

Industrial Flow Computer

FC-5000 BTU Monitor

DESCRIPTION

The Badger Meter® FC-5000 is a microprocessor-driven device designed for energy/BTU and flow monitoring. The FC-5000 BTU Monitor is compatible with the complete line of Badger Meter industrial flow meters and temperature sensors, creating a solution to monitor hydronic energy usage, flow rate and totals. 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
Sensor data display screen	Allows user to view raw and calculated flow data, both to and from the device, including flow data, energy usage 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	Provides accurate and fast programming of flow and temperature sensors with preprogrammed selection lists.

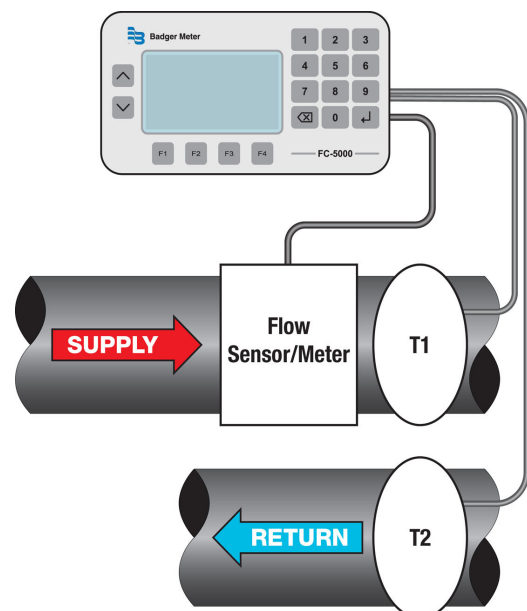


OPERATION

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. Energy rate and flow totals are examples of parameters that can be viewed on the panel display or through communications protocols such as BACnet or Modbus.

Two temperature sensor inputs can be configured to read RTDs or thermistors and are fully customizable to adapt to application needs. When used in conjunction with fluid flow, hydronic energy rates and total usage are achieved, while conforming to EN1434 standards.

Additionally, dedicated analog or frequency output channels provide scaled outputs that are assignable to parameters such as energy 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

VIEWING CAPABILITIES

Quickly toggle views on the Home screen to switch between:

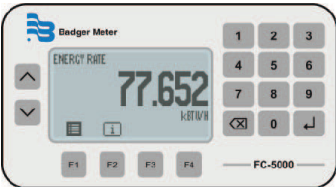


Figure 1: Single display

- Flow Rate
- Flow Total
- Energy/BTU Rate
- Energy/BTU Total

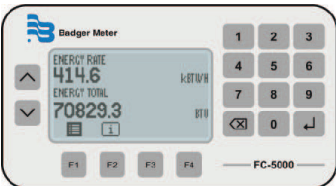


Figure 2: Dual display

- Flow Rate and Flow Total
- Energy/BTU Rate and Energy/BTU Total

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 BACnet or 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.

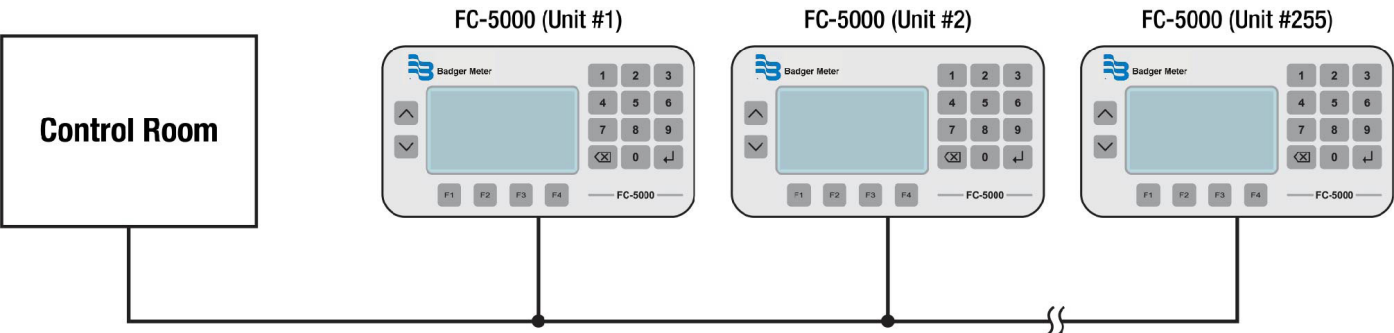
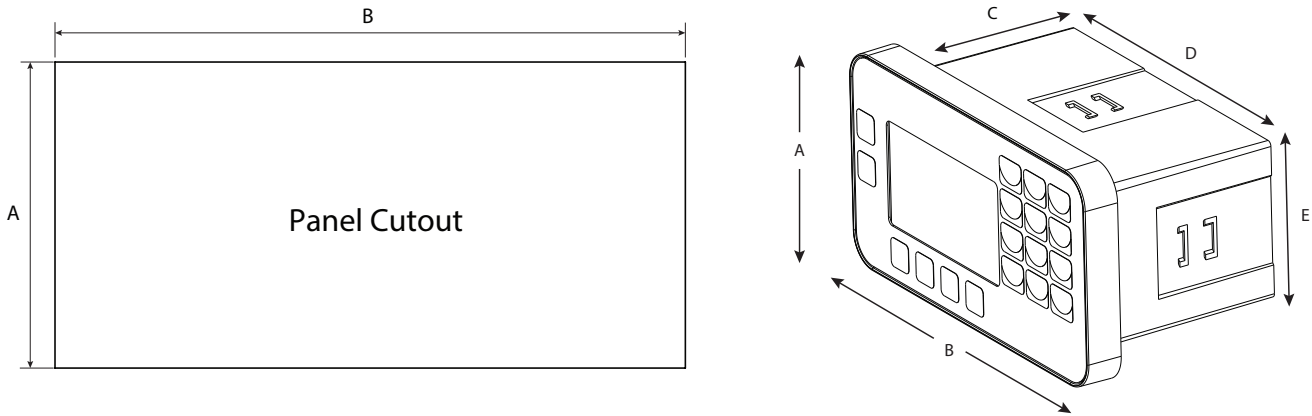


Figure 3: Daisy-chained units

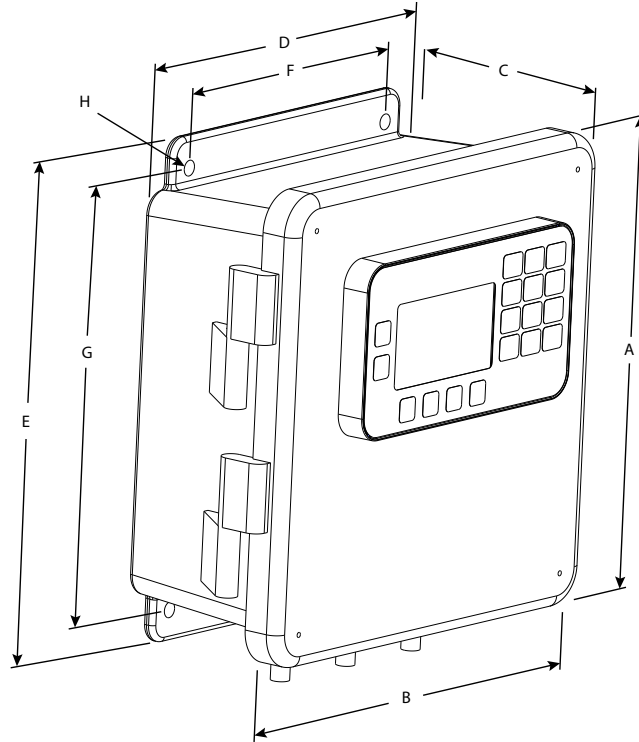
DIMENSIONS

Panel Mount Unit

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



Wall Mount Unit



	A Height in. (mm)	B Width in. (mm)	C Depth in. (mm)	D Width in. (mm)	E Height in. (mm)	F Width in. (mm)	G Height in. (mm)	H Hole Dia. in. (mm)
Panel Cutout	2.65 (67.31)	5.40 (137.16)	—	—	—	—	—	—
FC-5000 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 (50...60 Hz)		
	Maximum power consumption: 8 Watts (power supply must provide 8 watts at minimum)		
	Isolated from power ground		
	Over-voltage, transient and reverse polarity protected		
Flow Meter Input	Input Range: 0.3 Hz... 10 kHz		
	One (1) independent channel		
	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)		
Temperature Inputs	Two (2) independent channels		
	RTD Specifications	50 µA/1000 µA Excitation current source	
		2, 3 and 4-wire compatible	Platinum, 100 and 1000 Ohm RTDs
			Optional two-point or customizable calibration configuration
		Callendar-Van Dusen coefficients	
	Thermistor Specifications	Type II Thermistors or customizable calibration configuration	
		Steinhart-Hart coefficients	
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...30V as input		
	Debounce		
	0...5V, TTL, 200 ms 90-10% step response, driving < 0.1 uF		
Calculations	Flow Calculation	Uncertainty: ± 0.01%	
		Adjustable FIR/IIR filtering	
	BTU Calculation	Meets EN 1434 requirements	

Relay Outputs	Configuration Option "C"		Two (2) Form C Mechanical Relays	
	Configuration Option "A"		One (1) Form C Mechanical Relay and One (1) Form A Solid State Relay	
	Isolated coil drivers			
	Over-voltage, transient and reverse polarity protected			
	Form C Relay	Load	Resistive	
		Rated Carry Current	5 A (N.C. or N.O.)	
		Maximum Switching Voltage	250V AC, 30V DC	
		Minimum Permissible Load	10 mA at 5V DC	
		Coil Rating	5...24V DC	
		Life Expectancy	5,000,000 operations	
	Form A Relay (N.O. SPST)	Switching Speed	On (0.25 ms), Off (0.02 ms)	
		Current Rating (I _o)	1 A	
Maximum Output Voltage (V _o)		60V		
Output On-Resistance (R _(ON))		0.5 Ohms (Ω) @ I _F = 5 mA, I _o = 1 A		
Output Withstand Voltage (V _{O(OFF)})		60-65V @ V _F = 0.8V, I _o = 250 μA, T _A = 77° F (25° C)		
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			
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 Totalizers, Unlatch Relays and Reset Totalizers			
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 (M³), Cubic Feet (FT³), 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			
	Energy Units		kBTU, BTU, KW, TONS (RT), Custom (user-defined)	
	Temperature Units		° F (Fahrenheit), ° C (Celsius), R (Rankine) or K (Kelvin)	

PART NUMBERING CONSTRUCTION

Badger Meter

FC-5000 BTU Monitor



FUNCTION

BTU Monitor BM

SENSOR INPUTS

One Pulse / Two Temperature P1

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

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Control. Manage. Optimize.

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