

VANTAGE[®] 2200

A NEW STANDARD IN OPEN CHANNEL
FLOW AND LEVEL MEASUREMENT



Eastech Badger
FLOW TECHNOLOGY GROUP 

VANTAGE® 2200

EASTECH BADGER COMBINES FLOW MEASUREMENT, LEVEL TRANSMISSION AND DATA LOGGING WITH IEEE 754 PRECISION ACCURACY AND 5 MINUTE PROGRAMMING.

The Vantage 2200 is a state-of-the-art microprocessor-based ultrasonic transmitter utilized for measurement of both liquid level and flow in open channels. The 2200 is equipped, as standard, with an internal data logger that provides for on-screen display of maximum, minimum and average daily flows. More than 70 standard flow equations for flumes, weirs and open flow nozzles are stored in non-volatile memory. Dual sensors can be input to a single set of electronics for dual weir/flume or bar screen level applications. The Vantage 2200 is designed to be extremely user-friendly with an easy to read 20 character alphanumeric, self-prompting display and a menu-driven programming guide available in English, Spanish and German.

FLOW

The Vantage 2200 is normally pre-programmed at the factory for a specific open channel flow measurement application. However, for simple on-site calibration, more than 70 standard flow equations for flumes, weirs and open flow nozzles are stored in non-volatile memory. For specific or unique applications, a site specific H/Q table can be entered through the 16 button keypad.

APPLICATIONS

Plant Influent
Plant Effluent
Dual Channel Measurement

The model 2200 FB2 sensor head is capable of withstanding indefinite submersion and is supplied standard with 30 feet of cable. The sensor is both corrosion resistant and weatherproof (Tefzel®). The programming and data logger electronics are housed in a Nema 4, 4X enclosure and the FB2 sensor is designed to be certified for operation in Class I, Division 1 environments. Outputs are 4-20 mA, 5 programmable relays, built-in data logging, RS-232 serial port allowing for real time communications operating in a Modbus™ protocol, and a separate RS-485 port.



LEVEL

Utilized for level measurement, The Vantage 2200 will accurately measure fluid level in ranges to 50 feet. With 5 programmable relay outputs for level alarms or pump alternation, the 2200 becomes an extremely versatile instrument for level measurement and control.

APPLICATIONS

Level Measurement ◀
Differential Level Measurement ◀
Dual Channel Measurement ◀
Pump Alternation ◀

The model 2200 FB2 sensor head is a Tefzel® corrosion resistant unit capable of measuring level in a 0-16 foot range. The longer range FB3 is a glass-filled polyester sensor capable of measuring levels of up to 50 feet. Level measurement is programmed with the microprocessor-based electronic unit of the Vantage 2200. Vertical rectangular and cylindrical or horizontal cylindrical vessels are typical applications.



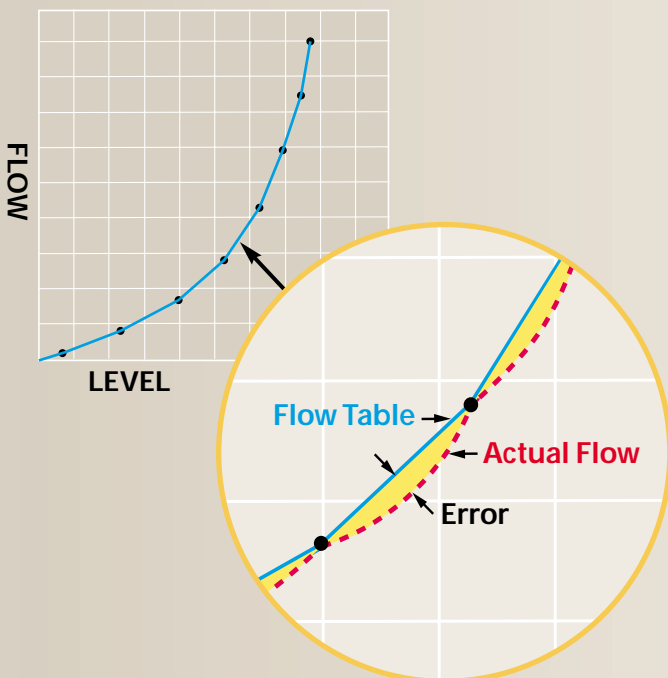
ACCURACY

IEEE 754 SINGLE POINT PRECISION

The overall accuracy of an ultrasonic open channel flowmeter is based upon conversion of level measurement to flow. The more accurate the conversion, the more accurate the flow data. By replacing the conventional method of calculating flow through the use of "level to flow lookup tables" with IEEE 754 single floating point precision mathematics, an extremely high level of flow data accuracy is achieved. With "flow lookup tables", errors of up to 2% may be introduced—dependent upon the number of data points in the flow table. The reason for this is that a table point determines the flow for only a specific point. All the values of level to flow between points are calculated as a straight line (shown below).

Since the Vantage 2200 employs IEEE 754 single floating point precision mathematics in all of its computations, an error of less than .0000005% is introduced during the level to flow conversion.

FLOW LOOKUP TABLE



RELIABILITY

ENGINEERED THROUGH FIELD EXPERIENCE

An in-depth analysis of all warranty repairs associated with the design of previous models offered a clear indication of specific engineering features that needed to be included in the new Vantage 2200. The 2200, with its advanced design now carries a 3-year warranty.



LONG CABLE RUNS

Near lightning strikes and power surges, especially in applications in which long lengths of cable are required for the 4-20 mA loop connection, can cause unexpected circuit failures. The Vantage 2200 is equipped with gas discharge arrestors and EMI/RFI filtering to prevent these types of failures.

FIELD REPLACEABLE RELAYS

The 2200 is provided, as standard, with five SPDT pluggable relays (0.25A @ 120 VAC or 0.50A @ 24 VDC) for ease of replacement after excessive wear.

A SINGLE CIRCUIT BOARD

Intercircuit board connectors have been eliminated from the design of the Vantage 2200. A single circuit board performs all the functions required for flow measurement, level transmission and data retrieval.



FIELD UPDATEABLE FIRMWARE

Because the Vantage 2200 utilizes flash memory instead of eeproms, all firmware is updateable in the field. Meter software revision can be simply accomplished through a connection port located on the front panel of the 2200.



APPLICATIONS

FLOW & LEVEL



FB2

FB3

The electronics of the 2200 is extremely versatile and can be programmed for flow (using weirs/flumes or any special H/Q function) or level measurement of up to 50 feet. Two sensors are available. The FB2 is a Tefzel® sensor capable of measuring flow or measuring level from 0-16 feet. The FB3 is a glass-filled polyester sensor with an extended level range of 0-50 feet.

FLOW

The following is a partial list of the stored flow to primary element functions.

- ▶ Parshall flumes
- ▶ Manhole flumes
- ▶ Palmer Bowlus flumes
- ▶ Trapezoidal flumes
- ▶ H flumes
- ▶ V Notch weirs
- ▶ Contracted weirs
- ▶ Suppressed weirs
- ▶ Cipoletti weirs
- ▶ Open flow nozzles
- ▶ Kennison nozzles
- ▶ Mannings circular
- ▶ Mannings rectangular
- ▶ Special H/Q

LEVEL

Level measurement can be programmed in the 2200 for a range of 0-50 feet. Vertical rectangular and cylindrical or horizontal cylindrical vessels are typical applications.

DUAL SENSORS

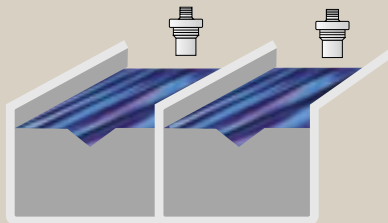


Dual sensors may be used with the Vantage 2200 electronics. Individual display functions for each sensor is provided. This allows for two separate measurements within a single meter.

Typical arrangements are:

Dual Sensors

Dual weirs or flumes or flow for flume/weir and level. Sensors may be programmed identically or with different calibration variables.



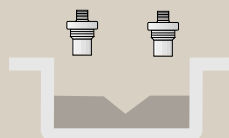
Bar Screen Level Differential

This will alert the operator to a clogged bar screen through the use of a specific alarm assigned to one of the relays. The difference between level 1 and Level 2 will be displayed.

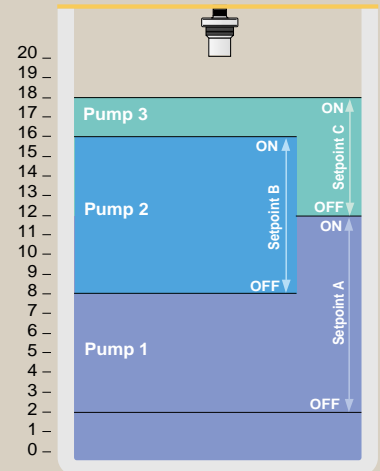


Compound Weirs

Programming dual sensors for a compound weir will allow for greater accuracy over the entire flow range.



PUMP ALTERNATION



The pump alternation feature of the Vantage 2200 is utilized when the treatment facility has more than two pumps that are to be actuated based upon level set points.

For example: a sewer line will feed into a wet well at a lift station. The station employs three pumps. The wet well is 20 feet deep. As the wet well fills, the operator wants to turn on the pump (Pump 1) when the level reaches 12 feet and off at 2 feet. If the level in the well continues to rise with only one pump running, the operator will probably require the second pump (Pump 2) to come on at a level of 16 feet and off at 8 feet. If the level in the well continues to rise with both pumps running, the operator will initiate a third pump (Pump 3) to come on at a level of 18 feet and off at 12 feet.

There are three setpoints: on at 12 feet, off at 2 feet (Setpoint A); on at 16 feet, off at 8 feet (Setpoint B); on at 18 feet, off at 12 feet (Setpoint C).

With the pump alternation feature, the setpoints in the 2200 are not assigned to a specific relay controlling a specific pump. The 2200 tracks each time a relay is activated, and when a setpoint is reached, the relay with the least number of activations is tripped. **WITH THIS FEATURE, ALL THREE PUMPS WILL EXPERIENCE EVEN WEAR.**

The pump alternation feature may also be employed on filling applications—such as a water tank fed by multiple pumps.

PROGRAMMING

04/05/2001 08:36.02
Flw1 451 GPM
LvL1 12.10 in
1T 14x10 GAL



5 Minute Field Programming

The Vantage 2200 utilizes a self-prompting display that allows for 5 minute programming of standard applications and 15 minute programming of in-depth data logging applications and auxiliary outputs. The menu driven programming feature allows the user to read the display status, log values, and calibrate the 2200 with a drill down type menu structure in English, Spanish and German.

Up to 78 primary element functions for weirs and flumes are stored by size and name with the added capability of entering special H/Q curves by flow (in engineering units). All flow calculations are displayed as actual primary elements, not as power function. Mounting dimensions for the sensor are displayed for each application.

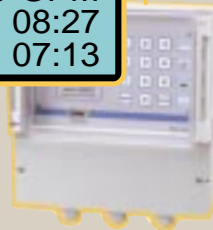
The microprocessor-based electronics can be programmed to allow customer selection of tank shape or flow functions. The following is standard: Parshall flume, Manhole™ flume, Lagco flume, V-Notch weir, open flow nozzle as well as Manning's equation. Special flumes can be programmed in the field by following a simple setup procedure.

A 16 button keypad drives the menu section. Outputs are 4-20 mA, 5 programmable relays, RS-232 serial port (allows for real-time communications operating in a Modbus protocol) and a separate RS-485 port.

Flash memory is employed for logging flow data. Data is retrieved by viewing the local display or downloaded via the serial port.

DATA LOGGING

04/05T 00x10
F1 Avg 249.96 GPM
Min 00 08:27
Max 250.0 07:13



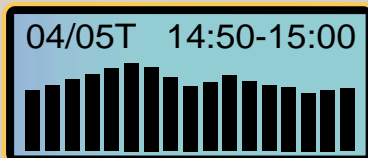
The Vantage 2200 has a 256K Byte logger with storage intervals. The logger can be programmed for various time intervals. Up to 8 channels can be logged, including flow, level setpoints, and totals for one or two sensors.

Daily Averages

Daily summary allows viewing of the previous eight days. This includes times, dates, averages, minimums, maximums and totals.

Logger Graph

In addition, a bar graph may be visually displayed on the 2200. The graph will display the stored logger data in pre-programmed time intervals.



Data Retrieval

Logger data can be collected by using a laptop computer, an optional modem installed in the 2200 enclosure or by the Palm PDA data collection module (see page 6). The Palm III may be utilized for downloading of all data from the 2200 logger. Just purchase a standard Palm III and download free software from the Eastech Badger website (available 9/01).



INFORMATION DISPLAY

04/05/2001 08:36.02
Flw1 451 GPM
LvL1 12.10 in
1T 14x10 GAL

Page 1

Flw2 451 GPM
LvL2 12.10 in
2T 14x10 GAL

Page 2

The Vantage 2200 utilizes a 20 character four line backlit display. The main screen can be programmed to display up to eight lines of meter information such as flow 1 and/or flow 2 (for dual sensors), totals 1 and/or totals 2 (for dual sensors), level 1 and/or level 2 (for dual sensors), time, date and relay alarms. The order of display line information is programmed to user preference. The backlit display may be programmed to be ON or OFF, or to remain OFF during a selected time interval. Display contrast is fully adjustable.

The 2200 will display proper mounting distances for all programmed primary devices. Diagnostic information is retrieved via a menu-driven self-test program capable of isolating fault parameters such as: loss of signal, 4-20 mA loop failure, logger memory full, communications error, sensor fault and open transmitter cable connection.

DATA TRANSFER



MULTIPLE OUTPUTS

The Vantage 2200 is designed for reliable and accurate retrieval of data—either on-site or remotely. The unit is equipped, as standard, with an integrated data logger capable of storing large amounts of information for later analysis. Because of its multiple output capability, this information may simply be retrieved through the use of one of the following methods.

CURRENT OUTPUT

4-20 mA. Isolated, 1000 ohms maximum.

RELAY OUTPUTS

Five SPDT relays available for alarm conditions.

Relay assignments include:

- ▶ Setpoints: 1, 2 or 3; On and Off selectable for High or Low alarms.
- ▶ Lost signal: used when the sensor does not receive a signal.
- ▶ 4-20 mA Loop: The 4-20 circuit is monitored to detect open circuits.
- ▶ Overrange 1: Maximum level is exceeded.
- ▶ Overrange 2: Identical to overrange 1 for an optional second sensor.
- ▶ Contact Integrator: Assignable to multiplied values in order to pace external equipment.

- ▶ 4-20 mA
- ▶ 5 SPDT Relays
- ▶ RS232
- ▶ RS485

SERIAL OUTPUTS

RS-232: With Modbus protocol. Flow control is CTS/RTS or none. DB-9 connection.

RS-485: With Modbus protocol, Opto-Isolated. Terminal strip connection. The RS-232 & RS-485 can be set with different slave I.D.s.

Data Logging: There are up to eight channels available to log. The storage capacity for a single channel @ 5 minute intervals is 113 days. IEEE floating point storage is used.

REMOTE DATA RETRIEVAL

The Vantage 2200 has a built in data logger capable of capturing and storing large amounts of information. The challenge has always been to transfer data efficiently and economically to a central location for analysis. The 2200 is designed for fast and user-friendly retrieval of data by two distinct methods.

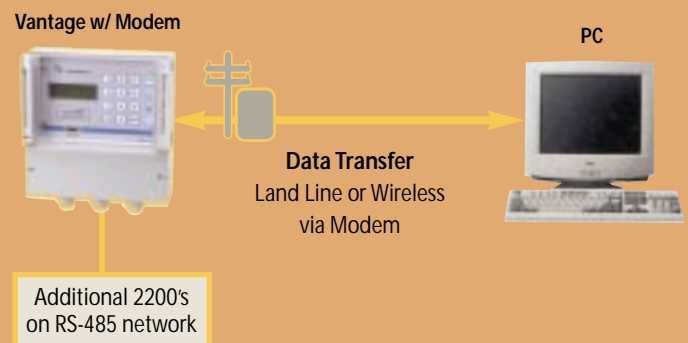
METHOD 1

The new Eastech Badger DCM data collection system allows plant operating personnel the ability to simply download logger data through the use of a standard Palm PDA or laptop. This information can then be transferred to a PC. Free operating software may be downloaded from the Eastech Badger website.



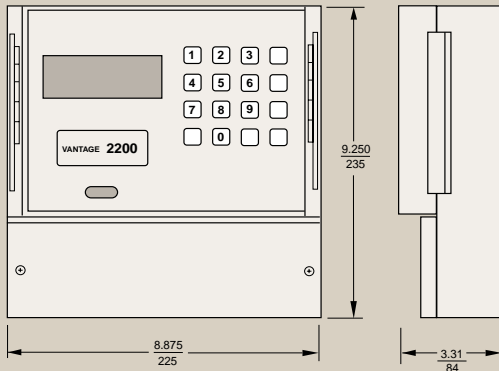
METHOD 2

A modem is installed within the enclosure of the 2200 for phone line or wireless transfer of data to a central location. Since the Vantage has two totally independent communications ports (RS-232 and RS-485), a single modem can provide data for multiple meters communicating serially through a field network such as Modbus.

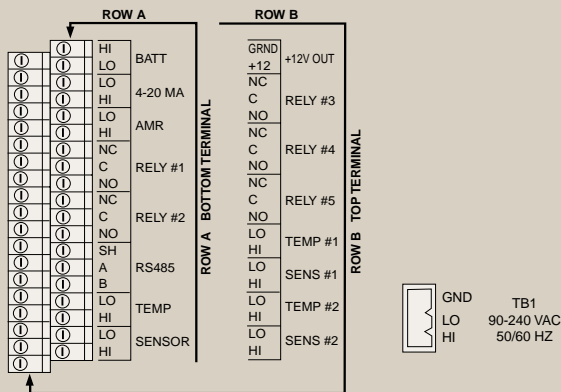


SPECIFICATIONS

Dimensions (inches/mm)



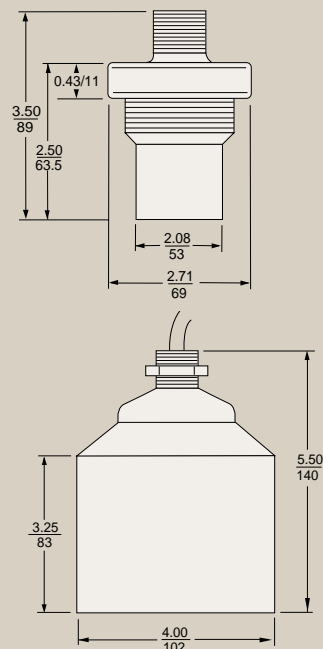
Wiring Schematic



METER

ENCLOSURE	
Standard	IP66 / Nema 4X polycarbonate enclosure
Optional	Explosionproof, Aluminum Enclosure Class I, Grps. C & D, Class II, Grps. E, F, G, Div. 1 & 2
Accessories	Heater and thermostat, Door Lock
TEMPERATURE	
Standard	-4° to 158°F (-20 to 70°C)
With Heater	-40° to 158°F (-40 to 70°C)
OUTPUTS	
4-20 mA	Analog isolated into 1000 ohms max, monitored to detect open circuits. RFI and gas discharge surge protection and two fuses.
Relay Alarms	Five SPDT relays (pluggable) 0.25A @ 120 VAC or 0.50A @ 24 VDC
RS-232 Serial Port	1200-38400 Baud, Modbus RTU protocol
RS-485 Serial Port	Optically isolated, Modbus RTU protocol
DC Power Out	12 VDC, 100mA maximum
DISPLAY	
Backlit LCD	4 Line x 20 character with front panel contrast control
POWER	
Wattage	12
Voltage	80/240 VAC, 50/60 Hz / 12-28VDC @ 150 mA.
DATA LOGGING	
Non-volatile flash memory, storage of up to 32768 records.	

Dimensions (inches/mm)



SENSORS

FB2	
Applications	Flow, Level and Chemical Tanks
Certification	Class I, Division 1, Groups A, B, C, D. (pending)
Sensor	Temperature compensated
Body & Topworks	Tefzel®
Span Range	0-16 feet max. w/ 12 inch minimum offset
Temperature	-40° to 158°F (-40° to 70°C)
Mounting	1" NPT nipple and 2" connection threads
Accuracy	± 0.08 or ± 0.1% of target distance.
Cable	30 feet
FB3	
Applications	Level Measurement
Certification	Nonincendive: Class I, Groups A, B, C, D, Div. 2
Sensor	Temperature compensated.
Body & Face	Glass filled polyester epoxy
Span Range	0-50 feet max. w/ 24 inch minimum offset
Temperature	-40° to 158°F (-40° to 70°C)
Mounting	1" NPT nipple
Accuracy	± 0.16 or ± 0.2% of span
Cable	100 feet

SUGGESTED SPECIFICATION

VANTAGE 2200

An ultrasonic microprocessor-based flow/level meter shall be installed at the location on the plans in accordance with the manufacturer's recommendation. The _____ (flow/level) meter shall be programmed for a _____ (size & type of primary element or tank type) and scale at maximum to _____ (max flow and engineering units or maximum level). The ultrasonic unit shall have the following features:

Enclosure: IP66/NEMA 4X (optional: Explosionproof, Class I, Groups C & D, Class II, Groups E, F & G, Divisions 1 & 2)

Power: 80/240 VAC, 50/60 Hz or 12-28 VDC @ 150 mA with surge suppression and fuse.

Outputs: 4-20 mA isolated into 1000 ohms, monitored to detect open circuits, with RFI and gas discharge surge protection and two fuses.

Relays: A minimum of 5 relays rated at 0.25A @ 120 VAC or 0.5 A @ 24 VDC. The relays must be assignable by the front panel keypad for up to three setpoints, loss of signal, 4-20 loop, overrange 1, overrange 2, contact integrator or pump alternation.

Data Logger: There shall be a data logger integral to the electronics. The data logger shall have non-volatile flash memory with a storage capacity of 32768 records. Software shall be supplied for downloading the data. The logged data shall have the capability to be displayed on the backlit display in graphing form for daily minimum, maximum, average and total flow units for the past eight days.

RS-232: There shall be a RS-232 serial port of 1200-38400 baud, Modbus RTU protocol.

RS-485: There shall be a RS-485 serial port optically isolated, Modbus RTU protocol.

Electronics: The display for the electronics must be a four line, 20 character display with the ability to turn the display On or Off by the front panel keypad and also to adjust the contrast. The meter must employ a menu-driven programming style of data entry. All programming functions and data entry and collection shall be initiated by the display and the 16 button keypad. At least 78 flow curve calculations shall be stored in the firmware with the ability to produce special curves either via flow equations or head vs flow tables. The unit shall compute all flow calculations using IEEE 754 single floating point precision. Units using flow lookup tables for standard flume or weir equations shall not be permitted. The electronics shall be able to accept up to two separate sensors and display all functions for both channels.

Warranty: The electronics and sensor shall carry a 3-year warranty.

SENSORS

Flow/Level (0-16 ft): The sensor shall be designed for flow or level and designed for use in Class I, Division 1, Groups A, B, C & D hazardous areas. The sensor shall be made of Tefzel® and be supplied with 30 feet of cable. 1000 ft. maximum cable runs allowed. Splices shall be made water proof. The maximum level range of the sensor shall be 16 ft.

Level (0-50 ft): The sensor shall be designed for levels up to a maximum of 50 ft. and designed for use in Class I, Division 2, Groups A, B, C & D hazardous areas. The sensor shall be made of glass filled polyester and be supplied with 100 ft. of cable. 300 ft. maximum cable runs allowed. Splices shall be made water proof.

The sensor cables shall be run in dedicated conduit.

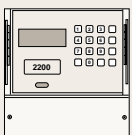
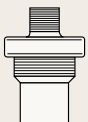
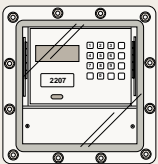

The unit shall be a Model 2200 as manufactured by Eastech Badger, Tulsa OK or equal.

Ordering Guide

Please provide the following information.

Size and type primary element: _____

Maximum flow: _____ Maximum level: _____

Enclosure	Sensor	Extra Cable	Options	Data Retrieval
2200 General Purpose Nema 4, 4x Same-Day Shipment 	 FB2 Flow/Level (0-16 ft)	_____ ft.	Factory Calibrated A Heater & Thermostat B Keylock C Splice Kit D	Palm III P (available 9/01) Modem (phone line) M
2207 Explosionproof Class I, Groups C & D Class II, Groups E, F & G Divisions 1 & 2 	 FB3 Level (0-50 ft)			