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Carter® Brand
Ground Fueling Equipment

**SM60129-1**
April 2011

Applicable additional manuals:

SM60427 Nozzle
SM40679 Quick Disconnect
SM427MISC Misc. Adapters
SM61154 Dry Break Disconnect
SM64348 Nozzle
SM64200 Nozzle

**Maintenance Manual**

# Hose End Regulator

**To Mate Model 60427 Nozzle**

## Model 60129-1

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**Maintenance, Overhaul & Test Instructions**
**Eaton Carter® Brand Model 60129-1**
**Hose End Regulator**

## 1.0 INTRODUCTION

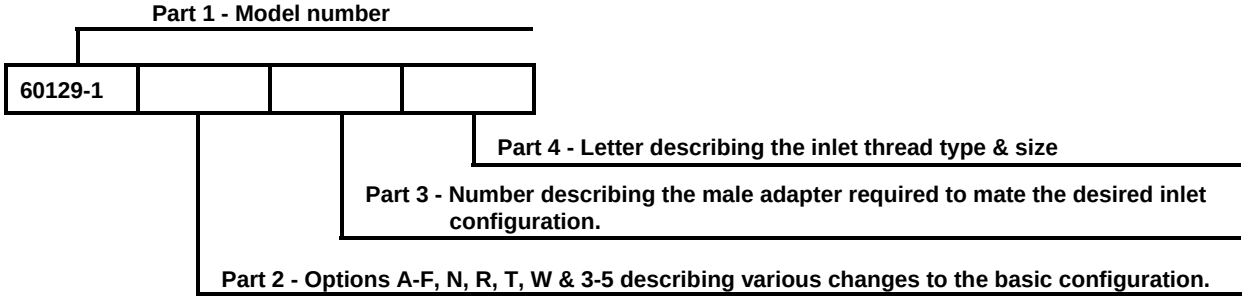
This manual furnishes detailed instructions covering the maintenance and overhaul of Eaton's Carter brand Model 60129-1 hose end regulator and its various options. The 60129-1 and earlier Model 40680 are interchangeable. Model 60129-1 is designed to provide a relatively fixed pressure at its outlet. Three pressure settings (35, 45, and 55 psi) are available and are procured by specifying the pressure setting as the dash number to the basic model number, e.g. 60129-14 is a regulator with a 45 psi spring (3 for 35 and 5 for 55 psi units). When the regulator is obtained as an integral part or option to a nozzle it is specified as noted in paragraph 3.0.

## 2.0 EQUIPMENT DESCRIPTION

Eaton's Carter brand Model 60129-1 hose end regulator is designed to be used as a part of Eaton's Carter brand nozzle models 60427, 64200 or 64348 or as a stand alone unit, to provide a relatively maximum pressure at its outlet ("nozzle pressure") to control the flow of fuel into the aircraft. In addition the unit responds to increases in pressure within the aircraft fuel manifold caused by closure of the aircraft's tank level control valves to either maintain the desired maximum pressure or to close to prevent an excessive "surge" pressure from being allowed within the aircraft. The unit is a direct acting, spring loaded regulator which will control pressure at its outlet in accordance with the spring force provided therein. A double ended piston of different areas is balanced against the spring and atmospheric pressure to provide the control. The smaller end of the piston is vented to the atmosphere through a screened breather to provide an atmospheric pressure reference point.

## 3.0 TABLE OF OPTIONS

See Model 60129-1 brochure for additional information.




**Part 2**

| Option | Description | Option | Description |
|---|---|---|---|
| *A | 40 mesh screen | N | Adds 2½" NPT male straight outlet (40779) |
| *B | 60 mesh screen | R | Adds inlet adapter to mate flight refueling disconnect (41600) |
| *C | 100 mesh screen | T | Adds adapter flange to outlet to mate military nozzle (60797) |
| D | Adds 2½" BSPP male straight outlet (40913) | W | Inlet and outlet flanges to mate Whittaker F116/ F117 nozzles. Can only be used with options 3-5. |
| E | Adds 2½" NPT female straight inlet (41914) | **3 | Specifies 35 psi spring setting |
| F | Adds outlet adapter to mate Thiem F116/F117 nozzle (60435) | **4 | Specifies 45 psi spring setting |
| | | **5 | Specifies 55 psi spring setting |

* Options B & C only available when a male half from part 3 or option R is specified. Option A available with option 7 from part 3 only.

** The spring setting number must be included at the end of part 2.

**Part 3**

One of the numbers below must be included as Part 3, as indicated above, to specify the type of inlet configuration desired, except when option R is ordered. The hose end regulator may be ordered with the inlet terminating in an adapter half only, if desired. In this case leave Part 4 blank. If a female half, either quick disconnect or dry break of some configuration is desired, Part 4 must be completed.

| Option | Description |
|---|---|
| 6 | Adds male adapter half (43046) to mate standard female QD 43108 & old style dry break QD 60672-1 |
| 7 | Adds male adapter half to mate 61154 dry break (44185) |

**Part 4**

One of the following letters must be included as Part 4 as indicated above to specify the inlet thread and size:

| Option | Description | Option | Description |
|---|---|---|---|
| H | Inlet thread - 2½" NPT | M | Inlet thread - 3" BSPP |
| K | Inlet thread - 2½" BSPP | P | Inlet thread - 2" NPT |
| L | Inlet thread - 3" NPT | | |

Examples: 60129-14 45 psi Hose End Regulator with inlet and outlet to mate 60427 Nozzle. (Formerly ordered as 40680-45 or 60129-1-45).

60129-1EN3 35 psi hose end regulator with 2½" NPT female inlet fitting and 2½" NPT male outlet fitting.

60129-1C56K 55 psi hose end regulator with 100 mesh screen, outlet to mate 60427 nozzle and inlet with 2½" BSPP QD

If the unit is to be ordered as a part of the nozzle, refer to the appropriate service manual for ordering information.

All current production units utilize the same Housing (23) and there is no external way of distinguishing between them. The 55 psi unit previously utilized Housing (23A) which had either a yellow painted or alodined (gold or yellow color) stripe around the housing or the housing was completely yellow. (It was the consensus of the industry that this was no longer desired). The individual springs are color coded as explained in a later section of this manual. (Older units may have the entire body alodined or be black with no identification as to spring setting).

## 4.0 SAFETY INSTRUCTIONS

**NOTE: The subject regulator incorporates a highly loaded spring that moves the piston against the pressure during operation. It is worth noting that one should take care in disassembly so as not to be injured by the spring loaded piston.**

The smaller end of the piston is vented to the atmosphere through a breather. Due to the fact that the piston is sealed with a sliding Teflon seal there is always a minute amount of leakage from the pressure side of the piston to the chamber behind the piston. As the amount of fuel increases in this cavity, it will be forced out of the breather with each stroke of the piston. This small leakage is normal, however as wear on the seal and piston become more with use the leakage will become more significant and the parts should be replaced. Care should be exercised such that the breather is not pointed toward the operator during operation to prevent fuel from coming into contact with sensitive areas of the body. The breather port should not be plugged at any time. This will make the unit inoperable.

## 5.0 SPECIAL TOOLS

The following special tools are recommended for proper repair and or overhaul of the hose end control valve:

- 61607 Ball Assembly Tool.
- 61656 Blockout device.
- No part number - Seal run-in tool - See Figure 4.
- WL4680 Torque Wrench or Standard torque wrench is required for some disassembly and re-assembly. WL4680 includes several sockets for special usage on Eaton's Carter brand products.

## 6.0 DISASSEMBLY

6.1 Remove the regulator from the nozzle by unscrewing the six screws and washers holding it to the nozzle and quick disconnect.

6.2 Depress piston (2) with the use of an arbor press or equivalent in order to remove the Retaining Ring (1) from its groove in the Housing (23) or (23A).

**WARNING**

**Piston (2) is under an initial spring load of approximately 65 pounds. Use care in disassembly to avoid serious injury to personnel and equipment.**

6.3 Slowly release the load from the arbor press and allow the Piston Spring (6), (6A), or (6B) to push the piston assembly out of the Housing (23) or (23A). It is now possible to remove the Outer Piston (2), the Screw (4),

The "Stat-O-Seal" (5) and the Inner Piston (3) as an assembly. Screw (4) should be removed and discarded at this time. **Reusing this screw is not recommended.**

6.4 Regulator is supplied with one of three Springs (6) that are rated to produce a controlled pressure at the nozzle of 35, 45 or 55 psig. The springs can be identified as shown in the table below:

| Rated press. psi | Spring color coding |
|---|---|
| 35 | White (older springs were orange, or plain with yellow on ends only). |
| 45 | Red or blue(latest design that assures limitation of pressure to 50 psi maximum during decreasing flow rates with 90 psi inlet pressure). (Older springs were black or natural stainless steel [brownish to gray to silver]). The red spring replaces the blue one in production to improve high flow capacity. Unless one is experiencing a flow restriction using the blue spring there is no need to replace it with a newer red one. |
| 55 | Yellow (inside diameter only). (Older springs were forest green). |

6.5 Screws (9) are self-locking type screws that utilize a nylon insert in the threads to affect the resistance required to provide the locking. They are designed to be reused a number of times before losing their locking effectively. Using a torque driver, remove Screw (9) and Washer (10), measuring the torque during removal. If the torque is less than 1.5 in lbs (0.017 m kg) discard the screw and replace it with a new one during reassembly. This permits the remainder of the parts, O-ring (15), Seal Spacer (16), Seals (17), O-Rings (18), Quad-Ring (12), Ball (13) and Spring (14), to be removed. Be careful not to lose the small Ball (13). There have been cases reported that during certain conditions of defueling an aircraft, Spring (14) has allowed the Ball (13) to be wedged inside the end coil. The Spring (14) has been redesigned to prevent this from happening and replaced with the part number shown. Since the two springs are very small it is not possible to distinguish between the old and new. It is recommended, therefore, unless it is known for certain that the new part number is being used, that the Spring (14) be replaced at each overhaul.

6.6 Carefully remove the Outer Piston Seal (7) and O-Ring (8) from their groove in the outlet of the Housing (23) or (23A).

6.7 Older units incorporate a Breather Assembly (19) that was built up from a basic plug, a piece of screen and a retaining ring. The outlet of the unit was directed straight outward from the body. Later units incorporated a solid appearing plug, however the plug, when inspected, contains an internally mounted sintered metal filter and two bleed holes that direct any flow back toward the body. This type of breather assembly has been replaced with a solid appearing plug that contains a screen that is permanently retained in the plug. It is not necessary to remove the Breather Assembly (19) unless the filter or screen is clogged and requires cleaning. In this case, remove the Assembly (19) and flush it vigorously in clean solvent. If the part remains dirty or clogged, then replacement of the entire assembly will be necessary.

## 7.0 INSPECTION

7.1 It is recommended that the following parts be replaced at each overhaul:

| Item Number | Description |
|---|---|
| 4 | Screw |
| 5 | Stat-o-seal |
| 7 | Outer Piston Seal |
| 8 | O-ring |
| 12 | Quad-ring |
| 15 | O-ring |
| 14 | Spring |
| 17 | Inner Piston Seal |
| 18 | O-Ring |
| 26 | O-Ring |

7.2 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.

7.3 Inspect the outer diameters of both the Inner (3) and Outer Pistons (2) for scratches. This part must be smooth and free of imperfections to prevent excessive leakage. If the unit exhibits continual leakage through the Breather Assembly (19) during operation, either the Inner Piston (3) or its Seal (17) or O-ring (18) are the cause. If the unit exhibits too great of pressure increase upon closure the fault can lie with either the Outer Piston

(2), its Seal (7), O-ring (8), Quad-ring (12) or O-ring (15).

## 8.0 REASSEMBLY

Reassemble in reverse order of disassembly, noting the following:

8.1 **Do not lubricate any seals or o-rings with the exception of items 12, 19 & 20.** These may be lubricated for ease of installation. Lubrication of the other seals may tend to cause leakage or pressure creep.

8.2 On older units, only one each O-ring (18) and Seal (17) will be used with two Spacers (16). It is recommended that this be changed to agree with the illustrated Figure I. O-ring (18) is installed in the groove in Seal (17) prior to inserting into Housing (23) or (23A). Be sure that the first Seal (17) is inserted into the Housing (23) or (23A) first, followed by a Spacer (16) then the other Seal (17). If only a single Seal (17) is used, a Spacer (16) is inserted on either side of the Seal (17).

8.3 Install O-ring (8) into the outside groove of Seal (7). This sub-assembly can be installed into the groove in the Housing (23) or (23A). Install Housing (23) or (23A) into a vise with the outlet accessible. Insert the lapping tool described in Figure 2 into a variable speed hand drill. Insert the modified Outer Piston on the tool into the Seal (7). Lubricate the seal and tool liberally with alcohol to prevent the seal from turning during the lapping operation. Start the drill at a medium speed (about 1,000 rpm) and move the tool up and down staying in the seal for at least one minute. Remove tool and clean seal and tool with alcohol.

8.4 Two drops of Loctite 222, 242 or 271 shall be applied to the threads of the Screw (4) prior to its being inserted into the assembly. (Shake Loctite well before using). The Screw (4) shall be tightened to a torque limit of 18 to 20 in-lbs (0.207 to 0.230 kg-m).

8.5 Insert Spring (14), Ball (13) and O-ring (12) into hole in Housing (23) or (23A).

8.6 Install O-Ring (15) into the Housing (23) or (23A) and using the four Screws (9) and Washers (10) reassemble the Seal Retainer (11). Be sure that the bleed hole in the Seal Retainer (11) aligns with the spring loaded Ball (13).

8.7 The remainder of the parts may be re-installed.

## 9.0 TEST

9.1 The reassembled unit may be tested as a separate unit or as a component of a complete nozzle.

9.2 Test conditions

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

9.3 Functional Test

If the unit is tested as a part of the nozzle, the nozzle should be attached to an Eaton Carter brand Model 6958CG or CH adapter and maintained in an open position during any test subjecting the assembly to 300 psi.

9.3.1 Simultaneously apply 300 psi fluid pressure to the inlet and outlet of the unit for 2 minutes, then reduce pressure to zero. During the second minute of pressurization, check the regulator for external leakage, distortion or any other damage to any part of the regulator. There shall be no evidence of distortion or damage to any part of the regulator. Formation of a free-falling drop of test fluid from the ambient vent port during the second minute of pressurization shall be cause for rejection. Leakage from this port can be caused by the seals of the Inner Piston (3) or the sealing surface of the piston itself. New regulators shipped from the factory since 1995 are not allowed to have any leakage or wetting at all. Leakage from this port can be caused by the seals of the Inner Piston (3) or the sealing surface of the piston itself.

9.3.2 The unit shall be installed in a test setup that provides a flow rate of 500 cc/min with gauges (0-100 psi) mounted upstream and downstream. Fill the unit with test fluid, ensuring that all air is purged from the assembly. Apply 15 ± 3 psig above the regulator spring rating to the inlet of the unit and establish a flow of 500 ± 50 cc/min. and read the outlet pressure. The outlet pressure shall not exceed 5 psig above the pressure rating of the regulator.

9.4 System Test - The hose end regulator controls pressure by creating a restriction in response to the pressure at its outlet. If the refueling system utilizes a secondary control valve it will be necessary to override the regulator to determine if the secondary is functioning properly. Naturally one can remove the regulator. The better choice is to utilize a Block Out Device. There are two possible choices of Block Out Devices available on the market.

- One such device consists of two fittings on a short hose that will connect the regulator breather port to a nozzle port. This will deactivate the regulator by routing the nozzle pressure into the ambient sense port (breather port). The regulator will therefore stay open. The refueling system may be fully checked out independently from the regulator. This type of

device has a large disadvantage. Fuel injected within the ambient cavity of the regulator must be drained. This is difficult and the fuel will continue to be pushed out of the Breather Assembly (19) for days after such a use. With such bleed flow one can't determine whether the unit is simply purging itself or whether there is a main seal leak.

Hose type block out devices are commercially available to fit all Eaton Carter brand nozzles and regulators. These units provide a quick disconnect fitting to replace the Breather Assy (19), a dry break fitting to fit into one of the nozzle ports and the hose assembly with the mating male disconnect fittings. The special fittings provided for the regulator and nozzle can remain installed at all times.

One device is manufactured by Warner Lewis, Jr., Industrie-Filter GmbH, Fasanenweg 5, D-65451 Kelsterbach, Germany, Fax 49-6107-6003.

- Eaton has a block out device, part number 61656, that does not introduce fuel into the ambient chamber and therefore overcomes the continuous bleed flow from the Breather Assembly (19). This block out device, shown in figure 4, can be used on the majority of all Eaton Carter brand regulators. There are some old units in service that will require the use of the hose method described above. On these units the hole at the bottom of the Breather Assembly (19) port is not large enough to accept the 61656. The instructions for use of the 61656 are included on the unit.

**CAUTION**

**Do not refuel an aircraft with the block out device in place. The hose end regulator will not be operative, therefore the primary control system will not function.**

After using the hose type block out device, cycle the system several times to force residual fuel out of the breather port of the regulator.

Another use for the block out device would occur should a pressure defueling of the aircraft be required and the pressure anticipated at the nozzle would be greater than 30 psi. The device is not normally required on suction defueling.

## 10.0 ILLUSTRATED PARTS CATALOG

Table 1.0 tabulates the parts and sub-assemblies comprising Model 60129-1 Hose End Regulator. The item numbers of the table are keyed to the exploded views of the regulator diagrammed in Figures 1 and 2.

**Table 1.0**

| Item | Part Number | Description | Units/ Assy | Nozzle Option | Spares/10 Units/Yr |
|---|---|---|---|---|---|
| 1 | RRT-268-S | Retaining Ring | 1 | All | - |
| 2 | 23889 | Outer Piston | 1 | All | - |
| 3 | 24096 | Inner Piston | 1 | All | - |
| 4 | LP526C1024R8 | Screw | 1 | All | 10 |
| 5 | 600-001-10 | Stat-O-Seal | 1 | All | 10 |
| 6 | 27014 | Spring, 35 psi (White) (older units orange) | 1 | "3" | - |
| 6A | 23892 | Spring, 45 psi (red) (older units blk or blue) | 1 | "4" | - |
| 6B | 28443 | Spring, 55 psi (Yellow) | 1 | "5" | - |
| 7 | 23893 | Seal, Outer Piston | 1 | All | 10 |
| 8 | MS29513-147 | O-Ring | 1 | All | 10 |
| 9 | LP515-8R7 | Screw | 4 | All | 40 |
| 10 | GF960-8 | Washer | 4 | All | - |
| 11 | 23890 | Seal Retainer | 1 | All | - |
| 12 | 220724-007 | Quad-Ring (Note 8) | 1 | All | 10 |
| 13 | GF19060-1012 | Ball | 1 | All | - |
| 14 | 210189 | Spring | 1 | All | - |
| 15 | MS29513-229 | O-Ring (Note 8) | 1 | All | 10 |
| 16 | 24059 | Spacer | 1 | All | 10 |
| 17 | 24085 | Seal | 2 | All | 20 |
| 18 | MS29513-126 | O-Ring | 2 | All | 10 |
| 19 | 40427 | Breather Assy | 1 | All | - |
| 20-22 | Left Intentionally Blank | | | | - |
| 23 | 40681 | Housing (35 & 45 psi) | 1 | "3 & 4" | - |
| 23A | 40681-55 | Housing (was 40681-1) | 1 | "5" | - |

| Item | Part Number | Description | Units/ Assy | Nozzle Option | Spares/10 Units/Yr |
|---|---|---|---|---|---|
| 23B | 47198 | Housing | 1 | W only | - |
| 24 | GF16995-49 | Screw | 6 | All | - |
| 25 | 5710-63-30 | Washer (was 25493) | 6 | All | - |
| 26 | 201201-151 | O-ring | 1 | All | 10 |
| 27 | 60129-1* | Regulator | - | - | - |
| 27A | 60129-1W* | Reguator (Whittaker flanges) | - | - | - |
| 28 | 40913 | 2½" BSPP Male Adapter | 1 | D | - |
| 29 | 40779 | 2½" NPT Male Adapter | 1 | N | - |
| 30 | 60435 | Thiem Adapter | 1 | F | - |
| 31 | 41914 | 2½" NPT Female Adapter | 1 | E | - |
| 32 | 60797 | Military Nozzle Adapter | 1 | T | - |
| 33 | 41600 | Flight Refueling Adapter (Note 3) | 1 | R | - |
| 34 | 43046 | QD Male Adapter (Note 4) | 1 | "6" | - |
| 35 | 44185 | DB Male Adapter (Note 5) | 1 | "7" | - |
| 36 | 41767-60 | Screen Assy - 60 mesh (Note 6) | 1 | B | - |
| | 41676-100 | Screen Assy - 100 mesh (Note 6) | 1 | C | - |
| 36A | 201201-039 | O-ring (Note 6) - obsolete | 1 | B, C | - |
| 36B | 80207-60 | Screen - 60 mesh - obsolete | 1 | B | - |
| | 80207-100 | Screen - 100 mesh - obsolete | 1 | C | - |
| 36C | 208091 | Retainer | 1 | B, C | - |
| 36D | 210398-60 | Screen - 60 mesh | 1 | B | - |
| | 210398-100 | Screen - 100 mesh | 1 | C | - |
| 37 | 44373-60 | Screen Assy - 60 mesh (Note 5) | 1 | B | - |
| | 44373-100 | Screen Assy - 100 mesh (Note 5) | 1 | C | - |
| 37A | 208092-60 | Screen - 60 mesh | 1 | B | - |
| | 208092-100 | Screen - 100 mesh | 1 | C | - |
| 36C | 208091 | Retainer | 1 | B,C | 3 |
| 38 | 40679-* | Quick Disconnect (Note 4) | 1 | H-P | - |
| 39 | 60672-1* | Dry Break (old style) (Note 7) | 1 | Note 7 | - |
| 40 | 61154* | Dry Break (new style) (Note 5) | 1 | Note 5 | - |
| | KD60129-1 | Kit, Seal to completely overhaul a unit.. Contains items number 4, 5, 7, 8, 9, 12, 15, 16, 17, 18, & 26. (Replaces Kit 80460-1). | | | |
| | KD60129-2 | Kit to convert single small piston seal unit to dual seal design. Contains items number 4, 5, 7, 8, 9, 12, 15, 16, 17, 18, & 26. | | | |

Notes:

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 and "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/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. For detail parts information refer to SM427MISC.
4. For detail parts information refer to SM40679.
5. For detail parts information refer to SM61154. Screen shown used only with item 40 only.
6. Screen shown used only with item 38. For detail parts information refer to SM40679. Older units utilize a Screen (36) that is retained in position by an o-ring. Newer units utilize a wire clip as a retainer. When replacing the older Screen (36) discard the o-ring as well as the Screen (36).
7. For detail parts information refer to SM60672-1.
8. Both items (12) and (15) are current production parts that replaced NAS1594-007 O-ring and 210174-229 Quad-ring respectively. These change were made as design improvements. The older parts can continue to be used until the newer parts are available. When ordered, the older parts will automatically be replaced with the new parts.
9. Item (27A), 47189 is used only on option W. Option W is a stand alone unit and can not be combined with any other options except for the choice of springs (6), (6A) or (6B).

* Indicates a dash number is required to complete the part number.

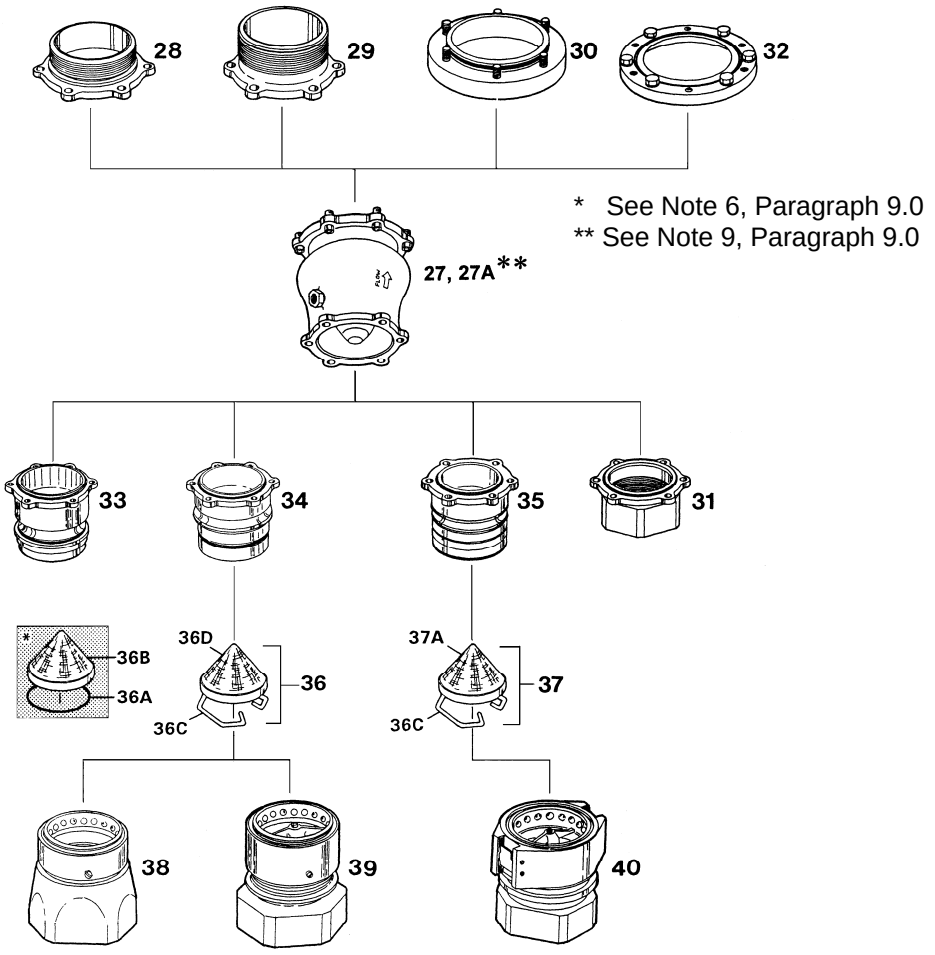



**Figure 1**
**Options for 60129-1**

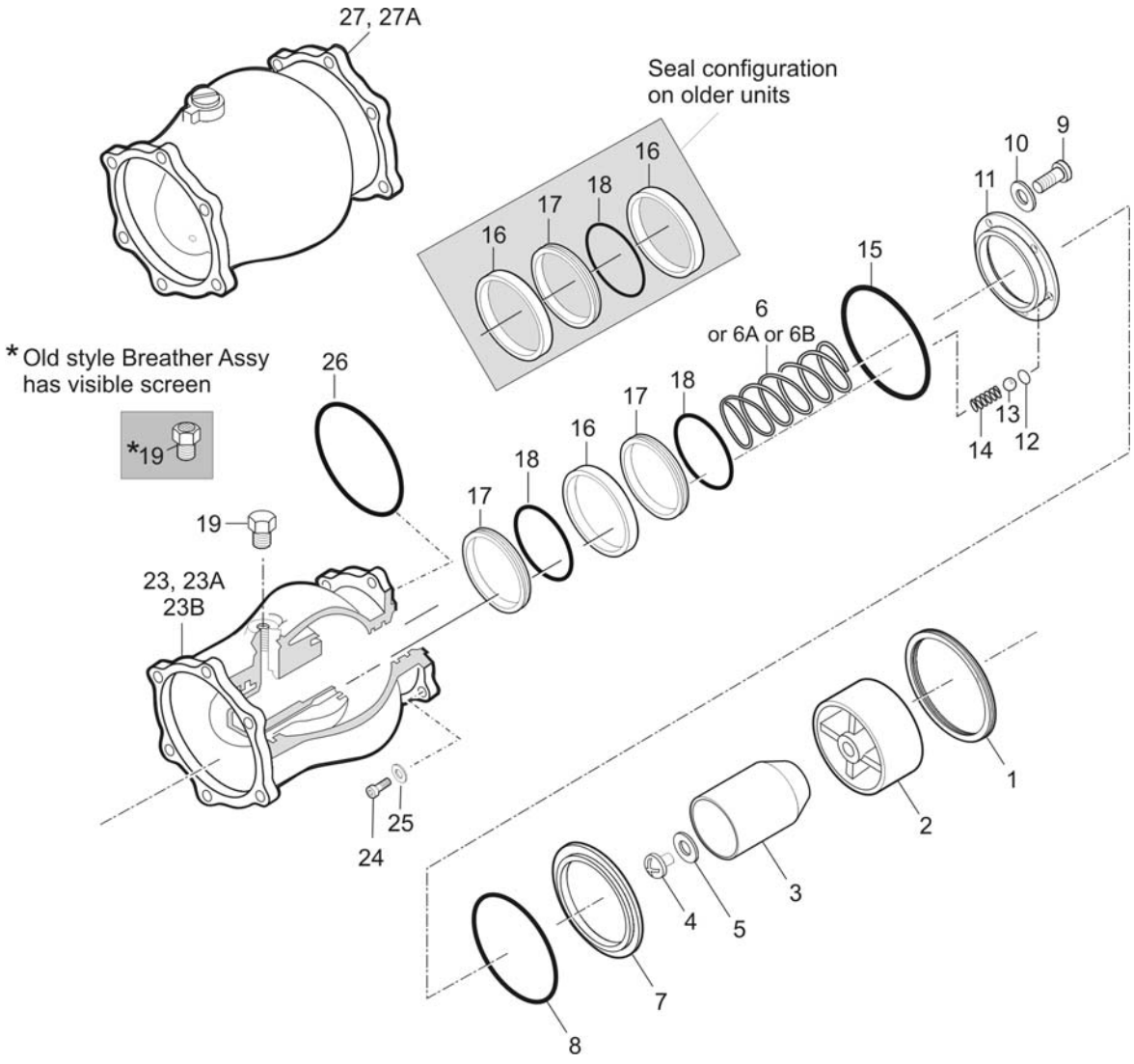



**Figure 2**
**Parts Breakdown**

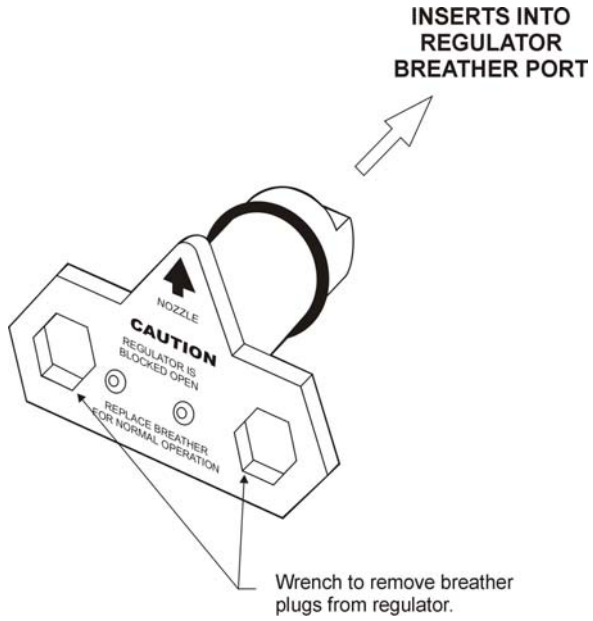
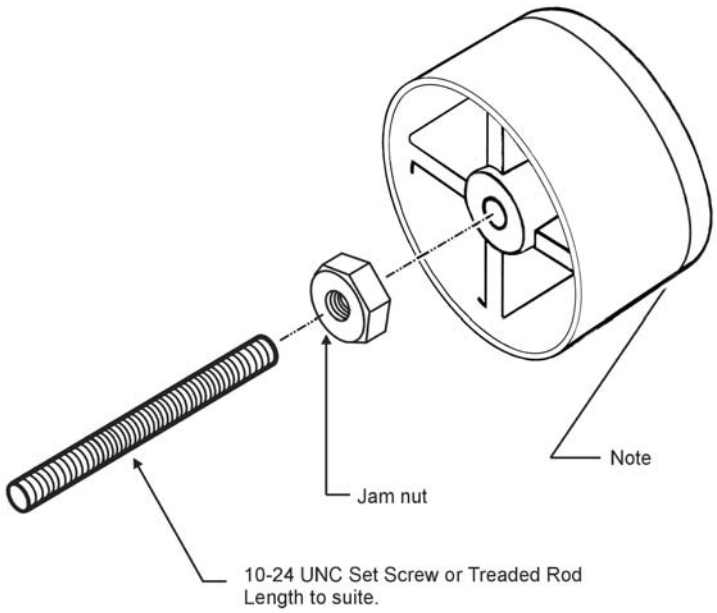



**Figure 3**
**61656 Blockout Device**




**Note:** Install set screw into (2) Outer Piston (23889) and fix with the jam nut. Using a hand drill fixed in a vise rotate the assembled tool at maximum speed of the drill. Using a long strip of emery cloth chamfer the edge of the piston (edge opposite the knife edge) to allow for ease of installation into regulator for lapping. See paragraph 8.2 for lapping instructions.

**Figure 4**
**Typical Lapping Jig**

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9650 Jeronimo Road
Irvine, CA USA 92618
Ph: (949) 452-9500
Fax: (949) 452-9992