



Halogenated Closed Recovery System **3G0095**

Model: Halogenated Closed Recovery System

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System Operation Requirements:

1. Air compressor – Capable of producing 75 – 125 PSI at 13 CFM minimum

Note: Customer supplied air compressor must have an adjustable pressure regulator

2. Weighing scale(s) – Digital or mechanical, Capacity; 0 – 50 lbs (for hand held extinguishers), & 0 – 200 lbs (for wheeled units and recovery cylinders).

3. Clean agent(s) bulk supply
(Customer must supply 40 lbs of “clean agent” to system recovery cylinder for initial set-up)

4. Nitrogen and Argon cylinders, with valves, and regulators
(Customer must supply a “Charge Gas” source for initial set-up)

Note: Nitrogen must be a minimum of -70 degrees Fahrenheit dew point

5. Scale stand (optional or customer supplied) or bench top

Recommended Operating Area:

Depth – 3 ft Width – 9 ft Height – 5 ft

	<u>Weight</u>	<u>Dimensions</u>
Console / Stand	116 lbs	24” d x 29” w x 42” h
Recovery Cylinder (Optional or customer supplied)	79 lbs	15” d x 15” w x 49” h
Scale (Optional or customer supplied)	12 lbs	12” d x 13” w x 3” h

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System Specifications:

- Vacuum – 20 Inches Maximum
- System Pressure – 275 PSI Maximum
- Clean Agent Liquid Per Minute – 20 lbs Maximum
- Moisture Eye – 20 PPM (**Green** = Dry), 65 PPM (Yellow = Wet)
- Filters – 15 Microns Particulate Matter, 5 PPM Moisture
- Recovery Cylinder – Maximum Pressure Not To Exceed 260 PSI

System Capabilities:

- Recover Liquid Clean Agents (Halon 1211, Halotron, or FE-36) and Vapor from Extinguishers (Portable Cylinders)
- Recover Charge Gas (Nitrogen or Argon) from Extinguishers (Portable Cylinders)
- Recharge Liquid Clean Agents (Halon 1211, Halotron, or FE-36), Vapor, and Charge Gas to Extinguishers (Portable Cylinders)
- Recycle Contaminated or Wet Clean Agents (Halon 1211, Halotron, or FE-36) back to Specifications
- Transfer Clean Agents (Halon 1211, Halotron, or FE-36) from Bulk Storage Cylinders to Extinguishers (Portable Cylinders)
- Recover at a Minimum Of 99% Efficiency Rate
- Detect Moisture in Clean Agents
- Filter Moisture down to 5 PPM and Filter Particulate Matter down to 15 Microns

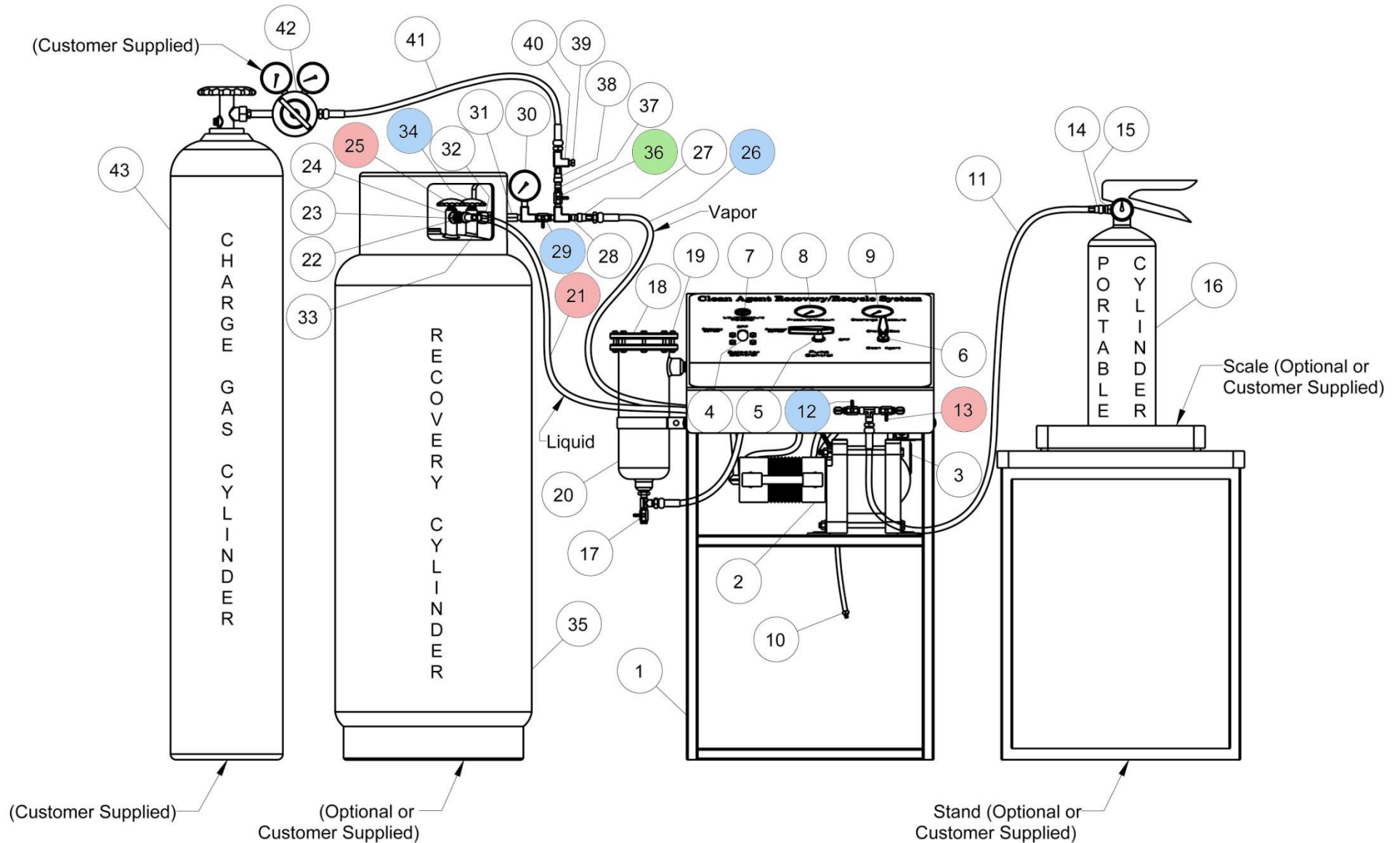
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Item Numbers / Description:

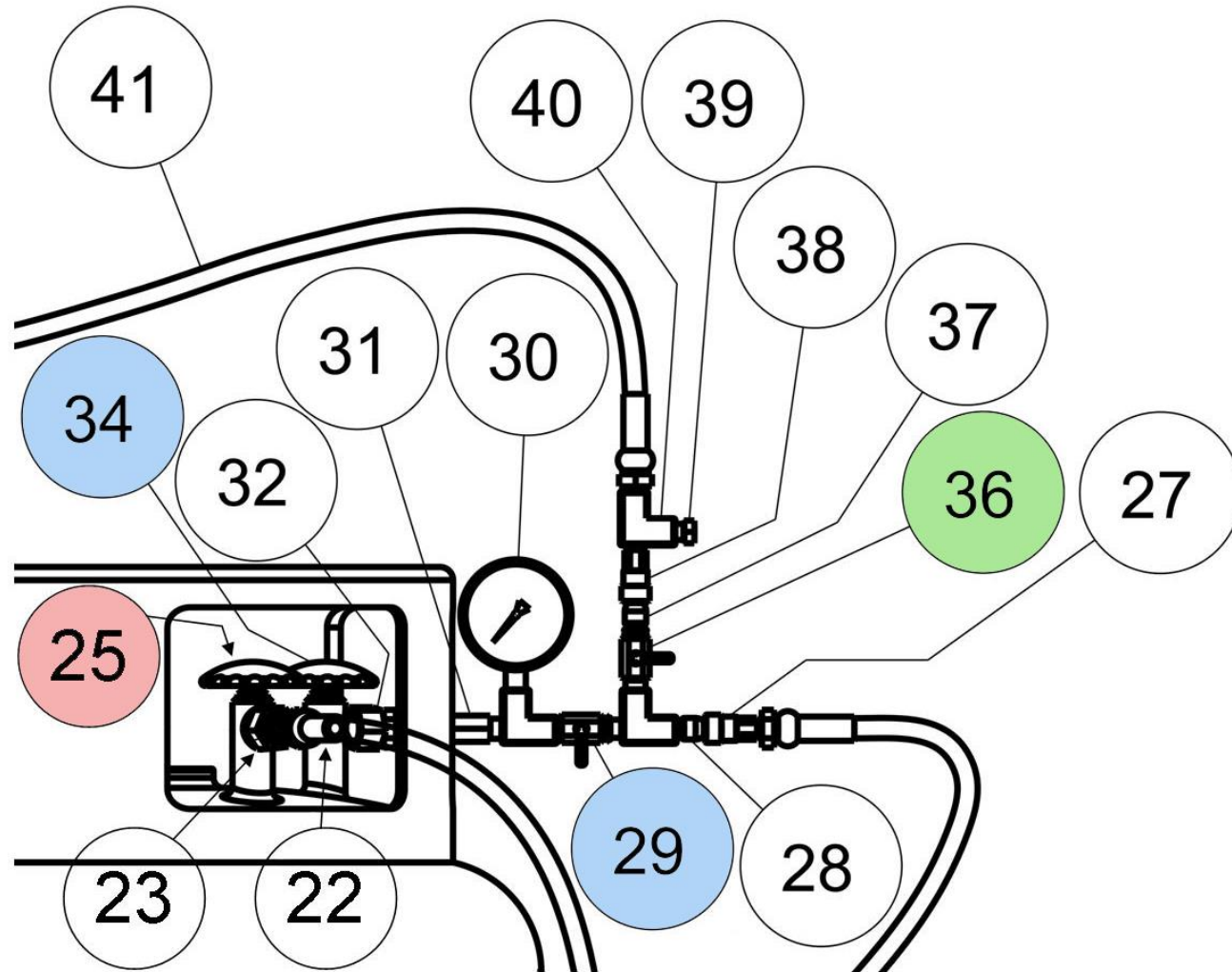
1. Clean Agent Stand/Console
2. Clean Agent Gas Booster (Pump)
3. Moisture Filter, Auto-Drain
4. Selector Control
5. Pump Control
6. Charge Gas/Clean Agent Valve
7. Liquid/Moisture Indicator
8. Pressure/Vacuum Gauge
9. Discharge Pressure Gauge
10. ¼" NPT Male Connector (Air Line)
11. Fill Line, To Portable Cylinder
12. ¼" **Blue** "Vapor" Ball Valve
13. ¼" **Red** "Liquid" Ball Valve
14. Female Quick Coupler (Fill Line)
15. Extinguisher (Portable Cylinder) Adapter
16. Extinguisher (Portable Cylinder)
17. ¼" Purge Ball Valve
18. Moisture Filter Shell End Plate
19. Moisture Filter Shell Bolts
20. Moisture Filter Shell
21. **Red** "Liquid" Line, To Recovery Cylinder
22. Female Quick Coupler (Liquid Line)
23. Recovery Cylinder Adapter Assembly (Liquid Port)
24. "Liquid" Port
25. **Red** "Liquid" Hand Wheel
26. **Blue** "Vapor" Line, To Recovery Cylinder
27. Female Quick Coupler (Vapor Line)
28. Male Quick Connect "Vapor" (Vapor/Gauge Assembly)
29. ¼" **Blue** "Vapor" Ball Valve (Vapor/Gauge Assembly)
30. 0 – 600 PSI Recovery Cylinder Pressure Gauge
31. ¼" Female Quick Coupler (Vapor/Gauge Assembly)
32. Recovery Cylinder Adapter Assembly (Vapor Port)
33. "Vapor" Port
34. **Blue** "Vapor" Hand Wheel
35. Recovery Cylinder (Optional or Customer Supplied)
36. ¼" **Green** "Gas" Ball Valve (Vapor/ Gauge Assembly)
37. Male Quick Connect "Gas" (Vapor/ Gauge Assembly)
38. Female Quick Coupler (Charge Gas Line)
39. 100 PSI Relief Valve (Charge Gas Line)
40. ¼" Tee (Charge Gas Line)
41. "Charge Gas" Supply Hose Assembly
42. Pressure Reducing Regulator
43. "Charge Gas" Cylinder

* Items 12 & 13 are part of the Liquid/Vapor Assembly

Recommended Layout



* Items 12 & 13 are part of the Liquid/Vapor Assembly



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Set-Up Procedure

1. Open all packages and unwrap all system components to prepare them for assembly. Inspect each part for evidence of shipping damage. (If any parts appear to be damaged please notify the freight carrier as well as Getz Equipment Innovators.)

Note: Skip step 2 if a recovery cylinder is already set up and in place.

2. Start with the (optional or customer supplied) recovery cylinder (item 35). Remove any valve protector caps from the valve ports (items 24 & 33) on the top of the recovery cylinder. Install the adapter assembly (item 23), turning clockwise, to threaded valve port (item 24) with the **red** “liquid” hand wheel. Tighten securely. Then install the adapter assembly (item 32), turning clockwise, to threaded valve port (item 33) with the **blue** “vapor” hand wheel. Tighten securely.

***** Included in the shipment is a package that contains Couplings (1G0507) and Quick Connects (1G0508). These fittings will be marked with green paint and are to be use with Halotron agent only.**

3. Connect the female quick coupler (item 31), of the vapor/gauge assembly, to the male quick connect of the adapter assembly (item 32), on the **blue** “vapor” port.
4. Connect the female quick coupler (item 27), of the **blue** “vapor” line, to the male quick connect (item 28), on the vapor/gauge assembly. Then connect the female quick coupler (item 22), of the **red** “liquid” line, to the male quick connect (item 23) on the adapter assembly.
5. Locate the “charge gas” supply hose assembly (item 41) and connect the female quick coupler (item 38) to the male quick connect (item 37). Attach the ¼” NPT male hose, of the “charge gas” supply hose assembly (item 41), to the low pressure side of the regulator on your “charge gas” supply cylinder. The “charge gas” regulator must be set to zero (0) PSI output pressure during assembly.
6. The pump control (item 5), on the control console, should be in the “off” position. The charge gas/clean agent valve (item 6) should be in the “clean agent” position. Connect the ¼” NPT male fitting (item 10) to the air compressor regulator. Set the regulator to 100 - 125 PSI.
7. Use a large capacity scale (0-200 lbs) to measure the amount of “clean agent” transferred from the bulk tank to the recovery cylinder.
8. Locate your “portable cylinder” clean agent(s) (Halon 1211, Halotron, or FE-36) recovery cylinder to the side of the control console, opposite of the small capacity scale, (As shown on page 6). The recovery cylinder should be pressurized with charge gas to approximately 60 PSI.
9. Turn the selector control (item 4), on the control console, to the “*recovery cylinder*” position. Close the two ¼” ball valves (items 29 & 36) on the vapor/gauge assembly. Open both the **red** “*liquid*” hand wheel (item 25) and the **blue** “*vapor*” hand wheel (item 34) on the recovery cylinder.

10. Transfer 40 lbs of “clean agent” from the bulk tank to the optional recovery cylinder (item 35), by connecting the female quick coupler (item 14) on the Fill Line (item 11), to the liquid port of the bulk tank. Complete by following the procedures in this manual.
11. Proceed to the next operating procedure or *close all valves*.

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Recovery Procedure:

1. Place the extinguisher (portable cylinder) (item 16) on the (optional or customer supplied) scale to record the total charged weight of “clean agent” prior to discharge. (If the nozzle or hose is included in the initial weight, include it in the final weight.)
2. Place the extinguisher (portable cylinder) (item 16) in a cylinder vise (optional or customer supplied). Remove the nozzle or hose assembly from the extinguisher valve and install the proper recharge adapter (item 15), tighten securely. Connect the female quick coupler (item 14), on the Fill Line (item 11), to the extinguisher recharge adapter (item 15).
3. Fully open the **blue** “vapor” handwheel (item 33) on the recovery cylinder, this will allow the pressure gauge (item 30) to show the recovery cylinder pressure. Fully open the **red** “liquid” hand wheel (item 25) on the recovery cylinder (item 35). Turn the selector control (item 4), on the control console, to the “*recovery cylinder*” position.
4. Locate the two, ¼” ball valves (items 12 & 13) on the Liquid/Vapor Assembly. Turn the ¼” **red** “liquid” ball valve (item 13) to the *open* position. The ¼” **blue** “vapor” ball valve (item 12) must be in the *closed* position.
5. The ¼” **blue** “vapor” ball valve (item 29), and the ¼” **green** “gas” ball valve (item 36) on the vapor/gauge assembly should be closed at all times during the recovery procedure.
6. The handle of the charge gas/clean agent valve (item 6), on the control console, should be in the “*clean agent*” position.
7. Turn the pump control (item 5) on the control console to the “*on*” position. While watching the clear glass liquid/moisture indicator (item 7), depress the valve lever on the extinguisher (portable cylinder) (item 16) and lock *open* with a suitable clamping device. If the liquid flowing through the indicator is anything other than clear, refer to the “recycle procedure” (pages 14 – 15).
8. Watch the pressure/vacuum gauge (item 8). When the pressure/vacuum gauge (item 8) reads 10 PSI, release the extinguisher from the cylinder vise and slowly rotate the extinguisher right side up to upside down; rock the extinguisher back and forth, while upside down. When the pressure/vacuum gauge (item 8) reads negative 15 inches of vacuum or greater; place the extinguisher back into the cylinder vise, remove the clamping device, and release the extinguisher lever.
9. Close the ¼” **red** “liquid” ball valve (item 13), on the Liquid/Vapor Assembly. Then turn the pump control (item 5), on the control console to the “*off*” position, and disconnect the female quick coupler (item 14) from the extinguisher recharge adapter (item 15).
10. Depress the extinguisher valve lever to make sure there is a good vacuum in the extinguisher (portable cylinder). It should make a whistling noise and suck air into the cylinder, check by putting your finger over the extinguisher adapter (item 15) hole.

Note: More than one hand held portable fire extinguisher may be recovered. When the recovery cylinder pressure gauge (item 30) reads approximately 100 PSI, the recovery cylinder is fully pressurized and the recovery process is complete. Maximum recommended pressure in the recovery cylinder is 100 PSI.

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Recovery Procedure (Cont'd):

11. You may continue the recovery process for more fire extinguishers until the recovery cylinder pressure is approximately 100 PSI or you have recovered approximately 200 lbs of “clean agent”.

Note: When using the (optional) recovery cylinder with the Halogenated Closed Recovery System, the maximum “clean agent” capacity is 239 lbs. And the maximum pressure rating is 260 PSI.

12. Follow the manufacturer’s instructions for disassembly, inspection, and rebuilding of each recovered extinguisher (portable cylinder).
13. Before attempting to *recharge* the extinguisher(s) (portable cylinders), *wait 15 minutes*. This will allow the liquid/moisture indicator eyelet (item 7) to react, if moisture is present in the clean agent recovery cylinder. The liquid/moisture indicator eyelet will change from **green** to **yellow** if moisture is present. If moisture is indicated, refer to the “recycle procedure” (page 14 – 15).
14. Proceed to the next operating procedure or *close all valves*.

Note: Always leave the charge gas/clean agent valve (item 6) in the “clean agent” position unless instructed to do otherwise.

It is recommended to flush/purge all liquid clean agent from the pump at the end of each day.

Getz Fire Equipment (DBA Getz Equipment Innovators) is not responsible for loss of agent due to incorrect operation.

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Recharge Procedure:

1. Install the proper recharge adapter (item 15) on the extinguisher (portable cylinder) valve. Tighten securely. Identify per the manufacturer label the total quantity of 'clean agent' required.
2. Connect the female quick coupler (item 14) on the Fill Line (item 11) to the extinguisher recharge adapter (item 15). Make sure the ¼" **blue** "vapor" ball valve (item 29) and the ¼" **green** "gas" ball valve (item 36), on the vapor/gauge assembly are closed.
3. Open both the **red** "*liquid*" handwheel (item 25) and the **blue** "*vapor*" handwheel (item 34) on the "clean agent" recovery cylinder (item 35).
4. Lay the extinguisher (portable cylinder) (item 16) on its side on the scale platform with the gauge visible. Lock the extinguisher valve lever open with a clamp or adjustable cinch strap. Turn the selector control (item 4), on the control console, to the "*portables cylinder*" position.
5. If you are using a digital scale, "tare" the extinguisher weight. For a mechanical scale, note the "empty weight". Slowly *open* the ¼" **red** "*liquid*" ball valve (item 13), on the Liquid/Vapor Assembly.

Note: The clean agent will flow freely into the fire extinguisher (portable cylinder) (item 16). Do not turn the pump control (item 5) to the "on" position until the clean agent has slowed or stopped flowing into the fire extinguisher (portable cylinder) (item 16), and the weight shown on the scale slows or stops increasing.

6. Slowly turn the pump control (item 5) to the "*on*" position. Check the scale for increased weight readings. As the extinguisher weight reading approaches within one (1) pound of calculated charge weight, slowly turn both the pump control (item 5) and the selector control (item 4) towards the "*off*" position, slowing the flow of the "clean agent" to the extinguisher. When the extinguisher reaches about ten to eleven (10-11) ounces (about $\frac{2}{3}$ lb) less than the calculated charge weight, turn the pump control (item 5) to the "*off*" position, and slowly turn the selector control (item 4) to the "*off*" position.

Note: Moving the selector control back and forth from any position will affect the portable cylinder weight. "Portables cylinder <> "off" (if approaching the goal weight); "recovery cylinder" <> "off" (over the goal weight), the operator should practice hitting the goal weight.

7. Close the ¼" **red** "*liquid*" ball valve (item 13), on the Liquid/Vapor Assembly and then turn the selector control (item 4) to the "recovery cylinder" position. With the charge gas/clean agent valve (item 6) still in the "clean agent" position, turn the pump control (item 5) to the "on" position and allow the pump to cycle until the pressure vacuum gauge (item 8) reads 5 inches of vacuum. Then turn the pump control (item 5) to the "off" position. Turn the selector control (item 4) to the "off" position.
8. Turn the charge gas/clean agent valve (item 6), to the "*charge gas*" position. Open the ¼" **blue** "vapor" ball valve (item 29) on the vapor/gauge assembly. Slowly open the ¼" **blue** "*vapor*" ball valve (item 12) on the Liquid/Vapor Assembly.

Note: When pressurizing 195 PSI extinguishers, turn the pump control (item 5) to the "off" position when the gauge needle is near the high side of the operable pressure, before the needle enters the **red** "overcharged" area, otherwise the 275 PSI relief valve will release.

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Recharge Procedure (Cont'd):

9. Slowly turn the pump control (item 5) to the “on” position and watch the extinguisher pressure gauge. When the extinguisher pressure gauge reads on the high side of the operable pressure, turn the pump control (item 5) to the “off” position. Shake the extinguisher to mix the “clean agent” and “charge gas”. *Repeat* step 9 if pressure drops below manufacturer’s recommended pressure.
10. Remove the clamp or adjustable cinch strap on the extinguisher (portable cylinder) valve lever. Close the ¼” **blue** “vapor” ball valve (item 12) on the Liquid/Vapor Assembly. Then close the ¼” **blue** “vapor” ball valve (item 29) on the vapor/gauge assembly. Turn the charge gas/clean agent valve (item 6) to the “clean agent” position. Open the ¼” **red** “liquid” ball valve (item 13) on the Liquid/Vapor Assembly.
11. Turn the selector control (item 4) to the “recovery cylinder” position. Turn the pump control (item 5) to the “on” position, allow the system to run until the pressure/vacuum gauge (item 8) reads 5 inches of vacuum. Then close the ¼” **red** “liquid” ball valve (item 13) and turn the pump control (item 5) to the “off” position.
12. Disconnect the female quick coupler (item 14), on the Fill Line (item 11), from the extinguisher recharge adapter (item 15). Reinstall the safety pull pin and the tamper seal. Leak test the extinguisher according to manufacturer’s recommendations. If leak detecting fluid is used, blow all liquid residue out of the valve and wipe extinguisher to dry the exterior. Reinstall the hose or nozzle. Then record the final extinguisher assembly weight.

Repeat the extinguisher recharge procedure if there are remaining extinguishers to be recharged, proceed to the next operating procedure, or *close all valves*.

Note: Always leave the charge gas/clean agent valve (item 6) in the “clean agent” position unless instructed to do otherwise.

It is recommended to flush/purge all liquid clean agent from the pump at the end of each day.

Getz Fire Equipment (DBA Getz Equipment Innovators) is not responsible for loss of agent due to incorrect operation.

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Procedure for Adding “Charge Gas” (Argon or Nitrogen) to the Recovery Cylinder:

1. Install a pressure reducing regulator (item 42) to the supply valve of your **Argon or Nitrogen** supply cylinder (item 43).
2. Attach the ¼” NPT male pipe thread, on the supply hose (item 41), to the low pressure outlet port on the regulator (item 42) of your charge gas supply cylinder.
3. Connect the female quick coupler (item 38), on the charge gas line (item 41), to the male quick connect (item 37), on the vapor/gauge assembly.

Note: The operator can skip step 4 if the check unit in the male connector (item 27) is not leaking, this will allow the charge gas to go directly into the recovery tank via the vapor/gauge assembly.

4. Connect the female quick coupler (item 27), on the **blue** “vapor” line (item 26), to the male quick connect (item 28), on the vapor/gauge assembly. Then turn the selector control (item 4) on the control console to the “*off*” position.
5. Set the pressure reducing regulator (item 42) to zero (0) output pressure, and *open* the supply valve on the charge gas cylinder (item 43).
6. Set the regulator (item 42) to 20 PSI above the reading on the recovery cylinder pressure gauge (item 30) but not to exceed 100 PSI. Optimum initial operating pressure for the recovery cylinder is 65 PSI.
7. *Open* the **blue** “vapor” hand wheel (item 34), on the recovery cylinder (item 35), and open the ¼” **blue** “vapor” ball valve (item 29) on the vapor/gauge assembly.
8. *Open* the ¼” **green** “charge gas” ball valve (item 36) until the desired pressure is reached on the recovery cylinder pressure gauge (item 30). Rock the recovery cylinder (item 35) back and forth to thoroughly mix the charge gas with the clean agent.
9. *Close* the ¼” **green** “charge gas” ball valve (item 36) and return the pressure reducing regulator (item 42) to zero (0) output pressure. *Close* the supply valve on the charge gas cylinder (item 43).
10. Proceed to the next operating procedure or *close all valves*.

Note: Always leave the charge gas/clean agent valve (item 6) in the “clean agent” position unless instructed to do otherwise.

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Recycle Procedure:

(For Removal of Moisture, Acid, Particulate Matter, and/or Color)

Caution: If the liquid/moisture indicator eyelet (item 7) on the control console is yellow or the clean agent is any color except clear, the “clean agent” must be recycled through the system before you refill the extinguisher (portable cylinder).

1. Make sure the ¼” **blue** “vapor” and **red** “liquid” ball valves (items 12 & 13), on the Liquid/Vapor Assembly, are *closed*. And that the charge gas/clean agent valve (item 6) is in the “clean agent” position.
2. Turn the selector control (item 4), on the control console, to the “recovery cylinder” position.
3. Close the ¼” **blue** “vapor” ball valve (item 29) on the vapor/gauge assembly. The **blue** “vapor” hand wheel (item 34), on the recovery cylinder (item 35) can be fully open if the ¼” **blue** “vapor” ball valve (item 29) is *closed*.
4. The female quick coupler (item 22), on the **red** “liquid” line (item 21), should be connected to the male connector of the recovery cylinder adapter assembly (item 23.) Turn the **red** “liquid” hand wheel (item 25), on the recovery cylinder (item 35), fully *open*.
5. Turn the pump control (item 5) on the control console to the “on” position and allow the system to cycle until the pressure/vacuum gauge reads negative 5 inches of vacuum.
6. With the system still cycling, remove the female quick coupler (item 27), on the **blue** “vapor” line (item 26), from the male quick connect (item 28) on the vapor/gauge assembly.
7. Connect the female quick coupler (item 14), on the Fill Line (item 11), to the male quick connect (item 28) on the vapor/gauge assembly.
8. Turn the pump control (item 5) to the “off” position and turn the selector control (item 4) to the “portables cylinder” position.
9. Open the ¼” **blue** “vapor” ball valve (item 29) on the vapor/gauge assembly, and open the ¼” **red** “liquid” ball valve (item 13), on the Liquid/Vapor Assembly. (Make sure the **blue** “vapor” handwheel (item 34) and the **red** “liquid” handwheel (item 25) on the recovery cylinder (item 35) are fully open.)
10. Turn the pump control (item 5) to the “on” position. Allow the system to circulate the “clean agent” through the filters until the liquid/moisture indicator eyelet (item 7) turns **green** or the “clean agent” looks clear through the liquid/moisture indicator glass.

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Recycle Procedure (Cont'd):

Note: Do not turn the pump control (item 5) fully on, as the system may build pressure after several minutes during the recycle phase because particulate matter will start to collect in the Y-Strainer. Closely watch the discharge pressure gauge (item 9) and slow the speed of the pump by turning the pump control (item 5) towards the “off” position (or “off”) if the discharge pressure gauge (item 9) begins to read over 200 PSI.

Refer to the “Procedure for Filter Replacement and Cleaning Brass Strainer” (pages 20-21) if the liquid/moisture indicator eyelet (item 7) does not change to **green** or the color does not return to clear within four hours.

11. Turn the pump control (item 5), on the control console to the “off” position. Turn the selector control (item 4) to the “recovery cylinder” position. Close the **blue** “vapor” hand wheel (item 34), on the recovery cylinder (item 35).
12. Turn the pump control (item 5), on the control console to the “on” position and allow the system to cycle until the pressure/vacuum gauge (item 8) reads negative 5 inches of vacuum. Then close both the ¼” **blue** “vapor” ball valve (item 29) on the vapor/gauge assembly and the **red** “liquid” ball valve (item 13), on the Liquid/Vapor Assembly. Turn pump control (item 5) to the “off” position.
13. Close the **red** “liquid” hand wheel (item 25), on the recovery cylinder (item 35). Turn the selector control (item 4) to the “off” position.
14. Disconnect the female quick coupler (item 14), on the Fill Line (item 11), from the male quick connect (item 28), on the vapor/gauge assembly. Connect the female quick coupler (item 27), on the **blue** “vapor” line, to the male quick connect (item 28), on the vapor/gauge assembly.
15. Proceed to the next operating procedure or *close all valves*.

Note: Always leave the charge gas/clean agent valve (item 6) in the “clean agent” position unless instructed to do otherwise.

It is recommended to flush/purge all liquid clean agent from the pump at the end of each day.

Getz Fire Equipment (DBA Getz Equipment Innovators) is not responsible for loss of agent due to incorrect operation.

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Procedure for Switching Clean Agents (Halon 1211 or FE-36):

1. *Open* both the **red** “liquid” hand wheel (item 25) and the **blue** “vapor” hand wheel (item 34) on the recovery cylinder (item 35). Make sure the ¼” **blue** “vapor” ball valve (item 29), on the vapor/gauge assembly is closed. Then turn the selector control (item 4), on the control console, to the “*recovery cylinder*” position. Turn the pump control (item 5) to “*on*” and allow the system to cycle until the pressure/vacuum gauge (item 8) reads negative 5 inches of vacuum. Turn the pump control (item 5) to “*off*”.
2. Disconnect the female quick coupler (item 27), on the vapor line (item 26), from the male quick connect (item 28), on the vapor/gauge assembly, if it is connected. Connect the female quick coupler (item 14), on the Fill Line (item 11), to the male quick connect (item 28) on the vapor/gauge assembly.
3. Make sure the selector control (item 4), is still in the “recovery cylinder” position and the charge gas/clean agent valve (item 6) is in the “clean agent” position. *Open* the ¼” **blue** “vapor” ball valve (item 29), on the vapor/gauge assembly and the ¼” **red** “liquid” ball valve (item 13) on the Liquid/Vapor Assembly.
4. Turn the pump control (item 5) to “*on*”. Allow the pump to run for 1 minute to purge all **liquid** from the system.
5. Close the **blue** hand wheel on the recovery tank (item 34) and allow the system to cycle until the pressure/vacuum gauge (item 8) reads negative 5 inches of vacuum. Then close the ¼” **blue** “vapor” ball valve (item 29), on the vapor/gauge assembly and turn the pump control (item 5) to “*off*”.
6. Connect the female quick coupler (item 38) on the **Nitrogen** supply hose (item 41), to the male quick connect (item 37) on the vapor/gauge assembly.
7. Set the pressure reducing regulator (item 42) to zero (0) output pressure, and *open* the supply valve on the **Nitrogen** cylinder (item 43).
8. Set the regulator to 20 PSI above the reading on the recovery cylinder pressure gauge (item 30), but do not exceed 80 PSI. *Open* the ¼” **green** “gas” ball valve (item 36) on the vapor/gauge assembly.
9. Turn the pump control (item 5) to “*on*”. Allow the pump to run for 1 minute to purge all **vapor** from the system.
10. Set the pressure reducing regulator (item 42) to zero (0) output pressure, and *close* the supply valve on the **Nitrogen** cylinder (item 43). Then close the ¼” **green** “gas” ball valve (item 36), on the vapor/gauge assembly. Allow the system to cycle until the pressure/vacuum gauge (item 8) reads negative 5 inches of vacuum. *Close* the **red** “liquid” hand wheel (item 25), on the recovery cylinder (item 35). Turn the pump control (item 5) to “*off*”.

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Procedure for Switching Clean Agents (Halon 1211 or FE-36) (Cont'd):

11. Close the **red** “liquid” ball valve (item 13) to the Fill Line. Disconnect the female quick coupler (item 14), on the Fill Line (item 11), from the male quick connect (item 28), on the vapor/gauge assembly.

Note: The ¼” purge ball valve (item 17) can be *opened* at this time to relieve the **Nitrogen** pressure inside the Halogenated Closed Recovery System. The operator should only open the ¼” purge ball valve (item 17) if they are certain that all of the liquid and vapor, of the “clean agent”, in the Halogenated Closed Recovery System has been purged by a **Nitrogen** source. If not, the Halogenated Closed Recovery System can be relieved of internal pressure by using two or three empty 17lb clean agent extinguishers and by carefully following steps A & B.

- A. Install the proper recharge adapter (item 15) on one empty 17lb clean agent extinguisher. Connect the female quick coupler (item 14), on the Fill Line (item 11), to the extinguisher recharge adapter (item 15) and lock the extinguisher valve open with a clamp or adjustable cinch strap. *Open* the ¼” **red** “liquid” ball valve (item 13) to the Fill Line and turn the selector control (item 4) to the “portables cylinder” position.
- B. Leave the extinguisher connected to the Halogenated Closed Recovery System until the discharge pressure gauge (item 9) on the control console stops decreasing in pressure. Release the extinguisher valve lever, close the ¼” **red** “liquid” ball valve (item 13). Disconnect the female quick coupler (item 14), on the Fill Line (item 11), from the extinguisher recharge adapter (item 15). Connect another empty extinguisher if necessary. *Repeat* steps A & B until the discharge pressure gauge (item 9) reads zero (0) PSI.

Note: The contents of the extinguisher(s) used to relieve the internal pressure of the Halogenated Closed Recovery System may be reclaimed by following the “recovery procedure” (pages 9 & 10).

12. Remove the recovery cylinder adapter assemblies (items 23 & 32) and install them on the next recovery cylinder containing the clean agent that you will be working with (Halon 1211 or FE-36).
13. Reconnect the female quick coupler (item 22), of the **red** “liquid” line (item 21), to the male quick connect (item 23), on the recovery cylinder. Then reconnect the female quick coupler (item 27), of the **blue** “vapor” line (item 26), to the male quick connect (item 28), on the vapor/gauge assembly.
14. You may now use a different clean agent (Halon 1211 or FE-36) **except Halotron**. Proceed to the next operating procedure or *close all valves*.

Note: Always leave the charge gas/clean agent valve (item 6) in the “clean agent” position unless instructed to do otherwise. It is recommended to flush/purge all liquid clean agent from the pump at the end of each day. Getz Fire Equipment (DBA Getz Equipment Innovators) is not responsible for loss of agent due to incorrect operation.

Model: Halogenated Closed Recovery System

Procedure for Switching to Halotron:

1. Open both the **red** “liquid” hand wheel (item 25) and the **blue** “vapor” hand wheel (item 34) on the recovery cylinder (item 35). Make sure the ¼” **blue** “vapor” ball valve (item 29), on the vapor/gauge assembly is closed. Then turn the selector control (item 4), on the control console, to the “*recovery cylinder*” position. Turn the pump control (item 5) to “*on*” and allow the system to cycle until the pressure/vacuum gauge (item 8) reads negative 5 inches of vacuum. Turn the pump control (item 5) to “*off*”.

***** Included in the shipment is a package that contains Couplings (1G0507) and Quick Connects (1G0508). These fittings will be marked with green paint and are to be use with Halotron agent only.**

2. Disconnect the female quick coupler (item 27), on the vapor line (item 26), from the male quick connect (item 28) on the vapor/gauge assembly, if it is connected. Connect the female quick coupler (item 14), on the Fill Line (item 11), to the male quick connect (item 28) on the vapor/gauge assembly.
3. Make sure the selector control (item 4), is still in the “recovery cylinder” position and the charge gas/clean agent valve (item 6) is in the “clean agent” position. *Open* the ¼” **blue** “vapor” ball valve (item 29), on the vapor/gauge assembly and the ¼” **red** “liquid” ball valve (item 13), to the Fill Line.
4. Turn the pump control (item 5) to “*on*”. Allow the pump to run for 1 minute to purge all **liquid** from the system.
5. Close the **blue** hand wheel on the recovery tank (item 34) and allow the system to cycle until the pressure/vacuum gauge (item 8) reads negative 5 inches of vacuum. Then close the ¼” **blue** “vapor” ball valve (item 29), on the vapor/gauge assembly and turn the pump control (item 5) to “*off*”.

Caution: Do not mix Nitrogen with Halotron

6. Connect the female quick coupler (item 38) on the **Argon** supply hose (item 41), to the male quick connect (item 37) on the vapor/gauge assembly.
7. Set the pressure reducing regulator (item 42) to zero (0) output pressure, and *open* the supply valve on the **Argon** cylinder (item 43).
8. Set the regulator to 20 PSI above the reading on the recovery cylinder pressure gauge (item 30), but do not exceed 80 PSI. *Open* the ¼” **green** “gas” ball valve (item 36) on the vapor/gauge assembly.
9. Turn the pump control (item 5) to “*on*”. Allow the pump to run for 1 minute to purge all **vapor** from the system.
10. Set the pressure reducing regulator (item 42) to zero (0) output pressure, and *close* the supply valve on the **Argon** cylinder (item 43). Then close the ¼” **green** “gas” ball valve (item 36), on the vapor/gauge assembly.

Model: Halogenated Closed Recovery System

Procedure for Switching to Halotron (Cont'd):

Allow the system to cycle until the pressure/vacuum gauge (item 8) reads negative 5 inches of vacuum. Close the **red** "liquid" hand wheel (item 25), on the recovery cylinder (item 35). Turn the pump control (item 5) to "off"

11. Close the **red** "liquid" ball valve (item 13) to the Fill Line. Disconnect the female quick coupler (item 14), on the Fill Line (item 11), from the male quick connect (item 28), on the vapor/gauge assembly.

Note: The ¼" purge ball valve (item 17) can be *opened* at this time to relieve the **Argon** pressure inside the CASP-G1. The operator should only open the ¼" purge ball valve (item 17) if they are certain that all of the liquid and vapor, of the "clean agent", in the CASP-G1 has been purged by an **Argon** source. If not, the CASP-G1 system can be relieved of internal pressure by using two or three empty 17lb clean agent extinguishers and by carefully following steps A & B.

- A. Install the proper recharge adapter (item 15) on one empty 17lb clean agent extinguisher. Connect the female quick coupler (item 14), on the Fill Line (item 11), to the extinguisher recharge adapter (item 15) and lock the extinguisher valve open with a clamp or adjustable cinch strap. Open the ¼" **red** "liquid" ball valve (item 13) to the Fill Line and turn the selector control (item 4) to the "portables cylinder" position.
- B. Leave the extinguisher connected to the CASP-G1 system until the discharge pressure gauge (item 9) on the control console stops decreasing in pressure. Release the extinguisher valve lever, close the ¼" **red** "liquid" ball valve (item 13). Disconnect the female quick coupler (item 14), on the Fill Line (item 11), from the extinguisher recharge adapter (item 15). Connect another empty extinguisher if necessary. Repeat steps A & B until the discharge pressure gauge (item 9) reads zero (0) PSI.

Note: The contents of the extinguisher(s) used to relieve the internal pressure of the CASP-G1 system may be reclaimed by following the "recovery procedure" (pages 9 & 10).

12. Remove the recovery cylinder adapter assemblies (items 23 & 32) and install them on the recovery cylinder containing **Halotron**.
13. Reconnect the female quick coupler (item 22), of the **red** "liquid" line (item 21), to the male quick connect (item 23), on the recovery cylinder. Then reconnect the female quick coupler (item 27), of the **blue** "vapor" line (item 26), to the male quick connect (item 28), on the vapor/gauge assembly.

You may now use **Halotron**. Proceed to the next operating procedure or *close all valves*.

Note: Always leave the charge gas/clean agent valve (item 6) in the "clean agent" position unless instructed to do otherwise. It is recommended to flush/purge all liquid clean agent from the pump at the end of each day. Getz Fire Equipment (DBA Getz Equipment Innovators) is not responsible for loss of agent due to incorrect operation.

Model: Halogenated Closed Recovery System

Procedure for Filter Replacement and Cleaning Brass Strainer:

1. *Open* both the **red** “liquid” hand wheel (item 25) and the **blue** “vapor” hand wheel (item 34) on the recovery cylinder (item 35). Make sure the ¼” **blue** “vapor” ball valve (item 29), on the vapor/gauge assembly is closed. Then turn the selector control (item 4), on the control console, to the “*recovery cylinder*” position. Turn the pump control (item 5) to “*on*” and allow the system to cycle until the pressure/vacuum gauge (item 8) reads negative 5 inches of vacuum. Turn the pump control (item 5) to “*off*”.
2. Disconnect the female quick coupler (item 27), on the vapor line (item 26), from the male quick connect (item 28), on the vapor/gauge assembly, if it is connected. Connect the female quick coupler (item 14), on the Fill Line (item 11), to the male quick connect (item 28) on the vapor/gauge assembly.
3. Make sure the selector control (item 4), is still in the “recovery cylinder” position and the charge gas/clean agent valve (item 6) is in the “clean agent” position. *Open* the ¼” **blue** “vapor” ball valve (item 29), on the vapor/gauge assembly and the ¼” **red** “liquid” ball valve (item 13) to the Fill Line.
4. Turn the pump control (item 5) to “*on*”. Allow the pump to run for 1 minute to purge all **liquid** from the system.
5. Close the ¼” **blue** “vapor” ball valve (item 29), on the vapor/gauge assembly and allow the system to cycle until the pressure/vacuum gauge (item 8) reads negative 5 inches of vacuum. Turn the pump control (item 5) to “*off*”.

Note: The appropriate “charge gas” for Halon 1211 or FE-36 is (Nitrogen), for Halotron it’s (Argon).

6. Connect the female quick coupler (item 38) on the **appropriate** “charge gas” supply hose (item 41), to the male quick connect (item 37) on the vapor/gauge assembly.
7. Set the pressure reducing regulator (item 42) to zero (0) output pressure, and *open* the supply valve on the “charge gas” cylinder (item 43).
8. Set the regulator to 20 PSI above the reading on the recovery cylinder pressure gauge (item 30), but do not exceed 80 PSI. *Open* the ¼” **green** “gas” ball valve (item 36) on the vapor/gauge assembly.
9. Turn the pump control (item 5) to “*on*”. Allow the pump to run for 1 minute to purge all **vapor** from the system.
10. Set the pressure reducing regulator (item 42) to zero (0) output pressure, and *close* the supply valve on the “charge gas” cylinder (item 43). Then close the ¼” **green** “gas” ball valve (item 36), on the vapor/gauge assembly. Close the **blue** “vapor” hand wheel (item 34), on the recovery cylinder (item 35) and *open* the ¼” **blue** “vapor” ball valve (item 29) on the vapor/gauge assembly. Allow the system to cycle until the pressure/vacuum gauge (item 8) reads negative 5 inches of vacuum. *Close* the **red** “*liquid*” hand wheel (item 25), on the recovery cylinder (item 35). Turn the pump control (item 5) to “*off*”

Model: Halogenated Closed Recovery System

Procedure for Filter Replacement and Cleaning Brass Strainer (Cont'd):

11. Close the ¼" **blue** "vapor" ball valve (item 29) on the vapor/gauge assembly and the **red** "liquid" ball valve (item 13) to the Fill Line. Disconnect the female quick coupler (item 14), on the Fill Line (item 11), from the male quick connect (item 28), on the vapor/gauge assembly.

Note: The ¼" purge ball valve (item 17) can be *opened* at this time to relieve the "charge gas" pressure inside the Halogenated Closed Recovery System. The operator should only open the ¼" purge ball valve (item 17) if they are certain that all of the liquid and vapor, of the "clean agent", in the Halogenated Closed Recovery System has been purged by a "charge gas" source. If not, the Halogenated Closed Recovery System can be relieved of internal pressure by using two or three empty 17lb clean agent extinguishers and by carefully following steps A & B.

- A. Install the proper recharge adapter (item 15) on one empty 17lb clean agent extinguisher. Connect the female quick coupler (item 14), on the Fill Line (item 11), to the extinguisher recharge adapter (item 15) and lock the extinguisher valve open with a clamp or adjustable cinch strap. *Open* the ¼" **red** "*liquid*" ball valve (item 13) to the Fill Line and turn the selector control (item 4) to the "*portables cylinder*" position.
- B. Leave the extinguisher connected to the Halogenated Closed Recovery System until the discharge pressure gauge (item 9) on the control console stops decreasing in pressure. Release the extinguisher valve lever, close the ¼" **red** "*liquid*" ball valve (item 13). Disconnect the female quick coupler (item 14), on the Fill Line (item 11), from the extinguisher recharge adapter (item 15). Connect another empty extinguisher if necessary. *Repeat* steps A & B until the discharge pressure gauge (item 9) reads zero (0) PSI.

Note: The contents of the extinguisher(s) used to relieve the internal pressure of the Halogenated Closed Recovery System may be reclaimed by following the "recycle procedure" (pages 14 & 15).

12. After all pressure has been relieved, remove the bolts (items 19) from the filter shell (item 20). Lift the filter end plate (item 18) away from the filter shell and replace the filter elements; following replacement procedures found on each replacement filter element canister.
13. Loosen the nut from brass strainer, pull the nut and screen assembly out of the strainer and clean as necessary.
14. Reconnect the female quick coupler (item 22), of the **red** "liquid" line (item 21), to the male quick connect (item 23), on the recovery cylinder. Then reconnect the female quick coupler (item 27), of the **blue** "vapor" line (item 26), to the male quick connect (item 28), on the vapor/gauge assembly.
15. Proceed to the next operating procedure or *close all valves*.

Note: Always leave the charge gas/clean agent valve (item 6) in the "clean agent" position unless instructed to do otherwise. It is recommended to flush/purge all liquid clean agent from the pump at the end of each day. Getz Fire Equipment (DBA Getz Equipment Innovators) is not responsible for loss of agent due to incorrect operation.

Model: Halogenated Closed Recovery System

Recommended Periodic Maintenance:

Note: These are minimum recommendations which can be performed on a more frequent basis, or as needed.

1. Lubricate all male quick connects (items 23, 28, & 37) and recharge adapters with a light coat of high quality o-ring lubricant when female quick couplers (items 14, 22, 27, & 38) are difficult to connect/disconnect.
2. Every two weeks, or every 50 extinguishers, or after the Recycle Procedure is performed, remove the nut on the brass strainer and clean as necessary. (Refer to the “Procedure for filter replacement and cleaning brass strainer”).
3. Once per month, check the complete system for leaks (while performing the “*recharge*” or “*recycle*” procedure) using a refrigerant leak detector or leak detecting fluid.

Note: If a leak detecting fluid is utilized, proper care should be observed to remove all excess fluid after testing.

4. Once per month, retighten all bolts and nuts securing component parts to the system.
5. Every three (3) months, or if pump slows while operating, lubricate the spool valve in the gas booster (item 2). (Refer to the “Clean agent pump operation and maintenance manual”).
6. Once per year, dismantle the gas booster (item 2). Clean and lubricate the o-rings on the air drive piston (refer to the booster manual).
7. Once per year, change the filter elements (in item 22). (Refer to the “procedure for filter replacement and cleaning brass strainer”).
8. Once per year, have your charge gas regulator on the charge gas supply cylinder cleaned and recalibrated.

MODEL: HALOGENATED CLOSED RECOVERY SYSTEM

Troubleshooting Guide:

Problem:

1. Clean agent flows slowly or not at all through the system
2. Clean agent leaks from the female quick couplers (items 14, 22, 27, & 38)
3. Pump cycle is slow
4. Pump control or charge gas/clean agent valve is leaking
Clean agent.
5. Pump cycles but will not build pressure

Solution:

1. A. Make sure all **red** "liquid" valves are open and the selector valve is in the proper position.
B. Check or change filters inside of the moisture filter shell (item 20) and clean the brass strainer (refer to procedure on pages 20-21.)
C. Make sure all of the female quick couplers (items 14, 22, 27, & 38) are clear of debris and that the internal check units are functioning properly.
2. Relieve internal pressure in system. (refer to procedure on pages 20-21), replace u-cup seal on the inside of the female quick coupler or replace the female quick coupler.
3. A. Check the incoming air pressure to the system, set at 75 – 125 PSI and 13 CFM minimum.
B. Refer to spool valve lubricating instructions in the clean agent gas booster maintenance manual. (refer to procedure on pages 26 – 39)
4. Insert an allen wrench in set screw on the side of the handle and loosen the set screw until the Handle is free. Lift the handle off the valve and slightly tighten the slotted packing nut around the valve stem. Replace the handle and retighten the set screw; or replace the valve.
5. Refer to "operations manual" for the procedure you are performing and verify that all valves are properly positioned and that all fittings are properly connected.

MODEL: HALOGENATED CLOSED RECOVERY SYSTEM

Troubleshooting Guide (Cont'd):

Problem:

6. Moisture indicator will not turn **green**, or is white
7. **Red** "liquid", **blue** "vapor", or **green** "gas"; ball valves leak clean agent
8. Relief valve exhausts Halon
9. Pump cycles but will not pull a vacuum
10. Clean agent leaks around the tank valve adapters (items 23 & 32)
11. Clean agent leaks out of the pump
12. Extinguisher begins building weight then stops. Or the extinguisher builds pressure but little or no weight.
13. Extinguisher is recharged but the pressure gauge on the extinguisher drops below manufacturer's recommended gauge pressure.

Solution:

6. A. Refer to the "procedure for filter replacement and cleaning brass strainer".
B. If moisture indicator eyelet is white, replace with new moisture indicator eyelet. Relieve all internal pressure in accordance with procedure on pages 20-21.
7. Replaces with new ball valve(s).
8. Refer to the "operations manual" for the procedure you are performing. Verify that all valves are in the proper position and all fittings are properly connected.
9. Leak test the system with a clean agent leak detector, repair leaks as necessary.
10. Tighten adapters or replace gaskets in adapters.
11. Refer to the clean agent pump maintenance manual
12. Add more clean agent (that is currently being used) to the recovery cylinder and pressurize to approximately 65 PSI. (reference procedure on page 13.)
13. Add the appropriate charge gas to the recovery cylinder in accordance with the procedure on page 13. recover the clean agent and recharge the extinguisher In accordance with applicable procedures.

MODEL: HALOGENATED CLOSED RECOVERY SYSTEM

Recommended Spare Parts:

<u>Part Number</u>	<u>Description</u>	<u>QTY</u>
1G0411	Valve 3/8 2-Way (Pump Control)	1
1G0412	Valve 3/8 3-Way (Charge Gas/Clean Agent)	1
1G0446	Moisture Eye	1
1G0418	Core for Shell (2 Per)	2
1G0042	Valve 1/4 Turn 1/4" Male x 1/4" Female Brass	4
1G0447	Strainer 3/8" Y (Nut/Screen Replacement)	1
1G0394	Seal Kit Air Drive Control Kit for Gas Booster	1
1G0395	Seal Kit Fluid Drive Gas Booster	1
1G0029	Coupling Female w/Check Unit 1/4"	2
-----	Seal Lubricant for Halon Pump Air Drive	1 TUBE
-----	O-Ring Lubricant	1 TUBE



HYDRAULICS INTERNATIONAL, INC.

OPERATION AND MAINTENANCE INSTRUCTIONS

FOR

AIR DRIVEN GAS BOOSTER

4:1 AREA RATIO

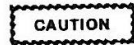
**DOUBLE ACTING, SINGLE AIR DRIVE
AND TWO STAGE, SINGLE AIR DRIVE**

7.0 MAINTENANCE.

7.1 Periodic.

All HII models incorporate a spool-type directional control valve that is the heart of the cycling system for the drive. This valve depends on dynamic O-rings which are lubricated with light grease at original assembly. Periodically, these valve O-rings should be wiped clean and regreased for reliable operation. The frequency will be determined by many variables such as air moisture content, contamination, cycle rates, and overall duty cycle of individual applications. All HII units are designed so that this spool/O-ring assembly is easily accessible with simple hand tools without disassembling any other sections of the drive. The typical symptom indicating need for regreasing the O-rings is slow, erratic cycling. It is suggested that a note be made of the frequency of this slow down, so that it can be predicted, and then the O-rings cleaned and regreased at a convenient shut down to insure uninterrupted operation when the unit is needed.

The detailed assembly drawing attached clearly shows the cycling spool/O-ring assembly and its accessibility.



Be sure the incoming air is shut off before removing any parts.

Periodic lubrication of any OTHER PARTS of the unit is NOT REQUIRED nor recommended.

7.2 Special Tools. Available at low cost from HII Service Dept.

P/N 80273-100 - Sleeve Extractor. Used for pulling the valve sleeve 80028-1 (Item 5, Page 2, Drawing 80351) out of end cap assembly (1). This is done only if it is necessary to replace the 4 each O-rings, Item (79) on the sleeve O.D., or the bumper, Item (24) behind the sleeve.

B. SPECIAL ATTACHMENTS BY MODEL

8.0 TROUBLESHOOTING.

8.1 Understanding How It Works.

NOTE: For consistency, all item numbers in this text will refer to the assembly drawing (not seal kit drawings).

8.2 The Basic Drive System. Refer to Pages 2 and 3, Drawing 80719.

There are two drive chambers: Left and right. The left chamber is enclosed by end cap item (2) (Page 3) and piston (3). The right chamber is enclosed by end cap (1) (Page 3) and piston (3).

The cycling valve (7), (Page 3) alternately pressurizes and exhausts these two chambers causing the piston (3) and its connecting rod (56) to reciprocate in drive barrel (4).

8.3 The Basic Gas Boosting System. Refer to Pages 3, 4 and 5, Drawing 80719.

Note the mechanical connecting rod arrangement between the drive piston (3) and the gas piston (53). Page 5 shows the gas section body (50) with dual inlet and outlet check valves all in series. As piston (53) reciprocates, inlet gas is boosted to tube (49) and the left side of piston (53). Piston (53) then moves left and boosts that charge to outlet for two stages of compression. The function of relief valve (114) is explained in paragraph 1.1.2.5.

CAUTION

Do not operate the unit without this relief valve.

8.4 The Basic Air Cycling System. Refer to Page 4, Drawing 80719.

Section F-F shows flow tube (21). This tube pressurizes or exhausts the left drive chamber, depending on the position of the cycling valve (7).

NOTE: Sections F-F and E-E are the reverse (backside) of Section B-B. Therefore, the valve end cap (1), is on the left and the opposite cap (2) is on the right in sections F-F and E-E.

When the cycling valve (7) is pressurizing the flow tube (21) and the left drive chamber, it is simultaneously connecting the right drive chamber to exhaust muffler (39). When valve (7) connects the flow tube (21) to exhaust, it simultaneously pressurizes the right drive chamber.

The cycling spool valve (7) receives input drive air at its center (Ref. Pages 3 and 4) from which it directs drive air left or right. Page 4 shows that when it shifts right, drive air flows left to the flow tube (21). When it shifts left, drive air flows right directly to the right drive chamber. Page 3 shows the valve shifted left.

The cycling spool shifts right or left due to the action of the air pilot poppet valves (41) and (113), section E-E. Note also that a small passage, off the drive-air-in channel provides constant air pressure to a small chamber on the left hand end of the spool (7). Therefore, as soon as drive air is turned on, spool (7) is biased to shift to the right. In this position, drive

air flows left to flow tube (21) and the left drive chamber driving the piston (3) and the gas piston assembly (53) right. Air piston (3) unseats left hand pilot poppet (113) section E-E. This pilot poppet receives a constant supply of pilot air either from the upper internal passage connected to the drive-air-in channel, Page 3; or, if modification “X” is used, the external pilot port, plug (68).

When the drive piston (3) opens this pilot poppet, pilot air is injected into the large pilot chamber on the right hand end of the spool. This chamber provides the force necessary to shift the spool valve (7) to the left overcoming the bias from the small air chamber on the left hand end of the spool.

With spool valve (7) shifted left, drive air is connected to the right drive chamber and the left drive chamber is connected to exhaust. Thus the piston (3) and the gas piston assembly (53) move left and the pilot poppet (113) springs closed. Pilot air is now trapped in the large pilot chamber, right hand end of spool valve (7), and in the pilot tube (22) section E-E. This tube connects the large pilot chamber to the opposite pilot poppet (41). The spool valve remains shifted left due to the trapped pilot air. The drive piston (3) then reaches the opposite pilot poppet (41) and opens it. This connects the pilot tube (22) and the large pilot chamber to a pilot vent port (not shown) in end cap (2).

With the large pilot chamber, right hand end of spool valve, now vented, the spool valve shifts right (due to the bias force from the small left hand chamber). In the shifted-right position, drive air pressurizes flow tube (21) and the cycle described above repeats.

8.5 Chart: Symptoms vs Suggested Remedies.

Symptom	Possible Cause	Suggested Remedy
1. Unit will not cycle after gas pressure is equalized (no sound).	<ul style="list-style-type: none"> A) Drive shut off. B) “X” Mod. Not plumbed. C) Spool valve (7) stuck due to friction of swollen O-rings due to chemical carryover from shop compressor oil. D) Unlikely, but possible: Poppet valves (41) or (113) may be short or springs (23) broken. Ref. Page 4, section E-E. 	<ul style="list-style-type: none"> A) Open drive valve. B) Connect external pilot port to air source. C) See Drawing 80719, Page 3. Unscrew retainer (8). Then remove (7) spool and inspect 8 O-rings, item (91). If swollen, they will be longer (not fatter) and droop down off the spool. Replace with Viton O-rings (seal kit SK5GA-4V, Drawing 80871). Apply light grease. Reassemble. <p>CAUTION: Retainer (8) should not be highly torqued.</p> <ul style="list-style-type: none"> D) Remove hex caps (9). Inspect springs and poppets. Replace as needed.

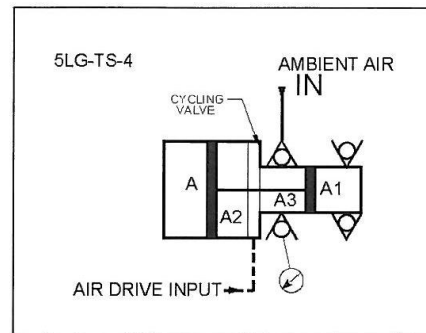
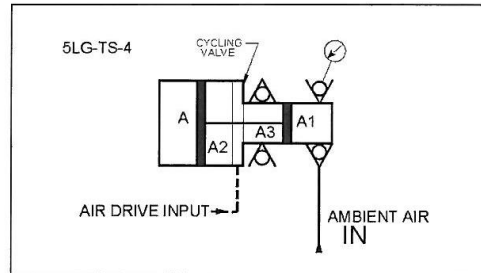
Symptom	Possible Cause	Suggested Remedy
2. Unit will not cycle and air bleeds out exhaust muffler.	<p>A) Insufficient internal air pilot volume due to long, small air drive line.</p> <p>B) Spool valve (7) stuck in center position due to friction of swollen or dry O-rings (see 1-C above).</p>	<p>A) Increase size of air drive line.</p> <p>B) See 1-C above.</p>
3. Unit cycles but bleeds air out exhaust muffler at stall (or at shut off of external pilot "X" modification).	<p>A) Drive piston O-ring (92) or barrel (4), Page 3, damaged, or shrinkage of drive O-ring (92).</p>	<p>A) Remove drive tie rod nuts (19), pull drive end caps (1), (2) apart. Inspect (92) and (4). If damaged, replace.</p> <p>NOTE: Always test O-ring (92) new or used, for shrinkage: Remove all grease from (92) and (4). Place (92) on flat surface. Put (4) down over (92). Lift (4). If (92) does not pick up inside (4), <u>discard it as undersize</u>.</p> <p>Lightly regrease. Reassemble. Review integrity of air drive filtration.</p>
4. Unit stops or "hunts" and air bleeds out pilot vent passage in air cap (2), Page 3.	<p>A) Drive air leaking into large pilot chamber on right end of spool valve (7) and pilot vent poppet (41) cannot dissipate it.</p>	<p>A) Remove retainer (8) Ref. 1-C above, and valve (7) and replace the 8th (far right) item (91) O-ring. Grease. Reinstall valve and retainer and test. If not cured, remove (8), (7) and sleeve (5) (using HII extractor tool P/N 80273-100). Replace all 4 O-rings, item (77) on sleeve. Grease. Reinstall.</p>
5. Audible airbleeds out 1/8 NPT breather (40) in air cap (1) at stall, or drive shut off.	<p>A) Rod seal wear (58) 2 places.</p>	<p>A) Remove tie rod nuts (19), pull drive section apart to expose piston (3). Remove 6 ea cap screws (65) with washers (66) from end cap (52). Pull off end cap (51) assembly including R.H. check valves and manifold fittings (60). Remove nut (48) and washer (44). Pull rod (56) with piston (3) left until rod (56) clears seals (58) 2 places. Remove retainer ring (29), then ring, seals, O-rings, and bearing (38), (58), (59), (77). Inspect all parts. Replace any damaged items including rod/piston assy if scratched. (Light scratches can be polished out.) Make sure</p>

Symptom	Possible Cause	Suggested Remedy
		chamfer on R.H. end of rod is smooth and no burrs. Do not lubricate. Push rod assembly back thru seals and pump piston (53). Tighten with piston inside barrel (52) while holding piston (3). Reassemble drive barrel (4) and tie bolts (17) (18)*.
6. Unit cycles but output performance is questionable.	<p>A) Worn gas piston seals (54) or scored barrel (52), due to contaminated air source.</p> <p>B) Check valves, section D-D, hanging up due to failed springs or contamination.</p>	<p>A) Disassemble per 5-A above. Inspect and replace all worn parts. Review air source filtration and/or source of contamination.</p> <p>B) Remove check retainer rings (30) and fittings (60) (61), seats (14) (62). Inspect all parts. Clean and/or replace as needed. Reassemble. <u>Do not lubricate.</u></p>
7. Unit false cycles (short strokes).	A) Pilot air venting prematurely due to damage or contamination of pilot vent poppet (41) in air cap (2); or external pilot air leaks from static O-rings sealing the pilot tube (22), or the pilot poppet hex cap (9) in air cap (2); or leakage at threaded plugs (35) ½ NPT, or (32) 1/8 NPT.	A) Inspect pilot vent poppet (41), spring (23), and seat in end cap (2). Replace if damaged. Check pilot tube ends (22) and hex cap (9) with soap solution for external leaks. Replace static seal O-rings (86) if soap bubbles are detected. Check plugs (35) and (32) with soap solution. Tighten or retape if leaking.

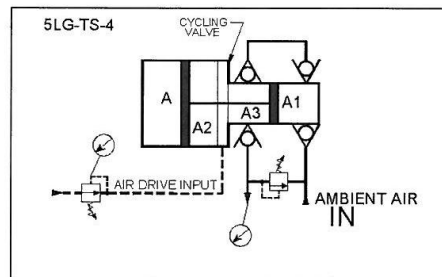
* Drive barrel (4) may be lightly greased along with drive piston O-ring (92). Do not lubricate rod (56) nor any parts in the boost section.

9.0 TESTING. Use Ambient Air only. **DO NOT USE COMPRESSED GAS LIQUID OR AIR AT “IN” PORT.**

9.1 Individual Direction of Stroke.



9.2 Both Sections in Series (two stage).



9.3 Drive Section.

Setup per above 9.2.3 but reduce drive air pressure to 15 PSI. Bleed air at gauge. Unit should cycle smoothly.

Setup and Steps:

- 9.1.1 Remove tube assy (118) and elbow (116). Install 1/8 NPT plug in place of elbow.
- 9.1.2 Remove fittings (60), tube (49) and ported fitting (45) with elbow (115) and relief valve (114).
- 9.1.3 Replace right hand fitting (60) with ported fitting (45), elbow and relief valve.
- 9.1.4 Install 0-500 PSI (minimum) pressure gauge in elbow (115).
- 9.1.5 Cycle Booster. If check valves and piston seal on right hand direction of stroke are operating properly, it should be able to boost **AMBIENT AIR** to 200-250 PSI. (The other side simply cycles out its open outlet).
- 9.1.6 Return (45) and other parts to original position on outlet of left side. Install same gauge. Cycle booster. This side also should be able to boost **AMBIENT AIR** to 200-250 PSI if check valves and piston seal are operating properly.

Setup and Steps:

- 9.2.1 Reinstall fittings (60), tube (49). Left side is now connected in series with the right side.
- 9.2.2 Install 0-500 PSI (minimum) gauge at outlet elbow (115).
- 9.2.3 Cycle Booster. It should be able to boost **AMBIENT AIR** up to 350-375 PSI on outlet gauge using 90-100 PSI air drive.
- 9.2.4 Shutoff and trap drive air. Using soap solution or “Leak Tec”, check all gas section external connections for leakage. All connections, except small gap between distance piece (48) and body (57) must be bubble tight.

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REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
A	SEE DCN	07-01	
B	SEE DCN	07-02	
C	SEE DCN	11-04	
D	SEE DCN	04-06	
E	SEE DCN	01-07	

1	1			1	1	80083-039	O RING			80
1	1			1	1	80083-037	O RING			79
2	2			2	2	80083-032	O RING			78
2	5	2	5	7	7	80083-020	O RING			77
6	6			6	6	80083-016	O RING			76
2	2			2	2	80083-014	O RING			75
2	2			2	2	80083-012	O RING			74
2	2			2	2	80083-010	O RING			73
1						80083-009	O RING			72
AR	AR	AR	AR	AR	AR	262	ADHESIVE	LOCTITE CORP. ROCKY HILL, CT		71
6	6	6	6	6	6	80728-2	INSERT			70
1	1	1	1	1	1	80726-1	NUT			69
	1	1			1	80514-1	PLUG			68
1	1	1	1	1	1	80493-1	ELBOW			67
6	6	6	6	6	6	80480-1	LOCK WASHER			66
6	6	6	6	6	6	80479-1	SCREW			65
2	2	2	2	2	2	80101-17	RETAINING RING			64
2	2	2	2	2	2	80434-1	RING			63
4	4	4	4	4	4	80476-1	SEAT			62
2	2	2	2	2	2	80474-1	FITTING			61
2	2	2	2	2	2	80474-2	FITTING			60
2	2	2	2	2	2	80473-1	BEARING			59
2	2	2	2	2	2	80472-1	SEAL ROD			58
1	1	1	1	1	1	80471-1	SPACER			57
1	1	1	1	1	1	80470-2	ROD PISTON			56
1	1	1	1	1	1	80469-1	BEARING PISTON			55
2	2	2	2	2	2	80468-1	SEAL PISTON			54
2	2	2	2	2	2	80467-1	PISTON-HALF			53
1	1	1	1	1	1	80466-1	SLEEVE			52
1	1	1	1	1	1	80465-1	END CAP			51
1	1	1	1	1	1	80463-1	BODY			50
1	1	1	1	1	1	80462-2	FLOW TUBE			49
1	1	1	1	1	1	80458-2	LOCK NUT			48
2	2			2	2	80084-912	O RING			47
2	2	2	2	2	2	80353-3	FITTING			46
2	2	2	2	2	2	80353-1	FITTING			45
9	9	9	9	9	9	80308-2	FLAT WASHER			44
4	4	4	4	4	4	80307-2	LOCK WASHER			43
1	1	1	1	1	1	80306-2	WASHER			42
2	2	2	2	2	2	80302-100	POPPET			41
-800-700-600-500-400-300-200-100										

1	1	1	1	1	1	1	80266-2	BREATHER			40
1	1	1	1	1	1	1	80265-1	MUFFLER			39
1	1	1	1	1	1	1	80239-3	RING			38
1	1	1	1	1	1	1	80222-1	HANDLE			37
4	4	4	4	4	4	4	80199-1	RIVET			36
1	1	1	1	1	1	1	80198-1	NAMEPLATE			35
1	1	1	1	1	1	1	80139-5	PLUG			34
1	1	1	1	1	1	1	80139-3	PLUG			33
3	3	3	3	3	3	3	80139-2	PLUG			32
AR	AR	AR	AR	AR	AR	AR	242	ADHESIVE	LOCTITE CORP. ROCKY HILL, CT		31
4	4	4	4	4	4	4	80101-16	RETAINING RING			30
1	1	1	1	1	1	1	80101-7	RETAINING RING			29
2	2	2	2	2	2	2	80101-4	RETAINER RING			28
4	4	4	4	4	4	4	80100-012	BACKUP RING			27
1	1			1	1		80075-1	PLUG			26
4	4	4	4	4	4	4	80072-16	BALL			25
1	1	1	1	1	1	1	80069-1	BUMPER			24
2	2	2	2	2	2	2	80068-1	SPRING			23
1	1	1	1	1	1	1	80060-1	PILOT TUBE			22
1	1	1	1	1	1	1	80059-1	FLOW TUBE			21
2	2	2	2	2	2	2	80058-1	BRACKET			20
4	4	4	4	4	4	4	80056-2	NUT			19
2	2	2	2	2	2	2	80055-5	BOLT			18
2	2	2	2	2	2	2	80055-2	BOLT			17
4	4	4	4	4	4	4	80053-1	SPRING			16
4	4	4	4	4	4	4	80051-1	SPRING			15
4	4	4	4	4	4	4	80049-1	SEAT			14
4	4	4	4	4	4	4	80048-1	RING			13
4	4	4	4	4	4	4	80047-1	CAGE			12
1	1	1	1	1	1	1	80043-1	SET SCREW			11
2	2	2	2	2	2	2	80042-1	BEARING			10
2	2	2	2	2	2	2	80041-1	CAP			9
1	1	1	1	1	1	1	80030-1	RETAINER			8
1	1	1	1	1	1	1	80029-1	SPOOL			7
1	1	1	1	1	1	1	80028-2	SLEEVE			6
1	1	1	1	1	1	1	80028-1	SLEEVE			5
1	1	1	1	1	1	1	80027-2	BARREL			4
1	1	1	1	1	1	1	80024-1	AIR PISTON			3
1	1	1	1	1	1	1	80022-1	END CAP			2
1	1	1	1	1	1	1	80021-3	VALVE END CAP			1
-800-700-600-500-400-300-200-100											

- ⚙️ TORQUE TO 18 - 25 FOOT POUNDS
- ⚙️ TORQUE TO 100-120 FOOT POUNDS
- ⚙️ TORQUE TO 45 FOOT POUNDS
- ⚙️ TORQUE TO 55 INCH POUNDS

8 REFER TO DWG. NO 810133 FOR MODIFICATIONS

PART NO.		DESCRIPTION		MATERIAL		SPECIFICATION		ITEM	
UNLESS OTHERWISE SPECIFIED FINISH IS 304 STAINLESS STEEL. DIMENSIONS ARE IN INCHES. DECIMALS ARE 1/16 INCHES. ANGLES ARE 20° UNLESS OTHERWISE SPECIFIED.									
CONTRACT NO.		DATE		APPROVALS		DATE		HYDRAULICS INTERNATIONAL, INC. CHATSWORTH, CALIFORNIA	
DRAWN		E.N		04-00		5 INCH LIQUID/GAS PUMP TWO STAGE -4 RATIO			
CHECKED		ISSUED		FINISH		SCALE		DWG. No. 80719	
NEXT ASSY		USED ON		DO NOT SCALE DWG.		ENGR.		REV E	
APPLICATIONS		SCALE		2N386		DWG. No. 80719		SHEET 1 OF 5	

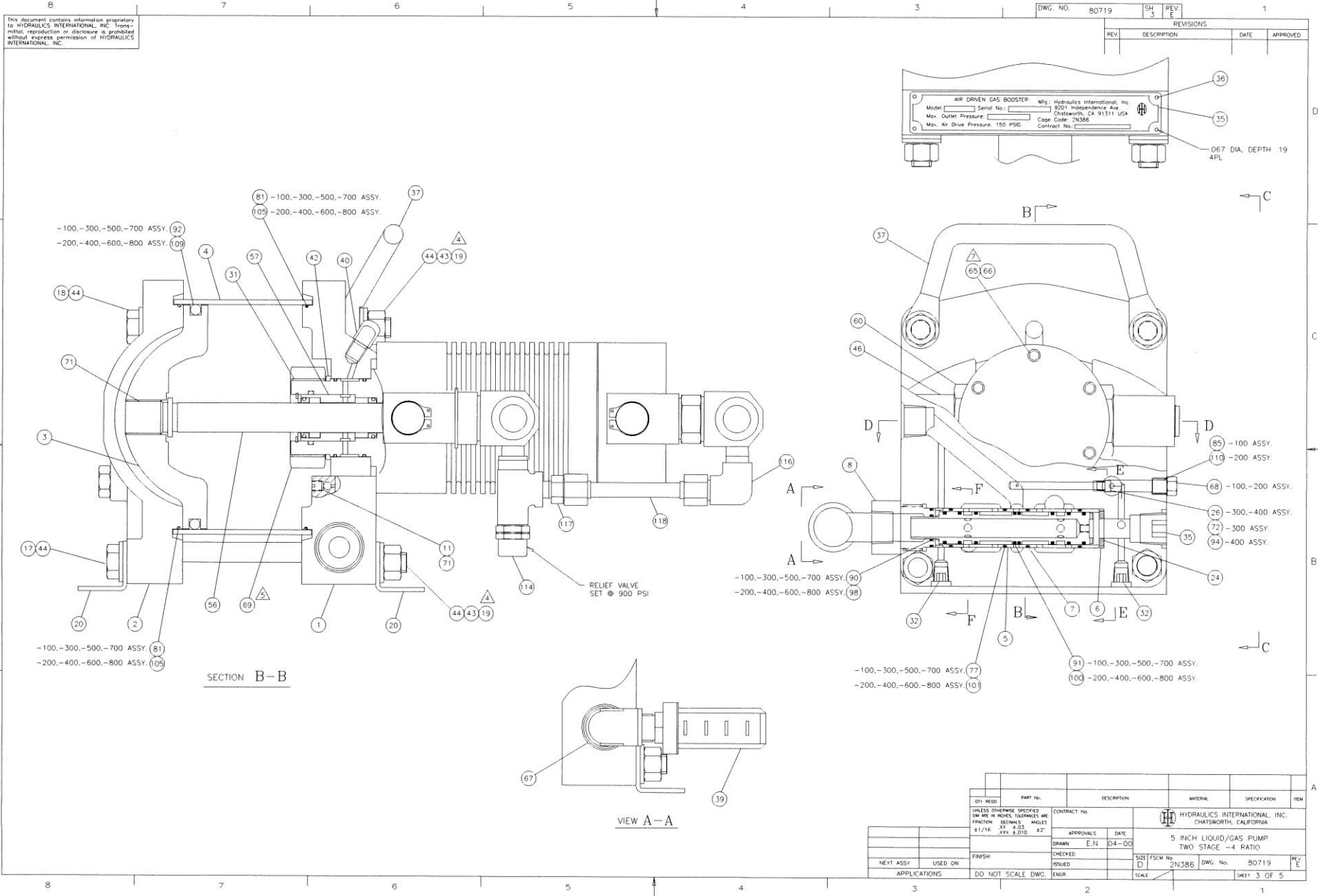
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DWG. NO. 80719 SH 2 REV 1

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED

2	2	2	2	2	80086-908	O-RING			119
1	1	1	1	1	1	810166-200	TUBE ASSY		118
1	1	1	1	1	1	810165-2	CONNECTOR		117
1	1	1	1	1	1	810164-2	ELBOW		116
2	2	2	2	2	2	810163-1	ELBOW		115
1	1	1	1	1	1	810162-100	RELIEF VALVE		114
2	2			2	2	80084-908	O RING		113
	2	2	2	2		80086-910	O RING		112
2	2			2	2	80086-906	O RING		111
	1				1	80086-904	O RING		110
1	1				1	80086-431	O RING		109
2	2	2	2	2		80086-142	O RING		108
1	1	1	1	1		80086-123	O RING		107
8	8	8	8	8		80086-117	O RING		106
2	2			2	2	80086-050	O RING		105
1	1	1	1	1		80086-039	O RING		104
1	1	1	1	1		80086-037	O RING		103
2	2	2	2	2		80086-032	O RING		102
5	2	5	2	7	7	80086-020	O RING		101
8	8			8	8	80086-017	O RING		100
6	6	6	6	6		80086-016	O RING		99
1	1	1	1	1		80086-015	O RING		98
2	2			2	2	80086-014	O RING		97
2	2	2	2	2		80086-012	O RING		96
2	2			2	2	80086-010	O RING		95
1				1		80086-009	O RING		94
2	2	2	2	2		80086-006	O RING		93
1	1	1	1	1		80085-431	O RING		92
8	8			8	8	80085-017	O RING		91
1	1			1	1	80085-015	O RING		90
2	2	2	2	2		80085-006	O RING		89
2	2			2	2	80086-912	O RING		88
2	2			2	2	80084-910	O RING		87
2	2			2	2	80084-906	O RING		86
	1				1	80084-904	O RING		85
2	2			2	2	80083-142	O RING		84
1	1			1	1	80083-123	O RING		83
8	8			8	8	80083-117	O RING		82
2	2	2	2	2		80083-050	O RING		81

QUOTE OR QUANTITY REQUIRED: ON 1/8" INCH TOLERANCES ARE FRACTION DECIMAL ANGLES 1/16 1/32 1/64 1/2 1/4 3/8 1/2		CONTRACT NO.: DRAWN BY: E.N. DATE: 04-00	HYDRAULICS INTERNATIONAL, INC. CHATSWORTH, CALIFORNIA
NEXT ASSY: APPLICATIONS: DO NOT SCALE DWG	FINISH: ENGR:	CHECKED: ISSUED:	SHEET FROM NO.: 2N386 DWG NO.: 80719 SHEET 2 OF 5



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DWG. NO.	80719	SH	3	REV	E
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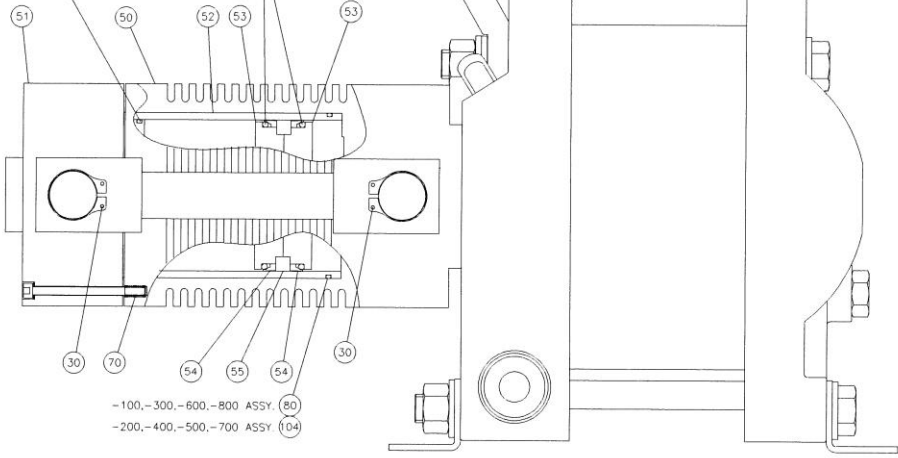
REVISIONS			
REV	DESCRIPTION	DATE	APPROVED

QTY	REQD	PART NO.	DESCRIPTION	MATERIAL	SPECIFICATION	ITEM

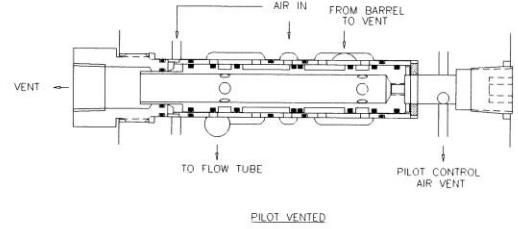
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DWG NO.	80719	SH.	4	REV.	E
REVISIONS					
REV.	DESCRIPTION	DATE	APPROVED		

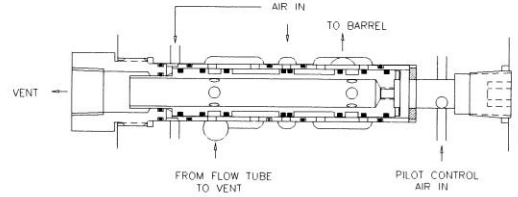
-100,-300,-600,-800 ASSY. (84)
 -200,-400,-500,-700 ASSY. (108)
 -100,-300,-600,-800 ASSY. (79)
 -200,-400,-500,-700 ASSY. (103)



VIEW C-C

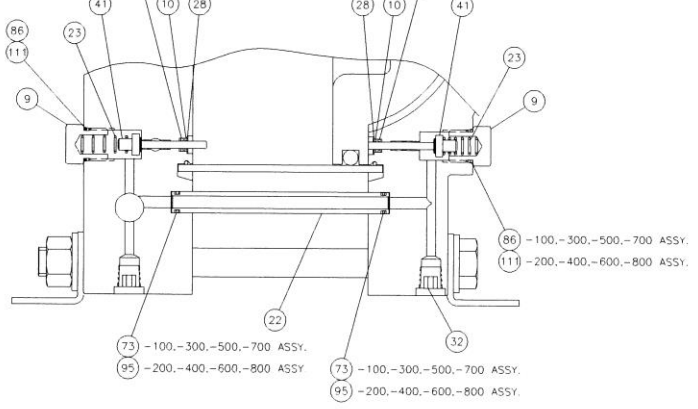


PILOT VENTED

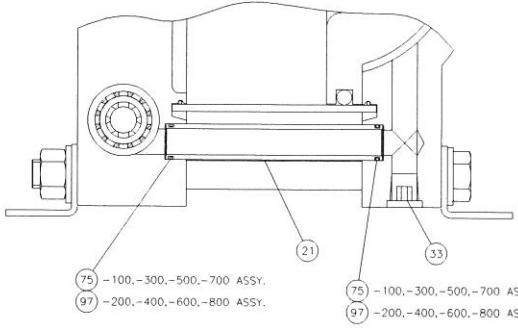


PILOT PRESSURIZED

-100,-300,-500,-700 ASSY. (89)
 -200,-400,-600,-800 ASSY. (93)
 -100,-300,-500,-700 ASSY. (89)
 -200,-400,-600,-800 ASSY. (93)



SECTION E-E

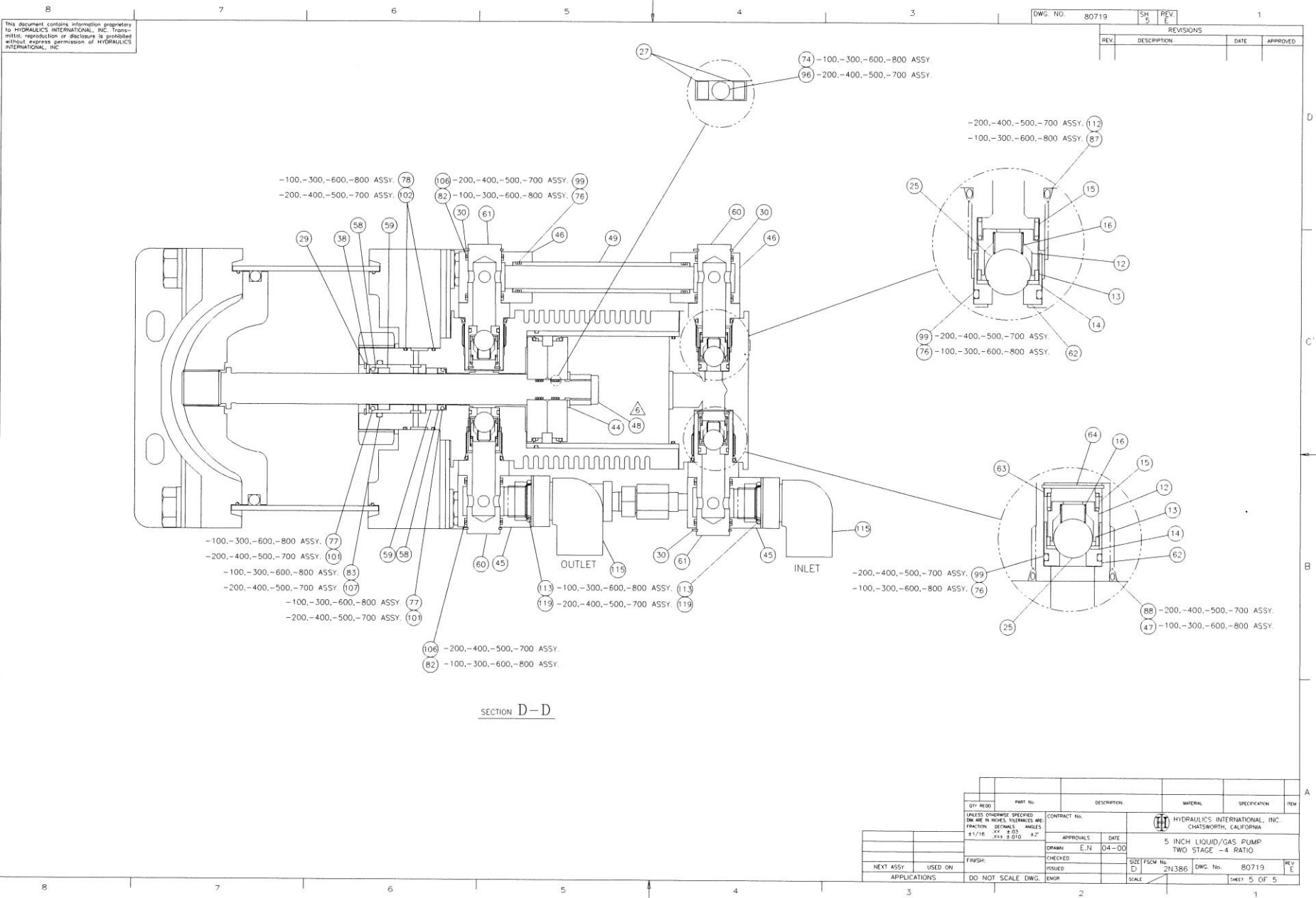


SECTION F-F

-100,-300,-500,-700 ASSY. (86)
 -200,-400,-600,-800 ASSY. (111)

(75) -100,-300,-500,-700 ASSY.
 (97) -200,-400,-600,-800 ASSY.
 (75) -100,-300,-500,-700 ASSY.
 (97) -200,-400,-600,-800 ASSY.

QTY	REGD	PART No.	DESCRIPTION	MATERIAL	SPECIFICATION	ITEM
UNLESS OTHERWISE SPECIFIED <small>1/16 INCHES TOLERANCES ARE FRACTION DECIMALS ANGLES .015 .005 .010 .1°</small>			CONTRACT No.	HYDRAULICS INTERNATIONAL, INC. CHATSWORTH, CALIFORNIA.		
APPROVALS			DATE	5 INCH LIQUID/GAS PUMP TWO STAGE -4 RATIO		
DRAWN			E.N.	DWG. No. 80719		
CHECKED				REV. E		
ISSUED						
NEXT ASSY. USED ON						
APPLICATIONS			DO NOT SCALE DWG.	ENGR.	SCALE	SHEET 4 OF 5



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DWG. NO. 80719 SH 5 REV E 1

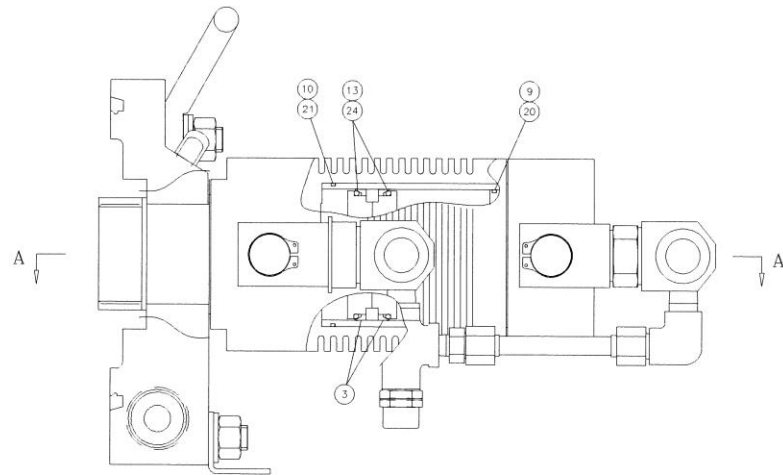
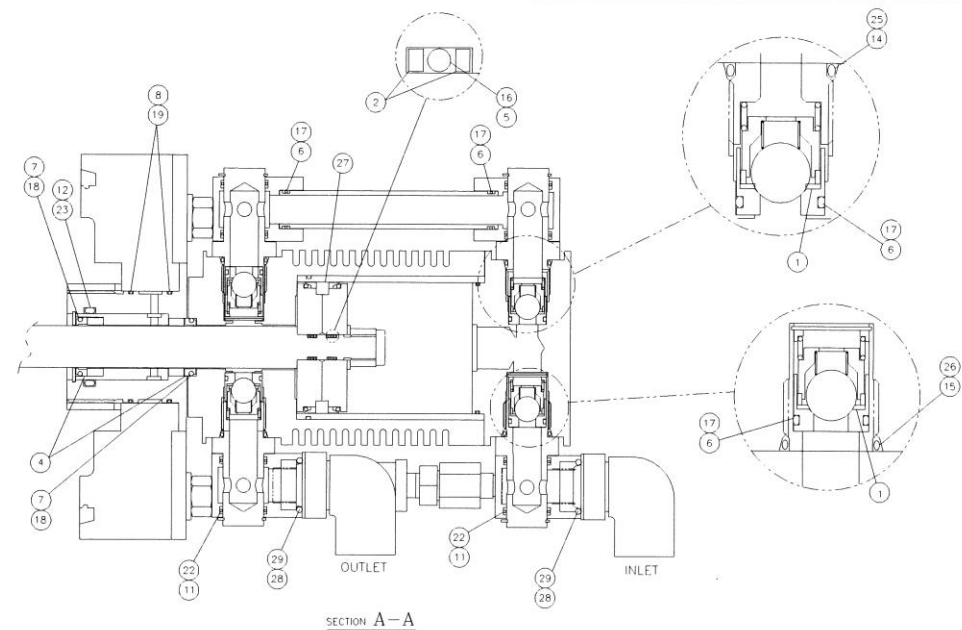
REVISIONS			
REV	DESCRIPTION	DATE	APPROVED

SECTION D-D

QTY REQD	PART NO.	DESCRIPTION	MATERIAL	SPECIFICATION	ITEM
UNLESS OTHERWISE SPECIFIED DIM. ARE IN INCHES, TOLERANCES ARE FRACTION DECIMALS ANGLES 1/16 .001 .02		CONTRACT NO. APPROVALS DATE DRAWN: E.N. 04-00		HYDRAULICS INTERNATIONAL, INC. CHATSORTH, CALIFORNIA	
NEXT ASSY USED ON		FINISH: CHECKED ISSUED		5 INCH LIQUID/GAS PUMP TWO STAGE -4 RATIO	
APPLICATIONS		DO NOT SCALE DWG. ENGR		SHEET/ROW No. 2N386 DWG. No. 80719 REV E	
				SCALE SHEET 5 OF 5	

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DWG. NO.	80849	SH	REV	B	1
REVISIONS					
REV.	DESCRIPTION	DATE	APPROVED		
A	SEE DCN	07-02			
B	SEE DCN	09-04			



2	80086-908	O RING			29
2	80083-908	O RING			28
1	80469-1	BEARING			27
2	80086-912	O RING			26
2	80086-910	O RING			25
2	80086-142	O RING			24
1	80086-123	O RING			23
8	80086-117	O RING			22
1	80086-039	O RING			21
1	80086-037	O RING			20
2	80086-032	O RING			19
2	80086-020	O RING			18
6	80086-016	O RING			17
2	80086-012	O RING			16
2	80084-912	O RING			15
2	80084-910	O RING			14
2	80083-142	O RING			13
1	80083-123	O RING			12
8	80083-117	O RING			11
1	80083-039	O RING			10
1	80083-037	O RING			9
2	80083-032	O RING			8
2	80083-020	O RING			7
6	80083-016	O RING			6
2	80083-012	O RING			5
2	80472-1	SEAL ROD			4
2	80468-1	SEAL PISTON			3
4	80100-012	BACKUP RING			2
4	80049-1	SEAT			1

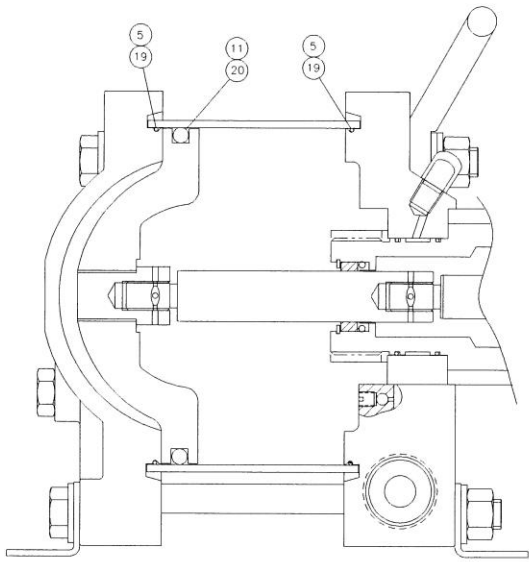
200-100	SH HEAD	PART No.	DESCRIPTION	MATERIAL	SPECIFICATION	REV
UNLESS OTHERWISE SPECIFIED DIM. ARE IN INCHES UNLESS NOTED FINISH: DECIMALS ANGLES 0.125 30° 0.010						
CONTRACT No.		APPROVALS		DATE		
		DRAWN: E.N.		04-00		
FINISH:		CHECKED:		DATE FROM No.		
NEXT ASSY:		ISSUED:		2N386		
APPLICATIONS		DO NOT SCALE DWG.		DWG. No. 80849		REV B
		ENGR:		SCALE		SHEET

HYDRAULICS INTERNATIONAL, INC.
CHATSORTH, CALIFORNIA

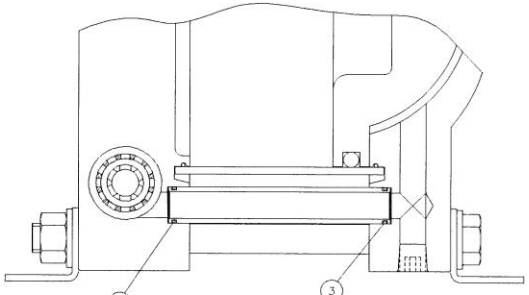
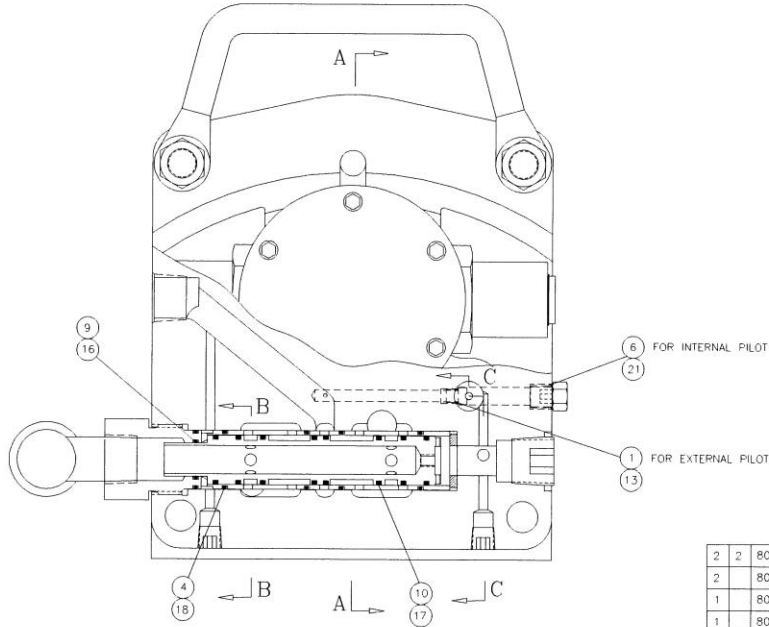
SEAL KIT, LIQUID/GAS SECTION
TWO STAGE -4 RATIO PUMP

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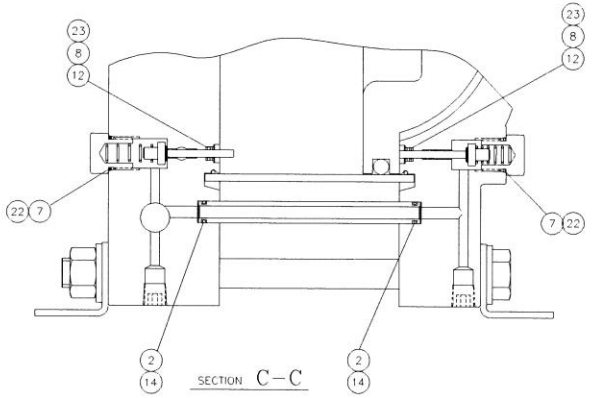
REVISIONS			
REV	DESCRIPTION	DATE	APPROVED



SECTION A-A



SECTION B-B



SECTION C-C

2	2	80101-4	RETAINING RING			23
2	2	80086-906	O RING			22
1	1	80086-904	O RING			21
1	1	80086-431	O RING			20
2	2	80086-050	O RING			19
5	5	80086-020	O RING			18
8	8	80086-017	O RING			17
1	1	80086-015	O RING			16
2	2	80086-014	O RING			15
2	2	80086-010	O RING			14
1	1	80086-009	O RING			13
2	2	80086-006	O RING			12
1	1	80085-431	O RING			11
8	8	80085-017	O RING			10
1	1	80085-015	O RING			9
2	2	80085-006	O RING			8
2	2	80084-906	O RING			7
1	1	80084-904	O RING			6
2	2	80083-050	O RING			5
5	5	80083-020	O RING			4
2	2	80083-014	O RING			3
2	2	80083-010	O RING			2
1	1	80083-009	O RING			1

200-100	PART No.	DESCRIPTION	MATERIAL	SPECIFICATION	ITEM
QTY REQD					
UNLESS OTHERWISE SPECIFIED DIM ARE IN INCHES, TOLERANCES ARE FRACTION DECIMALS ANGLES ±1/16 .001 ±.010 30'		CONTRACT No.	HYDRAULICS INTERNATIONAL, INC. CHATSORTH, CALIFORNIA		
APPROVALS		DATE	SEAL KIT, AIR SECTION 5 INCH GAS BOOSTER -4 RATIO		
DRAWN E.N. 03-00					
CHECKED					
ISSUED			SIZE TSCM No.	DWG. No.	REV
DO NOT SCALE DWG.		ENGR.	D	21386	80871
NEXT ASSY USED ON			SCALE	1/1"	SHEET
APPLICATIONS					1