



FB2200 Quick Reference Guide

(Replacement for FloBoss™ 107E (with integral sensor) 407, 503, ControlWave® GFC, and EFM)

The FB2200 flow computer measures and controls gas flow for up to two differential pressure or linear meter runs. With a rugged housing and multiple I/O, communications, and power options, the FB2200 provides accurate and reliable flow measurement in the harshest conditions.

Designed for simplified configuration and ease of use, the FB2200 has several power options and optional backlit LCD display and can be equipped with optional Mobile SCADA™ with Wi-Fi® that allows you to configure the flow computer and retrieve data remotely, and supports multiple flow and properties calculations out of the box.

Features

- Increased measurement confidence and reduced measurement uncertainty
- Industry leading differential and static pressure measurement including 5-year stability
- High accuracy temperature measurement including curve matching with Callendar Van Dusen equation
- Reduced need to re-calibrate and less time spent on site
- Simplified configuration and set-up with the new FBxConnect™ Tool
- Flexible design with configurable I/O and communication ports to meet site needs
- Standard firmware supports global calculations for orifice, cone, Venturi, nozzle, turbine, PD, Auto Adjust and Coriolis
- Flexible PID control with override complimented by configurable logic blocks and effects
- Easy to interface to 1 or 2 remote 4088B MVS transmitters (DP, P & T) by using one of the 3 onboard serial ports
- Simple selection of engineering units to suit local requirements
- Global Hazardous Area Approvals – Class 1 Div 2, ATEX & IEC Ex n
- Corrosion resistant aluminum and fiberglass enclosure options include radio mounting bracket and battery box for solar use
- Mobile SCADA allows secure local wireless access from safe area
- Ease of integration with support for Modbus, ROC, BSAP and DNP3 protocols
- Enhanced security preventing unauthorized access
- Enhanced alarming and historical data storage and improved audit trail
- API 21.1 compliant

Firmware

The base firmware in the FB2200 flow computer comes with all the calculations, features, and functionality required to provide consistent measurement with increased confidence for gas metering and control. The flow computer measures static pressure, differential pressure or pulse frequency, and temperature for up to two meter runs.

The flow computer performs gas flow calculations based on the following set of user-selectable global calculations. To satisfy local requirements, the engineering units are fully user-selectable between U.S. or metric, or a combination of each.

The firmware supports the following flow calculations:

- AGA 3 1992/2013 (volume, mass/density, and mass/relative density)
- ISO 5167 1991/1998/2003 (orifice, Venturi, and nozzle)
- Rosemount 405C Compact Orifice and 1595 Conditioning Orifice Plate
- McCrometer V-Cone® and Wafer Cone®
- NUFLO™ Cone
- AGA 7 2006 (pulsed turbine, PD, ultrasonic, and coriolis meter)
- AGA 11 2013
- Auto-Adjust™ meter

The firmware supports the following property calculations:

- AGA 8 1994 (Detailed, Gross 1, and Gross 2)
- NX-19 1962/MOD/VDI/VDE 2040
- ISO 12213 2009 (parts 2 and 3)
- S-GERG 1991 (Std., Alt 1, Alt 2, and Alt 3)
- GPA 2172 2009 (including saturated vapor calculation)
- ISO 6976 1995 (Superior and Inferior)

The firmware accepts heating value and relative density from any of the following sources:

- Gas Chromatograph (GC)
- Fixed value
- Periodic download from SCADA
- An external signal, such as an analog input
- Calculated based on gas composition

The firmware includes the following flow rates and totals:

- Indicated volume
- Corrected (standard) volume
- Mass
- Energy

The firmware supports a fallback mode when a process variable's value is questionable. The fallback options can be one of the following:

- Use last good value
- Use a fixed fallback value

Power Options

You can power the FB2200 with an external DC power supply or from an internal rechargeable battery linked to a solar system. The internal battery can power the device under normal operating conditions without charging for up to 50 days.

Note: Internal battery option is available with Class 1 Div 2 only.

Inputs and Outputs

Base I/O

In addition to the integral pressure sensor, the FB2200 includes the following I/O points:

- Two analog channels – individually software selectable analog inputs (AI) or analog outputs (AO)
- Two discrete channels – individually software selectable digital inputs (DI), digital outputs (DO), or pulse inputs (PI)
- One RTD/PRT (2, 3, or 4-wire)

Analog Inputs (AI) are individually software configurable for either 4 to 20mA or 1 to 5 Vdc operation.

In order to keep measurement uncertainty at a minimum, when external transmitters are being used, both the AI and AO channels have industry leading measurement accuracy with an excellent performance over a wide ambient temperature range.

Each Digital Input (DI) channel can also be software configured to function as a latched DI.

The Digital Output (DO) channels are solid-state normally open switches rated at 500 mA, enough to drive most samplers directly. Each channel can be software configured as a latched, toggled, momentary, timed duration output (TDO), or scaled pulse output.

The PI channels are most commonly used to interface with turbine meters, Coriolis meters, ultrasonic meters, and Positive Displacement (PD) meters. The high speed input supports signals up to 10.5 KHz.

Expansion I/O

In addition to the base I/O provided, the FB2200 I/O capability can be increased by adding two options. The expansion below provides 2500 Vdc isolation from the CPU.

- 8 channel – isolated expansion board. 4 channels that are individually software selectable as either analog inputs or analog outputs, and 4 channels that are individually selectable as either digital inputs, digital outputs, or pulse inputs.
- 6 channel – isolated expansion board. 2 channels that are individually software selectable as either analog inputs or analog outputs, and 4 channels that are individually selectable as either digital inputs, digital outputs, or pulse inputs.

Note: The 8 channel expansion board option must be added first. The 6 channel expansion board can only be used in units that already have the 8 channel board included.

Control

The FB2200 optionally supports control functions including PID control, basic programming through action blocks, effects, and math blocks.

PID Control – The FB2200 supports up to three Proportional, Integral, and Derivative (PID) control loops. Each PID loop supports a primary and an override loop. Each loop has its own user-defined input, output, and override capability.

Typically, a PID control maintains a process variable at set point. If you configure a PID override control, the primary loop is normally in control of the control device but the override loop can take over control of the process if required. A typical example would be primary flow control with a pressure override.

Action Blocks – The FB2200 supports up to 30 action blocks. Action blocks are used in conjunction with effect blocks to monitor a configured condition and to perform an action (effect) when the logic is “true.” An action block consists of a user defined Boolean logic statement with two variables. These variables can either be live parameter values or constants.

Each action block consists of basic block logic, optional bypass logic, optional chain logic, and optional action output. The result of each action block is always either active (“true”) or inactive (“false”). When the result is inactive, no effect occurs. When the result is active, the FB2200 performs some sort of action (effect).

Effects – The FB2200 supports up to ten effects. Effects cause an action to occur when the result of one or more action blocks is active (“true”). Multiple action blocks can cause the same effect, such as shutting a valve or enabling an alert beacon.

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You configure an effect by defining an output parameter and the values to write to that parameter when the effect is either active or inactive. You can also configure an active effect to be self-clearing or to require a manual reset.

Math Blocks – The FB2200 supports up to ten math blocks. Math blocks perform mathematical equations using user-defined variables as inputs. Each math block consists of up to four user-defined variables, three mathematical calculations, and the results of each calculation.

You define a parameter to use for each variable, and the flow computer then uses the value of that parameter as the value of the variable. The result of the math block can be assigned to a user data point or to a required database parameter. Mathematical calculations also support standard math functions (POW, EXP, LOG, SQRT, etc.), constants, and operators.

FBxConnect checks each calculation string for the correct syntax and uses double precision floating point math throughout the calculation.

Configurable User Data Points – User data points are configurable storage areas in the data base. These user data points can store the constants / variables that are inputs to the math blocks in addition to the calculated results of math blocks. They can also be used to represent interim calculation values or values of additional inputs or outputs etc. There are eight user data instances, each with a tag and description, 30 integers (byte, short and long), 20 single floating points, and 10 double floating points, providing storage for up to 480 variables.

Communications

The FB2200 provides up to five user-selectable communications ports. Three serial ports, one Ethernet port, and one optional port that supports Mobile SCADA Wi-Fi (802.11 b/g) communications.

- COM1 – 4-wire serial communications. Software selectable for EIA-232 (RS-232), EIA-422 (RS-422), or EIA-485 (RS-485) operation
- COM2 – 2-wire serial communications. Software selectable for EIA-232 (RS-232) or EIA-485 (RS-485) operation.
- COM3 – 22-wire serial communications. Software selectable for EIA-232 (RS-232) or EIA-485 (RS-485) operation.

- COM4 – Mobile SCADA with Wi-Fi (802.11 b/g) communications (optional)
- COM5 – Ethernet. 10/100BASE-T twisted pair. Supports up to seven sessions

The FB2200 supports multiple communications protocols, including DNP3, Modbus master and slave (ASCII and RTU), BSAP, and ROC on all serial ports. In addition, the Ethernet port supports Modbus encapsulated in TCP/IP protocol (master and slave), Modbus TCP/IP protocol (master and slave) and DNP3/IP, ROC and (BSAP pending).