

HANDBOOK

**OPERATION, SERVICE AND REPAIR
INSTRUCTIONS**

**WITH
ILLUSTRATED PARTS BREAKDOWN**

250GPM FUEL SYSTEM MODULE

ALC PART NO. 118463

NSN 4320-01-C15-2648



AIR LOGISTICS CORPORATION

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Yanmar L100 Operating Manual

- 1.1 The 200/250 GPM Fueling Module by Air Logistics Corp., Part Number 118463 is designed to provide filtered water-free fueling/defueling at 200 gpm or bulk fueling transfer at 250 gpm.
- 1.2 The module is designed for either airborne or ground installation; standard 2" unisex couplers may be fitted with various fuel delivery connectors and hoses, then connected to airborne or ground storage tanks to meet the mission fuel requirements. *See Figure 3.1 for various hose and connector configuration options.*
- 1.3 All components of the fueling module mounted in an aluminum frame. Lifting brackets are available which allow sling lifting by helicopter.
- 1.4 Pump/Engine. The module is equipped with an aluminum housed centrifugal pump close coupled to a single cylinder air-cooled 7HP diesel engine, which will operate on JP4-JP5 diesel 1 and 2 and B5 Bio-Diesel Fuels. See accompanying Yanmar L100 Operation Manual for detailed engine information.
- 1.5 Filtration. When desired, fuel is processed through four (4) cartridge filter separator at 200 gpm; the elements remove contaminants down to 1 micron

in size and forces out any water in the fuel. *See Fig. 3-5 Valve Position Filtered Fueling*

- 1.6 Fuel/Defuel Manifold. The Fuel/Defuel Manifold is equipped with a series of valves which allow the delivery hoses to be evacuated after each fueling or when desired by simply changing the valves positions. This eliminates any fuel spillage as well as entry of contaminants. *See 3-6 Valve Position Defuel*
- 1.7 Bulk Fuel Bypass. The module is equipped with a bypass valve (Bulk Fuel), which permits speedy transfer of unfiltered fuel at 250 gpm. *See Figure 3-7 Valve Position Bulk Fuel Transfer*
- 1.8 Off the Shelf Parts. Where possible, the fuel system uses commercially available parts. When procuring parts, refer to the illustrated parts breakdown in this manual for aid in identification, and contact the local dealer for the part manufacturer. Product sheets for many critical parts can be found at the back of this manual. Small parts, e.g. washers, fittings, bolts, can be purchased through typical supply channels such as McMaster-Carr. You can also call Air Logistics Corp. directly and we can assist you.

Important Notice: When ordering parts from Air Logistics Corp. please keep the serial number of the fuel system handy for quick identification.

- 2.1 The 200/250 GPM Fueling Module will normally arrive assembled and will require priming and fluid servicing prior to being placed used.
- 2.2 Preparing Fuel System for use.
 - a. Check Oil in unit by removing dipstick at the base of the engine. Fill crankcase to full mark with oil in accordance with the following schedule to ambient temperature:
 - b. Refer to the *"Yanmar L100 Manual"* for detailed engine information and instructions

<u>Temperature</u>	<u>Specification</u>	<u>Grade</u>
Above 32° F	MIL-L-2104	30
	MIL-L-6028	20-
40		
0° TO 32° F	MIL-L-2104	10
Below 0° F	MIL-L-10295	--

- c. Fill fuel tank with compatible fuel: JP4, JP5, Diesel 1 Diesel 2, or B5 Bio-Diesel Fuel
- d. Prime pump housing with approximately 5 gallons of fuel being transferred. This can be accomplished by opening the Bulk Fuel bypass valve, right above the pump housing, and

dumping the fuel in. This requires the unit to be tilted on its side. If the unit cannot be tilted, the pump can also be primed by removing the plug on the top of the pump housing with a wrench, and funneling the fuel into the opening. See *Figure 5.3#4* to assist in locating plug.

- e. Close all valves i.e. handles perpendicular to tube.
- f. Open fuel cock, set throttle to slow/run, then pull-start engine. Idle for approximately five minutes. *Refer to engine operating instructions in Yanmar L100 Manual for detailed starting instructions.*
- g. System Ready for Operation, see Section III

3.1 The 200/250 GPM Fueling Module is designed to fuel air- craft, helicopters, armor or vehicles providing 200 gpm of clean water-free fuel. The module will also transfer bulk fuel at 250 gpm. This section contains instructions necessary to operate the system.

3.2 With the system set up as shown in Figure 3-2 thru 3-7 proceed as follows:

3.3 Start Engine. After verifying oil level in pump motor, and priming pump (see section II) open fuel cock and position throttle to Slow/Run. Then set decompression lever, pull start motor and throttle down to idle.

3.4 Transferring fuel. Once the system is running, the system can be used for filter fueling machinery, evacuating hoses, and bulk fuel transferring as follows:

3.4.1 - Filtered Fueling. With the hoses set up for single or double fueling (See Figure 3-2 or 3-3), fuel vehicle as follows.

- a. Position module valves as shown in *Figure 3-5*.
- b. Open delivery nozzles.
- c. Open throttle wide open.
- d. Transfer desired amount of fuel.
- e. Return to Idle

3.4.2 - Defueling Hoses. With collapsible fueling hoses still attached to

fuel system for filtered fueling(See *Figure 3-2 or 3-3*), evacuate the fuel from hoses to storage as follows:

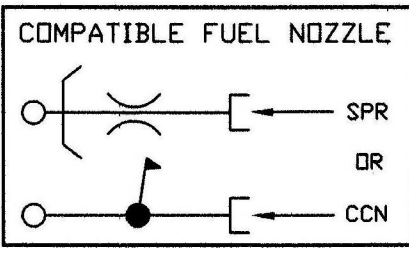
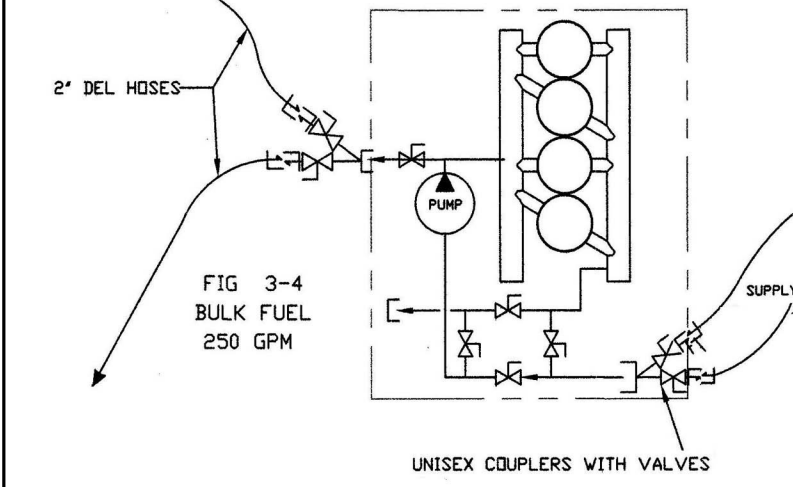
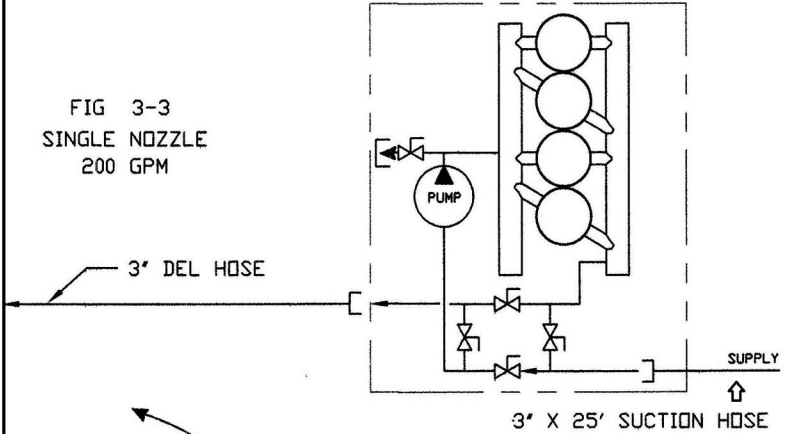
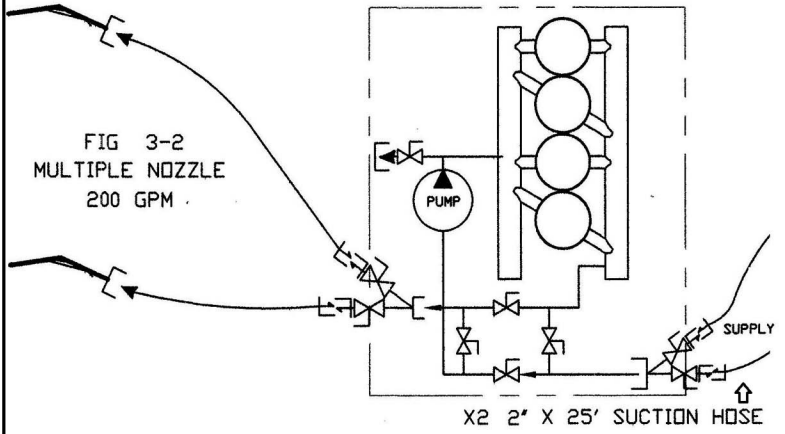
- a. With the engine running at idle; close delivery nozzle(s).
- b. Position valves as shown in *Figure 3-6*.
- c. Advance throttle to half.
- d. Hoses should immediately start to collapse.
- e. When hoses are fully collapsed, idle engine and close all module valves.

3.4.3 - Bulk Fuel Transfer (250 GPM). With the hoses set up for bulk fuel (See *Figure 3-4*), proceed as follow:

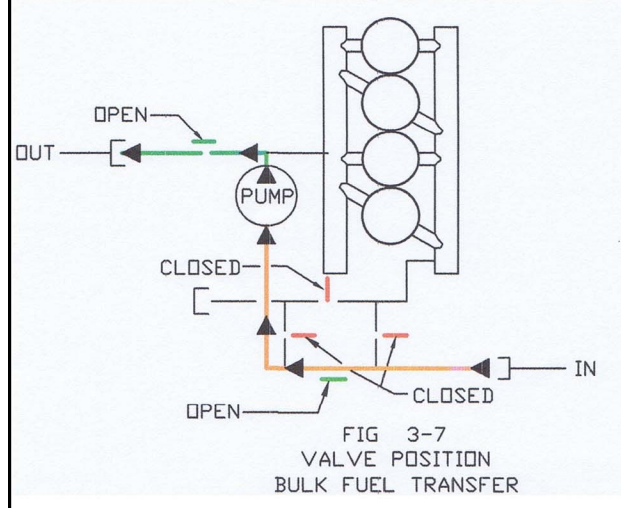
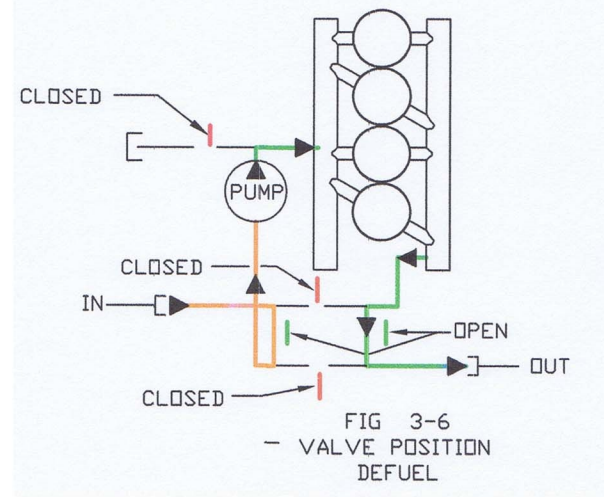
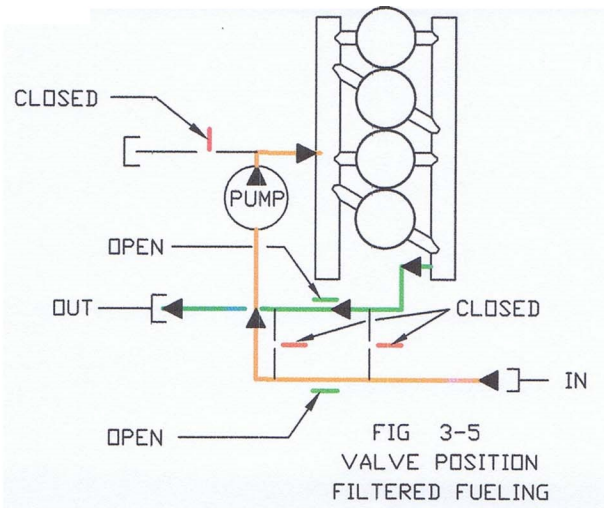
- a. Position module valves per *Figure 3-7*.
- b. Open throttle wide open.
- c. Transfer desired amount of fuel.
- d. Return engine to idle, allow idling 1 minute.
- e. Close all module valves.

3.5 Stop Engine/Cool Down. After any fuel transfer is complete, allow system to idle for 5 minutes before shutting down. After the cool down time has elapsed, shut off fuel cock, then set throttle to stop position. The motor should shut off quickly.

Common Hose Configurations



Valve Positions and Flow Diagram



PROBLEM	POSSIBLE CAUSE	REMEDY
ENGINE STARTING AND RUNNING FAULTS	Not Getting Fuel	Ensure Tank has Compatible Diesel or JP Fuel
	Varies	Refer to "Yanmar L100 Manual"
PUMP FAILS TO PRIME	Pump not primed.	Fill volute casing with liquid.
	Air leak in suction line.	Tighten connections, or replace hose or pipe. Use pipe dope on all threads.
	Lining of suction hose clogged or binding.	Replace suction hose.
	Leaking or worn seal or pump gasket.	Check pump vacuum. Replace leaking or worn seal or gasket.
	Suction lift or discharge head too high.	Check piping installation. Check that suction lift does not exceed 25 feet.
PUMP STOPS OR FAILS TO DELIVER RATED FLOW OR PRESSURE	Air leak in suction line.	Tighten connections, or replace hose or pipe. Use pipe dope on all threads.
	Suction intake not submerged at proper level or sump too high.	Check installation and correct as needed.
	Lining of suction hose collapsed.	Replace suction hose.
	Impeller or other wearing parts worn or damaged.	Check impeller clearance. Replace worn seal or gasket.
	Pump and/or impeller clogged.	Clean out debris.
	Pump speed too slow.	Increase engine RPM.
	Suction lift too high.	Reduce suction lift.
	Suction end out of liquid.	Reposition suction end.
	Leaking or worn seal or pump gasket.	Check pump vacuum. Replace leaking or worn seal or gasket.
	Line Strainer clogged.	Clean line strainer.
	Module valves improperly positioned.	Check valve position.
PUMP CLOGS FREQUENTLY	Suction check valve clogged or binding.	Free valve, and clean or replace it.
	Cavitation in pump.	Reduce suction lift and/or friction losses in suction lines.
EXCESSIVE NOISE	Pumping entrained air.	Locate and eliminate source of air bubble.
	Pump or drive not securely mounted.	Secure mounting hardware.
	Impeller clogged or damaged.	Clean out debris; replace damaged parts.

4.1 Overview

- a. The 200/250 GPM Fueling Module (See Figure 5-1) may be maintained in good operating condition and/or repaired in accordance with the instructions contained in the section. Section V of this manual contains complete parts breakdown, of all repairable subassemblies and components and can assist you in trouble shooting. In general, repair is accomplished by the replacement of damaged, worn, or otherwise of defective parts. Some parts have detailed technical sheets to assist in common repairs and have been included in this manual and referenced when applicable.

4.2 Diesel Engine

- a. Detailed maintenance and trouble shooting for the diesel engine are provided in the *“Yanmar L100 Manual”* Provided with this manual.

4.3 Filter Maintenance

- a. See *“Facet Filter Technical Sheet”*

4.4 Butterfly Valves

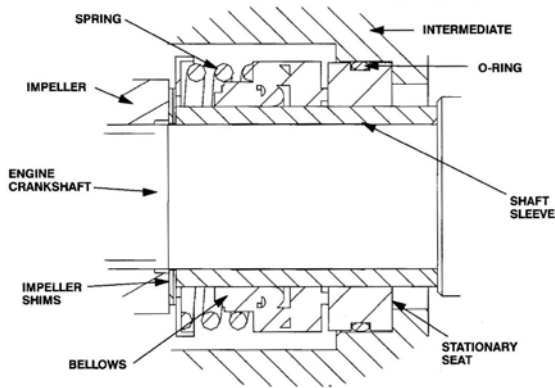
- a. See *“Ultra Flow Valve Technical Sheet”*

4.5 Centrifugal Pump

- a. Under normal use, the centrifugal pump bearing and/or seals may need to be serviced or replaced. Shaft seal replacement is indicated if there is a steady drip from the shaft seal hole in the pump. The bearing, which supports the shaft in the intermediate bracket, is pre-lubricated and needs no further attention. Its replacement is required only when visual inspection reveals damage or wear.

4.6 Pump Disassembly

- a. Position an approved container under the fuel tank to collect the fuel. Remove fuel cap. Remove the fuel tank drain plug and gasket to drain fuel. Or take other precautions that engine is inoperative.
- b. Remove the hex nuts, securing the volute assembly to the intermediate (FIG. 5-2, 12). Remove the pump mounting hardware and separate the volute and intermediate. Inspect the wear plate (FIG. 5-2, 16) and replace it if scored or worn.



- c. Unscrew the impeller (see above) from the engine shaft by turning the impeller counter clockwise. It may be necessary to tap the vanes with a soft hammer or block of wood to loosen the impeller.

WARNING

The impeller serves as a retainer for the shaft seal parts, which are spring loaded. Use caution when unscrewing the impeller to prevent the spring and/or seal parts from flying from the shaft when the impeller is disengaged.

- d. Remove the impeller adjusting shims (see above) Tag and tie the shims or measure and record their thickness, to ensure the same spacing at reassembly.

4.7 Seal Disassembly

- a. Remove the spring centering washer, and carefully slide the shaft

sleeve off the shaft. Remove the remaining seal parts, using a stiff wire with a hooked end to pry them out if necessary. Care should be taken not to crack or split seal faces.

- b. Clean the seal cavity and impeller shaft with a soft cloth soaked in cleaning solvent.

WARNING

Use cleaning solvents only in a well ventilated area free from excessive heat, sparks, and flame. Most cleaning solvents are toxic and flammable. Read and observe all precautions printed on solvent containers.

4.8 Seal Reassembly

- a. The seal is not normally reused because of high polish on the lapped faces. If it is necessary to reuse the old seal in an emergency, wash all metallic parts in cleaning solvent and dry thoroughly.
- b. Inspect seal components for wear, scoring, grooves and other damage that might cause leakage. If any components are worn, replace the complete seal, never mix old and new seal parts. Clean and polish the shaft sleeve, or replace it if

there are nicks or cuts on the end.

- c. The position of seal elements is shown in Figure 5-3.
- d. Place a drop of light lubricating oil on the lapped faces of the seal. Install the stationary seat and o-ring coating the o-ring with petroleum jelly. Slide the shaft sleeve onto the shaft shoulder. Lubricate the bellows with petroleum jelly, and install the balance of the seal elements as shown in Figure 5-3.

4.9 Pump Reassembly

- a. Reinstall the impeller adjusting shim (Fig. 5-3, 34) and impeller (Fig. 5-3, 2), a clearance, and add or subtract impeller shims until it is reached.
- b. It is recommended, that the old volute gasket set (Fig. 5-3, 15) be replaced by a new one when assembling the volute casing to the intermediate. A clearance of .008 to .015 inch between the impeller and the wear plate (Fig. 5-3, 16) is also recommended for maximum pump efficiency. This clearance can be reached by adding or subtracting gasket set until the impeller binds against the wear plate

when the shaft is turned by hand. After the impeller binds, remove .010 inch of gaskets.

- c. Secure pump to engine.

4.10 Flexible Pipe Couplings

- a. The outside surface of the pipe groove and pipe end must be smooth and free from indentations, projections, and roll marks to ensure a leak-tight seal for the gasket. All oil, grease, and dirt must be removed.
- b. Check the gasket to make sure it is suitable for the intended service. Apply a thin coat of Victaulic Lubricant or silicone lubricant to the gasket lips and exterior.
- c. Install the gasket over the pipe end. Make sure the gasket does not overhang the pipe end.
- d. Align and bring the two pipe ends together. Slide the gasket into position, and make sure it is centered between the grooves on the gasket extends into the groove on either pipe.
- e. Install the housings over the gasket. Make sure the housings' keys engage the grooves properly on both pipes.
- f. Install the bolts, and thread the nuts finger-tight onto the bolts. NOTE: Make

sure the oval necks of the bolts seat properly in the bolts holes.

- g. Tighten all nuts evenly by alternating sides until metal-to-metal contact occurs at the bolts pads. Make sure the housings' keys completely engage the grooves. NOTE: It is important to tighten all nuts evenly to prevent gasket pinching.

SECTION V

ILLUSTRATED PARTS BREAKDOWN

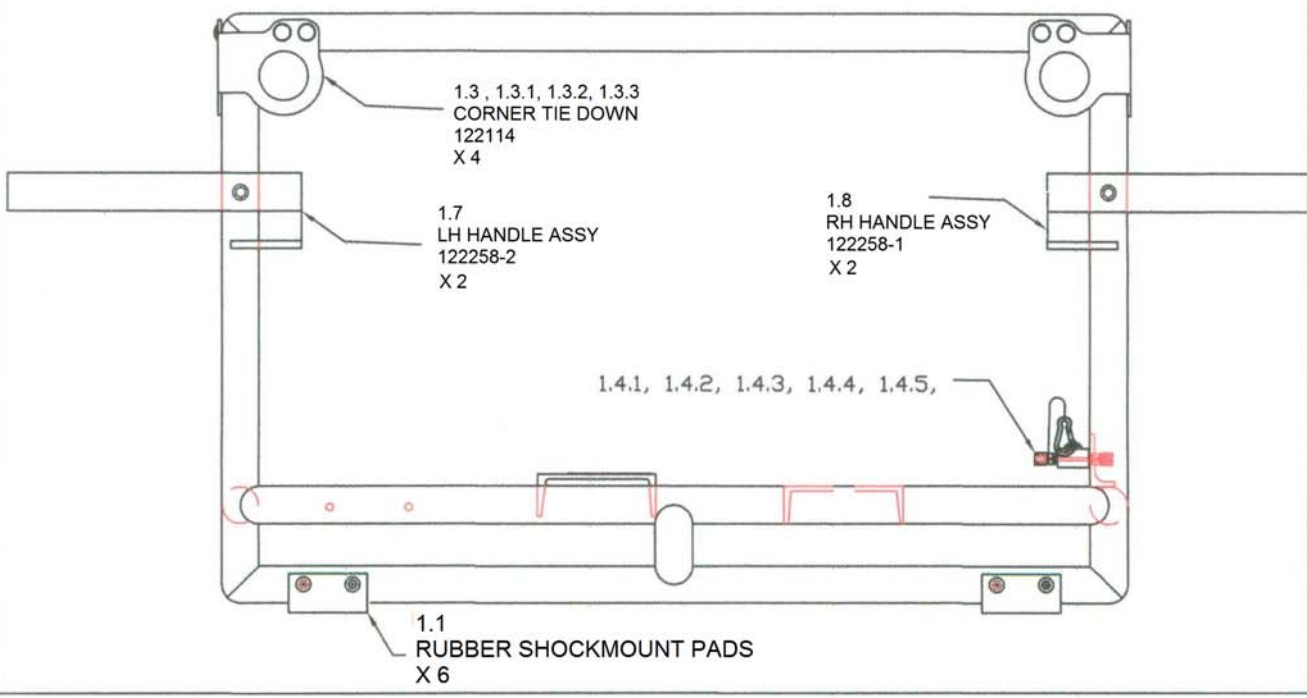
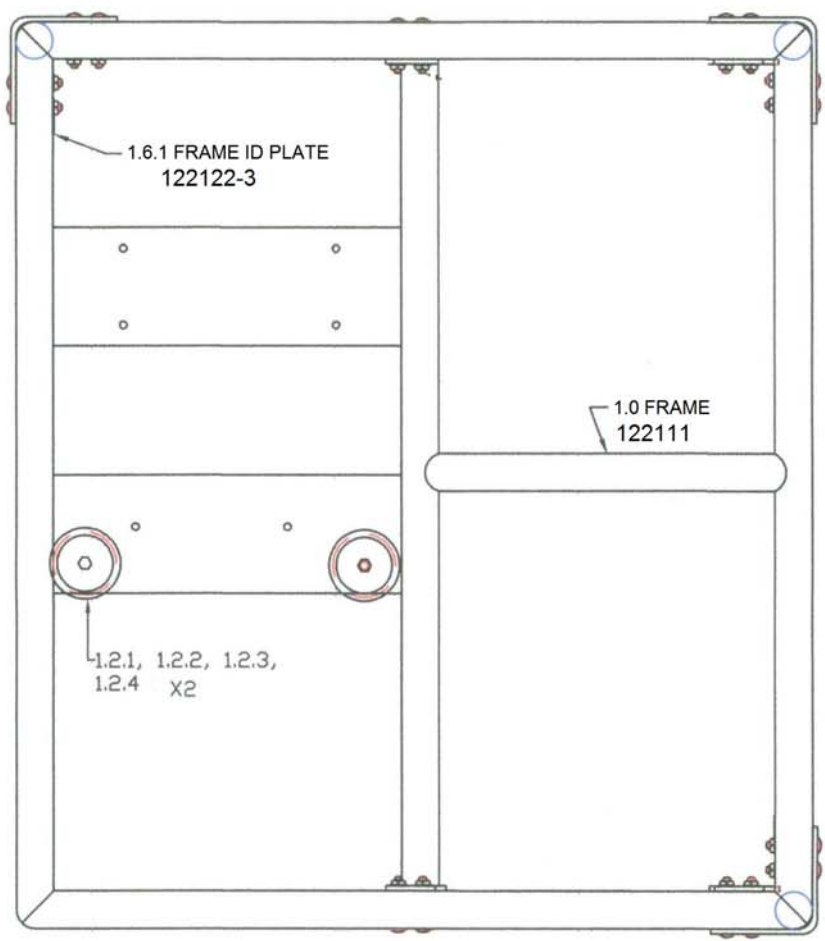
Note: Where possible, the Air Logistics Corp. 250 GPM Fuel System Module Fuel System uses commercially available parts. When procuring parts, refer to the *Illustrated Parts Breakdown* for aid in identification, and contact the local dealer/distributor for the applicable part manufacturer. Product sheets for many critical parts can be found at the back of the *Illustrated Parts Breakdown*. Small parts, e.g. washers, fittings, bolts, can be purchased through typical supply channels such as McMaster-Carr.

Air Logistics specific part numbers are 6 Digits long, with an optional dash at the end. E.g. 122117, 122115-9 For Air Logistics part numbers, or any part numbers you may need help with, please contact us directly.

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5.4

FRAME AND RELATED ASS'Y



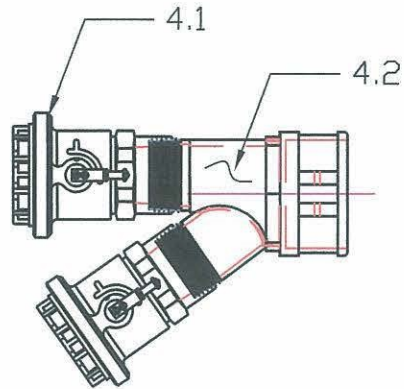
5.4

FRAME ASSEMBLY

FIG. & INDEX NO.	PART NUMBER	DESCRIPTION	UNIT PER ASSY.
1. 0	122111	FRAME (ALL ALUMINUM, SCH 80 PIPE, ANGLE, PLATE)	1
1.1	122110	RUBBER SHOCKMOUNT PADS	6
1.1.1	MS951943-32	1/4-28 NF PREVAILING TORQUE LOCKNUTS	12
1.1.2	AN4-33A	1/4-28 NF BOLTS	12
1.1.3	AN970-4	1/4" FENDER WASHERS	24
1.2	122121	DUST CAP HOLDER WELDMENT, ASSY	2
1.2.1	COM'L	3/8-16 X 1 1/2" LG, BOLT	2
1.2.2	COM'L	3/8" FLAT WASHER	2
1.2.3	COM'L	3/8" LOCK WASHER	2
1.2.4	COM'L	3/8-16 NC NUTS	2
1.3	122114	BRACKET, CORNER TIE DOWN	4
1.3.1	90185A636	3/8"-16 X 3" CARRIAGE BOLT	16
1.3.2	95462A031	3/8"-16 NUT	16
1.3.3	9114A031	3/8" FLAT LOCK WASHERS	16
1.4.1	S102408-7	CABLE, DRAIN VALVE	1
1.4.2	AN960-1016L	9/16" FLAT WASHERS	3
1.4.3	50635K374	TUBE TO ADAPTER, 45° COMPRESSION FITTING	2
1.4.4	4629K11	1/4" NPT FEMALE BALL VALVE, BRASS	1
1.4.5	3933T41	PEAR SHARE SPRING SNAP	1
1.5	13830	GROUND WIRE ASSY, GORMAN-RUPP	1
1.5.2	COM'L	1/4-20 NC X 1" LG, BOLT	2
1.5.3	COM'L	1/4" FLAT WASHER	2
1.5.4	COM'L	1/4" LOCK WASHER	2
1.6.1	122122-3	ID PLATE, FRAME (MFG. SERIAL NUMBER)	1
1.7	122258-2	HANDLE ASSEMBLY, LEFT HAND	2
1.7.1	122258-4	LIFTING HANDLE WELDMENT, LEFTHAND	1
1.7.2	94830A520	5/16"-18 FLEXTOP LOCKNUT	1
1.7.3	98017a199	3/8" FLAT WASHER, STAINLESS	1
1.7.4	91259A640	3/8" SHOULDER SCREW, 4" SHOULDER, 5/16"-18	1
1.8	122258-1	HANDLE ASSEMBLY, RIGHT HAND	2
1.8.1	122258-3	LIFTING HANDLE WELDMENT, LEFTHAND	1
1.8.2	94830A520	5/16"-18 FLEXTOP LOCKNUT	1
1.8.3	98017a199	3/8" FLAT WASHER, STAINLESS	1
1.8.4	91259A640	3/8" SHOULDER SCREW, 4" SHOULDER, 5/16"-18	1

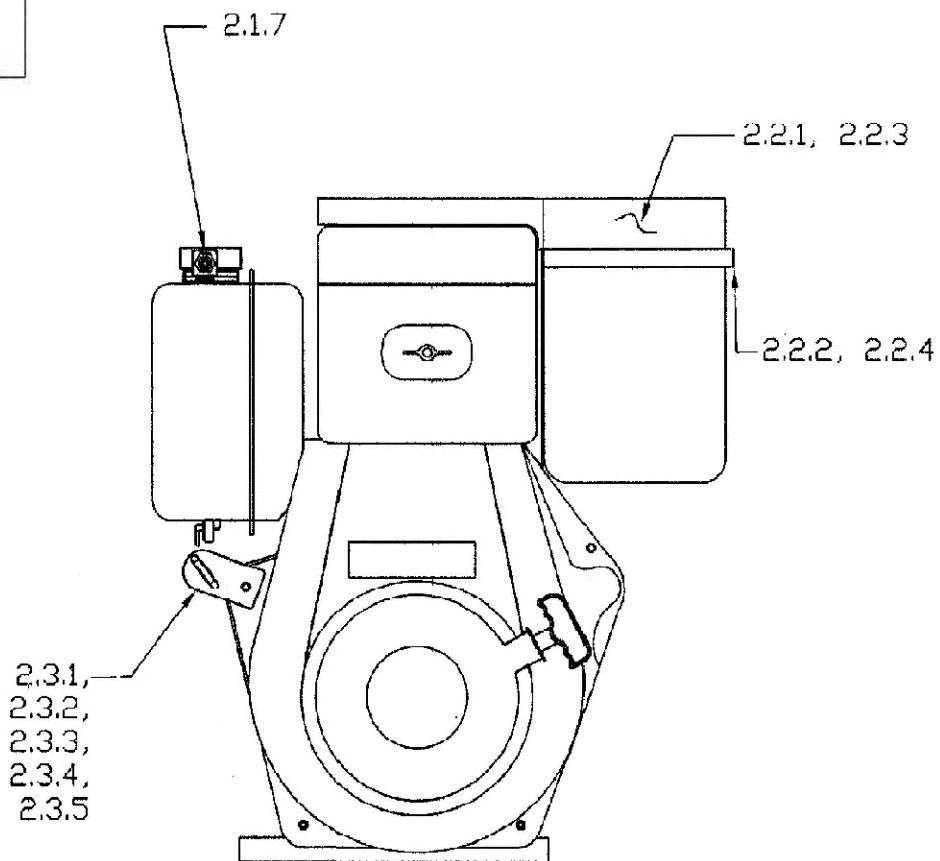
Unisex & Weldment Assembly

5.5



ENGINE ASSEMBLIES

5.6



5.5			
ENGINE & UNISEX COUPLER ASSEMBLY			
FIG. & INDEX NO.	PART NUMBER	DESCRIPTION	UNIT PER ASSY.
	122113	Unisex Coupler & Manifold assy	2
4.1	64020S	EATON UNISEX, DRY BRAKE COUPLER	2
4.2	122113-9	ALUMINUM WELDMENT	1
5.6			
	122126	ENGINE(YANMAR)/PUMP(GORMAN-RUPP) COMBO	1
2.1	AN6-15A	3/8-24 NF BOLTS	4
2.2	AN6-13A	3/8-24 NF BOLTS	2
2.3	AN960-616	3/8" FLAT WASHERS	6
2.4	AN365-624A	3/8-24 NF NYLON LOCKING NUTS	6
2.5	COM'L	3/8" FLAT WASHER	2
2.6	122122-5	ID Name Plates, PUMP (MFG. SERIAL NUMBER)	1
2.7	122122-7	ID Name Plates, MOTOR (MFG. SERIAL NUMBER)	1
2.1	122112	Fuel Tank Modification, 5.6	1
2.1.7	91465K62	90° ELBOW 1/4" ID-1/4" NPT, BRASS (HOSE BARB)	
2.2.1	122115	Hot Air Intake Manifold, 5.6	1
2.2.2	122115-9	GUARD, OVER MUFFLER	1
2.2.3	122115-13	INTAKE, OVER MUFFLER & AIR CLEANER	1
2.2.4	COM'L	M6 X 12 MM BOLT	2
2.3.1	122119	Throttle Brace	1
2.3.2	122119-3	THROTTLE BRACKET	1
2.3.3	122119-5	THROTTLE ROD	1
2.3.4	MS24665-134	COTTER PIN	1
2.3.5	COM'L	1/4" FLAT WASHER	2
3.	30 VAL	3" DUST CAP	3

1. BULK FUEL MANIFOLD - 122117

5.7 VALVE MANIFOLD ASSEMBLY

4. OUTLET MANIFOLD - 122104

5. PUMP INLET MANIFOLD - 122105

3. SUCTION INLET MANIFOLD - 122103

2. OUTLET MANIFOLD - 122102

VALVE #1

VALVE #2

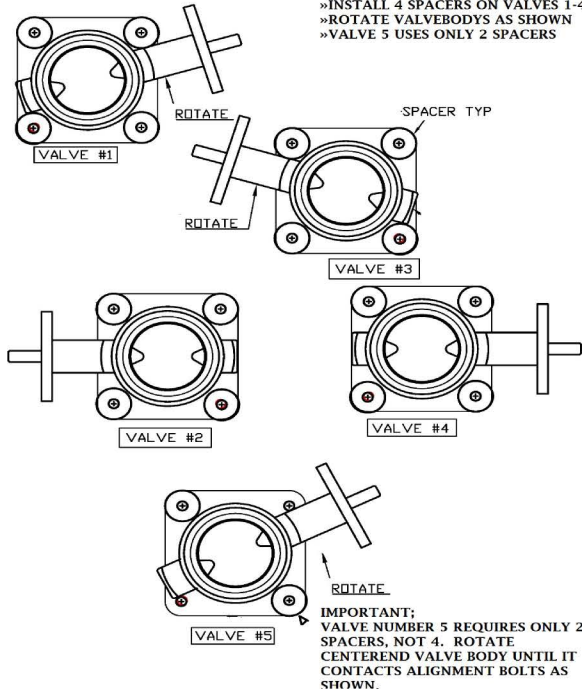
VALVE #3

VALVE #4

VALVE #5

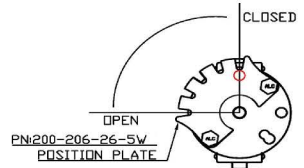
SPACER

5.7-1 SPACER AND VALVE ASSEMBLY & ALIGNMENT

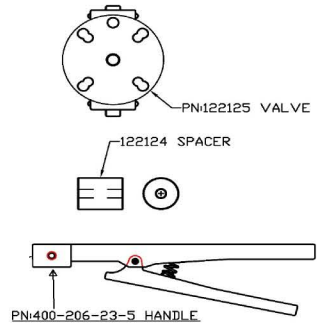


5.7-2 TYPICAL ASSEMBLY PARTS & NOTES

NUTS BOLTS WASHERS ETC:
SEE TABLE 5.7



»ALIGN THROTTLE PLATE AS SHOWN
 »INCLUDED W/ VALVE PN# 122125

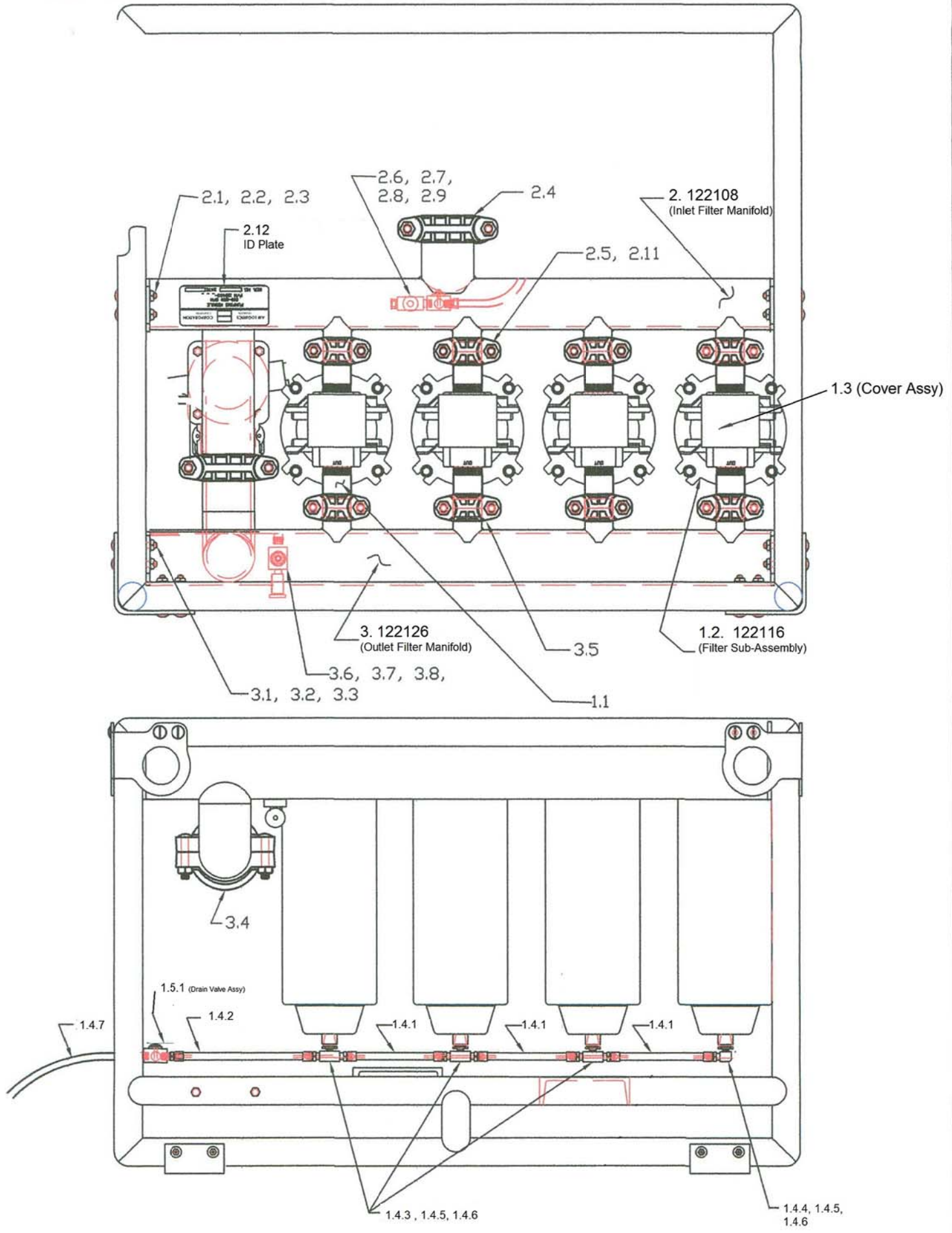


5.7

VALVE MANIFOLDS ASSEMBLY

FIG. & INDEX NO.	PART NUMBER	DESCRIPTION	UNIT PER ASSY.
1.	122117	Pump Manifold, Bulk Fuel	1
1.1	122106	Outlet Bulk Manifold	1
1.2	122125	390 SPLIT ALUMINUM BODY BUTTERFLY VALVE, ULTRA FLO	1
1.3	AN960-616	3/8" FLAT WASHERS	4
1.4	AN6-30A	3/8-24 NF BOLTS	4
1.5	AN365-624A	3/8-24 NF NYLON LOCKING NUTS	4
1.6	122124	SPACER, ACETAL	4
1.7	406-206-23-5	HANDLE ALUMINUM	1
2.	122102	Outlet Manifold	1
2.1	122125	390 SPLIT ALUMINUM BODY BUTTERFLY VALVE, ULTRA FLO	1
2.2	AN960-616	3/8" FLAT WASHERS	4
2.3	AN6-30A	3/8-24 NF BOLTS	4
2.4	AN365-624A	3/8-24 NF NYLON LOCKING NUTS	4
2.5	122124	SPACER, ACETAL	4
2.6	406-206-23-5	HANDLE ALUMINUM	1
3.	122103	Inlet Manifold	1
3.1	122121	Dust Cap Holder	1
3.2	122125	390 SPLIT ALUMINUM BODY BUTTERFLY VALVE, ULTRA FLO	1
3.3	AN960-616	3/8" FLAT WASHERS	12
3.4	AN6-30A	3/8-24 NF BOLTS	6
3.5	AN365-624A	3/8-24 NF NYLON LOCKING NUTS	6
3.6	COM'L	3/8-16 NC X 1 1/2" LG, BOLT	1
3.7	COM'L	3/8" FLAT WASHER	1
3.8	COM'L	3/8" LOCK WASHER	1
3.9	COM'L	3/8-16 NC NUTS	1
3.10	122124	SPACER, ACETAL	4
3.11	406-206-23-5	HANDLE ALUMINUM	1
4.	122104	Outlet Manifold	1
4.1	122125	390 SPLIT ALUMINUM BODY BUTTERFLY VALVE, ULTRA FLO	1
4.2	AN960-616	3/8" FLAT WASHERS	4
4.3	AN6-30A	3/8-24 NF BOLTS	4
4.4	AN365-624A	3/8-24 NF NYLON LOCKING NUTS	4
4.5	122124	SPACER, ACETAL	4
4.6	406-206-23-5	HANDLE ALUMINUM	1
5.	122105	Inlet Manifold, Pump Side	1
5.1	122125	390 SPLIT ALUMINUM BODY BUTTERFLY VALVE, ULTRA FLO	1
5.2	AN960-616	3/8" FLAT WASHERS	4
5.3	AN6-30A	3/8-24 NF BOLTS	4
5.4	AN365-624A	3/8-24 NF NYLON LOCKING NUTS	4
5.5	122124	SPACER, ACETAL	2
5.6	406-206-23-5	HANDLE ALUMINUM	1

5.8 FILTER RELATED ASSEMBLY



5.8

FILTER RELATED ASSEMBLY

FIG. & INDEX	PART NUMBER	DESCRIPTION	UNIT PER ASSY.
1. 1.1	122100A	NIPPLES, PIPE ALUMINUM 1.5" NPT x 1.5" GROOVE	8
1.2	122116	FILTER SUB-ASSEMBLY	4
1.2.1	VF22SB-PG	FACET, 22 SERIES HOUSING w/ DIFF PRESSURE GAUGE	1
1.2.2	CC-22-7	FILTER CARTRIDGE, 1 MICRON	1
1.2.3	051486	VENT VALVE, 1/8" NPT	1
1.2.4	4429K422	1/4" X 1/2" NPT, HEX REDUCING BUSHINGS, BRASS	1
1.3.1	122257	DIFFERENTIAL PRESSURE GAUGE COVER ASSY	4
1.3.2	122257-3	COVER GUIDE, MOUTING BRACKETS	2
1.3.3	122257-9	COVER DOOR, WELDMENT	1
1.3.4	91259A409	HEX SCREW, SHOULDER 3/16" DIA - #8-32 x 5/16" SHLDR LENGTH	2
1.3.5	94830A490	LOCKNUT, FLEX-TOP EXPANDING #8-32	2
1.3.6	91114A030	EXTERNAL TOOTH LOCK WASHER 5/16"	4
1.3.7	92865A622	HEX CAP SCREW 3/8-16 , 3/4" Long	4
1.4	122123	DRAIN LINES, HOSES (FILTER CARTRIDGE BASE)	
1.4.1	122123-3	WATER DRAIN HOSE, 1/4" ID x 1/2" OD x 4.9"	3
1.4.2	122123-5	WATER DRAIN HOSE, 1/4" ID x 1/2" OD x 7.5"	1
1.4.3	50785K322	1/4" NPT TEE FEMALE, BRASS	3
1.4.4	50785K43	90° ELBOW 1/4" NPT FEMALE X 1/4" NPT, BRASS	1
1.4.5	50635K374	ADAPTER, 1/4" 45° FLARE x 1/4" NPT MALE	9
1.4.6	53485K22	BARB HOSE FITTING, 45° FLARE COMPRESSION	9
1.4.7	122123-13	WATER DRAIN HOSE, 1/4" ID x 1/2" OD x 24"	1
1.5.1	SEE SECTION 5.4	DRAIN VALVE ASSY, SEE SECTION 5.4 - FRAME ASSEMBLY	1
2.	122108	INLET FILTER MANIFOLD	1
2.1	90185A636	3/8-16 X 3" CARRIAGE BOLT	4
2.2	95462A031	3/8-16 NUT	4
2.3	9114A031	3/8" FLAT LOCK WASHERS	4
2.4	DBV-BN300	DIXON GROOVE CLAMPS 3", FORGED ALUMINUM, NITRILE	1
2.5	75 1 1/2" T	STYLE 75 1.5" FLEXIBLE COUPLINGS, VICTAULIC NITRILE T	4
2.6	50785K322	1/4" NPT TEE FEMALE, BRASS	1
2.7	91465K91	1/4" NPT X 1/4" BARB HOSE FITTING, BRASS	2
2.8	50785K43	1/4" NPT FEMALE BALL VALVE, BRASS	1
2.9	5485K22	1/4" NPT HEX NIPPLE, BRASS 1 1/8" LG	1
2.10	122123-7	FUEL TANK HOSE	1
2.11	122107	RESTRICTOR, (PLACED INSIDE CENTER 77A 1 1/2 COUPLING)	1
2.12	118894	NAME PLATE, FLAT BLACK (See other Colors Below)	1
2.12	118894-503	NAME PLATE, DRAB GREEN	1
2.12	118894-505	NAME PLATE, DESERT TAN	1
3.	122109	OUTLET FILTER MANIFOLD	1
3.1	90185A636	3/8-16 X 3" CARRIAGE BOLT - (ALSO FASTENS CORNER TIE-DOWN)	4
3.2	95462A031	3/8-16 NUT	4
3.3	9114A031	3/8" FLAT LOCK WASHERS	4
3.4	DBV-BN300	DIXON GROOVE CLAMPS 3", FORGED ALUMINUM, NITRILE	1
3.5	75 1 1/2" T	STYLE 75 FLEXIBLE COUPLINGS, VICTAULIC NITRILE T	4
3.6	GTP-992-4MA	1/4" APT QUICK DISCONNECT COUPLING	1
3.7	GTP-150	DUST PLUG, FOR QUICK DISCONNECT	1
3.8	50785K322	1/4" NPT TEE FEMALE, BRASS	1

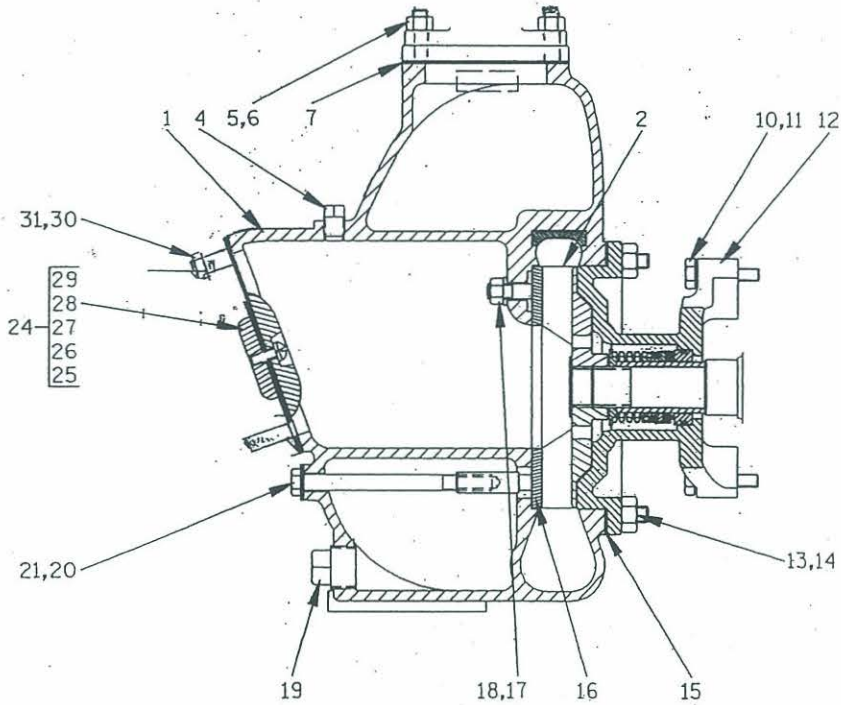
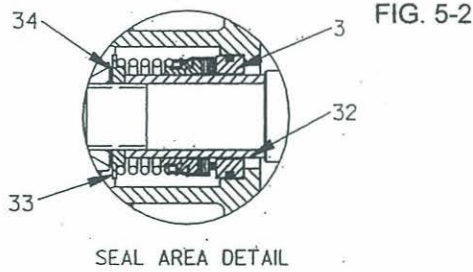
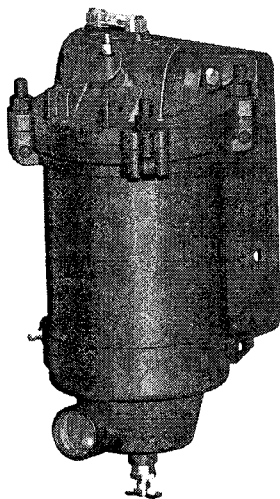


FIG. 5-3

ITEM NO.	PART NUMBER	PART NUMBER	MAT'L CODE	QTY	ITEM NO.	PART NUMBER	PART NUMBER	MAT'L CODE	QTY
1	PUMP CASING	6882B	13040	1	21	FLAT FIBER WASHER	KFO6	18040	1
2	IMPELLER	6950	13040	1	22				
3	SEAL ASSY	25271-043	- - -	1	23				
4	PIPE PLUG	PO4	15079	1	24	CHECK VALVE ASSY	544F	- - -	1
5	STUD	CO607	15991	4	25	-VALVE WEIGHT	18	10010	1
6	HEX NUT	DO6	15991	4	26	-RD HD MACH SCREW	XO403	17092	1
7	DISCH FLANGE GSKT	543G	20000	1	27	-LOCKWASHER	JO4	17090	1
8					28	-CHECK VALVE GSKT	544GB	19550	1
9					29	-VALVE WEIGHT	1364	10010	1
10	HEX HD CAP SCREW	22645-538	- - -	4	30	STUD	CO606	15991	4
11	LOCK WASHER	21171-510	- - -	4	31	HEX NUT	DO6	15991	4
12	INTERMEDIATE BRKT	38264-224	10010	1	32	SHAFT SLEEVE	2146	16000	1
13	STUD	CO606	15991	6	33	SPRING SEAT	3863	170010	1
14	HEX NUT	DO6	15991	6	34	IMP ADJ SHIM SET	2X	17090	1
15	CASING GASKET SET	229G	20010	1	NOT SHOWN:				
16	WEAR PLATE ASSY	6951	15991	1		SUCTION STICKER	6588AG	- - -	1
17	HEX NUT	DO6	15991	1		PRIMING STICKER	6588AH	- - -	1
18	LOCKWASHER	JO6	15991	1		NAME PLATE	38818-019	13990	1
19	CASING DRAIN PLUG	P12	15079	1		DRIVE SCREW	BM#04-03	17000	4
20	HEX HD CAP SCREW	BO618	15991	1		DISCHARGE STICKER	6588BJ	- - -	1

Swing Bolt Design



INSTALLATION:

Remove the housing thread protectors from the inlet and outlet connections. Make certain the connections are free of all debris.

(IMPORTANT: BE SURE TO CORRECTLY IDENTIFY THE INLET AND OUTLET CONNECTIONS TO AVOID PIPING THE UNIT BACKWARDS. THE UNIT WILL NOT PERFORM CORRECTLY IF CONNECTIONS ARE REVERSED.)

The petcock drain and vent valves should be installed using Teflon tape or similar sealant.

(Note: For jet fuel service, the included valves should be replaced with items not made from brass or bronze.)

Provide shut-off valves in the inlet and outlet piping as close to the unit as possible for isolating the unit from the systems when cartridge replacement is necessary.

Connect the housing into the piping system with a minimum number of turns and fittings, especially on the inlet side. For installation on fuel dispensing pumps, connect the fuel delivery hose directly to the outlet connection.

In order to provide electrical bonding for the housing and prevent static discharge, a bonding cable kit (P/N 644964) is available and recommended. One end should be attached to the sump drain 1/2" coupling and the other end to the inlet or outlet 1-1/2" piping.

Note: It is recommended that the vent and drain valves or plug be opened once each day to permit the escape of entrapped air and accumulated water.

Maintenance:

Since there are no moving parts, maintenance is limited to an occasional cartridge replacement, requiring only 2" (51mm) base clearance. (Note: Every Facet replacement element available for this housing comes with a new cover gasket. Install a new gasket when changing elements.)

Cartridge Replacement Procedures:

CAUTION:

1. **FULL FLOW MONITORS (WATER ABSORBING ELEMENTS) ARE NOT FOR USE WITH FUEL CONTAINING ANTI-ICING ADDITIVE (FSII, PRIST, DI-EGME). THIS INCLUDES PREMIXED AND MILITARY FUELS CONTAINING THIS ADDITIVE.**
2. **USE ONLY NON-SPARKING TOOLS WHEN PERFORMING ANY MAINTENANCE OR SERVICE WORK ON THIS EQUIPMENT.**

The frequency of cartridge replacement is dependent on the following conditions:

1. Effluent flow is noticeably reduced.
2. Differential pressure across the unit reaches 15 psid.
3. Recommended replacement is once yearly.

If any of the above noted conditions indicate that cartridge replacement is necessary follow procedures below.

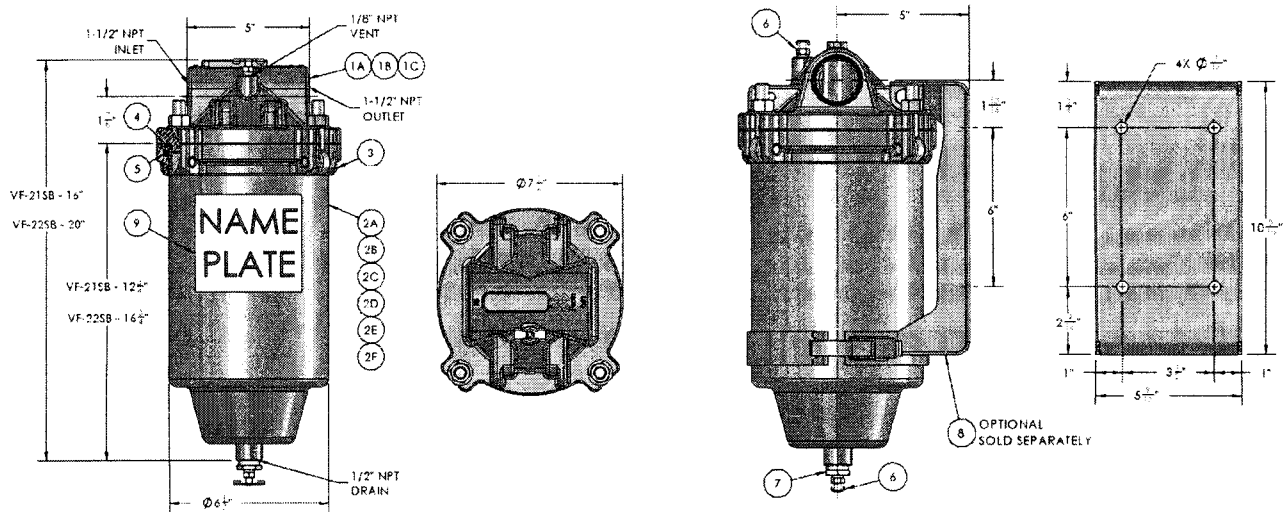
1. Close the inlet and outlet blocking valves to isolate the filter from the system.
2. Open the drain plug or drain valve on the housing bottom; allow all fluid to drain from the unit.
3. Open the vent valve on the cover of the housing; allow the unit to thoroughly vent before opening the cover.
4. Loosen (4) swing bolts, then remove the housing body and element.

(CAUTION: DUE TO THE TOXIC EFFECTS OF SOME ADDITIVES USED IN FILTERED FLUIDS, CARE SHOULD BE EXERCISED IN HANDLING THE EXPENDED CARTRIDGE AND/OR ALL INTERNAL PARTS THAT HAVE BEEN IN CONTACT WITH THE FILTERED PRODUCTS.)

5. Remove and discard the expended cartridge and closure o-ring in a FIRE-SAFE place.
6. Flush the interior of the housing with clean, processed, filtered product or a suitable solvent. A nonmetallic bristle brush will help to remove caked on debris. Rinse the housing and unit cover with clean solvent and dry with soft, lint-free wiping cloth.
7. Remove a new replacement cartridge from the shipping carton; closely inspect the cartridge before installing it. Slide the new cartridge into the housing.
8. Install new closure o-ring. Reassemble the body and align swing bolts with cover bolt slots. Tighten the bolts attaching the body to the housing cover. Torque to 10ft/ lbs.
9. Close the drain plug or valve on the bottom of the housing.
10. SLOWLY open the inlet and outlet valves; allow the unit to fill completely.
11. Leave the vent valve on top of the unit open, to allow entrapped air to escape while filling.
12. When a small amount of fluid flows from the vent, close it tightly.
13. During initial filling, after above maintenance, and while unit is in operation, examine housing and all connections for leaks.
14. Repair any leaks and replace damaged or deteriorated parts such as closure o-ring, vent and drain valves or plug as necessary.

**INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS
FOR VF-21-SB/22SB SERIES HOUSINGS AND CARTRIDGES**

ITEM #	PART #	DESCRIPTION	QTY REQ
1A	644159-MCH-PC	Head/Cover	1
1B	644548	Head/Cover/w/Pressure Gauge	1
1C	644159-MCH-PG2-PC	Head/Cover w/ 1/8" NPT Fittings	1
2A	609333	21 Series Body	1
2B	686687	21 Series Body w/ Sight Glass	1
2C	644760	21 Series Body w/ Water Probe Connection	1
2D	684276	22 Series Body	1
2E	686688	22 Series Body w/ Sight Glass	1
2F	644761	22 Series Body w/ Water Probe Connection	1
3	644161	Flange Assembly	1
4	644604	Flange O-Ring	1
5	606521	Closure O-Ring	1
6	051486	1/8" Vent & Drain Valve	2
7	608440	1/2" x 1/8" Bushing	1
8	644160	Mounting Bracket	*Sold separately
9	Consult Factory	Nameplate	1
10	644964	Bonding Cable Kit	*Sold Separately



Notes: All weights and Dimensions are approximate
Maximum Operating Pressure: 150 psi (1034kPa)

Estimated Housing Weight:

21 Series- (Dry) 15.5 lbs (7.0kgs)
(Wet) 25.5 lbs (11.6kgs)
22 Series- (Dry) 18.3 lbs (8.3 kgs)
(Wet) 31.3 lbs (14.2kgs)

Victaulic® Flexible Coupling

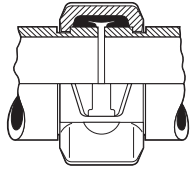
Style 75



06.05



1 – 8"/DN25 – DN200



Exaggerated for clarity

Housing:

Ductile iron conforming to ASTM A-536, Grade 65-45-Standard: Orange enamel.

1.0 PRODUCT DESCRIPTION

Available Sizes

- 1 – 8"/DN25 – DN200

Pipe Material

- Carbon steel
- Stainless steel

Maximum Working Pressure

- Accommodates pressures ranging from full vacuum (29.9 in Hg/760 mm Hg) up to 500 psi/3447 kPa/34 bar
- Working pressure dependent on material, wall thickness and size of pipe

Application

- Joins standard roll grooved and cut grooved pipe, as well as grooved fittings, valves and accessories
- Provides a flexible pipe joint which allows for expansion, contraction and deflection
- Up to 50% lighter in weight than standard Victaulic Style 77 or Style 177N flexible couplings

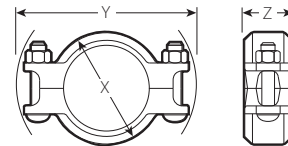
Bolts/Nuts:

Standard: Heat-treated plated carbon steel, trackhead meeting the physical and chemical requirements of ASTM A-449 and physical requirements of ASTM A-183

Grade “T” Nitrile

Nitrile (Orange stripe color code). Temperature range -20°F to +180°F/-29°C to +82°C. May be specified for petroleum products, air with oil vapors, vegetable and mineral oils within the specified temperature range. Not compatible for hot water services over +150°F/+66°C or for hot dry air over +140°F/+60°C.

Style 75



Size		Pipe End Separation ³	Deflection from Centerline ³		Bolt/Nut		Dimensions			Weight
Nominal inches DN	Actual Outside Diameter inches mm	Allowable inches mm	Per Cplg. Degrees	Pipe inches/ft. mm/m	Qty.	Size imperial metric	X inches mm	Y inches mm	Z inches mm	Approx. (Each) lb kg
1 ½ DN40	1.900 48.3	0–0.06 0–1.6	1°–56'	0.40 33	2	¾ x 2 M10 x 51	2.91 74	4.82 122	1.77 45	1.5 0.6
3 DN80	3.500 88.9	0–0.06 0–1.6	1°–2'	0.22 18	2	½ x 2 ¾ M12 x 70	4.50 114	7.00 178	1.88 48	2.9 1.3





The Right Connection®

Aluminum Groove Clamps



Features:

- Lightweight yet rugged. Unlike steel groove clamps that secure the pipe ends with high clamping force against the tubing/piping walls, the Dixon aluminum bolted clamp takes the full bolt force and locks into the groove of the tube/pipe, preventing distortion of the tube/pipe diameter.
- Precision casting and machined dimensions provide an exact fit and great appearance.
- Lock nuts prevent loosening in applications with vibration.

Size	Seal	Part #	Maximum PSI	Approximate Weight Lbs.	Bolt Torque ¹	Fuel Compatibility
2"	Buna	DBV-BN200	400	0.8	50 ft lbs	Gasoline and Diesel, up to E100 & B20 Biofuels
2"	FKM-B	DBV-VB200	400	0.8	50 ft lbs	Gasoline and Diesel, up to E100 & B100 Biofuels
2"	Baylast™	DBV-BL200	400	0.8	50 ft lbs.	Gasoline and Diesel, up to E100 & B100 Biofuels
3"	Buna	DBV-BN300	170	1.1	50 ft lbs	Gasoline and Diesel, up to E100 & B20 Biofuels
3"	FKM-B	DBV-VB300	170	1.1	50 ft lbs	Gasoline and Diesel, up to E100 & B100 Biofuels
3"	Baylast™	DBV-BL300	170	1.1	50 ft lbs.	Gasoline and Diesel, up to E100 & B100 Biofuels
4"	Buna	DBV-BN400	120	1.5	50 ft lbs	Gasoline and Diesel, up to E100 & B20 Biofuels
4"	FKM-BB	DBV-VB400	120	1.5	50 ft lbs	Gasoline and Diesel, up to E100 & B100 Biofuels
4"	Baylast™	DBV-BL400	120	1.5	50 ft lbs.	Gasoline and Diesel, up to E100 & B100 Biofuels

! ¹ Torque the bolts until metal to metal contact occurs at the bolt pads (about 20 ft-lbs). Bolts must be tightened evenly to prevent gasket pinching and clamp breaking. DO NOT tighten one side then the other. Over-torquing will not improve sealing and may result in failure of the clamps. DO NOT torque bolts over 30 ft-lbs.

Dixon Bayco

800 High Street • Chestertown, MD 21620
 ph: 410.778.2000 • fx: 410.778.4702
dixonvalve.com

Dixon Group Canada Ltd.

2315 Bowman Street • Innisfil, Ontario L9S 3V6
 ph: 800.355.1991 • fx: 877.436.6251
dixongroupcanada.com

390 and 380 Series

Split Body Design

- 1 Piece disc/stem meets FDA requirements
- 2"-12"
- Split body construction offers quick and easy cleaning/repairs
- Lightweight, durable construction
- Seat design ensures positive retention and easy replacement
- Hand polished disc/stems
- Direct mount top plate for easy automation
- Low profile neck increases clearance

Features

Primary and Secondary Seals

Prevent line media from contacting stem and body components. The primary seal is the interference fit between the disc hub and the seat flat. The secondary seal is the interference fit between the stem and seat stem hole.

Upper and Lower Stem Bushings

(Lower Bushing only on 4" and larger valves.) Heavy duty non-corrosive thermoplastic polymer helps eliminate galling and reduce torque.

Stem Packing

Ensures a positive seal for pressure or vacuum service and prevents external contaminants from entering the stem bore.

Top Plate

Industry standardized drilling for total manual operator and actuator interchangeability.

Split Body

This split body style allows for a one-piece Ultra thin Disc/Stem that does not require disc screws, for improved sanitary performance, discs with satin and high polish finishes are available. 390 series disc/stems are offered in rugged investment cast 17-4PH and 316 Stainless Steel – or 255 Duplex Stainless when both increased strength and sanitary requirements apply.

3" 390 Series Valves

have been designed to fit between TTMA, ASME & lightweight flanges. The body features alignment holes that ensure proper valve positioning and allow quick, problem free installation.



Technical Data:

Materials of Construction

Body:

Cast Aluminum or Cast Iron Epoxy Coated

Resilient Seat:

Food Grade - Nitrile (black or white), Buna-N, or EPDM. Non Food Grade - FKM., EPDM backed PTFE

Disc/Stem:

316SS, 17-4 PH or 255 Duplex Stainless

Stem Bushing:

Upper & Lower - Thermoplastic Polymer

Body Bolt:

Cadmium Plated Steel

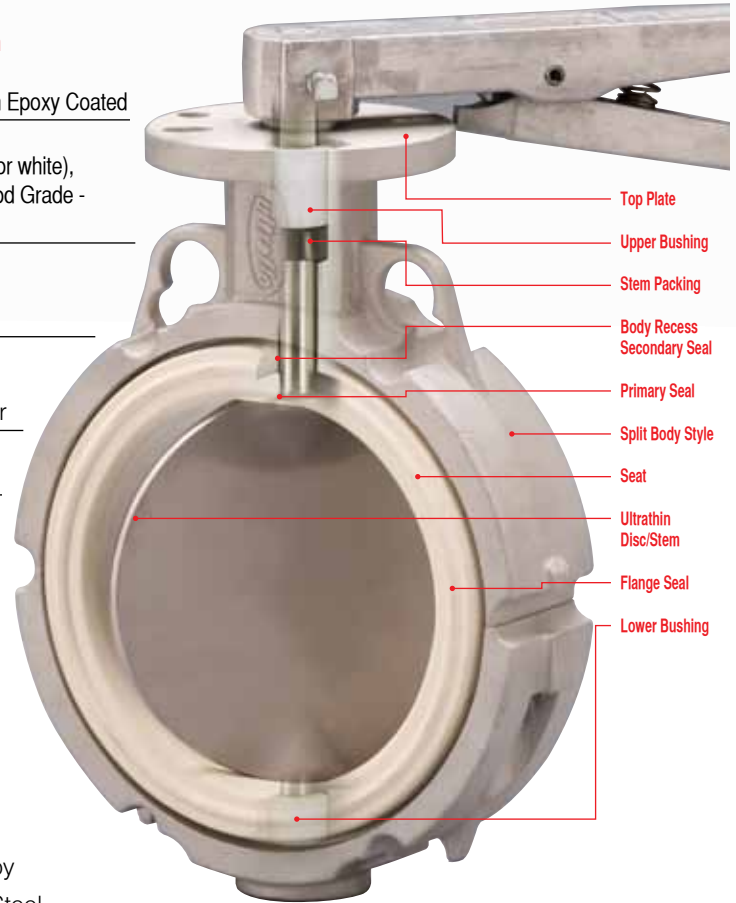
Manual Operator Components

Handle:

High strength aluminum alloy, Nodular Iron or Stainless Steel.

Throttling Plates:

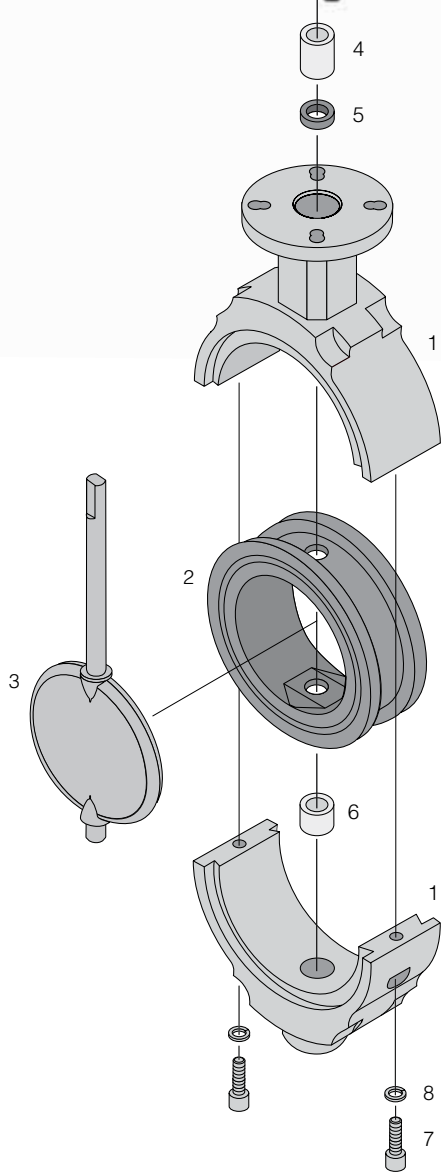
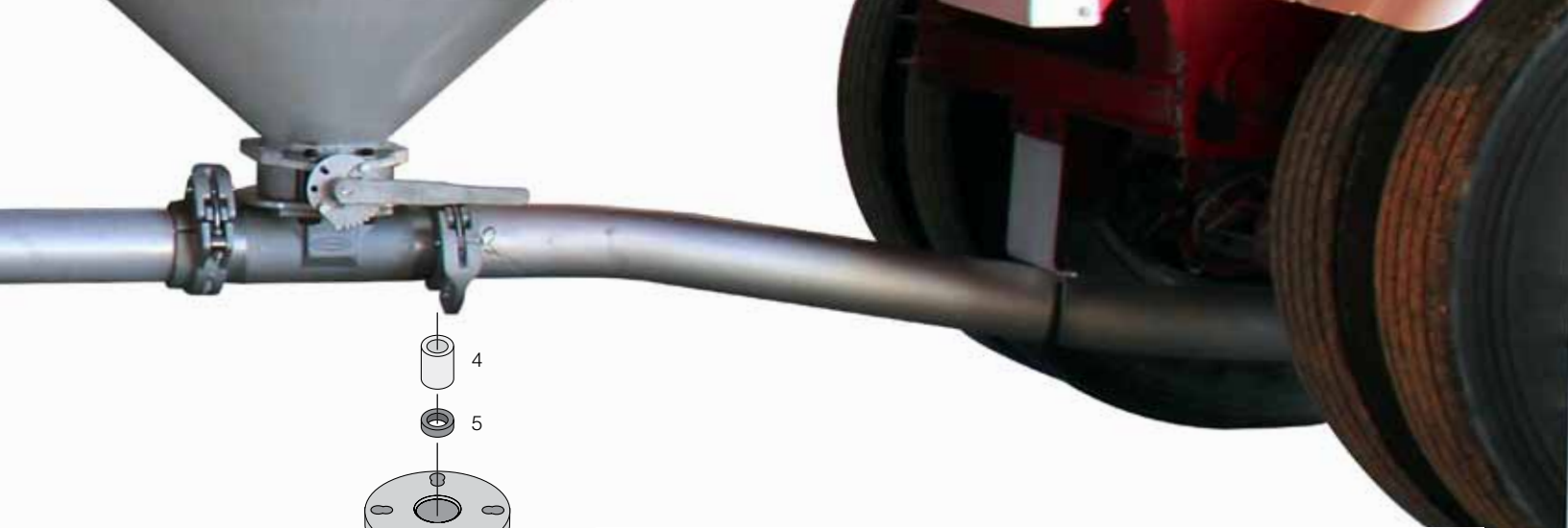
5 Position High strength aluminum alloy
 10 Position High strength aluminum alloy
 10 Position Stamped Steel



Bidirectional Pressure Ratings

Disc Type	Rating
Standard Under Cut Disc	50 psi
Optional Full Cut Disc	150 psi

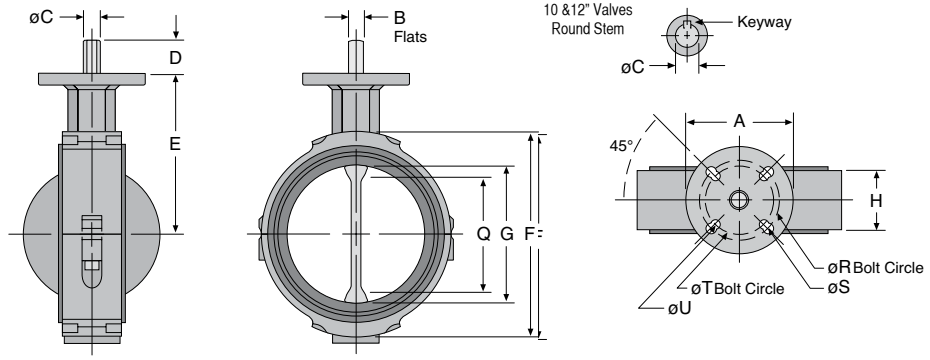




Dimensions 390 & 380 SERIES 2" - 12" Valves

Valve Size		A	B	C	D	E	F	G	H	Q	Top Plate Drilling Dimensions				
In.	mm										R	S	T	U	Holes
2	50	4.00	.375	.563	1.250	3.938	4.025	2.125	1.625	1.531	3.250	.438	2.760	.375	4
2 1/2*	65	4.00	.375	.563	1.250	4.50	4.775	2.50	1.750	1.969	3.250	.438	2.760	.375	4
3	75	4.00	.375	.563	1.250	4.875	5.275	3.125	1.750	2.689	3.250	.438	2.760	.375	4
4	100	4.00	.437	.625	1.250	6.00	6.775	4.125	2.00	3.719	3.250	.438	2.760	.375	4
5	125	4.00	.437	.625	1.250	6.00	7.650	5.188	2.125	4.813	3.250	.438	2.760	.375	4
6	150	4.00	.500	.750	1.250	6.50	8.650	6.125	2.125	5.813	3.250	.438	2.760	.375	4
8	200	6.00	.625	.875	1.250	8.313	10.900	8.125	2.50	7.813	5.00	.563	—	—	4
10	250	6.00	—	1.125	2.00	9.125	13.275	10.125	2.50	9.906	5.00	.563	—	—	4
12	300	6.00	—	1.125	2.00	10.645	16.025	12.093	3.00	11.938	5.00	.563	—	—	4

* 2 1/2" size valves are offered only in cast iron bodies and are not available in aluminum.



390 Series & 380 Series Components

Item	Description	Qty.
1	Split Body	1
2	Seat	1
3	Disc / Stem	1
4	Upper Bushing	1
5	Stem Packing	1
6	Lower Bushing (4" and larger only)	1
7	Body Bolt	2
8	Lock Washer	2

Dimension & Flanging Notes

H dimension is the installed width.
 Q dimension is the minimum allowable inside diameter of the pipe or mating flange.
 2" - 6" Valves are offered with 2 independent Top Plate Drilling patterns: R/S and T/U.

Flange Requirements: The valve O.D. and flange bolt circle must share a common center line.

All aluminum valves are designed to fit lightweight and ASME 125/150 flanges. 4", 5", 6" and 8" valves require additional machining to fit TTMA flanges and require an "A" following the size indication in the part number. 2" 400 Series and all Series 3" aluminum bodied Ultraflo valves fit TTMA flanges as standard.

390/380 Series 3" and 5" valves feature flange alignment holes to ensure proper positioning and ease of installation.

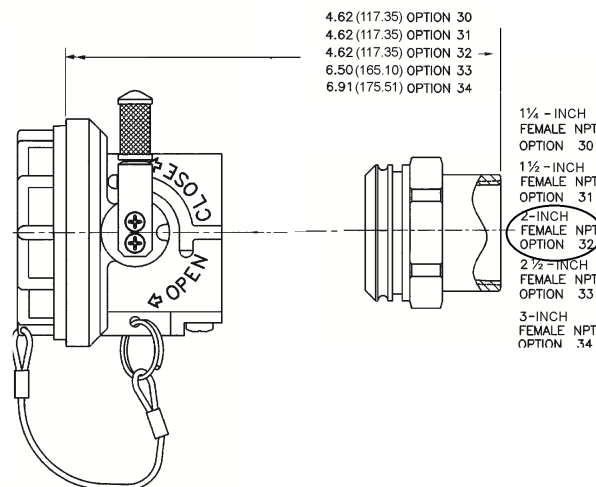
Eaton's Carter product line includes unisex couplings designed in accordance with A-A-59377 (supersedes MIL-C-53071) and completely interchangeable with similar 2-inch couplings made by Eaton's Aeroquip® product line. Unisex couplings, as the name implies, are designed to mate with each other allowing for the connection of hose assemblies, regardless of the end fitting. The basic Model 64320 Valved Unisex Coupling has various accessories and inlet options, as described under "Ordering Data."

Features

- Unisex connection allows indiscriminate mating
- Manual ball valve included
- Interlock feature prevents disconnection of unit with ball valve open
- Pressure tight dust cap included on all units
- Dust seal incorporated between connected units — protects mating surfaces
- Units are easily repairable
- Variety of inlet fittings options to suit system needs
- Tan color standard, green optional

Technical Information

- Qualified in accordance with A-A-59377
- Pressure drop — 3 psi (.206 bar) max for 2 inch units at 200 gpm (757 l/min)
- Operating pressure — 100 psi (6.895 bar)
- Burst pressure — 300 psi (20.684 bar)
- Hose swivel torque — 240 in-lb max at 100 psi (6.894 bar)
- Operating temperatures — -25°F to +155°F (-31.66°C to +65.55°C)
- Inlets to mate male or female NPT or BSPP camlocks, D-1/D-2/D-3 nozzle, hose barbs available. Special inlets available on request.
- Hose swivel integral to part



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 Fluid & Electrical Distribution Division
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SERVICE BULLETIN ALC P/N 118463 200/250 GPM FUEL SYSTEM MODULE (NSN 4320-01-C15-2648)

Number: 01
SUBJECT: RELOCATION OF FUEL TANK (REFUELING) VALVE
APPLICABILITY: ALL UNITS NOT PREVIOUSLY MODIFIED
DATE: 15 FEB 2015
REVISION: 0
SUMMARY: RELOCATES VALVE FROM THE FUEL TANK TO THE FUEL INTAKE MANIFOLD. RELOCATION REDUCES THE POSSIBILITY OF DAMAGE TO THE VALVE/TANK WHEN CARGO IS PUT ON TOP OF THE MODULE.
REQUIREMENTS: NO NEW PARTS ARE REQUIRED UNLESS A COMPONENT IS DAMAGED. NO SPECIAL TOOLS ARE REQUIRED OTHER THAN APPROPRIATE HAND TOOLS.

PROCEDURES:

DISASSEMBLY

- Remove hoses between the fuel tank and manifold and at the "tee" to the differential pressure gauge.
- Remove the valve and elbow assembly from the fuel tank.
- Separate the elbow and barb fitting from the valve.
- Remove the "tee" assembly from the filter manifold.
- Separate all fittings from the "tee" fitting.
- Clean the fittings, tank and manifold of old sealing materials.

REASSEMBLY

- Install new sealer material on all threads
- Install the barb fitting onto the elbow.
- Install the elbow/barb assembly on the fuel tank, with the barb facing straight down.
- Install the barb fitting onto one side of the "tee".
- Install the nipple onto the other side of the "tee".
- Install the valve onto the nipple with the valve handle facing away from the "tee" when the handle is in the closed position. The handle should face toward the valve when the valve is opened.
- Install the remaining barb fitting into the valve.
- Install the valve/"tee" assembly on the manifold with the barb fitting on the "tee" facing the hose to the gauge. The handle of the valve needs to face downwards so the "tee" can be screwed into the manifold. Handle points down when the valve is closed. Handle rotates 90° toward the "tee" when open and transferring fuel to the tank.
- Reconnect all hoses. The hose from the valve to the fuel tank will be slightly shorter but this should not be an issue.

See the attached pages for further information. Questions or comments should be directed to George Schirtzinger at 626.470.6132 (direct), 626.437.1445 (cell) or ghschirtz@airlog.com.

p/n118463 service bulletin 01 relocation of refueling valve

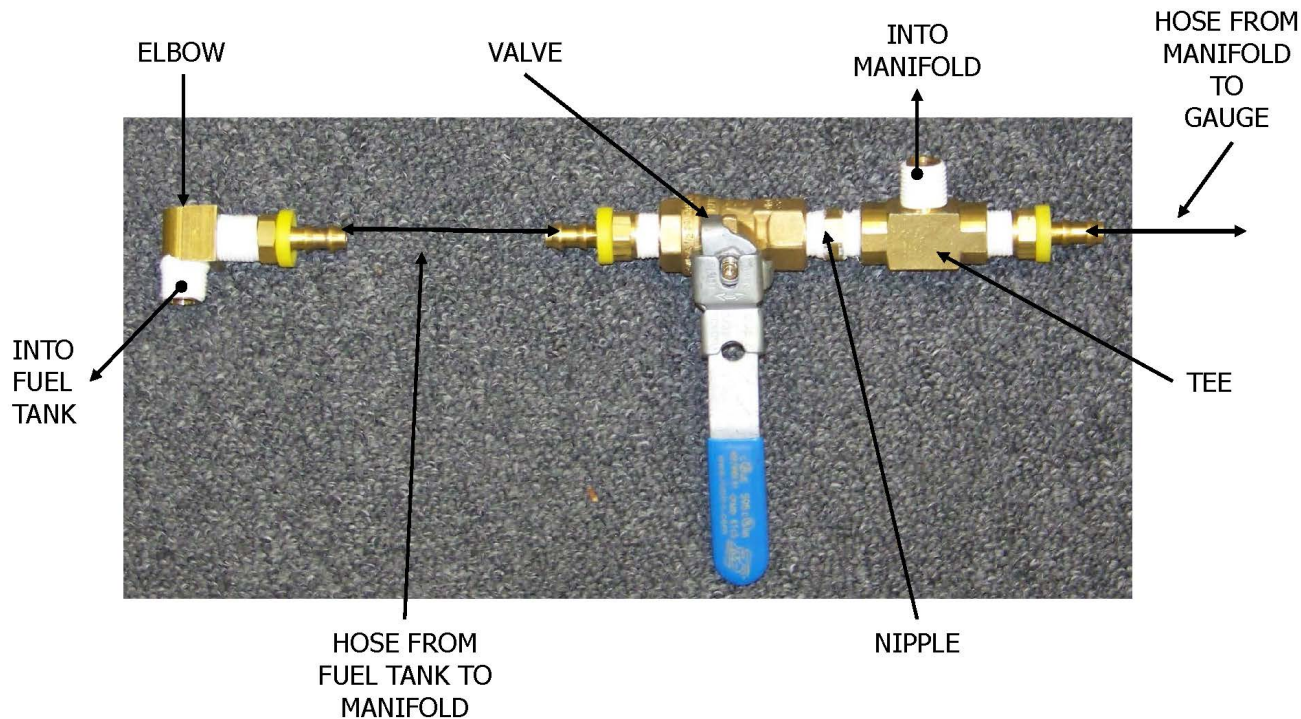
PARTS LISTING

ITEM	DESCRIPTION	PART NUMBER*	QUANTITY REQ'D	SOURCE*
1	90° Elbow, ¼" NPT, ¼" ID, Brass	50785K43	1	McMaster-Carr
2	Fitting, Hose Barb, Brass, ¼" NPT x ¼"	91465K91	3	McMaster-Carr
3	Tee, Female, Brass, ¼" NPT	50785K322	1	McMaster-Carr
4	Ball Valve, Female, Brass, ¼" NPT	4629K11	1	McMaster-Carr
5	Nipple, Hex, Brass, ¼" NPT	5485K22	1	McMaster-Carr
6	Hose, Push-on, ¼" ID x ½" OD (various lengths)	5288K11	1	McMaster-Carr

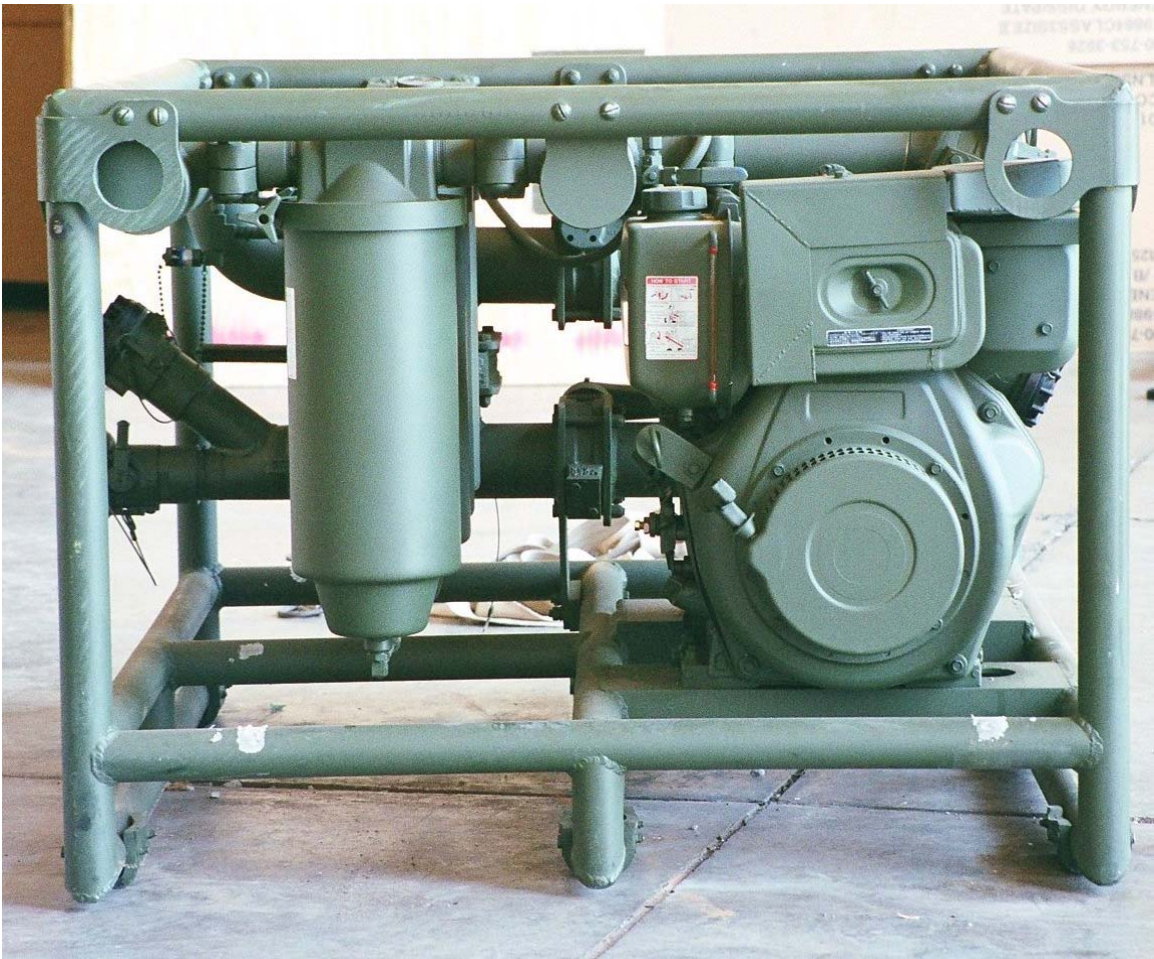
*Note: Part numbers are for McMaster-Carr items and listed for reference. Any commercially equivalent part may be substituted.

ASSEMBLED PARTS READY FOR INSTALLATION

P/N 118463 SERVICE BULLETIN 01
RELOCATION OF REFUELING VALVE



AIR LOGISTICS CORPORATION



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