



Aerospace Group
Conveyance Systems Division
Carter® Brand Ground Fueling Equipment

SM61654

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Applicable additional manuals:

NONE

Maintenance & Repair Manual

Hydrant Pit Valve

Model 61654

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MAINTENANCE, OVERHAUL & TEST INSTRUCTIONS CARTER PART NUMBER

1.0 INTRODUCTION

This manual furnishes detailed instructions covering the maintenance and overhaul of Carter Model 61654 Hydrant Valve, a family of hydrant valves as described in a later paragraph. This valve was created to provide a single model number to incorporate two different part numbers, 61153 and 60554-1, into a similar family. Both of these older part numbers and their options were combined to create the many

versions that are included within this family. The 61153 has been replaced by the 61654AJ and the 60554-1 has been replaced by the 61654EK.

Note: The various items specified in this manual are referred to in parenthesis and indicate the figure number and item number within that figure where the item appears. Example: Washer (1-6) is item 6 found in Figure 1.

2.0 EQUIPMENT DESCRIPTION

The Carter 61654 family of hydrant valves starting with serial number 1289 has been qualified in accordance with the Third Edition of API 1584. This version of the industry specification includes the up dating of the Second Edition and combines the requirements of the Institute of Petroleum Requirements to arrive at an industry wide specification. The main thrust of the Third Edition is to cover in more detail the "break-a-way" capability of the combination hydrant valve and coupler to improve safety on the ramp. Specific tests were required of the combination of products to prove that the hydrant valve and couplers met these requirements. Ask Carter for 3QTR61654 Test Report for the results of the tests on the Carter products.

Older units (serial numbers under 1289) can be updated to meet the new requirements by using a kit noted later.

The Carter 61654 family of hydrant valves is manufactured with a choice of four different pilot valve arrangements, lanyard or air pressure operation, capable of flowing in the fueling direction only, or with air pressure operation, capable of both

fueling and defueling operations and a dual air/lanyard pilot. All versions consist of three major sections:

- Lower Housing Assembly - functionally identical on the valves that are capable of flow in the fueling direction only. The "J" option uses a different assembly. The inlet flange, in all cases, is designed to mate a flat faced ANSI 150 lbs, 4 inch pipe flange.
- Upper Housing Assembly - functionally identical on all valves. The standard upper housing assembly consists of an aluminum base casting with a replaceable stainless steel coupler connecting ring. In addition, the "S" option changes the complete upper housing to stainless steel. The outlet connection in all cases is in accordance with API Bulletin 1584.
- Pilot Valve - four different pilot valves are utilized.

Various options are available to modify the basic part number to customize the end item to meet various customer's requirements. These options are explained in detail in paragraph 3.0 below.

3.0 TABLE OF OPTIONS & ORDERING INFORMATION

There are four basic valves to which various modifications may be added by option letters as shown in the table below. The four basic units are as follows:

- 61654D - Lanyard Operated Pilot Valve for manual on/off control. Valve allows flow in the fueling direction only.
- 61654E - Air Operated Pilot Valve for deadman control. Valve allows flow in the fueling direction only.

- 61654J - Air Operated Pilot Valve for deadman control with defuel control to allow flow of fuel in either fueling or defueling direction.
- 61654K - Air Operated Pilot Valve for deadman control. Valve allows flow in the fueling direction only. Built to Port of New

York and New Jersey specifications – one piece ductile iron upper half.

- 61654U – Dual Air and Lanyard Operated Pilot Valve for deadman control and manual on/off control for use in standard pits (18" or larger). Uni-directional only unless combined with option J.

TABLE OF OPTIONS

The following option letters may be combined with the above basic units to customize the valve to fit specific installation requirements:

OPTION LETTER	DESCRIPTION
A	Adds 10-mesh screen between upper & lower halves of unit (81557-10).
B	Adds 20-mesh screen between upper & lower halves of unit (81557-20).
C	Adds six-position product selection (44290).
M	Adds Quick Disconnect air connection to pilot port. Available only with E, F or U basic units only (44731).
Q	Replaces standard 2-piece (aluminum/stainless steel) upper with one piece ductile iron upper half (same as units previous to 2-piece units).(43214)
R	Replaces standard 2-piece (aluminum/stainless steel) upper with ductile/stainless steel 2-piece upper half. (47203-2)
S	Changes upper half housing to stainless steel (43214-4).

Example: 61654BD - Standard Unit with 6" inlet, manually operated pilot valve & optional 20-mesh screen.

4.0 SAFETY INSTRUCTIONS/PREVENTATIVE MAINTENANCE

4.1 SERVICING VALVE UTILIZATION - The unit incorporates a servicing control valve designed to allow the Upper Housing Assembly and/or the Pilot Valve to be removed while the inlet of the unit is under pressure. See caution below.

CAUTION!

It is not recommended that this procedure be utilized, except in an emergency condition. The use of this valve does pose a possible hazard if not correctly accomplished and the valve is not in good working order.

The Lower Housing Assembly consists of a pressure overbalanced piston assembly that shuts off the main flow path. The slipper type seals utilized on the piston are not absolutely zero leak seals and an increase in leakage past these seals is anticipated with age. If the leakage increases too much, the piston will no longer stay closed. It is therefore recommended that the hydrant not be

maintained by use of the servicing valve on a regular basis and when it is used, the following procedure should be followed to reduce the possibility of a major spillage of fuel:

- If an inlet butterfly valve is available, close it to reduce the inlet pressure from the hydrant system.
- Close the Servicing Valve (4-3) securely, by hand. The seal on this valve could be damaged if a wrench is utilized. No threads on the Stem (4-3) should be visible when the valve is fully seated.
- Manually depress the pressure Equalization Poppet (2-13) and allow the pressure inside the Upper Housing Assembly (2-6) to bleed. If the flow from the Equalization Poppet (2-13) reduces to a matter of leakage as differentiated from continuous flow under pressure, it is safe to proceed.

CAUTION!

If the flow from the Equalization Poppet (2-13) is steady and under pressure, do not continue to remove the Upper Housing Assembly (2-6).

- Remove the Pilot Valve (1-D, 1-E, 1-J or 1-U) and wait for at least one minute while checking the leakage out of the hole in which the Pilot Valve (1-D, 1-E, 1-J or 1-U) was mounted. If the leakage does not appear to be under pressure proceed with the next step.
- Remove the Screws (2-3 & 2-5) attaching the Upper Half Assembly (2-6) and Lower Half Assembly (5-1).

CAUTION!

As long as the hydrant system pressure is on do not attempt to remove the Lower Housing Assembly (5-1) from the inlet pipe or loosen the Servicing Valve (4-3).

- 4.2 HOT HYDRANT - Refer to paragraph 7.1.2 for the testing procedure to determine whether a hydrant is "hot" or not. This preventative maintenance procedure should be conducted after one year of service and every six months thereafter for maximum benefit.

5.0 OPERATION

Figure A reflects a lanyard operated pilot valve shown in the open position. The operation of the Hydrant Valve, whether the pilot is lanyard or air operated, is identical. Figure B reflects the same hydrant valve with the air pilot in a closed position. The only differences between the two units are in the operating mechanism that supplies the power to open and close the pilot valve. In the air operated pilot, the closing lanyard and opening latching mechanisms are replaced with an air operated piston.

Pilot Valve Open Servicing Valve Open

The open pilot valve allows the continuous passageway from the main piston chamber and from the closing control orifice. The piston chamber is vented through an opening control orifice and the open Servicing valve to a point in the Lower Valve Half. The pressure (P_2) at this point is less than the inlet pressure (P_1). The piston chamber pressure is also maintained at P_2 causing an unbalance of forces on the piston. The inlet pressure force is greater than the combined piston pressure force plus the spring force hence the valve will open to allow flow. This is assuming that the outlet adapter poppet in the Upper Valve Half has been opened by a Coupler.

The pilot poppet is maintained in the open position by one of two methods:

- Lanyard operated pilot - The pilot is opened by the pull of the "T" handle located on the top of the pilot valve. When it is pulled

upward, the spring loaded latch attached to the lanyard pivots to lock the pilot into the open position.

- Air or Air/Lanyard operated pilot - Air pressure applied to the pilot piston will maintain the pilot in the open position until the pressure has been depleted (by release of deadman).

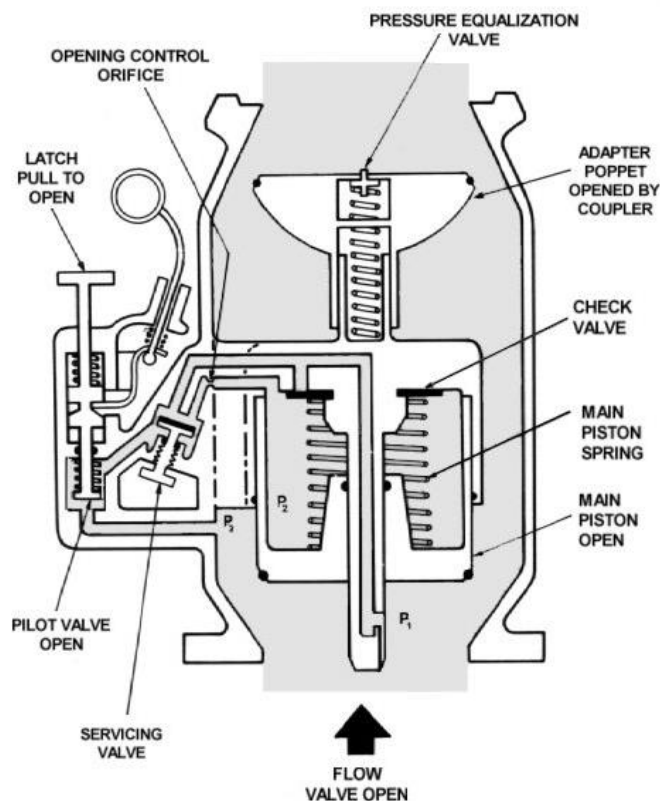


Figure A

Pilot Valve Closed Servicing Valve Open

Pulling the lanyard, or depleting the air supplied to their respective pilots, will allow the spring loaded pilot poppet to close. (Depleting the air supply can be accomplished by activating the deadman control or in the case of an Air/Lanyard Pilot pulling the lanyard will release the air pressure. The lanyard is meant for an emergency closure only and is not meant to be used at each refueling.) This action blocks off the venting of the piston chamber to the lower pressure area downstream. The piston chamber begins to equalize to the inlet pressure (P_1) through the check valve. The piston area is greater than the effective seal area, hence the unbalance of forces caused by the equal pressure plus the spring will cause the piston to begin to close. As the piston moves toward the closed position, the piston chamber volume increases and must be filled through the two series orifices.

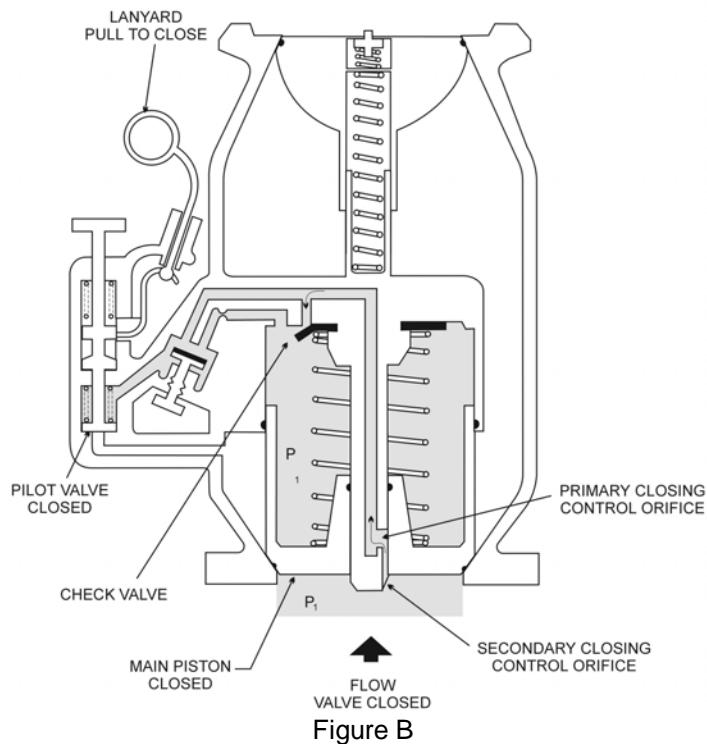
The primary orifice is considerably larger than the secondary (slot). During the initial and majority of

the travel of the piston, the primary orifice is fully exposed to the inlet pressure, hence the rate of closure is controlled by this orifice. When the piston moves far enough closed to cover the primary orifice, the secondary (smaller) orifice begins to control the closure rate. Hence the valve begins to close relatively rapidly and then slows down as it nears its closed position. The relative size and locations of these two orifices allows the valve to close to provide a minimum of overshoot and yet limit the surge pressure shock, on closing, and still maintain a closure rate in accordance with applicable international specifications.

On "J" Defueling options the pilot valve is manually held closed by the thumb screw to allow defueling flow. Pressure supplied to the hydrant valve outlet will cause the piston to open (as long as the pilot valve is manually held in the closed position). The overbalance of areas between the outer diameter of the piston versus the main piston seal area caused the outlet pressure to open the piston to allow defueling flow.

Servicing Valve Closed Pilot Valve Open or Closed

The closing of the Servicing Valve (4-3) has the same affect as closing the Pilot Valve (1-D, 1-E, or 1-J). That is, the flow passage from the piston chamber to the downstream side of the piston is blocked. The piston chamber pressure begins to equalize to the inlet pressure (P_1) through the check valve. The piston area is greater than the effective seal area, hence the unbalance of forces caused by the equal pressure, plus the spring, will cause the valve to stay closed.



6.0 DISASSEMBLY

This disassembly procedure assumes that the valve is located within a shop area

where there is the capability of supplying the necessary tools.

Note:

The valve will be full of fuel and provisions for draining into a safe container should be made prior to beginning to work on the unit.

- 6.1 Place the unit in a container sufficiently large enough to contain a minimum of 5 gallons (19 l) of fuel. Remove the Cover Assy (2-23). Push the Adapter Poppet (2-11) open and hold it open with a flexible plastic rod, or another non-marring item, to allow the unit to drain. **Hint: A scrap 23620 Rod used in Carter 60427 Nozzle is suitable for this job.**
- 6.2 Remove the Servicing Valve (4-3) and set aside.
- 6.3 Turn the unit over onto its outlet, being sure to place it on a surface that will not damage the outlet surfaces. Grasp the inlet flange and apply pressure to the Piston (4-18) to push it open sufficiently to insert a flexible plastic rod to keep the piston open as with the Adapter Poppet (2-11) above. Turn the valve over a few times to allow the trapped fuel to drain. The rod can then be removed to close the Piston (4-18).
- 6.4 Remove Screws (5-29 , 6-18, 7-18 or 7-18) and Washers (5-28 , 6-19, 7-19 or 7-19). Grasp the Pilot Valve (1-D, 1-E, 1-J or 1-U) and twist back and forth while applying a force away from the unit to remove the pilot. While removing the Pilot Valve (1-D, 1-E, 1-J or 1-U) be sure to maintain a straight upward pressure to prevent causing a binding of the parts contained within the Lower Housing Assy (4-10). Some of these parts could be damaged if a binding during disassembly occurs. Lay the Pilot Valve (1-D, 1-E, 1-J or 1-U) aside for now.
- 6.5 Remove Screws (2-3 & 2-5) and Washers (2-4). Note that Screw (2-5) is shorter than Screws (2-3). It should be noted that it was installed in the hole to the left of the Pilot Valve (1-D, 1-E, 1-J or 1-U) when facing the unit with the Pilot Valve (1-D, 1-E, 1-J or 1-U) directly in the center. Note that on newer units this shorter Screw (2-5) is made of stainless steel, for ease of identification only, instead of the normal cadmium plated Screws (2-3).
- 6.6 Using a thin, wide blade screwdriver, gently pry the Upper Half Assy (2-6) from the Lower Half Assy (4-1). Be careful not to

damage the epoxy coating. Remove and discard O-ring (2-22). Set the Lower Half Assy (4-1) aside.

- 6.7 Remove Strainer (2-21), if present, from unit. Set it aside.
- 6.8 **Upper Half Assy (2-6)** - Remove the plastic rod holding the Poppet (2-11) open and install the Cover Assy (2-23) to protect the Upper Half Assy (2-6). Turn the unit over onto the Cover Assy (2-23).
- 6.8.1 While pushing downward on Poppet Retainer (2-19), using a thin blade screwdriver, remove Retainer Ring (2-20) from Upper Housing (2-7). Slowly release downward pressure on Poppet Retainer (2-19) to remove it, Spring (2-18) and Poppet Assy (2-8).
- 6.8.2 Newer valves may have a "2-piece" upper housing. This is easily determined by the aluminum (no epoxy coating) cast upper housing and the stainless steel adapter ring. If the upper housing is epoxy coated or all stainless steel no further disassembly is possible. If it is the 2-piece upper it is not necessary to disassemble the part farther unless there is a leak at the joint between the Ring (3-4) and the Housing (3-2), then the O-ring (3-3) must be replaced. Another reason for further disassembly would be to replace the Ring (3-4) due to severe denting which can cause leakage when the coupler is attached.

NOTE!

If the O-ring (3-3) is being replaced it will be necessary to heat the assembly to 300°F (150° C) for at least one-half hour before trying to remove the Screws (3-5). Trying to remove them at room temperature may result in twisting them off due to the use of Locktite to retain them in place. If the Ring (3-4) is being replaced, then damaging the screws is of no concern since the ring will be discarded along with the screws.

Then remove the Screws (3-5) and Washers (3-6) from the inside of the unit. Carefully pry the stainless steel Ring (3-4) from the Housing (3-2). Remove and discard O-ring (3-3).

- 6.8.3 Using a thin blade screwdriver, carefully pry an end of the Retaining Ring (2-17) and remove it from its groove. Disassemble Poppet Assy (2-8), removing the various

- parts. Remove Seal Ring (2-9) from Seal (2-10) and discard Seal (2-10). Remove and discard Seal (2-12).
- 6.8.4 If present and the valve is the obsolete style that utilized bosses cast onto the Upper Housing (2-7), there is no need to disassemble the product selection part of the Upper Half Assy (2-6) unless parts need replacing due to missing or damaged parts. On newer valves, these bosses were removed and the product selection feature is achieved by the addition of the Product Selection Ring Assy (1-C). This ring is attached to the unit by using four extra long Bolts (1-5) and Standoffs (1-2). It is then necessary to disassemble the Product Selection Assy (1-C) from the unit during disassembly of the valve. On older versions of the newer valves, the Ring (1-1) holding the product selection studs is a solid one piece ring. On newer valves the ring is composed of four equally thick stamped Rings (1-1). The older units utilize one piece product selection studs while the newer units utilize standard Bolts (1-3) and a stack of Washers (1-4 & 1-6). If replacement of either the older ring or the studs is required, utilize the newer replacement parts.
- 6.9 **Lower Half Assy** - Turn Lower Half Assy (4-1) over to expose the inlet flange. Remove Screws (4-15). Early versions of the unit utilized only two Screws (4-15) to retain the Piston Retainer (4-16). The later versions utilize six. This change was made necessary on a similar valve, model 61654 with a six inch ANSI flange. On the model 61654, the Piston Retainer (4-16) is retained in place by the mating pipe flange hence the mandatory use of six screws is not necessary. However, if there are six present, all six should be replaced. Note: If Screws (4-15) are difficult to remove, an impact wrench may be necessary to prevent damage to the Phillips recesses of the Screws (4-15). Also note: Normally, the main Spring (4-26) will be strong enough to force the Piston Retainer (4-16) out of the unit. If not, use a thin blade screwdriver to carefully pry out Piston Retainer (4-16). Remove and discard O-Ring (4-17).
- 6.9.1 Remove Piston Assy (4-18 to 4-21), Spring (4-26), Washer (4-27) and Seal (4-28). Discard Seal (4-28). Remove Screws (4-19), Seal Retainer (4-20) and Seal (4-21). Discard Seal (4-21). Using an o-ring pick,
- carefully remove and discard O-Ring (4-22) and Slipper Seal (4-23) from Piston (4-18).
- 6.9.2 Using an o-ring pick, carefully remove Piston Seal (4-25) and O-Ring (4-24) and discard both.
- 6.9.3 Check to see if the Shaft (4-12) is loose in the Lower Housing (4-11) only, do not attempt to remove Screw (4-14), Washer (4-13) or Shaft (4-12) from Lower Housing (4-11). The Shaft (4-12) is press fitted into the Lower Housing (4-11) and neither part is available as a replaceable spare part. If it is necessary to replace the Shaft (4-12), it is necessary to replace the Housing Assy (4-10) as a complete unit.
- 6.9.4 Using an appropriately sized wide blade screwdriver, remove the Cage (5-18, 6-2 or 7-2) from Lower Housing (4-11) by unscrewing counter clockwise. Remove and discard O-Ring (5-1, 6-11 or 7-11) from Cage (5-18, 6-2 or 7-2).
- 6.9.5 It is not necessary to remove the Orifice (4-29) located in one of the internal holes visible through the Servicing Valve (4-3) port. Using shop air pressure, blow air through the opening to clear the Orifice (4-29). If the air does not flow easily through the orifice out through the inner part of the Lower Housing (4-11), the Orifice (4-29) may be plugged. In that case, it will be necessary to remove the Orifice (4-29) and either clean it or replace it.
- 6.10 **Air Operated Pilot Valve (1-E)** - In the history of the 61654 Hydrant Valve there have been three different Pilot Valves utilized:
- Current (1991 & later) production unit, part number 44721, utilizes the same Housing (6-1) and Piston (6-14) as is used on the Defueling Pilot Valve (1-J). A Spacer (6-17) is added on the Shaft (6-16) between the Housing (6-1) and the Piston (6-14). The change to this unit was made to standardize on production parts between the pilot valves used on both Options E and J. The only way to tell the obsolete pilot valve apart from the current production unit is to disassemble the unit and check for the presence of the Spacer (6-17) or to look at the bottom of the Piston (6-14) chamber of the Housing (6-1). If the chamber bottom is flat bottomed as opposed to a conical bottomed, the pilot valve is of current vintage. If the bottom is conical the pilot valve is an old style 44247.

- On newer valves (after first quarter 2000) the Housing (6-1) may be changed to provide better production economics. The newer valves may use the housing from the dual air/lanyard operated pilot valves with a Plug (6-27) to fill in the extra air port. This also gives the option to install the air connection in either of the available ports to move the connection farther away from possible damage from the dropping of the coupler onto the valve.

- Previous generation Pilot Valve (1-E) - As mentioned above, this unit has a conical bottomed piston chamber. The Piston (6-14) is also different. The older Piston (6-14) will not work in the newer pilot valve. Should an older Housing (6-1) be needed for replacement, it will be necessary to also procure a new Piston (6-14), Spacer (6-17) and the new Housing (6-1).

- First generation Pilot Valve (1-E) - This Pilot Valve, part number 42846, utilized some of the same parts as are currently utilized. However, there are major differences. One of these differences can be upgraded to current production by utilizing kit 2KD42836, provided the existing Cage (6-2) is still usable. This kit replaces the fixed pilot seal poppet with a "floating" design for more reliable operation. Since the older parts have been out of production for many years, it may be necessary to consider replacing the entire Pilot Valve 42846 with Pilot Valve 44721.

It is not necessary to remove the Air Quick Disconnect or Fusible Plug (1-M or 1-T if furnished as such) from the unit unless it is necessary to replace the unit.

Compress Spring (6-7) with Spring Retainer (6-6) sufficiently to remove Pin (6-4). This allows the removal of Poppet (6-3). Slide Spring (6-7) off of Shaft (6-16). Unscrew Adapter (6-5) from Shaft (6-16). Slide O-Ring Retainer (6-8) off of Shaft (6-16). Carefully pick out O-Ring (6-9) from Housing (6-1) and discard. Remove and discard O-Ring (6-10). Remove Cover (6-12) and Spring (6-13). Push Piston (6-14) out of Housing (6-1). Remove Spacer (6-17). It is not necessary to unscrew Shaft (6-16) from Piston (6-14) unless either part is damaged and must be replaced. Remove and discard Bal Seal (6-15) from Piston (6-14).

6.11 **Air Operated Pilot (1-E), 44247 (Obsolete)** - Follow above procedure in

paragraph 6.10 except the following parts are different:

Housing (Obsolete) instead of Housing (6-1)

Piston (Obsolete) instead of Piston (6-14).

6.12 **Air Operated Pilot (Defueling type) (1-J)** - Newer valves (those received after the first quarter of 2000) may have a different defuel control screw. The Screw (6-23) was shortened and made with a larger thread size to help prevent operators from bending it when the coupler is dropped onto the hydrant. This made it necessary also to change the Cover (6-22) and Pin (6-24) to suit. Ordering any of the older parts will automatically be entered as the pre-assembled Screw Assembly (6-21). In addition the Housing (6-1) was changed to provide better production economics. The newer valves may use the housing from the dual air/lanyard operated pilot valves with a Plug (6-27) to fill in the extra air port. This also gives the option to install the air connection in either of the available ports to move the connection farther away from possible damage from the dropping of the coupler onto the valve.

The disassembly procedure is the same as in paragraph 6.10 except for the following changes and the addition of several parts as noted:

Cover Assy (6-21) instead of (6-12).

Additional parts include Defuel Control Screw (6-23), Pin (6-24), Wave Washers (6-25), Washers (6-26) between the Wave Washers (6-25) and Wear Plate (6-20) between the Piston (6-14) and the screw on the Cover (6-22). Cover (6-22) need not be disassembled unless some part is damaged and needs replacing.

6.13 **Lanyard Operated Pilot (1-D)** - In the history of the 61654D Lanyard Operated Valve, there have been two different Lanyard Operated Pilots, 42836 and 44248. These units can be identified as follows:

- The current design unit incorporates a floating pilot poppet design to provide for more reliable operation. The Poppet (5-22) has a bonded on rubber seal. The Cage (5-18) now used is interchangeable with the older cage. In addition, when the valves leave the factory, the Cable Clamp (5-15) utilized is crimped onto the Cable (5-10).

- The first generation Lanyard Operated Pilot Valve, 42836, has the fixed pilot poppet design and utilizes a two piece screwed together Cable Clamp (5-15A). The pilot poppet seal is replaceable and is held in place by a screw.

Compress Spring (5-24) with Spring Retainer (5-23) sufficiently to remove Pin (5-20). This allows the removal of Poppet (5-22). Slide Spring (5-24) off of Shaft (5-16). Unscrew Adapter (5-21) from Shaft (5-16). Slide O-Ring Retainer (5-25) off of Shaft (5-16). Remove Pilot Retainer (5-27) and carefully pick out O-Ring (5-26) and discard. Remove and discard O-Ring (5-19).

Push Latch Spool (5-4) to force the Shaft (5-16) out of Housing (5-2) sufficiently to remove Pin (5-17). If the pilot latching mechanism requires servicing, cut the Cable Assy (5-10) or Clamp (5-15) after removing Hose (5-13) and Clamp (5-14). Cable Assy (5-10) can then be pulled back through Latch Bracket (5-9) to allow removal of Spring (5-12) and Latch Stop (5-11). If the Latch Bracket (5-9) is to be replaced, mount Housing (5-2) in a suitably padded vise and pull Pins (5-8) with pliers.

If necessary to replace parts, using a .187 (4.750 mm) dia. drift pin, remove Pin (5-7) from Handle (5-6) and Latch Spool (5-4). Note on older valves the hole in the Handle (5-6) for this Pin (5-7) is on center. Newer valves have the hole to one side. Even newer valves have a ball attached to the Handle (5-6) to prevent possible interference between the Handle (5-6) and the mating coupler bumper. Do not try to remove the ball from the end of the Handle (5-6) unless it is loose and needs replacing.

- 6.14 **Air/Lanyard Operated Pilot (1-U)** - It is not necessary to remove the Air Quick Disconnect (1-M if furnished as such) or the Fusible Link (1-T) from the unit unless it is necessary to replace the unit.

Compress Spring (7-7) with Spring Retainer (7-6) sufficiently to remove Pin (7-4). This allows the removal of Poppet (7-3). Slide Spring (7-7) off of Shaft (7-16). Unscrew Adapter (7-5) from Shaft (7-16). Slide O-Ring Retainer (7-8) off of Shaft (7-16). Carefully pick out O-Ring (7-9) from Housing (7-1) and discard. Remove and discard O-Ring (7-10). Remove Cover (7-12) and Spring (7-13). Push Piston (7-14) out of Housing (7-1). Remove Spacer (7-17). It is not necessary to unscrew Shaft (7-16) from Piston (7-14) unless either part is damaged and must be replaced. Remove and discard Bal Seal (7-15) from Piston (7-14).

Remove Air Bleed Valve Assembly (7-21) by removing the three Screws (7-20) and pulling Valve Assembly (7-21) from Housing (7-1).

Using a drift pin remove Pin (7-22) being sure to adequately support the Valve Assembly (7-21) so as not to damage it. This frees up several parts attached by means of the Pin (7-22). Remove Pin (7-26) as above. Unscrew Guide (7-30) from Connector (7-23). Items (7-31) through (7-34) may be removed for repair or replacement. Do not remove Ring (7-36) unless replacement of the Reset Ring (7-37) or Guide (7-30) is necessary. Do not remove Cable Assembly (7-38) unless it is necessary to repair or replace it. If necessary, cut Cable (7-41) after removal of Clamp (7-40) and Hose (7-42) to repair. Cable Retainer (7-34) can also be removed from the cut cable assembly.

- 6.15 **Servicing Valve (4-3)** - Carefully using a .156 inch (3.960 mm) drift pin, remove Pin (4-7). Remove Stem (4-6) from Poppet Retainer (4-8). Remove and discard O-Ring (4-9) and Gasket (4-2). If Poppet (4-4) does not need replacement, do not disassemble further. If necessary, using snap ring pliers, remove Ring (4-5) to replace Poppet (4-4).

7.0 INSPECTION

7.1 PERIODIC INSPECTIONS

The inspections listed in this section should be conducted on a periodic basis, the frequency of which should be no less than that mentioned in each section. The time

between testing should be tailored to fit the particular operation and age of the system.

- 7.1.1 **Fuel-in-the-air Check** (applicable to all Options but D) - It is recommended that this inspection procedure be conducted initially

on new units after one year of operating and then each six months thereafter.

Air operated hydrant valves are one possible source of contamination when fuel leaks into the air systems. Many of the standard air components used within a refueling system are not necessarily fuel resistant, hence the results can be costly and time consuming. In addition, fuel contamination in the air system will quickly be apparent by the expelling of a fuel mist out of the exhaust of the deadman valve. This is not a safe situation around hot jet engines. Air operated hydrant valves are not the primary source of the problem, just a possibility. Leakage of fuel into the air system can occur at any of the air-fuel interface points. These are normally found in either the line mounted pressure control valves, hydrant couplers, float operated water sump control valves or at the hydrant valve. Some of these types of components, Carter 60700-1 Hydrant Coupler and 61024 Line Mounted Pressure Control Valve, can be eliminated from consideration since they have a vent between the air to fuel interface. If the fuel seal leaks on these units, it results in an external leakage out of the vent point, not into the air system.

61654E, 61654J, 61654F and 61654U Hydrant Valves utilize air operated pilot valves with an air-to-fuel interface seal that is not vented, hence are candidates for fuel to the air system leakage with time.

Finding fuel in the air pilot's air chamber is not conclusive that the air pilot is the leakage source. However, every air pilot that is leaking will have the symptom of fuel in its operating air cavity and quick disconnect fitting (if so fitted).

The most obvious evidence that the air pilot is responsible for air system contamination is steady flow (or weepage) of fuel emitting from the quick disconnect fitting that is mounted to the air pilot. This confirmation will be made possible only if the fitting is specifically designed to allow air to bleed from within the air pilot's air cavity. If the quick disconnect fitting is full of fuel, but leakage flow, as described above, is not obvious, then the following procedure can be used to confirm that the air pilot is responsible for the leakage.

Remove the quick disconnect fitting and dry the interior of the air cavity and fitting with a

blast of clean, dry air. Perfection in this is not required, but closely examine and mentally record the condition of the air cavity after cleaning for comparison as noted below.

Refit the quick disconnect fitting. Establish full hydrant system pressure to the hydrant's inlet. Using a clean, dry source of air, which is set to the same pressure used during normal operation of the air pilot, apply and then remove the air pressure, cyclically, thirty (30) times (one to two seconds on, then one to two seconds off). When completed, remove the air fitting and inspect the air cavity again. Any accumulation of fuel, not logically associated with residual moisture available in the air cavity, indicates that the air pilot is responsible for air system contamination. Replace this air pilot with a new or rebuilt air pilot. Overhaul of the air pilot while in the pit is not recommended.

If no significant fuel is found in the air chamber after the above investigation, it can be assumed that the residual fuel previously seen in the air chamber came from another source (coupler or in line valve).

7.1.2 **"Hot Hydrant" Check** - A Carter hydrant valve consists of four major components all contained within a single valve element:

- Outlet Adapter - A spring loaded poppet valve that is manually opened and allowed to close by the opening and closing of a mating coupler. A pressure equalization valve is contained within the poppet. This allows the trapped pressure in the upper chamber of the valve to be bled into the hydrant coupler when extending the poppet to the open position.
- Inlet Shutoff Valve (Isolation Valve in the terms of the IP) - A spring loaded piston valve whose chamber is connected to the inlet of the hydrant valve via an orifice and to the outlet through the servicing and pilot valves. Its function is to control opening and closing times and to present a means for shutting off flow at the end of a refueling operation, either by means of a lanyard or air operated pilot valve.
- Pilot Valve - Either a lanyard or air operated valve that controls the outlet bleed path from the Inlet Shutoff Valve to the

chamber between the Inlet Shutoff Valve and the Outlet Adapter.

- **Servicing Valve** - A mechanical valve located in series with the Pilot Valve (between the Inlet Shutoff Valve and the Pilot Valve). It is designed to keep the Inlet Shutoff Valve in the closed position while allowing the changing of the upper half of the valve (Outlet Adapter) including the Pilot Valve.

Within the above sections of the hydrant valve there are various seals that prevent leakage between the elements. In a valve that is in good mechanical condition, the Inlet Shutoff Valve and Pilot Valve combine to keep the chamber between the Inlet Shutoff Valve and the Outlet Adapter at a lower than inlet pressure. This is only possible, theoretically, if there is zero leakage past the piston and Pilot Valve seals. **Any** leakage, with the passage of time, will allow this chamber to increase to inlet pressure. Fuel is not compressible, hence a very small amount of leakage will raise the pressure in this chamber to inlet. This does not mean that a hydrant valve is always "hot". If the leakage rate past the appropriate seals is greater than the amount of flow possible through the pressure equalization valve (at the time the coupler is attached and begins to be opened) then the valve is "hot". In other words, the equalization valve's capacity is insufficient to reduce the pressure in this chamber during the coupler opening operation.

WHAT PROBLEMS ARE CAUSED BY HOT HYDRANTS? - Two major problems, not readily apparent, are caused or are potentially caused by hot hydrants.

- Hot hydrant valves make the opening of the hydrant coupler more difficult. The hydrant valve has a poppet area, against which pressure reacts, of approximately 12.6 square inches. If the pressure against which this poppet must be opened is reduced appropriately by the pressure equalization valve to about 20 psi, the opening force that must be generated by the coupler mechanism is only 252 pounds. If, on the other hand, the valve is hot and the inlet pressure is as much as 150 psi, the opening force must be 1,890 pounds. Under normal pressure conditions, it is relatively easy to open a valve against 20 psi with the application of approximately 30

pounds force applied to the coupler handle (mechanical advantage reduces the force required). If the pressure is increased, by a hot hydrant, to 150 psi, the force necessarily applied to the coupler handle is increased to 225 pounds. This is outside of the realm of an average refueler so he will use his foot and force the handle to the open position. This tends to over stress the coupler mechanism resulting in a premature failure condition, hence expensive, unnecessary maintenance costs.

- A hot hydrant valve, caused by a failed Pilot or Inlet Shutoff Valve can be a potential major spill, with the possibility of a fire. A recent incident with a competitors hydrant valve resulted in a major spill. The coupler was knocked off a functioning hydrant valve by a baggage cart. The Outlet Adapter Poppet stuck open and the Inlet Shutoff Valve failed to close because of a non-functioning air operated pilot, even though the air hose to the unit was also severed. The result was a fairly major spill and luckily no fire. The failure was caused by the fact that the Pilot Valve's poppet, a synthetic ball, had deteriorated resulting in the failure. Subsequent testing of other valves at the location revealed nearly 50% were in the same dangerously potential situation. Periodic testing of the hydrant valves would have prevented this situation from occurring. The fixing of the hot hydrant valves would also make the refueling operation easier and reduce, significantly, the coupler maintenance costs.

TESTING PROCEDURES - It is recommended that all new hydrant valves be tested after one year of service and at least twice each year thereafter and any indicated hot hydrant valves be removed for maintenance immediately. The test procedure recommended is the same for a lanyard or air operated unit.

- **Equipment Required** - 61525E Coupler with pressure sense port in the elbow and the outlet plugged or a standard 61525 (any outlet thread) with a small (3/8") port in the outlet plug. A 60 psi air or nitrogen pressure source (for air operated valves only); a short length of 3/8" plastic tubing or hose attached to the pressure sense or outlet port, a manual valve in the hose or tube; a 1000 cc beaker; and a plastic 2 gallon bucket. (Note if a metal bucket is used, check with your company manual

about electrical bonding of the bucket to the coupler before proceeding.)

- **Inlet Piston Valve Seals Test** - Attach the above test coupler to the test hydrant valve with the coupler of the small shutoff valve open to the bucket and open the hydrant valve by pulling the "T" handle of Option D or by applying 60 psi air pressure to the pilot port of Options E or J. Allow the hydrant valve and coupler to be bled of air. Close the servicing valve of the test hydrant. Allow the leakage, if any, from the outlet to stabilize for about 30 seconds, then measure the leakage for at least 30 seconds. The amount of leakage caught in the 30 seconds should not exceed 250 cc. If it does, the hydrant valve should be tagged for removal and overhaul.

- **Pilot Valve & Servicing Valve Seals Test** - Close the pilot valve (pull the lanyard on Option D or remove the air pressure from Options E, F or J) and open the servicing valve. (The valve will remain in the closed position and the leakage rate under this condition should remain the same as in the test above, assuming the leakage measured was the result of faulty piston seals). Repeat the leakage test above. If the leakage is significantly greater than that noted in the first test (assuming that the leakage was well below the 500 cc/min. allowable), it is a good indication that the pilot valve seals are leaking and in need of overhaul. If the leakage rate is significantly lower, the first assumption that the majority of the leakage originally measured was through the piston seals was faulty and it could be an indication that the seals of the servicing valve are faulty. If the leakage rate remains approximately the same as in the first test, the pilot valve and servicing valve seals would appear to be performing well and that the original assumption (leakage past

the piston) was correct. Disconnect the test coupler and close the pilot valve before completing the test.

- **Simple Test** (will not test Servicing Valve Seals) - This test can be conducted on air operated units with the same equipment less the pressure source but it is not as complete and will not test the Servicing Valve. The Pilot Valve will remain closed during all phases of this test.

Close the Servicing Valve and conduct the leakage test specified above.

Open the Servicing Valve and recheck the leakage. If the leakage increases significantly, the pilot valve seals will be the contributor to the increased leakage. If the total leakage is less than 500 cc/minute, the valve can continue to be used. If greater, replace it immediately.

7.2 DETAIL PARTS INSPECTION

It is recommended that the parts in the following table be replaced at each overhaul. Detail inspection of parts shall be conducted in accordance with the information in the following paragraphs.

SAFETY NOTE:

Any and all quick disconnect fittings used to connect the air system to the hydrant valve must be configured or altered to not tightly shut off the air pilot's air cavity. Without this feature, full hydrant system pressure could build in the air pilot's air cavity as a result of the leaking air pilot. The hydrant would then be in an open condition or would be a "hot" unit causing problems in connecting the coupler. This would defeat the safe use of the hydrant as it was designed and would increase maintenance costs for the coupler.

PARTS TO BE REPLACED AT EACH OVERHAUL

Item Number	Description	Item Number	Description
1-32	O-ring	5-1	O-ring
2-3	O-ring	5-10, 7-40 or 7-41	Cable Assy (if cut during disassembly or worn only)
2-10	Seal	5-19	O-ring
2-12	Seal	5-26	O-ring
2-22	O-Ring	6-9	O-Ring
3-3	O-Ring (only if disassembled)	6-10	O-Ring
4-2	Gasket	6-11	O-Ring
4-9	O-Ring	6-15	Bal Seal
4-17	O-Ring	7-9	O-ring
4-19	O-ring	7-10	O-ring
4-21	Seal	7-11	O-ring
4-22	O-Ring	7-15	Seal
4-23	Seal	7-9	O-ring
4-24	O-Ring	7-10	O-ring
4-25	Seal	7-11	O-ring
4-26	O-ring	7-15	Seal
4-28	Seal	7-29	Pin

7.2.1 Inspect all metal parts for dings, gouges, abrasions, etc. Use 320 grit paper to smooth and remove sharp edges. Replace any part with damage exceeding 15% of local wall thickness. Use alodine 1200 to touch up bared aluminum.

7.2.2 If present, inspect Strainer (2-21) for damage and presence of dirt. Clean thoroughly to remove any potential blockage.

7.2.3 Inspect the exterior sealing and interior sealing surfaces on the outlet of the Upper Half Assy (2-6), where it mates the hydrant coupler and where the Seal (2-10) makes contact, for nicks, gouges or other distortions that may be a cause for leakage during operation. If the two-piece upper housing is present and the sealing surface is damaged, replace Ring (3-4). Check the red coating, if present for chips and missing portions. If the chips are apparent in the various sealing areas, it is necessary to strip and recoat the part. This can be accomplished by either of two companies:

E/M Corporation, 6940 Farmdale Ave., North Hollywood, CA 91605, Telephone (213) 875-0101. Their product is Eversilk 1201 and is applied .001 to .005 thick.

Whitford Corporation, Box 2347, West Chester, PA 19380, Telephone, (215) 296-3200, Fax (215) 647-4849. Their product is Xylan 1014 and is applied .001 to .005 thick. Whitford Corporation has facilities or agents in various countries throughout the world. Contact Carter or a Carter distributor for more information about a local source.

If neither of these products are available, an equal epoxy coating would be suitable provided the thickness is controlled to the above limits. Limited repairs to the surfaces that are not utilized for sealing purposes can be accomplished by using the process outlined in the following paragraphs.

- Degrease the entire area to be repaired, plus approximately one (1) inch (25 mm) beyond, with a good commercial degreasing solvent.
- With an abrasive media, emery paper or steel wool, abrade the previously cleaned area, to the bare metal if practical.
- With a paint brush, apply one coat of Henco-Phos 1326 Base (E/M Corporation) in accordance with the manufacturers instructions, and allow to air cure, approximately one hour.

- Utilizing a mixing dish and utensil, mix the two part epoxy kit, Everlube 13-509 (E/M Corporation), in accordance with instructions provided with the kit.

- Within a four hour period, liberally apply the mixed Everlube 13-509 coating to the prepared surface, with a paint brush in accordance with instructions provided with the kit. Make certain the entire prepared surface is coated. Allow to air cure until completely dry. Keep away from fuel or other solvents for at least 8 hours.

7.2.4 Check the underside of Ring (3-4) or the same surface on Upper Housing (2-7) on older units. This is the 45° bevel that contacts the lugs of the hydrant coupler. This surface should be smooth and continuous. If there are worn or flat spots on this surface, the part should be replaced.

7.2.5 Inspect the Lower Housing (4-11) for damage to the red coating as was done with the Upper Housing (2-7). Repair such damage in accordance with the instructions in paragraph 7.2.3 above.

Check all sealing surfaces for nicks, gouges or other damage that might cause leakage.

Verify that the Orifice (4-29), located in one of the holes visible through the Servicing Valve (4-3) port in the Lower Housing (4-11) has not been removed and not replaced during earlier overhauls. This orifice controls the opening time of the unit.

7.2.6 Inspect Poppet (4-4) for damage or to assure that the rubber portion is still bonded in place. If there is a permanent indentation in the sealing surface of the rubber, discard and replace.

7.2.7 Inspect Poppet (5-22, 6-3, 7-3 or 7-3) as in paragraph 7.2.6 above.

7.2.8 Inspect the sealing surface of the Housing (6-1), (7-1) and (7-1), especially the inside diameter in which the Piston (6-14), (7-14) and (7-14) slides. Polish out any irregularities that may have been caused by incursion of dirt or corrosion using a very fine emery cloth. Replace if the irregularities can not be polished out completely.

7.2.9 Inspect the Latch Bracket (5-9) for wear or rounded edge where it contacts the Latch Spool (5-4). Replace if this corner is rounded more than .04 (1 mm).

7.2.10 Check the Latch Spool (5-4) corner that comes in contact with the Latch Bracket (5-9). If this corner is worn to more than .04 (1 mm) replace the Latch Spool (5-4).

7.2.11 Inspect the lanyard Cable Assy (5-10), (7-37) or (7-41) for wear or fraying. Replace as necessary.

7.2.12 Inspect Cable Retainer (7-33) or (7-34) on Air/Lanyard Pilot Valve (1-F) or (1-U) for wear, replace if worn.

8.0 REASSEMBLY

Reassemble in reverse order of disassembly, noting the following:

8.1 **Upper Housing Assy (2-6)**

8.1.1 If 2-piece Upper Housing Assembly (2-6A) is present and has been disassembled, place O-ring (3-3) in the groove in Housing (3-2) and install Ring (3-4) with Screws (3-5) and Washers (3-6) using Loctite (3-7). Torque the Screws (3-5) to 23-25 in-lbs. (24.5 - 26.5 cm-kg.) Note that screws should be thoroughly cleaned with acetone prior to using Loctite (4-7).

Install Seal, (2-12) into Poppet (2-11) such that the larger diameter bead of rubber is positioned into the cavity in the Poppet (2-

11) and the smaller diameter bead of rubber will contact the equalization Poppet (2-13). Finish assembling the Poppet Assy (2-8), being certain that the Retaining Ring (2-17) is fully seated within the groove in the Poppet (2-11). The pressure equalization Poppet (2-13) should protrude beyond the Poppet (2-11) and return to a seated position when depressed by hand and released.

8.1.2 Place the Seal (2-10) in the groove created by the assembly of the Poppet (2-11) and Shroud (2-16). Using fingers only place the Seal (2-10) into the groove. Place one end of the Seal Ring (2-9) inside of the groove within the Seal (2-10) and wind it smoothly

into the Seal (2-10) being sure not to have the Seal Ring (2-9) cross over itself.

- 8.1.3 Place the Cover (2-23) onto the Upper Housing (2-7) to protect the sealing surfaces and turn the unit onto the covered end. Install the Poppet Assy (2-8) into the Upper Housing Assy (2-7). Place the Spring (2-18) into the Poppet Assy (2-8) and install the Poppet Retainer (2-19), holding it in position while inserting the Retainer Ring (2-20) into the groove within the Upper Housing (2-7). Once the Retainer Ring (2-20) is seated, the Poppet Retainer (2-19) can be released.

- 8.1.4 Turn the Upper Housing Assy (2-6) over and remove the Cover (2-23). Push the Poppet Assy (2-8) open and closed several times to assure that there is no binding and that all parts are properly retained.

8.2 Lower Housing Assy (4-1)

- 8.2.1 With the Lower Housing Assy (4-1) placed such that the inlet flange is up (be careful that the unit is placed on a smooth clean surface to prevent damage), insert O-Ring (4-24) into the groove in the Lower Housing (4-1). Hint: Grasp the O-Ring (4-24) in both hands and stretch it approximately 0.5 to 1.0 inch (12 - 25 mm) before inserting into groove. Place Slipper Seal (4-25) such that the flanged portion of the seal is facing upward (leg of seal into valve), carefully install it into the groove over the O-Ring (4-24). It will be necessary to deform the Slipper Seal (4-25) into a slight "heart" shape to insert it into the bore, however, do not exaggerate the deformation and do not crease the part. Smooth the installed Slipper Seal (4-25) on its inside diameter with a thumb to assure there are no wrinkles. Place a light coat of seal lubricant (specified earlier in this document) onto the Slipper Seal (4-25).

- 8.2.2 Place O-Ring (4-22) into groove in Piston (4-18). Carefully insert Slipper Seal (4-23) into the groove over the O-Ring (4-22). Smooth Slipper Seal (4-23) with finger to remove all possible wrinkles. Place a light coat of seal lubricant (specified earlier in this document) onto the Slipper Seal (4-23).

- 8.2.3 Place Seal (4-21) onto the face of the Piston (4-18) and smooth into place. Place the Seal Retainer (4-20) onto the Seal (4-21) and Piston (4-18) and hold in place while installing Screws (4-19). Tighten Screws (4-19) evenly until the heads

contact the Seal Retainer (4-20). The Seal Retainer (4-20) is held in place by the heads of the Screws (4-19). Torque the Screws (4-19) to 14 inch-lbs (16 cm-kg).

- 8.2.4 Place the flat Seal (4-28) in the piston cavity of the Lower Housing Assy (4-10). Insert the Washer (4-27) onto the Seal (4-28). Spring (4-26) is next placed to rest on Washer (4-27). Carefully guide the Piston Assy (4-18 to 3-23) into the Lower Housing Assy (4-10) and push it with even force until contact is made with resistance of the seals. Continue even pressure until the Piston Assy (4-18 to 3-23) is fully installed such that the Piston Retainer (4-16) can be installed and held in place with the Screws (4-15). Evenly tighten the Screws (4-15), then torque to 23 inch-lbs (26 cm-kg).

- 8.2.5 Push Piston Assy (4-18 to 4-23) open and allow it to be closed by the Spring (4-26) several times to check for binding that could be caused by pinched seals.

- 8.2.6 If the Cage (shown as a part of the Pilot Valve (1-D, 1-E, or 1-J)) (5-18, 6-2 or 7-2) was removed from the Lower Half Assy (4-1), replace the O-Ring (5-1, 6-11 or 7-11) and lightly lubricate it. Install it into the Lower Housing (4-1) and tighten by hand with a wide blade screwdriver.

- 8.3 **Servicing Valve (4-3)** - Using snap ring pliers, reassemble the Poppet (4-4) onto the Stem (4-6). Install O-Ring (4-9) onto Stem (4-6). Lightly lubricate O-Ring (4-9). Thread this assembly into Poppet Retainer (4-8) until the hole in the Stem (4-6) is well in the clear. Insert Pin (4-7) into the hole and with the Stem (4-6) fully supported on a soft surface (block of wood or plastic), drive it into place until its ends are approximately equally spaced on each side of the Stem (4-6). Install Gasket (4-2) onto the Poppet Retainer (4-8) and lightly lubricate it. Set this assembly aside for later reassembly into unit.

8.4 Air Operated Pilot Valve (1-E)

- 8.4.1 Carefully install the Seal (6-15) onto the Piston (6-14) being certain that the open portion of the "U" is facing away from the major portion of the piston (faces in the same direction as the Shaft (6-16)). Lightly lubricate it. If Shaft (6-16) was removed it should be reinstalled.

- 8.4.2 Drop Spacer (6-17) into its groove in the Housing (6-1). (Note: if there is no groove to receive the Spacer (6-17), the unit is not a current production unit. Refer to paragraph 6.10 for information about the identification of air operated pilot valves.) Carefully install the Bal Seal (6-15) onto the Piston (6-14) being certain that the open portion of the "U" is facing away from the major portion of the piston (faces in the same direction as the Shaft (6-16)). Lightly lubricate it. Place the assembled Piston (6- 14) - Shaft (6-16) assembly into the Housing (6-1) and slowly push it into place until resistance from the Bal Seal (6-15) is encountered. Continue a downward even pressure on the parts until the Piston (6-14)
- Shaft (6-16) assembly is fully into the Housing (6-1). It may be wise to use an "orange stick" (small round stick of hardwood with a flattened end) to assist in getting the Bal Seal (6-15) to evenly enter the Housing (6-1).
- 8.4.3 Lightly lubricate O-Ring (6-9) and insert into counter bore in Housing (6-1) and over Shaft (6-16). Push into place using O-Ring Retainer (6-8). (Note: O-Ring Retainer (6- 8) is symmetrical and can be inserted either end first).
- 8.4.4 Screw Adapter (6-5) onto Shaft (6-16) until it bottoms. Place Spring (6-7) over Shaft (6-16) and onto O-Ring Retainer (6-8). Place Spring Retainer (6-6) into Spring (6- 7) and compress sufficiently to uncover the cross hole in the Adapter (6-5). Place the Poppet (6-3) into the Adapter (6-5) and align the holes in both the Adapter (6-5) and Poppet (6-3). Push Pin (6-4) into the hole and release Spring Retainer (6-6) to retain the Pin (6-4) and Poppet (6-3).
- 8.4.5 Note that the Cage (5-18 , 6-2 or 7-2), although shown pictorially and furnished as part of the pilot valves, is assembled into the Lower Half Assy (4-1).
- 8.4.6 When ready to install the Pilot Valve (1-E) into the Lower Housing Assy (4-1), install O-ring (6-10) onto Housing (6-1) and carefully insert the previously assembled parts into the Cage (6-2), installed within the Lower Housing Assy (4-1). Note: When the Pilot Valve (1-E) is procured as a spare part, the Cage (6-2) is furnished as an integral part thereof. Insert Spring (6-13) into Piston (6-14) and place Cover (6-12) onto Spring (6-13) compressing into place

while inserting Screws (6-18) and Washers (6-19). Torque to 120 inch-lbs (138 cm-kg).

8.5 **Air Operated Pilot Valve - Defueling (1-J)**

- 8.5.1 Carefully install the Bal Seal (6-15) onto the Piston (6-14) being certain that the open portion of the "U" is facing away from the major portion of the piston (faces in the same direction as the Shaft (6-16)). Lightly lubricate it. If Shaft (6-16) was removed it should be reinstalled
- 8.5.2 Place one Wave Washers (6-25) into the piston bore of the Housing (6-1), then Washers (6-26) followed by the other Wave Washers (6-25).
- 8.5.3 Place the assembled Piston (6-14) - Shaft (6-16) assembly into the Housing (6-1) and slowly push it into place until resistance from the Bal Seal (6-15) is encountered. Continue a downward, even pressure on the parts until the Piston (6-14) - Shaft (6- 16) assembly is fully into the Housing (6-1). It may be wise to use an "orange stick" (small round stick of hardwood with a flattened end) to assist in getting the Bal Seal (6-15) to evenly enter the Housing (6- 1).
- 8.5.4 Lightly lubricate O-Ring (6-9) and insert into counter bore in Housing (6-1) and over Shaft (6-16). Push into place using O-Ring Retainer (6-8). (Note: O-Ring Retainer (6- 8) is symmetrical and can be inserted either end first).
- 8.5.5 Screw Adapter (6-5) onto Shaft (6-16) until it bottoms. Place Spring (6-7) over Shaft (6-16) and onto O-Ring Retainer (6-8). Place Spring Retainer (6-6) into Spring (6-7) and compress sufficiently to uncover the cross hole in the Adapter (6-5). Place the Poppet (6-3) into the Adapter (6-5) and align the holes in both the Adapter (6-5) and Poppet (6-3). Push Pin (6-4) into the hole and release Spring Retainer (6-6) to retain the Pin (6-4) and Poppet (6-3)
- 8.5.6 Note that the Cage (5-18 , 6-2 or 7-2), although shown pictorially and furnished as part of the pilot valves, is assembled into the Lower Half Assy (4-1).
- 8.5.7 When ready to install the Pilot Valve (1-J) into the Lower Housing Assy (4-1), install O-ring (6-10) onto Housing (6-1) and carefully insert the previously assembled parts into the Cage (6-2), installed within the Lower Housing Assy (4-1). Note: When

the Pilot Valve (1-J) is procured as a spare part, the Cage (6-2) will be furnished as an integral part thereof. Insert Wear Plate (6-20) and Spring (6-13) into Piston (6-14) and place Cover (6-12) with Screw (6-23) and Pin (6-24) installed onto Spring (6-13) compressing into place while inserting Screws (6-18) and Washers (6-19). Torque to 120 inch-lbs (138 cm-kg). If Screw (6-23) and Pin (6-24) were removed for replacement, reinstall prior to placing Cover (6-22) into place.

8.6 Lanyard Operated Pilot Valve (1-D)

8.6.1 With Housing (5-2) in a suitable vise, being careful not to damage part, place Latch Bracket (5-9) over corresponding holes in Housing (5-2) being certain that the tang of the Latch Bracket (5-9) is correctly positioned to enter the Housing (5-2) slot. Tap Pins (5-8) into the Housing (5-2), through the Latch Bracket, (5-9) until Pins (5-8) are bottomed. Slide Cable Assy (5-10) through hole in Latch Bracket (5-9), Latch Stop (5-11) and Spring (5-12), then through the appropriate hole in the Housing (5-2). Check, by pulling and releasing Cable Assy (5-10), to confirm that there is free movement of the Latch Bracket against the Spring (5-12). Place Hose (5-13) into position and retain with Clamp (5-14). If a suitable tool is available, the production Clamp (5-15) can be used. A suggested tool is made by National Telephone Supply Co., stock number 51-X-850 or equivalent. Thread the free end of the Cable Assembly (5-10) through the Clamp (5-15). Bend Cable Assy (5-10) to form a suitable loop in the free end. Thread the free end of the Cable Assy (5-10) back into the Clamp (5-15) and crimp in place. If a suitable tool is not available, use alternative Clamp (5-15A) which utilizes two screws to retain the loop.

8.6.2 Place Spring (5-3) over Latch Spool (5-4) and insert Latch Spool (5-4) into Housing (5-2). Note that the Latch Bracket (5-9) will have to be pulled out of the way by pulling upon the Cable Assy (5-10) while attempting to do this operation. Place Latch Cover (5-5) over Latch Spool (5-4) such that the large open end protrudes over the Housing (5-2). If Ball (5-6A) is to be replaced, tap it onto the end of Handle (5-6) that is farthest from the cross hole. Place Handle (5-6) over Latch Spool (5-4) and align holes. With adequate support for the parts, tap Pin (5-7) to retain assembly.

8.6.3 Pull Handle (5-6) and observe that the Latch Bracket (5-9) latches onto the Latch Spool. (5-4) Pull the Cable Assy (5-10) to release the Latch Spool (5-4).

8.6.4 While applying pressure to the Cable Assy (5-10) to keep the Latch Bracket (5-9) clear of the Latch Spool (5-4) and Spring (5-3), Push Handle (5-6) inward to force the Latch Spool (5-4) out of Housing (5-2) sufficiently to align Shaft (5-16) with Latch Spool (5-4) and install Pin (5-17).

8.6.6 Place Pilot Retainer (5-27) over Shaft (5-16) and move into groove in Housing (5-2). Lightly lubricate O-Ring (5-26) and insert into counter bore in Pilot Retainer (5-27) and over Shaft (5-16). Push into place using O-Ring Retainer (5-25). (Note: O-Ring Retainer (5-25) is symmetrical and can be inserted either end first).

8.6.7 Screw Adapter (5-21) onto Shaft (5-16) until it bottoms. Place Spring (5-24) over Shaft (5-16) and onto O-Ring Retainer (5-25). Place Spring Retainer (5-23) into Spring (5-24) and compress sufficiently to uncover the cross hole in the Adapter (5-21). Place the Poppet (5-22) into the Adapter (5-21) and align the holes in both the Adapter (5-21) and Poppet (5-22). Push Pin (5-20) into the hole and release Spring Retainer (5-23) to retain the Pin (5-20) and Poppet (5-22).

8.6.8 Note that the Cage (5-18, 6-2 or 7-2), although shown pictorially and furnished as part of the pilot valves, is assembled into the Lower Half Assy (4-1). Install O-ring (5-19) onto Pilot Retainer (5-27) and carefully insert the above assembled parts into the Cage (5-18) and align the mounting holes with the appropriate holes in the Lower Housing Assy (4-1). Fasten in place with Screws (5-29) and Washers (5-28). Tighten evenly and then torque to 120 inch-lbs (138 cm-kg).

8.7 Air/Lanyard Pilot Valve (1-F)

8.7.1 Reassemble in the reverse order of disassembly noting the following:

8.7.2 If the Cable Assembly (7-40) was cut, replace with new part pulling it through the Cable Retainer (7-33). Insert Ball Retainer (7-32) into Cable Retainer (7-33). Install Spring (7-30) into Ball Retainer (7-32). Assemble these parts into Housing (7-34) and hold in compressed position to insert Balls (7-31). Install these parts into

Connector (7-22). Screw on Lanyard Guide (7-29). Align holes in items (7-32) and (7-33) with slots in (7-29). Press in Pin (7-21).

- 8.7.3 Insert Poppet (7-24) into Shaft (7-28) and align hole for insertion of Pin (7-26). Hold in place by installing Retainer (7-25). Place Spring (7-27) over Retainer (7-25) and insert items into the open end of Connector (7-22). Align holes and insert second Pin (7-21) to retain in place. Pull Cable (7-40) to open unit and not allow damage to Poppet (7-24) during the next installation procedure. Screw in Seat (7-23) to a bottomed position.

- 8.7.4 Slide Reset Ring (7-36) over cable with lettering visible toward the cable. Install Retaining Ring (7-35) into the groove in Lanyard Guide (7-29) to retain. Slip Hose (7-41) over end of Lanyard Guide and retain in place with Clamp (7-39). If a suitable tool is available, the production Clamp (7-38) can be used. A suggested tool is made by National Telephone Supply Co., stock number 51-X-850 or equivalent. Thread the free end of the Cable Assembly (7-40) through the Clamp (7-38). Bend Cable Assy (7-40) to form a suitable loop in the free end. Thread the free end of the Cable Assy (7-40) back into the Clamp (7-38) and crimp in place. If a suitable tool is not available, use alternative Clamp (7-38A) which utilizes two screws to retain the loop.

- 8.7.5 Assemble the air piston section in accordance with paragraphs 8.4.

8.8 **Air/lanyard Pilot Valve (1-U)**

- 8.8.1 Reassemble in the reverse order of disassembly noting the following:

- 8.8.2 If the Cable Assembly (7-41) was cut, replace with new part pulling it through the Cable Retainer (7-34). Insert Ball Retainer (7-33) into Cable Retainer (7-34). Install Spring (7-31) into Ball Retainer (7-33). Assemble these parts into Housing (7-35) and hold in compressed position to insert Balls (7-32). Install these parts into Connector (7-23). Screw on Lanyard Guide (7-30). Align holes in items (7-33) and (7-34) with slots in (7-30). Press in Pin (7-22).

- 8.8.3 Insert Poppet (7-25) into Shaft (7-29) and align hole for insertion of Pin (7-27). Hold in place by installing Retainer (7-26). Place Spring (7-28) over Retainer (7-26) and

insert items into the open end of Connector (7-23). Align holes and insert second Pin (7-22) to retain in place. Pull Cable (7-41) to open unit and not allow damage to Poppet (7-25) during the next installation procedure. Insert assembly into Housing (7-1) and secure with Screws (7-20).

- 8.8.4 Slide Reset Ring (7-37) over cable with lettering visible toward the cable. Install Retaining Ring (7-36) into the groove in Lanyard Guide (7-30) to retain. Slip Hose (7-42) over end of Lanyard Guide and retain in place with Clamp (7-40). If a suitable tool is available, the production Clamp (7-40) can be used. A suggested tool is made by National Telephone Supply Co., stock number 51-X-850 or equivalent. Thread the free end of the Cable (7-41) through the Clamp (7-40). Bend Cable (7-41) to form a suitable loop in the free end. Thread the free end of the Cable (7-41) back into the Clamp (7-40) and crimp in place. If a suitable tool is not available, use alternative Clamp (7-40A) which utilizes two screws to retain the loop.

- 8.8.5 Assemble the air piston section in accordance with paragraphs 8.4.

8.9 **Final Assembly**

- 8.9.1 With Lower Half Assy (4-1) set up such that the piston (inlet) is against the work bench, insert the Strainer (2-21) as applicable.

- 8.9.2 Lightly lubricate and place O-Ring (2-22) into the groove in the Lower Half Assy (4-1).

- 8.9.3 Be sure that the Stem (4-6) of the Servicing Valve (4-3) is fully screwed out, install the Servicing Valve (4-3) into the Lower Half Assy (4-1). Torque to 100-110 ft lbs (13.83 to 15.21 m-kp). Do not over tighten. (Some valves were wire locked at the factory, but later versions substituted this torque requirement for the wire locking.)

- 8.9.4 Place the Upper Half Assy (2-6) onto the Lower Half Assy (4-1) such that the notch in the mating flange is located opposite to the pilot valve boss. The one shorter Screw (2-5) is to be installed in the hole just to the left of the pilot valve boss. Install Screws (2-3 & 2-5) and Washers (2-4) making sure that the Cover (2-23) is attached to one of the Screws (2-3). If product selection is used see paragraph 8.8.5 before completing this section. Tighten evenly and then torque to 120 inch-lbs (138 cm-kp).

8.9.5 If Product Selection Assy (1-C) was removed, replace it. Note that the position of selection desired is achieved by placing one of the set of Bolts (1-3) and stack of Washers (1-4 & 1-6) in the hole numbered to the position. The other two selection sets are always located in the two un-numbered holes. It should be noted also that the four Bolts (1-5) and Standoffs, (1-2) used to mount the product selector, replace the same number of Screws (2-3) and Washers (2-4).

the mounting bolts evenly. The bolts should then torqued in a normal cross pattern in three successive steps. If the bolt pattern is numbered 1 through 8 in a clockwise fashion, tighten in sequence 1, 5, 3, 7, 2, 6, 4 and 8. The torque for the three steps should be 40 ft-lbs (5.5 m-kg), 70 ft-lbs (9.7m-kg) and 93 ft-lbs (12.9 m-kg).

8.9.7 Service Manual SM47076 covers the installation of the 61654 into a 12 or 13-inch Avery Hardoll pit using option N of the 61654.

8.9.6 Installation of the 61654 onto the mating flange should be done by loosely tightening

9.0 TEST

9.1 Test conditions

Test media shall be JP-4, Jet A or odorless kerosene, commercial solvent 140.

9.2 Functional Test

The valve must be connected to a fluid pressure source with capability of static pressure of 300 psig, flow pressure (deadhead) of 120 psig and a flow rate of up to 1,100 USGPM. For the air operated units, a minimum of 120 psig air pressure must be available.

9.2.1 Leakage & Proof Pressure - Attach valve to a static fuel pressure source of 300 psig minimum. Open Pilot Valve (1-D, 1-E, 1-J or 1-U), open Servicing Valve (4-3) and fill valve manually opening the Pressure Equalization Poppet (2-13) in the outlet Poppet (2-11) to allow trapped air to escape. Blow the external wetness off of the valve and pressurize the unit to 25 psig and 300 psig for a minimum of one minute at each pressure and observe for external leakage. There should be no leakage.

9.2.2 Seal Leakage - With the unit in the same test setup, close pilot valve and block the outlet Poppet open with a soft plastic rod (see paragraph 6.1 for hint). Apply 25 and 300 psig for one minute at each pressure and observe for leakage as evidenced by fuel flow out of Poppet (2-11). There shall be no leakage from unit.

9.2.3 Servicing Valve Leakage - With the same test setup, close Servicing Valve (4-3) and open Pilot Valve (1-D, 1-E, 1-J or 1-U). Apply 300 psig for one minute and observe for leakage. The Servicing Valve (4-3) shall not open and there shall be no evidence of leakage as evidenced by leakage through the Poppet (2-11).

9.2.4 Flow Tests - Install the valve in high flow test stand. Connect the outlet of the unit to a Carter 61525 Coupler. Open Pilot Valve (1-D, 1-E, 1-J or 1-U). With 120 psig deadhead pressure establish a flow rate of 1100 USGPM.

9.2.4.1 Close the Pilot Valve (1-D, 1-E, 1-J or 1-U) and observe closing time and overshoot. Overshoot is defined as the volume of fluid that passes through the valve after the pilot valve has been closed. Closing time shall be 2 to 5 seconds and overshoot shall be less than 55 gallons at 1,100 USGPM.

9.2.4.2 Opening Time - Using the same test setup, start with a closed valve and 120 psig deadhead pressure, open Pilot Valve (1-D, 1-E, 1-J or 1-U) and observe opening time. Opening time is defined as the time required for the valve to achieve at least 90% of rated flow, 990 USGPM in this case. The opening time shall be 5 to 10 seconds.

10.0 TROUBLE SHOOTING

10.1 External Leakage - Between Upper and

Lower Housing Assy (2-6 & 3-1). - Flange Screws

(2-3 & 2-5) not tightened properly or O-Ring (2-22)
pinched or cut.

- | | | | |
|------|---|-------|--|
| 10.2 | Leakage past Servicing Valve (4-3). - Damaged Poppet (4-4). | 10.7 | On units with an Air Operated Defuel Pilot Valve (1-J). - Valve will not open when air pressure is applied - Defuel Screw (6-23) is screwed in too far. Back out the Screw (6-23) until it is stopped by Pin (6-24). |
| 10.3 | Leakage past Equalization Valve Poppet (2-13). - Damaged Seal (2-12) or Poppet (2-13). | 10.8 | On units with an Air Operated Defuel Pilot Valve (1-J). - Valve will not open to allow defueling operation - Defuel Screw (6-23) is not screwed in far enough. Be sure the Screw (6-23) is bottomed out on the Piston (6-14). |
| 10.4 | Valve does not close when Pilot Valve (1-D, 1-E, 1-J or 1-U) is closed. - If unit closes when Servicing Valve is shut, problem could be a damaged or leaking Pilot Valve Poppet (5-22 or 5-3) or O-Ring (5-1, 6-11 or 7-11). If Pilot Valve 1-E, 1-J or 1-U is used, check to see if Piston (6-14) is free to travel open and closed. If Lanyard Pilot 1- D is used, check to see if Cable Assy (5- 10) has been pulled to allow the pilot to close. | 10.9 | On units with an Air Operated Defuel Pilot Valve (1-J). - Valve will not open to allow defueling operation - Incorrect Piston Seal Retainer (4-20) is installed. The correct Seal Retainer (4-20) to have defueling capability is part number 207727. The height of the Seal Retainer (4-20) should be approximately 0.540 (13.72 mm) to be correct. Replace Seal Retainer (4-20) with correct part. |
| 10.5 | Valve does not close when Pilot Valve (1-D, 1-E, 1-J or 1-U) is closed and when Servicing Valve (4-3) is shut. - If flow rate, when attempting to close the valve, changes very little, the problem could be damaged Piston Slipper Seal (4-25) and/or O-Ring (4-24) or jammed main Piston (4- 18). Check for movement (manually) of Piston (4-18). If the flow rate changes to leakage when the valve is signaled to close, the problem could be the Piston Seal (4-21). | 10.10 | On units with a Lanyard Operated Pilot Valve (1-D). - If the valve won't open, check to see that the Latch Spool (5-4) remains in the locked up position. Pull and hold up the Handle (5-6) for 30 seconds. If flow is established, the Latch Spool (5-4) is not locking in the open position. Problem could be wear either on the Latch Bracket (5-9) or Latch Spool (5-4). |
| 10.6 | On units with an Air Operated Pilot Valve (1-E, 1-J or 1-U). - Valve will not open when air pressure is applied - Damaged Bal Seal (6-15), Piston (6-14) is binding or damaged bore of Housing (6-1). Actuate with up to 80 psig air pressure several times before checking for leaking Bal Seal (6-15). Leaking Bal Seal (6-15) should be evidenced by air flowing out of the gap between the Cover (6-12 , 6-2 or 7-22) and the Housing (6-1). | 10.11 | Fuel leakage into the air reference system (on air operated pilot valve units only, option E , F, J or U). - O-ring (6-9), (7-9) or (7-9) needs replacing. |
| | | 10.12 | On Dual Pilot Units, Option F or U, if the valve does not open when deadman is activated, manual pilot may need resetting to prevent the air pressure from bleeding out of the unit. |

11.0 ILLUSTRATED PARTS CATALOG

Tables 1.0 through 6.0 tabulate the parts comprising the various configurations and options of the 61654 Series of Hydrant Valves. The item numbers are keyed to the appropriate exploded view for the option or sub-assembly as diagrammed.

TABLE 1.0
61654 Series Hydrant Valve and Options
Figure 1

Fig.	Item	Part Number	Description	Units/ Assy	Hydrant Option	Spares/10 Units/Yr.
1	C	44290	Product Selection Ring Assy	1	C	-
	1	207721	Ring	4	C	-
	2	207722	Standoff	4	C	-
	3	GF6-13	Bolt	3	C	-
	4	GF960-616L	Washer	3	C	-
	5	GF5-35	Bolt	4	C	-
	6	GF960-616	Washer	27	C	-
	7	GF21083N6	Nut	3	C	-
	D	44248	Lanyard Pilot Valve	1	D	-
		42836	Lanyard Pilot Valve (Obsolete)	-	-	-
	E	44721	Pilot Valve, Air Operated	1	E	-
		44247	Pilot Valve (Obsolete)	-	E	-
		42846	Pilot Valve (Obsolete)	-	E	-
	F	47091-1	Pilot Valve, Dual Air/lanyard for small pits	1	F	-
	J	44570	Pilot Valve, Defueling	1	J	-
	M	44731	Quick Disconnect Assy	1	M	-
	18	B2K16-VB(S)DWC	Male QD Fitting	1	M	-
	19	220013-01	Close Nipple	1	M	-
	U	47361-1	Pilot Valve, Dual Air/lanyard large pit	1	U	-

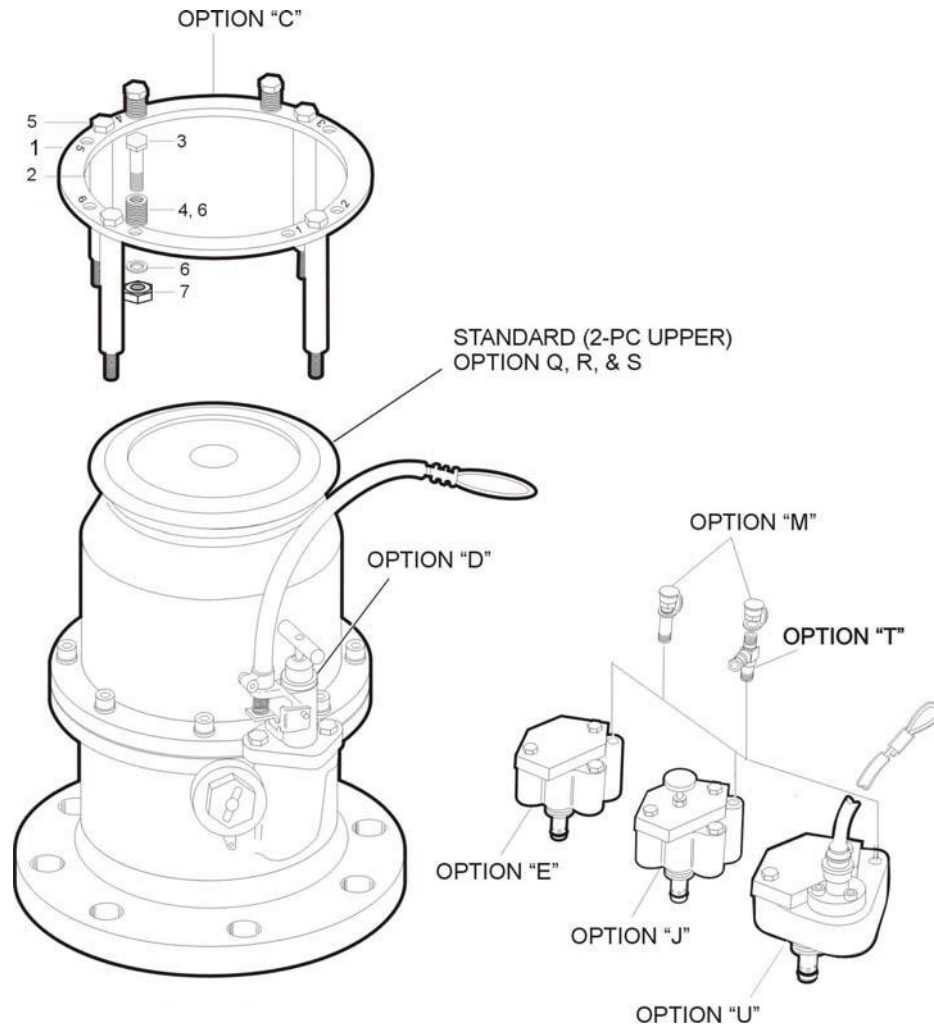


FIGURE 1 - 61654 SERIES HYDRANT VALVE OPTIONS

TABLE 2.0
Upper Housing Assy, Options A and B
Figure 2

Fig.	Item	Part Number	Description	Units/ Assy	Hydrant Option	Spares/10 Units/Yr.
2	3	GF16997-60	Screw	7	All	-
	4	GF960-516	Washer	8	All	-
	5	GF16996-32	Screw	1	All	-
	6A	47203-1	Upper Half Assy, 2-piece standard aluminum/st. steel.	1	All but K, Q, R, S	-
	7	47159-1	Upper Housing Assembly (See Table 3 for parts)	1	All but K, Q, R, S	-
	8	43795	Poppet Assy	1	All but K	-
	11	210284	Poppet – Steel	1	All but K	-
		200847-1	Poppet – Obsolete Aluminum (Note 7)	1	All but K	1
	12	221170	Seal	1	All but K	10
	13	200011	Poppet, Press. Equalization	1	All but K	2
	14	200014	Spring	1	All but K	-
	15	200012	Retainer	1	All but K	-
	16	200849	Shroud	1	All but K	-
	17	RS-156-S	Retaining Ring	1	All but K	-
	9	29472	Seal Ring	1	All but K	1
	10	29486	Seal	1	All but K	10
	18	28618	Spring	1	All but K	-
	19	200847	Retainer, Poppet	1	All but K	-
	6B	43214	Upper Half Assy, 1-piece ductile iron	1	Q	-
	8	43795	Poppet Assy	1	Q	-
	11	210284	Poppet – Steel	1	Q	-
		200847-1	Poppet – Obsolete Aluminum (Note 7)	1	Q	1
	12	221170	Seal	1	Q	10
	13	200011	Poppet, Press. Equalization	1	Q	2
	14	200014	Spring	1	Q	-
	15	200012	Retainer	1	Q	-
	16	200849	Shroud	1	Q	-
	17	RS-156-S	Retaining Ring	1	Q	-
	18	28618	Spring	1	Q	-
	19	200847	Retainer, Poppet	1	Q	-
	6C	47203-2	Upper Half Assy, 2-piece ductile/stainless steel.	1	R	-
		47159-2	Housing Assembly, Ductile Iron/Stainless Steel (See Table 3 for parts)	1	R	-

Fig	Item	Part Number	Description	Units/ Assy	Hydrant Option	Spares/10 Units/Yr.
2	8	43795	Poppet Assy	1	R	-
	9	29472	Seal Ring	1	R	1
	10	29486	Seal	1	R	10
	11	210284	Poppet – Steel	1	R	-
		200847-1	Poppet – Obsolete Aluminum (Note 7)	1	R	1
	12	221170	Seal	1	R	10
	13	200011	Poppet, Press. Equalization	1	R	2
	14	200014	Spring	1	R	-
	15	200012	Retainer	1	R	-
	16	200849	Shroud	1	R	-
	17	RS-156-S	Retaining Ring	1	R	-
	9	29472	Seal Ring	1	R	1
	10	29486	Seal	1	R	10
	18	28618	Spring	1	R	-
	19	200847	Retainer, Poppet	1	R	-
	6D	43214-4	Upper Half Assy, stainless	1	S	-
	7	29279-5	Upper Housing	1	S	-
	8	43795	Poppet Assy	1	S	-
	11	210284	Poppet - Steel	1	S	-
		200847-1	Poppet – Obsolete Aluminum (Note 7)	1	S	1
	12	221170	Seal	1	S	10
	13	200011	Poppet, Press. Equalization	1	S	2
	14	200014	Spring	1	S	-
	15	200012	Retainer	1	S	-
	16	200849	Shroud	1	S	-
	17	RS-156-S	Retaining Ring	1	S	-
	9	29472	Seal Ring	1	S	1
	10	29486	Seal	1	S	10
	18	28618	Spring	1	S	-
	19	200847	Retainer, Poppet	1	S	-
	6E	43214-1	Upper Half Assy, PONYA Specs	1	K	-
	7	29279-1	Upper Housing	1	K	-
	8	43795	Poppet Assy	1	All	-
	11	210284	Poppet - Steel	1	All	-
		200847-1	Poppet – Obsolete Aluminum (Note 7)	1	All	1
	12	221170	Seal	1	All	10
	13	200011	Poppet, Press. Equalization	1	All	2
	14	200014	Spring	1	All	-
	15	200012	Retainer	1	All	-
	16	200849	Shroud	1	All	-
	17	RS-156-S	Retaining Ring	1	All	-

Fig	Item	Part Number	Description	Units/ Assy	Hydrant Option	Spares/10 Units/Yr.
2	9	29472	Seal Ring	1	All	1
	10	29486	Seal	1	All	10
	18	28618	Spring	1	All	-
	19	200847	Retainer, Poppet	1	All	-
	20	29288	Ring Retainer	1	All	-
	21	81557-10	Strainer, 10-mesh	1	A	-
		81557-20	Strainer, 20-mesh	1	B	-
	22	MS29513-165	O-Ring	1	All	10
	23	41579	Cover Assy	1	All	3
	1	28622	Cover	1	All	3
	2	-	Cable Assy (Note 3)	1	All	-
	24	5757-21C2	Washer, Retaining	1	All	-
	3	GF16997-60	Screw	7	All	-
	4	GF960-516	Washer	8	All	-
	5	GF16996-32	Screw	1	All	-
	6A	47203-1	Upper Half Assy, 2-piece standard aluminum/st. steel.	1	All but Q, R, S	-
	7	47159-1	Upper Housing Assembly (See Table 3 for parts)	1	All but Q, R, S	-
	8	43795	Poppet Assy	1	All	-
	11	210284	Poppet - Steel	1	All	-
		200847-1	Poppet - Obsolete Aluminum (Note 7)	1	All	1
	12	221170	Seal	1	All	10
	13	200011	Poppet, Press. Equalization	1	All	2
	14	200014	Spring	1	All	-
	15	200012	Retainer	1	All	-
	16	200849	Shroud	1	All	-
	17	RS-156-S	Retaining Ring	1	All	-
	9	29472	Seal Ring	1	All	1
	10	29486	Seal	1	All	10
	18	28618	Spring	1	All	-
	19	200847	Retainer, Poppet	1	All	-
	6B	43214	Upper Half Assy, 1-piece ductile iron	1	Q	-
	8	43795	Poppet Assy	1	All	-
	11	210284	Poppet - Steel	1	All	-
		200847-1	Poppet - Obsolete Aluminum (Note 7)	1	All	1
	12	221170	Seal	1	All	10
	13	200011	Poppet, Press. Equalization	1	All	2
	14	200014	Spring	1	All	-
	15	200012	Retainer	1	All	-
	16	200849	Shroud	1	All	-
	17	RS-156-S	Retaining Ring	1	All	-
	18	28618	Spring	1	All	-
	19	200847	Retainer, Poppet	1	All	-
	6C	47203-2	Upper Half Assy, 2-piece ductile/stainless steel.	1	R	-

Fig	Item	Part Number	Description	Units/ Assy	Hydrant Option	Spares/10 Units/Yr.
2		47159-2	Housing Assembly, Ductile Iron/Stainless Steel (See Table 3 for parts)	1	R	-
	8	43795	Poppet Assy	1	All	-
	9	29472	Seal Ring	1	All	1
	10	29486	Seal	1	All	10
	11	210284	Poppet - Steel	1	All	-
		200847-1	Poppet – Obsolete Aluminum (Note 7)	1	All	1
	12	221170	Seal	1	All	10
	13	200011	Poppet, Press. Equalization	1	All	2
	14	200014	Spring	1	All	-
	15	200012	Retainer	1	All	-
	16	200849	Shroud	1	All	-
	17	RS-156-S	Retaining Ring	1	All	-
	9	29472	Seal Ring	1	All	1
	10	29486	Seal	1	All	10
	18	28618	Spring	1	All	-
	19	200847	Retainer, Poppet	1	All	-
6D		43214-4	Upper Half Assy, stainless	1	S	-
	7	29279-5	Upper Housing	1	S	-
	8	43795	Poppet Assy	1	All	-
	11	210284	Poppet - Steel	1	All	-
		200847-1	Poppet – Obsolete Aluminum (Note 7)	1	All	1
	12	221170	Seal	1	All	10
	13	200011	Poppet, Press. Equalization	1	All	2
	14	200014	Spring	1	All	-
	15	200012	Retainer	1	All	-
	16	200849	Shroud	1	All	-
	17	RS-156-S	Retaining Ring	1	All	-
	9	29472	Seal Ring	1	All	1
	10	29486	Seal	1	All	10
	18	28618	Spring	1	All	-
	19	200847	Retainer, Poppet	1	All	-
	20	29288	Ring Retainer	1	All	-
	21	81557-10	Strainer, 10-mesh	1	A	-
		81557-20	Strainer, 20-mesh	1	B	-
	22	MS29513-165	O-Ring	1	All	10
	23	41579	Cover Assy	1	All	3
	1	28622	Cover	1	All	3
	2	-	Cable Assy (Note 3)	1	All	-
	24	5757-21C2	Washer, Retaining	1	All	-

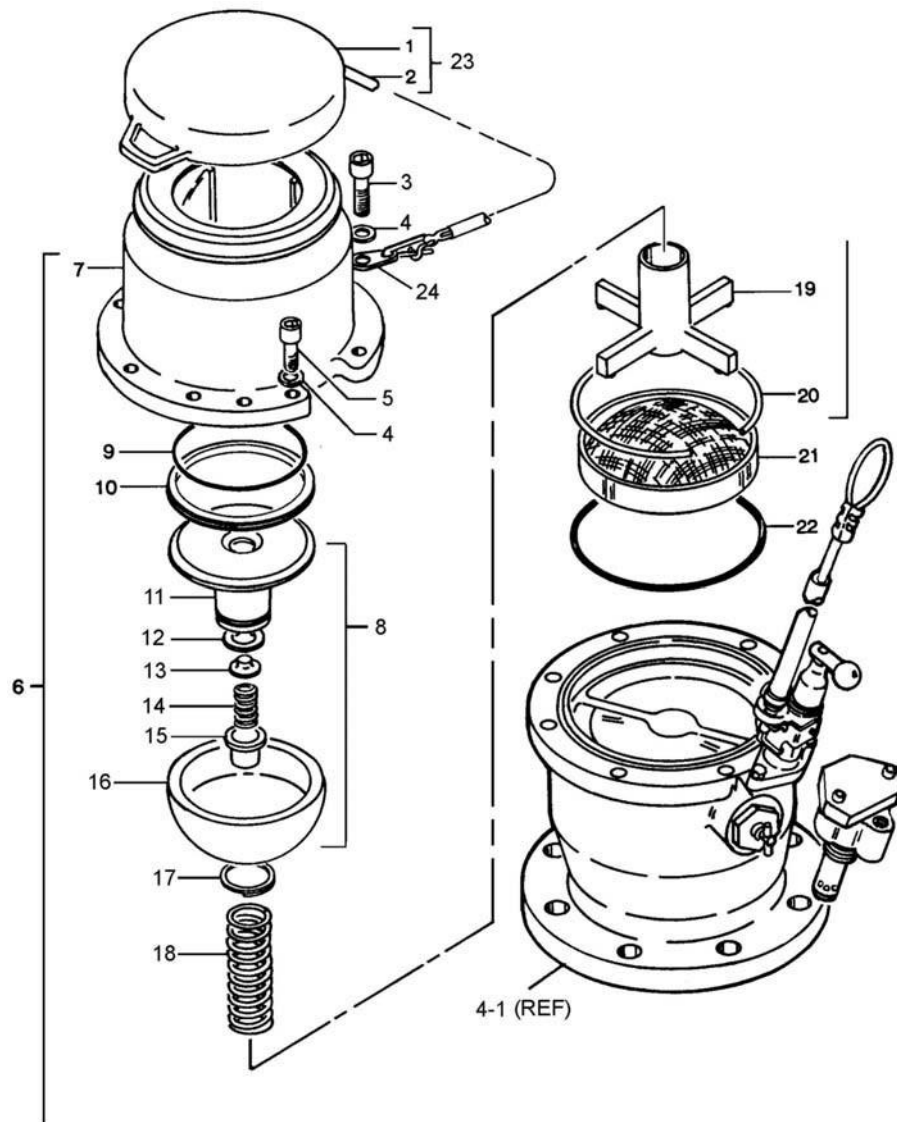


FIGURE 2 - UPPER HALF & OPTIONS A & B

TABLE 3.0
Standard and Option R Upper Half Assembly
Figure 3

Fig.	Item	Part Number	Description	Units/ Assy	Hydrant Option	Spares/10 Units/Yr.
3	1	47159-1	Housing Assembly, Aluminum/Stainless Steel	1	All but Q, R & S	-
		47159-2	Housing Assembly, Ductile Iron/Stainless Steel	1	R	-
	2	221289	Housing, aluminum	1	All but Q, R & S	-
		220844-2	Housing, Ductile Iron	1	R	-
	3	221118	O-ring	1	All but Q & S	10
	4	220856	Ring, Coupler Connecting	1	All but Q & S	1
	5	NAS1352N3-8	Screw	20	All but Q & S	-
	6	5710-159-16	Washer	20	All but Q & S	-
	7	603	Loctite, 10 ml.	A/R	All but Q & S	1

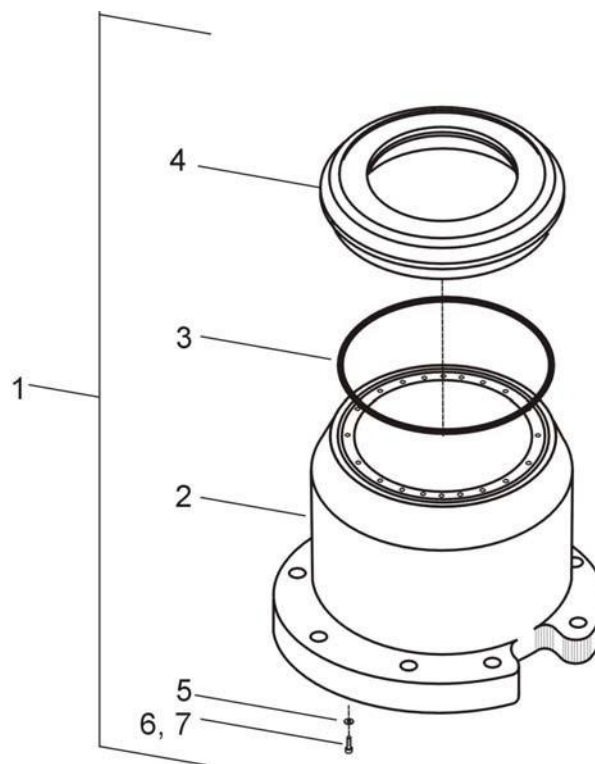


FIGURE 3 - 2-PIECE UPPER HALFTABLE 3.0
Standard and Option R Upper Half Assembly
Figure 3

TABLE 4.0
Lower Half Assy
Figure 4

Fig.	Item	Part Number	Description	Units/ Assy	Hydrant Option	Spares/10 Units/Yr.
4	1	43219	Lower Half Assy	1	All but J	-
		44292	Lower Half Assy	1	J	-
	2	MS29512-12	Gasket	1	All	10
	3	43272	Servicing Valve	1	All	-
	4	202597	Poppet	1	All	2
	5	5007-62-H	Retainer	1	All	-
	6	202631	Stem	1	All	-
	7	.156-1.000MDP	Pin	1	All	-
	8	202630	Retainer, Poppet	1	All	-
	9	MS29513-010	O-Ring	1	All	10
	10	42927	Lower Housing Assy	1	All	-
	11	202556	Lower Housing (Note 3)	1	All	-
	12	202593	Shaft (Note 3)	1	All	-
	13	5710-66-060	Washer	1	All	-
	14	GF51957-79	Screw	1	All	-
	15	NAS517-3-3	Screw	6	All	-
	16	202596	Retainer, Piston	1	All	-
	17	MS29513-249	O-Ring	1	All	10
	18	202592	Piston	1	All	Note 4
	19	GF51957-62	Screw	6	All	-
	20	203032	Retainer, Piston Seal	1	All but J	-
		207727	Retainer, Piston Seal	1	J	-
	21	210127	Seal, Piston	1	All	10
	22	MS29513-118	O-Ring	1	All	10
	23	203030	Seal, Slipper	1	All	10
	24	MS29513-245	O-Ring	1	All	10
	25	202594	Seal, Slipper	1	All	10
	26	202595	Spring	1	All	-
	27	203029	Washer	1	All	-
	28	203028	Seal	1	All	10
	29	29224-7	Orifice	1	All	-

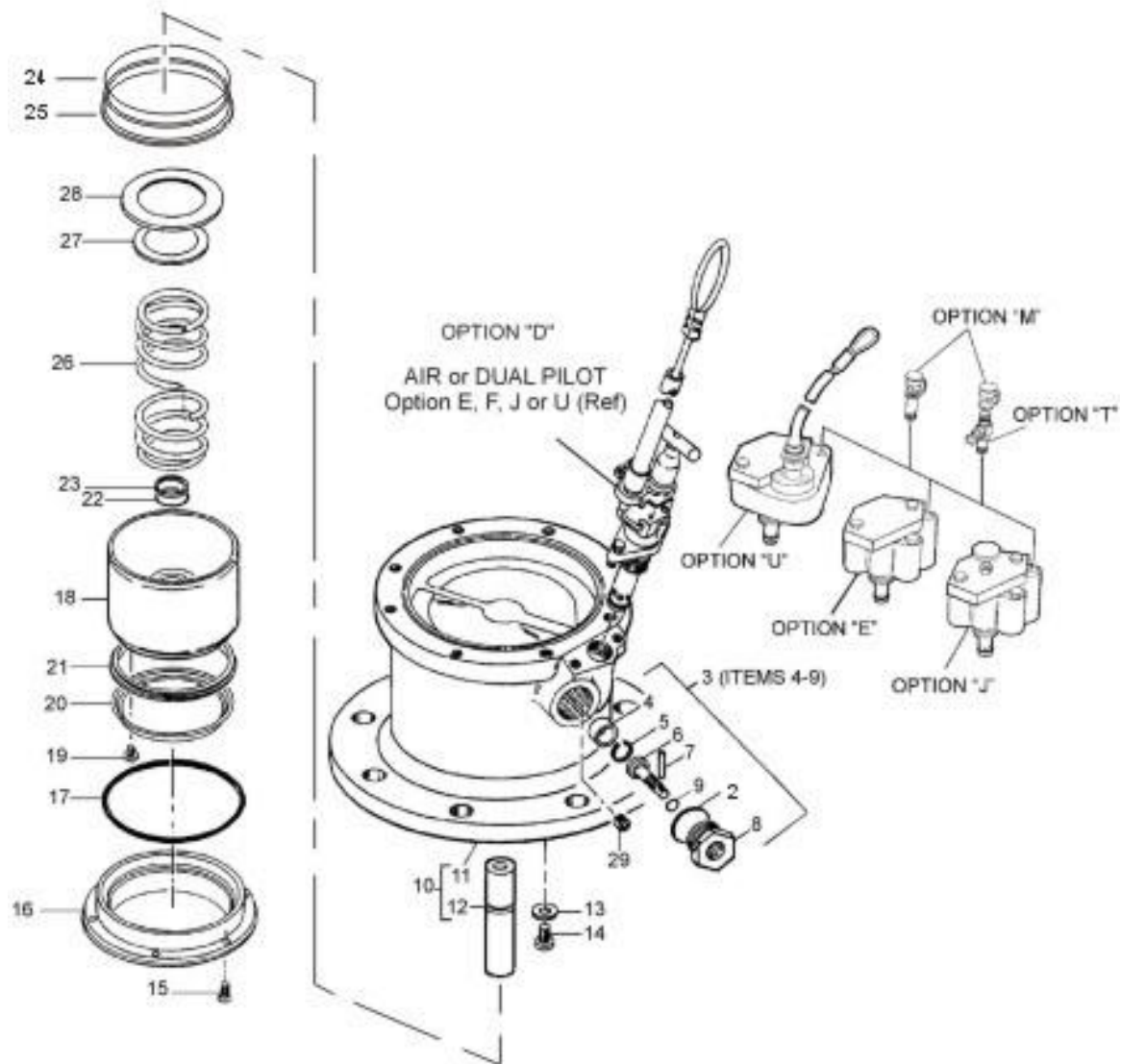
**FIGURE 4 - LOWER HALF ASSEMBLY (4-1)**

TABLE 5.0
Lanyard Operated Pilot Valve
Figure 5

Fig.	Item	Part Number	Description	Units/ Assy	Hydrant Option	Spares/10 Units/Yr.
5	D	44248	Lanyard Pilot Valve	1	D	Note 4
		42836	Lanyard Pilot Valve (Obsolete)	-	-	-
	1	201201-014	O-Ring	1	All	10
	2	202704	Housing	1	D	-
	3	202714	Spring	1	D	-
	4	202706	Spool, Latch	1	D	-
	5	202705	Cover, Latch	1	D	5
	6	203533	Handle	1	D	-
	6A	47084	Ball	1	D	-
	7	GF16562-234	Pin	1	D	-
	8	GF51923-297	Pin	2	D	-
	9	202716	Bracket, Latch	1	D	-
	10	42954	Cable Assy	1	D	-
	11	202717	Stop, Release	1	D	-
	12	202715	Spring, Release	1	D	-
	13	81052	Hose	1	D	1
	14	81094	Clamp, Hose	1	D	-
	15	82114	Sleeve	1	D	-
	15A	81095	Clamp, Cable	1	D	-
	16	207589	Shaft	1	D	-
	17	202743	Pin	1	D	-
	18	207718	Cage	1	All	-
	19	MS29513-114	O-Ring	1	All	10
	20	GF9105-04	Pin	1	All	2
	21	44252	Adapter	1	All	-
	22	207585	Poppet	1	All	5
	23	207586	Retainer	1	All	-
	24	202712	Spring	1	All	-
	25	202742	Retainer, O-ring	1	All	2
	26	201201-008	O-Ring	1	All	10
	27	202708	Retainer, Pilot Valve	1	D	-
	28	GF960-516	Washer	2	D	-
	29	GF35307-333	Bolt	2	D	-

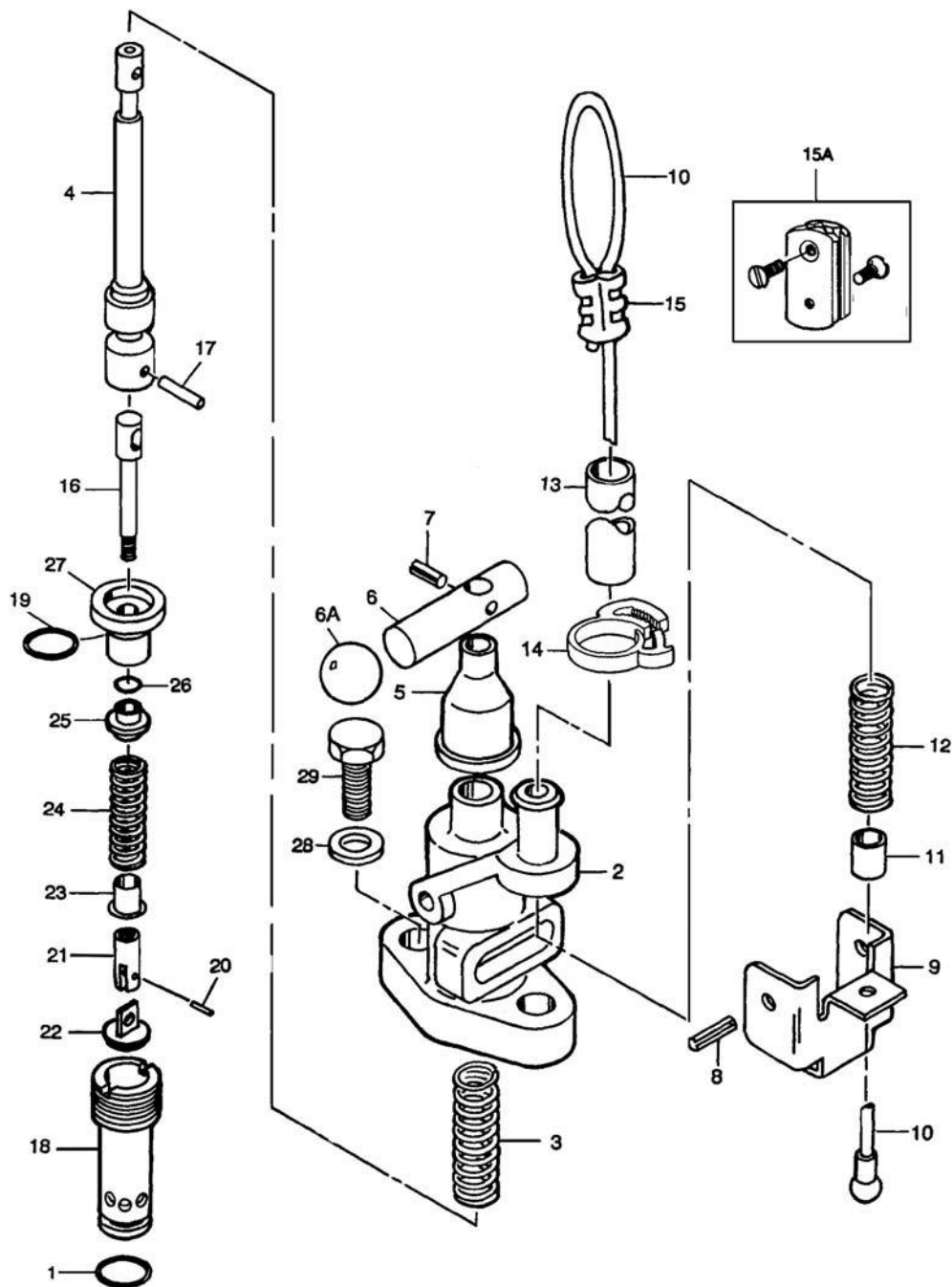


FIGURE 5 - LANYARD OPERATED PILOT VALVE

TABLE 6.0
Air Operated Pilot Valves, Options E & J
Figure 6

Fig.	Item	Part Number	Description	Units/ Assy	Hydrant Option	Spares/10 Units/Yr.
6	E	44721	Pilot Valve, Air Operated	1	E	Note 4
		44247	Pilot Valve (Obsolete)	-	E	-
		42846	Pilot Valve (Obsolete)	-	E	-
	1	47106	Housing (Newer Valves)	1	E	-
		208967	Housing (Obsolete)	-	E	-
		207600	Housing (Obsolete)	-	E	-
	2	207718	Cage	1	All	-
	3	207585	Poppet	1	All	5
	4	GF9105-04	Pin	1	All	2
	5	44252	Adapter	1	All	-
	6	207586	Retainer	1	All	-
	7	202712	Spring	1	All	-
	8	202742	Retainer, O-ring	1	All	-
	9	201201-008	O-Ring	1	All	10
	10	MS29513-114	O-Ring	1	All	10
	11	201201-014	O-Ring	1	All	10
	12	207598	Cover	1	E	-
	13	207706	Spring	1	E, J	-
	14	44571	Piston	1	E, J	-
		44253	Piston (Obsolete)	1	E	-
	15	221290	Seal	1	E, J	10
	16	207588	Shaft	1	E, J	-
	17	210176	Spacer	1	E	-
	18	GF16997-63	Screw	2	E, J	-
	19	GF960PD516	Washer	2	E, J	-
J		44570	Pilot Valve, Defueling	1	J	Note 4
	1	47106	Housing (Newer Valves)	1	J	-
		208967	Housing (Obsolete)	-	E, J	-
	2	207718	Cage	1	All	-
	3	207585	Poppet	1	All	5
	4	GF9105-04	Pin	1	All	2
	5	44252	Adapter	1	All	-
	6	207586	Retainer	1	All	-
	7	202712	Spring	1	All	-
	8	202742	Retainer, O-ring	1	All	-
	9	201201-008	O-Ring	1	All	10
	10	MS29513-114	O-Ring	1	All	10
	11	201201-014	O-Ring	1	All	10
	13	207706	Spring	1	E, J	-
	14	44571	Piston	1	E, J	-
	15	221290	Seal	1	E, J	10
	16	207588	Shaft	1	E, J	-

Fig.	Item	Part Number	Description	Units/ Assy	Hydrant Option	Spares/10 Units/Yr.
6	18	GF16997-63	Screw	2	E, J	-
	19	GF960PD516	Washer	2	E, J	-
	20	208958	Wear Plate	1	J	-
	21	47370	Screw Assembly	1	J	-
	22	221312	Cover	1	J	-
		208968	Cover (Obsolete)	-	J	Note 6
	23	221313	Screw	1	J	-
		208959	Screw (Obsolete)	-	J	Note 6
	24	GF16562-213	Pin	-	J	-
	25	SSR0150-S17	Wave Washer	2	J	-
	26	5710-355-30	Washer	1	J	-
	27	5406-P-04	Plug	1	E, J	-

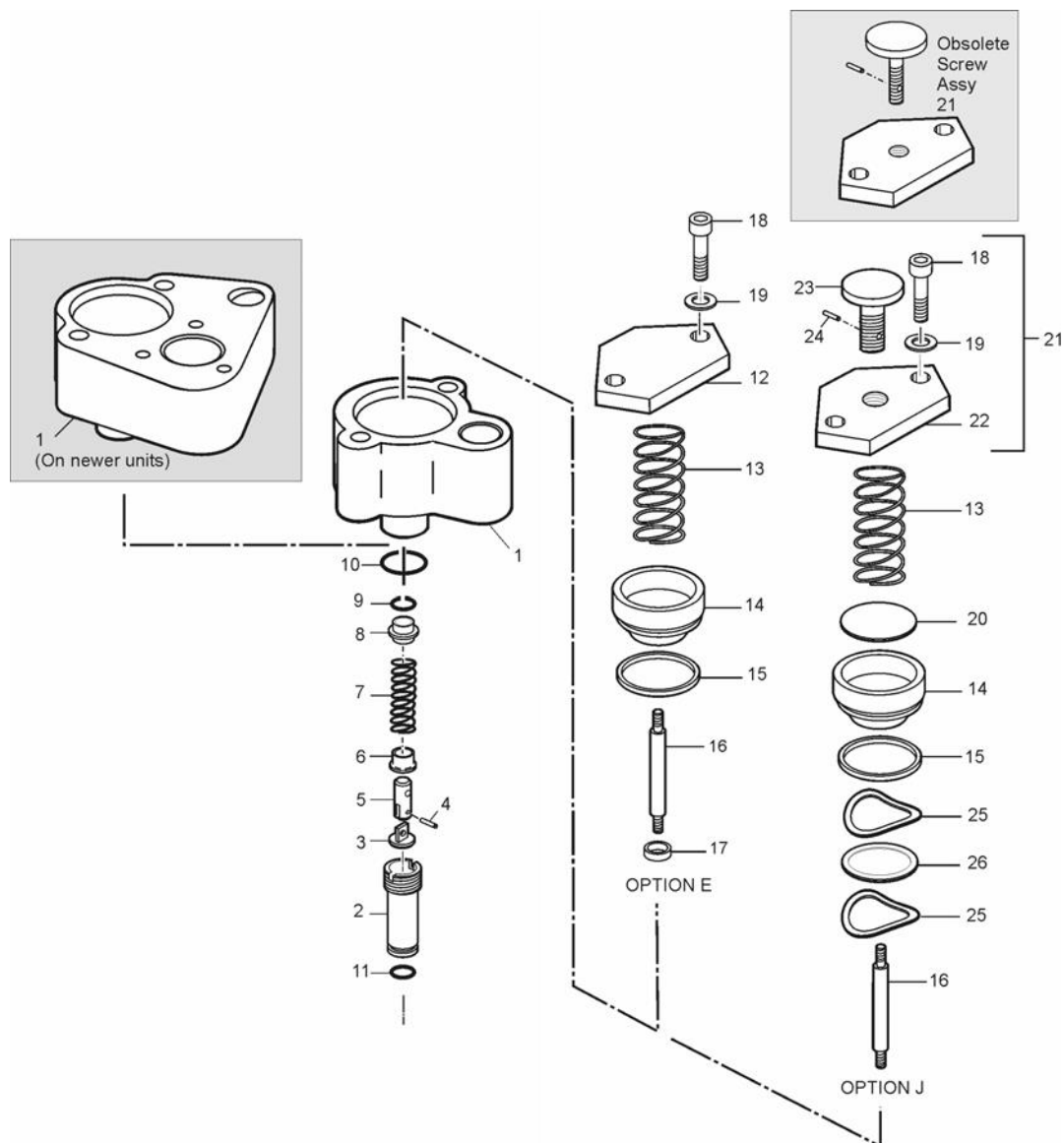


FIGURE 6 - AIR OPERATED PILOT VALVES

Table 7.0
Air/Lanyard Operated Pilot Valve, Option U

Figure	Item	Part Number	Description	Units Per Assembly	Hydrant Option	Spares/10 Units/Yr.
7	1-U	47362-1	Air/Lanyard Pilot Valve	1	U	-
	1	47359	Housing	1	U	-
	2	207718	Cage	1	All	-
	3	207585	Poppet	1	All	5
	4	GF9105-04	Pin	1	All	2
	5	44252	Adapter	1	All	-
	6	207586	Retainer	1	All	-
	7	202712	Spring	1	All	-
	8	202742	Retainer, O-ring	1	All	-
	9	201201-008	O-Ring	1	All	10
	10	MS29513-114	O-Ring	1	All	10
	11	201201-014	O-Ring	1	All	10
	12	207598	Cover	1	U U	-
	13	207706	Spring	1	U U	-
	14	44571	Piston	1	U U	-
	15	221290	Seal	1	U U	10
	16	207588	Shaft	1	U	-
	17	210176	Spacer	1	U	-
	18	GF16997-63	Screw	2	U	-
	19	GF960-516	Washer	2	U	-
	20	GF16997-45	Screw	3	U	-
	21	47360	Valve Assembly	1	U	-
	22	.125-1.000LDP	Pin	1	U	-
	23	221275	Connector	1	U	-
	24	207585	Poppet	1	U	5
	25	207586	Retainer	1	U	-
	26	GF9105-04	Pin	1	U	-
	27	10460	Spring	1	U	-
	28	220408	Shaft	1	U	-
	29	.125-1.250LDP	Pin	1	U	10
	30	220474	Lanyard Guide	1	U	-
	31	C0210-026-125S	Spring	1	U	-
	32	220417	Ball	3	U	-
	33	220412	Ball Retainer	1	U	-
	34	220411	Cable Retainer	1	U	-
	35	220409	Housing	1	U	-
	36	220489	Retaining Ring	1	U	-
	37	220475	Reset Ring	1	U	-
	38	No Part Number	Cable Assembly	1	U	-
	39	82114	Sleeve	1	U	-
	40A	81095	Clamp Assy (See 5-15A)	1	U	-
	40	81094	Clamp	1	U	-
	41	42954	Cable	1	U	1
	42	81052	Hose	1	U	1

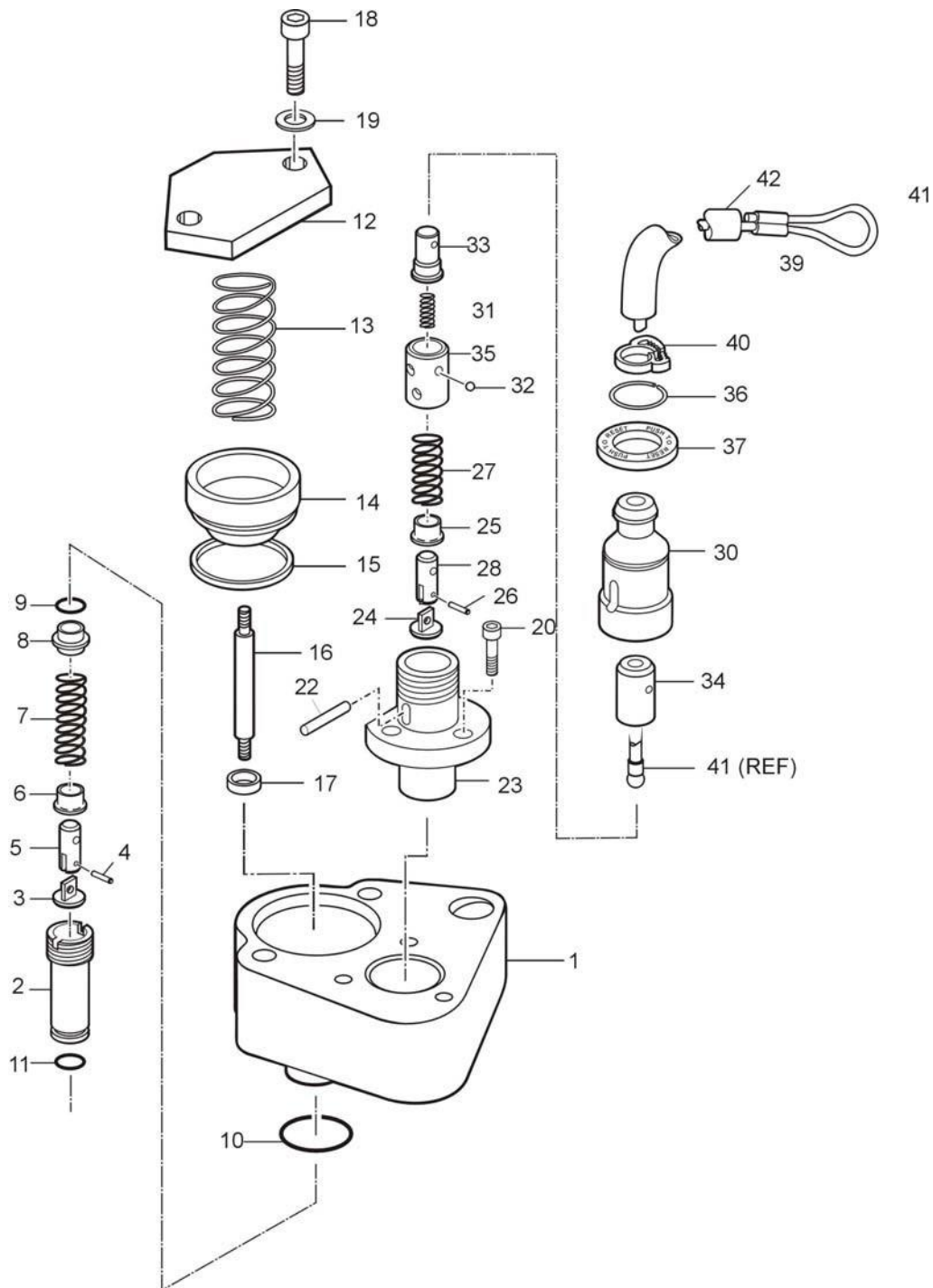


FIGURE 7 - AIR/LANYARD OPERATED PILOT VALVE, OPTION U

Table 8
KITS for Maintenance

The following kits are available for maintaining the units as noted:

KIT NUMBER	DESCRIPTION – CONTENTS	COMMENTS
KD61654-1	This kit is for use in repairing/overhauling any 61654 Hydrant Valve less the Pilot Valve and contains 2-10, 2-12, 2-22, 3-3, 4-2, 4-4, 4-9, 4-17, 4-21, 4-22, 4-23, 4-24, 4-25 & 4-28.	Replaces KD61654 Kit.
KD61654-2	This kit is for use in repairing a complete 61654D Hydrant Valve including the Lanyard Operated Pilot Valve and contains 2-10, 2-12, 2-22, 3-3, 4-2, 4-4, 4-9, 4-17, 4-21, 4-22, 4-23, 4-24, 4-25, 4-28, 5-1, 5-5, 5-19, 5-22 & 5-26 .	
KD61654-3	This kit is for use in repairing a complete 61654E or 61654J Hydrant Valve including either the Air Operated Pilot Valves with or without the defueling option and contains 2-10, 2-12, 2-22, 4-3, 4-2, 4-4, 4-9, 4-17, 4-21, 4-22, 4-23, 4-24, 4-25, 4-28, 6-3, 6-9, 6-10, 6-11, 6-13 & 6-15.	
KD61654-4	This kit is for use in repairing older Hydrant Valves with obsolete 42836 Pilot Valve and contains 2-10, 2-12, 2-22, 3-3, 4-2, 4-4, 4-9, 4-17, 4-21, 4-22, 4-23, 4-24, 4-25, 4-28, 5-1, 5-5, 5-19, 5-26 & Seal 202711.	For 61654D Valves with obsolete 42836 Pilot Valves.
KD61654-5	This kit is for use in repairing older Hydrant Valves with obsolete 42846 Pilot Valve and contains 2-10, 2-12, 2-22, 3-3, 4-2, 4-4, 4-9, 4-17, 4-21, 4-22, 4-23, 4-24, 4-25, 4-28, 6-9, 6-10, 6-11, Seal 600-015-10, MS29513-218, & Seal 202711.	For 61654E and J Valves with obsolete 42846 Pilot Valves.
KD61654-6	This kit is for use in repairing or converting 61654E or J Valves for use at temperatures down to -65° F and contains 2-22, 3-3, 4-2, 4-4, 4-9, 4-17, 4-21, 4-22, 4-23, 4-24, 4-25, 4-28, 6-10 , 6-11, & O-ring MS29513-014, Poppet 220424, Seal 220425, Seal 220426, & Seal 220427.	Valves using this kit may have limited operation life at normal operating temperatures and the conversion may be only useful during the winter months.
KD61654-7	This kit is for use in repairing a complete 61654F or 61654U Valves complete with Dual Air/Lanyard Pilot Valve and contains 2-10, 2-12, 2-22, 3-3, 4-2, 4-4, 4-9, 4-17, 4-21, 4-22, 4-23, 4-24, 4-25, 4-28, 6-3, 6-9, 6-10, 6-11, 6-13 & 6-15	
KD61654-8	This kit is for use in converting any one piece upper housing (except option S) to a two-piece aluminum/stainless steel upper. It contains 3-3, 3-4, 3-5 and 3-6.	

KIT NUMBER	DESCRIPTION - CONTENTS	COMMENTS
KD61654-9	This kit is used to upgrade hydrant valves with serial numbers 8454 to 11160 to meet the requirements of the 3 rd Edition of API 1584 – items 6A,	This kit provides the steel poppet and the two piece upper housing required for older valves to meet the requirements.
KD61654-10	This kit is used to upgrade later hydrant valves with the aluminum poppet assembly but with the appropriate upper half (aluminum housing with the replaceable stainless steel interface ring). Serial numbers 11161 and subsequent.	This kit is used to upgrade the poppet assembly only to the steel version to meet the requirements.
2KD42836	Kit to Upgrade the old style Lanyard Operated Pilot Valve, 42836, to the newer production style, 44248, allowing the use of current production hardware - items 5-1, 5-5, 5-16, 5-19, 5-20, 5-21, 5-22, 5-23 & 5-26.	
Notes:	<ol style="list-style-type: none"> 1. All part numbers beginning with "GF" are interchangeable with those beginning with either "AN" or "MS". If the "GF" is followed by three numbers it is interchangeable with an "AN" part, otherwise it is interchangeable with an "MS" part of the same number. 2. The recommended spare parts shown above are the number required to support 10 Units for one year or each overhaul whichever is sooner. These quantities do not include replacement spares for intermediate replacement of parts required by abuse or misuse of the equipment. The recommended quantities are based on the ratio of spare parts sold for each unit during a one year period of time. The actual quantity required will vary from location to location. 3. These items are not sold as separate parts, only the next assembly is available. 4. It is recommended that at least one each be on hand for each 50 or less hydrant valves in the system. 5. Air/Lanyard Pilots can be purchased without the Cage (7-2) and O-ring (7-11) if it is desired to replace the unit as a complete pilot valve. The Cage (7-2) and O-ring (7-11) can then be left installed inside the hydrant valve and need not be replaced. The part numbers for this replacement pilot valve would be 47091-3 for Option F pilot valve without the M Option or 47051-4 with the M Option. For Option U pilot valve without M Option it would be 47362-3 or with Option M it would be 47362-4. 6. The obsolete items 22-24 in Table 6 are no longer available as spare parts. If any one of the parts is ordered it will automatically be replaced with 47370 Screw Assembly. 7. The obsolete item 2-11 is no longer available as a spare part. If it is ordered it will be replaced by KD61654-10 to upgrade the poppet to the latests steel version. 	

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