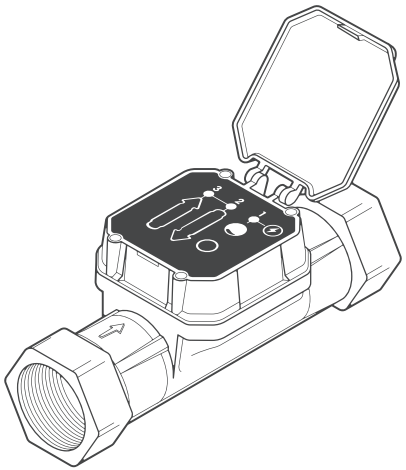
UFS Series

Ultrasonic Flow Sensor

Quick Start Guide



CAUTION:
The ultrasonic style flow sensor described in this manual is not intended for use in safety critical applications. Use of the device in this manner is done at the sole discretion of the customer and/or end user of the device.
The ultrasonic style flow sensor described in this manual is not intended for use in systems with flammable liquids or gases. Additionally, the device is not intended for systems containing hazardous fluids or fluids other than water.
The ultrasonic style flow sensor described in this manual must be installed in accordance with all local and federal codes or end-use standards, as applicable.
If the devices described in this manual are used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

⚠ WARNING:
Depressurize and vent the piping system prior to any installation or maintenance of the flow sensor.

1. INTRODUCTION

The Rain Bird® UFS Ultrasonic Flow Sensor is a high performance tool designed for Commercial irrigation installations where accurate low and high flow measurement are required.

It reads a greater range of flow than traditional flow sensors, reading high and very low flow rates in a single sensor. They are significantly more accurate at +/- 2 % of reading, have no moving parts, and are extremely durable with a glass-filled nylon flow tube, featuring a 200 psi rating, double that of traditional flow sensors.

Rain Bird's UFS Ultrasonic Flow Sensor has a diagnostic display on the top of the electronics housing with three LEDs to describe that highlight the following flow states:

1. Flashing to Solid Green LED (right) indicates Partial Fill or Full Pipe
2. Flashing Red LED (center) – Indicates Reverse flow
3. Flashing Green LED (left) indicates Rate of Flow

1.1 TECHNOLOGY

The ultrasonic flow sensor uses sound waves, transmitted through the moving water in the irrigation pipe, to measure the speed of the water flow. Two transmitters generate and receive the soundwaves. The soundwave moving upstream will be slower than the soundwave moving downstream. The difference in the transit time equates to the velocity of water flowing through the pipe.

The flow sensor generates an electrical pulse with a frequency proportional to the flow rate. An internal preamplifier allows the pulse signal to travel up to 2000 feet (610 meters) without further amplification. Power to operate the sensor is provided by the irrigation controller, 2-wire sensor decoder or pulse input type flow monitor.

1.2 COMPATIBILITY

The UFS series will be available in 2", 1.5", and 1" with NPT thread. Their output is compatible with Rain Bird's ESP-ME3, ESP-LXMEF, ESP-LXD, ESP-LXIVM, ESP-LXIVMP, IQ, Maxicom, and SiteControl controllers, and the PT322, PT5002 and PT3002 Flow Monitor/Pulse Transmitters. They are also compatible with third-party irrigation controllers that can be configured with a K-factor and offset.

This manual provides instructions for installation and operation of the UFS Series Ultrasonic Flow Sensor.

1.3 CERTIFICATIONS

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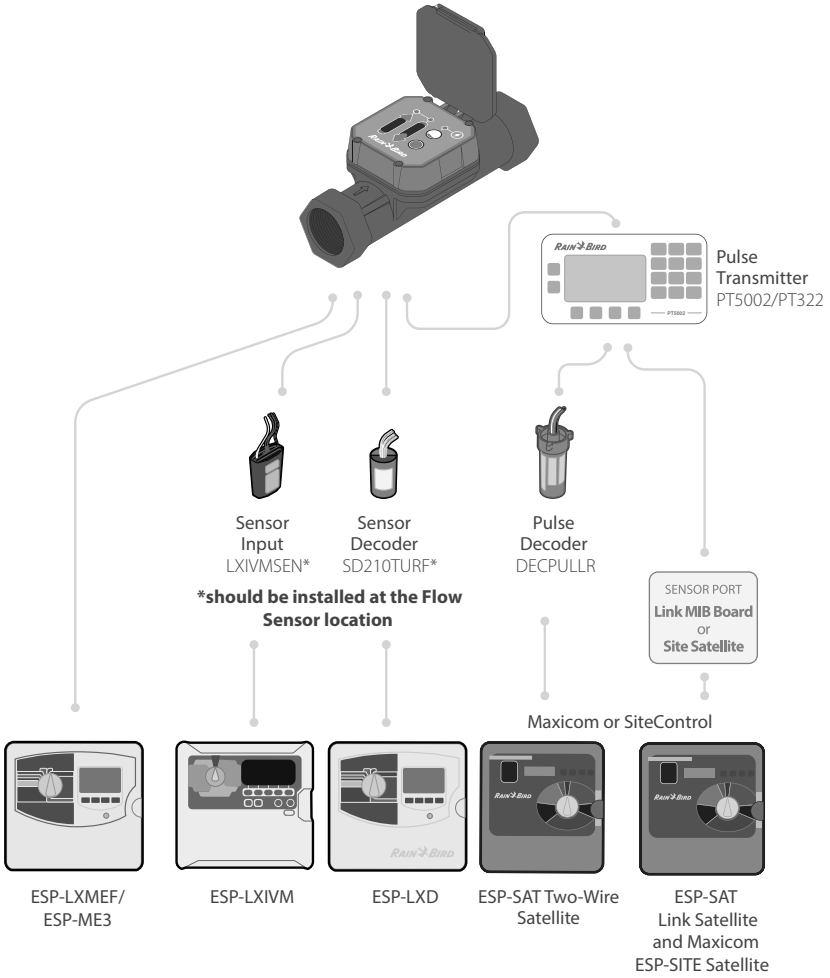
2. SYSTEM CONFIGURATION



3. INSTALLATION

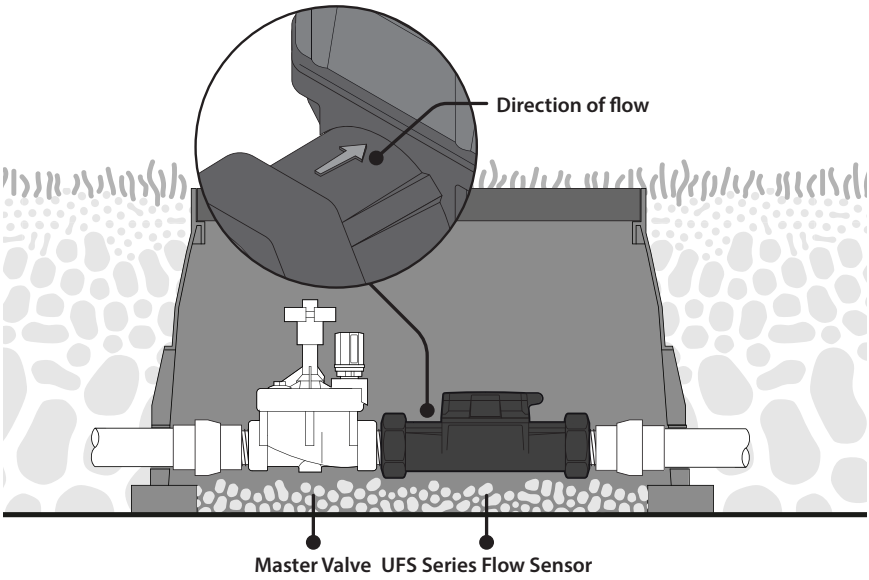
The accuracy of flow measurement for all flow measuring devices is dependent on proper location of the sensor in the piping system. Entrapped air in the pipe will cause inaccurate or "no-flow" readings. For best performance install the meter horizontally below or above ground, as shown in section 3.2. Accumulated debris or sediment in the pipe may also affect accuracy and repeatability.

Ultrasonic flow sensors are less affected by irregular flow velocity profiles caused by valves, fittings, pipe bends, or other obstructions than the flow sensors. The Rain Bird UFS Series Ultrasonic Flow Sensor is designed with long body which provides sufficient upstream and downstream straight-pipe requirement in most situations. It can be connected directly to a Rain Bird master valve or other device.

3.1 MECHANICAL INSTALLATION PROCEDURE

1. Make sure the UFS arrow faces the direction of flow.
2. Apply Teflon tape on all threaded connections. **DO NOT OVER TIGHTEN.**

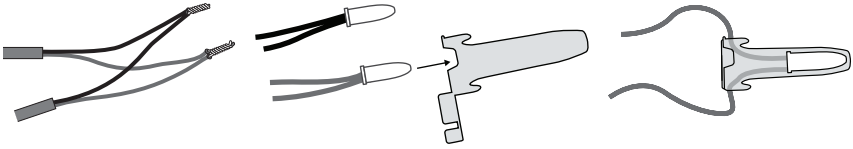
3.2 TYPICAL HORIZONTAL INSTALLATION



3.3 ELECTRICAL INSTALLATION PROCEDURE

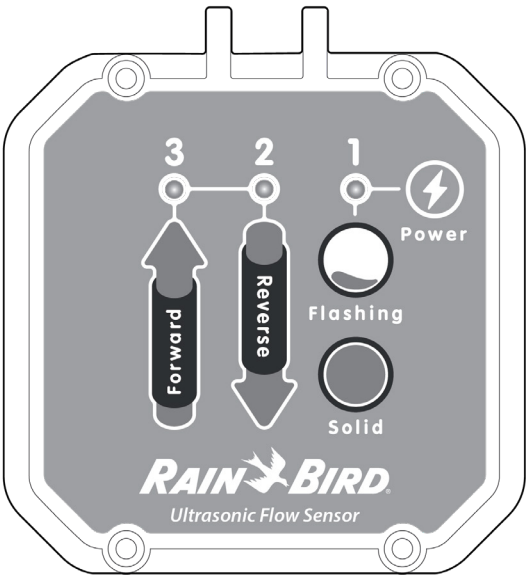
Disconnect the power from the flow sensor source and/or receiving device prior to any installation or maintenance of the system. Connecting power (24VAC, 110VAc, etc.) directly to the flow sensor wires will damage the sensor.

1. Use WC-20 Wire Splice connectors to connect the wire leads from the Rain Bird UFS Series Ultrasonic Flow Sensor to a 2-conductor shielded 20 AWG (or larger) flow sensor cable (Paige Electric P7162D or P7315D shielded cable or similar).



2. Route the cable from the Rain Bird UFS Series Ultrasonic Flow Sensor to the irrigation controller, 2-wire sensor decoder or pulse input type flow monitor. The cable may be extended up to 2000 feet. Be sure to leave enough flexibility in the cable or conduit to allow for future service of the sensor, if necessary.
3. When connecting to an irrigation controller, 2-wire sensor decoder or pulse input type flow monitor, connect the red wire to **FLOW (+)** terminal or wire, connect the black wire to **FLOW (–)** terminal.
4. When interfacing with other equipment, consult the manufacturer for input designations. The signal wave forms and power requirements are as shown in "Specifications" section of this manual.
5. After all electrical connections have been made, turn on power at the irrigation controller, 2-wire sensor decoder or pulse input type flow monitor. It may take 15 seconds before the green power LED-1 illuminates.

4. TROUBLESHOOTING



The status of your UFS Series Ultrasonic Flow Sensor can be determined by the LED lights on the upper body, or tested at the connection point of the controller. The sensor is essentially a 15 Ohm switch with a 600 µA leakage current. With no flow running, the sensor will appear to the controller input as a small current load. When flow is running, it appears a quick series of 5 millisecond short circuits.

- Before trying to troubleshoot, confirm that the flow rates are well above the minimum recommended flow rates. This will usually purge any air out of the line.
- Check the LED lights on the flow sensor upper body. See Installation Test Procedure for LED operation.
- If the controller is not recognizing a flow input from this sensor, verify flow sensing has been correctly configured and turn on at the controller. Test the controller itself by disconnecting the flow sensor, and very quickly and repeatedly short together the flow +/-terminals or wires that the flow sensor was connected to. The controller should report some flow. If it does not, the problem is in the controller, and not the flow sensor or the wiring to it.
- If the controller appears to be working, while the sensor is still disconnected measure the open circuit voltage on the controller's sensor input terminals. This voltage must be between 8 - 24V DC for the sensor to operate.
- If the voltage is acceptable, reconnect the flow sensor and re-measure. The voltage should drop slightly. If no drop is observed, the sensor is wired backwards, or there is a break in a wire or splice, or the sensor is open internally.
- If the voltage drops to near zero, there is either a short in the wiring or splice or the sensor is shorted internally. If the voltage drops below 7V—but not to levels indicating a short—there is most likely moisture penetration or corrosion in the wiring or in the sensor itself.

5. INSTALLATION TEST PROCEDURE

There are three LED lights visible on the top of the Rain Bird UFS Series Ultrasonic Flow Sensor. Once connected to a powered two-wire system, they will indicate the following conditions:

1 Green LED			
State		**Condition**	**Correction**
Off		There is no power to the flow sensor or insufficient power for normal operation, or the Red and Black wires have been reversed at the flow sensor or on the controller.	Check the power and wiring.
Flashing		Power is connected and is sufficient for operation. Insufficient water in the pipe for proper operation.	Check to ensure the pipe is full of water.
Solid		Power is connected and is sufficient for operation. Pipe is full and there is sufficient water in the pipe for proper operation.	Normal operation

2 Red LED			
State		**Condition**	**Correction**
Flashing		Water is flowing in the reverse direction. LED will flash proportionally to the flow rate.	Check arrow on meter is in the same direction as expected flow. Check for reverse flow conditions.

3 Green LED			
State		**Condition**	**Correction**
Off		No forward water flow	Check controller program times or manual run condition. Check for closed valves or obstructions preventing water flow.
Flashing		Water is flowing in the forward direction. LED will flash proportionally to the flow rate.	Normal operation.

6. K-FACTOR AND OFFSET

Rain Bird UFS Series Ultrasonic Flow Sensors use unique K-factor and offset numbers for calibration. This information is required when calibrating a controller or pulse transmitter, or when using the raw sensor data as direct output to interface with a device that is not a Rain Bird product.

The K-factor and offset numbers for each configuration are listed in the Calibration Table below.

Model	Size	K	Offset	Flow Range
UFS100	1 Inch (NPT)	**0.75**	**-1.66**	0.3 – 50 GPM
UFS150	1 ½ Inch (NPT)	1.70	-0.316	0.5 – 110 GPM
UFS200	2 Inch (NPT)	2.845	0.1439	1.0 – 200 GPM

7. SPECIFICATIONS

Materials	• Body; GFN (Glass Filled Nylon) • Upper: PPO (Poly Phenyl Oxide)
Sizes	• 1" Female Threaded (NPT) • 1 ½" Female Threaded (NPT) • 2" Female Threaded (NPT)
LED Indicators	• Power (On/Off and Full Pipe Indication) • Flow (Flashing proportional to flow rate) • Reverse Flow
Pressure Rating	200 PSI Working Pressure
Temperature	32° - 150° F Working Temperature
Accuracy	± 2 % of Reading over recommended design flow range
Repeatability	± 2 % of Reading over recommended design flow range
Power	Supply voltage = 8V DC min. 35V DC max.
	Quiescent current = 600 µA (typical)
	OFF State (V_{High}) = Supply voltage – (600 µA * Supply impedance)
	ON State (V_{Low}) = 1.2V DC @ 40 mA (15 Ω + 0.7V DC)
Output Frequency	0.5…200 Hz
Output Pulse Width	5 msec ±25%
Environmental	• IP 68 / NEMA 4X • Suitable for pollution degree 4 environments • Suitable for outdoor use below grade • Suitable for use in submerged installations (< 3 ft. water)
Electrical Cable	4 feet of 2-conductor AWG 18 UL PTLC drain wire provided for connection to irrigation controller. Rated to 221° F. May be extended to a maximum of 2000 feet with 20 AWG (or larger) shielded flow sensing cable (Paige Electric P7162D or equal) suitable for direct burial, or appropriate for installation.

SUPPLIER'S DECLARATION OF CONFORMITY

Responsible Party – U.S. Contact Information

Rain Bird Corporation

9491 Ridgehaven Court, Suite C,

San Diego, CA 92123, USA

www.rainbird.com

Unique Identifier: UFS100, UFS150, UFS200

FCC Compliance Statement

Note This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

NOTICE:

Changes or modifications not expressly approved by Rain Bird Corporation could void the user's authority to operate the equipment.