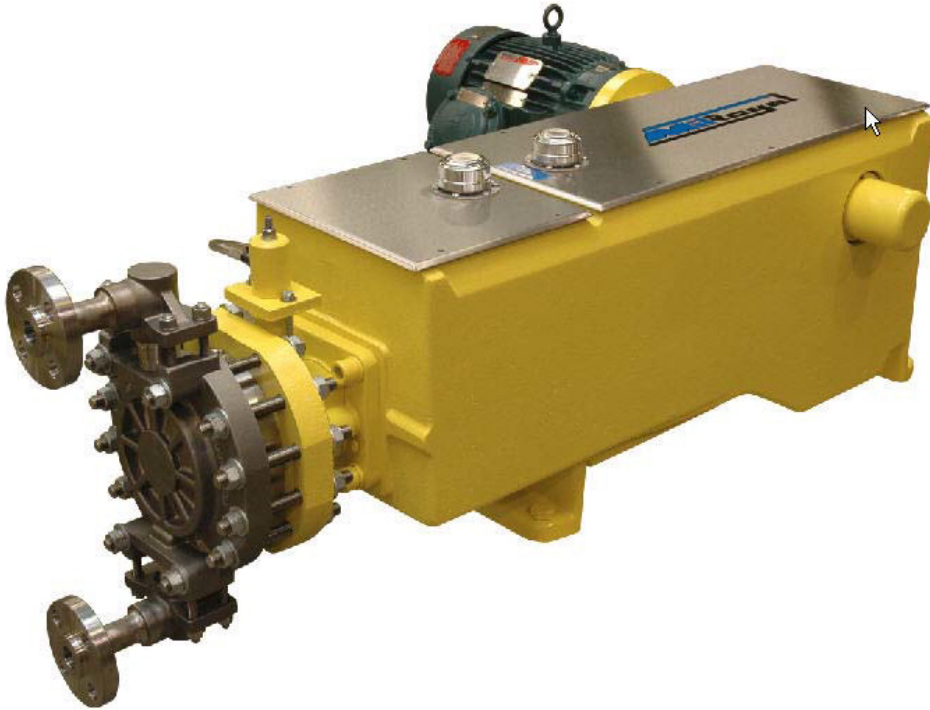




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High Performance Diaphragm Liquid End (HPD)

Milroyal® B, C & D IOM Manual

Manual No : 54146

Rev. : 00

Rev. Date : 10/2015



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PRECAUTIONS

The following precautions should be taken when working with metering pumps.
Please read this section carefully prior to installation.

Protective Clothing



ALWAYS wear OSHA approved protective clothing, face shield, safety glasses and gloves when working on or near your metering pump. Additional precautions should be taken depending on the solution being pumped. Refer to Safety Data Sheets (SDS) for the solution being pumped.

Hearing Protection



It is recommended that hearing protection be used if the pump is in an environment where the time weighted average sound level (TWA) of 85 dbA is exceeded. (As measured on the A scale - slow response)

Electrical Safety



- Remove power and ensure that it remains OFF while maintaining pump.
- DO NOT FORGET TO CONNECT THE PUMP TO EARTH.
- Electric protection of the motor (Thermal protection or by means of fuses) is to correspond to the rated current indicated on the motor data plate.

Liquid Compatibility



Verify if the materials of construction of the wetted components of your pump are recommended for the solution (chemical) to be pumped.

Pumps Water “Primed”



All pumps are tested with water at the factory. If your process solution is not approved with water, flush the Pump Head Assembly with an appropriate solution before introducing the process solution.

Plumbing and Electrical Connections



Always adhere to your local plumbing and electrical codes.

Line Depressurization



To reduce the risk of chemical contact during disassembly or maintenance, the suction and discharge lines should be depressurized before servicing.

Over Pressure Protection



To ensure safe operation of the system it is recommended that some type of safety / pressure-relief valve be installed to protect the piping and other system components from damage due to over-pressure.

Lifting



This manual should be used as a guide only - Follow your company's recommended lifting procedures. It is not intended to replace or take precedence over recommendations, policies and procedures judged as safe due to the local environment than what is contained herein. Use lifting equipment that is rated for the weight of the equipment to be lifted.



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1.1 GENERAL

This instruction manual is designed to serve as a supplement to instruction manuals 53940, 53939 and 53941, which provide both general information and specific instructions for installing, operating and maintaining Milton Roy pumps. This manual covers only the optional High Performance Diaphragm Liquid End (HPD). This manual covers single diaphragm HPD's only. For double diaphragm liquid ends, refer to instruction manual 54148. This liquid end cannot be retrofitted to a drive housing in place of other packed plunger, tubular diaphragm or disc diaphragm liquid ends. Do not rely on this manual alone when installing, maintaining and operating Milton Roy pumps. Use Milroyal® B HPD Low-Flow manual, 54149 for information on 7/16", 9/16", and 5/8" plunger diameters. For Milroyal® B or C pumps with critical service liquid ends. Refer to manual 54261

1.2 DESCRIPTION

The High Performance Diaphragm (HPD) liquid end combines all of the best characteristics of traditional liquid ends into one technologically advanced design. Its operating characteristics and simplicity of operation make it the best liquid end to consider first for most metering pump applications.

Milton Roy's HPD liquid end overcomes many of the Net Positive Suction Head (NPSH) restrictions associated with conventional disc diaphragm metering pumps. This is accomplished by a patented Mechanically Actuated Refill System (MARS) that eliminates the process side support plate and lowers NPSH requirements.

The MARS also does away with the need for field adjustment of the refill mechanism by automatically compensating for process liquid modifications. This, combined with removable check valves, makes the HPD an ideal choice for any process in which downtime is critical.

The HPD features a preformed, PTFE faced elastomer diaphragm that is compatible with a wide range of process liquids and chemicals. The composite diaphragm also offers extended life over conventional designs.

The HPD liquid End is particularly suitable for pumping costly, aggressive or hazardous liquids without leakage.

1.3 PRINCIPLE OF OPERATION *FIGURES 1 AND 2*

The mechanical drive system of the pump drives the piston back and forth in the High Performance Diaphragm (HPD) liquid end supplied with the pump. At the start of a suction stroke, the plunger moves away from the liquid end, drawing hydraulic fluid with it. As the hydraulic fluid is drawn back, the flexible diaphragm follows, lowering the pressure on the process fluid in the liquid end. This pressure causes the fluid to flow inward, lifting the suction ball check, and allowing process fluid to pass through the suction line into the diaphragm head. At the same time, the discharge ball check is pulled closed, blocking flow back through the discharge line. Minimum back pressure in discharge line of 30 psi is required.

At the end of the suction stroke, the process reverses, beginning the discharge stroke. Now the plunger moves forward, pushing hydraulic fluid before it. The hydraulic oil must therefore press against the diaphragm, flexing it forward and raising the pressure on the process fluid in the liquid end. This pressure causes the process fluid to flow outward, forcing the discharge ball check open and the suction ball check to seat, blocking back flow through the suction line. The process fluid flows out of the diaphragm head and into the discharge line. This suction / discharge action is repeated with every stroke of the pump plunger, and is the direct cause of the pumping action.

SECTION 1 - DESCRIPTION

As the pump operates, a small quantity of hydraulic oil is continuously bled through the air bleed / relief valve. After a while, this results in a shortage of hydraulic oil in the displacement chamber. When this happens, the diaphragm will be pulled tight against the contour plate, and part of the diaphragm will press against the patented Mechanically Actuated Refill System (MARS) valve. Now, when the plunger draws back, a vacuum is created in the displacement chamber. These two factors (diaphragm pressing against MARS valve & a vacuum in the displacement chamber) must occur together to trigger the MARS valve.

When both of these conditions are met, the MARS valve is forced to its rearward position and the poppet opens, allowing hydraulic oil from the reservoir to enter and replenish the lost oil. In this manner, proper hydraulic balance is constantly maintained in the displacement chamber.

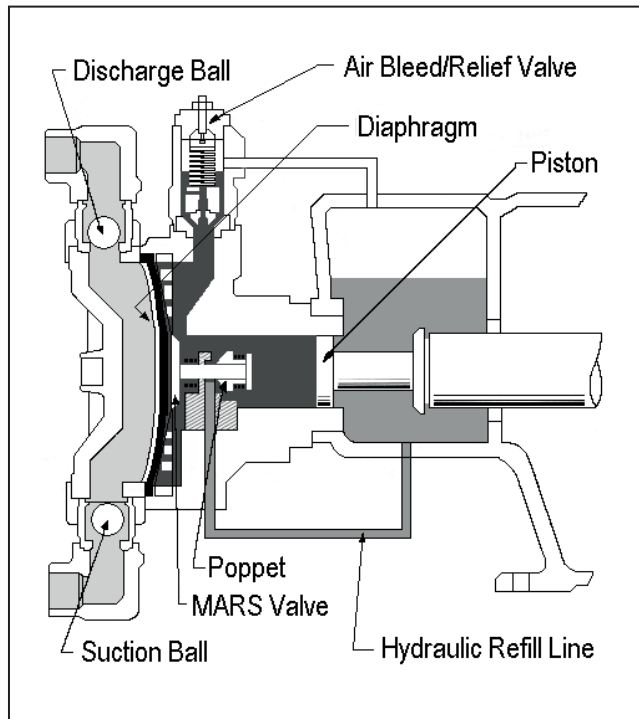


Figure 1. Principle of Operation-Suction.

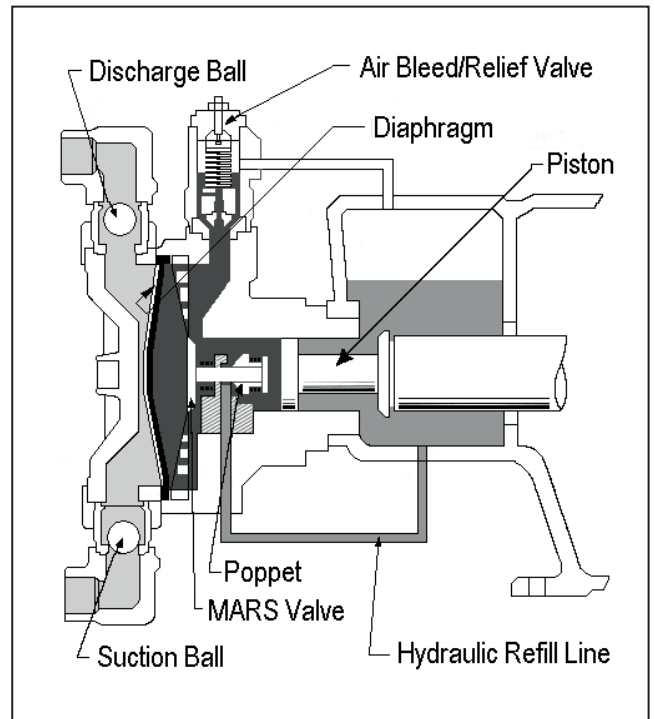


Figure 2. Principle of Operation-Discharge.

SECTION 1 - DESCRIPTION

1.4 MODEL CODING

The presence of an HPD liquid end on a Milroyal® pump is indicated by an “H” in the third position of the pump model code (xxH-xxx-xxxx-x). This model code can be found on the data plate attached to the pump. For more information on pump model coding, see the appropriate pump data sheet (www.miltonroy.com).

1.5 SPECIFICATIONS

Plunger Diameters:	Milroyal® D- 1", 1 1/4", 1 1/2"
	Milroyal® B- 1", 1 1/4", 1 1/2", 2", 2 1/2", 3 1/2", 4"
	Milroyal® C- 3/4", 7/8", 1", 1 1/4", 1 1/2", 2", 2 1/2", 3", 3 1/2", 5", 5 3/4"
Materials of Construction:	316SS, Alloy 20, Alloy C22, Plastic
Temperature Range:	Metallic: 10°F-190°F (standard)
	Metallic: 10°F-225°F (optional)
	Plastic: 10°F-140°F
Flow Rates and Pump Model Coding	See www.miltonroy.com
	Data Sheets for Download
	Milroyal® D - PD 3621
	Milroyal® B - PD 3641
Milroyal® C - PD 3661	
Net Positive Inlet Pressure Requirement	3 PSIA

2.1 UNPACKING

Pumps are shipped Free On Board (FOB) from the factory and the title passes to the customer when the carrier signs for receipt of it. The customer, therefore, must file damage claims with the carrier. The shipping crate should be carefully examined upon receipt from the carrier to be sure there is no obvious damage to the contents. Open the crate carefully, as there are sometimes accessory items fastened to the inside of the crate that may be lost or damaged. Examine all material inside crate and check against the packing list to be sure that all items are accounted for and undamaged.

2.2 SAFETY PRECAUTIONS

When installing, operating and maintaining an HPD pump, keep safety considerations foremost. Use proper tools, protective clothing, and eye protection when working on the equipment and install the equipment with a view toward ensuring safe operation. Follow the instructions in this manual and take additional safety measures appropriate to the liquid being pumped. Be extremely careful in the presence of hazardous substances. (e.g. corrosives, toxics, solvents, acids, caustics, flammables etc.)

2.3 MOUNTING

The HPD liquid end is shipped already mounted to the appropriate pump. Mounting, therefore, is simply a matter of securing the pump to a safe, level surface. For further information on proper pump mounting, see the appropriate pump instruction manual:

Milroyal® B	53940
Milroyal® C	53939
Milroyal® D	53941

2.4 CONVERSION PROCEDURES

A pump fitted for operation with any liquid end other than HPD cannot be converted for operation with an HPD liquid end. Drive housings for other liquids ends contain some machined features which make them incompatible with HPD liquid ends.

A pump can, however, be converted from an HPD liquid end plunger size or material of construction to other select HPD designs. For more information on converting between different HPD liquid end models, please contact the Milton Roy factory or your local authorized representative.

2.5 PIPING CONNECTIONS

General

General piping instructions are given in the pump drive instruction manual. No reciprocating plunger pump can be expected to perform satisfactorily unless those recommendations are followed. Pay particular attention to plastic liquid ends, as these units are relatively fragile and can be damaged by the installation. For best results, avoid straining the liquid end by installing a very short section of flexible tubing between rigid, fixed piping and suction and discharge cartridges on plastic liquid ends.

NOTE:

Maximum safety and reliability may be ensured by protecting liquid ends and piping with an external relief valve installed in the system discharge line.

SECTION 2 - INSTALLATION

2.6 NPSH CONSIDERATIONS

The HPD liquid end is far superior to conventional diaphragm liquid ends for suction lift and many other NPSH critical applications. It's patented diaphragm and advanced design refill mechanism give this liquid end truly high performance in these applications.

For more NPSH information, refer to Milton Roy web site (www.miltonroy.com) for aid in evaluating applications for this liquid end.

2.7 TYPICAL PIPING

In order to adjust the HPD relief valve, it is necessary to have a pressure gauge and a shut OFF valve installed in the discharge line. The pressure gauge must have a higher range than the desired pump relief pressure, and should be installed as close to the pump discharge connection as possible. The shut OFF valve should be installed downstream of the pressure gauge. These items are not required for normal operation, but for ease of pump maintenance and adjustment, it is suggested that they be permanently piped into the line.

Also see the instructions in the appropriate pump instruction manual for additional typical piping instructions.

3.1 PUMP START-UP PROCEDURE

▲ WARNING FAILURE TO CHECK ALL NON-METALLIC HEAD BOLTS PRIOR TO STARTUP AND AFTER ONE WEEK OF OPERATION MAY EXPOSE OPERATING PERSONNEL TO HAZARDOUS LIQUIDS.

▲ CAUTION DO NOT RUN THE MOTOR UNTIL ALL START UP STEPS HAVE BEEN COMPLETED. YOU COULD DAMAGE THE PUMP IF YOU RUN THE MOTOR BEFORE ALL OF THE STEPS HAVE BEEN COMPLETED. IT MAY BE NECESSARY TO TEST THE MOTOR OFF THE PUMP TO INSURE PROPER DIRECTION AND OPERATION. THE MOTOR DIRECTION IS CRITICAL. WIRE THE MOTOR SO THAT IT ROTATES IN THE DIRECTION OF THE ARROW CAST ON THE MOTOR MOUNT FLANGE. CONSULT MANUFACTURER DOCUMENTATION FOR MOTOR START UP RECOMMENDATIONS.

1. For plastic liquid ends, recheck bolt tightness and if necessary retighten bolts firmly (*Figures 3 and 4*). Do not overtighten, or the plastic diaphragm head could deform or crack.
2. Follow the motor mounting procedure before attempting to start your pumps. On some pumps, the motor is mounted at the factory.
3. Make the proper electrical connections to the motor per the manufacturer's recommendations. Make sure the motor is properly grounded.
4. Make sure that all of the mounting holes for the pump base are used to securely tighten the base to the mounting area.
5. Do not run the motor until ALL start up steps have been completed.
6. Remove the gear drive fill cap or cover / lid (the chamber closest to the motor).

PUMP	GEAR LUBRICANT	QUANTITY
Milroyal® D	Mobil SHC 629	1 PT (0.5 Liter)
Milroyal® B	Zurn AGMA 7	2.5 Gal (9.5 Liter)
Milroyal® C	Zurn AGMA 7	7.5 Gal (28.4 Liter)
Food grade substitutes: Nevastane EP460		

Table 1. Milroyal® D, B, & C Gear Oil

7. Fill the gear drive chamber with appropriate gear lubricant (Table 1). This oil was shipped with the pump. Fill this chamber so that the oil level is even with the top oil level plug. Do not overfill (*see appropriate pump drive instruction manual, paragraph 2.3*). Milroyal® D uses a common oil for gear lube and the hydraulic oil.
8. Remove the catchall cover or chamber vent cap (closest to the process liquid end of the pump) revealing the plunger. Fill this chamber with hydraulic oil, (Table 2). This oil was shipped with your pump, and is a lower viscosity compared to the gear oil. The hydraulic fluid must fill the catchall chamber so that the oil level is just above the plunger sleeve.

NOTE:
Two types of oils have been provided. They must be added at the proper location.

PUMP	HYDRAULIC OIL	QUANTITY
Milroyal® D	Mobil SHC 629	1 PT (0.5 Liter)
Milroyal® B	Zurnpreen 15A	3 QT (2.85 Liter)
Milroyal® C	Zurnpreen 15A	
	Up to 2"	2.5 Gal (9.5 Liter)
	2.5" & 3.5"	3 Gal (11.3 Liter)
	5" & 5.75"	5 Gal (18.9 Liter)
Food grade substitute all pumps-Nevastane AW 32		

Table 2. Hydraulic Oil

9. Replace catchall cover.
10. Now fill the entire diaphragm displacement chamber in the liquid end with hydraulic oil (Table 2).

NOTE:
The following steps (11-16) are not necessary on new pumps received from the factory. It is necessary anytime the head and diaphragm are removed (Section 4, maintenance).

SECTION 3 - OPERATION

11. Disconnect outlet tube from relief valve(335B) and remove relief valve from liquid end. Make sure that the O-ring between displacement chamber and relief valve does not get lost or damaged, and that the opening in the displacement chamber is clean.
12. Make sure that the capacity adjustment (hand knob or automatic control) is set at 100%.
13. Rotate motor coupling until the piston and crosshead are in the full forward position (closest to pump liquid end).
14. Fill the opening in the displacement chamber (221-A) through the port uncovered by removal of the relief valve in step 1 with the hydraulic oil furnished with the pump (Table 2). Fill the chamber slowly, allowing air bubbles to escape, until the oil level reaches the very top.

CAUTION IF THE DISPLACEMENT CHAMBER IS FILLED WITH THE PLUNGER FULLY REARWARD, THE DIAPHRAGM COULD RUPTURE AT START-UP. TO PROPERLY FILL THE DISPLACEMENT CHAMBER, THE PLUNGER MUST BE POSITIONED SO THAT IT IS FULLY FORWARD IN THE DISPLACEMENT CHAMBER.

15. With the plunger fully engaged in the displacement chamber (pump at TDC, Top Dead Center) adjust the stroke adjustment mechanism until the indicating needle reads 100%. Either turn the hand wheel on a micrometer, apply a 15-PSI supply signal for a Pneumatic, or apply a 20-mA signal for an Electronic actuator. In order to fill each displacement chamber, rotate the motor either by hand (by removing the fan cover and spinning the fan by hand), or by rotating the motor electrically. The motor may be jogged by turning the power ON and OFF very quickly.

CAUTION IT IS VERY IMPORTANT NOT TO ROTATE THE MOTOR AT HIGH SPEED, BECAUSE HYDRAULIC FLUID WILL BE FORCED FROM THE AIR BLEED PORT AT A VERY HIGH VELOCITY.

16. On multiplex units, repeat these two steps for each pump to insure proper hydraulic fill in each displacement chamber.
17. Recheck the oil level in the catchall reservoir and install the cover, screws and lock washers.

CAUTION ALWAYS WEAR THE PROPER PROTECTIVE GEAR WHEN WORKING ON THE PUMP LIQUID END.

18. Connect suction and discharge piping manifolds. Use the proper gaskets and tighten each flange evenly. Check that all connections are tight including the check valves, flanges, and air relief valves.
19. It is advisable to test the pump for proper operation by testing it with water before you use a process fluid.

CAUTION TAKE ADDITIONAL SAFETY MEASURES APPROPRIATE TO THE LIQUID BEING PUMPED. BE EXTREMELY CAREFUL IN THE PRESENCE OF HAZARDOUS SUBSTANCES (CORROSIVES, TOXINS, SOLVENTS, ACIDS, CAUSTICS, AND FLAMMABLES).

NOTE:

If so equipped, loosen each process bleeder barb on each pump to bleed any air from the liquid end. Connect a hose to this barb and use caution if you are pumping a hazardous chemical. After all process liquid ends have been purged of air, you can tighten all bleeder barbs to prevent leakage.

20. Now the motor can be started if and only if all steps have been followed.
 - a. For constant speed motors, adjust the stroke adjustment mechanism so that the indication needle reads 25-30%. Gradually increase the capacity adjustment mechanism and increase backpressure to insure that the pump has time to purge all air from the system.

- b. For a variable speed drive, the motor should be run at a very slow speed between 75-100 revolutions per minute, and the pump should have minimal process back pressure for initial start up. Gradually increase the motor speed and increase back-pressure to insure that the pump time to purge all air from the system.

▲ CAUTION WHENEVER AN HPD PUMP IS SHUT DOWN (NOT PUMPING) THE DISCHARGE LINE MUST BE RELIEVED OF PRESSURE WHEN THAT PRESSURE IS ABOVE THE MAX SUCTION PRESSURE. FAILURE TO RELIEVE PRESSURE IN THE DISCHARGE LINE CAN DAMAGE THE CONTOUR PLATE.

NOTE:

This concludes the start-up procedure. Please follow these steps to insure start-up success and reduce any risk of damage to the pump.

3.2 RELIEF VALVE ADJUSTMENT

▲ WARNING THE PRESSURE RELIEF VALVE (1040) IS FACTORY SET TO OPEN AT A PRESSURE SLIGHTLY ABOVE THE PUMP MAXIMUM OPERATING DISCHARGE PRESSURE; NEVER SET THE VALVE AT ANY GREATER PRESSURE.

All HPD liquid ends have a built in relief valve that allows hydraulic fluid to return to the hydraulic fluid reservoir if excessive pressure builds up in the discharge line. This effectively stops the pump from pumping, since the forward stroke of the piston will not displace the hydraulic fluid and force the diaphragm to flex. Please read "Principle of Operation" and see *Figures 1 and 2* for more information.

NOTE:

This relief valve is to protect the pump and is not to be used in lieu of a system relief valve.

The HPD liquid end relief valve may be adjusted to operating conditions by the following procedure. Adjust the relief valve after first installing the pump and after any maintenance procedures.

1. A pressure gauge and shut OFF valve must be installed in the discharge line to complete this procedure. If the necessary equipment is not installed, refer to the "Typical Piping" instructions in Section 2.
2. Make sure all shut OFF valves are open. Start pump and pump process liquid to drain or other safe point to establish proper pumping action.
3. Set capacity control at 30%.

▲ WARNING KEEP HANDS AWAY FROM RECIPROCATING PLUNGER AND CROSSHEAD. DO NOT LEAVE PUMP OPERATING UNATTENDED WITH SHUT OFF VALVE CLOSED. EXCESSIVE PRESSURE CAN BUILD QUICKLY, POSSIBLY CAUSING SEVERE DAMAGE TO PUMP AND / OR PIPING. SINCE THE RELIEF VALVE IS NOT YET PROPERLY ADJUSTED, IT CAN NOT BE RELIED ON TO LIMIT EXCESSIVE PRESSURE BUILD-UP. BE SURE TO WATCH PRESSURE GAUGE VERY CAREFULLY AND OPEN SHUT OFF VALVE IMMEDIATELY IF EXCESSIVE PRESSURE DEVELOPS.

4. Close shut OFF valve slowly ("dead head" the pump) and closely watch the pressure increase on the pressure gauge. If pressure exceeds desired value, quickly open shut OFF valve to relieve pressure in line. Back OFF relief valve pressure and repeat until pressure is below desired setting when valve is closed.
5. With shut OFF valves still closed, adjust relief valve adjusting screw located on top of valve until maximum desired relief valve pressure reading is obtained on gauge.
6. After setting relief valve, make sure shut OFF valve is fully open. Remove pressure gauge from line or leave in place, as desired, and place pump in routine service.

SECTION 4 - MAINTENANCE

4.1 RECOMMENDED SPARE PARTS

Be Prepared. To avoid delays in repairs, the following spare parts should be ordered for each pump:

One Routine Preventive Maintenance Kit (RPM), which contains replacements for those parts which are subject to wear; specifically the ball checks, check valve seats, gaskets, and the hydraulic fluid strainer (*See RPM Kits below*).

Milroyal®	Plunger Diameter	Liquid End Material	Kit Part Number
D	1"	316SS	RPM-0011-011
		Alloy 20	RPM-0011-015
		PVC	RPM-0011-052
	1.25", 1.5"	316SS	RPM-0011-021
		Alloy 20	RPM-0011-025
	1.25	PVC	RPM-0011-052
1.5	PVC	RPM-0011-062	
B	7/16", 9/16", 5/8" & 1"	316SS	RPM-0011-011
		Alloy 20	RPM-0011-015
		PVC	RPM-0011-052
	1.25", 1.5"	316SS	RPM-0011-021
		Alloy 20	RPM-0011-025
	1.25	PVC	RPM-0011-052
	1.5"	PVC	RPM-0011-062
	2", & 2.5"	316SS	RPM-0011-031
		Alloy 20	RPM-0011-035
		PVC	RPM-0011-062
	3.5" & 4"	316SS	RPM109
		Alloy 20	RPM110
		PVC	RPM-0011-072
		C-22	RPM 111

Table 3. Milroyal® D, B, & C RPM Kits

C	3/4", 7/8", 1", 1.25"	316SS,	RPM-0011-021
		Alloy 20	RPM-0011-025
	1.5", 2"	316SS	RPM-0011-031
		Alloy 20	RPM-0011-035
	2.5", 3", 3.5"	316SS,	RPM109
		Alloy 20	RPM110
		PVC	RPM-0011-072
		C-22	RPM 111
	5", 5.75"	316SS	RPM197
		PVC	RPM013

Table 3. Milroyal® D, B, & C RPM Kits (Cont)

Replacing these parts annually with an RPM kit can reduce the possibility of unexpected downtime and will help to extend pump life.

Parts orders must include the following information:

1. Serial number (found on nameplate)
2. Model number (found on nameplate)
3. Quantity required
4. Part number
5. Part description

Always include the serial and model numbers in all correspondence regarding the unit. Liquid ends with double balls requires 2 kits.

RPM Kits do not contain diaphragms.
See *diaphragm replacement later in section 4.*

4.2 RETURNING UNITS TO THE FACTORY

Pumps will not be accepted for repair without a Return Material Authorization, available from the factory or other authorized Customer Service Department. Pumps returned to the factory for repairs should be clearly labeled to indicate the liquid being pumped. Process liquid should be flushed from the pump liquid end before the pump is shipped.

NOTE:

Federal law prohibits handling of equipment that is not accompanied by an OSHA Safety Data Sheet (SDS). A completed SDS must be packed in the shipping crate with any pump returned to the factory. These safety precautions will aid the troubleshooting and repair procedure and preclude serious injury to repair personnel from hazardous residue in pump liquid end. A Safety Data Sheet must accompany all returns.

All inquiries or parts orders should be addressed to your local Milton Roy representative. Representatives can be found on our website (www.miltonroy.com).

4.3 ROUTINE PREVENTIVE MAINTENANCE

▲ WARNING BEFORE ANY MAINTENANCE, RELIEVE ALL PRESSURE FROM SYSTEM, ISOLATE LIQUID END FROM ALL SOURCES OF PROCESS LIQUID WITH APPROPRIATE VALVING, AND PURGE LIQUID END OF ALL PROCESS LIQUID.

4.4 MARS REFILL VALVE (640)

The MARS refill valve (640) requires no periodic maintenance. Clean hydraulic oil is critical for proper operation.

Strainer service: while replacing the hydraulic oil, it is also recommended that the hydraulic oil strainer be replaced. The strainer, which screws into the displacement chamber can become fouled or clogged over time.

Screw the valve back into the chamber. If the valve is damaged or broken, replace the entire assembly.

4.5 HYDRAULIC OIL REPLACEMENT

Inspect and replace hydraulic oil on the same schedule as the pump's gear drive lubricant (*see the appropriate pump drive instruction manual for this information*). Semiannual replacement is recommended, and can be scheduled to coincide with season oil changes.

To replace the hydraulic oil:

1. Remove the catchall cover by unscrewing the four screws, which hold it on.
2. Place a container under the pump catchall to catch the oil and unscrew the catchall drain plug.
3. When oil has finished draining, make sure that the area around the drain hole is clean. Screw drain plug back in securely.
4. Fill the catchall to the top of the piston sleeve with new, clean oil. Use hydraulic oil or any good quality type A automobile transmission fluid.
5. Replace the catchall cover the screw firmly in place.

NOTE:

It is not necessary to purge the liquid end displacement chamber of oil during annual oil replacement.

6. Dispose of oil according to federal, state, or local codes that may apply.

4.6 CHECK VALVE MAINTENANCE

4.6.1 Cleaning Fouled Check Valves

Check valve assemblies are designed to be self cleaning and should seldom need servicing. Fouled check valves can usually be cleaned by pumping a solution of mild detergent and warm water (if compatible with liquid being pumped) for 15 minutes, followed by flushing with water.

4.6.2 Check Valve Replacement

General

Milton Roy recommends at minimum an annual tune up using a RPM kit. The user may need to increase or decrease this frequency defined by their own specific operating conditions. RPM kits contain replacements for parts which are subject to wear; specifically ball checks, check valve seats, gaskets, and strainer. Replacing these parts annually, or defined by the user, with an RPM kit can reduce the possibility of unexpected downtime and will help to extend pump life.

NOTE:

Contact Milton Roy for information on special pumps configured with check valves for slurry service.

4.6.3 Disassembly

⚠ WARNING

BEFORE PERFORMING ANY MAINTENANCE ON THE CHECK VALVES, RELIEVE ALL PRESSURE FROM SYSTEM, ISOLATE LIQUID END FROM ALL SOURCES OF PROCESS LIQUID WITH APPROPRIATE VALVING, AND PURGE LIQUID END OF ALL PROCESS FLUID.

After insuring that all system pressure has been relieved and that all hazardous process liquids have been flushed from the liquid end, disconnect both the suction inlet and discharge outlet from the system piping.

1. Loosen the four retaining nuts evenly, then remove. Once disassembled, the PTFE gaskets should be discarded.
2. Check valves may be removed. A compressed PTFE gasket provides the seal to the head and should be replaced. Inspect the balls carefully. If they are smooth, round and free of deposits or pits, then they are suitable for continued use. Examine the check valve seats. The area of the seat where it meets the ball (the un-chamfered side) must be in near perfect condition for continued use. Any imperfection visible on the seating surface (pits, erosion, cracks, or a ball shaped contour greater than 0.030 deep) makes the seat unusable. If both the balls and seats are in good condition, then the length of time between parts replacement may be lengthened. If the balls and seats are severely damaged, then the length of time between parts replacement should be shortened.

3. Thin PTFE gaskets fit between all mating components of the check valve, and are held in place with sealing grooves in the metallic or plastic parts. Inspect these grooves with a magnifying glass. If the grooves are deformed, dented, or damaged in any manner, the damaged part should be replaced to prevent leakage. Clean these grooves with a small, stiff brush prior to reassembly. Note that the port connections and ball cages are not included with the RPM kit. If these parts are damaged, they must be ordered separately.
4. All PTFE gaskets should be replaced anytime check valves are disassembled.

4.6.4 Reassembly

1. Lubricate and replace PTFE gaskets on the check valves. Replace the components in the orientation shown in *Figures 5 through 11*, using the new parts included in the kit. Install an unused gasket between each set of thoroughly cleaned components. Attach port adapter and tighten the stud nuts evenly by hand only, then rotate the components to insure that they are properly guided and mated. Snug up on the nuts evenly to prevent cocking of the assembly and subsequent leakage of process liquid to surroundings.

4.7 DIAPHRAGM REPLACEMENT

The HPD diaphragm is extremely durable and often lasts for many years of service. The diaphragm must be removed from the pump to replace the diaphragm (See *Table below*).

Milroyal®	Plunger Diameter	Liquid End Material	Diaphragm Part Number
D	All Sizes	316SS, Alloy 20, & PVC	2980074099
B	7/16", 9/16", 5/8"	316SS, Alloy 20, & PVC	20325
	1", 1.25"	316SS, Alloy 20, & PVC	2980074099
	1.5", 2", 2.5"	316SS, Alloy 20, & PVC	2980072099
	3.5", 4"	316SS, Alloy 20, & PVC	2980068099
C	3/4", 7/8", 1"	316SS, Alloy 20	2980074099
	1.25", 1.5", 2"	316SS, Alloy 20	2980072099
	2.5", 3", 3.5"	316SS, Alloy 20, PVC	2980068099
	5", 5.75"	316SS, PVC	2980078099

Table 4. Milroyal® D, B, & C Diaphragm Part Numbers

SECTION 4 - MAINTENANCE

4.7.1 Removing the Liquid End

▲ WARNING STOP PUMP AND RELIEVE ALL PRESSURE FROM SYSTEM. ISOLATE THE LIQUID END FROM ALL SOURCES OF PROCESS LIQUID WITH APPROPRIATE VALVING AND PURGE LIQUID END OF ALL PROCESS FLUID.

1. Disconnect both the suction inlet and discharge outlet from the piping system.

NOTE:

Approximately one pint of oil will still be present in the contour plate area which will be released when the diaphragm is removed. Prepare your work area accordingly.

2. Remove the catchall cover and drain catchall of hydraulic oil by removing pipe plug (Milroyal® B and C, 340 and Milroyal® D, 585) at bottom of casing.
3. Completely loosen the piston rod retention nut (960, Milroyal® B & C) located inside the catchall (floating plunger nut, item 235, Milroyal® D).
4. Disconnect all tubing that connects the liquid end to the pump body.

NOTE:

The liquid end can be very heavy (150 lbs. or more). A hoist may be required to move it.

NOTE:

It is often easier to break head bolts (710) loose, prior to removing assembly from drive unit (see removing the diaphragm step 1).

5. Support liquid end with a hoist and remove liquid end head bolts that hold the displacement chamber (630) to the pump body. Pull liquid end and plunger off, being careful to protect the plunger from damage. Carefully raise liquid end and plunger over catchall and pull plunger from liquid end, allowing hydraulic fluid to drain back into catchall. Pull plunger firmly but carefully, being careful not to bend or otherwise damage the plunger.
6. Remove relieve valve (1040) and refill valve (640) from displacement chamber.

7. Place liquid end, diaphragm head up, on a bench or other clean, flat, and convenient working area.

4.7.2 Removing the Diaphragm

▲ WARNING THE CONTOUR PLATE CAN BE HEAVY, AND IF IT IS DROPPED, IT COULD BE DAMAGED OR CAUSE PERSONAL INJURY.

NOTE:

Approximately one pint of oil will still be present in the contour plate area which will be released when the diaphragm is removed. Prepare your work area accordingly.

1. Once the diaphragm head is adequately supported, the diaphragm head bolts (710) can be removed. Carefully pull the diaphragm head (700) and contour plate (650) away from the displacement chamber, being careful not to drop the contour plate. The white teflon® diaphragm and contour plate may remain with the displacement chamber.
2. The contour plate o-ring will come off with the contour plate. Clean the diaphragm groove and O-ring groove of the contour plate well. Be very careful not to scratch the grooves, or leakage will occur.
3. Clean the diaphragm groove in the displacement chamber and the flat surface in the displacement chamber where the o-ring rests.

4.7.3 Replace the Diaphragm

1. The diaphragm (670) may pull off with the diaphragm head or remain with the displacement chamber. Remove diaphragm (670). (When equipped with leak detection remove two diaphragms, leak detection ring A (8081), leak detection ring B (8080), and leak detection ring spacer (8082). Leak detection ring A, leak detection ring B, and leak detection ring spacer can be reused). See 54148, double Diaphragm Leak Detector Manual.

2. Apply a light coating of grease to the o-ring, contour plate o-ring groove, and diaphragm groove. Place o-ring into contour plate o-ring groove.
3. Place the contour plate into the displacement chamber. If your HPD liquid end has an orientation pin near the outer edge on the back side of the contour plate, make sure it is in the twelve o'clock position and that it slides into the orientation pin hole in the displacement chamber. The contour plate should rest flat against the displacement chamber and does not rock.
4. Place the black rubber side of the diaphragm against the contour plate, making sure the diaphragm sealing bead fits securely in the diaphragm groove of the contour plate. The white teflon side of the diaphragm should be facing outward and visible. (When equipped with leak detection install two diaphragms, leak detection ring A (8081), leak detection ring B (8080), and leak detection ring spacer (8082) removed previously. Apply a small amount of mineral oil between the diaphragms. Stacked diaphragms and rings may be aligned using the three small holes as a guide).
7. For metallic liquid ends, apply anti-seize to the diaphragm head bolts. Install the diaphragm head bolts in accordance with the following torque specifications. Bolts should first be torqued, in the sequence shown in the appropriate figure (*figure 3 or 4*) to one half of the value shown below. Following the same sequence, each bolt should then be torqued to the above final value. The pressure is the maximum discharge pressure listed on the pump nameplate. The bolt torque value stamped on the head only applies to the material grade supplied with the pump.

Pump Model	Plunger Diameter	Pressure	Torque (ft.-lbs)
Milroyal® D	All	All	75
Milroyal® B	1", 1-1/4"	All	75
	1-1/2", 2", 2-1/2"	- All	110
	3-1/2"	- All	150
Milroyal® C	1"	<1600 PSI	75
		>1600 PSI	94
	1-1/4", 1-1/2", 2"	<1600 PSI	110
		>1000 PSI	190
	2-1/2", 3-1/2"	All	150
5", 5-3/4"	All	97	

**Table 5. Head Bolt Torque Values
(Not for Plastic)**

NOTE:

Apply anti-seize thread lubricant to the bolts.

5. Lift the diaphragm head into place (use a hoist if necessary), making sure that any words cast into the head are in an upright position and that the diaphragm bead fits securely into both the head and contour plate grooves.
6. For plastic liquid ends, install and tighten bolts firmly. Do not overtighten, or the plastic diaphragm head could deform or crack.
8. Torque bolts in sequence to one half of the final torque value stamped on the head. Follow the bolt torque pattern as stamped on the head. Repeat the torque sequence until bolts are tightened to final torque value.
9. Reconnect suction inlet and discharge outlet to piping system.
10. Fill the liquid end with hydraulic oil (*refer to above "INITIAL START-UP" procedure, Section 3*).

SECTION 4 - MAINTENANCE

4.8 CORRECTIVE MAINTENANCE

4.8.1 Relief Valve Assembly

The relief valve assembly operates in filtered hydraulic oil and should require maintenance only if unusual circumstances occur, such as if corrosive media contaminates the fluid. Assembly and disassembly is straightforward. Field servicing should be limited to inspection and cleaning only. Repairs of this critical component should only be carried out by an authorized Milton Roy repair facility.

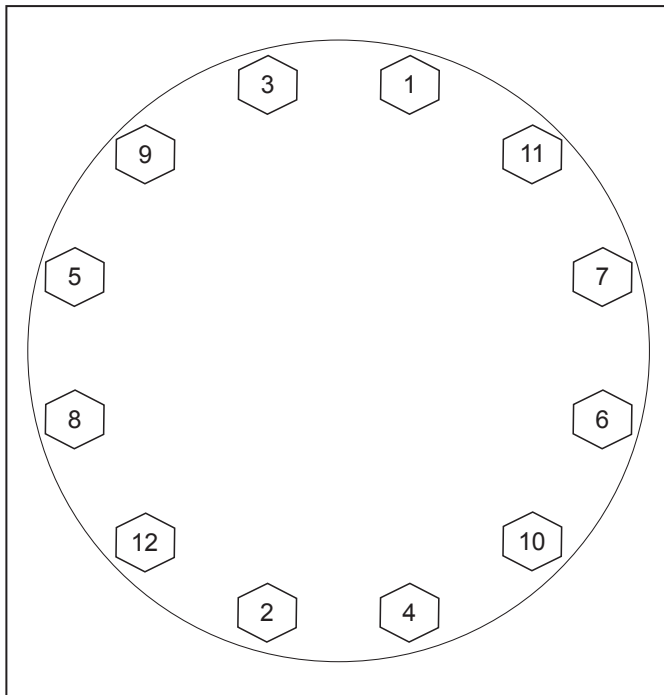


Figure 3. Twelve Bolt Tightening Sequence

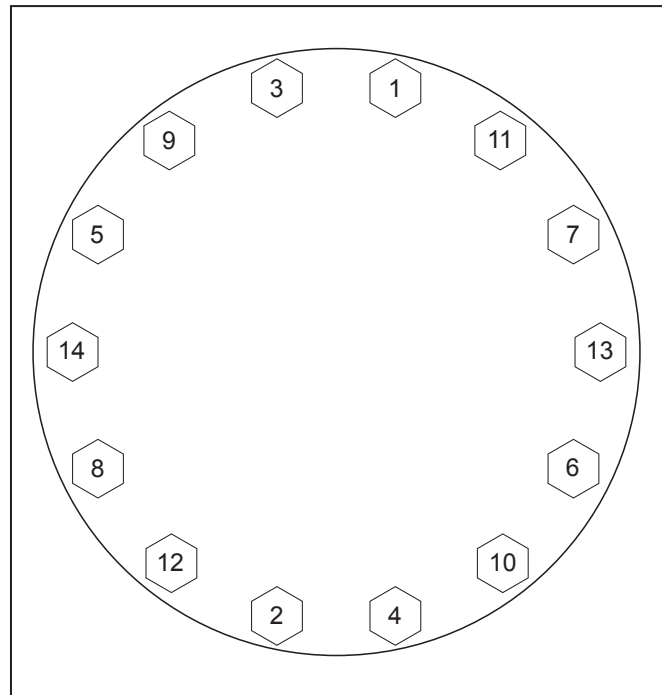


Figure 4. Fourteen Bolt Tightening Sequence

SECTION 5 - TROUBLESHOOTING

Pump drive instruction manuals list most possible malfunctions, their causes and remedies. The following problems are peculiar to HPD liquid ends and may be repaired as indicated below. Refer to the drive manuals listed in Sections 1 and 2 for additional troubleshooting procedures.

SYMPTOMS	REMEDIES
Excessive delivery	<ul style="list-style-type: none">• Low discharge line pressure. Increase line pressure. (e.g., Install a back pressure valve.)
Insufficient delivery	<ul style="list-style-type: none">• Relief valve relieving.<ul style="list-style-type: none">- Blocked discharge line. Clear line.- Relief valve set too low. Adjust valve to operating conditions.• Air in hydraulic system. Fill displacement chamber with hydraulic oil to proper level.• Clogged refill line. Remove strainer assembly and clean or replace.
Erratic delivery	<ul style="list-style-type: none">• Leaky relief valve. Repair or replace valve.• Blocked suction line. Clean line, particularly the line strainer.• Insufficient NPSH. Most common with long suction lines, small diameter suction lines, acid pumping, polymer (viscous) liquids, or drawing from a source lower than the pump. Consult your local representative or the Milton Roy factory.

SECTION 6 - PARTS

6.1 GENERAL

This section gives information regarding replaceable components for the various HPD liquid ends. Refer to the chart below to determine which figure applies to your particular liquid end. When ordering parts, please refer to the parts ordering instructions listed under "Recommended Spare Parts" in the Maintenance Section (*Section 4*). Be sure to include all required information with your parts order, or Milton Roy may be unable to process your order.

NOTE:

All drawings in this manual represent standard configured pumps. Notify Milton Roy for all special configured pumps.

6.2 ILLUSTRATED PARTS LIST

1. Figure and Item Number Column

- a. The item numbers shown in the detailed parts list correspond to the item numbers appearing on the exploded view illustration. To find an unknown part number, locate the part on the illustration and note the item number. Look for the item number on the detailed parts list. The part number is on the same line. A dash (-) precedes non-illustrated item numbers.

2. Description Column

- a. The name of the item is in the description column.

3. Part Number Column

- a. The supplier's part number is listed in the part number column.

4. Quantity Column

- a. The numbers appearing in the quantity column are the total quantity of the listed part required in its immediate assembly.

5. Reference Code Column

- a. This column is used to denote assembly and detail part variations among similar components (models) covered by this publication. When the symbol "A", "B", "C", etc. is entered in this column, the part is used only in the model (liquid end and material codes, see *Data Sheets (Referenced Section 1)* and pump data plate) at which the symbol appears. If the column is blank, the part is used in all models.

Pump	Plunger Diameter	Diaphragm Diameter	Metallic	Plastic
Milroyal® D	ALL	4.2"	Figure 5	Figure 6
Milroyal® B	1", 1 1/4"	4.2"	Figure 7	Figure 8
Milroyal® C	7/8", 1"	4.2"	Figure 9	N/A
Milroyal® B	1 1/2", 2", 2 1/2"	6.5	Figure 7	Figure 8
Milroyal® C	1 1/4", 1 1/2", 2"	6.5	Figure 9	N/A
Milroyal® B	3 1/2", 4"	10.5	Figure 7	Figure 8
Milroyal® C	2 1/2", 3 1/2"	10.5	Figure 9	Figure 11
Milroyal® C	5", 5 3/4"	14.4	Figure 10	Figure 11

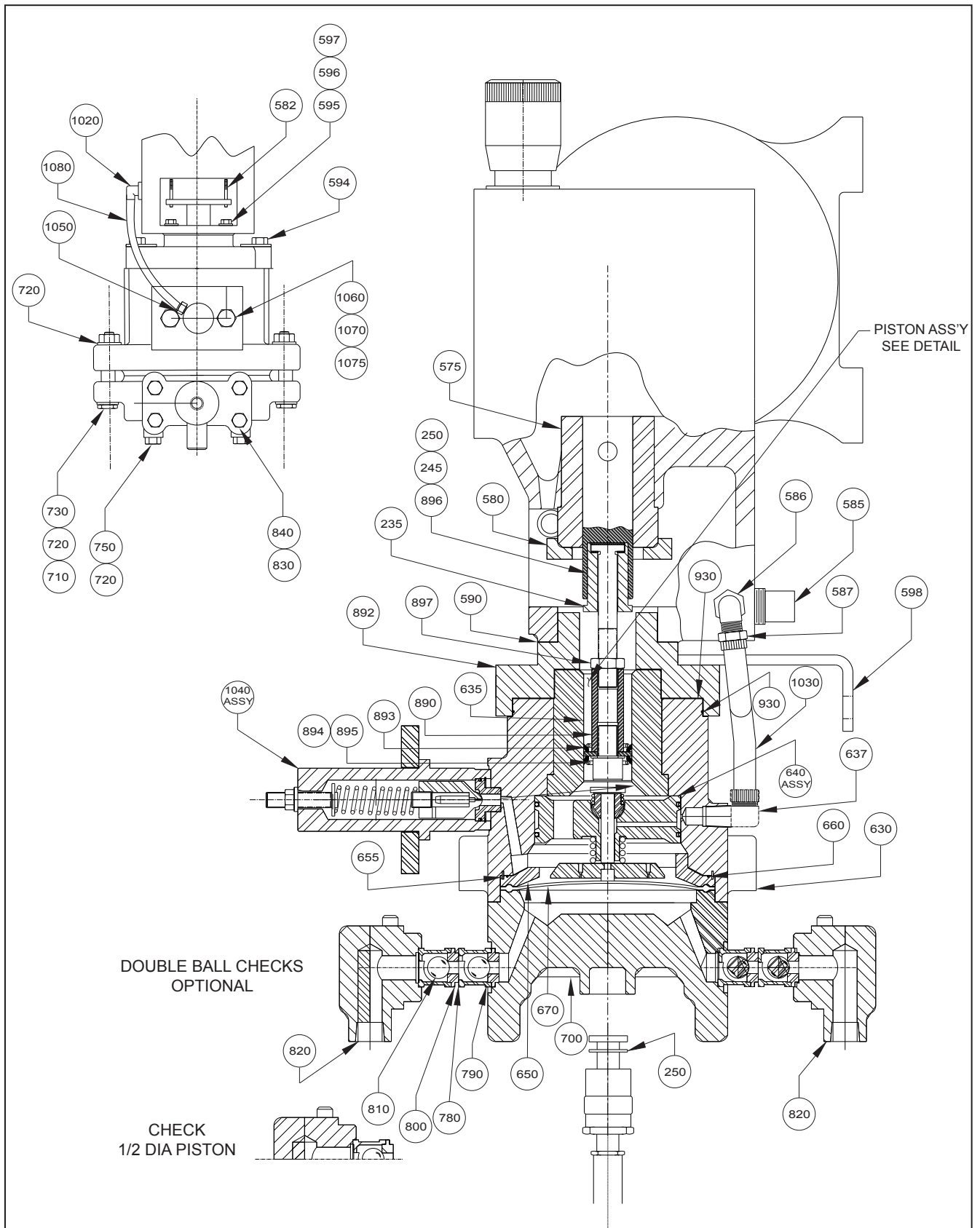


Figure 5. Milroyal® D HPD Metallic Liquid End Assembly (102-2906-000 Sheet 7)

6.3 MILROYAL® D METALLIC, 1" DIAMETER PLUNGER

Model:

<u>Liquid End:</u>	<u>Material:</u>	<u>Reference Code:</u>
16	1	A (316SS)
16	5	B (ALLOY 20)
16	6	C (ALLOY C22)

FIGURE NUMBER	ITEM NUMBER	DESCRIPTION	PART NUMBER	QTY	REFERENCE CODE
5	-	Piston Assembly, (Includes Items 235, 245, 250, 890, 893, 894, 895, 896 & 897)	21021	1	
	235	Floating Plunger Nut, 416SS	2729997017	1	
	245	Thrust Washer Disc	2199999052	1	
	250	Thrust Washer Ring	2199998052	1	
	575	Extension Adapter CRS	2720128006	1	
	580	Retaining Washer CRS	2190069006	1	
	582	Screw, Socket Head, #10-24 X 1-1/2"	4050025144	2	
	585	SQHDPLPIPE 3000 Thread 3/8", STL	4020011031	1	
	586	Strainer Fitting	2450021000	1	
	587	Elbow 3/8T X 1/4" NPT Brass	4020079031	1	
	590	Gasket, Disp Chamber	2250079099	1	
	592	Liquid End Adapter, Cast Iron	2720097001	1	
	594	Screw, Hex Head, 7/16-14 X 1-3/4"	4050019151	2	
	595	Stud, THD, 1/4NC X 1-1/4"	4050272071	3	
	596	Washer, Spring Lock, 1/4" 18.8SS	4040039022	3	
	597	Nut, Hex, 1/4" - 20NC 18.8SS	4050064012	3	
	598	Bracket, Support	2040128006	1	
	630	Displacement Chamber 106mm	2210672002	1	
	635	Piston Sleeve, 1" Bore	2370057106	1	
	637	Connector, Male, 3/8" X 1/4"	4020074031	1	
	640	MARS Valve Assy	20227	1	
	650	Contour Plate	2980121006	1	
	655	Orientation Pin, P/O Item 650 (Contour Plate)	4010001031	1	
	660	O-Ring, BUNAN	4080068471	1	
670	Diaphragm, PTFE / Nitrile, 106 HPD	2980074099	1		
700	Diaphragm Head, 106mm, 316SS	2210670016	1	A	
700	Diaphragm Head, 106mm, CA20	2210670029	1	B	

- Items Not Shown

* Double Quantity for Double Checks

FIGURE NUMBER	ITEM NUMBER	DESCRIPTION	PART NUMBER	QTY	REFERENCE CODE
5	700	Diaphragm Head, 106mm, HAST C22	2210670030	1	C
	710	Screw, Hex Head, 1/2" - 13 X 3-1/4"	4050020218	8	
	720	Washer, Flat	4040151033	20	
	730	Nut, Hex	4050068017	8	
	750	Screw, Hex Head, 1/2" - 13 X 3-1/2"	4050020228	4	
	780	Gasket, PTFE 3/8" Single Ball CK Valve	2250075075	6	
	780	Gasket, PTFE 3/8" Double Ball CK Valve	2250075075	10	
	790	Guide, 3/8" Single Ball CK Valve, 316SS	2920054016	2*	A
	790	Guide, 3/8" Single Ball CK Valve, CA-20	2920054029	2*	B
	790	Guide, 3/8" Single Ball CK Valve, C-22	2920054030	2*	C
	800	Seat, 3/8" Single Ball CK Valve, 316SS	2240099016	2*	A
	800	Seat, 3/8" Single Ball CK Valve, CA-20	2240099028	2*	B
	800	Seat, 3/8" Single Ball CK Valve, C-22	2240099030	2*	C
	810	Ball, 3/8" Single Ball CK Valve, 316SS	4070014112	2*	A
	810	Ball, 3/8" Single Ball CK Valve, CA-20	4070014113	2*	B
	810	Ball, 3/8" Single Ball CK Valve, C-22	4070014116	2*	C
	820	Adapter, Flange Port	2710044216	2	A
	820	Adapter, Flange Port, 150# Flanges, Socket Weld	2710059000	2	A
	820	Adapter, Flange Port, 150# Flanges, Threaded	2710044216	2	A
	-	1/2" Nipple Tube	4020052053	2	A
	-	Flange, 150#, 1/2"	4020013013	2	A
	820	Adapter, Flange Port	2710044229	2	B
	820	Adapter, Flange Port, 150# Flanges, Socket Weld	20119	2	B
	820	Adapter, Flange Port, 150# Flanges, Threaded	2710044229	2	B
	-	1/2" Nipple Tube	4020052058	2	B
	-	Flange, 150#, 1/2"	4020013017	2	B
	820	Adapter, Flange Port	2710044230	2	C

- Items Not Shown

* Double Quantity for Double Checks

FIGURE NUMBER	ITEM NUMBER	DESCRIPTION	PART NUMBER	QTY	REFERENCE CODE
5	820	Adapter, Flange Port, 150# Flanges, Socket Weld	10019	2	C
	820	Adapter, Flange Port, 150# Flanges, Threaded	2710044230	2	C
	-	1/2" Nipple Tube	40088	2	C
	-	Flange, 150#, 1/2"	4020013015	2	C
	830	Screw, Hex HD, Single Ball CK Valve	4050018136	8	
	830	Screw, Hex HD, Double Ball CK Valve	4050018169	8	
	840	Washer, Spring Lock, 3/8" 18.8SS	4040041022	8	
	890	Piston Coupling	2520114006	1	
	893	Piston Seal	4080107010	1	
	894	Washer, Spring Lock, 5/16"	4040040028	1	
	895	Screw, Socket HD, 5/16-24 X 3/4" STL	4050146034	1	
	896	Piston Stem	2680046006	1	
	897	Nut, Jam, 5/16-24 Hex	4050129011	1	
	920	O-ring, Buna	4080095291	1	
	930	Gasket, 166mm & 266mm	2250077099	1	
	1020	Elbow, Tube, 3/8" NPT X 3/8" ID	4020503051	1	
	1030	Tube, Polyethylene	4020145XXZ	8"	
	1040	Valve Assembly (Advise Serial & Model Number)	1010021X06	1	
	1050	Adapter, NPT Tube, 3/8" X 3/8"	4020225118	1	
	1060	Screw, Hex HD,	4050017199	2	
1070	Washer, Spring Lock	4040039022	2		
1075	Washer, Flat	4040006033	2		
1080	Tube, Vinyl, 0.5 ft. (must buy 12" min.)	4020296091	1ft		

- Items Not Shown

* Double Quantity for Double Checks

6.4 MILROYAL® D METALLIC, 1.25" DIAMETER PLUNGER

Model:

<u>Liquid End:</u>	<u>Material:</u>	<u>Reference Code:</u>
20	1	D (316SS)
20	5	E (ALLOY 20)
20	6	F (ALLOY C22)

FIGURE NUMBER	ITEM NUMBER	DESCRIPTION	PART NUMBER	QTY	REFERENCE CODE
5	-	Piston Assembly, (Includes Items 235, 245, 250, 890, 893, 894, 895, 896 & 897	21022	1	
	235	Floating Plunger Nut, 416SS	2729997017	1	
	245	Thrust Washer Disc	2199999052	1	
	250	Thrust Washer Ring	2199998052	1	
	575	Extension Adapter CRS	2720128006	1	
	580	Retaining Washer CRS	2190069006	1	
	582	Screw, Socket Head, #10-24 X 1-1/2"	4050025144	2	
	585	SQHDPLPIPE 3000 Thread 3/8", STL	4020011031	1	
	586	Strainer Fitting	2450021000	1	
	587	Elbow 3/8T x 1/4" NPT Brass	4020079031	1	
	590	Gasket, Disp Chamber	2250079099	1	
	592	Liquid End Adapter, Cast Iron	2720097001	1	
	594	Screw, Hex Head, 7/16"-14 X 1-3/4", ST	4050019151	2	
	595	Stud, THD, 1/4NC X 1-1/4", STL	4050272071	3	
	596	Washer, Spring Lock, 1/4" 18.8SS	4040039022	3	
	597	Nut, Hex, 1/4-20NC 18.8SS	4050064012	3	
	598	Bracket, Support	2040128006	1	
	630	Displacement Chamber 106mm	2210672002	1	
	635	Piston Sleeve, 1.25" Bore	2370057206	1	
	637	Connector, Male, 3/8" X 1/4"	4020074031	1	
	640	MARS Valve Assy	20227	1	
650	Contour Plate	2980121006	1		
655	Orientation Pin, P/O Item 650 (Contour Plate)	4010001031	1		
660	O-Ring, BUNAN	4080068471	1		

- Items Not Shown

* Double Quantity for Double Checks

FIGURE NUMBER	ITEM NUMBER	DESCRIPTION	PART NUMBER	QTY	REFERENCE CODE
5	670	Diaphragm, PTFE / Nitrile, 106 HPD	2980074099	1	
	700	Diaphragm Head, 106mm, 316SS	2210671016	1	D
	700	Diaphragm Head, 106mm, CA20	2210671029	1	E
	700	Diaphragm Head, 106mm, HAST C22	2210671030	1	F
	710	Screw, Hex Head, 1/2"-13 X 3-1/4"	4050020218	8	
	720	Washer, Flat	4040151033	20	
	730	Nut, Hex	4050068017	8	
	750	Screw, Hex Head, 1/2"-13 X 3-1/2"	4050020228	4	
	780	Gasket, PTFE, 5/8" Single Ball CK Valve	2250075175	6	
	780	Gasket, PTFE, 5/8" Double Ball CK Valve	2250075175	10	
	790	Guide, 5/8" Single Ball CK Valve, 316SS	2920051016	2*	D
	790	Guide, 5/8" Single Ball CK Valve, CA-20	2920051029	2*	E
	790	Guide, 5/8" Single Ball CK Valve, C-22	2920051030	2*	F
	800	Seat, 5/8" Single Ball CK Valve, 316SS	2240088016	2*	D
	800	Seat, 5/8" Single Ball CK Valve, CA-20	2240088028	2*	E
	800	Seat, 5/8" Single Ball CK Valve, C-22	2240088030	2*	F
	810	Ball, 5/8" Single Ball CK Valve, 316SS	4070014172	2*	D
	810	Ball, 5/8" Single Ball CK Valve, CA-20	4070014173	2*	E
	810	Ball, 5/8" Single Ball CK Valve, C-22	4070014176	2*	F
	820	Adapter, Flange Port	2710044116	2	D
	820	Adapter, Flange Port, 150# Flanges, Socket Weld	20125	2	D
	820	Adapter, Flange Port, 150# Flanges, Threaded	2710044116	2	D
	820	1/2" Nipple Tube	4020052053	2	D
	820	Flange, 150#, 1/2"	4020013013	2	D
	820	Adapter, Flange Port	2710044129	2	E
	820	Adapter, Flange Port, 150# Flanges, Socket Weld	20122	2	E
820	Adapter, Flange Port, 150# Flanges, Threaded	2710044129	2	E	

- Items Not Shown

* Double Quantity for Double Checks

FIGURE NUMBER	ITEM NUMBER	DESCRIPTION	PART NUMBER	QTY	REFERENCE CODE
5	-	1/2" Nipple Tube	4020052057	2	E
	-	Flange, 150#, 1/2"	4020013017	2	E
	820	Adapter, Flange Port	2710044130	2	F
	820	Adapter, Flange Port, 150# Flanges, Threaded	2710044130	2	F
	-	1/2" Nipple Tube	40088	2	F
	-	Flange, 150#, 1/2"	4020013015	2	F
	820	Adapter, Flange Port, 300# Flanges, Threaded	2710044130	2	F
	-	1/2" Nipple Tube	40088	2	F
	-	Flange, 300#, 1/2"	40635	2	F
	830	Screw, Hex HD, Single Ball CK Valve	4050018143	8	
	830	Screw, Hex HD, Double Ball CK Valve	4050018169	8	
	840	Washer, Spring Lock, 3/8 18.8SS	4040041022	8	
	890	Piston Coupling	2520114006	1	
	893	Piston Seal	4080107090	1	
	894	Washer, Spring Lock, 5/16	4040040028	1	
	895	Screw, Socket HD, 5/16"-24 X 3/4" STL	4050146034	1	
	896	Piston Stem	2680046006	1	
	897	Nut, Jam, Hex	4050129011	1	
	920	O-ring, Buna	4080095291	1	
	930	Gasket, 166mm & 266mm	2250077099	1	
	1020	Elbow, Tube, 3/8" NPT X 3/8" ID	4020503051	1	
	1030	Tube, Polyethylene	4020145XXZ	8"	
	1040	Valve Assembly (Advise Serial & Model Number)	1010021X06	1	
	1050	Adapter, NPT Tube, 3/8" X 3/8"	4020225118	1	
	1060	Screw, Hex HD	4050017199	2	
	1070	Washer, Spring Lock	4040039022	2	
	1075	Washer, Flat	4040006033	2	
	1080	Tube, Vinyl, 0.5 ft. (must buy 12" min.)	4020296091	1ft	

- Items Not Shown

* Double Quantity for Double Checks

6.5 MILROYAL® D METALLIC, 1.5" DIAMETER PLUNGER

Model:

<u>Liquid End:</u>	<u>Material:</u>	<u>Reference Code:</u>
24	1	G (316SS)
24	5	H (ALLOY 20)
24	6	I (ALLOY C22)

FIGURE NUMBER	ITEM NUMBER	DESCRIPTION	PART NUMBER	QTY	REFERENCE CODE
5	-	Piston Assembly, (Includes Items 235, 245, 250, 890, 893, 894, 895, 896, & 897	21023	1	
	235	Floating Plunger Nut, 416SS	2729997017	1	
	245	Thrust Washer Disc	2199999052	1	
	250	Thrust Washer Ring	2199998052	1	
	575	Extension Adapter CRS	2720128006	1	
	580	Retaining Washer CRS	2190069006	1	
	582	Screw, Socket Head, #10-24 X 1-1/2", STL	4050025144	2	
	585	SQHDPLPIPE 3000 Thread 3/8", STL	4020011031	1	
	586	Strainer Fitting	2450021000	1	
	587	Elbow 3/8T x 1/4" NPT Brass	4020079031	1	
	590	Gasket, Disp Chamber	2250079099	1	
	592	Liquid End Adapter, Cast Iron	2720097001	1	
	594	Screw, Hex Head, 7/16"-14 X 1-3/4", ST	4050019151	2	
	595	Stud, THD, 1/4" NC X 1-1/4", STL	4050272071	3	
	596	Washer, Spring Lock, 1/4" 18.8SS	4040039022	3	
	597	Nut, Hex, 1/4"-20NC 18.8SS	4050064012	3	
	598	Bracket, Support	2040128006	1	
	630	Displacement Chamber 106mm	2210672002	1	
	635	Piston Sleeve, 1.5" Bore	2370057306	1	
	637	Connector, Male, 3/8" X 1/4"	4020074031	1	
	640	MARS Valve Assy	1030001010	1	
	650	Contour Plate	2980075006	1	
655	Orientation Pin, P/O Item 650 (Contour Plate)	4010001031	1		
660	O-Ring, BUNA N	4080068471	1		

- Items Not Shown

* Double Quantity for Double Checks

FIGURE NUMBER	ITEM NUMBER	DESCRIPTION	PART NUMBER	QTY	REFERENCE CODE
5	670	Diaphragm 106, PTFE / Nitrile, HPD	2980074099	1	
	700	Diaphragm Head, 106mm, 316SS	2210671016	1	G
	700	Diaphragm Head, 106mm, CA20	2210671029	1	H
	700	Diaphragm Head, 106mm, HAST C22	2210671030	1	I
	710	Screw, Hex Head, 1/2"-13 X 3-1/4"	4050020218	8	
	720	Washer, Flat	4040151033	20	
	730	Nut, Hex	4050068017	8	
	750	Screw, Hex Head, 1/2"-13 X 3-1/2"	4050020228	4	
	780	Gasket, PTFE, 5/8" Single Ball CK Valve	2250075175	6	
	780	Gasket, PTFE, 5/8" Double Ball CK Valve	2250075175	10	
	790	Guide, 5/8" Single Ball CK Valve, 316SS	2920051016	2*	G
	790	Guide, 5/8" Single Ball CK Valve, CA-20	2920051029	2*	H
	790	Guide, 5/8" Single Ball CK Valve, C-22	2920051030	2*	I
	800	Seat, 5/8" Single Ball CK Valve, 316SS	2240088016	2*	G
	800	Seat, 5/8" Single Ball CK Valve, CA-20	2240088028	2*	H
	800	Seat, 5/8" Single Ball CK Valve, C-22	2240088030	2*	I
	810	Ball, 5/8" Single Ball CK Valve, 316SS	4070014172	2*	G
	810	Ball, 5/8" Single Ball CK Valve, CA-20	4070014173	2*	H
	810	Ball, 5/8" Single Ball CK Valve, C-22	4070014176	2*	I
	820	Adapter, Flange Port	2710044116	2	G
	820	Adapter, Flange Port, 150# Flanges, Socket Weld	20125	2	G
	820	Adapter, Flange Port, 150# Flanges, Threaded	2710044116	2	G
	820	Adapter, Flange Port	2710044129	2	H
	820	Adapter, Flange Port, 150# Flanges, Socket Weld	20122	2	H
820	Adapter, Flange Port, 150# Flanges, Threaded	2710044129	2	H	
820	Adapter, Flange Port	2710044130	2	I	
820	Adapter, Flange Port, 150# Flanges, Socket Weld	20128	2	I	

- Items Not Shown

* Double Quantity for Double Checks

FIGURE NUMBER	ITEM NUMBER	DESCRIPTION	PART NUMBER	QTY	REFERENCE CODE
5	820	Adapter, Flange Port, 150# Flanges, Threaded	2710044130	2	I
	-	1/2" Nipple Tube	40088	2	I
	-	Flange, 150#, 1/2"	4020013015	2	I
	820	Adapter, Flange Port, 300# Flanges, Threaded	2710044130	2	I
	-	1/2" Nipple Tube	40088	2	I
	-	Flange, 300#, 1/2"	40635	2	I
	830	Screw, Hex HD, Single Ball CK Valve	4050018143	8	
	830	Screw, Hex HD, Double Ball CK Valve	4050018169	8	
	840	Washer, Spring Lock, 3/8" 18.8SS	4040041022	8	
	890	Piston Coupling	2520115006	1	
	893	Piston Seal	4080107020	1	
	894	Washer, Spring Lock, 3/8	4040041022	1	
	895	Screw, Socket HD, 3/8"-24 X 3/4" STL	4050147034	1	
	896	Piston Stem	2680046006	1	
	897	Nut, Jam, Hex	4050073021	1	
	920	O-ring, Buna	4080095291	1	
	930	Gasket, 166mm & 266mm	2250077099	1	
	1020	Elbow, Tube, 3/8" NPT X 3/8" ID	4020503051	1	
	1030	Tube, Polyethylene	4020145XXZ	8"	
	1040	Valve Assembly (Advise Serial & Model Number)	1010021X06	1	
	1050	Adapter, NPT Tube, 3/8" X 3/8"	4020225118	1	
	1060	Screw, Hex HD	4050017199	2	
	1070	Washer, Spring Lock	4040039022	2	
1075	Washer, Flat	4040006033	2		
1080	Tube, Vinyl, 0.5 ft. (must buy 12" min.)	4020296091	1ft		

- Items Not Shown

* Double Quantity for Double Checks

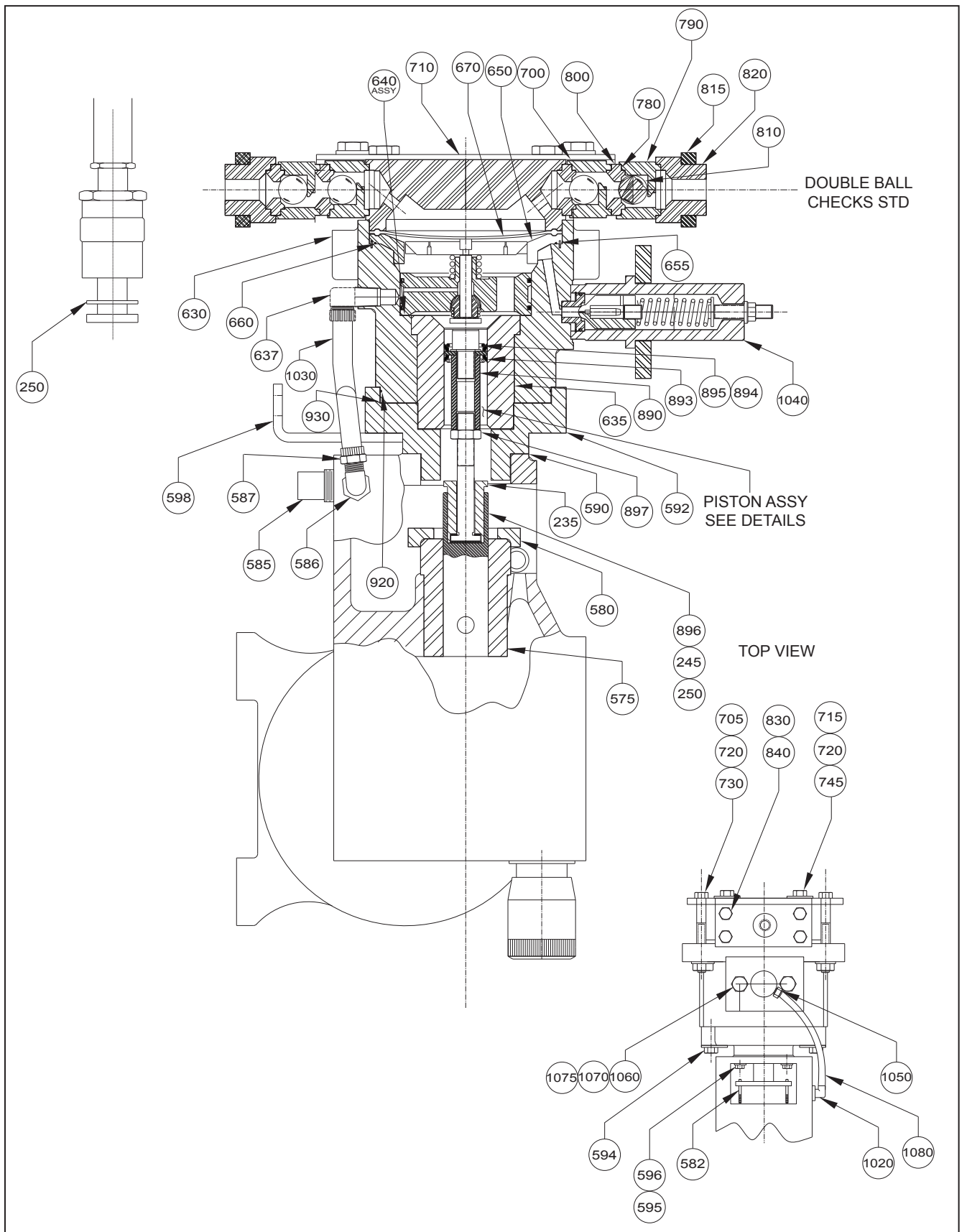


Figure 6. Milroyal® D HPD Plastic Liquid End Assembly (DWG. 102-2906-000 Sheet 6)

6.6 MILROYAL® D PLASTIC, 1", 1 1/4", & 1 1/2" DIAMETER PLUNGER

Model:

<u>Liquid End:</u>	<u>Material:</u>	<u>Reference Code:</u>
16	2	A (1" Plastic)
20	2	B (1 1/4" Plastic)
24	2	C (1 1/2" Plastic)

FIGURE NUMBER	ITEM NUMBER	DESCRIPTION	PART NUMBER	QTY	REFERENCE CODE
6	-	Piston Assembly, (Includes Items 235, 245, 250, 890, 893, 894, 895, 896, & 897	21021	1	A
	-	Piston Assembly, (Includes Items 235, 245, 250, 890, 893, 894, 895, 896, & 897	21022	1	B
	-	Piston Assembly, (Includes Items 235, 245, 250, 890, 893, 894, 895, 896, & 897	21023	1	C
	235	Floating Plunger Nut, 416SS	2729997017	1	
	245	Thrust Washer Disc	2199999052	1	
	250	Thrust Washer Ring	2199998052	1	
	575	Extension Adapter CRS	2720128006	1	
	580	Retaining Washer CRS	2190069006	1	
	582	Screw, Socket Head, #10-24 X 1-1/2"	4050025144	2	
	585	SQHDPLPIPE 3000 Thread 3/8", STL	4020011031	1	
	586	Strainer Fitting	2450021000	1	
	587	Elbow 3/8T x 1/4" NPT Brass	4020079031	1	
	590	Gasket, Disp Chamber	2250079099	1	
	592	Liquid End Adapter, Cast Iron	2720097001	1	
	594	Screw, Hex Head, 7/16"-14 X 1-3/4", ST	4050019151	2	
	595	Stud, THD, 1/4" NC X 1-1/4", STL	4050272071	3	
	596	Washer, Spring Lock, 1/4" 18.8SS	4040039022	3	
	597	Nut, Hex, 1/4" - 20NC 18.8SS	4050064012	3	
	598	Bracket, Support	2040128006	1	
	630	Displacement Chamber 106mm	2210672002	1	
	635	Piston Sleeve, 1" Bore	2370057106	1	A
	635	Piston Sleeve, 1.25" Bore	2370057206	1	B
635	Piston Sleeve, 1.50" Bore	2370057306	1	C	
637	Connector, Male, 3/8" X 1/4"	4020074031	1	A, B	

- Items Not Shown

FIGURE NUMBER	ITEM NUMBER	DESCRIPTION	PART NUMBER	QTY	REFERENCE CODE
6	640	MARS Valve Assy	20227	1	A, B
	640	MARS Valve Assy	1030001010	1	C
	650	Contour Plate	2980121006	1	A, B
	650	Contour Plate	2980075006	1	
	655	Orientation Pin, P/O Item 650 (Contour Plate)	4010001031	1	
	660	O-Ring, BUNA N	4080068471	1	
	670	Diaphragm, PTFE / Nitrile, 106 HPD	2980074099	1	
	700	Diaphragm Head, 106mm, 1" PVC	2210673071	1	
	700	Diaphragm Head, 106mm, 1 1/4" PVC	2210673071	1	
	700	Diaphragm Head, 106mm, 1 1/2" PVC	2210673071	1	
	705	Screw, Hex Head, 1/2-13 X 3-1/2"	4050020228	4	
	710	106mm HPD Back Up Plate	2710021006	1	
	715	Stud Anchors	2940016014	4	
	720	Washer, Spring Lock	4040043022	8	
	730	Nut, Hex	4050068012	4	
	745	Screw, Hex Head, 1/2-13 X 4-1/2"	4050020258	4	
	780	Gasket, PTFE, 5/8" Double Ball, CK Valve	2250075475	10	
	790	Guide, 5/8" Double Ball, CK Valve	2920055071	4	
	800	Seat, 5/8" Double Ball, CK Valve	2240092071	4	
	810	Ball, 5/8" Double Ball, CK Valve	4070015171	4	
	815	Compression Plate	2040127015	2	
	820	Connector, Port	2710022071	2	A
	820	Connector, Port, 150# Flanges, Socket Weld	21003	2	A
	-	Flange, 150#, 1/2", Socket Weld	40728	2	A
	-	Pipe, 1/2"	514004071	2"	A
	-	Elbow 90 Degrees, 1/2"	40727	2	A
	820	Connector, Port, 150# Flanges, Thread	2710022071	2	A
	-	Flange, 150#, 1/2", NPT, Flat	40728	2	A
	-	Pipe, 1/2"	4020052206	2	A
	-	Elbow 90 Degrees, 1/2" NPT	4020047032	2	A

- Items Not Shown

FIGURE NUMBER	ITEM NUMBER	DESCRIPTION	PART NUMBER	QTY	REFERENCE CODE
6	820	Connector, Port	2710022071	2	B
	820	Connector, Port, 150# Flanges, Socket Weld	21003	2	B
	-	Flange, 150#, 1/2", Socket Weld	40728	2	B
	-	Pipe, 1/2"	514004071	2"	B
	-	Elbow 90 Degrees, 1/2"	40727	2	B
	820	Connector, Port, 150# Flanges, Thread	2710022071	2	B
	-	Flange, 150#, 1/2", NPT, Flat	4020093011	2	B
	-	Pipe, 1/2"	4020052206	2	B
	-	Elbow 90 Degrees, 1/2" NPT	4020047032	2	B
	820	Connector, Port	2710022071	2	C
	820	Connector, Port, 150# Flanges, Socket Weld	21003	2	C
	-	Flange, 150#, 1/2", Socket Weld	40728	2	C
	-	Pipe, 1/2"	514004071	2"	C
	-	Elbow 90 Degrees, 1/2"	40727	2	C
	820	Connector, Port, 150# Flanges, Thread	2710022071	2	C
	-	Flange, 150#, 1/2", NPT, Flat	4020093011	2	C
	-	Pipe, 1/2"	4020052206	2	C
	-	Elbow 90 Degrees, 1/2" NPT	4020047032	2	C
	830	Screw, Hex HD, Double Ball CK Valve	4050018205	8	
	840	Washer, Spring Lock, 3/8" 18.8SS	4040041022	8	
	890	Piston Coupling	2520114006	1	A, B
	890	Piston Coupling	2520115006	1	C
	893	Piston Seal	4080107010	1	A
	893	Piston Seal	4080107090	1	B
	893	Piston Seal	4080107020	1	C
	894	Washer, Spring Lock, 5/16"	4040040028	1	A, B
	894	Washer, Spring Lock, 3/8"	4040041022	1	C
	895	Screw, Socket HD, 5/16"-24 X 3/4" STL	4050146034	1	A, B
	895	Screw, Socket HD, 3/8"-24 X 3/4" STL	4050147034	1	C
	896	Piston Stem	2680046006	1	

- Items Not Shown

FIGURE NUMBER	ITEM NUMBER	DESCRIPTION	PART NUMBER	QTY	REFERENCE CODE
6	897	Nut, Jam, Hex	4050129011	1	A, B
	897	Nut, Jam, Hex	4050073021	1	C
	920	O-ring, Buna	4080095291	1	
	930	Gasket, 166mm & 266mm	2250077099	1	
	1020	Elbow, Tube, 3/8" NPT X 3/8" ID	4020503051	1	
	1030	Tube, Polyethylene	4020145XXZ	8"	
	1040	Valve Assembly (Advise Serial & Model Number)	1010021X06	1	
	1050	Adapter, NPT Tube, 3/8" X 3/8"	4020225118	1	
	1060	Screw, Hex HD	4050017199	2	
	1070	Washer, Spring Lock	4040039022	2	
	1075	Washer, Flat	4040006033	2	
	1080	Tube, Vinyl, 0.5 ft. (must buy 12" min.)	4020296091	1ft	

- Items Not Shown

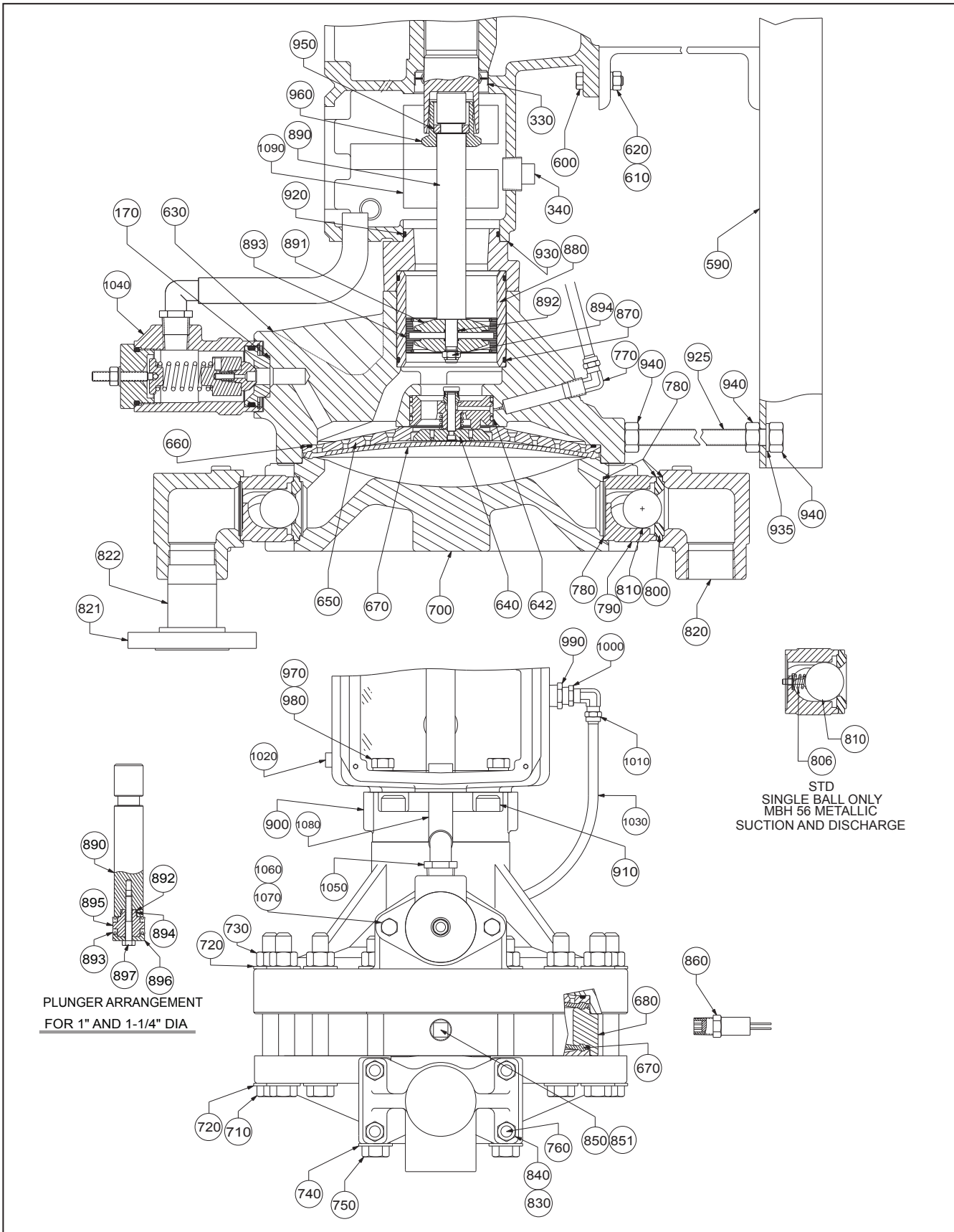


Figure 7. Milroyal® B HPD Metallic Liquid End Assembly (DWG. 102-2095-000 Sheet 3)

6.7 MILROYAL® B METALLIC (PLUNGER DIAMETER 1" AND 1-1/4")

Model:

<u>Liquid End:</u>	<u>Material:</u>	<u>Reference Code:</u>
16	1	A (1") Stainless Steel
16	5	B (1") Alloy 20
16	6	C (1") C-22
20	1	D (1 1/4") Stainless Steel
20	5	E (1 1/4") Alloy 20
20	6	F (1 1/4") C-22

FIGURE NUMBER	ITEM NUMBER	DESCRIPTION	PART NUMBER	QTY	REFERENCE CODE
7	170	O-ring, Viton	4080068045	1	
	330	Oil Seal - Crosshead	4080031020	2	
	340	Plug 1" NPT	4020009024	1	
	590	Base, Simplex, 8"	2010402006	2	
	590	Base, Duplex, 8"	2010351006	2	
	590	Base, Triplex	2010379006	2	
	590	Base, Quadruplex	20664	2	
	600	Screw, Hex Head	4050018143	4	
	610	Lock Washer, Spring	4040041022	4	
	620	Nut, Hex Head	4050066016	4	
	630	Displacement Chamber, 106mm	2210672002	1	
	640	MARS Valve Assembly	1030001010	1	
	642	O-ring	4080095251	2	
	650	Contour Plate, Steel, 106 HPD	2980075006	1	
	655	Orientation Pin, P/O Item 650 (Contour Plate)	4010002031	1	
	660	O-ring	4080068471	1	
	670	Diaphragm, PTFE / Nitrile, 106mm	2980074099	1	
	680	Inter isolation Chamber (See 54148, Double Diaphragm Leak Detector Manual)	2210675015	1	
	700	Diaphragm Head, 106mm, 316SS	2210670016	1	A
	700	Diaphragm Head, 106mm, Alloy 20	2210670029	1	B
700	Diaphragm Head, 106mm, C-22	2210670030	1	C	

- Items Not Shown

* Double Quantity for Double Checks

FIGURE NUMBER	ITEM NUMBER	DESCRIPTION	PART NUMBER	QTY	REFERENCE CODE
7	700	Diaphragm Head, 106mm, 316SS	2210671016	1	D
	700	Diaphragm Head, 106mm, Alloy 20	2210671029	1	E
	700	Diaphragm Head, 106mm, C-22	2210671030	1	F
	710	Screw, Hex Head	4050020218	8	
	720	Washer, Flat	4040151033	20	
	730	Nut, Hex	4050068017	8	
	740	Washer, Flat	4040151033	4	
	750	Screw, Hex Head	4050020228	4	
	760	Not used 1" and 1-1/4" Plunger			
	770	Elbow, 3/8" T X 3/8" NPT, Brass	4020079041	1	
	780	Gasket, PTFE, Single 3/8" Ball Check	2250075075	6	A
	780	Gasket, PTFE, Double 3/8" Ball Check	2250075075	10	A
	780	Gasket, PTFE, Single 5/8" Ball Check	2250075175	6	D
	780	Gasket, PTFE, Double 5/8" Ball Check	2250075175	10	D
	790	Guide, Single 3/8" Ball Check, 316SS	2920054016	2*	A
	790	Guide, Single 3/8" Ball Check, CA-20	2920054029	2*	B
	790	Guide, Single 3/8" Ball Check, C-22	2920054030	2*	C
	790	Guide, Single 5/8" Ball Check, 316SS	2920051016	2*	D
	790	Guide, Single 5/8" Ball Check, CA-20	2920051029	2*	E
	790	Guide, Single 5/8" Ball Check, C-22	2920051030	2*	F
	800	Seat, Single 3/8" Ball Check, 316SS	2240099016	2*	A
	800	Seat, Single 3/8" Ball Check, CA-20	2240099028	2*	B
	800	Seat, Single 3/8" Ball Check, C-22	2240099030	2*	C
	800	Hardened Seat, Single 3/8" Ball Check, 316SS (Optional)	2240134000	2*	A
	800	Seat, Single 5/8" Ball Check, 316SS	2240088016	2*	D
	800	Seat, Single 5/8" Ball Check, CA-20	2240088028	2*	E
	800	Seat, Single 5/8" Ball Check, C-22	2240088030	2*	F
	800	Hardened Seat, Single 5/8" Ball Check, 316SS (Optional)	2240136000	2*	D
	806	Not used 1" and 1-1/4" Plunger			
	810	Ball, Single 3/8" Ball Check, 316SS	4070014112	2*	A

- Items Not Shown

* Double Quantity for Double Checks

FIGURE NUMBER	ITEM NUMBER	DESCRIPTION	PART NUMBER	QTY	REFERENCE CODE
7	810	Ball, Single 3/8" Ball Check, CA-20	4070014113	2*	B
	810	Ball, Single 3/8" Ball Check, C-22	4070014116	2*	C
	810	Hardened Ball, Single 3/8" Ceramic Ball, 316SS (Optional)	4070015111	2*	A
	810	Ball, Single 5/8" Ball Check, 316SS	4070014172	2*	D
	810	Ball, Single 5/8" Ball Check, CA-20	4070014173	2*	E
	810	Ball, Single 5/8" Ball Check, C-22	4070014176	2*	F
	810	Hardened Ball, Single 5/8" Ceramic Ball, 316SS (Optional)	4070015171	2*	D
	820	Flange Port Adapter, NPT, 316SS	2710044216	2	A
	820	Flange Port Adapter, NPT, CA-20	2710044229	2	B
	820	Flange Port Adapter, NPT, C-22	2710044230	2	C
	820	Flange Port Adapter, NPT, 316SS	2710044116	2	D
	820	Flange Port Adapter, NPT, CA-20	2710044129	2	E
	820	Flange Port Adapter, NPT, C-22	2710044130	2	F
	820	Flange Port Adapter, ANSI 150#, SW	2710059000	2	A
	820	Flange Port Adapter, ANSI 150#, SW	20119	2	B
	820	Flange Port Adapter, ANSI 150#, SW	10019	2	C
	820	Flange Port Adapter, ANSI 150#, SW	20125	2	D
	820	Flange Port Adapter, ANSI 150#, SW	20122	2	E
	820	Flange Port Adapter, ANSI 150#, SW	20128	2	F
	820	Flange Port Adapter, ANSI 300#, SW	1791579016	2	A
	820	Flange Port Adapter, ANSI 300#, SW	20120	2	B
	820	Flange Port Adapter, ANSI 300#, SW	20126	2	D
	820	Flange Port Adapter, ANSI 300#, SW	20123	2	E
	820	Flange Port Adapter, ANSI 600#, SW	2710060000	2	A
	820	Flange Port Adapter, ANSI 600#, SW	20121	2	B
	820	Flange Port Adapter, ANSI 600#, SW	20127	2	D
	820	Flange Port Adapter, ANSI 600#, SW	20124	2	E
	820	Flange Port Adapter, ANSI 1500#, SW	20606	2	A
	820	Flange Port Adapter, ANSI 1500#, SW	2710042216	2	D
	820	Flange Port Adapter, ANSI 150#, 316SS, Thread	20606	2	A

- Items Not Shown

* Double Quantity for Double Checks

FIGURE NUMBER	ITEM NUMBER	DESCRIPTION	PART NUMBER	QTY	REFERENCE CODE
7	820	Flange Port Adapter, ANSI 150#, CA-20, Thread	2710044229	2	B
	820	Flange Port Adapter, ANSI 150#, C-22, Thread	2710044230	2	C
	820	Flange Port Adapter, ANSI 150#, 316SS, Thread	2710044116	2	D
	820	Flange Port Adapter, ANSI 150#, CA-20, Thread	2710044129	2	E
	820	Flange Port Adapter, ANSI 150#, C-22, Thread	2710044130	2	F
	820	Flange Port Adapter, ANSI 300#, 316SS, Thread	2710044216	2	A
	820	Flange Port Adapter, ANSI 300#, CA-20, Thread	2710044216	2	B
	820	Flange Port Adapter, ANSI 300#, 316SS, Thread	2710044116	2	D
	820	Flange Port Adapter, ANSI 300#, CA-20, Thread	2710044129	2	E
	820	Flange Port Adapter, ANSI 600#, 316SS, Thread	2710044216	2	A
	820	Flange Port Adapter, ANSI 600#, CA-20, Thread	2710044229	2	B
	820	Flange Port Adapter, ANSI 600#, 316SS, Thread	2710044116	2	D
	820	Flange Port Adapter, ANSI 600#, CA-20, Thread	2710044129	2	E
	821	Flange, ANSI 150#, Thread, 316SS	4020013013	2	A, D
	821	Flange, ANSI 150#, Thread, CA-20	4020013017	2	B, E
	821	Flange, ANSI 150#, Thread, C-22	4020013015	2	C, F
	821	Flange, ANSI 300#, Thread, 316SS	4020014013	2	A, D
	821	Flange, ANSI 300#, Thread, CA-20	4020014017	2	B, E
	821	Flange, ANSI 300#, Thread, C-22	40635	2	E
	821	Flange, ANSI 600#, Thread, 316SS	4020015013	2	A, D
821	Flange, ANSI 600#, Thread, CA-20	4020015017	2	B, E	

- Items Not Shown

* Double Quantity for Double Checks

FIGURE NUMBER	ITEM NUMBER	DESCRIPTION	PART NUMBER	QTY	REFERENCE CODE
7	822	Nipple, 1/2" (P/O 150, 300# Thread)	4020052053	2	A, D
	822	Nipple, 1/2" (P/O 150, 300# Thread)	4020052058	2	B
	822	Nipple, 1/2" (P/O 150# Thread)	4020052057	2	E
	822	Nipple, 1/2" (P/O 300# Thread)	4020052058	2	E
	822	Nipple, 1/2" (P/O 150# Thread)	40088	2	C, F
	822	Nipple, 1/2" (P/O 300# Thread)	40088	2	F
	822	Nipple, 1/2" (P/O 600# Thread)	4020052223	2	A, D
	822	Nipple, 1/2" (P/O 600# Thread)	4020052228	2	B, E
	822	Nipple, 1/2" (P/O 600# Thread)	4020052223	2	C, F
	830	Washer, Spring Lock, 3/8"	4040041022	8	
	840	Screw, Hex Head, Single Ball Check	4050018136	8	A, B, C
	840	Screw, Hex Head, Double Ball Check	4050018169	8	A, B, C
	840	Screw, Hex Head, Single Ball Check	4050018143	8	D, E, F
	840	Screw, Hex Head, Double Ball Check	4050018169	8	D, E, F
	850	Plug Socket, 1/2" NPT, 316SS	4020095042	1	
	851	Plug, 3/8", 316SS	4020095032	1	
	860	Alarm Probe, Conductivity	3010307000	1	
	870	Not used 1" and 1-1/4" Plunger			
	880	Sleeve, Piston	2370055006	1	A, B, C
	880	Sleeve, Piston	2370055106	1	D, E, F
	-	Piston Assembly, 1" (Includes Items 892, 893, 894, 895, 896, and 897)	2120125100	1	A, B, C
	-	Piston Assembly, 1-1/4" (Includes Items 890, 892, 893, 894, 895, 896, and 897)	2120125200	1	D, E, F
	890	Rod, Piston, 1" Steel, P/O Piston Assy	2120129006	1	A, B, C
	890	Rod, Piston, 1.25" Steel, P/O Piston Assy	2120135006	1	D, E, F
	891	Not used 1" and 1-1/4" Plunger			
	892	O-ring, P/O Piston Assy	4080109111	1	
	893	Seal, 1" Dia., 106 HPD, P/O Piston Assy	4080108010	2	A, B, C
	893	Seal, 1.25" Dia., 166 HPD, P/O Piston Assy	4080108020	2	D, E, F
	894	Back Up Ring, P/O Piston Assy	4080126111	1	
	895	Seal Support, P/O Piston Assy	2120124006	1	A, B, C

- Items Not Shown

* Double Quantity for Double Checks

FIGURE NUMBER	ITEM NUMBER	DESCRIPTION	PART NUMBER	QTY	REFERENCE CODE
7	895	Seal Support, P/O Piston Assy	2120126006	1	D, E, F
	896	Retainer, Piston Seal, 1", P/O Piston Assy	2120112006	1	A, B, C
	896	Retainer, Piston Seal, P/O Piston Assy	2120107106	1	D, E, F
	897	Screw, Hex Head, P/O Piston Assy	4050016159	1	
	900	Not used 1" and 1-1/4" Plunger			
	910	Not used 1" and 1-1/4" Plunger			
	920	O-ring	4080095291	1	
	925	Not used 1" and 1-1/4" Plunger			
	930	Gasket, 166 & 266 HPD	2250077099	1	
	935	Not used 1" and 1-1/4" Plunger			
	940	Not used 1" and 1-1/4" Plunger			
	950	Half Moon, Steel	2190063006	2	
	960	Nut, Rod	2720091006	1	
	970	Lock Washer, Spring	4040042022	2	
	980	Screw, Hex Head,	4050019151	2	
	990	Hex Pipe Bushing	4020001044	1	
	1000	Strainer Fitting	2450021000	1	
	1010	Elbow	4020079031	1	
	1020	Elbow, Tube, Poly 1/2" NPT X 3/8"	4020503081	1	
	1030	Tubing	4020145XXZ	24"	
	1040	Valve Assembly (Advise Serial & Model Number)	1010021X06	1	
	1050	Tubing, Barb	4020503091	1	
	1060	Lock Washer, Spring	4040040028	2	
1070	Screw, Hex Head	4050017199	2		
1080	Tubing	4020296091	1ft		

- Items Not Shown

* Double Quantity for Double Checks

6.8 MILROYAL® B METALLIC (PLUNGER DIAMETER 1-1/2", 2", AND 2-1/2")

Model:

<u>Liquid End:</u>	<u>Material:</u>	<u>Reference Code:</u>
24	1	A (1 1/2")
24	5	B (1 1/2")
24	6	C (1 1/2")
32	1	D (2")
32	5	E (2")
32	6	F (2")
40	1	G (2 1/2")
40	5	H (2 1/2")
40	6	J (2 1/2")

FIGURE NUMBER	ITEM NUMBER	DESCRIPTION	PART NUMBER	QTY	REFERENCE CODE
7	170	O-ring, Viton	4080068045	1	
	330	Oil Seal - Crosshead	4080031020	2	
	340	Plug 1" NPT	4020009024	1	
	590	Base, Simplex, 8"	2010402006	2	
	590	Base, Duplex, 8"	2010351006	2	
	590	Base, Triplex	2010379006	2	
	590	Base, Quadruplex	20664	2	
	600	Screw, Hex Head	4050018143	4	
	610	Lock Washer, Spring	4040041022	4	
	620	Nut, Hex Head	4050066016	4	
	630	Displacement Chamber, 166mm	2210839002	1	
	640	MARS Valve Assembly	1030001010	1	
	642	O-ring	4080095251	2	
	650	Contour Plate, 303 SS, 166 HPD	2980102014	1	
	655	Orientation Pin, P/O Item 650 (Contour Plate)	4010002031	1	
	660	O-ring	4080068571	1	
	670	Diaphragm, PTFE / Nitrile, 166mm	2980072099	1	
	680	Inter Isolation Chamber (See 54148, Double Diaphragm Leak Detector Manual)	2210674015	1	
	700	Diaphragm Head, 166mm, 316SS	2210822016	1	A
	700	Diaphragm Head, 166mm, CA-20	2210822029	1	B
700	Diaphragm Head, 166mm, C-22	2210822030	1	C	

- Items Not Shown

* Double Quantity for Double Checks

FIGURE NUMBER	ITEM NUMBER	DESCRIPTION	PART NUMBER	QTY	REFERENCE CODE
7	700	Diaphragm Head, 166mm, 316SS	2210823016	1	D, G
	700	Diaphragm Head, 166mm, CA-20	2210823029	1	E, H
	700	Diaphragm Head, 166mm, C-22	2210823030	1	F, J
	710	Screw, Hex Head	4050021239	8	
	720	Washer, Flat	4040151041	24	
	730	Nut, Hex	4050069019	12	A, B, C, D, E
	730	Nut, Hex	4050068012	1	F, G, H, J
	740	Washer, Flat	4040151041	4	
	750	Screw, Hex Head	4050021279	4	
	760	Stud 7/16", Single Ball Check	4050161071	8	A, B, C
	760	Stud 7/16", Double Ball Check	4050161331	8	A, B, C
	760	Stud 7/16", Single Ball Check	4050161091	8	D, E, F, G, H, J
	760	Stud 7/16", Double Ball Check	4050161141	8	D, E, F, G, H, J
	770	Elbow, 3/8" T X #/8 NPT, Brass	4020079041	1	
	780	Gasket, PTFE, Single 5/8" Ball Check	2250075175	6	A, B, C
	780	Gasket, PTFE, Double 5/8" Ball Check	2250075175	4	A, B, C
	780	Gasket, PTFE, Single 1" Ball Check	2250075275	6	D, E, F, G, H, J
	780	Gasket, PTFE, Double 1" Ball Check	2250075275	10	D, E, F, G, H, J
	790	Guide, Single 5/8" Ball Check, 316SS	2920051016	2*	A,
	790	Guide, Single 5/8" Ball Check, CA-20	2920051029	2*	B
	790	Guide, Single 5/8" Ball Check, C-22	2920051030	2*	C,
	790	Guide, Single 1" Ball Check, 316SS	2920052016	2*	D, G
	790	Guide, Single 1" Ball Check, CA-20	2920052029	2*	E, H
	790	Guide, Single 1" Ball Check, C-22	2920052030	2*	F, J
	800	Seat, Single 5/8" Ball Check, 316SS	2240088016	2*	A
	800	Seat, Single 5/8" Ball Check, CA-20	2240088028	2*	B
	800	Seat, Single 5/8" Ball Check, C-22	2240088030	2*	C
	800	Hardened Seat, Single 5/8" Ball Check (Optional)	2240136000	2*	A
	800	Seat, Single 1" Ball Check, 316SS	2240089016	2*	D, G
	800	Seat, Single 1" Ball Check, CA-20	2240089028	2*	E, H

- Items Not Shown

* Double Quantity for Double Checks

FIGURE NUMBER	ITEM NUMBER	DESCRIPTION	PART NUMBER	QTY	REFERENCE CODE
7	800	Seat, Single 1" Ball Check, C-22	2240089030	2*	F, J
	800	Hardened Seat, Single 1" Ball Check (Optional)	2240139000	2*	D, G
	810	Ball, Single 5/8" Ball Check, 316SS	4070014172	2*	A
	810	Ball, Single 5/8" Ball Check, CA-20	4070014173	2*	B
	810	Ball, Single 5/8" Ball Check, C-22	4070014176	2*	C
	810	Hardened Ball, Single 5/8" Ceramic Ball (Optional)	4070015171	2*	A
	810	Ball, Single 1" Ball Check, 316SS	4070014232	2*	D, G
	810	Ball, Single 1" Ball Check, CA-20	4070014233	2*	E, H
	810	Ball, Single 1" Ball Check, C-22	4070014236	2*	D, E
	810	Hardened Ball, Single 1" Ceramic Ball (Optional)	4070015231	2*	D, G
	820	Flange Port Adapter, NPT, 316SS	2710045116	2	A
	820	Flange Port Adapter, NPT, CA-20	2710045129	2	B
	820	Flange Port Adapter, NPT, C-22	2710045130	2	C
	820	Flange Port Adapter, NPT, 316SS	2710045216	2	D, G
	820	Flange Port Adapter, NPT, CA-20	2710045229	2	E, H
	820	Flange Port Adapter, NPT, C-22	2710045230	2	F, J
	820	Flange Port Adapter, ANSI 150#, SW	2710048016	2	A
	820	Flange Port Adapter, ANSI 150#, SW	20131	2	B
	820	Flange Port Adapter, ANSI 150#, SW	20134	2	C
	820	Flange Port Adapter, ANSI 150#, SW	20135	2	D, G
	820	Flange Port Adapter, ANSI 150#, SW	20138	2	E, H
	820	Flange Port Adapter, ANSI 150#, SW	20140	2	F, J
	820	Flange Port Adapter, ANSI 300#, SW	2710037116	2	A
	820	Flange Port Adapter, ANSI 300#, SW	20132	2	B
	820	Flange Port Adapter, ANSI 300#, SW	20136	2	D, G
	820	Flange Port Adapter, ANSI 300#, SW	20139	2	E, H
	820	Flange Port Adapter, ANSI 600#, SW	20130	2	A
	820	Flange Port Adapter, ANSI 600#, SW	20133		B
	820	Flange Port Adapter, ANSI 150#, 316SS, Thread	2710045116	2	A
	820	Flange Port Adapter, ANSI 150#, CA-20, Thread	2710045129	2	B

- Items Not Shown

* Double Quantity for Double Checks

FIGURE NUMBER	ITEM NUMBER	DESCRIPTION	PART NUMBER	QTY	REFERENCE CODE
7	820	Flange Port Adapter, ANSI 150#, C-22, Thread	2710045130	2	C
	820	Flange Port Adapter, ANSI 150#, 316SS, Thread	2710045216	2	D, G
	820	Flange Port Adapter, ANSI 150#, CA-20, Thread	2710045229	2	E, H
	820	Flange Port Adapter, ANSI 150#, C-22, Thread	2710045230	2	F, J
	820	Flange Port Adapter, ANSI 300#, 316SS, Thread	2710045116	2	A
	820	Flange Port Adapter, ANSI 300#, CA-22, Thread	2710045129	2	B
	820	Flange Port Adapter, ANSI 300#, 316SS, Thread	2710045216	2	D, G
	820	Flange Port Adapter, ANSI 300#, CA-20, Thread	2710045229	2	E, H
	820	Flange Port Adapter, ANSI 600#, 316SS, Thread	2710045116	2	A
	820	Flange Port Adapter, ANSI 600#, CA-20, Thread	2710045129	2	B
	821	Flange, ANSI 150#, Thread, 316SS	4020013033	2	A
	821	Flange, ANSI 150#, Thread, CA-20	4020013037	2	B
	821	Flange, ANSI 150#, Thread, C-22	4020014013	2	C
	821	Flange, ANSI 150#, Thread, 316SS	4020013033	2	D, G
	821	Flange, ANSI 150#, Thread, CA-20	4020013037	2	E, H
	821	Flange, ANSI 150#, Thread, C-22	4020013035	2	F, J
	821	Flange, ANSI 300#, Thread, 316SS	4020014033	2	A
	821	Flange, ANSI 300#, Thread, CA-20	4020013037	2	B
	821	Flange, ANSI 300#, Thread, C-22	4020014013	2	C
	821	Flange, ANSI 300#, Thread, 316SS	4020014033	2	D, G
	821	Flange, ANSI 300#, Thread, CA-20	4020014037	2	E, H
	821	Flange, ANSI 300#, Thread, C-22	4020013035	2	F, J
	821	Flange, ANSI 600#, Thread, 316SS	4020015033	2	A
821	Flange, ANSI 600#, Thread, CA-20	4020015037	2	B	

- Items Not Shown

* Double Quantity for Double Checks

FIGURE NUMBER	ITEM NUMBER	DESCRIPTION	PART NUMBER	QTY	REFERENCE CODE
7	822	Nipple, 1" 316SS (P/O 150# Thread)	4020054043	2	A
	822	Nipple, 1" 316SS (P/O 300, 600# Thread)	4020054203	2	A
	822	Nipple, 1" CA-20 (P/O 150# Thread)	4020054048	2	B
	822	Nipple, 1" CA-20 (P/O 300, 600# Thread)	4020054208	2	B
	822	Nipple, 1" C-22 (P/O 150# Thread)	40092	2	C
	822	Nipple, 1" 316SS (P/O 150# Thread)	4020054043	2	D, G
	822	Nipple, 1" 316SS (P/O 300# Thread)	4020054203	2	D, G
	822	Nipple, 1" CA-20 (P/O 150# Thread)	4020054048	2	E, H
	822	Nipple, 1" CA-20 (P/O 300# Thread)	4020054208	2	E, H
	822	Nipple, 1" C-22 (P/O 150# Thread)	40092	2	F, J
	830	Washer, Spring Lock, 7/16"	4040042022	8	
	840	Nut, Hex	4050067012	8	
	850	Plug Socket, 1/2" NPT, 316SS	4020095042	1	
	851	Plug, 3/8", 316SS	4020095032	1	
	860	Alarm Probe, Conductivity	3010307000	1	
	870	Not used 1-1/2", 2", and 2-1/2" Plunger			
	880	Sleeve, Piston	2370050006	1	A, B, C
	880	Sleeve, Piston	2370050106	1	D, E, F
	880	Sleeve, Piston	2370051006	1	G, H, J
	-	Piston Assembly, 1.5" (Includes Items 890, 891, 892, 893, and 894)	2120128000	1	A, B, C
	-	Piston Assembly, 2" (Includes Items 890, 891, 892, 893, and 894)	2120128100	1	D, E, F
	-	Piston Assembly, 2.5" (Includes Items 890, 891, 892, 893, and 894)	2120128200	1	G, H, J
	890	Rod, Piston, 2" Steel, P/O Piston Assy	2120131106	1	A, B, C, D, E, F
	890	Rod, Piston, 2.5" Steel, P/O Piston Assy	2120131306	1	G, H, J
	891	Washer, P/O Piston Assy	2190079006	2	A, B, C
	891	Washer, P/O Piston Assy	2190080006	2	D, E, F
891	Washer, P/O Piston Assy	2190081006	2	G, H, J	

- Items Not Shown

* Double Quantity for Double Checks

FIGURE NUMBER	ITEM NUMBER	DESCRIPTION	PART NUMBER	QTY	REFERENCE CODE
7	892	O-ring, P/O Piston Assy	4089996012	1	A, B, C, D, E,F
	892	O-ring, P/O Piston Assy	4080109101	1	G, H, J
	893	Seal, 166 HPD, P/O Piston Assy	4080107020	1	A, B, C
	893	Seal, 166 HPD, P/O Piston Assy	4080107030	1	D, E, F
	893	Seal, 166 HPD, P/O Piston Assy	4080107040	1	G, H, J
	894	Nut, Flex Lock, P/O Piston Assy	4050200065	1	
	900	Not used 1-1/2", 2", and 2-1/2" Plunger			
	910	Not used 1-1/2", 2", and 2-1/2" Plunger			
	920	O-ring	2250077099	1	
	925	Not used 1-1/2", 2", and 2-1/2" Plunger			
	930	Gasket, 166 & 266 HPD	2250077099	1	
	935	Not used 1-1/2", 2", and 2-1/2" Plunger			
	940	Not used 1-1/2", 2", and 2-1/2" Plunger			
	950	Half Moon, Steel	2190063006	2	
	960	Nut, Rod	2720091006	1	
	970	Lock Washer, Spring	4040042022	2	
	980	Screw, Hex Head,	4050019149	2	
	990	Hex Pipe Bushing	4020001044	1	
	1000	Strainer Fitting	2450021000	1	
	1010	Elbow	4020079031	1	
	1020	Elbow, Tube, Poly 1/2" NPT X 3/8"	4020503081	1	
	1030	Tubing	4020145XXZ	24"	
	1040	Valve Assembly (Advise Serial & Model Number)	1010021X06	1	
	1050	Tubing, Barb	4020503091	1	
	1060	Lock Washer, Spring	4040040028	2	
	1070	Screw, Hex Head	4050017199	2	
1080	Tubing	4020296091	1ft		

- Items Not Shown

* Double Quantity for Double Checks

6.9 MILROYAL® B METALLIC (PLUNGER DIAMETER 3.5" AND 4")

Model:

<u>Liquid End:</u>	<u>Material:</u>	<u>Reference Code:</u>
56	1	A (3.5")
56	5	B (3.5")
56	6	C (3.5")
64	1	D (4")
64	5	E (4")
64	6	F (4")

FIGURE NUMBER	ITEM NUMBER	DESCRIPTION	PART NUMBER	QTY	REFERENCE CODE
7	170	O-ring, Viton	4080095111	1	
	330	Oil Seal - Crosshead	4080031020	2	
	340	Plug 1" NPT	4020009024	1	
	590	Base, Simplex, 266mm	2010343000	1	
	590	Base, Duplex, 266mm	2010360000	1	
	590	Base, Triplex, 266mm	2010396000	1	
	600	Screw, Hex Head	4050018159	4*	
	610	Lock Washer, Spring	4040041022	4*	
	620	Nut, Hex Head	4050066016	4*	
	630	Displacement Chamber, 266mm	2210642002	1	
	640	MARS Valve Assembly	1030001010	1	
	642	O-ring	4080095255	2	
	650	Contour Plate, Steel, 106 HPD	2980067006	1	
	660	O-ring	4080095671	1	
	670	Diaphragm, PTFE / Nitrile, 10.5" HPD	2980068099	1	
	680	Inter Isolation Chamber (See 54148, Double Diaphragm Leak Detector Manual)	2210689015	1	
	700	Diaphragm Head, 266mm, 316SS	2210824016	1	A, D
	700	Diaphragm Head, 266mm, CA-20	2210824029	1	B, E
	700	Diaphragm Head, 266mm, C-22	2210824030	1	C, F
	710	Screw, Hex Head	4050021249	10	
720	Washer, Flat	4040151041	28		
730	Nut, Hex	4050069019	14		
740	Washer, Flat	4040151041	4		
750	Screw, Hex Head	4050021299	4		

- Items Not Shown

* Double Quantity for Double Checks

FIGURE NUMBER	ITEM NUMBER	DESCRIPTION	PART NUMBER	QTY	REFERENCE CODE
7	755	Stud 7/16", Single Ball Check	4050161111	8	
	755	Stud 7/16", Double Ball Check	4050161201	8	
	770	Elbow, 3/8" T X #/8 NPT, Brass	4020079041	1	
	780	Gasket, PTFE, Single 1-1/2" Ball Check	2250075375	6	
	780	Gasket, PTFE, Double 1-1/2" Ball Check	2250075375	10	
	790	Guide, Single 1-1/2" Ball Check, 316SS	2920049016	2*	A, D
	790	Guide, Single 1-1/2" Ball Check, CA-20	2920049029	2*	B, E
	790	Guide, Single 1-1/2" Ball Check, C-22	2920049030	2*	C, F
	800	Seat, Single 1-1/2" Ball Check, 316SS	2240084016	2*	A, D
	800	Seat, Single 1-1/2" Ball Check, CA-20	2240084028	2*	B, E
	800	Seat, Single 1-1/2" Ball Check, C-22	2240084030	2*	C, F
	800	Hardened Seat, Single 1-1/2" Ball Check (Optional)	2240142000	2*	A, D
	806	Spring, Single 1-1/2" Ball Check, C-276	40953	2*	
	810	Ball, Single 1-1/2" Ball Check, 316SS	40954	2	A, D
	810	Ball, Single 1-1/2" Ball Check, CA-20	40951	2	B, E
	810	Ball, Single 1-1/2" Ball Check, C-22	40956	2	C, F
	810	Ball, Double 1-1/2" Ball Check, 316SS	4070014272	4	A, D
	810	Ball, Double 1-1/2" Ball Check, CA-20	4070014273	4	B, E
	810	Ball, Double 1-1/2" Ball Check, C-22	4070014276	4	C, F
	810	Hardened Ball, Single 1-1/2" Ceramic Ball (Optional)	4070015271	2*	A, D
	820	Flange Port Adapter, NPT, 316SS	2710046016	2	A, D
	820	Flange Port Adapter, NPT, CA-20	2710046029	2	B, E
	820	Flange Port Adapter, NPT, C-22	2710046030	2	C, F
	820	Flange Port Adapter, ANSI 150#, SW	20141	2	A, D
	820	Flange Port Adapter, ANSI 300#, SW	20145	2	A, D
	820	Flange Port Adapter, ANSI 150#, SW	20142	2	B, E
	820	Flange Port Adapter, ANSI 300#, SW	20146	2	B, E
	820	Flange Port Adapter, ANSI 150#, SW	20143	2	C, F
	821	Flange, ANSI 150#, Thread	4020013053	2	A, D
	821	Flange, ANSI 300#, Thread	4020014053	2	A, D

- Items Not Shown

* Double Quantity for Double Checks

FIGURE NUMBER	ITEM NUMBER	DESCRIPTION	PART NUMBER	QTY	REFERENCE CODE
7	821	Flange, ANSI 150#, Thread	4020013057	2	B, E
	821	Flange, ANSI 300#, Thread	4020014057	2	B, E
	821	Flange, ANSI 150#, Thread, HC-22	4020013055	2	C, F
	822	Nipple, 1-1/2" (P/O 150# Thread)	4020121043	2	A, D
	822	Nipple, 1-1/2" (P/O 300# Thread)	4020330203	2	A, D
	822	Nipple, 1-1/2" (P/O 150, 300# Thread)	4020121048	2	B, E
	822	Nipple, 1-1/2" (P/O 150# Thread)	40239	2	C, F
	830	Washer, Spring Lock, 7/16	4040042022	8	
	840	Nut, Hex,	4050067012	8	
	850	Plug Socket, 1/2" NPT, 316SS	4020095042	1	
	851	Plug, 3/8", 316SS	4020095032	1	
	860	Alarm Probe, Conductivity	3010307000	1	
	870	O-ring	4080095331	2	A, B, C
	870	O-ring	4080109421	2	D, E, F
	880	Sleeve, Piston	2370053006	1	A, B, C
	880	Sleeve, Piston	20411	1	D, E, F
	-	Piston Assembly, 3.5" (Includes Items 890, 891, 892, 893, and 894)	2120128500	1	A, B, C
	890	Rod, Piston, 3-1/2" Steel, P/O Piston Assy	2120133006	1	
	891	Washer, P/O Piston Assy	2190083006	2	A, B, C
	891	Washer, P/O Piston Assy	20412	2	D, E, F
	892	O-ring, P/O Piston Assy	4080109101	2	
	893	Seal, 266 HPD, P/O Piston Assy	4080107050	1	A, B, C
	893	Piston (Seal), 100mm HPD, P/O Piston Assy	4080107100	1	D, E, F
	894	Nut, Flex Lock, P/O Piston Assy	4050200075	1	
	900	Liquid End Adapter	2720092001	1	
	910	Screw, Socket Head	4050032164	4	
	920	O-ring	4080095291	1	
	925	Stud	4050163301	1*	
	930	Gasket, 166 & 266 HPD	2250077099	1	
	935	Washer, Spring Lock	4040044022	2*	

- Items Not Shown

* Double Quantity for Double Checks

FIGURE NUMBER	ITEM NUMBER	DESCRIPTION	PART NUMBER	QTY	REFERENCE CODE
7	940	Nut, Hex	4050069019	2	
	950	Half Moon, Steel	2190063006	2	
	960	Nut, Rod	2720091006	1	
	980	Screw, Hex Head,	4050019149	2	
	990	Hex Pipe Bushing	4020001044	1	
	1000	Strainer Fitting	2450021000	1	
	1010	Elbow	4020079031	1	
	1020	Elbow, Tube, Poly 1/2" NPT X 3/8"	4020503081	1	
	1030	Tubing	4020145XXZ	24"	
	1040	Valve Assembly (Advise Serial & Model Number)	1010020010	1	
	1050	Tubing, Barb	4020503091	1	
	1060	Lock Washer, Spring	4040042022	10	
	1070	Screw, Hex Head	4050019161	2	
	1080	Tubing	4020296171	1ft	

- Items Not Shown

* Double Quantity for Double Checks

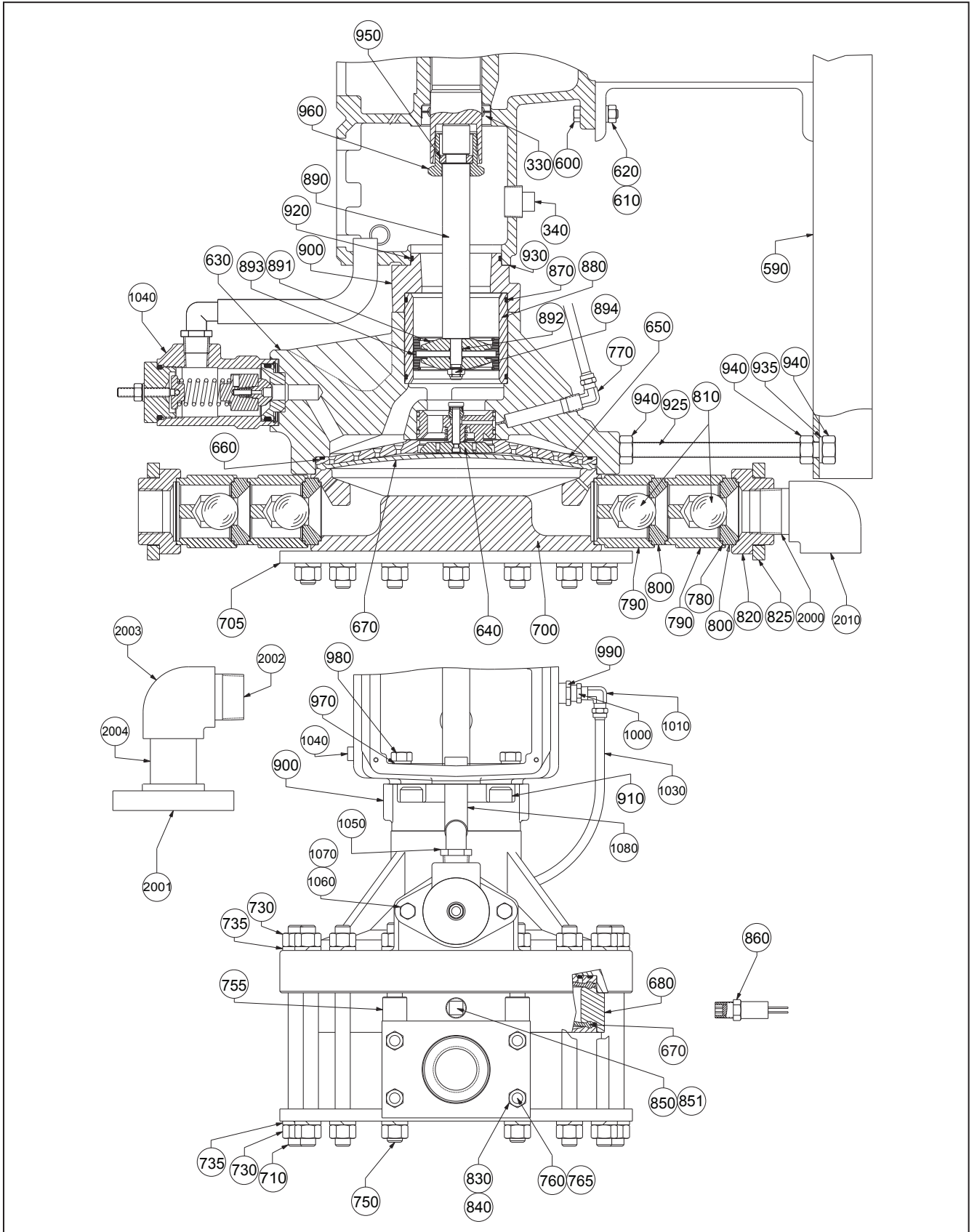


Figure 8. Milroyal® B HPD Plastic Liquid End Assembly (DWG. 102-2095-000 Sheet 4)

6.10 MILROYAL® B PLASTIC (PLUNGER DIAMETER 1" AND 1-1/4")

Model:

<u>Liquid End:</u>	<u>Material:</u>	<u>Reference Code:</u>
16	2	A (1")
20	2	B (1.25")

FIGURE NUMBER	ITEM NUMBER	DESCRIPTION	PART NUMBER	QTY	REFERENCE CODE
8	330	Oil Seal - Crosshead	4080031020	2	
	340	Plug, 1" NPT	4020009024	1	
	590	Base, Simplex, 8"	2010402006	2	
	590	Base, Duplex, 8"	2010351006	2	
	590	Base, Triplex	2010379006	2	
	590	Base, Quadruplex	20664	2	
	600	Screw, Hex Head	4050018143	4	
	610	Lock Washer, Spring	4040041022	4	
	620	Nut, Hex Head	4050066016	4	
	630	Displacement Chamber, 106mm	2210672002	1	
	640	MARS Valve Assembly	1030001010	1	
	650	Contour Plate	2980075006	1	
	655	Orientation Pin, P/O Item 650	4010001031	1	
	660	O-Ring, BUNA N	4080068471	1	
	670	Diaphragm, PTFE / Nitrile, 106 HPD	2980074099	1	
	680	Inter Isolation Chamber (See 54148, Double Diaphragm Leak Detector Manual)	2210675015	1	
	700	Diaphragm Head, 106mm, PVC	2210673071	1	
	705	Back Up Plate, 106mm HPD	2710021006	1	
	710	Screw, Hex Head, 1/2"-13 X 3-1/2"	4050020228	4	
	710	Screw, Hex Head, 1/2"-13 X 5", Double Diaphragm	4050020268	4	
730	Nut, Hex	4050068012	4		
735	Lock Washer, Spring	4040043022	8		
750	Screw, Hex Head, 1/2"-13 X 4-1/2"	4050020258	4		
750	Screw, Hex Head, 1/2"-13 X 6", Double Diaphragm	4050020285	4		

- Items Not Shown

* Double Quantity for Double Checks

FIGURE NUMBER	ITEM NUMBER	DESCRIPTION	PART NUMBER	QTY	REFERENCE CODE
8	755	Anchors, Stud	2940016014	8	
	760	Screw, Hex Head, 3/8"-16 X 3	4050018205	8	
	770	Elbow	4020079041	1	
	780	Gasket, PTFE, Double Ball, CK Valve	2250075475	10	
	790	Guide, 5/8" Double Ball CK Valve, PVC	2920055071	4	
	800	Seat, 5/8" Double Ball CK Valve, PVC	2240092071	4	
	810	Ball, 5/8" Double Ball CK Valve, Ceramic	4070015171	4	
	820	Port Connector, PVC	2710044116	2	
	820	Port Connector, PVC, 150# Flanges, Socket Weld	21003	2	
	820	Port Connector, PVC, 150# Flanges, Threaded	2710022071	2	
	821	Flange, 150#, 1/2", Threaded	4020013015	2	
	822	1/2" x 2", Nipple Tube	4020052206	2	
	822	1/2" x 3", Nipple Tube	4020052226	2	
	823	Elbow	4020047032	2	
	825	Plate, Compression	2040127015	1	
	830	Washer, Spring Lock, 3/8 18.8SS	4040041022	8	
	840	Screw, Hex HD	4050018193	8	
	850	Plug Socket, 1/2" NPT, DD, 316SS	4020095042	1	
	851	Plug	4020095032	3	
	860	Alarm Probe, Conductivity	3010307000	1	
	870	Not used 1" and 1-1/4"			
	880	Sleeve, Piston, 1"	2370055006	1	A
	880	Sleeve, Piston, 1-1/4"	2370055106	1	B
	-	Piston Assembly, 1" (Includes Items 890, 892, 893, 894, 895, 896, and 897)	2120125100	1	A
	-	Piston Assembly, 1-1/4" (Includes Items 890, 892, 893, 894, 895, 896, and 897)	2120125200	1	B
	890	Piston Rod, 1", P/O Piston Assy	2120129006	1	A
	890	Piston Rod, 1-1/4", P/O Piston Assy	2120135006	1	B
	891	Not used 1" and 1-1/4" Plunger			
	892	O-ring, P/O Piston Assy	4080109111	1	
	893	Piston Seal, 1", P/O Piston Assy	4080108010	2	A

- Items Not Shown

* Double Quantity for Double Checks

FIGURE NUMBER	ITEM NUMBER	DESCRIPTION	PART NUMBER	QTY	REFERENCE CODE
8	893	Piston Seal, 1-1/4", P/O Piston Assy	4080108020	2	B
	894	Back Up Ring, P/O Piston Assy	4080126111	1	
	895	Seal Support, 1", P/O Piston Assy	2120124006	1	A
	895	Seal Support, 1-1/4", P/O Piston Assy	2120126006	1	B
	896	Retainer, Piston Seal, 1", P/O Piston Assy	2120112006	1	A
	896	Retainer, Piston Seal, 1-1/4", P/O Piston Assy	2120107106	1	B
	897	Screw, Hex HD, P/O Piston Assy	4050016159	1	
	900	Not used 1" and 1-1/4" Plunger			
	910	Not used 1" and 1-1/4" Plunger			
	920	O-ring, Buna	4080095291	1	
	925	Not used 1" and 1-1/4" Plunger			
	930	Gasket, 166mm & 266mm	2250077099	1	
	950	Half Moon, Steel	2190063006	2	
	960	Nut, Rod	2720091006	1	
	970	Washer, Spring Lock	4040042022	2	
	980	Screw, Hex Head	4050019151	2	
	990	Hex Pipe Bushing	4020001044	1	
	1000	Strainer Fitting	2450021000	1	
	1010	Elbow	4020079031	1	
	1030	Tubing	4020145XXZ	24"	
	1040	Valve Assembly (Advise Serial & Model Number)	1010021X06	1	
	1050	Tubing, Barb	4020503091	1	
1060	Lock Washer, Spring	4040040028	2		
1070	Screw, Hex Head	4050017199	2		
1080	Tubing	4020296091	1ft		

- Items Not Shown

* Double Quantity for Double Checks

6.11 MILROYAL® B PLASTIC (PLUNGER DIAMETER 1-1/2", 2", AND 2-1/2")

Model:

<u>Liquid End:</u>	<u>Material:</u>	<u>Reference Code:</u>
24	2	A (1-1/2")
32	2	B (2")
40	2	C (2-1/2")

FIGURE NUMBER	ITEM NUMBER	DESCRIPTION	PART NUMBER	QTY	REFERENCE CODE
8	330	Oil Seal - Crosshead	4080031020	1	
	340	Plug, 1" NPT	4020009024	1	
	590	Base, Simplex, 8"	2010402006	2	
	590	Base, Duplex, 8"	2010351006	2	
	590	Base, Triplex	2010379006	2	
	590	Base, Quadruplex	20664	2	
	600	Screw, Hex Head	4050018143	4	
	610	Lock Washer, Spring	4040041022	4	
	620	Nut, Hex Head	4050066016	4	
	630	Displacement Chamber, 166mm	2210839002	1	
	640	MARS Valve Assembly	1030001010	1	
	650	Contour Plate	2980102014	1	
	655	Orientation Pin, P/O Item 650	4010002031	1	
	660	O-Ring, BUNA N	4080068571	1	
	670	Diaphragm, PTFE / Nitrile 166 HPD	2980072099	1	
	680	Inter Isolation Chamber (See 54148, Double Diaphragm Leak Detector Manual)	2210674015	1	
	700	Diaphragm Head, 166mm, PVC	2210663071	1	
	705	Back Up Plate, 166mm HPD	2710047006	1	
	710	Screw, Hex Head, 5/8"-11 X 5-1/2"	4050021275	4	
	710	Screw, Hex Head, 5/8"-NC X 7-3/4", Double Diaphragm	4050163256	8	
	730	Nut, Hex	4050069019	12	
	735	Lock Washer, Spring	4040044022	12	
750	Stud, Engagement	2320035014	4		
750	Stud, Engagement, Double Diaphragm	2320036014	4		

- Items Not Shown

FIGURE NUMBER	ITEM NUMBER	DESCRIPTION	PART NUMBER	QTY	REFERENCE CODE
8	760	Screw, Hex Head, 7/16"-NC X 6"	4050161183	8	
	770	Elbow	4020079041	1	
	780	Gasket, PTFE, Double Ball, CK Valve	2250075575	10	
	790	Guide, 1" Double Ball CK Valve, PVC	2920053071	4	
	800	Seat, 1" Double Ball CK Valve, PVC	2240091071	4	
	810	Ball, 1" Double Ball CK Valve, Ceramic	4070015231	4	
	820	Port Connector, PVC	2710019071	2	
	820	Port Connector, PVC, 150# Flanges, Socket Weld	20945	2	
	820	Port Connector, PVC, 150# Flanges, Threaded	2710019071	2	
	821	Flange, 150#, 1", Threaded	4020093031	2	
	822	1" x 2", Nipple Tube	4020054186	2	
	822	1" x 3", Nipple Tube	4020054206	2	
	823	Elbow	4020047052	2	
	825	Plate, Compression	2040126115	1	
	840	Screw, Hex HD	4050067012	8	
	850	Plug Socket, 1/2" NPT, DD, 316SS	4020095042	1	
	851	Plug	4020095032	3	
	860	Alarm Probe, Conductivity	3010307000	1	
	870	Not used 1-1/2", 2", and 2-1/2" Plunger			
	880	Sleeve, Piston, 1-1/2"	2370050006	1	A
	880	Sleeve, Piston, 2"	2370050106	1	B
	880	Sleeve, Piston, 2-1/2"	2370051006	1	C
	-	Piston Assembly, 1.5" (Includes Items 890, 891, 892, 893, and 894)	2120128000	1	A
	-	Piston Assembly, 2" (Includes Items 890, 891, 892, 893, and 894)	2120128100	1	B
	-	Piston Assembly, 2.5" (Includes Items 890, 891, 892, 893, and 894)	2120128200	1	C
	890	Piston Rod, 1-1/2", P/O Piston Assy	2120131106	1	A
	890	Piston Rod, 2", P/O Piston Assy	2120131106	1	B
	890	Piston Rod, 2-1/2", P/O Piston Assy	2120131306	1	C
	891	Washer, Steel, P/O Piston Assy	2190079006	2	A
	891	Washer, Steel, P/O Piston Assy	2190080006	2	B

- Items Not Shown

FIGURE NUMBER	ITEM NUMBER	DESCRIPTION	PART NUMBER	QTY	REFERENCE CODE
8	891	Washer, Steel, P/O Piston Assy	2190081006	2	C
	892	O-ring, P/O Piston Assy	4089996012	2	A, B
	892	O-ring, P/O Piston Assy	4080109101	2	C
	893	Piston Seal, 1-1/2", P/O Piston Assy	4080107020	2	A
	893	Piston Seal, 2", P/O Piston Assy	4080107030	2	B
	893	Piston Seal, 2-1/2", P/O Piston Assy	4080107040	2	C
	894	Nut, Flex lock, P/O Piston Assy	4050200065	1	
	900	Not used 1-1/2", 2", and 2-1/2" Plunger			
	910	Not used 1-1/2", 2", and 2-1/2" Plunger			
	920	O-ring, Buna	4080095291	1	
	925	Not used 1-1/2", 2", and 2-1/2" Plunger			
	930	Gasket, 166mm & 266mm	2250077099	1	
	950	Half Moon, Steel	2190063006	2	
	960	Nut, Rod	2720091006	1	
	970	Washer, Spring Lock	4040042022	2	
	980	Screw, Hex Head,	4050019149	2	
	990	Hex Pipe Bushing	4020001044	1	
	1000	Strainer Fitting	2450021000	1	
	1010	Elbow	4020079031	1	
	1030	Tubing	4020145XXZ	24"	
	1040	Valve Assembly (Advise Serial & Model Number)	1010021X06	1	
	1050	Tubing, Barb	4020503091	1	
	1060	Lock Washer, Spring	4040040028	2	
1070	Screw, Hex Head	4050017199	2		
1080	Tubing	4020296091	1ft		

- Items Not Shown

* Double Quantity for Double Checks

6.12 MILROYAL® B PLASTIC (PLUNGER DIAMETER 3-1/2" AND 4")

Model:

<u>Liquid End:</u>	<u>Material:</u>	<u>Reference Code:</u>
56	2	A (3-1/2")
64	2	B (4")

FIGURE NUMBER	ITEM NUMBER	DESCRIPTION	PART NUMBER	QTY	REFERENCE CODE
8	330	Worm Shaft Seal	4080031050	1	
	340	Plug, 1" NPT	4020009024	1	
	590	Base, Simplex, 8"	2010343000	2	
	590	Base, Duplex, 8"	2010360000	2	
	590	Base, Triplex	2010396000	2	
	600	Screw, Hex Head	4050018159	4	
	610	Lock Washer, Spring	4040041022	4	
	620	Nut, Hex Head	4050066012	4	
	630	Displacement Chamber, 266mm	2210642002	1	
	640	MARS Valve Assembly	1030001010	1	
	650	Contour Plate	2980067006	1	
	660	O-Ring, BUNA N	4080095671	1	
	670	Diaphragm, PTFE / Nitrile, 266mm HPD	2980068099	1	
	680	Inter Isolation Chamber (See 54148, Double Diaphragm Leak Detector Manual)	2210689015	1	
	700	Diaphragm Head, 266mm, PVC	2210648071	1	
	705	Back Up Plate, 266mm HPD	2710016006	1	
	710	Screw, Hex Head, 5/8"-11 X 6-1/2"	4050021299	10	
	710	Screw, Hex Head, 5/8"-11 X 9-1/8", Double Diaphragm	2320030214	10	
	730	Nut, Hex	4050069019	18	
	735	Lock Washer, Spring	4040044022	18	
750	Stud, Engagement	2320024014	4		
750	Stud, Engagement, Double Diaphragm	2320031014	4		
760	Stud, 7/16"-NC X 8"	4050161283	8		
770	Elbow	4020079041	1		

- Items Not Shown

* Double Quantity for Double Checks

FIGURE NUMBER	ITEM NUMBER	DESCRIPTION	PART NUMBER	QTY	REFERENCE CODE
8	780	Gasket, PTFE, Double Ball, CK Valve	2250075675	10	
	790	Guide, 1-1/2" Double Ball CK Valve, PVC	2920050071	4	
	800	Seat, 1-1/2" Double Ball CK Valve, PVC	2240086071	4	
	810	Ball, 1-1/2" Double Ball CK Valve, Ceramic	4070015271	4	
	820	Port Connector, PVC	2710015071	2	
	820	Port Connector, PVC, 150# Flanges, Socket Weld	21875	2	
	820	Port Connector, PVC, 150# Flanges, Threaded	2710015071	2	
	821	Flange, 150#, 1-1/2", Threaded	4020093051	2	
	822	1-1/2" x 1-3/4", Nipple Tube	40200121176	1	
	822	1-1/2" x 3", Nipple Tube	40201214206	2	
	823	Elbow	4020047072	2	
	825	Plate, Compression	2040123015	2	
	840	Screw, Hex HD	4050067012	8	
	850	Plug Socket, 1/2" NPT, DD, 316SS	4020095042	1	
	851	Plug	4020095032	3	
	860	Alarm Probe, Conductivity	3010307000	1	
	870	O-ring	4080095331	2	A
		O-ring	4080109421	2	B
	880	Sleeve, Piston, 3-1/2"	2370053006	1	A
	880	Sleeve, Piston, 4"	20411	1	B
	-	Piston Assembly, 3.1/2" (Includes Items 890, 891, 892, 893, and 894)	2120128500	1	A
	890	Piston Rod, 3-1/2", P/O Piston Assy	2120133006	1	A
	891	Washer, Steel, P/O Piston Assy	2190083006	2	B
	891	Washer, Steel, P/O Piston Assy	20412	2	A
	892	O-ring, P/O Piston Assy	4080109101	2	B
	893	Piston Seal, 3-1/2", P/O Piston Assy	4080107050	2	
	893	Piston Seal, 4", P/O Piston Assy	4080107100	2	
	894	Nut, Flex lock, P/O Piston Assy	4050200075	1	

- Items Not Shown

* Double Quantity for Double Checks

FIGURE NUMBER	ITEM NUMBER	DESCRIPTION	PART NUMBER	QTY	REFERENCE CODE
8	900	Adapter, Liquid End	2720092001	1	
	910	Screw, Socket Head	4050032164	4	
	920	O-ring, Buna	4080095291	1	
	925	Stud	4050163301	1	
	930	Gasket, 166mm & 266mm	2250077099	1	
	935	Washer, Spring Lock	4040044022	2	
	940	Nut, Hex	4050069019	2	
	950	Half Moon, Steel	2190063006	2	
	960	Nut, Rod	2720091006	1	
	970	Washer, Spring Lock	4040042022	2	
	980	Screw, Hex Head,	4050019149	2	
	990	Hex Pipe Bushing	4020001044	1	
	1000	Strainer Fitting	2450021000	1	
	1010	Elbow	4020079031	1	
	1020	Crank	2160004062	1	
	1030	Tubing	4020145XXZ	24"	
	1040	Valve Assembly (Advise Serial & Model Number)	1010021X06	1	
	1045	Plug	4020009137	1	
	1060	Lock Washer, Spring	4040040028	2	
	1070	Screw, Hex Head	4050019161	2	
1080	Tubing	4020296171	1ft		

- Items Not Shown

* Double Quantity for Double Checks

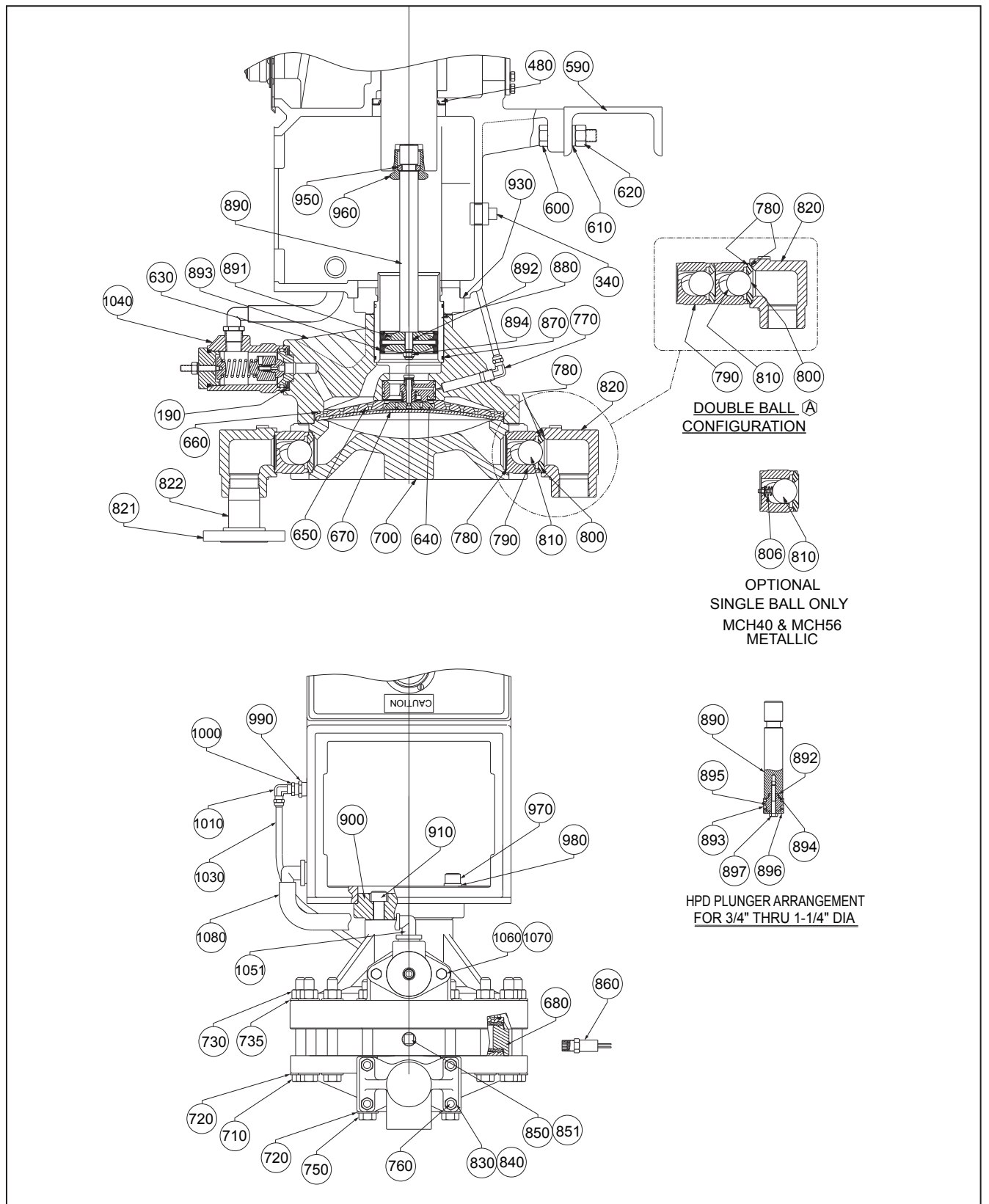


Figure 9. Milroyal® C HPD Metallic Liquid End (DWG. 102-2285-000 Sheet 4)

6.13 MILROYAL® C METALLIC (PLUNGER DIAMETER 7/8" AND 1")

Model:

<u>Liquid End:</u>	<u>Material:</u>	<u>Reference Code:</u>
BD	1	A (7/8", 1601-3025 psig)
BD	5	B (7/8", 1601-3025 psig)
14	1	C (7/8", 0-1600 psig)
14	5	D (7/8", 0-1600 psig)
14	6	E (7/8", 0-1600 psig)
BG	1	F (1", 1601-3025 psig)
BG	5	G (1", 1601-3025 psig)
16	1	H (1", 0-1600 psig)
16	5	J (1", 0-1600 psig)
16	6	K (1", 0-1600 psig)

FIGURE NUMBER	ITEM NUMBER	DESCRIPTION	PART NUMBER	QTY	REFERENCE CODE
9	190	O-ring, Viton	4080068045	1	
	340	Plug 1" NPT	4020009024	1	
	480	Oil Seal, Crosshead	4080035010	1	
	590	Base, Simplex, 4"	2010005006	2	
	590	Base, Duplex, 4"	2010004006	2	
	590	Base, Triplex	2010021006	2	
	590	Base, Quadruplex	2010119006	2	
	600	Screw, Hex Head	4050022201	4	
	610	Lock Washer, Spring	4040045022	4	
	620	Nut, Hex Head	4050070012	4	
	630	Displacement Chamber, 106mm	2210672002	1	
	635	O-ring, 2-238 Buna N	4080095291	1	
	640	Mars Valve Assembly	1030001010	1	
	642	O-ring, 2-234 Buna N	4080095251	2	
	650	Contour Plate, 106mm, HPD	2980075006	1	
	655	Orientation Pin, P/O Item 650	4010001031	1	
	660	O-ring, 2-157 Buna N	4080068471	1	
	670	Diaphragm, PTFE / Nitrile, 106mm, HPD	2980074099	1	
	680	Inter Isolation Chamber (See 54148, Double Diaphragm Leak Detector Manual)	2210675015	1	
	700	Diaphragm Head 316SS	2210818016	1	A, F
700	Diaphragm Head 316SS	2210671016	1	C, H	

- Items Not Shown

* Double Quantity for Double Checks

FIGURE NUMBER	ITEM NUMBER	DESCRIPTION	PART NUMBER	QTY	REFERENCE CODE
9	700	Diaphragm Head CA-20	2210818028	1	B, G
	700	Diaphragm Head CA-20	2210671029	1	D, J
	700	Diaphragm Head C-22	2210671030	1	E, K
	710	Stud	22084	4	
	720	Washer, Flat	4040151033	20	
	730	Nut, Hex	4050068017	8	
	735	Washer, Flat	4040043022	8	
	750	Stud	22085	8	
	760	Screw, Hex 3/8-16x3	4050018205	8	
	770	Elbow	4020079041	1	
	780	Gasket, PTFE, Single 5/8" Ball Check	2250075175	6	
	780	Gasket, PTFE, Double 5/8" Ball Check	2250075175	10	
	790	Guide, Single 5/8" Ball Check, 316SS	2920051016	2*	A, C, F, H
	790	Guide, Single 5/8" Ball Check, CA-20	2920051029	2*	B, D, G, J
	790	Guide, Single 5/8" Ball Check, C-22	2920051030	2*	E, K
	800	Seat, Single 5/8" Ball Check, 316SS	2240088016	2*	A, C, F, H
	800	Seat, Single 5/8" Ball Check, CA-20	2240088028	2*	B, D, G, J
	800	Seat, Single 5/8" Ball Check, C-22	2240088030	2*	E, K
	800	Hardened Seat Insert, Single 5/8" Ball Check (Optional)	2240136000	2*	A, C, F, H
	810	Ball, Single 5/8" Ball Check, 316SS	4070014172	2*	A, C, F, H
	810	Ball, Single 5/8" Ball Check, CA-20	4070014173	2*	B, D, G, J
	810	Ball, Single 5/8" Ball Check, C-22	4070014176	2*	E, K
	810	Hardened Ball, Single 5/8" Ceramic Ball (Optional)	4070015171	2*	A, C, F, H
	820	Flange Port Adapter, NPT, 316SS	2710044116	2	A, C, F, H
	820	Flange Port Adapter, NPT, CA-20	2710044129	2	B, D, G, J
	820	Flange Port Adapter, NPT, C-22	2710044130	2	E, K
	820	Flange Port Adapter, ANSI 150#, SW	20125	2	A, C, F, H
	820	Flange Port Adapter, ANSI 300#, SW	20126	2	A, C, F, H
	820	Flange Port Adapter, ANSI 600#, SW	20127	2	A, C, F, H
	820	Flange Port Adapter, ANSI 1200#, SW	2710042216	2	A, C, F, H
	820	Flange Port Adapter, ANSI 150#, SW	20122	2	B, D, G, J

- Items Not Shown

* Double Quantity for Double Checks

FIGURE NUMBER	ITEM NUMBER	DESCRIPTION	PART NUMBER	QTY	REFERENCE CODE
9	820	Flange Port Adapter, ANSI 300#, SW	20123	2	B, D, G, J
	820	Flange Port Adapter, ANSI 600#, SW	20124	2	B, D, G, J
	820	Flange Port Adapter, ANSI 150#, SW	20128	2	E, K
	821	Flange, ANSI 150#, Thread, 316SS	4020013013	2	A, C, F, H
	821	Flange, ANSI 300#, Thread, 316SS	4020014013	2	A, C, F, H
	821	Flange, ANSI 600#, Thread, 316SS	4020015013	2	A, C, F, H
	821	Flange, ANSI 150#, Thread, CA-20	4020013017	2	B, D, G, J
	821	Flange, ANSI 300#, Thread, CA-20	4020014017	2	B, D, G, J
	821	Flange, ANSI 600#, Thread, CA-20	4020015017	2	B, D, G, J
	821	Flange, ANSI 150#, Thread, C-22	4020013015	2	E, K
	821	Flange, ANSI 300#, Thread, C-22	40635	2	E, K
	822	Nipple, 1/2" (P/O 150, 300# Thread), 316SS	4020052053	2	A, C, F, H
	822	Nipple, 1/2" (P/O 600# Thread), 316SS	4020052223	2	A, C, F, H
	822	Nipple, 1/2" (P/O 150# Thread), HC276	4020052057	2	B, D, G, J
	822	Nipple, 1/2" (P/O 300# Thread), CA-20	4020052058	2	B, D, G, J
	822	Nipple, 1/2" (P/O 600# Thread), CA-20	4020052228	2	B, D, G, J
	822	Nipple, 1/2" (P/O 150, 300# Thread), HC- 22	40088	2	E, K
	830	Lock Washer, Spring	4040041022	8	
	840	Screw, Hex Head	4050018143	8	
	850	Plug Socket, 1/2" NPT, DD, 316SS	4020095042	1	
	851	Plug	4020095032	2	
	860	Alarm Probe, Conductivity	3010307000	1	
	880	Sleeve, Piston, 7/8"	1790791000	1	A, B, C, D, E
	880	Sleeve, Piston, 1"	2370056006	1	F, G, H, J, K
	-	Piston Assembly, 7/8" (Includes Items 890, 892, 893, 894, 895, 896, and 897)	1790793000	1	A, B, C, D, E
	-	Piston Assembly, 1" (Includes Items 890, 892, 893, 894, 895, 896, and 897)	2120125300	1	F, G, H, J, K
	890	Rod, Piston, 7/8", P/O Piston Assy	1790792000	1	A, B, C, D, E
	890	Rod, Piston, 1", P/O Piston Assy	2120130006	1	F, G, H, J, K
	891	Not used 7/8" and 1" Plunger			
	892	O-ring, Buna N, P/O Piston Assy	4080109091	1	A, B, C, D, E

- Items Not Shown

* Double Quantity for Double Checks

FIGURE NUMBER	ITEM NUMBER	DESCRIPTION	PART NUMBER	QTY	REFERENCE CODE
9	892	O-ring, Buna N, P/O Piston Assy	4080109111	1	F, G, H, J, K
	893	Seal, Piston, 7/8" Dia., P/O Piston Assy	4080108050	2	A, B, C, D, E
	893	Seal, Piston, 1" Dia., P/O Piston Assy	4080108010	2	F, G, H, J, K
	894	Ring, Back Up, Buna N, P/O Piston Assy	4080126091	1	A, B, C, D, E
	894	Ring, Back Up, Buna N, P/O Piston Assy	4080126111	1	F, G, H, J, K
	895	Seal, Support, P/O Piston Assy	1790790000	1	A, B, C, D, E
	895	Seal, Support, P/O Piston Assy	2120124006	1	F, G, H, J, K
	896	Seal, Retainer, Piston, 7/8", P/O Piston Assy	1790789000	1	A, B, C, D, E
	896	Seal, Retainer, Piston, 1", P/O Piston Assy	2120112006	1	F, G, H, J, K
	897	Screw, Hex Head, P/O Piston Assy	4050016159	1	
	900	Adapter	2720096001	1	
	910	Screw, Socket Head	4050033164	4	
	915	Lock Washer, Spring	4040045022	4	
	930	Gasket, (Adapter to Housing)	2250028199	1	
	935	Gasket, (Displacement Chamber to Adapter)	2250077099	1	
	950	Half Moon, Steel	2190063006	2	
	960	Nut, Rod	2720091006	1	
	970	Screw, Socket Head	4050033164	4	
	980	Lock Washer, Spring	4040045022	4	
	990	Hex Pipe Bushing	4020001044	1	
	1000	Strainer Fitting	2450021000	1	
	1010	Elbow	4020079031	1	
	1030	Tubing	4020145XXZ	24"	
	1040	Valve Assembly (Advise Serial & Model Number)	1010021X06	1	
	1050	Tube, Plastic	4020503212	1	
	1051	Elbow	4020503081	1	
	1060	Screw, Hex Head	4050019151	2	
	1070	Lock Washer, Spring	4040042022	2	
1080	Tubing	4020296091	1ft		

- Items Not Shown

* Double Quantity for Double Checks

6.14 MILROYAL® C METALLIC (PLUNGER DIAMETER 1-1/4", 1-1/2", AND 2")

Model:

<u>Liquid End:</u>	<u>Material:</u>	<u>Reference Code:</u>
CA	1	A(1-1/4", 1601-3025 psig)
CA	5	B (1-1/4", 1601-3025 psig)
20	1	C (1-1/4", 0-1600 psig)
20	5	D (1-1/4", 0-1600 psig)
20	6	E (1-1/4", 0-1600 psig)
CE	1	F (1-1/2", 1601-3025 psig)
CE	5	G (1-1/2", 1601-3025 psig)
24	1	H (1-1/2", 0-1600 psig)
24	5	J (1-1/2", 0-1600 psig)
24	6	K (1-1/2", 0-1600 psig)
32	1	L (2")
32	5	M (2")
32	6	N (2")

FIGURE NUMBER	ITEM NUMBER	DESCRIPTION	PART NUMBER	QTY	REFERENCE CODE
9	190	O-ring, Viton	4080068045	1	
	340	Plug 1" NPT	4020009024	1	
	480	Oil Seal, Crosshead	4080035010	1	
	590	Base, Simplex, 4"	2010005006	2	
	590	Base, Duplex, 4"	2010004006	2	
	590	Base, Triplex	2010021006	2	
	590	Base, Quadruplex	2010119006	2	
	600	Screw, Hex Head	4050022201	4	
	610	Lock Washer, Spring	4040045022	4	
	620	Nut, Hex Head	4050070012	4	
	630	Displacement Chamber, 166mm	2210839002	1	
	635	O-ring, 2-238 Buna N	4080095291	1	
	640	Mars Valve Assembly	1030001010	1	
	642	O-ring, 2-234 Buna N	4080095251	2	
	650	Contour Plate, 166mm, HPD	2980102014	1	
	655	Orientation Pin, P/O Item 650	4010002031	1	
	660	O-ring, 2-157 Buna N	4080068571	1	
670	Diaphragm, PTFE / Nitrile, 166mm, HPD	2980072099	1		

- Items Not Shown

* Double Quantity for Double Checks

FIGURE NUMBER	ITEM NUMBER	DESCRIPTION	PART NUMBER	QTY	REFERENCE CODE
9	680	Inter Isolation Chamber (See 54148, Double Diaphragm Leak Detector Manual)	2210674015	1	
	700	Diaphragm Head 316SS	2210841216	1	A
	700	Diaphragm Head 316SS	2210822016	1	C
	700	Diaphragm Head 316SS	2210841116	1	F
	700	Diaphragm Head 316SS	2210823016	1	H, L
	700	Diaphragm Head CA-20	2210841228	1	B
	700	Diaphragm Head CA-20	2210822029	1	D
	700	Diaphragm Head CA-20	2210841128	1	G
	700	Diaphragm Head CA-20	2210823029	1	J, M
	700	Diaphragm Head C-22	2210822030	1	E
	700	Diaphragm Head C-22	2210823030	1	K, N
	710	Screw, Socket Head, 5/8"-11 X 5-1/2"	4050032264	8	A, B, F, G
	710	Screw, Socket Head, 5/8"-11 X 3-3/4"	4050021239	8	C, D, E, H, J, K, L, M, N
	720	Washer, Flat	4040151041	24	
	730	Nut, Hex	4050069019	12	
	750	Screw, Hex Head		4	A, B, F, G
	750	Screw, Hex Head, 5/8"-11 X 5-1/2"	4050021279	4	C, D, E, H, J, K, L, M, N
	760	Stud 7/16"NC X 2-1/2", Single 5/8" Ball	4050161071	8	A, B, C, D, E
	760	Stud 7/16"NC X 3-3/4", Double 5/8" Ball	4050161331	8	A, B, C, D, E
	760	Stud 7/16"NC X 3", Single 1" Ball	4050161091	8	F, G, H, J, K, L, M, N
	760	Stud 7/16"NC X 4-1/2", Double 1" Ball	4050161141	8	F, G, H, J, K, L, M, N
	770	Elbow	4020079041	1	
	780	Gasket, PTFE, Single 5/8" Ball Check	2250075175	6	A, B, C, D, E
	780	Gasket, PTFE, Double 5/8" Ball Check	2250075175	10	A, B, C, D, E
	780	Gasket, PTFE, Single 1" Ball Check	2250075275	6	F, G, H, J, K, L, M, N
	780	Gasket, PTFE, Double 1" Ball Check	2250075275	10	F, G, H, J, K, L, M, N
	790	Guide, Single 5/8" Ball Check, 316SS	2920051016	2*	A, C
	790	Guide, Single 5/8" Ball Check, CA-20	2920051029	2*	B, D

- Items Not Shown

* Double Quantity for Double Checks

FIGURE NUMBER	ITEM NUMBER	DESCRIPTION	PART NUMBER	QTY	REFERENCE CODE
9	790	Guide, Single 5/8" Ball Check, C-22	2920051030	2*	E
	790	Guide, Single 1" Ball Check, 316SS	2920052016	2*	F, H, L
	790	Guide, Single 1" Ball Check, CA-20	2920052029	2*	G, J, M
	790	Guide, Single 1" Ball Check, C-22	2920052030	2*	K, N
	800	Seat, Single 5/8" Ball Check, 316SS	2240088016	2*	A, C
	800	Seat, Single 5/8" Ball Check, CA-20	2240088028	2*	B, D
	800	Seat, Single 5/8" Ball Check, C-22	2240088030	2*	E
	800	Hardened Seat Insert, Single 5/8" Ball Check (Optional)	2240136000	2*	A, C
	800	Seat, Single 1" Ball Check, 316SS	2240089016	2*	F, H, L
	800	Seat, Single 1" Ball Check, CA-20	2240089028	2*	G, J, M
	800	Seat, Single 1" Ball Check, C-22	2240089030	2*	K, N
	800	Hardened Seat Insert, Single 1" Ball Check (Optional)	2240139000	2*	F, H, L
	810	Ball, Single 5/8" Ball Check, 316SS	4070014172	2*	A, C
	810	Ball, Single 5/8" Ball Check, CA-20	4070014173	2*	B, D
	810	Ball, Single 5/8" Ball Check, C-22	4070014176	2*	E
	810	Hardened Ball, Single 5/8" Ceramic Ball (Optional)	4070015171	2*	A, C
	810	Ball, Single 1" Ball Check, 316SS	4070014232	2*	F, H, L
	810	Ball, Single 1" Ball Check, CA-20	4070014233	2*	G, J, M
	810	Ball, Single 1" Ball Check, C-22	4070014236	2*	K, N
	810	Hardened Ball, Single 1" Ceramic Ball (Optional)	4070015231	2*	F, H, L
	820	Flange Port Adapter, NPT, 316SS	2710044116	2	A, C, F, H, L
	820	Flange Port Adapter, NPT, CA-20	2710044129	2	B, D, G, J, M
	820	Flange Port Adapter, NPT, C-22	2710044130	2	E, K, N
	820	Flange Port Adapter, ANSI 150#, SW	20125	2	A, C, F, H, L
	820	Flange Port Adapter, ANSI 300#, SW	20126	2	A, C, F, H, L
	820	Flange Port Adapter, ANSI 600#, SW	20127	2	A, C, F, H, L
	820	Flange Port Adapter, ANSI 1200#, SW	2710042216	2	A, C, F, H, L
	820	Flange Port Adapter, ANSI 150#, SW	20122	2	B, D, G, J, M

- Items Not Shown

* Double Quantity for Double Checks

FIGURE NUMBER	ITEM NUMBER	DESCRIPTION	PART NUMBER	QTY	REFERENCE CODE
9	820	Flange Port Adapter, ANSI 300#, SW	20123	2	B, D, G, J, M
	820	Flange Port Adapter, ANSI 600#, SW	20124	2	B, D, G, J, M
	820	Flange Port Adapter, ANSI 150#, SW	20128	2	E, K, N
	821	Flange, ANSI 150#, Thread, 316SS	4020013013	2	A, C, F, H, L
	821	Flange, ANSI 300#, Thread, 316SS	4020014013	2	A, C, F, H, L
	821	Flange, ANSI 600#, Thread, 316SS	4020015013	2	A, C, F, H, L
	821	Flange, ANSI 150#, Thread, CA-20	4020013017	2	B, D, G, J, M
	821	Flange, ANSI 300#, Thread, CA-20	4020014017	2	B, D, G, J, M
	821	Flange, ANSI 600#, Thread, CA-20	4020015017	2	B, D, G, J, M
	821	Flange, ANSI 150#, Thread, C-22	4020013015	2	E, K, N
	821	Flange, ANSI 300#, Thread, C-22	40635	2	E, K, N
	822	Nipple, 1/2" (P/O 150, 300# Thread), 316SS	4020052053	2	A, C, F, H, L
	822	Nipple, 1/2" (P/O 600# Thread), 316SS	4020052223	2	A, C, F, H, L
	822	Nipple, 1/2" (P/O 150# Thread), HC276	4020052057	2	B, D, G, J, M
	822	Nipple, 1/2" (P/O 300# Thread), CA-20	4020052058	2	B, D, G, J, M
	822	Nipple, 1/2" (P/O 600# Thread), CA-20	4020052228	2	B, D, G, J, M
	822	Nipple, 1/2" (P/O 150, 300# Thread), HC- 22	40088	2	E, K, N
	830	Nut, Hex, 7/16"	4050067012	8	
	840	Lock Washer, Spring, 7/16"	4040042022	10	
	850	Plug Socket, 1/2" NPT, DD, 316SS	4020095042	1	
	851	Plug	4020095032	2	
	860	Alarm Probe, Conductivity	3010307000	1	
	880	Sleeve, Piston, 1-1/4" Plunger	2370052006	1	A, B, C, D, E
880	Sleeve, Piston, 1-1/2" Plunger	2370052106	1	F, G, H, J, K	
880	Sleeve, Piston, 2" Plunger	2370052206	1	L, M, N	

- Items Not Shown

* Double Quantity for Double Checks

FIGURE NUMBER	ITEM NUMBER	DESCRIPTION	PART NUMBER	QTY	REFERENCE CODE
9	-	Piston Assembly, 1-1/4" (Includes Items 890, 891, 892, 893, 894, 895, and 897)	2120125400	1	A, B, C, D, E
	-	Piston Assembly, 1-1/2" (Includes Items 890, 892, 893, 894, 895, 896 and 897)	2120125500	1	F, G, H, J, K
	-	Piston Assembly, 2" (Includes Items 890, 891, 892, 893, and 894)	2120128300	1	L, M, N
	890	Rod, Piston, 1-1/4" Plunger, P/O Piston Assy	2120132006	1	A, B, C, D, E
	890	Rod, Piston, 1-1/2" Plunger, P/O Piston Assy	2120132106	1	F, G, H, J, K
	890	Rod, Piston, 2" Plunger, P/O Piston Assy	2120131206	1	L, M, N
	891	Seal, Piston, P/O Piston Assy	2120107006	1	A, B, C, D, E
	891	Washer, P/O Piston Assy	2190080006	2	L, M, N
	892	Ring, Back Up, Buna N, P/O Piston Assy	4080126111	1	A, B, C, D, E, F, G, H, J, K
	892	O-ring, Buna N, P/O Piston Assy	4089996012	2	L, M, N
	893	Seal, Piston, 1-1/4" Dia. HPD, P/O Piston Assy	4080108020	2	A, B, C, D, E
	893	Seal, Piston, 1-1/2" Dia. HPD, P/O Piston Assy	4080108030	2	F, G, H, J, K
	893	Seal, Piston, 2" Dia. HPD, P/O Piston Assy	4080107030	2	L, M, N
	894	O-ring, Buna N, P/O Piston Assy	4080109111	1	A, B, C, D, E, G, H, J, K
	894	Nut, Flex Lock, 3/8-24, P/O Piston Assy	4050200065	1	L, M, N
	895	Seal, Support, P/O Piston Assy	2120126106	1	A, B, C, D, E
	895	Seal, Support, P/O Piston Assy	2120127006	1	F, G, H, J, K
	896	Seal, Retainer, Piston, 1-1/4"	2120107006	1	A, B, C, D, E
	896	Seal, Retainer, Piston, 1-1/2"	2120109006	1	F, G, H, J, K
	897	Screw, Hex Head, P/O Piston Assy	4050018159	1	
	900	Adapter	2720096001	1	

- Items Not Shown

* Double Quantity for Double Checks

FIGURE NUMBER	ITEM NUMBER	DESCRIPTION	PART NUMBER	QTY	REFERENCE CODE
9	910	Screw, Socket Head, 7/16-14 X 1-3/4"	4050030154	4	
	915	Lock Washer, Spring	4040045022	4	
	930	Gasket, (Adapter to Housing)	2250028199	1	
	935	Gasket,(Displacement Chamber to Adapter)	2250077099	1	
	950	Half Moon, Steel	2190063006	2	
	960	Nut, Rod	2720091006	1	
	970	Screw, Socket Head, 3/4-10 X 2"	4050033164	4	
	980	Lock Washer, Spring, 3/4"	4040045022	4	
	990	Hex Pipe Bushing	4020001044	1	
	1000	Strainer Fitting	2450021000	1	
	1010	Elbow	4020079031	1	
	1030	Tubing	4020145XXZ	24"	
	1040	Valve Assembly (Advise Serial & Model Number)	1010021X06	1	
	1050	Tube, Plastic	4020503212	1	
	1051	Elbow	4020503081	1	
	1060	Screw, Hex Head, 5/16-18 X 2-3/4	4050017199	2	
	1070	Lock Washer, Spring	4040040028	2	
	1080	Tubing	4020296091	1ft	

- Items Not Shown

* Double Quantity for Double Checks

6.15 MILROYAL® C METALLIC (PLUNGER DIAMETER 2-1/2", 3", AND 3-1/2")

Model:

<u>Liquid End:</u>	<u>Material:</u>	<u>Reference Code:</u>
40	1	A (2-1/2")
40	5	B (2-1/2")
40	6	C (2-1/2")
48	1	D (3")
56	1	E (3-1/2")
56	5	F (3-1/2")
56	6	G (3-1/2")

FIGURE NUMBER	ITEM NUMBER	DESCRIPTION	PART NUMBER	QTY	REFERENCE CODE
9	190	O-ring, Viton	4080095111	1	
	340	Plug 1" NPT	4020009024	1	
	480	Oil Seal, Crosshead	4080035010	1	
	590	Base, Simplex, 6"	2010194006	2	
	590	Base, Duplex, 6"	2010195006	2	
	590	Base, Triplex	2010365006	2	
	600	Screw, Hex Head	4050022201	4	
	610	Lock Washer, Spring	4040045022	4	
	620	Nut, Hex Head	4050070012	4	
	630	Displacement Chamber, 266mm	2210642002	1	
	640	Mars Valve Assembly	1030001010	1	
	642	O-ring, Buna N	4080095251	2	
	650	Contour Plate, 266mm, HPD	2980067006	1	
	660	O-ring, Buna N	4080095671	1	
	670	Diaphragm, PTFE / Nitrile, 266mm, HPD	2980068099	1	
	680	Inter Isolation Chamber (See 54148, Double Diaphragm Leak Detector Manual)	2210689015	1	
	700	Diaphragm Head 316SS	2210824016	1	A, D, E
	700	Diaphragm Head CA-20	2210824029	1	B, F
	700	Diaphragm Head C-22	2210824030	1	C, G
	710	Screw, Hex Head, 5/8-11 X 4"	4050021249	10	
720	Washer, Flat, 5/8"	4040151041	24		

- Items Not Shown

* Double Quantity for Double Checks

FIGURE NUMBER	ITEM NUMBER	DESCRIPTION	PART NUMBER	QTY	REFERENCE CODE
9	730	Nut, Hex, 5/8"	4050069019	14	
	750	Screw, Hex Head, 5/8-11 X 6-1/2"	4050021299	4	
	755	Stud, 7/16NC X 3-1/2"	4050161111	8	
	755	Stud, 7/16NC X 5-3/4", Double Diaphragm	4050161201	8	
	770	Elbow	4020079041	1	
	780	Gasket, PTFE, Single 1-1/2" Ball Check	2250075375	6	
	780	Gasket, PTFE, Double 1-1/2" Ball Check	2250075375	10	
	790	Guide, Single 1-1/2" Ball Check, 316SS	2920049016	2*	A, D, E
	790	Guide, Single 1-1/2" Ball Check, CA-20	2920049029	2*	B, F
	790	Guide, Single 1-1/2" Ball Check, C-22	2920049030	2*	C, G
	800	Seat, Single 1-1/2" Ball Check, 316SS	2240084016	2*	A, D, E
	800	Seat, Single 1-1/2" Ball Check, CA-20	2240084028	2*	B, F
	800	Seat, Single 1-1/2" Ball Check, C-22	2240084030	2*	C, G
	800	Hardened Seat Insert, Single 1-1/2" Ball Check (Optional)	2240142000	2*	A, D, E
	806	Spring, C-276, Used with Item 40954, 40951, & 40956	40953	2	A, D, E
	810	Ball, Single 1-1/2" Ball Check, 316SS	40954	2	A, D, E
	810	Ball, Double 1-1/2" Ball Check, 316SS	4070014272	4	A, D, E
	810	Ball & Stem Assy, Single 1-1/2" Ball Check, CA-20	40951	2	B, F
	810	Ball, Double 1-1/2" Ball Check, CA-20	4070014273	4	B, F
	810	Ball & Stem Assy, Single 1-1/2" Ball Check, C-22	40956	2*	C, G
	810	Ball, Double 1-1/2" Ball Check, C-22	4070014276	2	C, G
	810	Hardened Ball, Single 1-1/2" Ceramic Ball (Optional)	4070015271	2*	A, D, E
	820	Flange Port Adapter, NPT, 316SS	2710046016	2	A, D, E
	820	Flange Port Adapter, NPT, CA-20	2710046029	2	B, F
	820	Flange Port Adapter, NPT, C-22	2710046030	2	C, G
	820	Flange Port Adapter, ANSI 150#, SW	20141	2	A, D, E
	820	Flange Port Adapter, ANSI 300#, SW	20145	2	A, D, E
	820	Flange Port Adapter, ANSI 150#, SW	20146	2	B, F
820	Flange Port Adapter, ANSI 150#, SW	20143	2	C, G	

- Items Not Shown

* Double Quantity for Double Checks

FIGURE NUMBER	ITEM NUMBER	DESCRIPTION	PART NUMBER	QTY	REFERENCE CODE
9	821	Flange, ANSI 150#, Thread, 316SS	4020013053	2	A, D, E
	821	Flange, ANSI 300#, Thread, 316SS	4020014053	2	A, D, E
	821	Flange, ANSI 150#, Thread, CA-20	4020013057	2	B, F
	821	Flange, ANSI 300#, Thread, CA-20	4020014057	2	B, F
	821	Flange, ANSI 150#, Thread, C-22	4020013055	2	C, G
	821	Flange, ANSI 300#, Thread, C-22	40635	2	E, K
	822	Nipple, 1-1/2" (P/O 150# Thread), 316SS	4020121043	2	A, D, E
	822	Nipple, 1-1/2" (P/O 300# Thread), 316SS	4020330203	2	A, D, E
	822	Nipple, 1-1/2" (P/O 150 & 300# Thread), CA-20	4020121048	2	B, F
	822	Nipple, 1-1/2" (P/O 150# Thread), HC-22	40239	2	C G
	830	Lock Washer, Spring, 7/16"	4040042022	8	
	840	Nut, Hex, 7/16"	4050067012	8	
	850	Plug Socket, 1/2" NPT, DD, 316SS	4020095042	1	
	851	Plug, 3/8" Hex Socket, DD	4020095032	3	
	860	Alarm Probe, Conductivity	3010307000	1	
	870	O-ring, Buna N	4080095331	2	
	880	Sleeve, Piston, 2-1/2"	2370054106	1	A, B, C
	880	Sleeve, Piston, 3"	2370054306	1	D
	880	Sleeve, Piston, 3-1/2"	2370054006	1	E, F, G
	-	Piston Assembly, 2-1/2" (Includes Items 890, 891, 892, 893, and 894)	2120128400	1	A, B, C
	-	Piston Assembly, 3-1/2" (Includes Items 890, 891, 892, 893, and 894)	2120128600	1	E, F, G
	890	Rod, Piston, 3-1/2", P/O Piston Assy	2120133106	1	
	891	Washer, P/O Piston Assy	2190082006	2	A, B, C
	891	Washer, P/O Piston Assy	20895	2	D
	891	Washer, P/O Piston Assy	2190083006	2	E, F, G
	892	O-ring, Buna N, P/O Piston Assy	4080109101	2	
	893	Seal, Piston, 2-1/2" Dia. Plunger	4080107040	2	A, B, C
	893	Seal, Piston, 3" Dia. Plunger, P/O Piston Assy	40624	2	D
	893	Seal, Piston, 3-1/2" Dia. Plunger, P/O Piston Assy	4080107050		E, F, G

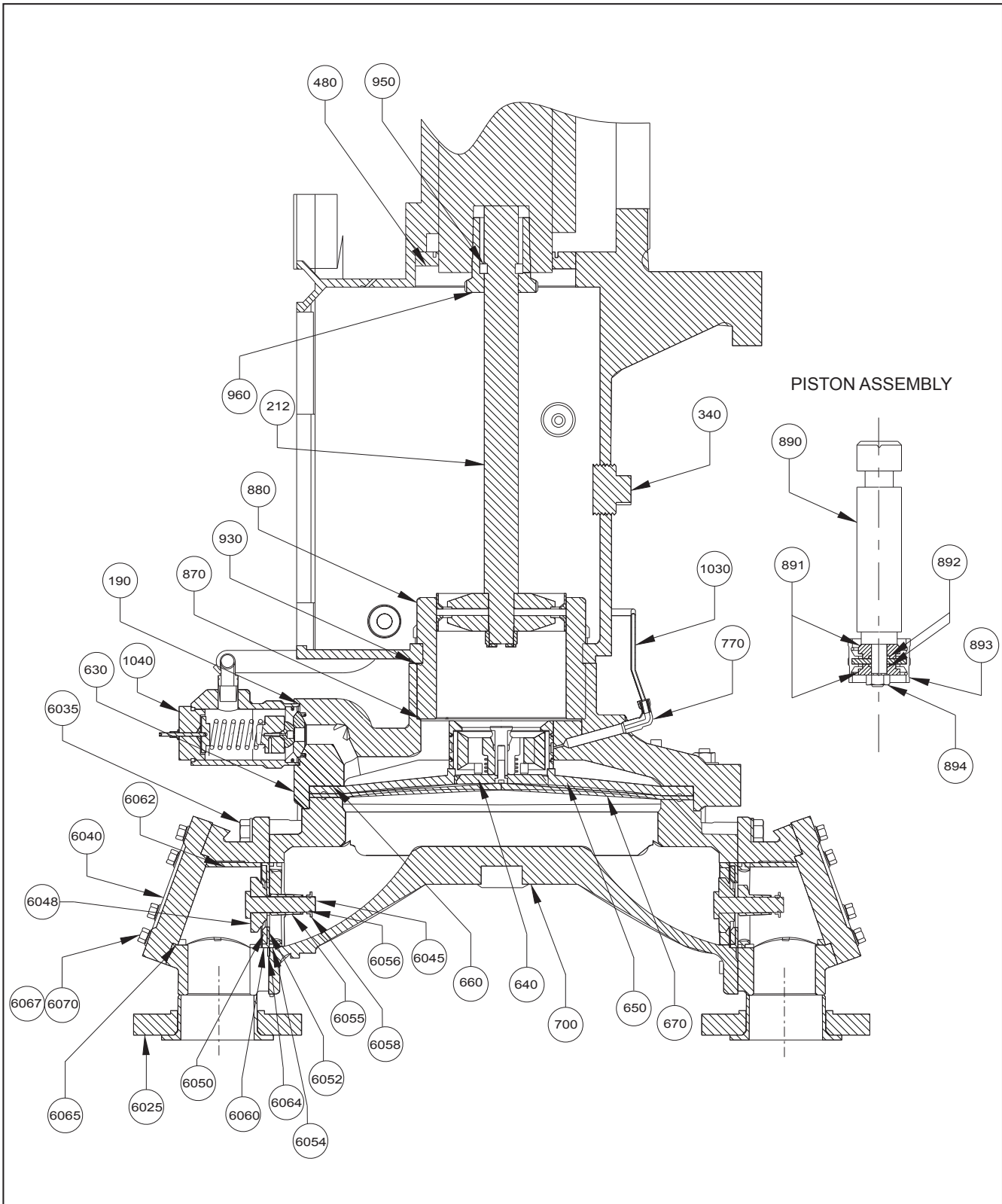
- Items Not Shown

* Double Quantity for Double Checks

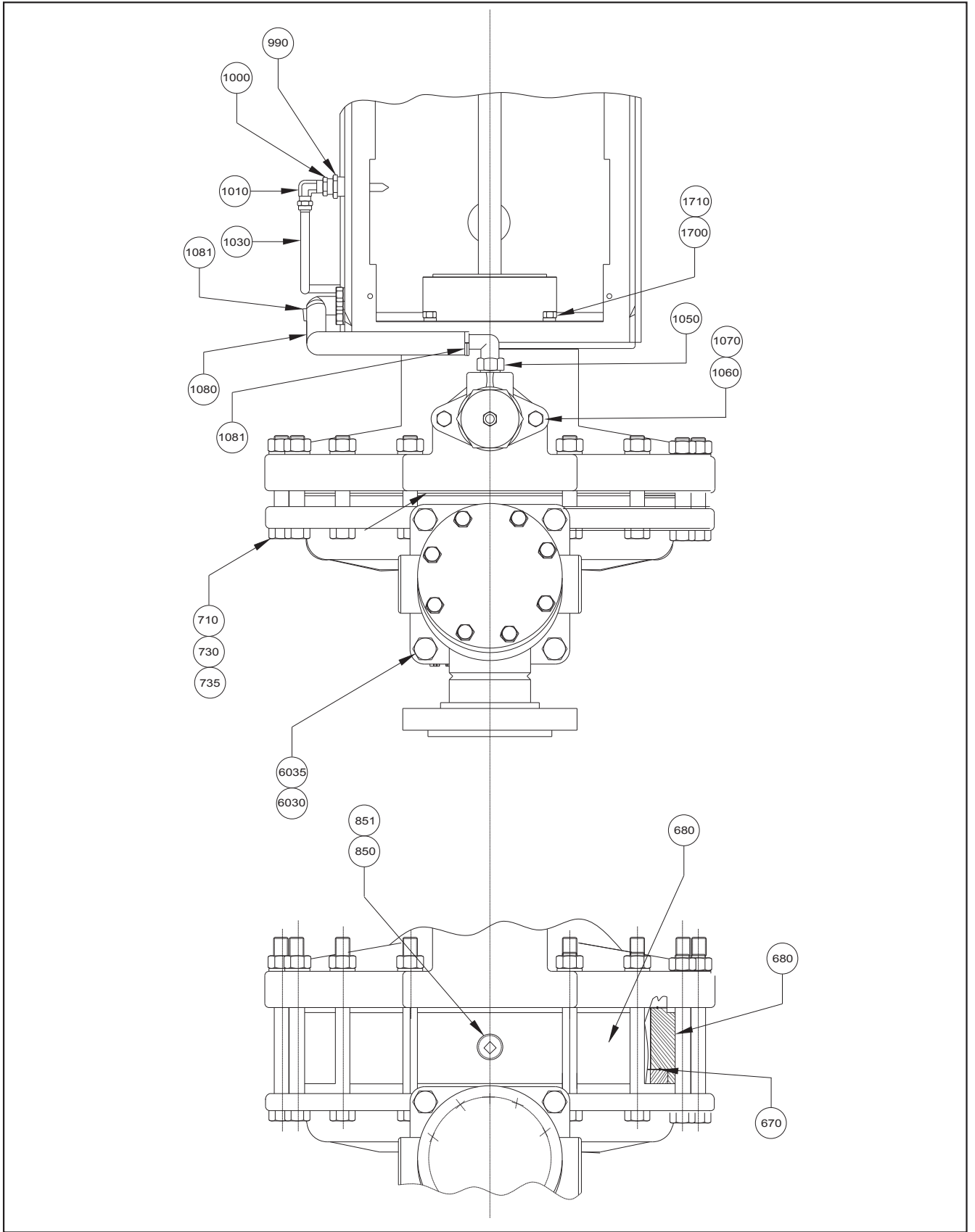
FIGURE NUMBER	ITEM NUMBER	DESCRIPTION	PART NUMBER	QTY	REFERENCE CODE
9	894	Nut, Flex Lock, 7/16", P/O Piston Assy	4050200075	1	
	900	Adapter	2720093001	1	
	910	Screw, Socket Head, 5/8"	4050032164	4	
	915	Lock Washer, Spring, 5/8"	4040044022	4	
	930	Gasket, (Adapter to Housing)	2250028199	1	
	950	Half Moon, Steel	2190063006	2	
	960	Nut, Rod	2720091006	1	
	970	Screw, Socket Head, 5/8"-11 X 2"	4050021161	4	
	980	Lock Washer, Spring, 5/8"	4040044022	4	
	990	Hex Pipe Bushing	4020001044	1	
	1000	Strainer Fitting	2450021000	1	
	1010	Elbow	4020079031	1	
	1020	Crank,	2160004062	1	
	1030	Tubing	4020145XXZ	24"	
	1040	Valve Assembly (Advise Serial & Model Number)	1010020010	1	
	1050	Tube, Plastic	4020503162	1	
	1051	Elbow	4020503162	1	
	1060	Screw, Hex Head	4050019161	2	
	1070	Lock Washer, Spring	4040042022	2	
1080	Tubing	4020296171	1ft		

- Items Not Shown

* Double Quantity for Double Checks



**Figure 10. Milroyal® C HPD Metallic Liquid End, Plunger Diameter 5'' and 5-3/4''
(DWG. 102-1281-000 Sheet 1)**



**Figure 10. Milroyal® C HPD Metallic Liquid End, Plunger Diameter 5" and 5-3/4"
(DWG. 102-1281-000 Sheet 2)**

6.16 MILROYAL® C METALLIC (PLUNGER DIAMETER 5" AND 5-3/4")

Model:

<u>Liquid End:</u>	<u>Material:</u>	<u>Reference Code:</u>
80	1	A (5")
80	5	B (5")
92	1	C (5-3/4")
92	5	D (5-3/4")

FIGURE NUMBER	ITEM NUMBER	DESCRIPTION	PART NUMBER	QTY	REFERENCE CODE
10	190	O-ring	4080095111	1	
	340	Plug 1" NPT	4020009024	1	
	480	Oil Seal, Crosshead	4080035010	1	
	-	Base, Simplex, 366 MCH	2010005006	2	
	-	Base, Duplex, 366 MCH	2010369006	1	
	-	Base, Triplex, 366 MCH	2010370006	1	
	-	Screw, Hex Head, 3/4"-10 X 3"	4050022201	4	
	-	Lock Washer, Spring, 3/4"	4040045022	4	
	-	Nut, Hex Head	4050070012	4	
	630	Displacement Chamber, 366mm	2210676002	1	
	640	Mars Valve Assembly	1030001010	1	
	650	Contour Plate, 366mm, HPD	2980077006	1	
	660	O-ring, Contour Plate	2250080082	1	
	670	Diaphragm, PTFE / Nitrile, 366mm, HPD	2980078099	1	
	680	Inter Isolation Chamber (See 54148, Double Diaphragm Leak Detector Manual)	2210680015	1	
	700	Diaphragm Head 316SS	2210677016	1	A, C
	700	Diaphragm Head CA-20	2210677028	1	B, D
	710	Screw, Hex Head	4050021299	4	
	730	Nut, Hex, 5/8"-11	4050069019	8	
	735	Washer, Spring Lock Washer, 5/8"	4040044022	8	
	770	Elbow	4020079041	1	
	-	Alarm Probe, Conductivity	3010307000	1	
	870	O-ring	4080027371	1	
880	Sleeve, Piston, 5"	2370058006	1	A, B	

- Items Not Shown

* Double Quantity for Double Checks

FIGURE NUMBER	ITEM NUMBER	DESCRIPTION	PART NUMBER	QTY	REFERENCE CODE
10	880	Sleeve, Piston, 5-3/4"	2370059006	1	C, D
	212	Piston Assembly, 5" (Includes Items 890, 891, 892, 893, and 894)	2120128700	1	A, B
	212	Piston Assembly, 5-3/4" (Includes Items 890, 891, 892, 893, and 894)	2120128800	1	C, D
	890	Rod, Piston (See Item 212)	2120134006	1	
	891	Washer (See Item 212)	2190084006	2	A, B
	891	Washer (See Item 212)	2190085006	2	C, D
	892	O-ring, Buna N (See Item 212)	4080109151	1	
	893	Seal, Piston, 5" Dia. HPD (See Item 212)	4080107060	2	A, B
	893	Seal, Piston, 5-3/4" Dia. HPD (See Item 212)	4080107070	2	C, D
	894	Nut, Flex Lock (See Item 212)	4050200115	1	
	930	Gasket, Displacement Chamber	2250082098	1	
	950	Half Moon, Steel	2190063006	2	
	960	Nut, Rod	2720091006	1	
	990	Hex Pipe Bushing	4020001044	1	
	1000	Strainer Fitting	2450021000	1	
	1010	Elbow	4020079031	1	
	1030	Tubing	4020145XXZ	24"	
	1040	Valve Assembly (Advise Serial & Model Number)	1010021X06	1	
	1050	Tube, Plastic	4020503162	1	
	1060	Screw, Hex Head	4050019161	2	
	1070	Lock Washer, Spring	4040042022	2	
	1080	Tubing	4020296171	1ft	
	1081	Clamp, Tube	4020158011	2	
	1700	Screw, Hex Head	4050021161	4	
	1710	Lock Washer, Spring	4040044022	4	
	6025	Port Flange Connection Assy, 316SS	2710026016	2	A, C
	6025	Port Flange Connection Assy, CA-20	2710026028	2	B, D
	6035	Screw, Hex Head	4050021151	8	

- Items Not Shown

* Double Quantity for Double Checks

FIGURE NUMBER	ITEM NUMBER	DESCRIPTION	PART NUMBER	QTY	REFERENCE CODE
10	6040	Port Connector Cover, 316SS	2810187016	2	A, C
	6040	Port Connector Cover, CA-20	2810187028	2	B, D
	6045	Valve Stem, 316SS	2120144016	2	A, C
	6045	Valve Stem, CA-20	2120144028	2	B, D
	6048	Poppet, 316SS	2120143016	2	A, C
	6048	Poppet, CA-20	2120143028	2	B, D
	6050	Seat, Insert	2240127075	2	
	6052	Seat, 316SS	2240128016	2	A, C
	6052	Seat, CA-20	2240128028	2	B, D
	6054	Gaskets	2250081075	2	
	6055	Poppet Guide, 316SS	2030016016	2	A, C
	6055	Poppet Guide, CA-20	2030016028	2	B, D
	6056	Collar, Clamping, 316SS	2260003016	2	A, C
	6056	Collar, Clamping, CA-20	2260003028	2	B, D
	6058	Shoulder Stops, 316SS	2920057016	2	A, C
	6058	Shoulder Stops, CA-20	2920057028	2	B, D
	6060	Seat Rings, 316SS	2190068016	2	A, C
	6060	Seat Rings, CA-20	2190068028	2	B, D
	6062	Sleeve, Port Connection, 316SS	2190067016	2	A, C
	6062	Sleeve, Port Connection, CA-20	2190067028	2	B, D
	6064	Gasket	2250081175	2	
	6065	O-ring, PTFE	4080096393	2	
	6067	Washer, Spring Lock	4040043022	16	
6070	Screw, Stick	4050020144	16		

- Items Not Shown

* Double Quantity for Double Checks

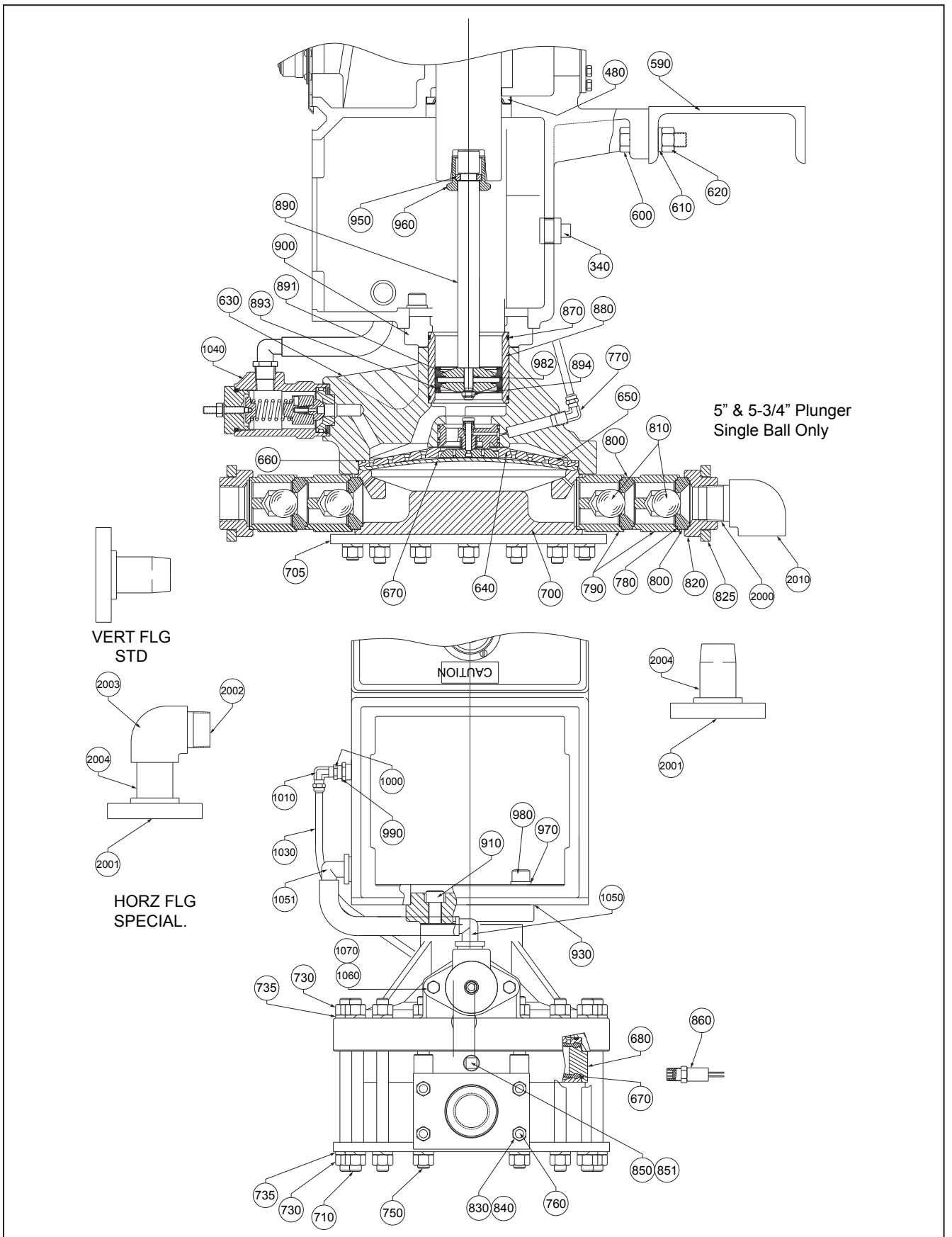


Figure 11. Milroyal® C, HPD Plastic Liquid End Assembly (DWG. 102-2285-000 Sheet 5)

6.17 MILROYAL® C PLASTIC (PLUNGER DIAMETER 2-1/2" AND 3-1/2")

Model:

<u>Liquid End:</u>	<u>Material:</u>	<u>Reference Code:</u>
40	2	A (2-1/2")
56	2	B (3-1/2")

FIGURE NUMBER	ITEM NUMBER	DESCRIPTION	PART NUMBER	QTY	REFERENCE CODE
11	190	O-ring, Viton	4080095111	1	
	340	Plug 1" NPT	4020009024	1	
	480	Oil Seal, Crosshead	4080035010	2	
	590	Base, Simplex, 8"	2010354006	2	
	590	Base, Duplex	2010353006	2	
	590	Base, Triplex	2010359006	2	
	600	Screw, Hex Head, 3/4"-10 X 3"	4050022201	8	
	610	Lock Washer, Spring, 3/4"	4040045022	8	
	620	Nut, Hex Head	4050070012	8	
	630	Displacement Chamber, 266mm	2210642002	1	
	640	Mars Valve Assembly	1030001010	1	
	650	Contour Plate, 266mm, HPD	2980067006	1	
	660	O-ring, Contour Plate	4080095671	1	
	670	Diaphragm, PTFE / Nitrile, 266mm, HPD	2980068099	1	
	680	Inter Isolation Chamber (See 54148, DD Leak Detector Manual)	2210689015	1	
	700	Diaphragm Head, PVC	2210648071	1	
	705	Back Up Plate	2710016006	1	
	710	Screw, Hex Head	4050021299	10	
	710	Screw, Hex Head, DD Only	2320030214	10	
	730	Nut, Hex, 5/8"-11	4050069019	18	
	735	Washer, Spring Lock Washer, 5/8"	4040044022	22	
	750	Stud, 10.5" HPD Engagement	2320024014	4	
	750	Stud, 10.5" HPD Engagement, DD Only	2320031014	4	
760	Stud, 7/16NC X 8"	4050161283	8		
770	Elbow	4020079041	1		
780	Gasket, PTFE, 1-1/2" Ball	2250075675	10		
790	Guide, 1-1/2" Ball	2920050071	4		

- Items Not Shown

* Double Quantity for Double Checks

FIGURE NUMBER	ITEM NUMBER	DESCRIPTION	PART NUMBER	QTY	REFERENCE CODE
11	800	Seat, 1-1/2" Ball	2240086071	4	
	810	Ball, 1-1/2" Ceramic, (Double Ball Only)	4070015271	4	
	820	Connector, PVC Port, 1-1/2" NPT	2710015071	2	
	820	Adapter, PVC Port, SW	21875	2	
	821	Flange, ANSI, 150#, Thread, PVC	4020093051	2	
	822	Nipple, 1-1/2" X 1-3/4", P/O 150# Thread	4020121176	1	
	822	Nipple, 1-1/2" X 3", P/O 150# Thread	4020121206	1	
	825	Plate, Compression, 1-1/2" NPT	2040123015	2	
	830	Lock Washer, Spring, 7/16"	4040042022	8	
	840	Nut, Hex, 7/16"-14NC	4050067012	8	
	850	Plug Socket, 1/2" NPT, 316SS, DD Only	4020095042	1	
	851	Plug, 3/8 316SS, DD Only	4020095032	1	
	860	Alarm Probe, Conductivity, DD Only	3010307000	1	
	870	O-ring	4080095331	2	
	880	Sleeve, Piston, 2-1/2"	2370054106	1	A
	880	Sleeve, Piston, 3-1/2"	2370054006	1	B
	-	Piston Assembly, 2-1/2" (Includes Items 890, 891, 892, 893, and 894)	2120128400	1	A
	-	Piston Assembly, 3-1/2" (Includes Items 890, 891, 892, 893, and 894)	2120128600	1	B
	890	Rod, Piston, 3-1/2", P/O Piston Assy	2120133106	1	
	891	Washer, P/O Piston Assy	2190082006	2	A
	891	Washer, P/O Piston Assy	2190083006	2	B
	892	O-ring, P/O Piston Assy	4080109101	2	
	893	Seal, Piston, P/O Piston Assy	4080107040	1	A
	893	Seal, Piston, P/O Piston Assy	4080107050	1	B
	894	Nut, Flex Lock, P/O Piston Assy	4050200075	1	
	900	Adapter	2720093001	1	
	910	Screw, Socket Head	4050032164	4	
	930	Gasket	2250028199	1	
	950	Half Moon, Steel	2190063006	2	
	960	Nut, Rod	2720091006	1	
990	Hex Pipe Bushing	4020001044	1		

- Items Not Shown

* Double Quantity for Double Checks

FIGURE NUMBER	ITEM NUMBER	DESCRIPTION	PART NUMBER	QTY	REFERENCE CODE
11	1000	Strainer Fitting	2450021000	1	
	1010	Elbow	4020079031	1	
	1030	Tubing	4020145XXZ	24"	
	1040	Valve Assembly (Advise Serial & Model Number)	1010021X06	1	
	1050	Tube, Elbow, Plastic	4020503162	1	
	1060	Screw, Hex Head	4050019161	2	
	1070	Lock Washer, Spring	4040042022	2	
	1080	Tubing	4020296171	1ft	
	1690	Washer, Spring Lock	4020158011	4	
	1700	Screw, Hex Head	4050021161	4	
	2001	Flange, 1-1/2" CPVC Socket Type	4020516051	2	
	2002	Nipple, 1-1/2" X 2-1/2", Socket Weld	4020375026	1	
	2003	Elbow, Socket Weld	4020381071	1	
	2004	Nipple, 1-1/2" X 3", Socket Weld	4020375036	2	

- Items Not Shown

* Double Quantity for Double Checks

6.18 MILROYAL® C PLASTIC (PLUNGER DIAMETER 5" AND 5-3/4")

Model:

<u>Liquid End:</u>	<u>Material:</u>	<u>Reference Code:</u>
80	2	A (5")
92	2	B (5-3/4")

FIGURE NUMBER	ITEM NUMBER	DESCRIPTION	PART NUMBER	QTY	REFERENCE CODE
11	190	O-ring, Viton	4080095111	1	
	340	Plug 1" NPT	4020009024	1	
	480	Oil Seal, Crosshead	4080035010	2	
	590	Base, Simplex, 366 MCH	2010394006	2	
	590	Base, Duplex, 366 MCH	2010369006	2	
	590	Base, Triplex, 366 MCH	2010370006	2	
	600	Screw, Hex Head, 3/4"-10 X 3"	4050022201	8	
	610	Lock Washer, Spring, 3/4"	4040045022	8	
	620	Nut, Hex Head	4050070012	8	
	630	Displacement Chamber, 366mm	2210676002	1	
	640	Mars Valve Assembly	1030001010	1	
	650	Contour Plate, 366mm, HPD	2980077006	1	
	660	O-ring, Contour Plate	2250080082	1	
	670	Diaphragm, PTFE / Nitrile, 366mm, HPD	2980078099	1	
	680	Inter Isolation Chamber (See 54148, Double Diaphragm Leak Detector Manual)	2210680015	1	
	700	Diaphragm Head, PVC	2210678073	1	
	705	Back Up Plate	2710023006	1	
	710	Studs, Bolting, 5/8"-11	2320030014	10	
	710	Studs, Bolting, 5/8"-11 X 11-13/16", DD Only	2320030114	10	
	730	Nut, Hex, 5/8"-11	4050069019	28	
	735	Washer, Spring Lock Washer, 5/8"	4040044022	28	
	750	Stud, Engagement	2320028014	4	
	750	Stud, Engagement, DD Only	2320028114	4	
	760	Stud, 7/16NC X 8"	2320029014	8	
770	Elbow	4020079041	1		
780	Gasket, PTFE	2250075775	6		
790	Guide, 2-3/4" Ball	2920056071	2		

- Items Not Shown

* Double Quantity for Double Checks

FIGURE NUMBER	ITEM NUMBER	DESCRIPTION	PART NUMBER	QTY	REFERENCE CODE
11	800	Seat, 2-3/4" Ball	2240093071	2	
	810	Ball, 2-3/4" PTFE	4070170375	2	
	820	Connector, PVC Port, 2-1/2" NPT	2710024071	2	
	820	Connector, PVC Port, 2-1/2" SW	22122	2	
	820	Connector, PVC Port, 2-1/2" Thread	2710024071	2	
	825	Plate, Compression	2040129015	2	
	830	Lock Washer, Spring, 7/16"	4040042022	10	
	840	Nut, Hex, 7/16"-14NC	4050067012	8	
	860	Alarm Probe, Conductivity, DD Only	3010307000	1	
	870	O-ring	4080027371	1	
	880	Sleeve, Piston, 5"	2370058006	1	A
	880	Sleeve, Piston, 5-3/4"	2370059006	1	B
	-	Piston Assembly, 5" (Includes Items 890, 891, 892, 893, and 894)	2120128700	1	A
	-	Piston Assembly, 5-3/4" (Includes Items 890, 891, 892, 893, and 894)	2120128800	1	B
	890	Rod, Piston, 5", P/O Piston Assy	2120134006	1	
	891	Washer, P/O Piston Assy	2190084006	2	A
	891	Washer, P/O Piston Assy	2190085006	2	B
	892	O-ring, Buna N, P/O Piston Assy	4080109151	2	
	893	Seal, Piston, P/O Piston Assy	4080107060	1	A
	893	Seal, Piston, P/O Piston Assy	4080107070	1	B
	894	Nut, Flex Lock, P/O Piston Assy	4050200115	1	
	930	Gasket, Displacement Chamber	2250082098	1	
	950	Half Moon, Steel	2190063006	2	
	960	Nut, Rod	2720091006	1	
	990	Hex Pipe Bushing	4020001044	1	
	1000	Strainer Fitting	2450021000	1	
	1010	Elbow	4020079031	1	
	1030	Tubing	4020145XXZ	24"	
	1040	Valve Assembly (Advise Serial & Model Number)	1010021X06	1	
	1050	Tube, Elbow, Plastic	4020503162	1	
1060	Screw, Hex Head	4050019161	2		

- Items Not Shown

* Double Quantity for Double Checks

FIGURE NUMBER	ITEM NUMBER	DESCRIPTION	PART NUMBER	QTY	REFERENCE CODE
11	1070	Lock Washer, Spring	4040042022	2	
	1080	Tubing	4020296171	1ft	
	1081	Tube Clamp	4020158011	2	
	1700	Screw, Hex Head	4050021161	4	
	2000	Nipple, 2-1/2" X 3", P/O 150# Thread	4020222166	1	
	2000	Nipple, 2-1/2" X 4.5", P/O 150# SW	41338	1	
	2001	Flange, Pipe, 2-1/2" 150# Thread PVC	4020093071	2	
	2001	Flange, Pipe, 2-1/2" 150# SW PVC	41085	2	
	2004	Nipple, 2-1/2" X 6", P/O 150# Thread	41300	2	
	2004	Nipple, 2-1/2" X 6", P/O 150# SW	41339	2	
	2010	Elbow, 90D, 2-1/2 NPT, P/O 150# Thread	4020047112	1	
	2010	Elbow, 90D, 2-1/2 NPT, P/O 150# SW	41343	1	

- Items Not Shown

* Double Quantity for Double Checks

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