



*Proven Performance  
for Over 50 Years*

# **SERIES 12**

## **VARIABLE AREA FLOWMETERS**

### **INSTALLATION, OPERATION & SERVICE INSTRUCTIONS**



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## SECTION I

### USE AND MAINTENANCE

#### 1-1. PURPOSE.

1-2. The Series 12 flowmeter is an instrument for the accurate and continuous measurement of the rate of flow for liquids and gases at nominal pressures.

#### 1-3. MODELS.

1-4. The Series 12 flowmeter is available in three basic models; Model 124, Model 129 and Model 120. (Refer to Flowmeter Model Conversion Key, Page 9). Each model is available as a single stage or multi-stage flowmeter. Each stage consists of a matched tube and float with a calibrated scale and necessary mounting connections. A multi-stage flowmeter consists of two or more matched tubes and floats, normally of the same model together with scales and mounting connections, assembled into a steel shell.

1-5. Bypass valves are required for most multi-stage flowmeters to bypass the lower stages when operating in the higher flow ranges, thus maintaining a normal pressure drop over the entire flow range.

#### NOTE

On a maximum stage standard flowmeter of any model, the pressure drop through the flowmeter will not exceed 6 psig, except for flowmeters with bypass orifice sections where the pressure drop is approximately 8 psig.

#### 1-6. VARIATIONS WITHIN MODELS.

1-7. Multi-stage flowmeters usually consist of tubes of the basic model as in paragraph 1-4, but to meet certain requirements, some multi-stage flowmeters have been produced with intermixed size 40, 90, 100 and 140 tubes. Other requirements have resulted in incorporating size 60 tubes intermixed with one or more of the standard Series 12. To correctly identify any tube refer to the number etched near the top of the tube. This number consists of the flowmeter serial number, tube size, and model number. For example, 12001-47 indicates flowmeter serial number 12001-47 and tube size seven in the Model 124-300 group.

#### 1-8. Other variations within models are:

- a. Fluorescent backlighting for each and convenience in reading flow.

- b. Orifice valve and calibrated auxiliary bypass orifice to increase the capacity of a particular flowmeter.

#### 1-9. DESCRIPTION.

1-10. In multi-stage flowmeters the top of each glass tube is connected with the bottom of the next larger tube by a copper tube at the rear of the shell. This provides a continuous passage from inlet at the lower end of the first tube to the outlet at the top of the last tube (see fig. 3). Each tube is fitted with a metal float which positions itself in the tube according to the rate of flow. Since the pressure drop across the float is constant throughout the range of any particular tube, any change in rate of flow will result in a relocation of the float to a position where the annulus area is such as to maintain this constant pressure drop across the float. Since the tube is of an expanded taper, an increase in flow will result in a rise in the float position and inversely a decrease in flow will result in a lowering of the float position. When the maximum capacity of a tube is approached, the increased rate of flow affects the float in the next tube. This sequence is continued through all tubes until one of the floats comes to rest within the limits of its scale at which point the rate of flow is read. Tubes are calibrated and scales are engine divided to read in pounds per hour, gallons per minute or other units to fit specific requirements.



Figure 2. Metering Tube and Float - Sectional View

**Section I**  
**Paragraphs 1-11 to 1-13**

1-11. TUBES (fig. 2). Tubes are precision molded of borosilicate glass with four float guides and tapered flutes integral with the tube. The inner diameter across the guides is the same from top to bottom but the inner diameter of the tapered flutes expands logarithmically giving an increasing flow area past the float as it rises. The guides confine the float to the central axis of the tube and diminish swirls of fluid passing through the tube. Tubes have flowmeter serial number and tube size etched near the top of the tube.

1-12. FLOATS (fig. 2). Floats are machined of a material impervious to the fluid used and precisely fitted to the tube making a matched assembly of float and tube. Floats are provided with a short threaded stub extension for attachment of a rod to facilitate removal or installation. Floats are etched with the flowmeter serial number and tube size.

**NOTE**

Tubes, floats, and scales are calibrated as a unit and are not interchangeable. If a tube is broken, a new tube, float, and scale must be ordered. An unserviceable float can be replaced by fitting and recalibrating a new float to the old tube. Damaged scales can be replaced if flowmeter serial number, tube number, and sizes are furnished.

1-13. SCALES (fig. 4). Each tube with its float is accurately calibrated and its scale graduated to agree with the calibration. The 18-inch logarithmic type scale provides the same degree of reading accuracy throughout the flow range. Scales are made of plastic or aluminum and engraved with contrasting figures. Scales are attached to adjustable support posts which

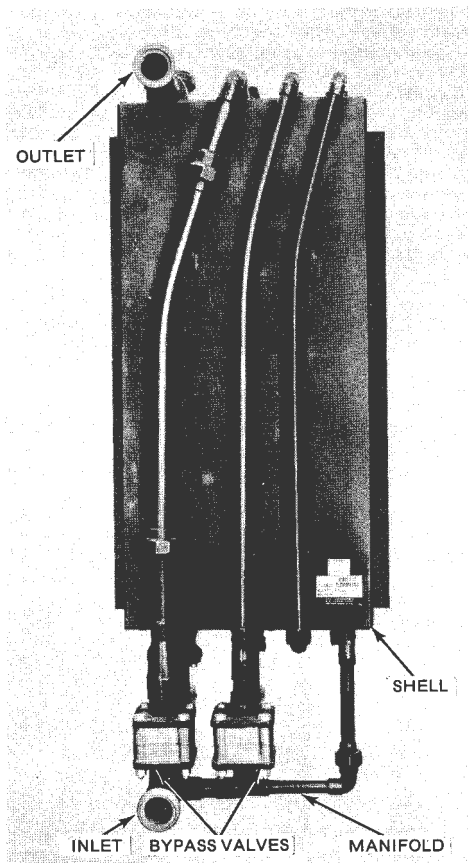


Figure 3. Rear View of Series 12 Flowmeter

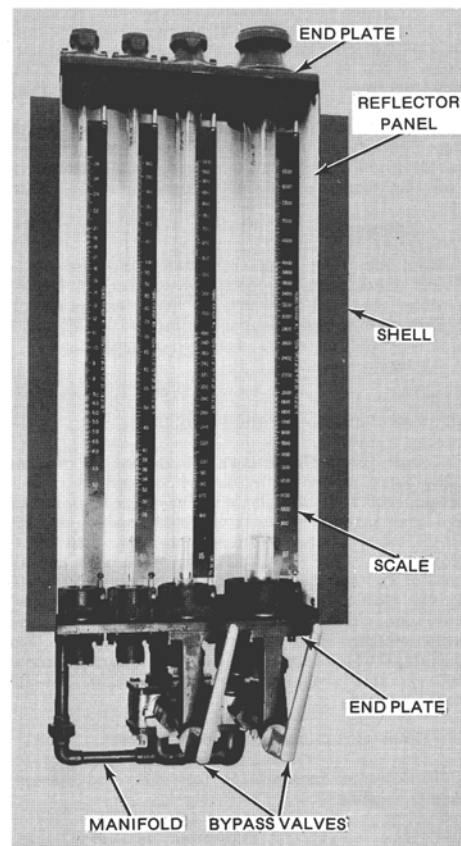


Figure 4. Front View of Series 12 Flowmeter - Bezel Removed

are located in drilled holes in front corners of the tube packing glands and secured by screws. Scales are aligned with tube index line by adjusting the support posts. Packing glands are drilled at each side permitting scales to be mounted on both sides if desired.

1-14. TUBE MOUNTING (fig. 15). Tubes are fitted into upper and lower end castings and are held in position by packing glands. The glands are tightened against gaskets to prevent leakage. The end caps mounted on lower and upper end castings contain float stops with springs.

1-15. TUBE CONNECTIONS. End casting fittings extend toward the back of the instrument and are connected in series by copper tubing. Bottom fittings are provided with bypass valves when required. The fluid enters a manifold assembly at the bottom and is then distributed as governed by the position of the bypass valves. Outlet is from the top of the last tube.

1-16. The ball type bypass valve is manufactured by the Worcester Valve Co. and is furnished in 3/4, 1-1/4 and 2-inch sizes.

1-17. The valve consists of a bronze body and ball with Buna N seals to prevent leakage. One end of the handle assembly, available in varying lengths, is connected to the valve by a coupling while the bracket on the opposite end is connected to the shell.

1-18. A 2-inch orifice ball valve is provided, in flowmeters, to divert a portion of the flow through the calibrated orifice increasing the flow range of the instrument. Flowmeters incorporating a bypass orifice are provided with a special inlet elbow to eliminate entrance effects.

1-19. INSTRUCTION PLATE. An instruction plate, mounted behind the bezel window provides instructions for operating the flowmeters and reading the position of the float.

1-20. SHELL. All tubes and fittings are mounted in a welded steel shell. End castings are bolted to upper and lower members. Shells are designed for flush panel mounting. A bezel holding a safety glass window covers the front of the instrument. A white enameled steel reflector panel is mounted behind the tubes. Valve shafts extend through the bezel. Handles are installed on the ends of the valve shafts.

1-21. BURST DISC ASSEMBLY. A burst disc assembly can be furnished to protect the flowmeter tube in installations where the flowmeter might be subjected to excessive pressure surges. This disc assembly is furnished as standard equipment on any flowmeter incorporating a 48, 99, 109 or 148 size tube and can also be ordered for any particular flowmeter. The disc assembly is installed in a tee on the inlet side of the

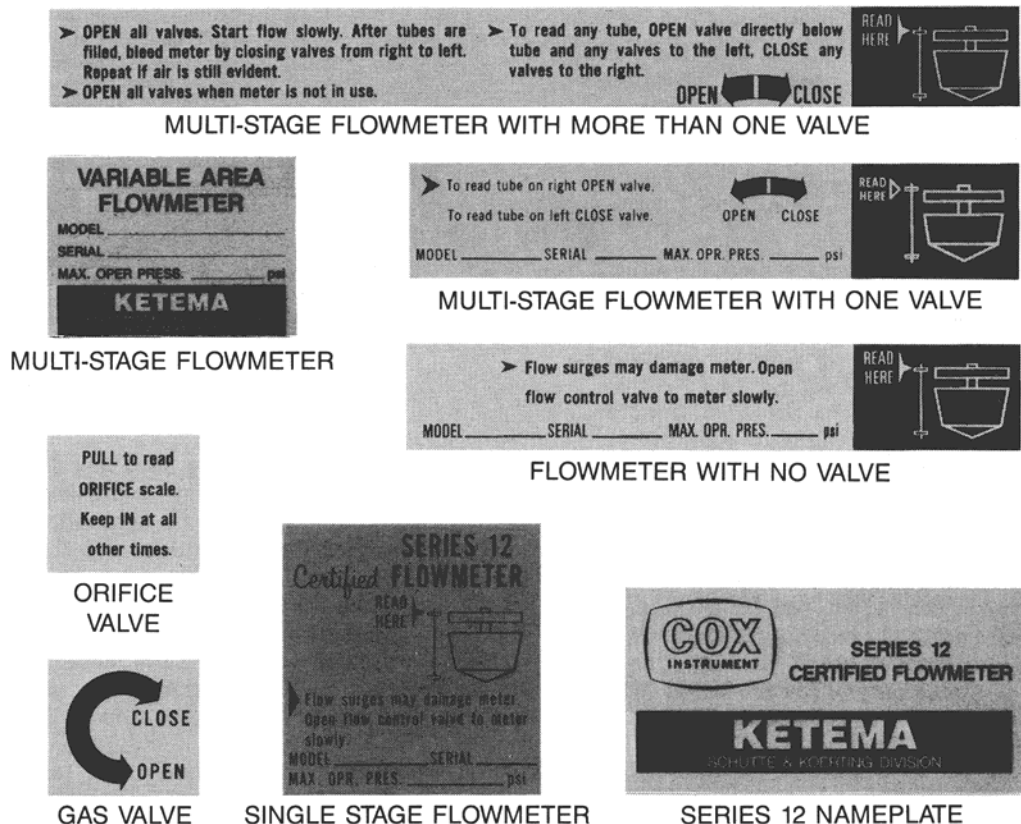


Figure 5. Instruction Plates

**Section 1**  
**Paragraphs 1-22 to 1-29**

flowmeter and is designed to burst at a pressure lower than the bursting pressure of the largest tube. The disc is rated to burst at 85 psi.  $\pm$  5 psi. This provides a bypass through which the flow may be returned to the supply tank.

1-22. LIGHTS. Depending on size and number of stages used, flowmeters can be equipped with explosion proof or non-explosion proof fluorescent lights mounted behind the tubes.

1-23. AIR CYLINDERS. Flowmeters can be equipped with air cylinders to operate the bypass valves. Different cylinder assemblies are used for 1-1/4 and 2-inch valves.

1-24. SPECIFICATIONS.

1-25. CAPACITY. Cox Variable Area Flowmeters Bulletin CA 6001 provides information on the range and capacity for all standard combinations of Series 12 Flowmeters.

1-26. MOUNTING DIMENSIONS. Cox Variable Area Flowmeter Bulletin CA 6001 provides information on mounting dimensions for all standard Series 12 Flowmeters.

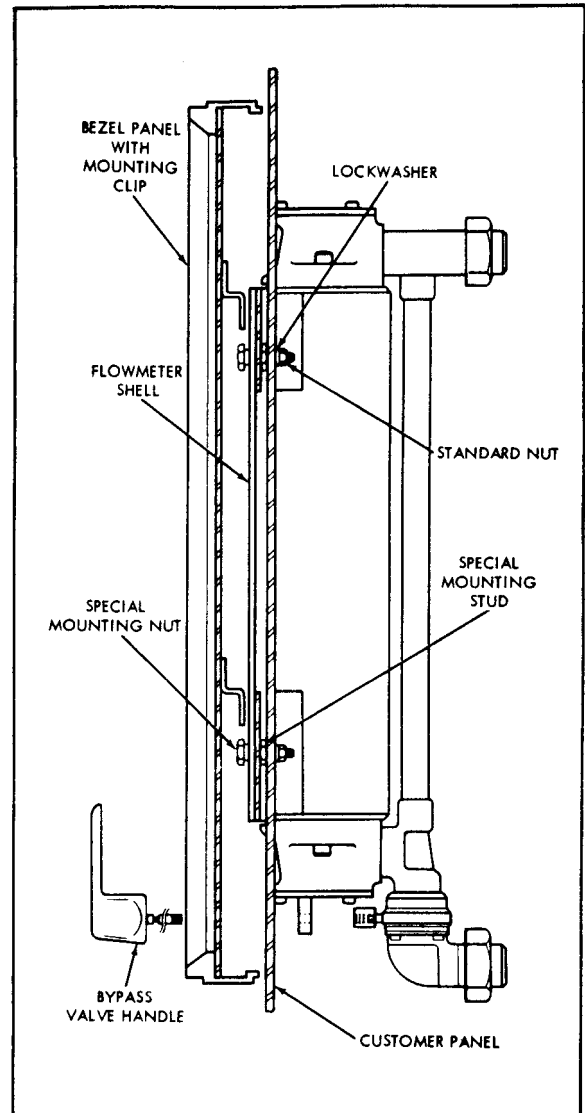
1-27. PREPARATION FOR USE.

1-28. UNPACKING. Unpack instrument carefully. Parts of this flowmeter are fragile and can be easily damaged. Check all parts against packing slip to be sure that none are discarded. Floats, 0.375-inch and larger, are packed separately in a small container. Handle floats carefully. Floats are fitted to the tubes with extreme accuracy and the slightest damage may make them useless. Replace them in original containers after checking until ready for their installation.

1-29. INSTALLATION (fig. 6).

a. Flowmeter should be mounted in a vertical position and as free from vibration as possible. The maximum allowable position is approximately  $5^\circ$  off the center vertical centerline. A position greater than  $5^\circ$  would tend to introduce about a 1 to 2% error in accuracy. Install special mounting stud (longer threaded portion first) into holes drilled in customer's panel. Secure in place with lockwasher and standard hex nut. Install meter shell onto studs and secure in place with special nut with shoulder toward panel.

b. Clean inside of instrument thoroughly. Wipe reflector with a clean cloth. The red index line on scale must align with red mark on tube. Loosen set screws holding scale support posts in packing glands and adjust scales if necessary. Install bezel with window on front of shell by engaging clips on inside of bezel in special mounting studs.



**Figure 6. Flowmeter Installation**

c. To avoid strain and transmitting vibration to flowmeter, flexible hoses or lines should be installed between flowmeter and service lines. If inlet and outlet unions cannot be separated by the fingers, use two wrenches. All tubing joints are soft soldered and strain on them should be avoided. With suitable adaptor, connect flexible lines to unions and service piping. Use two wrenches to tighten. A shut-off valve should be installed in discharge line beyond the flexible connection. This will prevent possible drainage of the instrument when device being checked is disconnected. When furnished, install pressure blowout disc assembly in inlet line to flowmeter.

d. A 25 micron filter should be installed on the inlet side of the flowmeter. This will keep the flowmeter clean and keep floats from sticking and collecting dirt. Collecting dirt adds weight to the float which in turn changes flow rate reading.

In addition, a thermometer should be installed as close to the inlet of the flowmeter as possible. This will provide a constant check to assure proper flow readings.

e. The flowmeters are calibrated on a Cox Liquid Calibrator maintaining a 10-15 psig back pressure. Back pressure should be provided in the installation to aid in purging air out of the system and introducing float stability.

f. Remove fillister head screws holding end caps to upper end castings and lift off caps. Remove floats from their container and wipe them off thoroughly with a clean soft cloth. Notice that floats are etched with the serial number of instrument and tube size. Thread the float extractor rod to each float, insert float in proper tube and lower to bottom of tube. Unscrew rod. Use care to get floats in proper tube. Install end caps with their "O" rings and tighten screws. Clearance on panel cut-out should be provided in the top of any test stand to allow for float removal.

#### CAUTION

Do not drop floats into tubes.

#### 1-30. OPERATION.

1-31. GENERAL. The instrument has been accurately calibrated for a specific liquid or gas and the scales divided accordingly. Variations in temperature or in specific gravity, which are marked on edges of scales, will affect correctness of readings.

1-32. LEAKAGE. The equipment to be tested is normally connected to the outlet of the instrument. The connections between flowmeter and equipment must be tight. Any leakage in this line will result in high readings. If the equipment to be tested is installed on the inlet side, leakage will result in low readings.

1-33. EXPEL AIR. Open the bypass valves and provide means to return the maximum flow to fuel supply tank. Open supply line to flowmeter and set up rate of flow corresponding to full scale reading on largest tube, open and close largest tube valve and allow to remove air. Reduce flow within range of next largest tube following a bypass valve and repeat procedure until all air is expelled. Continue in a like manner until flowmeter is completely purged of air.

#### CAUTION

Do not operate valves until flowmeter is filled with liquid. Always leave valve in "OPEN" position when flowmeter is not in use.

1-34. VALVES. In a multi-stage flowmeter, all valves must be closed when reading flow in the smaller tubes. As each

valve is opened, the tubes below it are inoperative and pressure drop is maintained at a minimum. All valves must be opened when reading last tube.

1-35. READING THE SCALES. Scales are read opposite top surface of float disc. On units equipped with an orifice, read the scale on the right side of the largest tube when the orifice valve is opened. Readings are accurate only when eye of observer is at the same level as top of float. (See fig. 5.)

1-36. TEMPERATURE. Watch temperature of liquid during test. Endeavor to keep it within plus or minus 3°F of value marked on scale. Three degrees Fahrenheit temperature change is equal to approximately 0.1% shift in flow rate.

1-37. PRESSURE BLOWOUT DISC ASSEMBLY. If a flowmeter utilizing a pressure blowout disc assembly has been subjected to excessive pressure surges causing the blowout disc to burst, the following procedure must be followed before resuming operation.

1. Shut down fuel supply to flowmeter

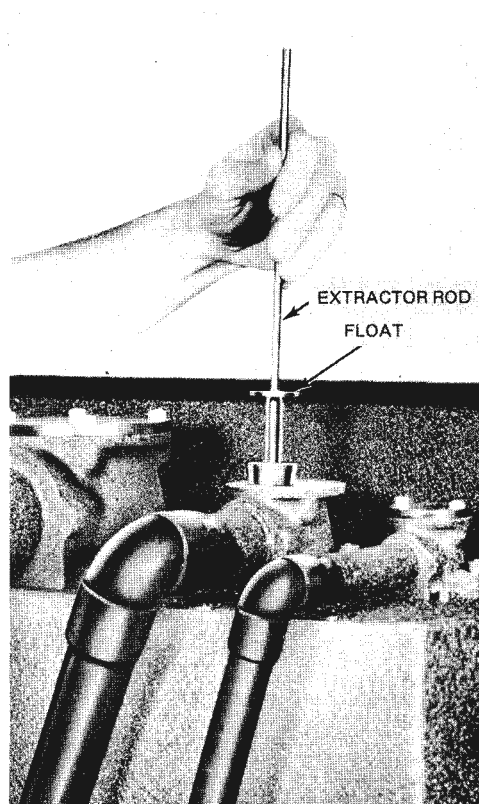


Figure 7. Installing or Removing Float

**Section I**  
**Paragraphs 1-38 to 1-44**

2. Determine cause of excessive pressure surges and correct if possible.
3. Replace ruptured blowout disc.

1-38. MAINTENANCE.

1-39. GENERAL. Periodic cleaning of tubes and floats is necessary to remove all deposit of foreign matter. A regular schedule of cleaning should be adhered to depending on nature of liquid being used. Deposits on floats or tube walls which restrict flow will result in high readings.

1-40. CLEANING TUBES AND FLOATS

- a. Relieve pressure on instrument. Do not drain.
- b. Remove fillister head screws holding end cap to upper end castings.
- c. Insert float extractor rod (fig. 7), thread it onto float, and lift out float. Handle floats carefully to avoid damage.
- d. With the proper size brush, clean tube thoroughly with eight or ten strokes of brush for entire length of tube (fig. 8).
- e. Drain and flush with clean fluid.
- f. Wipe float with clean soft cloth to remove all dirt and gum deposit. Do not polish float with any abrasive.
- g. Attach extractor rod and carefully lower float until float rests on lower stop. Detach rod.
- h. Install end cap and tighten screws. Clean remaining stages in order.

**NOTE**

Use extreme care at all times to avoid damage to float. Any damage will affect calibration of any tube and result in inaccurate readings. Also be sure that floats are not interchanged.

1-41. ALIGNMENT OF SCALES. Check alignment of scales when cleaning tubes. Red index line on scale should align with red index line on tube. If out of line, loosen screws holding scale support posts, align scale and tighten screws.

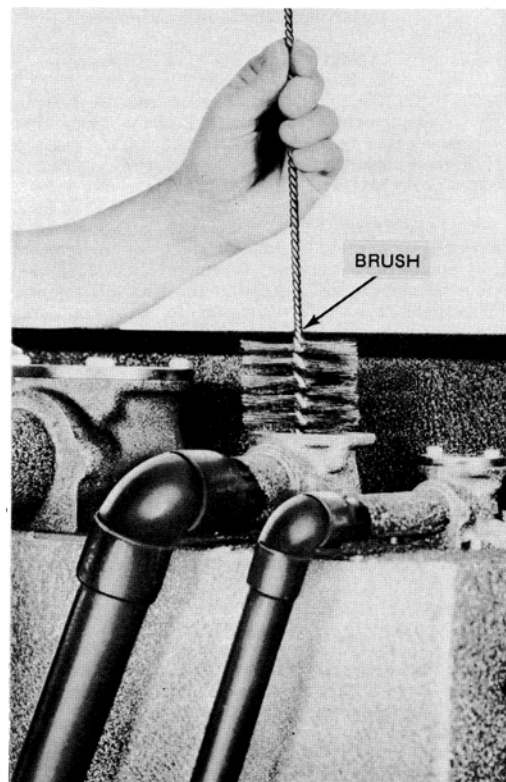
1-42. PARTS REPLACEMENT.

1-43. PERMISSIBLE OVERHAUL. Flowmeters are assembled and calibrated by trained personnel under exacting conditions and no general disassembly is ever required or recommended. For

this reason the repairs and replacements considered are limited to replacement tube gaskets, valve seals, metering tubes, and repair of damaged copper tubing.

1-44. REPLACING TUBE GASKETS (fig. 9).

- a. Relieve pressure on instrument.
- b. Remove top end caps and floats.
- c. Remove end caps from bottom end castings to drain unit.
- d. Remove bezel with window from front of instrument.
- e. Remove screw holding scale to lower support post. Loosen screw holding upper support post and pull down to remove scale and upper support post.
- f. Remove socket head cap screws holding glands in position. Slip glands toward center of tube, lift tube slightly and remove from instrument. Notice arrangement of tube gaskets when removing. Note that one aluminum backing washer, then the four or five Buna N gaskets (to make ½-inch thickness) go on tube and are slipped into gland in that order, then the second aluminum washer is placed on the gaskets. The thin fairprene gasket is then placed in gland.



**Figure 8. Cleaning Tubes**

This thin gasket can be held in position by coating with a thin film of cup grease to prevent shifting while assembling gland and tube. A tube stop washer is then installed as the last item in the bottom gland only.

**CAUTION**

Do not use cup grease on flowmeters for oxygen service.

- g. To assemble, place tube in position with aligning mark toward front. Slip glands into position and secure with cap screws. Tighten screws evenly.
- h. Install scale and upper support post. Install screw holding scale to lower support post. Align mark on scale with mark on tube and tighten support post set screws.
- i. Install lower end caps and tighten fillister head screws.
- j. Install floats using rod to carefully lower float onto bottom stop.
- k. Install upper end caps and tighten fillister had screws.
- l. Install bezel with window to front of instrument.

1-45. REPLACING BROKEN METERING TUBE. As all tubes are calibrated with their floats, and scales graduated to conform, replacement tubes are supplied with floats, scales, and necessary gaskets. For removal and replacement of tubes refer to paragraph 1-44. Damaged scales can be replaced by giving tube size and serial number of the flowmeter. This number is etched on tube near the stop and on the float shank.

1-46. REPLACING FLOAT STOPS. Float stops are rods threaded on one end and screwed into end caps. Stops are equipped with springs. To replace, grip stop in vise and unscrew end cap and install new stop. Spring can be unscrewed from old stop and installed on replacement. When replacing float stop, the stop and end cap must be square.

1-47. REPAIRS TO METAL TUBING AND FITTINGS. No one except a repairman thoroughly experienced and competent in making solder joints should be permitted to make repairs or replacements on the metal tubing.

**WARNING**

If the vapor of the liquid used in this instrument is highly volatile, the instrument must be thoroughly cleaned before any heat is used in disassembly.

1-48. REPLACING VALVES.

- a. Disconnect inlet tube union to first stage and loosen all cap screws in lower flanges holding manifold to valves and

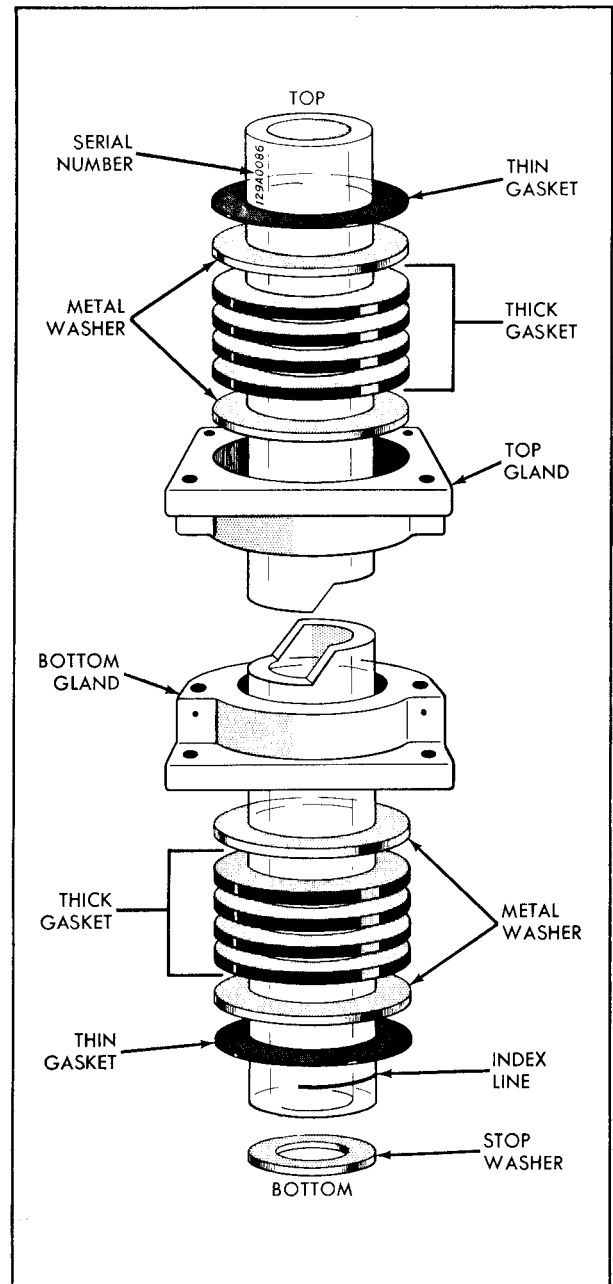


Figure 9. Series 12 Flowmeter Gasket Arrangement

remove manifold. Remove cap screws from the upper flange of the valves to be replaced and withdraw valves.

- b. See that seals and seats are in position on both faces, insert valve between flanges and install cap screws on top and bottom flanges. Tighten upper screws and pull screws in lower flange up evenly. Tighten inlet union. Connect handle assembly to valve, utilizing pin and coupling.

**Section I**  
**Paragraphs 1-49 to 1-54**

1-49. REPAIR OF VALVES. If the valve becomes worn or defective, replacement parts may be purchased from the manufacturer. See Section II for detailed parts lists.

1-50. SHIPMENT.

1-51. The flowmeter should never be shipped unless carefully boxed and fully protected. Floats, 3/8 inch and larger, must be removed from tubes and wrapped separately to prevent damage.

1-52. STORAGE.

1-53. If flowmeter is to be placed in storage, fill tube with oil SAE-10 and open all valves.

**CAUTION**

For oxygen service flowmeters, clean with Freon after storage.

1-54. TROUBLESHOOTING.

<b>TROUBLE</b>	<b>POSSIBLE CAUSE</b>	<b>REMEDY</b>
READINGS TOO HIGH	Temperature of fuel below specifications.	Correct temperature.
	Viscosity of fuel higher than specified.	Use specified fuel if possible.
	Dirty floats or metering tubes.	Clean (par. 1-40).
	Leaks in gaskets in tubes of higher capacity than tube being read.	Replace gaskets (par. 1-44).
	Leak between instrument and test unit (if on outlet side).	Check for and repair leakage.
READINGS TOO LOW	Temperature of fuel above specifications.	Correct temperature.
	Viscosity of fuel lower than specified.	Use specified fuel if possible.
	Leaks through bypass valves.	Check valves are correct.
	Leak between instrument and test unit (if on inlet side).	Check for and repair leakage.
READING INACCURATE (EITHER HIGH OR LOW)	Reading taken improperly.	Eye must be on level with float top (par. 1-35).
	Scales improperly set.	Align scale and tube red index lines (par. 1-41).
FLOATS FLUCTUATE	Pump surge reaches instrument.	Install surge trap or change pump.
	Air in system.	Bleed air (par. 1-33).
FLOAT STICKS IN TUBE	Tube or float dirty.	Clean (par. 1-40).
EXCESSIVE PRESSURE DROP THROUGH INSTRUMENT	Closed bypass valves.	Check and correct valves.
	Float sticks.	Clean float (par. 1-40).

1-55. BACK LIGHTING MAINTENANCE. Bulb replacement is accomplished as follows:

a. Non-Explosionproof (See figures 10 and 11)

1. Disconnect power and electrical wires to shell assembly.
2. Remove four (4) screws (10-32 x 3/8) holding shell assembly to housing.
3. Slide out shell assembly.
4. Remove and replace defective fluorescent bulb (G.E. P/N F20T12/D) and/or starter (G.E. P/N FS-2) as required.
5. Slide shell on housing and align.
6. Reinstall screws removed in second step.
7. Reconnect electrical wires disconnected in first step.

b. Explosionproof (See figures 10 and 12)

1. Disconnect power, conduit, and electrical wires to shell assembly.
2. Remove four (4) screws (10-32 x 3/8) holding shell assembly to flowmeter housing.
3. Slide out shell assembly.
4. Remove upper cap (end opposite conduit connection) by turning cap counter-clockwise.

5. Remove and replace defective fluorescent bulb (G.E. P/N F15T12/CW) and/or starter (G.E. P/N FS-2) as required. Maintenance instructions for this operation are printed on the cap inside face.

6. Reinstall the cap removed in the fourth step.
7. Slide shell assembly on flowmeter housing and align.
8. Reinstall screws removed in second step.
9. Reconnect electrical wires and conduit disconnected in first step.

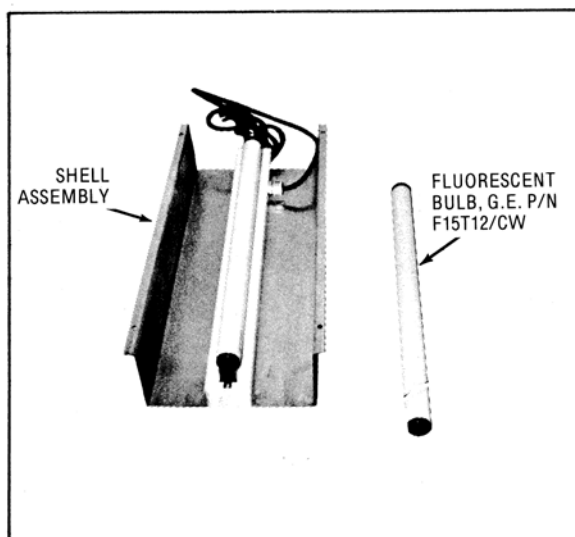


Figure 11. Non-Explosionproof Back Lighting

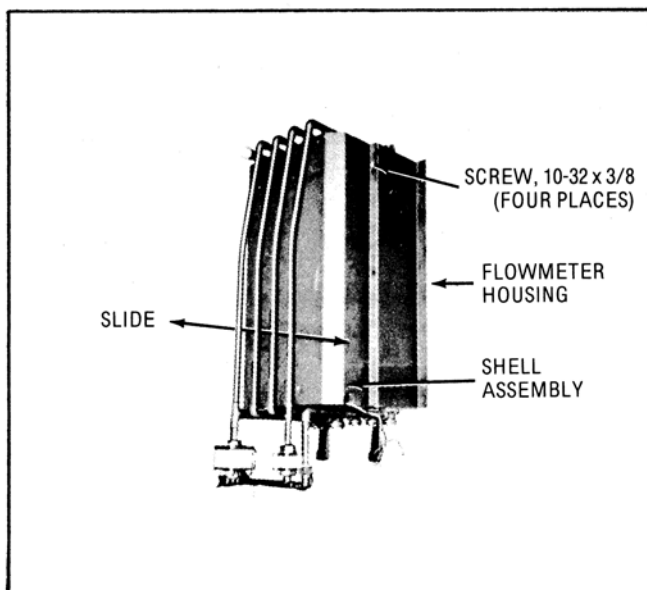


Figure 10. Shell Assembly Removal

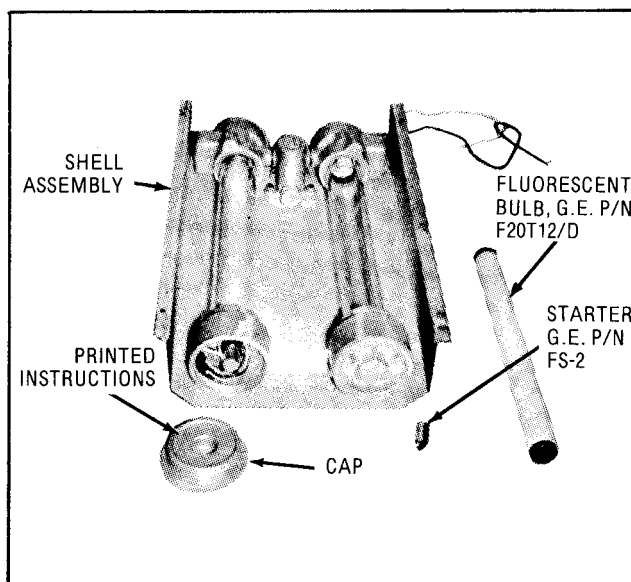


Figure 12. Explosionproof Back Lighting

## FLOWMETER MODEL CONVERSION KEY

MODEL	SHELL NO.	TUBE NUMBERS	RECOMMENDED SAFE WORKING PRESSURE (psig)
124-200	8	141	200
124-201	14	141-142	200
124-202	15	141-142-143	160
124-203	3	141-142-143-144	14
124-204	4	141-142-143-144-145	110
124-205	5	141-142-143-144-145-146	95
124-206	6	141-142-143-144-145-146-147	70
124-207	7	141-142-143-144-145-146-147-148	65
124-208	8	142	200
124-209	14	142-143	160
124-210	2	142-143-144	140
124-211	3	142-143-144-145	110
124-212	4	142-143-144-145-146	95
124-213	5	142-143-144-145-146-147	70
124-214	6	142-143-144-145-146-147-148	65
124-215	9	143	160
124-216	1	143-144	140
124-217	2	143-144-145	110
124-218	4	143-144-145-146	95
124-219	5	143-144-145-146-147	70
124-220	6	143-144-145-146-147-148	65
124-221	9	144	140
124-222	1	144-145	110
124-223	3	144-145-146	95
124-224	4	144-145-146-147	70
124-225	6	144-145-146-147-148	65
124-226	10	145	110
124-227	2	145-146	95
124-228	3	145-146-147	70
124-229	5	145-146-147-148	65
124-230	11	146	95
124-231	2	146-147	70
124-232	4	146-147-148	65
124-233	12	147	70
124-234	3	147-148	65

## FLOWMETER MODEL CONVERSION KEY – CONTINUED

FUEL (120 – 200 to 120 – 222)	OIL (120 – 240 to 120 – 261)	GASES (120 – 277 to 120 – 294)	SHELL NO.	TUBE NUMBERS	RECOMMENDED SAFE WORKING PRESSURE (psig)	
					LIQUIDS	GASES
		120-277	8	61	270	180
		120-279	8	65	260	170
120-200	120-240	120-280	8	102	210	140
120-201	120-241	120-281	1	102-105	140	90
120-202	120-242	120-282	3	102-105-108	75	50
120-203			3	102-105-108*	75	-
120-204	120-243	120-283	8	103	175	115
120-205	120-244	120-284	1	103-106	110	70
120-206	120-245	120-285	3	103-106-109	65	50
120-207	120-246		3	103-106-109*	65	-
120-208	120-247	120-286	9	104	170	110
120-209	120-248	120-287	2	104-107	95	60
120-210	120-249		2	104-107*	95	-
120-211	120-250	120-288	9	105	140	90
120-212	120-251	120-289	2	105-108	75	50
120-213	120-252		2	105-108*	75	-
120-214	120-253	120-290	10	106	110	70
120-215	120-254	120-291	3	106-109	65	50
120-216	120-255		3	106-109*	65	-
120-217	120-256	120-292	11	107	95	60
120-218	120-257		12	107*	95	-
120-219	120-258	120-293	12	108	75	50
120-220	120-259		12	108*	75	-
120-221	120-260	120-294	13	109	65	50
120-222	120-261		13	109*	65	-
FUEL (129 – 200 to 129 – 234)	OIL (129 – 240 to 129 – 271)	GASES (129 – 277 to 129 – 304)	SHELL NO.	TUBE NUMBERS	RECOMMENDED SAFE WORKING PRESSURE (psig)	
		129-277	8	61	270	180
		129-279	8	65	260	170
129-200	129-240	129-280	8	91	210	140
129-201	129-241	129-281**	14	91-93	175	115
129-202	129-242	129-282	2	91-93-95	140	90
129-203	129-243	129-283	3	91-93-95-97	90	60
129-204	129-244	129-284	5	91-93-95-97-99	65	50
129-205			5	91-93-95-97-99*	65	-
129-206	129-245	129-285	8	92	210	140
129-207	129-246	129-286**	14	92-94	170	110
129-208	129-247	129-287	2	92-94-96	110	70
129-209	129-248	129-288	4	92-94-96-98	75	50
129-210			4	92-94-96-98*	75	-

\* 2-inch orifice valve

\*\* No. 1 shell used

FLOWMETER MODEL CONVERSION KEY – CONTINUED

FUEL (129 – 200 to 129 – 234)	OIL (129 – 240 to 129 – 271)	GASES (129 – 277 to 129 – 304)	SHELL NO.	TUBE NUMBERS	RECOMMENDED SAFE WORKING PRESSURE (psig)	
					LIQUIDS	GASES
129-211	129-249	129-289	8	93	175	115
129-212	129-250	129-290	1	93-95	14	90
129-213	129-251	129-291	3	93-95-97	90	60
129-214	129-252	129-292	5	93-95-97-99	65	50
129-215			5	93-95-97-99*	65	-
129-216	129-253	129-293	9	94	170	110
129-217	129-254	129-294	1	94-96	110	70
129-218	129-255	129-295	3	94-96-98	75	50
129-219	129-256		3	94-96-98*	75	-
129-220	129-257	129-296	9	95	140	90
129-221	129-258	129-297	2	95-97	90	60
129-222	129-259	129-298	4	95-97-99	65	50
129-223	129-260		4	95-97-99*	65	-
129-224	129-261	129-299	10	96	110	70
129-225	129-262	129-300	2	96-98	75	50
129-226	129-263		2	96-98*	75	-
129-227	129-264	129-301	11	97	90	60
129-228	129-265		12	97*	90	-
129-229	129-266	129-302	3	97-99	65	50
129-230	129-267		3	97-99*	65	-
129-231	129-268	129-303	12	98	75	50
129-232	129-269		12	98*	75	-
129-233	129-270	129-304	13	99	65	50
129-234	129-271		13	99*	65	-

\* 2-inch orifice valve

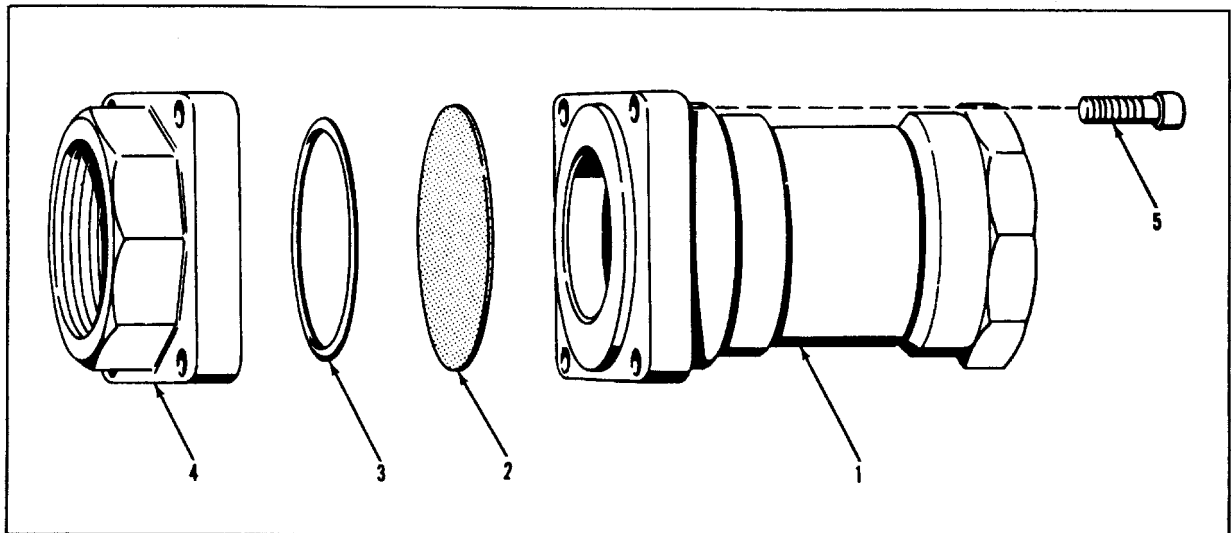


Figure 13. Burst Disc Assembly - Exploded View

SECTION II  
PARTS BREAKDOWN

FIGURE AND INDEX NO.	PART NUMBER	DESCRIPTION	QTY PER ASSY
13-	25861	BURST DISC ASSEMBLY	1
-1	25862	STRAINER ASSY	1
-2	85309	BLOWOUT DISC	1
-3	AN6230-8	"O" RING	1
-4	25867A	THREADED END FLANGE	1
-5	5 / 16-24 x 1	SOCKET HEAD SCREW	4
14-	36638	INLET ELBOW ASSY, 2-inch	1
	36634	INLET ELBOW ASSY, 3-inch	1
-1	No Number	INLET ELBOW, 2-inch	1
	No Number	INLET ELBOW, 3-inch	1
-2	AN6230-4	"O" RING, 2-inch elbow	1
	AN6230-13	"O" RING, 3-inch elbow	1

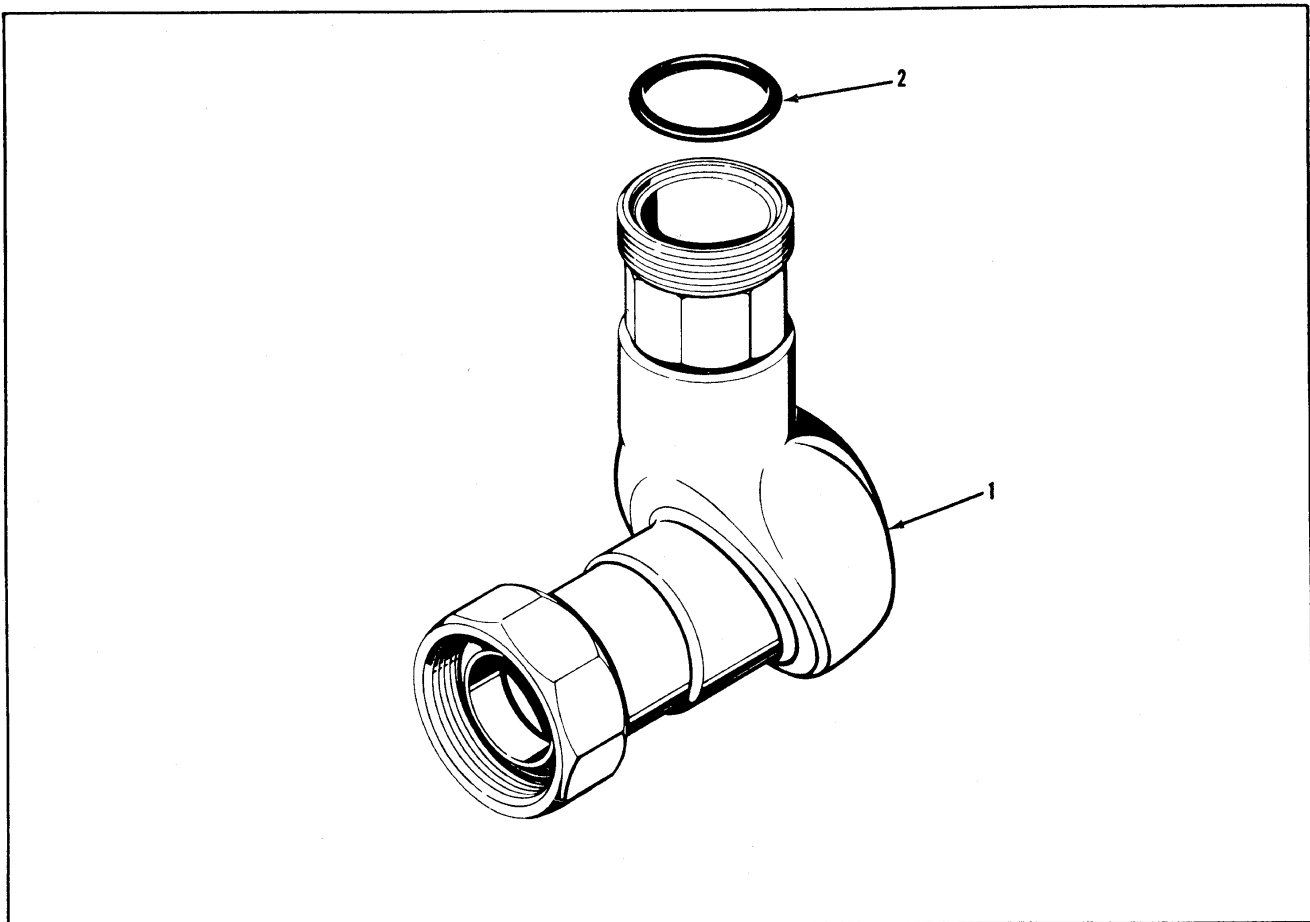


Figure 14. Inlet Elbow Assembly

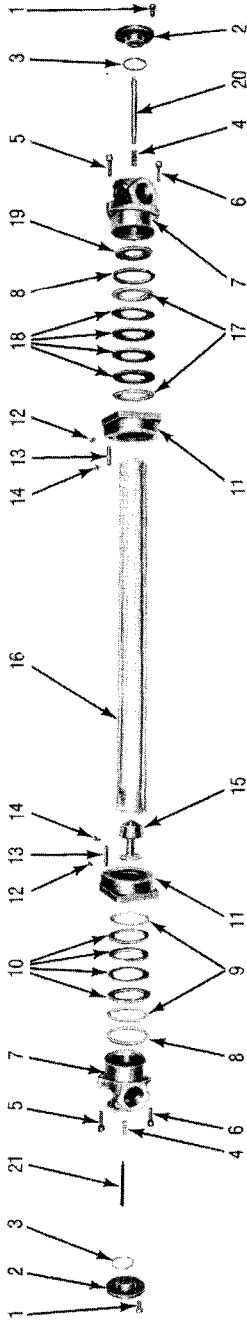


Figure 15. Tube Assembly - Exploded View

FIGURE AND INDEX NO.	DESCRIPTION	41, 42, 91, 92, 93, 102, 103, 141, 142, 143	43, 44, 94, 95, 104, 105, 144	45, 96, 106, 145	46, 97, 107, 146	47, 98, 108, 147	48, 99, 109, 148
15-1	SOCKET HEAD SCREW	No. 8-32x3/8"	No. 10-24x1/2"	No. 10-24x1/2"	1/4-20x1/2"	1/4-20x1/2"	1/4-20x1/2"
-2	END CAP	20826	20876	20926	20976	21026	21076
-3	"O" RING GASKET	AN6227-9	AN6227-14	AN6227-17	AN6227-24	AN6230-2	AN6230-8
-4	FLOAT STOP SPRING	**	24959	24958	24958	24958	24958
-5	SOCKET HEAD SCREW	No. 10-24x7/8"	1/4-20x1"	1/4-20x1"	5/16-18x1"	5/16-18x1"	7/16-14x1-1/4"
-6	SOCKET HEAD SCREW	No. 10-24x1"	No. 10-24x1"	1/4-20x1"	1/4-20x1"	1/4-20x1"	1/4-20x1"
-7	END CASTING	20818	20868	20918	20968	21018	21068
-8	BACKING WASHER	20835	20885	20935	20985	21035	21085
#-9	GASKET						
	GASKET BACKING	20834	20884	20934	20984	21034	21084
	UPPER WASHER						
#-10	TUBE UPPER GASKET	20833	20883	20933	20983	21033	21083
-11	PACKING GLAND	20821	20871	20921	20971	21021	21071
-12	FILLISTER HEAD SCREW	No. 6-32x1/4"	No. 6-32x1/4"	No. 6-32x1/4"	No. 6-32x1/4"	No. 6-32x1/4"	No. 6-32x1/4"
-13	SCALE SUPPORT POST	20825	20875	20925	20975	20825	20825
-14	FILLISTER HEAD SCREW	No. 6-32x1/4"	No. 6-32x1/4"	No. 6-32x1/4"	No. 6-32x1/4"	No. 6-32x1/4"	No. 6-32x1/4"
*-15	FLOAT						
*-16	TUBE						
#-17	GASKET BACKING	20834	20884	20934	20984	21034	21084
	LOWER WASHER						
-18	TUBE LOWER GASKET	20833	20883	20933	20983	21033	21083
-19	TUBE STOP WASHER	25440	25441	25443	25444	25445	25447
-20	FLOAT LOWER STOP	20832	20880	**	**	**	**
-21	FLOAT UPPER STOP	**	20878	20928	21029	21028	25949
*	SCALE	24211	24236	24236	24236	24236	24336
USE TUBE NUMBERS AS SHOWN ABOVE							

\* PARTS MARKED (\*) ARE FURNISHED IN MATCHED SETS ONLY (PAR. 1-13).  
# SPECIFY UPPER OR LOWER OD OF TUBE WHEN ORDERING BACKING WASHERS OR GASKETS.  
\*\* SPECIFY TUBE SERIAL NUMBER WHEN ORDERING FLOAT STOPS.

FIGURE AND INDEX NO.	DESCRIPTION	FLOWMETER SHELL	PART NUMBER		
			3/4 -inch valve	1-1/4-inch valve	2-inch valve
16-1	WORCESTER VALVE*		411TB-3/4	411TB-1-1/4	411TB-2
-2	ROLL PIN		3/16"x1-1/8"	3/16"x1-1/8"	3/16"x1-1/8"
-3	COUPLING		48467-3/4	48467-1-1/4	48468-2
-4	PIN		703563	703563	703563
-5	BRACKET		48458	48458	48458
-6	HANDLE ASSEMBLY				
	WITHOUT LIGHT SHELL	1	3-82900C-9	3-82900C-9	--
	WITHOUT LIGHT SHELL	2	4-82900C-9	4-82900C-9	--
	WITHOUT LIGHT SHELL	3 thru 7	6-82900C-9	6-82900C-9	5-82900C-9
	WITH LIGHT SHELL	1	7-82900C-9	7-82900C-9	--
	WITH LIGHT SHELL	2	8-82900C-9	8-82900C-9	--
	WITH LIGHT SHELL	3 thru 7	10-82900C-9	10-82900C-9	9-82900C-9

\* Teflon Seal Kits available. When ordering, specify valve size.

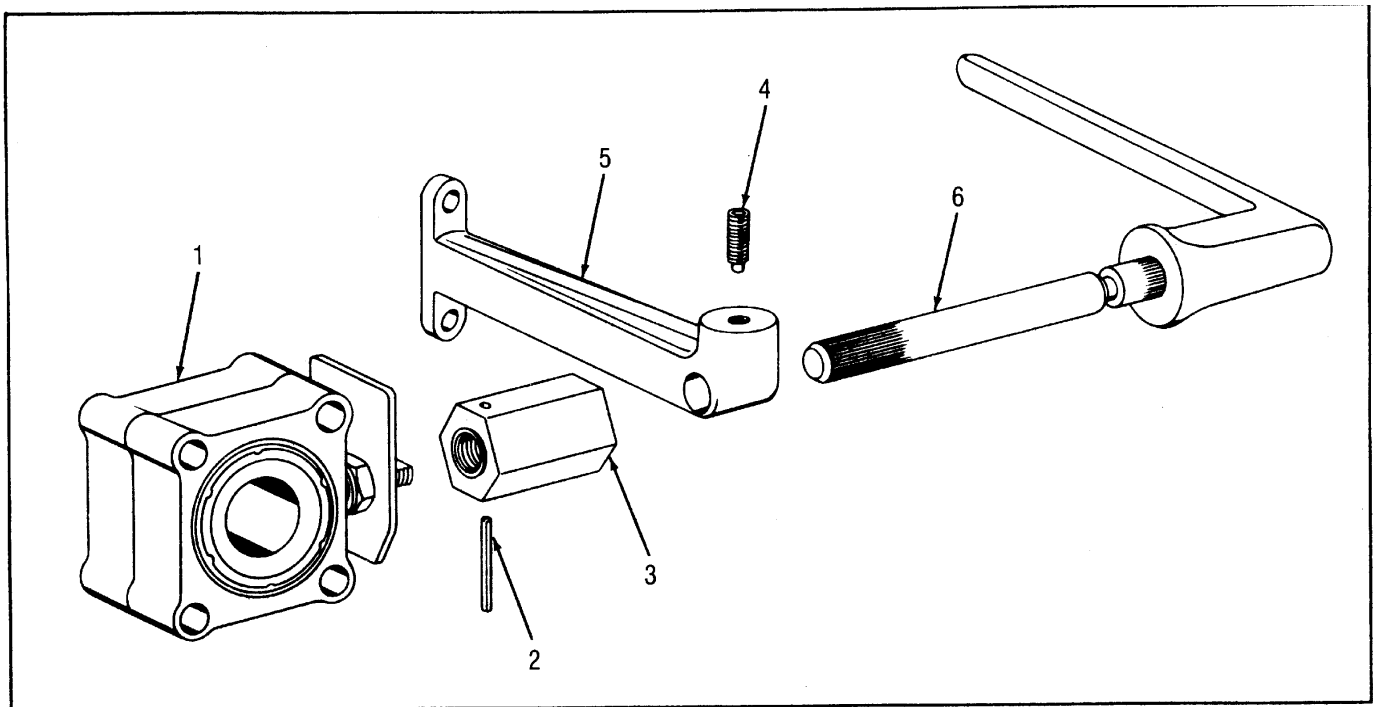


Figure 16. Worcester Valve Handle Assembly

090804



