Series 4000/7000

Operations & Maintenance Guide

Omni®

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Electronically published by OMNI Flow Computers, Inc. in the United States of America

OMNI Flow Computers Inc.

Our Mission

OMNI Flow Computers Inc. sets the world's standard for the design, development and manufacture of flow computers. For more than 30 years, we have supplied high-integrity equipment to offshore production facilities, oil and gas pipelines, terminals, refineries and petrochemical and gas plants worldwide.

We are determined to be the best in what we do, which is driven by our commitment to providing an excellent customer experience. We offer a multi-tiered promise to our customers, employees and business partners, which includes:

- Actively communicating with customers, integrators and original equipment manufacturers.
- Collaborating with our customers to determine the best solutions.
- Providing superior performance based on quality metrics.
- Operating with integrity and traceability.
- Providing continuous, relevant innovation that builds upon, rather than obsoletes, previous generations.

Our Users

Our products are currently being used worldwide at:

- Offshore oil and gas production facilities.
- Crude oil, refined products, liquefied petroleum gas (LPG), natural gas liquids (NGL) and gas transmission lines.
- Storage, truck and marine loading/offloading terminals.
- Refineries, petrochemical and cogeneration plants.

Contact Us

We are committed to our products, our people and our customers. To contact our corporate headquarters:

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Copyright Information

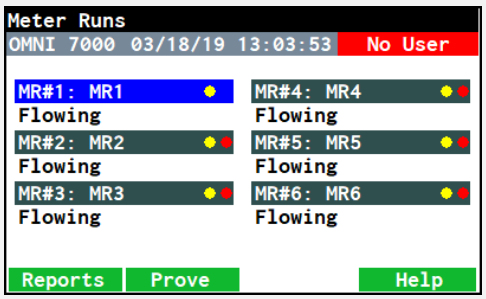
Warranty, Licenses and Product Registration

See the Terms and Conditions associated with your purchase order for the OMNI 4000/7000 flow computer warranty, licenses and product registration.

Document Conventions

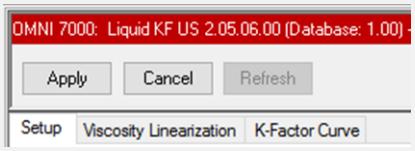
Document conventions help you navigate through the information in this manual. Instructions are contained inside grey tables and use the following conventions:

1.	Labeled cables and connections are bolded in the instructions: Connect **I/O Cable A** connector to **CONN A** on the motherboard.
2.	Front panel screen and function key selections are bolded in the instructions: • Scroll to select Meter Run 1. • Press the Reports function key to run a report.



3. OMNICONNECT® screen, window, field and button labels are bolded:

- Click **Apply** to save any selections or any edits made to fields before moving to the next screen.
- In the **Setup Sites** window, click **Add Site** to open the **Setup Communications** window.



4. A white box outlined in blue in an instructional step provides information that you need to know.

> This will help you complete the action.

5. F1 in an instruction step is a prompt for you to go to OMNICONNECT Help for additional details to perform an action.

Your cursor must be on the OMNICONNECT screen for F1 to open to the correct help content.

> Press F1 to access OMNICONNECT Help for assistance.

Boxes with icons provide information. When an icon alerts you to a potential safety concern, observe these precautions to prevent injury to people or damage to equipment.

The tip icon indicates additional information about the current topic.

The bookmark icon indicates a reference to another guide in this series.

WARNING:

The warning icon indicates a definite risk of danger to personnel or damage to equipment. Failure to observe and follow proper procedures could result in serious or fatal injury to personnel or significant property loss or equipment damage.

CAUTION:

The caution icon indicates a potential risk of injury to personnel or damage to equipment. Take extreme care when performing operations or procedures preceded by this symbol.

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	**Earth Ground Requirements**: The Earth Ground requirements icon reminds operators to verify that grounds are connected when there is a possibility of electrical shock.
	The electrostatic icon reminds operators to observe the precautions for handling electrostatic-sensitive devices.
	The recycle icon provides recycling instructions for the item.

Electronically published by OMNI Flow Computers, Inc. in the United States of AmericaThe OMNI 4000/7000 Series

1. The OMNI 4000/7000 Series

The Operations and Maintenance Guide for the OMNI 4000 and OMNI 7000 series of flow computers includes:

- An overview of the OMNI 4000/7000 flow computer.
- OMNICONNECT software operations.
- Front panel operations.
- Maintenance instructions.
- Hardware component troubleshooting.

Review these instructions and guidelines to ensure a safe installation and startup of your OMNI 4000/7000 flow computer.

1.1 Users of this Guide

As a user reference guide, the OMNI 4000/7000 Operations and Maintenance Guide is intended for an audience with knowledge of liquid and gas flow measurement technology. The user does not need to be an expert to 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.

This manual is written for:

- Operators.
- Advanced Technicians.
- System and Project Managers.
- Engineers and Programmers.

Only qualified personnel should operate, configure and calibrate OMNI flow computers.

1.2 Where Installed and Operated

The OMNI 4000/7000 should have previously been installed in a climate-controlled environment that has access to stable back-up power. It can be operated locally from the front panel or remotely through Modbus communications.

1.3 Certifications and Standards

OMNI 4000/7000 flow computers have earned the following certifications:

Nederland Meetinstituut (NMi)	
2004/108/EC	Electromagnetic Compatibility Directive
2004/22/EC	Measuring Instruments Directive
OIML R117-1	Dynamic Measuring Systems for Liquids Other Than Water Standard, Edition 2007; part of MID Software Guide–Measuring
WELMEC 7.2	Software Guide Measuring Instruments Directive, Chapter P and Extensions L, T, S, D and I5, Edition 2015

Nederland Meetinstituut (NMi)	
WELMEC 8.8	General and Administrative Aspects of the Voluntary System of Modular Evaluation of Measuring Instruments under the MID, Edition 2:2012
EN 55011:2009+ A1:2010	Industrial, Scientific and Medical (ISM) Equipment–Radio-Frequency Disturbance Characteristics
EN 61326-1:2013	Electrical Equipment for Measurement, Control and Laboratory Use–EMC Requirements–Part 1: General Requirements
EN 12405-1:2005+ A2:2010	Gas Meters - Conversion Devices - Part 1: Volume Conversion, Edition 2005+A2:2010

European Conformity (CE)	
2011/65/EU	Restriction of Hazardous Substances in Electronic Equipment (RoHS2) Directive
CE 93/68/EEC	Marking as per European Conformity Directive

TÜV Rheinland	
UL 60950-1:2007	Information Technology Equipment–Safety–Part 1: General Requirements
UL 61010-1	Issued: 2004/07/12 Ed: 2 Rev: 2008/10/28 UL Standard for Safety Electrical Equipment for Measurement, Control, and Laboratory Use; Part 1: General Requirements
CSA C22.2 61010-1	Issued: 2004/07/12 Ed: 2 (R2009) Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use Part 1: General Requirements, with general instruction No. 1:2008/10/28–(R2009)
ISO 9001:2015	Issued: 2018/08/15 Quality management system–Requirements

American Petroleum Institute (API)	
Manual of Petroleum Measurement Standards (MPMS)	
Chapter 4	Proving Systems
Chapter 5	Metering
Chapter 6	Metering Assemblies
Chapter 8	Sampling
Chapter 9	Density Determination
Chapter 11	Physical Properties Data (Volume Correction Factors)
Chapter 12	Calculation of Petroleum Quantities
Chapter 13	Statistical Aspects of Measuring and Sampling
Chapter 21	Flow Measurement Using Electronic Metering Systems

1.3.1 IEC Test Procedure Compliance

To meet the standards/directives in Section 1.3, the OMNI 4000/7000 models comply with the IEC test procedures listed in this section.

IEC 60068-2-1	Environmental testing–Part 2-1: Tests–Test A: Cold
IEC 60068-2-2	Environmental testing–Part 2-2: Tests–Test B: Dry heat
IEC 60068-2-47	Environmental testing–Part 2-47: Test–Mounting of specimens for vibration, impact and similar dynamic tests
IEC 60068-2-64	Environmental testing–Part 2-64: Tests–Test Fh: Vibration, broadband random and guidance
IEC 60068-3-1	Environmental testing–Part 3: Background information–Section One: Cold and dry heat tests
IEC 60068-3-4	Environmental testing–Part 3-4: Supporting documentation and guidance–Damp heat tests
IEC 60654-2	Operating conditions for industrial-process measurement and control equipment–Part 2: Power
IEC 61000-2-1	Electromagnetic Compatibility (EMC)–Part 2: Environment–Section 1: Description of the environment–Electromagnetic environment for low-frequency conducted disturbances and signaling in public power supply systems
IEC 61000-4-1	Electromagnetic Compatibility (EMC)–Part 4-1: Testing and measurement techniques–Overview of IEC 61000-4 series
IEC 61000-4-2	Electromagnetic Compatibility (EMC)–Part 4-2: Testing and measurement techniques–Electrostatic discharge immunity test
IEC 61000-4-3	Electromagnetic Compatibility (EMC)–Part 4-3: Testing and measurement techniques–Radiated, radio-frequency, electromagnetic field immunity test
IEC 61000-4-4	Electromagnetic Compatibility (EMC)–Part 4-4: Testing and measurement techniques–Electrical fast transient/burst immunity test
IEC 61000-4-5	Electromagnetic Compatibility (EMC)–Part 4-5: Testing and measurement techniques–Surge immunity test
IEC 61000-4-6	Electromagnetic Compatibility (EMC)–Part 4-6: Testing and measurement techniques–Immunity to conducted disturbances, induced by radio-frequency fields
IEC 61000-4-8	Electromagnetic compatibility (EMC)–Part 4-8: Testing and measurement techniques–Power frequency magnetic field immunity test
IEC 61000-4-17	Electromagnetic Compatibility (EMC)–Part 4-17: Testing and measurement techniques–Ripple on D.C. input power port immunity test
IEC 61000-4-29	Electromagnetic Compatibility (EMC)–Part 4-29: Testing and measurement techniques–Voltage dips, short interruptions and voltage variations on D.C. input port immunity tests
IEC 61000-6-1	Electromagnetic compatibility (EMC)–Part 6-1: Generic standards–Immunity for residential, commercial and light-industrial environments
IEC 61000-6-2	Electromagnetic compatibility (EMC)–Part 6-2: Generic standards–Immunity for industrial environments
IEC 61000-6-4	Electromagnetic compatibility (EMC)-Part 6-4: Generic standards–Emission standard for industrial environments

1.3.2 Measurement Security and Firmware Downloads (WELMEC 7.2 Extension D)

The OMNI 4000 and 7000 models have 16 password-protected access levels for protecting configuration parameters and for firmware downloads. When software sealing for parameters and firmware is applied, the highest level is reserved for Weights and Measures Agents and other agencies that act in the same way. Through software sealing, all communication ports can be set to “read-only.”

Only licensed firmware files can be transmitted.

This method of firmware transmission meets all requirements of WELMEC 7.2 2015 Extension D, Software Guide—Measuring Instruments Directive.

1.4 Calculations

The OMNI 4000/7000 includes, but is not limited to, support for the following calculations:

Liquid (U.S. Units)	
API MPMS CH. 11.1 (2007) Commodity Types: • Crude Oil • Refined Products • Lubricating Oil • Special Applications	**Crude Oil Historical Tables** **(API STD 2540/ASTM D1250, 1952 edition)** • Table 23/24 • Table 5/6
ASTM D1555 Aromatic Hydrocarbons	**LPGs and NGLs** • API MPMS CH. 11.2.4 - 23E/24E – (GPA TP27) • API MPMS CH. 14.7/14.4 – GPA 2145-16*
Mass Calculation	
Liquid (Metric Units)	
API MPMS CH. 11.1 (2007) • Crude Oil • Refined Products • Lubricating Oil • Special Applications	**Crude Oil Historical Tables** **(API STD 2540/ASTM D1250, 1952 edition)** Table 53/54
ASTM D1555M Aromatic Hydrocarbons	**LPGs and NGLs** • API MPMS CH. 11.2.4-53E/54E-(GPA TP27M)
Mass Calculation	**Alcohols** • Alcohol (ABNT NBR 5992:2008) • Alcohol (OIML) R22

Gas (U.S. Units)	
Flow Calculations **DP Meters** • API MPMS CH. 14.3 (AGA-3): 2012 • ASME MFC 3M (Non-Flange DP types) **Pulse Meters** • AGA-7: 2006	**Density Calculations** AGA-8 1994 • Method 1-Detailed Analysis • Method 2-HV/SG/CO2 • Method 3-SG/N2/CO2
Heating Value Calculation • GPA 2172 2009 • ISO 6976 60/60F • AGA 5 2009	**Speed of Sound** • AGA-10
Viscosity Calculation • LBC	**Isentropic Exponent Calculation** • Estimated • AGA-10
Gas (Metric Units)	
Flow Calculations **DP Meters** • ISO 5167:2003 • API MPMS CH. 14.3 (AGA-3): 2012 **Pulse Meters** • AGA-7: 2006	**Density Calculations:** AGA-8 1994 • Method 1-Detailed Analysis • Method 2-HV/SG/CO2 • Method 3-SG/N2/CO2
Heating Value Calculation • ISO 6976 (1995) • GPA 2172 (2009) • AGA-5 (2009)	**SGERG 1988** • Method 2-HV/N2/SG/H2 • Method 3-N2/CO2/SG/H2 • Method 4-HV/N2/CO2/H2
Viscosity Calculation • LBC	**ISO 12213-3 2006 (SGERG)** • Method 1-HV/N2/SG/H2
Isentropic Exponent Calculation • Estimated • AGA-10	**Speed of Sound** • AGA-10

*API MPMS CH. 14.7/14.4 is available with Firmware version 2.11 and higher for the US Liquid K-Factor Linearization Application. It requires the purchase of an Advanced firmware license with the API MPMS CH. 14.7/14.4 feature enabled.

1.5 Equipment Overview

OMNI 4000s and 7000s are microprocessor-based flow computers that perform liquid and gas flow calculations in accordance with the methods listed in Section 1.4 Calculations.

The flow computer connects to field transmitters in single and multiple Meter Run applications to monitor:

- Liquid and gas flow measurements in the pipeline.
- Custody transfer applications.

The flow computer calculates flow values and displays additional data and measurement information. This data and information can be transmitted over communication channels and printed, as needed.

In addition, audit trail logs are available for registering changes to measurement parameters and firmware updates. The audit trail can be printed directly from the front panel of the flow computer or viewed with the OMNICONNECT software when connected to a computer.

All input/output (I/O) modules are quality tested and temperature trimmed to optimize analog inputs before the flow computer is shipped. A label containing information such as the system serial number and model number is located on the inner chassis or on the outer cover in the case of the panel mount configuration.

On-site, OMNI 4000/7000 flow computers are configurable, but the firmware code is not user programmable. We do this to prevent the modification of WELMEC-approved metrologically relevant areas of the software code. If firmware modifications were allowed, they would render an existing EC-evaluation certification invalid.

With an OMNI flow computer, the factory-programmed software does not need modification in the field. This preserves the integrity of existing certifications and provides assurance that software and firmware have been validated and cannot be modified.

Every OMNI 4000/7000 flow computer has the following components and features:

Hardware

- 7201 central processing unit (CPU)
- 4.3-inch (10.922 cm) Color LCD with 800 x 480 resolution
- USB Mini-B port on the front panel for configuring the flow computer using OMNICONNECT
- USB-A Host port on the front panel for updating the OMNI CPU firmware using a memory stick
- USB Mini-B port on the CPU for configuration or updating the OMNI CPU firmware using OMNICONNECT
- Dual Ethernet (DE) module with:
  - 2 onboard RJ-45 100 Mbps Ethernet jacks
  - 10 Mbps using the back panel
- Expandable to allow for 2 DE modules (4 physical Ethernet ports for a total of 32 virtual connections).
- Expandable to allow for up to 10 Serial ports with different combinations of DE and S cards. *Must purchase separately.*
- Digital I/O Multiplexer (DM) module with 10 independent channels
- Digital I/O channels that support up to 3 externally installed Digital Terminals (DTs), which can be used in sequence. Each DT contains 16 I/O points. *DTs are optional purchase items.*
- 2 local printers, which can be connected to any RS-232 Serial port

Firmware

- All firmware applications in one programming file
- Daily, Batch, and Prove Historical Reports and for gas applications, a Detailed Daily report:
  - The 35 most recent reports are stored in the CPU memory.
  - Older reports are stored on the SD card, which has capacity of 8 GB of data.
  - 2 GB is allocated for each report type.
- Audit trail and alarm reports
- User database mapping providing standardization of local data maps or custom interfacing*
- Programmable Boolean and variable statements–128 statements with a 32-character length allowing technical flexibility for adding custom functions
- Support for 6 Meter Runs, which can be configured for Liquid and Gas measurement independently
- 2 sets of detector switches for dual prover volumes
- Proves based on run repeatability or random uncertainty**
- Selectable Master Meter prove meter
- Programmable security settings:
  - 1 Administrator and 16 users with separate permissions
  - Different passwords for users and data system connections
- A full audit feature, with separate reports for the system and measurement audits
- Support for:
  - SSL*
  - Dual Stations*
  - User Database Mapping*
  - A Gas/Liquid combination mode*

*These features require the Standard firmware license (not included in the Basic firmware license).

**Random Uncertainty is available with Firmware version 2.11and higher for the US Liquid K-Factor Linearization Application. It requires the purchase of an Advanced firmware license with the Prover Uncertainty feature enabled.

1.6 Safety

1.6.1 Basic Electric Safety

Observe precautions for handling electrostatic-sensitive devices.

Take basic electrical safety precautions to prevent injury and equipment damage:

☐ Keep the area around the equipment clean and free of clutter.

☐ Verify that the power is not connected to the system when installing or removing main system components, including I/O modules.

CAUTION:

Do not hot swap I/O modules. Electrical shock may occur, resulting in injury to personnel and damage to the flow computer or connected field devices/control systems.

☐ Connect the power using a readily accessible disconnect device certified as being safe for the area.

☐ If an electrical accident occurs, disconnect the power to the system by removing the plug(s) from the outlet(s). Some systems may have multiple power cords that connect to more than one outlet.

1.6.2 Electrical Grounding Requirements

Follow these requirements for grounding equipment:

☐ The rack or cabinet that will house the flow computer must be properly Earth Grounded before installation.

☐ An Earth-Grounded electrical outlet must be available for all power cables.

☐ If using a power cable other than the factory-supplied cable, the power cord must include an Earth-Grounding pin.

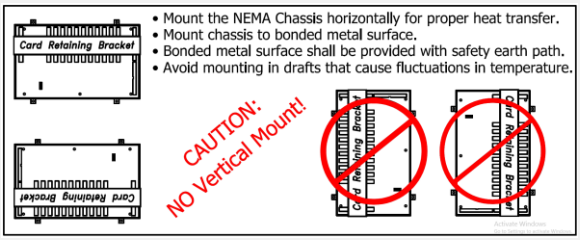
Earth Ground Requirements: Do not apply power before confirming that grounds are connected. Electrical shock can cause serious or fatal injury. Follow the National Electrical Code (NEC) and local codes for the safe installation of this equipment.

☐ To minimize the effects of electrical transients, the outer chassis of the flow computer must have a secure Earth Ground.

1.6.3 Safety Labels

Table 1-1 describes the safety labels that are posted on the OMNI 4000/7000 flow computer.

Table 1-1: Safety Label Descriptions



The No Vertical Mount safety label is located on the side of the National Electrical Manufacturers Association (NEMA) chassis where the I/O ribbon cables are connected and provides recommendations for mounting the NEMA chassis.

The label reads:

CAUTION: NO Vertical Mount!

- *Mount the NEMA Chassis horizontally for proper heat transfer.*
- *Mount chassis to bonded metal surface.*
- *Bonded metal surface shall be provided with a safety earth path.*
- *Avoid mounting in drafts that cause fluctuations in temperature.*

The Earth Ground safety label is located below the Earth Ground connection on the chassis.

It indicates where to connect the flow computer to safety Earth Ground.

The alternating current (AC) voltage safety label is located below the Serial Number label on the Panel mount chassis and on the side of the NEMA chassis.

It denotes the specified AC voltage at which the flow computer operates.

The fuse safety label is located on the panel mount back panels and provides the proper fuse specifications for the OMNI 4000/7000.

2. OMNI 4000/7000 Overview

The OMNI 4000/7000 flow computer is supplied with firmware and Windows PC configuration software that allow a single flow computer to perform a wide range of flow measurement tasks simultaneously, including:

- Multiple Meter Run totalizing, batching, proving and data archiving.
- Flow and control.
- Communications protocols (selectable) to directly interface with Distributed Control Systems (DCSs), Programmable Logic Controllers (PLCs) and Supervisory Control and Data Acquisition (SCADA) host systems.

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

2.1 Hardware

Front Panel

The front panel of the flow computer features an active alarm Light-emitting Diode (LED), a color graphics display and a 25-key keypad for navigation of the menu system, data selection and data entry. The front panel provides the capability to configure system parameters, view flow data, perform I/O calibrations and print reports.

Back Panel

All signal I/O terminals and power connector/terminals are located on the back panel. The OMNI 4000 has four I/O terminal blocks and the OMNI 7000 has ten I/O terminal blocks.

All flow measurement inputs are first received at the back panel and then through plug-in I/O combination (combo) modules. Four types of combo modules are available: A, B, E and E/D.

Flow computers may be used to interface with any approved compatible 4-20 mA or 1-5 V temperature, pressure and differential pressure transmitter from the back panel. They can also receive direct inputs from 4-wire, 100-ohm Resistance Temperature Detectors (RTDs), which conform to either Deutsches Institut für Normung (DIN) IEC 751 or American curves.

Pulse inputs from any approved turbine, positive displacement, or Coriolis mass flow meter may be used.

Chassis

The chassis houses the I/O modules, the motherboard, the CPU and the power supply.

CPU Module

All custody transfer measurement programs and configurations can be stored in non-volatile memory for up to 10 years without power. This method prevents damage caused by electrical noise or tampering with the integrity of calculation specifications, and it does not rely on a battery.

2.2 Firmware

Real-time Operating System

The real-time operating system and dual Ethernet adapt to load placement, which creates a high-speed, multitasking environment and quick turnaround on all communications. The operating system adapts to meet increased demand, and its pre-packaged, certified and standardized code makes the software easier to maintain.

Cycle Time

The flow computer performs all time-critical measurement functions every 500 milliseconds or less. For example, the Digital MUX, pulse density and double chronometry critical functions occur every 10 milliseconds. This cycle time makes measurement calculations more accurate and permits faster pipeline operations response for critical control functions such as opening or closing valves.

On-line Diagnostics and Calibration

Diagnostic software is built into the system so that a technician can debug a possible problem remotely without interrupting on-line measurement. Technicians can also remotely test Modbus communications through a unique Modbus register master simulator that is built into the software.

The flow computer has an automatic, two-point calibration system. The operator inputs the high and low points of the calibrator into the flow computer, which then calculates the calibration.

CPU Firmware

Firmware is stored in flash memory, which is located in the CPU module. The firmware contains the liquid and gas flow calculations for both metric and US standard units.

Firmware can be updated in two ways:

- With a factory-provided Universal Serial Bus (USB) flash drive
- Through OMNICONNECT when connected to the USB port on the CPU

2.3 Software

OMNICONNECT®

Online or offline configuration of OMNI 4000 and 7000 models is possible using a personal computer that can run the OMNICONNECT software. This software manages the flow computer's configuration, operation, security setup, and supports the updating of the CPU's firmware. OMNICONNECT can connect to the flow computer via the Ethernet ports, Serial ports, the front panel USB port and the CPU USB port.

OMNICONNECT requires a license to run. OMNICONNECT is licensed to the individual PC or laptop.

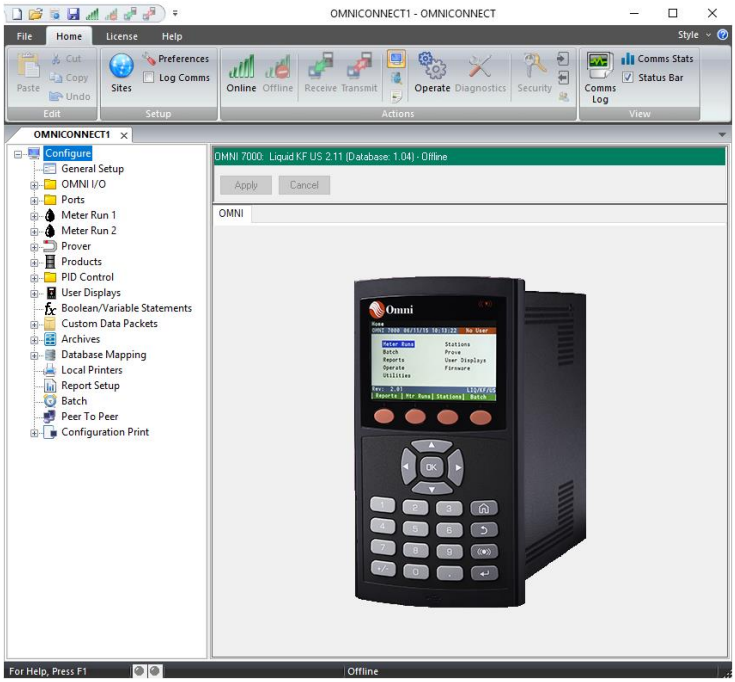


Figure 2-1: OMNICONNECT®

OMNIPANEL

The OMNIPANEL software remotely replicates all the functionality of the OMNI 4000/7000 flow computer's front panel for times when physical access to the flow computer is not possible.

Figure 2-2: OMNIPANEL

Network Utility

Network Utility is part of the OMNI software suite and is used to view the configuration settings of the DE module and to upgrade the DE module firmware. Although the IP addresses of the DE Module can be modified, the program cannot be used to modify the remaining DE module configuration settings. This must be completed through OMNICONNECT, although some of the settings required to establish communications can be modified from the flow computer front panel.

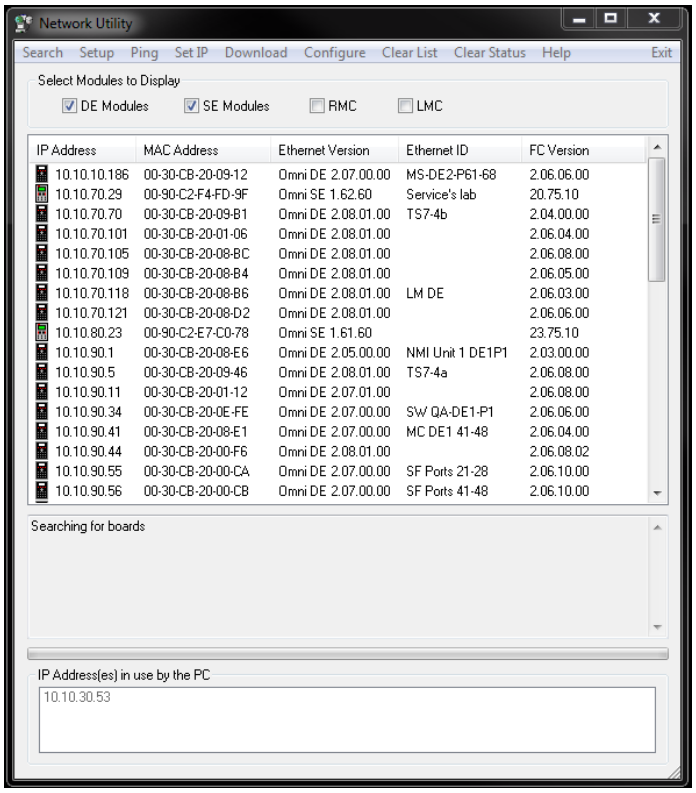


Figure 2-3: Network Utility

OMNI Modbus Tester

The OMNI Modbus Tester is a Modbus Master that can test a device that implements a Modbus slave protocol, such as an OMNI flow computer. The tester can communicate using Modbus over TCP, RTU or ASCII protocol. The register addressing can be Logical (1 float register is 4 bytes), Register (two consecutive 16-bit registers are combined to make 1 float) or Modicon compatible (two consecutive 16-bit registers are combined to make 1 float and the float bytes are swapped from ‘aa bb cc dd’ to ‘cc dd aa bb’).

The tester supports all the major function codes as well as user-defined function codes. It also supports a wide range of data types including Booleans and strings. You can repeat transmissions of one register with a delay and set up a list of registers for one transmission or repeated transmissions based on continuous, number of times, or over a date/time range.

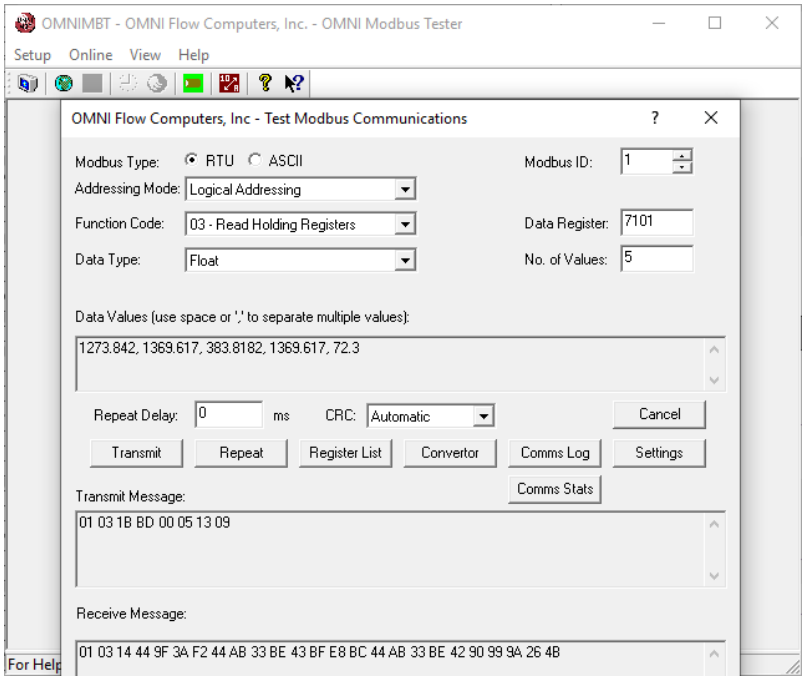
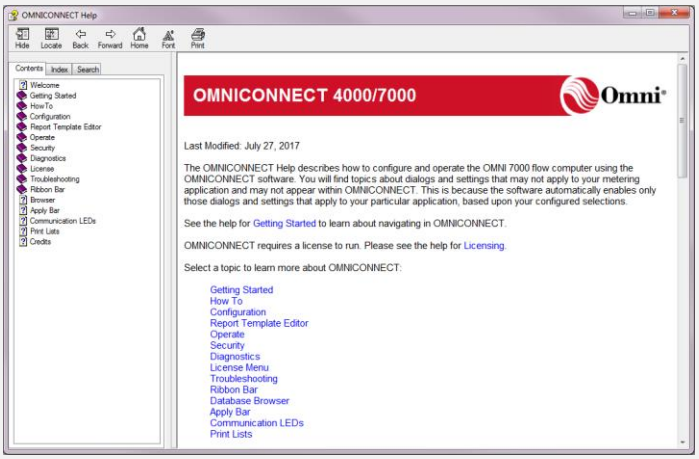


Figure 2-4: OMNI Modbus Tester

3. OMNICONNECT® Operations

At any point while using OMNICONNECT, you may press **F1** on your keyboard to access OMNICONNECT Help. This gives more detailed descriptions of each tree item and screen. Your cursor must be on the tree item or screen of interest to open the corresponding help information.



3.1 Communications

After the OMNICONNECT software is activated, connect the software on your PC to the flow computer through a selected communication method.

If you have previously configured Serial or Ethernet ports through the flow computer's front panel (see Section 4.3 Configuring Communications Ports (Front Panel) in the Installation Guide), you still must create sites to match them in OMNICONNECT to communicate with those ports, as they are not created automatically.

See Section 4.7.2 Setup Sites in the Installation Guide for instructions on how to configure sites and units within OMNICONNECT to allow access to the flow computer or access the OMNICONNECT Help File under the How To section.

3.2 Security

See Section 4.8 Security Setup in the Installation Guide for further instructions on how to configure user permissions and port security, if needed.

3.2.1 Enter Password

The password window appears when connecting to an OMNI flow computer from OMNICONNECT or OMNIPANEL. Click the drop-down arrow and select your Administrator-assigned User ID from the list of available names. Enter your password and press OK.

The following rules apply to passwords:

- The default timeout for a user password is 30 minutes, but the Administrator can modify the timer.
- If five invalid password attempts are made within a two-minute period, the port will be locked for one minute.

3.2.2 Lost Password

If a user loses an OMNICONNECT or front panel-access password, contact your company's flow computer Administrator to have the password reset. The Administrator can set a new password and inform the user.

If the Administrator has lost the Administrator password or needs further assistance, contact the OMNI Help Desk at helpdesk@omniflow.com.

3.2.3 User Permissions

Any operation in the flow computer require specific user permissions as selected by the system Administrator. In both the front panel and OMNICONNECT, users must enter their password to access any editable items.

3.3 Application Types

When OMNICONNECT opens to the Startup Screen, choose from the following options (Figure 3-1):

- Select an option from the eight application types presented in the window to open a "New" file.
- Use the "Recent Files" option to select a configuration file that was recently opened.
- Select "Open" to open an existing configuration file.
- Select "Connect" to connect to an OMNI flow computer.

You can also set the preferences to not display this screen upon startup and default to the last application used.

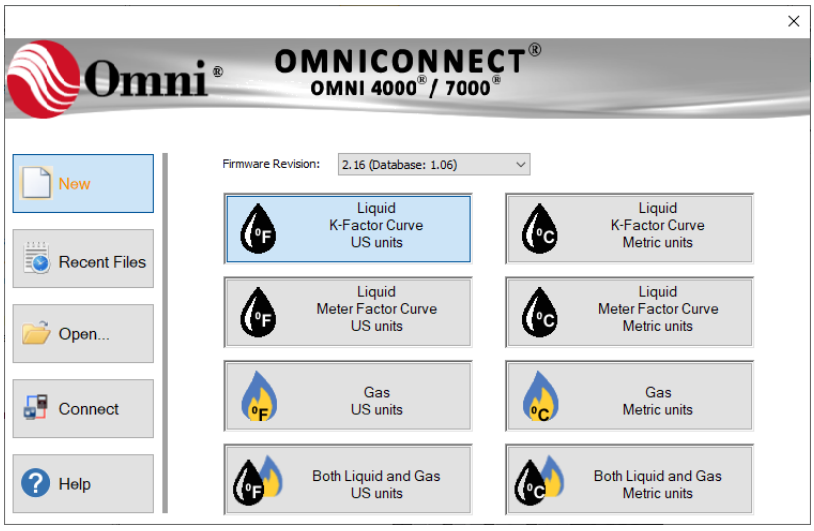


Figure 3-1: Startup Screen

OMNICONNECT currently supports three different pulse type flow meters: Turbine, Positive Displacement and Coriolis Mass Pulse. Gas product applications have the added option of configuring orifice differential pressure type flow meters.

From the Startup Screen, you can also choose whether to use a K-Factor (KF) multi-point curve or a Meter Factor (MF) multi-point curve for applying a correction factor to the flow pulses in liquid measurement. The gas applications always use the K-Factor curve option for pulse type flow meters.

When selecting a liquid KF curve application, you have the option for each volumetric pulse flow meter to configure a curve with up to 12 points for KFs and associated flow meter frequencies. For mass pulse flow meters, certain Coriolis flow meter models can use a curve with up to 12 points for MFs and associated Reynolds Numbers and Flow Rates. When selecting a liquid MF curve application, you can configure a curve with up to 12 MFs and associated flow rates for each of the six flow meters under each of the 32 products.

3.4 Configurations

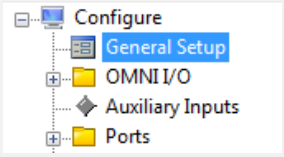
3.4.1 Meter Run Configurations

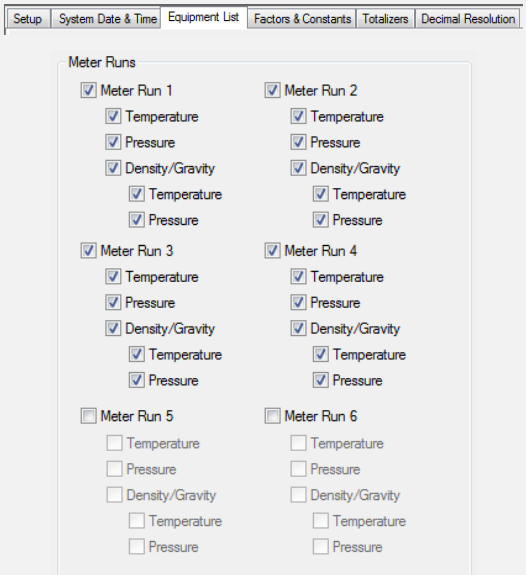
To create a Meter Run or make changes to current settings, follow these instructions:

1. In the Actions ribbon, click **Configure**.

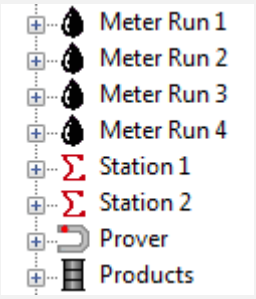
2.

a. To make changes the settings of an existing Meter Run go to Step 4.
b. To create Meter Runs or edit the attributes of an existing Meter Run, click on **General Setup** in the **Configure** tree.
c. Click on the **Equipment List** tab.
d. Select the number of Meter Runs needed and their attributes, or edit the selections of the current Meter Run.



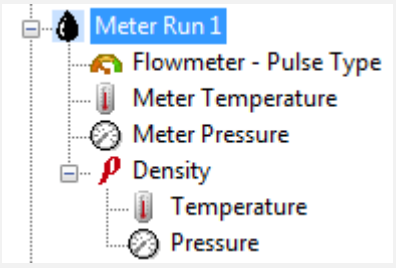


3. When finished, click **Apply** to save your changes. The Meter Runs you selected will now appear in the **Configure** tree.

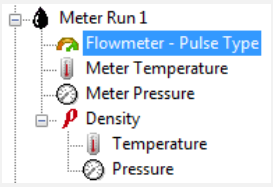


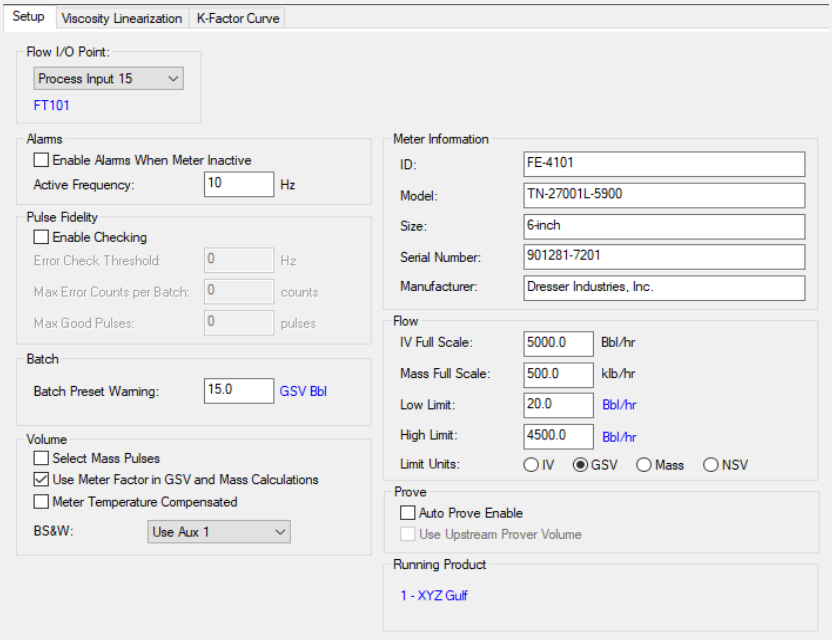
4. To make changes to an existing Meter Run, expand that Meter Run in the **Configure** tree.

> You may see different items listed in the tree, depending on your selections in the **Equipment List**.



5. Click on any of the items listed under the Meter Run in the tree to make changes to the settings, as needed.





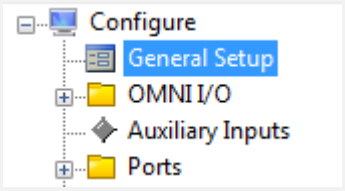
6. Continue to edit Meter Run settings, as needed, by repeating Steps 4 and 5.

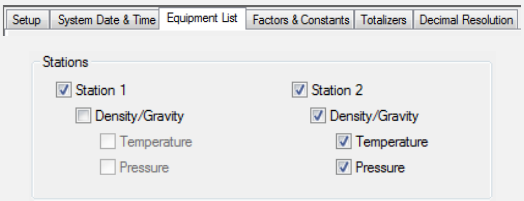
3.4.2 Station Configurations

To create a Station or make changes to current settings, follow these instructions:

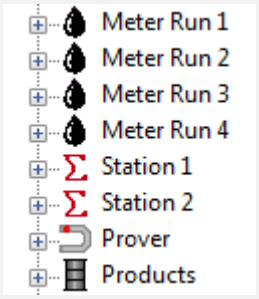
1. In the Actions ribbon, click **Configure**.

2.
a. To make changes to an existing Station, go to Step 4.
b. To create a Station, click on **General Setup** in the **Configure** tree.
c. Click on the **Equipment List** tab.
d. Select either one or both Stations, as needed.



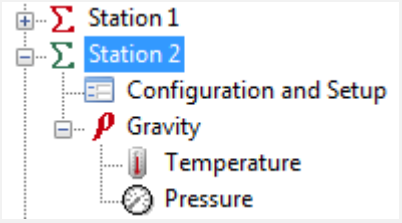


3. When finished configuring the Stations, click **Apply** to save your changes. The Stations you selected will now appear in the **Configure** tree.

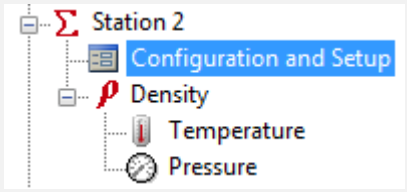


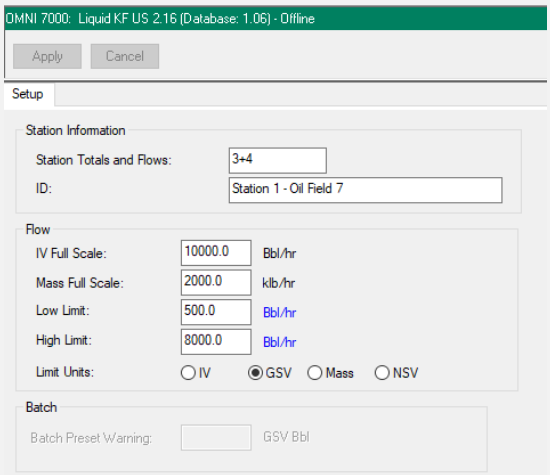
4. To make changes to an existing Station, expand that Station in the **Configure** tree.

> You may see different items listed in the tree, depending on your selections in the **Equipment List**.



5. Click on any of the items listed under the Station in the tree to make changes to the settings, as needed.





6. If you created the second Station in the **Equipment List** (Step 2) and need to make changes, repeat Steps 4 and 5 for the second Station.

3.4.3 Products Configuration

Some products will likely be configured during installation of the flow computer. However, updates may need to be made when new products enter the pipeline.

Liquid Products

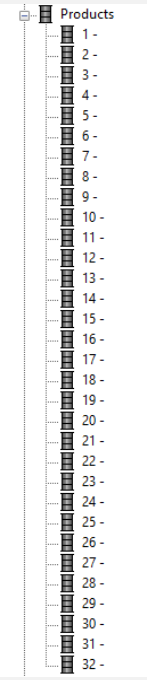
To configure liquid products, follow these instructions:

1. In the Actions ribbon, click **Configure**.

2.

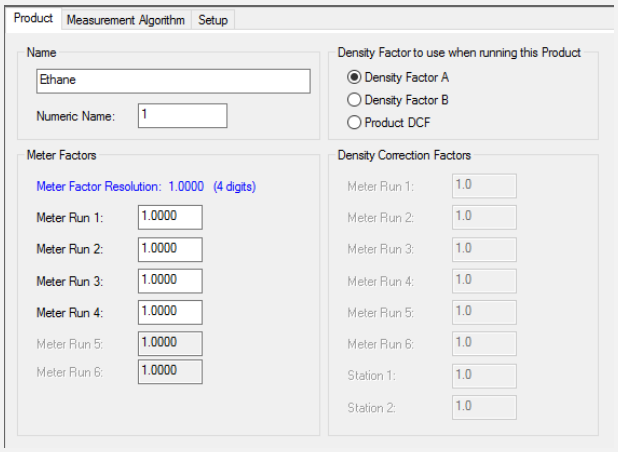
a. Select **Products** in the **Configure** tree in the left panel.
b. Expand the item to see the entire list of products.

For liquid applications, there are up to 32 configurable products. You do not have to use or configure all of them.



3.

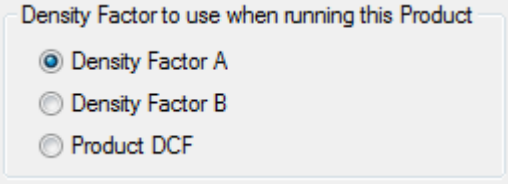
a. Select a product in the tree to display its configuration options in the screens on the right.
b. In the **Product** tab, enter a name or identifier (up to 32 character ASCII string) for the product in the **Name** group.
c. Enter a numeric identifier in the **Numeric Name** group, as needed.



4.

Select the **Density Correction Factor** (DCF) to use when running this product.

If a Meter Run or Station has been set up for density/gravity, the DCF A and B values can be found and/or adjusted at **Configure** tree > **Meter Run/Station (#)** item > **Density** options > **Setup** tab.

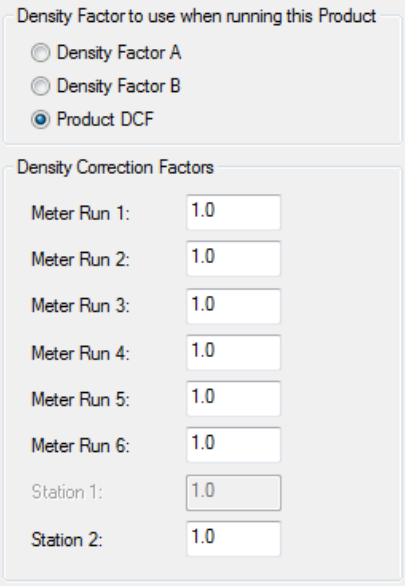


The calibration result of some densitometer devices, also known as a pycnometer test for establishing a DCF, varies with the product. **Density Factor A** and **B** are associated with the specific densitometer assigned to a Meter Run. The **Product DCF** is associated with the specific product selected.

5.

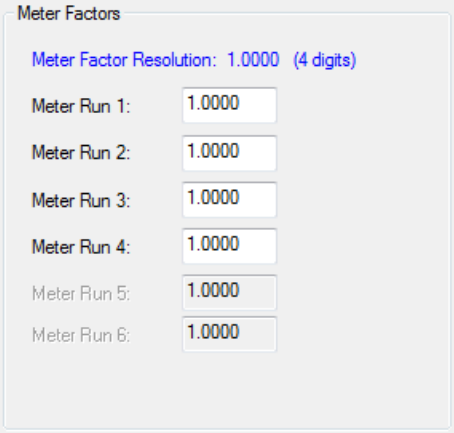
a. If the product requires a unique DCF other than Factors A or B, choose **Product DCF**.
b. The **Density Correction Factors** group is now visible. Enter the individual DCFs for this product for each enabled Meter Run or Station.

The **Density Correction Factors** group must have the **Product DCF** option selected and the meter or station must have a valid density I/O point assigned to become enabled.



6.

a. Enter the **Meter Factors** for each Meter Run if you want to update them manually (optional).
b. When you are finished, click **Apply** to save the changes.



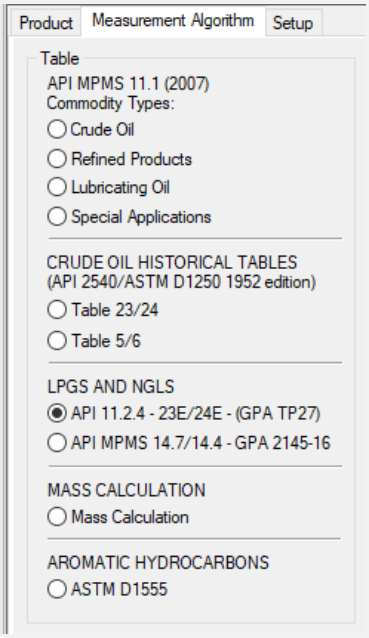
If you choose to automatically update Meter Factors after a successful prove sequence, go to Section 0

Prove Configuration, Step 11. You do not have to edit these values manually.

You can also manually enter Meter Factors from the front panel of the flow computer using the **Operate/Edit MF** menu.

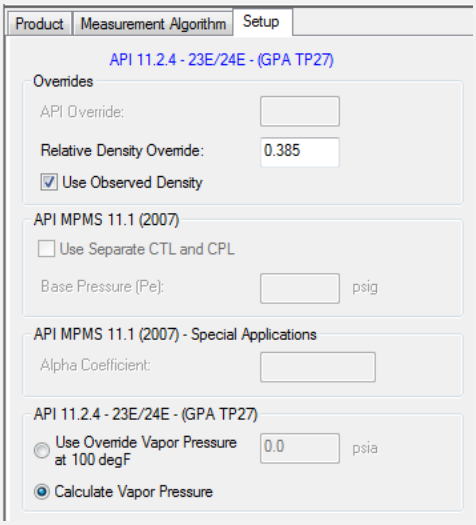
7.

a. Click on the **Measurement Algorithm** tab.
b. Select the **Table** or measurement algorithm to use for this product, based on the product specifications.
c. Click **Apply** to save the selection.



8.

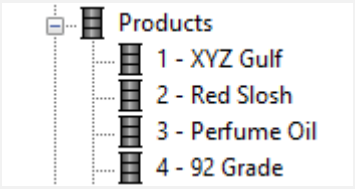
a. Click on the **Setup** tab. Only the items applicable to the **Table** you chose in Step 7 will be enabled.
b. Enter or select the required parameters on this screen.
c. When you are finished, click **Apply** to save the changes.



9.

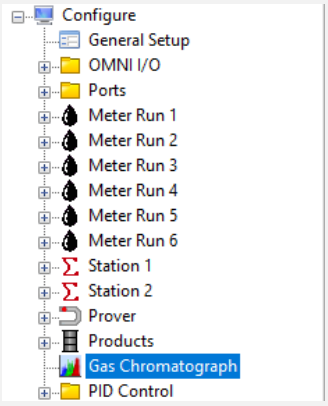
Continue to move down the list of products in the tree to configure new products or make changes to existing products.

After these specific products are configured, you can select them when setting up batch sequences in the batch stack queues (see Section 3.6.1 Batch Setup and Scheduling Configuration).



10.

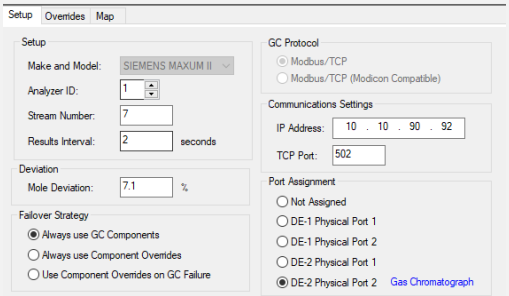
a. If the flow computer is equipped with a Gas Chromatograph for liquid applications (selected on the **Equipment List** screen found on **Configure** tree > **General Setup** item > **Equipment List** tab), select **Gas Chromatograph** on the tree.



11.

a. Fill in the information on all three gas chromatograph screens.

b. When you are finished, click **Apply** to save the changes.



12.

Gas Products

To configure gas fluid products, follow these instructions:

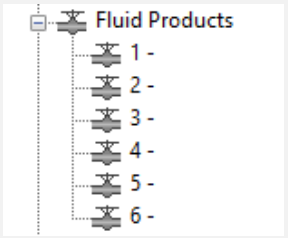
1.

In the Actions ribbon, click **Configure**.

2.

a. Select **Fluid Products** in the **Configure** tree.

b. Expand the item to see the entire list of products.

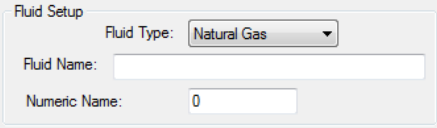


For gas applications, six products can be configured. You do not have to use or configure all of them.

3. Select a product in the tree to display its configuration options in the screens on the right.

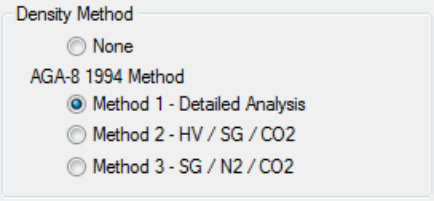
4.

a. Select the **Fluid Type** from the drop-down list in the **Fluid Setup** group.
b. Enter a name or identifier (up to 32 ASCII characters).
c. Enter a numeric identifier in the **Numeric Name** group, as needed.



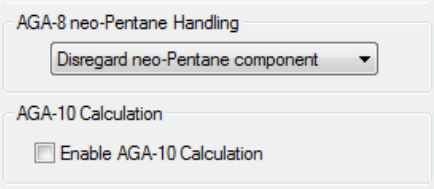
5. In the center column of the **Setup** screen, select the **Density Method** for this product.

This selection turns on or off multiple fields and tabs associated with the selection, namely in the far-right column of this screen and in the **1994 Analysis** tab.



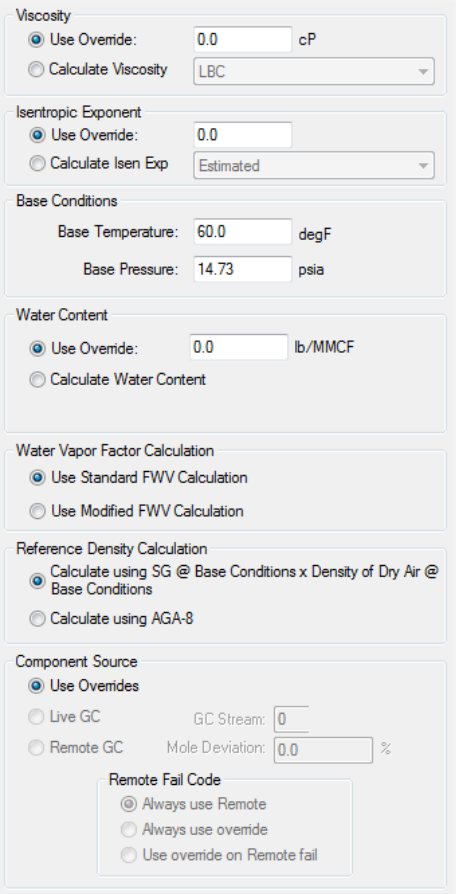
6.

a. Select how to handle neo-Pentane from the **AGA-8 neo-Pentane Handling** drop-down list.
b. Click the check box if you want to enable the **AGA-10 Calculation**.



7. In the left column of the **Setup** screen, enter the override values and select the preferred calculations for this product.

> **Viscosity** and **Isentropic Exponent** information are required only for differential pressure devices.

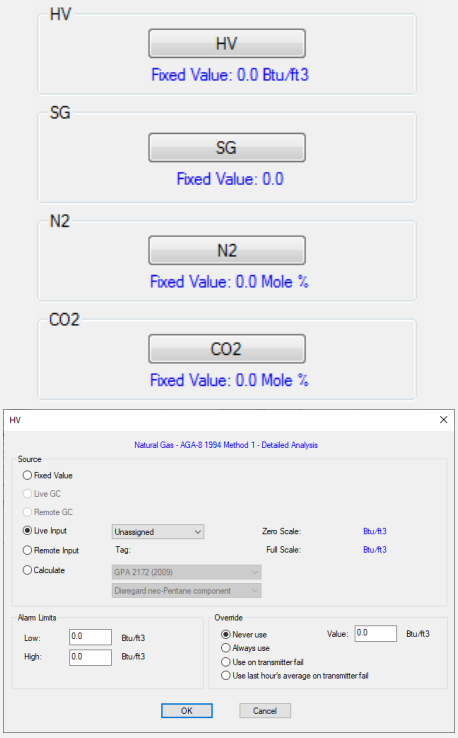


8. Depending on which **Density Method** you chose, the available applications in the right-hand column may change.

a. Click on any of the **HV, SG, N2** or **CO2** buttons to open their configuration windows, and assign source inputs, alarms and overrides, as needed.

b. Click **OK** to save the changes and close the window.

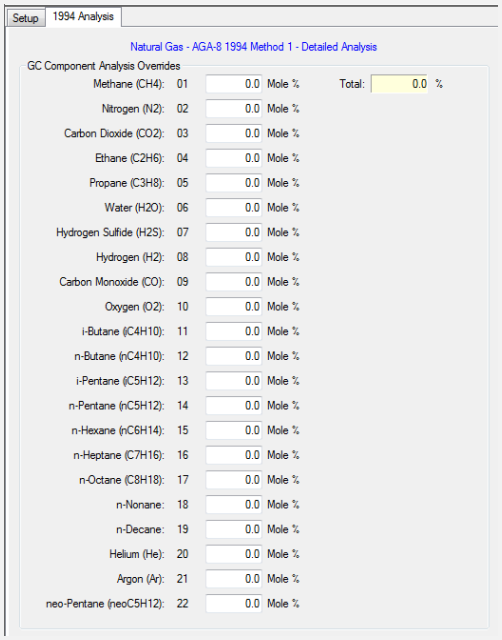
> Configuration of these selections is optional and is not necessary if these values are being provided by a Gas Chromatograph (GC).



9. When you are finished with the **Setup** screen, click **Apply** to save your changes.

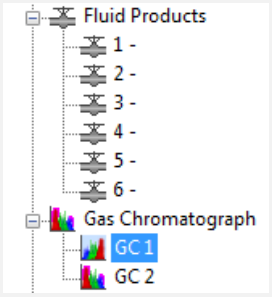
10.
a. Click on the **1994 Analysis** tab. Depending on which **Density Method** you chose, the analysis overrides available on this screen may change.
b. Enter the necessary **GC Component Analysis Overrides**.

These override values can be obtained by a laboratory analysis of the product, or they can be written through Modbus writes.



11. Continue to move down the list of products in the tree to configure new products or make changes to existing products.

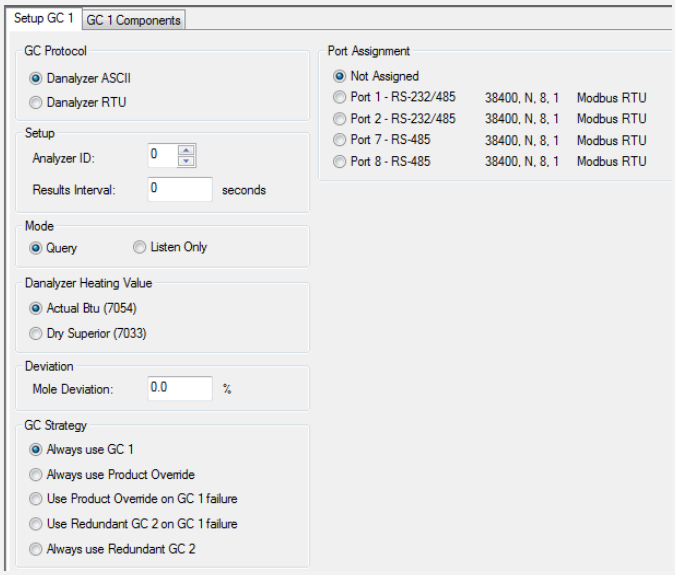
12.
a. If the flow computer is equipped with a Gas Chromatograph (selected on the **Equipment List** screen found on **Configure** tree > **General Setup** item > **Equipment List** tab), select and expand **Gas Chromatograph** on the tree.
b. Select **GC 1** to display its configuration settings in the screens on the right.



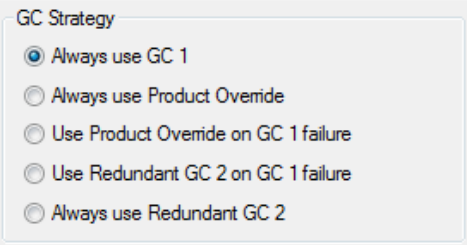
13.

a. Fill in the information on both gas chromatograph screens.

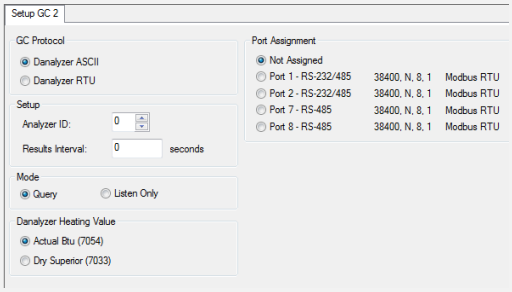
b. When you are finished, click **Apply** to save the changes.



For GC 1, pay particular attention to the selections in the **GC Strategy** group. If you have a redundant GC, the last two options in the list will be active. If you choose the **Use Redundant GC 2 on GC 1 failure** option, and both GCs fail, the default setting for the flow computer is to use the **Product Override**.



14. Repeat Steps 12 and 13 for GC 2 if you have redundant gas chromatographs.



Assign Gas Product to Meter Run

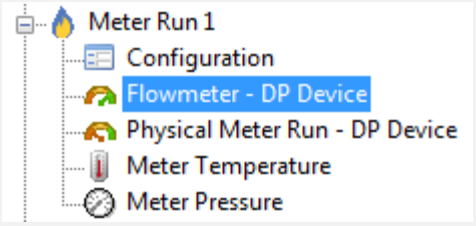
In liquid applications, products are assigned to Meter Runs using batches and batch stacks. Go to Section 3.6

Batch Operations for more information on batches.

To assign a gas fluid product to a Meter Run, follow these instructions:

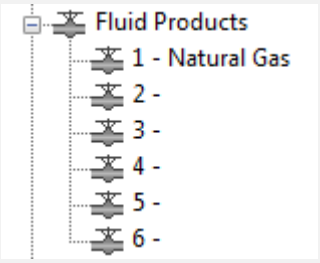
1. In the Actions ribbon, click **Configure**.

2.
a. Expand a **Meter Run** in the **Configure** tree.
b. Click on **Flowmeter** to display its configuration options in the screens on the right.



3. In the lower right-hand corner of the Setup screen, select a product number in the **Flow Stream** group to assign that product stream to that Meter Run.

> This number corresponds to the numbered gas fluid product (1 through 6) listed under **Fluid Products** in the **Configure** tree.



4. When you are finished with the **Setup** screen, click **Apply** to save your changes.

5. Continue to assign products to other Meter Runs, as needed.

3.5 Proving Functions

3.5.1 Prove Types

The three types of liquid proving options are: Conventional, Pulse Interpolation and Master Meter (gas only supports Master Meter).

Use the Conventional prover option or ball prover if more than 10,000 flow meter pulses are accumulated between detectors. If less than 10,000 pulses are accumulated between detectors, use Pulse Interpolation (double chronometry) proving, also known as compact or small volume, for improved pulse resolution.

An E-combo module card is required for a Pulse Interpolation or small volume-type prover.

For both Conventional and Pulse Interpolation, you can select the type of pipe setup: unidirectional or bi-directional. In a unidirectional pipe, there is no reversal of flow meter flow, although you may still have different sphere and valve arrangements. The 4-way valve in the bi-directional type of prover can reverse the direction of flow through the prover.

Master Meter proving compares the flow through a designated and certified Master Meter against the flow through the custody meter to determine a correction factor. Master Meters are usually independently calibrated and certified by a third-party laboratory to provide a high level of accuracy to prove other flow meters in the field.

A Meter Factor Linearization feature can be included in flow computers for liquid applications. After each prove completes and the meter factor accepted, the flow computer automatically adjusts a meter factor curve. This feature can be applied regardless of the prove type.

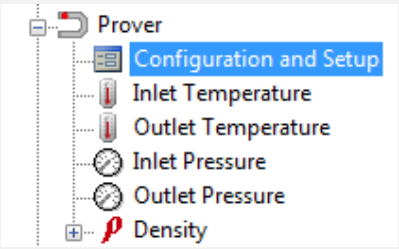
Refer to the Technical Bulletin TB-970803B Meter Factor Linearization for more information. This bulletin is for the OMNI 3000/6000 flow computers. You can use the OMNICONNECT database browser to look up the 6000 Modbus register to determine the corresponding 4000/7000 registers.

3.5.2 Prove Configuration

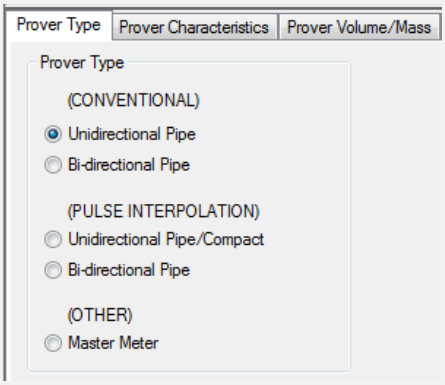
To access proving configuration settings, follow these instructions:

1. In the Actions ribbon, click **Configure**.

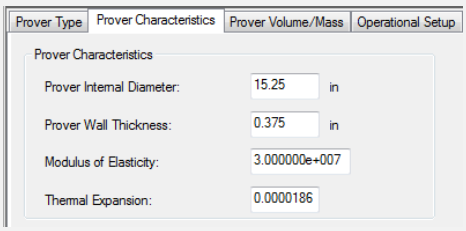
2.
a. Expand the **Prover** function in the **Configure** tree.
b. Select **Configuration and Setup** to display the **Prover** configuration options in the screens on the right.



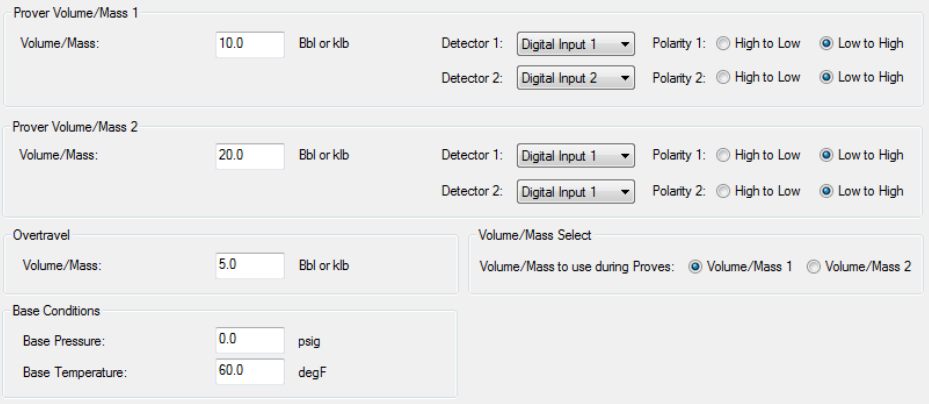
3.
a. Select the **Prover Type** as discussed in Prove Types in Section 3.5.1.
b. Click **Apply**.



4.
a. Select the **Prover Characteristics** tab (liquid applications only), and verify or make changes to the settings.
b. Click **Apply**.

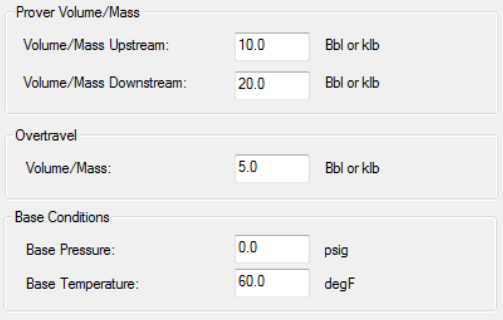


5. For Conventional-type provers, the **Prover Volume/Mass** screen gives you selection options for both Detectors on each prover, in addition to **Overtravel** Volume/Mass and the option to select which prover **Volume/Mass to use during Proves** (either 1 or 2).

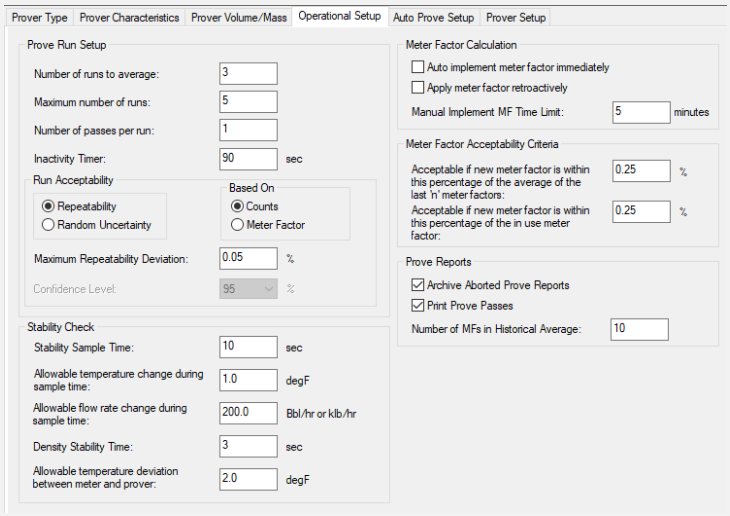


Before a run is repeated, the flow computer waits until the **Overtravel** volume or mass has passed through the meter. In unidirectional pipe provers, this assures that the sphere is back in the launch position and is ready to be re-launched for the next run; or, for bi-directional provers, the return trip.

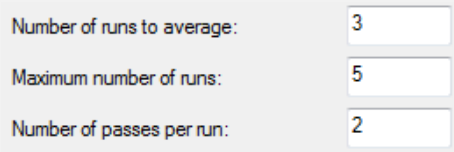
Pulse Interpolation-type provers and gas applications do not have the extended **Volume/Mass** options on this screen.



6. Select the **Operational Setup** tab and verify or make changes to the settings. Use the Meter Factor to adjust flow meter readings to show the actual volume measured during proving.



7. In the **Prove Run Setup** group, adjust the **Number of runs to average, Maximum number of runs** and **Number of passes per run,** as needed.

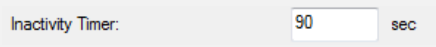


The **Number of runs to average** is the number of consecutive runs required that meet the set prove criteria to complete a prove sequence. The **Maximum number of runs** is how many times the sphere will launch to try to attempt a complete prove sequence. In the example displayed in Step 7, if three consecutive runs out of five do not meet the criteria, then the prove sequence is incomplete, or aborted.

The Number of runs to average is only enabled for Repeatability.

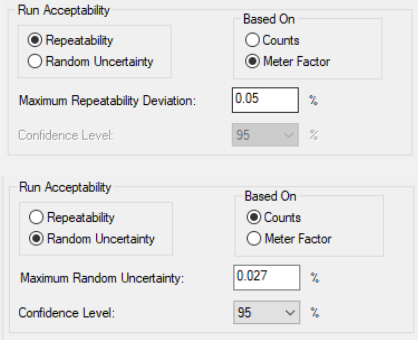
The **Number of passes per run** field is only enabled for Pulse Interpolation-type provers.

8. In the **Prove Run Setup** group, adjust the **Inactivity Timer**, as needed.



The **Inactivity Timer** entry specifies the maximum period of time, in seconds, allowed to elapse between the prove events. If this period is exceeded before the next event is expected, the flow computer aborts the prove operation, sets a "prove failed" flag, and prints a prove abort report. The inactivity timer is reset after the successful completion of each event during the prove sequence.

9. In the **Prove Run Setup** group, adjust the **Run Acceptability** settings, as needed.



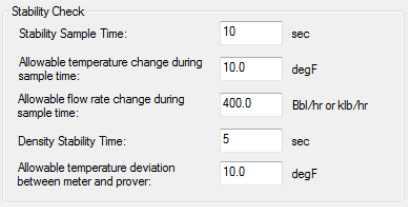
Run Repeatability between runs is calculated either by comparing raw counts or the calculated Meter Factor for the run, depending upon the configuration setup.

When the required number of runs has been completed, the Meter Factor is calculated using either the average data method or the average Meter Factor method, depending upon user configuration.

The 'Prove in Progress' status flag is then cleared, and the prove report is generated.

Random Uncertainty complies with API MPMS CH. 4.8 and API MPMS CH. 13.1 and is the preferred method to accept prove runs. A minimum of three runs and a maximum of 30 runs is required. The numerical requirement on random uncertainty is 0.027% at a 95% confidence level. A custom report template is required in order to print a prove report using Random Uncertainty.

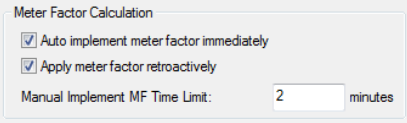
10. Adjust the settings in the **Stability Check** group, as needed.



The flow computer checks for stability by reading the temperature and flowrate at the rate entered for Temperature Stability Time and compares these readings against the acceptable limits (Temperature Stability Limit and Flowrate Stability Limit).

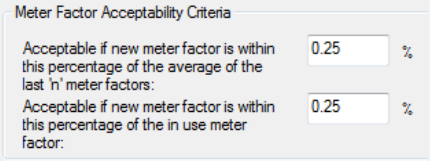
11. In the **Meter Factor Calculation** group, select these options:

- **Auto implement meter factor immediately** to automatically implement the new meter factor at the end of the prove.
- **Apply meter factor retroactively** to retroactively apply the Meter Factor from the beginning of the batch.



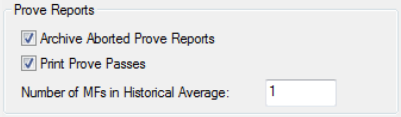
The **Manual Implement MF Time Limit** specifies the number of minutes the Operator has to manually accept the Meter Factor after a complete prove sequence. However, this timer will not be used if the **Auto implement meter factor immediately** is enabled.

12. In the **Meter Factor Acceptability Criteria** group, adjust the allowable average Meter Factor (or K-Factor) percentages, as needed.



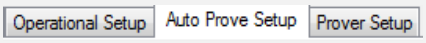
13. In the **Prove Reports** group, select the options you require for your reports and passes.

Go to Section 3.5.7 Print Prove Passes for more information on prove passes.

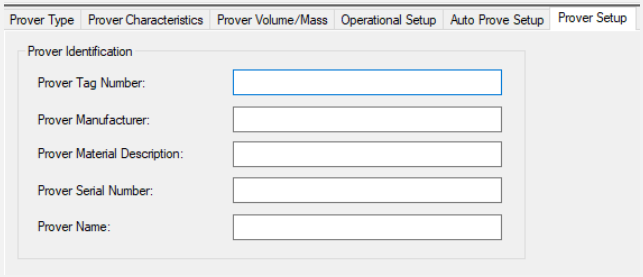


14. For instructions on the settings displayed on the **Auto Prove Setup** tab, go to Section

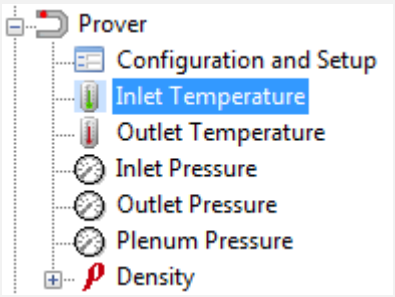
Auto Prove Setup.



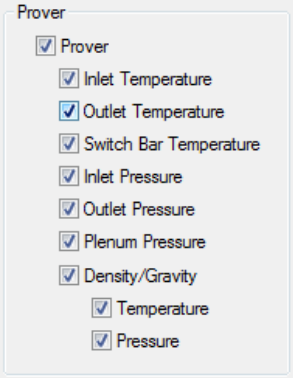
The final tab in the configuration and setup series, **Prover Setup**, displays identification information.



15. After the main **Prover Configuration and Setup** tabs are complete, continue to verify settings or make changes to the settings for the other items in the **Prover** tree, as needed.



The items in the **Prover** tree can be individually selected and enabled in the **Equipment List** (**Configure** tree > **General Setup** item > **Equipment List** tab).



Plenum Pressure Option

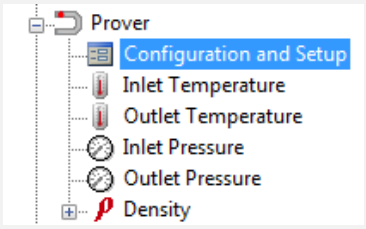
For Unidirectional/Compact types of provers, you can choose to monitor the plenum pressure constant value. These provers use a nitrogen-pressured plenum to close the displacer poppet valve when the launch command is given. Insufficient or excessive plenum pressure can cause inaccurate prove measurements.

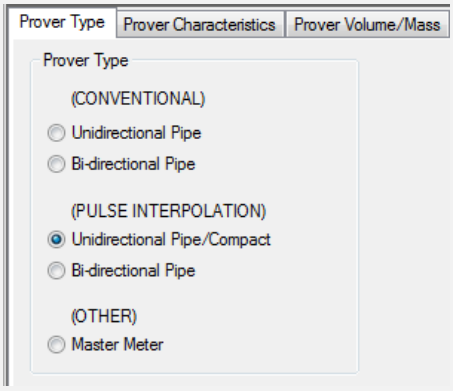
The flow computer calculates the correct plenum pressure at the beginning of each prove sequence and charges or vents nitrogen until the measured plenum pressure is within the specified deadband percentage entry. The prove sequence will not continue until this pressure is correct. Allow sufficient time in the inactivity timer entry (see Section 0) to accommodate the time required to stabilize the plenum pressure.

To set up the plenum pressure option, follow these instructions:

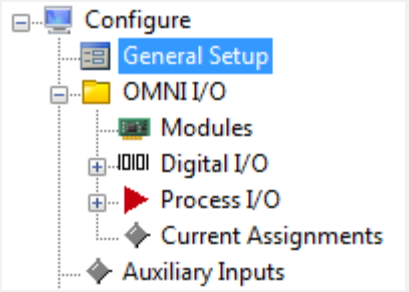
1. In the Actions ribbon, click **Configure**.

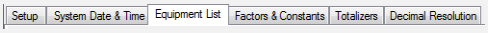
2.
a. Expand the **Prover** function in the **Configure** tree.
b. Select **Configuration and Setup**.
c. Verify that a **Pulse Interpolation** type prover is selected in the **Prover Type** screen.



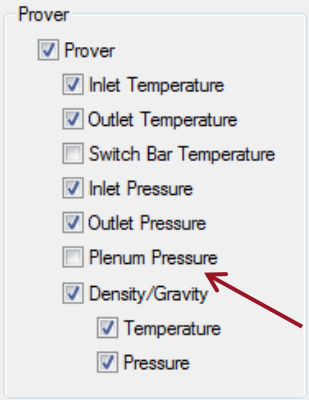


3.
a. Click on **General Setup** in the **Configure** tree.
b. Select the **Equipment List** tab in the screens on the right.



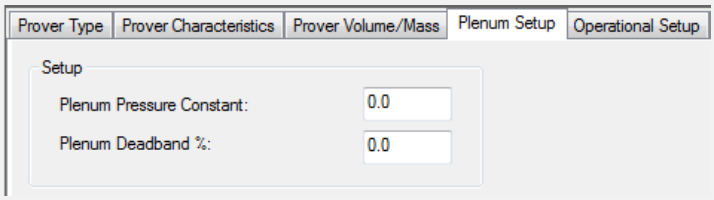


4.
a. In the **Prover** group on the lower right-hand side of the screen, check the **Plenum Pressure** option.
b. Click **Apply** to save your change.



5.

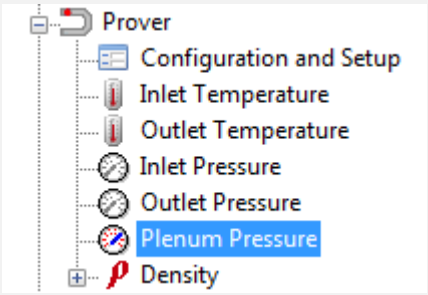
a. Return to the **Configuration and Setup** screens under **Prover** in the **Configure** tree.
b. Select the now visible **Plenum Setup** tab.
c. Enter the values for **Plenum Pressure Constant** and **Plenum Deadband %**.



Press **F1** to access OMNICONNECT Help for a table of pressure constants and a formula to calculate the Plenum Pressure.

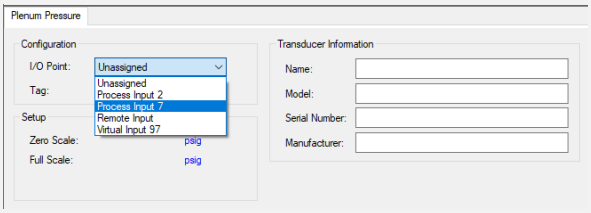
6.

Select the now visible **Plenum Pressure** item in the **Prover** tree to see the configuration options.



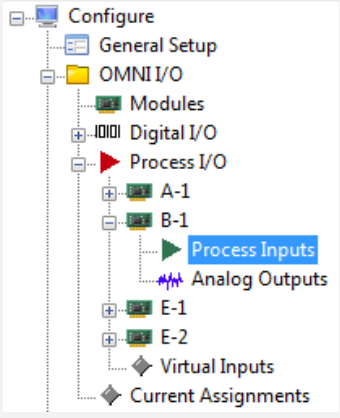
7.

a. In the **Plenum Pressure** screen, select an **I/O Point** (configured for pressure) from the drop-down box.
b. Click **Apply** to save your change.

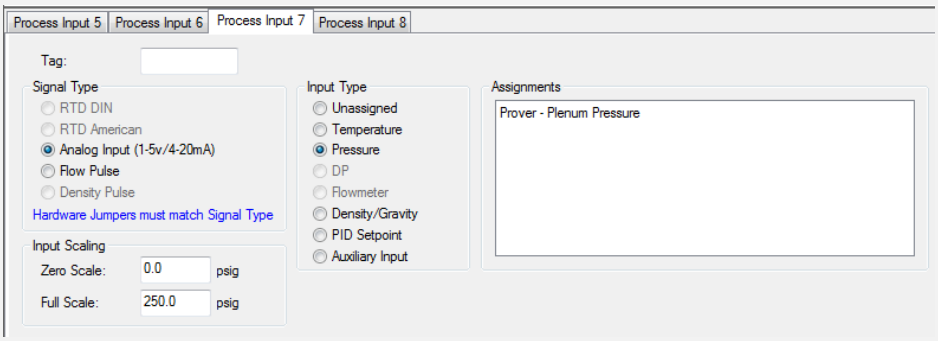


8.

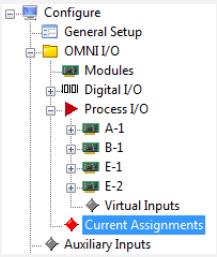
a. To verify the I/O selection, expand the **OMNI I/O** and **Process I/O** functions in the **Configure** tree.
b. Select the **Process Input** that corresponds with the **I/O Point** you assigned in Step 7.

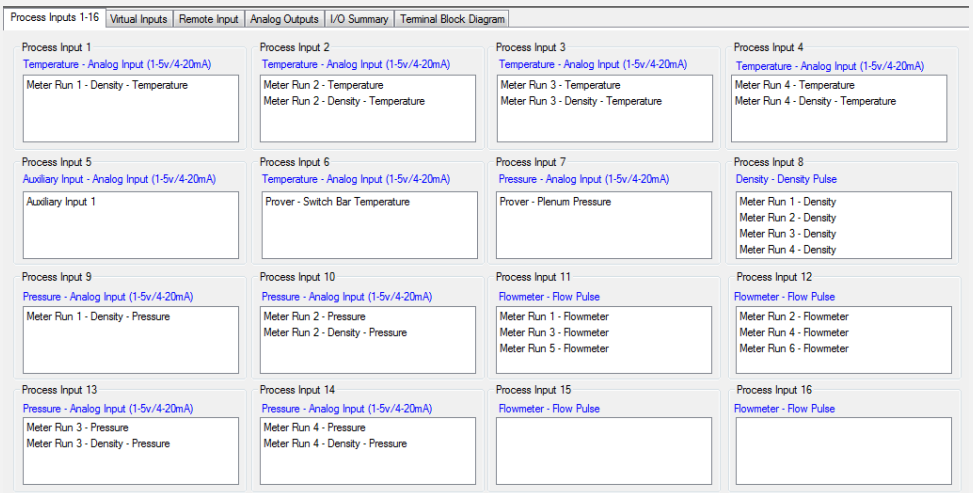


In this case, it is **Process Input 7** in the **B-1** module. **Plenum Pressure** is now listed in the **Assignments** on the right.



For assistance viewing input channel assignments, click on **Current Assignments** in the **Process I/O** tree.





Switch Bar Temperature Option

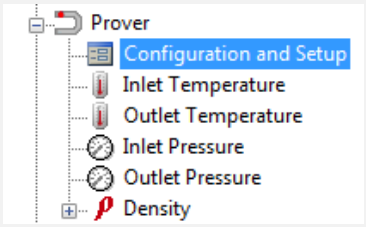
With Pulse Interpolation and when using piston-type provers, the switch bar temperature accounts for the effect of expansion or contraction the temperature has on the distance between the optical detector switches located on the switch bar.

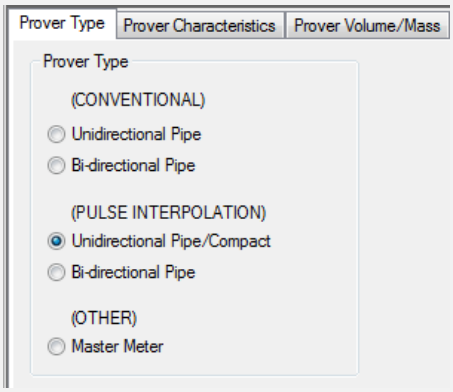
In most cases, Pulse Interpolation prover detector switches are not positioned in the prover flow tube; they are mounted externally. The distance between the optical detector switches determines the prover volume. A spacing rod (also known as a switch bar or invar rod) separates these optical detector switches by a precise distance. Ambient temperature variations cause the switch bar to expand or contract, which requires adjustments to the prover water draw volume.

To set up the switch bar temperature option, follow these instructions:

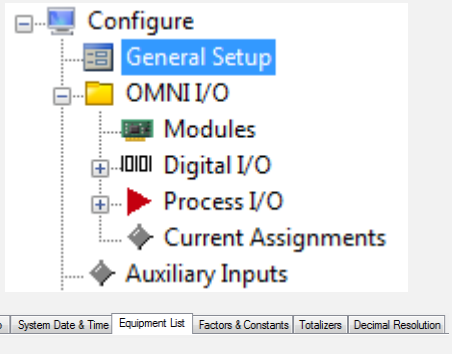
1. In the Actions ribbon, click **Configure**.

2.
a. Expand the **Prover** function in the **Configure** tree.
b. Select **Configuration and Setup**.
c. Verify that a **Pulse Interpolation** type prover is selected in the **Prover Type** screen.



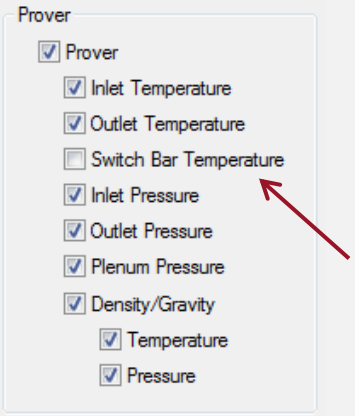


3.
a. Click on **General Setup** in the **Configure** tree.
b. Select the **Equipment List** tab in the screens on the right.



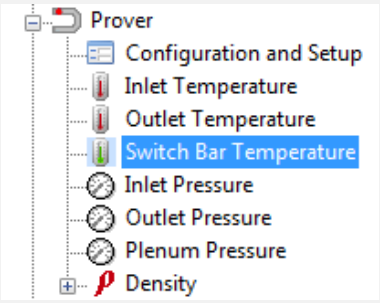
4.

a. In the **Prover** group on the lower right-hand side of the screen, check the **Switch Bar Temperature** option.
b. Click **Apply** to save your change.



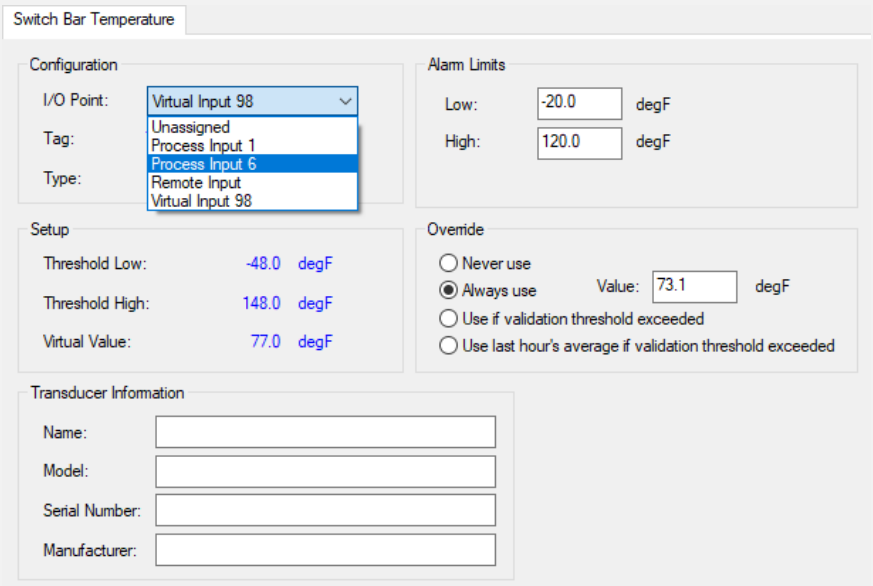
5.

a. Expand the **Prover** function in the **Configure** tree. Now that you have selected the option in the **Equipment List**, "**Switch Bar Temperature"** now appears as an option in the tree.
b. Click on **Switch Bar Temperature** to see the configuration options.



6.

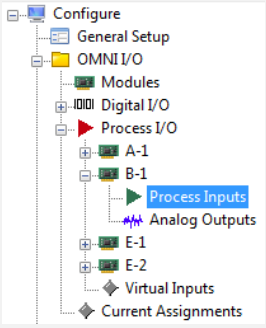
a. In the **Switch Bar Temperature** screen, select an **I/O Point** from the drop-down box.
b. Enter the **Alarm Limits** and **Override Values** (optional).
c. Click **Apply** to save your changes.



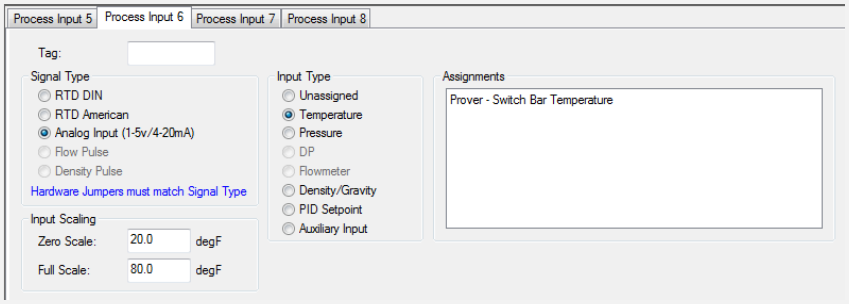
7.

a. To verify the I/O selection, expand the **OMNI I/O** and **Process I/O** functions in the **Configure** tree.

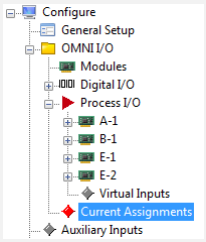
b. Select the **Process Input** that corresponds with the **I/O Point** you assigned in Step 6.

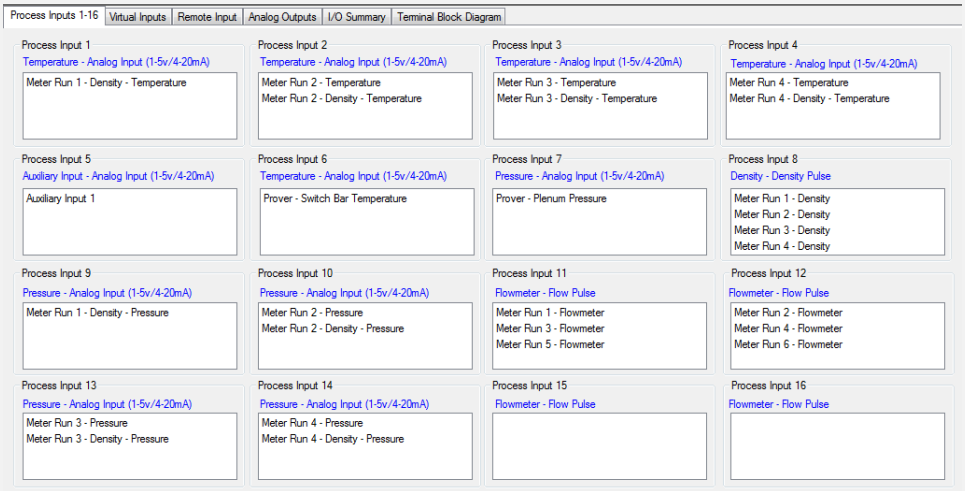


In this case, **Process Input 6** in the **B-1** module has been selected. **Switch Bar Temperature** is now listed in the **Assignments** on the right.



For assistance viewing input channel assignments, click on **Current Assignments** in the **Process I/O** tree.





3.5.3 Prove Sequence

A prove sequence consists of a series of command actions and observed events, such as Overtravel volume, the inactivity timer, run repeatability settings and checking for stability.

For example, Table 3-1 displays the prove sequence or list of status messages received when a prove request is made for a unidirectional Conventional prove configured with three runs to average.

Table 3-1: Prove Run Sequence Status Messages

	Status Message	Description
Prove Request	Checking Temp Stability	Verify process variables within set parameters of prover configuration
First Run		
	Launch Forward	Command to start the launch
	First Detector Switch	Start run counts
	In Flight Forward	Status between detector switches
	Second Detector Switch	End run counts

	Status Message	Description
Run Complete	Overtravel Forward	Buffer to allow prover to ready itself for next run

The prove sequence includes each run as configured in the prover Operational Setup tab to meet the required run repeatability criteria ending with a Prove Complete and acceptable Meter Factor. At this point you can choose to automatically or manually implement the Meter Factor. See Section 0 for directions on how to configure prove operations criteria.

If there is a problem with an element of the prove configuration or any of the physical components involved, you may receive a prove fail or prove abort message. Table 3-2 displays a list of possible reasons why a prove may fail.

Table 3-2: Prove Sequence Fail Messages

Fail Message	Description
Prover Inactivity	A prove was requested but it exceeded the configured Inactivity Timer before the sphere hit the first detector switch.
P&M Temp Out Limit	The allowable temperature deviation between meter and prover was exceeded.
Bad Repeatability/Bad Uncertainty	The run results exceeded the Run Repeatability or Random Uncertainty run acceptability criteria.
Prover Seal Not OK	The prover seal status has failed.
Flowrate Unstable	During the Stability Check, the parameters were outside the acceptable criteria.
No Prover Permissive	The Prove Permissive status bit was in the wrong state.
Meter Not Active	A meter active status flag was set low.

Most ‘Prove Complete’ or ‘Prove Abort’ status flags indicating the result of a prove sequence are updated at the end of a prove sequence or at the time of a prove abort. These flags remain set until the next prove sequence is requested, at which time all status flags are cleared.

3.5.4 Auto Prove Setup

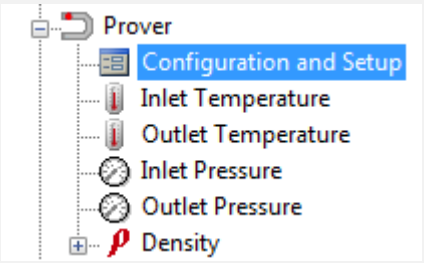
The Auto Prove function is not available for Master Meter proving.

The Auto Prove function selects the criteria for the flow computer to automatically execute a prove sequence, such as sustained changes in flow rates. A prove sequence may be executed after a certain amount of flow since the last prove sequence or after a set amount of flow has occurred after flow meter startup.

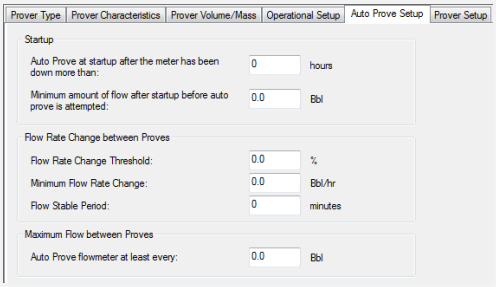
To configure the Auto Prove function, follow these instructions:

1. In the Actions ribbon, click **Configure**.

2.
a. Expand the **Prover** function in the **Configure** tree.
b. Select **Configuration and Setup** to display the **Prover** configuration options in the screens on the right.



3.
a. Select the **Auto Prove Setup** tab.
b. Enter the necessary values to configure **Startup** time and flow, **Flow Rate Change between Proves**, and **Maximum Flow between Proves**.
c. Click **Apply** to save your changes.



3.5.5 Manual Prove Request

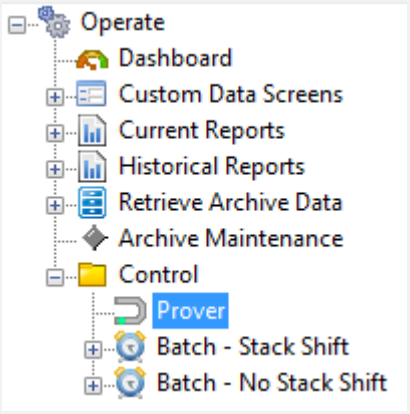
You can access the prover in OMNICONNECT and manually request a prove at any time while OMNICONNECT is online with the flow computer.

To manually request a prove, follow these instructions:

1. In the Actions ribbon, click **Operate**.

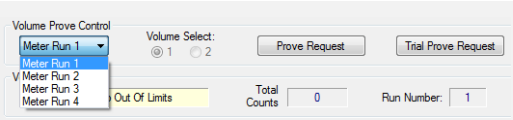
2.

a. Expand the **Control** tree.
b. Select **Prover** to see the **Prover Control** screen to the right.



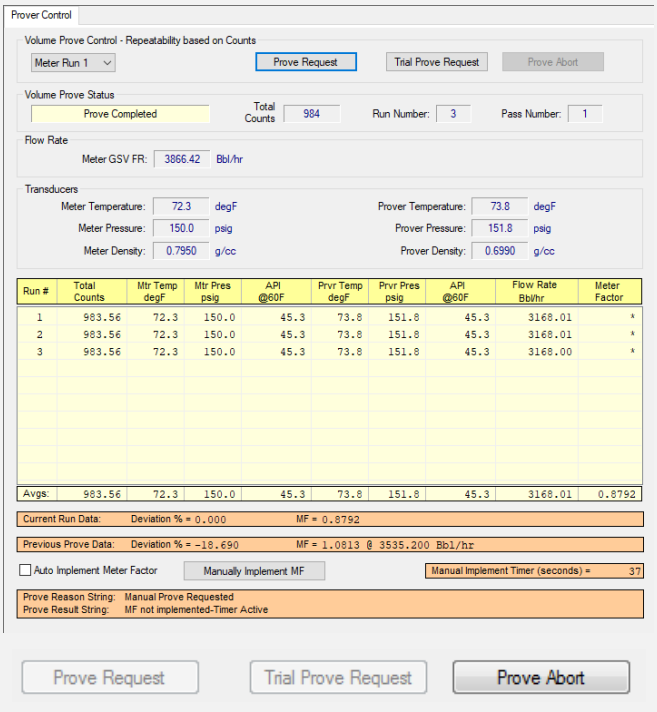
3.

a. In the **Volume/Mass Prove Control** drop-down box, select a Meter Run.
b. Click the **Prove Request** button.



4.

The prove sequence begins after a prove is requested (see Section 3.5.3 Prove Sequence for more information). Status messages will appear in the **Volume Prove Status** field and the run information box will populate automatically. At any time, click **Prove Abort** to stop the prove sequence process while a prove is running.



3.5.6 Remote Prove Request

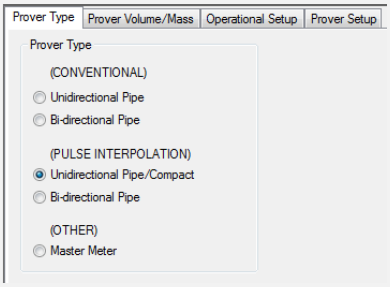
You can use Modbus communications to remotely trigger a prove. Write to the appropriate address from the following command points to execute a prove sequence:

- 1732 – Meter 1 Prove Request
- 1733 – Meter 2 Prove Request

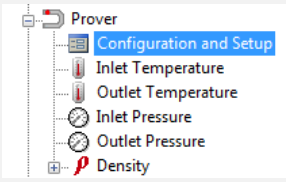
- 1734 – Meter 3 Prove Request
- 1735 – Meter 4 Prove Request
- 1736 – Meter 5 Prove Request
- 1737 – Meter 6 Prove Request

3.5.7 Print Prove Passes

The **Print Prove Passes** option can only be selected if the prove is a type of Pulse Interpolation, such as a small volume prover.



To print individual, prove pass data immediately after each pass during the prove sequence, follow these instructions:

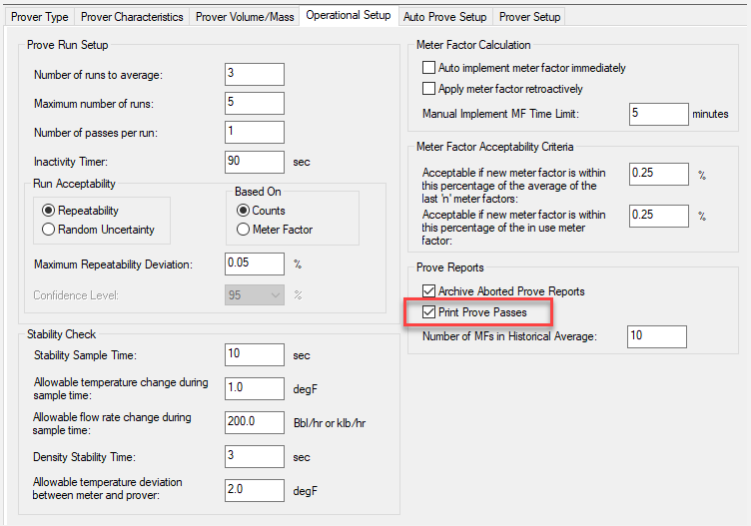
1.	In the Actions ribbon, click **Configure**.	
2.	a. Expand the **Prover** function in the **Configure** tree. b. Select **Configuration and Setup** to display the **Prover** configuration options in the screens on the right.	

3.

a. Click on the **Operational Setup** tab. The **Prove Reports** group is in the lower right-hand corner.
b. Select the **Print Prove Passes** if it is not already checked.
c. Click **Apply** to save your changes.

For more information on reports, including customization, see Section 4 OMNICONNECT® Reports. Go to Section

Printer Setup for instructions on how to set up your printers and select which reports to print.



3.6 Batch Operations

For liquid applications, the OMNI flow computer can track six independent flow Meter Run batches, each independently running any one of the 32 different configurable products in the flow computer. You can combine some or all of the flow meters into Stations as needed and create common batch stacks for the flow meters that will run the same products simultaneously. Batching is allowing in both gas and liquid applications, but batch stacks are used only in liquid applications and a maximum of two Stations is allowed.

Flow meters using independent batch stacks can be defined as part of a Station solely for the purpose of sending a Station batch end command and ending all the individual Meter Run batches simultaneously. This action does not necessarily require the use of a Station common batch stack.

For gas applications, the flow computer can also track six independent flow Meter Run batches. While liquid applications can have multiple products running, in gas applications a single product is normally tied to a flow meter and rarely changes. Therefore, the use of batch stacks is not required.

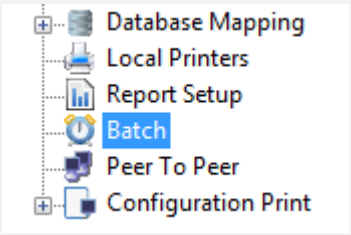
All resulting batch totalizers and batch flow weighted averages can be printed, saved and reset at the end of each batch based on the transacted quantity, change of product or on demand.

3.6.1 Batch Setup and Scheduling Configuration

To make changes to batch setup and scheduling configurations, follow these instructions:

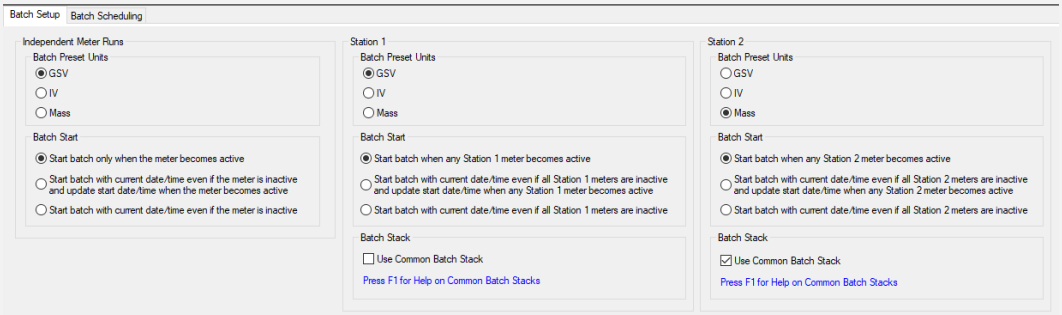
1. In the Actions ribbon, click **Configure**.

2. Select **Batch** in the **Configure** tree. This opens both the **Batch Setup** and **Batch Scheduling** screens.

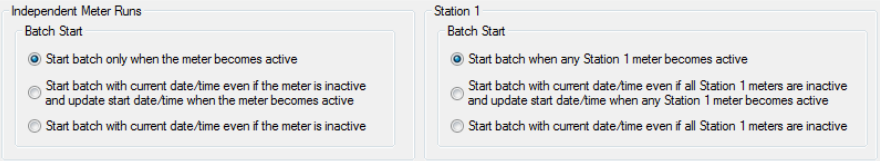


3. In the **Batch Setup** screen, make changes as needed to the independent Meter Runs and any Stations you have set up. **Batch Preset Units** are only available for liquid applications.

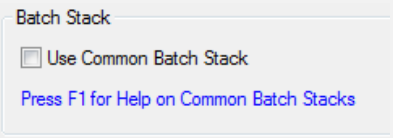
Liquid:



Gas:

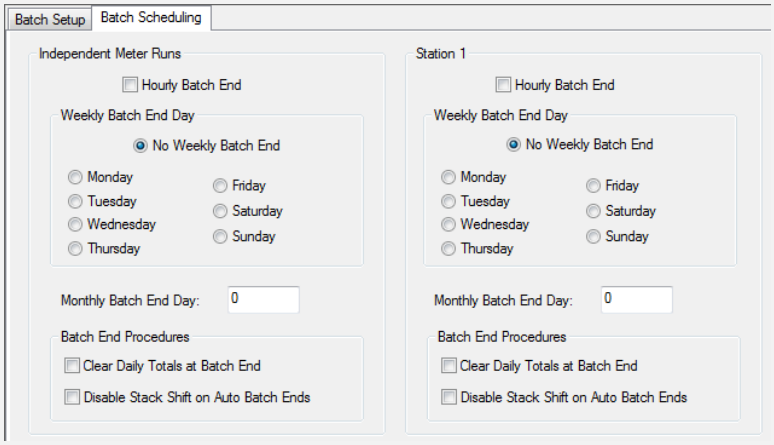


For Stations in liquid applications, the **Batch Setup** screen is where you can select the option to **Use Common Batch Stack** for that Station. It is not selected as a default.



4.

a. Click on the **Batch Scheduling** tab to make any changes to those options. The **Disable Stack Shift on Auto Batch Ends** option is only available for liquid applications.
b. Click **Apply** to save your changes.
c. For more information on batch scheduling and ending operations, go to Section 3.6.4
d. Ending a Batch.
e. For information on Batch Reports, go to Section 4.5.5 Batch, Daily and Prove Reports.



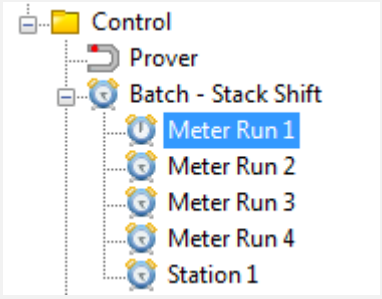
3.6.2 Adjust Batch Size

To adjust the batch size in liquid applications, follow these instructions:

1. In the Actions ribbon, click **Operate**.

2.

a. Expand the **Control** tree, and expand the **Batch – Stack Shift** list.
b. Select a Meter Run or Station batch to edit.

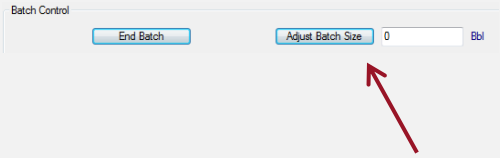


3.

a. To adjust the size of the batch in progress or a currently idle batch, go to Step 4.
b. To adjust the size of a batch in the sequence other than the batch in progress or one that is currently idle, go to Step 5.

4.

a. In the **Batch Control** screen, enter the adjustment amount in the **Adjust Batch Size** field.
b. Click the **Adjust Batch Size** button to update the batch size to the amount you entered.
c. Click **Apply** to save your changes.

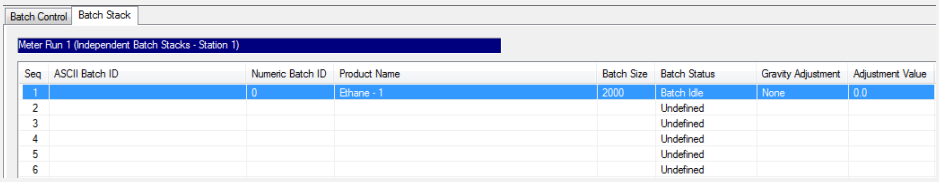


You can enter a positive number to increase the batch size or a negative number to decrease the batch size.

5.

For liquid applications:

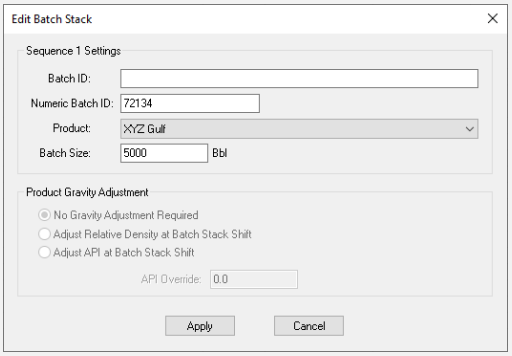
a. Click on the **Batch Stack** tab.
b. Double-click on the numbered row of the batch you need to adjust to open the **Edit Batch Stack** window.



6.

In the **Edit Batch Stack** window, enter the new total amount in the **Batch Size** field.

Unlike the **Adjust Batch Size** option on the **Batch Control** screen (Step 3), the **Batch Size** field automatically changes the entire batch to match the new amount instead of adding or subtracting anything.



7.

Click **Apply** to save your changes and update the size in the sequence list.

3.6.3 Batch Stack Control

In liquid applications, each independent flow Meter Run has a batch stack queue or sequence that has one active running product with five additional slots for queueing future products for batching. “Independent” batch stacks are useful when running different products simultaneously on each Meter Run. This stack configuration allows six batches to be programmed into the flow computer for each Meter Run.

In applications where multiple flow meters are running the same product simultaneously, a shared “common” batch stack feature with one active product and 23 queue slots can be configured by defining a Station that includes the individual flow meters. A maximum of two Stations can be configured. A mix of independent and common batch stacks can be used in the flow computer.

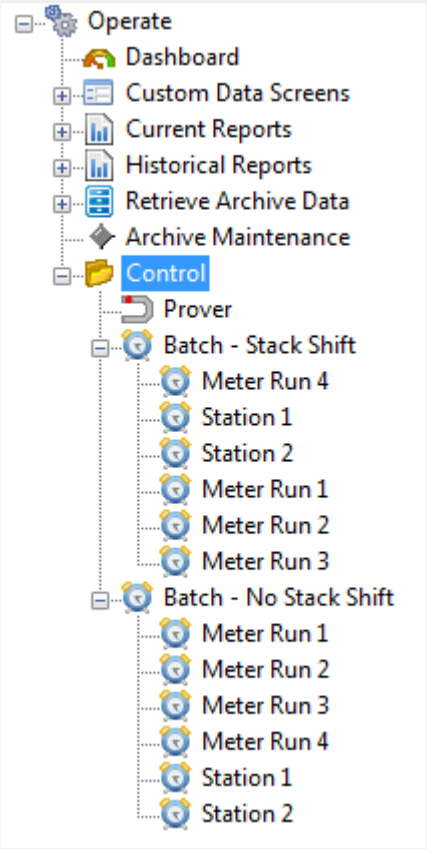
By default, the flow computer automatically sets the first product (Product 1 in the list) as the active product number for all batch stacks.

To access batch stack control settings, follow these instructions:

1. In the Actions ribbon, click **Operate**.

2. Expand the Control tree to see the previously configured Meter Runs and Stations under each batch group:

- Go to Section 3.4.1 Meter Run Configurations for information on how to make changes to Meter Runs.
- Go to Section 3.4.2 Station Configurations for information on how to make changes to Stations.



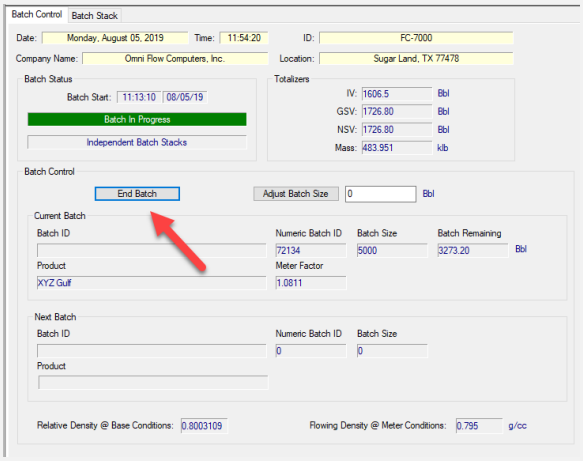
Two different groups of batch stacks are listed on the Control tree:

- **Stack Shift** – Using this option instructs the flow computer to end the batch on the current running product, shift the batch stack upwards, and begin a new batch on the first product in the batch stack. If a new product number is not entered into the batch stack before ending the batch, the flow computer will not shift the batch stack, and it will begin a new batch measuring the same product as the batch that just ended.
- **No Stack Shift** – Using this option instructs the flow computer to end the batch on the current running product and to begin a new batch measuring the same product as the batch that just ended. The flow computer will not shift the batch stack, even if there are products entered into the batch stack before ending the batch.

3. Click on any of the Meter Runs or Stations to see their **Batch Control** screens. This screen displays an overview of the batch's ID information, current status and totalizers.

a. End the batch from this screen if needed by clicking the **End Batch** button. Go to Section 3.6.4 for more instructions on ending batches.

b. Adjust the batch size from this screen if needed. Go to Section 3.6.2 Adjust Batch Size for more instructions on adjusting batch sizes.



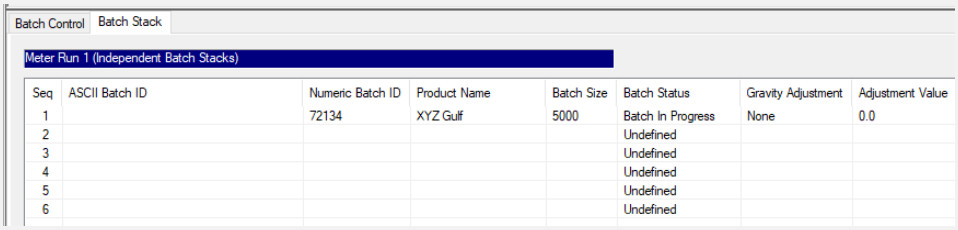
On the **Batch Control** screen, you can also see the batch status and type.

The batch status appears as:

- **In Progress –** Batch is in progress with the meter active.
- **Idle** – Batch is in progress with the meter not active.
- **Batch Ended** – Batch End has been received with the meter not active.

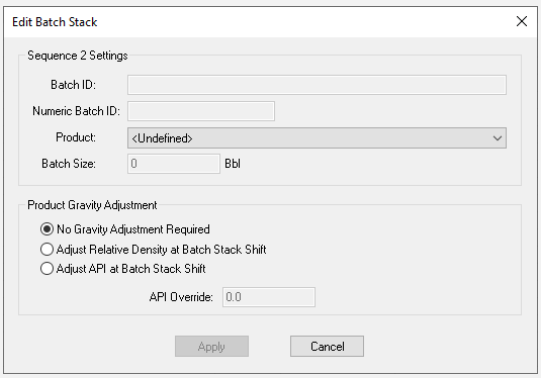
The batch stack type is either **Independent** or **Common**.

4. Click the **Batch Stack** tab to see the batch stack sequence for that Meter Run or Station.



Seq	ASCII Batch ID	Numeric Batch ID	Product Name	Batch Size	Batch Status	Gravity Adjustment	Adjustment Value
1		72134	XYZ Gulf	5000	Batch In Progress	None	0.0
2					Undefined		
3					Undefined		
4					Undefined		
5					Undefined		
6					Undefined		

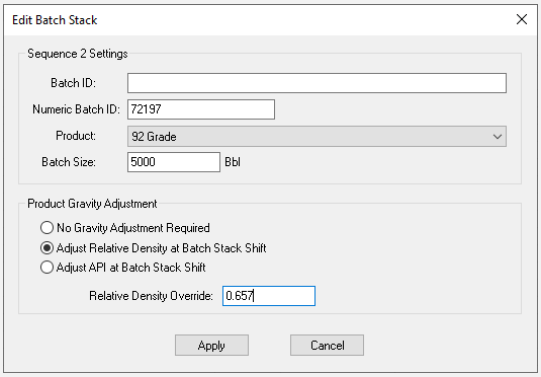
5. Double click (or right-click and select **Edit**) on any of the numbered rows to open the **Edit Batch Stack** window for that batch in that sequence



6. Fill in the information as required and choose a product for that batch from the **Product** drop-down list.

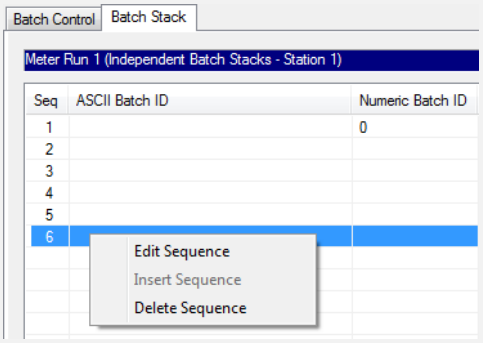
When this stack entry becomes the running product, its meter factors, measurement selections and setup selections as they are currently configured become active.

If you need to make changes to your list of products, go to Section 3.4.3 Products Configuration.



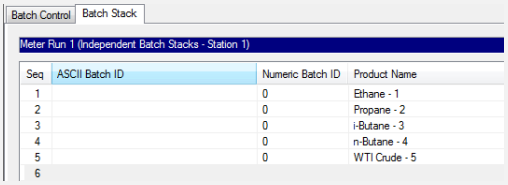
7.

a. Double-click on another row to edit a different batch in the sequence, as needed.
b. Right-click on a row to edit, insert or delete that batch from the sequence.



8.

a. To automatically change batches in a sequence from one product to another within a single Meter Run or Station, assign the applicable products to the different batches as you move down the sequence.
b. To manually end a batch and change the batch to a different product, go to Manual Batch End in Section 3.6.4 for instructions.



9. When you are finished, click **Apply** to save your changes.

3.6.4 Ending a Batch

End a batch in progress through OMNICONNECT in one of three ways: manually through the Batch Control screen, automatically through a timed schedule, or remotely through Modbus writes.

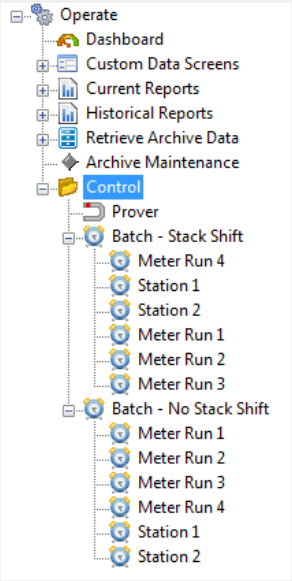
Manual Batch End

To manually stop an individual batch, follow these instructions:

1. In the Actions ribbon, click **Operate**.

2. Expand the **Control** tree to see the previously configured Meter Runs and Stations under each batch category.

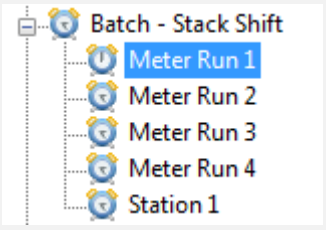
a. For liquid applications, go to Step 3.
b. For gas applications, go to Step 4.

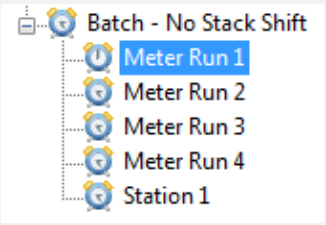


When ending a batch while flow is occurring, remember that the next batch will start immediately after you end the current one.

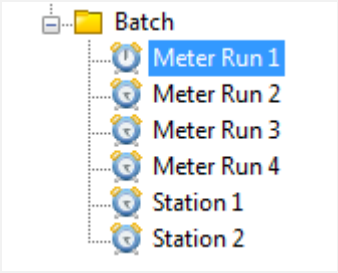
3. For liquid applications:

a. To end a batch and automatically cause a stack shift, which automatically starts to measure the next queued product in the sequence, select an option in the **Batch – Stack Shift** list.
b. To end a batch and not automatically shift the stack, select an option in the **Batch – No Stack Shift** list.
c. Go to Step 5.

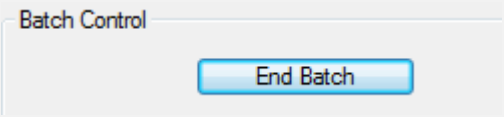




4. For gas applications, select a Meter Run or Station in the **Batch** list.



5. In the **Batch Control** screen to the right, click the **End Batch** button to manually end your selected batch.



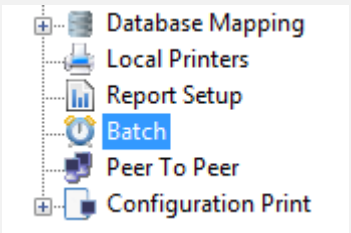
6. Ending a batch automatically generates a report. Go to Section 4.5.5 for more information on Batch Reports.

Automatic Batch End

To automatically end a batch on a set schedule, follow these instructions:

1. In the Actions ribbon, click **Configure**.

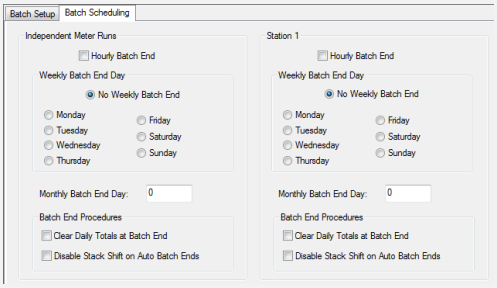
2. Select **Batch** in the **Configure** tree. This opens both the **Batch Setup** and **Batch Scheduling** screens.



3.

a. Click on the **Batch Scheduling** tab to create a schedule for the batch ends—hourly, weekly, or monthly—for both the Meter Runs and the Stations.

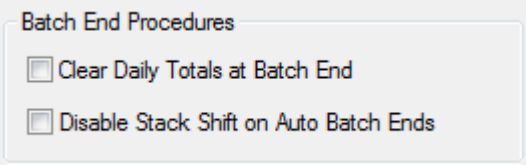
b. Click **Apply** to save your changes.



> The **Independent Meter Runs** options group refers to all Meter Runs not grouped within a Station. The schedule set up here applies to all independent Meter Runs associated with this flow computer, not to any singular Meter Run (such as Meter Run 1).

When ending a batch while flow is occurring, remember that the next batch will start immediately after you end the current one unless it is configured otherwise.

For liquid applications, the **Batch End Procedures** options on the **Batch Scheduling** screen include the **Disable Stack Shift on Auto Batch Ends** selection. This will determine whether the flow computer will shift the batch stack upon ending the previous scheduled automatic batch. If it is not checked, it will shift the stack.



4. Ending a batch automatically generates a report. Go to Section 4.5.5 for more information on Batch Reports.

Remote Batch End

To remotely end a batch, use custom programmable statements in the flow computer or through Modbus-written commands from control systems.

Batch Recalculate and Ticket Reprint

Any one of the last 35 completed batches can be recalled from the front panel of the flow computer through the Batch menu by using the Recalc function key and entering a new Base Sediment and Water (BS&W) percentage and/or a new Reference Density/Relative Density/API override value before executing a batch recalculation. These new override values are usually obtained from a laboratory analysis report of a sample taken after the batch has ended.

See the Modbus Database Browser in OMNICONNECT for the Modbus registers relating to batch recalculation through Modbus writes.

3.6.5 Batch Preset Counters

During the configuration of a Meter Run or Station in liquid applications, there is an option to activate a batch preset counter and warning flags to achieve set batch sizes.

You can create a Batch Preset Warning through a Meter Run's flow meter setup if it is configured as an Independent Batch Stack. However, if the Meter Run is part of a Station's Common Batch Stack, you can only set up the warning through the Station's configuration screen.

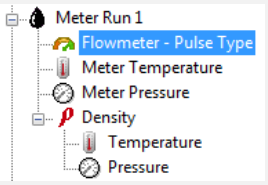
Each batch preset counter is pre-loaded with the batch size taken from the appropriate batch stack queue. The counter is automatically decremented by the GSV flow of the Meter Run or Station.

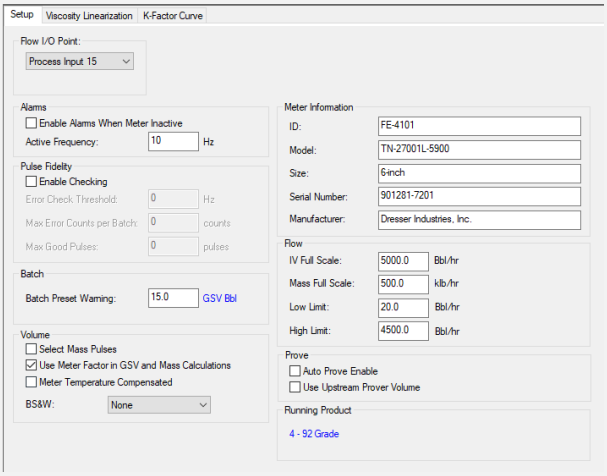
To activate a Batch Preset Warning flag and Batch Preset Reached flag, follow these instructions:

1. In the Actions ribbon, click **Configure**.

2.

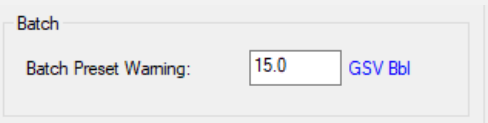
a. Expand a Meter Run or Station in the tree.
b. Select the **Flowmeter** item to view the **Setup** screen.





3.

a. In the **Batch Preset Warning** field, enter the number of barrels or cubic meters in advance of the total batch size, that when reached, triggers a warning flag that tells the Modbus database that it is almost time to end the batch for that Meter Run or Station.
b. Click **Apply** to save your changes.

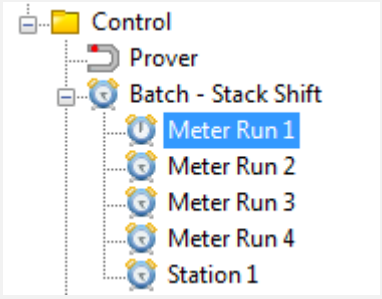


The default amount in this field is "0.0." A batch with the preset warning size of zero sets both the **Batch Preset Warning** and the **Batch Preset Reached** flags simultaneously when the batch size decrements to zero.

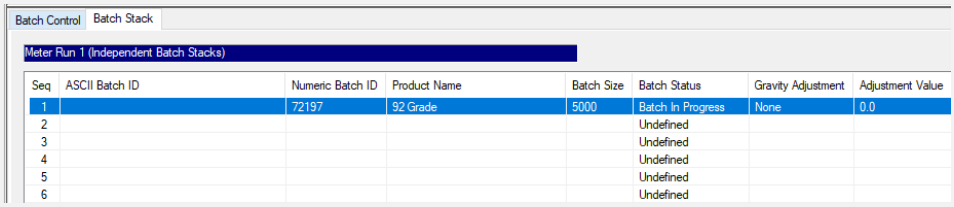
To activate the **Batch Preset Counter**, you must enter a batch size other than zero before the batch starts.

4. To enter a batch size, go to the Actions ribbon and click **Operate**.

5.
a. Expand the **Control** tree.
b. Select the same Meter Run or Station batch to edit that you selected in Step 2.



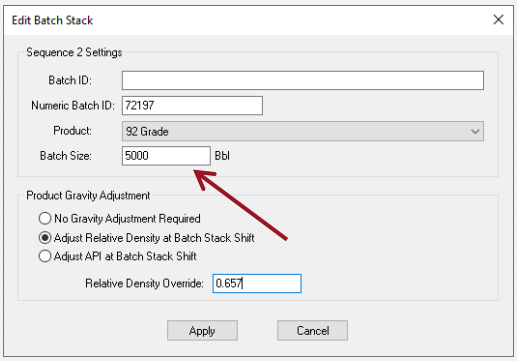
6.
a. Click on the **Batch Stack** tab.
b. Double-click on the numbered row of the batch you need to edit to open the **Edit Batch Stack** window.



Seq	ASCII Batch ID	Numeric Batch ID	Product Name	Batch Size	Batch Status	Gravity Adjustment	Adjustment Value
1		72197	92 Grade	5000	Batch In Progress	None	0.0
2					Undefined		
3					Undefined		
4					Undefined		
5					Undefined		
6					Undefined		

7.
a. Enter the batch size amount in the **Batch Size** field.
b. Click **Apply** to update the batch size in the sequence list.

Now that there is a number set in the **Batch Preset Warning** field and a fixed **Batch Size**, you will receive both the **Batch Preset Warning** and the **Batch Preset Reached** flags.



The **Batch Preset Warning** and the **Batch Preset Reached** flags can be used in custom Boolean and Variable statements to end batches or control systems operators can monitor batches using the flags. The operators can remotely close valves in advance of ending batches and open valves to start batches on new products.

3.6.6 Product Interface Detection

The flow computer can automatically detect product interfaces by monitoring the user-configured sustained rate of change in the specific gravity/density of a new product in the line (Figure 3-2 and Table 3-3). For example, a custom Boolean statement can be programmed to be active whenever the specific gravity rate of change and the Batch Preset Reached flags are set. These flags can cause a 'batch end' command to be issued with custom Boolean statements or remotely through Modbus writes from external devices.

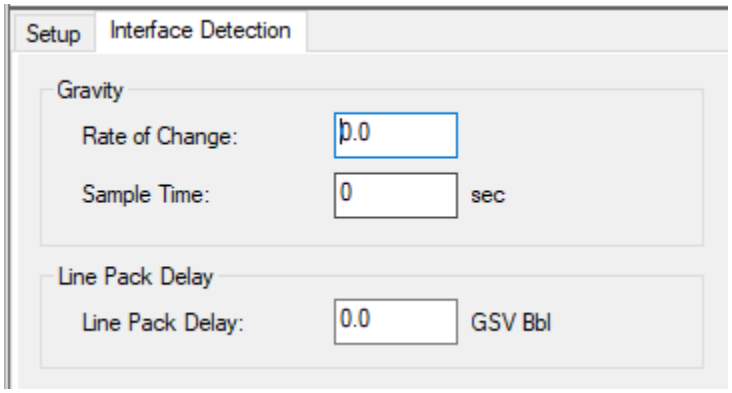


Figure 3-2: Interface Detection Screen

Table 3-3: Product Interface Detection Flags

Interface Detection Flags	Description
Gravity/Density Rate of Change and Sample Time	The specific gravity/density rate of change alarm flag is a flag within the database that is triggered whenever the rate of change of the gravity/density with respect to flow exceeds the preset limit for a sustained amount of time. It is used to detect a change in flowing product and is available for use in programmable Boolean equations and digital I/O channel functions.
Line Pack Delay	In many cases, the densitometer or gravitometer used to detect the product interface is mounted well in advance of the flow meter measuring the product or at the valve manifold. A Line Pack Delay flag, which is delayed by the amount of line pack Bbl (m^3 or liter), provides an accurate indication of when the interface reaches the flow meter and it is time to execute a batch end command.

3.7 PID Configuration

Operators may use proportional-integral-derivative (PID) control to position valves and adjust pump motor speeds through the front panel, as explained in Section 6.6.6 PID Control. However, before output and setpoint adjustments can be made to the PID loops, the configuration and setup entries must be programmed into the flow computer through OMNICONNECT.

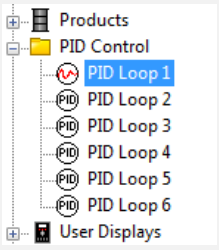
3.7.1 Primary and Secondary Variable Configuration

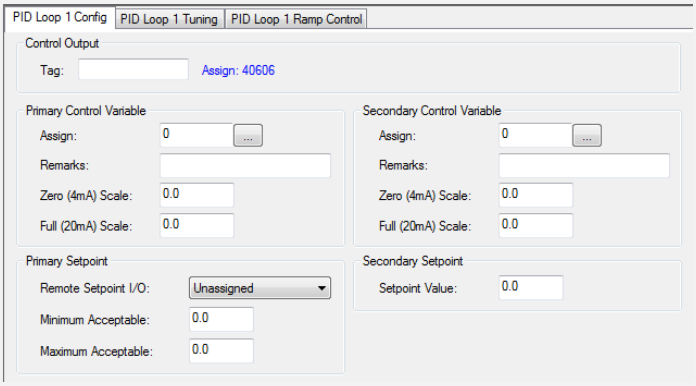
Each PID control loop involves a primary controlled variable with override control by a secondary variable. The primary variable is the controlled variable unless the secondary variable exceeds or falls below a secondary setpoint.

To access primary variable configuration entries, follow these instructions:

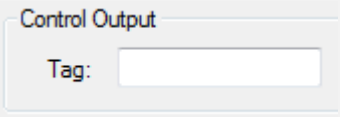
1. In the Actions ribbon, click **Configure**.

2. a. Select and expand **PID Control** in the **Configure** tree.
b. Select **PID Loop 1** to display its configuration screens to the right.





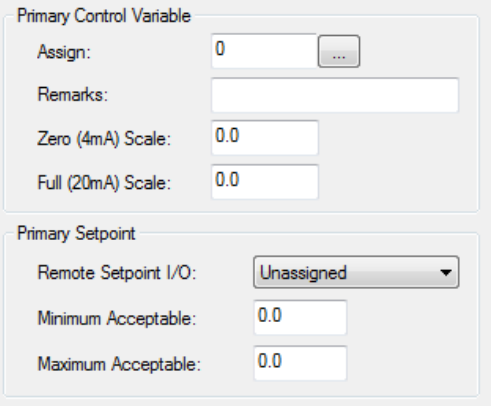
3. In the **PID Loop 1 Config** tab, enter an eight-character ASCII string in the **Control Output Tag** field to identify the control loop output.



4.

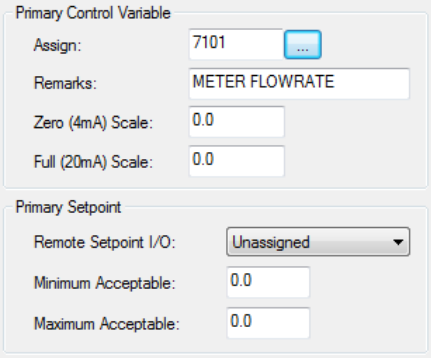
a. In the **Primary Control Variable** group, enter the database address of the primary variable in the **Assign** field.
b. If you do not know the specific register number, click on the **ellipses** button to open the **OMNI Database Browser** to conduct a search.

In applications requiring flow and pressure control, the **Assign** entry should be a flowrate variable. For example, if you want the primary control variable to be Meter Run 1 IV/Gross flowrate, the entry is 7101. Set this entry to zero if you do not require flowrate control.



5.

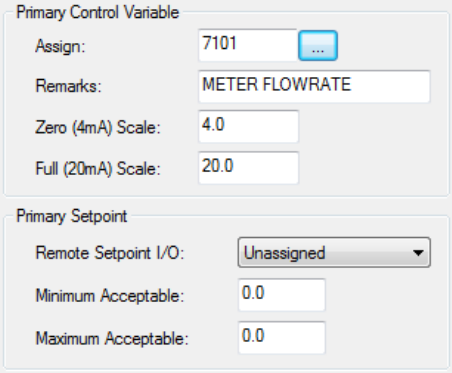
Enter a description of the primary variable, up to 16 characters long, in the **Remarks** field.



6.

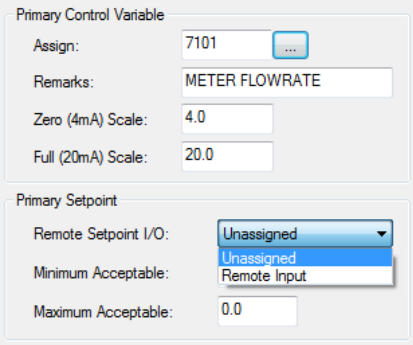
Enter the **Zero (4 mA)** and **Full (20 mA) Scale** values, in engineering units, for the primary variable.

These entries are required even if you do not intend to use a remote setpoint input for the PID controller. The PID algorithm uses these values to determine the zero value for the primary controlled variable.



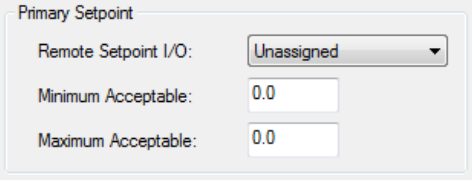
7. In the **Primary Setpoint** group, select an option in the **Remote Input I/O** drop-down list:

a. Choose **Unassigned** if you will input the primary setpoint locally through the front panel.
b. Choose **Remote Input** if you will provide a remote source through Modbus writes.



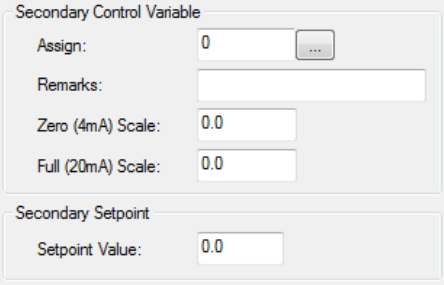
8. Enter the **Minimum** and **Maximum Acceptable** primary setpoint values (optional).

When a setpoint value outside of this range is received, the setpoint will not be allowed to rise above or below these values.



9. a. Repeat Steps 4 through 6 for the secondary control variable, if using.
b. Enter a value for the **Secondary Setpoint**.

The primary variable will be the controlled variable until the secondary variable reaches this setpoint. The secondary variable will not be allowed to drop below or rise above this setpoint, depending on the **Error Select** entry in the **PID Loop 1 Tuning** tab.



10. Click **Apply** to save your changes.

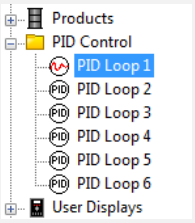
3.7.2 PID Tuning Configuration

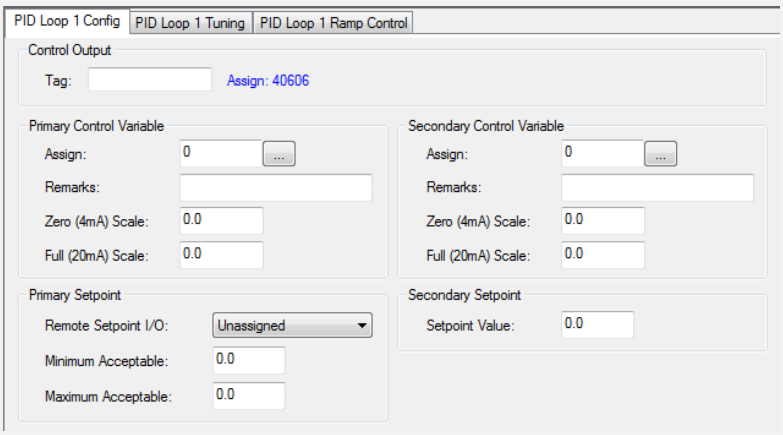
To access PID tuning setup options, follow these instructions:

1. In the Actions ribbon, click **Configure**.

2.

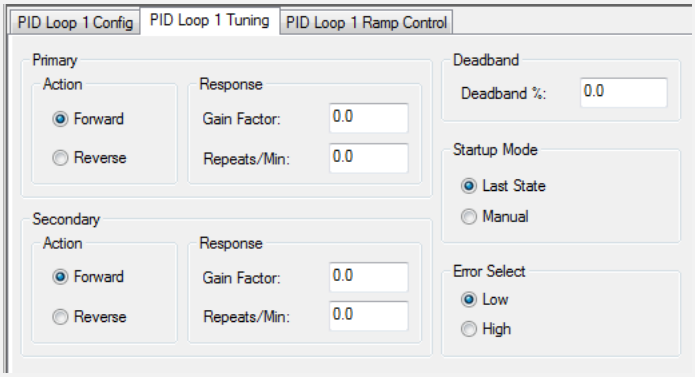
a. Select and expand **PID Control** in the **Configure** tree.
b. Select **PID Loop 1** to display its configuration screens to the right.





3.

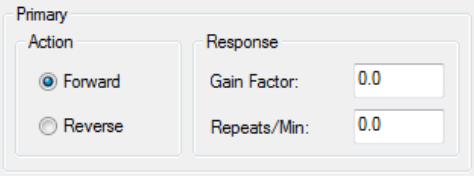
Click on the **PID Loop 1 Tuning** tab.



4.

In the **Primary** group (for the primary control variable), select the appropriate **Action**:

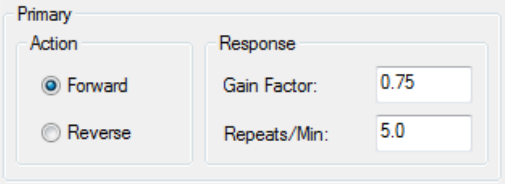
a. Choose **Forward** if the primary variable value increases as the controller output increases.
b. Choose **Reverse** if the primary variable value decreases as the controller output increases.



It is recommended that the action entry is always set to **Forward**. If necessary, select **Reverse** action when configuring the analog output.

5. In the **Response** group, enter the **Gain Factor** and **Repeats/Min** values for the primary control variable.

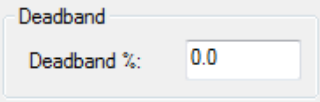
a. Enter a **Gain Factor** number between 0.01 and 99.99.
b. Enter a **Repeats/Min** value between 0.0 and 40.00.



The **Primary Gain Factor** setting determines how responsive the control will be to changes or upsets to the primary variable. The higher the entry, the more responsive the control, but a value that is too high will cause instability and oscillations to occur. If the setting is too low, the system will be slow to respond and unable to adapt to changing conditions. For flow control, an initial value of 0.75 is reasonable.

The **Repeats per Minute** entry determines the integral action of the controller. Integral action gradually integrates the error between the measurement and the setpoint, adjusting the error to zero. The larger this entry is, the faster the output will respond. If this entry is set too high, the system will be too responsive, and the controller will overshoot the setpoint, causing instability and oscillations. An initial value of 5 is a reasonable starting point for both primary and secondary entries.

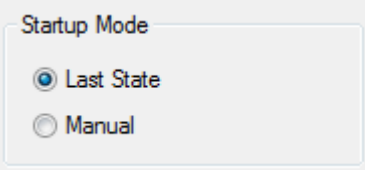
6. Enter a **Deadband %** number.



PID **Deadband** is used to minimize wear and tear on the control valve actuator in cases where the controlled variable is continuously changing. The control output of the flow computer will not change as long as the calculated PID error percentage is less than or equal to the entered **Deadband** percentage.

7. Select the **Startup Mode**:

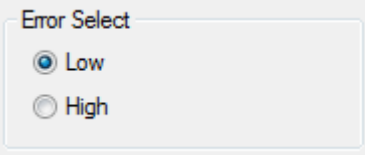
a. Choose **Last State** to keep the PID loop in the operating mode it was in before a system reset occurs.
b. Choose **Manual** to start up in the **Manual Mode** with the control output percentage frozen to the value it was before the system reset.



This entry determines how the PID control will resume after a system reset or power-up (such as a momentary power loss).

8. Select the **Error Select** parameter:

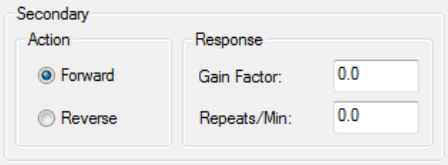
a. Choose **Low** to instruct the flow computer to control which variable (primary or secondary) has the "lowest calculated error percentage."
b. Choose **High** to control which variable has the "highest calculated error percentage."



The **Error Select** entry is used to determine whether the secondary variable should be prevented from falling below or rising above its setpoint. The control action selected for the primary and secondary variables also affects the setting for this entry (Step 4).

This entry must be set to **High Error Select** in applications using only one control variable, as the unconfigured control variable always has a zero error.

9. Repeat Steps 4 and 5 for the secondary control variable, if using.



The secondary **Gain Factor** is used to trim out response variances between the primary and secondary variables. For example, movements in the control valve may produce a larger response in pressure than in flowrate. In this case, the secondary **Gain Factor** is adjusted to a value that is less than one, ensuring a consistent system gain when control is automatically switching between primary and secondary variables. An initial value of 1.0 assumes that the primary and secondary variable have the same response to control valve movement.

10. Click **Apply** to save your changes.

3.7.3 PID Ramp Control Configuration

To minimize the possibility of equipment damage or spills resulting from rapid startups or shutdowns, some applications require that the flow be slowly ramped up to the setpoint and then ramped down. Two PID permissive flags (1722 and 1752) control the startup and shutdown ramp functions, and these permissives may be manipulated using Boolean statements or remotely through Modbus writes.

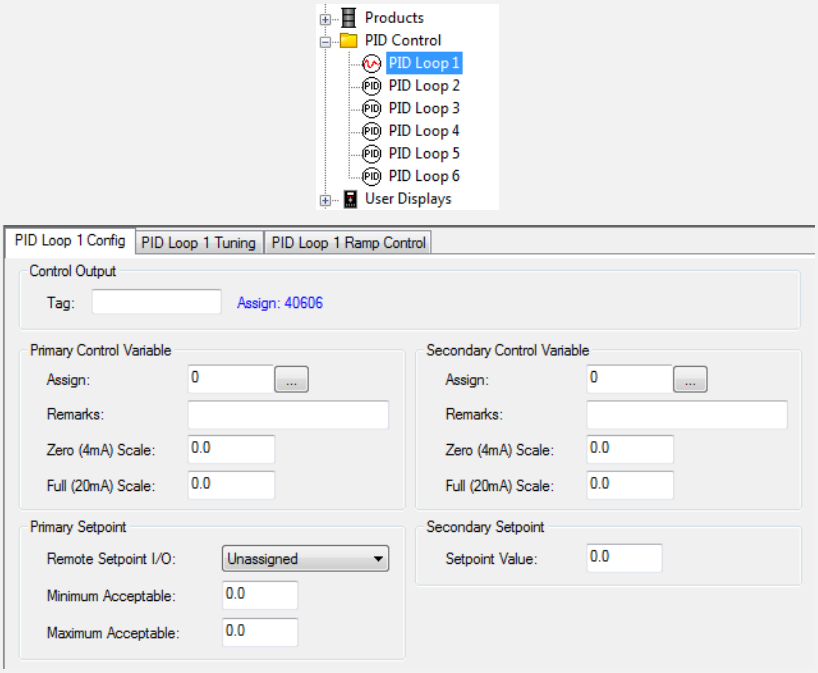
PID Start, Shutdown and Stop command points, which are manually controlled through the front panel, eliminate the need to manipulate the PID permissives directly. Using these command points greatly simplifies operation of the PID ramping functions.

In OMNICONNECT, you can configure the startup ramp, shutdown ramp and minimum output percentages. To access these setup options, follow these instructions:

1. In the Actions ribbon, click **Configure**.

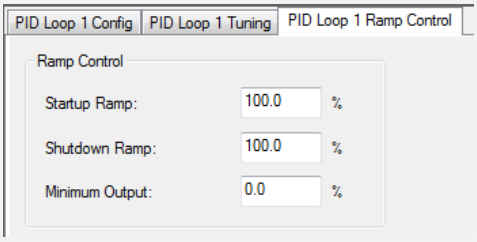
2.

a. Select and expand **PID Control** in the **Configure** tree.
b. Select **PID Loop 1** to display its configuration screens to the right.



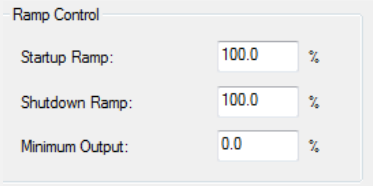
3.

Click on the **PID Loop 1 Ramp Control** tab.



4.

a. Enter the **Startup Ramp** percentage, or the maximum percentage that the control output will be allowed to change each 500 ms cycle.
b. Enter the **Shutdown Ramp** percentage, or the rate at which the control output will ramp down toward 0% when the first permissive is lost.
c. Enter the **Minimum Output** percentage, or the minimum percentage to which the control output will be allowed to ramp down.



When the stop command is received, the control output is immediately set to zero.

The **Startup** and **Shutdown Ramp** entries are used to specify the maximum speed that the valve can open or close during startup or shutdown conditions. This is entered as a percentage of allowed movement per half second, so an entry of 1% per 1/2 second would require 50 seconds to move the valve from the fully closed to the fully open position. Note that the ramping control has no effect during normal operations.

For example, you can activate the PID Loop 1 start command 2013, and set the PID Loop 1 permissive 2001 and 2007 to “ON.” This action starts ramping the flowrate toward the setpoint. When the delivery is almost complete, activate the PID Loop 1 shutdown command 2025, which resets the PID Loop 1 permissive 2001 and causes the flowrate to ramp down to the minimum valve open percentage. Last, terminate the delivery by activating PID Loop 1 Stop command 2019, resetting 2007 and causing the valve to close completely.

5. Click **Apply** to save your changes.

3.8 User Displays

The flow computer allows up to 10 configurable user display screens, each with up to 20 Modbus points. These screens are configured in OMNICONNECT, and then the chosen information is displayed through the front panel (see Section 6.5 User Displays).

For example, in the Meter 1 real-time user display in Figure 3-3, all 20 points are listed, but not all are used. The settings an Operator can fill out for each point include:

- Register – the Modbus register of the point
- Description – a 32-character alphanumeric description
- Units – the engineering units of the register variable
- Hex – an option for the value to be displayed in hexadecimal format (check for yes)
- Exp. Notation – an option for the value to be displayed in exponential notation (check for yes)
- Precision – an option to select the precision if the register is float or a double

User Display 1

Title: Meter 1 Edit User Units

Warning: Units are for display purposes only - no conversion is made on the value

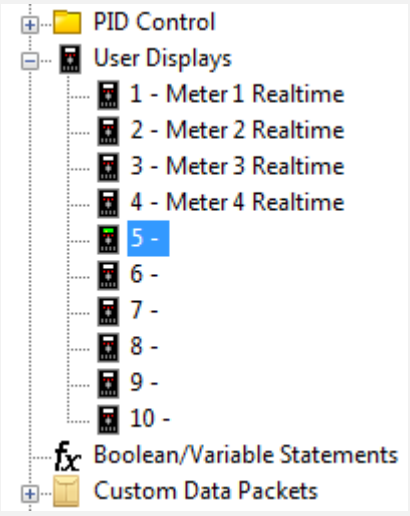
	Register	Description	Units	Hex	Exp. Notation	Precision
1	7101	Flow Rate - IV	System Units	☐	☐	3
2	7102	Flow Rate - GSV	System Units	☐	☐	3
3	7103	Flow Rate - Mass	System Units	☐	☐	3
4	7104	Flow Rate - NSV	System Units	☐	☐	3
5	7105	Temperature	System Units	☐	☐	2
6	7106	Pressure	System Units	☐	☐	1
7	7108	Unfactored Density	System Units	☐	☐	4
8	7109	Flowing Density	System Units	☐	☐	4
9	7110	Density Temperature	System Units	☐	☐	2
10	7111	Density Pressure	System Units	☐	☐	1
11	41227	Meter Density	System Units	☐	☐	4
12	52151	Density at Reference	System Units	☐	☐	4
13	52152	Density at Base Temp	System Units	☐	☐	4
14	41212	Density kg/m3 @Ref T	kg/m3	☐	☐	3
15	7118	CTL	None	☐	☐	6
16	7119	CPL	None	☐	☐	6
17	41214	Current CTPL	None	☐	☐	6
18	0		System Units	☐	☐	0
19	0		System Units	☐	☐	0
20	0		System Units	☐	☐	0

Figure 3-3: User Display Example

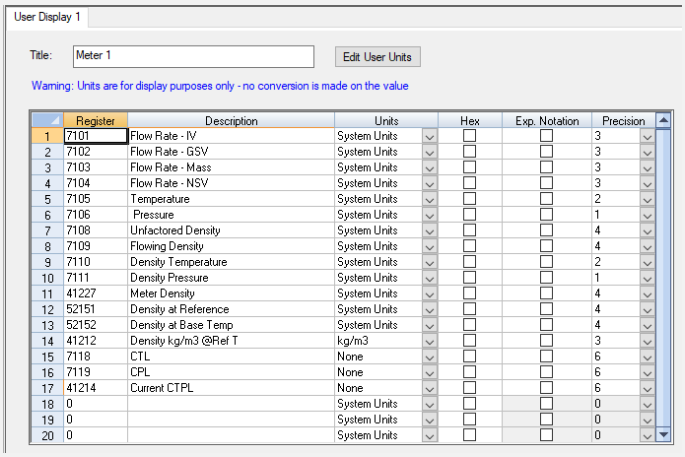
To access user display configurations, follow these instructions:

1. In the Actions ribbon, click **Configure**.

2.
a. Select and expand the **User Displays** option in the **Configure** tree.
b. Select either a previously configured user display to edit its settings, or a new user display. This example uses a new display, #5.



3. Give the display a descriptive title in the **Title** field, if needed.



	Register	Description	Units	Hex	Exp. Notation	Precision
1	7101	Flow Rate - IV	System Units			3
2	7102	Flow Rate - GSV	System Units			3
3	7103	Flow Rate - Mass	System Units			3
4	7104	Flow Rate - NSV	System Units			3
5	7105	Temperature	System Units			2
6	7106	Pressure	System Units			1
7	7108	Unfactored Density	System Units			4
8	7109	Flowing Density	System Units			4
9	7110	Density Temperature	System Units			2
10	7111	Density Pressure	System Units			1
11	41227	Meter Density	System Units			4
12	52151	Density at Reference	System Units			4
13	52152	Density at Base Temp	System Units			4
14	41212	Density kg/m3 @Ref T	kg/m3			3
15	7118	CTL	None			6
16	7119	CPL	None			6
17	41214	Current CTPL	None			6
18	0		System Units			0
19	0		System Units			0
20	0		System Units			0

4. Begin to fill out the point register variables, as needed. In the **Register** column, either:

a. Double click in the box to enter the register number, or

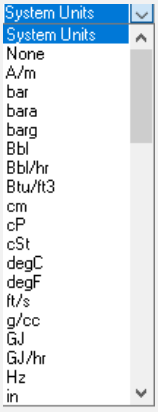
b. Right-click and select **Browser** to open the **OMNI Database Browser** to search for the register number.

	Register	Description
1	7101	Meter 1 - Flow Rate - Gross (I
2	4848	Current Time
3	0	

5. Add a brief **Description**. If the field is left blank, the description from the database is populated as a default.

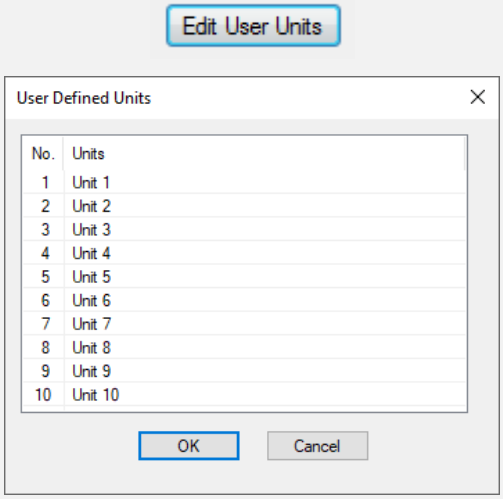
	Register	Description
1	7101	Meter 1 - Flow Rate - IV
2	7102	Meter 1 - Flow Rate - GSV
3	7103	Meter 1 - Flow Rate - Mass
4	7104	Meter 1 - Flow Rate - NSV
5	7105	Meter 1 - Temperature
6	7106	Meter 1 - Pressure
7	0	
8	0	
9	0	
10	0	
11	0	
12	0	
13	0	
14	0	
15	0	
16	0	
17	0	
18	0	
19	0	
20	0	

6. Choose the unit of measure from the **Units** drop-down box, as applicable.



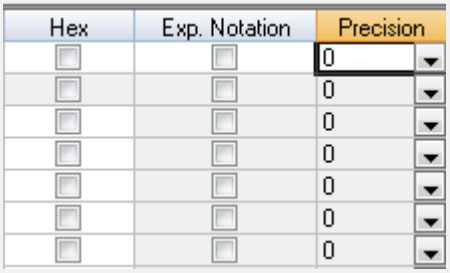
7. If you choose to define your own units, you can edit 10 user-defined units.

a. Click the **Edit User Units** button to open the **User Defined Units** window.
b. Click within any field in the **Units** column to edit the name of the unit.
c. Click **OK** when you are finished. Your new units will now be listed in the **Units** drop-down box in Step 6.



8. Continue to edit the user display screen by selecting the following:

a. **Hex** – check for yes or leave blank for no (default)
b. **Exp. Notation** – check for yes or leave blank for no (default)
c. **Precision** – choose a number from the drop-down box (default is zero)



9. Click **Apply** to save your changes.

4. OMNICONNECT® Reports

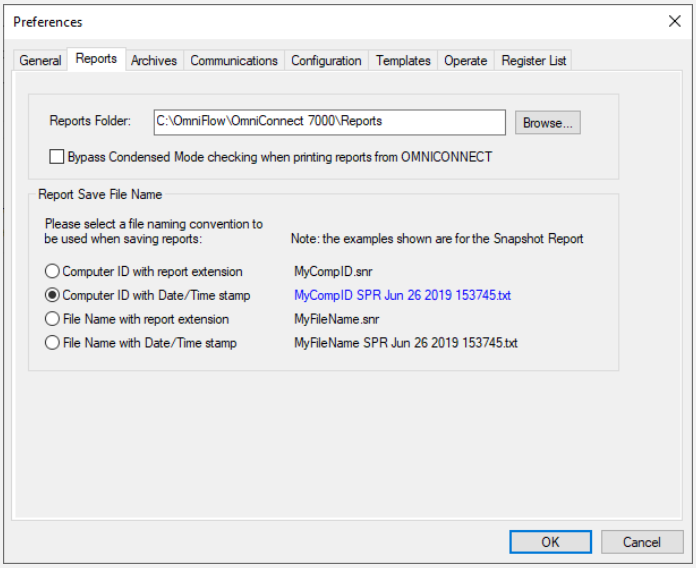
Most reports include a header that lists information such as the date and the time the report was run, the location from which the report was accessed, the firmware revision of the flow computer (Rev: 02.05) and the flow computer's application mode (Liquid KF US) (Figure 4-1).

```
                        OMNI Flow Computers, Inc.
                             Snapshot Report

Computer ID: FC267                                          Rev: 02.05
                                                          Liquid KF US
Date: 05/12/17   Time: 10:20:51
Location: Sugar Land, Texas USA
```

Figure 4-1: Report Header Example

By default, reports that are retrieved and saved within OMNICONNECT are automatically named and saved to C:\Omniflow\OmniConnect 7000\Reports. The file path of the reports folder and file naming conventions for these saved reports can be changed through the **Reports** tab in the **Preferences** window (**Setup** ribbon > **Preferences** button > **Reports** tab).



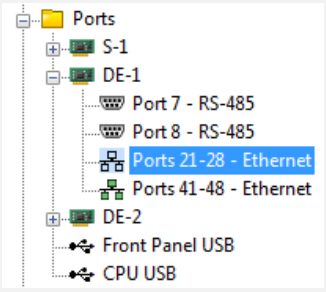
4.1 Printer Setup

4.1.1 Ethernet Printer Connection

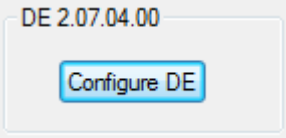
To print reports through an Ethernet printer connection, follow these instructions:

1. In the Actions ribbon, click **Configure**.

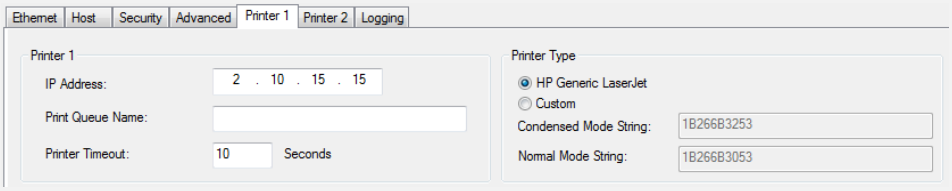
2.
a. Expand the **Ports** tree.
b. Select and expand a **Dual Ethernet** card.
c. Select the **Ethernet** ports to see the configuration options in the screens to the right.



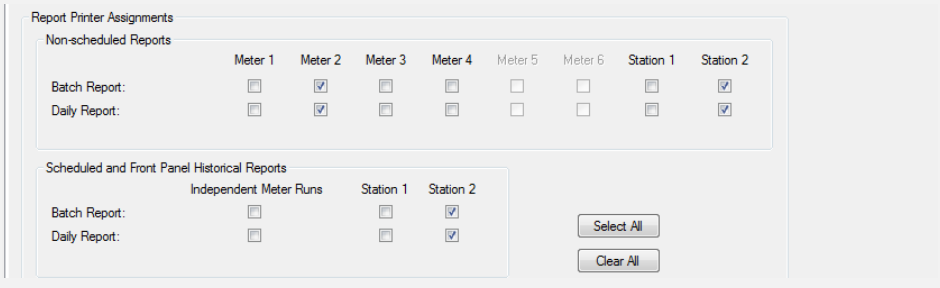
3. Click on the **Configure DE** button to open the **Ethernet Configuration** window.



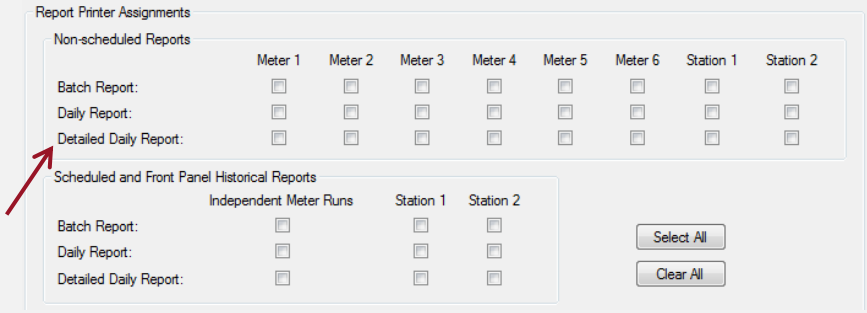
4.
a. Click on either **Printer** tab.
b. Fill in the IP address of the selected printer.
c. Fill in other printer-specific information, as needed.



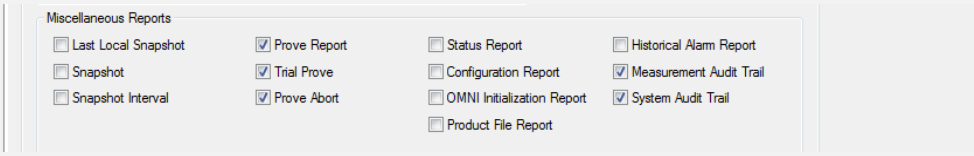
5.
a. Select the **Non-scheduled Reports** from specific Meter Runs and Stations.
b. Select the **Scheduled and Front Panel Historical Reports** from specific Independent Meter Runs and Stations.



In gas applications, **Report Printer Assignments** will also include the **Detailed Daily Report**.



6. In the **Miscellaneous Reports** group at the bottom, select any or all of the other types of reports you wish to print. This includes the **Prove Report**, **Trial Report**, and **Prove Abort**.



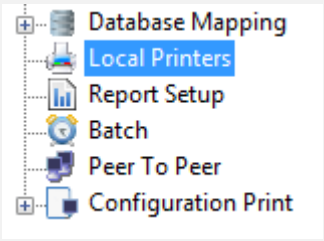
7. When finished selecting reports, click **Apply** to save your changes.

4.1.2 Local Printer Connection

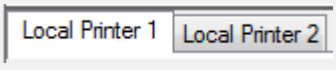
To print reports through a local printer connection, follow these instructions:

1. In the Actions ribbon, click **Configure**.

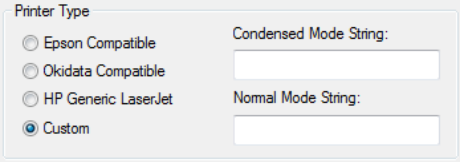
2. Click on **Local Printers** in the **Configure** tree to open the printer setup option screens to the right.



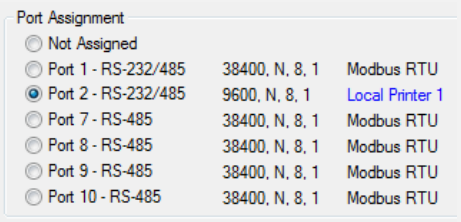
3. Click on either **Local Printer** tab.



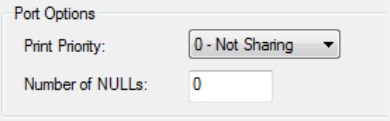
4. Select the **Printer Type** and enter its applicable **Mode String**.



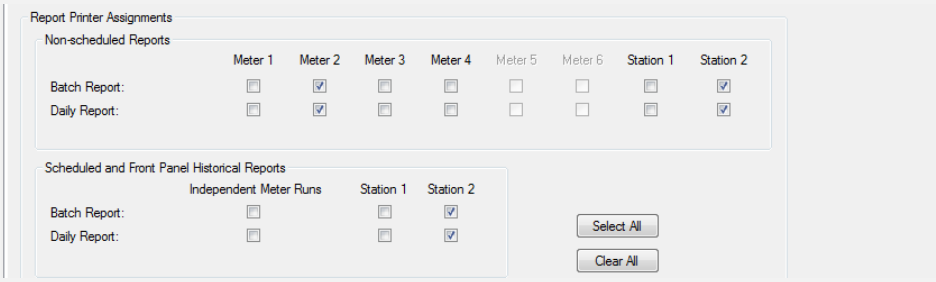
5. In the **Port Assignment** group, assign a port for Printer 1 if it is not yet assigned.



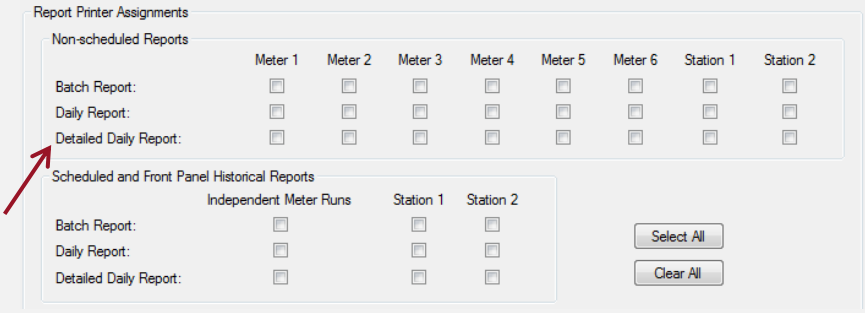
6. In the **Port Options** group, select an option from the **Print Priority** drop-down list.



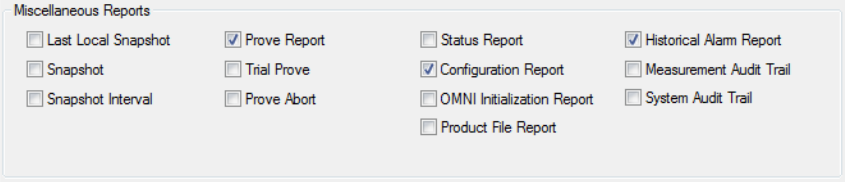
7.
a. Select the **Non-scheduled Reports** from specific Meter Runs and Stations.
b. Select the **Scheduled and Front Panel Historical Reports** from specific Independent Meter Runs and Stations.



In gas applications, **Report Printer Assignments** will also include the **Detailed Daily Report**.



8. In the **Miscellaneous Reports** group at the bottom, select any or all of the other types of reports you wish to print. This includes the **Prove Report**, **Trial Report**, and **Prove Abort**.



9. When finished selecting reports, click **Apply** to save your changes.

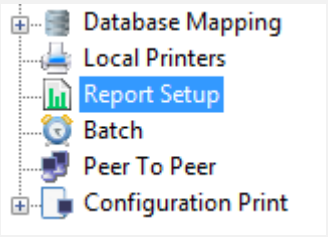
10. Repeat Steps 4 through 9 for the other **Local Printer**, as needed.

4.2 Report Setup

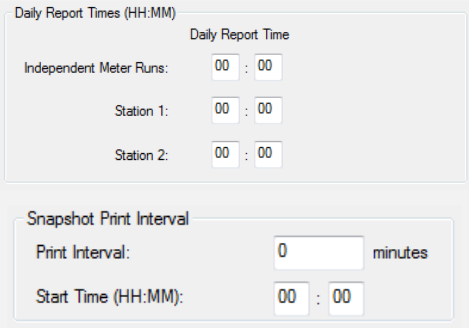
To access the report setup options for Daily and Snapshot Reports, follow these instructions:

1. In the Actions ribbon, click **Configure**.

2. Click on the **Report Setup** option in the **Configure** tree to display the report setup screen.



3.
a. Enter specific times for **Daily Reports** and **Snapshot Report** printing, as needed.
b. Click **Apply** to save your changes.
c. Go to Section 4.3 Custom Report Templates for instructions on **Report Template Selection** (optional).



4.3 Custom Report Templates

Customized report templates can generate custom reports instead of using the default report templates built into the firmware. Four reports can be customized with the use of custom report templates:

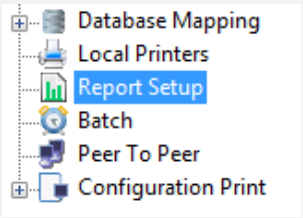
- Snapshot Report
- Batch Report
- Daily Report
- Prove Report

Default report templates built into the firmware are dynamic and automatically adjust when the totalizer and correction factors resolution settings in the configuration are changed. However, custom report templates are static and will not adjust automatically. If the resolution configuration settings are changed, the custom report templates will need to be updated manually.

To select and edit custom report templates, follow these instructions:

1. In the Actions ribbon, click **Configure**.

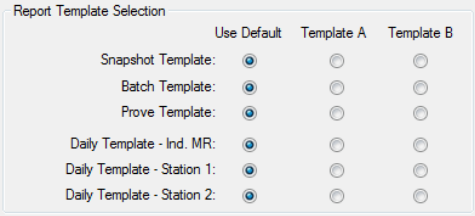
2. Click on the **Report Setup** option in the **Configure** tree to display the report template settings.



3.

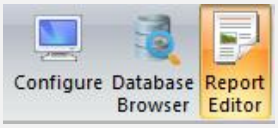
a. In the **Report Template Selection** group, select the templates you want to use for each type of report. By default, no custom report templates have been imported into the flow computer before shipping.

b. Click **Apply** to save your changes.



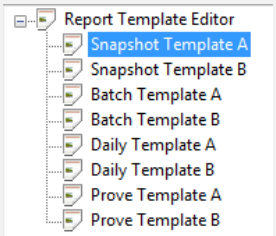
> If you choose either Template A or B for any of the reports, you must remember to import a custom report template to generate that report.

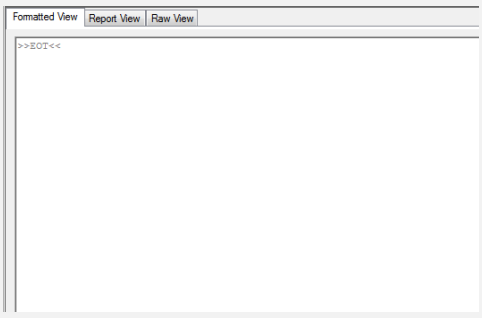
4. In the Actions ribbon, click **Report Editor**.



5. In the **Report Template Editor** tree, click on the report template you want to customize.

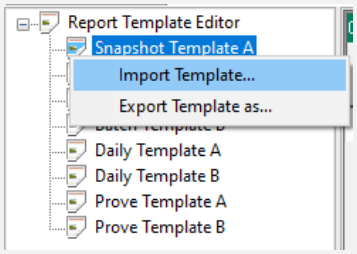
Unless a template has been imported, you should see a blank screen in the **Formatted View** tab.





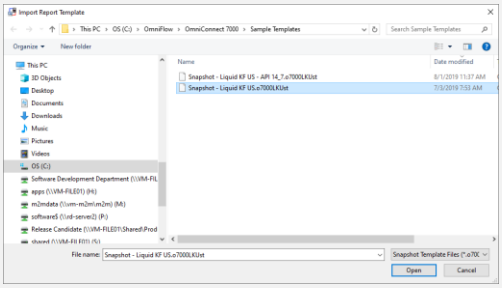
6.

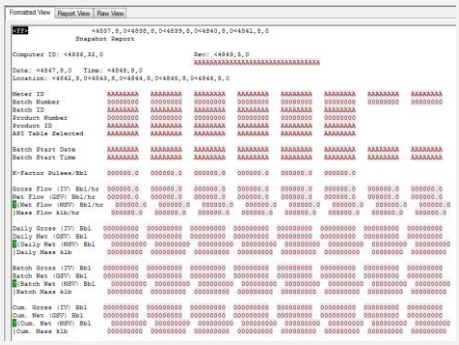
a. If you have a previously-built template ready for import or if you want to see or use one of the sample custom report templates provided on your hard disk when OMNICONNECT was installed, right-click on the template in the **Report Template Editor** tree.
b. Click **Import Template**.



7.

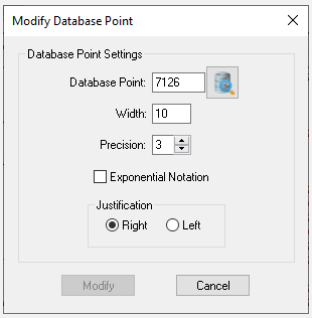
a. The **Import Template Window** opens directly to the sample templates provided by OMNICONNECT. If you have a different template saved elsewhere, use this window to navigate to its location and select it.
b. Select a template; then click **Open**. A customizable template is now visible in the **Formatted View** tab.





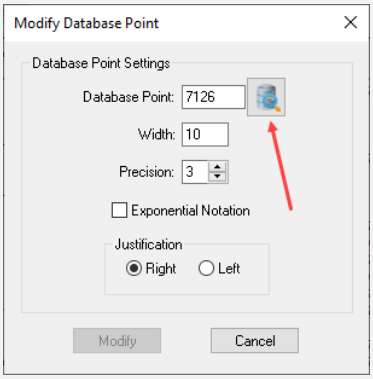
8.

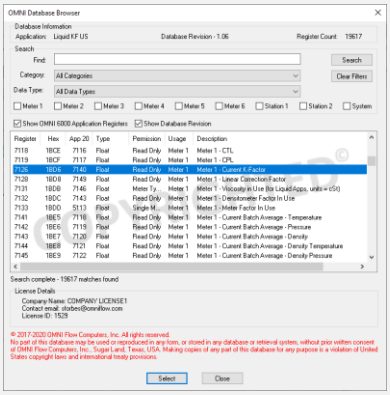
To edit a template in the **Formatted View** tab, double-click (or right-click and select **Modify**) on a highlighted segment to open the **Modify Database Point** window.



9.

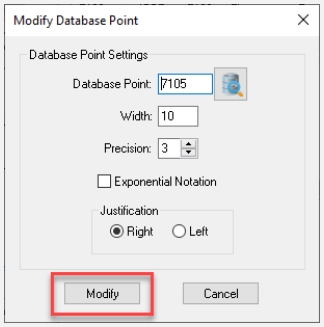
a. Edit the settings.
b. Click the database **ICON** to open the **OMNI Database Browser,** if needed.





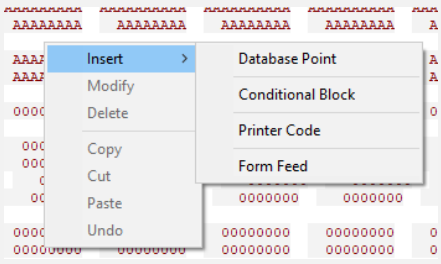
10.

a. When you have made your selection, click **Select** to close the **OMNI Database Browser** window.
b. Click **Modify** to close the **Modify Database Point** window and update your changes.

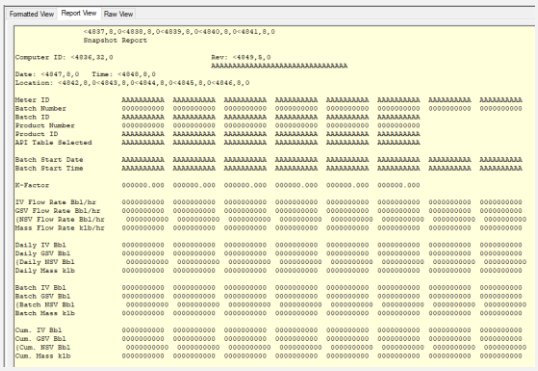


11.

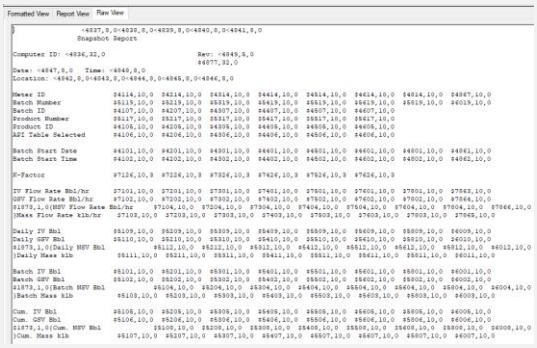
a. To add new lines of code, place your cursor in a blank line and right-click.
b. Select **Insert**.
c. Choose which of the four types of code options to add.
d. When finished editing in the **Formatted View** tab, click **Apply** to save your changes to the entire template.



The **Report View** tab allows you to view the report as it would look when it is printed. You can check the final alignment of values and make changes in the **Formatted View** or **Raw View** tabs, but you cannot edit the template in the **Report View** tab.



12. Click on the **Raw View** tab. This tab allows you to see Modbus field descriptions, the Modbus registers used to populate the values, each printed value's maximum width and the decimal placement for each value.



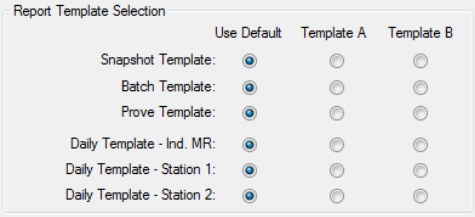
> The "$" symbol indicates that the Modbus register number that follows is where the printed value will be retrieved from.

13.

a. Edit the template in this screen by placing the cursor in any position within the template and simply using your keyboard to make changes.
b. When finished editing in the **Raw View** tab, click **Apply** to save your changes to the entire template.

14.

a. Continue to import custom templates for the other types of reports, as needed.
b. When finished, return to the **Report Setup** option in the **Configure** tree and verify that the templates you have imported match the templates you have selected in the **Report Template Selection** group (go back to Steps 1 through 3).



4.4 Current Reports

The OMNI flow computer offers access to the reports listed in Table 4-1. The naming of the reports can be set in Preferences under the Reports tab.

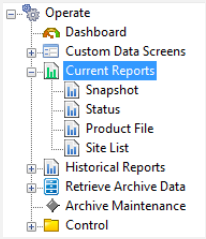
Table 4-1: Current Reports

Report	Description	File Extension
Snapshot	Live process variables and current totalizers	.txt or .snr
Status	Live view of the active meters, operating batch stacks and active alarms	.txt or .sts
Product File	List of all configured products and their Meter Factors	.txt or .prd
Site List	Lists the flow computer communication sites configured in OMNICONNECT	,txt or .site

If OMNICONNECT is online, follow these instructions to access and save current reports:

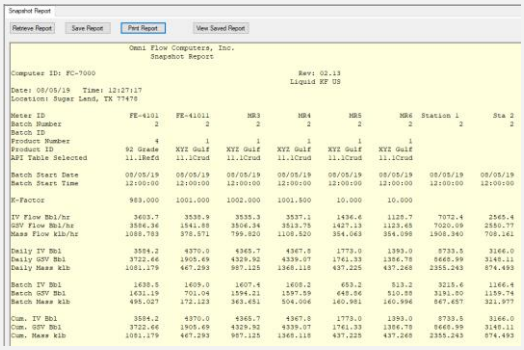
1. In the Actions ribbon, click **Operate**.

2.
a. In the **Operate** tree, expand **Current Reports**.
b. Click on **Snapshot**, **Status**, **Product File** or **Site List** to view one of these current reports.



3. After a report is selected, OMNICONNECT automatically retrieves and displays the current report.

Select one of the four options:
a. To refresh the report, click **Retrieve Report**.
b. To save the current report, click **Save Report**.
c. To print the report, click **Print Report** and follow the standard printing prompts.
d. To view a saved report, click **View Saved Report** and follow the standard opening prompts.



4.5 Historical Reports and Audits

The OMNI flow computer offers access to the reports and audit trails listed in Table 4-2. The naming of the reports can be set in Preferences under the Reports tab.

There are 35 of the most recent records of the Batch, Daily, Detailed Daily (Hourly), and Prove report type stored in the CPU memory. The remaining records are stored on the SD card, and the size of the SD card limits the number of stored records that can be retrieved.

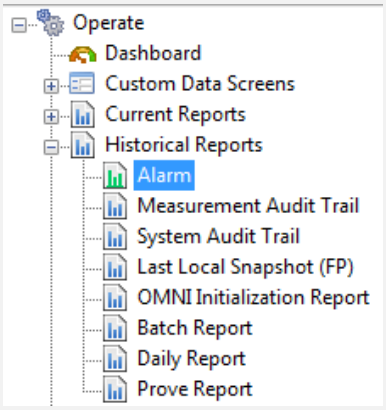
Table 4-2: Historical Reports and Audits

Report	Description	File Extension
Alarm	Lists up to the last 1,000 alarm occurrences from the flow computer	.txt or .alr
Measurement Audit Trail	Lists up to the last 1,000 measurement database changes	.txt or .adt
System Audit Trail	Lists up to the last 1,000 system database changes	.txt or .sat
Last Local Snapshot	A copy of the last requested snapshot report (from the front panel) of real-time conditions	.txt or .snl
OMNI Initialization Report	A running list of flow computer power lost and power restored date/time stamps	.txt or .init
Batch Report	Details the results of a batch end	.txt or .bch
Daily Report	Details the results of a day's end	.txt or .day
Prove Report	Details the results of a prove sequence	.txt or .prv

If OMNICONNECT is online, follow these instructions to access and save historical reports:

1. In the Actions ribbon, click **Operate**.

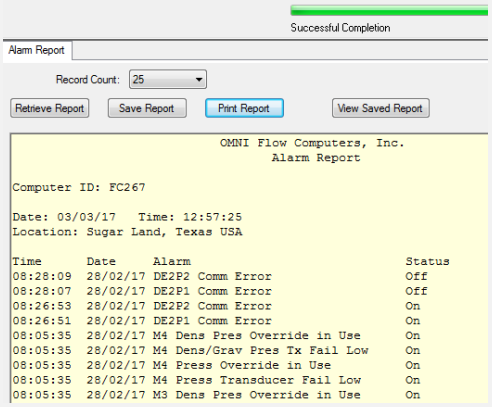
2.
a. In the **Operate** tree, expand **Historical Reports**.
b. Click on any of the items in the list to view the historical report.



3. After a report is selected, OMNICONNECT automatically retrieves and displays the current report.

Select one of the four options:

a. To change the number of events to retrieve, select an option from the **Record Count** drop-down box and refresh the report by clicking **Retrieve Report**.
b. To save the current report, click **Save Report**.
c. To print the report, click **Print Report** and follow the standard printing prompts.
d. To view a saved report, click **View Saved Report** and follow the standard prompts to browse for the report.



4. For more information on how to read or browse the reports, go to the following sections:

a. Section 4.5.1 Alarm Reports
b. Section 4.5.2 Measurement Audit Trail and System Audit Trail Reports
c. Section 4.5.3 Last Local Snapshot Reports
d. Section 4.5.4 OMNI Initialization Reports
e. Section 4.5.5 Batch, Daily and Prove Reports

4.5.1 Alarm Reports

The historical Alarm Report details up to the last 1,000 alarm occurrences from the flow computer (Figure 4-2). The report lists the date, time, and name (or short description) of the alarm, as well as the following variables:

- Status – Whether the alarm condition is clearing (Off) or activating (On)
- Value – The numeric value of the alarm in scientific notation
- IV/Gross Total – A snapshot of volume totalizers at the time of the event
- Mass Total – A snapshot of mass totalizers at the time of the event
- Modbus – The address of the alarm (Modbus register)

Omni Flow Computers, Inc.
Alarm Report Page: 1

Computer ID: FC-7000 Rev: 02.13
Liquid KF US

Date: 08/05/19 Time: 14:51:01
Location: Sugar Land, TX 77478

Time	Date	Alarm	Status	Value	IV Total	Mass Total	Modbus
14:50:50	08/05/19	M2 Batch Suspended	Off	2.294506E+03	11962.9	1279.541	1264
14:50:50	08/05/19	M1 Batch Suspended	Off	2.336521E+03	11316.1	3417.235	1164
14:50:50	08/05/19	Sta2 Flowrate Low Low	Off	4.591533E+02	8670.2	2393.900	2979
14:50:50	08/05/19	Sta2 Flowrate Low	Off	4.591533E+02	8670.2	2393.900	2980
14:50:50	08/05/19	Sta1 Flowrate Low Low	Off	4.551644E+03	23907.8	6449.714	1809
14:50:50	08/05/19	Sta1 Flowrate Low	Off	4.551644E+03	23907.8	6449.714	1810
14:50:49	08/05/19	M6 Flowrate Low Low	Off	2.295881E+02	3814.8	1197.010	1621
14:50:49	08/05/19	M6 Flowrate Low	Off	2.295881E+02	3814.8	1197.010	1622
14:50:49	08/05/19	M5 Flowrate Low Low	Off	2.295652E+02	4855.4	1196.890	1521
14:50:49	08/05/19	M5 Flowrate Low	Off	2.295652E+02	4855.4	1196.890	1522

Figure 4-2: Historical Alarm Report Example

4.5.2 Measurement Audit Trail and System Audit Trail Reports

The Measurement Audit Trail Report details the last 1,000 changes to the flow measurement calculations and related configuration settings, where each change is a numbered event in the audit trail (Figure 4-3). The System Audit Trail Report details other audit events not related to flow measurement calculations, such as user logins. The reports list the event number, time and date of the event and include the following variables:

- Modbus – The point number of the variable involved (Modbus register address)
- Old Value/# of Points – The old value or identifier
- New Value/Serial Port – The new value or identifier
- IV/Gross Total* – A snapshot of volume totalizers at the time of the change
- Mass Total* – A snapshot of mass totalizers at the time of the change
- User Name – The user account information of the Operator or Administrator who made the change
- Port – The location from which the flow computer was accessed (for example: Serial port, Ethernet port, front panel keyboard)

*Measurement Audit Trail Reports only

Omni Flow Computers, Inc.
Measurement Audit Report Page: 1

Computer ID: FC-7000 Rev: 02.13
Liquid KF US

Date: 08/05/19 Time: 14:51:32
Location: Sugar Land, TX 77478

Event No.	Time	Date	Modbus	Old Value/ # of Points	New Value/ Serial Port	IV Total	Mass Total	User Name	Port
21	12:03:24	08/05/19	61837	72134	72197	2149.8	647.815	U00	CPU USB
20	12:00:07	08/05/19	11800	0	3	1953.2	588.413	U00	CPU USB
19	11:54:16	08/05/19	61837	0	72134	1601.5	482.444	U00	CPU USB
18	11:33:24	08/05/19	1732	0	1	348.8	104.990	U00	CPU USB
17	11:33:17	08/05/19	11936	0	2	0.0	0.000	U00	CPU USB
16	11:31:35	08/05/19	1732	0	1	240.2	72.280	U00	CPU USB
15	11:31:16	08/05/19	11933	30	5	0.0	0.000	U00	CPU USB
14	11:31:16	08/05/19	11932	0	3	0.0	0.000	U00	CPU USB
13	11:31:03	08/05/19	11936	2	0	0.0	0.000	U00	CPU USB
12	11:30:50	08/05/19	1732	0	1	195.2	58.713	U00	CPU USB

Figure 4-3: Measurement Audit Trail Report Example

4.5.3 Last Local Snapshot Reports

The Last Local Snapshot Report is a copy of the last Snapshot Report printed locally from the front panel of the flow computer. It includes IV/Gross, Daily, Batch and Cumulative totals from the flow computer, as well as process variable live values.

4.5.4 OMNI Initialization Reports

The Initialization Report lists the date and time stamps of flow computer power loss and power-up events.

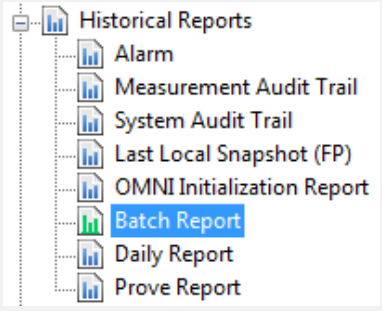
4.5.5 Batch, Daily and Prove Reports

Batch, Daily and Prove Reports are all similar in structure, and the user interface in OMNICONNECT has several filter options for browsing.

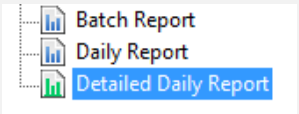
To access and search for Batch, Daily and Prove Reports, follow these instructions:

1. In the Actions ribbon, click **Operate**.

2.
a. In the **Operate** tree, expand **Historical Reports**.
b. Select either **Batch**, **Daily** or **Prove Report**.



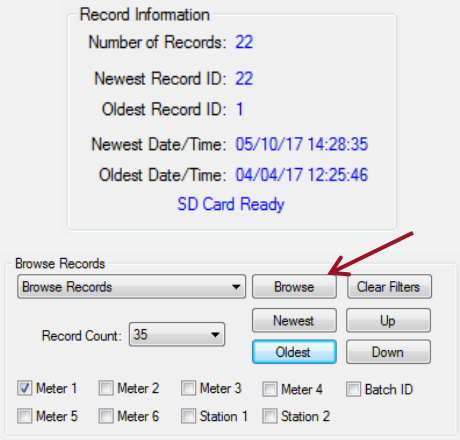
Gas applications have a **Detailed Daily Report** in place of a **Prove Report**.



3. Each report has a **Record Information** group, which shows the number of records the flow computer currently holds and their date ranges:

a. Use the **Browse Records** group to help search for reports by such filters as choosing specific Meter Runs or Stations, number of records, and order of appearance.

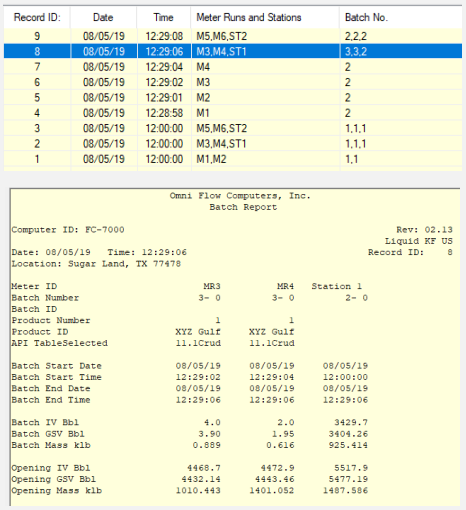
b. When the search filters are set, click **Browse** to update the list of records on the far right of the screen.



4.

a. When you find the record you wish to read in the list, double-click it to retrieve and display the report (in text report format) in the view box.

b. Save or print the report, as needed.



Record ID:	Date	Time	Meter Runs and Stations	Batch No.
9	08/05/19	12:29:08	M5,M6,ST2	2,2,2
8	08/05/19	12:29:06	M3,M4,ST1	3,3,2
7	08/05/19	12:29:04	M4	2
6	08/05/19	12:29:02	M3	2
5	08/05/19	12:29:01	M2	2
4	08/05/19	12:28:58	M1	2
3	08/05/19	12:00:00	M5,M6,ST2	1,1,1
2	08/05/19	12:00:00	M3,M4,ST1	1,1,1
1	08/05/19	12:00:00	M1,M2	1,1

```
                    Omni Flow Computers, Inc.
                         Batch Report

Computer ID: FC-7000                                        Rev: 02.13
                                                          Liquid KF US
Date: 08/05/19   Time: 12:29:06                        Record ID:    8
Location: Sugar Land, TX 77478

Meter ID                          MR3          MR4   Station 1
Batch Number                    3- 0         3- 0         2- 0
Batch ID
Product Number                     1            1
Product ID                   XYZ Gulf     XYZ Gulf
API TableSelected           11.1Crud     11.1Crud

Batch Start Date            08/05/19     08/05/19     08/05/19
Batch Start Time            12:29:02     12:29:04     12:00:00
Batch End Date              08/05/19     08/05/19     08/05/19
Batch End Time              12:29:06     12:29:06     12:29:06

Batch IV Bbl                     4.0          2.0       3429.7
Batch GSV Bbl                   3.90         1.95       3404.26
Batch Mass klb                 0.889        0.616       925.414

Opening IV Bbl                4468.7       4472.9       5517.9
Opening GSV Bbl               4432.14      4443.46      5477.19
Opening Mass klb              1010.443     1401.052     1487.586
```

Batch Reports include the following:

- Meter and product identifiers
- Start and end dates and times
- Batch totals
- Opening and closing cumulative totals
- Batch flow weighted averages

Daily Reports include the following:

- Meter and product identifiers
- Start and end dates and times
- Daily totals
- Daily flow weighted averages
- All active Meter Runs and Stations

Prove Reports include the following:

- Prove Data – Prover and product data
- Meter Data – Proved Meter data
- Data from Consecutive Prove Runs – Forward and total counts, process variables, Meter Factors
- Calculated Data for Prover – Prover and Meter correction factors
- Calculated Meter Factor

Detailed Daily Reports (for gas applications) include hourly data broken out on a daily report.

5. OMNICONNECT® Data Retrieval

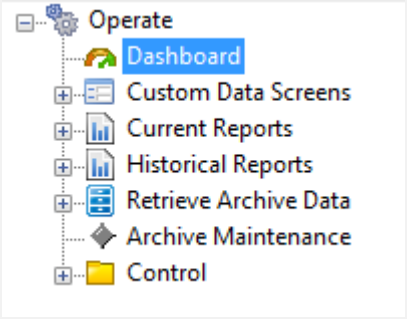
5.1 Dashboard

When using OMNICONNECT and when online with the OMNI flow computer, you can view a summary of any Meter Run or Station through the dashboard function.

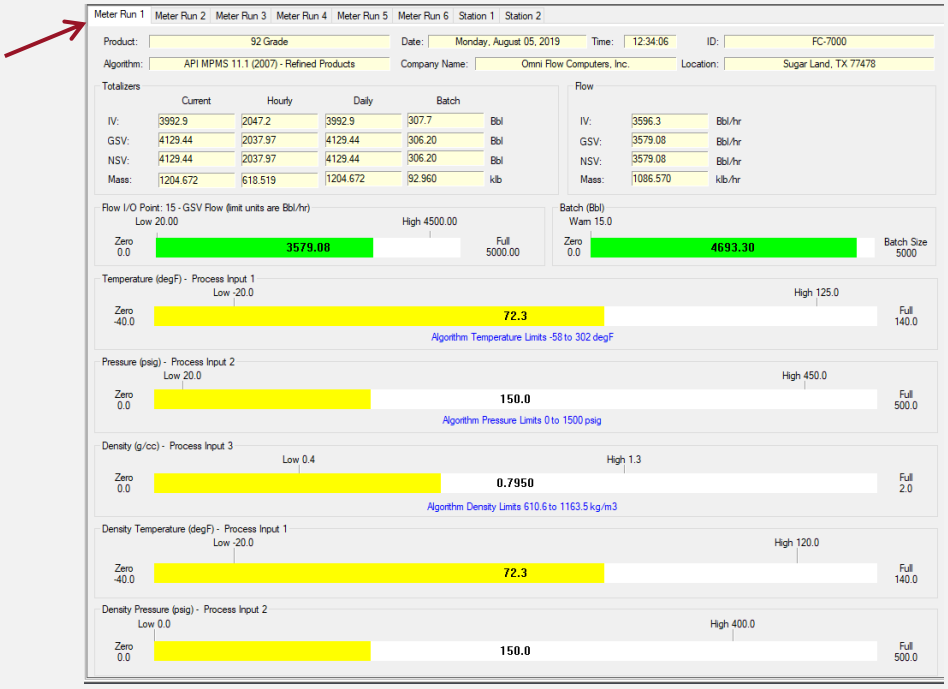
To access the dashboard, follow these instructions:

1. In the Actions ribbon, click **Operate**.

2. In the **Operate** tree, click **Dashboard**.



3. Select any of the **Meter Run** or **Station** tabs previously configured (go to Section 3.4 Configurations for configuration instructions) to see a summary of key information for that Meter Run or Station.



5.2 Custom Data Screens

Custom data screens can be created for your personal use. Unlike the User Display (the customizable screens on the flow computer's front panel display), these Custom Data Screens reside on your PC hard disk. OMNICONNECT uses the screens to retrieve and view Modbus registers data from any OMNI 4000/7000 flow computer you are connected to without affecting any configurations.

You can create up to 10 Custom Data Screens, each with up to 10 tabs and 100 Modbus registers available for each tab. Therefore, the maximum number of data points that can be retrieved and viewed from a single flow computer is 10,000.

An entire Custom Data Screen configuration or just an individual tab configuration can be imported or exported to your PC's hard drive if you are using the -AU command line switch in the OMNICONNECT launch icon properties. Close OMNICONNECT; then open the icon properties and add the -AU switch at the end of the command line.

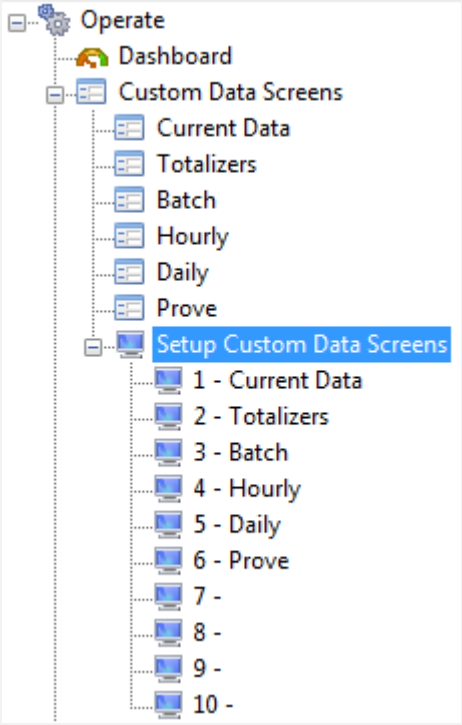
To set up Custom Data Screens, follow these instructions:

1. In the Actions ribbon, click **Operate**.

2.

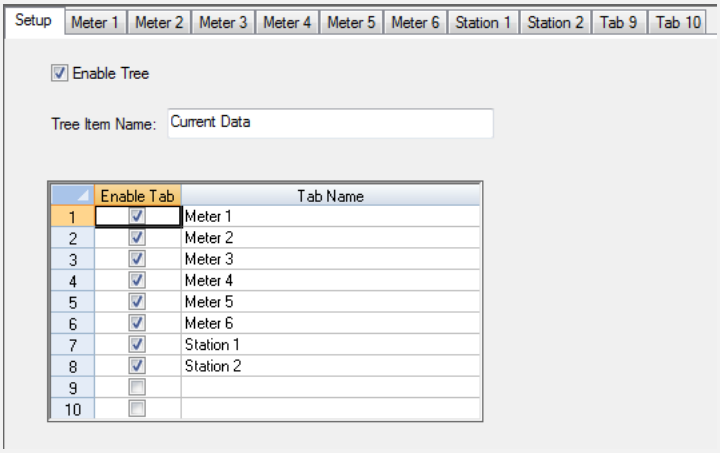
a. Expand the **Custom Data Screens** item in the **Operate** tree.
b. Expand the **Setup Custom Data Screens** item to access the setup options in the screens to the right.

The screens listed under the **Custom Data Screens** item show what information is currently selected and which tabs are enabled.



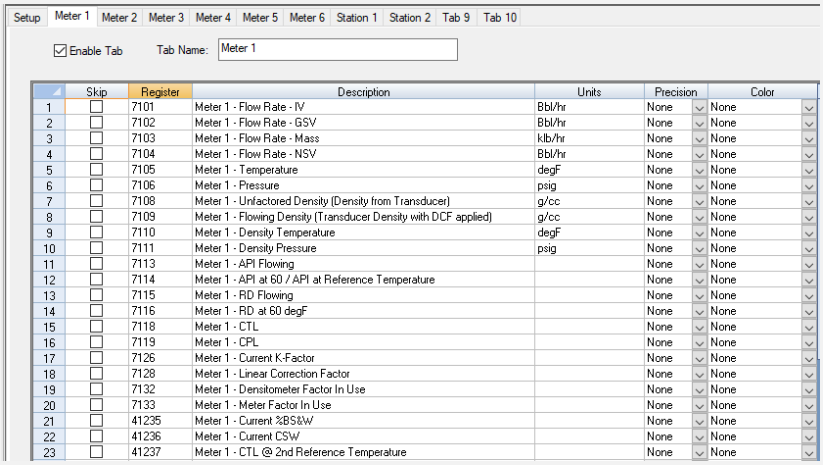
3. Each of the 10 available screens has a **Setup** tab in addition to the 10 Meter and Station tabs.

a. In the **Setup** tab, choose whether to enable the tree.
b. Name the screen in the **Tree Item Name** field.
c. Select which tabs to enable.
d. Click the **Apply** button to save your choices.

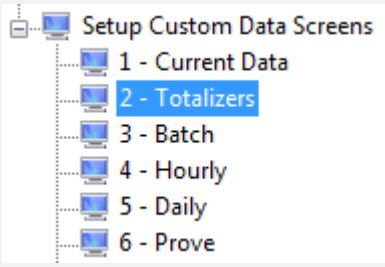


4.

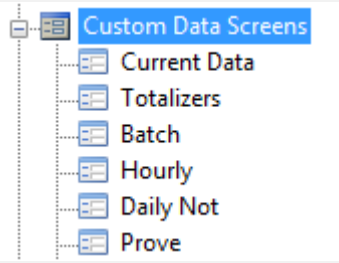
a. Click on the **Meter 1** tab. Each Meter or Station tab has a list of the Modbus registers and their descriptions that are currently being measured.
b. Retrieval of data from all registers is enabled by default. To skip the reading of one of the registers, click on its check box in the **Skip** column.
c. Edit or add a register or description by double-clicking in the box.
d. Delete a register row by right-clicking the numbered cell in the far-left column and selecting **Delete Row**.
e. If needed, also choose **Precision** values and a **Color** from the drop-down boxes.



5. Continue to edit or add **Custom Data Screens** as needed. You do not have to use all 10.



After you click the **Apply** button and apply any changes to any screen or tab in the **Setup Custom Data Screens** tree, the updates will automatically show as items in the main **Custom Data Screens** tree.



5.3 Archives

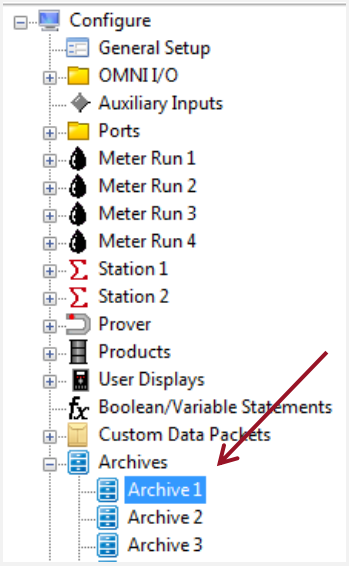
Archives of raw data from user-specified Modbus registers based on user-specified event flags are useful for collecting and archiving certain data not already automatically archived by the flow computer (such as hourly, batch, daily and prove). If an external polling device loses communication with the flow computer, the data is still archived and stored in the flow computer during the communications outage and is available for retrieval when communications with the flow computer are restored.

5.3.1 Configure Archives

To configure archives, follow these instructions:

1. In the Actions ribbon, click **Configure**.

2.
a. Expand the **Archives** tree.
b. Select the applicable archive (there are 25 total to configure, as needed).

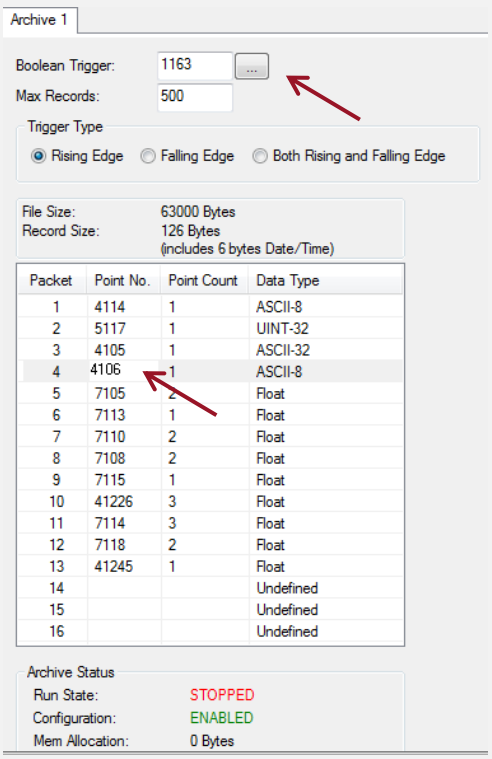


3. Update the fields, as applicable.

There are two ways to access the **Database Browser** for the **Boolean Trigger**:

a. Click the **ellipses** button, or
b. Right-click in the **Boolean Trigger** field.

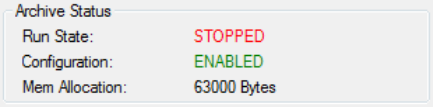
The only way to view the **Database Browser** and make your selection for point numbers is to right-click in the activated field. If the entire row is selected, you will not get the browser option.



4. Click **Apply** to save your changes.

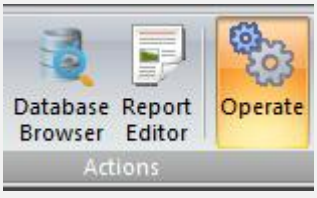
5.3.2 Run Archives

At the bottom of the **Archive** screen is the **Archive Status**. The default status for all archives is **STOPPED,** and the ability to configure them is **ENABLED**. To start the archiving feature and begin collecting the data, the configuration status must first be disabled.

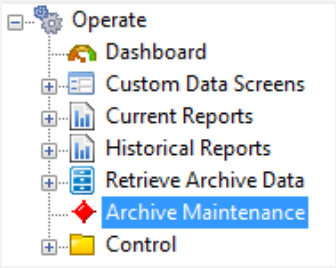


To run the archives and collect the raw data, follow these instructions:

1. In the Actions ribbon, click **Operate**.

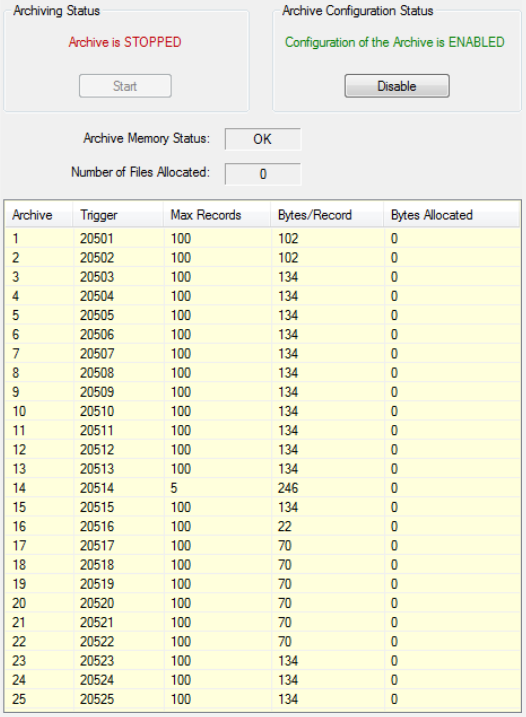


2. Select and expand the **Archive Maintenance** item in the **Diagnostics** tree.



3.

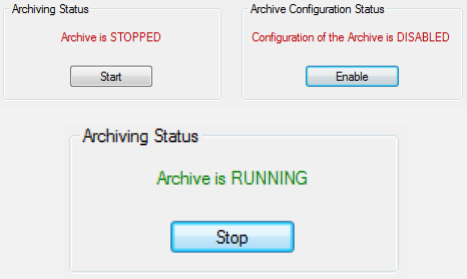
a. In the **Archive Configuration Status** group on the right, click the **Disable** button to turn off the ability to make configuration changes to the archives.
b. Click **OK** to confirm the action.



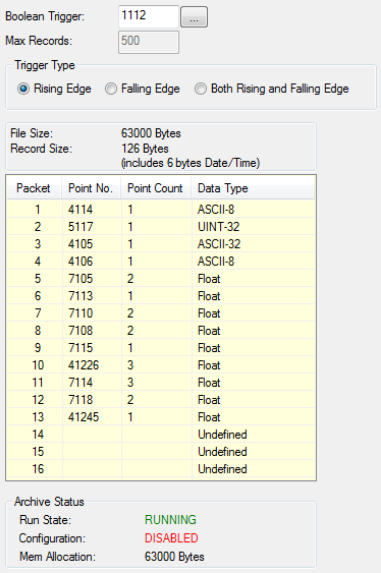
Archive	Trigger	Max Records	Bytes/Record	Bytes Allocated
1	20501	100	102	0
2	20502	100	102	0
3	20503	100	134	0
4	20504	100	134	0
5	20505	100	134	0
6	20506	100	134	0
7	20507	100	134	0
8	20508	100	134	0
9	20509	100	134	0
10	20510	100	134	0
11	20511	100	134	0
12	20512	100	134	0
13	20513	100	134	0
14	20514	5	246	0
15	20515	100	134	0
16	20516	100	22	0
17	20517	100	70	0
18	20518	100	70	0
19	20519	100	70	0
20	20520	100	70	0
21	20521	100	70	0
22	20522	100	70	0
23	20523	100	134	0
24	20524	100	134	0
25	20525	100	134	0

4.

a. In the **Archiving Status** group on the left, click the **Start** button to begin gathering data.
b. Click **OK** to confirm the action.

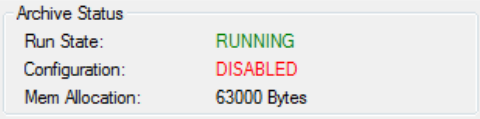


While the archiving configuration function is disabled, you cannot make changes to the list of data registers collected for each archive. However, you can change the Boolean trigger event and trigger type that causes data to be archived, if needed.



5.3.3 Retrieve Archives

To retrieve archive data, the **Archive Status Run State** must be **RUNNING**. If the **Run State** is **STOPPED** and/or the configuration is disabled, follow the instructions in Section 5.3.2 Run Archives to change it.

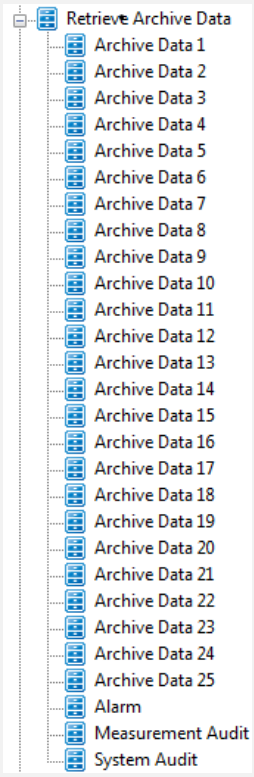


To retrieve archive data, follow these instructions:

1. In the Actions ribbon, click **Operate**.

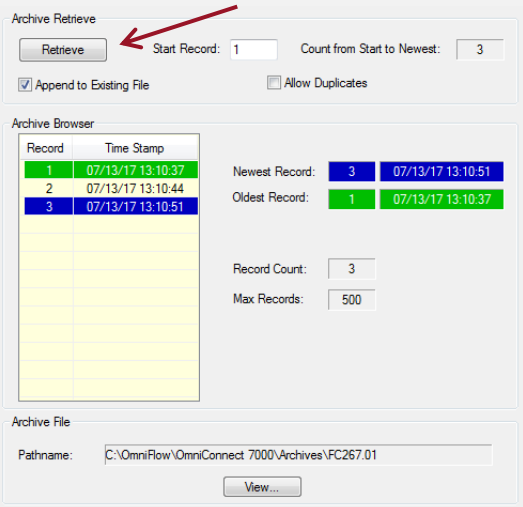
2.

a. Select and expand the **Retrieve Archive Data** item in the **Operate** tree.
b. Click on the archive you want to retrieve.



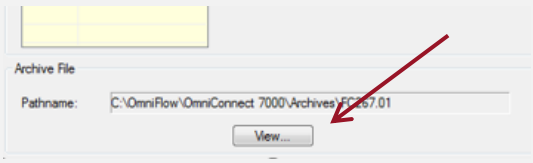
3.

Click the **Retrieve** button to save the data to the file location that is written at the bottom of the screen. The file location can be changed in your **Preferences** (**Setup** ribbon > **Preferences** button > **Archives** tab).



4.

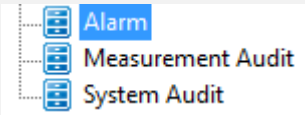
Click the **View** button to open the file and view the results.



The data recorded from all configured Modbus registers in each configured archive is shown as comma-separated data in the file; each record begins with the date and time that the group of registers were recorded.

Data from this file can be imported for analysis into a MS Excel spreadsheet or a database with predefined field names that match the description of the registers configured in the flow computer archive.

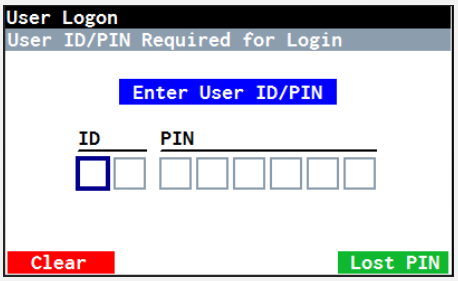
The **Alarm**, **Measurement Audit** and **System Audit** archive reports hold the same data (comma-separated) as their **Historical Report** counterparts when retrieved as formatted text reports. However, the raw data in the archives are listed from oldest to newest from top to bottom, while the **Historical Reports** are listed newest to oldest from top to bottom.



6. Front Panel Operations

At various points during front panel operations you may be prompted to log in to the flow computer. If you do not know your password, contact your flow computer Administrator.

The default Administrator password is 00 (ID) 0000 (PIN).



6.1 Observing Flow

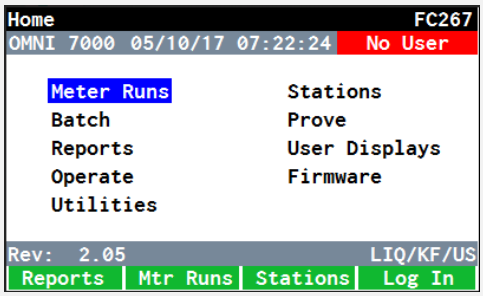
6.1.1 Meter Runs

To access current Meter Run flow measurements, follow these instructions:

1.

a. In the **Home** menu, use the arrow navigation keys to go to and select **Meter Runs**.
b. Press the **OK** key.

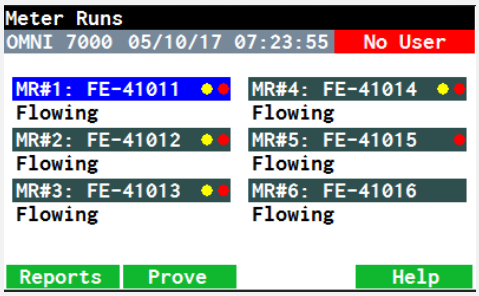
Alternatively, you can also press the **Mtr Runs** function key along the bottom of the screen to access the same **Meter Runs** screen as shown in Step 2.



2.

a. Use the **Up** or **Down** arrow navigation keys to select the Meter Run you wish to access.
b. Press **OK** to go to the detail screen for that Meter Run.

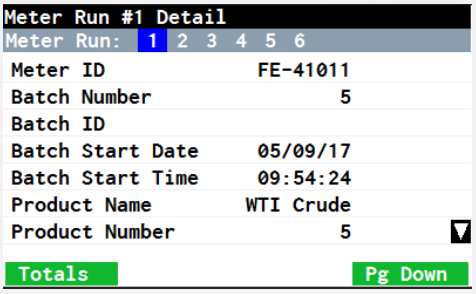
Press the **Prove** function key to go to the **Prover Control** screen (Section 6.3 Proving Functions). Press the **Reports** function key to go to the **Reports** screen (Section 6.4 Front Panel Reports).

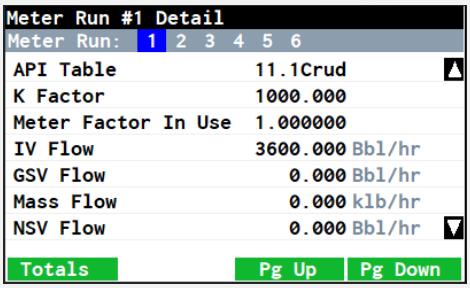


The yellow dots on this screen indicate that the Meter Run is not receiving a real signal, or it is in override or a simulated mode. The red dots indicate that an alarm has been triggered.

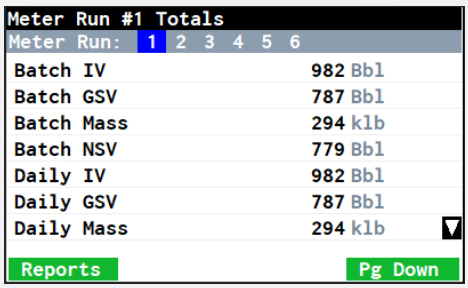
3. Use the **Page Up** or **Page Down** buttons to scroll through the **Detail** screen for the Meter Run or view the entire list of variables currently being measured.

> You can use the **Right** or **Left** arrow keys to switch to a different Meter Run from this **Detail** screen.

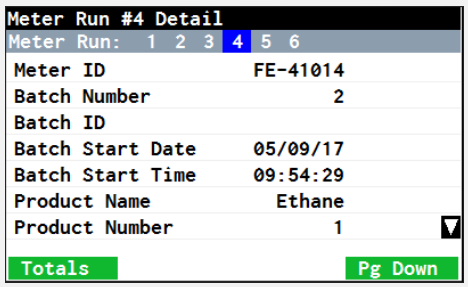




4. Press the **Totals** button on the bottom left at any time to view the **Totals** screen or the current totalizers for the batch and daily values for the highlighted Meter Run.



5. To return to the **Meter Runs** menu and view a different Meter Run, either press the **Back** key until you see the screen shown in Step 2 or use the **Right** or **Left** arrow keys to select a different Meter Run at the top of the screen.



6. Continue to select each Meter Run to view its details or totals, as needed.

7. When finished, press the **Home** key or **Back** key to return to the **Home** menu, as needed.

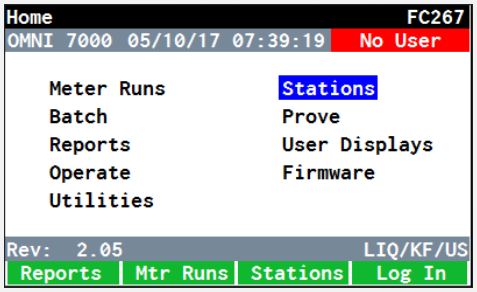
6.1.2 Stations

To access current Station operations, follow these instructions:

1.

a. In the **Home** menu, use the arrow navigation keys to go to and select **Stations**.
b. Press the **OK** key.

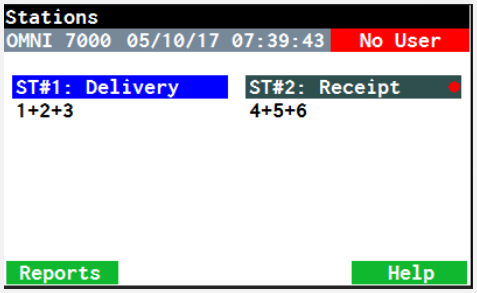
Alternatively, you can also press the **Stations** function key along the bottom of the screen to access the same **Stations** screen as shown in Step 2.



2.

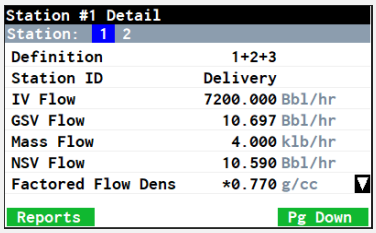
a. Use the **Left** or **Right** arrow navigation keys to select the Station you wish to access.
b. Press **OK** to go to the detail screen for that Station.

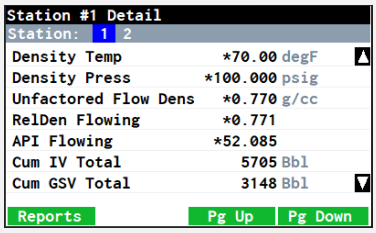
Press the **Reports** function key to go to the **Reports** screen (Section 6.4).



3.

Use the **Page Up** or **Page Down** buttons to scroll through the **Detail** screen for the Station or view the entire list of variables currently being measured.

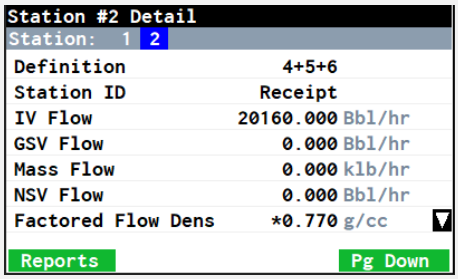




4.

To return to the **Stations** menu and view Station 2, either press the **Back** key until you see the screen shown in Step 2 or use the **Right** arrow key to highlight Station 2 at the top of the screen.

Station 2 is not a standard feature and will only appear if licensed.



5.

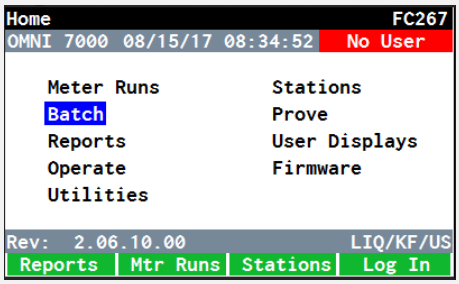
When finished, press the **Home** key or **Back** key to return to the **Home** menu, as needed.

6.2 Batch Status

To access a snapshot of the current batch status, follow these instructions:

1.

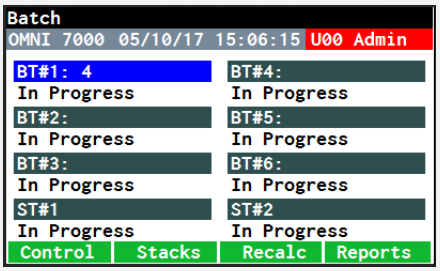
a. In the **Home** menu, use the arrow navigation keys to go to and select **Batch**.
b. Press the **OK** key.

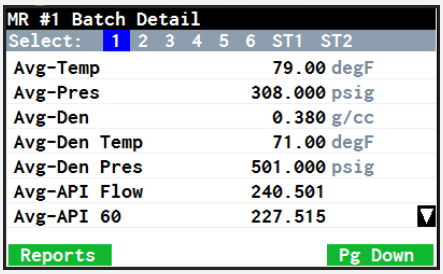


2.

The **Batch** screen displays a simple status of the batches and Stations.

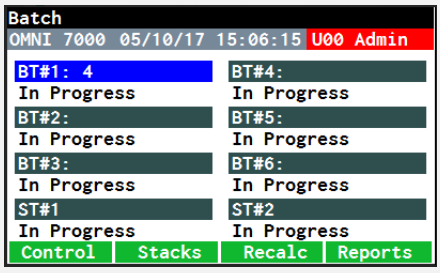
To see the **Batch Detail** screen for any of these items, use the navigation keys to highlight a batch or Station in blue, and press **OK**.





The **Control**, **Stacks**, **Recalc** and **Reports** function keys along the bottom of the **Batch** screen connect to their respective operations as outlined in the following sections:

- **Control** – Section 6.6.5: Batch Control/Ending a Batch
- **Stacks** – Section 6.6.5: Edit Batch Stacks
- **Recalc** – Section 6.6.5: Recalculate Previous Batches
- **Reports** – Section 6.4 Front Panel Reports



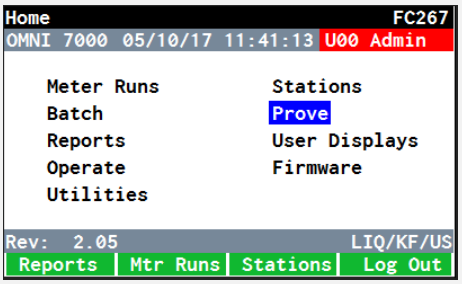
6.3 Proving Functions

6.3.1 Manual Prove Request

To manually request a prove, follow these instructions:

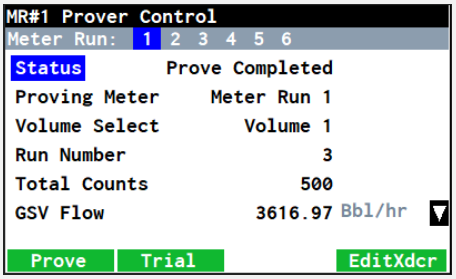
1.

a. In the **Home** menu, use the arrow navigation keys to go to and select **Prove**.
b. Press the **OK** key.



2.

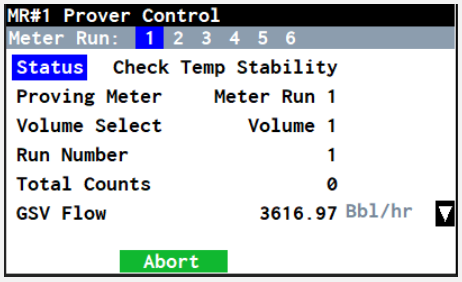
a. Use the **Right** or **Left** arrow keys to select the Meter Run (at the top of the screen) for which you need to run a prove.
b. Press the **Prove** function key to start the prove sequence.



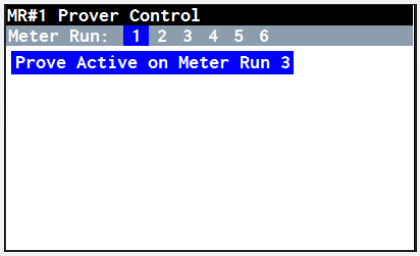
3.

Press the **Abort** function key at any time to stop the prove, if needed.

> The **Status** field shows the status of the prove as it progresses. Go to Section 3.5.3 for more information on prove status messages.

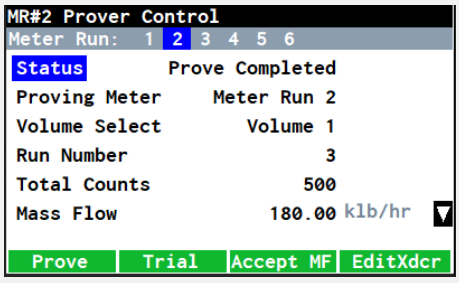


If a prove is active on a different Meter Run, you will see this temporary message.



4.

If you need to run a prove on a different Meter Run, use the **Right** or **Left** arrow keys to select a different Meter Run at the top of the screen.

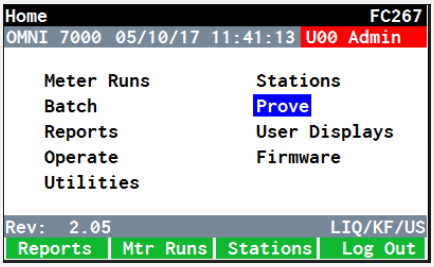


6.3.2 Edit Prove Transducers

To edit proving process input variables, follow these instructions:

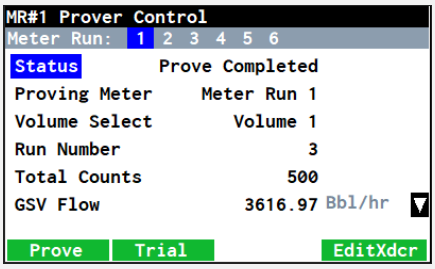
1.

a. In the **Home** menu, use the arrow navigation keys to go to and select **Prove**.
b. Press the **OK** key.



2.

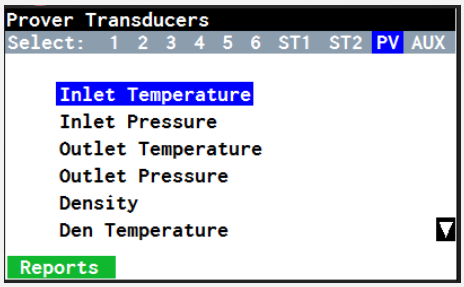
a. Use the **Right** or **Left** arrow keys to select the Meter Run (at the top of the screen) for which you need to edit the proving process input variables.
b. Press the **EditXdcr** function key.



3.

This is the **Prove Transducers** screen, which lists the editable process input variables for the prove.

a. Use the **Up** or **Down** arrow keys to choose the process input variable you wish to edit.
b. Press **OK**.

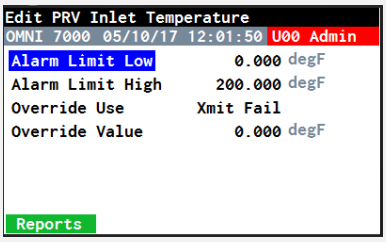


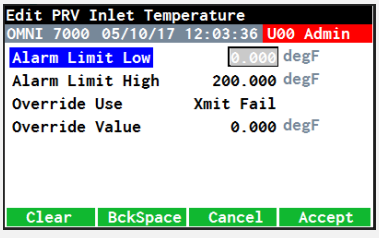
> You can also access this screen directly by selecting **Operate** on the **Home** screen, selecting **Edit Transducers,** and using the arrow keys to navigate past the Meter Runs and Stations to the Process Variables (**PV**) screen.

4.

For the process input variables temperature, pressure and density, you can edit the **Alarm Limits** and **Override** values.

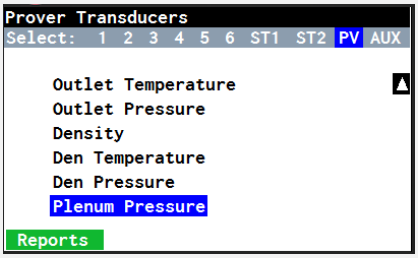
a. Use the arrow keys to select the variable you wish to edit
b. Press **OK** to access the field and make changes.
c. Press **OK** or the **Accept** function key to save your changes.

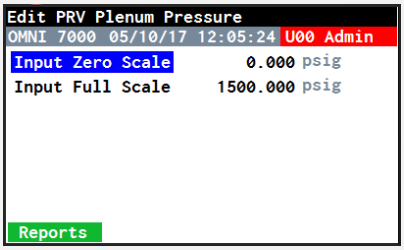




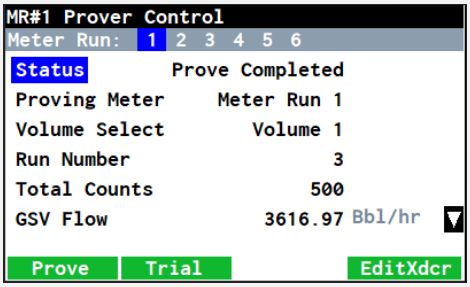
5. For some small volume type provers that have been configured to measure the **Plenum Pressure** process variable, there is also an option to edit the **Input Zero Scale** and **Input Full Scale** values.

a. Use the arrow keys to select the variable you wish to edit.
b. Press **OK** to access the field and make changes.
c. Press **OK** or the **Accept** function key to save your changes.





6. When finished, press the **Back** key to return to the **Prove Control** screen to initiate a new prove sequence, or press it again to return to the **Home** screen.



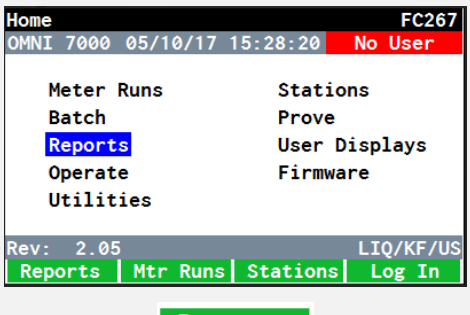
6.4 Front Panel Reports

While all of the flow computer's reports can be accessed through OMNICONNECT, you can also print reports from the front panel.

To access and print reports, follow these instructions:

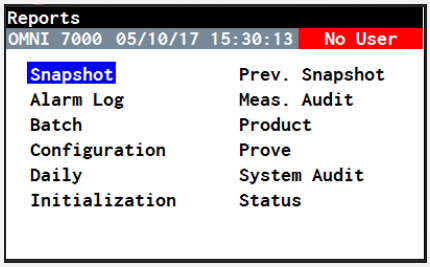
1. a. In the **Home** menu, use the arrow navigation keys to go to and select **Reports**.
b. Press the **OK** key.

Alternatively, you can access the **Reports** screen by pressing the **Reports** function key, whenever it appears, from any screen in the flow computer.



2.

a. Use the arrow keys to scroll through the list of reports to choose the report you wish to print or generate.
b. Press **OK**.

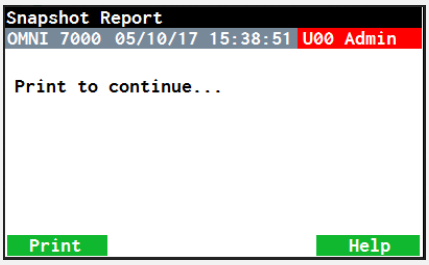


3.

Most of the reports listed in the **Reports** screen have no options available other than printing, such as the following:

- Snapshot
- Configuration
- Initialization
- Previous Snapshot
- Product
- Status

If you select a report to print from this list, press the **Print** button on the left of the screen.

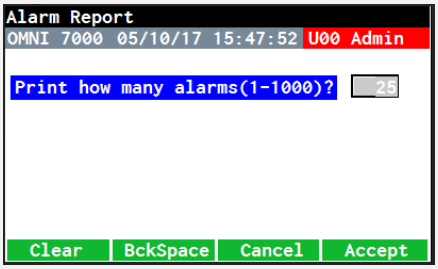


Pressing **Print** will send the report to the printer(s) configured in Section 3.5.7.

4.

The **Alarm Log** report requires you to choose a specific number of alarms, up to 1000, to print.

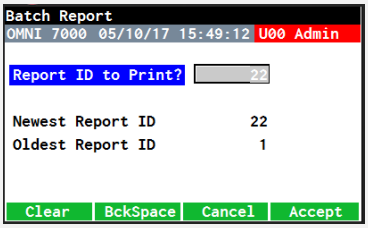
a. Press **OK** to access the number field if you wish to edit the number of alarms printed.
b. Press **OK** or the **Accept** function key to save your changes.
c. Press **Print** to print the report.

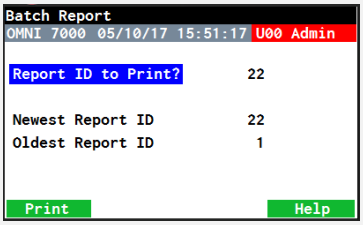


5.

The **Batch**, **Daily** and **Prove** reports require you to choose a specific ID number of the desired batch, day or prove report to print.

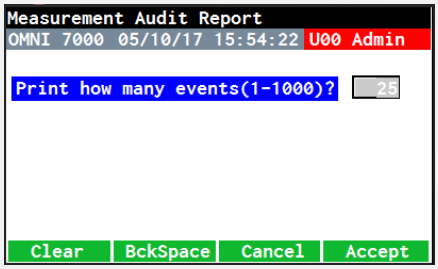
a. Press **OK** to access the number field if you wish to edit the ID number of the report to be printed.
b. Press **OK** or the **Accept** function key to save your changes.
c. Press **Print** to print the report.





6. The **Measurement Audit** and **Status** reports require you to choose a specific number of events, up to 1000, to print.

a. Press **OK** to access the number field if you wish to edit the number of events to be printed.
b. Press **OK** or the **Accept** function key to save your changes.
c. Press **Print** to print the report.



6.5 User Displays

The User Display option in the Home menu gives Operators the ability to view the real-time screens or live data produced by the flow computer (Figure 6-1). These numbered displays are configured through OMNICONNECT (go to Section 3.8

User Displays).

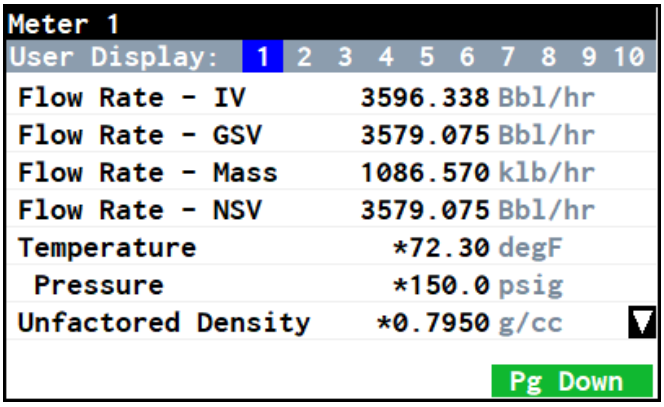


Figure 6-1: User Display Example

6.6 Operate Features

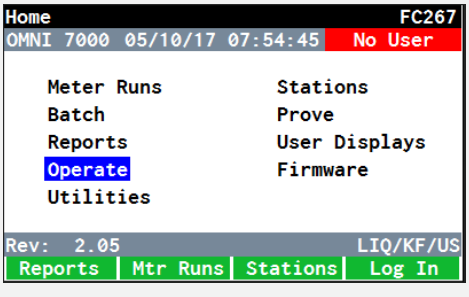
The Operate menu gives you the ability to edit process functions and access the batch control settings as well as PID control functions.

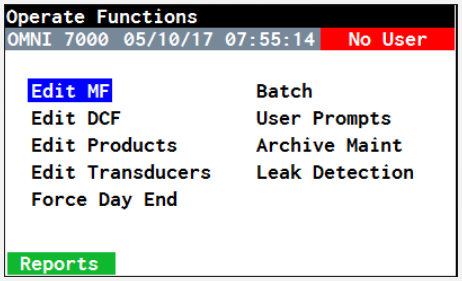
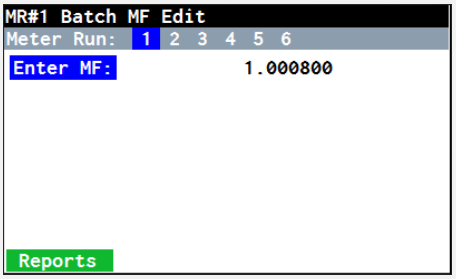
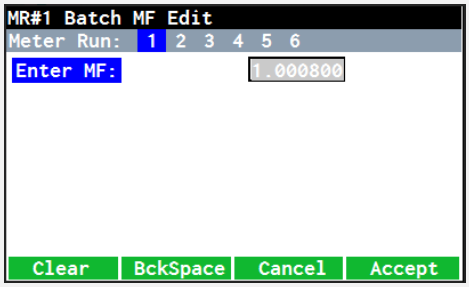
6.6.1 Edit Meter Factor

To edit the Meter Factor (MF), follow these instructions:

1.

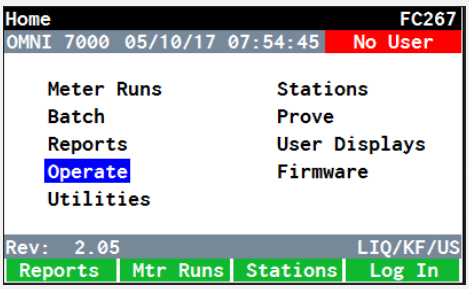
a. In the **Home** menu, use the arrow navigation keys to go to and select **Operate**.
b. Press the **OK** key.



2.	a. In the **Operate Functions** menu, select **Edit MF**. b. Press **OK**.	
3.	a. Use the **Right** or **Left** arrow keys to select the Meter Run (at the top of the screen) for which you need to update the Meter Factor. b. When the correct Meter Run is selected and the **Enter MF** line is highlighted, press **OK**.	
4.	a. When the **Enter MF** field becomes active, use the number keys to enter the new Meter Factor. b. When finished, press **OK** or the **Accept** function key to save your changes.	
5.	Use the **Right** or **Left** arrow keys to select a different Meter Run at the top of the screen to edit other Meter Factors or press the **Home** or **Back** keys to return to the **Operate Functions** menu.	

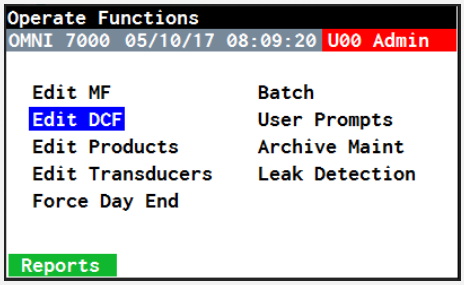
6.6.2 Edit Density Correction Factor

To edit the Density Correction Factor (DCF), follow these instructions:

1.	a. In the **Home** menu, use the arrow navigation keys to go to and select **Operate.** b. Press the **OK** key.	

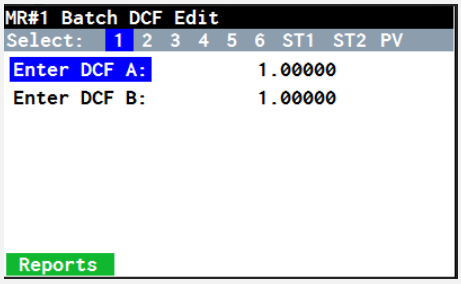
2.

a. In the **Operate Functions** menu, select **Edit DCF**.
b. Press **OK**.

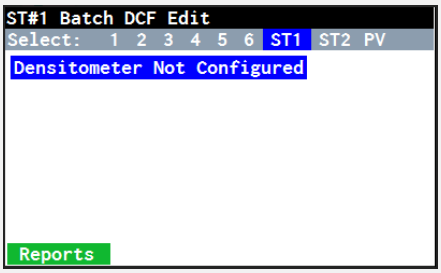


3.

Use the **Right** or **Left** arrow keys to select the Meter Run or Station (at the top of the screen) for which you need to update the DCF.

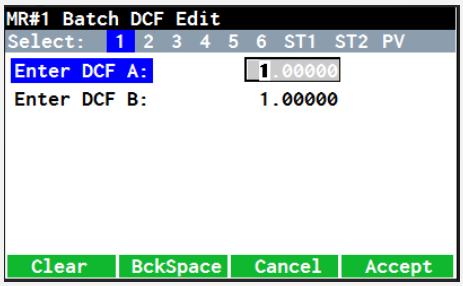


If the densitometer was not configured for a Station in OMNICONNECT, you will see this message.



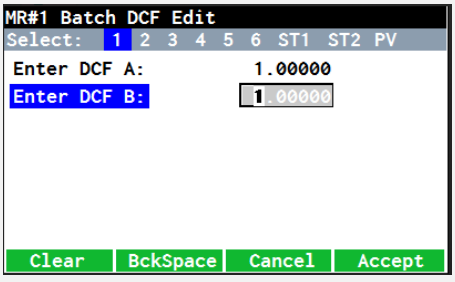
4.

a. When the correct Meter Run or Station is selected, use the **Up** or **Down** arrow keys to choose either the **Enter DCF A** or **Enter DCF B** line to edit.
b. Press **OK**.

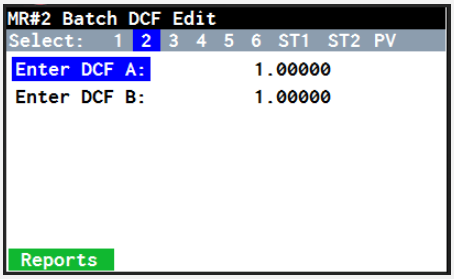


5.

a. When the **Enter DCF A/B** field becomes active, use the number keys to enter the new DCF.
b. When finished, press **OK** or the **Accept** function key to save your changes.



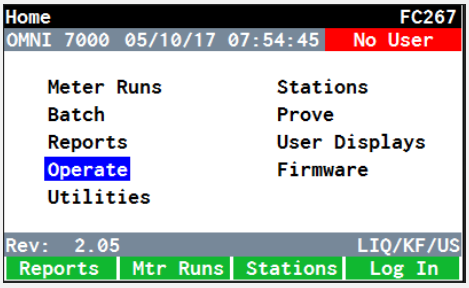
6. Use the **Right** or **Left** arrow keys to select a different Meter Run or Station (at the top of the screen) to edit other DCFs or press the **Home** or **Back** keys to return to the **Operate Functions** menu.



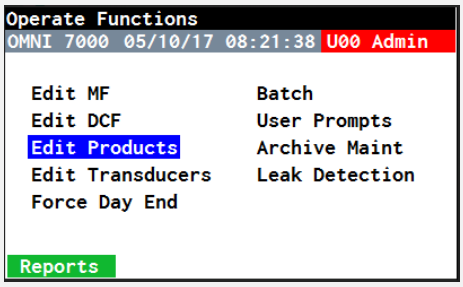
6.6.3 Edit Products

To edit products, follow these instructions:

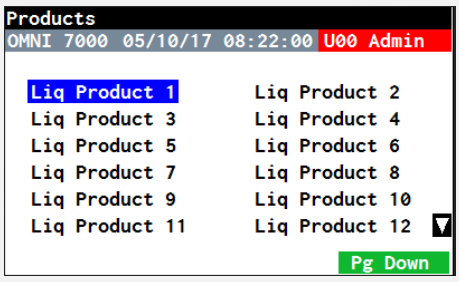
1.
a. In the **Home** menu, use the arrow navigation keys to go to and select **Operate**.
b. Press the **OK** key.



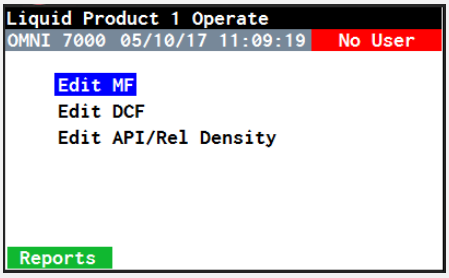
2.
a. In the **Operate Functions** menu, select **Edit Products**.
b. Press **OK**.



3.
a. Use the arrow keys and page buttons to navigate to the product you wish to edit.
b. When the correct product is highlighted, press **OK**.

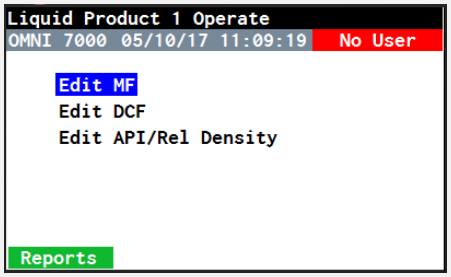


4. This is the **Product # Operate** screen.
a. If you need to edit the product's Meter Factor, go to Step 5.
b. If you need to edit the product's DCF, go to Step 6.



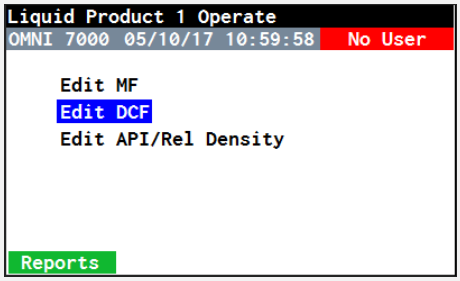
5.

a. If you need to edit the product's Meter Factor, select **Edit MF**.
b. Press **OK**.
c. Go to Section 6.6.1 Edit Meter Factor, and follow the instructions in Steps 3-5 to edit the Meter Factor.
d. When finished, press the **Back** key to come back to this screen; then continue from here to Step 6 to edit the DCF.



6.

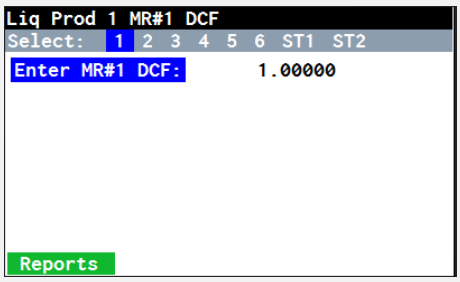
a. If you need to edit the product's DCF, select **Edit DCF**.
b. Press **OK**.



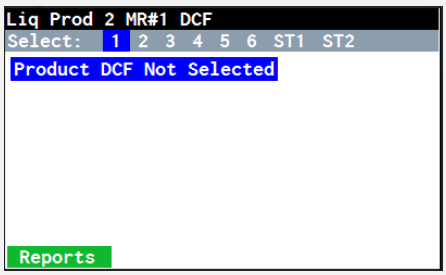
7.

If the product is configured in OMNICONNECT to use the **Product DCF**, you can edit it for any Meter Run or Station from this screen using the arrow and number keys.

a. Press **OK** to access the number field and enter your changes.
b. When finished, press **OK** or the **Accept** function key to save your changes

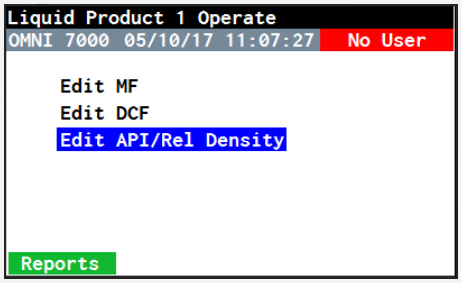


If the product is configured to use the Meter Run or the Station's DCF (A or B), you will see this screen.



8.

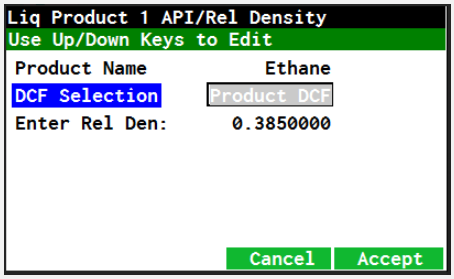
a. Press the **Back** key to come back to the **Product # Operate** screen.
b. Select **Edit API/Rel Density** to edit the DCF selection or relative density values. If you have a Metric firmware application, select **Edit Ref Density**.

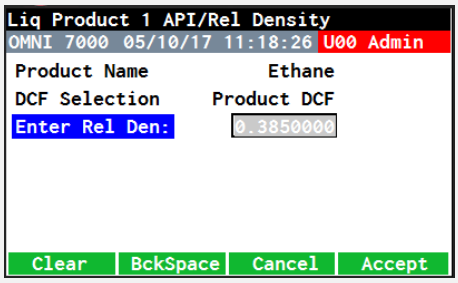


9.

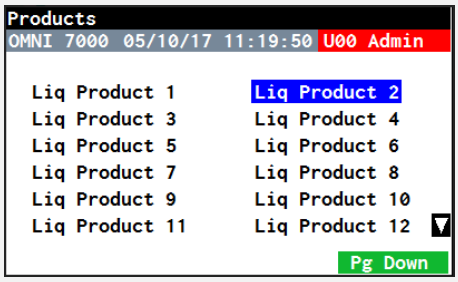
a. Use the arrow keys to select the line you wish to edit and then press **OK** to access the field and make changes.
b. When finished, press **OK** or the **Accept** function key to save your changes.

While you can only edit the product name from OMNICONNECT, you can edit both the **DCF Selection** (A, B or Product) and the **Relative Density** value from this screen.





10. Press the **Back** key to return to the main **Products** screen and select the next product to edit, as needed.

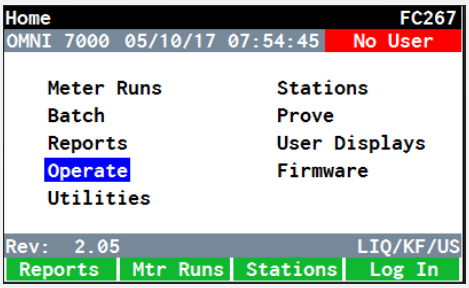


6.6.4 Edit Transducers

To edit transducer settings, follow these instructions:

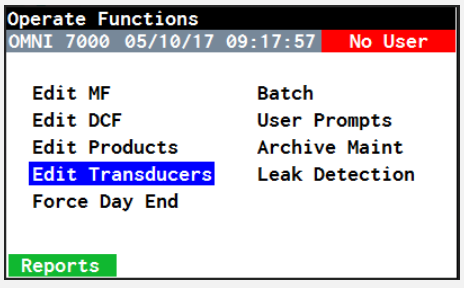
1.

a. In the **Home** menu, use the arrow navigation keys to go to and select **Operate**.
b. Press the **OK** key.

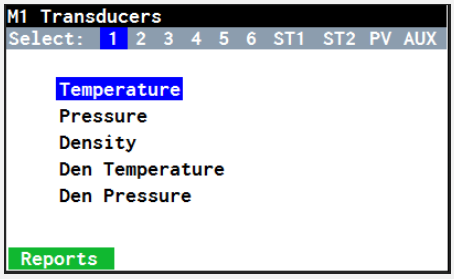


2.

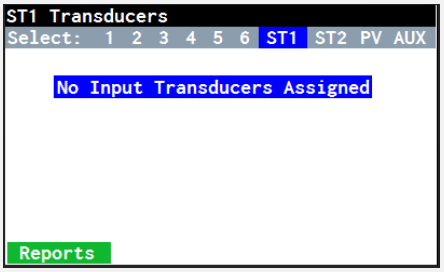
a. In the **Operate Functions** menu, select **Edit Transducers**.
b. Press **OK**.



3. Use the **Right** or **Left** arrow keys to select the Meter Run or Station (at the top of the screen) for which you need to update the process variables.

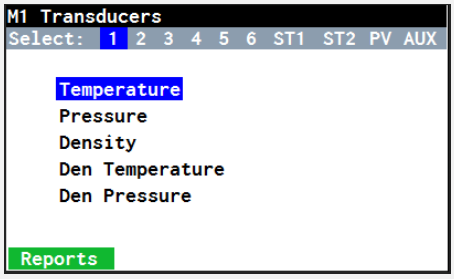


If these process variables were not configured for a Station in OMNICONNECT, you will see this message.



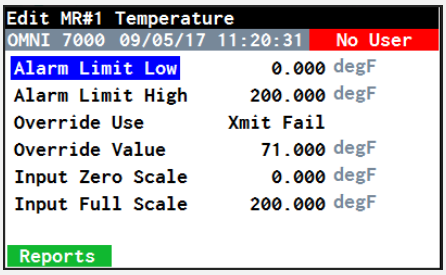
4.

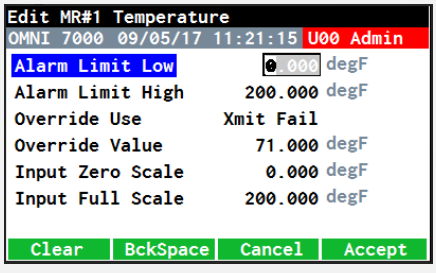
a. When the correct Meter Run or Station is selected, use the **Up** or **Down** arrow keys to choose the process variable you wish to edit.
b. Press **OK**.



5.

a. Use the arrow keys to select the variable you wish to edit.
b. Press **OK** to access the field and make changes.
c. Press **OK** or the **Accept** function key to save your changes.

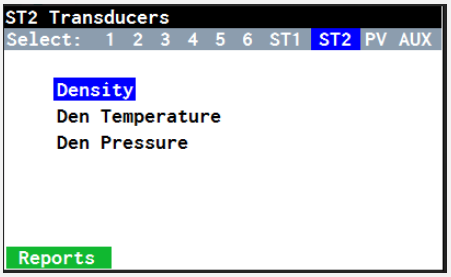




Depending on the I/O type assigned to the transducer (Temperature, Pressure, etc.), you may see different items listed on this screen.

6.

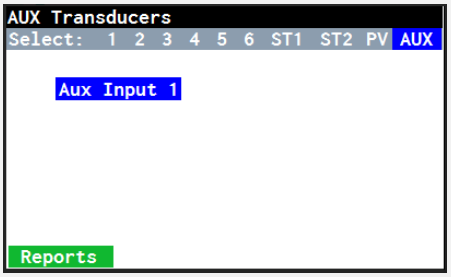
a. Press the **Back** key to return to the main **Transducers** menu.
b. Use the navigation keys to select a different Meter Run or Station to edit, as needed.

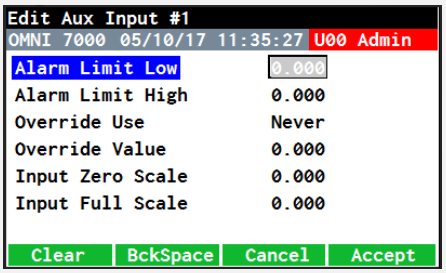


7.

If the flow computer is configured through OMNICONNECT to use **Auxiliary Inputs**, you can also access and edit their process variables through the **Transducers** screen.

> **Auxiliary Inputs** can be used to bring in signals for variables such as %BS&W and viscosity.



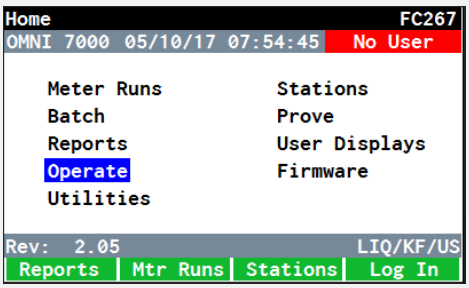


6.6.5 Batch Operations

To access batch operations from the front panel, follow these instructions:

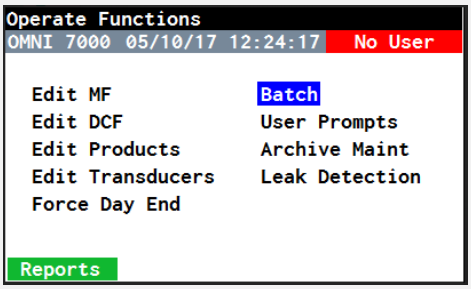
1.

a. In the **Home** menu, use the arrow navigation keys to go to and select **Operate**.
b. Press the **OK** key.



2.

In the **Operate Functions** screen, select **Batch**.

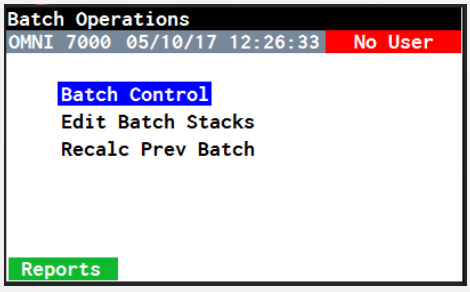


3.

a. Use the arrow keys to select one of the following operations:

- **Batch Control**
  (go to Section 6.6.5: Batch Control/Ending a Batch)
- **Edit Batch Stacks**
  (go to Section 6.6.5: Edit Batch Stacks)
- **Recalc Prev Batch**
  (go to Section 6.6.5: Recalculate Previous Batches)

b. Press **OK**.

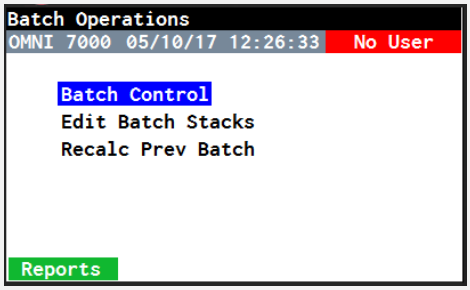


Batch Control/Ending a Batch

To access batch control operations, follow these instructions:

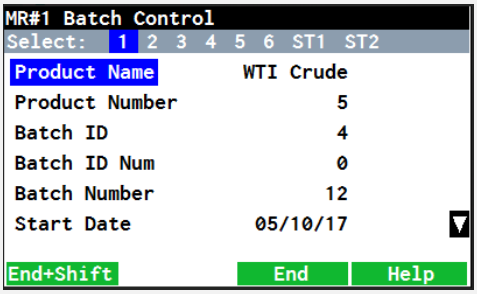
1.

a. From the **Batch Operations** screen, select **Batch Control**.
b. Press **OK**.



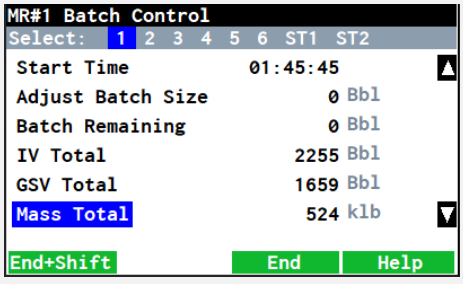
2.

To view a current batch, use the **Right** or **Left** arrow keys to select a Meter Run or Station (at the top of the screen) currently running a batch.



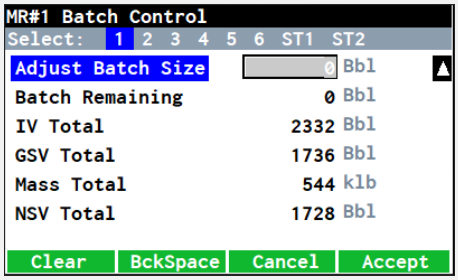
3.

Use the **Up** or **Down** arrow keys to scroll through the list of details for that batch.

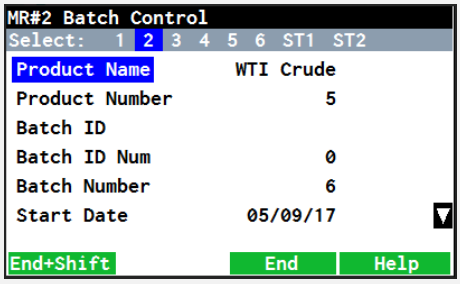


4. You can edit some of the variables for any of the batches currently configured, such as **Batch ID Number**, **Adjust Batch Size**, **Batch Remaining** and any of the **Batch Total** values.

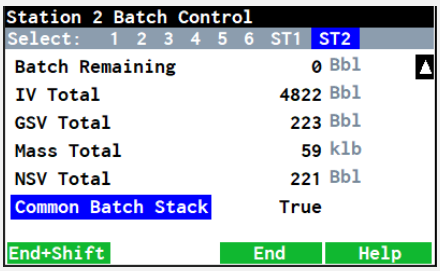
a. Use the arrow keys to select the variable you wish to edit.
b. Press **OK** to access the field and make changes.
c. Press **OK** or the **Accept** function key to save your changes.

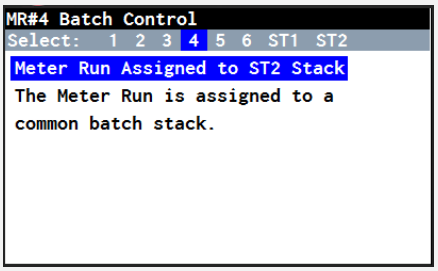


5. Use the **Right** or **Left** arrow keys to select a different Meter Run or Station (at the top of the screen) to view or edit its batch operations.

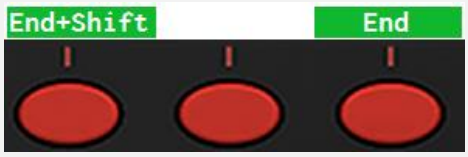


If a Station is running a common batch stack, it will be listed on its **Batch Control** screen (left). The Meter Runs defined as part of a Station and using a common batch stack will display a notice (right) rather than displaying individual Meter Run batch details as it would for a Meter using an Independent batch stack.





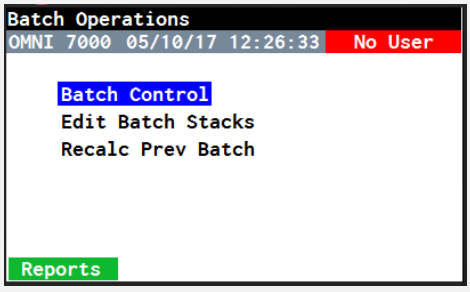
6. To end a selected batch and generate a report, either press the **End+Shift** function key or the **End** function key.



The **End+Shift** function key ends the current batch, but it allows the next batch in the sequence to start on the next product in the batch stack queue. The **End** function key ends the current batch and starts a new batch with the same product as was running before, not allowing a batch stack to shift to the next product in the queue.

7.

a. Continue to view, edit or end batches, as needed.
b. When finished, press the **Back** key to return to the **Batch Operations** screen or the **Home** key to return to the **Home** screen.

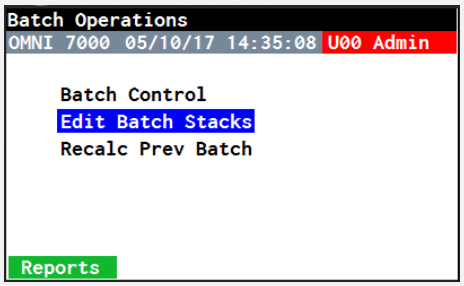


Edit Batch Stacks

To edit batch stacks, follow these instructions:

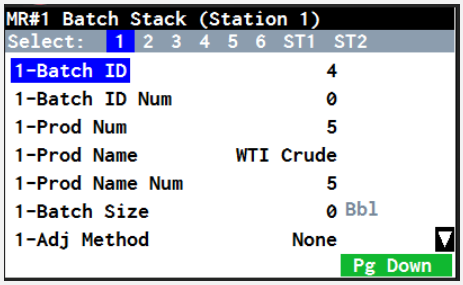
1.

a. From the **Batch Operation** screen, select **Edit Batch Stack**.
b. Press **OK**.



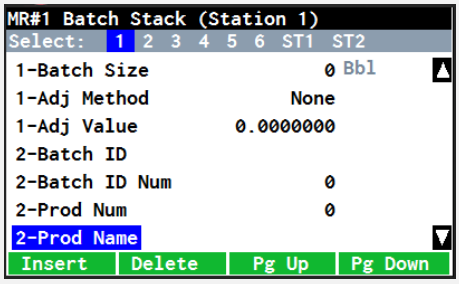
2.

To view a current batch stack, use the **Right** or **Left** arrow keys to select a Meter Run or Station (at the top of the screen) running a batch.



3.

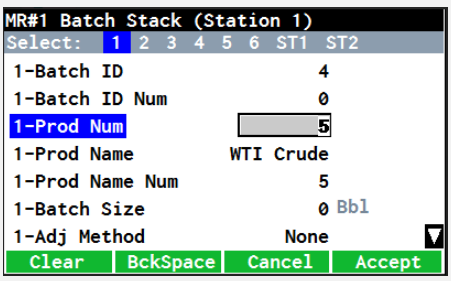
Use the **Up** or **Down** arrow keys to scroll through the list of details for that batch stack and all the batches in its sequence.



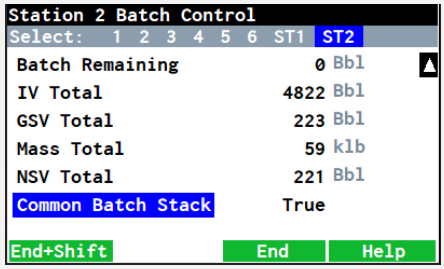
4.

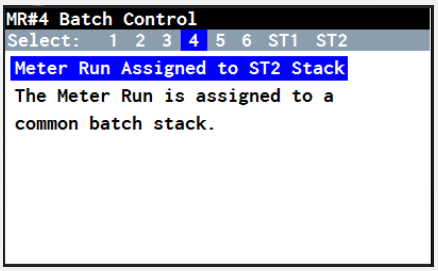
You can edit some of the variables for any of the batches currently configured, such as **Batch ID Number**, **Batch Size** and **Product Number**.

a. Use the arrow keys to select the variable you wish to edit.
b. Press **OK** to access the field and make changes.
c. Press **OK** or the **Accept** function key to save your changes.

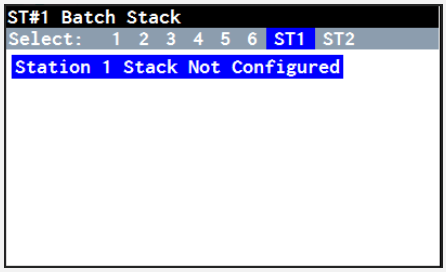


If a Station is running a Common Batch Stack, it will be listed on its **Batch Control** screen (left). The Meter Runs assigned to this stack will display a notice (right) rather than any batch details (as it would for an Independent Batch).



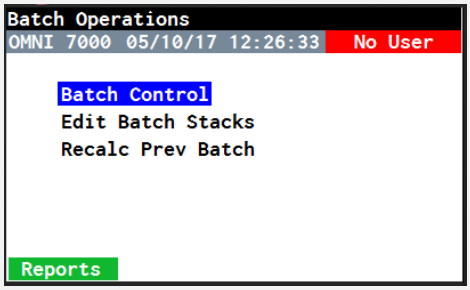


If a stack is not configured in OMNICONNECT, the flow computer will display a notice.



5.

a. Continue to view or edit batch stacks, as needed.
b. When finished, press the **Back** key to return to the **Batch Operations** screen or the **Home** key to return to the **Home** screen.



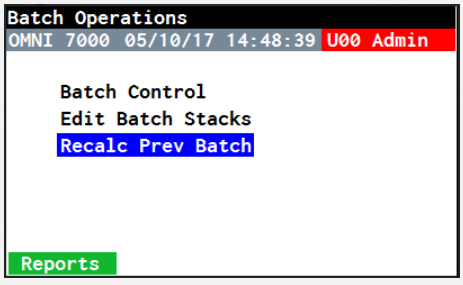
Recalculate Previous Batches

Previous batches may need to be recalculated based on updated volume correction data, such as %BS&W or reference gravity/density, which is usually determined by laboratory analysis.

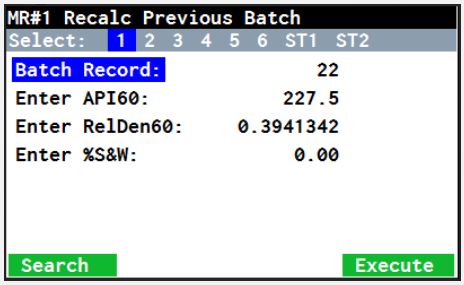
To access previous batch records and recalculate them, follow these instructions:

1.

a. From the **Batch Operation** screen, select **Recalc Prev Batch**.
b. Press **OK**.



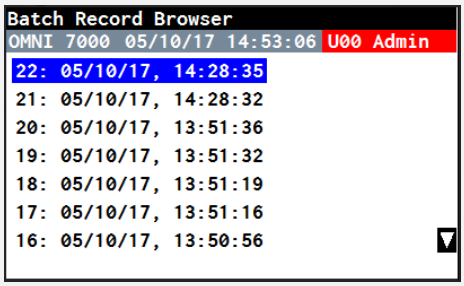
2. Use the **Right** or **Left** arrow keys to select a Meter Run or Station (at the top of the screen) to access the batch records for each.



3. After selecting the Meter Run or Station, press the **Search** button on the left to view the list of previous batch records.

4.

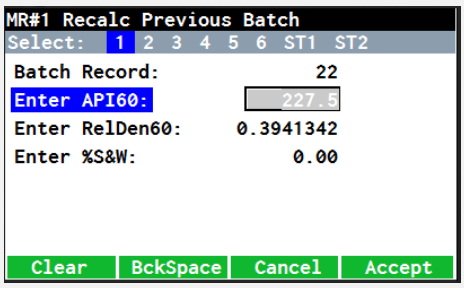
a. In the **Batch Record Browser**, use the **Up** or **Down** arrow keys to scroll through the list of records for that Meter Run or Station.
b. Select the batch you wish to recalculate.
c. Press **OK**.



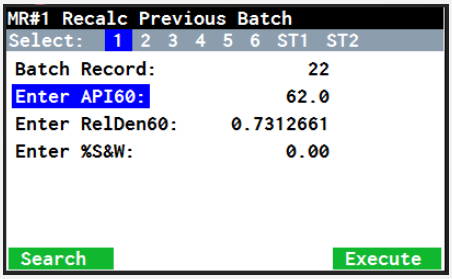
> You can search for a batch by the time and date it was run or by its number in the left-hand column, which is also accessible in the **Historical Batch Reports** through OMNICONNECT.

5.

a. Use the arrow keys to select the variable you wish to edit.
b. Press **OK** to access the field and make changes.
c. Press **OK** or the **Accept** function key to save your changes.

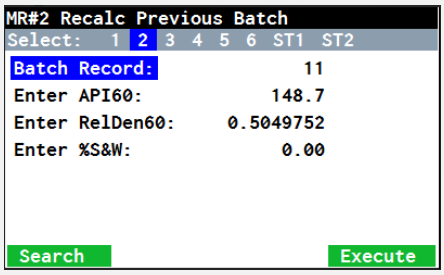


6. When finished entering your changes, press the **Execute** function key to recalculate the batch and generate a report.



If a printer is connected and the flow computer is configured to print batch reports to it, the recalculated batch report will automatically print. You can also manually print reports from the front panel (Section 6.4) or access them through OMNICONNECT (Section 4).

7. Continue to recalculate batches as needed by selecting the Meter Run or Station and searching for the batch.



6.6.6 PID Control

PID control functions are accessible through the front panel through Modbus writes. You can also manage a limited number of PID settings through the front panel, but to fully configure PID functions, go to Section 3.7

PID Configuration to complete PID setup in OMNICONNECT.

PID control gives you the ability to vary output to a control valve based on process variable readings using independent control loops (see Section 3.7 for setup) (Figure 6-2). Each of the six available loops can control a primary variable setpoint (usually flow rate) with a secondary variable setpoint (usually meter back pressure or delivery pressure).

The primary and secondary setpoints can be adjusted locally through the front panel and remotely through a communication link. The primary setpoint can also be adjusted through an analog input to the flow computer.

Operators can use contact closures to initiate the startup and shutdown ramp function, which limits the control output slew rate during startup and shutdown conditions.

A high or low 'error select' function causes automatic override control by the secondary variable when it is necessary either to maintain a minimum secondary process value or limit the secondary process maximum value.

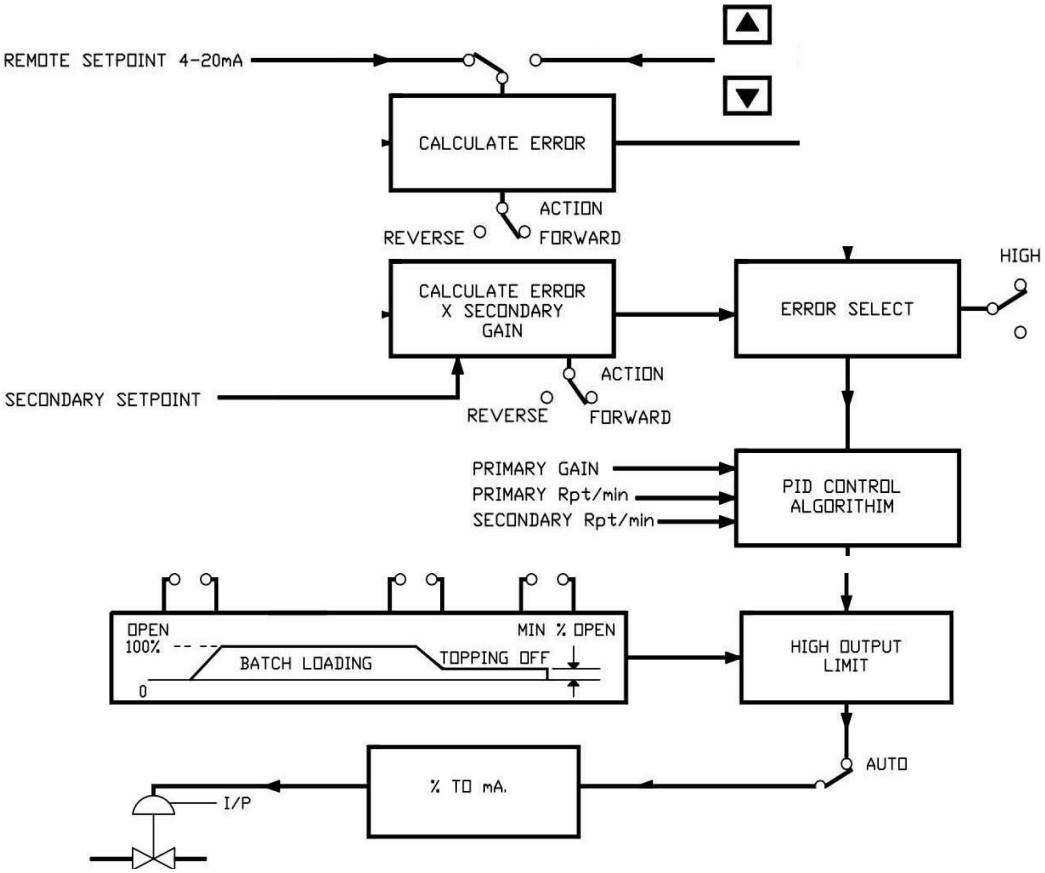
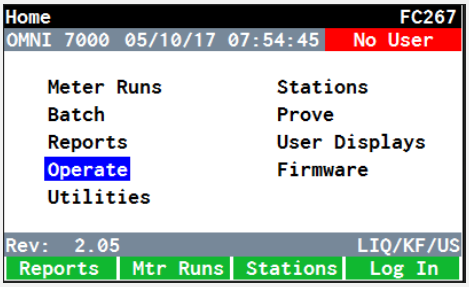
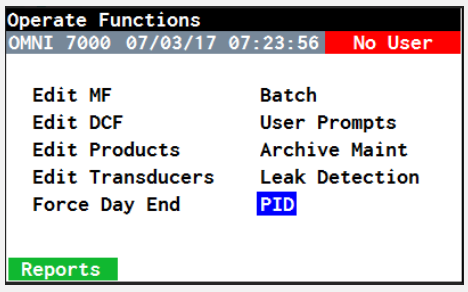
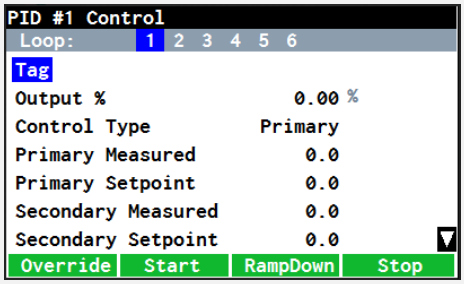


Figure 6-2: Typical PID Control Application (Single Loop)

To access PID control functions, follow these instructions:

1.	a. In the **Home** menu, use the arrow navigation keys to go to and select **Operate**. b. Press the **OK** key.	
2.	a. In the **Operate Functions** menu, select **PID**. b. Press **OK**.	

3. Use the right or left arrow keys to view the settings for each loop.



Key PID control settings include:

- **Control Type** – Indicates which parameter is being controlled: primary or secondary
- **Primary/Secondary Measured** – Shows the actual measurement value of the primary or secondary parameter in engineering units
- **Primary/Secondary Setpoint** – Shows the actual primary or secondary setpoint currently used in engineering units
- **Primary Setpoint Source** – Indicates whether the source of the primary input is remote or local
- **Remote Setpoint Value** – Shows the current value of the remote setpoint in engineering units

4. To edit the control settings, go to the following sections in Section 6.6.6 for PID operations information and instructions:

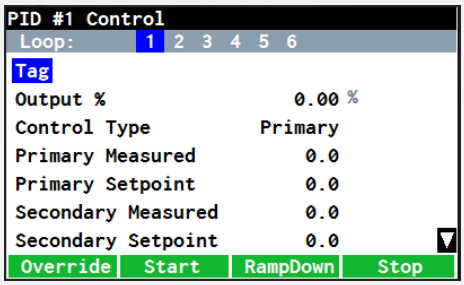
- Change PID Operating Mode.
- Local and Remote Setpoints
- Startup and Shutdown Ramping Functions.
- PID Control Tuning.

Change PID Operating Mode

While the default PID control operating mode is automatic, the flow computer incorporates local manual control of the control output through the front panel and a bumpless transfer between automatic and manual control.

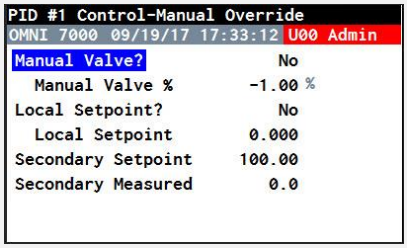
To change the PID control operating mode from automatic to manual (and back), follow these instructions:

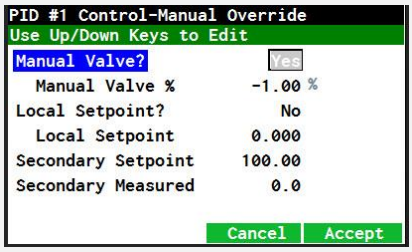
1. In the **PID Control** screen for your selected loop, press the **Override** function key on the bottom left.



2.

a. With **Manual Valve?** highlighted, press the **OK** key to open the option field.
b. Scroll down to select **Yes**, and press **OK** again.



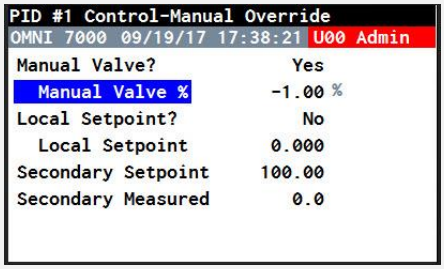


Even if the **Local Setpoint** is set to **Yes** on this screen, you are still in **Automatic Mode** if the **Manual Value?** is set to **No**. The **Manual Value?** must be set to **Yes** to enter **Manual Mode**.

3.

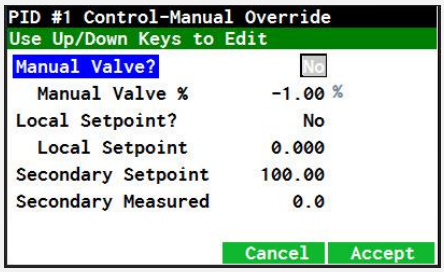
You are now in **Manual Control**.

a. Scroll down to highlight **Manual Valve %** and press **OK**.
b. Adjust the percentage that the valve is left open, as needed.
c. When finished, press **OK**.



4.

To return to **Automatic Control**, highlight and select **Manual Valve?** again, and select **No**.



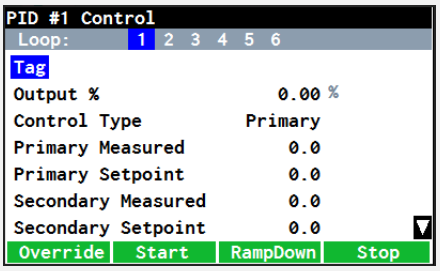
Local and Remote Setpoints

The PID control loop can be configured to accept either a Local Setpoint or a Remote Setpoint value for the Primary Controlled variable. The Remote Setpoint is derived from a Modbus write or an analog input (usually 4–20 mA). This input is scaled in engineering units.

You must configure both zero (4mA) and Full Scale (20mA) values. The 4–20 mA scaling of this input determines the scaling of the controlled variables.

To switch from a Remote to a Local Setpoint (and back), follow these instructions:

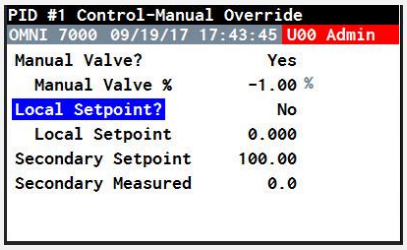
1. In the **PID Control** screen for your selected loop, press the **Override** function key on the bottom left.

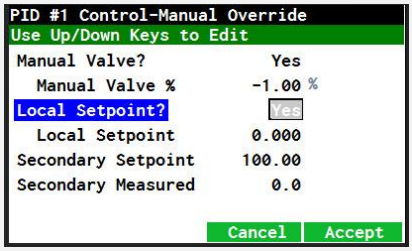


2.

a. Use the arrow keys to scroll down and highlight **Local Setpoint?**.
b. Press **OK** to open the option field, and select **Yes**.
c. Press **OK**.

You can change from a **Remote Setpoint** to a **Local Setpoint** while in either **Automatic** or **Manual Mode**. The switch from **Remote** to **Local** is bumpless.

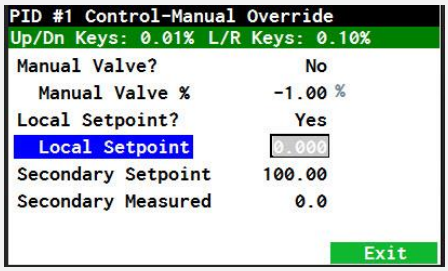




3.

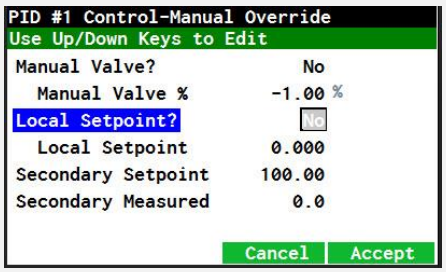
a. Scroll down to **Local Setpoint** and press **OK**.
b. Enter the new **Local Setpoint** value.
c. Press **OK**.

Setting a **Secondary Setpoint** value is optional.



4. To return to a **Remote Setpoint**, highlight and select **Local Setpoint?** again, and select **No**.

The switch to the **Remote Setpoint** may not be bumpless, depending upon the **Remote Setpoint** source.



Startup and Shutdown Ramping Functions

Startup and shutdown ramping functions are enabled when a startup and/or shutdown ramp rate between 0 and 99% is entered during PID configuration (Section 3.7).

On the bottom of the main PID Control screen (Figure 6-3), there are three command function keys (besides Override, as discussed in Local and Remote Setpoints):

- Start – Begin the process of the valve ramping open (start the batch).
- RampDown – Begin the process of the valve ramping down to the minimum percent open.
- Stop – Immediately close the valve after it has been ramped to the minimum percent open and stop the flow.

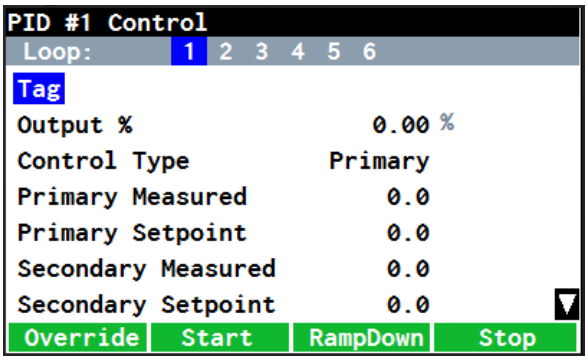


Figure 6-3: PID Control Screen

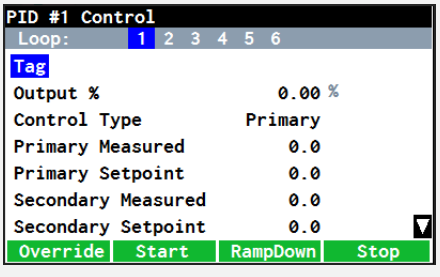
Inputs are provided for startup and shutdown ramp rates and minimum output percentage settings. When these startup and shutdown ramp rates are applied to the control output, movements will be limited to the stated percentage of movement per half-second. On receipt of a shutdown signal (the RampDown function key), the output will ramp to the minimum output percentage for top off purposes.

PID Control Tuning

Individual control of gain and integral action are provided for both the primary and secondary control loops.

To tune PID loops, follow these instructions:

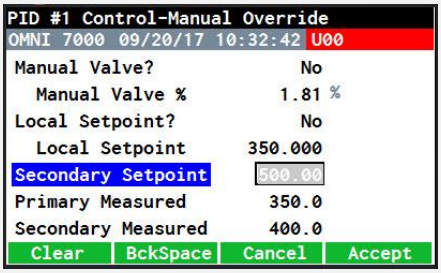
1. In the **PID Control** screen for your selected loop, press the **Override** function key on the bottom left to enter the **Manual Override** screen.



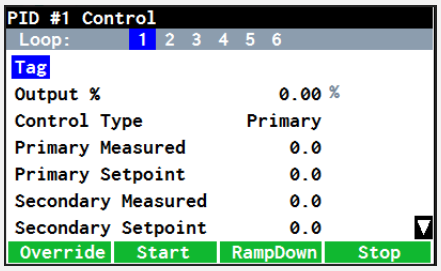
2. Tune the primary variable loop first:

a. Use the arrow keys to scroll down and highlight **Secondary Setpoint**.
b. Press **OK**.
c. Enter the new **Secondary Setpoint** value.
d. Press **OK** again to save the entry.

Set the **Secondary Setpoint** high or low enough to stop the secondary control loop from taking control.



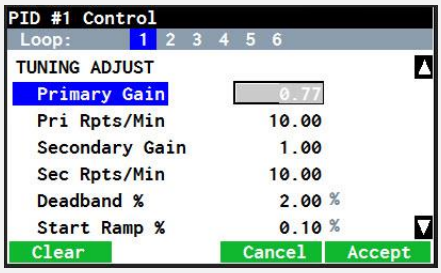
3. Press the **Return** button to go back to the **PID Control** screen.



4.

a. Use the arrow navigation keys to scroll down and highlight **Primary Gain**.
b. Press **OK**.
c. Enter the new value.
d. Press **OK** again to save the entry.

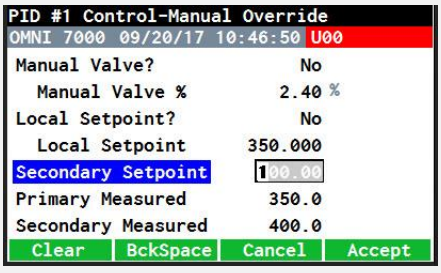
Adjust the primary gain and integral repeats per minute for stable control.



5. Press the **Override** function key again to return to the **Manual Override** screen.

6.

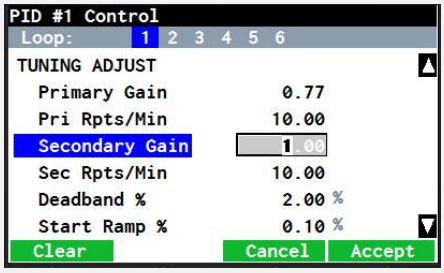
a. Use the arrow navigation keys to scroll down and highlight **Secondary Setpoint**.
b. Press **OK**.
c. Temporarily adjust the **Secondary Setpoint** to allow control on the secondary variable without interference from the primary variable.
d. Press **OK** again to save the entry.



7. Press the **Return** button to go back to the **PID Control** screen.

8.

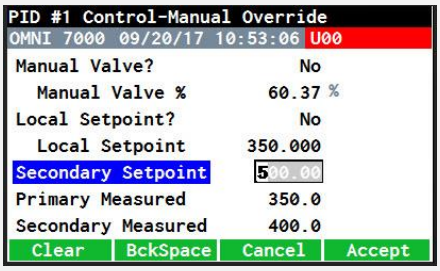
a. Use the arrow navigation keys to scroll down and highlight **Secondary Gain**.
b. Press **OK**.
c. Adjust the **Secondary Gain** and integral repeats per minute for stable control of the secondary variable.
d. Press **OK** again to save the entry.



9. Press the **Override** function key again to return to the **Manual Override** screen.

10.

a. Use the arrow navigation keys to scroll down and highlight **Secondary Setpoint**.
b. Press **OK**.
c. Return the **Secondary Setpoint** to the original value so that the primary variable will be controlled again.
d. Press **OK** again to save the entry.



Estimate PID Loop Gain

Each process loop will exhibit a gain function. A change in control valve output will produce a corresponding change in each of the process variables. The ratio of these changes represents the gain of the loop. For example, if a 10% change in control output causes a 10% change in the process variable, the loop gain is 1.0. If a 10% change in control output causes a 20% change in process variable, the loop gain is 2.0.

To provide stable control, the gain of each loop with the controller included must be less than 1.0. In practice, the controller gain is usually adjusted so that the total loop gain is between 0.6 and 0.9. Unfortunately, the gain of each loop can vary with operating conditions. For example, a butterfly control valve may have a higher gain when almost closed, than when it is almost fully open. This means that in many cases, the controller gain must be set low so that stable control is achieved over the required range of control.

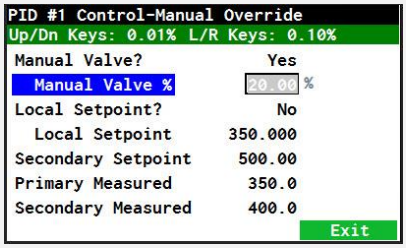
To estimate the gain of each loop for the required range of operating conditions, follow these instructions:

1. Go to the Change PID Operating Mode in Section 6.6.6 and place the PID operating mode into **Manual Mode**.

When finished, continue to Step 2.

2. While in **Manual Mode**, use the arrow navigation keys to scroll down and highlight **Manual Value %**.

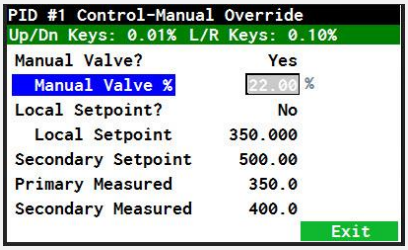
Adjust the control output for the required flow conditions and note the process variable values.



3.

a. Press **OK** to open the field for editing.
b. Make a known percentage step change of output.
c. Press **OK** again to save the entry.

For example, from 20% to 22% equals a 10% change.



Note the percentage change of each process variable:

- Primary Gain Estimate = 0.75 (Primary Loop Gain)
- Secondary Gain = 0.75 (Secondary Loop Gain Estimate)

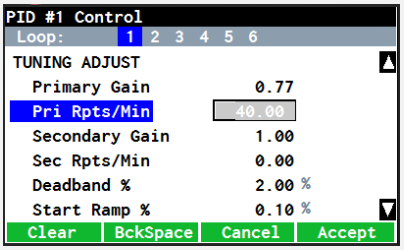
For example, 100 m^3/hr to 110 m^3/hr equals a 10% change in flow rate.

Estimate PID Repeats and Minutes

To estimate the repeats and minutes and fine-tune the gain, follow these instructions:

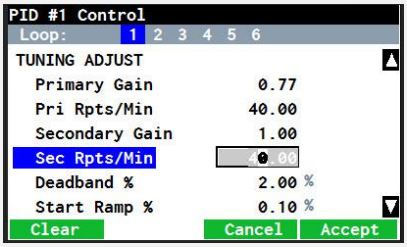
1.

a. In the **PID Control** screen, use the arrow navigation keys to scroll down and highlight **Pri Rpts/Min**.
b. Press **OK**.
c. Enter 40 as the new primary variable.
d. Press **OK** to save your changes.



2.

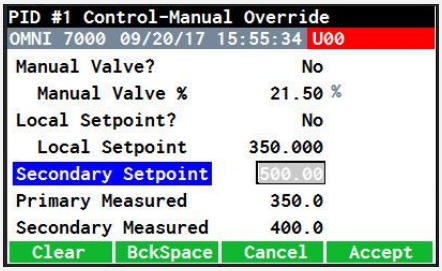
a. Scroll down and highlight **Sec Rpts/Min**.
b. Press **OK**.
c. Enter 40 as the new secondary variable.
d. Press **OK** again to save the entry.



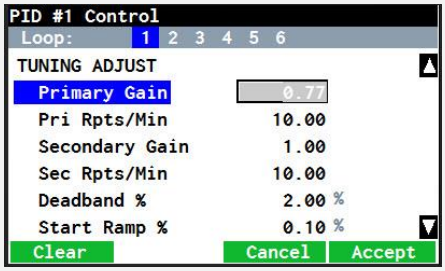
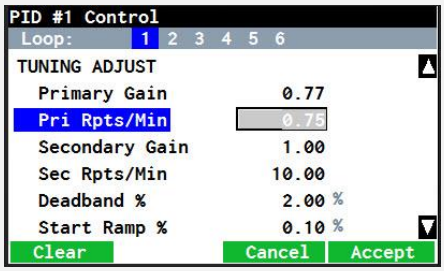
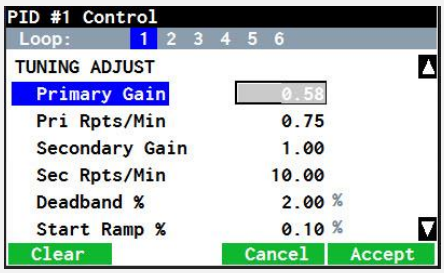
3. Press the **Override** function key on the bottom left to enter the **Manual Override** screen.

4. Adjust the setpoints so that only the primary variable is in control.

Go back to PID Control Tuning in Section 6.6.6 for instructions. When finished, continue to Step 5.



5. Press the **Return** button to go back to the **PID Control** screen.

6.	a. Use the arrow navigation keys to scroll down and highlight **Primary Gain**. b. Press **OK**. c. While controlling the primary variable (Step 4), increase the primary gain until some controlled oscillation is observed. d. Press **OK** again to save the entry.	
7.	a. Scroll to and highlight **Pri Rpts/Min** and press **OK**. b. Set the **Pri Rpts/Min** to equal 0.75 (period of the oscillation in minutes). c. Press **OK**.	
8.	a. Scroll to and highlight **Primary Gain** again and press **OK**. b. Set the **Primary Gain** to 75% of the value needed to make the loop oscillate.	
9.	Repeat Steps 3 to 9 for the secondary variable.	

6.6.7 Other Operations

Force Day End

The Force Day End operation is accessible through the Operate Functions screen (Home menu > Operate). You may manually force the end of operations for the day and immediately start a new day for any given Meter Run or Station and generate a Daily report.

User Prompts

The User Prompts operation is accessible through the Operate Functions screen (Home menu > Operate). You may view the list of up to 16 user prompts previously configured in OMNICONNECT.

Archive Maintenance

The Archive Maintenance operation is accessible through the Operate Functions screen (Home menu > Operate). You may view the archive status and disable or enable the configuration to allocate memory for data to be archived through OMNICONNECT, but you cannot edit any archive details through this screen.

Leak Detection

The Leak Detection operation is accessible through the Operate Functions screen (Home menu > Operate). You may manually command the flow computer to capture the current totalizer values at the time a leak is detected. The Leak Detection command can also be issued through a Modbus write.

6.7 Firmware

The Firmware screen, which is accessible through the Home menu, allows Operators to see a list of firmware features on the flow computer with their current revision numbers and checksums (Figure 6-4). These include the following features:

- Main firmware application revision
- CPU serial number
- Dual Ethernet firmware revisions
- Configuration and metrological checksums

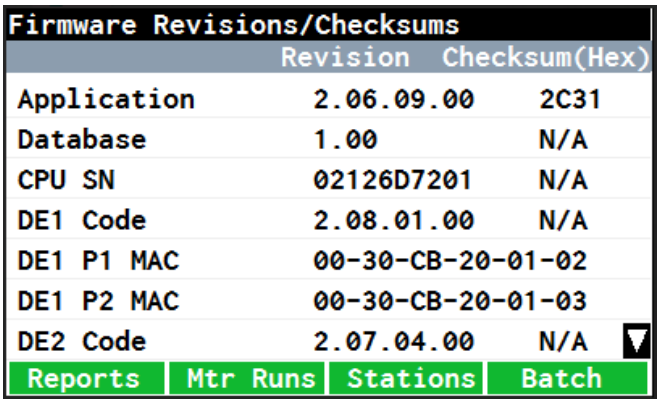


Figure 6-4: Firmware Revisions/Checksums Screen

7. Maintenance

7.1 Software and Firmware Updates

See Section 4.7.3 Setup Preferences and Section 4.9 Check for Updates in the Installation Guide to set preferences for firmware and software updates as well as instructions on how to manually check for new version releases.

7.2 OMNICONNECT® Diagnostics

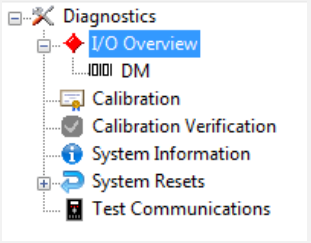
7.2.1 I/O Overview

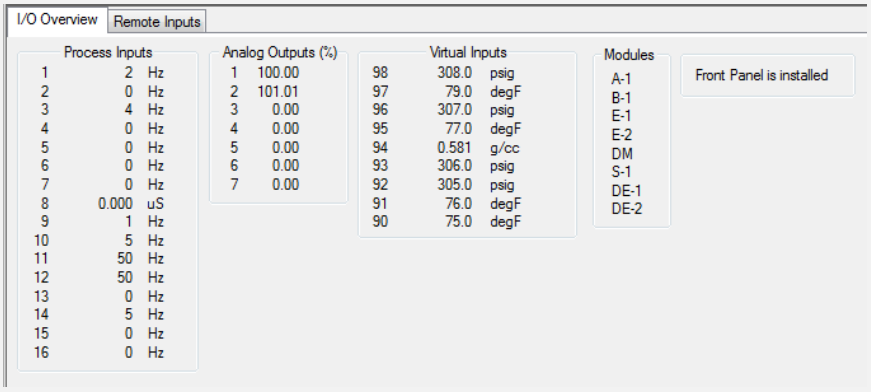
The I/O Overview function allows you to view the flow computer's diagnostics information and system overview through OMNICONNECT. It also has the related Digital MUX screen, which shows digital input and output points for the system and can indicate whether there is a problem with any of the fuses.

To view this information, follow these instructions:

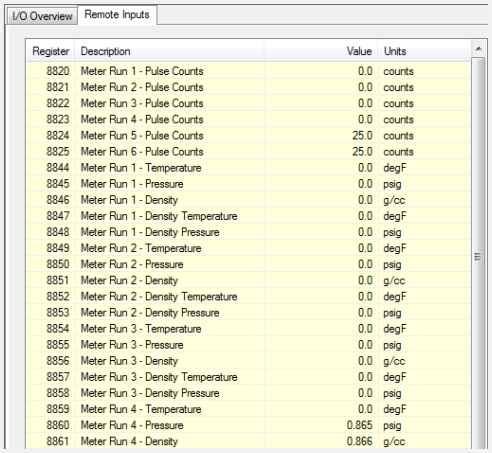
1. In the Actions ribbon, click **Diagnostics**.

2. Select and expand **I/O Overview** in the **Diagnostics** tree. This opens the **I/O Overview** screen, which displays a live view of the flow computer's general signals.



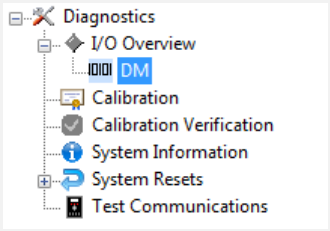


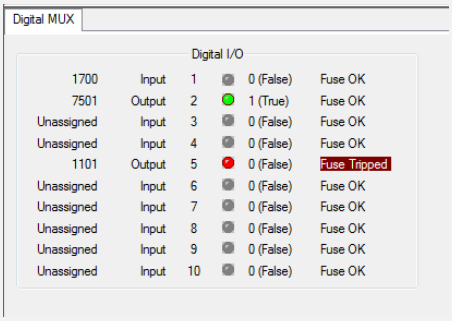
3. Click on the **Remote Inputs** tab to view a list of live remote inputs coming from the flow computer.



4. Click on **DM** in the **Diagnostics** tree. This opens the **Digital MUX** screen, which shows the digital I/O points for the modules that are present in the system.

The LED status indicators show green (ON), gray (OFF or not in use) or red when the fuse is tripped. The far-right column displays either “Fuse OK” or “Fuse Tripped.”





If an electronic fuse on the DM module has tripped, you should verify that the wiring is correct between the external device and the flow computer (as depicted by your installation drawings). If the wiring is correct, there may be a problem with the external device.

7.2.2 Calibration

To calibrate an analog input channel, follow these instructions:

The Calibration menu can be accessed through the **Diagnostics** button on the Home ribbon. If there is a project-specific requirement to reset all input and output channels before calibration, perform the steps in the applicable Reset Single Channel Calibration or Reset Multiple Channel Calibration instructions in Section 7.2.5 System Resets before calibrating.

For inputs and outputs:

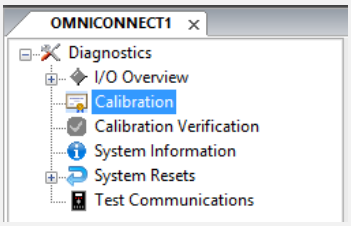
- Click the **Restore** button any time after starting a calibration. This command restores the calibration constants to the values they were when the **c**alibration was initiated.
- Click the **Apply Defaults** button any time after starting a calibration to:
  - Reset the calibration constants to their default non-calibrated values.
  - Clear the adjustments for a selected channel.

Analog Inputs

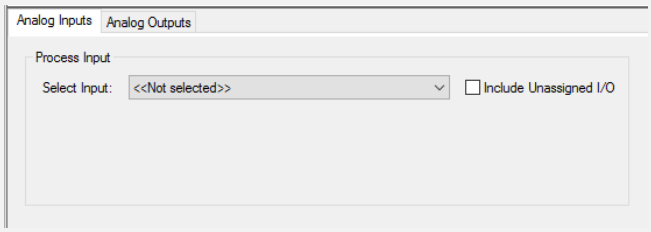
To calibrate analog input channels that are configured in the flow computer, follow these instructions:

1. Click the **Diagnostics** button in the Home ribbon to open the **Diagnostics** tree in the left panel.

2. Click **Calibration** in the left panel to display its configuration settings in the screens on the right.

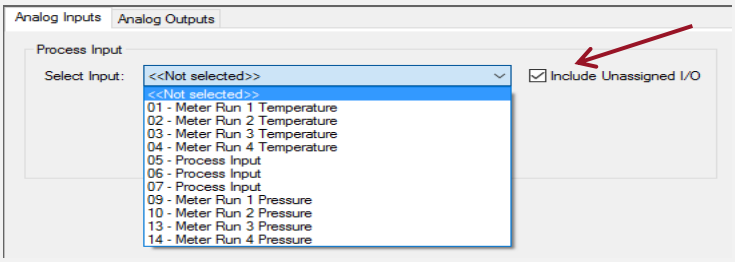


3. Select the **Analog Inputs** tab.



4. Select the input channel to calibrate from the drop-down list.

To include input channels in the drop-down list that were not assigned during configuration, check the **Include Unassigned I/O** box.



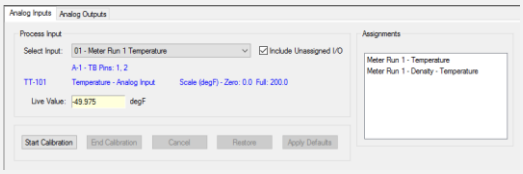
For a selected input channel with an active signal connected, the flow computer recognizes the live value and displays it in the **Live Value** field.

If an I/O is assigned, the live value is displayed in engineering units.

5. Verify that the signal wiring on the back panel is correct.

6. a. Click **Start Calibration**.

b. Click **Yes** to confirm on the pop-up window.



This action records the following information in the **Measurement Audit Trail Log**:

- Time, date and I/O index
- Input # 'n' calibration start (n = input channel number)
- User name, user ID and port used for the calibration

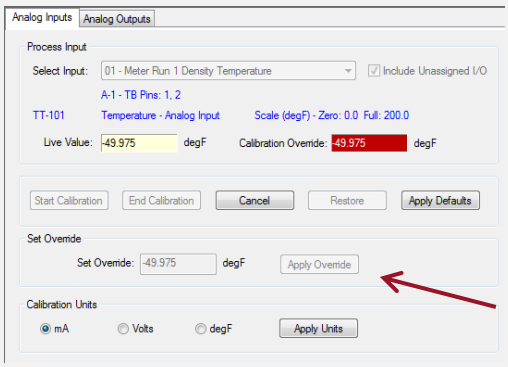
If the Remark field is not filled in during the Analog input channel configuration, then the Modbus register's database description, the hardware module and the Terminal Block pin numbers are still displayed in blue text after a selection is made. If the input channel is unassigned, only the hardware module and Terminal Block pin numbers are still displayed in blue text.

7. If you are calibrating an input that has been assigned, the **Set Override** group will appear and you will be able to enter the override value:

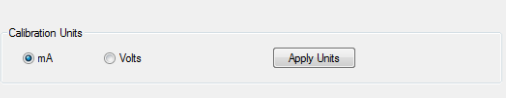
a. Verify or edit the default value and then click **Apply Override**.

b. Go to to Step 10.

If you are calibrating an input that has not been assigned, only the **Calibration Units** group will appear (it will skip the **Set Override** group). Continue to Step 8.



8. Select the type of signal (for which the channel has been configured with the hardware jumpers) and click **Apply Units**.

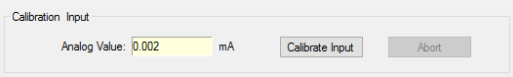


The unit options are:

- mA
- Volts
- Ohms (if the channel has been configured for an RTD type signal)
- Engineering units (if an I/O channel is assigned)

9. Click **Calibrate Input.**

Click **Abort** to abort the current calibration sequence.



10. To apply the low calibration value in the **Calibration Values** screen:

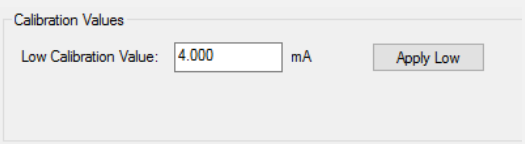
a. Adjust the **Signal Generator** or configure the **Transmitter**, whichever is connected, to output the lowest value needed to calibrate.

b. Wait 20 to 30 seconds for the readings to stabilize.

c. Enter an equivalent value in the appropriate units into the **Low Calibration Value** field (for example, 4 mA or 0.000 °F).

d. Click **Apply Low**.

Low values are 4.00 mA for a 4–20 mA input, 1 V for a 1–5 V input, and 25 ohms for an RTD input.



11. To apply the high calibration value in the **Calibration Values** screen:

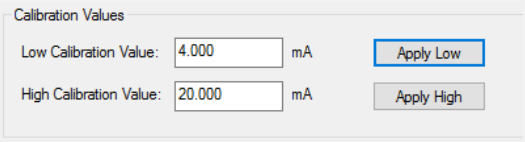
a. Adjust the **Signal Generator** or configure the **Transmitter** to output the highest value needed for calibration.

b. Wait 20 to 30 seconds for the readings to stabilize.

c. Enter an equivalent value in the appropriate units into the **High Calibration Value** (for example, 20 mA or 0.000 °F).

d. Click **Apply High**.

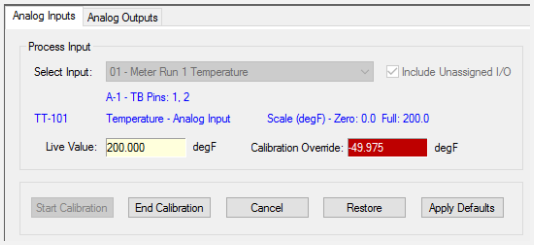
High values must be stated for each type of input: 20.00 mA for a 4–20 mA input, 5 V for a 1–5 V input, and 150 ohms for an RTD input.



12. To stop calibration, disconnect any signal simulators that are being used to calibrate the input channel, and reconnect the field instrument wiring according to your project-specific diagrams.

13. Click **End Calibration** to complete the calibration of the input channel. The calibration constants will be saved.

Click **Cancel** at any time to end the calibration without saving the calibration constants.



14. Continue calibrating additional analog inputs by repeating Steps 1 through 13.

15. If you have trouble calibrating the input channel, reset the channel and attempt to calibrate the channel again.

- For troubleshooting a single input channel, go to Reset Single Channel Calibration in Section 7.2.5.
- For troubleshooting multiple input channels, go to Reset Multiple Channel Calibration in Section 7.2.5.

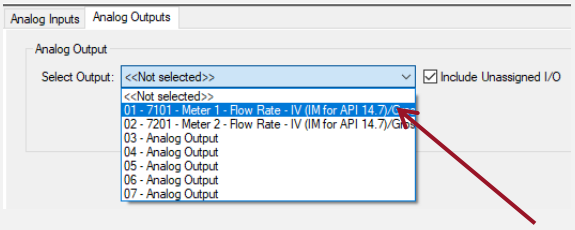
Analog Outputs

To calibrate analog output channels that are configured in the flow computer, follow these instructions:

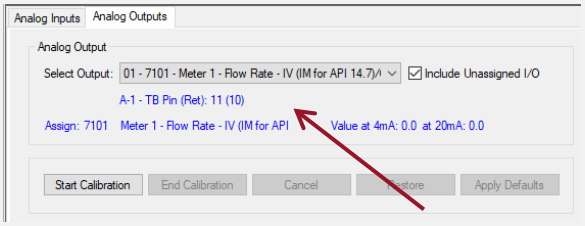
1. On the **Calibrations** screen, select the **Analog Outputs** tab.

Select the 4–20 mA output channel to calibrate from the drop-down list.

To include output channels in the drop-down list that have not been assigned in the configuration, check the **Include Unassigned I/O** box.



2. If the channel has been assigned in the configuration, confirm that the Modbus Register Assignment, Remark and Values at 4 mA and 20 mA are displayed in blue text.



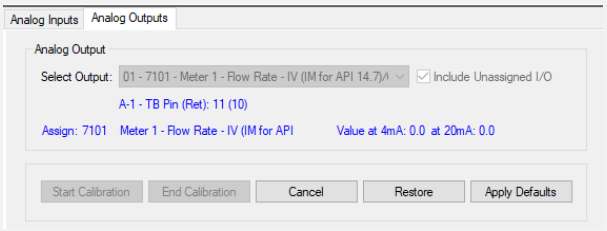
If the Remarks field is not filled in during the Analog output channel configuration, then the Modbus register's database description, the hardware module and the Terminal Block pin numbers are still displayed in blue text after a selection is made. If the output channel is unassigned, only the hardware module and Terminal Block pin numbers are still displayed in blue text.

3. Connect an ammeter to the **Terminal Block** output pins in series between the flow computer and the external 4–20 mA device.

4. Click **Start Calibration**.

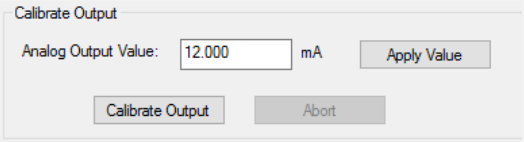
This action records the following information in the **Measurement Audit Trail Log**:

- Time, date and output index
- Output # ‘n’ calibration start (n = output channel number)
- User name, user ID and port hosting the calibration



5. If needed, enter a value in milliamps in the **Analog Output Value** field, and click **Apply Value**.

The flow computer will output the value using the current calibration constants.



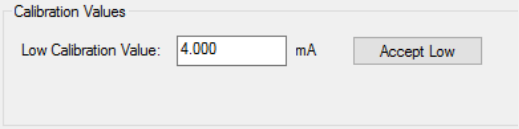
6. Click **Calibrate Output**. If needed, click **Abort** to abort the current calibration sequence.

The flow computer is instructed to output 4 mA.

7. Wait 20 to 30 seconds for the readings to stabilize.

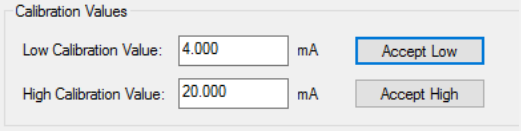
8. Enter the value displayed on the ammeter; then click **Accept Low**.

If the low value is accepted, the flow computer is instructed to output 20 mA.



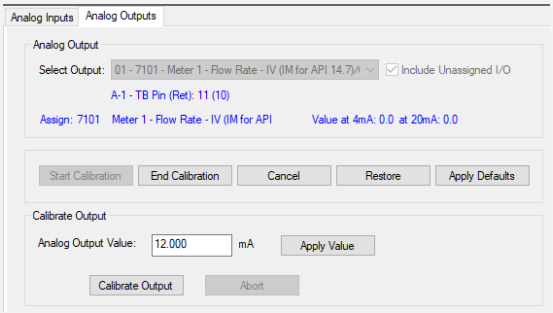
9. Wait 20 to 30 seconds for the readings to stabilize.

10. Enter the value displayed on the ammeter; then click **Accept High**.



11. Click **End Calibration** to complete the calibration and save the calibration constants.

Click **Cancel** at any time to end the calibration without saving the calibration constants.



12. Continue calibrating additional analog outputs as needed by repeating this section.

13. If you have trouble calibrating the output channel, reset the channel and attempt to calibrate the channel again.

- For troubleshooting a single output channel, go to Reset Single Channel Calibration in Section 7.2.5.
- For troubleshooting multiple output channels, go to Reset Multiple Channel Calibration in Section 7.2.5

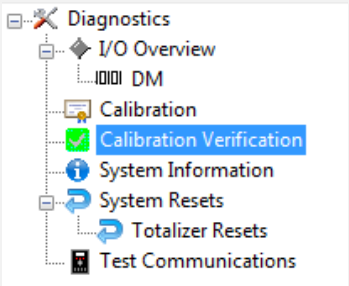
7.2.3 Calibration Verification

Analog Input Verification

To verify that the input calibration variables are correct or within the acceptable error tolerance and so do not require calibration, follow these instructions:

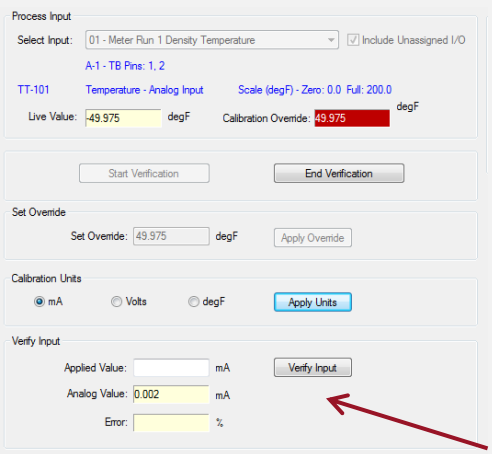
1. In the Actions ribbon, click **Diagnostics**.

2. Click on **Calibration Verification** in the **Diagnostics** tree.



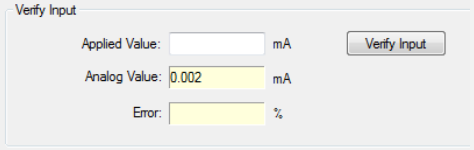
3. Select an analog input calibration to verify by following the instructions in Steps 3 through 8 in the Analog Inputs section in Section 7.2.2 Calibration.

After you apply your chosen **Calibration Units**, the **Verify Input** group will appear.



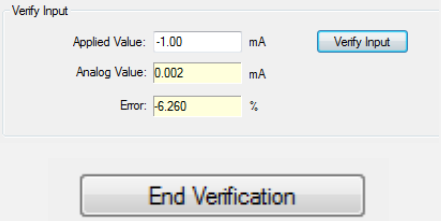
4.

a. Enter the **Applied Value** from the calibration verification instrumentation.
b. Click **Verify Input**.



5. The **Error** field will now display the percentage of error of the verification.

a. If the percentage of error is within acceptable limits, you do not need to re-calibrate the input channel.
b. If the percentage of error is not within acceptable limits, you may need to re-calibrate the input channel (go to Section 7.2.2).
c. Click **End Verification** to stop the process.

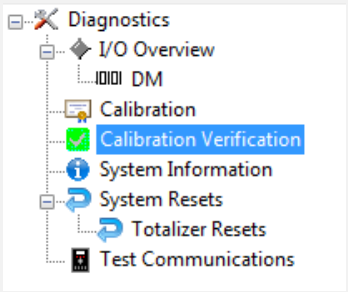


Analog Output Verification

To verify that the output calibration variables are correct or within the acceptable error tolerance, follow these instructions:

1. In the Actions ribbon, click **Diagnostics**.

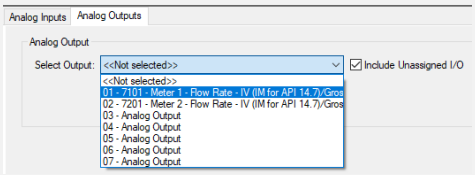
2. Click on **Calibration Verification** in the **Diagnostics** tree.



3.

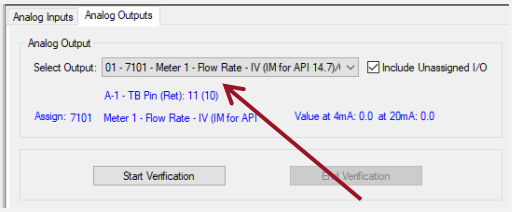
a. Click on the **Analog Output** tab.
b. Select an analog output channel to verify from the **Select Output** drop-down box.

To include output channels in the drop-down list that have not been assigned in the configuration, check the **Include Unassigned I/O** box.



4.

If the channel has been assigned in the configuration, confirm that the Modbus Register Assignment, Remark and Values at 4 mA and 20 mA are displayed in blue text.



If the Remark field is not filled in during the Analog output channel configuration, then the Modbus register's database description, the hardware module and the Terminal Block pin numbers are still displayed in blue text after a selection is made. If the output channel is unassigned, only the hardware module and Terminal Block pin numbers are still displayed in blue text.

5.

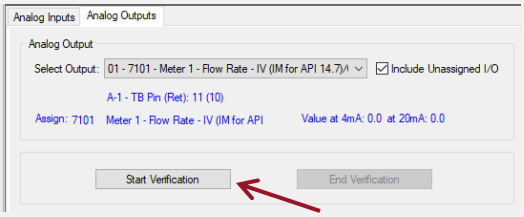
Connect an ammeter to the **Terminal Block** output pins in series between the flow computer and the external 4–20 mA device.

6.

When ready to begin the verification process, click **Start Verification**.

This action records the following information in the **Measurement Audit Trail Log**:

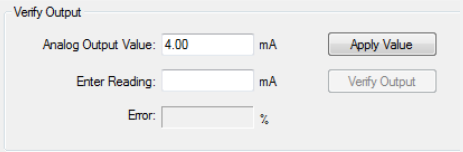
- Time, date and output index
- Output # 'n' calibration start (n = output channel number)
- User name, user ID and port hosting the calibration



7.

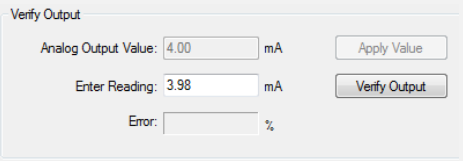
a. In the **Verify Output** group, enter an **Analog Output Value**.
b. Click **Apply Value**.

The flow computer will output the value using the current calibration constants.



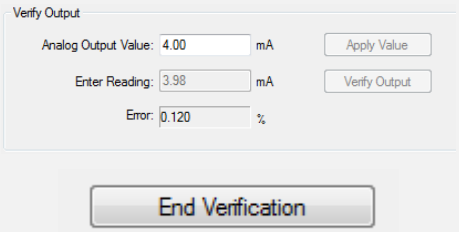
8.

a. Enter the value displayed on the ammeter in the **Enter Reading** field.
b. Click **Verify Output**.



9. The **Error** field will now display the percentage of error of the verification.

a. If the percentage of error is within acceptable limits, you do not need to re-calibrate the input channel.
b. If the percentage of error is not within acceptable limits, you may need to re-calibrate the input channel (go to Section 7.2.2).
c. Click **End Verification** to stop the process.

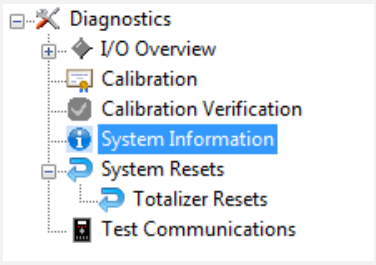


7.2.4 System Information

To access the flow computer's general system information, follow these instructions:

1. In the Actions ribbon, click **Diagnostics**.

2. Click **System Information** in the **Diagnostics** tree to display the flow computer's general system information screens to the right.



The **System Information** tabs are detailed in the following sections:

- Statement Results
- User Prompts
- Task Timings
- Checksums
- Firmware License

Statement Results

The Statement Results tab displays the results of previously configured Boolean and Variable statements. There are two lists: the first displays the Boolean statement results, and the second shows the Variable results (Figure 7-1). Any math or logic statements would be visible in these lists.

No.	Skip	Variable	Label	Statement	Remark	Results Value
1		40001		7089=#25	SimulateMeterFreq 1	25.0
2		40002		8824=#25	SimulateMeter5Freq	25.0
3		40003		8825=#25	SimualteMeter6Freq	25.0
4		40004		8811=#75.0	M5 Remote Temp/DensTemp	75.0
5		40005		8812=#76.0	M6 Remote Temp/DensTemp	76.0
6		40006		8813=#305.0	M5 Remote Press/DensPress	305.0
7		40007		8814=#306.0	M6 Remote Press/DensPress	306.0
8		40008		8860=#0.865	M5 Remote Density	0.865
9		40009		8861=#0.866	M6 Remote Density	0.866
10		40010		8815=#0.581	Station2 RemoteDensity	0.581
11		40011		8816=#77.0	Station2 Remote Dens Temp	77.0
12		40012		8817=#307.0	Station2 Remote Dens Press	307.0

Figure 7-1: Variable Statement Results Example

User Prompts

The User Prompts tab displays the results of any previously-programmed user prompts (Figure 7-2).

Register	User Prompt	Results Value
40717		0.0
40718		0.0
40719		0.0
40720		0.0
40721		0.0
40722		0.0
40723		0.0
40724		0.0
40725		0.0
40726		0.0
40727		0.0
40728		0.0
40729		0.0
40730		0.0
40731		0.0
40732		0.0

Figure 7-2: User Prompts Example

Task Timings

The Task Timings tab shows a live feed of the different tasks the processor is processing every 500 milliseconds or less (Figure 7-3).

Description	Current (us)	Average (us)	Maximum (us)	Task Counter
Meter 1 Algorithms	182.886	219.0614	65242.98	1149373
Meter 2 Algorithms	198.084	235.5641	110837.4	1149373
Meter 3 Algorithms	208.59	240.3773	65343.04	1149372
Meter 4 Algorithms	224.808	243.0874	65257.66	1149372
Meter 5 Algorithms	202.674	242.0912	68435.27	1149372
Meter 6 Algorithms	201.144	243.4225	69712.0	1149372
Boolean Statements	199.716	203.7419	445.536	24939
Variable Statements	155.958	158.7981	183.09	4987
Archiving	3.978	3.647161	19.89	4987
Process PI	16012.88	16071.64	16550.21	4987
Digital MUX	117.402	120.0535	408.102	249399
100ms ISR	3.468	4.899271	24.276	24939
Batching	9377.982	9342.566	40611.81	4987
Initialization	264476.0	264476.0	264476.0	1

Figure 7-3: Task Timings Example

Checksums

The Checksums tab shows the current firmware revisions and checksum calculations for the flow computer (Figure 7-4). The Operator can use this information to verify that the standard of certification is current (for example, the International Organization of Legal Metrology [OIML] Code) and to monitor any configuration changes. If the Metrological Configuration is updated, a red “Changed” box will appear beside it, and its status must be cleared.

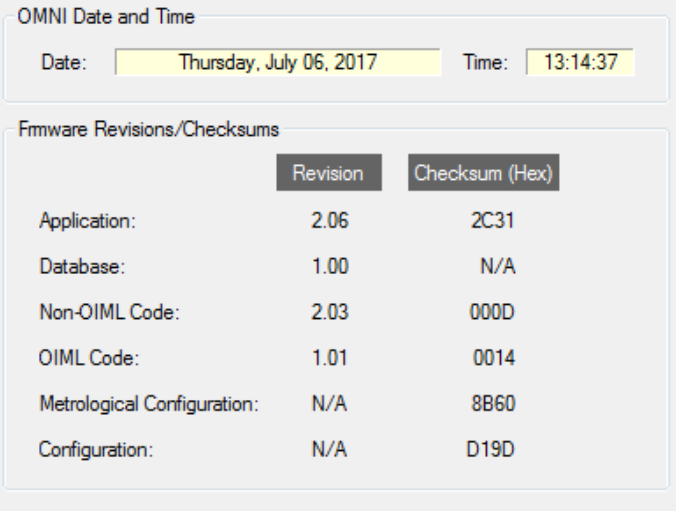


Figure 7-4: Checksums Tab

Firmware License

The Firmware License tab lists the optional features in the firmware that require a license. A green check mark indicates that the feature is available for use in the flow computer (Figure 7-5).

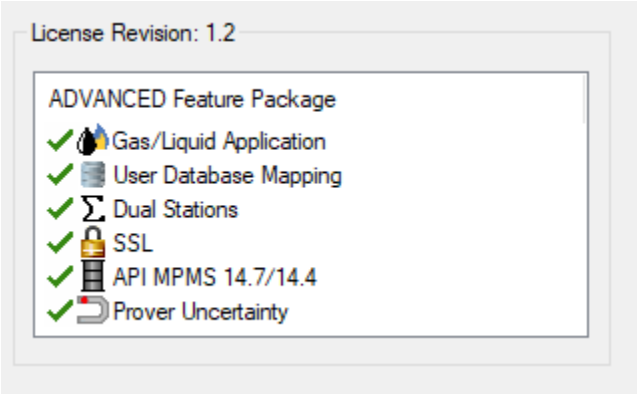


Figure 7-5: License Revision Tab

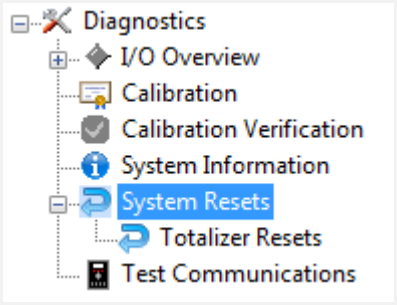
The Advanced Feature license package is available with Firmware versions 2.11 and higher.

7.2.5 System Resets

To access the flow computer's system reset options, follow these instructions:

1. In the Actions ribbon, click **Diagnostics**.

2. Click **System Resets** in the **Diagnostics** tree to display the flow computer's system reset option screens to the right.



The **System Reset** tabs are detailed in the following sections:

- Reset Date and Time
- Reset Single Channel Calibration
- Reset Multiple Channel Calibration
- Reset Prove
- Reset Application
- Reset RAM
- Reset Totalizers

Reset Date and Time

The Reset Date and Time tab allows Operators the ability to manually set the flow computer's date and time, or to synchronize with the PC's current date and time by clicking the Get PC Date and Time button (Figure 7-6).

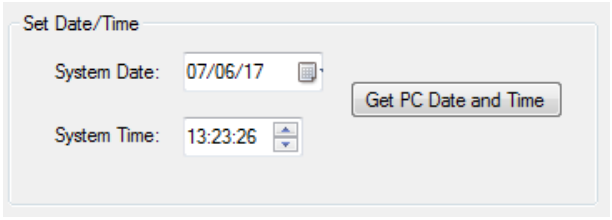


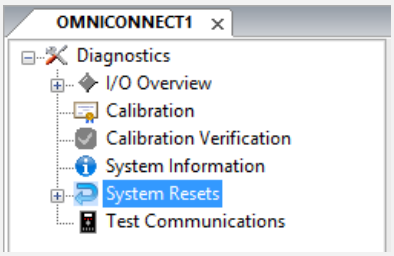
Figure 7-6: Reset Date and Time Tab

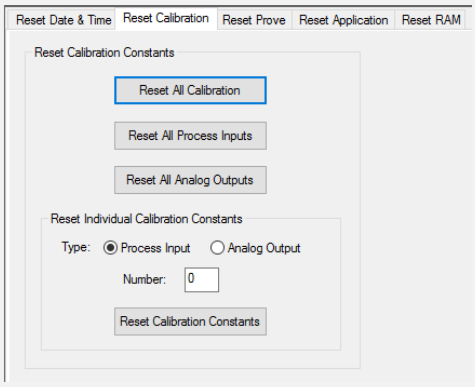
Reset Single Channel Calibration

To reset the channel if you have trouble calibrating an individual analog input or output channel, follow these instructions:

1. Click the **Diagnostics** button in the Home ribbon to open the **Diagnostics** tree in the left panel.

Select **System Resets** in the left panel and then select the **Reset Calibration** tab in the screens to the right.



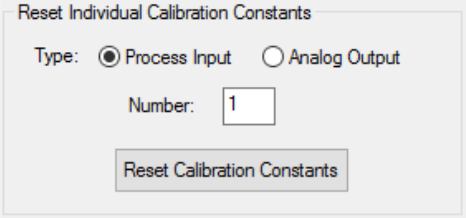


2. In the **Reset Individual Calibration Constants** section of the **Reset Calibration** screen:

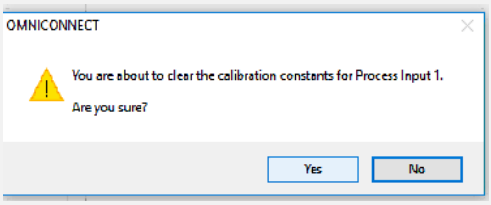
a. Select the **Type** radio button for the channel.

b. Input the channel number in the **Number** field.

c. Click **Reset Calibration Constants**.



3. At the prompt, click **Yes** to reset the channel.



4. After you reset the channel, you can attempt to calibrate the channel again. You can do this either through OMNICONNECT (Section 7.2.2) or the front panel (Section 7.3.2).

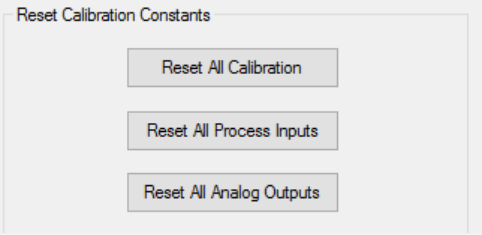
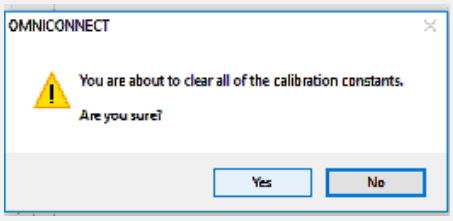
5.	If the problem persists: a. Check the hardware jumper settings for the channel in question. b. Check the software configuration settings to verify that they are set to the same type of input or output as the hardware jumpers. c. Contact the OMNI Help Desk at helpdesk@omniflow.com or call +1 281-240-6161.

Reset Multiple Channel Calibration

Use the option to reset multiple channels when:

- Project-specific requirements necessitate resetting all channels before beginning calibration.
- Multiple input or output channels will not calibrate correctly.

To reset multiple channels simultaneously, follow these instructions:

1.	For multiple calibration resets, click the appropriate button: • **Reset All Calibration** for resetting all Inputs and Outputs • **Reset All Process Inputs** for resetting analog inputs only • **Reset All Analog Outputs** for resetting analog outputs only	
2.	At the prompt, click **Yes** to reset multiple channels.	
3.	After you reset the channels, you can attempt to calibrate them again. You can do this either through OMNICONNECT (Section 7.2.2) or the front panel (Section 7.3.2).	
4.	If the problem persists: a. Check the hardware jumper settings for the channel in question. b. Check the software configuration settings to verify that they are set to the same type of input or output as the hardware jumpers. c. Contact the OMNI Help Desk at helpdesk@omniflow.com or call +1 281-240-6161.	

Reset Prove

The Reset Prove tab gives the Operator the ability to delete historical Meter Factor data for all or some of the Meter Runs. The following information is reset:

- Meter Factor History (last 10 implementations) of most recently proved Meter:
  - Date (4945 – 4954)
  - Meter Factor and Deviation: (8589 and 8590 – 8607 and 8608)
- Last Meter Factor implementation information:
  - Temperature – 7945
  - Pressure – 7946
  - Density – 7948
  - Flow Rate – 7966
  - Density at Ref Temp/RD60 – 7944
- Meter Factor in use at last Meter Factor implementation – 8728
- Net or Mass (if Meter is mass pulses) Totalizer at last Meter Factor implementation – 5924
- IV Totalizer at last Meter Factor implementation – 5925

Click any individual Meter Run button (#1 through 6) to reset only that Meter Run's prove data or click "All Meters" to reset them all at the same time (Figure 7-7).

Figure 7-7: Reset Prove Tab

Reset Application

CAUTION:
If you choose to change any application feature through this screen, it will clear any current settings and you will have to re-configure the flow computer. If this action is necessary, save a copy of the current configuration file before you reset any applications.

The Reset Application tab allows the Operator to change the flow computer's application of the firmware (Figure 7-8).

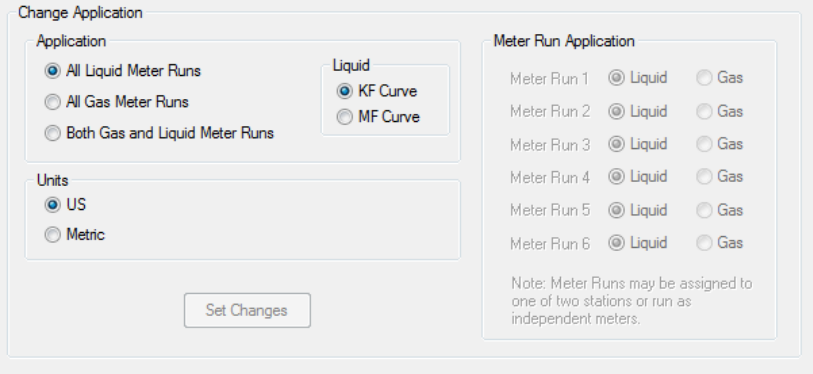


Figure 7-8: Reset Application Tab

Reset RAM

CAUTION:
Do not clear the flow computer's Random Access Memory (RAM) unless you have verified that all important information has been saved through OMNICONNECT. Clearing the RAM will erase important operating information such as:

- Configurations
- Live process inputs
- Registers
- Totalizers and calibration data (in some cases)

The only data kept after a full system reset is the current firmware revision.

The Reset RAM tab has two options: clear only the configuration data or clear the entire RAM from the flow computer (Figure 7-9).

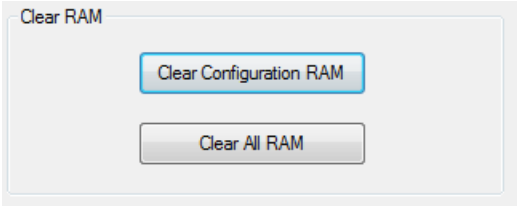


Figure 7-9: Reset RAM Tab

Reset Totalizers

You can only reset the totalizers if there is no flow in either the individual Meter Run you wish to reset, or in all Meter Runs if you want to reset all of them at the same time.

To reset totalizer decimal resolutions, follow these instructions:

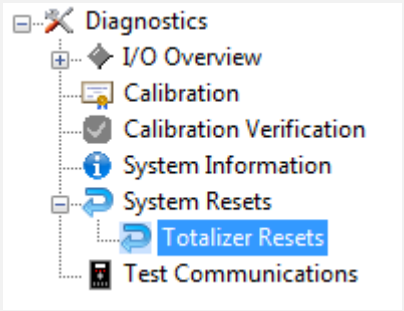
1. Confirm there is no flow to the meter(s) or station(s) you want to reset.

2. In the Actions ribbon, click **Diagnostics**.

3. Expand the **System Resets** option in the **Diagnostics** tree and click on **Totalizer Resets**.

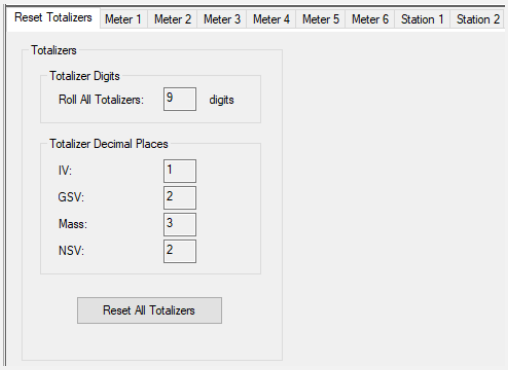
To reset all totalizers, continue to Step 4.

To reset individual Meter Runs and Stations, continue to Step 7.



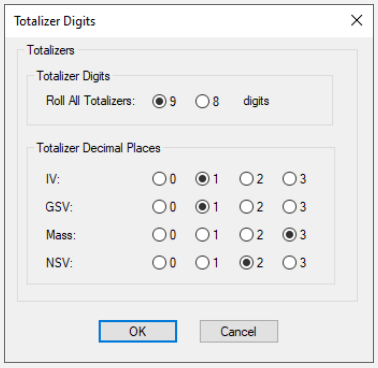
Press F1 to access OMNICONNECT Help for more information on how the flow computer resets totalizers.

4. To reset all totalizers, in the **Reset Totalizers** tab click on the **Reset All Totalizers** button.



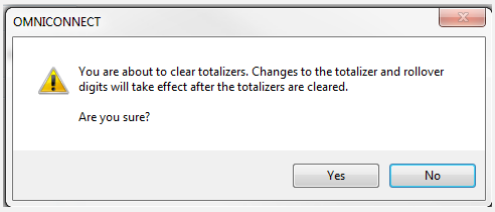
5.

a. In the **Totalizer Digits** window, select the number of **Totalizer Digits** and **Totalizer Decimal Places**, as needed.
b. Click **OK**.



6.

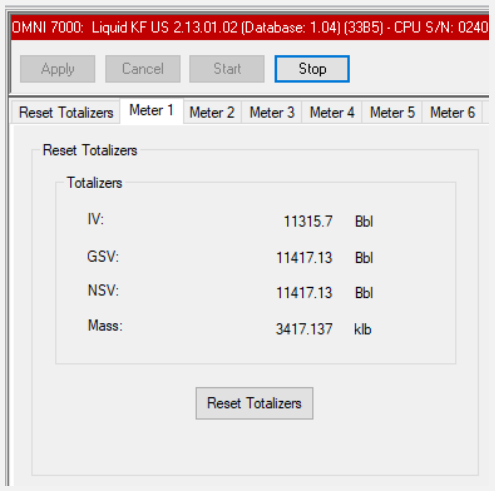
At the prompt, click **Yes**.



7.

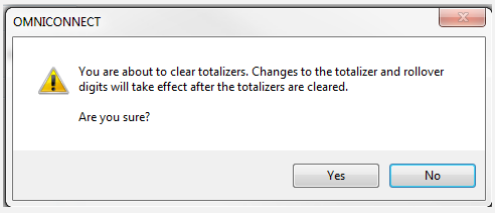
To reset individual Meters or Stations:

a. Click on the tab of the Meter Run or Station you want to reset.
b. Click the **Reset Totalizers** button to apply the changes you made in the **Reset Totalizers** tab.



8.

At the prompt, click **Yes**. The totalizers will reset to zero (0).



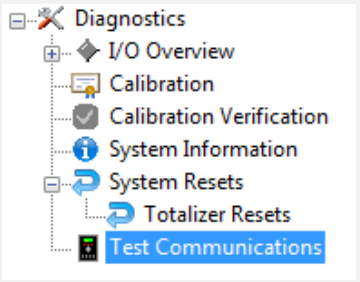
7.2.6 Test Communications

If you need to troubleshoot communication issues by determining the proper way to access certain Modbus register types, the Test Communications function acts as a Modbus master simulator where you can read and write the data to an individual register.

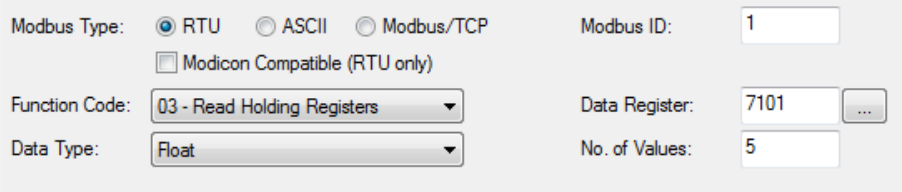
To use the test communications application, follow these instructions:

1. In the Actions ribbon, click **Diagnostics**.

2. Click on **Test Communications** in the **Diagnostics** tree.



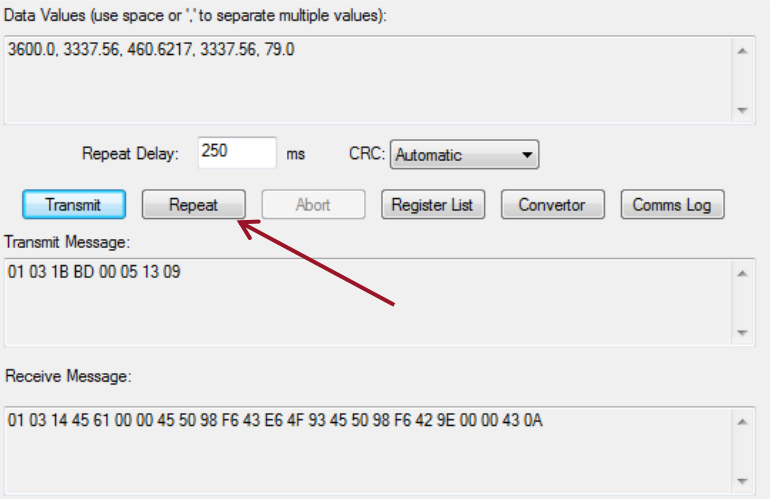
3. Use the options at the top of the screen to define the data register you wish to test.



4.

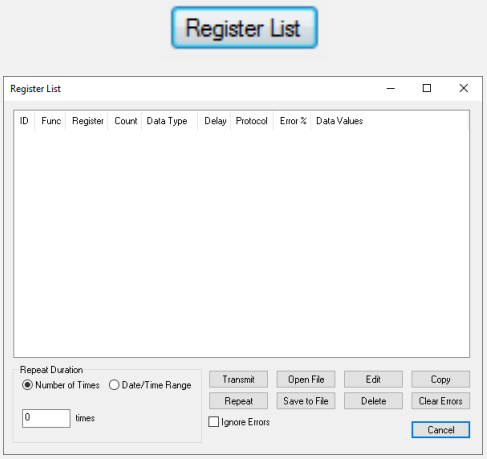
a. Click the **Transmit** button to send the test message to the flow computer. You should receive back **Data Values**, the **Transmit Message**, and a **Receive Message**.

b. Click the **Repeat** button to send the message continuously. You can edit how fast it repeats in the **Repeat Delay** field.



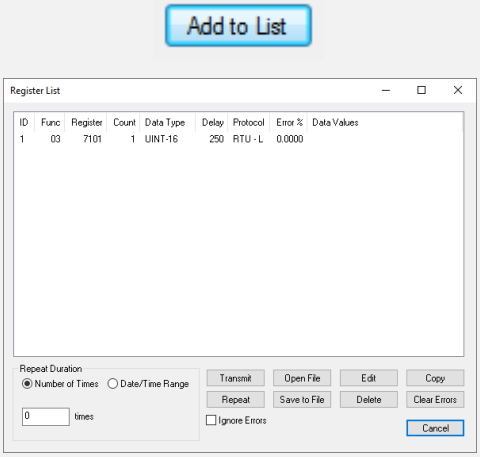
5. To record and save the test, click the **Register List** button. This opens the **Register List** window.

Keep the window open; you can still interact with the **Test Communications** screen in OMNICONNECT while the **Register List** is active.



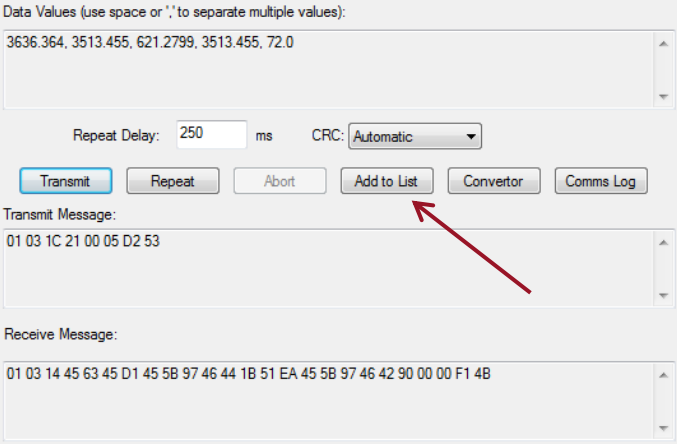
6. With the previous test information still on the screen (and the **Register List** window still open), click the new **Add to List** button.

Now the test information is listed in the window.



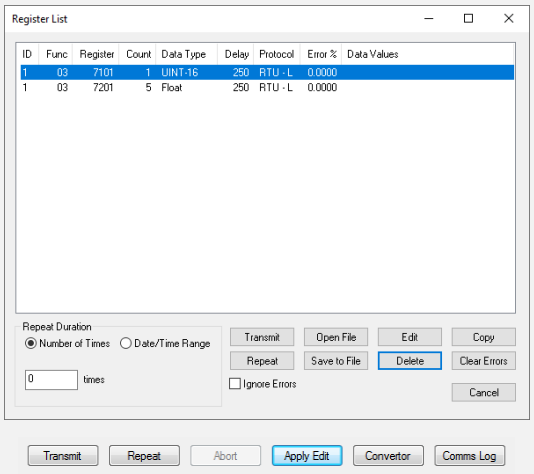
7.

a. To test a different register, click back on the screen and change the register parameters.
b. Click **Transmit** again to send the new message.
c. Click **Add to List** again to add the new test to your **Register List**.



8.

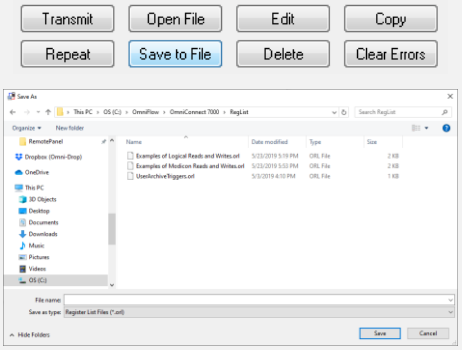
a. To edit a previous register test, double-click on the test in your **Register List**. When it is highlighted in blue, press the **Edit** button. You can also right-click it and select **Edit**.
b. Make changes on the **Test Communications** screen.
c. When finished, press the **Apply Edit** button and it will be updated on the **Register List** screen.
d. Click on your next action: **Transmit**, **Repeat**, **Edit**, etc.



Select multiple registers for editing in the **Register List** window and the edits will be applied to all highlighted registers. You can also copy, move and delete items from the **Register List**.

9.

a. To save your **Register List** for future reference, click the **Save to File** button.
b. Select a place to save the file on the PC or use the default **RegList** location OMNICONNECT automatically creates. You can also set this folder in your **Preferences** (**Setup** ribbon > **Preferences** button > **Register List** tab).
c. Name the file, and click **Save**.



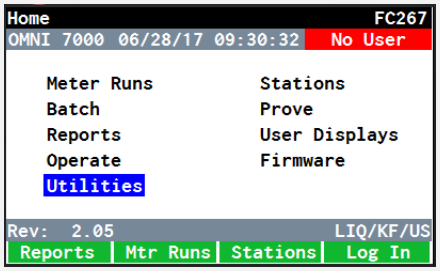
7.3 Front Panel Maintenance

7.3.1 System Date/Time

To access and configure the system date and time settings, follow these instructions:

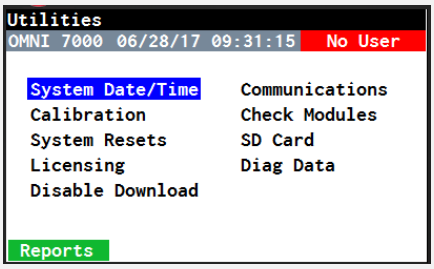
1.

a. In the **Home** menu, use the arrow navigation keys to go to and select **Utilities**.
b. Press the **OK** key.



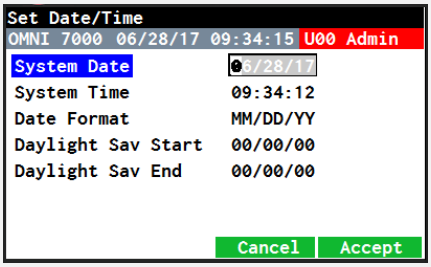
2.

With **System Date/Time** highlighted, press **OK**.



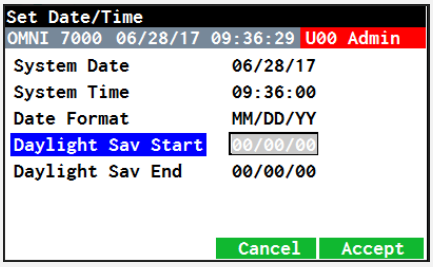
3.

a. Use the arrow keys to select the variable you wish to edit.
b. Press **OK** to access the field and make changes.
c. Press **OK** or the **Accept** function key to save your changes.



4.

a. Continue to view or edit date and time settings, as needed.
b. When finished, press the **Back** key to return to the **Utilities** screen or the **Home** key to return to the **Home** screen.



7.3.2 Calibration

Input Calibration

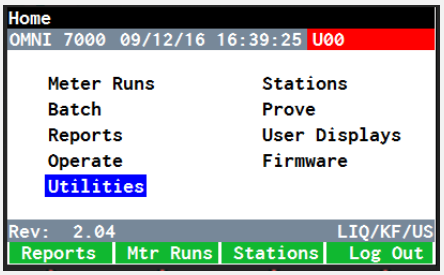
The options to calibrate by variable name (for example, ‘Temperature’), will not be selectable under the six individual Meter Runs or the two Stations or the prover until input channels have been assigned to them in OMNICONNECT.

To calibrate the input channels, follow these instructions:

1.

a. From the **Home** screen on the front panel display, use the arrow keys to navigate to and select **Utilities**.

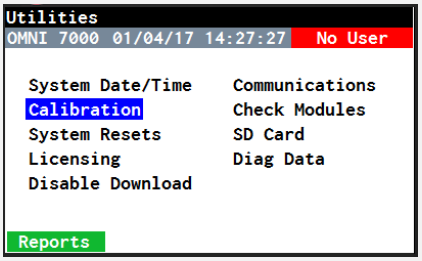
b. Press the **OK** key.



2.

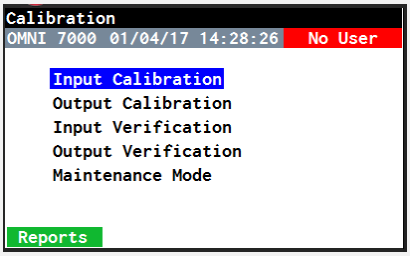
a. On the **Utilities** screen, use the arrow keys to navigate to the **Calibration** menu selection.

b. Press **OK**.



3.

With **Input Calibration** highlighted, press **OK**.

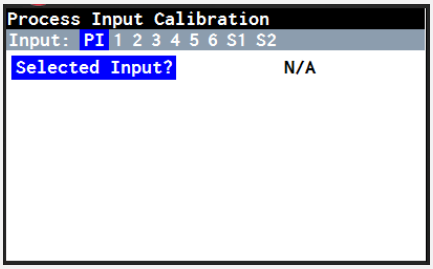


The **Process Input Calibration** screen includes a horizontal Input bar at the top with these options:

- Process Input (PI) allows you to calibrate by channel number selection (for example, 1 through 32).
- Numbers 1 through 6 allow you to calibrate using a process input variable name for individual Meters 1 through 6 (for example, Meter 1 Temperature or Meter 5 Density Pressure).
- S1 and S2 allow you to calibrate using a process input variable name for Individual Station 1 and Station 2 (for example, Station 1 Density Temperature or Station 2 Density Pressure).

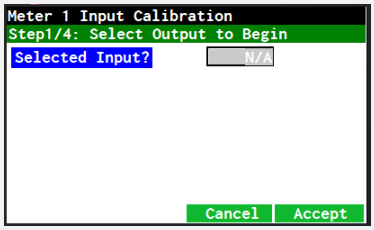
4.

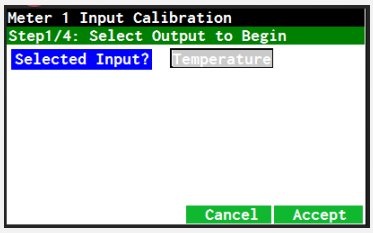
Use the arrow navigation keys to select an option on the **Input** bar; then press **OK.**



5. Use the **Up** or **Down** arrow navigation keys to scroll through the available channels or variables to calibrate.

a. Press **OK** or the **Accept** function key to continue.
b. Press the **Cancel** function key to abort the calibration process.



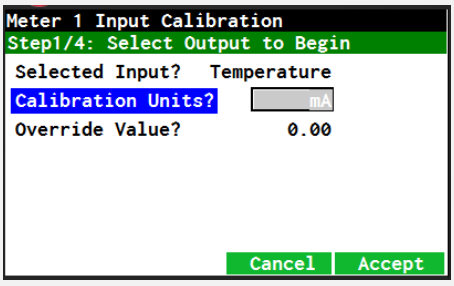


6. Use the **Up** or **Down** arrow navigation keys to scroll to each field.

Press **OK** to enter the edit mode for the selected field, and edit the values or selections as needed:

a. Choose the **Calibration Units** from the drop-down list (for example, mA, Ohms).
b. Type in the desired **Override Value** in engineering units.

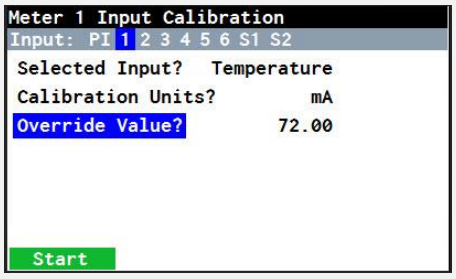
After editing each field, press **OK** or the **Accept** function key to continue.



- **Selected Input?** displays the channel number or process variable name selected for calibration.
- **Calibration Units?** appears only after an input has been selected.
- **Override Value?** will not appear under the PI menu selection if the channel number has not yet been assigned in the flow computer configuration. The flow computer will use the engineering value in its flow calculations while the input channel is being calibrated.

7. Verify that the signal wiring is properly connected to the appropriate input channel at the Terminal Block on the flow computer back panel.

8. Press the **Start** function key to begin the calibration.



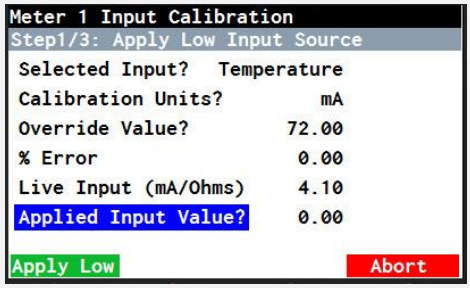
9. Adjust the **Signal Generator** or configure the **Transmitter** (whichever is connected) to output the appropriate **Low** value according to the selected calibration units.

> Low values are 4.00 mA for a 4–20 mA input, 1 V for a 1–5 V input, and 25 ohms for an RTD input.

10. Confirm that the **Live Input (mA/Ohms)** field value is close to the applied value from the field transmitter or signal generator.

If the value is not close to the applied value, check:

- The wiring is connected to the correct channel.
- The hardware jumper settings.

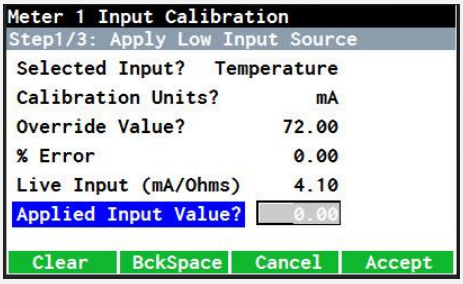


See the following sections in the Installation Guide for more information on wiring and jumper settings:

- Section 3.7.5 Process I/O Modules for tables on back panel wiring.
- Appendix A: Jumper Settings for hardware jumper settings.

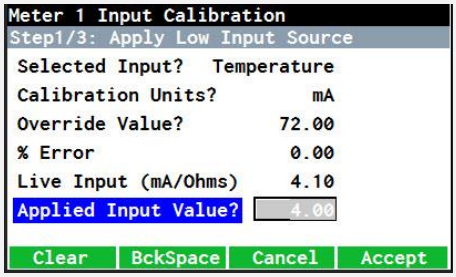
11. Wait 20 to 30 seconds for the readings to stabilize.

12. While the **Applied Input Value?** field is highlighted, press **OK**.

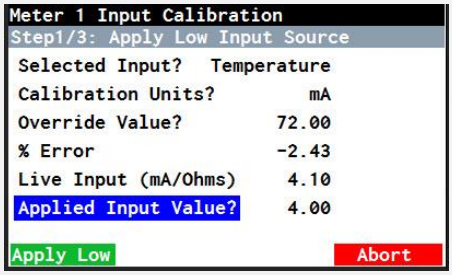


13. Using the numeric keypad, enter a value that exactly matches the value at the field transmitter or the signal generator.

Press **OK**.



14. Press the **Apply Low** function key to complete the **Low** adjustment or the **Abort** function key to discard.



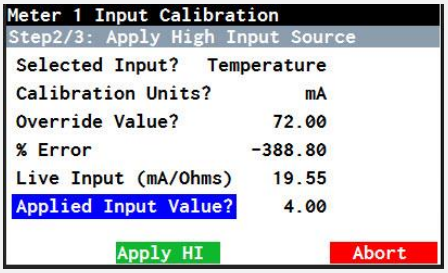
15. Adjust the **Signal Generator** or configure the **Transmitter**, whichever is connected, to output the appropriate **HI** value according to the selected calibration units.

> High values are 20.00 mA for a 4–20 mA input, 5 V for a 1–5 V input, and 150 ohms for an RTD input.

16. Confirm that the **Live Input (mA/Ohms)** field value in the **Apply High Input Source** screen is close to the applied value from the field transmitter or signal generator.

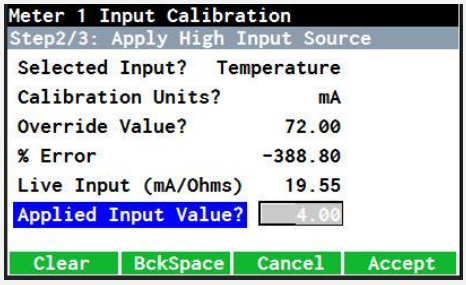
If the value is not close to the applied value, check:

- The wiring is connected to the correct channel.
- The hardware jumper settings.



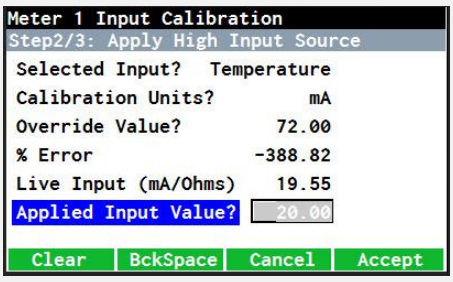
17. Wait 20 to 30 seconds for the readings to stabilize.

18. While the **Applied Input Value?** field is highlighted, press **OK**.

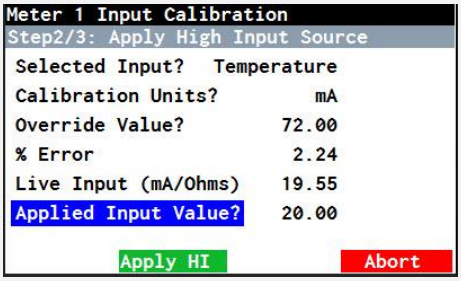


19. Using the numeric keypad, enter a value that exactly matches the value at the field transmitter or the signal generator.

Press **OK**.

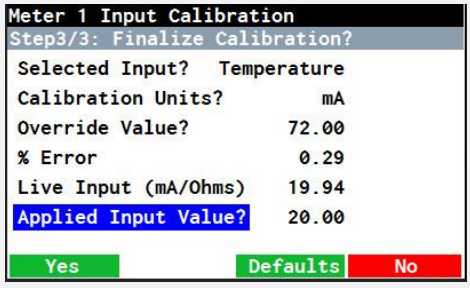


20. Press the **Apply HI** function key to complete the span adjustment or the **Abort** function key to discard.



21. After pressing the **Apply HI** function key, the **Finalize Calibration?** screen displays.

a. If you have trouble calibrating the input channel, reset the channel by pressing the **Defaults** function key; then attempt to calibrate the channel again.
b. Press the **Yes** function key to finalize the calibration of the input channel.
c. Press the **No** function key to discard the calibration changes.

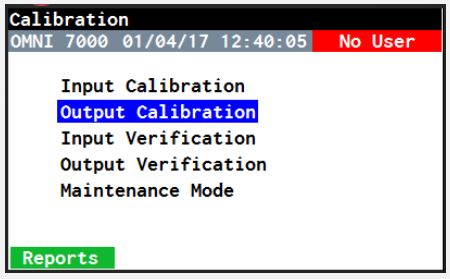


22. Continue calibrating additional input channels as needed by repeating these steps.

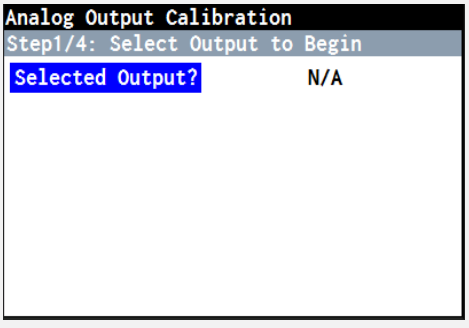
Output Calibration

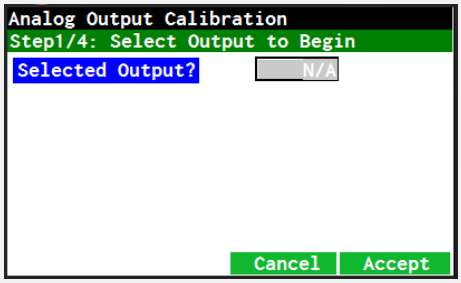
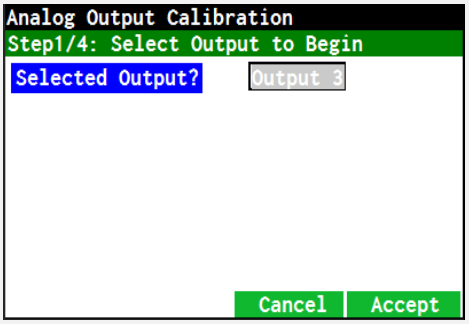
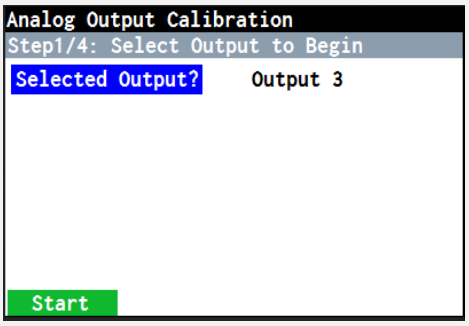
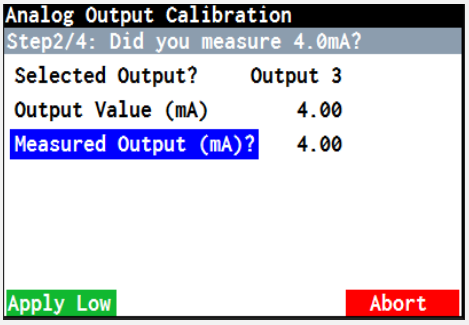
To calibrate the 4–20 mA output channels, follow these instructions:

1.
a. From the main menu of the front panel, select **Utilities** and press **OK**.
b. Select **Calibration**, press **OK**.
c. Select **Output Calibration**.



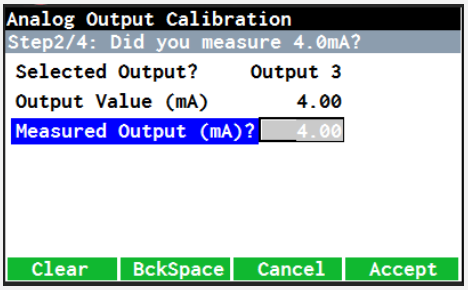
2. Press **OK** to enter the edit mode of the **Selected Output?** field.



3.	Use the **Up** or **Down** arrow keys to scroll through the list of output channels.	
4.	Press the **Cancel** function key to abort the calibration process or press **OK** or the **Accept** function key to select the highlighted channel.	
5.	Connect an ammeter in series between the flow computer and the external 4–20 mA device.	
6.	Press the **Start** function key to begin the calibration process.	
7.	Confirm that the next screen shows the **Output Value (mA)** field default of 4.00.	
8.	Wait 20 to 30 seconds for the readings to stabilize.	
9.	Note the value indicated on the ammeter.	

10. Use the front panel to key in the value that appears on the ammeter:

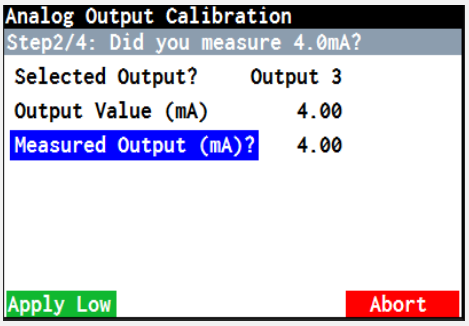
a. Select the **Measured Output (mA)**? field.
b. Press **OK**.
c. Enter the value.
d. Press **OK** again or the **Accept** function key.



11. If needed, press the **Abort** function key to cancel the calibration.

To continue to the 20 mA calibration screen, press the **Apply Low** function key.

The next screen shows the **Output Value (mA)** field default of 20.00.

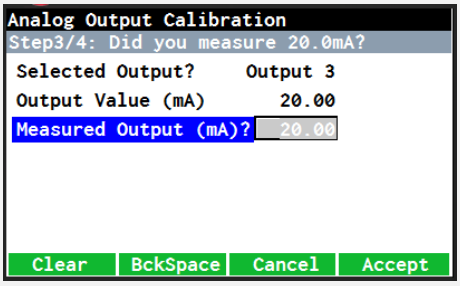


12. Wait 20 to 30 seconds for the readings to stabilize.

13. Note the value indicated on the ammeter.

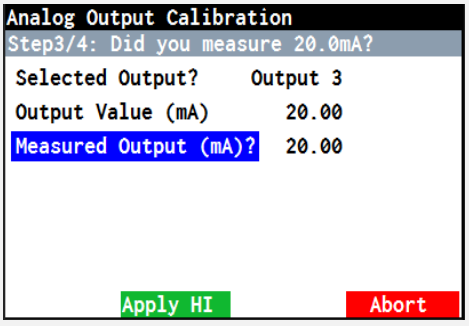
14. Use the front panel of the flow computer to key in the value displayed by the ammeter:

a. Select the **Measured Output (mA)**? field.
b. Press **OK**.
c. Enter the value.
d. Press **OK** again or the **Accept** function key.



15. If needed, press the **Abort** function key to cancel the calibration.

To continue to the **Finalize Calibration** screen, press the **Apply HI** function key.

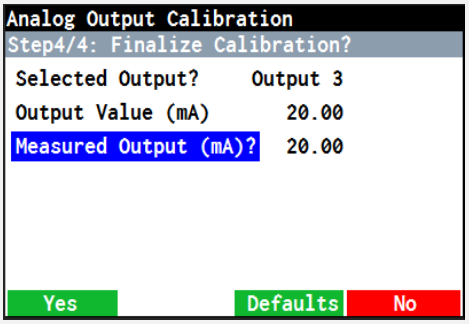


16.

a. If you have trouble calibrating the output channel, reset the channel by clicking the **Defaults** function key and attempt to calibrate the channel again.

b. Press the **Yes** function key to finalize the calibration of the output channel.

c. Press the **No** function key to discard the calibration changes.



17. Continue calibrating additional output channels by repeating Steps 1 through 16.

7.3.3 Calibration Verification

Input Verification

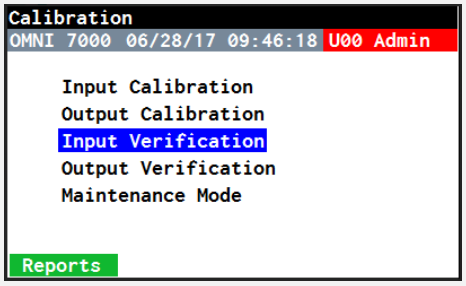
To verify that the input calibration variables are correct or within the acceptable error tolerance and so do not require calibration, follow these instructions:

1.

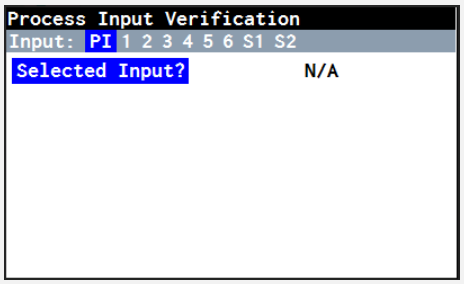
a. From the main menu of the front panel, select **Utilities** and press **OK**.

b. Select **Calibration**, press **OK**.

c. Select **Input Verification**.



2. Use the arrow navigation keys to select an option on the **Input** bar; then press **OK.**

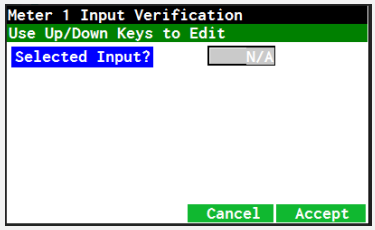


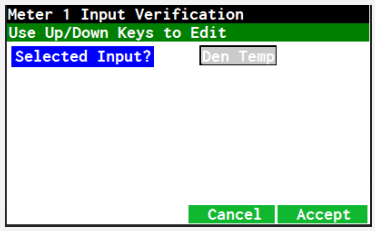
The **Process Input Verification** screen includes a horizontal Input bar at the top with these options:

- PI allows you to calibrate by process input channel number selection (for example, 1 through 32).
- Numbers 1 through 6 allow you to calibrate using a process input variable name for individual Meters 1 through 6 (for example, Meter 1 Temperature or Meter 5 Density Pressure).
- S1 and S2 allow you to calibrate using a process input variable name for Individual Station 1 and Station 2 (for example, Station 1 Density Temperature or Station 2 Density Pressure).

3. Use the **Up** or **Down** arrow navigation keys to scroll through the available channels or variables to verify.

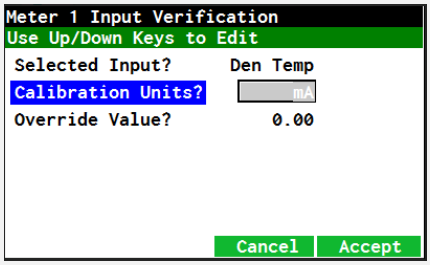
a. Press **OK** or the **Accept** function key to continue.
b. Press the **Cancel** function key to abort the verification process.





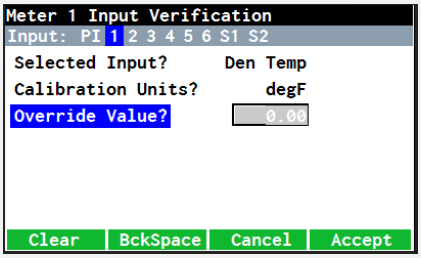
4. If you are verifying a value other than the default (mA) unit, use the arrow navigation keys to scroll down and highlight **Calibration Units?**.

a. Press **OK** to open the field box and use the arrow keys again to scroll through the options and choose a different unit (Volts, Ohms or degF).
b. When the new unit is selected, press **OK**.

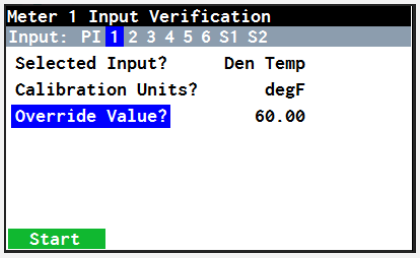


5.

a. Scroll to and highlight **Override Value?**.
b. Press **OK**.
c. Enter the Override Value you want to use for this verification test.
d. Press **OK** to save the entry.

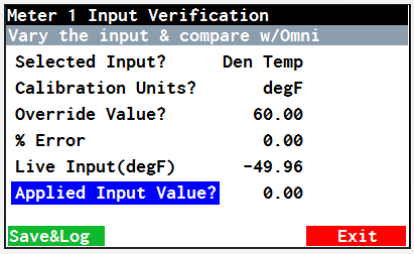


6. Press the **Start** function key to begin the Input Verification test.



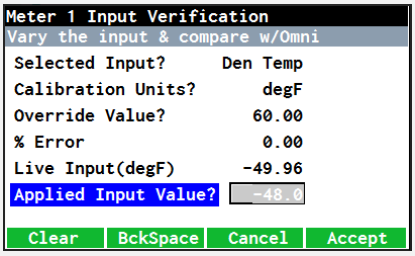
7. On this screen you are given the flow computer's **Live Input Value**. At any time, you can:

a. Press the **Save&Log** function key to save and log the input verification test in the **Measurement Audit Trail Report**.
b. Press the **Exit** function key to stop the input verification process and return to the **Input Verification** screen in Step 2.



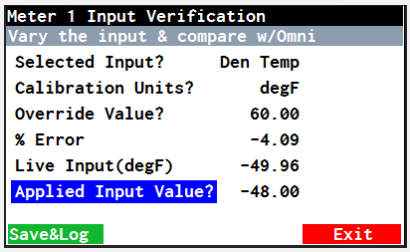
8. Now you can vary the input value and compare it with the flow computer's value by entering an **Applied Input Value**.

a. While **Applied Input Value?** is highlighted, press **OK** to open the entry field.
b. Enter your **Applied Input Value**.
c. Press **OK**.



9. The flow computer now gives you a **% Error** based on the **Applied Input Value** you entered. You can:

a. Press the **Save&Log** function key to save this entry.
b. Press **OK** to enter a new **Applied Input Value** and complete a different input verification test.
c. Press the **Exit** function key and exit the process.

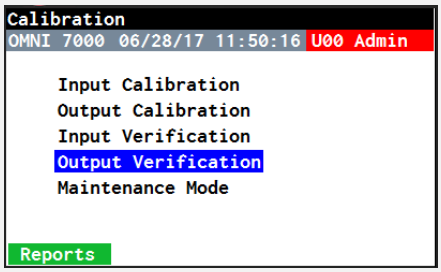


Output Verification

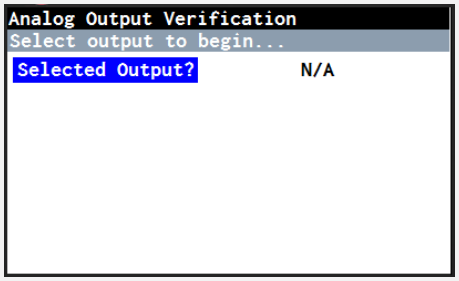
To verify that the output calibration variables are correct or within the acceptable error tolerance, follow these instructions:

1.

a. From the main menu of the front panel, select **Utilities** and press **OK**.
b. Select **Calibration**; press **OK**.
c. Select **Output Verification**.

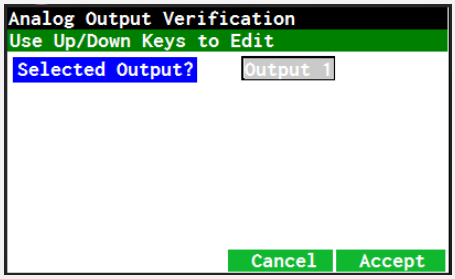


2. Press **OK** to enter the edit mode of the **Selected Output?** field.



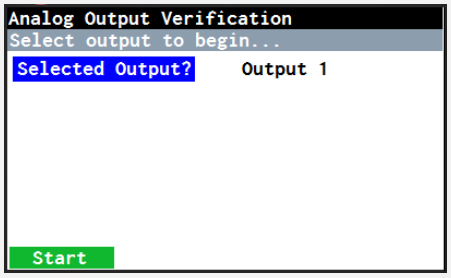
3. Use the **Up** or **Down** arrow keys to scroll through the list of output channels.

Press the **Cancel** function key to abort the calibration process or press **OK** or the **Accept** function key to select the highlighted channel.



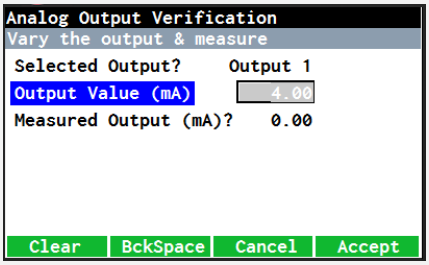
4. Connect an ammeter in series between the flow computer and the external 4–20 mA device.

5. Press the **Start** function key to begin the verification process.



6. Use the front panel to key in the value originally calibrated (the default is 4 mA):

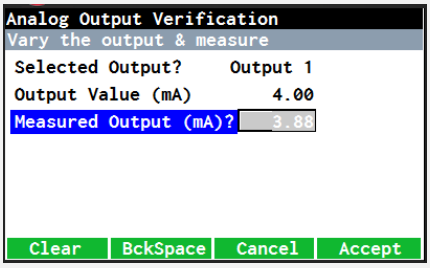
a. Select the **Output Value (mA)**? field.
b. Press **OK**.
c. Enter the value.
d. Press **OK** again or the **Accept** function key.



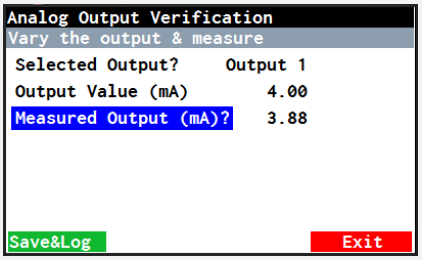
7. If needed, press the **Exit** function key to cancel the calibration.

8. Now key in the value that appears on the ammeter:

a. Select the **Measured Output (mA)**? field.
b. Press **OK**.
c. Enter the value.
d. Press **OK** again or the **Accept** function key.

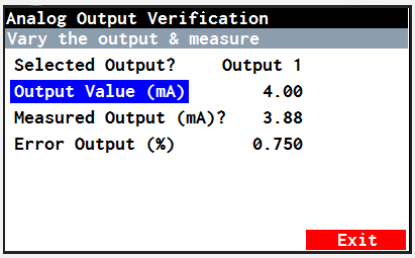


9. Press the **Save&Log** function key to both run the verification process and log it in the flow computer's **Measurement Audit Trail Report**.

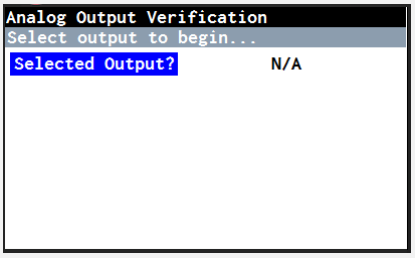


10. The verification screen now displays the **Error Output (%)**.

If this percentage is within your acceptable error tolerance, you do not need to re-calibrate the analog output channel. If it is not, go to Output Calibration in Section 7.3.2 and follow the instructions to re-calibrate the flow computer.



11. Press the **Exit** function key to return to the **Analog Output Verification** screen to choose a different output to verify, or to use a different value.

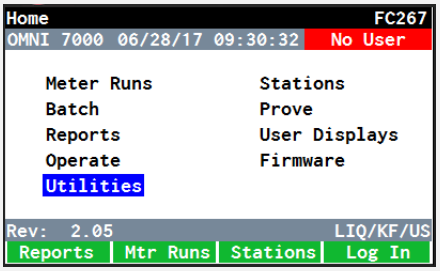


7.3.4 Maintenance Mode

Placing the flow computer in Maintenance Mode gives operators the ability to verify Meter Run calculations without adversely affecting the overall operation of the normal totalizers. Maintenance Mode freezes all analog inputs so that maintenance can be completed on transmitters without affecting any process variables used during normal mode calculations.

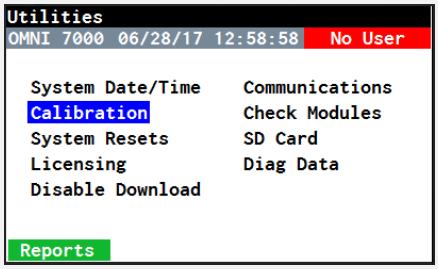
To access the Maintenance Mode through the front panel, follow these instructions:

1.
a. In the **Home** menu, use the arrow navigation keys to go to and select **Utilities**.
b. Press the **OK** key.



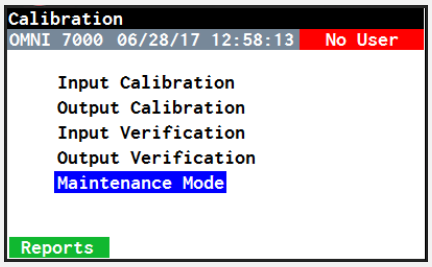
2.

a. On the **Utilities** screen, use the arrow keys to navigate to the **Calibration** menu selection.
b. Press **OK**.



3.

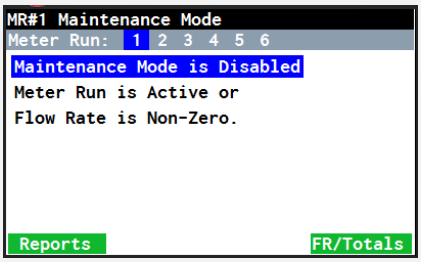
a. Use the arrow keys to scroll down and highlight **Maintenance Mode**.
b. Press **OK**.



4.

Maintenance Mode is disabled by default. Use the right and left arrow keys to navigate to different Meter Runs, if needed.

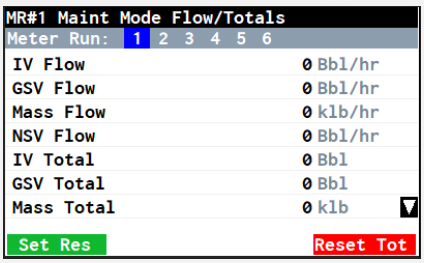
When ready to enable Maintenance Mode, press the **FR/Totals** function key.



5.

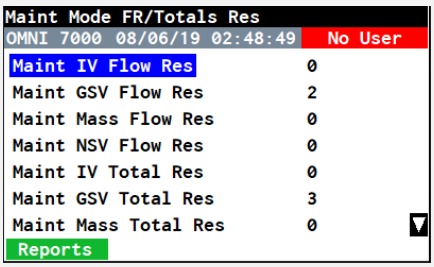
The **Maint Mode Flow/Totals** screen displays a list of all the flow rates and totalizers you can adjust in this mode.

Press the **Set Res** function key to enter new decimal resolutions.



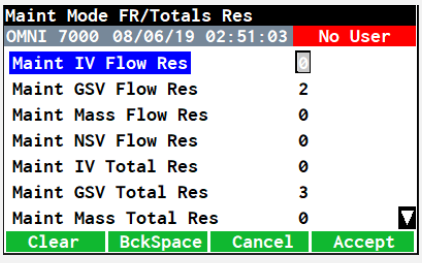
6.

Use the **Up** and **Down** arrow navigation keys to scroll to and highlight the flow or totalizer decimal resolution you wish to change and press **OK** to open the entry field.

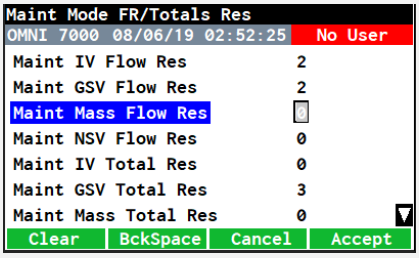


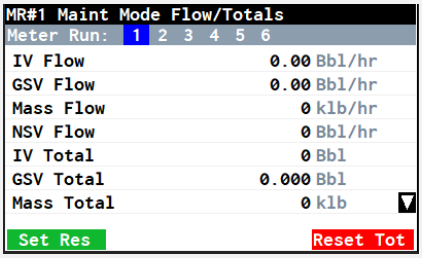
7.

Enter the new value for your selection and press **OK**.



8. Continue entering new values, as needed. When finished, press the **Back** key to go back to the **Maint Mode Flow/Totals** screen.



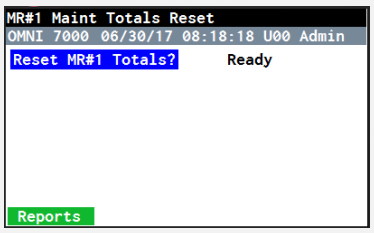


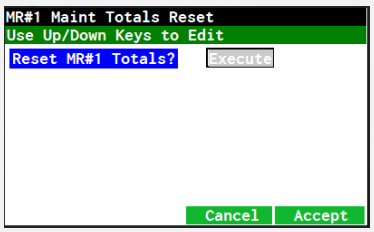
9. On the main **Maint Mode Flow/Totals** screen, press the red **Reset Tot** function key to reset the totalizer values to zero.

This does not affect the decimal resolutions set in Step 6; they can only be changed manually.

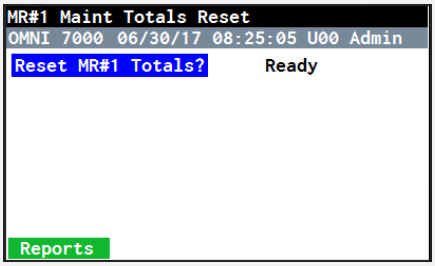
10.

a. When ready to reset the Maintenance Mode totals, press **OK** and use the **Up** and **Down** arrow keys to change the status from **Ready** to **Execute**.
b. Press **OK** again to start the reset.





11. When the reset is complete, the status automatically returns to **Ready**. Press the **Back** key to go back to the **Maint Mode Flow/Totals** screen and continue in Maintenance Mode, or the **Home** button to return to the main menu.



7.3.5 System Resets

CAUTION:

Do not clear the flow computer's RAM unless you have verified that all important information has been saved through OMNICONNECT. Clearing the RAM will erase important operating information such as:

- Configurations.
- Live process inputs.
- Registers.
- Totalizers and calibration data (in some cases).

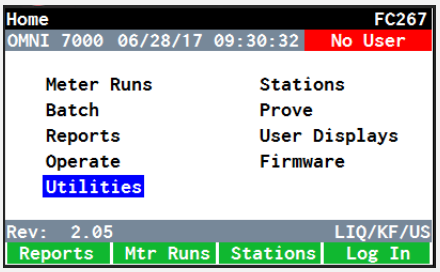
The only data that is kept after a system reset is the current firmware revision.

The purpose of the System Resets function is to clear the flow computer's RAM.

To access the System Resets, follow these instructions:

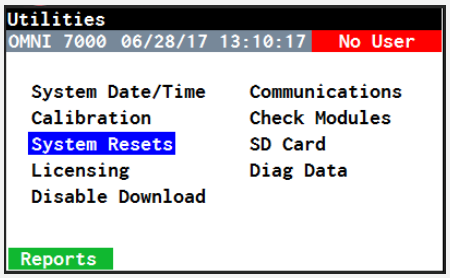
1.

a. In the **Home** menu, use the arrow navigation keys to go to and select **Utilities**.
b. Press the **OK** key.



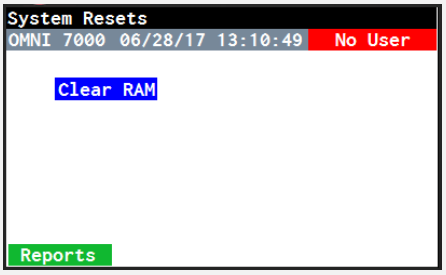
2.

a. Use the arrow keys to scroll down and highlight **System Resets**.
b. Press **OK**.



3.

If you are ready to clear the RAM and have all pertinent information saved to another location through OMNICONNECT, press **OK**.

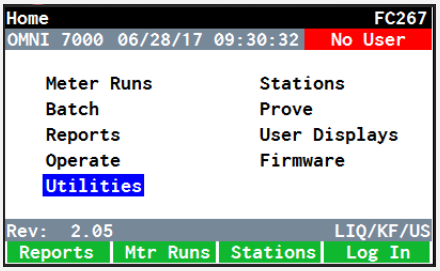


7.3.6 Licensing

To access the flow computer's firmware license information through the front panel (software license information can be found in OMNICONNECT), follow these instructions:

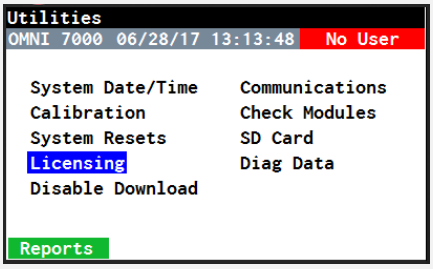
1.

a. In the **Home** menu, use the arrow navigation keys to go to and select **Utilities**.
b. Press the **OK** key.



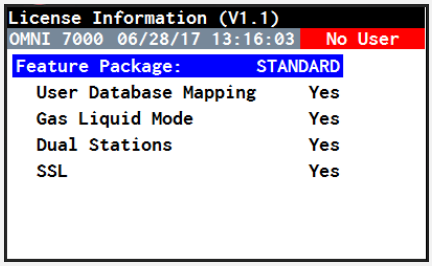
2.

a. Use the arrow keys to scroll down and highlight **Licensing**.
b. Press **OK**.



3.

You can now view your flow computer's current licenses for optional firmware features on the **License Information** screen.



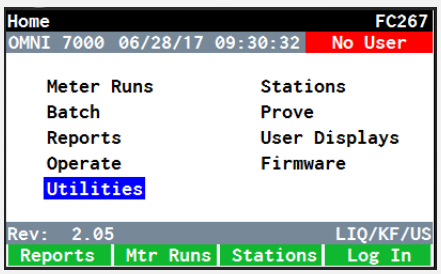
7.3.7 Disable Download

The Disable Download function controls the ability of the flow computer to either transmit or receive a configuration file.

To access the Disable Download settings, follow these instructions:

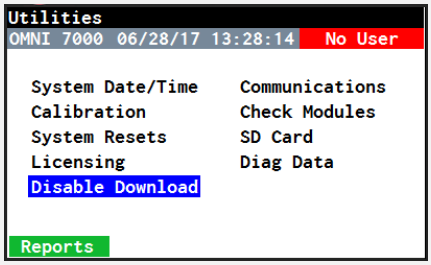
1.

a. In the **Home** menu, use the arrow navigation keys to go to and select **Utilities**.
b. Press the **OK** key.



2.

a. Use the arrow keys to scroll down and highlight **Disable Download**.
b. Press **OK**.

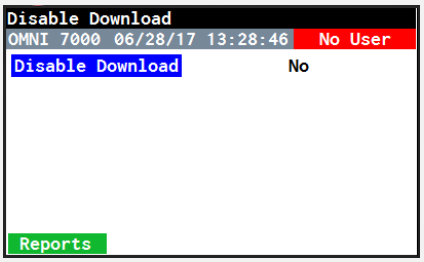


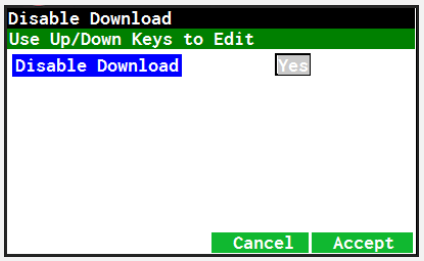
3.

The default setting for the **Disable Download** function is **No**.

Press **OK** to select the option box and use the up or down arrow keys to change it to **Yes**.

> The **No** setting means the flow computer can receive entire configurations. The **Yes** setting means that it cannot receive them, and any changes must be made in individual configuration screens while online.





7.3.8 Communications

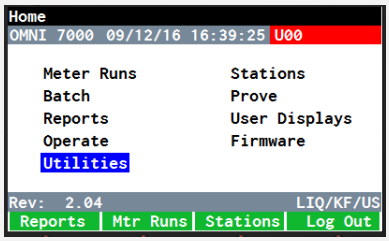
See Section 4.3 Configuring Communications Ports (Front Panel) in the Installation Guide to configure Serial and Ethernet ports.

7.3.9 Check Modules

To properly allocate any changes to the hardware's I/O channels for later configuration and assignment using the OMNICONNECT software, follow these instructions:

1.

a. From the **Home** screen on the front panel display, use the arrow navigation keys to go to and select **Utilities.**
b. Press **OK.**

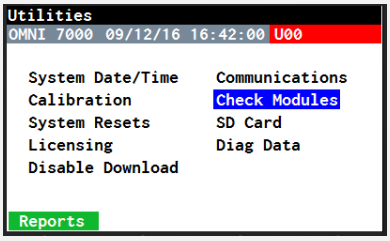


2.

a. On the **Utilities** screen, navigate to the **Check Modules** menu selection.

b. Press **OK** or the **Enter** key.

The flow computer detects any changes in the hardware modules installed.



3.

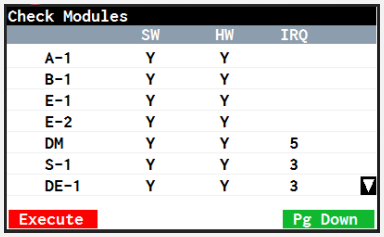
a. Verify that the **SW (Software)** and **HW (Hardware)** columns both display **Y (Yes)** for each module.

b. Use the **Pg Down** or **Pg Up** function keys to scroll up or down the screen to view all the modules, as necessary.

c. If the **SW** and **HW** columns display all **Y**s, then you are finished.

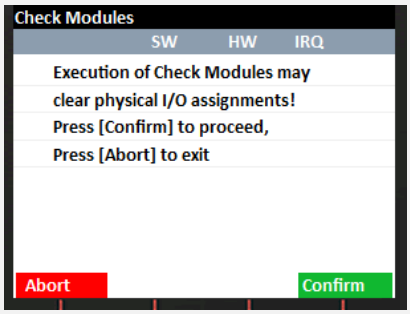
d. If modules show **N (No)** under either the **SW** or **HW** columns, press the **Execute** function key.

Do not be concerned if not all of the modules show a value under the **IRQ** (Interrupt Request) column. The IRQ is fixed for some modules.



4.

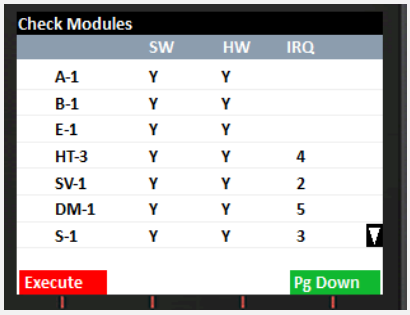
Press the **Confirm** function key to proceed with the **Check Modules** command so that all installed modules show **Y** under both the **SW** and **HW** columns.



5.

a. Confirm that any modules that previously said **N** under the **SW** column now say **Y**, indicating that their software has been updated to reflect the hardware installation.

b. Confirm that any modules that previously showed **N** under the **HW** column no longer appear on the screen after the list has been updated, which indicates that the module has been removed.



In this example, the **E-2 module** has been physically removed from the flow computer, and after performing the **Check Modules** function, it no longer appears in the module list.

6. When complete, press the **Back** key to return to the **Utilities** screen.

7.3.10 Secure Digital Card

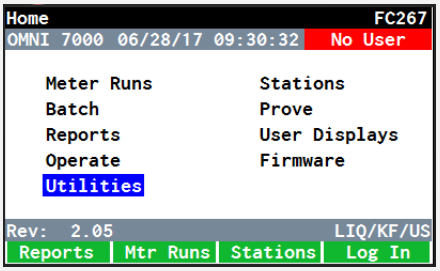
The Secure Digital (SD) card stores all data from the flow computer. If the card is full or there is a problem and it needs to be replaced, the flow computer will give an error message.

To eject an SD card and format a new card, follow these instructions:

1.

a. In the **Home** menu, use the arrow navigation keys to go to and select Utilities.

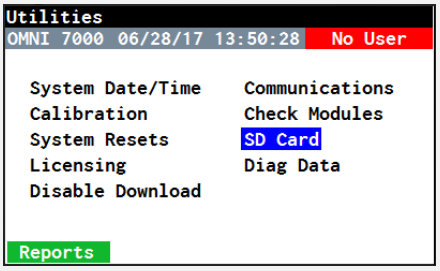
b. **Press** the **OK** key.



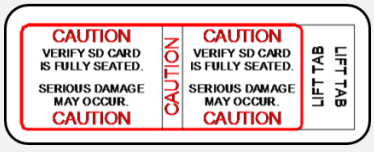
2.

a. Use the arrow keys to scroll down and highlight **SD Card**.

b. Press **OK**.

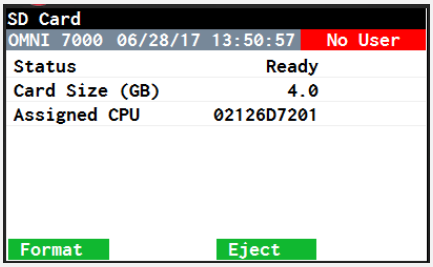


3. On the flow computer CPU module, physically remove the protective adhesive tape covering the SD card slot.



4.

a. Press the **Eject** function key.
b. Remove the old SD Card.
c. Insert the new SD Card.
d. Press the **Format** button.



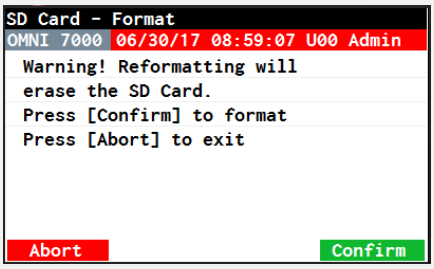
5.

On the flow computer CPU module, replace the protective adhesive tape covering the SD card slot.

6.

a. When you are ready to format the newly-inserted SD Card, press the **Confirm** button.
b. Press **Abort** to exit the Format screen.

Pressing the **Confirm** button will erase anything currently on the new SD Card. Once a new SD card has been formatted, the flow computer will no longer be able to access the previous SD card's data if it is reinserted.



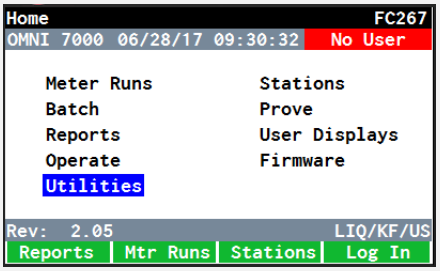
7.3.11 Diagnostic Data

These screens display diagnostic information about the flow computer such as number and type of I/O modules installed, current output percentage of analog outputs and raw input signals coming into the flow computer.

To access the Diagnostic Data information, follow these instructions:

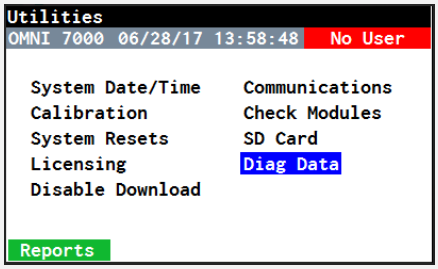
1.

a. In the **Home** menu, use the arrow navigation keys to go to and select **Utilities**.
b. Press the **OK** key.



2.

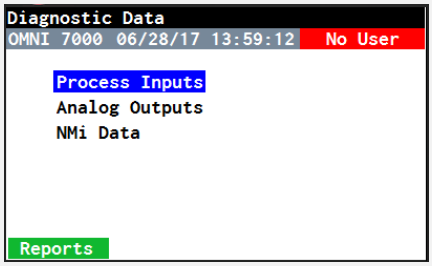
a. Use the arrow keys to scroll down and highlight **Diag Data**.
b. Press **OK**.

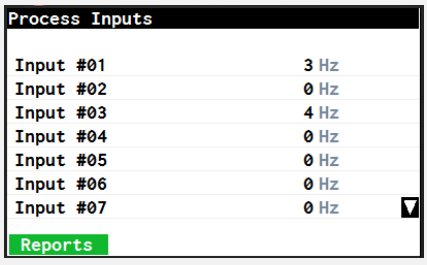


3.

Use the arrow keys to navigate to any of the three selections and press **OK** to view their data.

> **NMi Data** is a special screen of information required for the flow computer to receive the NMi certification for measuring instruments.





7.4 Component Maintenance

If maintenance needs to be completed on any component of the OMNI 4000/7000 flow computer while it is in operation, inform the responsible technicians according to your company- or project-specific procedures. Only qualified individuals should perform maintenance on these components.

Contact the OMNI Sales Department at Sales@omniflow.com or +1-281-240-6161 to inquire about purchasing replacement parts for the following components:

- Fuse kits
- Modules
- Cables

7.4.1 Inspection

See Section 7.2 Troubleshooting Tables in the Installation Guide to verify that the hardware is operating normally and all alarms are cleared.

As part of your company-specific scheduled maintenance program, you may conduct a visual inspection of the OMNI 4000/7000 components.

To complete a visual inspection, follow these instructions:

CAUTION: If there is any evidence of burnt components, or you need to access the flow computer enclosure to inspect the interior, verify the following before opening the flow computer:

- OMNICONNECT configurations and reports have been saved.*
- Flow in the pipe has been shut off.*
- The flow computer has been powered off.

*If required by your local procedures for taking the flow computer offline.

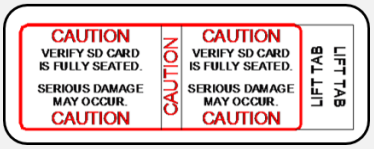
Observe precautions for handling electrostatic-sensitive devices.

1.	Make a visual inspection of the flow computer. Pay particular attention to the input channel on the module where the transducer is connected.	
2.	If you see any of the following problems, take corrective actions as defined by your project-specific or company-specific procedures:	• Signs of burned components • Bent or broken pins • Moisture • Discoloration • Broken parts • Stress on any cables (For the Serial interface cables, check the jackets for loose wires, problems with insulation, or other signs of stress.) • Dust or foreign material

3.	If you suspect that a DC or AC fuse is malfunctioning, go to Section 7.4.3 Fuse Service and Replacement.
4.	Inspect the buttons on the front panel keyboard for blockage because of environmental conditions, such as dirt or salt build-up (when installed near the ocean), and clean them, if needed. If the buttons are too degraded or cannot be cleaned, the front panel may need to be replaced.

CAUTION: If you apply a cleaning solution to the front panel, do not use a solvent cleaner. Solvent cleaners may further degrade the buttons on the front panel.

5.	Verify that the protective tape holding the SD card in place is still functioning properly. If the adhesive has worn off and the tape needs to be replaced, contact the OMNI Help Desk at helpdesk@omniflow.com or call +1 281-240-6161.



7.4.2 Change Modules

If you want to add or remove a module, change the installed order of the modules, or simply replace a damaged card, complete the following instructions.

Take the Flow Computer Out of Service

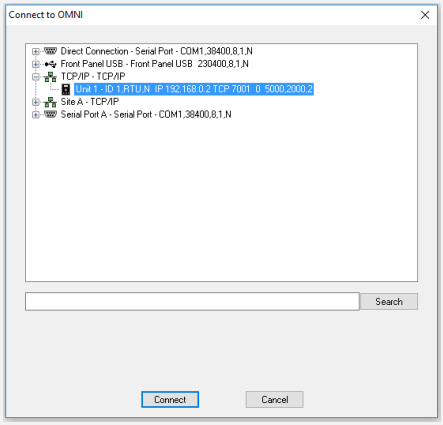
1.	Follow your local procedures for taking the flow computer out of service, which may or may not include: • Stopping active flow of the product in the pipeline system connected to the flow computer. • Ending all batches, either remotely or manually (Step 2). • Saving configuration data (Steps 3 through 5). • Saving reports and archive data (Steps 6 and 7). When you have completed your local procedures, go to Step 8.

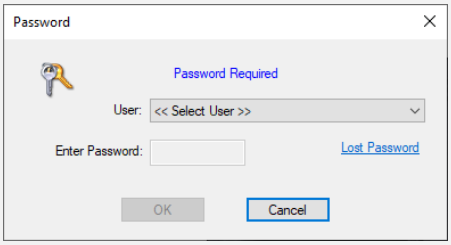
2.

a. To end a batch through OMNICONNECT, go to Section 3.6.4.
b. To end a batch through the front panel, go to Batch Control/Ending a Batch in Section 6.6.5.

3. In OMNICONNECT, retrieve the current configurations and save the file to your PC:

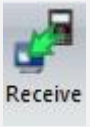
a. If not currently online with the flow computer, click the **Online** button and connect to the unit.
b. In the **Connect to OMNI** window, choose which unit to connect with from the list presented.
c. Enter the appropriate user name and password when prompted.

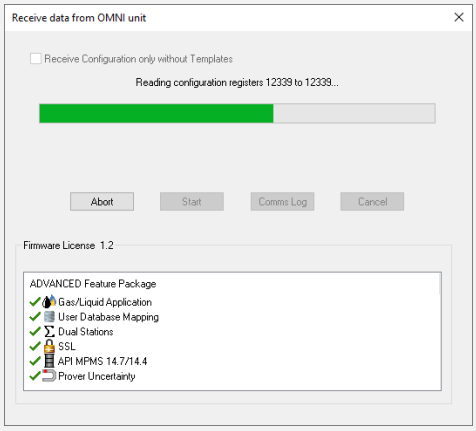




4.

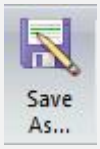
a. Click the **Receive** button in the Home ribbon to open the **Receive Data from OMNI Unit** window and receive the current configuration from the flow computer.
b. Click **Start** to receive the data from the flow computer.

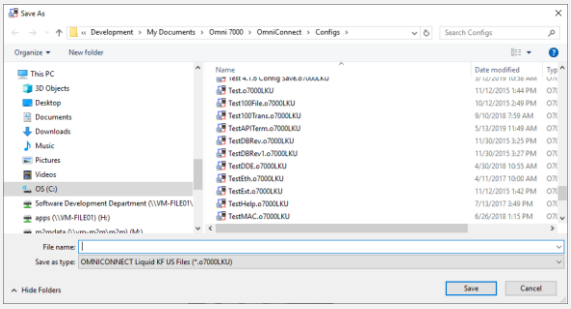




5.

a. Click on the File ribbon and select **Save As…**
b. In the **Save As** window, enter a file name and navigate to a chosen location on your PC or use the default Omni folder.
c. Click **Save**.

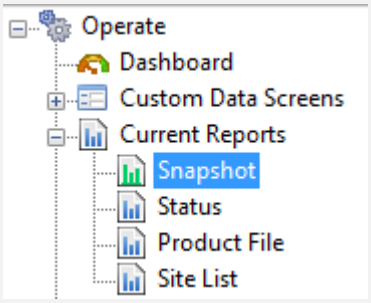


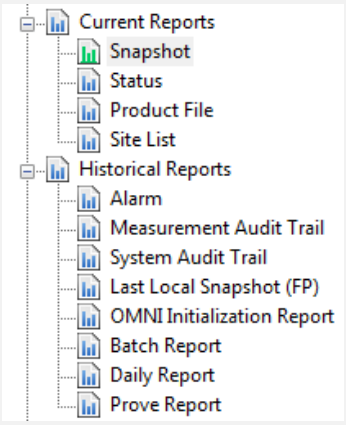


6.

Before powering off the flow computer, you should also retrieve all archive reports through OMNICONNECT:

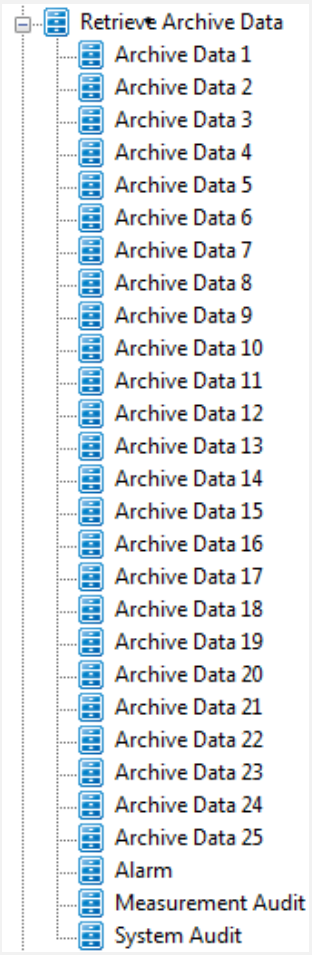
a. In the **Operate** tree, click on the first **Current Report**: **Snapshot**.
b. Click **Save Report**.
c. Continue saving reports for all **Current Reports** and **Historical Reports** in the tree.





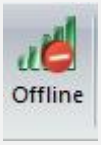
7. Retrieve any raw archived data by following the instructions in Section 5.3.3 Retrieve Archives, as applicable.

If you are not running the archive data feature, you should still retrieve the **Alarm**, **Measurement Audit** and **System Audit** archives.



8.

a. When you have finished retrieving and saving all relevant configurations, reports and data, click the **Offline** button.
b. Close OMNICONNECT.



9. Power down the flow computer and verify that no voltages are present.

WARNING: When working with external devices connected to the OMNI 4000/7000 back panel, verify that no power is applied to the flow computer. External devices may have their own source of power.

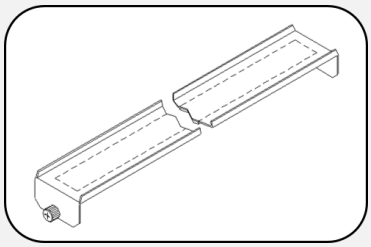
Earth Ground Requirements:

Electrical shock can cause serious or fatal injury. Follow the National Electrical Code (NEC) and local codes for the safe operation and maintenance of this equipment.

Add, Remove and Replace Modules

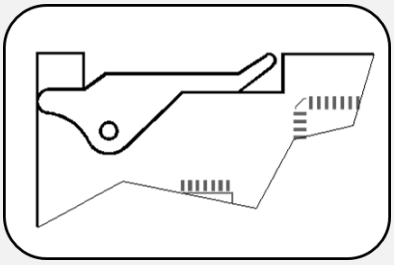
1. If you are using the panel mount chassis, lift the Front Panel Bezel upwards to slide the inner chassis out.

If you are using the NEMA chassis, remove the card-retaining bracket from the chassis.



2. Use the card ejector to remove the module from the chassis.

Make note of the module's designated slot number on the motherboard.



If removing a CPU or power supply card, there will be cables to disconnect before you are able to remove the card from the chassis. Remember to re-connect these cables when putting in the new cards.

3. Insert the new module into its designated slot.

4. To reinstall the panel mount chassis, slowly slide the inner chassis back into the flow computer.

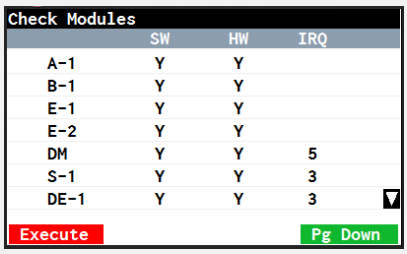
For the NEMA chassis, re-install the card-retaining bracket.

If you have added a module, removed a module or changed the order of the modules, go to the back panel wiring tables in Section 3.7 Connect to Field Devices in the Installation Guide to verify or re-configure the wiring.

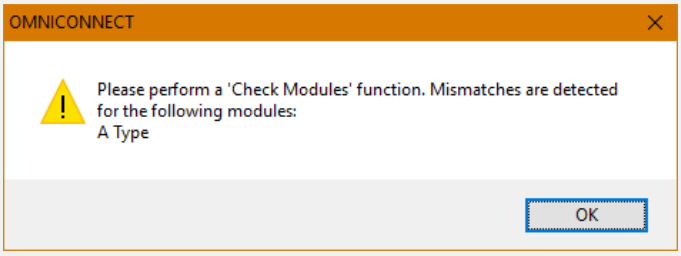
If you have replaced a module (with the same type of module), the back panel wiring does not change.

5. Power up the flow computer.

6. Go to Section 7.3.9 Check Modules and follow the instructions to complete the **Check Modules** feature. If any module indicates a **N** for NO under the Hardware or Software column, execute the **Check Modules** feature until all modules indicate **Y** for YES under both columns.



If you have added or replaced a Serial, DE or Digital Multiplexer module, when the flow computer powers up it will automatically check for and adjust the hardware configurations. With any other module card, you may receive a message upon connecting to the flow computer in OMNICONNECT stating that there is a mismatch and you need to run **Check Modules**. It is good practice to manually run **Check Modules** regardless of whether you receive this message or the type of module you add or replace.



Verify Configuration

Adding, removing or changing the order of modules may clear your previous I/O assignments and reallocate the input and output channels to fit the new module order, or even clear all configuration settings. You must now review all configurations in the flow computer and re-assign any input channels that were cleared by your previous actions.

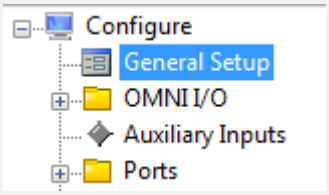
1.

a. Open OMNICONNECT.
b. Follow Steps 3 and 4 above to go online with the flow computer and retrieve the data.

If upon retrieving the data you discover that your previous configurations have been cleared, you can open a previously-saved configuration file. Go to **File** > **Open** and navigate to the correct file. Adjust the new configuration to match any old settings that still apply and change new settings as necessary (such as updating DCFs and MFs).

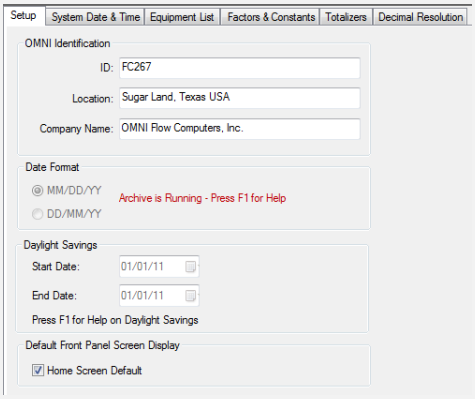
2.

a. In the Actions ribbon, click on **Configure**.
b. Click on **General Setup** in the **Configure** tree.

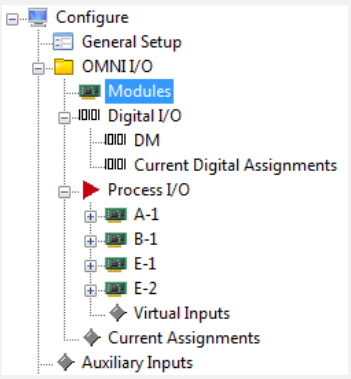


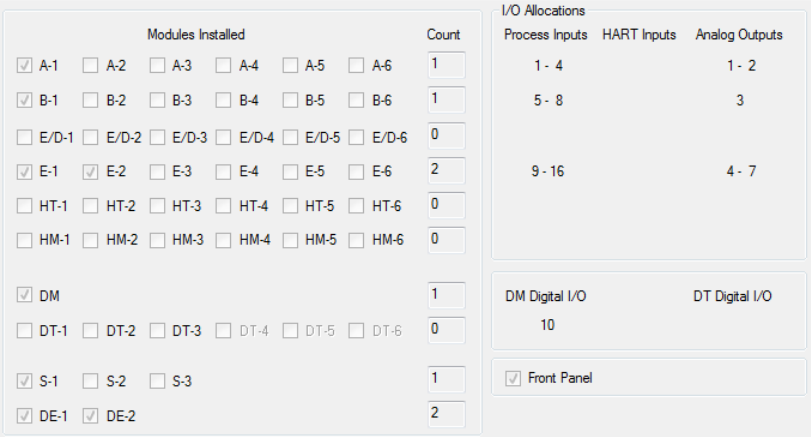
3. Beginning with the first **General Setup** tab, review all configurations and input assignments:

a. Expand every expandable item in the **Configure** tree.
b. One by one, select every item in the tree and review each configuration screen and tab.
c. Re-assign input channels, as necessary
d. Make adjustments to configurations, as necessary.



Pay particular attention to the items in the **OMNI I/O** folder, as most potential changes or updates will involve the flow computer's input and output assignments. The **Modules** screen displays an overview of the installed modules and current I/O allocations.





4. Follow your local procedures for placing the flow computer back into service, which may or may not include:

- Starting the archiving raw data feature (Step 21).
- Starting batches and initiating flow in the pipes through PID loops (Step 22).
- Notifying the responsible persons that the maintenance is complete (Step 23).

5.	If you want to begin archiving raw data again, go to Section 5.3.2 and follow the instructions for starting this feature if it has stopped.
6.	If you are using PID Loops, start your batches or open the pipeline system valves and initiate flow through PID Control (go to Startup and Shutdown Ramping Functions in Section 6.6.6).
7.	If you are not using PID Loops to start the batches, notify your SCADA operator or technician to initiate flow.

7.4.3 Fuse Service and Replacement

Specifications

Fuses are located on the panel mount and short extended back panels (Table 7-1) or extended back panels (Table 7-2).

Table 7-1: Power Fuse Specifications

Location	Specifications
• Standard Back Panel (4000/7000) • Short Extended Back Panel (7000)	• AC Fuse 5x20 = 1.6 A Fast Blow (Littelfuse #021701.6) • DC Fuse 5x20 = 3.15 A Slow Blow (Littelfuse #02183.15)

Table 7-2: NEMA Mount Power Fuse Specifications

Location	Specifications
Extended Back Panel (7000)	• AC Fuse 5x20 = 1.6 A Fast Blow (Littelfuse #021701.6) • DC Fuse 2AG = 3 A Slow Blow (Littelfuse #0229003) • Transducer Loop power fuses 1 through 8 DC Fuse 2AG = 250 mA Fast Blow (Littelfuse #0225.250)

Test and Replace Fuses

Note the part number on any fuse you plan to replace and use the specifications in Table 7-1 and Table 7-2 to verify that you are installing the correct fuse with the matching part number.

If power is being provided to the flow computer but the flow computer is not on, or the flow computer is providing power to an outside device and that device is not on, there could be a problem with a fuse.

Test a suspected malfunctioning fuse by measuring across it with a multi-meter to test continuity. If the fuse tests “Open,” it may need to be replaced.

To remove and replace a suspected malfunctioning fuse, follow these instructions:

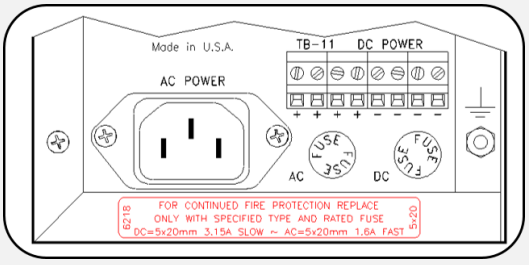
1. Follow your local procedures for taking the flow computer out of service. Go to Section 7.4.2 for further instructions on saving configurations, ending batches and archiving data, if needed.
2. Power down the flow computer.

WARNING: When working with external devices connected to the OMNI 4000/7000 back panel, verify that no power is applied to the flow computer. External devices may have their own source of power.

Observe precautions for handling electrostatic-sensitive devices.

3. Verify that the power to the flow computer is **OFF.**
4. Access the back panel or extended back panel:
   - For panel mount and short extended back panel devices, go to Step 5.
   - For extended back panel devices, go to Step 8.
5. Both fuses on the panel mount back panel and the short extended back panel are 1/4 turn cartridge fuses that can be unscrewed by hand.

   By hand, carefully apply downward pressure and turn the base of the fuse holder counter-clockwise to remove the fuse.



6.

a. Replace the malfunctioning fuse with a new one, following the specifications for the Standard Back Panel indicated in Table 7-1.
b. Carefully apply downward pressure and turn the base of the fuse holder clockwise to re-install the fuse. Do not over-tighten (the fuse holder will stop when tightened sufficiently).
c. Verify that the fuse cartridge is fully seated.

7.

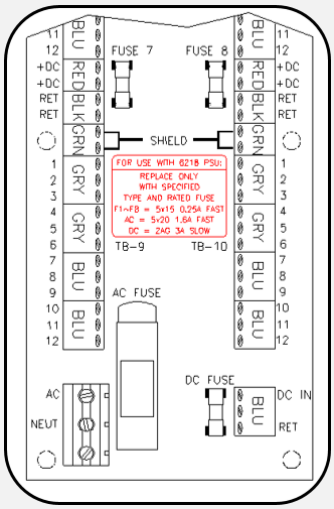
Repeat Steps 5 and 6 for the second fuse, if needed.

When finished, go to Step 16 to complete the fuse maintenance.

8.

The standard extended back panel has one 1/4 turn AC cartridge fuse, one DC power fuse and eight loop power fuses (F1–F8) that are installed in clips (Table 7-2):

a. For the AC cartidge fuse, go to Step 9.
b. For the clip-installed fuses, go to Step 11.



9.

a. To remove the AC cartridge fuse, use a flat-head screwdriver and insert the head into the slot at the top of the fuse holder.
b. Apply downward pressure and turn the screwdriver counter-clockwise to remove the fuse.

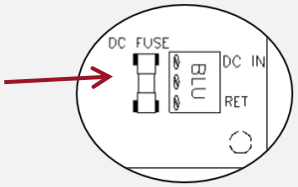
10.

a. Replace the malfunctioning fuse with a new one, following the specifications for the AC 5x20 fuse indicated in Table 7-2.
b. Carefully use the screwdriver to apply downward pressure and turn the fuse holder clockwise. Do not over-tighten.
c. Verify that the fuse cartridge is fully seated.

11.

To remove a clip-installed fuse, disconnect its power connections to the field device before removing the fuse.

12.	Place the flat end of the screwdriver underneath the fuse in between the clips and carefully pop out the fuse from the clips.
13.	a. Replace the malfunctioning fuse with a new one, following the specifications for the Extended Back Panel DC 2AG fuses indicated in Table 7-2. b. Place the terminals of the fuse on top of each clip and carefully press down to seat the fuse into place.
14.	Re-connect the fuse's power connections to the field device that you removed in Step 11.
15.	Repeat Steps 11 through 14 for any other clip-style fuse, if needed. When finished, continue to Step 16 to complete the fuse maintenance.
16.	Power up the flow computer.
17.	Follow your local procedures for placing the flow computer back into service and verify that all functions are operating normally.



If after you replace a suspected malfunctioning fuse and the original situation that prompted the replacement has not changed, the problem may lie with an external device.