IDS 314

Irrigation™
Low Pressure Meters

INSTALLATION OPERATION & MAINTENANCE MANUAL

Issue Date: February 2018

FM314/FT194-11

SPARLING

NOTE:

To insure all warranties expressed or implied are allowed, it is important that the unit be installed and calibrated per this manual. Follow all instructions starting in ***SECTION 1.0 on page 1*** *concerning verifying equipment and operation, installation instructions and notes and wiring instructions.*

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1.0 Unpacking & Inspection

1.1 Receiving & Inspection

Locate the packing slip shipped with your unit, this will list all the items sent with the shipment. Compare packing slip to order acknowlegement you received previously and verify that all items correspond.

If all items correspond, examine the shipping containers for unusual denting and/or damage. If shipping containers are in good condition, begin unpacking. Do a general examination of each part as it is removed from its packaging, checking for any obvious signs of physical damage.

If there is no apparent damage to the items you may begin the installation procedure in SECTION 3, although we recommend that you familiarize yourself with SECTION 2*: Application/Installation Considerations* prior to going to SECTION 3.

If any item shows damage due to shipment call the Customer Service Department immediately, at (626) 444-0571 you will then be advised of the measures to take.

If you find items are missing from your shipment, contact the Sparling Customer Service Department immediately, at (626) 444-0571. They will verify the order and trace any missing item for you.

1.2 Storage

This equipment should be stored in a clean, dry environment. Do not store outside in an unprotected area. Observe the storage temperature requirements.

1.3 Operation

The Model FM314 features the FT194 battery powered electronic rate/totalizer which senses the rotation of the propeller by means of a magnetic pickup sensor located in the gearbox. The rate/totalizer and pickup are completely isolated from the flow stream.

Utilizing the simple principle of the screw propeller, the Sparling FM314 registers total flow, much as an odometer registers auto mileage. The electronic rate/totalizer converts the revolutions of the propeller to cubic feet, gallons or other standard engineering volumetric units. The rotation of the propeller also affords a basis for indicating and recording gallons per minute or other rates.

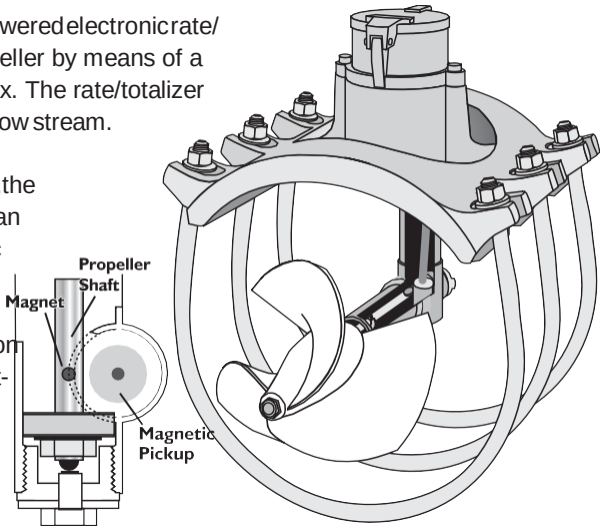

Figure 1.1
Meter Operation

The LCD digital display is activated by a photoelectric cell. When the cover of the bonnet is opened, the display is activated. The display will go into "sleep mode" after a preprogrammed time interval. Low light conditions may require the use of a flashlight to activate and read the display.

1.4 Specifications

FM 314

Accuracy	±2.0% of flow
Liquid Operating Temperature	32°F to 100°F
Ambient & Storage Temperature	-40°F to 175°F
Materials of Construction	Saddle ..... Cast Iron (2" - 12") / Cast Aluminum (14") Propeller ..... Polyethylene Gearbox ..... Bronze Mechanical Parts ..... Stainless Steel Coatings ..... Grey water base paint
Mounting	Plain end steel tube (4") Plain end steel tube w/straightening vanes (6"-14") Meterhead only with stainless steel straps (4"-14") Meterhead only with U-bolts (4"-8", 14") Meterhead only with anchor bars (10"-12")

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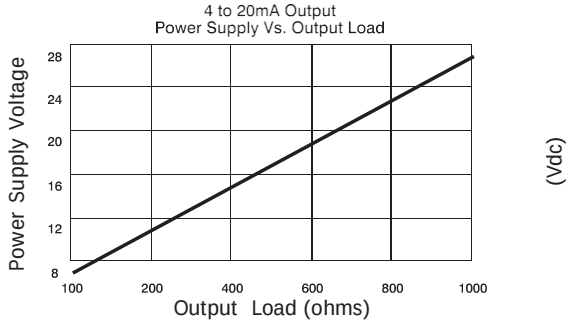
Accuracy	Rate: ±0.25% of full scale Totalization: ±0.1% of rate (in addition to propeller meter accuracy)
Power	3.6V Lithium battery (3 year average life) 4-20mA and scaled pulse output with external 24 Vdc power source Battery operating temperature: -55°F to 185°F
Operating Temperature	-10°F to 158°F (-23°C to 70°C)
Storage Temperature	-40°F to 158°F (-40°C to 70°C)
Display	5-digit rate indicator (0.35 inches high) 8-digit totalizer indicator (0.25 inches high) LCD 2-line display with simultaneous rate and total, and low battery indication.
Construction	Sturdy die cast aluminum bonnet NEMA-4X, NEMA-6, IP67 & IP68 environmental ratings.
Optional Outputs	4-20mA & scaled pulse output, contact on time 100 milliseconds. User selectable units of measure for every contact closure.



Scaling	Totalizer Scaler - 0.0001 to 9999.0 / Rate Scaler - 0.0001 to 9999.0 Decimal point can be moved to five positions
Scaling Units	Totalizer - Gallons, cubic feet, Liters, cubic meters, Acre Feet Rate - GPM, CFS, MGD, LPS, M^3/Hr
Electrical Rating	General Purpose

2.0 Pre-Installation

2.1 Process Fluid

The FM314 MainLine Electronic Propeller Meter is designed to operate with relatively clean process water. The percentage of solids should not exceed 0.5%. While the propeller shape is designed to shed debris and the propeller material is durable and somewhat pliable, large solid objects in the flowing stream could damage or become entangled in the propeller, causing inaccuracies or malfunction. These meterheads will function despite the presence of small abrasive particles (such as sand) but the life of the propeller shaft bearings may be reduced.

2.2 Handling Precautions

Although this device is ruggedly constructed, it is a precise measuring instrument and can be damaged by rough handling or if dropped. If the meterhead is not shipped already installed into a flow tube, care should be taken to avoid damaging the propeller during installation.

3.0 Installation

3.1 Site Selection Criteria

Choose a location that assures a pipe full of water flowing at or above the minimum velocity for the meter. There should not be any enlargements, diffusers or obstructions upstream that would produce a jet or spiraling flow into the meter. Ten diameters of straight pipe upstream and 1 diameter downstream are recommended to avoid errors caused by skewed velocity profiles. See figure 3.1.

Ajetcausedbyapartiallyopened valve, a centrifugal pump, or a pipe enlargement upstream from the meter can cause inaccurate registration.

Often such disturbances can be avoidedbylocatingthe meteron thesuctionsideofthepump.The meterwillregisterjustas efficiently on a vertical or slanting pipe as onahorizontalline.Thestraightening vanes eliminate cork-screw effects in the flow profile. Flow conditioners may be required in installations where less than optimum conditions exist. See Figure 3.1.

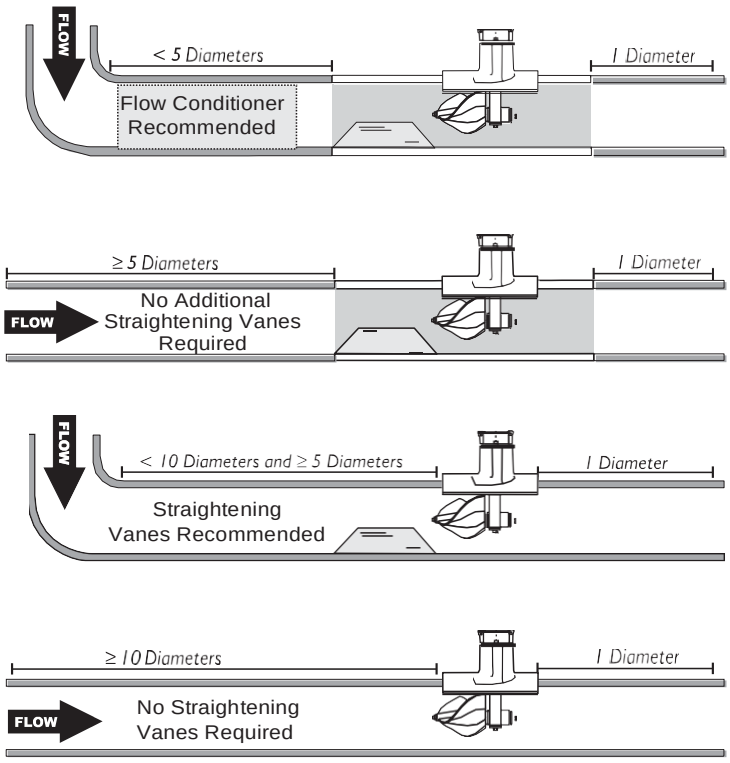


Figure 3.1
Installation Considerations

3.0

Installation
cont'd.

3.2 Mounting The Low Pressure Line Meter

Meterheads are available with either a plain end tube or as a meterhead only which is strapped onto existing process pipe.

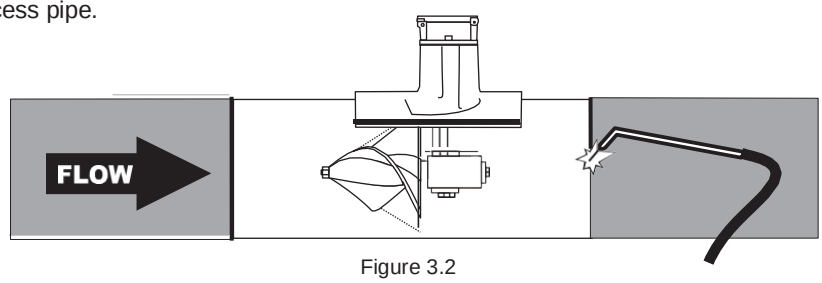


Figure 3.2
Tube Mounting

3.2.1 Meterhead with Plain End Steel Tube

a. Be sure to read Section 3.1 Site Selection Criteria prior to installing your meter.

b. Install the tube meter in the line just as though it were a short length of pipe

c. Place the meter/tube section in place with the arrow on the meter saddle pointing in the direction of the flow. Secure the tube section into place with mechanical couplings or by welding into place (see figure 3.2).

3.2.2 Meterhead with customers' existing pipe- 4" to 12"

a. Read Section 3.1 Site Selection Criteria prior to installing your meter.

b. Prepare a template for the cut-out from the dimensions shown in Table 1. Place the template on the pipe and scribe a line for cutting.

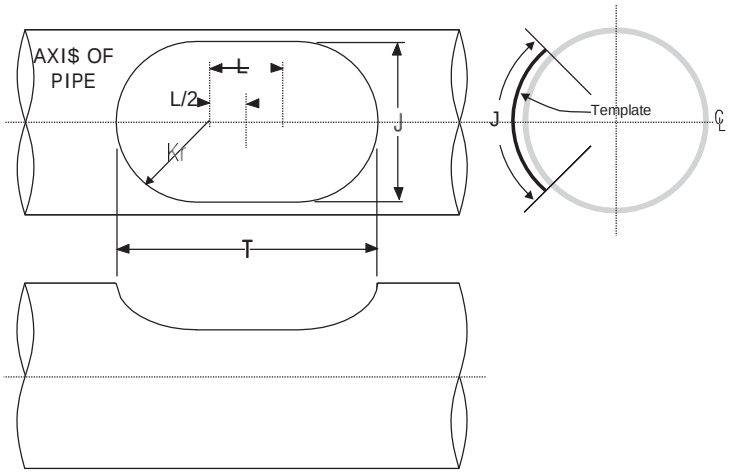


Figure 3.3
Template for 4"-12" Meters

TABLE 1 - TEMPLATE DIMENSIONS

$ize	J	Kr	L	L/2	T
4 "	4-5/8	2-5/16	2-9/16	1-9/32	7-1/16
6 "	6-5/8	3-5/16	0	0	6-5/8
8 "	6-1/4	3-1/8	1-1/2	3/4	7-3/4
10 "	6-3/4	3-3/8	1-1/4	7/8	8
12"	8	4	0	0	8

3.0

Installation
cont'd.

3.2.2 Meterhead with customers existing pipe – 4" to 12" - Cont'd.

c. Cut or burn a full opening in the pipe so there will be no projections of the pipe beyond the straight inside edge of the hole. Smooth the pipe around the opening to make a good surface for the saddle.

d. If straightening vanes are required, see section 3.2.4. If not, see 3.2.2 e.

e. Place O-ring gasket on the pipe. Put saddle in place. The arrow on the saddle should face in the direction of the flow. Bolt or strap on to the pipe securely.

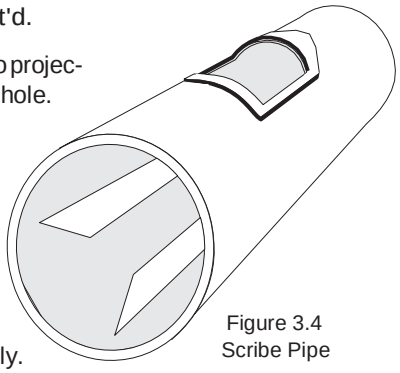


Figure 3.4
Scribe Pipe

3.2.3 Meterhead with customers existing pipe – 14"

a. Read Section 3.1 Site Selection Criteria prior to installing your meter.

b. Place gasket on the pipe and scribe a line on the inside of the gasket. Remove gasket and cut or burn a full opening in the pipe so there will be no projections of the pipe beyond the straight inside edge of the hole. Smooth the pipe around the opening to make a good surface for the saddle.

c. If straightening vanes are required, see section 3.2.4. If not, see 3.2.3 d.

d. Place gasket on the pipe. Put saddle in place. The arrow on the saddle should face in the direction of the flow. Bolt or strap on to the pipe securely (Figure 3.5).

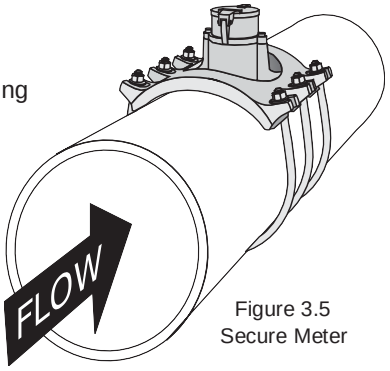


Figure 3.5
Secure Meter

3.2.4 Install straightening vanes (if required) as shown on Figure 3.6.

Three straightening vanes are required. Vanes should be equally spaced radially and parallel with the longitudinal axis of the pipe (1)

Welding Vanes
a. Space vanes equally at 120° radially and locate longitudinally as shown.
b. Secure vanes with a continuous bead weld around both ends and with intermittent staggered bead welds along the vane.

Bolting Vanes
a. For easy vane installation, place each vane in its equivalent position on the outside of the pipe (2) and mark the location for bolt holes.
b. Drill holes. Install vanes inside the pipe. Place lead washer and then steel washer on the bolt on outside of pipe and tighten nuts securely (3).

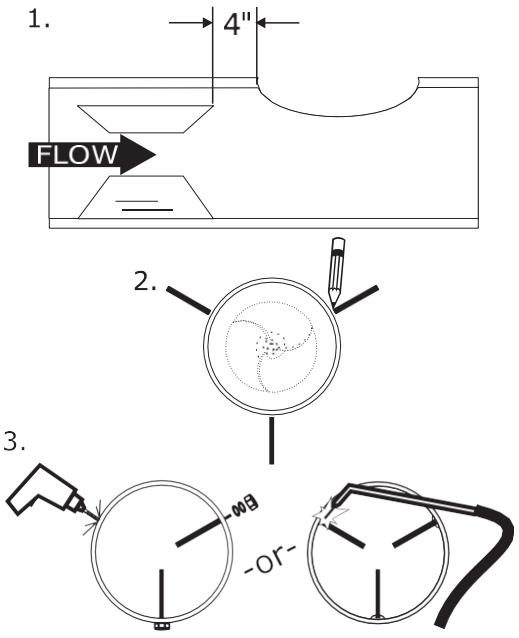


Figure 3.6
Install Straightening Vanes

Note: Installations with both forward and reverse flows* may require additional vanes on the downstream side of the meter. Install in the same manner, 4" from the downstream saddle opening.

*Option requiring dual remote mounted totalizers.

4.0

Flow Rates & Dimensions

Maximumflowrangescanbesafelyexceededby50%whenusedintermittently(10-15%ofthetime).YourSparling meterutilizes specially designed propellers and bearings matched to yourflowrange to insure long life.

For proper configuration of meter construction anticipated flow ranges, including minimum and normal flow rates expected, should always be specified on application sheets accompanying your order.

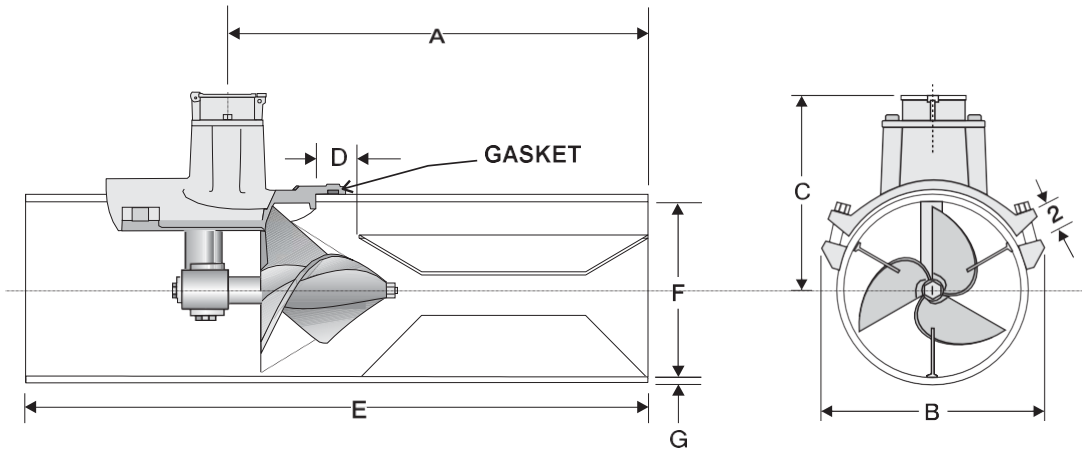


TABLE 2 • FLOW & DIMENSIONS

Size		Flow Range		Std.	Dimensions w/o Tube(in)					Dimensions w/Tube (in)			
		Standard	High	Press.	A	B	C	D	Wt.	E	F	G	Wt.
04	4"	50 - 400	120 - 600	100 psi	9.19	8.00	7.63	N/A	20	16.0	4.03	.24	40
06	6"	90 - 900	200 - 1600	100 psi	14.44	9.00	7.88	2.75	25	22.0	6.36	.13	45
08	8"	100 - 1200	240 - 2300	100 psi	15.94	10.50	9.44	3.00	30	24.0	8.36	.13	65
10	10"	125 - 1600	320 - 3000	100 psi	19.94	11.50	9.56	3.25	35	30.0	10.38	.19	80
12	12"	150 - 2200	400 - 4000	100 psi	23.94	12.38	11.50	3.25	40	36.0	12.38	.19	125
14	14"	250 - 3000	520 - 5000	50 ft.	28.00	17.63	11.13	4.88	30	42.0	13.63	.19	140

5.0

Meter Maintenance

5.1 Preventative Maintenance

Low pressure line meters with ball bearings (low flow range) should be greased every 90 days of actual operation time with Lubriplate #105. Meters with fluted rubber bearings (standard flow range) and don't need to be lubricated as water provides their lubrication.

Remove the meter from the line once each year and inspect the propeller shaft bearings, propeller, straightening vanes and tube condition.

5.1.1 Remove Meterhead

Depressurize the line, remove the U-bolts or straps and withdraw the meter from the line. It may be necessary to maneuver the meter so that one blade tip can be lifted through the opening, allowing clearance for the remaining blades.

5.1.2 Inspect vanes for damage and tubes and vanes for foreign matter

Examine the pipe for any foreign matter that may have accumulated. Look at the upstream ends of the straightening vanes and remove accumulated matter. See if the vanes have been damaged - straighten any bends.

5.1.3 Inspect Propeller & Bearings

a. See that the propeller blades are smooth and clean.

b. Spin the propeller with your fingers (a). The propeller should spin freely without binding and crunching noises. The register should advance properly.

c. Next, pull on the propeller (b). The propeller should have a little freedom of movement (about 1/64") due to the designed play in the bearings which allows grit to pass through. If movement is over 1/64" but under 1/32" adjust per 5.1.4 Adjust Bearings.

d. Finally, hold the propeller with your fingers and rock it from side to side (c). There should be minimal movement when rocking the propeller, about 1/64".

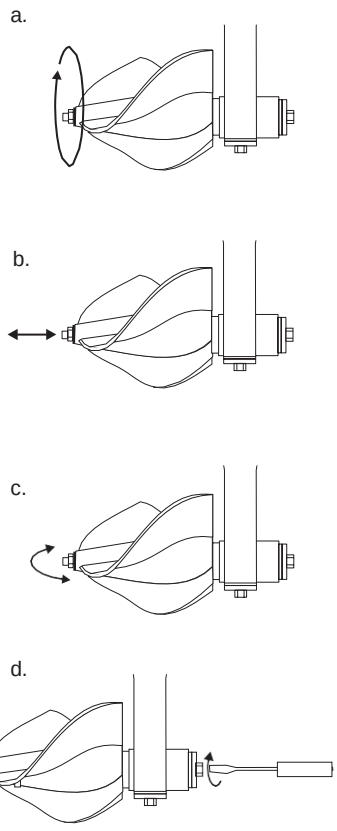


Figure 5.1
Inspection Steps

If you experience:

- binding or crunching when spinning the propeller
- the propeller has excessive play

it could signal excess bearing wear or failure. Go to Section 5.2 Disassembly and Repair

If the register does not advance properly, go to Section 5.2 Disassembly and Repair.

Check the gasket before replacing the meterhead. Replace it if it is damaged. Finally, if everything checks out as it should, return meter to line, bolt in place and repressurize the line.

5.1.4 Adjust Bearings

The front propeller shaft bearing is the key to the life of the meter. If it is kept in good condition the other parts will last almost indefinitely.

Adjust the thrust screw (d) on the back of the propeller shaft plug to achieve 1/64" end play. Screw the thrust screw until it comes in contact with the end of the propeller shaft, then back off the thrust screw 1/4 turn and tighten the locknut and re-check the end play.

Spin the propeller to ensure that it spins freely and that the register advances properly. No further maintenance is required, and the meter may be reinstalled. If you found a problem, proceed to 5.2 Disassembly & Repair.

5.0

Meter Maintenance

5.2 Disassembly & Repair

5.2.1 Grip the propeller and removethe propeller nut. Slip the propeller off by tapping it lightly and remove the propeller shaft key (a).

5.2.2 Remove the propeller shaft plug assembly and drivethepropellershaftouttherearofthegear boxbytappingat the end ofthepropellershaft with a rubber mallet or a piece of wood to protect the shaft (b). While removing you may have to rotate the shaft to avoid damaging the bearing retaining ring - do not force.

5.2.3 Grip the propeller shaft between the magnets and the front bearing retaining ring. Remove the rear bearing nut, rear bearing, rear bearing washer and the front bearing retaining ring (c). Inspect the propeller shaft for straightness, carefully examining magnet discs for cracks, looseness or missing discs. If faulty, a new propeller shaft must be installed.

5.2.4 Using a wood dowel, gently tap out the front bearing from the gear box (d).

5.2.5 Check for worn or damaged parts and replace.

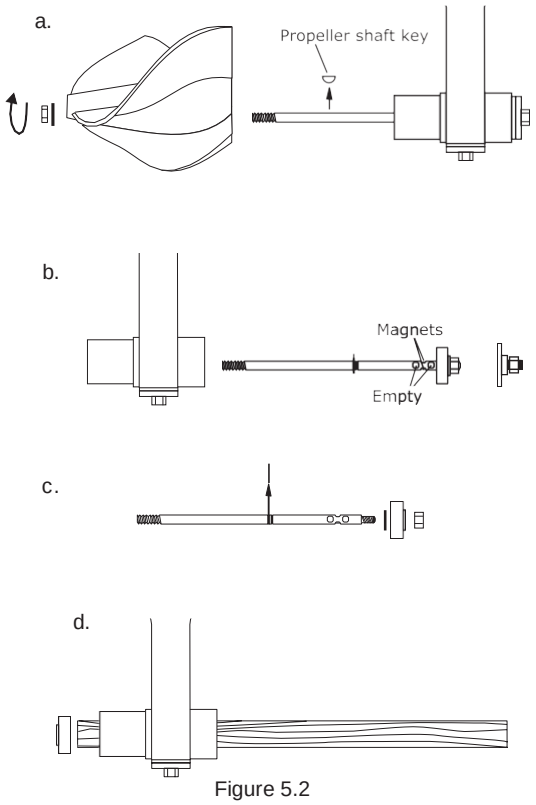


Figure 5.2
Disassembly & Repair

5.3 Reassembly

5.3.1 Install the front bearing by pushing the bearing into the gearbox. DO NOT HAMMER THE BEARING INTO PLACE. Coat bearing with Lubriplate.

5.3.2 Install the rear bearing washer, rear bearing andthe bearingretainer nut onthe propeller shaft. Tighten the nut snugly, but do not over-tighten. Coat bearing with Lubriplate.

5.3.3 Install the frontbearingretaineronthepropellershaft.The retainer shouldbeplacedin the frontslot for ballbearingsorinthe rear slot forrubber bearings. Note: there is aroundedside andasharpside to the front bearing retaining ring. Be sure to put the rounded side toward the propeller.

5.3.4 Insert the propeller shaft assembly into the rear of the gearbox. Rotate the shaft if necessary to avoid damaging the front bearing retaining ring. Reinstall the propeller shaft thrust plug assembly and tighten firmly.

5.3.5 Check the propeller shaft end play. Adjust the thrust screw on the back of the propeller shaft plug to achieve 1/64" end play. Screw the thrust screw until it comes in contact with the end of the propeller shaft, back of thrust screw 1/4 turn and tighten the lock nut and recheck the end play.

5.3.6 Install the propeller shaft key, the propeller, and the propeller washer and nut. Use the new propeller nut furnished with the front bearing. Tighten the nut snugly.

5.3.7 Spin the propeller and check for free movement and that the register advances properly. Binding bearings may be freed by alternate light taps to the rear of the gearbox and the front of the propeller shaft to properly seat the bearings. Recheck propeller shaft end play.

6.0

Totalizer Maintenance

6.1 Preventative Maintenance — Inspection of Totalizer

The ideal time to inspect the totalizer is when you are changing the battery.

6.1.1 Inspect Display - Remove Totalizer
Open meter cover and check for condensation on inside of glass. Spin propeller and make sure that the register advances properly. Remove screws holding the totalizer on the meterhead.

6.1.2 Inspect battery contacts
Examine the battery contacts for signs of moisture intrusion. Examine the battery for any signs of leakage.

6.1.3 Inspect Connectors
There are two connectors. One on each side of the battery bracket. Check each for moisture intrusion.

6.1.4 Reinstall Totalizer
If everything checks out you can reseat the gasket and mount the totalizer back on the meterhead. Tighten screws until firm, then tighten an additional 1/4 turn. Spin propeller and make sure that the register advances properly.

If there are any signs of moisture intrusion into the Totalizer see Section 6.2.

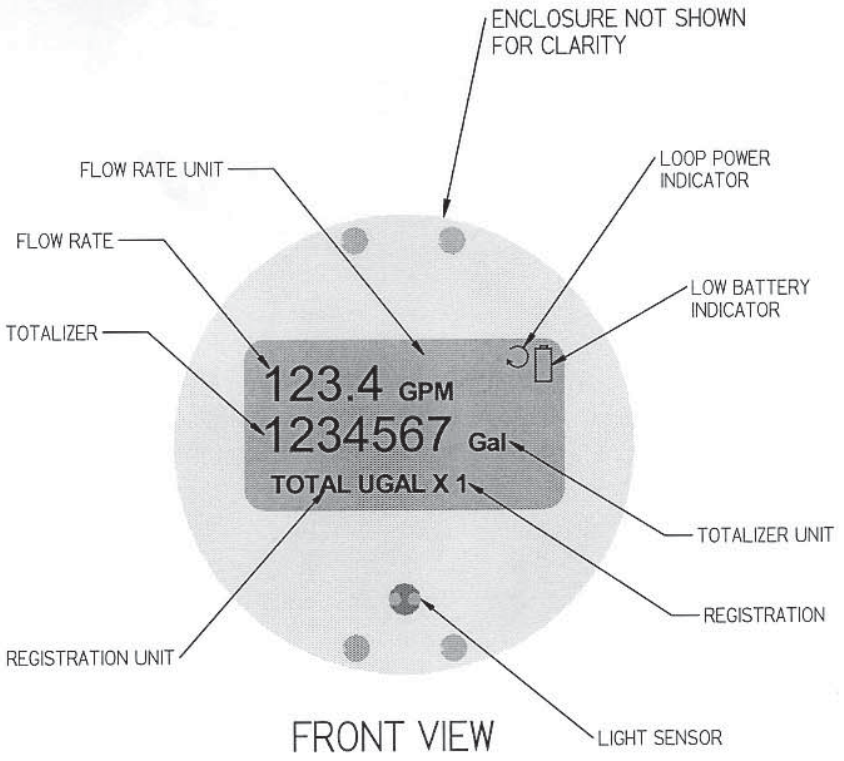
6.2 Troubleshooting

6.2.1 Moisture under glass
Replace totalizer

6.2.2 Rate and Totalizer do not indicate
Bad contact? Examine & clean.
Propeller Jammed? See Section 5.2 Disassembly & Repair
Damaged or missing magnets in propeller shaft? See Section 5.2 Disassembly & Repair

6.2.3 Contacts corroded
Moisture intrusion? Totalizer was not replaced properly. Replace totalizer.

7.0 Wiring Diagram



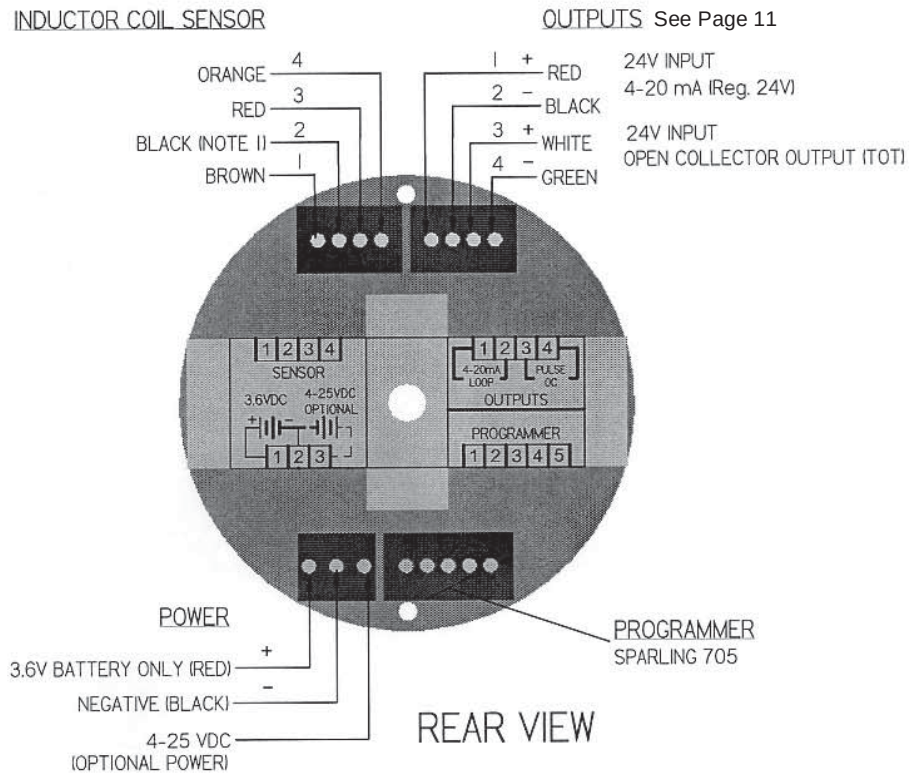


Figure 7.1

NOTES:
1. PREVIOUS SENSOR TYPE USED RED.

7.0

Wiring Diagram FT194-II Forward & Reverse Register

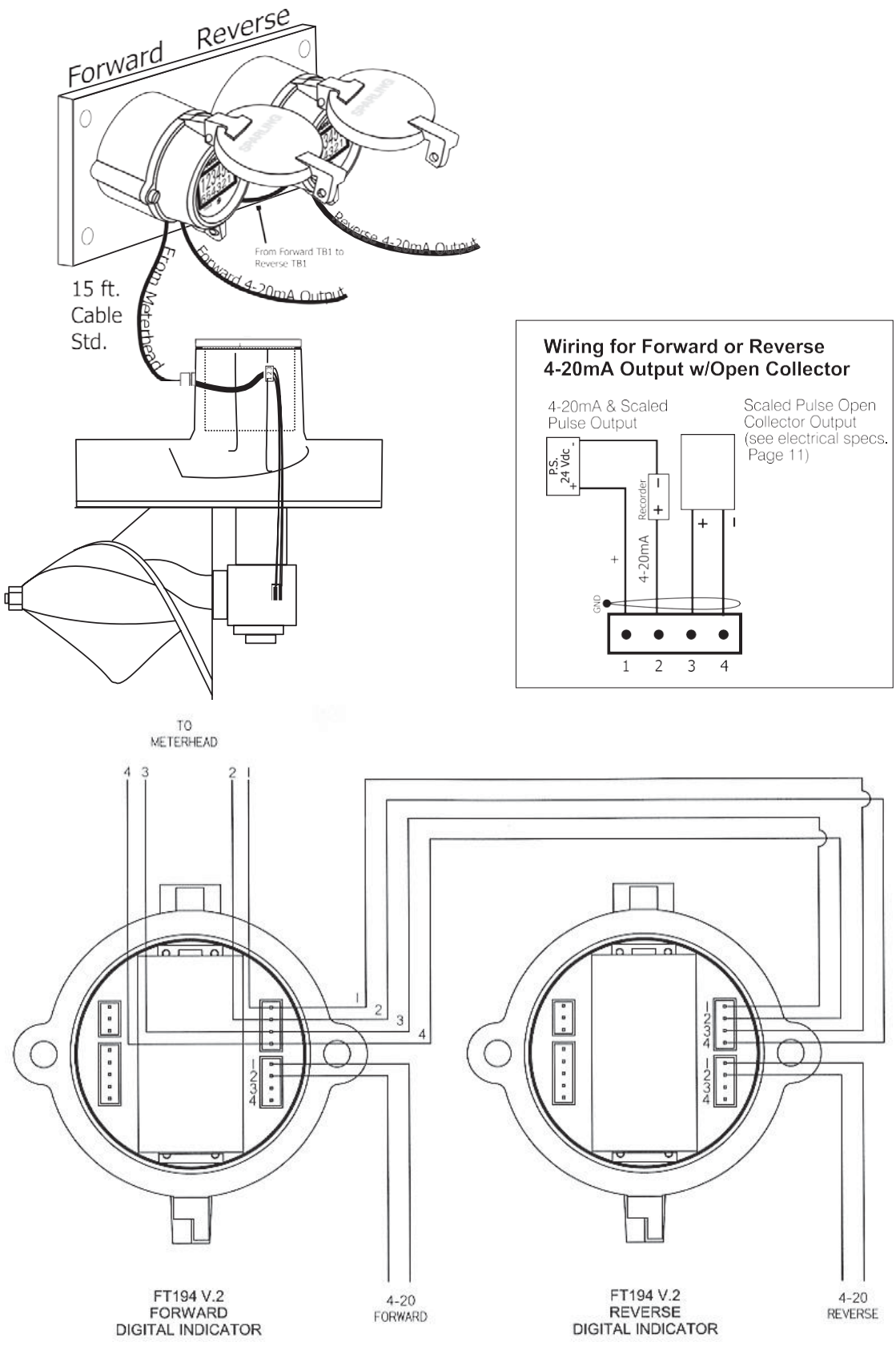


Figure 7.2

4-20mA Installation on Forward/Reverse Unit

8.0 Programming

A705 Sparling programmer is required to access the programmable parameters for the unit.

Figure 8.1

Connecting the 705 Programmer:

81 Remove the mounting screws. Access the bottom of the unit and plug the programmer in the 5-pin connector as shown.

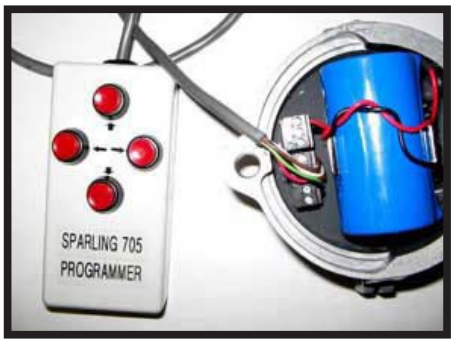


Figure 8.2

Programming Mode:

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8.2.1 General Guide when using the menu:

a. Moving the cursor past the farthest digit to the right will enter the value.

b. Moving the decimal point: remove the current point first by making it a zero, then place the new point where desired.

c. Once in a sub-menu (Rate, Total, Display, etc) you must go through to get back to the main menu.

8.2.2 Entering menu:

a. Press the left or right arrow key on the 705 programmer to access the main menu. The screen will change to that of figure 8.3. Use the right/left keys to move the cursor to the next/previous digit and up/down to scroll the digit. Press the right key when the cursor is under the farthest digit to the right to enter the value.

Figure 8.3

8.0

Programming
cont'd.

b. There are two screens for the main menu. The first one (figure 8.4) allows access to Rate, Total anddisplayparameters. The secondone (figure 8.5) has Output, Diagnostics (Diag.) andHelp. Press the right arrow when Display is highlighted to access the second screen. Move left one more time when Output is highlighted on the second screen to get back to the first.

8.2.3 Main Menu - Rate

a. The Rate menu allows access to Units and Full scale. Predefined units are: GPM, LPM, CFS, M^3H, MGD. If none of the predefined units match your application, set the units to User. This allows you to define the unit name and conversion factor.

b. Full Scale affects the 4-20mA loop current only. At full scale of the rate, the loop current will be 20mA. A zero flow will make it 4mA.

8.2.4 Main Menu - Total (Totalizer)

a. The Totalmenu allows access to Units, Registration and the Totalizer Reset menu. Predefined units are: US Gallons (Gal), Acre-Feet (A-ft), Imperial Gallons (IGal), Liters (Ltr), Cubic meters (M^3), Cubic feet (Ft^3), Acre-inches (A-in). If none of the predefined units match your application, set the units to User. This allows you to define the unit name and conversion factor.

b. The registration value is used to divide the internal (and external) totalizer by the required number of engineering units. It is normally set to an even number like 0.1, 1, 10, etc. Example: If set to 10, the internal totalizer will increment by one count every 10 units (where units can be anytotalizerspecifiedunit). Atthesametime, apulse willbedriventotheexternalpulseoutput.

Reset sub-menu: This sub section of the Totalizer menu (if available) let the user Reset, lockout or change the password for the totalizer.

Reset: Makes the value of the totalizer zero.
Change password: Changes the password for this sub-menu
Lockout: It disables this sub-menu. Warning: lockout is final!

8.2.5 Main Menu - Display

The Display menu allows access to Timeout, Update, Contrast and On level.
Timeout: Sets the number of seconds the display will stay on if the lid is not closed.
Update: The display rate and totalizer values willbeupdated according to this value.
Contrast: Sets how dark or light the display looks.
On level: Sets the brightness of the light required toturn onthe display after the lid is open.

8.2.6 Main Menu - Output

a. The Output menu allows access to Update, 4-20mA adjustment.

Update:Setshowmuchofthenewflowvalueisusedtoupdatetheoutputs.Useasmallervalueto slow the tracking of the output to the display rate indicator.

b. 4-20mA calibration - The 4 and 20mA are calibrated at thefactory. There should be no need for re-calibration under normal operating conditions but due to tolerances in equipment, the user may want to fine tune the output to its own equipment.

This section is only available if the unit is loop powered. The actual value have no direct relevance to the output. It is only a visual indication of how much the output can be changed. Each 4 and 20mA allow arange of ±75 steps. The value is saved in non-volatile memory once entered.

8.0

Programming
cont'd.

8.2.7 Main Menu - Diag. (Diagnostics)

The Diagnostic menu allow the user to change the meter factor and the main menu password.

8.2.8 Main Menu - Help

The Help menu shows the serial number, meter factor and technical support information.

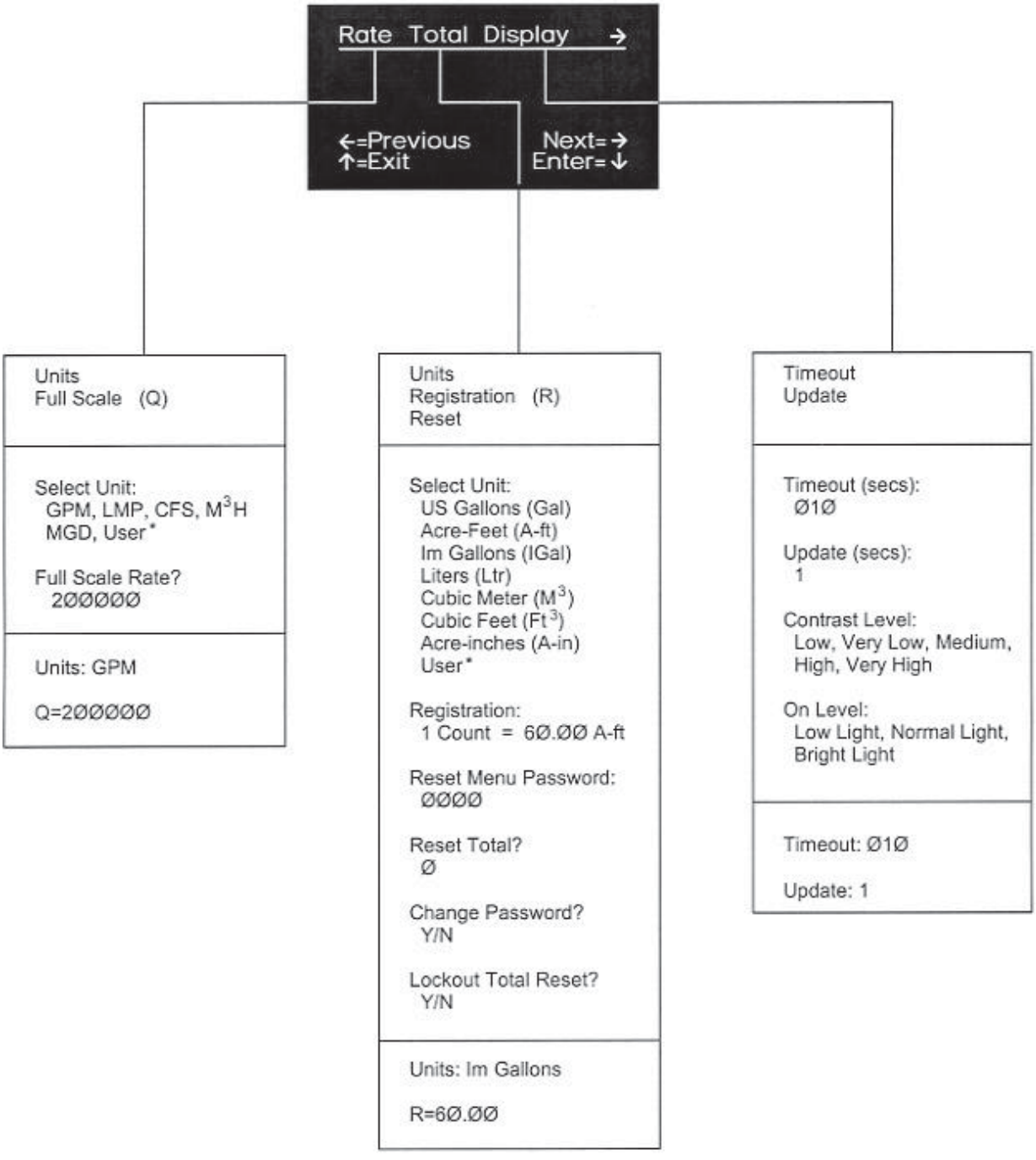


Figure 8.4

Figure 8.4

* See Section 8.2.3 & 8.2.4 a

8.0

Programming
cont'd.

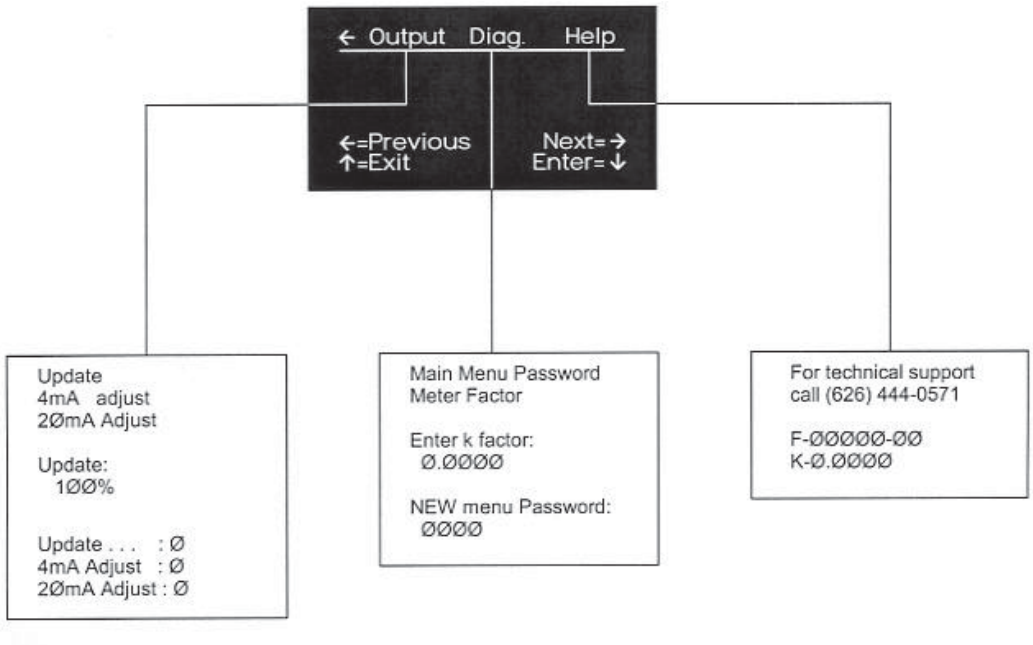
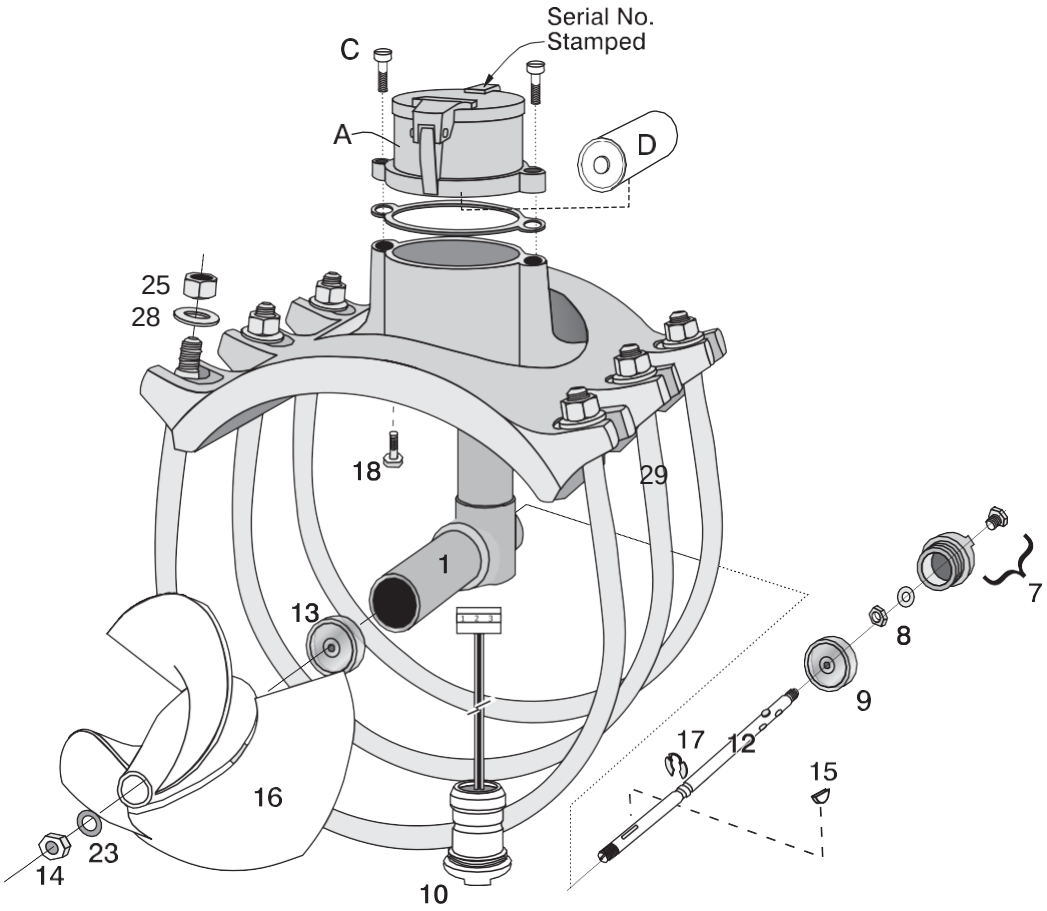


Figure 8.5

TABLE 2 - STANDARD REGISTRATION FOR FT194-II

Norn. Size	Cubic Feet	U.S. Gallons	Irnperial Gallons	Acre Feet	Cubic Meters	Liters
2	1.0	10.0	10.0	0.00001	0.01	10.0
3	1.0	10.0	10.0	0.0001	0.1	100.0
4	10.0	100.0	100.0	0.0001	0.1	100.0
5	10.0	100.0	100.0	0.0001	0.1	100.0
6	10.0	100.0	100.0	0.001	1.0	100.0
8	10.0	100.0	100.0	0.001	1.0	1000.0
10	100.0	100.0	100.0	0.001	1.0	1000.0
12	100.0	1000.0	1000.0	0.001	1.0	1000.0
14	100.0	1000.0	1000.0	0.001	1.0	1000.0
16 - 30	100.0	1000.0	1000.0	0.01	10.0	10000.0
36 & 42	1000.0	10000.0	10000.0	0.01	10.0	10000.0
48 - 72	1000.0	10000.0	10000.0	0.1	100.0	100000.0

9.0
Replacement Parts List



Item No.	Description	P/N
A	FT194 Totalizer*	FT194
B	Totalizer Gasket	521361
C	Register Bolt	101238
D	Battery	564038
8	Hex Nut	100313
7	Prop Shaft Plug Assy	504903
9	Rear Bearing	124529
10	Inductor Assy w/Plug	558249
12	Propeller Shaft	559411
13	Front Bearing	129959
14	Nut	100321
15	Shaft Key	100355
17	Retainer Ring	100397
23	Washer	100389
24	Washer	100503
25	Nut	100686
28	Washer	100694

		P/N					
Item No.	Description	4"	6"	8"	10"	12"	14"
1	Gear Box	518954	518954	517716	517716	517568	517568
16	Propeller*	502080	502098	502105	502113	502121	502139
27	Meterhead O-Ring/Gasket	519142	519275	519449	517419	519621	559429
29	U-Bolts or	517401	559445	501959			559453
	Anchor Bars				502147	539437	

* Provide Serial Number when Ordering

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