Badger® 735 Series	Plastic Tee Type Impeller Flow Sensor	Installation & Operation Manual

BadgerMeter, Inc.

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INTRODUCTION

Used in conjunction with any Badger flow monitor or transmitter, Badger Meter non-magnetic Impeller flow sensors provide an accurate reading of the rate of liquid flow as well as total accumulated flow.

The flow sensors generate a frequency which is proportional to flow rate. An internal preamplifier allows the pulse signal to travel up to 2000 feet without further amplification. The impeller bearing assembly, shaft and o-rings are replaceable in the field.

Badger Meter Impeller flow sensors feature a four-bladed impeller design, using a proprietary, non-magnetic sensing technology. As the liquid flow turns the impeller, a low impedance signal is transmitted with a frequency proportional to the flow rate.

Sensors of similar type are interchangeable, so there is no need for recalibration after servicing or replacement.

Electronic Types

Sensors are normally supplied with two single conductor 18 AWG solid copper wire leads with U.L. Style 116666 direct burial insulation. These IR models are used in below grade applications such as irrigation, municipal, and groundwater monitoring. All Badger® Series 735 sensor electrical components are self-contained. Pressure/temperature ratings for the various models are contained in the *Specifications* section of this manual. These models can be further described as follows:

"IR" Sensor

Designed for below grade applications such as irrigation, municipal, and groundwater monitoring where the flow rates are between 2-20 feet/second and temperatures are below 110°F. IR sensors are supplied with two single conductor, 18 AWG solid copper wire with U.L. Style 116666 direct burial insulation.

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Model 735PV

These models feature a modified PVC tee with solvent weld socket end connections, and a removable PPS sensor insert. Sizes of 1/2”, 3/4", and 1” are available.

Model 228PD and 220PF

No longer in production - see obsolete manuals at www.badgermeter.com.

MECHANICAL INSTALLATION

General

The accuracy of flow measurement for all flow measuring devices is highly dependent on proper location of the sensor in the piping system. Irregular flow velocity profiles caused by valves, fittings, pipe bends, etc. can lead to inaccurate overall flow rate indications even though local flow velocity measurement may be accurate. A sensor located in the pipe where it can be affected by air bubbles, floating debris, or sediment may not achieve full accuracy and could be damaged. Badger Meter flow sensors are designed to operate reliably under adverse conditions, but the following recommendations should be followed to ensure maximum system accuracy:

1) Choose a location along the pipe where ten pipe diameters upstream and five pipe diameters downstream of the sensor provide no flow disturbance. Pipe bends, valves, other fittings, pipe enlargements and reductions should not be present in this length of pipe.

2) The preferred location for the sensor around the circumference of a horizontal pipe is on top. If trapped air or debris will interfere, then the sensor should be located further around the pipe from the top but not more than 45 degrees from top dead center. The sensor should never be located at the bottom of the pipe, as sediment may collect there. Locations off top dead center cause the impeller friction to increase, which may affect performance at low flow rates and increase wear. Any circumferential location is correct for installation in vertical pipes. Rising flow preferred to reduce effects of any trapped air.

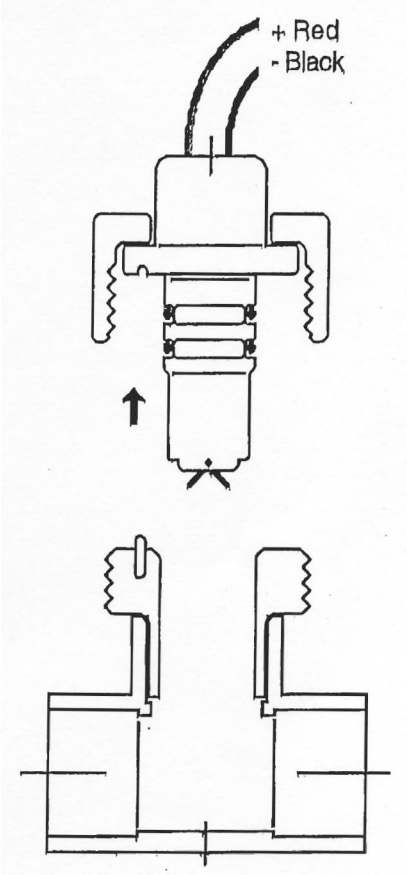
Badger® 735PV Series Plastic Tee Sensors Matrix

Example:	735	PV	05	0	6	-	1	2	0	1
STYLE										
Tee Mounted Insert Sensor	0									
MATERIAL										
PVC		PV								
Size										
1/2"			05							
3/4"			75							
1"			10							
Electronics Housing										
PPS				0						
ELECTRONICS										
IR-Irrigation (not available with PVDF sensors)					6					
O-RING										
EPDM							1			
SHAFT										
Tungsten Carbide								2		
IMPELLER										
300 SST									0	
BEARING										
UHMWPE										1

INSTALLATION INFORMATION

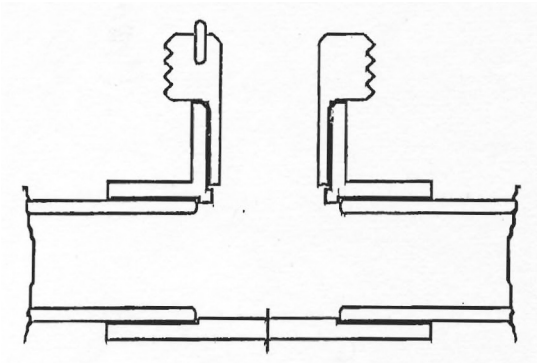
Step 1:

Remove sensor assembly, and nut, from tee.



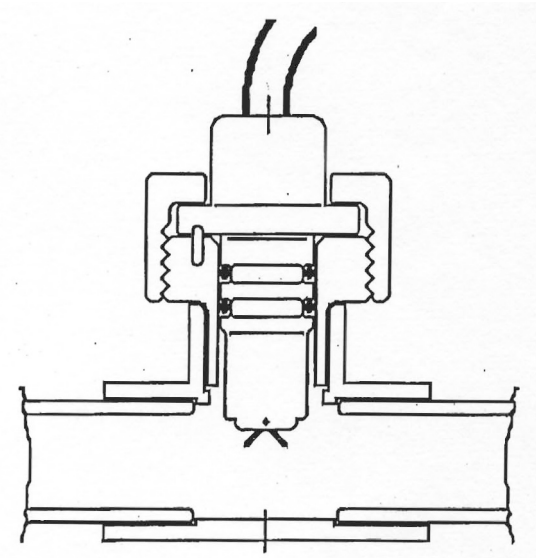
Step 2:

- Deburr pipe ends and remove dirt and loose debris from pipe and tee sockets.
- Glue line pipe into tee, using an appropriate primer and cement, according to the manufacturers Instructions.
- DO NOT use or leave excess glue. Glue build-up in the tee can affect the measurement performance of the unit and/or prevent the impeller from turning. DO NOT let glue or primer contact the bore where the o-rings seal.



Step 3:

- Insert sensor into tee, carefully lining up the locating hole in the sensor with the locating pin in the tee.
- Install and HAND TIGHTEN the retaining nut.
- If not already wired, complete wiring connectlons.



Miscellaneous Information

- The unit functions best with schedule 40 or a pipe wall thinner than schedule 40.
- Keep all parts as clean as possible. Do Not let glue or primer contact the surfaces where the o-rings make their seal.
- Although the meter can measure at velocities up to 20 FPS, most irrigation companies do not recommend working velocities above 7.5 FPS, and not to exceed 10 FPS, due to potential damage from pressure and/or water hammer.

Calibration

Badger Impeller sensors use unique K and offset numbers for calibration. These numbers are derived from calibration runs using NIST traceable instruments. Using both a K and an Offset number provides higher accuracy than using a K factor alone. K and Offset numbers for each tee configuration are listed in the following table.

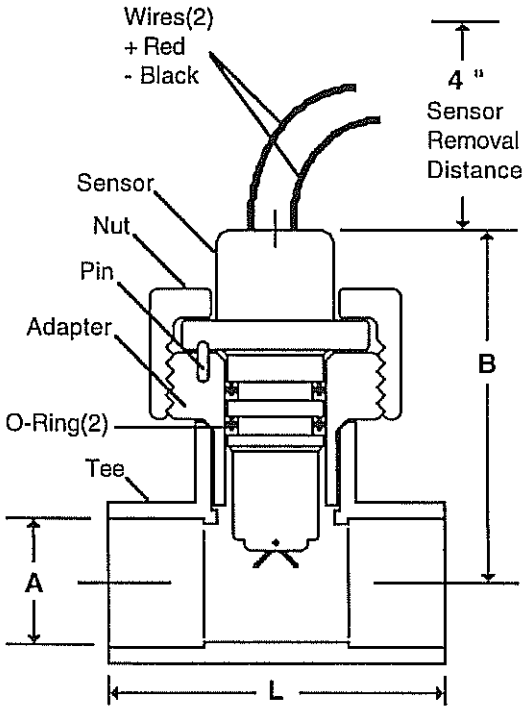
Calibration Tables
The table to the right provides calibration and operation data for Badger Meter Plastic Tee Sensors 1 1/2” to 4”.

Column 1 Sensor Model Number

Columns 2 and 3 The K value and Offset values to use in our frequency equation:

$$Freq = \frac{Gpm}{K} - offset$$

This equation describes the frequency of the output signal of all Badger Meter flow sensors. By substituting the appropriate K and Offset values from the table, the sensor’s output frequency can be calculated for each pipe size. This information is required when calibrating an output board or when using the raw sensor data as direct output to interface with a device that is not a Badger Meter product.



Dimensions

A Soc Size, NPS	B C/L to Top	L
1/2" [ø.840"]	3.85"	3.06"
3/4" [ø1.050"]	3.85"	3.31"
1" [ø1.315"	3.94"	3.50"

Calibration Table for Series 735PV

Size/Schedule	K	Offset
1/2" S40	0.078000	0.9
1/2" SDR 13.5	0.120119	0.1
3/4" S40	0.156300	0.9
3/4" SDR 21	0.197000	-0.6
1" S40	0.261119	1.2
1" SDR 21	0.321739	0.6

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Please see our website at **www.badgermeter.com** for specific contacts.

Due to continuous research, product improvements and enhancements, Badger Meter reserves the right to change product or system specifications without notice, except to the extent an outstanding contractual obligation exists.

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