

User's Guide



Carbon Steel



PVC

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**FTB700-Series
Inline Turbine Meters**



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The information contained in this document is believed to be correct, but OMEGA accepts no liability for any errors it contains, and reserves the right to alter specifications without notice.

WARNING: These products are not designed for use in, and should not be used for, human applications.

GENERAL INFORMATION and SPECIFICATIONS

GENERAL INFORMATION

This unique system of 2" to 8" turbine meters uses just one moving part, a precision helical rotor. Rotation of the rotor is electronically detected and processed. The high-quality jewel bearings and shafts minimize friction while providing long wear life in non-lubricating fluids. The entire rotor assembly can be easily removed for field service without removing the meter from the pipe.

FTB700 bodies are fabricated from Schedule 80 PVC fittings, carbon steel tubing, or stainless steel tubing. The turbine insert on carbon meters is machined from a stainless steel casting. The PVC turbine insert is machined from a solid piece of PVC. Turbine rotors on all models are PVDF.

FTB700 meters can be ordered with various output options. The basic model comes with pulse output only. An electronic display is mounted on the FTB700-D model to display flow rate and total (resettable or non-resettable), and provide a programmable pulse or 4-20 mA output. Other electronics options include a blind 4-20 mA transmitter on the FTB700-T model. All of these controls/displays can be mounted on the meter or remotely mounted on a wall or panel up to 2,000 feet away. FTB700 meters are compatible for use with most other remote-mount Omega displays and controls as well.

SPECIFICATIONS*

		PVC				Carbon				
		2"	3"	4"	6"	2"	3"	4"	6"	8"
Pipe Sizes		2", 3", 4", 6"				2", 3", 4", 6", 8"				
Materials	Meter Body	PVC Schedule 80 fittings				Painted carbon steel				
	Turbine Insert	PVC				CF8M cast stainless				
	Rotor	PVDF				PVDF				
	Shaft	Zirconia ceramic 3"-6"				Zirconia ceramic 3"-8"				
	Shaft	Tungsten Carbide 2"				Tungsten Carbide 2"				
	Bearings	Sapphire journal, ruby endstone				Sapphire journal, ruby endstone				
Cable		#22 AWG 3-con, 18'; 2000' max				#22 AWG 3-con, 18'; 2000' max				
Flanges		Optional (See Dimensions)				150 lb. drilling (3-8" only)				
Maximum Pressure		150 psi @ 75° F (10 bar @ 24° C) (see chart)				200 psi (14 bar)				
Maximum Temperature		120° F (50° C) (see chart)				200° F (93° C)				
Accuracy		+/- 1% of full scale				+/- 1% of full scale				
Flow Range (GPM)		2"	3"	4"	6"	2"	3"	4"	6"	8"
	Minimum	2	3	6	12	2	3	6	12	30
	Maximum	150	400	600	1200	150	400	600	1200	3000

Electronic Options Specifications

FTB700 (Pulse Output Only)		FTB700-D (Powered Rate/Totalizer)	
Power	6-24 Vdc	Power	12-32 Vdc (for 4 mA DC min); 24-32 Vdc (for accuracy of 4-20 mA loop)
Pulse Output	0-75 pulse/second current sinking	Rate	6-digit autorange
FTB700-T (Blind 4-20 Transmitter)		Total	8-digit
Power	24 - 36 Vdc (isolated)	Memory	Non-volatile (no battery needed)
Analog Output	4-20 mA loop	Pulse Output	0.1 second open collector (scaled); 0-75 pulse/second passthrough (unscaled); High alarm or low alarm
Response Time	2-60 seconds, 90% of full scale (depends on input averaging)	Analog Output	4-20 mA loop (24-32 Vdc required)

*Specifications subject to change

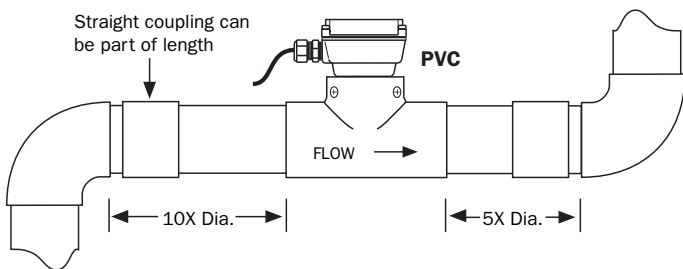
INSTALLATION, CONNECTIONS, MAINTENANCE and REPAIR

INSTALLATION



CAUTION: These water meters are not recommended for installation downstream of the boiler feedwater pump where installation fault may expose the meter to boiler pressure and temperature. Maximum recommended temperature is 120° (PVC) or 200° (Metal).

Piping Conditions. Installing the meter with 10 diameters of straight pipe upstream and 5 downstream is recommended.

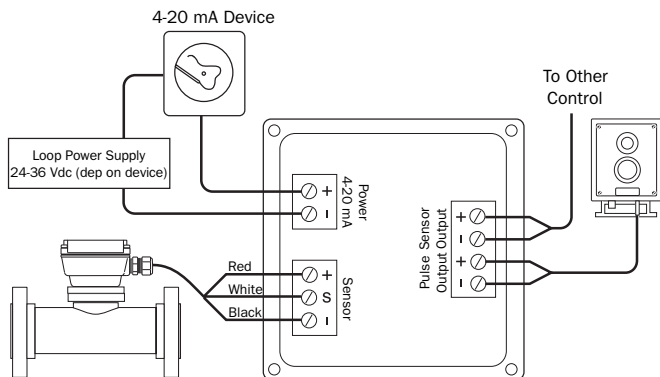


Flanges. For 3-8" carbon steel meters, standard flanges are 150 lb. ANSI drilling. 2" meters and all PVC meters can be installed with optional flanges according to pipe manufacturer's recommendations. For PVC a bolt torque of 10-20 ft-lbs. for 2" flanges, 20-30 ft-lbs. for 3" and 4" flanges, and 35-50 ft-lbs. for 6" flanges is recommended.

Either partial or full-face gaskets can be used. Tighten the bolts evenly. Use care to prevent a misaligned gasket from entering the flow stream.

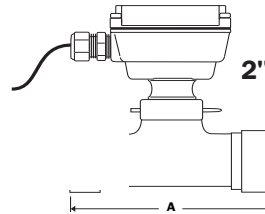
Position. The FTB700-Series are all-position meters, operable in a vertical or horizontal position, with the meter insert in any radial position. A horizontal position is preferred if there is a risk of air becoming trapped due to constant low flows. Operating the meter in partially-filled pipe will result in inaccuracies.

CONNECTIONS



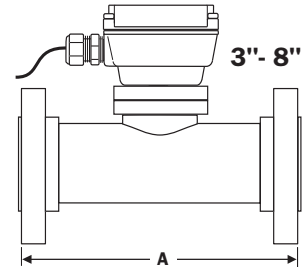
For operating instructions for the various electronic modules, consult the section for the specific module, included with the meter at purchase.

Carbon Meters

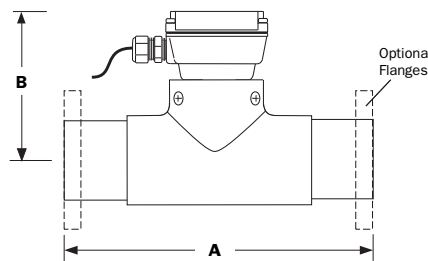


Size	Dim A
2"	* 8"/±10"
3"	12"
4"	14"
6"	18"
8"	20"

*Without flange
±With flange



PVC Meter



Size	A	B
2"	10"	7.5"
3"	12"	6.5"
4"	14"	7.0"
6"	18"	8.5"

MAINTENANCE and REPAIR

Recalibration. If it is necessary to recalibrate the meter for any reason, please contact Omega.

Turbine Insert Removal and Installation. First remove all pressure from the line. Then remove the screws that hold the insert in place (or the U-clip in the 2" meters) and tug gently until the insert comes free. A twisting motion can help to loosen the O-ring seal. Reverse the procedure to reinstall, after coating the O-ring with a plastics-compatible lubricant in the PVC model. *Do not overtighten the screws.* Snug tightening with a hand screwdriver is sufficient.

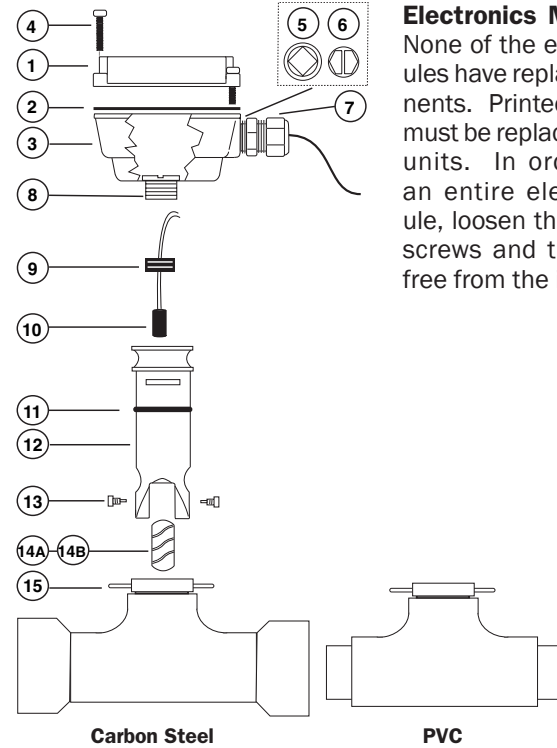
Rotor and Shaft Replacement. Examine the rotor to determine if bearings or shaft are damaged or excessively worn. The rotor should spin smoothly and freely, with no visible wobble. Back and forth play should be very minor, less than 1/64". If it is necessary to replace the rotor or shafts, first back out both shafts with a small blade screwdriver. The rotor will come free as soon as the shaft ends come free of the rotor bearings. Reverse the procedure to reinstall. **Note:** *Do not overtighten the shaft screws.* Check to be sure that a small amount of free play between the shaft ends and the bearings remains.

Sensor Replacement. This is rarely necessary. However, certain electrical conditions can damage the sensor. To replace it, first remove the electronics module. Disconnect the sensor leads from the electronics module terminals and remove the threaded plug over the sensor. Finally, remove the sensor by pulling on the sensor leads. A gentle tug should be sufficient. Reverse the process to replace the sensor.

REPLACEMENT PARTS

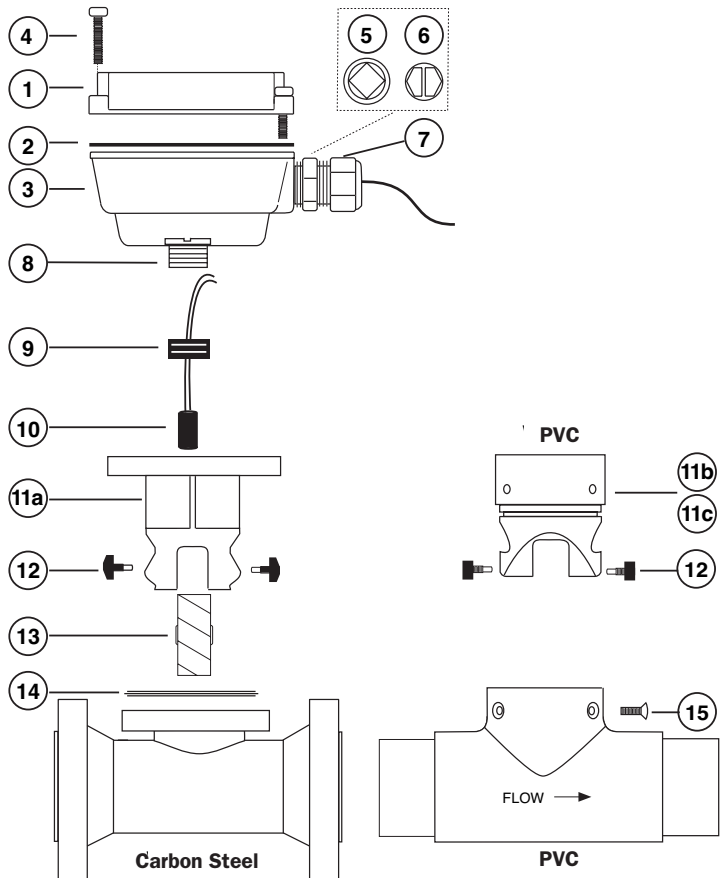
2" METERS		
1-6	Housing	see 3 - 8"
7	Strain relief	07655
8	Square housing adapter	Not Available
9	Pickup retaining screw	25321
10	Pickup, Micropower (for WT104)	29953
	Pickup, Standard (for WT101)	26310
11	O-ring, EPDM	25081
12	Insert	Contact Factory
13	Shaft assembly, ceramic (2 req)	16710 BEFORE 1-1-2011
14A	Rotor Assembly PVDF/bearing assembly	25947 BEFORE 1-1-2011
	Rotor repair kit, PVDF	25945
14B	Rotor Assembly, Polypro/Tungsten Carbide	33015 AFTER 1-1-2011
	Rotor Repair Kit, Polypro/Tungsten Carbide	33087
15	U-clip, stainless	15527

3" - 8" METERS		C	P
1	Upper blind housing assembly	30475	30475
1	Powered rate/totalizer	FTB700-D	
1	Blind 4-20 mA transmitter	FTB700-T	
2	Lower housing gasket	26211	26211
3	Lower housing	29930	29930
4	Upper housing screw assembly (4 req)	26229	26229
5	Plug, steel	26073	26073
6	Water seal assembly	26079	26079
7	Strain relief	07655	07655
8	Square housing adapter	Not Replaceable	
9	Pickup retaining screw	25321	25321
10	Pickup, standard	26310	26310
11a	Insert, 3"-8" Carbon	26464	N/A
11b	Insert, 3" PVC	N/A	26461
11c	Insert, 4"-6" PVC	N/A	26462
12	Shaft assembly, ceramic (2 req)	16710	16710
	Shaft assembly, carbide (2 req)	30473	30473
13	Rotor (PVDF)/bearing assembly	15316	25962
14	O-ring, EPDM	25105	16426
15	Insert screw (4 req'd)	N/A	07689



Electronics Module Repair.

None of the electronics modules have replaceable components. Printed circuit boards must be replaced as complete units. In order to replace an entire electronics module, loosen the four retaining screws and the unit will lift free from the insert housing.



FTB700-D FLOW COMPUTER

INSTRUCTIONS

GENERAL INFORMATION

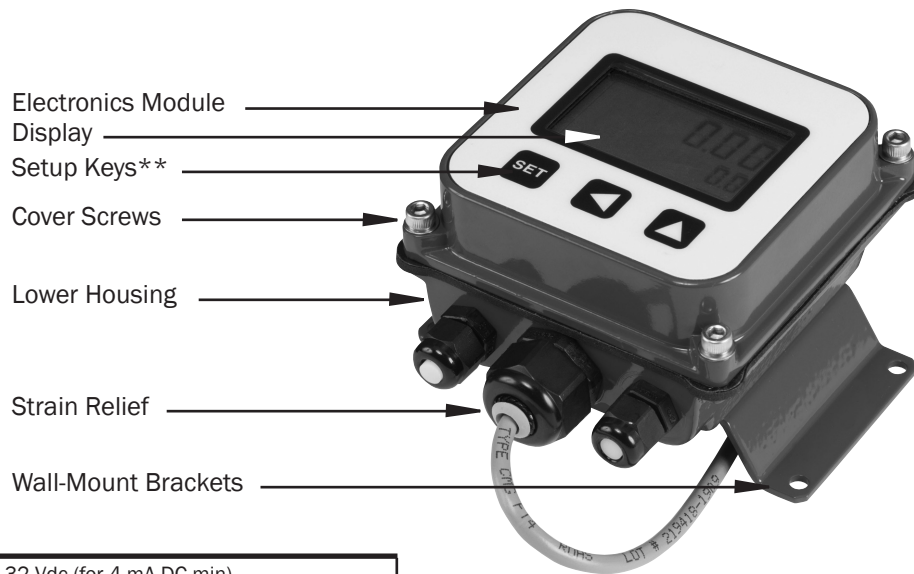
These flow computers are microcontroller-based indicator/transmitters that display flow rate and total and provide output signals. The FTB700-D is powered by external DC voltage and has both pulse and 4-20 mA analog outputs. When the FTB700-D is being used in the 4-20 mA mode, it is a “two-wire” or “loop-powered” device, meaning that the 4-20 mA output signal doubles as its power supply.

The addition of a dual-relay output board allows for certain applications requiring contact output isolation (e.g., certain metering pumps and water treatment controls). Dual solid state relays provide exactly the same pulse output as the standard unit, and each can signal one external device. A non-resettable total is also available.

The FTB700-D can be ordered in a plastic enclosure with a 115 Vac power supply for use with mechanical meters, or with a built-in 115 Vac/12-24 Vdc dual power supply for magmeters.

Housings are rugged cast aluminum, potted and gasketed for maximum environmental protection. A membrane keypad allows settings to be changed without removing the cover. (Password protection, a standard feature, can be used to prevent settings from being changed.)

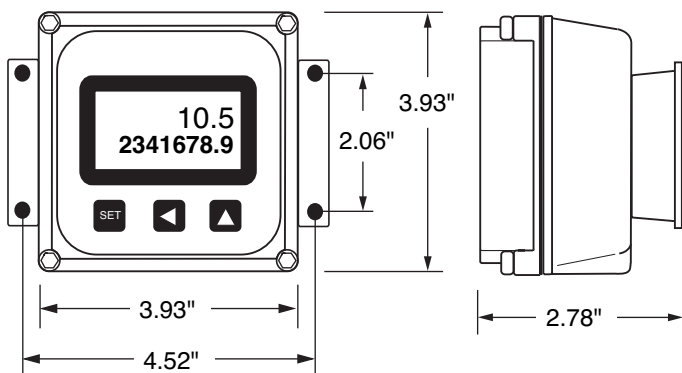
FEATURES



SPECIFICATIONS

Power	12-32 Vdc (for 4 mA DC min) 24-32 Vdc (for accuracy of 4-20 mA loop)
Display	Rate 6-digit autorange, 1/2" character height
	Total 8-digit, 5/16" character height
Output	Pulse 0.1 second open collector pulse (scaled); 0-75 pulse/sec passthrough (unscaled); High alarm or low alarm
	Analog 4-20 mA loop (requires 24-32 Vdc)
Pulse Output Range	0.1 - 9999999.9 units/pulse
Input	Open collector/switch @ 5 Vdc
Input Range	1.0 - 1,500 pulses/second
K-Factor Range	.001 - 99999.999
Flow Alarm Output Range	.01 - 999999.99
Temperature	0° C - 70° C (32° - 158° F)
Environmental	NEMA 4X

Wall Mounting. To mount the FTB700-D on a wall, hold the unit in the desired position, mark the holes in the mounting feet, drill, and mount with screws.



CONNECTIONS

See Connections Diagram for FTB700-D, next page.



Caution: If output is being used to control an external device, such as a metering pump, do not connect the device until programming is completed. If malfunction or incorrect programming of the output could cause personal injury or property damage, separate safeguards must be installed to prevent such injury or damage.

K-FACTOR

At a minimum, every FTB700-D flow computer must be programmed with the “K-factor” (This is the number of pulses that the meter produces per gallon of flow.) If you wish to read in units other than gallons, see below.

The K-factor can be found on the model-serial label. The line reading K = xxxx gives the desired number.

READING IN OTHER UNITS

Changing Volume Units. The default K-factor units are pulses per gallon. To read your total in metric or other units instead, the standard K-factor must be converted to the desired volume units. For example, to read in pulses per liter, the K-factor must be multiplied by the applicable number shown below.

NOTE: Both rate & total will read in whatever units you choose.

To Convert K to:	Multiply by:
Liters	.26418
Cubic Meters	264.18
Fluid Ounces	.0078
Cubic Feet	7.48

Changing Time Units: To read your rate in liters per second (for example), convert the K-factor volume units as shown above and change the time units to Seconds, using the Set Time Unit instructions at right.

SETTINGS

Set K. Begin by pressing the SET key once. The prompt SET K should appear on the display. The digit to the far right will be blinking. Use the up arrow key to reach your desired value. Then press the left arrow key to move to the next digit. Repeat the process until the entire number is entered. (Note that the decimal is fixed at three places. If you only have two decimal places for your K-factor, enter a zero for the third digit.) Press SET to advance.

Set P/Flow Alarm. At this screen you may select between pulse output (P) or flow alarm (A) functions. If the pulse output and flow alarm features are not being used, this step can be skipped. The P (pulse output) setting does not affect anything if it is not being used.

Set P is the default that appears on a new display. On a unit that has been previously set up with flow alarm function, an A will appear on this screen. To move between P and A screens, firmly press all three keys for 5-10 seconds, then use the up arrow to scroll through the three options: P, AL HI (high flow alarm) and AL LO (low flow alarm).

Set P. From this screen, follow the same process as for Set K to enter the desired pulse rate. This is the number of gallons (or whatever units are programmed) between pulses. (**Note:** Using the pulse output function disables the high and low flow alarm functions.)

Set Flow Alarm. From the A screen, use the up arrow key to choose either AL HI or AL LO and then press the SET key to set the alarm rate. Use the up arrow and left arrow as above to reach the desired digits. (**Note:** Using the flow alarm function disables the pulse output function.)

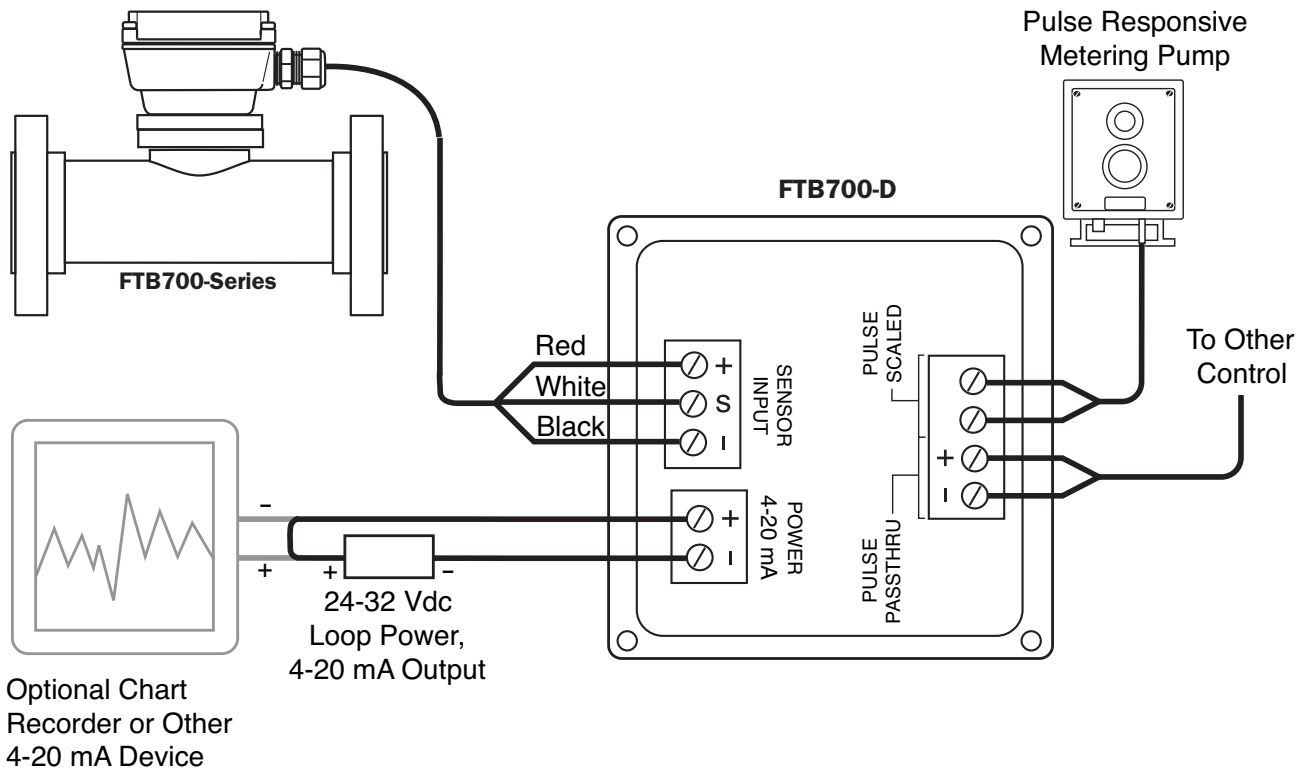
Set 20 mA. Press the SET key to advance to SET 20, to set the flow rate, in volume units per time unit, at which 20 mA is desired. Use the up arrow key to reach your desired value. Then press the left arrow key to move to the next digit. Repeat the process until the entire number is entered. The processor will automatically scale the 4-20 mA loop accordingly, with 4 mA at zero flow.

Set Decimal Point. Press the SET key again for the D prompt. Pressing the up arrow key switches among no decimal place, one decimal place and two decimal places.

Set Time Unit. When the SET key is pressed again, a blinking time unit appears. Press the up arrow key to select SEC (seconds), MIN (minutes), HR (hours) or DAY (days) (for example, gal/min, or gal/hr).

To return to normal operation after entering settings, press SET again. When the unit is connected to an operating flow sensor, the rate (larger digits) and total (smaller digits) indicator numbers should appear in the display.

FTB700-D CONNECTION DIAGRAM

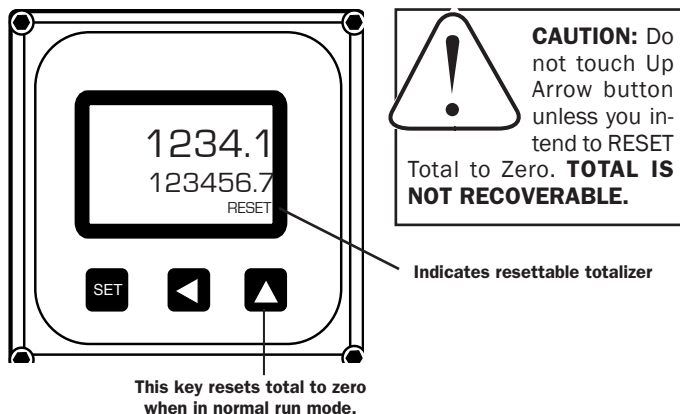


If the 4-20 mA current signal is not required, connect the power terminals to any 12-32 Vdc current source.

FTB700-D OPERATION

Resettable/Non-Resettable Totalizer. Unless the unit has been ordered with the non-reset option, a RESET prompt is visible in the lower right corner above the up arrow key, when the display is in use. Press the up arrow key at any time to reset the totalizer to zero.

Operation of 4-20 mA Output. If the 4-20 mA output is in use and is correctly connected, the signal should vary between 4 mA and 20 mA in proportion to the flow, with the top flow rate set by the user. At no time should the signal drop below 4 mA. A reading between 0 and 4 mA indicates a fault of some type, typically in the loop power supply or the connections (see Troubleshooting). In the rare instance that the 4-20 signal fluctuates excessively (“paints”) it may need to be damped by additional averaging. Contact Omega for information on how to increase filtering.

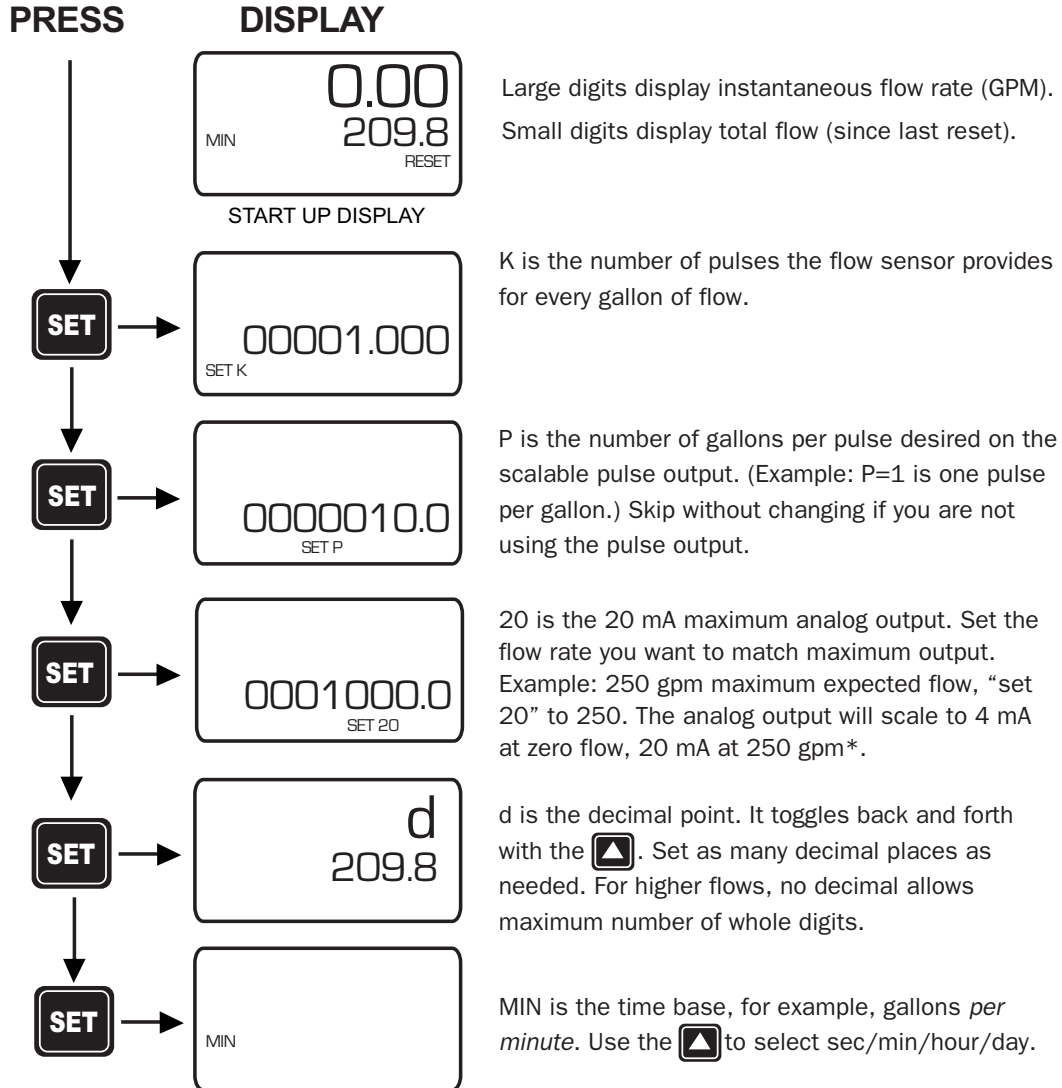


Operation of the Pulse Output. If the pulse output is being used, it should pulse for 0.1 second every time the set number of gallons has been totalized. If a pulse-responsive metering pump is properly connected to this output, it should stroke periodically. If this does not occur, see Troubleshooting.

QUICK SETTINGS OVERVIEW

See following page for step-by-step instructions on changing these settings

Pass through all settings and return to original display to save settings.



***NOTE:** Use the up arrow key to reach your desired digit. Then press the left arrow key to move to the next digit. Repeat the process until the entire number is entered.

Problem	Probable Cause	Try...
Display blank	No power to the unit Short in sensor circuit	Check for minimum 12 Vdc at power terminals Disconnect sensor, see if display returns (zero flow rate)
Display missing segments	Damaged display module	Contact Omega for return/replacement
Display reading meaningless characters	Unit's microcontroller crashed	Disconnect and reconnect power. If problem repeats, contact Omega for return/replacement
Display reads normally,	Wrong K-factor or time base entered	Enter correct K-factor from meter
Display reads normally, incorrect pulse output	Wrong pulse output setting Polarity reversed on pulse output terminals	Use "Set P" to correct pulse output setting Reverse leads
Display reads normally, but no (or incorrect) 4-20 mA output	Wrong 20 mA setting Inadequate loop power supply voltage Polarity incorrect in 4-20 mA loop circuit	Use "Set 20" to correct target top flow rate Check voltage (For 4-20 mA applications, 24-32 Vdc recommended) Compare to Connections diagram
Display reads zero when there is flow	Flow sensor failed Break in flow sensor circuit	Consult Omega Check for continuity with multimeter
Display reads flow rate when there is none	Long flow sensor wire, running parallel to power wires Flow sensor malfunction Flow "jitter" (oscillating slosh) reads as flow	Reroute wire or change to shielded wire Consult Omega Consult Omega for "anti-jitter" setting



FTB700-T BLIND ANALOG TRANSMITTER INSTRUCTIONS

GENERAL INFORMATION

The Omega FTB700-T is a blind (non-indicating) 4-20 mA transmitter. It accepts a pulse frequency input from the flow sensor, and converts this input into a continuous analog output signal. Power for the transmitter is taken from the current loop itself, so only two wires are required. The digital design makes it possible to span the unit in the field without tools. The frequency at which 20 mA is desired is entered on a set of rotary switches, and an internal microcontroller automatically scales all other values accordingly. An additional benefit of the microcontroller is its ability to average inputs, for smoothing of the output signal. The degree of averaging can be selected in the field, from 2 to 16 seconds.

For maximum environmental protection, the electronic components are encased in a special semi-flexible urethane potting material. The housing is cast from aluminum and fuse-coated. The clamshell housing is provided with mounting feet for remote mounting.

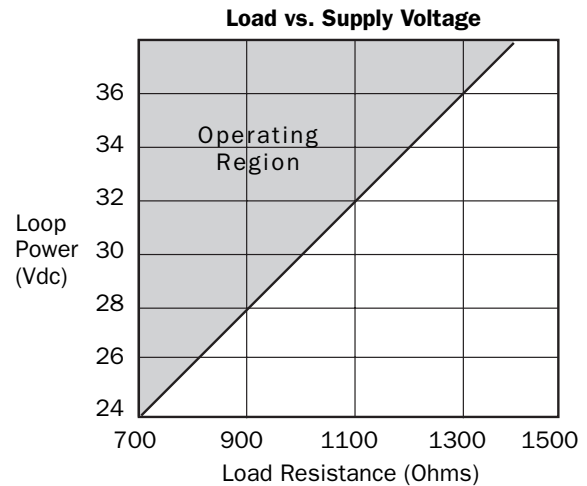
The FTB700-T will operate on a relatively wide range of current loop voltages, 24 to 36 Vdc. Lower voltages limit the load that can be applied to the loop without distortion of the signal. (See Load/Supply chart below if there is a question regarding voltage vs. load.) A built-in power regulator supplies the appropriate power to the flow sensor.

Typical applications for this transmitter are telemetry (or SCADA), distributed control systems, programmable controllers, data logging, and chart recording.

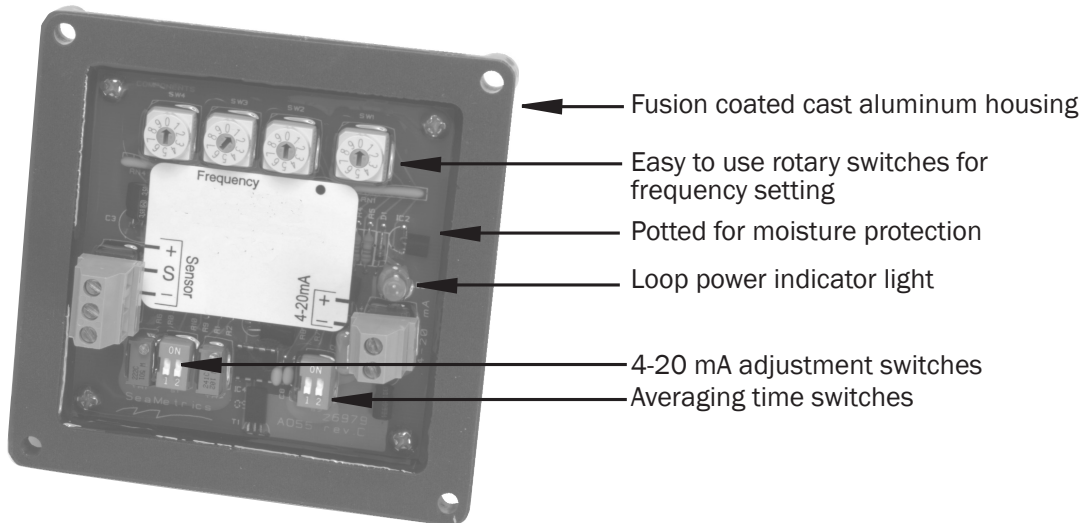
SPECIFICATIONS

Power	24 - 36 Vdc	
Temperature	32° - 130° F (0° - 55° C)	
Input	Open-collector solid state sensor	
Input Averaging	2 - 16 seconds (switch selectable)	
Response Time	2-60 seconds; 90% of full scale (dependent on input averaging)	
Frequency	Minimum	10 Hz (@20 mA)
	Maximum	999.9 Hz
	Setting	4 Rotary DIP switches
Output	Proportional 4-20 mA	

*Specifications subject to change




FEATURES



INSTALLATION

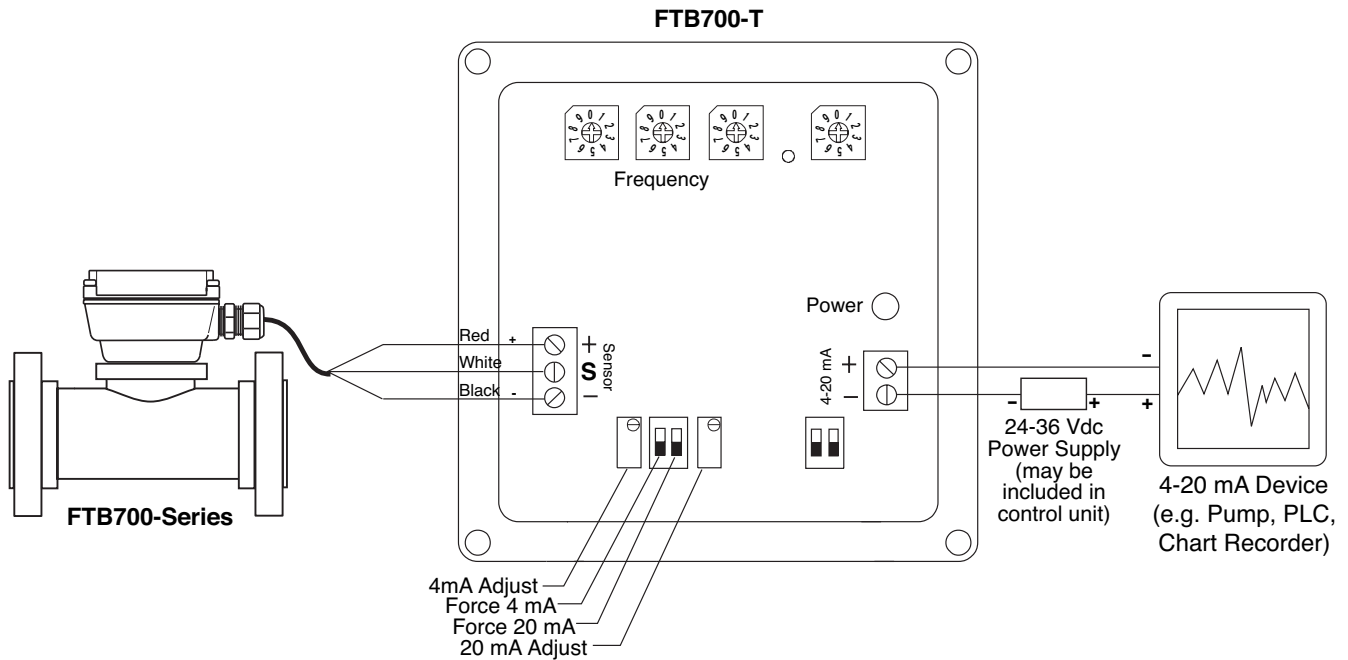
Connection. The upper portion of the housing must be removed to make connections. Use a standard hex wrench (5/32" or 4 mm) to loosen the screws, then remove the upper half. The connections are made to terminal blocks in the upper half, which contains the potted electronics.

Consult the FTB700-T Connections Diagram before connecting to the current loop and flow sensor. Be careful to follow the color coding of the flow sensor wires in order to establish the correct polarity. Incorrect polarity can damage the sensor.



Caution: If output is being used to control an external device, such as a metering pump, do not connect the device until programming is completed. If malfunction or incorrect programming of the output could cause personal injury or property damage, separate safeguards must be installed to prevent such injury or damage.

FTB700-T CONNECTION DIAGRAM



SETTINGS

Setting Frequency. The FTB700-T converts a train of off/on pulses from the flow sensor into a continuous milliAmp signal that ranges from 4 mA at zero flow to 20 mA at the desired maximum flow. The desired maximum is determined by the user and entered as a frequency as follows:

- 1) Decide what flow rate should represent the top of the scale. This is ordinarily the maximum expected flow, or a value just above it, in gallons per minute.
- 2) Locate the K-factor of the flow sensor (found on the Serial Number label on your meter). K-factor is the number of pulses the flow sensor produces per gallon of flow.
- 3) Calculate frequency, using this formula:

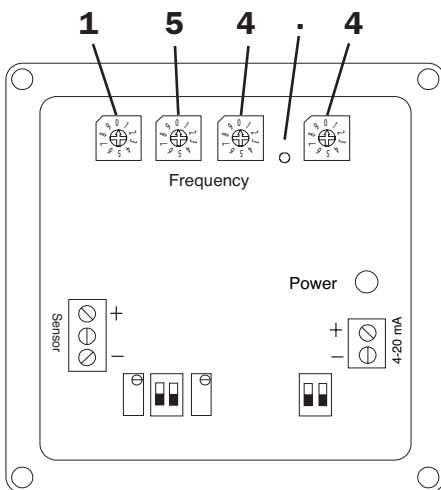
$$\text{K-Factor} \times \frac{\text{Top Flow (GPM)}}{60} = \text{Frequency}$$

- 4) Enter the frequency using the four rotary Frequency switches. Note the decimal point between the third and fourth switches.

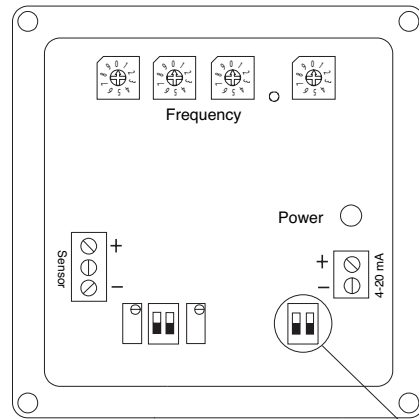
SETTING FREQUENCY EXAMPLE

- 1) In an installation with an estimated maximum flow rate of about 150 GPM, a flow rate of 170 GPM is selected as the full-scale maximum, the flow at which the current will register 20 mA.
- 2) In this example, "K = 54.50". (In your actual application, look for the K-factor on the Serial Number label on your meter.)
- 3) Calculate the frequency as

$$54.50 \times \frac{170}{60} = 154.42$$
- 4) Rounding to one decimal point, enter 154.4 on the rotary switches by turning the rotary switch pointer to the desired digit.

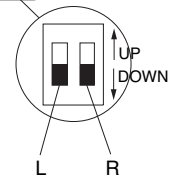


Setting Averaging Time. For most applications, this step can be ignored, as the standard setting will work fine. However, when a particularly steady output signal is desired, or in large pipe, a larger averaging period may be desirable. Note however that the averaging period requires a tradeoff, since a longer averaging period implies a slower response time. If steady signal is more important than fast response, increase the averaging time as desired. See the diagram below for the switch positions and their corresponding times.



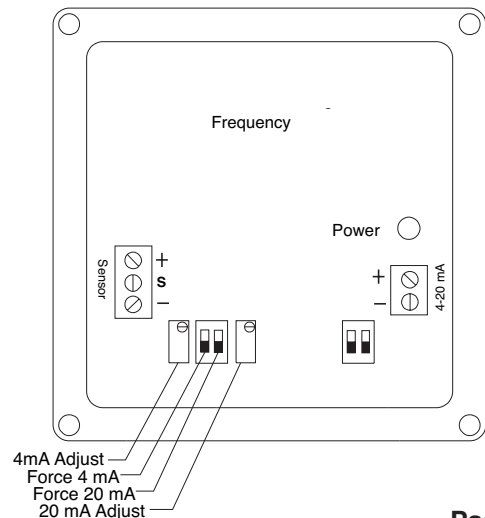
Switch Position

Seconds	L	R
2	down	down
4	down	up
8	up	down
16	up	up



Checking Calibration

Normally it should not be necessary to check calibration, since the digital design of this unit virtually eliminates drift. However, there are two types of calibration check that can be performed. Look at the diagram below to locate the 4 and 20 mA force switches. To force the 4 mA output, put its switch in the up position. Check the current output at the Power terminals, and if necessary trim to 4.00 mA using the appropriate trimpot. Return the switch to the down position, and repeat the process with the 20 mA switch.



Problem	Probable Cause	Try...
No analog signal at reading device	Break in current loop Dead power supply Reversed polarity	Check if loop indicator light is on Check multimeter voltage on power supply Check polarity
Output stuck at 4 mA	No frequency input from flow sensor	Check flow sensor connections Check flow sensor polarity Be sure terminal blocks are firmly plugged in With flow sensor disconnected, use short wire to repeatedly short between sensor "S" and "-" terminals. Output should rise.
mA signal does not match flow rate	Inadequate voltage Wrong frequency setting	Check Load vs. Supply chart Review setting procedure Check multimeter voltage on power supply



WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **13 months** from date of purchase. OMEGA's WARRANTY adds an additional one (1) month grace period to the normal **one (1) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit malfunctions, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective, it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of having been damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components in which wear is not warranted, include but are not limited to contact points, fuses, and triacs.

OMEGA is pleased to offer suggestions on the use of its various products. However, OMEGA neither assumes responsibility for any omissions or errors nor assumes liability for any damages that result from the use of its products in accordance with information provided by OMEGA, either verbal or written. OMEGA warrants only that the parts manufactured by the company will be as specified and free of defects. OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESSED OR IMPLIED, EXCEPT THAT OF TITLE, AND ALL IMPLIED WARRANTIES INCLUDING ANY WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. LIMITATION OF LIABILITY: The remedies of purchaser set forth herein are exclusive, and the total liability of OMEGA with respect to this order, whether based on contract, warranty, negligence, indemnification, strict liability or otherwise, shall not exceed the purchase price of the component upon which liability is based. In no event shall OMEGA be liable for consequential, incidental or special damages.

CONDITIONS: Equipment sold by OMEGA is not intended to be used, nor shall it be used: (1) as a "Basic Component" under 10 CFR 21 (NRC), used in or with any nuclear installation or activity; or (2) in medical applications or used on humans. Should any Product(s) be used in or with any nuclear installation or activity, medical application, used on humans, or misused in any way, OMEGA assumes no responsibility as set forth in our basic WARRANTY/DISCLAIMER language, and, additionally, purchaser will indemnify OMEGA and hold OMEGA harmless from any liability or damage whatsoever arising out of the use of the Product(s) in such a manner.

RETURN REQUESTS/INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting OMEGA:

1. Purchase Order number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR **NON-WARRANTY** REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

1. Purchase Order number to cover the COST of the repair,
2. Model and serial number of the product, and
3. Repair instructions and/or specific problems relative to the product.

OMEGA's policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering.

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