

**Flow Max 810  
Installation and Service Manual**

*P/N 016-0159-562 Rev C 12/15*

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# SYMBOL DEFINITION

GPM - Gallons per minute  
lit/min - Liters per minute  
dl/min - Deciliter per minute  
PSI - Pounds per square inch  
[] - Metric numbers

## **METER CAL CONVERSIONS**

To convert the METER CAL number simply divide the original number (number printed on Flow Meter label) by the desired conversion factor.

### **FOR EXAMPLE:**

$$\frac{\text{Original METER CAL No.}}{128} = \text{METER CAL No. for displays in } \mathbf{Fluid\ Ounces}$$

$$\frac{\text{Original METER CAL No.}}{3.785} = \text{METER CAL No. for displays in } \mathbf{Liters}$$

$$\frac{\text{Original METER CAL No.}}{\text{Weight of one gallon}} = \text{METER CAL No. for displays in } \mathbf{Pounds}$$

## **LIQUID CONVERSIONS**

U.S. Gallons x 128 = Fluid Ounces  
U.S. Gallons x 3.785 = Liters  
U.S. Gallons x 0.83267 = Imperial Gallons  
U.S. Gallons x 8.34 = Pounds (Water)

## **PRESSURE**

1 psi = 6.89 kPa

# INTRODUCTION

The Raven FLOW MAX 810 (AUTOMATIC BATCH CONTROL SYSTEM) is designed to provide automatic on/off control and flow totalizing for any volumetric batch application. Its performance relies on the installation and preventive maintenance of the complete system. It is important that this Installation and Service Manual be reviewed thoroughly before operating the system. This Manual provides a simple step-by-step procedure for installing and operating.

The FLOW MAX 810 consists of a computer based Control Console, a turbine type Flow Meter, and a motorized On/Off Valve. The Console mounts directly on the vehicle for easy operator use. The motorized On/Off Valve and Flow Meter mount directly to the framework of the sprayer. Appropriate cabling is furnished for field installation.

The operator sets the batch size (volume) to be metered and the FLOW MAX 810 automatically monitors the flow and shuts off the valve at the set batch size. The FLOW MAX 810 additionally functions as a volume totalizer and may be used as a totalizer with simply a flow meter.

# INSTALLATION

## 1. MOUNTING THE FLOW METER

- 1) Mount the Flow Meter in the area of the On/Off Valve per Figure 1. All flow through the Flow Meter must go to the outlet only, i.e. no return line to tank or pump after Flow Meter.
- 2) Mount Flow Meter vertical for most reliable low end operation. However, the Flow Meter may be mounted horizontal to accommodate system plumbing.
- 3) For best results, allow a minimum of 7 1/2 inches [20 cm] of straight hose on inlet of Flow Meter. Bend radius of hose on outlet of Flow Meter should be gradual.
- 4) Flow must be in direction of arrow on Flow Meter.

**NOTE:** Mount the Flow Meter vertical with arrow pointing upward for flow rates that approach low end operation.

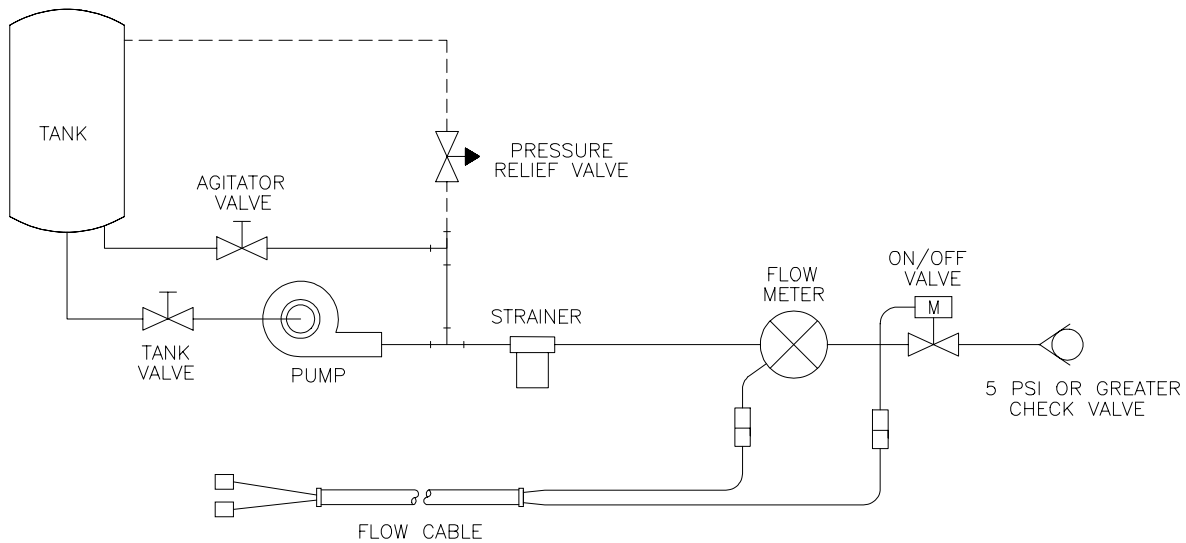


FIGURE 1

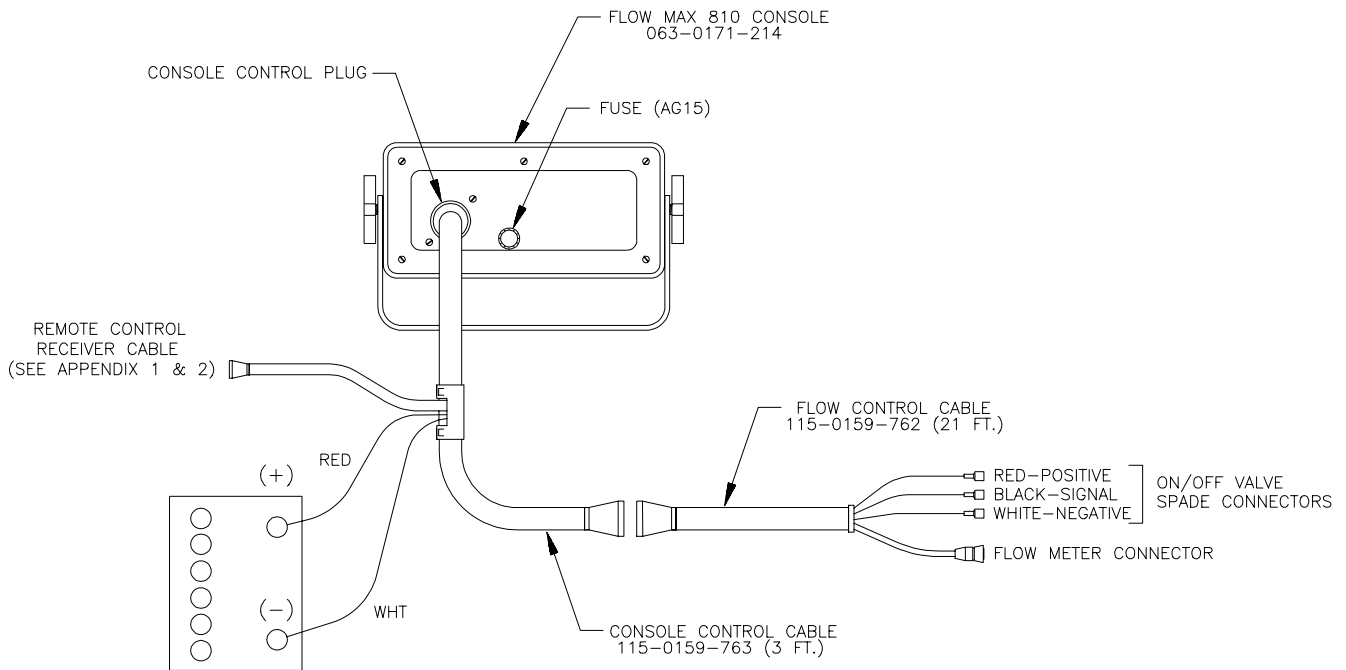
**NOTE:** It is essential, when using suspensions, that the system be thoroughly flushed each day after use. Failure to do so may cause system to malfunction.

## 2. MOUNTING THE ON/OFF VALVE

- 1) Mount the On/Off Valve in the main hose line between the Flow Meter and the outlet.
- 2) Connect the Flow Control Cable connectors to On/Off Valve and Flow Meter.

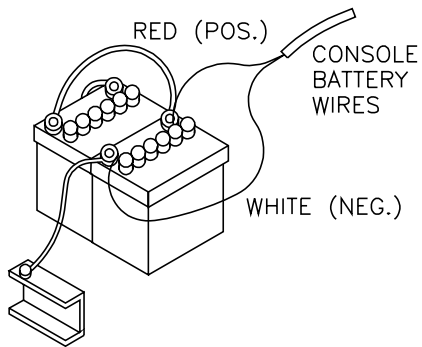
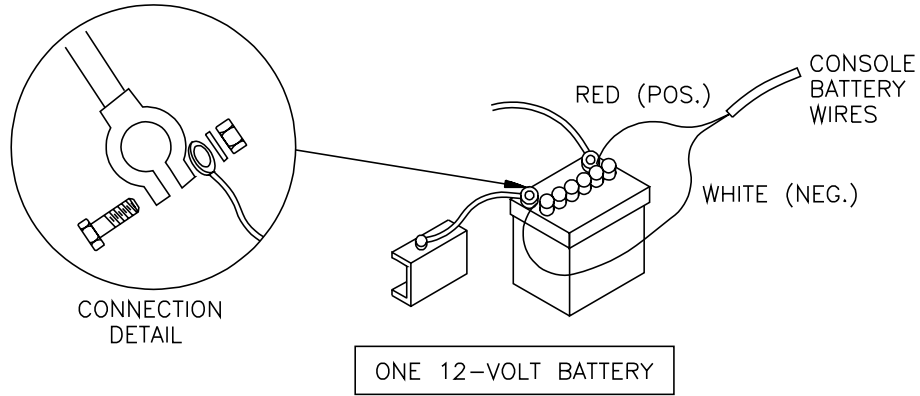
### 3. MOUNTING THE CONSOLE AND CABLING

- 1) Mount the Console to a secure support on the vehicle.
- 2) Connect the Console Control Cable to the plug in the back of the Console. Route the Flow Control Cable out of the vehicle cab. (Extension cables are available from your Dealer).
- 3) Turn POWER switch OFF and route Red and White battery wires to a 12 volt battery. Attach White battery wire to the **NEGATIVE** (-) battery terminal, and the Red battery wire directly to the **POSITIVE** (+) battery terminal. See Figure 3 on page 6. **(DO NOT CONNECT RED AND WHITE WIRES TO THE STARTER)**. Secure the battery wires with plastic cable ties. **DO NOT** tie battery wires close to existing battery leads or any other electrical wiring.
- 4) Initial installation of the system is now complete.

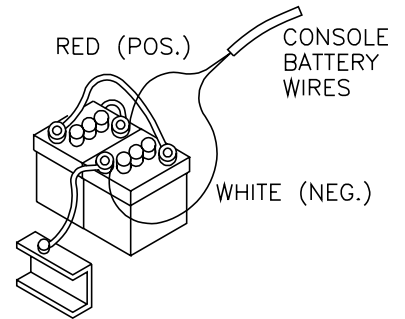


**FIGURE 2**

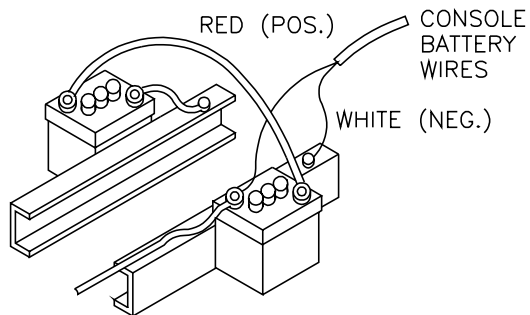
# BATTERY CONNECTIONS



24-VOLT SYSTEM USING TWO 12-VOLT BATTERIES



12-VOLT SYSTEM USING TWO 6-VOLT BATTERIES

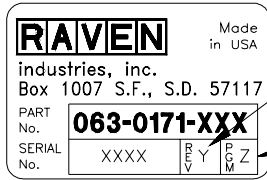


12-VOLT SYSTEM USING TWO 6-VOLT BATTERIES

FIGURE 3

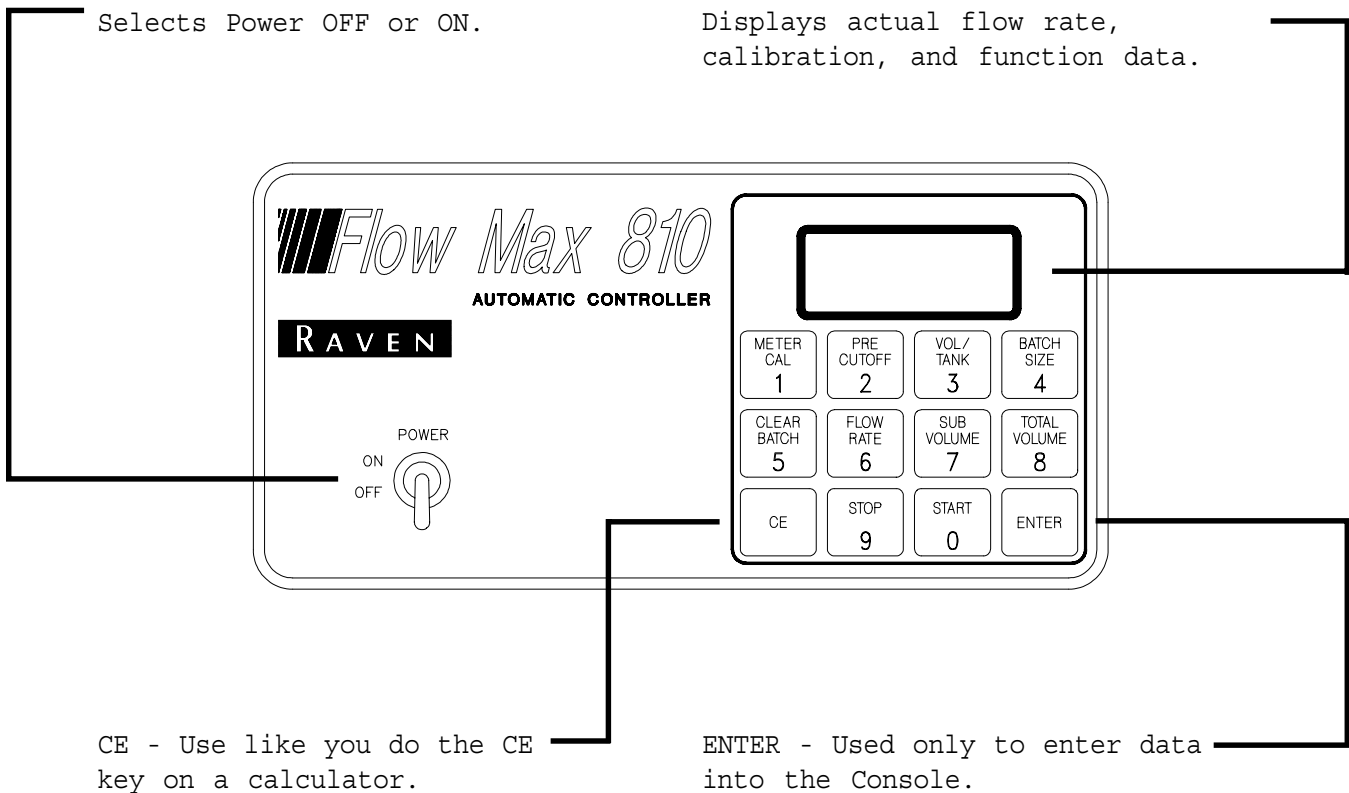
# CONSOLE FEATURES

**IMPORTANT:** This Console requires selection of the number of displayed decimal places for batch size (0,1,or 2).



Console Revision can be determined by letter stamped in REV box on label.

Console Program can be determined by letter stamped in PGM box on label.



CALIBRATION KEYS -- Used to enter data into the Console to calibrate the system.

- METER CAL -- Flow Meter Calibration Number
- PRE CUTOFF -- Volume before end of batch to start closing On/Off Valve. Determined by system.
- BATCH SIZE -- Volume to be Metered

FUNCTION KEYS -- Used to display data

- VOL/TANK -- Volume Remaining in Tank (You must enter starting volume)
- CLEAR BATCH -- Reset Batch Volume After Stopped
- FLOW RATE -- Actual Flow Rate
- SUB VOLUME -- Sub Volume Metered
- TOTAL VOLUME -- Total Volume Metered
- STOP -- Stop or Pause Batch
- START -- Start and Re-start Batch



# CONSOLE CALIBRATION

## 1. CALCULATING "METER CAL"

The Flow Meter calibration number is stamped on the label attached to each Flow Meter. This number is to be used for gallons [liters].

To convert original METER CAL from gallons to desired units of measure (oz. or lbs.), see METER CAL CONVERSIONS on page 2. Write down this number for future reference when programming the Console.

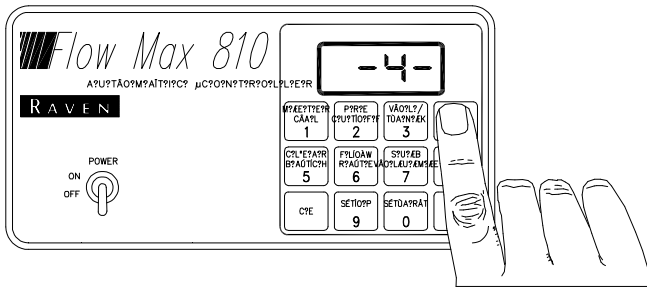
### **VERIFYING FLOW RATE LIMITS:**

The gallons per minute (GPM) (liter per minute [lit/min]) flow rate of the system must be within the range of that specified for the Flow Meter included.

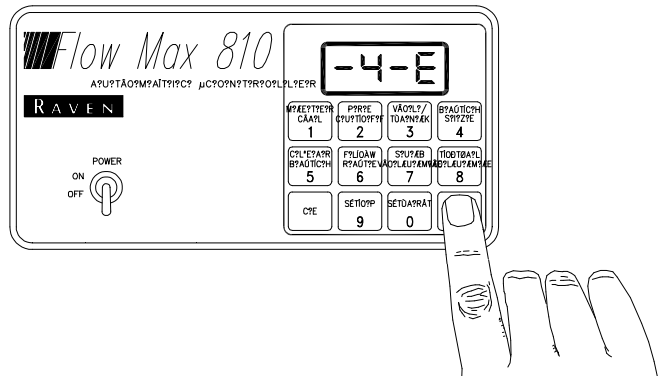
<u>FLOW METER MODEL</u>	<u>FLOW RANGE</u>
RFM 5	0.05-5 GPM [0.2-18.9 lit/min]
RFM 15	0.3-15 GPM [1.1-56.8 lit/min]
RFM 55/55A	1-55 GPM [3.8-208 lit/min]
RFM 100	3-100 GPM [11.4-379 lit/min]
RFM 200/200 Poly	15-200 GPM [56.8-757 lit/min]
RFM 400	25-400 GPM [94.6-1514 lit/min]

# CONSOLE PROGRAMMING

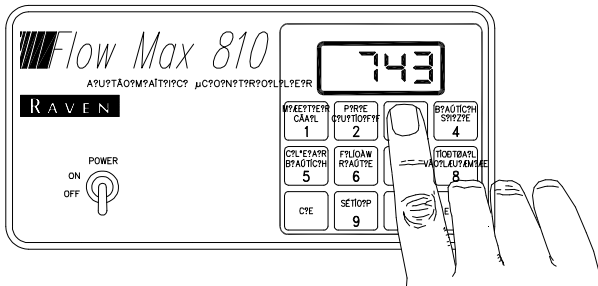
When entering data into the Console, the entry sequence is always the same. (NOTE: DATA MUST BE ENTERED INTO KEYS 1, 2, AND 4).



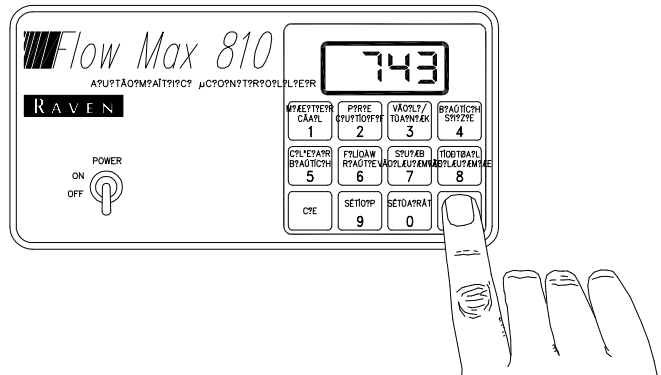
Depress the key in which you wish to enter data.



Depress the ENTER key. An "E" will illuminate in the DATA display.



Depress the keys corresponding to the number you wish to enter (i.e. "7", "4", "3"). The numbers will be displayed as they are entered.



Complete the entry by again depressing the ENTER key.

# 1. INITIAL CONSOLE PROGRAMMING

When you first turn on Console power, after all installation procedures have been completed, the Console will display -0-d in the display window. This means you must "calibrate", or program, the Console before it can be operated. This is a one-time operation which does not have to be repeated. Turning OFF the POWER switch does not affect the Console memory. All data is retained.

**IMPORTANT:** If an entry selection error is made during Steps 1 & 2, place the POWER switch to OFF. Depress  key and hold while placing the POWER switch to ON. This will "reset" the Console. The Display will now show -0-d. The following Steps must be followed:

**1)** Display -0-d (no decimal place), -1-d (one decimal place), or -2-d (two decimal places).

a) Depressing momentarily  steps the DATA display from -0-d to -1-d.

b) Depressing momentarily  steps the DATA display from -1-d to -2-d.

c) Depressing momentarily  steps the DATA display from -2-d to -0-d.

**2)** Enter METER CAL calibration number in key labelled:

**3)** Enter PRE CUTOFF calibration number in key labelled: number is determined, see page 13.

Enter "0" until

**4)** Enter desired BATCH SIZE in key labelled:

**YOU HAVE NOW COMPLETED PROGRAMMING THE CONSOLE**

You may also wish to enter data in the key labelled:

Although it is not required for the operation of the system.

**5)** Enter the estimated total VOLUME IN TANK when you start operating the system

in key labelled:

Each time the tank is refilled, this number must be re-entered. To display VOLUME

IN TANK, momentarily depress key labelled:

## 2. OTHER DISPLAYS & FUNCTIONS

**1)** To display actual FLOW RATE, momentarily depress key labelled:



**2)** To display SUB VOLUME metered, momentarily depress key labelled:



To "zero out" this total at any time, enter a "0" in this key.

**3)** To display TOTAL VOLUME metered, momentarily depress key labelled:



To "zero out" this total at any time, enter a "0" in this key.

**4)** To START a batch (open On/Off Valve), or re-start a batch after stopping, momentarily depress key labelled:



**5)** To STOP or pause a batch (close On/Off Valve), momentarily depress key labelled:



**6)** To CLEAR BATCH (re-set to full batch volume) after stopping a batch, momentarily depress key labelled:



**7)** To display the decreasing BATCH SIZE while metering out a batch, momentarily depress key labelled:





# INITIAL SYSTEM SET-UP & TEST

- 1) Fill tank with water only. (If positive displacement type pump is used, fully open pressure relief valve, PRV).
- 2) Place POWER ON/OFF switch to ON.
- 3) Verify correct METER CAL, PRE CUTOFF, and BATCH SIZE.
- 4) Run pump at normal operating RPM.
- 5) If centrifugal pump is used, proceed to Step 6. If positive displacement type pump is used, set pressure relief valve (PRV) to desired pressure.
- 6) Adjust agitator line hand valve for desired agitation. Verify desired pressure is still present.
- 7) Depress START key to begin a batch. Verify On/Off Valve opens and FLOW RATE is registered.
- 8) After batch is completed, verify correct batch volume.

## CALCULATING "PRE CUTOFF"

Complete INITIAL CONSOLE PROGRAMMING before doing this procedure. If the Flow Meter is not new or its calibration has not been checked recently, verify the calibration number before doing this procedure. (See Appendix 5, Step 8).

The PRE CUTOFF number tells the On/Off Valve at what volume, before the end of the batch, to begin closing. This number is required to ensure metering out the exact batch size. The PRE CUTOFF number will depend on your On/Off Valve, system set-up, and operating pressure. The following procedure can be used to determine the PRE CUTOFF number.

- 1) Fill tank with water.
- 2) Run pump at desired RPM and pressure to be used when metering batches.
- 3) Enter a BATCH SIZE large enough to allow the valve to reach full open, otherwise the actual batch size to be metered.
- 4) Meter out a sample batch by depressing key labelled: 
- 5) While valve is fully open, depress key labelled  and write down the displayed flow rate.
- 6) Time how long the valve takes to close. (Cont. on next page).

7) Determine the PRE CUTOFF number as follows:

**EXAMPLE:** Flow Rate = 15 GPM  
Valve Time to Close = 2 seconds

$$\text{PRE CUTOFF} = \frac{\text{Flow Rate} \times \text{Valve Time to Close}}{60}$$
$$= \frac{15 \times 2}{60} = 0.5 \text{ gallons}$$

8) Enter this number in key labelled:

PRE  
CUTOFF  
2

9) Perform a catch test in a calibrated container. If the measured batch volume is more than 3% different than the programmed BATCH SIZE, adjust the PRE CUTOFF number accordingly and perform another catch test.

This PRE CUTOFF number does not need to be changed for any changes in BATCH SIZE when the system pressure and pump RPM does not change. For significant pressure or RPM changes, re-do Step 9 to correct the PRE CUTOFF number.

## PREVENTIVE MAINTENANCE

Preventive maintenance is most important to assure long life of the FLOW MAX 810 System. The following maintenance procedures should be followed on a regular basis:

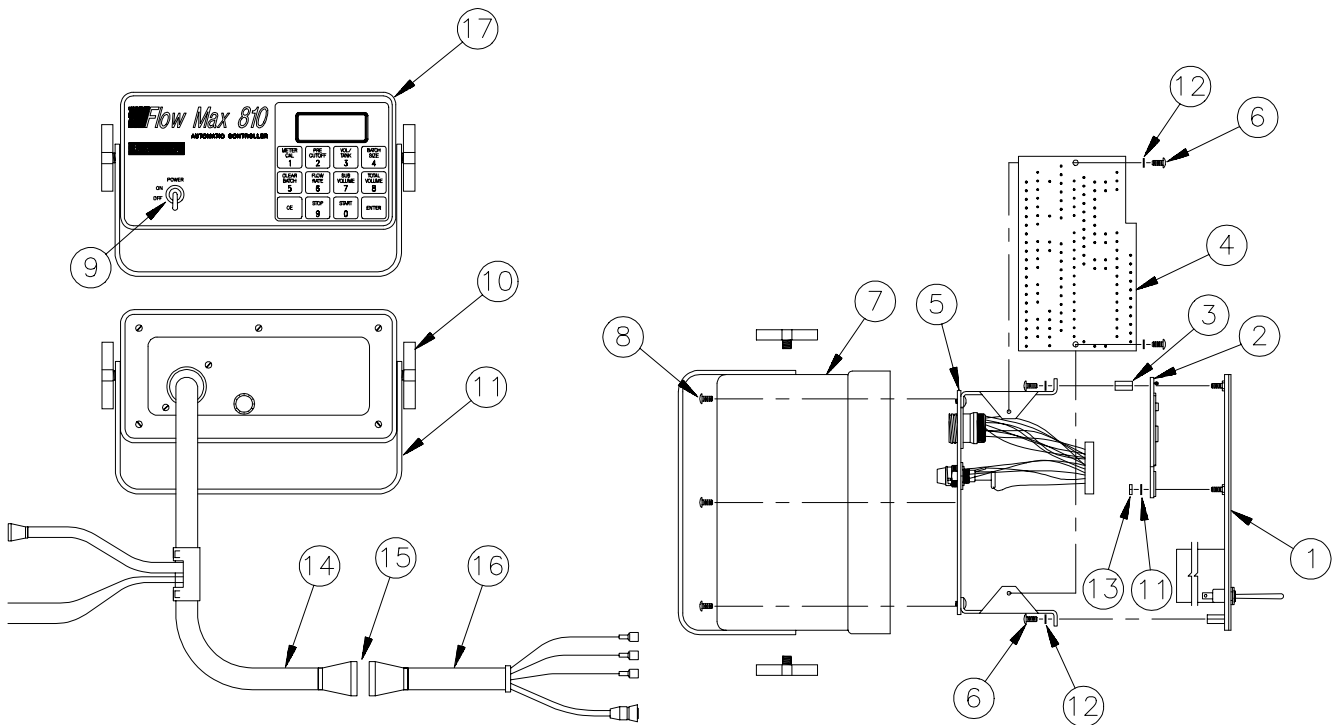
- 1) Flush entire system with water after use of suspension type chemicals. Failure to clean system can result in crystallization of chemicals which may plug the Flow Meter, lines, and/or valves.
- 2) Flush and drain system before storing. **FREEZING TEMPERATURES MAY DAMAGE FLOW METER IF WATER IS NOT DRAINED.**
- 3) Remove Flow Meter at the end of each season. Clean Flow Meter turbine and inlet hub. Clean off all metal filings and wetttable powders which have hardened on the plastic and metal parts. Check the inlet hub and turbine assembly for worn or damaged turbine blades and bearings. Flush Flow Meter with clear water and drain.

**KEEP FROM FREEZING**

- 4) Remove Console when not in use for extended periods.

# FLOW MAX 810 REPLACEMENT PARTS

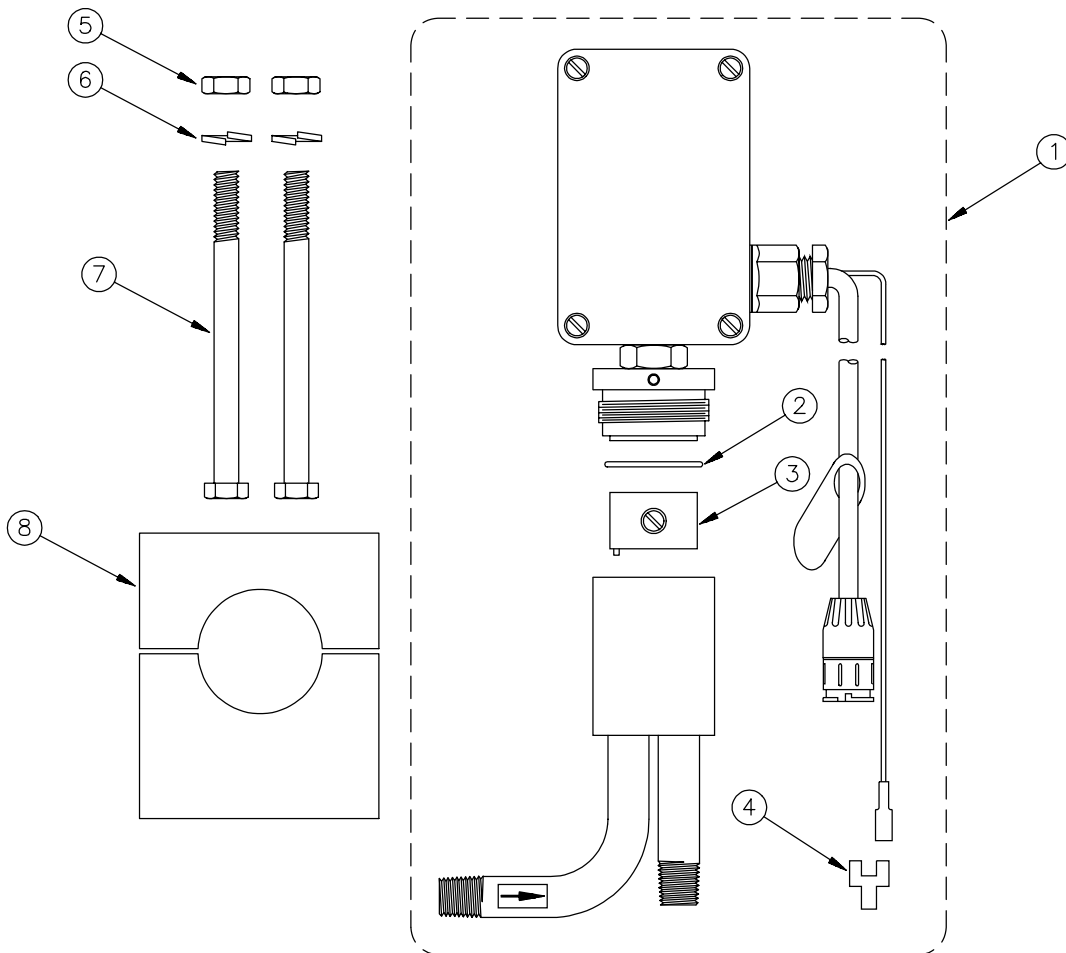
ITEM	DESCRIPTION	RAVEN PART #
1	Faceplate Assembly	063-0171-215
2	Display P.C. Assembly	064-0159-535
3	Spacer, Threaded	305-2540-625
4	Processor P.C. Assembly	064-0159-558
5	Connector Plate Assembly	063-0171-217
6	Screw, 6-32 UNC x 5/16 in.	311-0004-008
7	Enclosure, With Inserts	063-0171-135
8	Screw, 6-32 UNC	321-0000-085
9	Master Switch	412-2011-037
10	Knob	309-1000-006
11	Mounting Bracket	107-0159-007
12	Washer, Lock Internal	313-3000-007
13	Hex Nut	312-1001-014
14	Console Cable (3 ft.) (Optional)	115-0159-763
15	Extension Cable (10 ft.) (Optional) (Not Shown)	115-0159-764
16	Flow Control Cable (21 ft.) (Optional)	115-0159-762
17	810 Console	063-0171-214



# RFM 5 FLOW METER REPLACEMENT PARTS

063-0159-470

ITEM	DESCRIPTION	RAVEN PART #
1	RFM 5 Transmitter Assembly	063-0159-469
2	O-Ring, Viton	219-0002-026
3	Turbine/Bearing	321-0000-201
4	Terminal Tab	405-2001-028
5	5/16" Nut	312-1001-034
6	5/16" Lock Washer	313-1000-019
7	5/16" Bolt	311-0052-609
8	Pipe Clamp	107-0159-681

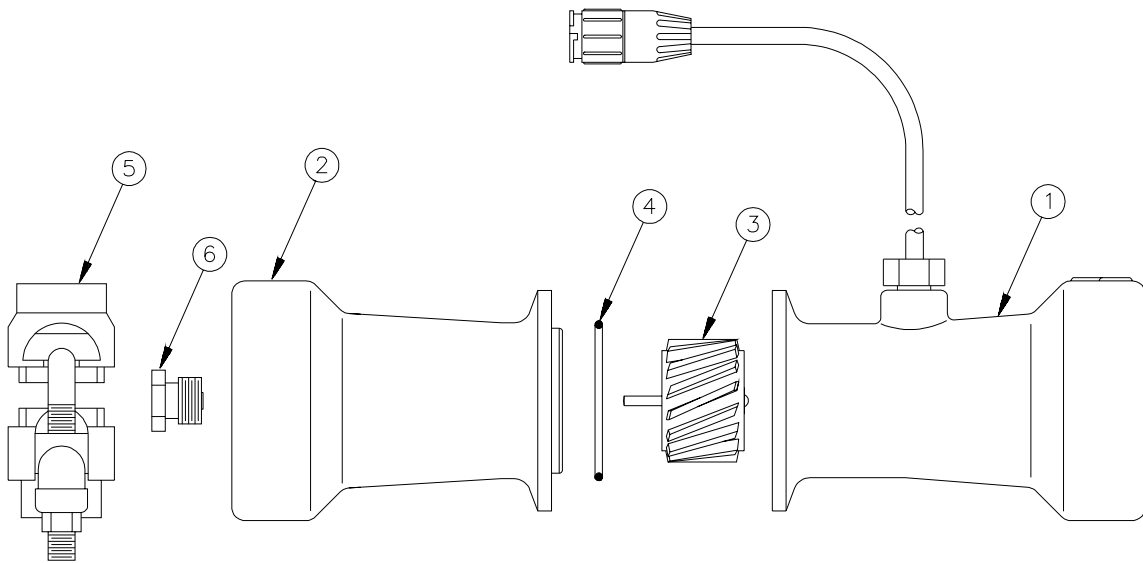




# RFM 15 FLOW METER REPLACEMENT PARTS

063-0171-121

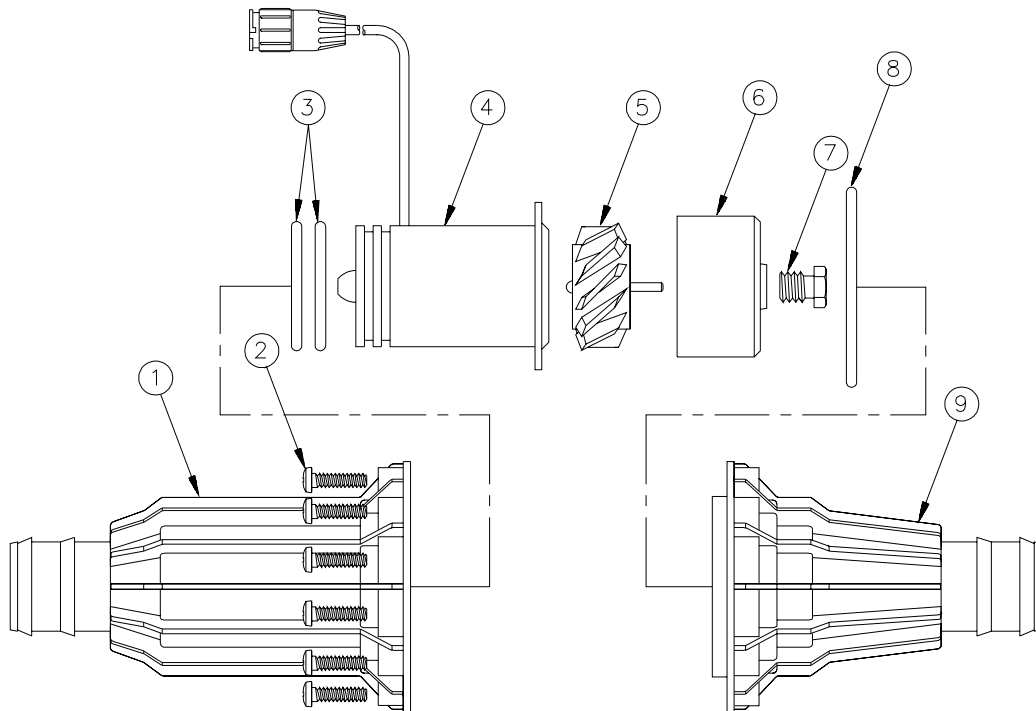
ITEM	DESCRIPTION	RAVEN PART #
1	Housing, Sensor Assembly, RFM 15	063-0171-123
2	Housing, Inlet Assembly, RFM 15	063-0171-122
3	Turbine, RFM 15	019-0159-164
4	O-Ring, Viton	219-0002-028
5	Clamp, V-Band Retainer	435-3003-033
6	Stud, Bearing	063-0159-570



# RFM 55 FLOW METER REPLACEMENT PARTS

063-0159-571

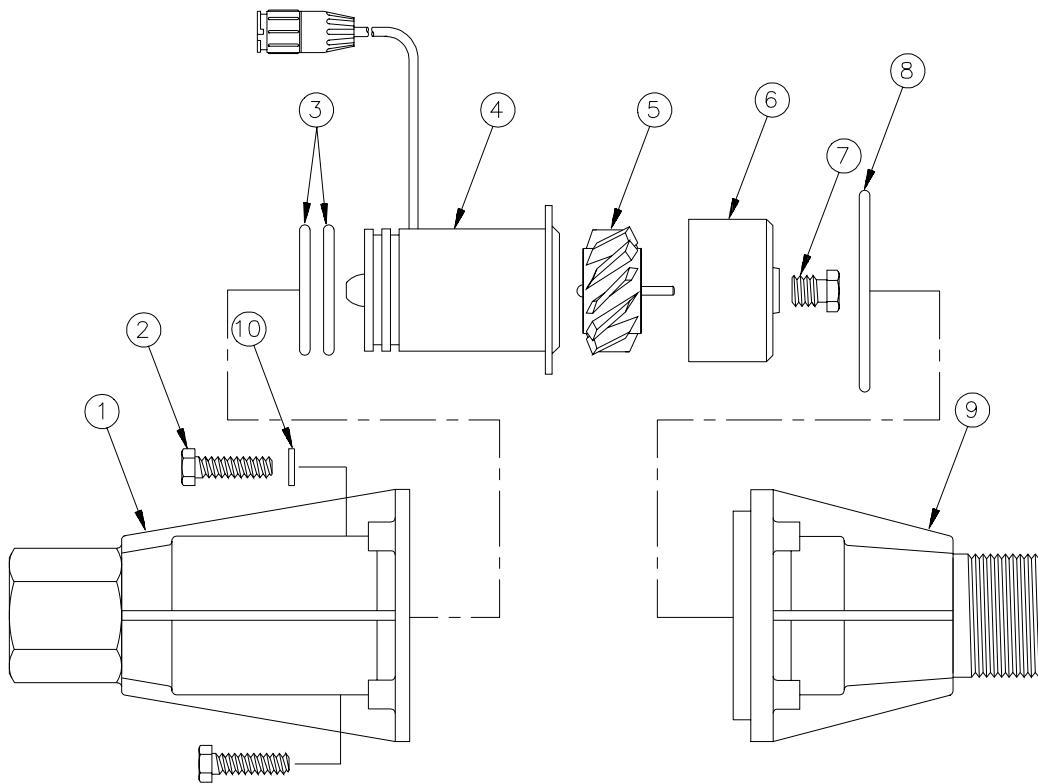
ITEM	DESCRIPTION	RAVEN PART #
1	Sensor Housing	019-0159-085
2	#10-32 x 3/4" S.S. Screw	311-0007-037
3	O-Ring, Viton	219-0002-030
4	RFM 55 Dual O-Ring XDCR Assembly	063-0159-749
5	RFM 55 Turbine	117-0159-020
6	Turbine Hub/Bearing Assembly	063-0359-563
7	Turbine Stud Assembly	063-0159-570
8	O-Ring, Viton	219-0000-042
9	Hub Housing w/Inserts	063-0159-776
10	Mounting Bracket, RFM 55 (Not Shown)	107-0159-507
**	Dual O-Ring Transducer Kit (Includes Items #3 & 4)	117-0159-569



# RFM 55A FLOW METER REPLACEMENT PARTS

063-0159-572

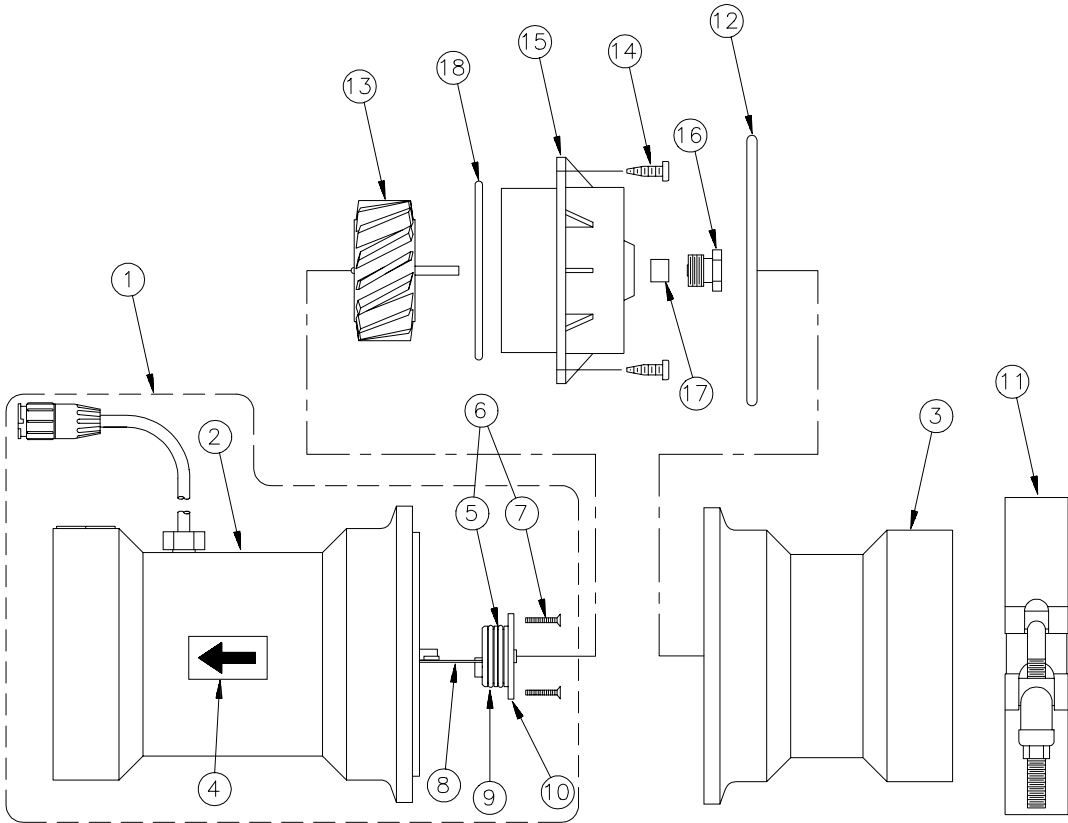
ITEM	DESCRIPTION	RAVEN PART #
1	Sensor Housing	105-0159-002
2	1/4-20 x 1 1/4" Bolt	311-0050-231
3	O-Ring, Viton (For Chemical)	219-0002-030
	O-Ring, Butyl (For NH3)	219-0006-030
4	RFM 55 Dual O-Ring XDCR Assembly	063-0159-749
5	RFM 55 Turbine	117-0159-020
6	Turbine Hub/Bearing Assembly	063-0359-563
7	Turbine Stud Assembly	063-0159-570
8	O-Ring, Viton	219-0000-042
9	Hub Housing	105-0159-001
10	1/4" Spring Washer	313-2400-001
11	Mounting Bracket, RFM 55(Not Shown)	107-0159-507
**	Dual O-Ring Transducer Kit (Includes Items #3 & 4)	117-0159-545



# RFM 100 POLY FLOW METER REPLACEMENT PARTS

063-0171-066

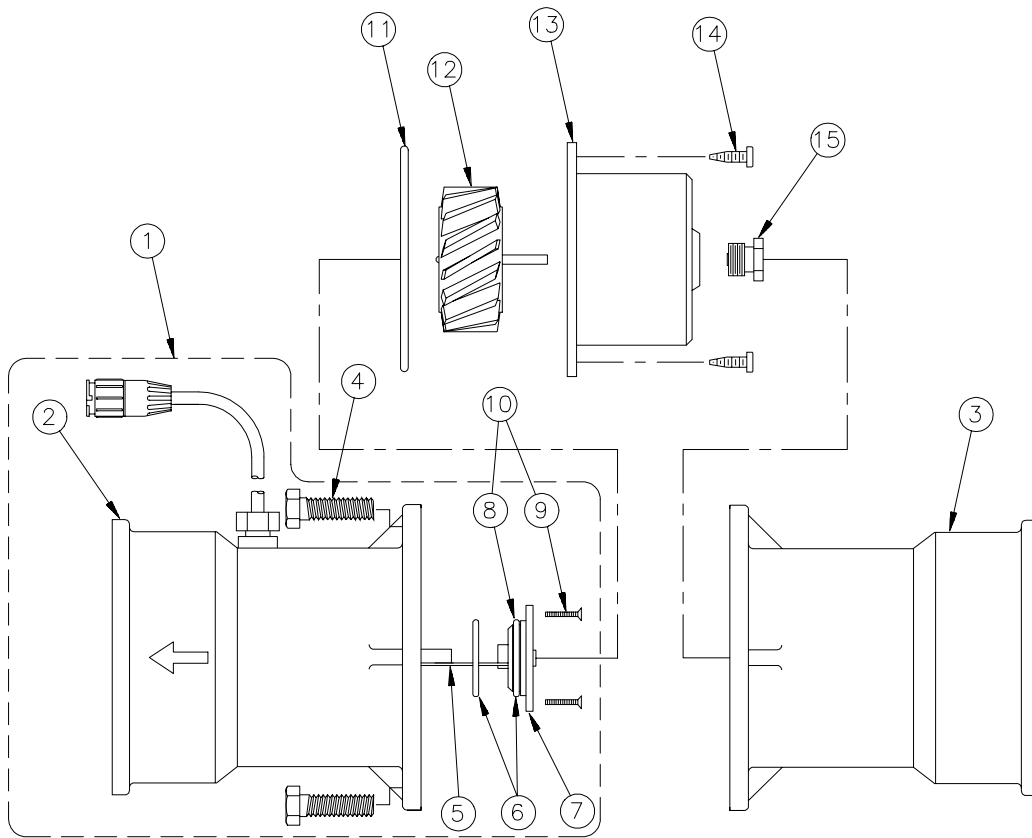
ITEM	DESCRIPTION	RAVEN PART #
1	Outlet Housing Assembly	063-0171-068
2	Outlet Housing	107-0171-006
3	Hub Housing, Inlet	107-0171-005
4	Label, Yellow w/Black Arrow	039-0159-023
5	End Bearing/P.C. Assembly	063-0171-069
6	End Bearing/P.C. Assembly Kit	117-0159-567
7	2-56 x 1/2" Flat Hd. S.S. Screw	311-0013-390
8	P.C. Assembly	064-0159-913
9	O-Ring, Viton	219-0000-018
10	End Bearing Assembly	063-0171-067
11	Retaining Clamp	435-3003-032
12	O-Ring, Viton	219-0000-238
13	RFM 100 Turbine	321-0000-221
14	6-20 x 1/2" Pan Hd. S.S. Screw	310-0002-133
15	Turbine Hub/Bearing Assembly	321-0000-222
16	Turbine Stud Assembly	063-0171-082
17	Carbon Bushing	325-0000-003
18	O-Ring, Viton	219-0002-140
19	Thread Sealer (Not Shown)	222-1001-016
20	Mounting Bracket, RFM 100 (Not Shown)	107-0159-509
21	Hose Clamp (Not Shown)	435-3003-009
22	Cable Kit (Not Shown)	117-0159-441



# RFM 200 FLOW METER REPLACEMENT PARTS

063-0159-574

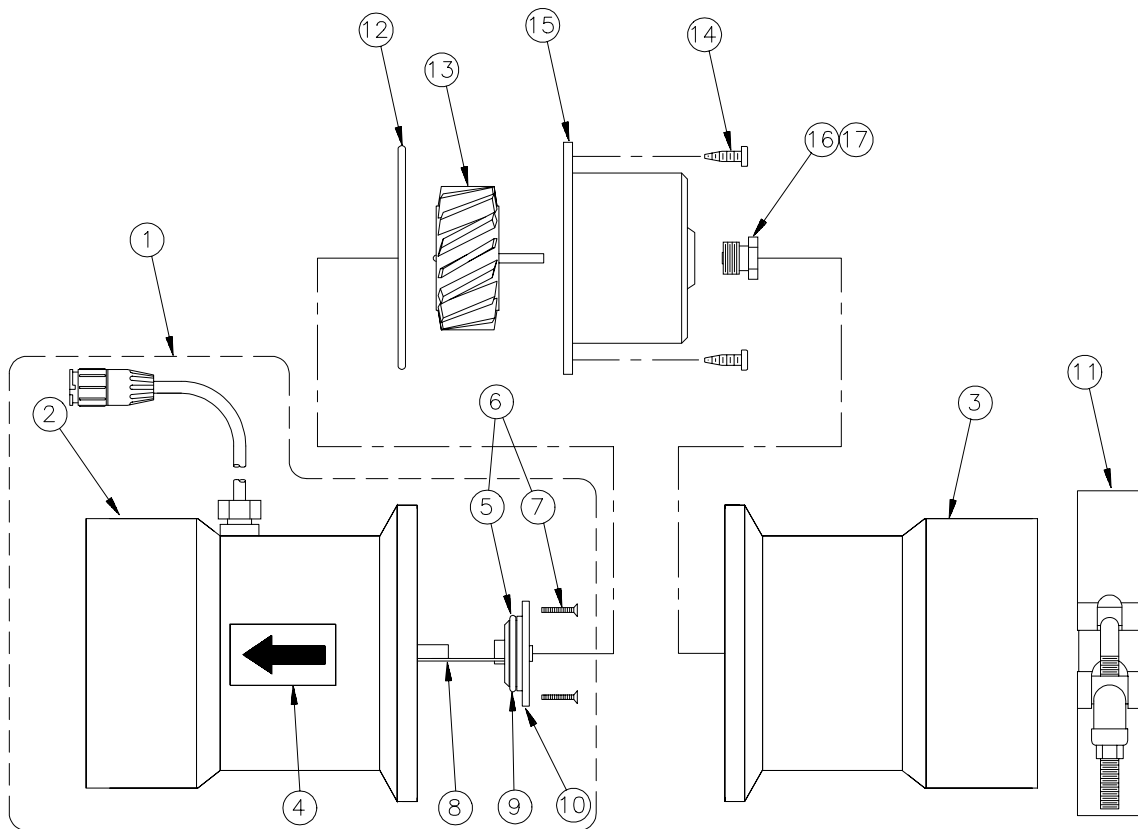
ITEM	DESCRIPTION	RAVEN PART #
1	Sensor Housing Assembly	063-0159-573
2	Sensor Housing	105-0159-004
3	Hub Housing	105-0159-003
4	1/4-20 x 1" Bolt	311-0050-230
5	P.C. Assembly	064-0159-447
6	O-Ring, Viton	219-0000-040
7	End Bearing Assembly	063-0159-591
8	End Bearing/P.C. Assembly	063-0159-646
9	2-56 x 5/16" Stainless Steel Screw	311-0011-030
10	End Bearing/P.C. Assembly Kit	117-0159-428
11	O-Ring, Viton	219-0000-052
	O-Ring, Butyl	219-0000-051
12	RFM 200 Turbine	117-0159-017
13	Turbine Hub/Bearing Assembly	063-0159-564
15	Stud W/Bearing	063-0159-575
16	Cable Kit (Not Shown)	117-0159-441
17	Thread Sealer (Not Shown)	222-1001-016
18	Mounting Bracket, RFM 200 (Not Shown)	107-0159-509
19	Hose Clamp (Not Shown)	435-3003-009



# RFM 200 POLY FLOW METER REPLACEMENT PARTS

063-0159-751

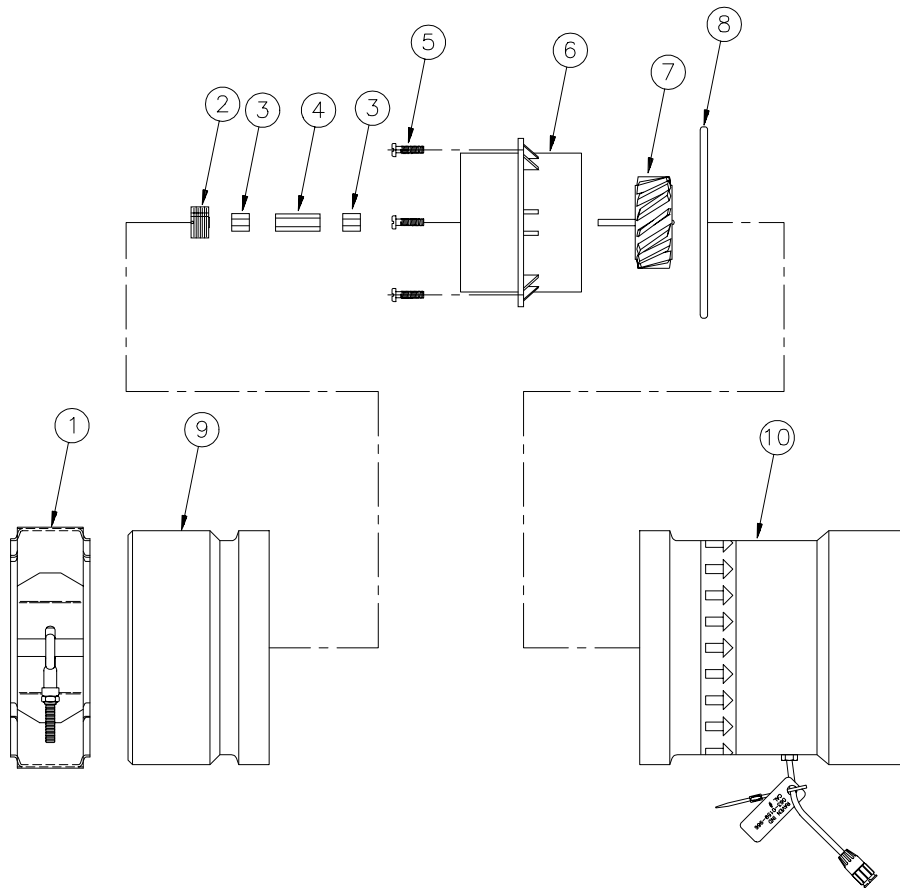
ITEM	DESCRIPTION	RAVEN PART #
1	Sensor Housing Assembly	063-0159-750
2	Sensor Housing	107-0159-617
3	Hub Housing	107-0159-618
4	Label, Yellow w/Black Arrow	039-0159-023
5	End Bearing/P.C. Assembly	063-0159-646
6	End Bearing/P.C. Assembly Kit	117-0159-428
7	2-56 x 1/2" Flat Hd. Screw	311-0013-390
8	P.C. Assembly	064-0159-447
9	O-Ring, Viton	219-0000-040
10	End Bearing Assembly	063-0159-591
11	Retainer Clamp	435-3003-031
12	O-Ring, Viton	219-0000-052
13	RFM 200 Turbine	117-0159-017
14	4-20 x 1/2" Pan Hd. Screw	311-0008-027
15	Turbine Hub/Bearing Assembly	063-0159-564
16	Turbine Stud Assembly w/Bearing	063-0159-575
17	Thread Sealer	222-1001-016
18	Mounting Bracket, RFM 200 (Not Shown)	107-0159-509
19	Hose Clamp (Not Shown)	435-3003-009
20	Cable Kit (Not Shown)	117-0159-441



# RFM 400 FLOW METER REPLACEMENT PARTS

063-0159-966

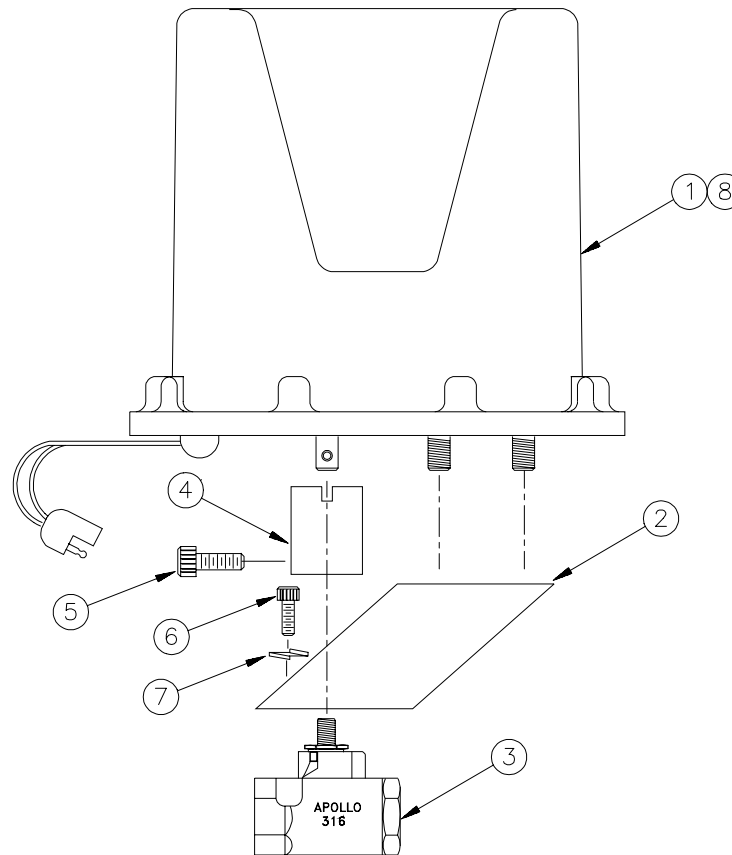
ITEM	DESCRIPTION	RAVEN PART #
1	Clamp, V-Band	435-3003-034
2	Stud/Bearing Assembly	063-0159-975
3	Bushing	325-0000-013
4	Spacer	107-0159-863
5	10-32 x 5/16" Pan Hd. Screw	311-0002-043
6	Inlet Hub	321-0000-281
7	Rotor	321-0000-280
8	O-Ring, Viton	219-0002-355
9	Hub Housing, Inlet	107-0171-067
10	Hub Housing, Outlet	107-0171-066
11	Cable Kit (Not Shown)	117-0159-441
12	Flat Head S.S. Screw (Not Shown)	311-0013-390



# 1/4" STAINLESS STEEL CONTROL VALVE REPLACEMENT PARTS

063-0159-808

ITEM	DESCRIPTION	RAVEN PART #
1	Motor Control Assembly	063-0159-619
2	Bracket	107-0159-668
3	Valve	443-0001-028
4	Coupler	107-0159-669
5	1/4-20 UNC x 1/2" Socket Hd. Cap Screw	311-0068-064
6	10-24 x 3/8" Socket Hd. Cap Screw	311-0068-047
7	#10 Lock Washer	313-1000-041
8	Cover (Blue)	106-0159-444
9	Polarity Reversal Jumper (Not Shown)	115-0159-415

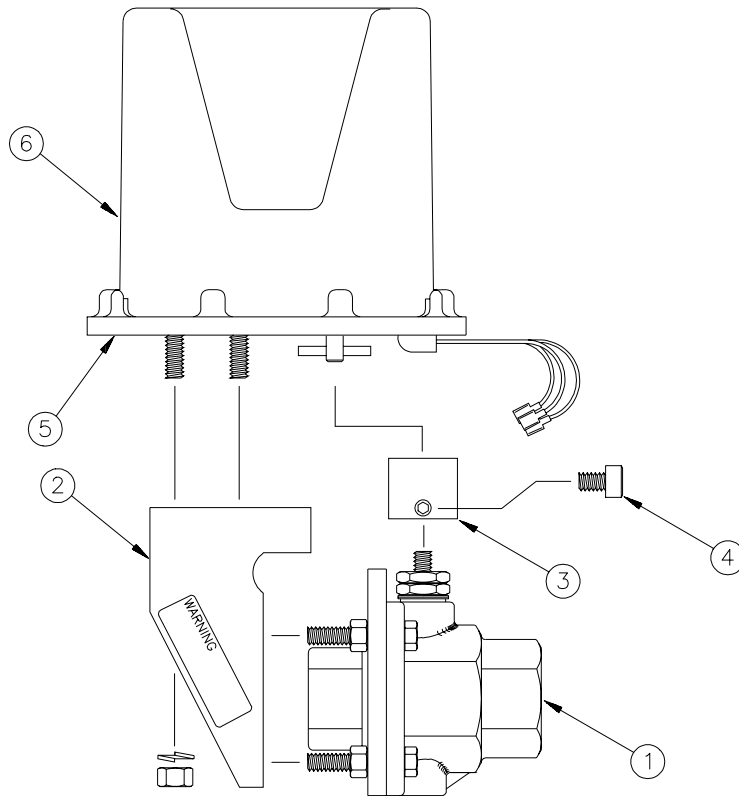




# 1" ON/OFF VALVE REPLACEMENT PARTS

063-0159-500

ITEM	DESCRIPTION	RAVEN PART #
1	1" Ball Valve	334-0001-010
2	Valve Bracket	107-0159-474
3	Coupler	107-0159-608
4	1/4-20 x 1/2" Cap Screw	311-0068-064
5	On/Off Valve Motor Control Assembly (Includes Cover)	063-0159-487
6	Cover (Black)	106-0159-426
7	Kit On/Off Valve Cable	117-0159-410
8	Wiring Kit (Not Shown)	117-0159-423

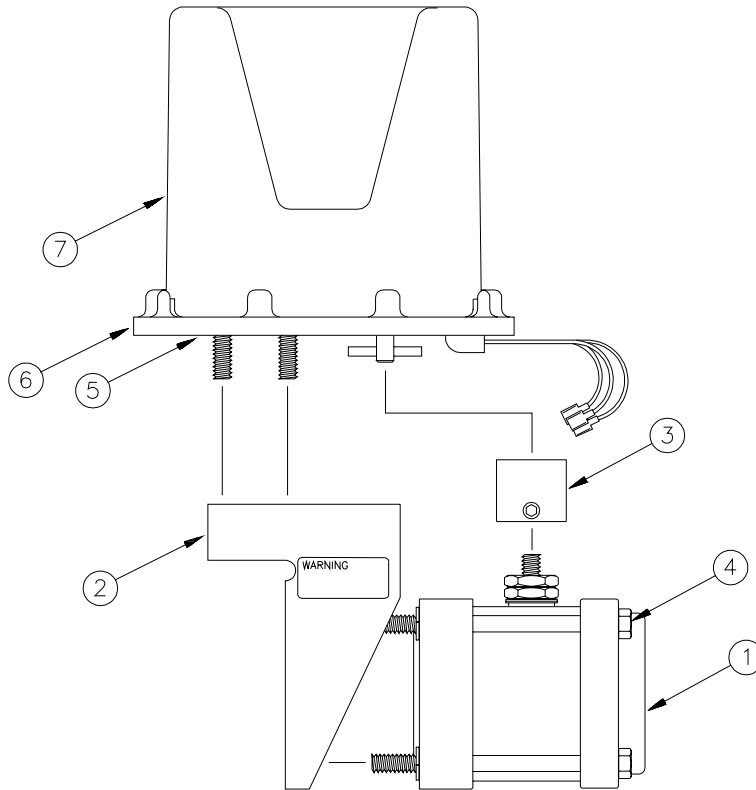


# 1 1/2" AND 2" POLY ON/OFF BALL VALVE REPLACEMENT PARTS

063-0159-503

063-0159-504

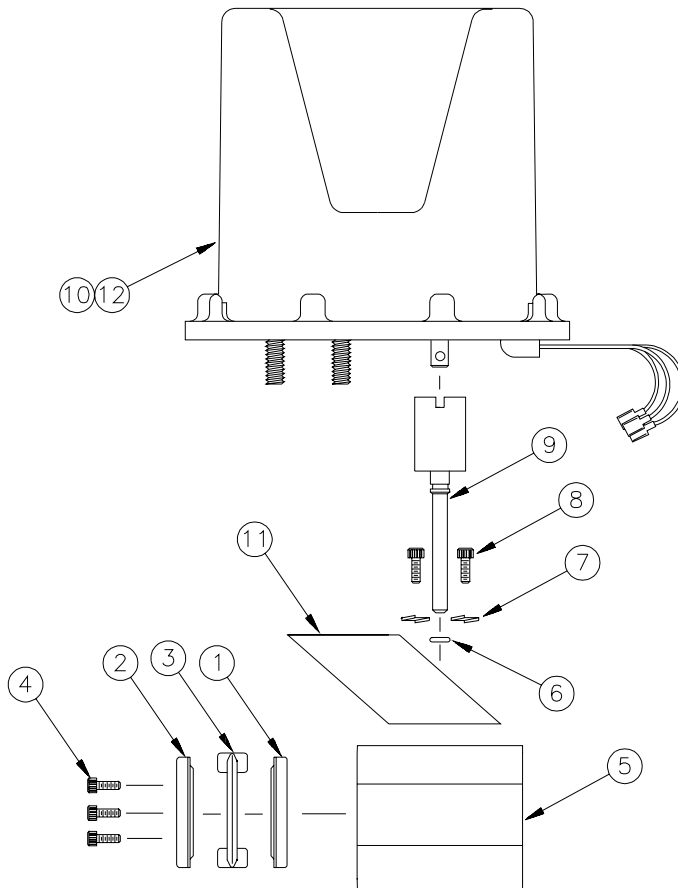
ITEM	DESCRIPTION	RAVEN PART #
1	1 1/2" Ball Valve	063-0159-586
	2" Ball Valve	063-0159-587
2	Valve Bracket	107-0159-477
3	Valve Coupler	107-0159-609
4	3/8-16 x 1/2" Bolt	019-0159-037
5	5/16" I.D. O-Ring	219-0001-010
6	On/Off Valve Motor Control Assembly (Includes Cover)	063-0159-487
7	Cover (Black)	106-0159-426
8	Wire/Switch Accessory Kit (Available)	117-0159-411
9	Seal/Packing Kit (Available)	117-0159-412



# 2" STAINLESS STEEL ON/OFF BUTTERFLY VALVE REPLACEMENT PARTS

063-0159-506

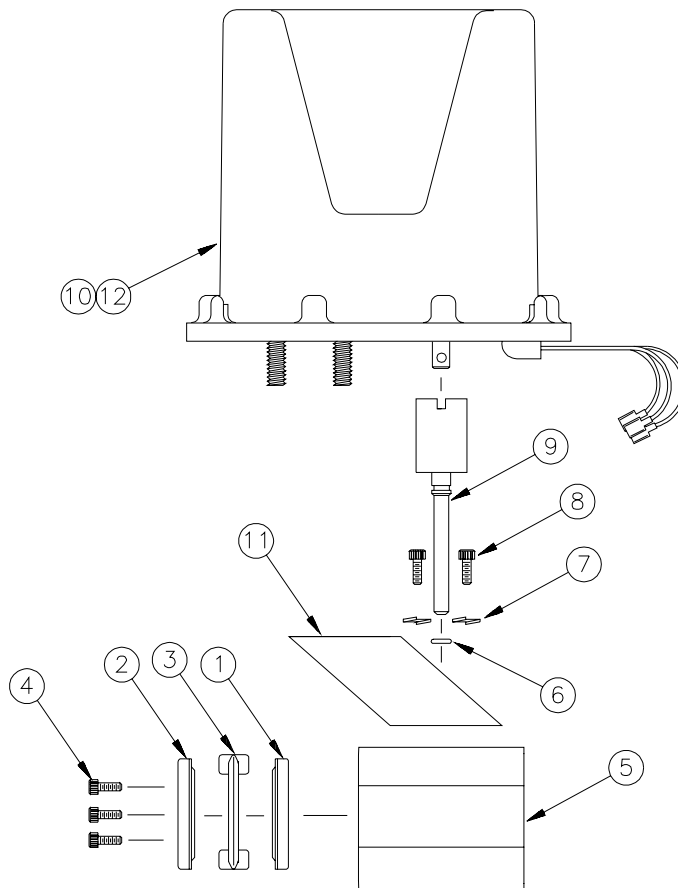
ITEM	DESCRIPTION	RAVEN PART #
1	Butterfly Half (Tapped)	107-0159-649
2	Butterfly Half (Counter Bored)	107-0159-665
3	Seal	219-0000-068
4	#8-32 x 1/2" Cap Screw	311-0068-176
5	Valve Body	063-0159-799
6	O-Ring, Viton	219-0000-026
7	#10 Lock Washer	313-1000-036
8	#10-32 x 3/8" Cap Screw	311-0068-177
9	Stem	107-0159-648
10	Motor Assembly	063-0159-487
11	Bracket	107-0159-666
12	Cover (Black)	106-0159-426



# 3" STAINLESS STEEL ON/OFF BUTTERFLY VALVE REPLACEMENT PARTS

063-0159-984

ITEM	DESCRIPTION	RAVEN PART #
1	Butterfly Half (Tapped)	107-0159-701
2	Butterfly Half (Counter Bored)	107-0159-700
3	Seal	219-0000-068
4	#8-32 x 1/2" Cap Screw	311-0068-176
5	Valve Body	063-0159-703
6	O-Ring, Viton	219-0000-026
7	#10 Lock Washer	313-1000-036
8	#10-32 x 3/8" Cap Screw	311-0068-177
9	Stem	107-0159-702
10	Motor Assembly	063-0159-487
11	Bracket	107-0159-666
12	Cover (Black)	106-0159-426



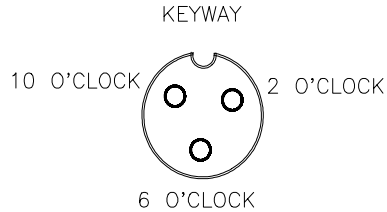




# APPENDIX 1

## PROCEDURE TO TEST FLOW METER CABLES

Disconnect cable from Flow Sensor. Hold Flow Sensor cable so that the keyway is pointing in the 12 o'clock position:



- 1) 2 o'clock socket is ground.
- 2) 10 o'clock socket is power.
- 3) 6 o'clock socket is signal.

### VOLTAGE READINGS

- 1) 2 o'clock to 6 o'clock (+5 VDC).
- 2) 2 o'clock to 10 o'clock (+5 VDC).

Procedure to check cable:

**1)** Place POWER switch ON.

**2)** Enter a METER CAL number of one (1) in key labelled:

METER  
CAL  
1

**3)** Depress key labelled:

START  
0

**4)** Depress key labelled:

TOTAL  
VOLUME  
8

**5)** With small jumper wire (or paper clip), short between 2 o'clock and 6 o'clock sockets with a "short-no short" motion. Each time a contact is made, the TOTAL VOLUME should increment up 1 or more counts.

**6)** If TOTAL VOLUME does not count up, perform step 7.

**7)** Perform above voltage checks.

**8)** If all cables test good, replace Flow Sensor.

**NOTE:** After testing is complete, re-enter correct METER CAL numbers before metering.

## APPENDIX 2

# FLOW METER MAINTENANCE AND ADJUSTMENT PROCEDURE

- 1)** Remove Flow Meter from equipment and flush with clean water to remove any chemicals.
- 2)** Remove flange bolts or flange clamp from the Flow Meter.
- 3)** Remove the turbine hub and turbine from inside Flow Meter.
- 4)** Clean turbine and turbine hub of metal filings and any other foreign material, such as wettable powders. Confirm that the turbine blades are not worn. Hold turbine and turbine hub in your hand and spin turbine. It should spin freely with very little drag.
- 5)** If transducer (XDCR) assembly is replaced or if turbine stud is adjusted or replaced, verify the turbine fit before reassembling. Hold turbine hub with turbine on transducer. Spin turbine by blowing on it. Tighten turbine stud until turbine stalls. Loosen turbine stud 1/3 turn. The turbine should spin freely.
- 6)** Re-assemble Flow Meter.
- 7)** Using a low pressure (5 psi [34.5 kPa]) jet of air, verify the turbine spins freely. If there is drag, loosen hex stud on the bottom of turbine hub 1/16 turn until the turbine spins freely.



## APPENDIX 3

### PROCEDURE TO RE-CALIBRATE FLOW METER

- 1) Enter a METER CAL number of 10 [38] in the key labelled: METER  
CAL  
1
- 2) Enter a TOTAL VOLUME of 0 in key labelled: TOTAL  
VOLUME  
8
- 3) Enter a BATCH SIZE of 15 in key labelled: BATCH  
SIZE  
4
- 4) Remove outlet hose and place in calibrated 5 gallon container.
- 5) Push key labelled: START  
0 Pump exactly 10 gallons [38 liters].  
 Push key labelled: STOP  
9 Each time the 5 gallon container is filled.
- 6) Depress the key labelled: TOTAL  
VOLUME  
8 The number in the DATA display is the METER CAL number. **EXAMPLE:** If the data display reads 3600, you would enter 3600 as the METER CAL in the key labelled: METER  
CAL  
1
- 7) Repeat this procedure several times to confirm accuracy. (Always "zero out" the TOTAL VOLUME display before retesting).
- 8) To verify Flow Meter calibration, fill applicator tank with a predetermined amount of measured liquid. (i.e. 250 gallons). **DO NOT RELY ON GRADUATION NUMBERS MOLDED INTO APPLICATOR TANK.** Empty the applicator tank under normal operating conditions. If the number displayed under TOTAL VOLUME is different from the predetermined amount of measured liquid by more than +/- 3%, complete the following calculation.

**EXAMPLE:**

Old METER CAL	= 3500 [925]
TOTAL VOLUME amount (Console is displaying)	= 260 [983]
Predetermined amount of measured liquid	= 250 [945]

$$\begin{aligned}
 \text{Corrected METER CAL} &= \frac{\text{OLD METER CAL X TOTAL VOLUME amount}}{\text{Predetermined amount of measured liquid}} \\
 &= \frac{3500 \times 260}{250} = 3640 \qquad \frac{[925] \times [983]}{[945]} = [962]
 \end{aligned}$$

Corrected METER CAL = 3640 [962]