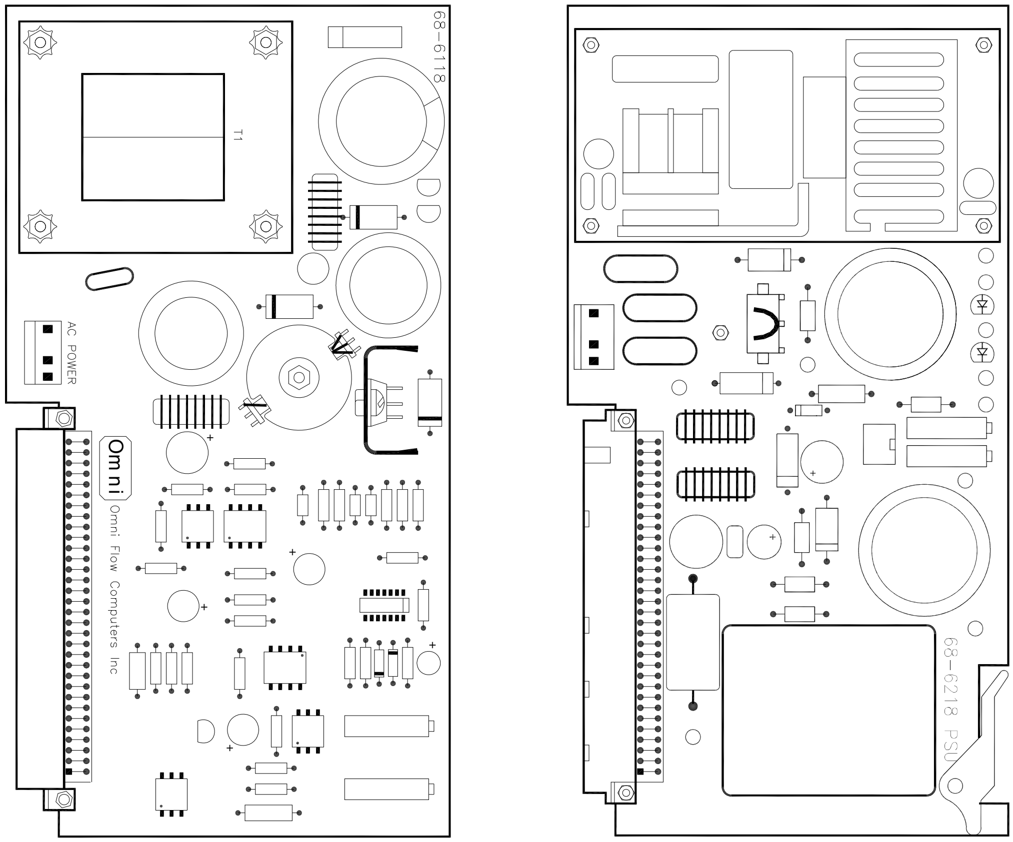


Figure 40. 68-6118 and 68-6218 Power Supplies

3.2.1 AC Powered Unit

Model 68-6118 Power Supply

When the 68-6118 Power Supply is AC powered (120VAC, 50 Watt minimum capacity) applied to the AC connector or terminal block, approximately 500mA at 24VDC is available from the DC terminal block on the Back Panel to drive transducer loops, pre-amplifiers, and digital I/O loads.

The flow computer can be special ordered to operate from 220-250 VAC power source. This requires factory modification of the 68-6118 power supply unit. These units are identified with a ‘230 VAC’ decal and will ship with a different power cord.

NOTE: On the 68-6118 Power Supply an absolute maximum of 500mA of transducer loop power is available with a fully loaded system of 6 combo I/O modules, 2 digital I/O modules and 2 dual serial I/O modules. The loops must be powered from an external 24 VDC PSU or the computer must be DC powered if this 500mA limit is to be exceeded.

CAUTION: To reduce the risk of electrical shock and/or equipment damage, provide a secure safety earth path with Green Ground Wire between the Unit Chassis and Bonded Metal Surface

Model 68-6218 Power Supply

When the 68-6218 Power Supply is AC powered (90VAC to 264VAC, 60 Watt minimum capacity 47 – 440Hz) applied to the AC connector or terminal block, approximately 750mA at 24VDC is available from the DC terminal block on the Back Panel to drive transducer loops, pre-amplifiers, and digital I/O loads. This power supply requires no modification; however the customer must indicate North America or European use in order to receive the proper power cord.

NOTE: On the 68-6218 Power Supply an absolute maximum of 750mA of transducer loop power is available with a fully loaded system of 6 combo I/O modules, 2 digital I/O modules and 2 dual serial I/O modules. The loops must be powered from an external 24 VDC PSU or the computer must be DC powered if this 750mA limit is to be exceeded.

3.2.2 DC Powered Unit

Model 68-6118 Power Supply

When the 68-6118 Power Supply is DC powered, a minimum of 22 to 26 VDC, 24 Watts is applied to the DC terminal block on the Back Panel (this wattage figure does not include power sourced from the digital output terminals).

Model 68-6218 Power Supply

When the 68-6218 Power Supply is DC powered, a minimum of 22 to 26 VDC, 30 Watts is applied to the DC terminal block on the Back Panel (this wattage figure does not include power sourced from the digital output terminals). The maximum common mode offset from DC+ or DC- to Earth ground must be less than 120 VDC.

3.2.3 Service & Fuse Replacement

- Service should be performed by qualified service personnel.
- Power should be disconnected before servicing the unit.

Panel Mount

On the panel mount units, two types of fuses have been used which are physically different and are not interchangeable. Earlier production units use a 2AG style fuse while later production units use a 5x20 style fuse which is slightly larger. The value of the AC fuse for both styles depends on the power supply installed in the unit. The 68-6218 Universal Power supply can be identified by the card ejector and it does not have the large transformer that is present on the 68-6118 model.

Identify which Power Supply and Back Panel are installed on the flow computer and use the following guide to select the proper replacement fuse.

DC Fuse: **All Power Supply Modules**

2AG = 3 Amp Slow Blow (Littelfuse # 0229003)
5x20 = 3.15 Amp Slow Blow (Littelfuse # 02183.15)

AC Fuse: **68-6218 Power Supply Modules**

2AG = 750mA Fast Blow (Littelfuse # 0229.750)
5x20 = 1.6 Amp Fast Blow (Littelfuse # 021701.6)

AC Fuse: **All Other Power Supply Modules**

2AG = 500mA Fast Blow (Littelfuse # 0225.500)
5x20 = 315mA Fast Blow (Littelfuse # 0217.315)

NEMA Mount

The 3000 Extended Back Panel is identical to the Back Panel used on the panel mount unit. Refer to the previous section to identify the proper fuses.

The 6000 Extended Back Panel uses a 5x20 style fuse for the AC fuse and uses a 2AG style fuse for the DC fuse. The value of the AC fuse depends on the power supply installed in the unit. The 68-6218 Universal Power supply can be identified by the card ejector and it does not have the large transformer that is present on the 68-6118 model. Check your model before ordering fuses.

DC Fuse: **All Power Supply Modules**

2AG = 3 Amp Slow Blow (Littelfuse # 0229003)

AC Fuse: **68-6218 Power Supply Modules**

5x20 = 1.6 Amp Fast Blow (Littelfuse # 021701.6)

AC Fuse: **All Other Power Supply Modules**

5x20 = 315mA Fast Blow (Littelfuse # 0217.315)

Fuses: F1 - F8: Eight additional fuses used for transducer loop power.

2AG = 250mA Fast Blow (Littelfuse # 0225.250)

3.2.4 Electrical Safety Precautions

Basic electrical safety precautions should be followed to protect the user / installer from harm and the equipment from damage.

- Read the manual before attempting to install or work on the equipment.
- If an electrical accident occurs, remove power to the system by removing the plugs(s) from the outlet(s). Some may have multiple power cords which connect to more than one outlet.
- Power should be connected via a readily accessible disconnect device certified as being safe for the area.
- When AC powered, the power cord must include a grounding pin and must be plugged into a grounded electrical outlet.
- The rack in which the equipment is installed should be reliably grounded.
- Allow 2 inches (50mm) between this equipment and other equipment to allow for free flow of air movement.
- Power should always be disconnected from the system removing or installing main system components, such as modules. When disconnecting power, first power-down the system with the operating system then unplug the power cord.
- Replacement fuses shall be the same type and rating as required for the equipment. Refer to section Service and Fuses.
- Keep the area around the equipment clean and free of clutter.

NOTE: Earth Ground Requirements: To minimize the effects of electrical transients, the outer chassis of the flow computer shall be connected to secure earth ground using the Ground Stud located on the back of the Panel Mount Chassis or connected to the Ground Nut located on the end of the NEMA Chassis.

Chapter 4

4. Connecting to Flowmeters

4.1. Turbine Flowmeter (A or B Combo Module)

Input Channels 3 and 4 can be independently jumpered to accept pulse signals. Channel 3 on the A and B Combo Modules and Channel 4 on the A Combo Module can be used to input turbine or positive displacement flowmeters. The input threshold is approximately 3.5 volts; hysteresis ± 1/2 volt.

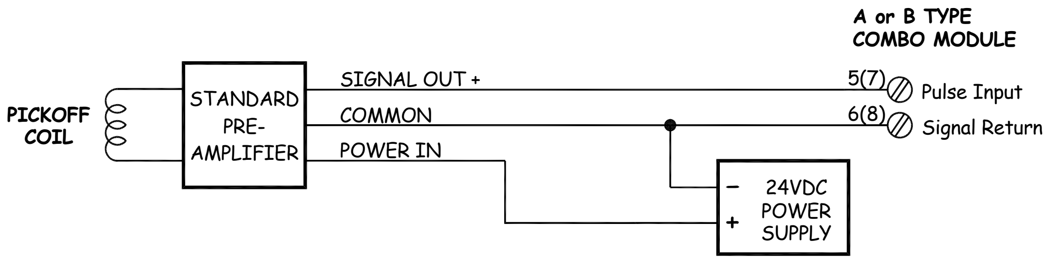


Figure 41. Connecting to Turbine Pre-amp

4.2. Wiring Flowmeter Signals to E Type Combo Modules

Input Channels 3 and 4 of each E Type Combo Module are used to input signals from turbine or PD flowmeters. Both channels share a common signal return at the OMNI terminals. Input threshold can be jumpered for +1 or +3.5 volt. Input coupling can be AC or DC (Review Chapter 2). Hysteresis is approximately 0.5 volt.

Figure 40, 41, and 42 is typical and shows additional wiring needed to interface to a pipe prover detector switch set.

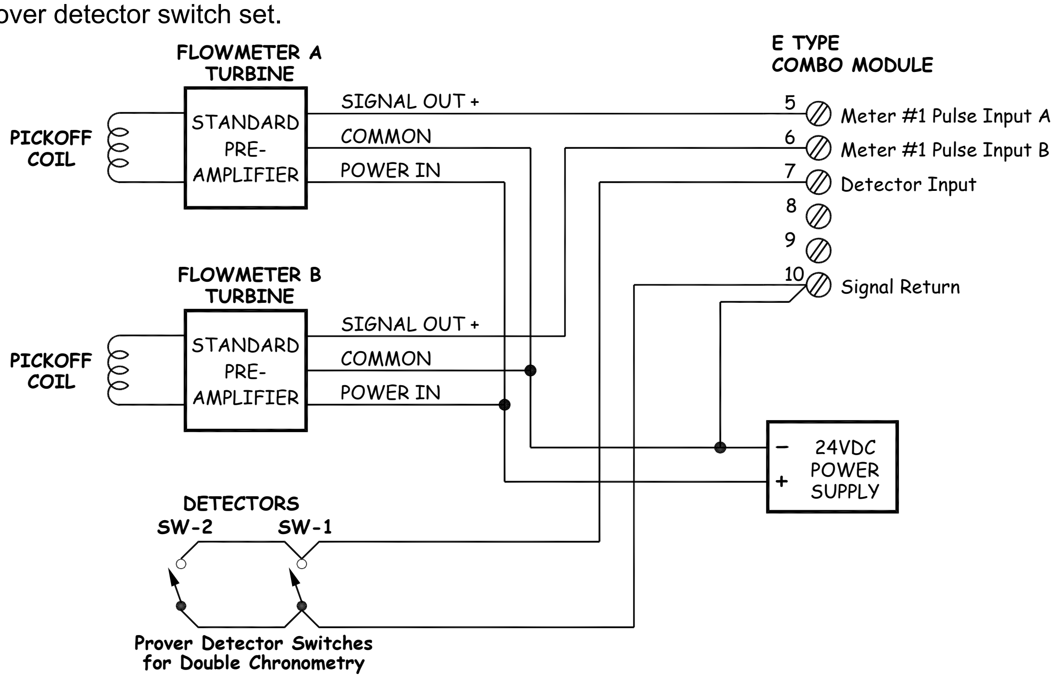


Figure 42. Wiring to Turbine Pre-Amps

4.3. Faure Herman™ Turbine Meters (E Combo Module)

Faure Herman™ Turbine Meters are used in liquid applications only. For these flowmeters, threshold jumpers must be installed to select high threshold on the E Type Combo Module (Figure 43 and 44).

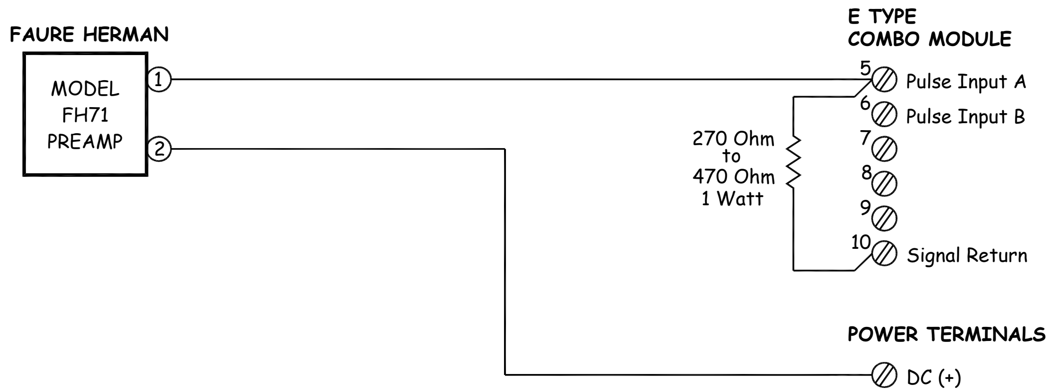


Figure 43. Pre-amp Using OMNI 24 VDC

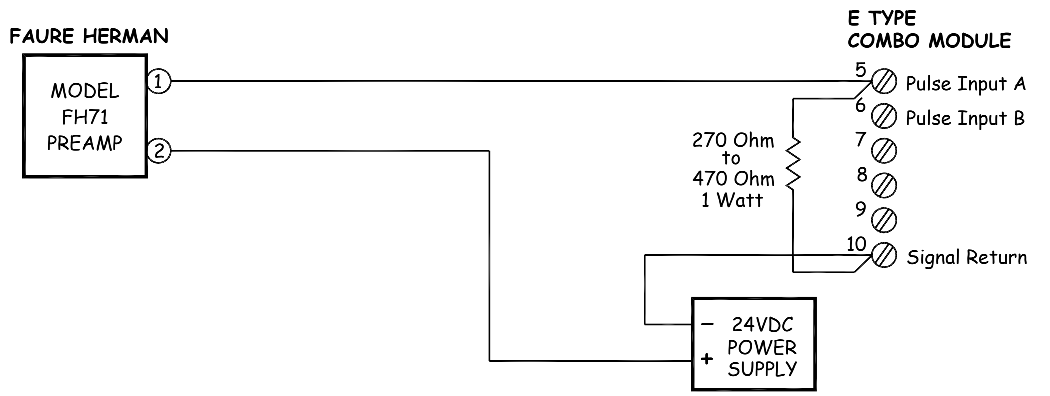


Figure 44. Pre-amp Using External 24 VDC

4.4. Pulse Fidelity and Integrity Checking with E Type Combo Modules

A flowmeter with dual channel out-of-phase outputs can be connected as shown in Figure 45. The flow computer can be configured to continuously compare the signals for frequency and sequence on a pulse-to-pulse basis, and alarm and log any differences. (Review Technical Bulletin 52-0000-0008 (970901) for more information on Pulse Fidelity Checking)

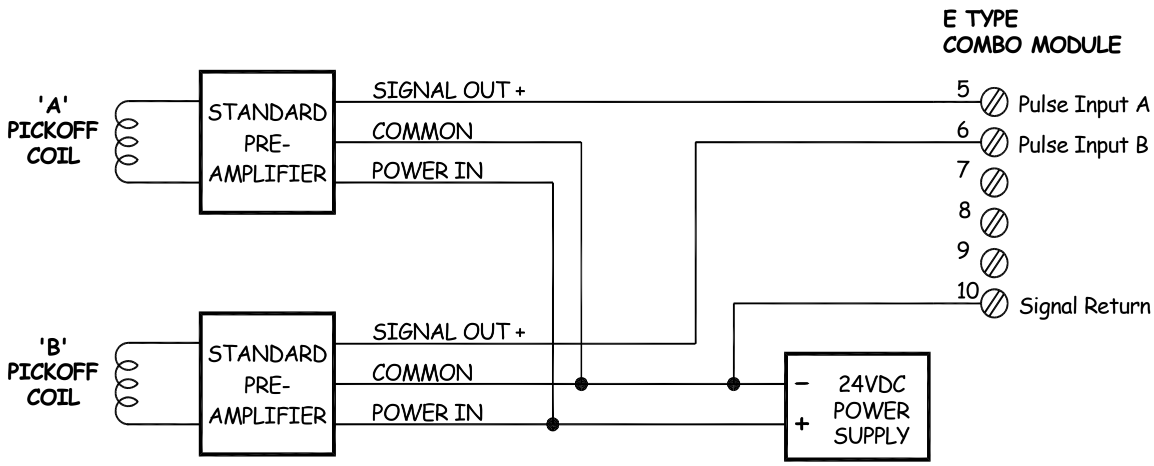


Figure 45. Connecting Dual Coil Turbines

Chapter 5

5. Connecting to Transducers and Transmitters

5.1. Wiring the Input Transducers

Because of the high density of connections on the back panel terminal module, it is recommended that wiring to the terminals be made with 18-22 gauge wire wherever possible (Figure 46). Transducers should be wired using twisted pairs of shielded wire. The shields should be connected together and grounded at the flow computer end. To prevent ground loops, shields should be taped back and insulated at the transducer end.

Each of the 4-20 mA process input channels are individually optically isolated. The transmitter may be connected in series with either the power or return line of the transducer current loop. The Figure 44 shows a transducer wired in the power leg of the loop.

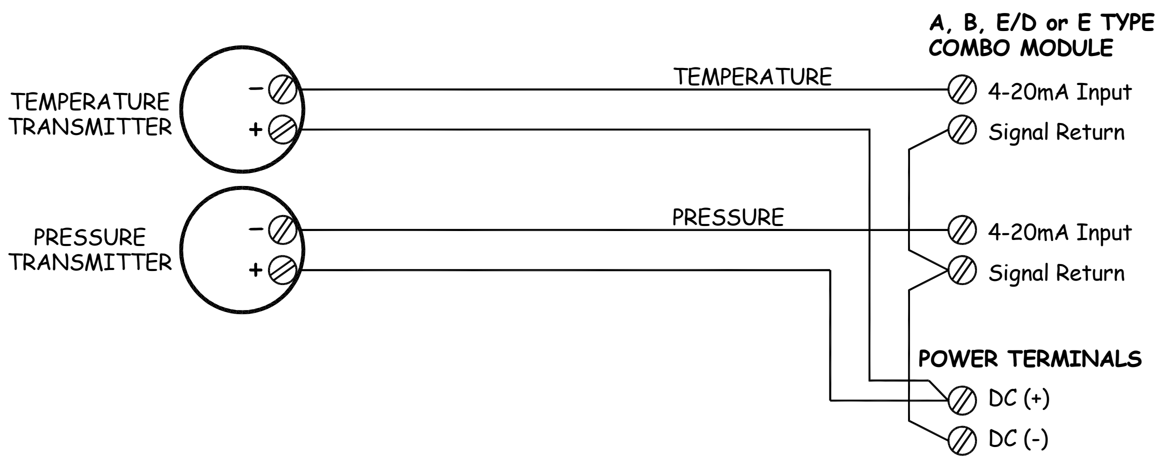


Figure 46. Wiring the 4-20mA Inputs

5.2. Wiring of a Dry ‘C’ Type Contact

Certain types of flowmeter photo-pulsers produce a low frequency contact pulse output (typical 1 pulse per rotation). To accommodate these low frequencies, they can be wired to any pulse input on A or E Type Combo Modules, as shown in Figure 47.

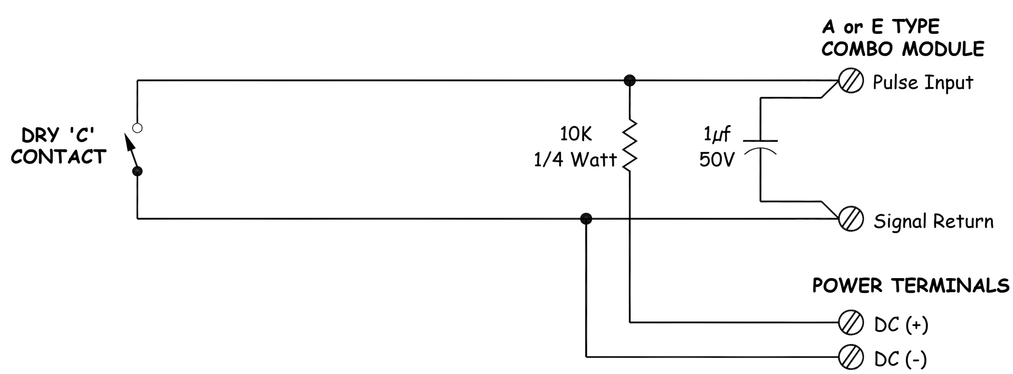


Figure 47. Wiring for Dry C Type Contact

5.3. Wiring RTD Probes

NOTE: A and B Type Combo Modules always have 1 RTD excitation current source available at Terminal 9. A second excitation source is available on B combo modules at Terminal 12.

The excitation current source for an RTD need not come from the same combo module that the signal is input to. We recommend that you always verify and recalibrate input channels connected to an RTD. This is necessary because the OMNI factory calibration usually assumes that all input channels will be configured as 4-20 mA types.

Channels 1 and 2 of each combo I/O module can be configured to accept a signal from a 100 ohm RTD probe by positioning jumpers on the module. The flow computer firmware accepts either the DIN 43-760 curve (α= 0.00385) or the American curve (α=0.00392). The probe is wired in a 4-wire configuration as shown in Figure 48.

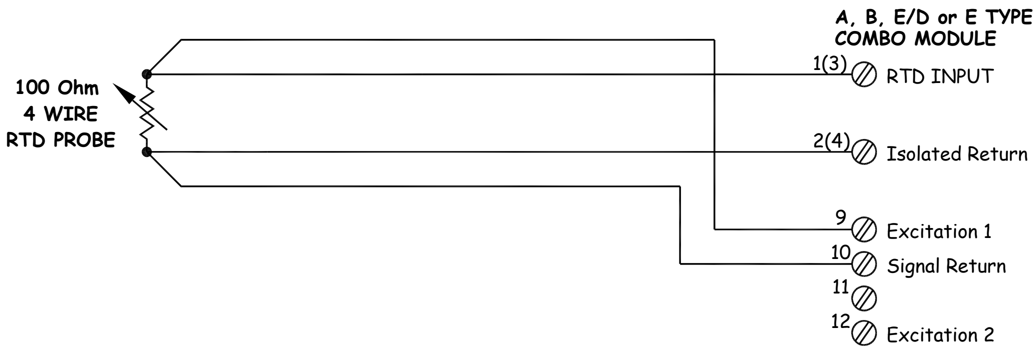


Figure 48. Wiring a 4-Wire RTD Temperature Probe

5.4. Wiring Densitometers

5.4.1. Wiring Densitometer Signals to an B and E/D Type Combo Modules

5.4.2 Solartron™ Densitometers

NOTE: Because the density pulse signal can be a small AC signal with a large DC offset, you must select AC coupling and low trigger threshold for the combo module channel used. Input impedance will be 10kohms; 1.5Vpp is required from the densitometer to reliably trigger the input.

When configuring the flow computer, select the DIN curve for this RTD temperature point.

Connecting to a Solartron Digital Densitometer usually involves two devices: the densitometer current pulse signal and the densitometer 4-wire RTD probe attached to the vibrating tube. The pulse signal is connected to Channel 4 of a B Type Combo Module. The RTD is connected to Channel 1 or Channel 2. The device can be connected with or without safety barriers, depending on the needs of the application (Figure 49).

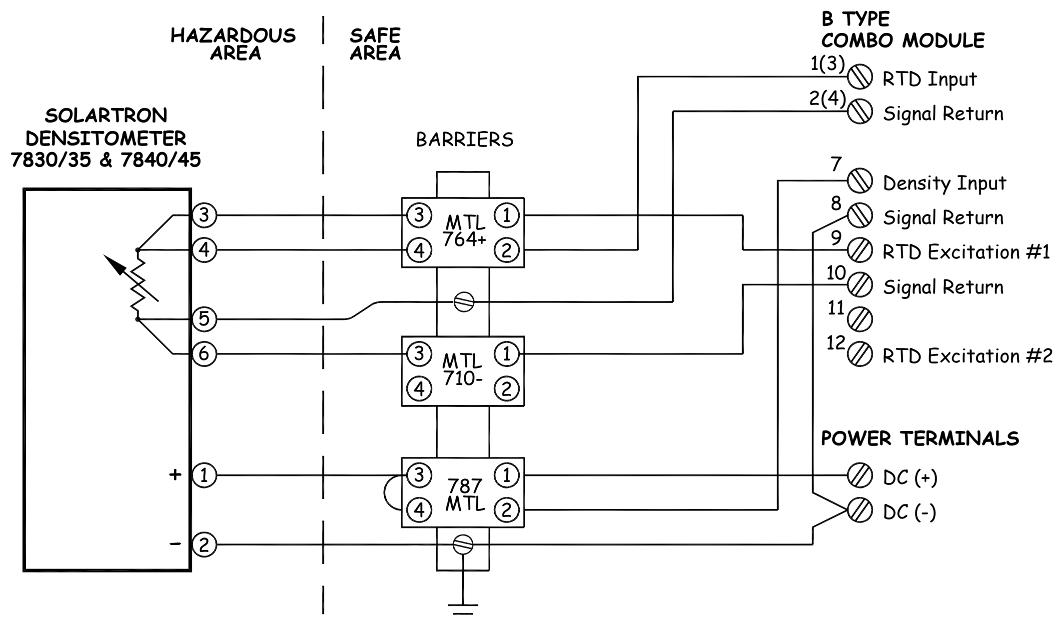


Figure 49. Wiring Safety Barriers to a B Type Combo Module

Two independent densitometers with RTD probes can be wired directly to an E/D type combo module. Solartron[tm], Sarasota, and UGC[tm] frequency densitometers can be wired to the same E/D type module.

Wiring an E/D module with two RTD and two frequency Density inputs will use the terminals shown in Figure 48:

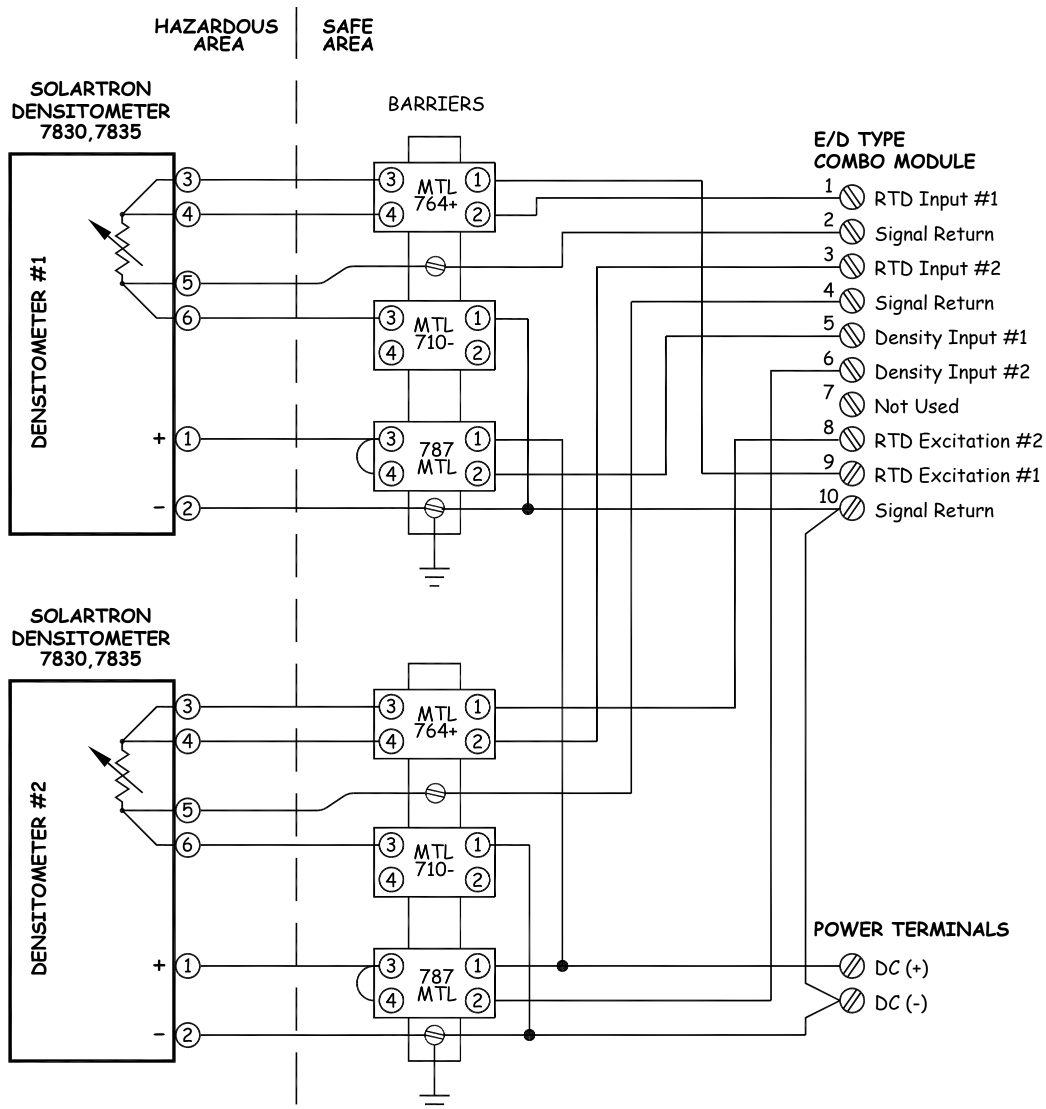


Figure 50. Wiring Safety Barriers to a E/D Type Combo Module

Two independent densitometers with RTD probes can be wired directly to an E/D type combo module. Solartron[tm], Sarasota, and UGC[tm] frequency densitometers can be wired to the same E/D type module.

Wiring an E/D module with two RTD and two frequency Density inputs will use the terminals as shown in Figure 50, 51, and 52.

CAUTION: Diagrams shown are based on published manufacturers', data. OMNI accepts no responsibility for wiring or installation of equipment in a hazardous area. Equipment must always be installed in compliance with local and national safety standards

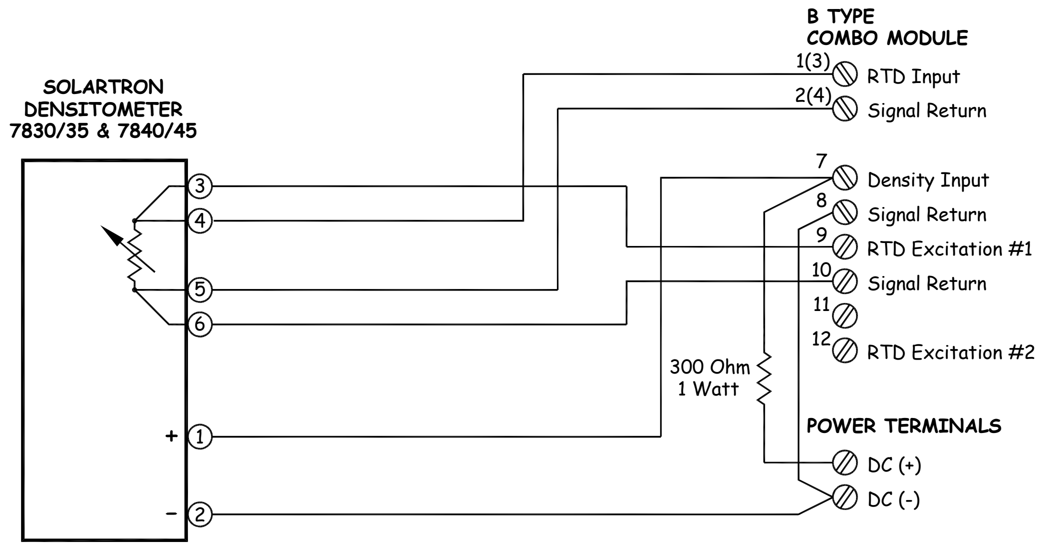


Figure 51. Wiring 'B' Type Combo Module

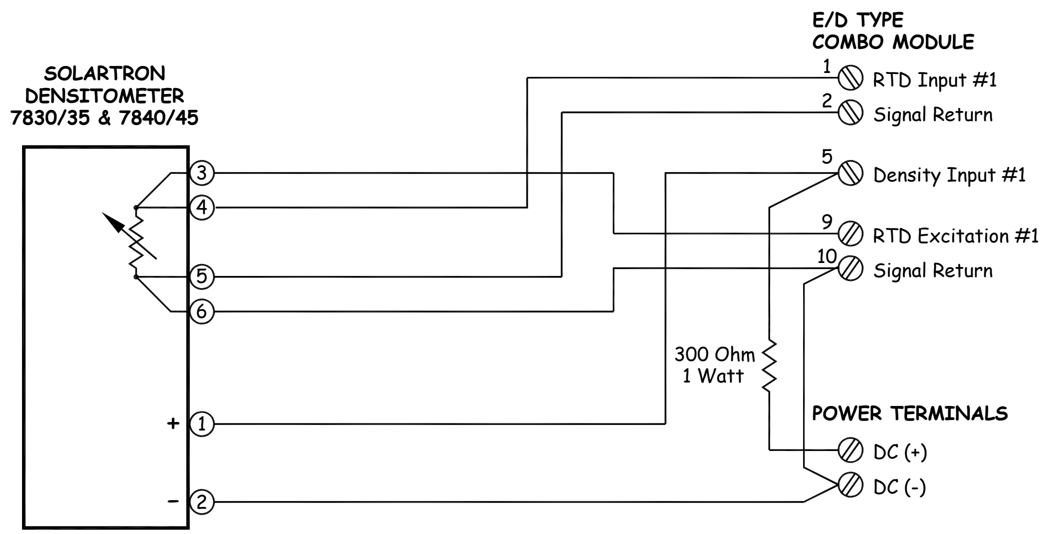


Figure 52. Wiring 'E/D' Type Combo Module

5.4.3. Sarasota™ Densitometers

NOTE: Because the density pulse signal can be a small AC signal with a large DC offset, you must select AC coupling and low trigger threshold for the combo module channel used. Input impedance will be 10kohms; 1.5Vpp is required from the densitometer to reliably trigger the input

When configuring the flow computer, select the DIN curve for this RTD temperature point

The Sarasota™ Densitometer provides a voltage pulse signal representing density and also a 4-wire 100 ohm RTD probe monitoring the temperature of the device. The pulse signal is connected to Channel 4 of a B Type Combo Module. The RTD is connected to Channel 1 or Channel 2 of any module. The device can be connected with or without safety barriers, depending on the needs of the application.

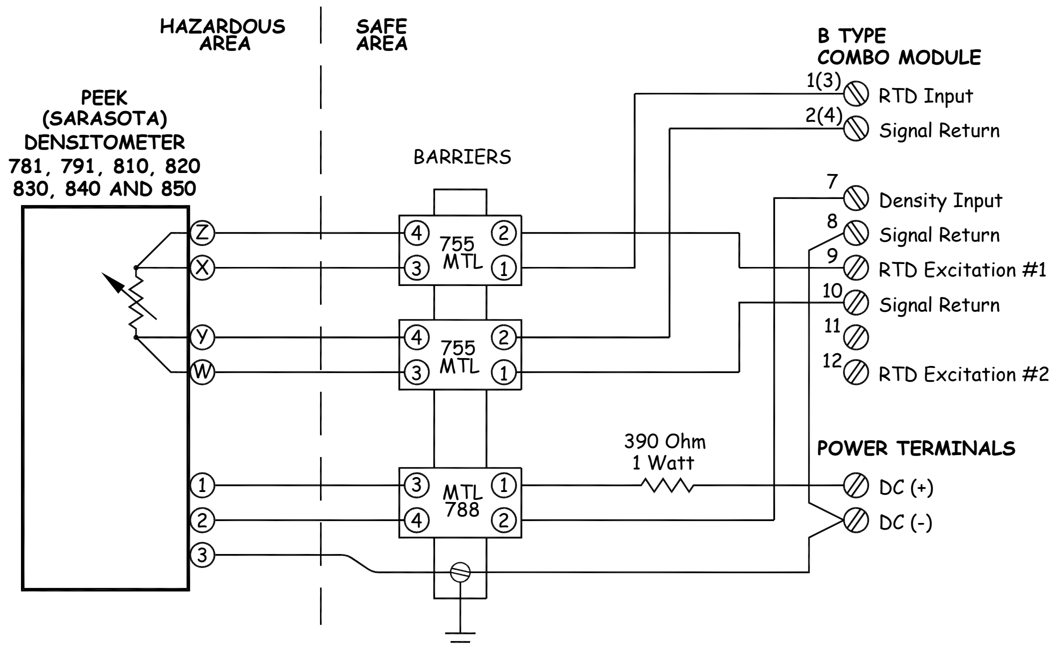


Figure 53. Wiring Safety Barriers to 'B' Combo Module

Two independent densitometers with RTD probes can be wired directly to an E/D type combo module. Solartron™, Sarasota, and UGC™ frequency densitometers can be used.

Wiring an E/D module with two RTD and two frequency Density inputs will use the OMNI back panel terminals shown in Figure 54:

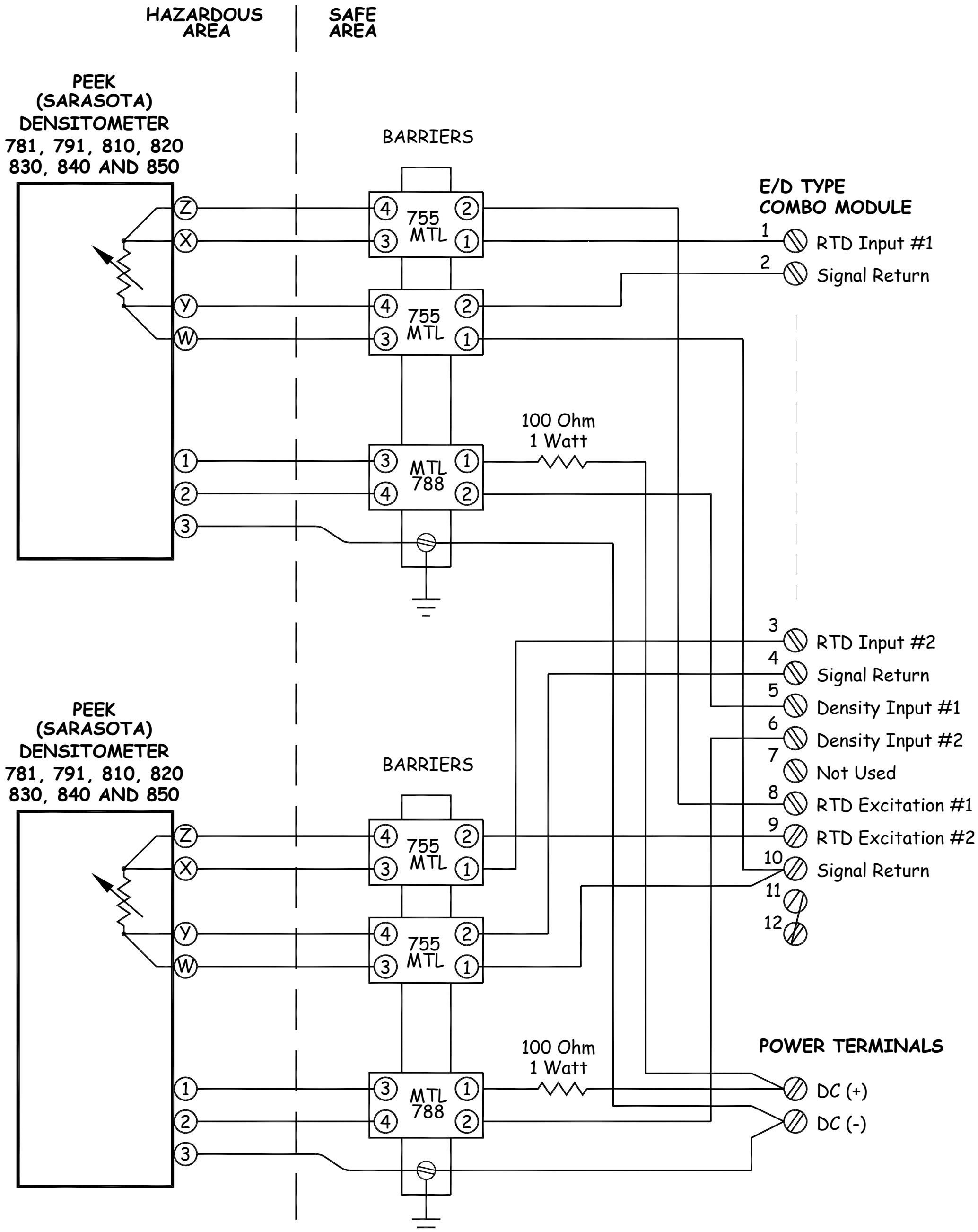


Figure 54. Wiring a Densitometer with Safety Barriers to 'E/D' Type Combo Module

CAUTION: Diagrams shown in Figures 53, 54, 55, and 56 are based on published manufacturers', data. OMNI accepts no responsibility for wiring or installation of equipment in a hazardous area. Equipment must always be installed in compliance with local and national safety standards.

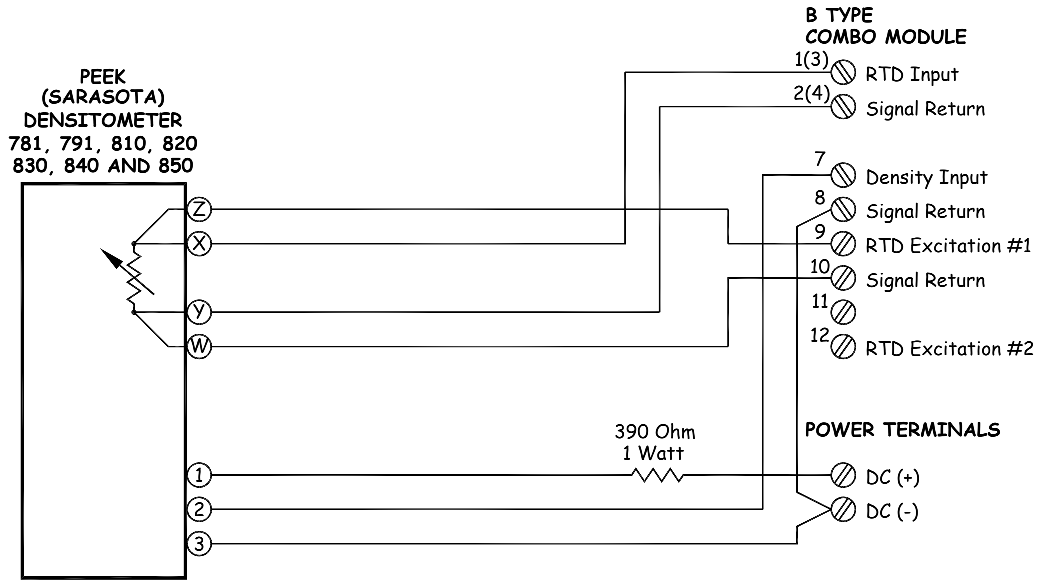


Figure 55. Wiring a Densitometer to a 'B' Type Combo Module

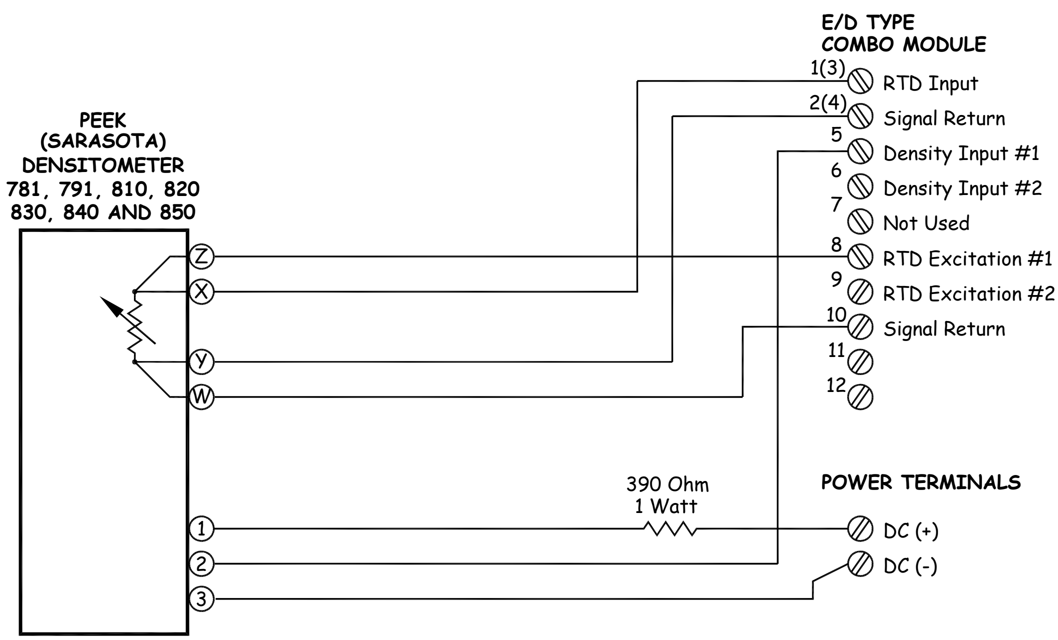


Figure 56. Wiring a Densitometer to a 'E/D' Type Combo Module

The UGC Densitometer output provides an open collector transistor that requires an external pull-up resistor to 24 volts DC. The densitometer provides a 24 volt DC pulse output in the range of 1 to 2 kHz. The pulse signal is connected to Channel 4 of a B Type Combo Module and can be connected with or without safety barriers, depending on the application requirements (Figures 57, 58, 59, 60, 61, 62, 63, and 64).

NOTE: Because the density pulse signal is a large DC pulse signal with little or no DC offset, you must select DC coupling with normal trigger threshold for the combo module channel used. Input impedance will be 1Mohms; <3.0Vfor low level and >4V.0 for high level is required from the densitometer to reliably trigger the input

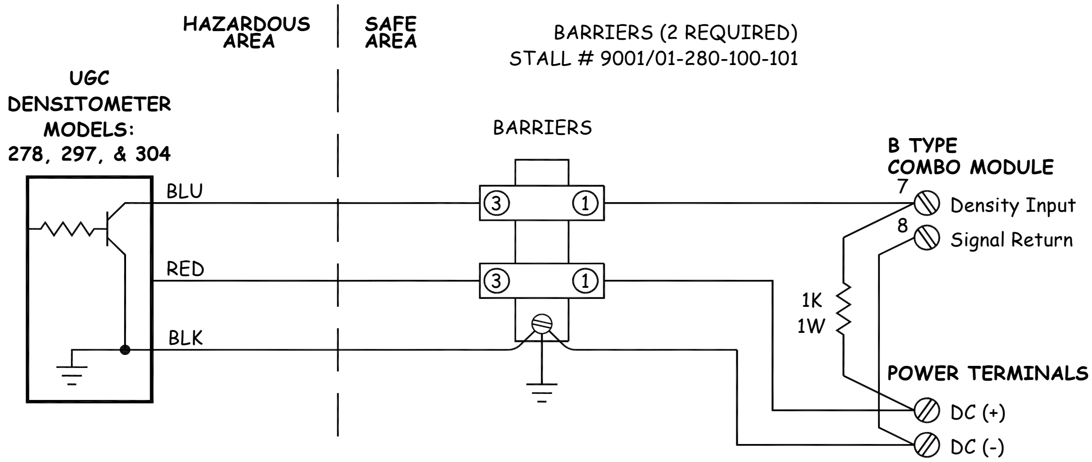


Figure 57. Wiring Densitometer with Safety Barriers to 'B' Type Combo Module

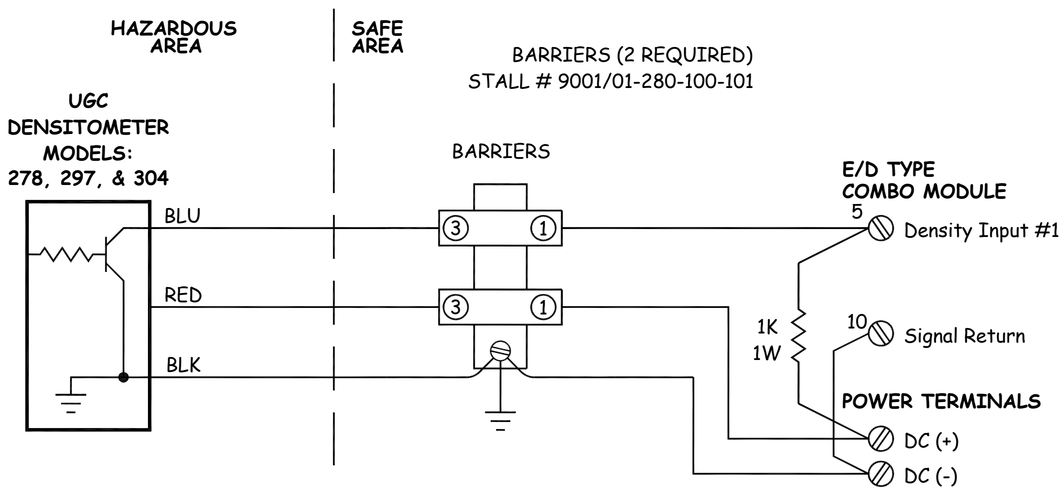


Figure 58. Wiring Densitometer with Safety Barriers to 'E/D' Type Combo Module

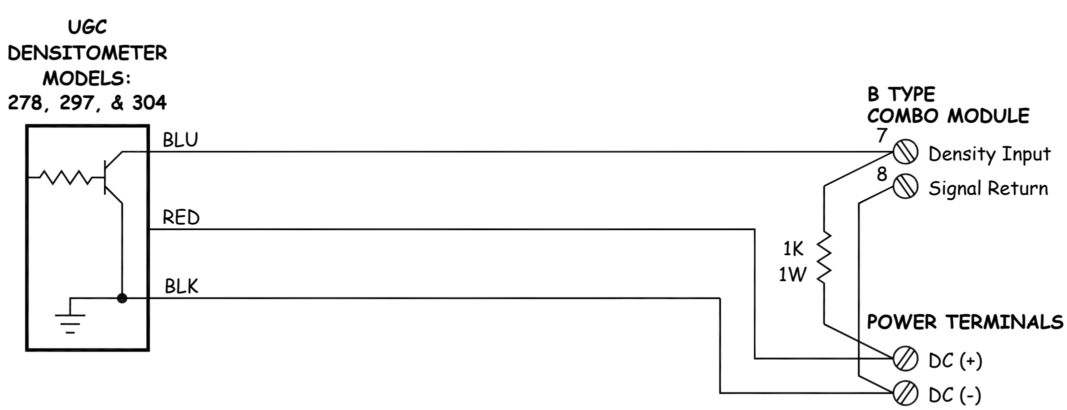


Figure 59. Wiring Densitometer to 'B' Type Combo Module

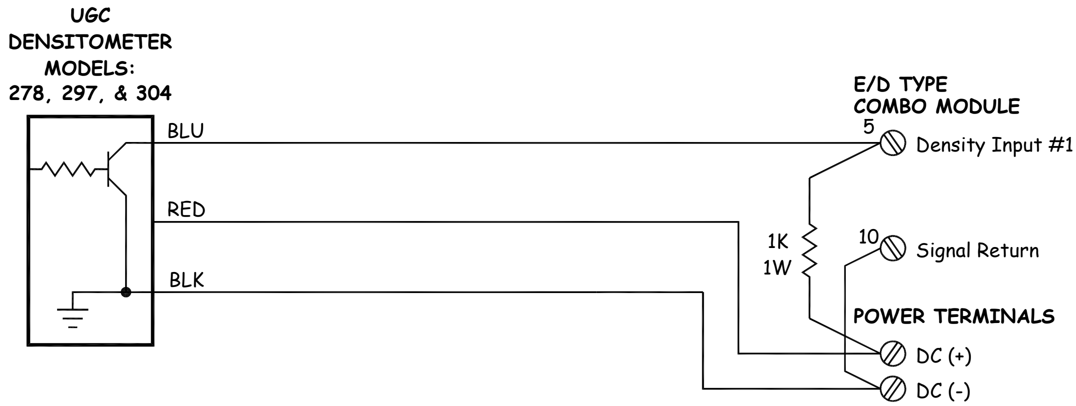


Figure 60. Wiring Densitometer to 'E/D' Type Combo Module

5.5. Gas Densitometer Solartron Model 7812

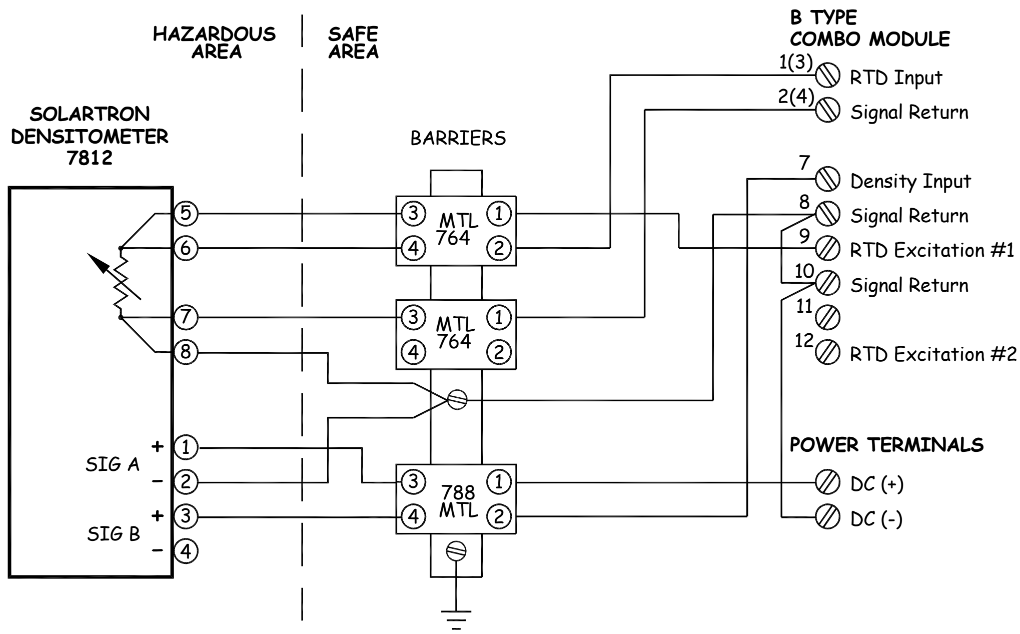


Figure 61. Wiring Densitometer 3 Wire Mode to 'B' Type Combo Module

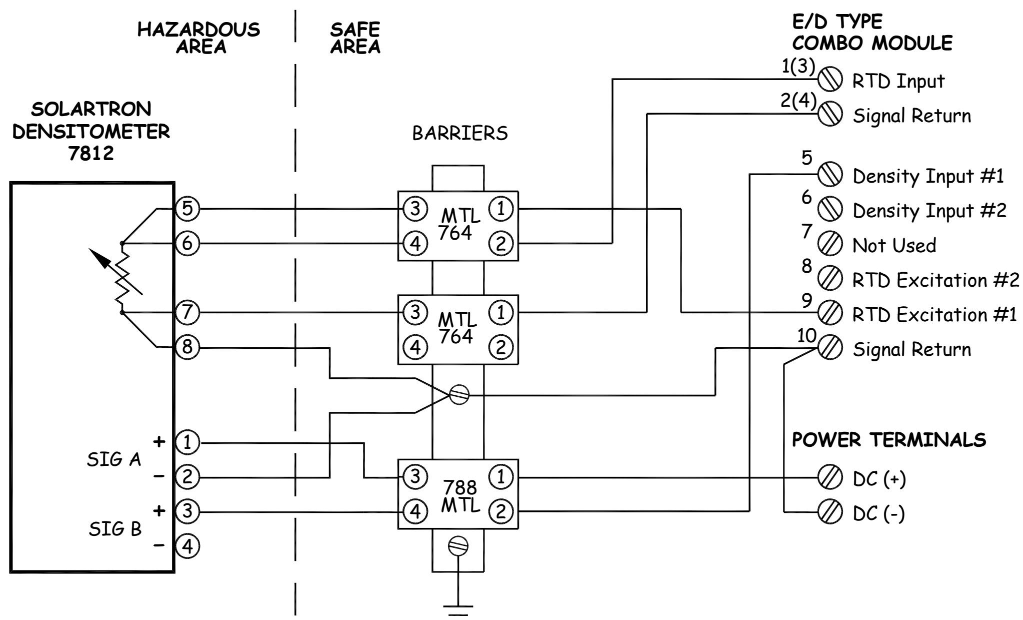


Figure 62. Wiring Densitometer 3 Wire Mode to E/D Type Combo Module

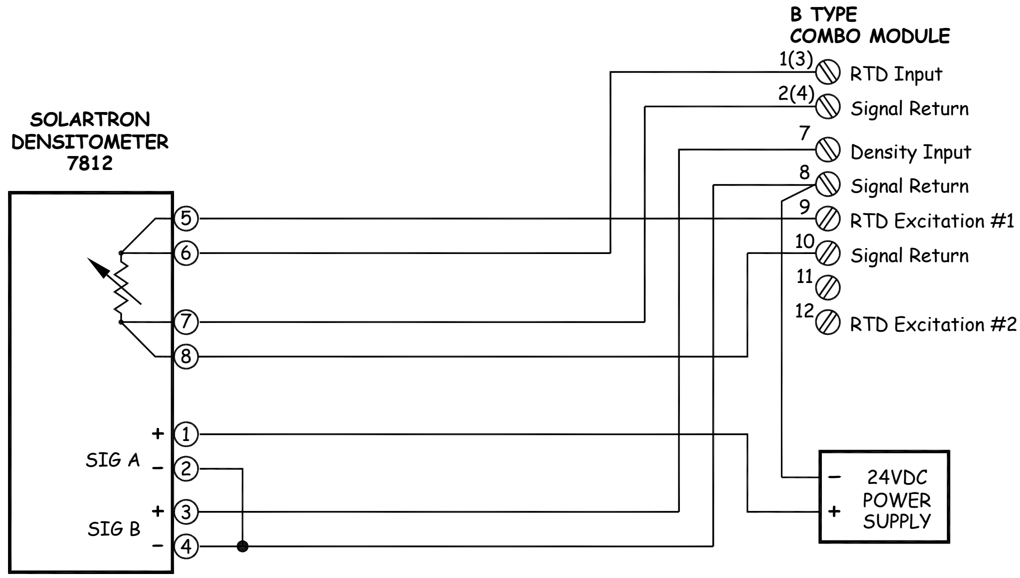


Figure 63. Wiring a Densitometer 3 Wire Mode to B Type Combo Module

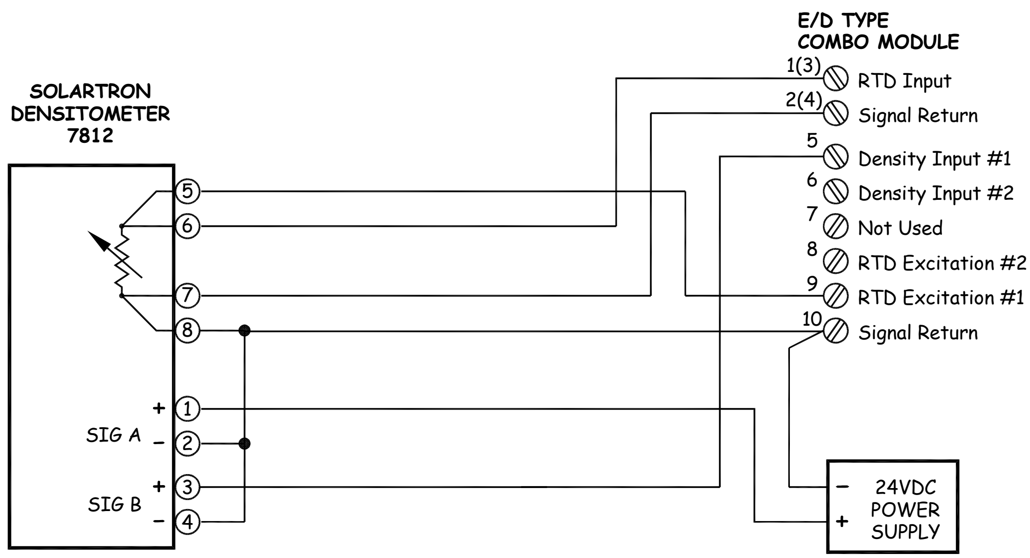


Figure 64. Wiring aDensitometer3 Wire Mode to E/D Type Combo Module

5.6. Wiring of Honeywell™ ST3000 Transmitters

Up to four Honeywell Smart Transmitters can be wired to each H Type Combo I/O Module (Figure 65). Loop power is provided by the combo module. No external power is required.

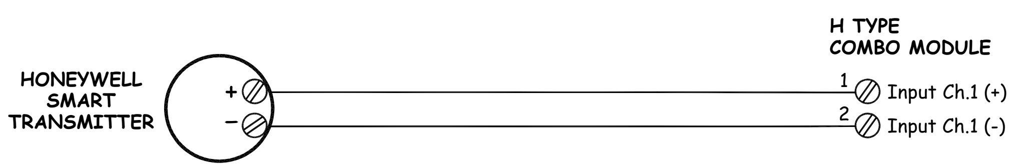


Figure 65. Wiring of a Honeywell™ Smart Transmitter

5.7. Wiring of HART Transmitters

One HART transmitter can be wired to each network on and HT module, up to four transmitters or one multi-variable transmitter can be wired to the networks on an HM module (Figure 66). Refer to Technical Bulletin 090003A (52-000-0019) 68-6207 HT/HM HART Module for additional wiring diagrams.

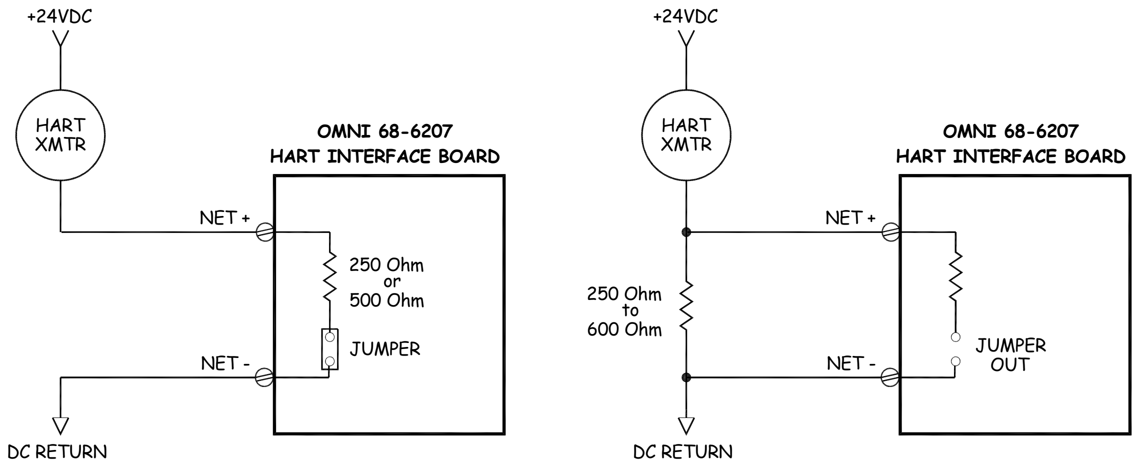


Figure 66. HART Connection using External Load

5.8. Wiring Micro Motion™ Transmitters

5.8.1 Connecting Micro Motion™ RFT9739 Transmitter to A Type or E Type Process I/O Combination Modules

The frequency/pulse output that represents the volume flow from the RFT9739 Transmitter can be wired directly into either Frequency Channel 3 or 4 on A Type or E Type Combo Modules (Technical Bulletin 980401 (52-0001-0001)) per Figure 67.

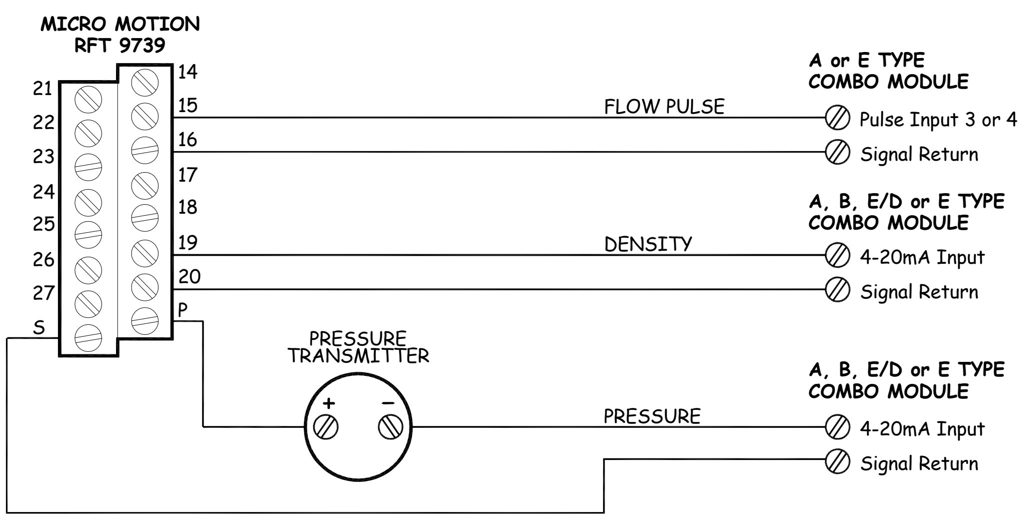


Figure 67. Wiring aRFT9739 Field-Mount (Explosion-Proof) Transmitter

5.8.2 Connecting Micro Motion™ RFT 9739 via RS-485 Serial Communications

Serial communication via RS-485 can be accomplished using the Peer-to-Peer Mode via OMNI Serial Port #2 of the RS-232-C/485 Serial Module # 68-6205, with selection jumpers in the RS-485 position (Figure 68). See Technical Bulletin 980401 (52-0001-0001).

NOTE: Users of Micro Motion™ RFT 9739 devices connected to the peer-to-peer port (Port #2) of the OMNI, please note that the resistor networks should be positioned for 2-wire RS-485 and that Terminal (A) from the RFT 9739 should be wired to OMNI Terminal 7 and (B) from the RFT must be wired to Terminal 11.

Figure 68. Wiring aRFT9739viatwo wire RS 485 Communications

5.8.3 Connecting Micro Motion™ Model 2700

The frequency/pulse output that represents the volume flow from the 2700 Transmitter can be wired directly into either Frequency Channel 3 or 4 on A Type or E Type Combo Modules. Also available is 4-20mA Density and 4-20mA Temperature (Figure 69).

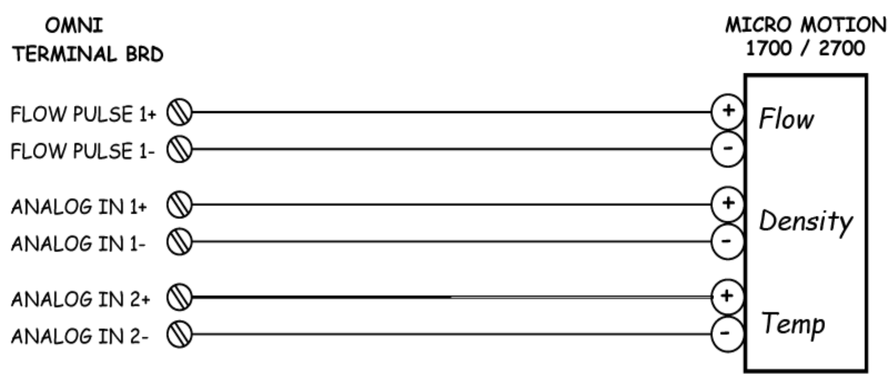


Figure 69. Wiring of Field-Mount Transmitter

5.8.4 Connecting Micro Motion™ Model 2700 via Serial RS-485

Some Micro Motion 2700 (Figure 70) series models are equipped with RS 485 Modbus ports. Serial communication to the Micro Motion 2700 transmitter via RS-485 is accomplished by utilizing the OMNI Peer-to-Peer Mode using Serial Port #2 in the RS485 configuration.

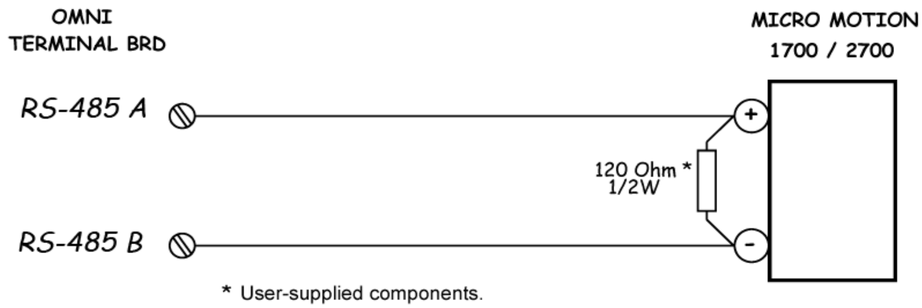


Figure 70. Wiring of Field-Mount (Explosion-Proof) Transmitter Via Serial RS-485

5.8.5 Wiring of Daniel Senior Sonic Ultrasonic Flowmeter Model 3400

Figures 70 and 71 are the typical wiring diagrams for the Daniel Ultrasonic Meter. Additional information on this meter can be found in Technical Bulletin 020501 (54-0004-0003), also available on the web site www.Omniflow.com.

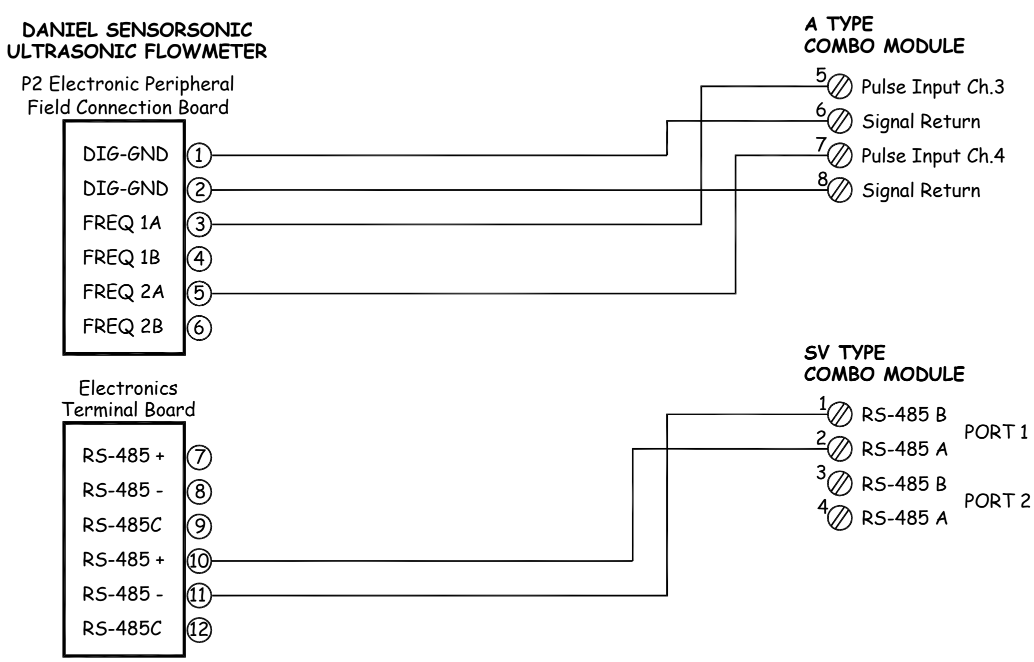


Figure 71. Forward and Reverse Flow Signals

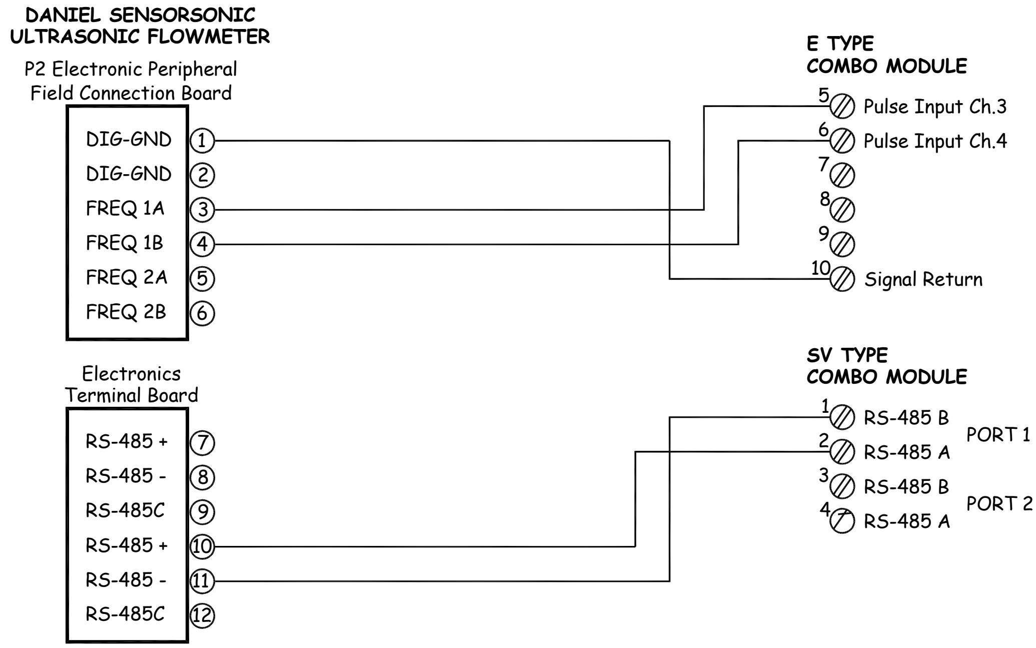


Figure 72. Forward Flow with (Dual) Pulse Fidelity & Integrity Checking

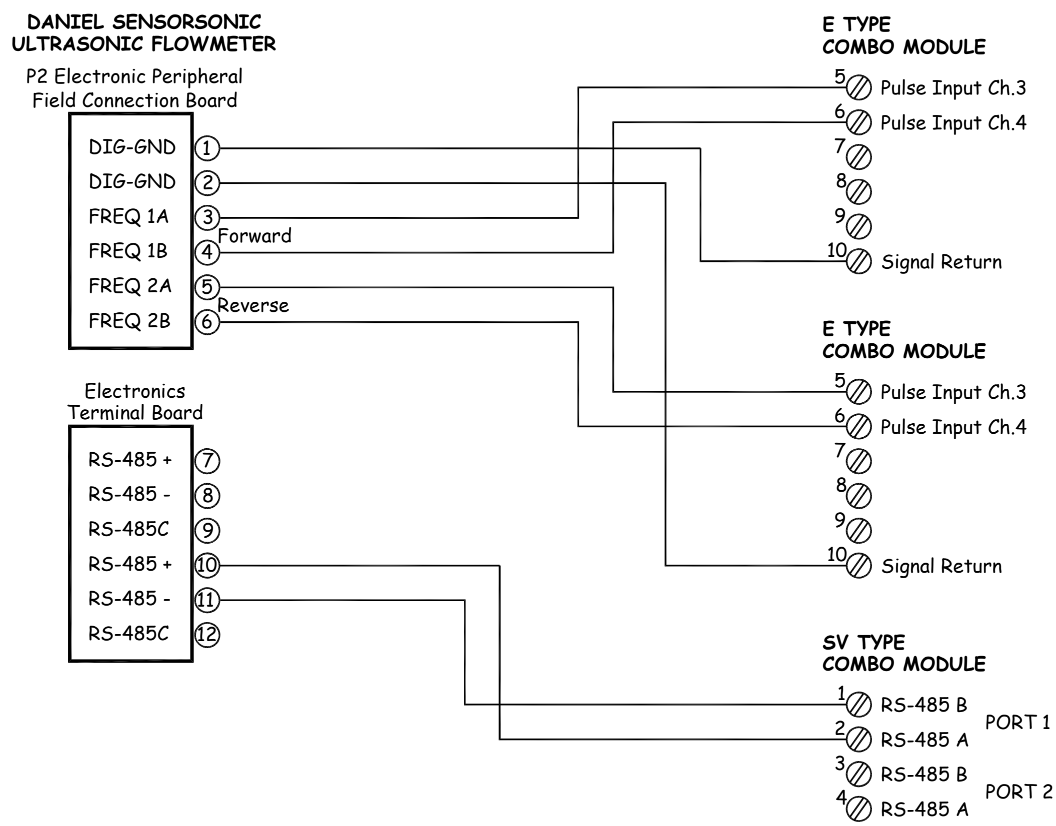


Figure 73. Forward & Reverse Flow with (Dual) Pulse Fidelity & Integrity Checking

5.8.6 Wiring of Instromet Q-Sonic Ultrasonic Flowmeter

Figure 71 as shown are the typical wiring diagrams for the ultrasonic Meter. Additional information on this meter can be found in Technical Bulletin 990101 (52-0004-0001), also available on the web site www.Omniflow.com

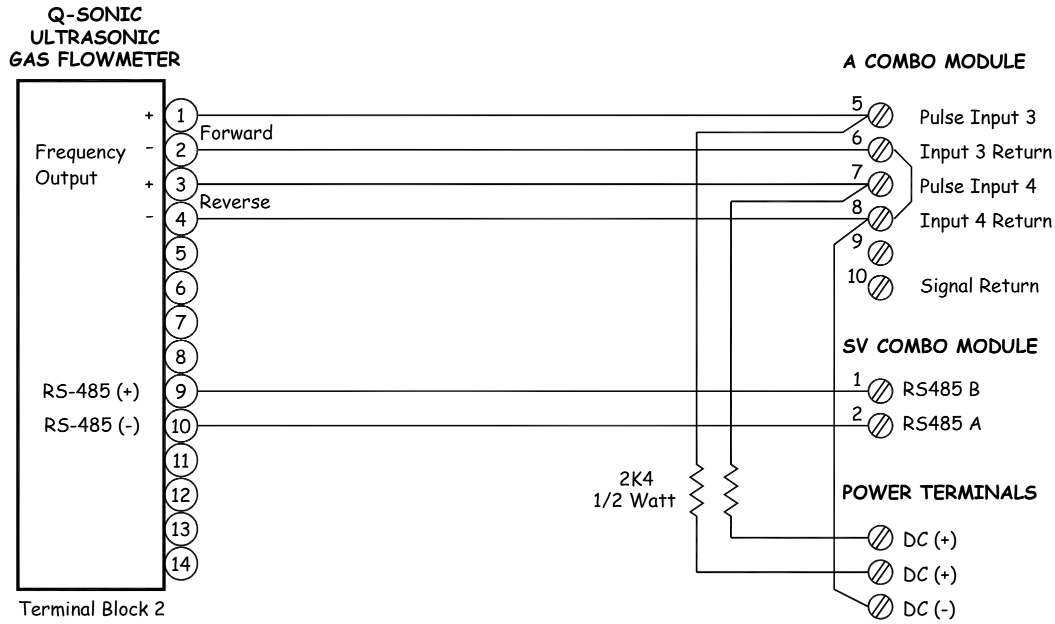


Figure 74. Wiring of Q-Sonic Ultrasonic Gas Flow Meter

5.8.7 Wiring of FMC MPU1200 Ultrasonic Gas Flow Meter Model A or B

Figures 72, 73, and 74 are the typical wiring diagrams for the ultrasonic Meter. Additional information on this meter can be found in Technical Bulletin 010701 (52-0004-0002), also available on the web site www.Omniflow.com.

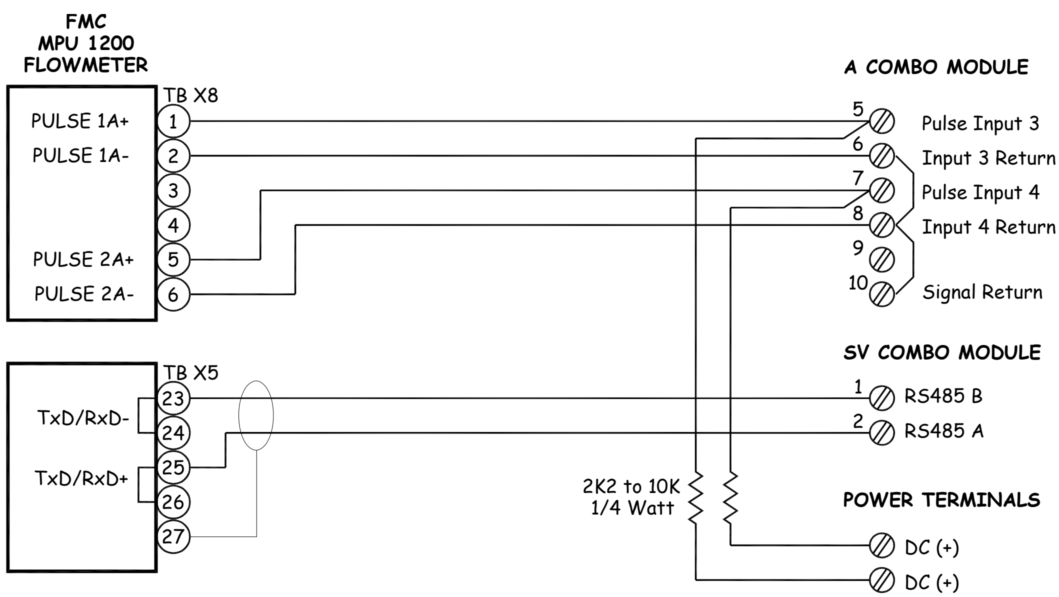


Figure 75. Forward and Reverse Flow Signals

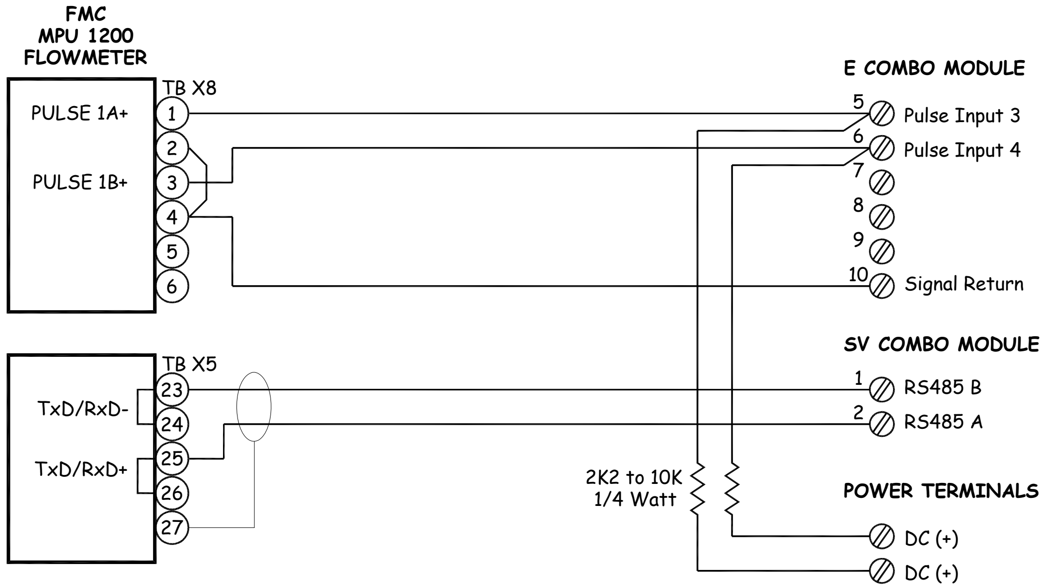


Figure 76. Forward Flow Only (Dual) Pulse Fidelity & Integrity Checking

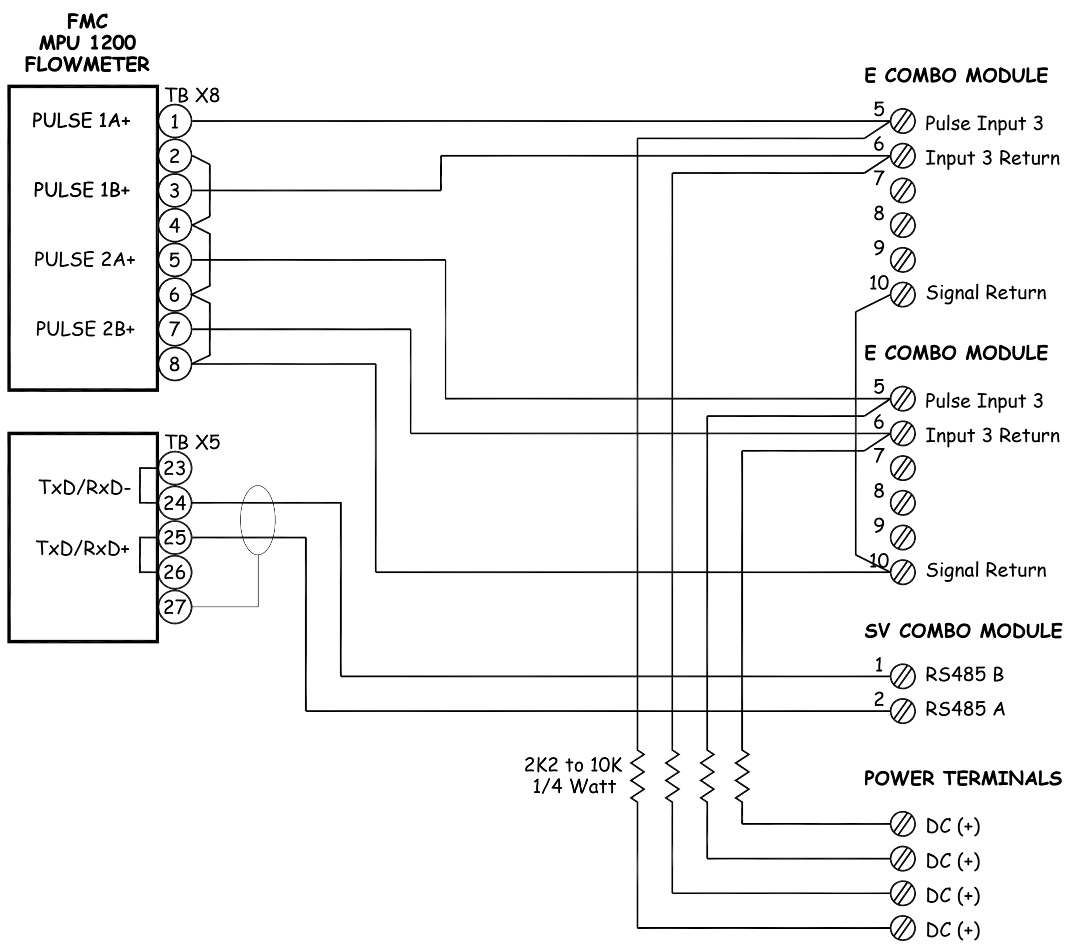


Figure 77. Forward & Reverse Flow Only (Dual) Pulse Fidelity & Integrity Checking

5.8.8 Wiring of SICK Flowsic 600 Ultrasonic Gas Flow Meter

Figures 75 and 76 are the typical wiring diagrams for the Sick Ultrasonic Meter. Additional information on this meter can be found in Technical Bulletin 060401 (52-0004-0004) also available on the web site www.Omniflow.com

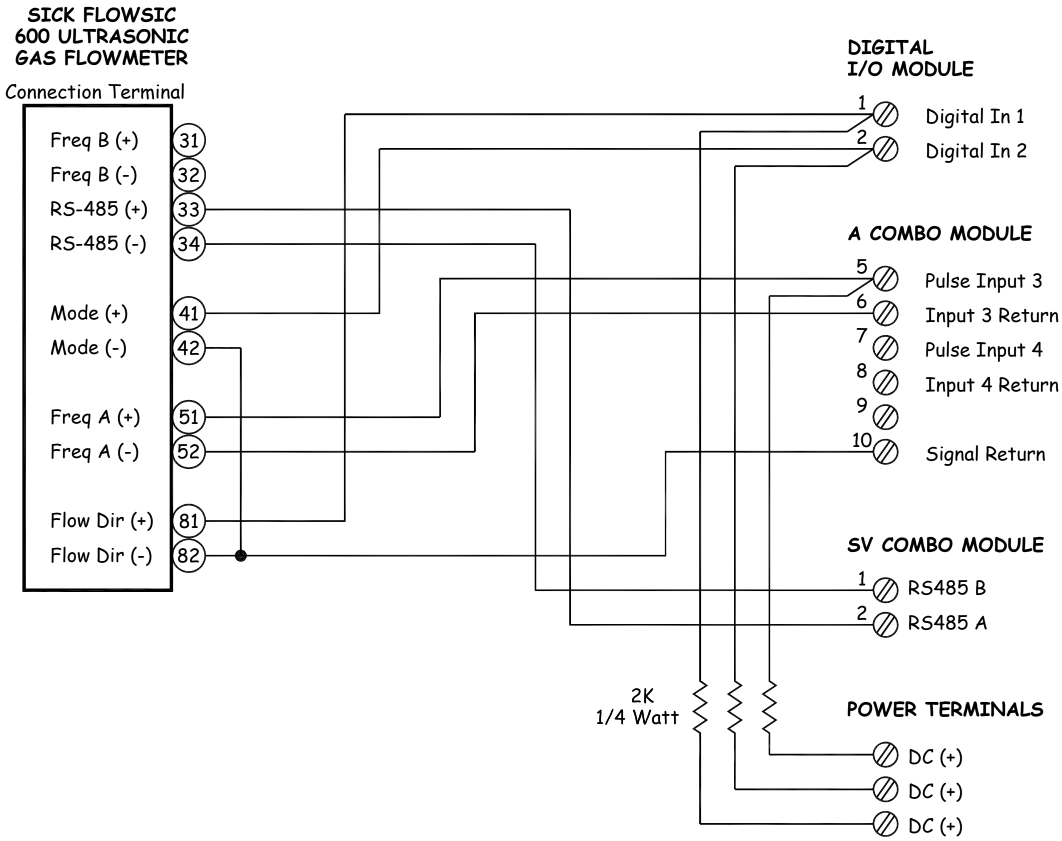


Figure 78. Forward and Reverse Flow Signals

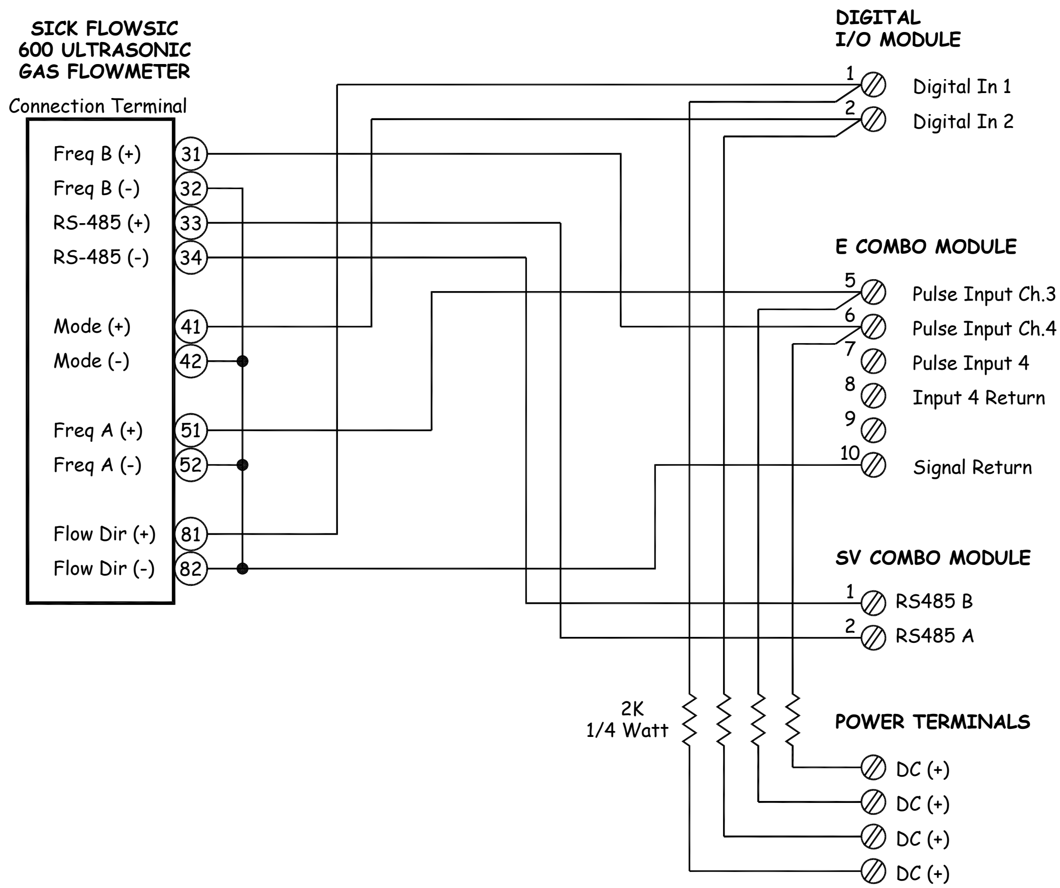
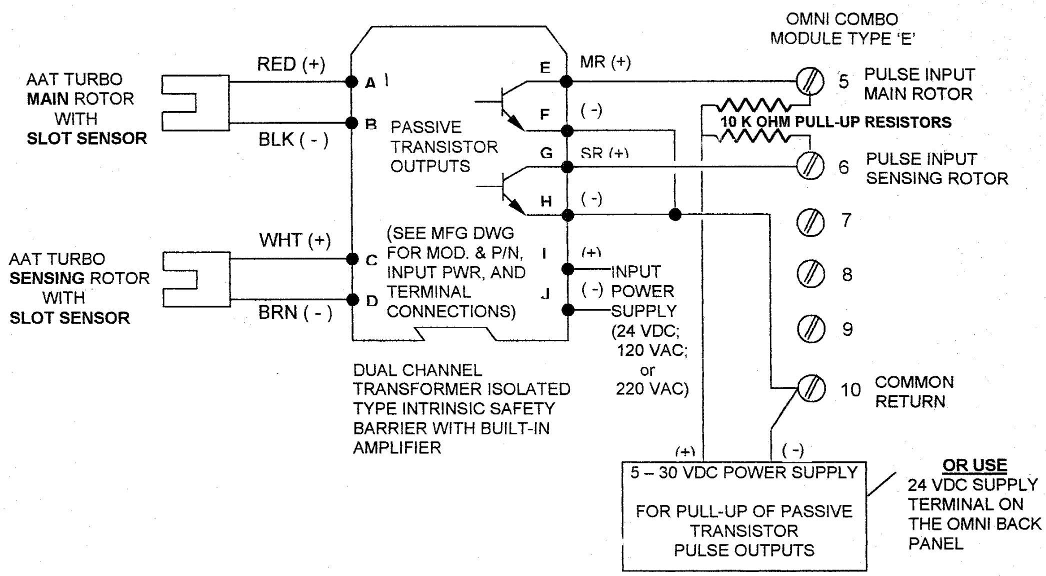


Figure 79. Wiring Forward & Reverse with (Dual) Pulse Fidelity & Integrity Checking

5.8.9 Wiring of Invensys Auto-Adjust (AAT) Turbo-Meter

Figures 77, 78, 79, 80, and 81 are the typical wiring diagrams for the AAT Turbo-Meter. Additional information on this meter can be found in Technical Bulletin 000314 (52-0003-0005) also available on the web site www.Omniflow.com

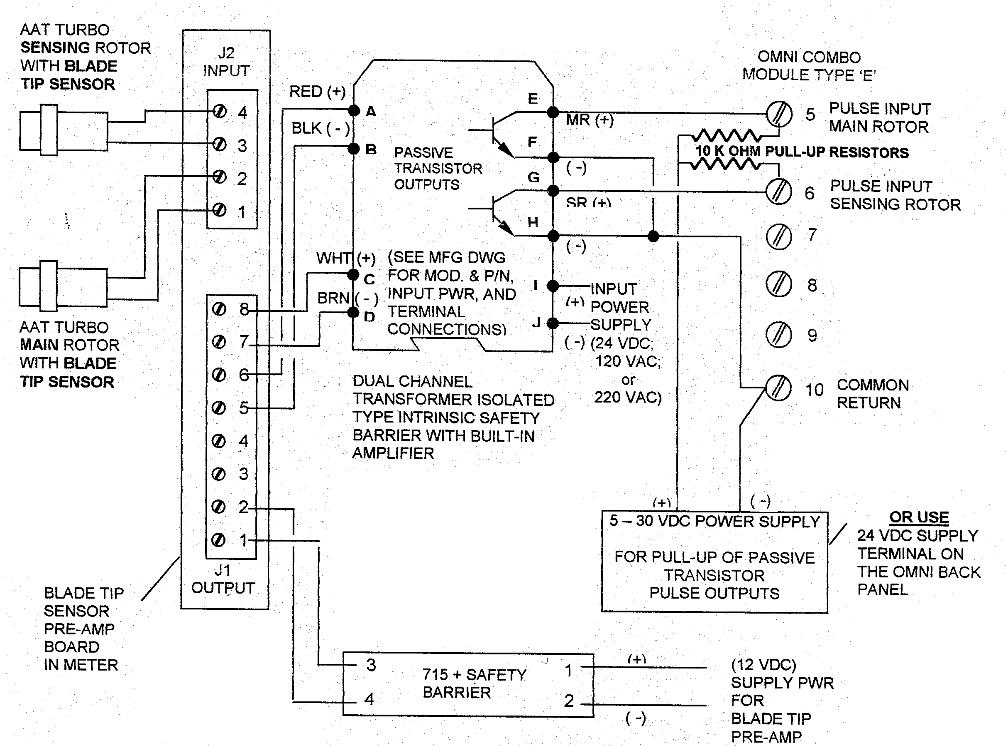


Available Dual Channel Amplifiers

Invensys P/N	Model No.	Supply Power	Mailing Dwg No.
950965	KFD2-SOT-Ex 2	24 VDC	MM-1708-B
951163	KFA5-SOT2-Ex 2	120 VAC	MM-1708-B
951164	KFA6-SOT2-Ex 2	220 VAC	MM-1708-B
950966	WE77 Ex2/OT (old style)	120 VAC	Not Available

Invensys P/N	A	B	C	D	E	F	G	H	I	J	Comments:
950965	1	3	4	6	8	7	10	9	11	12	For Slot Sensors
951163	1	3	4	6	8	7	10	9	11	12	For Slot Sensors
951164	1	3	4	6	8	7	10	9	11	12	For Slot Sensors
950966	8	9	2	1	13	15	10	12	18	17	Jumpers 7-8 & 2-3

Figure 80. Wiring (SLOT SENSOR) Signals to E Type Combo Modules



Available Dual Channel Amplifiers

Invensys P/N	Model No.	Supply Power	Mailing Dwg No.
951342	KFD2-SOT/Ex 2-Y93522	24 VDC	MM-1890-B

Invensys P/N	A	B	C	D	E	F	G	H	I	J	Comments:
951342	2	3	5	6	8	7	10	9	11	12	Blade Tip Sensors

Figure 81. Wiring (BLADE TIP SENSOR) Signals to E Type Combo Modules

Chapter 6

Connecting Analog Outputs and Miscellaneous I/O Including Provers

6.1 Analog Outputs

Analog outputs are available for RTUs (remote terminal units), flow controllers, and recording devices. The analog outputs source 4-20 mA into a load wired to the flow computer's DC power return. Maximum load resistance is 950 ohms at 24 VDC at the flow computer's DC+ terminal. Digital-to-Analog conversion is accomplished with a 12-bit binary resolution.

A, E, E/D, H and HV combo modules provide two digital-analog outputs (Figure 82). B combo modules have only one digital to analog output. SV- Modules provide six digital to analog outputs.

To calibrate; each of the outputs is set to output 4.00 and then 20.00 mA while in the Diagnostic Mode (described later) and the software zero and span adjusted as needed. Any value between 2.5 and 23.0 mA may be output.

Each output is assigned via the keypad or serial link to one of the many variables available within the flow computer (Volume 3).

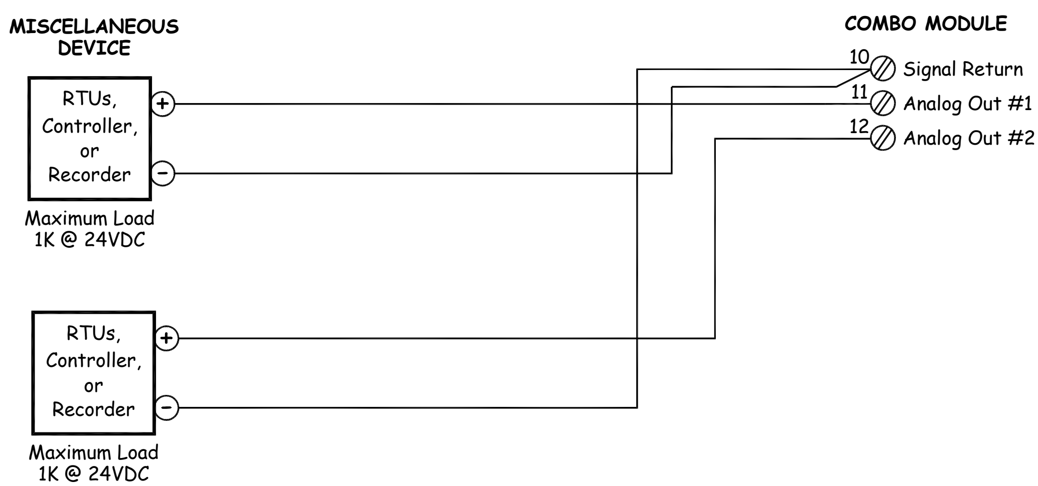


Figure 82. Wiring Devices to the Flow Computer's Digital to Analog Outputs

6.2. Digital Inputs/Outputs

6.2.1. Wiring a Digital Point as an Input or an Output

Digital I/O modules have 12 digital I/O points. Each point can be independently configured as either an input or output via the keypad or via OMNICOM over a communication port (Figure 83 and 84).

The power and returns for all digital I/O signals are common with the DC power terminals. Digital output loads are connected between the I/O terminal and DC power return. An approximate total load of 500 mA per module (per 12 points) is allowed although an individual point can handle 200 mA. Voltages applied to I/O points used as inputs must not exceed the DC supply voltage at the DC terminal, or the protective fuse for that point on the digital I/O module may open circuit.

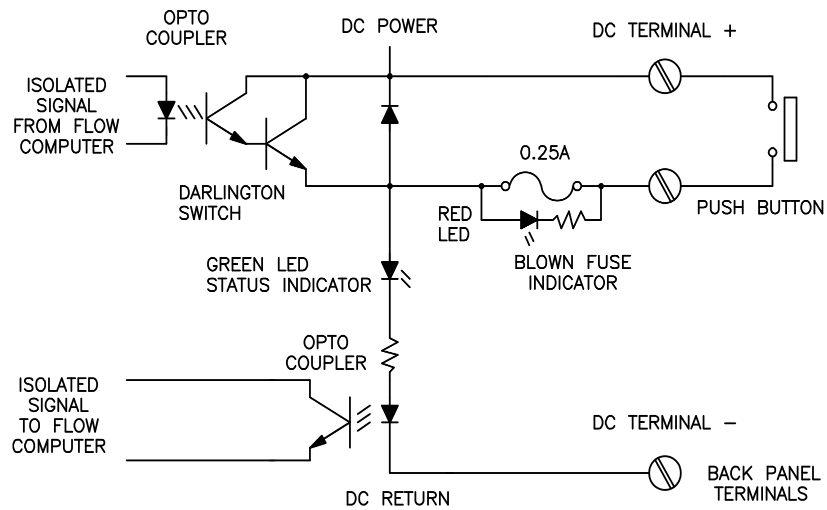


Figure 83. Wiring of a Digital I/O Point as an Input

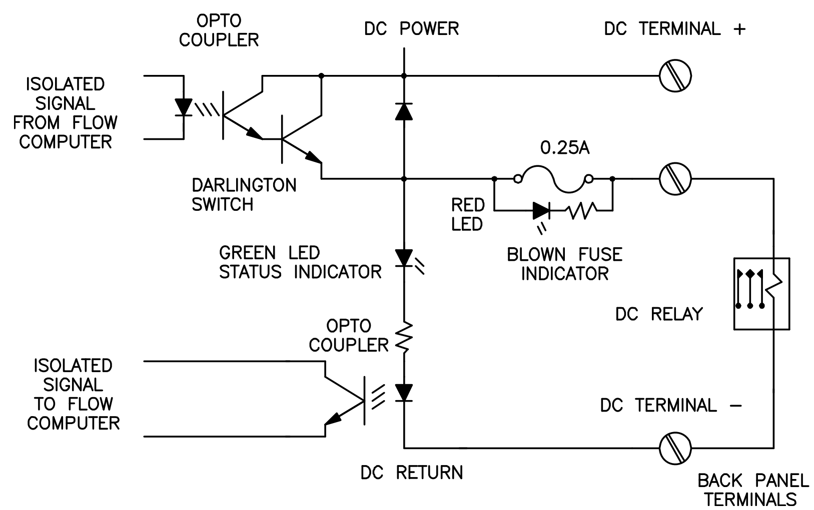


Figure 84. Wiring of a Digital I/O Point as an Output

6.2.2. Connecting Various Digital I/O Devices

Digital I/O Module #1 off the OMNI 6000 handles I/O points 1 through 12. It is plugged into the backplane connector that is marked ‘I/O Module #1’. This in turn is connected to Terminal Strip TB1 connections 1 through 12. Digital I/O Module #2, handling points 13 through 24, is plugged into the backplane connector that is marked ‘I/O Module #2’. This in turn is connected to Terminal Strip TB2 connections 1 through 12. The OMNI 3000 can have only one digital I/O module and this is connected to Terminal TB1 connections 1 through 12 on the back panel (Figure 85).

Figure 85 diagram shows the typical wiring required to interface to other devices, such as: switches, relays, prover detector switches, programmable logic controllers, and other devices.

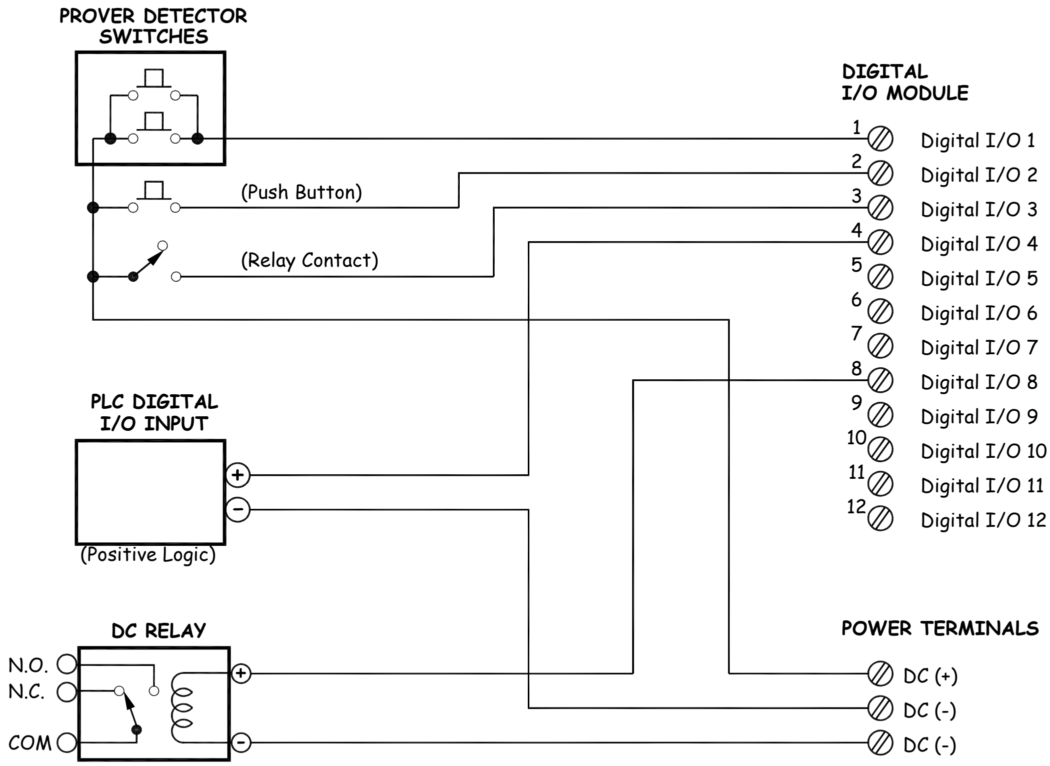


Figure 85. Connecting Digital I/O Devices to the Flow Computer

6.3. Provers

6.3.1. Connecting Pipe Prover Detector Switches

NOTE: The prover detector switch signal activates an interrupt request into the computer. Jumpers JP1 and JP2 on digital I/O module #1 (Figure 5) control which edge of the signal will cause the interrupt. Pulse counting should start when the sphere first activates the detector switch. Install JP1 in cases where the detector switch's normally opened contacts are used (Figure 9). Install JP2 in cases where the detector switch's normally closed contacts are use

When using double chronometry proving, the detector switch input is not connected to a digital module it is connected to Terminal 7 of a terminal strip connected to an E Type Combo I/O Module

Pipe prover detector switches are the only I/O signal that must be connected to a specific I/O point. They must be wired as shown in Figure 4 to Digital I/O Point #1, and the I/O point should be assigned to Boolean 1700 in the software configuration (Volume 3). This is because Digital I/O Point #1 is internally jumpered to cause a high priority interrupt of the computer used to start and stop the prover pulse counting circuits. Digital I/O Point #1 can still be used as a normal I/O point if pipe proving is not needed.

NOTE*:* If a second digital module is installed, you must remove jumper JP1 jumper on this second module, as it could interact with detector switch signal on the first module.

6.3.2. Interfacing to a Brooks™ Compact Prover

The OMNI Flow Computer can interface to the Brooks™ Compact Prover Skid Electronics (the Brooks Prover Control Box is **not** required). The control interface involves one digital output to control the piston launch, a digital input point to monitor the position of the piston, and a detector switch signal that is wired in parallel to each of the E combo modules with flow meters connected to them. Compact provers use the 'Pulse Interpolation Method' of measuring the flowmeter counts between the detector switches. The interpolation method requires that the detector switches activate high speed hardware timers on the OMNI's E combo I/O module. The detector switch signals, called 'First and Final Pickoff' by Brooks, are connected to the 'Detector Switch' input of each E Type Combo Module installed in the flow computer.

The following diagram shows the complete installation wiring, including 4-20 mA signals representing the temperature and pressure of the prover cylinder, as well as the nitrogen plenum chamber. The 12-volt DC power supply is user supplied.

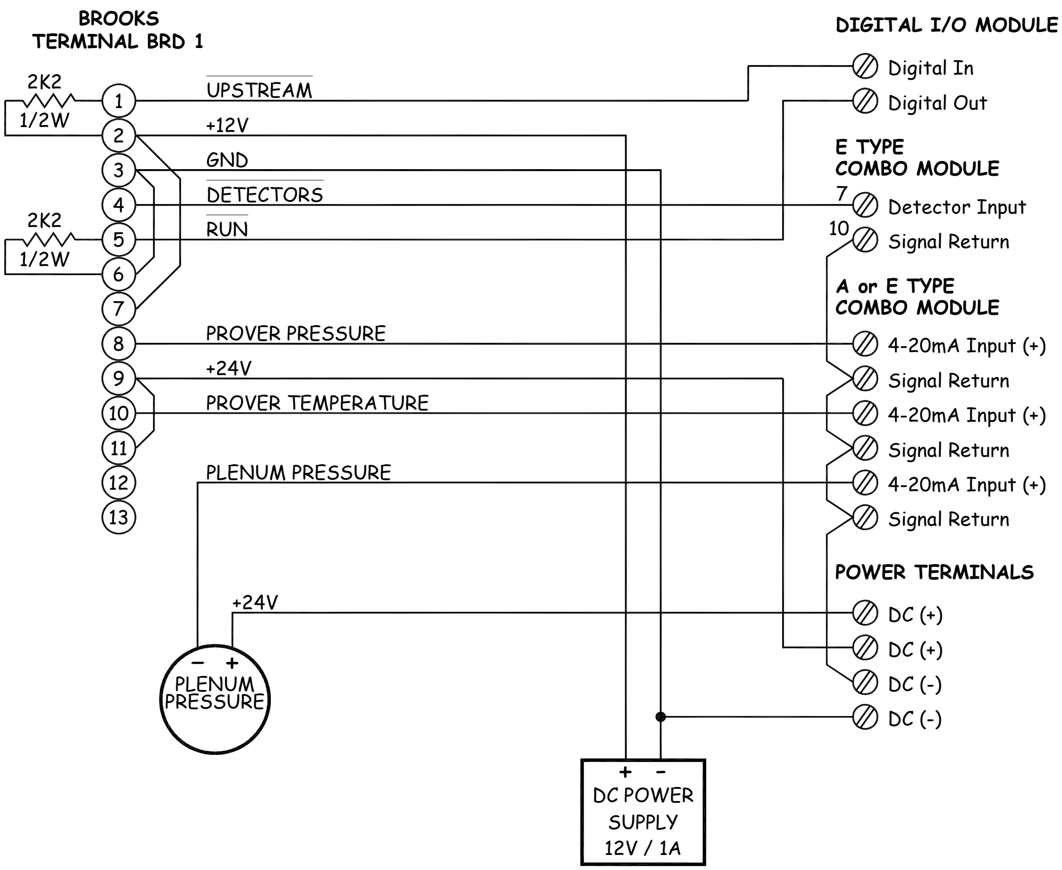


Figure 86. Wiring to a Brooks™ Compact Prover

6.3.3 Controlling the Plenum Pressure of a Brooks™ Compact Prover

The plenum chamber pressure is used as an air spring to close the poppet valve of the prover piston. This causes the piston to be moved forward by the flowing liquid. The pressure required to close the poppet valve varies with pipeline pressure. Too high a plenum pressure causes the piston to be pushed downstream by this excess pressure and can lead to inaccurate provings.

The OMNI Flow Computer can monitor the plenum pressure and line pressure, and automatically increase or decrease the spring pressure by charging or venting nitrogen from the plenum chamber.

Before commencing a proving run, the OMNI Flow Computer checks the plenum pressure versus the required pressure and activates either the 'charge' or 'vent' solenoid valve. The pressures will be matched within some user entered deadband percent. The OMNI activates the solenoids via low voltage relays (not shown).

An additional enhancement shown is a pressure switch signaling low nitrogen bottle pressure. In this case, the prove attempt would be aborted if it became impossible to achieve the correct plenum pressure.

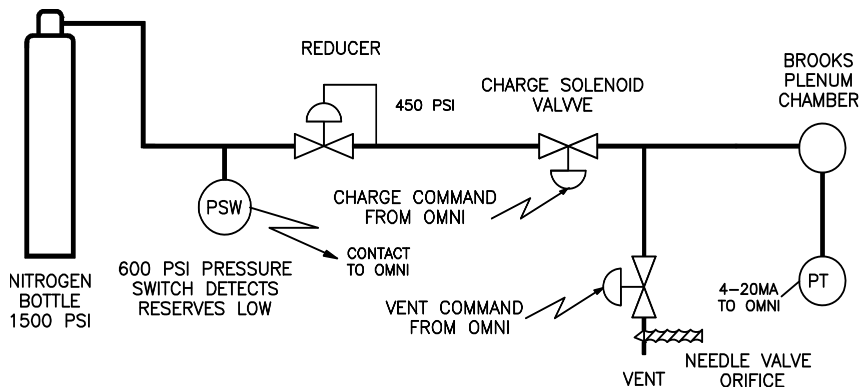


Figure 87. Controlling the Plenum Pressure of a Brooks™ Compact Prover

Chapter 7

7. Connecting to Serial Devices

7.1 Serial Port Connection Options

NOTE: Up to 12 flow computers and/or other compatible serial devices can be multi-dropped using OMNI's proprietary RS-232-C serial port. 32 devices may be connected when using the RS-485 mode. Typically, one serial I/O module can be installed in the OMNI 3000, providing two communication ports. Three serial modules can be installed in the OMNI 6000, providing six communication port.

RS-485 Communications with an RS-232-C Serial I/O Module #68-6005 This module is limited to RS-232 connections. It is necessary to use an RS-232 to RS-485 converter when interfacing to RS-485 serial devices

Special Considerations when SV Modules are Installed - In addition to the 68-6205 Serial I/O module , the flow computer may have an SV Module installed to communicate with **RS-485 compatible multivariable transmitters**. The 68-6205 Serial I/O module must be jumpered to use IRQ 3 whenever an SV Module is installed. Without an SV Module, the IRQ jumper must always be placed in the IRQ 2 position. It is not possible to use an SV Module with the older 68-6005 Serial module. The 68-6205 serial module must be used whenever an SV module is installed. See Technical Bulletin 980503 (52-0001-0003).

The total number of serial communication ports available depends upon the number of dual port serial I/O modules installed. The OMNI 6000 accepts a maximum of 3 serial I/O modules; the OMNI 3000 accepts 1 dual port module. The model # of the current dual port serial I/O module is 68-6205. This module can be jumpered for RS232C, RS485 4 wire, and RS 485 2 wire communications. Earlier flow computers may have an older version of dual port serial module installed (model # 68-6005). This older serial I/O module was only capable of communicating via RS 232 and is no longer available for purchase (Chapter 1 for details).

Both modules provide two optically isolated RS-232-C serial ports that can operate from 0.3 to 38.4 kbps. These ports are used for printers, personal computers, and SCADA devices. Although the output voltage levels are compatible with the RS-232 standard, the output is actually tri-stated when not sending data. This allows the transmit output from multiple flow computers to be bussed. A terminating resistor is provided at the back panel connections to pull down the transmitter signal to a mark signal level (-9V). Hence, a short jumper is required in many cases from TX (Out) to Term.

In addition to RS 232C operation, each port of the 68-6205 serial module can be configured independently to operate using RS 485 signals. RS-485 communications allows interconnecting multiple flow computers, programmable logic controllers, multivariable transmitters, and other serial devices in either four-wire multi-drop mode or *peer-to-peer* two-wire multi-drop mode.

7.2. Connecting to Printers

NOTE: The speed that data can be accepted by the printer depends on the size of the input buffer (if any) and the print mode (draft or near letter quality). Typical printers provide about 120 printed characters/second

The flow computer's default settings for the printer port are 9600 baud, 1 stop bit and no parity. These are the settings that the flow computer will always use after a cold boot i.e. due to a fatal error or fault condition. By matching these settings in the printer your printer will be able to print any error messages output by the flow computer during the boot-up process.

7.2.1. Connecting to a Dedicated Printer (Port 1)

Figure 88 diagram shows the OMNI Flow Computer connected to a dedicated printer. The hardware handshake wire connected to Pin 20 of the DB25 connector is optional, as the computer can be made to insert null characters after each carriage return to match the computer data transmission rate to the printer speed.

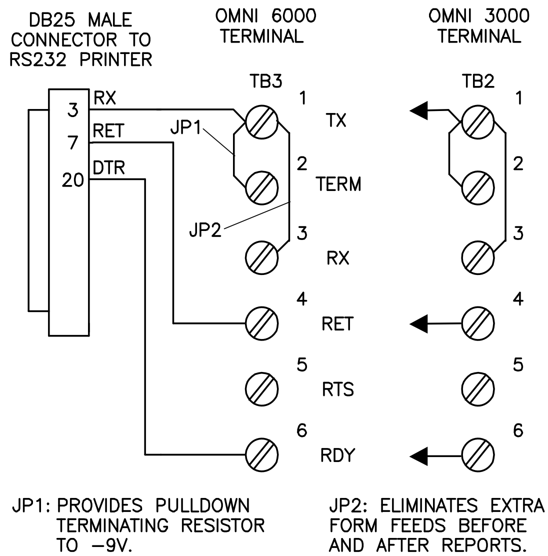


Figure 88. Connecting Printer to Serial Port #1 of the Flow Computer

7.2.2. Connecting to a Shared Printer (Port 1)

Up to 12 OMNI Flow Computers can share a printer (Figure 89). They are connected as shown. One flow computer is assigned as the master and manages all traffic to the printer. Each computer monitors the data transmitted to the printer by having its TX terminal jumpered to its RX terminal. Resident firmware ensures that only one computer will attempt to access the printer at any one time.

NOTE: That only 1 terminating pull-down resistor is jumpered in place

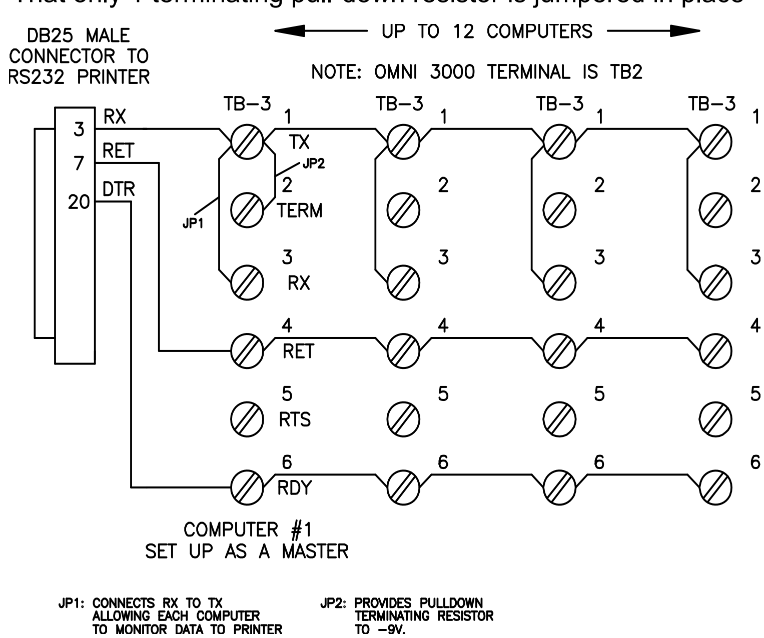


Figure 89. Connecting Several Flow Computers to a Shared Printer

7.2.3. Print Sharing Problems

NOTE: Refer to Volume 3, Chapter 2 for Printer Settings

Most problems associated with printer sharing show up as garbled reports or locked up printers. This is usually caused by one or more computers sending data to the printer at the same time. Check your wiring to the Figure 87 and consult the following checklist if you experience problems:

1. Check that all computers are set to the same baud rate, stop bits, and parity settings as the printer.
2. All computers must have the 'Transmitter Key Delay' set to 'zero' (0).
3. One and only one computer must have its 'Printer Priority Number' set to '1'. All computers must have a different priority number (2 through 12).
4. Some printers provide jumpers or switches which set the polarity of the 'Printer Ready' signal on Pin 20. This signal must be positive when the printer is ready.
5. When not using the 'Printer Ready' signal (Pin 20), ensure that you have entered enough NULs to prevent overrunning the printer buffer.

7.3. Connecting to a Personal Computer and Modem

NOTE: Port 4 can also be configured to communicate using Allen-BradleyDF1 protocol (Figure 96).

That only 1 terminating pull-down resistor is jumpered in place

Ports #1 and #2 of an OMNI 3000 (Ports #3, #4*, #5 and #6 of an OMNI 6000) can provide access to the computer's database using a Modbus protocol interface. This port is usually connected to a PC running the OMNICOM configuration software. Up to 12 OMNI Flow Computers can be connected to 1 PC. The Modbus protocol includes an address field which ensures that only 1 unit will transmit at a time (Figure 90, 91, and 92).

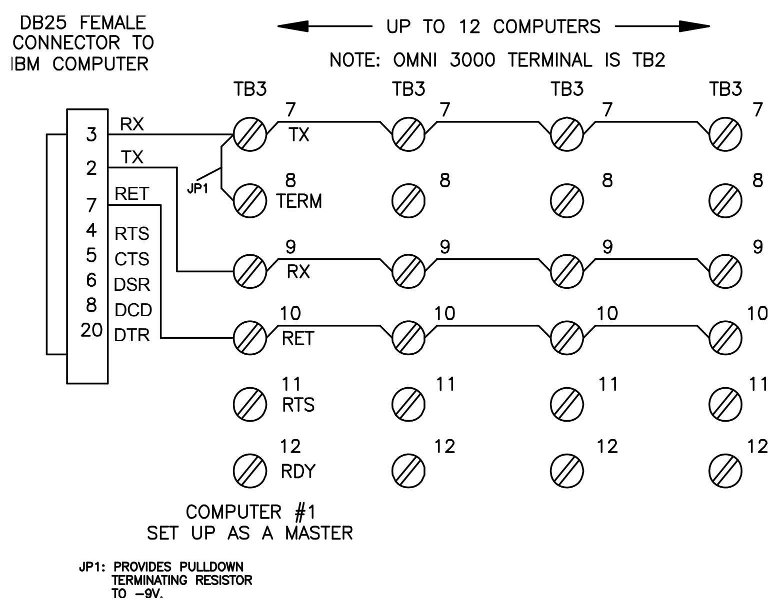


Figure 90. DB25 Female Connector (Using Port #2 as an example)

NOTE: That only 1 terminating pull-down resistor is jumpered in place

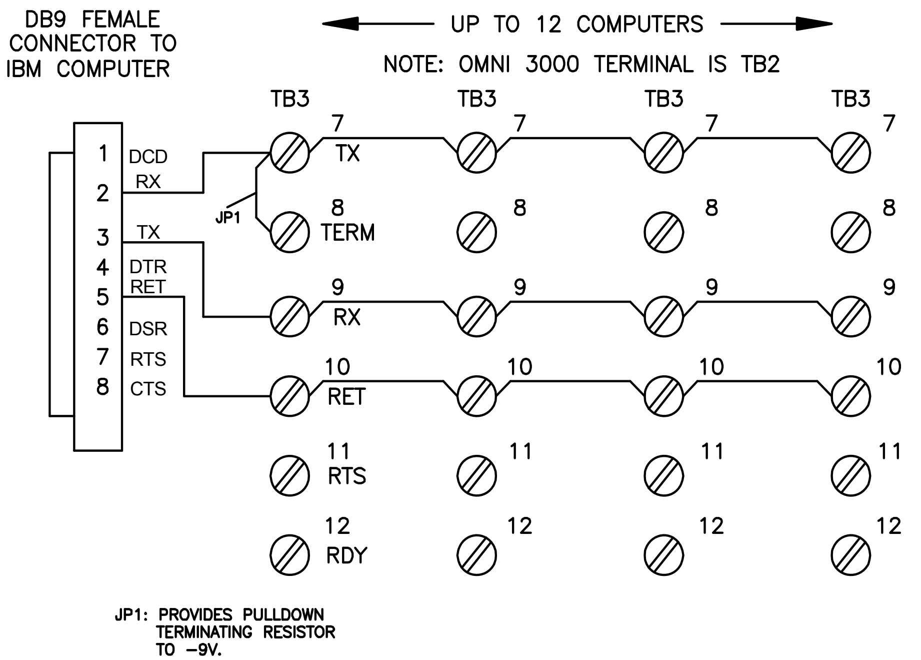


Figure 91. Direct Connect to a Personal Computer 0DB9 Female Connector

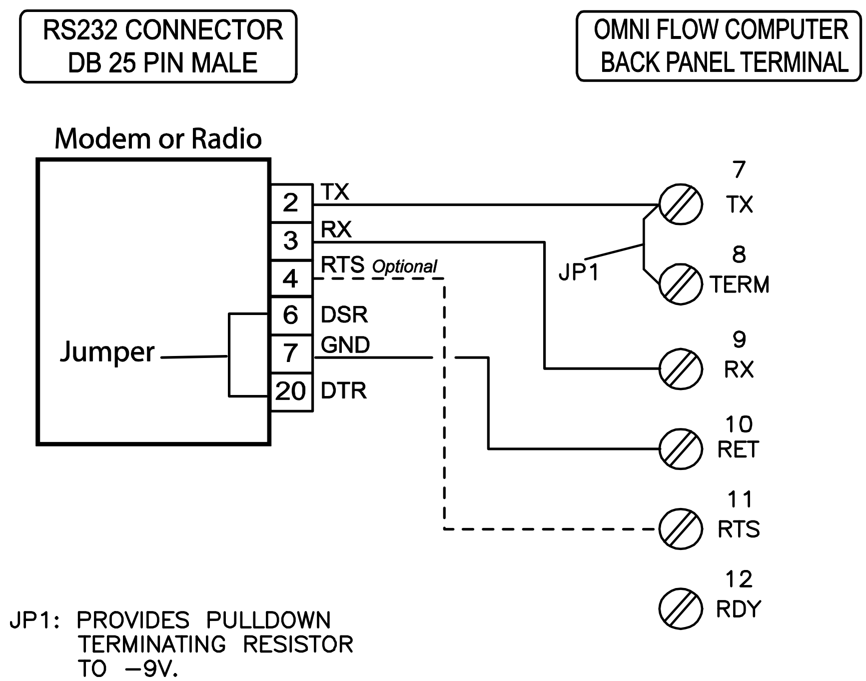


Figure 92. Connecting Port #2 to a Modem

7.4. Peer-to-Peer Communications and Multi-drop Modes

NOTE: Peer-to-Peer Communications - The peer-to-peer communication feature allows you to multi-drop up to 16 flow computers and other devices in RS-485 serial communications mode, and up to 12 using RS-232-C communications

Peer-to-Peer Redundancy Schemes - Redundancy schemes allows for uninterrupted measurement and control functionality by interconnecting two identically equipped and configured flow computers (Technical Bulletin 980402 (52-0001-0002).

OMNICOM® and Peer-to-Peer - The OMNICOM Configuration PC Software package supplied with your OMNI Flow Computer cannot be used on Serial Port #2 when it is being used as a peer-to-peer link

Serial Port #2 can also be configured by the application software to act as a peer-to-peer Modbus master port. This is a half duplex/simplex link which allows any OMNI Flow Computer to communicate with any other flow computer or Modbus slave device. That data link can operate at up to 38.4 kbps and uses a proprietary token passing scheme. Interconnecting multiple flow computers and or multiple serial devices can be accomplished via RS-232-Compatible or RS-485 communications.

7.4.1. Peer-to-Peer RS-485 Two-wire Multi-drop Mode

Figure 93 diagram shows the wiring requirements for multi-dropping two or more flow computers via RS-485 in two-wire mode. This option is available only with the OMNI Serial I/O Module #68-6205. See Technical Bulletin 980401 (52-0001-0001)

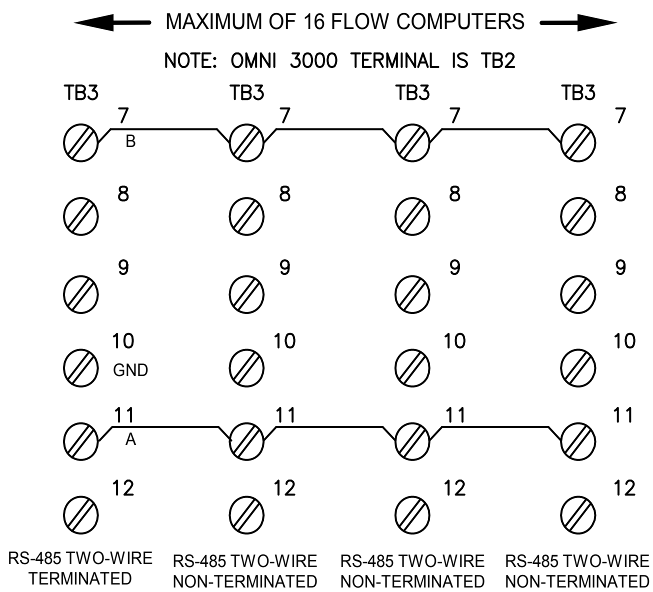


Figure 93. Wiring of Several Flow Computers using the Peer-to-Peer Feature via RS-485 Communications in Two-wire Multi-drop Mode

7.4.2. Peer-to-Peer via RS-232-C Communications

Figure 94 shows the wiring requirements for multi-dropping two or more flow computers in RS-232 C (compatible) mode. When multi-dropping two or more flow computers with other serial devices via the RS-232-C mode, an RS-232-to-RS-485 standard converter may be required (Technical Bulletin 980401 (52-0001-0001)).

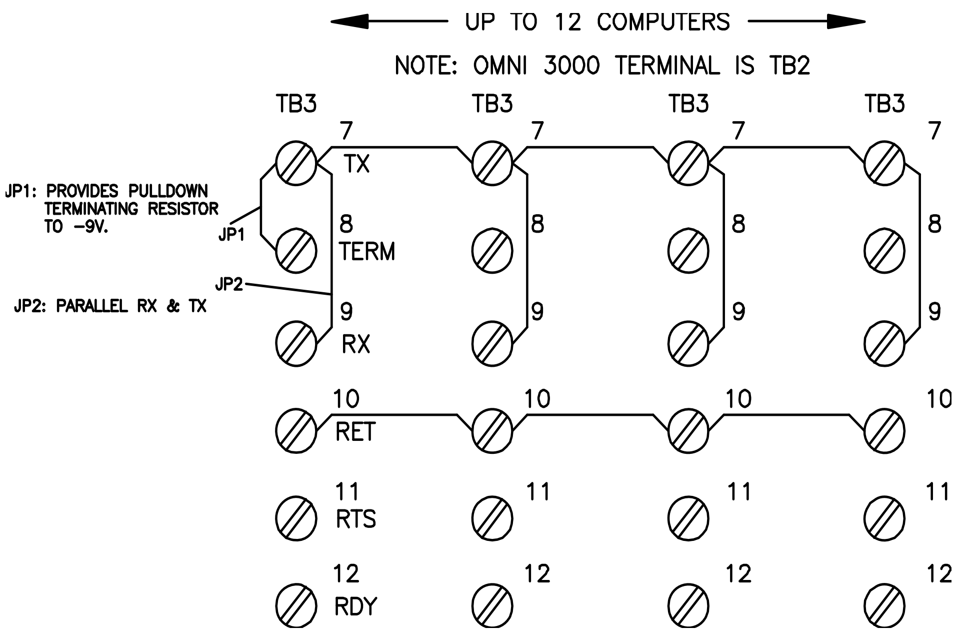


Figure 94. Wiring of Several Flow Computers in the Peer-to-Peer Mode using RS-232-C Communications

7.4.3. Keying the Modem or Radio Transmitter Carrier in Multi-drop Applications

Use the RTS signal to key the modem or radio transmitter carrier in a multi-drop application. A delay between activating the RTS signal and actually sending data is provided to allow for carrier acquisition at the remote end. This delay can be selected as 0.0 msec, 50 msec, 100 msec, or 150 msec.

NOTE: Refer to Volume 3, Chapter 2 “Flow Computer Configuration

7.4.4. RS-485 Four-wire Multi-drop Mode

Figure 95 diagram shows the wiring requirements for multi-dropping two or more flow computers via RS-485 in four-wire mode to a third party PLC type device. Note that in the wiring example shown in Figure 95, the PLC acts as a master and can communicate with either flow computer. A four-wire wiring system does not allow communications between slaves; i.e., data can only be transferred between master and slaves. The RS-485 option is available only with the OMNI Serial I/O Module #68-6205.

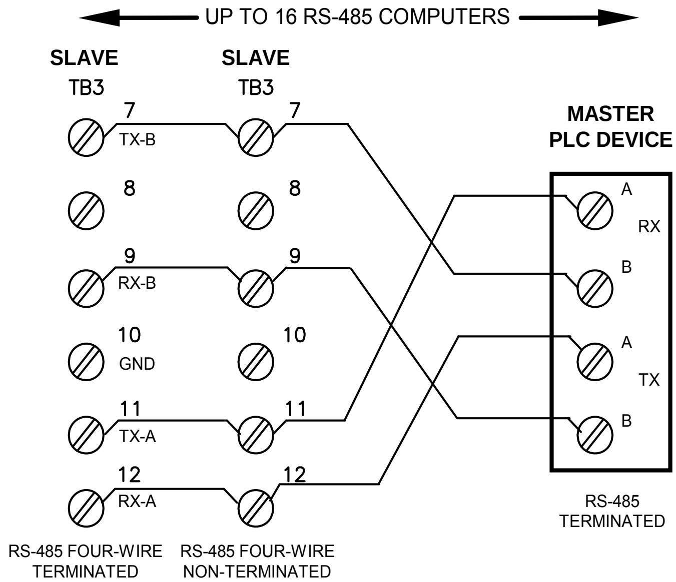


Figure 95. Wiring of Multiple Flow Computers to a PLC Device Via RS-485 Communications in Four-wire Multi-drop Mode

7.5. Connecting to a SCADA Device

When using an OMNI 6000 with 2 serial I/O modules installed, a second Modbus port (Physical Port #3 used as an example) can provide access to the computer's database (Figure 96). This port can also be connected to a PC or any SCADA device either directly, via modem, or via radio link.

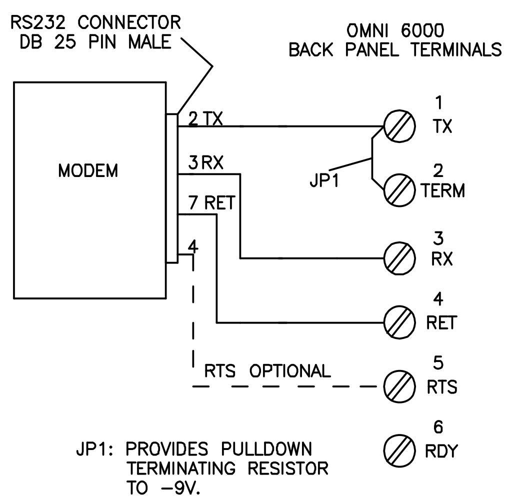


Figure 96. Typical Wiring of Port #3 to a SCADA Device via Modem

7.6. Interfacing the Fourth Serial Port to an Allen-Bradley™ KE Module

Port #4 is available on OMNI Flow Computers with the second serial module fitted. This port can be selected to communicate with Allen-Bradley™ devices using DF1 full duplex or half duplex protocol, or set up for Modbus devices. The example Figure 97 assumes that the Allen-Bradley Protocol has been selected.

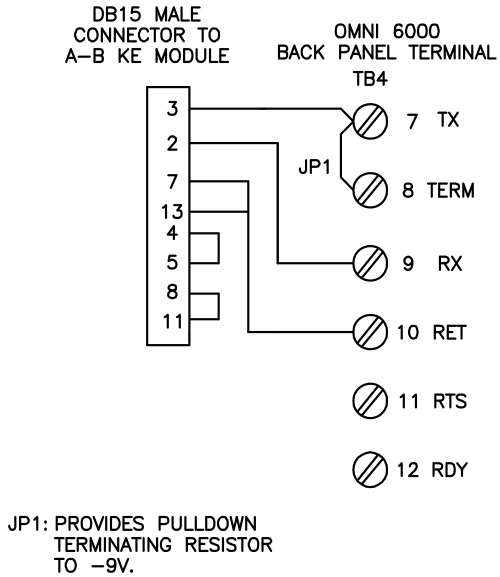


Figure 97. Wiring Serial Port #4 to Allen-BradleyTM KE Communications Module

7.7. Network Printing

To use serial/Ethernet modules to configure the flow computers to print to network printers, please refer to Technical Bulletin 080001 (52-0001-0009).

Chapter 8

8. Diagnostic and Calibration Features

8.1. Introduction

In the diagnostic mode you can verify that the I/O modules and transducers are working and are calibrated to specification.

The actual process transducers used may provide a variety of signal types, ranging from voltage or current pulses of various levels, to linear analog signals such as 4-20 mA., 1-5V, 0-1V or RTD elements. In the case of pulse inputs, the input module provides amplification and/or level shifting, Schmitt triggering and opto-isolation.

When analog signals are used the input module provides all signal conditioning, opto-isolation, and converts the analog signal to a high frequency pulse train, in the range of 0 - 20 kHz. By using a precision voltage to frequency converter, typical linearity of +/-0.01 % is obtained.

Certain diagnostic displays are always available while in the Display Mode. For example pressing **[Input]** then **[Display]** will display the raw frequency input from each process input point. The up/down arrow keys can be used to scroll through all inputs.

NOTE: When viewing an analog input point, the frequency displayed approximates 1000Hz/mA. When viewing a turbine or photo pulsar signal, the display is the actual input frequency

A typical display shows:

```
Input % Freq/Period
#1             2530
Input % Freq /Period
#2             3021
```

NOTE: 0.0% corresponds to 4mA. 100.0% corresponds to 20mA

Pressing **[Output] [Status] [Display]** shows the current percentage output for each of the digital to analog 4-20 mA outputs.

```
Analog Output %
#1           55.79
Analog Output %

#2           34.10
```

Important timing information is available by pressing **[Time]** then **[Display]** and then scrolling down using the down arrow. The displays are as follows:

```
Power Applied
Time:      09:10:30
Date:      01/21/91
```

```
Power Last Lost
Time:       10:25:21
Date:       01/20/91
```

The previous two displays of power lost and power applied allow the user to estimate the amount of product flow which may be unaccounted for in the event of a power failure.

Scrolling down further displays:

```
Main Task Timing-Sec
20 mS Task     00.00
50 mS Task     00.00
100mS Task     00.01
500mS Task     00.04
Background     00.02
```

This timing information refers to various main application tasks that run within the computer. The information may be useful to OMNI in the event of a problem.

8.2. Calibrating in the Diagnostic Mode

NOTE: The Diagnostic LED glows red after a valid password has been asked for and entered.

In the Diagnostic Mode the user selects a specific process variable to calibrate or view. The display shows the input channel and combo module used for the variable. Calibration override values can be input and the input signals can be viewed simultaneously as engineering values % span, input voltage and current. Analog outputs and digital I/O points can also be viewed and manipulated.

8.2.1. Entering the Diagnostic Mode

To enter the diagnostic mode, proceed as follows press the **[Alpha Shift]** key, then the **[Diag]** key.

NOTE: The '**Select Input/Output**' screen must be displayed when making a new selection while in the Diagnostic Mode. Return to this screen by pressing the **[Diag]** key once.

The front panel diagnostic LED will glow green and the following will be displayed on the first three lines of the LCD Display:

```
Select Input/Output
to Calibrate,
Press "Diag" to
Exit
```

The fourth line of the display is used to show the user's selection. The user can choose to calibrate or view any analog input or output, or manipulate any set of digital I/O points.

8.2.2. Display Groups in the Diagnostic Mode

To display an input or output variable to calibrate, select from the following display groups and associated key presses or select the I/O number if known, (usually supplied on a separate sheet).

NOTE: Each input channel of each combo module has had its temperature coefficient trimmed to ±10 ppm/°F. To avoid temperature gradient effects and for best results, always allow the internal temperature of the computer to stabilize before making your final calibration adjustments

DISPLAY VARIABLES	VALID KEY PRESSES
All of the following key presses are valid in the Diagnostic Mode. To enter the Diagnostic Mode, these key presses must be preceded by the **[Alpha Shift] [Diag]** keys.	
Input Channels (n = 1 through 24)	**[Input]** or **[Input] [*n*]**
Meter Temperature (n = 1 through 4)	**[Temp]** or **[Temp] [Meter] [*n*]**
Meter Pressure (n = 1 through 4)	**[Press]** or **[Press] [Meter] [*n*]**
Meter Density (n = 1 through 4)	**[Density]** or **[Dens] [Meter] [*n*]**
Meter Density Temp (n = 1 through 4)	**[Density][Temp]** or **[Density][Temp][Meter][*n*]**
Meter Dens Pressure (n = 1 through 4)	**[Density][Press]** or **[Density][Press][Meter][*n*]**
Prover Temperature (Left, Right)	**[Prove} [Temp]**
Prover Pressure (Left, Right)	**[Prove} [Temp]**
Output Channels (n = 1 through 24)	**[Output] [*n*]**
Digital I/O (n = 1 or 2)	**[Status] [*n*]**

8.2.3. Leaving the Diagnostic Mode

Once you are done viewing and/or modifying the calibration settings, press **[Diag]** to return to the selection screen as follows:

```
Select Input/Output
to Calibrate,
Press "Diag" to
exit
```

Press the **[Diag]** key again to return to the Display Mode (Diagnostic LED will turn off).

8.3. Calibration Instructions

NOTE: You can also calibrate the input and output of your choice by entering the number of that input or output; e.g.: Press **[Input] [1] [Enter]**; press **[Output] [4] [Enter]**. With this method you can calibrate the inputs and outputs to the computer without having them assigned to any I/O point numbers.

8.3.1 Calibrating A Voltage or Current Analog Input

While the above display is shown select the input variable to calibrate. For example to calibrate Meter Run #1 Temperature, press **[Meter] [1] [Temp]** (or the input # if known). The display shows:

```
Select Input/Output
to Calibrate,
Press "Diag" to Exit
Meter 1 Temp
```

Other key press combinations work. **[Temp] [Meter] [1]** means the same to the computer as **[Meter] [1] [Temp]**. Pressing **[Temp]** without a meter number allows all of the temperatures to be scrolled through and calibrated.

Now enter the selection by pressing **[Display]** and the following is displayed:

```
Temperature #1
Input# & Module 1-a1
Override        60.0
Calibrate Input ?  _
```

NOTE: Unless previously entered, a request for a valid password is made at this point. The calibrate override value entered will be substituted for all process variables assigned to this physical I/O point when the user answers **[Y]** to 'Calibrate Input? It is automatically removed when the user presses the **[Diag]** key to exit or make a new selection.

The display shows the process variable name, the input channel number and combo module used. This example shows Temperature Meter Run #1 connected to Channel 1 of Combo Module A1.

Before calibrating an input the user should enter a Cal Override value to be used in all calculations in place of the live value.

Answer **[Y]** to the 'Calibrate Input?' question and the following is displayed:

```
Meter 1           27.5
% Value          50.00
Input Volts      3.000
mA Value         12.00
```

NOTE: Each input channel of each combo module has had its temperature coefficient trimmed to ±10 ppm/°F. To avoid temperature gradient effects and for best results, always allow the internal temperature of the computer to stabilize before making your final calibration adjustments.

The **[☐]/[☐]** keys are used as the 'Zero' adjustment and the **[☐]/[☐]** keys are used for the 'Span' adjustment. Adjustments made when the Shift LED is on are approximately ten times more sensitive. Holding the arrow keys longer than two seconds speeds up the rate of adjustment

The Span adjustment has no effect at 4mA or 1v. Always adjust the 'Zero' first at exactly 4mA or 1v.

Leaving the Diagnostic Mode - In the 'Select Input/Output' screen, press the **[Diag]** key to return to the Display Mode (Diagnostic LED will turn off).

To calibrate the input channel follow these instructions:

- Disconnect the transducer signal and replace it with a stable current or voltage source capable of inputting 4.000 to 20.000 mA or 1.000 to 5.000 V signal.
- Set the input signal to 4.000 mA or 1.000 V as applicable.
- Wait 30 seconds for the reading to stabilize.
- Using the Up/Down arrow keys adjust the displayed value so it reads 4.000 mA / 1.000 V.
- Set the input signal to 20.000 mA or 5.000 V as applicable.
- Wait 30 seconds for the reading to stabilize.
- Using the Left/Right arrow keys adjust the displayed value so it reads 20.000 mA / 5.000 V.
- Recheck step 2) No further adjustment is normally needed if the Zero is adjusted at exactly 4.0 mA.

- Disconnect the calibrator signal and reconnect the transducer signal.
- Press the **[Diag]** key to return to the selection screen.

```
Select Input/Output
to Calibrate,
Press "Diag" to Exit
```

8.3.2. Calibrating an RTD Input Channel

While the above screen is being displayed select a process variable which is assigned as an RTD probe input. For example, assuming a pulse type densitometer is installed, pressing **[Meter] [1] [Density] [Temp]** (or the input # if known), selects the input channel used to process Meter Run #1's Densitometer integral RTD. Other key press combinations will work, and [**Density] [Meter] [1] [Temp]** all mean the same. Pressing **[Density] [Temp]** allows the user to scroll through all density temperature channels.

Now enter the selection by pressing **[Display]** and the following is displayed:

```
Dens #1 Temperature
Input# & Module 2-B1
Cal Overide     60.0
Calibrate Input  ? _
```

Enter the Calibrate Override value and answer **[Y]** to the 'Calibrate Input?' question and a screen similar to the following is displayed:

```
Dens#1 Deg.F    65.0
% Value        60.00
Resistance Value
Ohms          100.00
```

NOTE: Each input channel of each combo module has had its temperature coefficient trimmed to ±10 ppm/°F. To avoid temperature gradient effects and for best results, always allow the internal temperature of the computer to stabilize before making your final calibration adjustments

The **[☐]/[☐]** keys are used as the 'Zero' adjustment and the **[☐]/[☐]** keys are used for the 'Span' adjustment. Adjustments made when the Shift LED is on are approximately ten times more sensitive. Holding the arrow keys longer than two seconds speeds up the rate of adjustment

The Span adjustment has no effect at 4mA or 1v. Always adjust the 'Zero' first at exactly 4mA or 1v.

Leaving the Diagnostic Mode - In the 'Select Input/Output' screen, press the **[Diag]** key to return to the Display Mode (Diagnostic LED will turn off).

To Calibrate an RTD input channel proceed as follows:

- Disconnect the RTD probe and connect precision decade resistance box. capable of inputting 30.00 to 150.00 Ohms as shown in Figure 98.
- Set the decade box to 30.00 Ohms.
- Wait 30 seconds for the reading to stabilize.
- Using the Up/Down arrow keys adjust the displayed value so it reads 30.00 Ohms.
- Set the decade box to 150.00 Ohms.
- Wait 30 seconds for the reading to stabilize.
- Using the Left/Right arrow keys adjust the displayed value so it reads 150.00 Ohms.

- Recheck step 2). No further adjustment is normally needed if the Zero is adjusted at exactly 30 Ohms.
- Disconnect the decade box and reconnect the RTD probe.
- Press the **[Diag]** key to return to the selection screen.

```
Select Input/Output
to Calibrate,
Press "Diag" to Exit
```

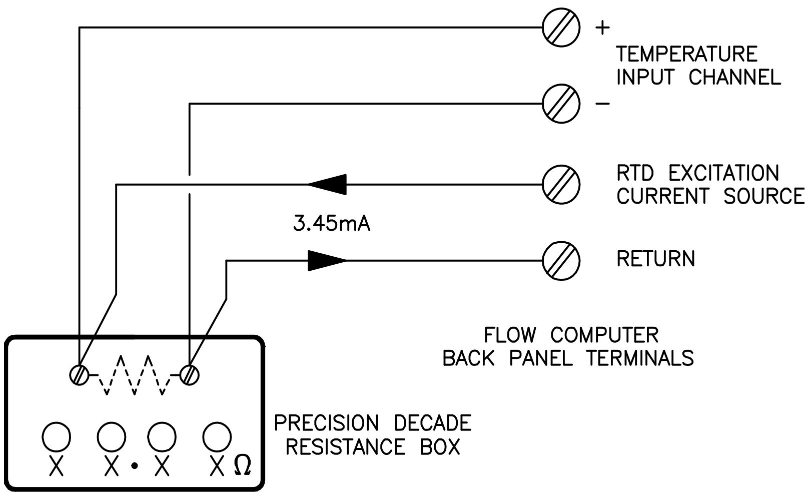


Figure 98. Figure Showing Calibration of RTD Input Channel

8.3.3. Calibrating a 4 to 20 mA Digital to Analog Output

Each of the analog outputs can be calibrated by monitoring the loop current with an accurate milliamp meter and setting the output current to 4.00 mA and 20.00 mA. For example to calibrate Analog Output #1 proceed as follows:

While the 'Select Input/Output' screen is displayed, press **[Output] [1] [Display]**. The display shows:

```
Analog Output #1
0%=4mA, 100%=20mA
Override %      0.00
Calibrate Output ? _
```

Answer **[Y]** to the 'Calibrate Output?' question and the display shows:

CAUTION: At this point, the analog output reflects the value of the currently displayed override, not the assigned variable. The user must ensure that any equipment using the output signal will not cause an unsafe condition to arise or cause erroneous results to be generated

```
Analog Output #1
0%=4mA, 100%=20mA
Override %      0.00
Override Now Active
```

To calibrate the output channel follow these steps:

- Connect an accurate milliamp meter in series with the load.
- Input 0.00 % (4.00 mA) as the output override.
- Wait 30 seconds for the reading to stabilize.
- Using the Up/Down arrow keys adjust the output current until the milliamp meter indicates 4.00 mA.
- Input 100.00 % (20.00 mA) as the output override.
- Wait 30 seconds for the reading to stabilize.
- Using the Left/Right arrow key adjust the output current until the milliamp meter indicates 20.00 mA.
- Repeat steps 2) through 5) until no further improvement can be obtained.
- Remove the milliamp meter and reconnect the load.
- Press the **[Diag]** key to return to the selection screen.

NOTE: Leaving the Diagnostic Mode - In the 'Select Input/Output' screen, press the **[Diag]** key to return to the Display Mode (Diagnostic LED will turn off).

```
Select Input/Output
to Calibrate,
Press "Diag" to Exit
```

8.3.4. Verifying the Operation of the Digital I/O Points

The digital I/O points can be manipulated as a group by pressing **[Status] [1]** for digital points 1 through 12 or **[Status] [2]** for digital points 13 through 24. Pressing **[Status]** will allow the user to scroll to either group. Press **[Display]** and a screen similar to the following is displayed:

```
Digital#1 I/O Points
Input   001011001011
Overide 101010101010
Force  To Output ? _
```

CAUTION: After answering [Y], the digital outputs will reflect the value of the currently displayed override, not the assigned variable. The user must ensure that any equipment using the output signal will not cause an unsafe condition to arise or cause erroneous results to be generated

The second line shows the status of the I/O points frozen at the time that the screen was displayed. The points are numbered left to right (1 to 12) with a '0' indicating that a point is off and a '1' indicating that a point is on. The third line shows the override bit values that will be forced to the output port when the user answers **[Y]** to the 'Force To Output?' question. A screen similar to the following is displayed:

```
Digital#1 I/O Points
Input   101110001101
Overide 101010101010
Override Now Active
```

NOTE: To avoid a hardware conflict, only points that have been assigned as outputs will accept an override of '1'; i.e., entering a '1' at an input position will be ignored and displayed as a '0'.

The override '1's and '0's can be changed at any time while the 'Override Now Active' line is displayed. The input status displayed on the second line should always agree with the green LEDs on the edge of the digital I/O module. Red LEDs lit indicate blown fuses on the digital I/O module.

Outputs on this I/O module that are assigned as totalizer outputs will stop counting while the 'Override Now Active' line is displayed. Pulses to be output are accumulated and are output at the maximum allowed rate as soon as the **[Diag]** key is pressed.

NOTE: **Leaving the Diagnostic Mode -** In the 'Select Input/Output' screen, press the **[Diag]** key to return to the Display Mode (Diagnostic LED will turn off).

Press **[Diag]** to return to the selection screen as follows:

```
Select Input/Output
to Calibrate,
Press "Diag" to Exit
```

8.3.5. Verifying the Operation of the Front Panel Counters

The front panel counters A, B and C can be forced to output a single count to verify operation. To force a counter output in the diagnostic mode, using the display as follows press counts and the number of the counter A=1 B=2 C=3, and press "enter" A password will be required the first time. You should notice that the counter will increment by one count.

```
Select Input/Output
to Calibrate,
Press "Diag" to Exit
Counts 1
```

Press "Enter"

```
Force to Output?
```

Press Alpha Shift "y" Enter,

```
Password Required
```

Enter Password, Press enter.

Press **[Diag]** to return to the selection screen as follows:

```
Select Input/Output
to Calibrate,
Press "Diag" to Exit
```

Chapter 9

9. Flow Computer Specifications

9.1. Dimensions

CAUTION: OMNI Flow Computers, Inc., pursuant to a policy of product development and improvement, may make any necessary changes to these specifications without notice

Panel Cut-out: ☐ 8.25 x 4.75 in (210 x 121 mm)

Behind Panel: ☐ **OMNI 3000:** 8.75 in (222 mm)
OMNI 6000: 15.5 in (394 mm)

Front Panel Bezel: ☐ 9 x 5 in (229 x 127 mm)

Weight: ☐ **OMNI 3000:** 9 lbs (4.08 kg)
☐ **OMNI 6000:** 16 lbs (7.26 kg)

9.2 Environmental

Operating Temperature: ☐ +14°F to +140^{0}F (-10°C to +60° C)

Storage Temperature: ☐ -4° to +158° F (-20° to +70° C)

Relative Humidity: ☐ 90% non-condensing maximum

9.3. Electrical

Supply Voltage for Power Supply

Module Model 68-6118: ☐ 110 to 120 VAC, 50 to 500 Hz; or 22 to 26 VDC, 10 to 20 Watts *(excluding transducer loops)* 10 to 35 Watts *(including transducer loops)*

☐ **Optional:** 220 to 240 VAC, 50 to 500 Hz; or 22 to 26 VDC, 10 to 20 Watts *(excluding transducer loops)*

Supply Voltage for Power Supply

Module Model 68-6218: ☐ 90 to 264 VAC, 47 to 440 Hz; or 22 to 26 VDC, 10 to 20 Watts *(excluding transducer loops)* 10 to 35 Watts *(including transducer loops)*

☐ **Caution:** Maximum DC Offset from +DC or –DC to Earth ground is 120 VDC.

Transducer Output Power: ☐ 24 VDC at ~400 mA for most configurations *(when AC powered)*

Isolation: ☐ All analog inputs and outputs are optically isolated from computer logic supply

☐.Maximum common mode voltage on any input or output is ± 250 VDC to chassis ground.

Power Fuse: ☐.110 AC receptacle (DC connections available)

Transient/Over-voltage Protection for

Power Supply Module Model 68-6118: ☐ Power supply crowbar, Transorbs and self-resetting fuses.

Transient/Over-voltage Protection for

Power Supply Module Model 68-6218: ☐ Current limiting, Transorbs and self-resetting fuses.

9.4. 68-6001 Microprocessor & Memory

Type:	☐ 32-bit CMOS Microprocessor ☐ Clock Speed: 16 MHz, 0 wait state; Throughput 4,000,000 instructions/sec
Coprocessor:	☐ Floating point math coprocessor ☐ Clock Speed: 16 MHz; Throughput 50,000 floating point operations/sec
EPROM:	☐ 1 MB
Static RAM:	☐ 1 MB Maximum (RAM available for archive approx 200K with plug in RAM and approx 750K with SMT RAM)
Real Time Clock:	☐ Battery backed-up, time of day; programmable interval down to 10 msec ☐ Maintains time during power loss ☐ Reports downtime on power-up
Logic Voltage:	☐ 5 VDC
Over-voltage Protection:	☐ Crowbar on power supply fires at 6.25 VDC approx.
Transient Protection for Power Supply Module Model 68-6118:	☐ Transorbs on power supply module
Transient Protection for Power Supply Module Model 68-6218:	☐.Transorbs on power supply and backplane
RAM Memory Battery Backup:	☐ 3.6 VDC NiMH; rechargeable
Typical Memory Backup Period:	☐ 30 days assured – 60+ days typical *(with power removed). The actual* backup period is dependent on the ambient temperature of the equipment. Higher ambient temperatures increase the internal discharge rate of the battery.

9.5. 68-6201 Microprocessor & Memory

Type:	☐ 32-bit Microprocessor ☐ Clock Speed: 150 MHz Maximum
Flash:	☐ 4 MB
Fast RAM:	☐ 4 MB
RAM:	☐ 2 MB Battery Backed – 1.5 MB minimum available for archive data
Real Time Clock:	☐ Battery backed-up, time of day; programmable interval down to 10 msec ☐.Maintains time during power loss ☐ Reports downtime on power-up
Logic Voltage:	☐ 5 VDC, 3.3 VDC, 1.5 VDC
Over-voltage Protection:	☐ Crowbar on power supply fires at 6.25 VDC approx.
Transient Protection for Power Supply Module Model 68-6118:	☐ Transorbs on power supply module
Transient Protection for Power Supply Module Model 68-6218:	☐ Transorbs on power supply and backplane
RAM Memory Battery Backup:	☐ 3.6 VDC NiMH

Typical Memory Backup Period: ☐ 60 – 120 days *(with power removed).*

9.6. Backplane

Type: ☐ Passive; configured with plug-in DIN connectors

Number of I/O Module Slots: ☐ OMNI 3000: 4 slots

☐ OMNI 6000: 10 slots

9.7. Process Input/Output Combo Modules

CAUTION: OMNI Flow Computers, Inc., pursuant to a policy of product development and improvement, may make any necessary changes to these specifications without notice.

TYPE	INPUT #1	INPUT #2	INPUT #3	INPUT #4	ANALOG OUTPUTS	ADDITIONAL FEATURES
A	1-5v; 4-20mA; RTD		1-5v; 4-20mA; Flow Pulses		Two 4-20mA	• Pipe Proving
B	1-5v; 4-20mA; RTD		1-5v; 4-20mA Flow Pulse	Frequency Density	One 4-20mA	• Pipe Proving
E/D	1-5v; 4-20mA; RTD		Frequency Density		Two 4-20mA	
E	1-5v; 4-20mA; RTD		Flow Pulses		Two 4-20mA	• Pipe Proving • Double Chronometry. Proving • Level A Pulse Fidelity
H	Honeywell DE Protocol				Two 4-20mA	
HV	Honeywell Multivariable DE Protocol				Two 4-20mA	
HT/HM	HART FSK Protocol				Two 4-20mA	
	PORT #1		**PORT #2**			
SV	RS-485 Multi-drop to Various Multivariable Transmitters				Six 4-20mA	

9.8. Flowmeter Pulse Inputs

Use DC Coupling – High Threshold setting

Input Frequency: ☐ DC to 15 kHz. Square Wave
DC to 12 kHz Sine Wave*

Positive Going Trigger Threshold: ☐ +4.2 Volts +/- 0.2 volts (Nominal @ 1kHz)

Negative Going Trigger Threshold: ☐ +3.2 Volts +/- 0.2 volts (Nominal @ 1kHz)

Input impedance: ☐ 1 M Ohm (Nominal @ 1kHz)

Configuration: ☐ Differential input *(E module inputs are single ended referenced to DC ret.)*

Common Mode Voltage: ☐ ±250 VDC to chassis ground

Pulse Fidelity Check: ☐ Channels are continuously compared for frequency and sequence.

E Module Only: ☐ Complete failure of either A or B channel will not effect totalizing

☐ Simultaneous noise pulses are rejected with better than 90% certainty

* The maximum frequency allowed is reduced when operating with a sine wave input signal. This is because the signal must extend beyond the high level threshold and below the low level threshold for a minimum of 30 micro seconds to allow the photo optical-couplers to conduct.

9.9. Densitometer Pulse Inputs

Use AC Coupling – Low Threshold setting

Positive Going Trigger Threshold: ☐ +1.6 Volts +/- 0.2 volts

Negative Going Trigger Threshold: ☐ +1.2 Volts +/- 0.2 volts

Minimum Signal Level: ☐ 2 Volts Peak to Peak

Maximum Signal Level: ☐ 5 Volts Peak to Peak

Minimum Frequency: ☐ 250 Hz (4000 micro second period)

Maximum Frequency: ☐ 6.7 KHz (150 micro second period)

** AC Coupling is only used in conjunction with the low signal input threshold setting. It is meant for densitometer periodic time measurements only.

9.10. Detector Switch Inputs

(Non-Double Chronometry)

Input Type: ☐ Voltage

Gating Transition: ☐ Application of voltage starts and stops proves

Minimum Time Pulse High: ☐ 1 msec

Minimum Time Pulse Low: ☐ >2 seconds

Input Impedance: ☐ 4.7 k Ohms

Input On Voltage: ☐ >10 V On, <4 VDC+ Off *(referenced to DC Power Return)*

Debounce: ☐ 2 sec in Software

Common Mode Voltage: ☐ ±250 VDC to chassis ground

9.11. Detector Switch Inputs of E Combo Module

(Double Chronometry)

- ☐ Normally driven by bounce free open collector transistor or Normally Open switch.
- ☐ Debounce circuit may be needed with pipe prover switch type detectors.

9.12. Analog Inputs

Input Type:	☐ 1-5 V or 4 - 20 mA
Input Impedance:	☐ 1 Meg Ohm when 1-5V, (250 Ohms when *4-20 mA. selected by installing shunt resistor)*
Resolution:	☐ 14 Binary Bits
Accuracy:	☐ ±0.025% of reading +/- 2 counts 41°F to 122°F (+5°C to +50°C)
Common Mode Voltage:	☐ ±250 VDC to chassis ground

9.13. RTD Inputs

RTD Configuration:	☐ 4-wire Bridge
RTD Resistance:	☐ 100 Ohm @ 32°F (0°C)
Excitation Current:	☐ 3.45 mA Nominal (+/- 0.02 mA)
Maximum Field Wiring Resistance:	☐ 1k Ohm per wire
Resolution:	☐ 0.008 Ohms
Range:	☐ -229°F to 293°F (-145°C to +145°C)
Accuracy:	☐ ±0.025% of reading +/- 2 counts 41°F to 122°F (+5°C to +50°C)
Common Mode Voltage:	☐ ±250 VDC to chassis ground

9.14. Analog Outputs

CAUTION: OMNI Flow Computers, Inc., pursuant to a policy of product development and improvement, may make any necessary changes to these specifications without notice.

Resolution:	☐ 12 Binary Bits
Output:	☐ Current source 4-20 mA *(referenced to transducer power return terminal)*
Common Mode:	☐ ±250 Volts to chassis ground
Max./Min. Working Loop Voltage:	☐ 30 VDC to 18 VDC
Loop Resistance:	☐ 900 Ohm with 24 VDC Power
	☐ 1.2 k Ohm with 30 VDC Power
Update Rate:	☐ Each 500 milliseconds
Accuracy:	☐ ±0.05 % of reading +/- 2 counts 32°F to 122°F (+5°C to +50°C)

9.15. Control Outputs/Status Inputs

(12 per module)

Configuration: ☐ Open emitter Darlington or FET transistor source
(Referenced to transducer power return terminal)
(Configured as an Output)

Current Capacity: ☐ 200 mA max. per point, 500 mA per digital I/O module

Output Voltage: ☐ +DC – 1v nominal *(Configured as an Input)*

Input Impedance: ☐ 4.7 k Ohms in series with 2 LEDs

Input Voltage: ☐ Input voltages > 8 to < DC+ will be recognized as on

☐ Input voltages < +2 V will be recognized as off

LEDs: ☐ Operating and Fuse open circuit indicators on each channel

Common Mode: ☐ ±250 Volts to chassis ground

Scan Rate: ☐ Outputs may be pulsed at 50Hz Maximum

9.16. Multi-bus Serial I/O Interface

(2 Ports per Module) each port can be jumpered for RS-232C, RS-485 2 or 4 wire.

9.16.1. RS-232 Compatible

Serial Data Output Voltage: ☐ ±7.5 Volts typical

Recommended Load Impedance: ☐ 1.5 k Ohm

Short Circuit Current: ☐ 10 mA limited

Input Low Threshold: ☐ Vl = -3.0 Volts

Input High Threshold: ☐ Vh = +3.0 Volts

Baud Rate: ☐ Software Selectable Range: 1.2, 2.4, 4.8, 9.6, 19.2, 38.4 kbps

Common Mode Voltage: ☐ ±250 Volts DC to chassis ground

LEDs: ☐ Indicator LEDs for each channel input, output and handshaking signals

9.16.2 RS-485

Serial Data Output Voltage: ☐ 5 Volts differential driver

Recommended Load Impedance: ☐ 120 Ohm (located on module)

Short Circuit Current: ☐ 20 mA Limited

Input Low Threshold: ☐ 0.8 Volts

Baud Rate: ☐ Software selectable
☐ Range 1.2, 2.4, 4.8, 9.6, 19.2, 38.4 k bps

Common Mode Voltage: ☐ ±250 Volts DC to chassis ground

LEDs: ☐ Indicator LEDs for each channel input, output and handshaking signals

9.17. Ethernet

Physical: ☐ 10BaseT

Speed: ☐ 10MBits/Sec

Connections: ☐ 8 simultaneous

Protocols: ☐ Modbus, Modbus/TCP, LPD, Syslog, Telnet, TCP, UDP

9.18. HART

Physical: ☐ FSK
Networks: ☐ 4 per Module – 16 Max
Sensors: ☐ 4 per Network – 64 Max

9.19. Operator Keypad

Keypad Characteristics: ☐ 34-key, domed membrane, with tactile and audio feedback
Material: ☐ Autotex 2 Hard coat Polyester Film
Data Entry Lockout: ☐ Internal switch and software passwords
Key Debounce: ☐ Software controlled

9.20. LCD Display

Display: ☐ 4 lines of 20 Characters
☐ 5 x 8 Dot Matrix
Character Height: ☐ 4.75 mm
Display Data: ☐ Alphanumeric, 80 characters
Backlight: ☐ Green/Yellow LED
☐ Viewing angle, contrast and backlight controlled from keypad
Viewable Temperature: ☐ +32°F to +122°F (0°C to 50°C)

9.21 Electromechanical Counters

Quantity: ☐ Three, with programmable function
Display: ☐ 6-digit, non-resetable
Character Height: ☐ 5 mm
Maximum Count Rate: ☐ 10 counts per second

9.22 Operating Mode Indicator LEDs

CAUTION: OMNI Flow Computers, Inc., pursuant to a policy of product development and improvement, may make any necessary changes to these specifications without notice

Quantity: ☐ Four
Dual Color: ☐ Red/Green
Indication: ☐ Active Alarm LED
- Green: to indicate that an acknowledged alarm exist
- Red: to indicate that a new, unacknowledged, alarm exists

☐ Diagnostic LED
- Green: to indicate Diagnostic or Calibration Mode is active
- Red: to indicate password is active

☐ Program LED
- Green: to indicate Program or Configuration Mode is active
- Red: to indicate password is active

☐ Alpha Shift LED
- Green: to indicate Alpha Shift Lock Mode

is active
- ♦ Red: to indicate alpha shift next key only

9.23 Security

Hardware: ☐ Optional lock on housing and internal keyboard program lockout

Software: ☐ Multi-level password control