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FLOBOSS™ 103 AND 104 FLOW MANAGERS

Instruction Manual

Flow Computer Division

Website: www.EmersonProcess.com/flow

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Process Management

Revision Tracking Sheet

August 2004

This manual is revised periodically to incorporate new or updated information. The date revision level of each page is indicated at the bottom of the page opposite the page number. A major change in the content of the manual also changes the date of the manual, which appears on the front cover. Listed below is the date revision level of each page.

Page	Revision
All Pages	Aug/04 (applies to FloBoss 104)
All Pages	4/04 (applies to version 1.30)
All Pages	12/03 (applies to version 1.20)
All Pages	10/02 (applies to version 1.10)
All Pages	04/02 (applies to version 1.0)

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SECTION 1 – GENERAL INFORMATION

This section describes the FloBoss™ 100-Series Flow Managers, part of the family of FloBoss flow computers manufactured by Emerson Process Management. It focuses on function and electronics.

This section contains the following information:

1.1 Product Overview

The FloBoss 100-Series unit is a 32-bit microprocessor-based Electronic Flow Computer. The FloBoss 100-Series Flow Manager electronically measures, monitors, and manages gas flow for a single meter run using orifice plate, rotary meter, or tubine meter techniques. This economical flow computer reliably and accurately performs gas flow calculations, temperature measurements, data archival, and remote communications with an optional communications card installed.

The FloBoss 100-Series unit performs minute, hourly (periodic), daily, and minimum / maximum historical data archivals for standard history and a configurable time interval archival for extended history. The FloBoss 103 is the perfect solution to electronically replace traditional paper charting. The FloBoss 100-Series unit records the corrected gas flow across an orifice plate or meter, stores the data, and has the ability to send the data to a remote host.

The FloBoss 100-Series unit computes gas flow for both volume and energy. The FloBoss provides on-site functionality and supports remote monitoring, measurement, data archival, communications, and control. The FloBoss design allows you to configure specific applications, including those requiring logic and sequencing control using a Function Sequence Table (FST).

The FloBoss 100-Series unit provides the following components and features:

- Weather-tight enclosure.
- Termination Board.
- 32-bit Processor Board.
- Battery Charger Board.
- Backplane Board.
- 2 MB of flash ROM (Random Access Memory), which is field upgradeable.
- 512 KB of battery backed-up RAM (Random Access Memory) storage.

- Integral Dual-Variable Sensor (DVS) for static pressure and differential pressure measurement using orifice metering (FloBoss 103).
- Pulse Interface Module for line pressure and pulse counts using turbine or rotary metering (FloBoss 104).
- Support for a three-wire 100-ohm Resistance Thermal Detector (RTD) input.
- Internal lead-acid batteries (optional).
- Local Operator Interface (LOI) port – EIA-232 (RS-232).
- EIA-485 (RS-485) on Comm 1 port.
- Communications card using EIA-232 (RS-232), dial-up modem, or spread spectrum radio on Comm 2 port (optional).
- Extensive applications firmware.

Physically, the FloBoss 100-Series unit consists of a termination board with or without optional I/O points, RAM battery backup board, optional Comm 2 communications card, processor board, charger board, backplane board, and optional display housed in a compact, weather-tight case. The FloBoss is packaged in a NEMA 4 windowed enclosure that mounts on a pipestand, to an orifice plate via a three or five valve manifold, to a turbine meter, or to a rotary meter. The aluminum enclosure protects the electronics from physical damage and harsh environments. Refer to Figure 1-1, Figure 1-3, and Figure 1-4.

The enclosure is fabricated from die-cast aluminum alloy with iridite plating and paint. The NEMA 4 enclosure protects the electronics from physical damage and harsh environments. The caps at either end of the enclosure can be unscrewed to allow field maintenance. The FloBoss has two ¾-14 pipe threaded holes for field conduit wiring, and communications.

The DVS flange has bracket holes that allow the enclosure and DVS to be mounted on a pipestand or mounting bracket. The Pulse Interface Module, on a FloBoss 104, has a universal mounting plate that also has bracket holes to allow the enclosure and Interface to be mounted on a meter.

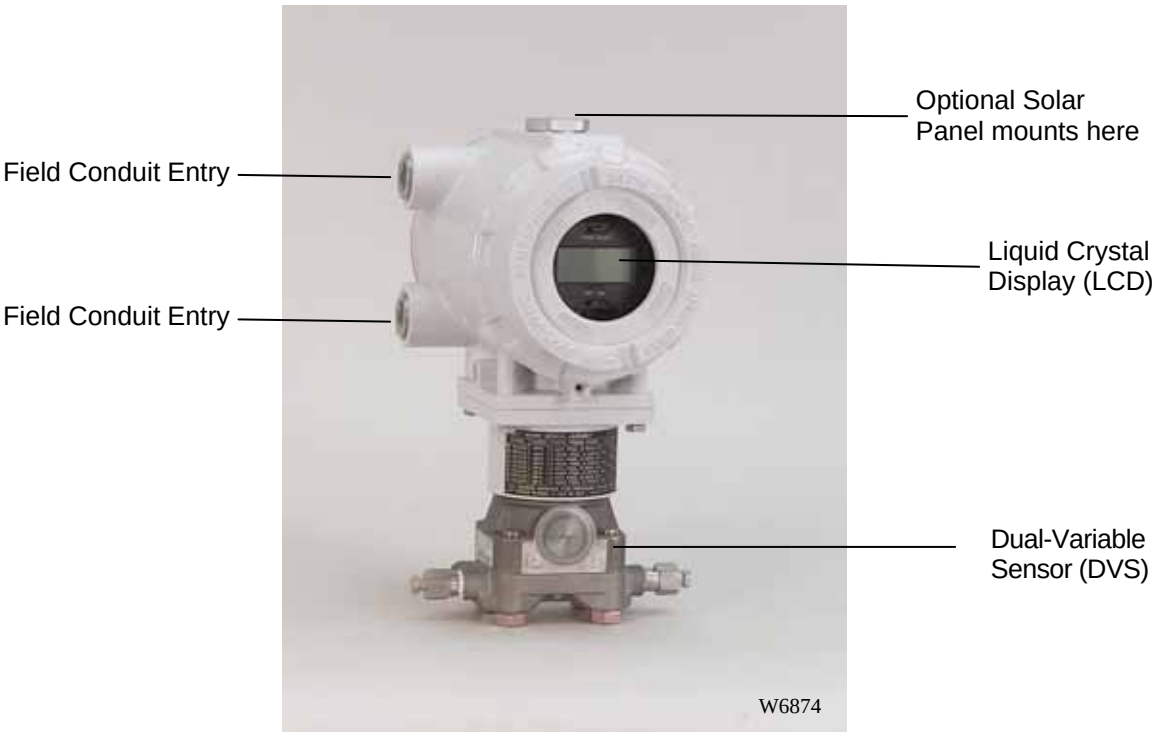

Figure 1-1. FloBoss 103 Flow Manager with LCD

Figure 1-2. FloBoss 104 Flow Manager

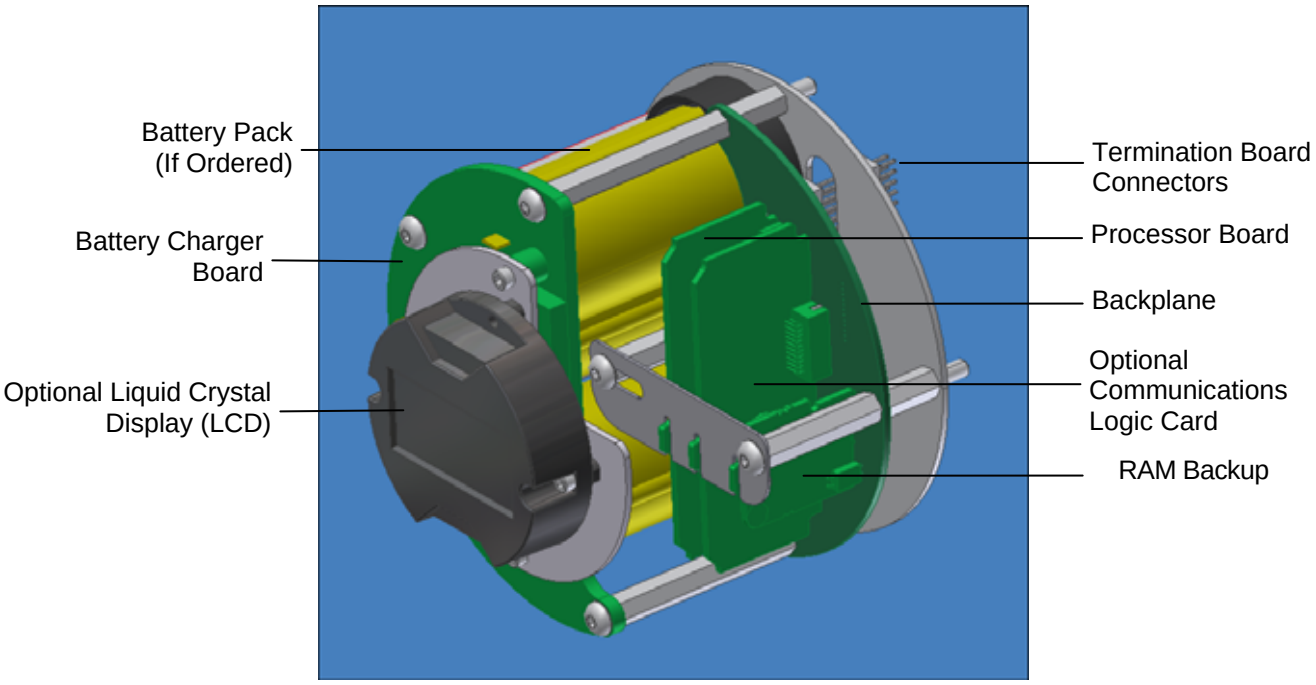

Figure 1-3. Inside the FloBoss 100-Series Enclosure

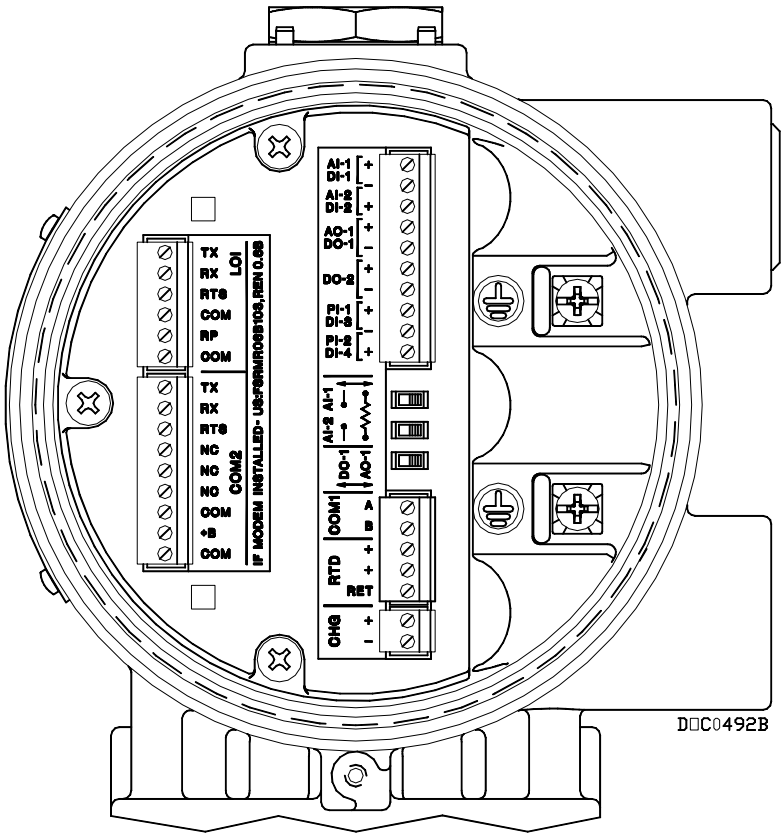

Figure 1-4. Wiring Terminals

1.1.1 Hardware

The **backplane board** provides the power regulation, the routing of the signals to the termination board, the processor board, the backup battery board, the optional communications board, the Dual-Variable Sensor (DVS), the Pulse Interface Module, and the battery charger board. Refer to Figure 1-3.

The **termination board** provides connections to the field wiring and is located in the terminal side of the explosion proof housing. Refer to Figure 1-4. Connections include the power supply, Local Operator Interface (LOI) communications, Comm 1 (for EIA-485 (RS-485) communications), optional Comm 2 (for EIA-232 (RS-232), wireless spread-spectrum radio, or dial-up modem communications), RTD wiring, and the I/O field wiring. The termination board provides surge and static discharge protection for the field wiring. Electronics include the RTD circuits and the final I/O drivers/receivers. The radio interface board mounts to the termination board. The termination board also serves as an interface to the backplane board in the electronics portion of the enclosure.

The 32-bit **processor board** contains the processor, memory (static RAM, Flash EEPROM, and boot ROM), Local Operator Interface (LOI) EIA-232 (RS-232) communications driver, Comm 1 EIA-485 (RS-485) communications driver, the reset controller, and the real-time clock. The processor board, also called the central processor unit (CPU), provides the Serial Peripheral Interface (SPI) bus, the Liquid Crystal Display (LCD) drivers, the Dual-Variable Sensor (DVS) control, the Pulse Interface Module control, and the optional I/O termination points control.

The microprocessor has low-power operating modes, including inactivity and low battery condition. The FloBoss comes standard with 512 KB of built-in, static random access memory (SRAM) for storing data and history. The FloBoss also has 2 MB of programmable read-only memory (flash ROM) for storing operating system firmware, applications firmware, and configuration parameters.

The **charger board** controls the charging of the internal batteries, if installed. The batteries are three D-size lead-acid batteries providing 2.5 Amp-hours of current at 6.2 volts nominal. The charger board also serves as the interface to the optional LCD assembly, as well as supporting the On/Off and Norm/Reset jumpers.

A **backup battery** provides backup power for the Static RAM and the Real-Time Clock. This battery is field replaceable. Under normal conditions, the battery has a functional life in excess of five years.

The **Dual-Variable Sensor (DVS)** of the FloBoss 103 measures static pressure and differential pressure for orifice flow calculation by converting the applied pressure to electrical signals and making the readings available to the processor board. The DVS housing fastens to a flanged adapter, which, in turn, mounts with four bolts to the bottom of the enclosure. The DVS cable connects into the backplane board. Refer to Section 6, Dual-Variable Sensor.

The **Pulse Interface Module** of the FloBoss 104 measures the flow of natural gas using turbine metering or rotary metering, by converting the applied pressure to electrical signals and counting the number of pulses (from rotary meter) and making the readings available to the processor board. The module housing fastens to a flanged adapter, which, in turn, mounts with four bolts to the bottom of the enclosure. A cable connects into the backplane board. Refer to Section 7, Pulse Interface Module.

An **RTD temperature** probe typically mounts in a thermowell on the meter run. The RTD measures the flowing temperature. RTD wires should be protected either by a metal sheath or by conduit connected to a liquid-tight conduit fitting on the enclosure. The RTD wires connect directly to the RTD connector on the termination board inside the enclosure. Refer to Section 5, Input/Output and RTD.

The **built-in inputs and outputs (I/O)** on the FloBoss consist of a 2 or 3-wire 100-ohm Resistance Thermal Detector (RTD) input interface and a port for either a Dual-Variable Sensor (DVS) or a Pulse Interface Module. Three diagnostic analog inputs (AI) monitor the battery voltage, logical voltage, and enclosure/battery temperature. Refer to Section 5, Input/Output and RTD.

The **Local Operator Interface (LOI)** port provides for a direct, local link between the FloBoss and a personal computer (PC) through a Local Operator Interface Cable using EIA-232 (RS-232) communications. With a PC running ROCLINK 800 software, you can configure the functionality of the FloBoss and monitor its operation.

The **Comm 1** allows for EIA-485 (RS-485) serial communication protocols.

The optional communications logic card for EIA-232 (RS-232) or dial-up modem and the optional communications logic card for wireless radio activate **Comm 2**. Refer to Section 4, Communication Cards.

The I/O parameters, DVS inputs, flow calculations, power control, security, and FST programmability are configured and accessed using ROCLINK 800 software. Refer to the *ROCLINK 800 Configuration Software User Manual* (Form A6121) for details concerning software capabilities.

1.1.2 Firmware

The firmware contained in flash ROM on the processor board, determines the functionality of the FloBoss 100-Series and includes:

- 1992 AGA-3 flow calculations (with user-selectable AGA8 compressibility Detail, Gross I, or Gross II) for a single meter run.
- 1996 AGA-7 flow calculations (with user-selectable AGA8 compressibility) for a single meter run.
- Memory logging of 240 alarms and 240 events.
- Archival of minute data from the last 60 minutes for up to 35 points (Standard History).
- Archival of 35 days of hourly data for up to 35 points (Standard History).
- Archival of 35 days of daily data for up to 35 points (Standard History).
- Archival of Min / Max historical data for today and yesterday (Standard History).
- Archival of 5040 entries for up to 15 points at user-specified interval (Extended History).
- Power control (wake up on ring) on optional internal modem.
- Logic and sequencing control using a user-defined Function Sequence Table (FST).
- Closed-loop (PID) control capabilities (requires optional I/O termination points).

- Communications based on the ROC protocol or Modbus slave, or optional host, (ASCII or RTU) protocol for use with EFM applications.
- Alarm call-in to host for Spontaneous-Report-By-Exception (SRBX).
- User level security.

1.1.3 Options and Accessories

The FloBoss 100-Series supports the following options and accessories:

- Communication cards for either EIA-232 (RS-232), dial-up modem, or spread spectrum radio communications.
- 6 Input/Output (I/O) termination points.
- Local Operator Interface (LOI) cable.
- Liquid Crystal Display (LCD) with two-line alpha-numeric viewing.
- Solar panel mast assembly.
- Blank plate for the FloBoss 103 for use when no DVS is required.

Plug-in **communication cards** allow you to customize the FloBoss installation for most communication requirements. Optional communication cards provide the ability to send and receive data.

One of the following card types can be accommodated:

- EIA-232 (RS-232) for asynchronous serial communications.
- Dial-up modem for communications over a telephone network.
- Spread Spectrum wireless radio communications.

The local operator interface (LOI) port provides for a direct, local link using a **Local Operator Interface Cable** between the FloBoss and a personal computer. With the personal computer running ROCLINK 800 software, you can configure the functionality of the FloBoss and monitor its operation.

The optional **Liquid Crystal Display** (LCD) provides the ability to view data and configuration parameters while on site without using the local operator interface (LOI) and a PC. The LCD display plugs into the battery charger board and is visible through the window on the front of the FloBoss. The LCD can be rotated 90° in either direction. The LCD two-line display shows one line for a value and the other line for a five-character alphanumeric description of the value. The display operates from the internal 3.3 Volt supply. Through this display, you can view predetermined information stored in the FloBoss. Up to 16 items can be defined for display. The display automatically cycles through the configured list of items displaying a new value approximately every three seconds.

An external **solar panel** can be installed to recharge the backup batteries; it connects to the CHG+ / CHG- inputs on the termination board. An integral solar panel (2 W or 5 W) is available from the Flow Computer Division of Emerson Process Management; it will connect directly to the charger board assembly. Circuitry on the battery charger board monitors and regulates the charge based on battery voltage, charging voltage, and temperature. The FloBoss requires a minimum 8-volt 200 mA solar panel.

The optional **input/output (I/O) termination points** provide additional inputs and outputs for expanded monitoring and control applications. I/O includes analog input (AI), analog output (AO), discrete input (DI), discrete output (DO), and pulse input (PI). The DO circuitry is optically coupled to help isolate the processor board from the output device. I/O can be used to drive a sampler or odorizer, open a valve, or monitor an additional analog input.

1.1.4 FCC Information

This equipment complies with Part 68 of the FCC rules. On the termination board is a label that contains, among other information, the FCC certification number and Ringer Equivalence Number (REN) for this equipment. If requested, this information must be provided to the telephone company.

The REN is used to determine the quantity of devices that may be connected to the telephone line. Excessive RENs on the telephone line may result in the devices not ringing in response to an incoming call. Typically, the sum of the RENs should not exceed five (5.0). To be certain of the number of devices that may be connected to a line (as determined by the total RENs), contact the local telephone company.

If this equipment, dial-up modem, causes harm to the telephone network, the telephone company will notify you in advance that temporary discontinuance of service may be required. But if advance notice isn't practical, the telephone company will notify the customer as soon as possible. Also, you will be advised of your right to file a complaint with the FCC if you believe it necessary.

The telephone company may make changes to its facilities, equipment, operations or procedures that could affect the operation of the equipment. If this happens the telephone company will provide advance notice so you can make the necessary modifications to maintain uninterrupted service.

If trouble is experienced with this equipment, dial-up modem, for repair or warranty information, please contact Emerson Process Management, Flow Computer Division (641) 754-3923. If the equipment is causing harm to the telephone network, the telephone company may request that you disconnect the equipment until the problem is resolved.

1.2 Product Functions

This section describes the functions of the FloBoss 100-Series, most of which is determined by firmware. The features and applications provided by the firmware, which must be configured by using ROCLINK 800 software, include:

- Flow calculations for an orifice meter (AGA3) or rotary or turbine meter (AGA7).
- Extensive historical data archival.
- Memory logging of 240 alarms and 240 events.
- Security with local and remote password protection.
- Logic and sequencing control using a user-defined FST program.
- Spontaneous-Report-by-Exception (SRBX) capability.

1.2.1 Flow Measurement

The primary function of the FloBoss 100-Series is to measure the flow of natural gas through an orifice or turbine or rotary meter in accordance with the 1992 American Petroleum Institute (API) and American Gas Association (AGA) standards.

The primary inputs used for AGA3 flow measurement function are differential pressure, static pressure, and temperature. The differential and static pressure inputs, which are sampled once per second, come from the Dual-Variable Sensor. The temperature input, which is sampled and linearized once per second, comes from an RTD probe.

The primary inputs used for AGA7 flow measurement are Pulse Input (PI) counts, static pressure, and temperature. The Pulse Input counts are acquired from a rotary meter (pulse interface module) or turbine meter (PI on termination board), the static pressure (including auxiliary pressure) inputs come from the pressure transducers, and the temperature input is read from an RTD probe.

1.2.1.1 Flow Calculations for Orifice Metering

The flow calculation is in accordance with ANSI/API 2530-92 (AGA Report No. 3 1992), API Chapter 14.2 (AGA Report No. 8 1992 2nd printing 1994), and API Chapter 21.1. The flow calculation may be configured for either Metric or English units.

Flow Time

The differential pressure stored for each second is compared to the configured low flow cutoff. If the differential pressure is less than or equal to the low flow cutoff or the converted static pressure is less than or equal to zero, flow is considered to be zero for that second. Flow time for a recalculation period is defined to be the number of seconds for which the differential pressure exceeded the low flow cutoff.

Input and Extension Calculation

Each second the FloBoss 103 stores the measured input for differential pressure, static pressure, and temperature and calculates the Integral Value (IV). IV is the square root of the absolute upstream static pressure times the differential pressure.

Flow time averages of the inputs and the IV over the configured calculation period are calculated, unless there is no flow for an entire calculation period. Linear Averages of the inputs are recorded to allow monitoring during no flow periods.

Instantaneous Rate Calculations

The instantaneous value of the Integral Value (IV) is used with the previous calculation period's Integral Multiplier Value (IMV) to compute the instantaneous flow rate. The IMV is defined as the value resulting from the calculation of all other factors of the flow rate equation not included in the IV. The instantaneous flow rate is used with the volumetric heating value to compute the instantaneous energy rate.

Flow and Energy Accumulation

The averages of the differential and static pressure, temperature, and sum of the IV are used with the flow time to compute the flow and energy over the calculation period. The flow and energy are then accumulated and stored at the top of every hour. At the configured contract hour, the flow and energy are then stored to the Daily Historical Log and zeroed for the start of a new day (contract hour).

1.2.1.2 Flow Calculations for Turbine Metering

The turbine flow calculation is in accordance with 1996 AGA Report No. 7 (1993 API Chapter 21.1). The FloBoss performs 1992 AGA8 compressibility calculations in accordance with AGA Report No. 8 1992 (API Chapter 14.2).

Once every Scan Period, the FloBoss unit processes the pulse counts, determines the number of pulse counts since the last reading, and calculates a rate. Next, the static pressure and auxiliary pressure values are read. Then the temperature is read and linearizing compensation is applied to the pressure readings if necessary.

All resultant values are stored in the current value database. The values are taken from the current value database and used to calculate the Minute, Hour, and Daily historical values.

Once a minute and once an hour, the values are logged along with other configured values to the Historical Database. At the configured Contract Hour, the values are stored to the Daily Historical Log and zeroed for the start of a new day.

1.2.2 History Points

History is saved to 2 databases: Standard and Extended History. The number of entries/logs available to Standard and Extended History is configurable.

The Standard history archives up to 35 points (8 are pre-configured) of min/max, minute, hourly and daily values. The min/max values are from today and yesterday; the minute values are from the last 60 minutes; the hourly values are from the last 35 days; and the daily values are from the last 35 days.

The Extended History database creates 1 entry for up to 15 points at a user-specified interval (see Specifications table). All the points in the Extended History will be logged at the same interval.

The default setting for Extended history archives 4 points of 10-minute values (from the last 35 days). 10-minute archiving provides a monitoring resolution similar to a chart recorder.

The first eight history points are pre-configured for flow metering history and cannot be changed. They are as follows:

1. Flowing Minutes Today (Accumulate archive type).
2. Differential Pressure for AGA3 (Average) or Accumulated Raw Pulses for AGA7 (Totalize).
3. Static or Line Pressure (Average).
4. Flowing Temperature (Average).

5. IMV (Integral Multiplier Value) for AGA3 (Average) or BMV (Base Multiplier Value) for AGA7 (Average).
6. Pressure Extension for AGA3 (Average) or Today's Total for AGA7 (Totalize).
7. Instantaneous Flow (Accumulate).
8. Instantaneous Energy (Accumulate).

History Point 2 (AGA3), History Point 3, History Point 4, and History Point 6 (AGA3) are all set up as an Average Archive Type that employs one of the following techniques:

- Flow dependent time-weighted linear averaging (default).
- Flow dependent time-weighted formulaic averaging.
- Flow-weighted linear averaging.
- Flow-weighted formulaic averaging.

The Averaging Technique is selected by using ROCLINK 800 software. The selected Averaging Technique is applied to the meter inputs. Refer to the *ROCLINK 800 Configuration Software User Manual* (Form A6121).

1.2.2.1 Minute Historical Log

The FloBoss has a 60-minute historical log for every history point. The Minute Historical Log stores the last 60 minutes of data from the current minute. Each history point has Minute Historical Log entries, unless the history point is configured for FST-controlled logging.

1.2.2.2 Hourly Historical Log

The FloBoss has a total of 35 days of hourly historical logs available for every history point. The Hourly Historical Log is also called the Periodic database. Normally, the Hourly Log is recorded at the beginning of every hour. The exceptions are FST Minute and FST Second logging.

The time stamp for periodic logging consists of the month, day, hour, and minute. The exception is for FST Second logging, in which the time stamp consists of the day, hour, minute, and second.

1.2.2.3 Daily Historical Log

The FloBoss has a total of 35 daily historical logs for every history point. The Daily Log is recorded at the configured contract hour every day with a time stamp that is the same as the Hourly Log. Each history point has daily historical log entries, unless the history point is configured for FST-controlled logging.

1.2.2.4 Min / Max Historical Log

The Min / Max database displays the minimum and the maximum values for the database points over a 24-hour period for today and yesterday. The Min / Max historical log can be viewed, but not saved to disk.

1.2.2.5 Extended History Log

The FloBoss has configurable archive times which, in turn, determine the number of entries. The four default 10-Minute history points include differential pressure, static pressure, flowing temperature, and an auxiliary Analog Input.

1.2.2.6 Alarm Log

The Alarm Log contains the change in the state of any alarm signal that has been enabled for alarms. The system Alarm Log has the capacity to maintain and store up to 240 alarms in a "circular" log. The Alarm Log has information fields that include time and date stamp, alarm clear or set indicator, and either the Tag name of the point or a 14-byte detail string in ASCII format.

In addition to providing functionality for appending new alarms to the log, the Alarm Log allows host packages to request the index of the most recently logged alarm entry. Alarm logging is available internally to the system, to external host packages, and to FSTs. Alarm Logs are not stored to the flash ROM during the Save Configuration function in ROCLINK 800 software.

The Alarm Log operates in a circular fashion with new entries overwriting the oldest entry when the buffer is full. The Alarm Log provides an audit history trail of past alarms. The Alarm Log and the Event Log are stored separately to prevent recurring alarms from overwriting configuration audit data.

1.2.2.7 Event Log

The Event Log contains changes to any parameter within the FloBoss made through the protocol. This Event Log also contains other FloBoss events, such as power cycles, cold starts, and disk configuration downloads. The Event Log provides an audit history trail of past operation and changes.

The system Event Log has the capacity to maintain and store up to 240 events in a circular log. The Event Log has information fields that includes point type, parameter number, time and date stamp, point number if applicable, the operator identification, and either the previous, current parameter values, and either the Tag name of the point or a 14-byte detail string in ASCII format.

In addition to providing functionality for appending new events to the log, the Event Log allows host packages to request the index of the most recently logged event entry. Event logging is available internally to the system, to external host packages, and to the FST.

Event Logs are not stored to flash ROM when Save Configuration is issued in ROCLINK 800 software. The Event Log operates in a circular fashion with new entries overwriting the oldest entry when the buffer is full. The Event Log provides an audit trail history of past operation and changes. The Event Log and Alarm Log are stored separately to prevent recurring alarms from overwriting configuration audit data.

The FloBoss 100-Series has the ability to limit the AGA calculation-related events to only critical events. This can keep unnecessary events from being logged and filling the event log. The events which will not be logged are temperature, pressure, Reynolds number, and warnings for orifice diameter, pipe diameter, and beta ratio.

1.2.3 Security

The FloBoss provides for security within the unit. A maximum of 16 log-on identifiers (IDs) may be stored. In order for the unit to communicate, the log-on ID supplied to ROCLINK 800 software must match one of the IDs stored in the FloBoss. The Local Operator Interface port (Security on LOI) has security Enabled by default. The Comm 1 and Comm 2 can likewise be configured to have security protection, but is disabled by default.

1.2.4 Function Sequence Tables (FST)

The FloBoss supports FST user programmability. Two FST programs can be developed with a maximum length of 3000 bytes each (typically 300 lines of code). The number of FST lines per execution cycle can be configured in ROCLINK 800 software. The number set on the ROC > Information screen will determine both FST programs.

The FST code resides in static RAM and is backed up to flash memory when the Save Configuration function is issued through ROCLINK 800 software.

1.2.5 PID Control

PID Control is available when the optional I/O termination points are installed. PID (Proportional, Integral, and Derivative) functionality calculates both the Primary Control and Override Control change in output. PID Control then selects which Control is to be used, based upon whether the High Override Type Select or Low Override Type Select is chosen and adjusts the Output control as necessary. The Output of the PID functions can be implemented through an Analog Output or the two Discrete Outputs.

1.2.6 Spontaneous-Report-By-Exception (SRBX) Alarming

The SRBX functionality allows a communications port to be set up to enable the FloBoss to contact the host computer when specified alarm conditions exist. To configure SRBX alarming, each comm port must have the SRBX parameter enabled, each point must have the alarming parameter enabled, and points must have the SRBX Set on Clear parameter set.

1.2.7 Pass Through Communications

Pass Through Communications allow the user to configure a FloBoss 100-Series unit to send Pass Through messages, when using a FloBoss 100-Series. By using any of the FloBoss 100-Series communications ports, Pass Through Mode allows data to be received by one unit and then passed through to other devices connected on any other communications port. For example, the host communicates via a radio on the FloBoss 100-Series Comm 2 port. Other FloBoss 100-Series units can then be connected via EIA-485 (RS-485) on the Comm 1 port of the first FloBoss 100-Series unit, and then all the FloBoss 100-Series units can use the one radio to communicate to the host.

- **NOTE:** Comm 2 may only use a Dial-up modem if it is receiving Pass Through messages. It cannot transmit to other field devices via Dial-up modem.

❖ **NOTE:** The Device Group of the FloBoss 100-Series receiving the data must match the Device Group of the FloBoss 100-Series unit(s) to which the data will be passed. If the Device Group does not match, the data will not be forwarded. The Device Group may be found on the General tab of the ROC > Information screen.

1.2.8 Protocol Automatic Switching

The FloBoss 100-Series has the capability to communicate with ROC or Modbus protocol. With the standard version of FloBoss firmware, Modbus Slave is standard. If you require Modbus Host functionality, contact your local sales representative.

1.2.9 User C Capability

The FloBoss 100-Series has User C capability that allows special features to be written which can be loaded into the FloBoss unit to enhance the function of the FloBoss unit. User programs typically provide the ability to interface with alternate metering equipment, perform alternate calculation methods, or communicate with alternate protocols. Consult your local sales representative for User C applications.

1.3 Product Electronics

This section describes the FloBoss 100-Series electronics. For Communication Cards, refer to Section 4. For I/O Termination Points, refer to Section 5. For the Dual-Variable Sensor, refer to Section 6. For the Pulse Interface Module, refer to Section 7.

1.3.1 Termination Board Overview

The Termination Board (Figure 1-4) components support the functionality of the FloBoss 100-Series and includes:

- Local operator interface (LOI) EIA-232 (RS-232) terminations.
- EIA-485 (RS-485) communications (Comm 1) terminations.
- RTD input terminations.
- Optional I/O and terminations.
- Remote charge terminations.
- Optional Comm 2 terminations.

1.3.2 Processor and Memory

The FloBoss derives processing power from a 32-bit microprocessor. The 32-bit CMOS micro-processor features dual 32-bit internal data buses and a single 8-bit external data bus. The unit can address up to 4 MB of memory, including high-speed direct memory access.

The FloBoss has 512 KB of static random access memory (SRAM) for storing interrupt vectors, Proportional, Integral, and Derivative alarms, events, and history data.

The FloBoss also has a 2 MB flash memory chip for storing the operating system factory code, configuration parameters, and user C programs.

1.3.3 Liquid Crystal Display

An optional two-line Liquid Crystal Display (LCD) panel mounts on the Battery Charger Board.

The LCD allows you to view the current and past gas volumes on site without requiring a PC. The LCD provides you a visual indication of the status of the meter run by displaying the historical performance data to help ensure the health and integrity of your installation.

The LCD panel remains on at all times when the power is applied in the valid operating range. The panel cycles its display through a configured list of up to 16 parameter values, with the first seven being pre-configured. The first three displays show values for time, date, and battery condition and cannot be configured. The next five displays show certain flow parameters and are factory configured, but you may change their configuration.

To configure the list of values for the LCD panel, refer to the LCD User List Setup procedure in the *ROCLINK 800 Configuration Software User Manual* (Form A6121).

1.3.4 Communications Ports

The FloBoss provides two standard and one optional communication ports:

- Standard Operator interface port EIA-232 (RS-232) – LOI.
- Standard EIA-485 (RS-485) Communications – Comm 1.
- Optional EIA-232 (RS-232), Spread-spectrum Wireless Radio, or Dial-up Modem Communications – Comm 2.

1.3.4.1 Local Operator Interface Port – LOI

The Local Operator Interface (LOI) port provides direct communications between the FloBoss unit and the serial port of an operator interface device, such as an IBM compatible computer using an EIA-232 (RS-232) link. The interface allows you to access the FloBoss 100-Series unit (using ROCLINK 800 software) for configuration and transfer of stored data. The LOI port is capable of initiating a message in support of Spontaneous-Report-by-Exception (SRBX) alarming.

The LOI terminal on the Termination Board provides wiring access to a built-in EIA-232 (RS-232) serial interface, which is capable of up to 19.2K bps operation. The operator interface port supports ROC or Modbus protocol communications. The LOI also supports the log-on security feature of the FloBoss 100-Series, if the Security on LOI is Enabled in ROCLINK 800 software.

1.3.4.2 EIA-485 (RS-485) Serial Communications – Comm 1

Use Comm 1 to monitor or alter the FloBoss unit from a remote site, using a host or ROCLINK 800 software. Comm 1 supports baud rates up to 19,200 bps. Comm 1 also supports the log-on security feature of the FloBoss unit if the security on Comm 1 is enabled in ROCLINK 800 software.

Comm 1 sends and receives messages using the ROC or Modbus protocol. Comm 1 is capable of initiating a message in support of Spontaneous-Report-by-Exception (SRBX) alarming. Comm 1 permits EIA-485 (RS-485) serial communication protocols that meet EIA-485 (RS-485) specifications for differential, asynchronous transmission of data over distances of up to 1220 m (4000 ft). The EIA-485 (RS-485) drivers are designed for true multi-point applications with multiple devices on a single bus.

The default values for the EIA-485 (RS-485) communications are: 9600 Baud Rate, 8 Data Bits, 1 Stop Bit, No Parity, 10 millisecond Key On Delay, and 10 millisecond Key Off Delay. The maximum baud rate is 19,200 bps. The Comm 1 port may be enabled or disabled on the Configure > Radio Power Control screen of ROCLINK 800 software (enabled is default).

1.3.4.3 Optional Communication Cards – Comm 2

Two plug-in communication cards and one communication module allow you to customize the FloBoss 100-Series unit installation for most communication requirements. The communication cards and module provide an interface for the host communications Comm 2 port. These cards permit serial communication protocols and dial-up modem communications. The Comm 2 port is capable of initiating a message in support of Spontaneous-Report-by-Exception (SRBX) alarming. Refer to Section 3 for additional information. One of the following card types can be accommodated:

- EIA-232 (RS-232) for asynchronous serial communications (baud rate up to 19,200).
- Dial-up modem for communications over a telephone network (default at 2400 baud).
- Spread spectrum radio for wireless communications.

1.3.5 RTD Input

The FloBoss 100-Series supports a direct input from a Resistance Thermal Detector (RTD) sensor to measure flowing temperature. The RTD has a measurement range of -40 to 240°C (-40 to 464°F). The terminals for the RTD wires are labeled “RTD.”

During operation, the RTD is read once per second. The value from the RTD is linearized, and then it is sent to processing as Analog Input (AI) Point Number A3. The AI routine converts this value to engineering units, and checks alarming. To conserve power, the RTD power is switched on and off. During calibration, the RTD power will be on constantly. Once calibration is completed, the RTD will cycle power again.

1.3.6 Real-Time Clock

The real-time clock provides the FloBoss 100-Series with the time of day, month, year, and day of the week. The real-time clock automatically switches to backup power when the FloBoss loses primary input power. Backup power for the real-time clock is adequate for a period in excess of five years with no power applied to the FloBoss.

1.3.7 Diagnostic Monitoring

The electronics board has three diagnostic inputs incorporated into the circuitry for monitoring battery voltage, logical voltage, and board temperature. Access these analog inputs using the I/O function of ROCLINK 800 software. The three values are available as the following Analog Input (AI) points:

- E1 – logical voltage.
- E2 – battery voltage.
- E5 – board (battery) temperature.

1.3.8 Automatic Self Tests

The FloBoss 100-Series unit performs the following self-tests on a periodic basis:

- Software and hardware watchdog.
- Sensor operation.
- Memory validity.

The FloBoss 100-Series unit will operate with its internal batteries down to 5.4 volts dc. The LCD becomes active when input power with the proper polarity and startup voltage (typically set greater than 8.0 volts) is applied to the CHG+ / CHG- connector (provided the power input fusing/protection is operational). The battery and logical voltage tests ensure that the FloBoss unit is operating in the optimum mode.

The software watchdog is controlled by the central processor unit (CPU). The software will arm the watchdog timer every second. If the watchdog timer is not armed for a period of 9 seconds, then the watchdog timer forces the FloBoss unit to reset. If necessary, the software automatically resets. The hardware watchdog is controlled by the CPU and monitors the power to the hardware. If the battery voltage drops below 5.4 volts, the FloBoss unit automatically shuts down.

The FloBoss 103 monitors its orifice-metering Dual-Variable Sensor for accurate and continuous operation. The FloBoss 104 monitors its Pulse Interface Module.

1.3.9 Low Power Mode

Sleep mode is used to place the CPU in a low power mode. The battery voltage is monitored by low voltage detection circuitry and the low voltage limit value is set at 5.4 volts. During Sleep mode, sub-modules are powered down. The FloBoss 100-Series unit enters Sleep mode after one minute of inactivity on the communication ports. The FloBoss 100-Series units have the option of not uusing the sleep mode, thus staying awake all the time.

Wake-up from Sleep occurs when the FloBoss 100-Series unit receives a:

- Timed interrupt from the Real-Time Clock.
- Signal from one of the communication ports.

1.4 Additional Information

The following manual includes additional information not found in this manual:

- 🕮 *ROCLINK 800 Configuration Software User Manual* – Form A6121 - Part Number D301159X12

1.5 FloBoss 103 and 104 Specifications

FloBoss 103 Specifications

PROCESSOR INFORMATION

32 bit, running at 3.68 MHz.

Program Memory: 2 MB flash EPROM (programmable) for firmware and configuration.

Data Memory: 512 KB SRAM.

Boot Memory: 128 KB Flash EPROM.

TIME FUNCTIONS

Clock: Real Time. Year/Month/Day and Hour/Minute/Second. Battery Backed. Automatically adjusts for Daylight Savings Time (selectable).

DIAGNOSTICS

These conditions are monitored and can be configured for alarming: sensor point fail, battery and internal voltages, and internal temperature.

COMMUNICATIONS

Local Operator Interface: EIA-232 (RS-232C) format. Software configurable, 1200 to 19,200 bps rate selectable.

EIA-485 (RS-485): Software configurable, 1200 to 19,200 bps rate selectable.

Host: EIA-232 (RS-232) or Modem interface, when optional communications card is installed.

Protocols: ROC or Modbus Slave or optional Modbus Host (ASCII or RTU).

Radio: Spread-spectrum wireless radio, when optional logic card and radio are installed.

POWER

Internal Batteries: Lead-acid. Rechargeable. Nominal 6.2 V dc, 2.5 Amp-hour. Battery life with no charging input and no communications: 3 weeks.

External Power Charging Input: 8-28 V dc.

Input Current: 5 mA nominal. 9.5 mA at 100% duty cycle (battery charging not included).

ENCLOSURE

Housing and Cap: Die-cast aluminum alloy with iridite plating and paint.

WEIGHT

6.58 kg (14.5 lbs).

SOLAR PANEL (OPTIONAL)

2 Watts Output: 9 Volts nominal. Size: 114 mm by 159 mm (4.5 in. by 6.25 in.).

5 Watts Output: 9 Volts nominal. Size: 222 mm by 229 mm (8.75 in. by 9 in.)

RTD INPUT

Quantity/Type: Single input for a 2 or 3-wire RTD element with alpha of 0.00385.

Terminals: "RTD+" current source, "RTD+" signal positive input, and "RTD RET" signal negative input.

Sensing Range: -40 to 240°C (-40 to 464°F).

Accuracy: ±0.2°C (0.64°F) over sensing range (includes linearity, hysteresis, repeatability).

Ambient Temperature Effects per 28°C (50°F): ±0.50°C (0.90°F) for process temperatures from -40 to 240°C (-40 to 464°F).

Filter: Band-pass hardware filter.

Resolution: 16 bits.

Sample Period: 1 sec minimum.

ENVIRONMENTAL

Operating Temperature: -40 to 75°C (-40 to 167°F).

LCD Display: -20 to 75°C (-4 to 167°F).

Storage Temperature: -50 to 85°C (-58 to 185°F).

Operating Humidity: 5 to 95%, non-condensing.

Vibration: Meets SAMA PMC 31.1.

Radiated/Conducted Transmissions: Meets requirements of IEC 61326 Electrical Equipment for Measurement, Control and Laboratory Use.

Radiated Emissions: Meets FCC Part 15, Class A.

DIMENSIONS

Enclosure: 160 mm H by 150 mm W by 135 mm D (6.3 in H by 5.9 in W by 5.3 in D) excludes mounting flange and sensor.

Pipestand Mounting: Mounts on a 2-inch pipe with U-bolt mounting kit (optional).

APPROVALS

Evaluated per the following North American standards:
CSA C22.2 No. 30
CSA C22.2 No. 213
UL 1203
UL 1604.

Meets CSA standards for hazardous locations as:
Model W40106 (with enclosure plug) Type 4 enclosure
Class I, Division 1, Groups C & D
Class I, Division 2, Groups A, B, C & D Temp T3.
Model W40112 (with optional solar panel mast assembly) Type 4 enclosure
Class I, Division 2, Groups A, B, C & D Temp T3.

FloBoss 104 Specifications

PROCESSOR INFORMATION

32 bit, running at 3.68 MHz.

Program Memory: 2 MB flash EPROM (programmable) for firmware and configuration.

Data Memory: 512 KB SRAM.

Boot Memory: 128 KB Flash EPROM.

TIME FUNCTIONS

Clock: Real Time. Year/Month/Day and Hour/Minute/Second. Battery Backed. Automatically adjusts for Daylight Savings Time (selectable).

DIAGNOSTICS

These conditions are monitored and alarmed: Pulse Interface Module and RTD point fail, battery and internal voltages, internal temperature.

COMMUNICATIONS

Local Operator Interface: EIA-232 (RS-232C) format. Software configurable, 1200 to 19,200 bps rate selectable.

EIA-485 (RS-485): Software configurable, 1200 to 19,200 bps rate selectable.

Host: EIA-232 (RS-232), Modem, or Radio interface, when optional communications card is installed.

Protocols: ROC or Modbus Slave or optional Modbus Host (ASCII or RTU).

Radio: Spread-spectrum wireless radio, when optional logic card and radio are installed.

POWER

Internal Batteries: Lead-acid. Rechargeable. Nominal 6.2 V dc, 2.5 Amp-hour. Battery life with no charging input and no communications: 1 week.

External Power Charging Input: 8-28 V dc.

Input Current: 5 mA nominal. 9.5 mA at 100% duty cycle (battery charging not included).

ENCLOSURE

Housing and Cap: Die-cast aluminum alloy with iridite plating and paint.

WEIGHT

4.3 kg (9.5 lbs) approximate, with Pulse Interface Module.

SOLAR PANEL (OPTIONAL)

2 Watts Output: 9 V nominal. Size: 114 mm by 159 mm (4.5 in. by 6.25 in.).

5 Watts Output: 9 V nominal. Size: 222 mm by 229 mm (8.75 in. by 9 in.).

RTD INPUT

Quantity/Type: Single input for a 2 or 3-wire RTD element with alpha of 0.00385.

Terminals: "RTD+" current source, "RTD+" signal positive input, and "RTD RET" signal negative input.

Sensing Range: -40 to 240°C (-40 to 464°F).

Accuracy: ±0.2°C (0.64°F) over sensing range (includes linearity, hysteresis, repeatability).

Ambient Temperature Effects per 28°C (50°F): ±0.50°C (0.90°F) for process temperatures from -40 to 240°C (-40 to 464°F).

Filter: Band-pass hardware filter.

Resolution: 16 bits.

Sample Period: 1 sec minimum.

ENVIRONMENTAL

Operating Temperature: -40 to 75°C (-40 to 167°F).

LCD Display: -20 to 75°C (-4 to 167°F).

Storage Temperature: -50 to 85°C (-58 to 185°F).

Operating Humidity: 5 to 95%, non-condensing.

Vibration: Meets SAMA PMC 31.1.

Radiated/Conducted Transmissions: Meets requirements of IEC 61326 Electrical Equipment for Measurement, Control and Laboratory Use.

Radiated Emissions: Meets FCC Part 15, Class A.

DIMENSIONS

160 mm H by 150 mm W by 135 mm D (6.3 in H by 5.9 in W by 5.3 in D), excludes mounting flange and interface.

APPROVALS

Designed to meet the following North American standards:
CSA C22.2 No. 30
CSA C22.2 No. 213
UL 1203
UL 1604.

Meets CSA standards for hazardous locations as:
Model W40106 (with enclosure plug) Type 4 enclosure
Class I, Division 1, Groups C & D
Class I, Division 2, Groups A, B, C & D Temp T3.
Model W40112 (with optional solar panel mast assembly) Type 4 enclosure
Class I, Division 2, Groups A, B, C & D Temp T3.

SECTION 2 – INSTALLATION AND USE

This section provides generalized guidelines for successful installation and operation of the FloBoss 100-Series unit. This section contains the following information:

2.1 Installation Overview

The following steps must be taken to install a FloBoss 103 to a pipestand or orifice plate or a FloBoss 104 to a turbine or rotary meter. Refer to the Table of Contents to find an explanation of each step in the appropriate sections of this manual.

1. If pipestand mounting, install the pipestand per the directions include with the pipestand.
2. Remove the orifice/meter run from service.
3. Mount the FloBoss assembly according to the procedures in Section 2.3.1 or 2.3.2.
4. Connect the impulse lines.
5. Install the RTD and connect it to the termination board.
6. Connect the FloBoss 100-Series unit to the operator interface (ROCLINK 800 software).
7. Power the FloBoss unit. If powered externally, wire the unit to the external power source.
8. Calibrate the input(s) from the Dual-Variable Sensor or Pulse Interface Module.
9. Calibrate the RTD input.
10. Connect the FloBoss 100-Series unit to any other external communication devices or networks.

Place the meter run in service and monitor with ROCLINK 800 software for proper operation.

2.2 Installation Requirements

Planning helps to ensure a smooth installation. Be sure to consider location, ground conditions, climate, and site accessibility, as well as the suitability of the FloBoss application while planning an installation.

The versatility of the FloBoss allows it to be used in many types of installations. For additional information concerning a specific installation, contact your local sales representative.

- **NOTE:** The FloBoss 100-Series has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits provide reasonable protection against harmful interference when the equipment operates in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy. If not installed and used in accordance with this instruction manual, the FloBoss 100-Series may cause harmful interference to radio communications. Operation of the equipment in a residential area is likely to cause harmful interference, in which case you will be required to correct the interference at your own expense.

2.2.1 Environmental Requirements

The FloBoss enclosure is classified as a NEMA 4 equivalent enclosure. This provides the level of protection required to keep the units operating under a variety of weather conditions.

The FloBoss 100-Series unit is designed to operate over a wide range of temperatures. However, in extreme climates it may be necessary to moderate the temperature in which the unit must operate.

The FloBoss 100-Series is designed to operate over a -40 to 75°C (-40 to 167°F) temperature range. The LCD temperature range is -25 to 70°C (-13 to 158°F). When mounting the unit, be aware of external devices that could have an effect on the operating temperature. Operation beyond the recommended temperature range could cause errors and erratic performance. Prolonged operation under extreme conditions could also result in failure of the unit.

Check the installation for mechanical vibration. The FloBoss 100-Series unit should not be exposed to levels of vibration that exceed 2g for 15 to 150 Hz and 1g for 150 to 2000 Hz.

2.2.2 Site Requirements

Careful consideration in locating the FloBoss 100-Series unit on the site can help prevent future operational problems. The following items should be considered when choosing a location:

- Local, state, and federal codes often place restrictions on monitoring locations and dictate site requirements. Examples of these restrictions are fall distance from a meter run, distance from pipe flanges, and hazardous area classifications.
- Locate the FloBoss 100-Series unit to minimize the length of signal and power wiring.
- When using solar-powered FloBoss 100-Series units, orient solar panels to face due South (not magnetic South) in the Northern Hemisphere and due North (not magnetic North) in the Southern Hemisphere. Make sure nothing blocks the sunlight from 9:00 AM to 4:00 PM.
- Antennas for radio and cellular communications must be located with an unobstructed signal path. If possible, locate antennas at the highest point on the site and avoid aiming antennas into storage tanks, buildings, or other tall structures. Allow sufficient overhead clearance to raise the antenna.

- To minimize interference with radio or cellular communications, locate the FloBoss 100-Series unit away from electrical noise sources, such as engines, large electric motors, and utility line transformers.
- Locate the FloBoss 100-Series unit away from heavy traffic areas to reduce the risk of being damaged by vehicles. However, provide adequate vehicle access to aid in monitoring and maintenance.

2.2.3 Compliance with Hazardous Area Standards

The FloBoss 100-Series, without optional mast kit, has hazardous location approval for Class I, Division 1, Groups C to D exposures. The FloBoss 100-Series unit also has a Class I Division 2 Groups A, B, C & D approval. The Class, Division, and Group terms are defined as follows:

Class defines the general nature of the hazardous material in the surrounding atmosphere. Class I is for locations where flammable gases or vapors may be present in the air in quantities sufficient to produce explosive or ignitable mixtures.

Division defines the probability of hazardous material being present in an ignitable concentration in the surrounding atmosphere. Division 1 locations are presumed to be hazardous. Division 2 locations are areas where gas, dust or vapors can exist under abnormal conditions.

Group defines the hazardous material in the surrounding atmosphere. Groups A to D are defined as follows:

Group A – Atmosphere containing acetylene, gases or vapors of equivalent hazards.

Group B – Atmosphere containing hydrogen, gases or vapors of equivalent hazards.

Group C – Atmosphere containing ethylene, gases, or vapors of equivalent hazards.

Group D – Atmosphere containing propane, gases, or vapors of equivalent hazards.

For the FloBoss 100-Series to be approved for hazardous locations, it must be installed according to the National Electrical Code (NEC) Article 501, and any local code requirements, if applicable.

⚠ CAUTION

When installing units in a hazardous area, make sure all installation components selected are labeled for use in such areas. Installation and maintenance must be performed only when the area is known to be non-hazardous. Installation in a hazardous area could result in personal injury or property damage.

2.3 Mounting

When choosing an installation site, be sure to check all clearances. Provide adequate clearance for wiring and service. The optional LCD should be visible and accessible for the on-site operator. When using a solar panel, allow adequate clearance, and view of the sun should not be obstructed. Allow adequate clearance and an obstructed location for antennas when using cellular phones or radios.

2.3.1 Mounting the FloBoss 103

The FloBoss enclosure assembly can mount directly to an orifice plate by using a 3 or 5 valve manifold or by using the standard Rosemount 2" pipe mounting kit with impulse tubing connecting the FloBoss 103 to the meter run.

The Dual-Variable Sensor factory-mounts directly on a flat flange to the FloBoss enclosure with a 4-bolt pattern. An adapter coupling provides the mounting interface between the enclosure and the DVS. See Section 4 for additional information.

The optional blank plate is available when the FloBoss 103 is ordered without a DVS. The blank plate factory-mounts directly on a flat flange to the FloBoss enclosure with a 4-bolt pattern. The blank plate mounts onto a pipestand, using the standard Rosemount 2-inch pipe mounting kit and 2 user-supplied bolts (5/16 X 1 3/8) and lock washers.

Mounting of the FloBoss 103 can be accomplished using either of the following methods:

Pipestand mounted – The FloBoss 103 can mount to a 2-inch pipestand. Ensure that the pipestand meets all weight requirements and installation conforms to local building codes.

Orifice Plate – Directly mount to an orifice plate via a 3 or 5 valve manifold.

With either mounting method, the pressure inputs must be piped to the process connections on the DVS. For more information on process connections, refer to Section 6.

Refer to Figure 2-1 and Figure 2-2 for dimensions. If the FloBoss unit will be used with a 5 Watt solar panel, the dimensions are 22.86 mm W by 48.01 mm H by 31.12 mm D (9.00 in. W by 18.90 in. H by 12.25 in. D).

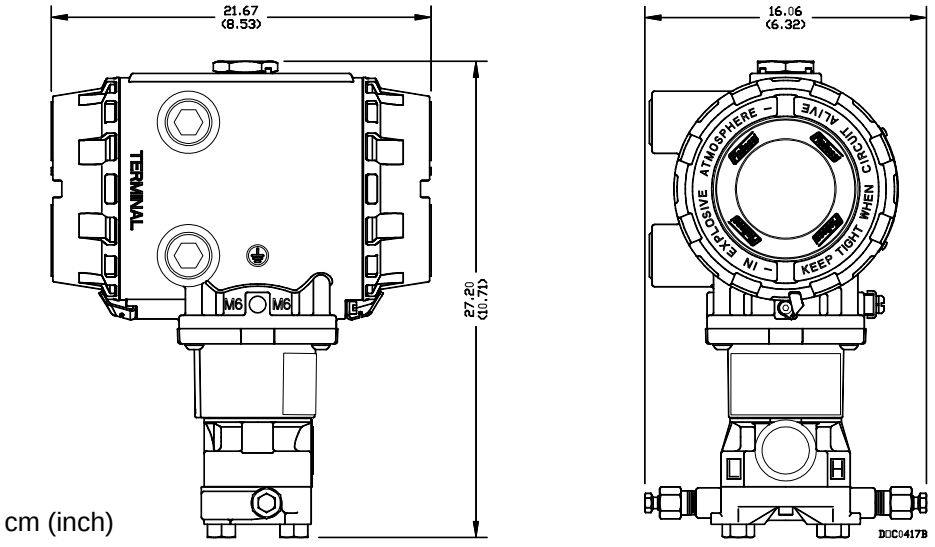

Figure 2-1. Outline and Mounting Dimensions without Solar Panel

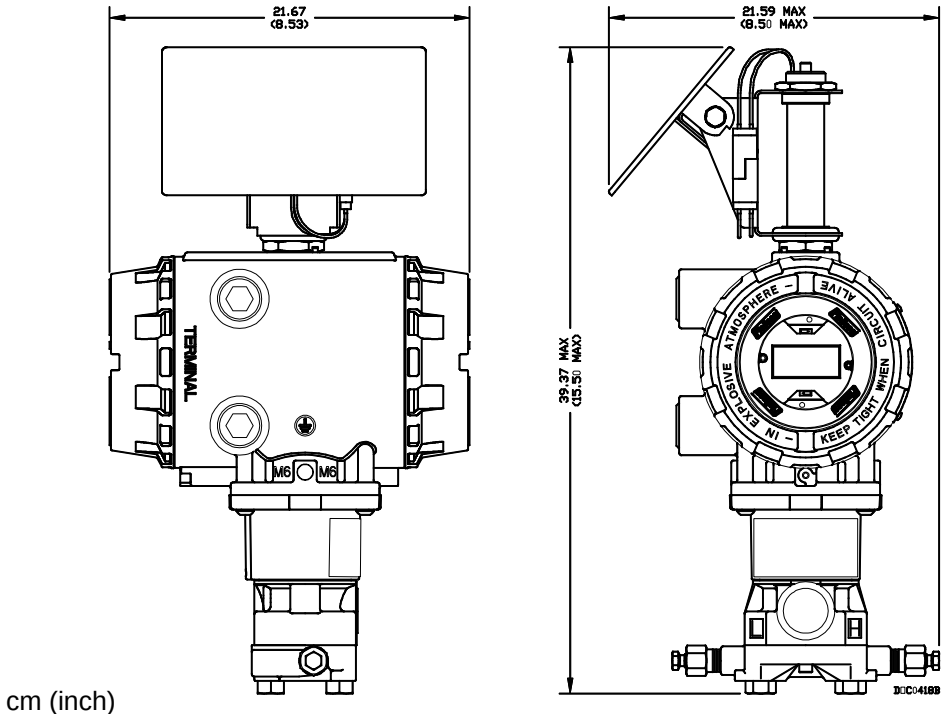

Figure 2-2. Outline and Mounting Dimensions with 2 Watt Solar Panel and LCD

2.3.1.1 How to Install the FloBoss 103 on a Pipestand

To install the FloBoss 103 on a 2-inch pipestand:

1. Install the pipestand per the directions included with the pipestand.
2. Remove the orifice/meter run from service.
3. Install the FloBoss 103 on the pipestand using clamps or mounting brackets. Refer to Figure 2-3.

2.3.1.2 How to Install the FloBoss 103 on an Orifice Plate

To install the FloBoss 103 on an orifice plate:

1. Remove the orifice/meter run from service.
2. Install the FloBoss 103 on the meter run using a manifold and hardware to secure the FloBoss 103 to the orifice flanges. Refer to Figure 2-3.

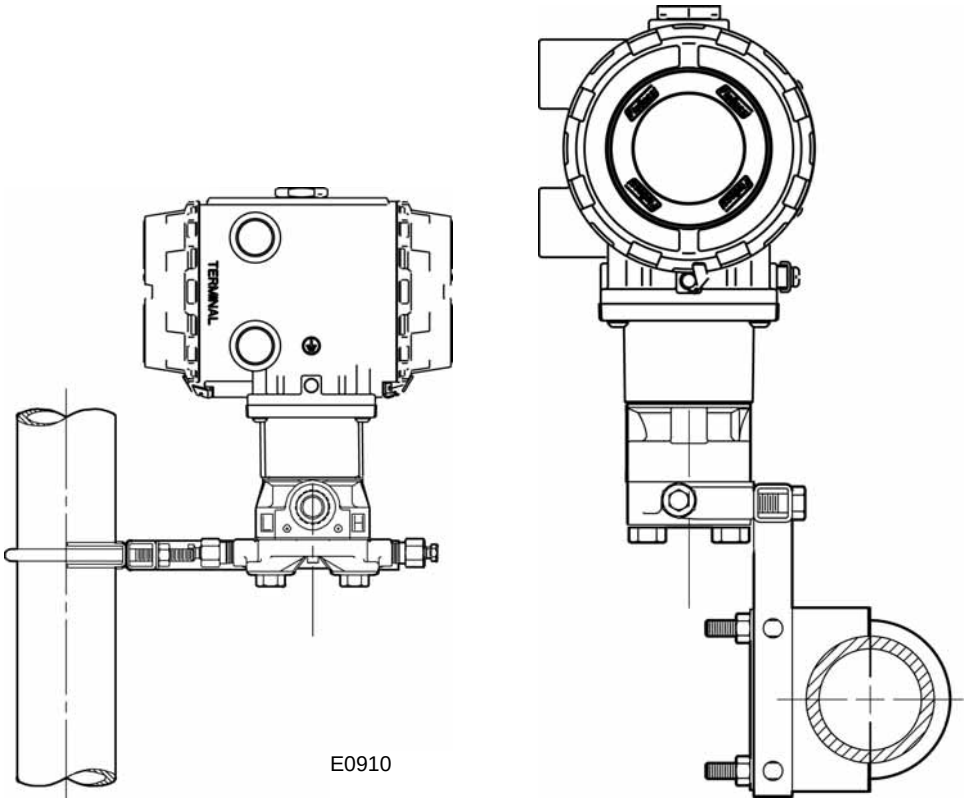

Figure 2-3. Mounting Styles

2.3.2 Mounting the FloBoss 104

The Pulse Interface Module will arrive from the factory already attached to the base of the FloBoss 104 unit. Due to cable connections between the interface and the FloBoss backplane, do **not** remove the FloBoss unit from the Pulse Interface Module.

- **NOTE:** The Pulse Interface Module should only be installed and removed from the FloBoss 104 unit at the factory. The Pulse Interface Module cable plugs directly into the backplane board and should only be installed and removed at the factory.

- **NOTE:** The Pulse Interface Module is not equipped to provide a temperature input to the FloBoss for gas compensations in AGA7 calculations. This input should come directly into the FloBoss 104 by means of the built-in RTD input on the termination board.

If the FloBoss 104 has an optional LCD, be careful to make sure the display will be visible after installation.

The Pulse Interface Module mounts between the bottom of the FloBoss unit and the top of the rotary meter or turbine meter.

To attach the FloBoss 104 and Pulse Interface Meter to a **turbine** meter, attach the universal mounting plate on the base of the Pulse Interface Module to the meter flange. Use 5/16-inch bolts (user-supplied). Refer to Figure 2-6.

To attach the FloBoss 104 and Pulse Interface Meter to a **rotary** meter, perform the following steps.

1. Determine which threaded hex shaft adaptor to use. The short adaptor has a 0.126-0.128 inch inner diameter at one end and a 0.110-0.112 inch inner diameter at the other end. The short adaptor requires a rotary meter shaft length of 0.150-0.210 inch. The long adaptor has a .187-.189 inch inner diameter. The long adaptor requires rotary meter shaft length of 0.150-0.260 inch.
2. If the short shaft adaptor is used, determine which end of the adaptor fits tighter to the shaft. The end that fits tighter is the end the set-screw will be installed on.
3. Loosely install the 5-40 set-screw into the appropriate hole on the shaft adaptor. The kit includes two set-screws: 0.125 inch and 0.188 inch long. The 0.125 inch long set- screw is for the long shaft adaptor. The 0.188 inch long set-screw is for the short shaft adaptor.
4. Place the adaptor with the set-screw inserted over the rotary meter shaft, and tighten the set-screw to lock the adaptor in place.

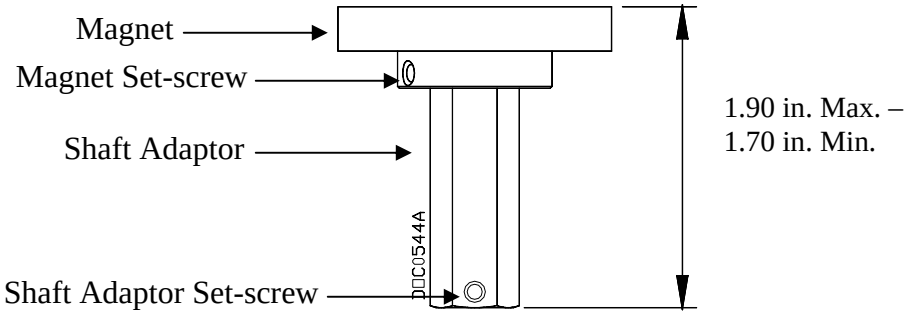

Figure 2-4. Magnet Installed on Long Shaft Adaptor

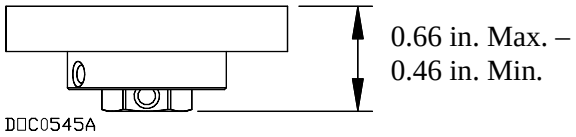

Figure 2-5. Magnet Installed on Short Shaft Adaptor

5. Thread the magnet assembly on to the shaft adaptor until the top of the magnet is between 0.68-0.71 inches above the meter housing. Refer to Figure 2-6. The magnet set-screw should be positioned over a flat in the hex shaft adaptor. Tighten the set-screw to lock the magnet assembly in place. Refer to Figure 2-4 and Figure 2-5.

❖ **NOTE:** Align the magnet assembly to a position so that the magnet set-screw contacts one of the shaft adaptor flats and NOT the shaft adaptor set-screw or threaded areas.

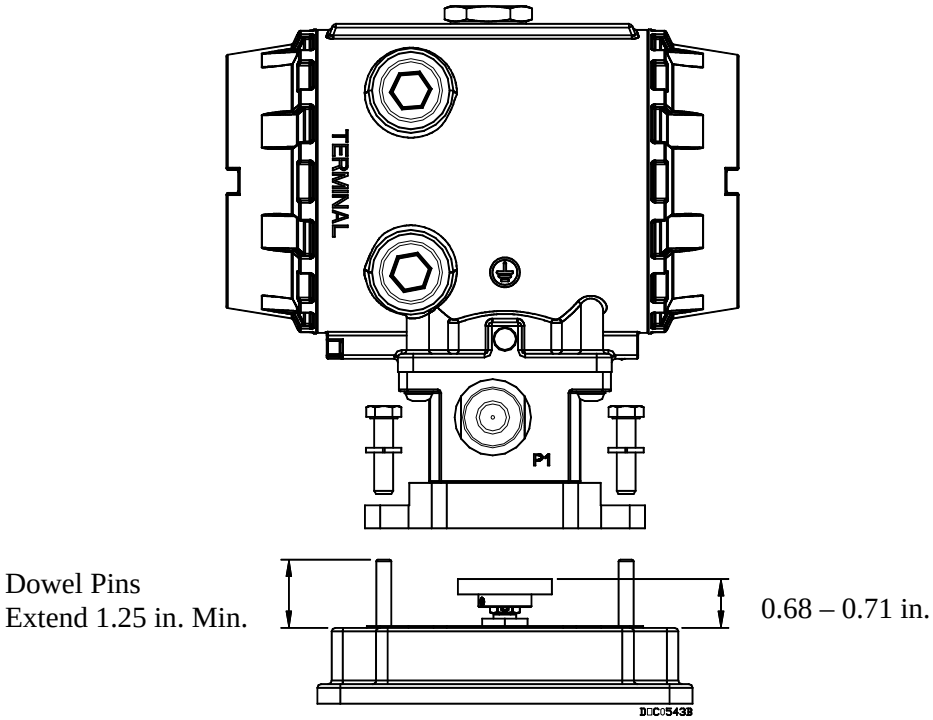

Figure 2-6. Shaft Adaptor, Magnet and Dowel Pins Installed

6. Insert 0.25 inch diameter dowel pins (user-supplied) in two of the 5/16-18 UNC threaded holes on the top of the rotary meter. These pins should extend at least 1.25 inches above the meter housing so that they can be easily removed later.
7. Place the gasket provided over the dowel pins and rest it flatly on the meter housing.
8. Position the FB104 assembly over the meter housing and carefully lower into place using the dowel pins to guide alignment.
9. Loosely install two 5/16-18 x 7/8 long bolts with lock washers (user-supplied) into the two threaded meter holes which do not have dowel pins. 18-8 stainless steel fasteners and washers are recommended.
10. Remove the two dowel pins. In their place, install two 5/16-18 x 7/8 long bolts and lock washers. Securely tighten all bolts attaching the FB104 to the meter.

The Pressure transducers will be attached to the process after the Pulse Interface Module has been installed on the meter. Refer to “How to Make Process Connections” in Section 7.

2.4 Startup and Operation

Before starting the FloBoss 100-Series unit, perform the following checks to ensure the unit is properly installed.

- Check the field wiring for proper installation. Refer to Sections 3 and 4.
- Make sure the input power has the correct polarity.
- Make sure the input power is fused at the power source. Plug the input power into the connector labeled **CHG+ / CHG-**.

⚠ CAUTION

When installing equipment in a hazardous area, ensure that all components are approved for use in such areas. Check the product labels. Change components only in an area known to be non-hazardous. Performing these procedures in a hazardous area could result in personal injury or property damage.

2.4.1 How to Start the FloBoss 100-Series

The FloBoss 100-Series unit ships with the reset jumper in the OFF position to prevent unnecessary battery drainage.

To apply power to the FloBoss 100-Series unit:

1. Unscrew the front end cap cover (LCD end).
2. Place the power jumper (located on the LCD if installed or located at J1 on the Battery Charger Board) in the **ON** position.
3. Reattach the top-end cap cover (LCD end). Screw the cover on until metal contacts metal. Do not over-tighten the cover.

After the FloBoss 100-Series completes start-up diagnostics (RAM and other internal checks), the optional LCD displays the date and time to indicate that the FloBoss completed a valid reset sequence. If the LCD does not come on, refer to Section 9 for possible causes.

2.4.2 Operation

Once startup is successful, it is necessary to configure the FloBoss 100-Series Flow Manager to meet the requirements of the application. *ROCLINK 800 Software User Manual* (Form A6121) details the procedure for configuring the FloBoss and calibrating the I/O. Once the FloBoss is configured and calibrated, it can be placed into operation.

⚠ CAUTION

When the enclosure end caps are unscrewed, local configuration or monitoring of the FloBoss 100-Series through its LOI port must be performed only in an area known to be non-hazardous. Performance of these procedures in a hazardous area could result in personal injury or property damage.

During operation, the FloBoss 100-Series can be monitored (to view or retrieve current and historical data) either locally or remotely. Local monitoring is accomplished either by viewing the LCD panel or by using ROCLINK 800 software on a PC connected through the LOI port. Remote monitoring is performed through Comm 1 or Comm 2 of the FloBoss using ROCLINK 800 software or a host system.

2.5 Configuration

The FloBoss 100-Series Flow Manager has a number of software settings, called parameters, which must be configured before it is calibrated and placed into operation. Configuration must be performed using ROCLINK 800 software, which runs on an IBM-compatible personal computer. The personal computer is normally connected to the LOI port of the flow computer to transfer configuration data into the FloBoss 100-Series, although much of the configuration can be done off-line and later loaded into the unit.

Default values for all parameters exist in the firmware of the flow computer. If the default is acceptable for your application, it can be left as it is. Refer to the *ROCLINK 800 Configuration Software User Manual* (Form A6121).

SECTION 3 – POWER CONNECTIONS

This section describes wiring of power from a DC voltage source, solar panel. It also describes batteries and grounding. This section contains the following information:

⚠ CAUTION

When installing units in a hazardous area, make sure all installation components selected are labeled for use in such areas. Installation and maintenance must be performed only when the area is known to be non-hazardous. Installation in a hazardous area could result in personal injury or property damage.

3.1 Power Installation Requirements

Typical sources of primary power for FloBoss 100-Series installations are DC voltage sources and solar power. Care must be taken to route power away from hazardous areas, sensitive monitoring devices, and radio equipment. Local and company codes generally provide guidelines for power installations. Adhere rigorously to all local and National Electrical Code (NEC) requirements for power installations.

The FloBoss 100-Series accepts input voltages from 8.0 volts to 28 volts at the charge (CHG+ / CHG-) terminals on the termination board. **The maximum power for DC voltage sources is 130 mWatts for FloBoss 103 and 300 mWatts for FloBoss 104, not including battery charging.**

- **NOTE:** Do not allow the batteries to fully discharge. If the batteries are fully discharged, the battery charger board may enter thermal limiting.

3.2 Grounding Installation Requirements

Grounding wiring requirements for DC voltage sources equipment are governed by the National Electrical Code (NEC). When the equipment uses DC voltage sources, the grounding system must terminate at the service disconnect. All equipment grounding conductors must provide an uninterrupted electrical path to the service disconnect.

- The National Electrical Code Article 250-83 (1993), paragraph c, defines the material and installation requirements for grounding electrodes.
- The National Electrical Code Article 250-91 (1993), paragraph a, defines the material requirements for grounding electrode conductors.
- The National Electrical Code Article 250-92 (1993), paragraph a, provides installation requirements for grounding electrode conductors.
- The National Electrical Code Article 250-95 (1993) defines the size requirements for equipment grounding conductors.

3.2.1 Grounding for the FloBoss 100-Series

Proper grounding of the FloBoss 100-Series unit helps to reduce the effects of electrical noise on the unit's operation and protects against lightning. The FloBoss provides lightning protection for built-in field wiring inputs and outputs. Install a surge protection device at the service disconnect on DC voltage source systems to protect against lightning and power surges for the installed equipment. You may also consider a telephone surge protector for the optional dial-up modem communications card.

All earth grounds must have an earth to ground rod or grid impedance of 25 ohms or less as measured with a ground system tester. The grounding conductor should have a resistance of 1 ohm or less between the FloBoss enclosure ground and the earth ground rod or grid.

The recommended cable for I/O signal wiring is an insulated, shielded, twisted-pair. The twisted pair and the shielding minimize signal errors caused by EMI (electromagnetic interference), RFI (radio frequency interference), and transients.

3.2.2 How to Install Grounding for the FloBoss 100-Series

The FloBoss 100-Series unit has two grounding screws inside the enclosure and one grounding screw outside the enclosure. For the grounding screw locations, refer to Figure 3-1.

The grounding installation method for the FloBoss 100-Series depends on whether the pipeline has cathodic protection. On pipelines with cathodic protection, the FloBoss must be electrically isolated from the pipeline.

Electrical isolation can be accomplished by using insulating flanges upstream and downstream on the meter run. In this case, the FloBoss 100-Series could be flange mounted or saddle-clamp mounted directly on the meter run and grounded with a ground rod or grid system.

On pipelines without cathodic protection, the pipeline itself may provide an adequate earth ground and the FloBoss 100-Series could mount directly on the meter run using an orifice plate. Test with a ground system tester to make sure the pipeline to earth impedance is less than 2 ohms. If the pipeline provides an adequate ground, you may not need to install a separate ground rod or grid system. All grounding should terminate at a single point.

If the pipeline to earth impedance is greater than 2 ohms, the FloBoss installation should be electrically isolated and a ground rod or grid grounding system installed.

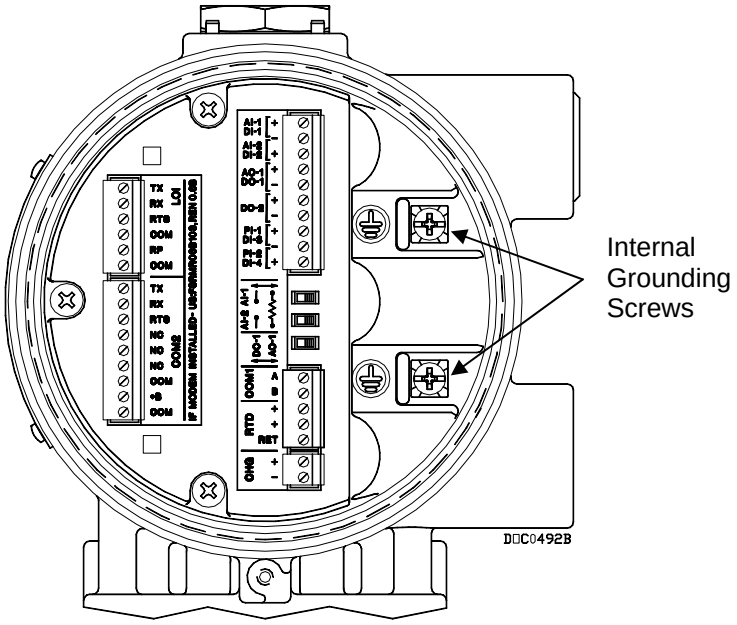

Figure 3-1. Location of Grounding Screws

3.3 How to Determine Power Requirements

To adequately meet the needs of the FloBoss system, it is important to determine the total power consumption and size of solar panel requirements accordingly. For total FloBoss power consumption, be sure to add the power consumption (in mW) of any other devices used with the FloBoss in the same power system. **The maximum power for DC voltage sources is 130 mWatts for the FloBoss 103 and 300 mWatts for the FloBoss 104, not including the battery charging.**

Convert the total value (in mW) to Watts by dividing it by 1000.

mW / 1000 = Watts

For selecting an adequate power supply, use a safety factor (SF) of 1.25 to account for losses and other variables not factored into the power consumption calculations. To incorporate the safety factor, multiply the total power consumption (P) by 1.25.

P_{SF} = P x 1.25 = _____ Watts

To convert P_{SF} to current consumption in amps (I_{SF}), divide P_{SF} by the system voltage (V) of 12 volts.

$I_{SF} = P_{SF} / 12V$ = _____ Amps

3.4 Solar Powered Installations

Solar power allows installation of the FloBoss 100-Series in locations where a DC voltage source is not available. Size solar panels properly for the application and geographic location to ensure continuous, reliable operation.

A 2 Watt or 5 Watt solar panel can be ordered and installed to provide charging power for the backup batteries. An external solar panel typically mounts to the same 2-inch pipe that supports the FloBoss 100-Series. The panel wiring terminates at the charge (CHG+ / CHG-) power terminals on the termination board.

The panel must face due South (not magnetic South) in the Northern Hemisphere and due North (not magnetic North) in the Southern Hemisphere. The panel must also be tilted at an angle from horizontal dependent on latitude to maximize the energy output. The angles for different latitudes are normally included in the solar panel documentation. At most latitudes, the performance can be improved by less of an angle during the summer and more of an angle during the winter.

As a site may have additional power requirements for repeaters, and other monitoring devices, power supply and converter accessories may be used to minimize the number of separate power sources required for an installation.

Solar arrays generate electrical power for the FloBoss 100-Series from solar radiation. The size of solar panels required for a particular installation depends on several factors, including the power consumption of all devices connected to the solar array and the geographic location of the installation.

The optional solar panel is adequate for support of API Chapter 21.1 compliant measurement and the retrieval of the historical logs once a day using the internal communication methods.

3.4.1.1 How to Size the Solar Panel

To determine solar panel output requirements, first determine the solar insolation for your geographic area. The map in Figure 3-2 shows solar insolation (in hours) for the United States during winter months. Call your local sales representative for a map detailing your specific geographic area.

Insolation (from map) = _____ hours

Next, calculate the amount of current required from the solar array per day using the following equation. I_{SF} is the system current requirement. Refer to Section 3.3 on page 3-3.

I_{array} = [I_{SF} (amps) × 24 (hrs)]/Insolation (hrs) = _____ amps

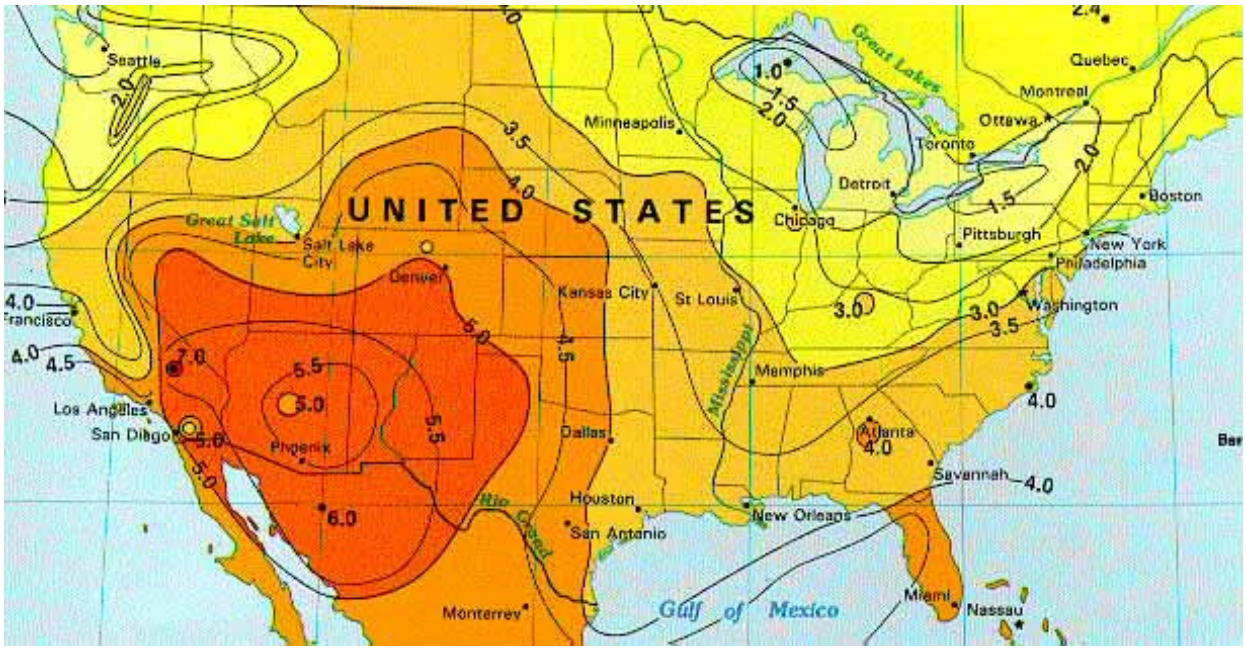

Figure 3-2. Solar Insolation in Hours for the United States

- **NOTE:** Refer to **http://www.solar4power.com/solar-power-global-maps.html** for global solar insolation maps.

Finally, the number of solar panels can be determined using the following equation:

Number of Panels = I_{array} amps/(I_{panel} amps/panel) = _____ panels

- **NOTE:** The "I_{panel}" value varies depending on the type of solar panel installed. Refer to the vendor's specifications for the solar panel being used.

- **NOTE:** The current accepted by the FloBoss 100-Series is limited by its charging circuit to around 1 Amp. Therefore, it is not practical to install a solar array that supplies significantly more than 1 Amp to the FloBoss. The maximum input is 28 volts.

- **NOTE:** Do not allow the batteries to fully discharge. If the batteries are fully discharged, the battery charger board may enter thermal limiting.

3.5 Batteries

Batteries provide power for the FloBoss 100-Series unit when the solar panels are not generating sufficient output. The batteries are three D-size lead-acid batteries providing 2.5 Amp-hours of current at 6.2 volts.

The batteries are connected in series by the Battery Charger Board to achieve the required capacity. The amount of battery capacity determines the number of days of reserve (autonomy) desired.

When the FloBoss 100-Series is configured as an API compliant Electric Flow Management (EFM) and requires an internal communications card, a solar panel, and the internal batteries, the FloBoss should be able to communicate the API audit trail information once a day to a remote host using no additional battery source, no additional solar panel, and maintain a 13 day autonomy in the event that the solar panel is lost.

❖ **NOTE:** The batteries and the charger board are matched to provide proper charging circuitry. Use only batteries supplied by the Flow Computer Division of Emerson Process Management for use in a FloBoss 100-Series unit.

3.5.1 How to Determine the Battery Requirements

To determine the system capacity requirements, multiply the system current load (I_{SF}) on the batteries by the amount of reserve time required. Compute "I_{SF}" as described in Section 3.3, How to Determine Power Requirements. The equation is as follows:

System Requirement = I_{SF} amps × Reserve hrs = _____ amp-hrs

3.5.2 How to Replace the Batteries

The battery pack contains three D-size lead-acid batteries providing 2.5 Amp-hours of current at 6.2 volts nominal.

⚠ CAUTION

When installing equipment in a hazardous area, ensure that all components are approved for use in such areas. Check the product labels. Change components only in an area known to be non-hazardous. Performing these procedures in a hazardous area could result in personal injury or property damage.

To avoid circuit damage when working inside the unit, use appropriate electrostatic discharge precautions, such as wearing a grounded wrist strap.

To replace the battery pack.

1. Unscrew the front end (LCD end) cap cover.
2. Place the power jumper (located at J1 on the Battery Charger Board) in the OFF position.
3. Remove the ribbon cable from the Battery Charger Board to the Backplane Board.
4. Remove the four screws from the Battery Charger Board.
5. Remove the Battery Charger Board.
6. Replace the Battery Charger Board.
7. Replace the four screws from the Battery Charger Board.
8. Replace the ribbon cable from the Backplane Board to the Battery Charger Board.
9. Place the power jumper (located at J1 on the Battery Charger Board) in the ON position.

10. Replace the front end cap cover. Screw the cover on until metal contacts metal. Do not over-tighten the cover.

3.6 Wiring Connections

The following paragraphs describe how to connect the FloBoss 100-Series unit to power, I/O devices, and communications devices. Use the recommendations and procedures described in the following paragraphs to avoid damage to equipment.

❖ **NOTE:** It is important to check the input power polarity before turning on the power.

The external connections or field terminals are all located on the termination board. The terminal block accepts wires up to 16 AWG in size.

⚠ CAUTION

Always turn off the power to the FloBoss unit before you attempt any type of wiring. Wiring of powered equipment could result in personal injury or property damage.

To avoid circuit damage when working inside the unit, use appropriate electrostatic discharge precautions, such as wearing a grounded wrist strap.

3.6.1 How to Make Wiring Connections

The FloBoss Termination Board connectors use compression terminals. The input power termination (CHG+ / CHG-) uses a removable connector and accommodates wiring up to 16 AWG in size. In all cases, make connections by baring the end (¼ inch maximum) of the wire, inserting the bared end into the clamp beneath the termination screw, and then tightening the screw to 0.25 N-m (2.2 lb-in.).

❖ **NOTE:** Take Caution. Do not over torque the connector screws.

The inserted wires should have a minimum of bare wire exposed to prevent short circuits. Allow some slack when making connections to prevent strain.

3.6.2 How to Connect Enclosure Ground Wiring

The FloBoss 100-Series unit and related components use the National Electrical Code (NEC) that governs the ground wiring requirements.

Two ground screws are located inside the back of the enclosure. **It is recommended that a minimum of 14 AWG wire be used for the ground wiring.**

3.6.3 How to Connect Main Power Wiring

The FloBoss 100-Series accepts input voltages from 8.0 volts to 28 volts at the charge terminals (CHG+ / CHG-) with no external current limiting (internal current limit is 200 mA). **The maximum power for DC voltage sources is 130 mWatts for the FloBoss 103 and 300 mWatts for the FloBoss 104, not including battery charging.**

The terminals are labeled CHG+ for positive power connection (Battery 8.0 to 28 volts power) and CHG- for negative power connection (Battery Common) on a label on the termination board. Refer to Figure 3-3.

- **NOTE:** The terminal block for power (CHG) has changed location and orientation on all terminal boards. The CHG terminations are now at the bottom of the right hand column. This change only affects the FloBoss 103, as the change took effect before the FloBoss 104 was released.

- **NOTE: Check the label** for the pin location of the CHG+ and CHG- terminals **carefully**. If the positive and negative connections are reversed, the internal batteries will not charge.

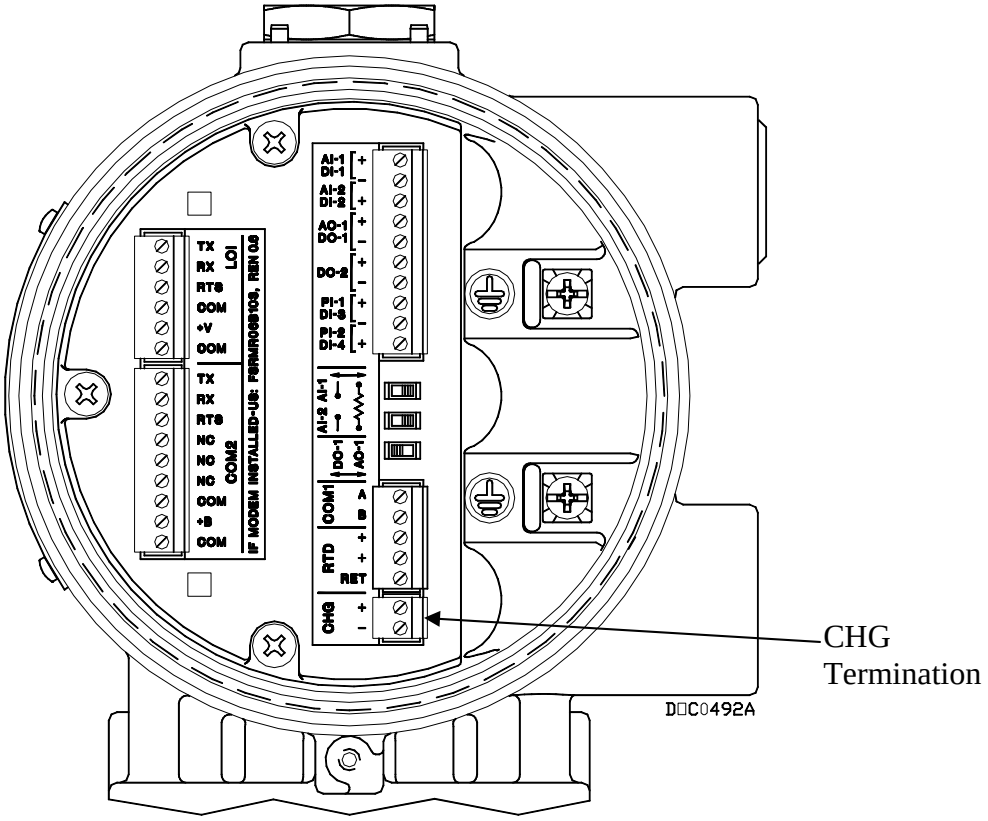

Figure 3-3. Termination Board

It is important that good wiring practice be used when sizing, routing, and connecting power wiring. All wiring must conform to state, local, and NEC codes. **The CHG+ / CHG- terminal can accommodate up to 16 AWG wire.**

- **NOTE:** Keep in mind that a solar panel size may violate certain CSA Class I, Division 1 ratings. Be sure to use approved connectors on the FloBoss 100-Series enclosure for routing the power wiring.

These connections provide the input voltage and power for the battery charging circuitry. The maximum voltage that can be applied to the CHG+ / CHG- terminals is 28 volts dc.

3.7 How to Backup Configuration and Log Data

Perform this backup procedure, before removing power to the FloBoss 100-Series unit for repairs, troubleshooting, removing or adding components, or upgrades. This procedure preserves the current flow computer configuration and log data held in RAM.

⚠ CAUTION

When installing equipment in a hazardous area, ensure that all components are approved for use in such areas. Check the product labels. Change components only in an area known to be non-hazardous. Performing these procedures in a hazardous area could result in personal injury or property damage.

To avoid circuit damage when working inside the unit, use appropriate electrostatic discharge precautions, such as wearing a grounded wrist strap.

1. Launch ROCLINK 800 software and connect to the FloBoss unit.
2. Ensure that the configuration is saved in flash memory by performing a **Save to Flash Memory** (ROC > Flags). This saves all configuration settings, including the current states of the ROC Flags and calibration values.
3. Select ROC > **Collect Data** and select the All checkbox. Click OK. This action saves event logs, alarm logs, report data, and history. You can specify your own file name and path if desired.
4. Select File > **Save**. The Save As dialog box appears.
5. Type the desired **File name** for the backup file, or use the default.
6. Click **Save**. The file is saved in the default directory C:/Program Files/ROCLINK 800/Data, unless you changed the directory.

SECTION 4 – COMMUNICATIONS

The FloBoss communicates to external devices through its local operator interface port (LOI), the Comm 1 EIA-485 (RS-485) port, or the optional Comm 2 EIA-232 (RS-232)/dial-up modem/spread spectrum wireless radio port.

The communications terminals and communication cards provide communications between the FloBoss 100-Series and a host system or external devices. The communications cards install directly onto the backplane board and activate the host port (Comm 2) when installed. You may use the EIA-232 (RS-232) Serial Communications Card, the Dial-up Modem Communications Card, or the Spread Spectrum Wireless Radio Module.

- **NOTE:** To enable or disable the Comm 2 port, select Configure > Radio Power Control and select the Enabled or Disabled radio button under Radio Power Control.

This section contains the following information:

4.1 EIA-485 (RS-485) Communications Wiring

The EIA-485 communications provides for RS-485 signals on the Comm 1 port. The Comm 1 port is on the termination board.

4.1.1 How to Wire EIA-485 (RS-485) Communications

Wiring should be twisted-pair cable. The terminals and their functions are Pin 1 is Terminal B and Pin 2 is Terminal A. Refer to Figure 4-3. Connect A on the FloBoss to A or +, and connect B on the FloBoss to B or -. Should you encounter difficulties establishing a connection, try reversing the connections.

4.2 Local Operator Interface Port Wiring

The Local Operator Interface (LOI) port provides connections for a built-in EIA-232 (RS-232) communications interface to a local configuration and monitoring device. The configuration and monitoring device typically is an IBM-compatible personal computer. A prefabricated operator interface cable is available as an accessory. Refer to Figure 4-1.

The LOI port is intended for use with a PC running ROCLINK 800 software. This LOI port is compatible with EIA-232 (RS-232) levels.

4.2.1 How to Wire the LOI Port

The Table 4-1 shows the signal routing of the Termination Board connections. The FloBoss 100-Series unit's EIA-232 (RS-232) transmit connects to the PC's receive.

Table 4-1. Local Operator Interface Port Wiring

Signal	Label
Transmit[1]	TX
Receive	RX
Ready to Send	RTS
Common	COM
Not Used	RP
Common	COM
1. Transmit is the FloBoss 100-Series unit's EIA-232 (RS-232) transmission that connects to the PC's receive.	

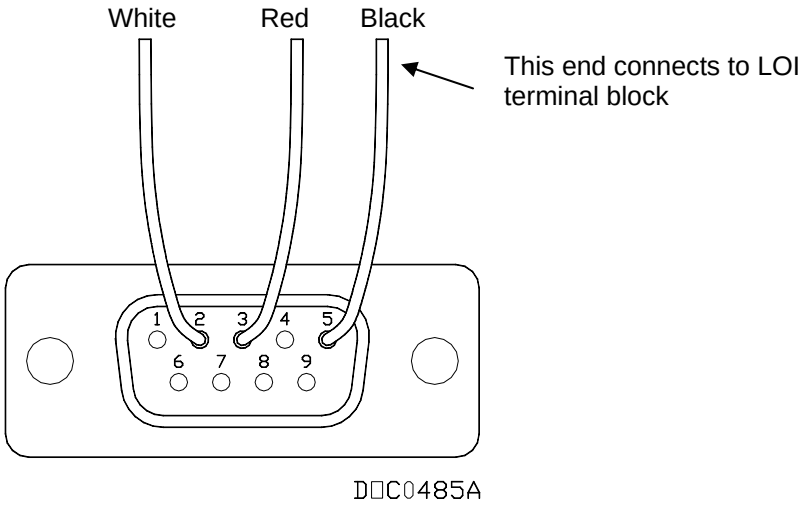

Figure 4-1. PC Comm Port Wiring

Table 4-2. PC Comm Port Wiring

Signal	Pin	Label
Transmit[1]	2	TX
Receive	3	RX
Ground	5	GND
1. Transmit (TX) connects to the FloBoss 100-Series unit's receive. Receive (RX) connects to the FloBoss 100-Series unit's transmit.		

4.3 Serial Communications Card

The EIA-232 communications card meets all EIA-232 specifications for single-ended, RS-232 asynchronous data transmission over distances of up to 15 m (50 ft). The EIA-232 (RS-232) communications card provides transmit, receive, and modem control signals. The EIA-232 (RS-232) communications logic card activates Comm 2.

The EIA-232 (RS-232) communications card defaults are: 9600 baud rate, 8 data bits, 1 stop bit, no parity, 10 millisecond Key On Delay, and 10 millisecond Key Off Delay. The maximum baud rate is 19,200 bps.

The EIA-232 (RS-232) communications card signals include RX, TX, and RTS signal/control lines. Refer to Table 4-3.

Table 4-3. Communications Card Signals

Signals	Action
RTS	The **request to send** signals that the modem is ready to transmit.
RX	The RXD **receive data** signals that data is being received at the communications card.
TX	The TXD **transmit data** signals that data is being transmitted from the communications card.

4.3.1 How to Wire EIA-232 (RS-232) Communications

Signal wiring connections to the communications card are made through the terminal block located on the termination board. A nine-terminal removable connector is used for the wiring of external device communications.

A EIA-232 (RS-232) communications card in the Comm 2 port provides a means to switch power to external communication devices, such as a radio, to conserve power. A label on the termination board denotes the usage of each pin on the connector. Table 4-4 displays connector signals and their functions.

Table 4-4. EIA-232 (RS-232) Communications Card Wiring

Pin	Signal	Label
9	Ring / Transmit data	TX[3]
8	Tip / Receive data	RX
7	Request to Send	RTS
3	Ground	COM[1]
2	Switched Power	B+[2]
1	Signal Common Negative	COM[1]

1. COM at Pin 1 and COM at Pin 3 are identical. They are only separated for ease of wiring.
2. Switched power is for use with an internal radio or cell phone and not for power to external devices.
3. Transmit is the FloBoss 100-Series unit's EIA-232 (RS-232) transmission that connects to the field device's receive.

4.4 Dial-up Modem Communications Card

The dial-up modem communications card supports V.22 bis/2400 baud communications with auto-answer/auto-dial features. The modem card is FCC part 68 approved for use with public-switched telephone networks (PSTNs). A label on the termination board and Section 4.6.2 provide the FCC registration number and the ringer equivalent.

The optional modem communications logic card for the host port activates Comm 2.

The defaults for the dial-up modem communications card are: 2400 baud rate, 8 data bits, 1 stop bit, no parity, 10 millisecond Key On Delay, and 10 millisecond Key Off Delay. On power up, the modem must be set up for Auto Answer. Periodic checks are made to ensure that the modem is still in Auto Answer or that it is not left off the hook after a certain period of non-communication.

The modem card interfaces to two-wire, full-duplex telephone lines using asynchronous operation at data baud rates of 1200 and 2400. The modem can be controlled using industry-standard AT command software. A 40-character command line provides AT command set, which is compatible with EIA document TR302.2/88-08006.

The initialization Config Command modem strings are:

- 1200 Dial-up Modem – ATSØØ=Ø1SØ7=Ø2
- 2400 Dial-up Modem – ATSØØ=Ø1

4.4.1 How to Wire the Dial-Up Modem Communications Card

Signal wiring connections to the communications card are made through the terminal block located on the termination board. A nine-terminal removable connector is used for the wiring of external device communications. A label on the termination board denotes the usage of each pin on the connector.

The dial-up modem card interfaces to a PSTN line through the screw terminals with two wires. The dial-up modem card provides for a telephone interface on the host port that is capable of both answering and originating phone calls. The dial-up modem card also provides electronics that conserve power when the phone line is not in use. The dial-up modem card provides some protection from transients on the phone lines; however, if the potential for lightning damage is high, additional surge protection for the phone lines should be installed outside the FloBoss enclosure.

Table 4-5 displays the connector signals and their functions:

Table 4-5. Dial-Up Modem Communications Card Wiring

Pin	Signal	Label
9	Tip / Transmit data	TX
8	Ring / Receive data	RX

❖ **NOTE:** Tip and Ring are the telephone interface signals.

4.5 Radio Communications Cards

The Radio module consists of three parts: the spread spectrum wireless radio, an interface card, and a logic card. Two models of Spread Spectrum wireless radios are available for use in the FloBoss 100-Series.

The optional radio communications interface cards provide radio communications through Comm 2. Radio power control, accessed with ROCLINK 800 configuration software, is used to turn power on to the spread spectrum radio and provides a low power mode when the radio is not communicating.

Although the radio communications interface cards are intended for host communications, they may also be employed for operator access at the FloBoss. Alternatively, the LOI connection on the LOI port may be used for operator access while the radio communication card is mounted and functioning in the FloBoss housing.

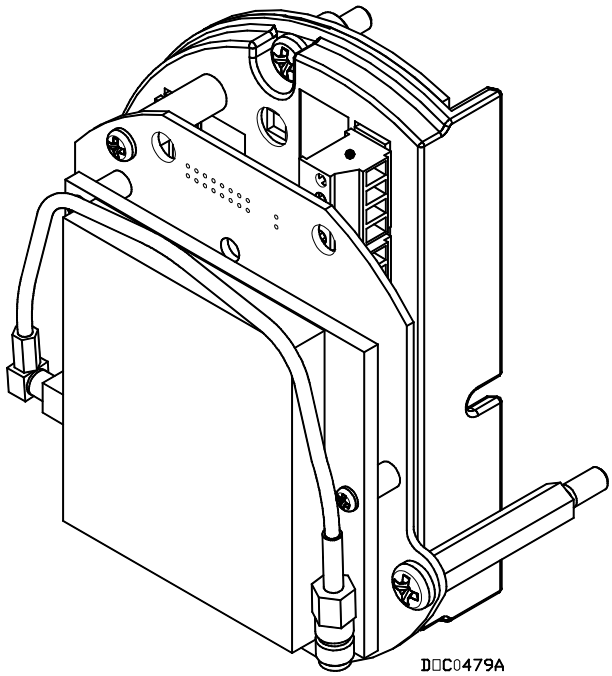

Figure 4-2. Radio and Interface Card (FreeWave shown)

4.5.1 How to Install a Radio Communications Card

If you have ordered the FloBoss 100-Series unit with a radio, the installation is already complete. To install a radio communications card to an existing FloBoss 100-Series unit, perform the following steps. Both models of radio communication cards are mounted within the enclosure in the same manner.

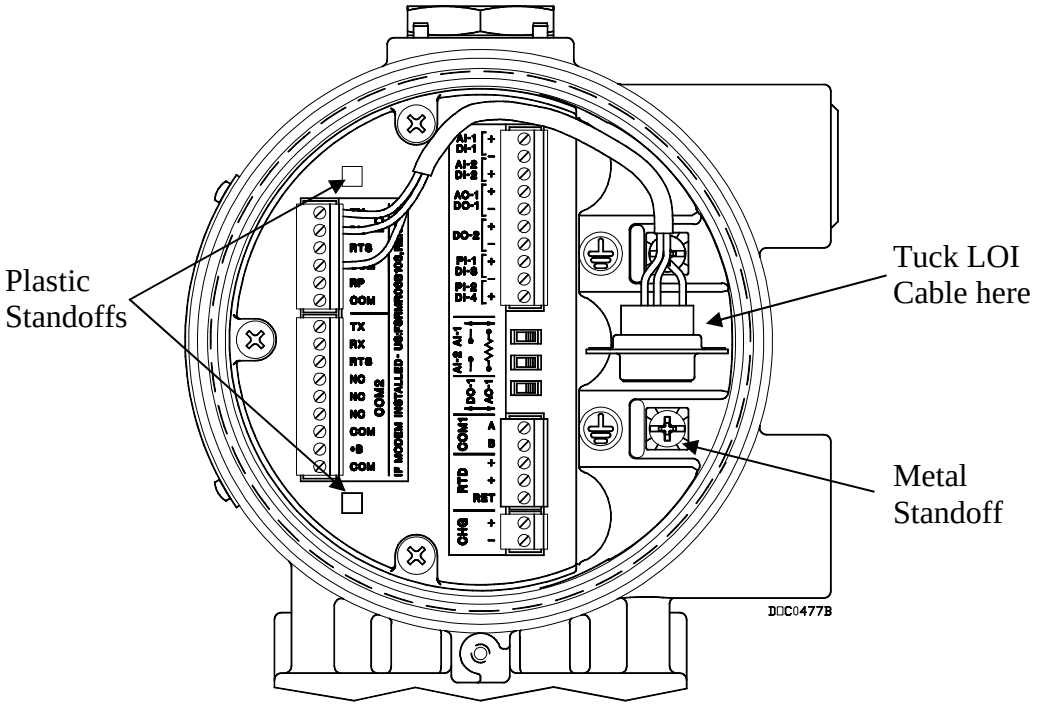

Figure 4-3. Termination Board

1. If the FloBoss 100-Series unit does not have a communications logic card, you will need to install one. Refer to Section 4.5.2.

2. Remove the termination end cap cover.

3. Use a Phillips head screwdriver to unscrew the lower grounding screw to the right of the termination board. Screw the metal standoff into the hole. Refer to Figure 4-3.

4. Push plastic standoffs into holes at top and bottom of the left side of the termination board. Refer to Figure 4-3.

5. Tuck the LOI interface cable and connector off to the upper right corner of the termination board. Refer to Figure 4-3.

6. Signal wiring connections to the communications card are made through the terminal block located on the termination board. A nine-terminal removable connector is used for the wiring of external device communications. A label on the termination board denotes the usage of each pin on the connector (Pin 1 will connect to COM). The nine-terminal connector is attached to the ribbon cable of the radio interface card.

7. Center the card over the standoffs.

8. Use a small Phillips head screwdriver to screw the card down to the plastic standoffs.

9. Use the larger screw to attach the card to the metal standoff.

10. Plug the Reverse Polarity SMA connector into a user-supplied antenna cable. This cable will have to be threaded through one of the side ports to a user-supplied antenna.

11. Replace the back end cap cover.

4.5.2 How to Install a Radio Communications Logic Card

If the FloBoss 100-Series unit does not have a radio communications logic card, you will need to install one to use the Comm 2 port. A different card is used for the optional EIA-232 (RS-232) and dial-up modem.

If you ordered an optional Comm 2 radio module with your FloBoss 100-Series unit, the communications logic card was installed at the factory, and you will not need to use this procedure.

1. Unscrew the front end cap cover (LCD end).
2. Place the power jumper (located at J1 on the Battery Charger Board) in the OFF position.
3. Remove the ribbon cable from the Battery Charger Board to the Backplane Board.
4. Remove the four screws from the Battery Charger Board.
5. Remove the Battery Charger Board.
6. Remove the screws holding the retaining bar in front of the processor card.
7. Insert a communications logic card into the communications card slot beside the processor card. See Figure 1-3 in Section 1.
8. Replace the retaining bar over the communications card and the processor card.
9. Replace the Battery Charger Board, and then replace the ribbon cable to the Battery Charger Board.
10. Place the power jumper (located at J1 on the Battery Charger Board) in the ON position.
11. Replace the front end cap cover. Screw the cover on until metal contacts metal. Do not over-tighten the cover.

4.6 Communication Cards Specifications

This section lists the specifications for each communications card.

4.6.1 Serial Card Specifications

Serial Card Specifications

EIA-232D CARD

Meets EIA-232 standard for single-ended data transmission over distances of up to 50 feet (15 m).

Data Rate: Selectable from 1200 to 19,200 bps.

Format: Asynchronous, 7 or 8-bit (software selectable) with full handshaking.

Parity: None, odd, or even (software selectable).

POWER REQUIREMENTS

3.3 Vdc, 0.03 W maximum, supplied by processor board. When EIA-232D card is switching power, the requirement will be higher.

DIMENSIONS

18 mm H by 51 mm W by 70 mm L (0.7 in. H by 2.0 in. W by 2.75 in. L).

ENVIRONMENTAL

Operating Temperature: -40 to 75°C (-40 to 167°F).

Storage Temperature: -50 to 85°C (-58 to 185°F).

Operating Humidity: To 95% relative, non-condensing.

APPROVALS

Same as the FloBoss 100-Series unit in which it is installed.

4.6.2 Dial-up Modem Card Specifications

Dial-up Modem Card Specifications

OPERATION

Mode: Full-duplex 2-wire for dial-up PSTN (Bell 212 compatible).

Data Rate: 1200, or 2400 baud. asynchronous (software selectable).

Parity: None, odd, or even (software selectable).

Format: 8, 9, 10, or 11 bits, including start, stop, and parity (software selectable).

Modulation: V2.1 and 103, binary phase-coherent FSK; V2.2 and 212A, 4 point DPSK at 600 baud; V2.2bis, 16 point QAM at 600 baud.

Transmit Carrier Frequencies: Originate, 1200 Hz ± 0.1%; Answer, 2400 Hz ± 0.1%.

Receive Carrier Frequencies: Originate, 2400 Hz ± 7 Hz; Answer, 1200 Hz ± 7 Hz.

Telephone Line Impedance: 600 ohm typical.

RTS to Transmission Delay: Configurable in 50 millisecond periods (software selectable).

Receiver Sensitivity: Off to On threshold, -45 dBm. On to Off threshold, -48 dBm.

Maximum Output Level: 0 dBm nominal into 600 ohms.

Surge Protection: Conforms to FCC part 68 and DOC.

Surge Isolation: 1000 V ac and 1500 volt peak.

Certification: FCC Part 68 approved.

DIMENSIONS

See Serial Card Specifications.

ENVIRONMENTAL

See Serial Card Specifications.

POWER REQUIREMENTS

3.3 Vdc, 0.25 W maximum, supplied by processor board.

APPROVALS

Same as the FloBoss 100-Series unit in which it is installed.

FCC registered modem chip.
Registration Number US:FSRMR06B103, REN 0.6B.

4.6.3 Radio Cards Specifications

FreeWave M-Series Radio Card Specifications

RADIO LINK

Frequency Range: 902-928 MHz.
Type: Frequency hopping Spread Spectrum.
Channel Capacity: 50 to 112, user selectable.
Hopping Patterns: 15 per band, 105 total, user selectable.
Hopping Bands: 7, user selectable.
Baud Rate: 2400 to 19.2K bps, selectable.
Radio Data Throughput: 115.2K bps standard speed, 38.4 K bps low speed.
Range: 96 km (60 mi) line of sight.[1]

TRANSMITTER

Output Power: 100 mW – 1 W (+30 dBm).

RECEIVER

Sensitivity: -106 dBm for 10^{-6} BER. -108 dBm for 10^{-4} BER.

ANTENNA CONNECTOR

Straight SMA jack, female.

POWER REQUIREMENTS

Input Voltage Range: 5.5 to 7.5 Vdc.
Current Consumption:
At 6 Vdc: Transmit 1000 mA, Receive 152 mA, Idle 40 mA, Sleep 8 mA.
At 30 Vdc: Transmit 200 mA, Receive 43 mA, Idle 12 mA, Sleep 3 mA.

DIMENSIONS

91 mm H by 86 mm W by 15 mm D (3.6 in. H by 3.4 in. W by 0.6 in. D).

ENVIRONMENTAL

Operating Temperature: -40 to 75°C (-40 to 167°F).

APPROVALS

Same as the FloBoss 100-Series unit in which it is installed.

1. Line of Sight signifies a path that is free of natural and man-made obstacles.

MaxStream 9XStream Radio Card Specifications

RADIO LINK

Frequency Range: 902 to 928 MHz, unlicensed ISM band.
Type: Frequency hopping Spread Spectrum transceiver.
Channel Capacity: 25 channels.
Hopping Patterns: 7 hopping sequences.
Baud Rate: 9600 bps.
Radio Data Throughput: 9600 bps.
Range: Indoor 182 – 457 m (600 – 1500 ft). Outdoor 11 km (7 mi) with dipole and 32 km (20 mi) with high gain antenna.

TRANSMITTER

Output Power: 100 mW.

RECEIVER

Sensitivity: -110 dBm.

POWER REQUIREMENTS

Input Voltage Range: 5 Vdc +/- 0.25 V.
Current Consumption: Transmit – 150 mA nominal. Receive – 50 mA nominal. Other cyclic power down modes available.

ANTENNA CONNECTOR

Straight SMA jack, female.

DIMENSIONS

91 mm H by 86 mm W by 10 mm D (3.6 in. H by 3.4 in. W by 0.4 in. D).

ENVIRONMENTAL

Operating Temperature: Standard 0 to 70°C (32 to 158°F). Industrial Version -40 to 75°C (-40 to 167°F).

APPROVALS

Same as the FloBoss 100-Series unit in which it is installed.

SECTION 5 – INPUT/OUTPUT & RTD INPUT

This section describes the optional Input/Output (I/O) termination points available on the termination board. The I/O termination points provide additional inputs and outputs for implementing expanded monitoring and control applications. This section also describes the RTD Input on the termination board.

This section contains the following information:

5.1 I/O Description

The I/O uses the microprocessor for monitoring, control, and acquisition of data from external devices connected to the I/O channels. The I/O channels have a removable plug-in terminal block for field wiring. I/O includes:

- Analog Input – AI.
- Analog Output – AO.
- Discrete Input – DI.
- Discrete Output – DO.
- Pulse Input – PI.

Five of the six points of I/O are selectable. The Analog Output may be switched to a Discrete Output (switch on termination board). The Analog Inputs and Pulse Inputs may be selected as Discrete Inputs on the I/O Setup screen in ROCLINK 800 Configuration Software.

Table 5-1. I/O Terminations

Termination Number	I/O Type
10	AI1+/DI1+
9	COMMON
8	AI2+/DI2+
7	AO+/DO1+
6	AO-/DO1-
5	DO2+
4	DO2-
3	PI1+/DI3+
2	COMMON
1	PI2+/DI4+

5.1.1 How to Select the Type of I/O

To select the type of output for the **Analog Output/Discrete Output** #1 channel, flip the AO/DO switch on the termination board to the desired position. Refer to Figure 5-1 for the switch location. Then select the desired output type on the Configure > I/O > Setup screen in ROCLINK 800 configuration software. Analog Output is the default position for this channel.

To select the type of input for the **Analog Input/Discrete Input** and **Pulse Input/Discrete Input** channels, use the Configure > I/O > Setup screen in ROCLINK 800 configuration software. The defaults are Analog Input and Pulse Input.

- **NOTE:** Make sure you select the I/O types **before** you configure the I/O in ROCLINK 800 software.

- **NOTE:** When an Analog Input/Discrete Input channel is selected to Analog Input, be sure the 250 Ohm Resistor Active switch is set to the resistor active position. Refer to Figure 5-1 for the switch location.

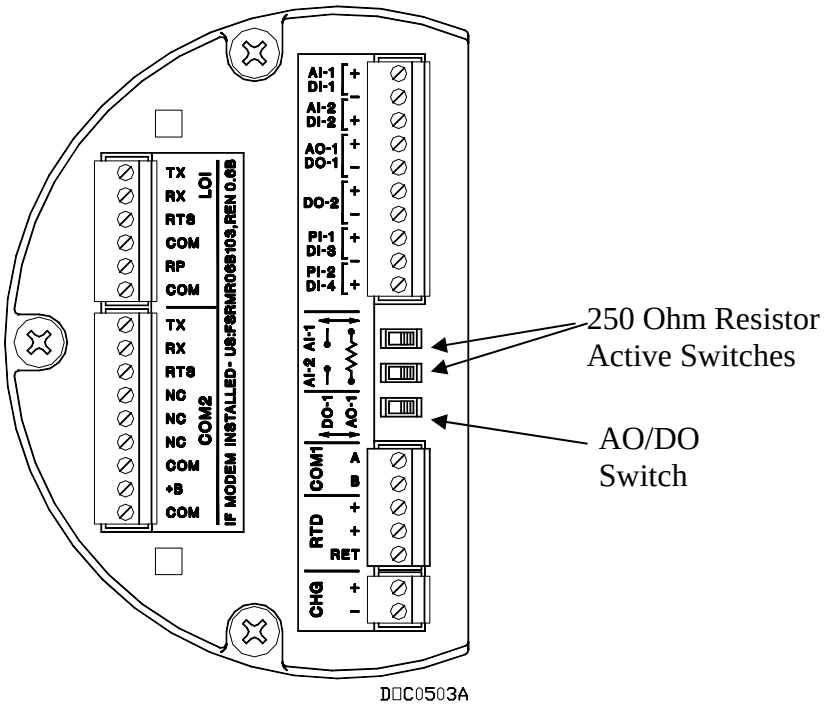

Figure 5-1. Termination Board with Optional I/O

5.2 I/O Wiring Requirements

I/O wiring requirements are site and application dependent. Local, state, or NEC requirements determine the I/O wiring installation methods. Direct burial cable, conduit and cable, or overhead cables are options for I/O wiring installations.

5.3 Analog Input

The diagnostic Analog Inputs (logic voltage, battery voltage, and board/battery temperature) are not designed to be configured or wired.

The pressure and temperature inputs are configured as the first three Analog Input points in ROCLINK 800 Configuration Software: Differential pressure or Pressure, Static pressure or Auxiliary pressure, and RTD temperature. The RTD input is the only one of these to be wired, refer to Section 5.8.1.

The Analog Input (AI) on the termination board monitors current loop and voltage input devices. The A/D signal input range is 0 to 5 volts, or 4 to 20 mA, with 12-bit resolution. The AI is configured through ROCLINK 800 software.

- ❖ **NOTE:** External power is required to power the devices sending the 4 to 20 mA signals to the FloBoss unit.

5.3.1 How to Wire the Analog Input

The terminals for connecting the Analog Input wiring are shown in Figure 5-1.

The "+" terminal is the positive signal input and the "-" terminal is the signal common. These terminals accept a voltage signal in the 0 to 5 volt range. Because the "-" terminal is internally connected to common, the Analog Input channels function as single-ended inputs only.

Current inputs of 4-20 mA can be used when the switch for a 250-ohm resistor is in the resistor installed position. This switch is located below the terminations. Refer to Figure 5-1.

- **NOTE:** When **connecting the analog input channel to a voltage device**, be sure to **set the 250-ohm resistor** switch to the 250 Ohm Resistor Active position on the termination board.

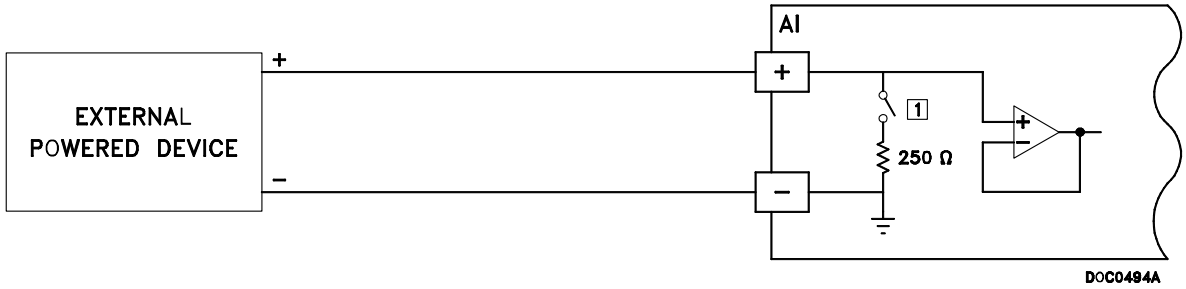

Figure 5-2. Analog Input Wiring

5.4 Analog Output

The Analog Output (AO) on the new 6 Point I/O termination board provides a 4-20 mA current source. The analog outputs use a 12-bit D/A converter with A/D values of 0 and 4095.

- **NOTE:** The switch for the selectable Analog Output/Discrete Output should be in the AO position, when configured for use as an Analog Output.

The Analog Output (AO) on the older 4 Point I/O termination board provides either a 1-5 volt signal or a 4-20 mA current control. The analog outputs use a 8-bit D/A converter with A/D values of 0 and 250. The AO is located at Point Number B2.

5.4.1 How to Wire the Analog Output on the 6 Point I/O Termination Board

The Analog Output provided on the I/O termination board connects as follows:

AO+ Positive
AO- Common

Figure 5-3 shows wiring for the Analog Output.

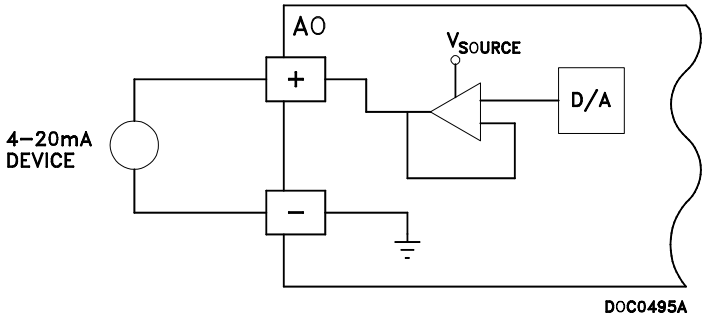

Figure 5-3. Analog Output Wiring

5.4.2 How to Wire the Analog Output on the Older 4 Point I/O Termination Board

The Analog Output provided on the I/O termination board connects as follows:

AO+ Positive
IC Current control
AO- Common

Figure 5-3 shows wiring for the Analog Output.

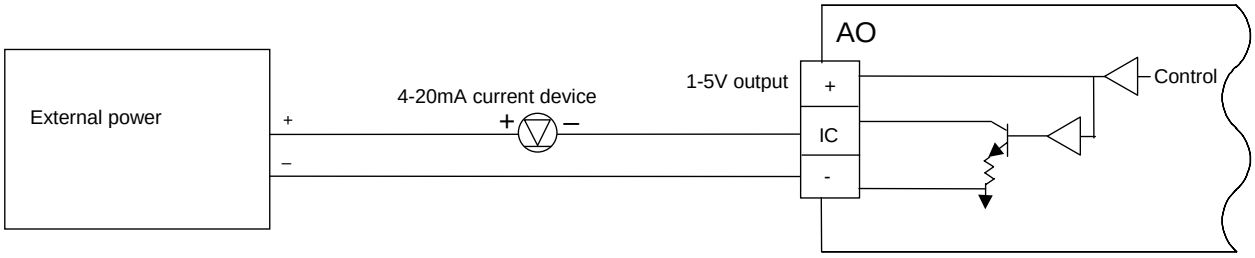

Figure 5-4. 4-20 mA Analog Output Current Control

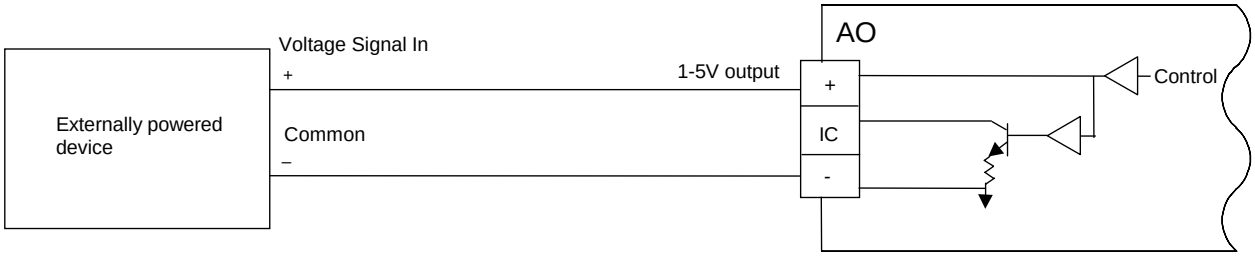

Figure 5-5. 1-5 Volts Analog Output Voltage Control

5.5 Discrete Input

The Discrete Input (DI) monitors the status of relays, solid-state switches, or open collector devices. DI functions support discrete latched inputs and discrete status inputs.

When a field device, such as a relay contact or open collector is connected across "+" and "-," the closing of the contacts completes the circuit which causes a flow of current between Vs and ground at terminal "-." This current flow activates and is sensed in the DI circuitry that, in turn, signals the FloBoss electronics indicating that the relay contacts have closed. When the contacts open, current flow is interrupted and the DI circuit signals to the FloBoss electronics that the relay contacts have opened.

The selectable Pulse Inputs/Discrete Inputs are configured as Pulse Inputs through ROCLINK 800 software. Refer to Section 5.1.1.

- ❖ **NOTE:** The selectable Analog Inputs/Discrete Input channels should have the 250 ohm resistor switched off, when configured for use as Discrete Inputs.

5.5.1 How to Wire the Discrete Input

The terminals for connecting the DI wiring are shown in Figure 5-1.

The "+" terminal is the positive signal input and the "-" terminal is the signal common. The Discrete Input operates by providing a closed contact across terminals "+" and "-". Refer to Figure 5-6.

⚠ CAUTION

The Discrete Input is designed to operate only with non-powered discrete devices, such as "dry" relay contacts, open collector devices, or isolated solid state switches. Use of the DI channel with powered devices may cause improper operation or damage.

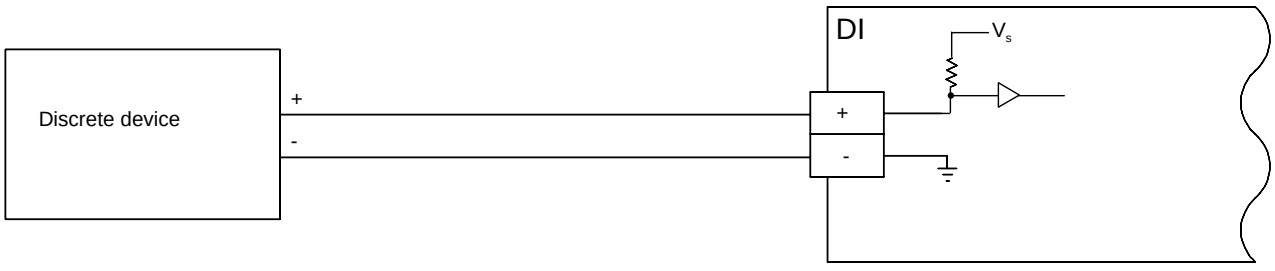

Figure 5-6. Discrete Input Wiring

5.6 Discrete Output

The Discrete Output (DO) provides a solid-state switch to control relays and to power small electrical loads. The DO circuitry is optically coupled to help isolate the processor board from the input signal. Refer to Figure 5-7.

DO functions include:

- Sustained discrete outputs.
- Momentary discrete outputs.
- Slow pulse-train outputs.

The Discrete Output channel is a normally-open, FET switch. The Discrete Output is a solid-state switch enabled by individual signals from the processor I/O lines and capable of handling 50 V dc at 0.2 A maximum.

The Discrete Output on the I/O termination board can be used in:

- Toggle mode.
- Latched mode.
- Timed discrete output (TDO) mode.

❖ **NOTE:** The switch for the selectable Analog Output/Discrete Output (DO-1) should be in the DO position, when configured for use as an Discrete Output.

5.6.1 How to Wire the Discrete Output

The terminals for connecting the DO wiring are shown in Figure 5-1.

The "+" terminal is the normally open contact and the "-" terminal is the common. Refer to Figure 5-7.

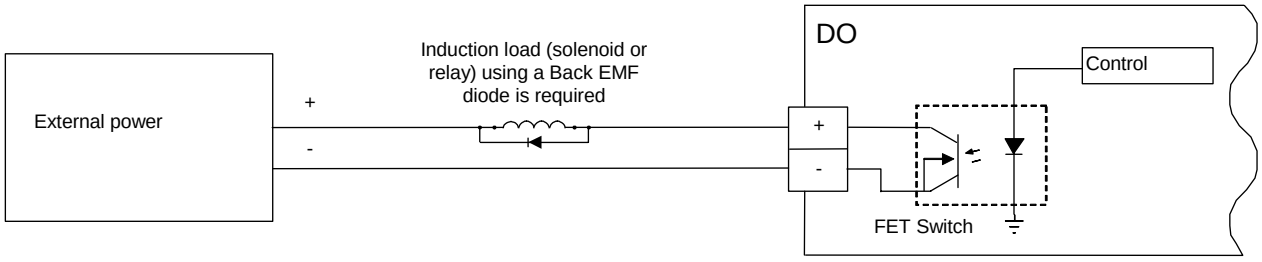

Figure 5-7. Solid State Relays – Discrete Outputs

5.7 Pulse Input

Pulse Inputs (PI) count pulses from pulse-generating devices. The FloBoss 100-Series Pulse Input circuits are physically the same as the Discrete Inputs. The Pulse Input, after the isolation, routes to a pulse accumulator, where the pulses are counted and accumulated.

The selectable Pulse Inputs/Discrete Inputs are configured as Pulse Inputs through ROCLINK 800 software. Refer to Section 5.1.1.

5.7.1 How to Wire the Pulse Input

The terminals for connecting the DI wiring are shown in Figure 5-1.

The "+" terminal is a positive source voltage; the "-" terminal is the signal return.

To use the channel as a Pulse Input (shown in Figure 5-8), connect the "+" and "-" field wires to terminals "PI-1+" or "PI-2+" and "-".

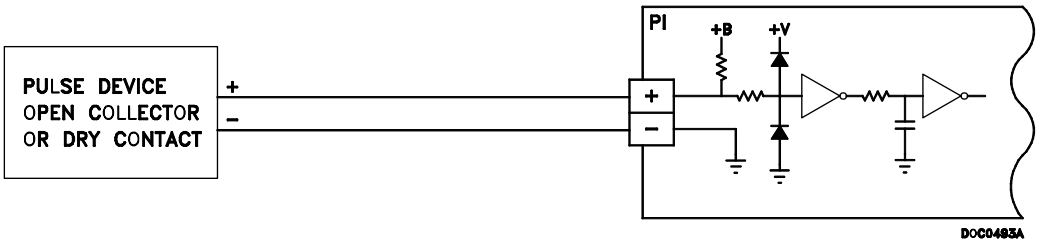

Figure 5-8. Pulse Input Wiring

5.8 RTD Input

The temperature is input through the Resistance Temperature Detector (RTD) probe and circuitry. The RTD temperature probe mounts directly to the piping using a thermowell, outside the FloBoss enclosure. The RTD probe is then wired to the FloBoss RTD connections. The RTD wires should be protected either by a metal sheath or by conduit connected to a liquid-tight field conduit wiring fitting on the enclosure. The RTD signal will be monitored by a 16 bit A/D converter and then be read by the microprocessor.

5.8.1 How to Wire the RTD Input

The RTD wires connect to the three screw terminals designated "RTD" on the Termination Board.

The FloBoss 100-Series unit provides terminations for a three-wire or two-wire 100-ohm platinum RTD with a DIN 43760 curve. The RTD has an alpha equal to 0.00385.

Wiring between the RTD probe and the FloBoss unit should be shielded wire, with the shield grounded only at one end to prevent ground loops. Ground loops can cause RTD input signal errors.

Table 5-2 displays the connections at the RTD terminals for the various RTD probes.

Table 5-2. RTD Signal Routing

Terminal	Designation	3-Wire RTD	2-Wire RTD
+	Signal positive input	RTD +	RTD +
+	Signal positive input	RTD +	Jumper to RTD +
RET	Return reference	RTD RET	RTD RET

5.9 I/O Termination Point Specifications

I/O Termination Points Specifications

ANALOG INPUT (OPTIONAL)

Type: Single-ended, voltage-sense analog inputs (current loop if resistor is switched On).

Signal: 0 to 5 V dc, software configurable. 4 to 20 mA, with 250Ω resistor switched to On.

Accuracy: 0.5% over -40 to 65°C (-40 to 149°F) range.

Isolation: None.

Input Impedance: 1 MΩ.

Filter: Single pole.

Resolution: 12 bits.

Sample Period: 1.0 second minimum.

ANALOG OUTPUT (OPTIONAL)

Type: 4-20 mA high side source current.

Resolution: 12 bits.

Accuracy: 0.1% of full-scale output.

Reset Action: Output goes to last value or low scale (software configurable) on power-up, warm start, or on watchdog time-out.

DISCRETE INPUT (OPTIONAL)

Type: Contact-sense discrete input.

Current Rating: 35 µA in the active (on) state, 0 µA in the inactive (off) state.

Isolation: None.

Frequency: 0.5 Hz maximum.

Sample Period: 1.0 second minimum.

DISCRETE OUTPUT (OPTIONAL)

Type: Solid-state switch.

Switch Rating: 50 V dc, 0.2 A maximum.

Isolation: 3000 V from processor.

Reset Action: Output goes to last value or off (software configurable) on power-up, warm start, or on watchdog time-out.

PULSE INPUT (OPTIONAL)

Type: High-speed pulse counter inputs, dry contact.

Frequency: 10 KHz maximum.

Signal Current: 65 µA in the active (on) state, 0 µA in the inactive (off) state.

Filter: Slow pulse input debounce filter. Software selectable. Filter times from 0.025 to 5 sec.

RTD INPUT (STANDARD)

Quantity/Type: Single input for a 2 or 3-wire RTD element with alpha of 0.00385.

Terminals: "RTD+" current source, "RTD+" signal positive input, and "RTD RET" signal negative input.

Sensing Range: -40 to 240°C (-40 to 464°F).

Accuracy: ±0.2°C (0.64°F) over sensing range (includes linearity, hysteresis, repeatability).

Ambient Temperature Effects per 28°C (50°F): ±0.50°C (0.90°F) for process temperatures from -40 to 240°C (-40 to 464°F).

Filter: Band-pass hardware filter.

Resolution: 16 bits.

Sample Period: 1 sec minimum.

CLASSIFICATION

FCC Class A and CISPR 22 computing device.

ENVIRONMENTAL

Same as the FloBoss unit in which it is installed.

APPROVALS

Same as the FloBoss unit in which it is installed.

SECTION 6 – DUAL-VARIABLE SENSOR

This section describes the Dual-Variable Sensor (DVS), which provides differential pressure and static pressure inputs to the FloBoss 103 for orifice flow calculation. Note that the DVS is not equipped to provide a temperature input to the FloBoss; this input comes directly into the FloBoss by means of the RTD input on the termination board.

This section contains the following information:

6.1 Dual-Variable Sensor

The DVS, which uses Rosemount sensor technology, measures differential pressure and absolute or gauge (static) pressure by converting the applied pressure to electrical signals and making the readings available to the processor board. The sensor housing screws into an adapter. The adapter, in turn, mounts with four bolts to the bottom of the FloBoss enclosure.

- **NOTE:** The DVS Sensor should only be installed and removed at the factory.
- **NOTE:** The DVS cable plugs directly into the backplane board. The DVS cable should only be installed and removed at the factory.

The readings from the Dual-Variable Sensor are stored in analog inputs on the FloBoss. If the alarm for the AI point is enabled, and the DVS fails to communicate during either initialization or operation, an alarm is entered in the Alarm Log.

The DVS uses an interrupt to inform the processor board that it is ready for an update. This must occur at least once per second. The FloBoss then converts this value and stores it in the proper analog input for access by other functions within the unit. If an update does not occur in the one-second interval, the sensor is re-initialized. A point fail alarm is set if the DVS does not respond to the initialization.

The DVS pressure sensors mount to the base of the explosion proof housing and provide the measurement of the P1 pressure and the differential pressure for orifice plate flow measurement applications. The Specifications table on page 6-3 displays the DVS ranges.

For information on calibration of a DVS sensor, refer to Section 7.

- **NOTE:** Consult your local sales representative for special ranges.

6.1.1 Process Connections

Piping from the meter run connects to the Dual-Variable Sensor (DVS) of the FloBoss. Both the static and differential pressures pipe to female ¼-18 NPT connections on the bottom of the DVS. The FloBoss is an **upstream** device, meaning that the static pressure line normally connects to the high pressure side (labeled "H" on the sensor body).

❖ **NOTE:** The FloBoss 103 is intended to be used as an upstream device.

⚠ CAUTION

Open the by-pass valve on the valve manifold prior to isolating the sensor from the process, to protect the differential cell of the Dual-Variable Sensor. This keeps one side of the differential sensor from being subjected to high pressure while the other side has no pressure applied. This is required when calibrating either differential or static pressure. Refer to Section 7 for the recommended sequence.

Do NOT close the by-pass valve on the valve manifold until after process pressure has been reapplied, to protect the differential cell of the Dual-Variable Sensor. This keeps one side of the differential sensor from being subjected to high pressure while the other side has no pressure applied. Refer to Section 7 for the recommended sequence.

6.1.2 Configuration

Use ROCLINK 800 configuration software to configure the DVS.

- The differential pressure is configured at Analog Input Point Number A1.
- The static pressure (gauge or absolute) is configured at Analog Input Point Number A2.

The Analog Input Points A1-A4 can be configured for fault mode operation on the Advanced tab of the Analog Input Setup screen. The Action on Failure field will determine whether the FloBoss unit should hold the last known value or set to a specified fault value.

The defaults contained within the DVS are the initial pressures read. The initial range of the differential pressure and the static pressure are listed in the Specifications table in Section 6.2. You can re-range each sensor through the calibration routines. The turndown on the range should not be greater than the turndown value in the Specifications table on page 6-3.

The DVS also supports the conversion of values to metric units. In metric mode, both the differential pressure and the static pressure are in kPa. To enter metric mode, use ROCLINK 800 software. The FloBoss automatically adjusts the units of the differential pressure, static pressure, RTD, and enclosure/battery temperature, to the Metric mode.

❖ **NOTE:** When selecting metric mode, the FloBoss adjusts the Units only. You must manually change all values to the proper unit of measurement.

6.2 DVS Specifications

Dual-Variable Sensor Specifications

DIFFERENTIAL PRESSURE INPUT

Range Options:

0 - 62.2 kPa (0 - 250 in. H_2O).

0 - 248.8 kPa (0 - 1000 in. H_2O).

Reference Accuracy: ±0.075% of span with a 10:1 turndown (includes linearity, hysteresis, and repeatability effects).

STATIC PRESSURE INPUT

Range Options: Either Absolute or Gauge:

0 - 5516 kPa (0 - 800 psia/psig).

0 - 25,000 kPa (0 - 3626 psia/psig).

Reference Accuracy: ±0.075% of span with a 6:1 turndown (includes linearity, hysteresis, and repeatability effects). For spans with less than 6:1 turndown, contact factory.

Stability: ±0.1% of upper range limit for 12 months.

PROCESS CONNECTIONS

1/4-18 NPT on 2-1/8 in. centers, located on bottom of Coplanar flange.

CONSTRUCTION

316 SST*. Wetted O-rings are glass-filled TFE. Coupler is stainless steel (CF8M).

ENVIRONMENTAL AND OTHER SPECS

Meets the Environmental specifications of the FloBoss 103 unit, including Temperature and Voltage Surge specifications.

Note: *Consult factory for special ranges and materials that may be available.

SECTION 7 – PULSE INTERFACE MODULE

This section describes the Pulse Interface Module, which provides pressure inputs and pulses counts to the FloBoss 104 for AGA7 flow calculation with AGA8 compressibility. The Pulse Interface Module is intended for applications with Rotary Meters and Turbine Meters.

This section contains the following information:

7.1 Pulse Interface Module

The primary function of the FloBoss 104 is to measure the flow of natural gas using turbine metering or rotary metering in accordance with the American Gas Association (AGA) and American Petroleum Institute (API) standards. When performing AGA7 calculations, the FloBoss unit uses 1992 AGA8 compressibility.

The Pulse Interface Module consists of two parts: a pulse counter interface and a pressure transducer.

- When used with a Rotary meter, the Pulse Interface Module creates and measures electrical signals (pulses) from the rotary meter and raw pressure inputs from the pressure transducer. The module automatically interprets the direction of rotation. The module has a resolution of 1000 pulses per revolution.
- When used with a Turbine input, the pressure is measured by the pressure transducer and pulses from the turbine meter are measured by the Pulse Input on the optional I/O board.

The Pulse Interface Module makes the readings available to the processor board. The pressure inputs are read from an Analog Input, while the pulse counts are read as a Pulse Input.

The primary inputs used for AGA7 flow measurement are Pulse Input (PI) counts, static pressure, and temperature. The Pulse Input counts are acquired from a rotary meter or turbine meter, the static pressure (including auxiliary pressure) inputs come from the pressure transducers, and the temperature input is read from an RTD probe. After the static pressure and auxiliary pressure values are read, the flowing temperature is read. The inputs are read by the FloBoss processor at the following rates:

- Pulse counts are read from the Pulse Interface Module once per second.
- Static pressure is sampled once per second.
- Temperature is sampled and linearized once per second.

Figure 7-1. FloBoss 104 Assembly

Standard PI and AI alarming are implemented, along with sensor and flow alarms. If the sensor fails to communicate, either during initialization or run time, the Failure bit in the Pulse Input and Analog Input alarm code is set. If alarms are enabled, an alarm is also entered in the Alarm Log.

The two Pulse Inputs in the Pulse Interface Module will be used for counting pulses acquired from a rotary meter. PI1 is for clockwise (CW) rotation; PI2 is for counter-clockwise (CCW) rotation. The optional Pulse Inputs on the termination board can be used for other pulse input devices.

The pressure transducers provide the measurement of the line pressure (P1) and can optionally measure downstream pressure or station inlet pressure (aux P2). The Specifications table on page 7-3 displays the sensor ranges.

The Pulse Interface Module will arrive from the factory already attached to the base of the FloBoss unit. Due to cable connections between the interface and the FloBoss backplane, do **not** remove the FloBoss unit from the Pulse Interface Module.

The Pulse Interface Module mounts between the bottom of the FloBoss unit and the top of the rotary meter or turbine meter. Refer to Section 2 for Mounting instructions.

- **NOTE:** The Pulse Interface Module is not equipped to provide a temperature input to the FloBoss for gas compensations in AGA7 calculations. This input should come directly into the FloBoss by means of the RTD input on the termination board.

7.1.1 How to Make Process Connections

Piping from the meter run connects to the pressure transducers of the Pulse Interface Module. Both the line and auxiliary pressures pipe to female ¼-18 NPT connections on the sides of the Pulse Input Module.

CAUTION

When loosening the connections between the piping and the pressure transducers, use a wrench to hold the pressure transducers in place against the Pulse Input Module. The wiring connections between the Pulse Input Module and the pressure transducers must be kept firmly in place to avoid internal damage.

7.1.2 How to Configure the Pulse Interface Module

Use ROCLINK 800 configuration software to configure the Pulse Interface Module. Refer to the *ROCLINK 800 Configuration Software User Manual* (Form A6121) for instructions on configuring the meter, the Analog Inputs, the Pulse Inputs, and any other parameters for your application

The defaults contained within the sensor are the initial pressures read. You can re-range each sensor through the calibration routines.

7.2 Positive Displacement Interface Specifications

Pulse Interface Module Specifications

PRESSURE TRANSDUCER INPUT

Range Options:

0 - 6.9 bar (0 - 100 psi).
0 - 20.7 bar (0 - 300 psi).
0 - 69.0 bar (0 - 1000 psi).

Accuracy: 0.35% of Span at -40 to 70°C (-40 to 158°F) for all range options.

PROCESS CONNECTIONS

1/4-18 NPT, located on sides of interface.

DIMENSIONS

66 mm H by 133 mm W by 117 mm D (2.58 in. H by 5.25 in. W by 4.62 in. D) includes adaptor and pressure transducers.

CONSTRUCTION

Interface housing: Aluminum.

Pressure Transducers: SST.

Mounting flange: Aluminum.

ENVIRONMENTAL AND APPROVALS

Same as the FloBoss unit in which it is installed.

SECTION 8 – CALIBRATION

This section describes the calibration procedures for the Analog Input, RTD Input and Dual-Variable Sensor Inputs. For information on wiring and process connections, refer to Sections 5 and 6.

This section contains the following information:

8.1 Calibration (AI, RTD & DVS)

Use ROCLINK 800 software to perform initial calibration or re-calibration, such as after a change in an orifice plate in the meter run handled by the FloBoss unit.

The calibration routines support 5-point calibration, with the three mid-points calibrated in any order. The low-end or zero reading is calibrated first, followed by the high-end or full-scale reading. The three mid-points can be calibrated next, if desired.

The diagnostic analog inputs for logic voltage E1, battery voltage E2, and board/battery temperature E5 are not designed to be calibrated. The diagnostic analog input for charge input can be resealed and calibrated.

The built-in inputs may be calibrated with the 5-point routine. The built-in inputs are assigned to the first three Analog Input points:

- Differential pressure (for AGA3) or Meter pressure (for AGA7) located at AI Point A1.
- Static pressure (for AGA3) or Auxiliary pressure (for AGA7) located at AI Point A2.
- RTD temperature located at AI Point A3.

The optional Analog Inputs, if configured as Analog Inputs, on the termination board the can be calibrated with the 5 point routine.

8.2 How to Perform a Calibration

Perform the following steps:

1. Launch ROCLINK 800 Configuration software and connect to the FloBoss 100-Series unit.

2. Select either Meter > **Calibration** or Configure > I/O > Analog Input > **AI Calibration** tab. If you are calibrating the Analog Input on the optional I/O termination board, you must select Configure > I/O > Analog Input > **AI Calibration** tab.

   The current reading displays under each meter input as the Freeze Value. The FloBoss uses these values in the flow calculations while calibrating the points.

3. Click **Freeze**.

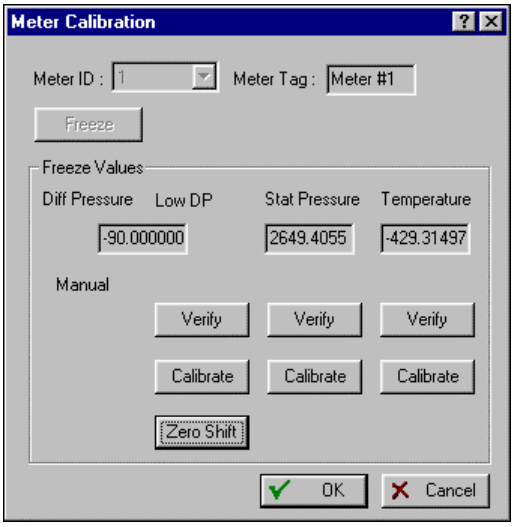

Figure 8-1. Meter Calibration (FloBoss 103 Shown)

4. If you are calibrating a **pressure input**, read the following Caution, and then **isolate** the pressure sensors from the process.

   If you are calibrating a RTD temperature input, proceed to Step 6. If you are calibrating the optional AI (AI Point Number B1), proceed to Step 8.

⚠ CAUTION

Open the by-pass valve on the valve manifold prior to isolating the sensor from the process, to protect the differential cell of the Dual-Variable Sensor. This keeps one side of the differential sensor from being subjected to high pressure while the other side has no pressure applied. This is required when calibrating either differential or static pressure. Refer to Figure 8-2 for the recommended sequence.

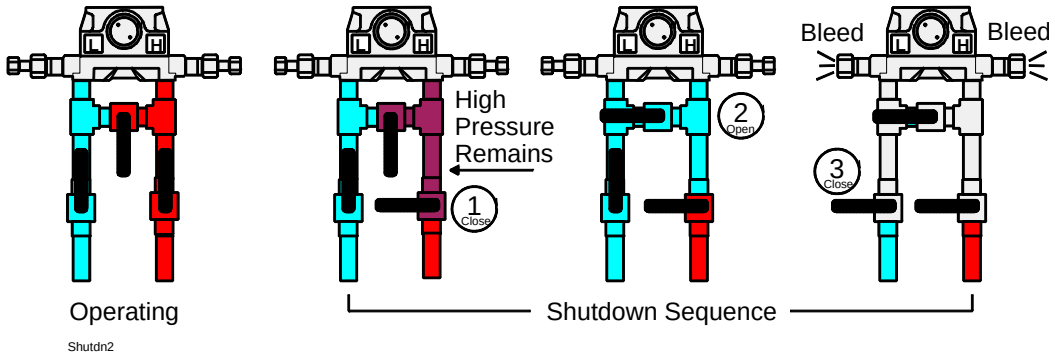

Figure 8-2. Removing the DVS from Service

5. If you are calibrating a **pressure input**, set up the pressure calibrator and make the necessary connections to the DVS. Refer to Figure 8-3 for the line orientation during the calibration.

CAUTION

Do not exceed the Differential Pressure range on the DVS to protect the differential cell of the Dual-Variable Sensor. Refer to the Specifications table in Section 7 for the range.

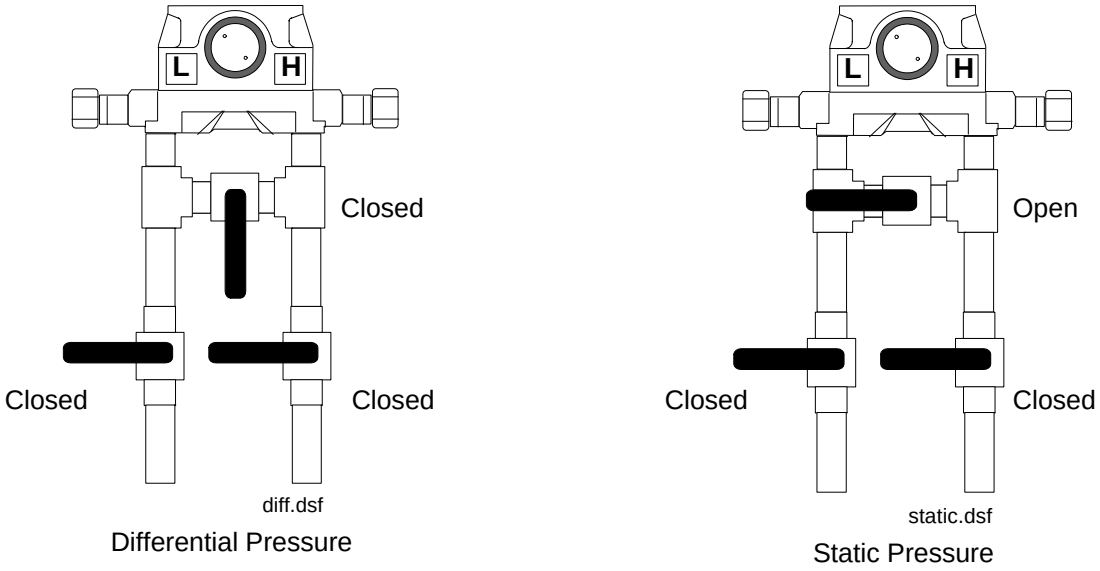

Figure 8-3. Pressure Calibration Open/Close Orientation

6. If you are calibrating a **temperature input**, disconnect the RTD sensor and connect a decade box (or comparable equipment) to the RTD terminals of the FloBoss.

7. Click **Calibrate** under the desired input to calibrate Diff Press, Stat Press, or Temperature. This displays the Set Zero calibration window as in Figure 8-4.

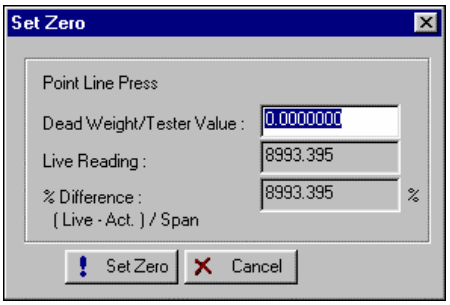

Figure 8-4. Set Zero Calibration Example

8. Apply the **low (zero) value**. For a pressure input, this would typically be open to atmosphere.

9. Enter the applied value in the **Dead Weight / Tester Value** field of the Set Zero dialog. Refer to Figure 8-4. For static pressure on an absolute-pressure device, remember to enter the actual current atmospheric pressure, such as 14.73 psi.

10. When the displayed Live Reading is stable, click **Set Zero** to calibrate the zero reading. The Set Span window then appears, as in Figure 8-5.

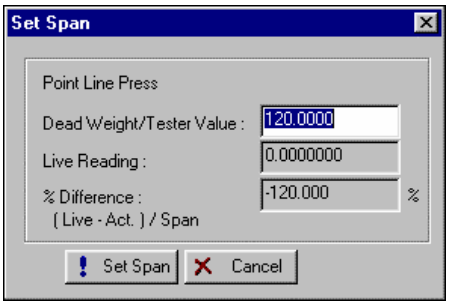

Figure 8-5. Set Span

11. Apply the desired **high value** to the input (the top end of the expected operating range). To maintain rated accuracy, be sure to observe the turndown limits listed in the Specifications table in Sections 5 and 6.

12. Enter the applied value in the **Dead Weight / Tester Value** field of the Set Span dialog. For static pressure on an absolute-pressure device, add the actual atmospheric pressure, such as 300 + 14.73.

13. When the Live Reading is stable, click **Set Span** to calibrate the high reading. The window advances to the Set Midpoint 1 window, as in Figure 8-6.

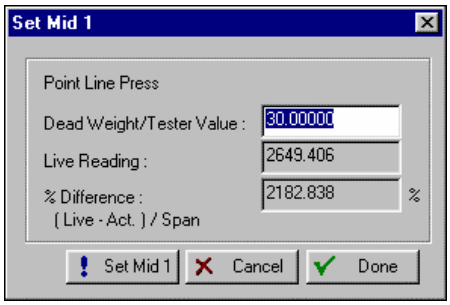

Figure 8-6. Set Midpoint 1

14. If you are performing a **two-point** calibration, click **Done**. Calibration for this input is complete.
15. To calibrate Midpoints, apply the desired pressure or temperature and enter the applied value in the **Dead Weight / Tester Value** field. Note that you can calibrate the midpoints in any order.
16. When the Live Reading is stable, click **Set Mid 1** to calibrate this reading. The display advances to the Set Midpoint 2 window, as in Figure 8-7.

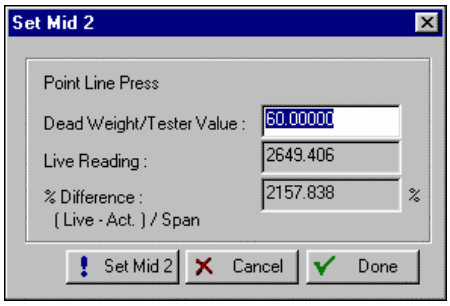

Figure 8-7. Set Midpoint 2

17. If you are performing a **three-point** calibration, click **Done**. Calibration for this input is complete.
18. To calibrate additional Midpoints, apply the desired pressure or temperature and enter the applied value in the **Dead Weight / Tester Value** field.
19. When the Live Reading is stable, click **Set Mid 2** to calibrate this reading. The display advances to the Set Midpoint 3 window, as in Figure 8-8.

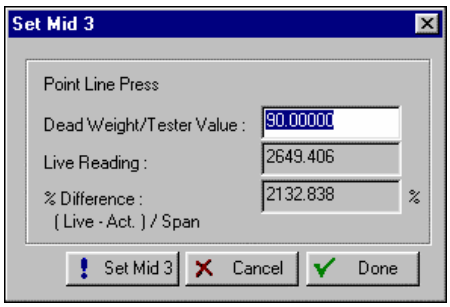

Figure 8-8. Set Midpoint 3

20. If you are performing a **four-point** calibration, click **Done**. Calibration for this input is complete.

21. To calibrate a third Midpoint, apply the desired pressure or temperature and enter the applied value in the **Dead Weight / Tester Value** field.

22. When the Live Reading is stable, click **Set Mid 3** to calibrate this reading. The calibration is complete, and the display returns to the Meter Calibration window.

23. When the calibration for a selected point is complete, you have the choice to calibrate another input, to verify the calibration or to close the calibration screen.

    When the calibration is complete and you calibrated **pressure inputs**, read the following Caution and return the Dual-Variable Sensor to service.

⚠ CAUTION

Do NOT close the by-pass valve on the valve manifold until after process pressure has been reapplied, to protect the differential cell of the Dual-Variable Sensor. This keeps one side of the differential sensor from being subjected to high pressure while the other side has no pressure applied. Refer to Figure 8-9.

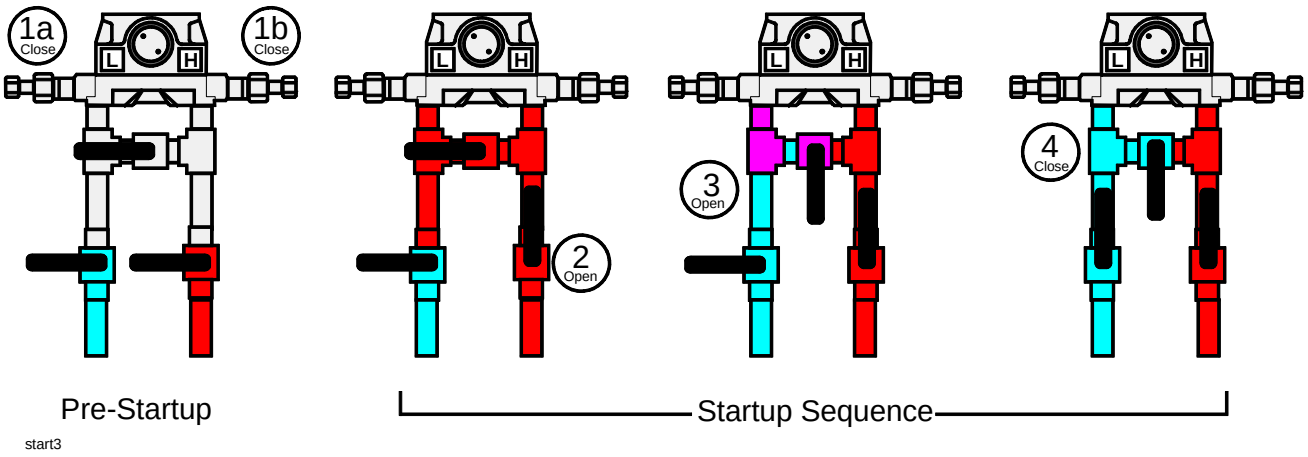

Figure 8-9. Returning the DVS to Service

❖ **NOTE:** If you calibrated the Differential Pressure input, refer to Section 8.2.1, Zero Shift, before completing the last step.

4. Click **OK** to close the calibration window, cancel freeze values (unfrozen) and enable live readings for use in the flow calculations. The Event Log records all calibration settings that were changed.

8.2.1 Zero Shift

If desired, use the Zero Shift procedure after calibrating the Differential pressure input. The Differential Pressure is calibrated without line pressure being applied to the sensor. When the sensor is connected back to the process after calibration, a shift in the differential pressure can occur due to the influence of the line pressure. This effect can be canceled out with a Zero Shift adjustment.

8.2.1.1 How to Adjust for Zero Shift

To check or adjust for Zero Shift, leave the sensor by-pass valve open (to simulate a no-flow condition), with either line pressure or a normal operating static pressure from the calibrator applied to the sensor. This applies the same pressure to both sides of the differential pressure diaphragm to give a zero differential pressure reading.

Perform the following steps:

1. Ensure ROCLINK 800 software is connected to the FloBoss 100-Series unit and running the calibration procedure.

2. If the meter inputs were already released from the freeze condition, click **Freeze**. This returns the Meter Calibration window as shown in Figure 8-11.

3. Under the Diff Press input, click **Zero Shift** to open the Set Zero Shift window shown in Figure 8-10.

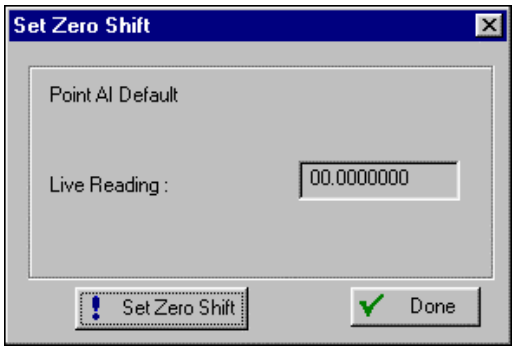

Figure 8-10. Set Zero Shift

4. Check the **Reading** to determine if you need to perform a Zero Shift correction.

5. If the reading is not zero, click **Set Zero Shift** to adjust the Zero Shift. If adjustment is zero, click Done or after you click, Set Zero Shift, click Done.

6. The Meter Calibration window displays. Refer to Figure 8-1. Click **OK** to close the calibration window, cancel the freeze values, and cause the FloBoss 100-Series unit to begin using live readings for the flow calculations.

8.3 How to Verify a Calibration

ROCLINK 800 software can verify the calibration to check if the DVS requires re-calibration. To verify, perform the following steps:

1. Launch ROCLINK 800 software and connect to the FloBoss 100-Series unit.
2. Select Meter > **Calibration**.
3. Click **Freeze**. This opens the Meter Calibration window. Refer to Figure 8-11. The current reading displays under each meter input as the Freeze Value. The FloBoss uses these values in the flow calculations while verifying the points.

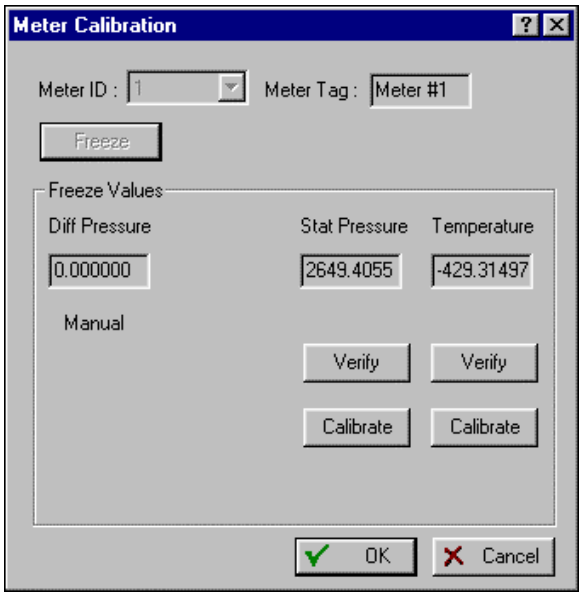

Figure 8-11. Meter Calibration Window

⚠ CAUTION

Open the by-pass valve on the valve manifold prior to isolating the sensor from the process, to protect the differential cell of the Dual-Variable Sensor. This keeps one side of the differential sensor from being subjected to high pressure while the other side has no pressure applied. This is required when calibrating either differential or static pressure. Refer to Figure 8-2 on page 8-3 for the recommended sequence.

4. While observing the previous Caution, apply the desired **pressure** setting to the input.
5. Click **Verify** listed under the input you desire to calibrate.

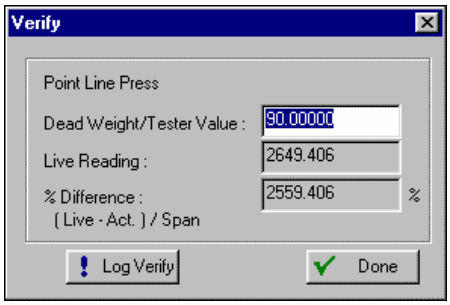

Figure 8-12. Verify Calibration

6. To log the Tester Value and the Live Reading to the Event Log as a record of the verification, click **Log Verify**.
7. Click **Done**.
8. Continue to verify all required **pressures/values**.
9. When the verification for a selected point is complete, you have the choice to verify another input, perform a calibration, or close the calibration screen. When complete, read the following Caution and connect the **Dual-Variable Sensor** back to the process.

⚠ CAUTION

Do NOT close the by-pass valve on the valve manifold until after process pressure has been reapplied, to protect the differential cell of the Dual-Variable Sensor. This keeps one side of the differential sensor from being subjected to high pressure while the other side has no pressure applied. Refer to Figure 8-9 on page 8-6.

10. Click **OK** to close the calibration window, to cancel freeze values (unfrozen) and to enable live readings for use in the flow calculations. The Event Log records all calibration settings that were changed.

SECTION 9 – TROUBLESHOOTING

This section provides generalized guidelines for troubleshooting of the FloBoss 100-Series. The procedures in this chapter should be performed before removing power for any reason, after restoring power, and if the unit is disassembled.

The following tools are required for troubleshooting:

- IBM-compatible personal computer.
- ROCLINK 800 software.
- Flat-head and Philips screwdrivers.

9.1 Troubleshooting Guidelines

When you are attempting to diagnose a problem with a FloBoss 100-Series unit:

- Remember to write down what steps you have taken,
- Save the configuration and log data (see Section 9.3.1),
- Note the order in which you remove components,
- Note the orientation of the components before you alter or remove them,
- Read and follow all Cautions in this manual.

When you are done troubleshooting, perform the restart procedure in Section 9.3.3.

9.2 Troubleshooting Checklists

9.2.1 Dial-up Modem

If you are experiencing troubles with an internal **dial-up modem**:

- Check to make sure power is applied to the FloBoss unit. Check the ON/OFF jumper, the wiring connections at CHG+ and CHG-, and the wiring at the power source.
- Check the wiring to the modem. Refer to Section 4.
- Check the communication port settings in ROCLINK 800 Configuration Software. Refer to *ROCLINK 800 Configuration Software User Manual* (Form A6121).

- Check the modem INIT string. It will be displayed in the communication port settings in ROCLINK 800 Configuration Software. Refer to *ROCLINK 800 Configuration Software User Manual* (Form A6121).

9.2.2 Serial Communications

If you are experiencing troubles with a **serial communications** connection (LOI, EIA-232, or EIA-485):

- Check to make sure power is applied to the FloBoss unit. Check the ON/OFF jumper, the wiring connections at CHG+ and CHG-, and the wiring at the power source.
- Check the wiring to the termination block or connector. Refer to Section 4.
- Check the communication port settings in ROCLINK 800 Configuration Software. Refer to *ROCLINK 800 Configuration Software User Manual* (Form A6121).

9.2.3 Optional I/O

If you are experiencing troubles with an optional **I/O point** (Analog Input, Analog Output, Discrete Input, Discrete Output, or Pulse Input):

- Check to see how the channel is configured using ROCLINK 800 software.
- If the configuration looks correct, then simulate an input (within the range of the input) or force an output to be produced using ROCLINK 800 software.
- If the types of I/O available for configuration do not match the type of I/O wired to the I/O terminations, check the I/O Setup screen. Refer to Section 5 for wiring schematics and instructions.
- If an input channel is in question, you may be able to use one of the outputs (known to be in working order) to simulate the required input. Likewise, if an output channel is in question, you may able to connect it to a working input channel and check the results.

❖ **NOTE:** No field repair or replacement parts are associated with the I/O termination points.

9.2.4 Software Issues

If you are experiencing problems with the FloBoss 100-Series that appear to be **software**-related, try resetting the FloBoss 100-Series unit.

- Use a Warm Start to restart without losing configuration or log data. To perform a Warm Start, open ROCLINK 800 software, connect to the FloBoss unit and select ROC > **Flags**. Refer to *ROCLINK 800 Configuration Software User Manual* (Form A6121).
- Use a Cold Start to restart without a portion of the configuration, log data, or programming that may be the trouble. To perform a Cold Start, open ROCLINK 800 software, connect to the FloBoss unit and select ROC > **Flags**. Refer to *ROCLINK 800 Configuration Software User Manual* (Form A6121).

- If a warm start and a cold start do not allow you to connect and you can not connect to the FloBoss 100-Series unit via the LOI port, use the RESET jumper on the FloBoss unit and cycle power to restore the LOI Communications parameters to factory defaults. Refer to Section 9.3.2.

❖ **NOTE:** If these methods do not solve the problem, contact your local sales representative.

9.2.5 Power Issues

If you are experiencing trouble with **powering** up the FloBoss 100-Series:

- Check the ON/OFF jumper, the wiring connections at CHG+ and CHG-, and the wiring at the power source.
- Check the batteries for voltage. The battery pack contains three D-size lead-acid batteries providing 2.5 Amp-hours of current at 6.2 volts nominal. If the batteries are below the nominal voltage, replace them. Refer to Section 3.

9.2.6 DVS

If your Dual-Variable Sensor (**DVS**) is not responding:

1. Launch ROCLINK software.
2. Select Configure >I/O > **AI Points**.
3. Select **Analog Input 1**.
4. Ensure that the DVS is not in manual mode by setting the **Scanning** field to **Enabled**.
5. If the DVS is still not responding, reset the DVS to factory defaults to clear invalid calibration data.
6. If the input shows a Point Fail alarm, then the sensor is not communicating with the FloBoss.

No field repair or replacement parts are associated with the DVS or DVS input. Return the FloBoss to your local sales representative for repair or replacement.

❖ **NOTE:** The DVS should only be installed and removed at the factory.

9.2.7 Pulse Interface Module

If your **Pulse Interface Module** is not responding:

1. Launch ROCLINK software.
2. Select Configure >I/O > **AI Points**.

   Select **Analog Input 1** or **2**. Analog Input 1 is the Meter Pressure; Analog Input 2 is the Auxiliary pressure. If the Auxiliary pressure is not installed, this point will show inactive.

   Ensure that the Pulse Interface Module is not in manual mode by setting the **Scanning** field to **Enabled**.

3. Go to the Utilities > **Pulse Interface Module Data** screen in ROCLINK 800 software and use the diagnostics provided on the screen. Refer to the *ROCLINK 800 Configuration Software User Manual* (Form A6121) for more information on this screen.

No field repair or replacement parts are associated with the Pulse Interface Module. Return the FloBoss to your local sales representative for repair or replacement.

❖ **NOTE:** The Pulse Interface Module should only be disconnected from the FloBoss 104 at the factory.

9.2.8 RTD

If you are experiencing troubles with the RTD:

- Check to see how the RTD point is configured as Analog Input 3.
- Verify that the wiring to the RTD terminations is correct. Refer to Section 5.
- Verify that the user-supplied RTD probe is not faulty. Refer to the instructions that accompanied the RTD probe.

No field repair or replacement parts are associated with the RTD input. Return the FloBoss to your local sales representative for repair or replacement.

9.3 Procedures

9.3.1 How to Preserve Configuration and Log Data

Perform this backup procedure, before removing power to the FloBoss unit for repairs, troubleshooting, removing or adding components, or upgrades. This procedure preserves the current flow computer configuration and log data held in RAM.

⚠ CAUTION

When installing equipment in a hazardous area, ensure that all components are approved for use in such areas. Check the product labels. Change components only in an area known to be non-hazardous. Performing these procedures in a hazardous area could result in personal injury or property damage.

To avoid circuit damage when working inside the unit, use appropriate electrostatic discharge precautions, such as wearing a grounded wrist strap.

1. Launch ROCLINK 800 software and connect to the FloBoss 100-Series unit.
2. Ensure that the configuration is saved in flash memory by performing a Save to Flash Memory (ROC > Flags). This saves all configuration settings, including the current states of the ROC Flags and calibration values.

3. Select ROC > Collect Data and select the All checkbox. Click OK. This action saves event logs, alarm logs, report data, and history. You can specify your own file name and path if desired.
4. Select File > Save Configuration. The Save As dialog box appears.
5. Type the desired File name for the backup file, or use the default.
6. Click Save. The file is saved in the default directory C:/Program Files/ROCLINK 800/Data unless you changed the directory.

9.3.2 How to Reset the FloBoss 100-Series Unit

The Reset jumper is located on the LCD (if installed) or on the Battery Charger Board. It can be used to perform a special type of cold start. This jumper permits a power-up reset to re-establish a known operating point. This includes re-initializing the Communication Ports to the factory default configuration.

This cold start does not include any of the clearing options available in a Cold Start performed using ROCLINK 800 software.

❖ **NOTE:** This type of reset restores the communications ports to the factory configuration defaults. Some user-entered configuration parameters may be lost. Therefore, try to back up any required data before performing this reset.

1. Refer to Section 9.3.1 and perform the backup procedure.
2. Unscrew the front end cap cover (LCD end).
3. Place the reset jumper (located on the LCD, if installed, or on the Battery Charger Board at J2) in the **RST** position.
4. Cycle the power.
5. Remove the reset (RST) jumper and install it in the normal (**NORM**) position.

❖ **NOTE:** It is good practice to lubricate the end cap covers every time they are removed for maintenance.

6. Replace the front end cap cover (LCD end). Screw the cover on until metal contacts metal. Do not over-tighten the cover.
7. Refer to Section 9.3.3 and perform the Restart and Reconfigure procedure.

This reset action loads the factory default values into the communication ports.

9.3.3 How to Restart and Reconfigure

After removing power to the FloBoss unit and performing maintenance or repair as needed, perform the following steps to start your FloBoss unit and reconfigure your data. The procedure assumes you are using ROCLINK 800 software.

⚠ CAUTION

Ensure all input devices, output devices, and processes remain in a safe state upon restoring power. An unsafe state could result in property damage.

When installing equipment in a hazardous area, ensure that all components are approved for use in such areas. Check the product labels. Change components only in an area known to be non-hazardous. Performing these procedures in a hazardous area could result in personal injury or property damage.

1. Reconnect power to the FloBoss unit by inserting the **CHG+ / CHG-** power terminal block.
2. Launch ROCLINK 800 software, log in, and connect to the FloBoss unit.
3. Verify that the configuration is correct. If it is not, continue by configuring the required items. If major portions or the entire configuration needs to be reloaded, perform the remaining steps.
4. Select File > **Download**.
5. From the **Open** dialog box, select the backup configuration file (has extension *.800).
6. Select the portions of the configuration you want to download (restore).
7. Click **Download** to restore the configuration.

9.3.4 How to Connect the Termination Board to the Backplane

Older FloBoss 103 units were shipped with the termination board connected to the backplane through a 34-pin interface connector. You may have a shrouded connector which ensures the correct polarity. If for any reason you must disconnect the termination board from the backplane, be careful to re-connect the shrouded connector using the following steps.

1. Insert the 34-pin interface connector into the backplane connector. Make sure that the connector shell faces away from the backplane and toward the termination board. See Figure 9-1.
2. Once the connection has been made to the backplane, use the connector shell to guide the pins of the 34-pin interface connector into the termination board connector. See Figure 9-2. Use caution; you will not be able to see the connection being made within the housing.

❖ **NOTE:** If the 34-pin interface connector and boards are not re-assembled in this manner, the pins may be misaligned and not make a full connection. The FloBoss 103 will not function correctly. Depending on which connections are made, the unit may appear to be working if the LCD is present.

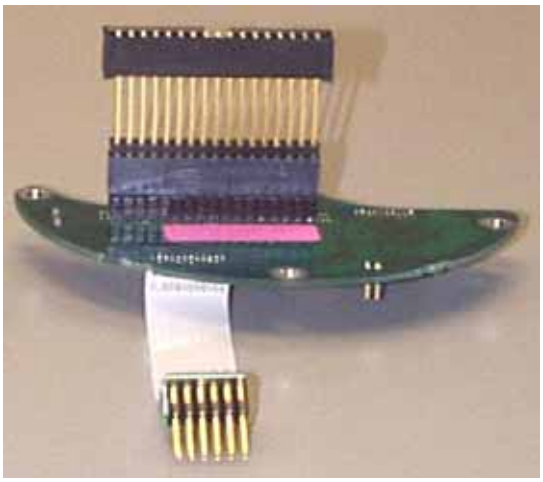

Figure 9-1 . Backplane with 34-Pin Interface Connector

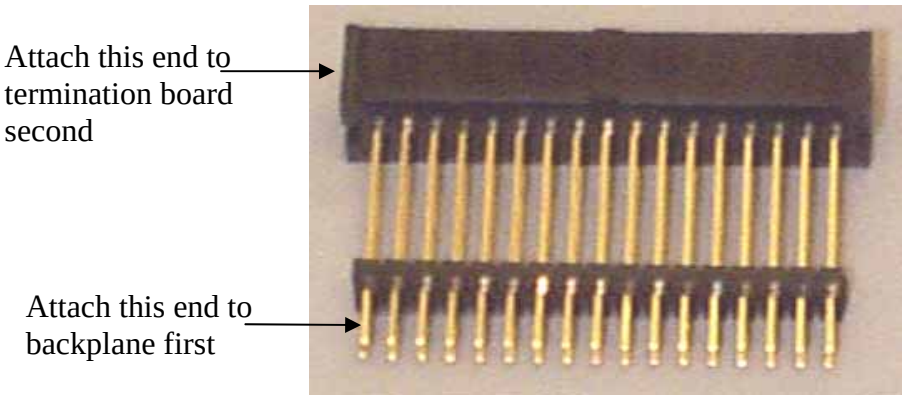

Figure 9-2 . 34-Pin Interface Connector

GLOSSARY OF TERMS

A

AGA – American Gas Association. Association that oversees the AGA3, AGA5, AGA7, AGA8 and AGA11 gas flow calculations.

AI – Analog Input.

AO – Analog Output.

Analog – Analog data is represented by a continuous variable, such as an electrical current signal.

AP – Absolute Pressure.

ASCII – American (National) Standard Code for Information Interchange.

B

Built-in I/O – I/O channels that are fabricated into the FloBoss and do not require a separate option. Also called “on-board” I/O.

C

Configuration – Typically, the software setup of a device, such as a FloBoss, that can often be defined and changed by the user. Can also mean the hardware assembly scheme.

CSA – Canadian Standards Association.

CTS – Clear To Send modem communications signal.

D

DB – Database.

dB – Decibel. A unit for expressing the ratio of the magnitudes of two electric signals on a logarithmic scale.

DCD – Data Carrier Detect modem communications signal.

DI – Discrete Input.

Discrete – Input or output that is non-continuous, typically representing two levels such as on/off.

DO – Discrete Output.

Download – To send data, a file, or a program to the FloBoss unit.

DP – Differential Pressure.

DSR – Data Set Ready modem communications signal.

DTR – Data Terminal Ready modem communications signal.

Duty Cycle – Proportion of time during a cycle that a device is activated. A short duty cycle conserves power for I/O channels, radios, and such.

DVM – Digital voltmeter.

DVS – Dual-Variable Sensor. Provides static and differential pressure inputs to a FloBoss 103.

E

ESD – Electronic Static Discharge.

EIA-232 – Serial Communications Protocol using three or more signal lines, intended for short distances. Also referred to as RS-232.

EIA-485 – Serial Communications Protocol requiring only two signal lines. Can allow up to 32 devices to be connected together in a daisy-chained fashion. Also referred to as RS-485.

EMI – Electro-magnetic interference.

EU – Engineering Units.

F

Firmware – Internal software that is factory-loaded into a form of ROM. In the FloBoss, the firmware supplies the software used for gathering input data, converting raw input data calculated values, storing values, and providing control signals.

Flash ROM – A type of read-only memory that can be electrically re-programmed. It is a form of permanent memory and requires no backup power.

FSK – Frequency shift keyed.

FST – Function Sequence Table, a type of program that can be written by the user in a high-level language designed by Emerson Process Management Flow Computer Division.

G

GFA – Ground fault analysis.

GND – Electrical ground, such as used by the FloBoss power supply.

GP – Gauge Pressure.

H

hw – Differential pressure.

I, J

I/O – Input/Output.

IEC – Industrial Electrical Code.

K

KB – Kilobytes.

kHz – Kilohertz.

L

LCD – Liquid Crystal Display. Display only device used for reading data.

LOI – Local Operator Interface. Refers to the serial (RS-232) port on the FloBoss through which local communications are established, typically for configuration software running on a PC.

M

mA – Milliamp(s); one thousandth of an ampere.

mW – Milliwatts, or 0.001 watt.

mV – Millivolts, or 0.001 volt.

N

NEC – National Electrical Code.

NEMA – National Electrical Manufacturer's Association.

O

OH – Off-Hook modem communications signal.

Off-line – Accomplished while the target device is not connected (by a communications link). For example, off-line configuration is configuring a FloBoss in an electronic file that is later loaded into the FloBoss.

Ohms – Units of electrical resistance.

On-line – Accomplished while connected (by a communications link) to the target device. For example, on-line configuration is configuring a ROC while connected to it, so that current parameter values are viewed and new values can be loaded immediately.

Opcode – Type of message protocol used by the FloBoss to communicate with ROCLINK software, as well as host computers with ROC driver software.

P, Q

Parameter – A property of a point that typically can be configured or set by the user. For example, the Point Tag ID is a parameter of an Analog Input point. Parameters are normally edited by using configuration software running on a PC.

PC – Personal computer.

Pf – Flowing pressure.

PI – Pulse Input

Point – Software-oriented term for an I/O channel or some other function, such as a flow calculation. Points are defined by a collection of parameters.

Point Number – The number of an I/O point as installed in the FloBoss system.

PRI – Primary PID control loop.

Protocol – A set of standards that enables communication or file transfers between two computers. Parameters include baud rate, parity, data bits, stop bit, and the type of duplex.

PSTN – Public Switched Telephone Network.

PT – Process Temperature.

PTC – Positive Temperature Coefficient.

PTT – Push-to-Talk signal.

Pulse – Transient variation of a signal whose value is normally constant.

Pulse Interface Module – Provides line pressure, aux pressure and pulse counts to the FloBoss 104.

R

RAM – Random Access Memory. In a FloBoss, it is used to store history, data, most user programs, and additional configuration data.

RBX – Report By Exception. See SRBX.

RFI – Radio frequency interference.

RI – Ring Indicator modem communications signal.

ROC – Remote Operations Controller is a microprocessor-based unit that provides remote monitoring and control.

ROCLINK Software – Configuration software used to configure FloBoss units.

ROM – Read-only memory. Typically used to store firmware.

RTD – Resistance Temperature Detector.

RTS – Ready to Send modem communications signal.

RXD – Received Data communications signal.

S

SP – Setpoint, or Static Pressure.

SRAM – Static Random Access Memory. Stores data as long as power is applied; typically backed up by a lithium battery or supercapacitor.

SRBX – Spontaneous Report By Exception. FloBoss function to initiate reports of alarm conditions to the host. Sometimes referred to as RBX.

System Variables – Parameters configured that describe the FloBoss unit. These parameters are set in the Device Information screen of ROCLINK software.

T-Z

Tf – Flowing temperature.

TLP – Type (of point), Logical (or point) number, and Parameter number.

TXD – Transmitted Data communications signal.

Upload – Send data, a file or a program from the FloBoss unit to a configuration PC or the Host.

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If you have comments or questions regarding this manual, please direct them to your local sales representative or contact:

Emerson Process Management
Flow Computer Division
Marshalltown, IA 50158 U.S.A.
Houston, TX 77065 U.S.A.
Pickering, North Yorkshire UK Y018 7JA
Website: www.EmersonProcess.com/flow