Badger Meter

Industrial Flow Computer

FC-5000 Flow Computer

DESCRIPTION

The Badger Meter® FC-5000 is a microprocessor-driven device designed for flow monitoring. The FC-5000 Flow Computer is compatible with the complete line of Badger Meter industrial flow meters and temperature sensors, creating a solution to totalize and indicate fluid flows. Many years of experience in the industrial market has allowed Badger Meter to incorporate features indispensable in control operations.

Features	Benefits
Large, backlit graphical display	Provides enhanced viewing capabilities, near and far from the device
Integrated softkeys and full numerical keypad	Promotes intuitive navigation and programming
100-point linearization	Provides higher resolution for improved linearization
Sensor data display screen	Allows user to view raw and calculated flow data, both to and from the device, including flow data and temperature readings. Additionally, users can see relay, output and digital I/O statuses
Plug-and-play terminals	Provides easier, user-friendly installation
User-programmable relay configuration	Enables alarms or totalizing output capabilities for rates, totals and temperatures
User-programmable scaled outputs	Outputs transmit rate, total or temperature data via dedicated output channels
Robust enclosure, keypad and mechanical relays	Provides application ruggedness

PROGRAMMABILITY

Features	Programming Options
Fluid Properties	Custom fluid characteristics can be stored for calculations and reference.
Digital I/O	Ability to reset relays, totals or both remotely via the 6 available I/O ports.
Scaled Outputs	Fully configurable outputs that can be assigned to rates, totals and temperature.
Relay Outputs	Fully configurable relays that can be assigned to rates, totals and temperature as either a totalizing output or alarm indication. Option to enable/disable latching functionality.
Display Properties	Adjustable contrast and brightness for readability and controlling power consumption.
Stored or Custom Units of Measure	Ability to select from a list of standardized units of measure, or complete the customized option with labels and quantity assignments.
Passcodes	User-defined passcodes to manage advanced configuration parameters and reset functions.
Sensor Inputs	Accurate and fast programming of flow and temperature sensors with preprogrammed selection lists.

OPERATION

Input signal—in the form of sine waves or pulses from open collector transistors or dry contact closures—can be scaled to any unit of measure for totalization and instantaneous rate-of-flow indication. Linearized volumetric flow rate and totals are examples of flow parameters that can be viewed on the panel display or through Modbus communications.

Units configured with a temperature sensor input can compensate for changes in fluid viscosity when process temperature varies. The expansion and contraction of the flow meter housing due to thermal effects is also compensated for by means of proven Roshko/Strouhal algorithms.

Dedicated analog or frequency output channels provide scaled outputs that are assignable to parameters such as flow rate, total and temperature. A user defined damping function can be applied for improved stability of the flow readings.

FLEXIBILITY

- Non-volatile memory preserves all configured settings and totalization values during power failure
- Low voltage AC/DC power
- Dynamic menu selection and programming reduces potential programming errors
- Ability to restore to factory programmed settings

Product Data Sheet

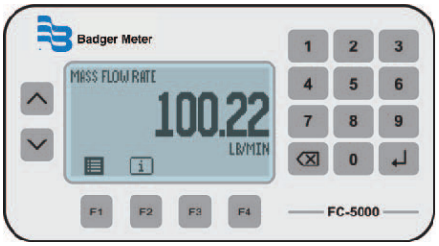
VIEWING CAPABILITIES

Quickly toggle views on the *Home* screen to switch from or to:

- FLOW RATE (*Figure 1*)
- FLOW TOTAL (*Figure 1*)
- FLOW RATE AND FLOW TOTAL (Dual Display) (*Figure 2*)
- MASS FLOW RATE
- MASS FLOW TOTAL
- MASS FLOW RATE AND MASS FLOW TOTAL

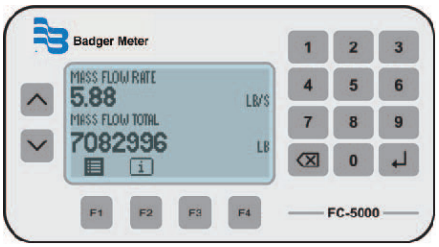
Dual Sensor Input configurations also allow for a second flow sensor, indicated by rate/total CH2:

- FLOW RATE 1 OR 2
- FLOW TOTAL 1 OR 2
- FLOW RATE 1 OR 2 AND FLOW TOTAL 1 OR 2
- MASS FLOW RATE 1 OR 2
- MASS FLOW TOTAL 1 OR 2
- MASS FLOW RATE 1 OR 2 AND MASS FLOW TOTAL 1 OR 2



- Flow Rate
- Flow Total
- Mass Flow Rate
- Mass Flow Total

Figure 1: Single display



- Flow Rate and Flow Total
- Mass Flow Rate and Mass Flow Total

Figure 2: Dual display

ACCESSORIES

RTDs	
Part No.	**Description**
8RTD100	Replacement RTD Element
8RTD106B	1/4 in. NPT; BR; ADJ Depth; 6 in. Leads
8RTD116B	3/4 in. NPT; BR TW; 1-5/8 in. Depth; 1/2 in. Conduit Conn.
8RTD116S	3/4 in. NPT; SS TW; 1-5/8 in. Depth; 1/2 in. Conduit Conn.
8RTD125	3/4 in. NPT; SS TW; 2-1/2 in. Depth; 1/2 in. Conduit Conn.
8RTD140	3/4 in. NPT; SS TW; 4 in. Depth; 1/2 in. Conduit Conn.
8RTD160	3/4 in. NPT; SS TW; 6 in. Depth; 1/2 in. Conduit Conn.

Table 1: RTD part numbers

Thermistors

Part No.	Description
8T106B	1/4 in. NPT; BR Thermistor; ADJ Depth
8T106S	1/4 in. NPT; SS Thermistor; ADJ Depth
8T116B	3/4 in. NPT; BR Thermowell; 1-5/8 in. Depth
8T116S	3/4 in. NPT; SS Thermowell; 1-5/8 in. Depth
8T125	3/4 in. NPT; SS Thermowell; 2-1/2 in. Depth
8T140	3/4 in. NPT; SS Thermowell; 4 in. Depth
8T160	3/4 in. NPT; SS Thermowell; 6 in. Depth
8T180	3/4 in. NPT; SS Thermowell; 8 in. Depth
67002	Replacement Thermistor Element

Table 2: Thermistor part numbers

Consult the factory or your local representative for availability, pricing and delivery estimates for additional parts and accessories.

EIA-485 (RS-485) NETWORK

All FC-5000 BTU Monitors come equipped with an EIA-485 (RS-485) physical layer, and use Modbus RTU protocols, selectable and programmed in the firmware. Up to 255 FC-5000 products can be run on a single daisy-chain network and be individually queried for flow/energy rate, positive flow/energy accumulator, supply temperature, return temperature and other information.

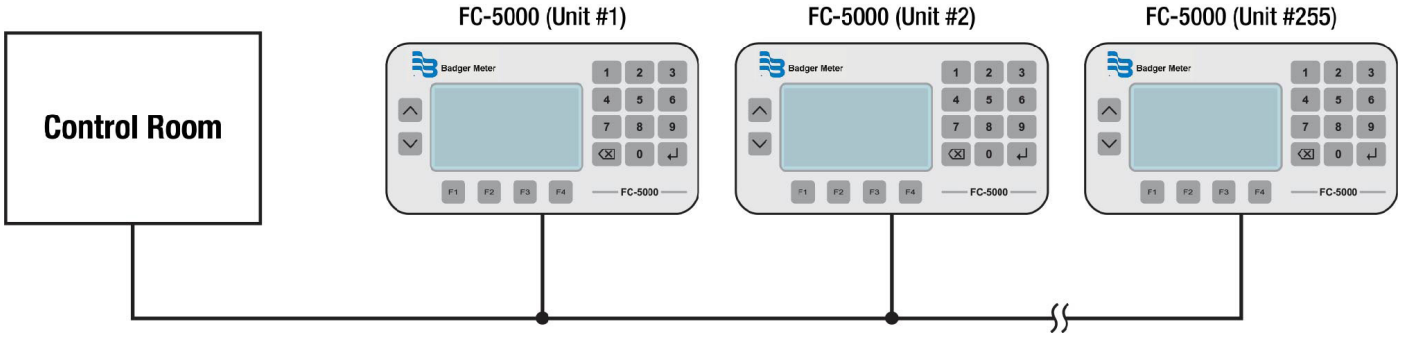
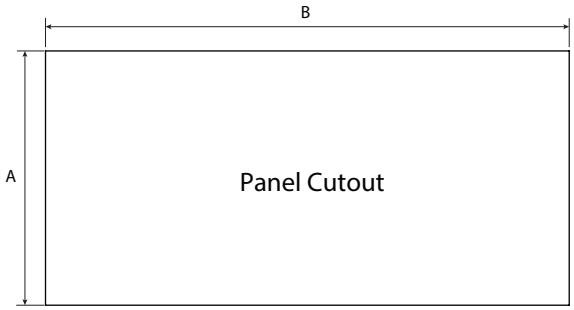


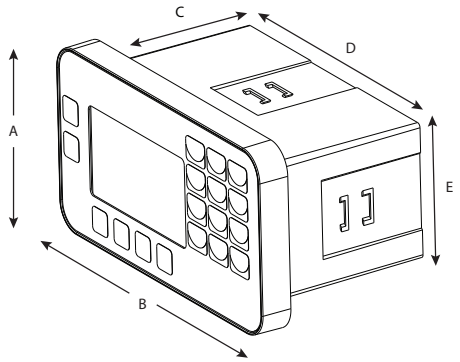
Figure 3: Daisy-chained units

DIMENSIONS

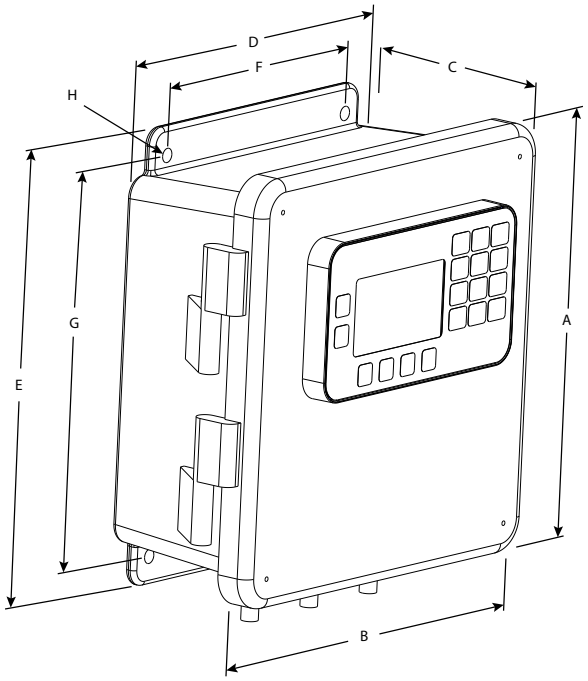
Panel Mount Unit

Mounting clips can accommodate a maximum panel thickness of 1.5 in. (38.1 mm).





Wall Mount Unit



	A	B	C	D	E	F	G	H
	Height in. (mm)	**Width in. (mm)**	**Depth in. (mm)**	**Width in. (mm)**	**Height in. (mm)**	**Width in. (mm)**	**Height in. (mm)**	**Hole Dia. in. (mm)**
Panel Cutout	2.65 (67.31)	5.40 (137.16)	—	—	—	—	—	—
Panel Mount Unit	3.50 (89.00)	6.22 (158.00)	3.07 (78.00)	5.38 (136.65)	2.54 (64.52)	—	—	—
Wall Mount Unit	9.38 (238.25)	9.38 (238.25)	4.88 (123.95)	8.00 (203.20)	9.56 (242.83)	6.00 (152.40)	8.75 (222.25)	0.31 (7.87)

SPECIFICATIONS

Power Supply	Input range 10…40V DC and 9…28V AC RMS	
	AC input voltage frequency range 50…60 Hz	
	Maximum 8 Watts power consumption	
	Isolated from power ground	
	Over-voltage, transient and reverse polarity protected	
Flow Meter Input	Input Range: 0.3 Hz…10 kHz	
	One (1) or two (2) independent channels	
	Configurable as square wave 0…30V pulse with 2.5V threshold	
	Configurable as sine wave, zero-centered with 45 mV threshold	
	Configurable debounce	
	Excitation Output	12V DC source
	Voltage	Low: –0.3…1.85V DC
		High: 2.5…25V DC
	Impedance	Pullup to 12V DC
	VDC Current	±50 mA, short circuit current
	Response	100 µs/3.5 ms min pulse (high/low speed)
Scaled Outputs	Two (2) independent channels	
	Isolated from power ground	
	Over-voltage, transient and reverse polarity protected	
	Output is multiplexed on the process out pins	
	Analog Output (option A)	Configurable to 0…5V, 0…10V or 4…20 mA
		Uncertainty: ±0.1% of reading
		16-bit resolution (0…10V and 4…20 mA), 15-bit resolution (0…5V)
		200 ms, 90-10% step response
		Sourcing analog output signal
	Frequency Output (option F)	TTL, 1…4000 Hz, square wave
		Uncertainty: ±0.01% reading
		Resolution: 0.01 Hz
Digital I/O	Six (6) independent channels	
	Isolated from power ground	
	Over-voltage, transient and reverse polarity protected	
	0…30 Volts as input	
	Debounce	
	0…5V, TTL, 200 ms 90-10% step response, driving < 0.1 uF	
Relay Outputs	2 Form C mechanical	
	Isolated coil drivers	
	Over-voltage, transient and reverse polarity protected	
Network Communications	**Network Types/Communication Protocols**	Modbus RTU, Modbus ASCII or BACnet
	Physical Layer	EIA-485 (RS-485)
	Baud Rates	1200…115.2K
	Two-wire (half-duplex)	
	Over-voltage/ESD Protection	
	Isolated from power ground	
USB Communications	**USB (HOST)**	Type-A Receptacle | Currently not supported
	USB (DEVICE)	Mini-B Receptacle (used for field updates)
	Over-voltage/ESD/transient protected	

Display/User interface	**Keypad**		Membrane overlay, domed tactile response keys
	Display		128 × 64 pixel LCD graphical display, LED backlit
	Protected from EMI/RFI		
	Keypad interface is protected from ESD		
Flow Calculation	Uncertainty: ± 0.01%		
	Adjustable FIR/IIR filtering		
Environmental Ratings	**Pollution Degree**		2
	Altitude Restriction		Up to 2000 m (6561 ft)
	Over-Voltage Rating		Category II (CAT II)
	Ambient Temperature Range		32…130° F (0…55° C)
	Storage Temperature Range		–40…160° F (–40…70° C)
	Humidity		0…85%, non-condensing
Weights (Approx.)	**Panel Mount**		1.25 lb (0.57 kg)
	Wall Mount (Including Unit)		4.54 lb (2.06 kg)
Operator Functions	Unlatch Relays, Reset Totalizer, Unlatch Relays and Reset Totalizer, Inhibit Flow Channels		
Parameters	**Maximum Displayed Digits**	**Rates**: Max 8 (7 with decimal)	
		Totals: Max 9 (8 with decimal)	
	Resolution/ Display Precision	Configurable, 0…4	
	Volumetric Flow Rate Units Seconds (S), Minute (MIN), Hour (H), Day (D)		US Gallons (US GAL), Imperial Gallons (I GAL), Mega US Gallons (US MGAL), Mega Imperial Gallons (I MGAL), Liters (L), Mega Liters (ML), Cubic Meters (M^3), Cubic Feet (FT^3), Acre Feet (AC-FT), Oil Barrels (OBBL), Liquid Barrels (LBBL), US Ounces (US OZ), Imperial Ounces (I OZ), Custom (user-specified)
	Volumetric Flow Total Units		
	Mass Rate Units Seconds (S), Minute (MIN), Hour (H), Day (D)		Pounds (LB), Kilograms (KG), Custom (user-specified)
	Mass Total Units		
	Temperature Units	° F (Fahrenheit), ° C (Celsius), R (Rankine) or K (Kelvin)	

PART NUMBERING CONSTRUCTION

FC5	-	FM	-	P2	-			6	A	-	

FC-5000 Flow Computer

FUNCTION

Flow Computer — FM

SENSOR INPUTS

Two Pulse / One Temperature — P2

SCALED OUTPUTS

Two Analog Outputs — A

Two Frequency Outputs — F

RELAY OUTPUTS

One Form C Relay / One Form A Relay — A

Two Form C Relays — C

DIGITAL INPUTS/OUTPUTS

Six Programable Inputs/Outputs — 6

COMMUNICATIONS

EIA-485(RS-485); Modbus; BACnet; USB — A

MOUNTING METHOD

Panel Mount — P

Wall Mount | Includes NEMA 4X (IP67) Rated Enclosure — W

FC5	-	FM	-		-	F		6	A	-	

FC-5000 Flow Computer

FUNCTION

Flow Computer — FM

SENSOR INPUTS

One Pulse — P0

Two Pulse — P3

SCALED OUTPUTS

Two Frequency Outputs — F

RELAY OUTPUTS

One Form C Relay / One Form A Relay — A

Two Form C Relays — C

DIGITAL INPUTS/OUTPUTS

Six Programable Inputs/Outputs — 6

COMMUNICATIONS

EIA-485(RS-485); Modbus; BACnet; USB — A

MOUNTING METHOD

Panel Mount — P

Wall Mount | Includes NEMA 4X (IP67) Rated Enclosure — W

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