Hydro Gas Chlorination Systems

Instruction Manual

All HYDRO Chlorination systems are carefully designed and tested for years of safe, accurate field service. All HYDRO Chlorination systems are carefully chlorine tested prior to shipment. All HYDRO products are made of the finest materials. To insure best operation, read these instructions carefully and completely and store them where all maintenance personnel will have access to them.

Each chlorination system consists of the following:

1. The vacuum regulator which mounts on the chlorine cylinder.
2. The ejector, with nozzle and diffuser, mounts directly to the pipe line, storage tank, wet well, or to a solution line.
3. Standard accessories:
   a. Cylinder wrench.
   b. Twenty-five feet of appropriate polyethylene tubing for vacuum lines.
   c. Ten lead gaskets for chlorinator to cylinder valve.
4. Additional parts available from any plumbing supply, or can be ordered through HYDRO:
   a. Pressure gauge.
   b. Water shut off valve.
   c. Y-type strainer.

SECTION I-A: SAFETY INFORMATION (150 LB. CYLINDERS)

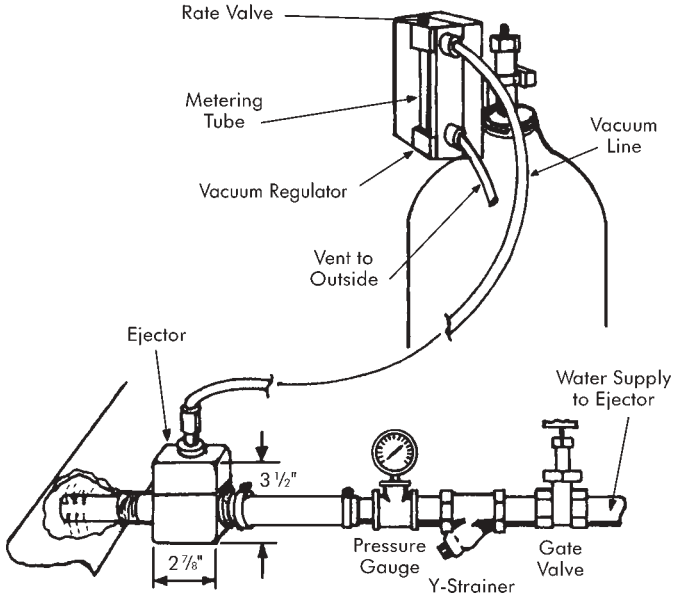
TAKE CARE WITH CHLORINE!

1. Always keep chlorine cylinders in an upright position with the valve cap screwed on tight before moving full or empty cylinders. Cylinders should be moved with care.
2. A safety chain must be placed around the cylinder and secured to a wall. Spare full cylinders should also be secured carefully.
3. For best operation and safety, the **vacuum regulator and cylinders should be protected from the elements including direct sunlight.**
4. **Never** place heaters or heat lamps directly on a cylinder.
5. **Ammonia gas should NOT be stored or fed in the same room with chlorine.** Contact of the gases will result in an explosive mixture.

IMPORTANT NOTE:

HYDRO does not recommend the use of chlorine gas manifolds. *Manifolds contain pressurized chlorine gas thereby increasing the risk of a pressurized chlorine leak. HYDRO vacuum regulators are designed to mount directly onto the valve of chlorine and sulfur dioxide cylinders.* ***Direct cylinder mounting*** *is the easiest and* ***safest*** *configuration to operate and maintain. With this configuration, the chlorine gas flows under vacuum everywhere beyond the one pressure point at the chlorine cylinder valve.*

FIGURE 1A



A typical HYDRO Model 500 series installation injecting chlorine into a pipe line using city water. The water supply to the ejector should be approximately twice the pressure of the chlorinated pipe line in order to create a sufficient vacuum at the ejector.

Hydro Instruments Gas Chlorination Equipment Torque Specifications

Item	Min. inch•lbs.	Max. inch•lbs.
Yoke Bolts	20	25
Body Bolts	20	25
Meter Block Bolts	20	25
Vacuum Fittings	15	20
Inlet Plug	10	15
Dummy Plug	7	10
Item	**Min. foot•lbs.**	**Max. foot•lbs.**
Yoke Half Dog	20	25

SECTION I-B: SAFETY INFORMATION (TON CYLINDERS)

TAKE CARE WITH CHLORINE!

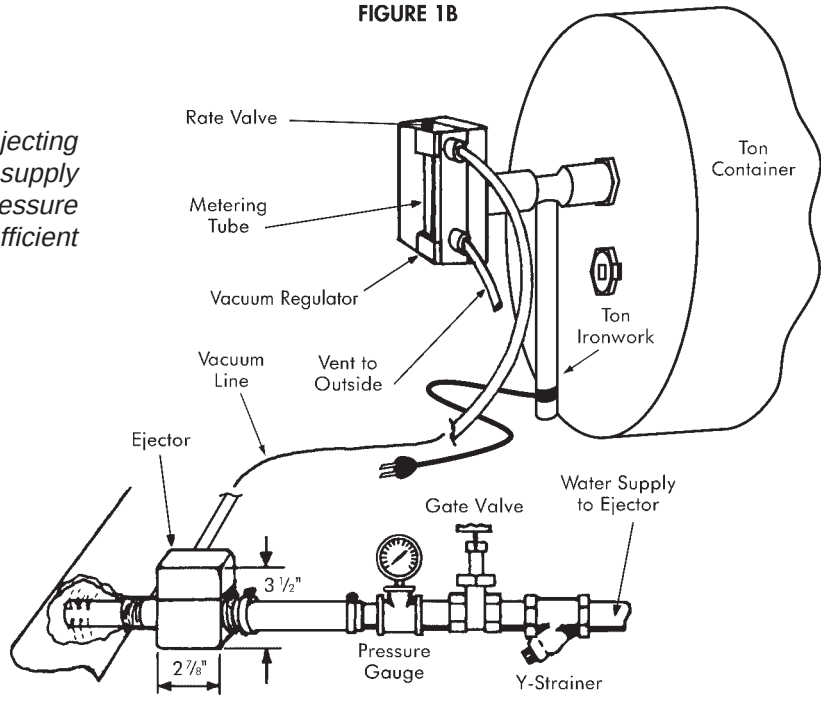
1. Valve protection covers must be on ton container valves **before tons are ever moved.**
2. The ton container should be placed on a pair of trunions and should be level.
3. Always place container so valves are at vertical position and use only the top valve which is the gas valve. **BOTTOM VALVE IS LIQUID—DO NOT USE.**
4. For best operation and safety, the ton cylinders and vacuum regulator should be protected from the elements and direct sunlight.
5. **NEVER** apply heaters or heat lamps directly on a cylinder.

IMPORTANT NOTE:

HYDRO does not recommend the use of chlorine gas manifolds. *Manifolds contain pressurized chlorine gas thereby increasing the risk of a pressurized chlorine leak. HYDRO vacuum regulators are designed to mount directly onto the valve of chlorine and sulfur dioxide cylinders.* ***Direct cylinder mounting*** *is the easiest and* ***safest*** *configuration to operate and maintain. With this configuration, the chlorine gas flows under vacuum everywhere beyond the one pressure point at the chlorine cylinder valve.*

A typical HYDRO Model 700 series installation injecting chlorine into a pipe line using city water. The water supply to the ejector should be approximately twice the pressure of the chlorinated pipe line in order to create a sufficient vacuum at the ejector.

FIGURE 1B



SECTION II: DESIGN AND INSTALLATION NOTES

1. **The "all vacuum" system** means that system will shut off at the cylinder valve, should the vacuum line be broken, if water is stopped for any reason, or if the vacuum regulator is physically damaged.
2. Choosing a **vacuum regulator feed capacity:**

   VACUUM REGULATOR SIZE SHOULD BE ON MAXIMUM POSSIBLE FLOW.

   Imperial Units:

GPM	x	0.012	x	(PPM) Dosage	=	PPD
Gallons Per Minute				Parts Per Million		Pounds Per Day (Cl_2)

   Example: 600 GPM x 0.012 x 3 PPM = 21.6 PPD
   In this example a HYDRO 50 PPD vacuum regulator would be adequate.

   Metric Units:

LPM	x	0.0599	x	(PPM) Dosage	=	GPH
Liters Per Minute				Parts Per Million		Grams Per Hour (Cl_2)

3. **TOTAL BACK PRESSURE** is the pressure in the pipeline to be chlorinated plus the friction losses in the solution line between the ejector and the point of injection at the pipeline. Ejectors capable of operating with back pressures up to 300 Psig are available.
4. It is preferable to locate the ejector at the point of solution injection in order to eliminate the need for **solution lines.** Friction losses in the solution line will **increase the ejector back pressure.** To reduce the friction losses, increase the solution line internal diameter and limit the number of flow restrictions and turns. Also be sure that the solution line material is resistant to **the highly concentrated chlorine mixture. Avoid solution lines wherever possible.**
5. The only connection between the ejector and the vacuum regulator is the HYDRO specified black polyethylene tubing which carries the vacuum (originating at the ejector) to the vacuum regulator, allowing the system to operate. Up to 100 feet of polyethylene tubing between vacuum regulator and ejector is standard. For longer distances consult HYDRO.

SECTION III: SYSTEM INSTALLATION

(I) INSTALLATION OF HYDRO EJECTOR (Refer to Figure 1)

1. Installation of HYDRO EJECTOR:
   a. Remove the diffuser from the ejector assembly and place two wraps of Teflon tape on diffuser threads.
   b. **Do Not** install diffuser into pipe line when assembled with ejector.
   c. Turn diffuser by hand into NPT threads of pipe line ($^3/_4$" or 1 $^1/_4$" NPT). Place wrench on diffuser and tighten **one half turn maximum.**
   d. Reconnect diffuser to ejector making sure black kora-seal gaskets are on each side of nozzle and diffuser.
2. Testing of ejector. *(Note: The vacuum regulator should still be in the shipping case.)*
   i. Piping hook up to ejector (Refer to Figure 1 and **Servicing Section in this Manual**).
      a. Ejector should be installed down stream at a sufficient distance so that chlorinated water is not re-circulated through the booster pump.
      b. On the water inlet side to the ejector nozzle the following should be installed: a water inlet valve, Y-strainer, and a pressure gauge.

ii. Testing for sufficient pump pressure to operate ejector. Also checking that booster pump (if applicable) operating in the proper direction.

Note 1: Ejector must have some back pressure to prevent jetting. (Jetting causes loss of vacuum)

Note 2: When chlorinating into a contact chamber a tee should be installed on the solution line with a vacuum breaker to prevent siphoning.

a. If operating with city water pressure (no booster pump), open the water inlet valve to the ejector and feel for suction (with your finger) at the fitting on the top of the ejector.

b. If using a booster pump, open the water inlet valve to the ejector and the pressure gauge should indicate a sufficient boost. (See ejector curves at the end of this manual.) If pump is operating in proper direction there should be a strong vacuum at the fitting on the top of the ejector. Feel for suction (with your finger) at the fitting on the top of the ejector.

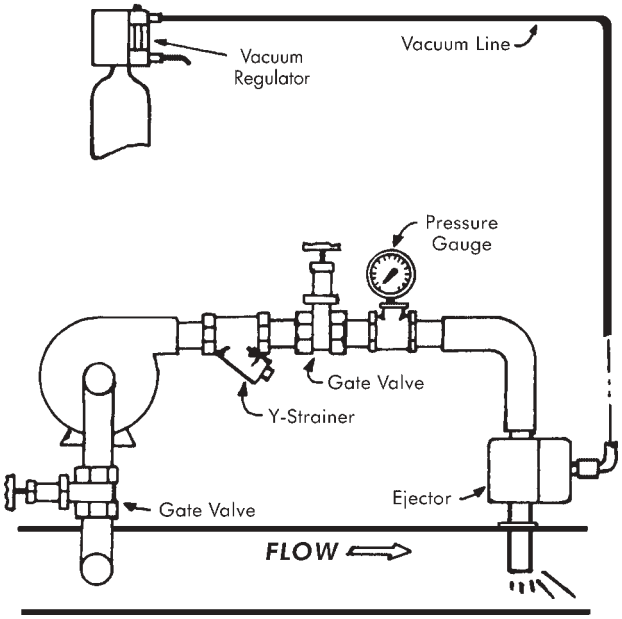
c. If the ejector has tested satisfactorily continue on to the next step (Mounting the Vacuum Regulator).

(II-A) INSTALLATION OF HYDRO VACUUM REGULATOR (150 lbs. Cylinders)

NOTE: The chlorine cylinder valve is CLOSED. Do not open the cylinder until instructed to do so.

1. See that safety chain is secured around chlorine cylinder.
2. Remove the cylinder protection cap from the chlorine cylinder.
3. Examine the vacuum regulator for obvious damage.
4. Remove masking tape on the back of the vacuum regulator used for shipping purposes.
5. Place lead gasket over vacuum regulator inlet assembly.
6. While placing lead gasket on vacuum regulator see that the filter is installed in the inlet assembly. (This filter is necessary to remove particles that may cause the vacuum regulator to leak to vent.)
7. Mount vacuum regulator on cylinder valve being sure the yoke screw is backed out far enough for sufficient clearance. While tightening the yoke screw be certain that the lead gasket stays in place. Excessive tightening can damage gasket and/or yoke screw. DO NOT USE EXCESSIVE FORCE.

FIGURE 2A



A typical HYDRO Model 500 series installation injecting chlorine into a pipe line using a centrifugal pump. Note the location of gate valves for easy Y-strainer cleaning and practical pump maintenance.

NOTE: Pump suction should be 5 feet away from ejector injection point. On larger pipe diameters of 6 inches or greater a distance of 10 times the pipe diameter should be maintained so that chlorinated water is not recirculated through the booster pump.

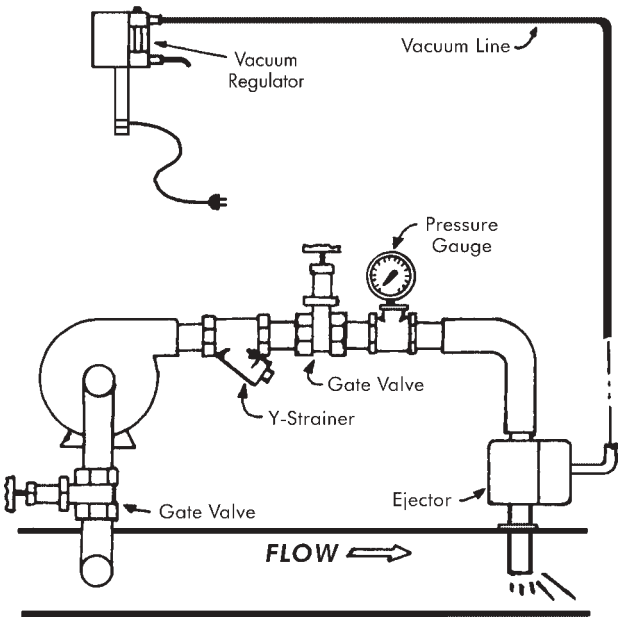
NOTE: Pump suction and ejector must be from the side of pipeline, not from top of the main.

(II-B) INSTALLATION OF HYDRO VACUUM REGULATOR (Ton Cylinders)

NOTE: The chlorine cylinder valve is CLOSED. Do not open the cylinder until instructed to do so.

1. After the chlorine cylinder has been properly installed, remove the valve protector.
2. Chlorine container valves must be in the vertical position with one valve directly above the other.
3. Look at position of top valve. If it faces to or opens on left, a left hand chlorinator is required. Check vacuum regulator to see if you have a left hand unit.
4. Prior to removing valve cap covering the chlorine container valve outlet, make certain the valve is in the closed position. Proceed by removing the cap **slowly.**
5. Inspect for and remove any debris found on the chlorine container valve or on the outlet gasket surface. Do not use a screwdriver or sharp tool to clean.
6. Before mounting, remove all tags and tape from the vacuum regulator. *NOTE: Check that all bolts are tight.*
7. Loosen yoke half-dog until the valve plate can be pushed all the way back.
8. Place **new** $^{1}/_{16}$" gasket over chlorine inlet assembly. **Never** use any other type of gasket or re-use the same gasket.
9. Mount vacuum regulator on cylinder valve with yoke over the valve with the inlet and outlet properly aligned. Tighten the yoke screw while making certain the gasket has not fallen out. Excessive tightening can damage the gasket or yoke screw.
10. Place support bracket, found on the vacuum regulator drip leg, over the lower valve.
11. Warm liquid drip leg by plugging in 25-watt heater. **This must be turned on 15 minutes before start-up.**

FIGURE 2B



A typical HYDRO basic installation injecting chlorine into a pipe line using a centrifugal pump. Note the location of gate valves for easy Y-strainer cleaning and practical pump maintenance.

NOTE: Pump suction should be 5 feet away from ejector injection point. On larger pipe diameters of 6 inches or greater a distance of 10 times the pipe diameter should be maintained so that chlorinated water is not recirculated through the booster pump.

NOTE: Pump suction and ejector must be from the side of pipeline, not from top of the main.

(III) CONNECTING VACUUM LINES BETWEEN VACUUM REGULATOR AND EJECTOR AND VACUUM REGULATOR VENT TO OUTSIDE (Refer to Figures 1 and 2)

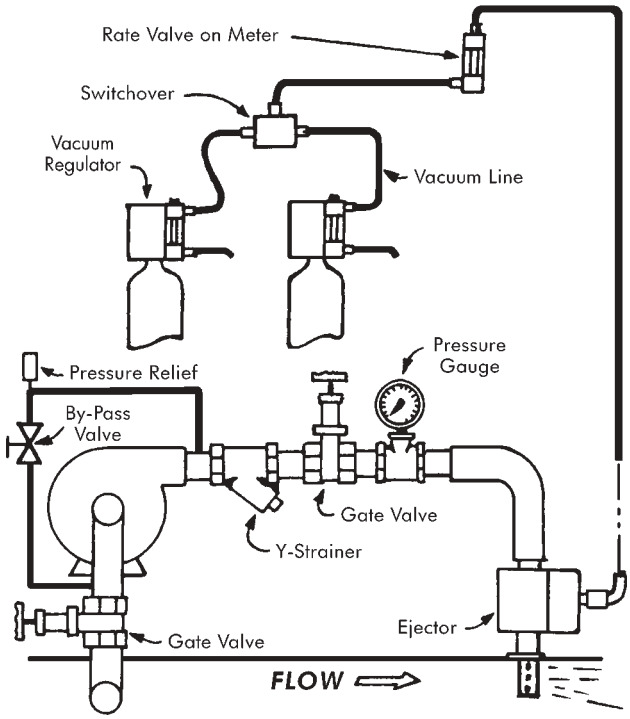
1. For units of 250 PPD (5 kg/hr) or less, the upper connector on right top of vacuum regulator is for vacuum line tubing to ejector. For 500 PPD (10 kg/hr) and above units, the lower connector on the right side of the back body is for the vacuum tubing to the ejector. (Allow enough vacuum tubing for changing cylinders.)
2. Connect vacuum tubing to second connector on the vacuum regulator and vent to safe area outside of building. (Place bug screen outside on end of vent tubing.)

   *NOTE: **Do Not** connect vent lines from two vacuum regulators to one common vent. You **must** run **separate** vent lines to the outside, when using multiple vacuum regulators.*

(IV) UNITS WITH SWITCHOVER MODULES AND/OR REMOTE METERS (Refer to Figure 3)

1. **Switchover modules:** (Gas flow is from bottom/side to top from one side only at a time)
   a. Connect the two lines from the vacuum regulators to the side tube connectors.
   b. Connect the single line out to the remote meter(s) to the top tube connector.
2. **Remote Meters:** (Gas flow is from bottom to top through the tube)
   a. Connect the line in to the bottom tube connector.
   b. Connect the line out to the feed point to the top connector.

FIGURE 3A

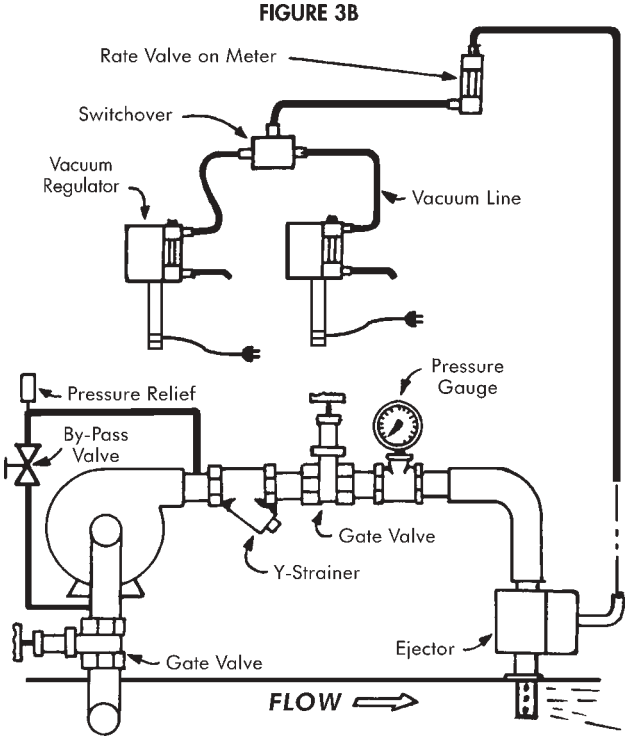


A typical HYDRO MODEL 502 SWITCHOVER System injecting chlorine into a pipeline using a turbine positive displacement pump. Pressure relief valve must discharge to a drain or outside of building. Note the by-pass piping from pump discharge through by-pass valve back to suction side of pump.

NOTE: By-pass valve must never be completely closed.

NOTE: Pump suction and ejector must be from the side of the pipeline, not from the top of the line.

FIGURE 3B



A typical HYDRO SWITCHOVER System injecting chlorine into a pipeline using a turbine positive displacement pump. Pressure relief valve must discharge to a drain or outside of building. Note the by-pass piping from pump discharge through by-pass valve back to suction side of pump.

NOTE: By-pass valve must never be completely closed.

NOTE: Pump suction and ejector must be from the side of the pipeline, not from the top of the line.

SECTION IV: CHLORINATION SYSTEM VACUUM TEST

1. **Do Not** open chlorine cylinder valve until vacuum test is satisfactorily completed.
   a. Vacuum Test
   With the chlorine cylinder still closed, start the ejector booster pump and the meter tube ball should drop to the bottom within about ten seconds. If the ball continues to bounce there is either a leak at the lead gasket or a loose connection at the vacuum tube fittings or meter tube. (The tube fittings should be hand tight. It is not necessary to use pliers or a wrench on these fittings. If meter tube needs tightening, use a quarter and finger tighten inlet plug.) At this time the rate valve on the vacuum regulator should be open two or three turns.
   b. If the ejector is operating properly (pulling sufficient vacuum) the red indicator on the front of the vacuum regulator should be showing.
   c. Turn off water supply to ejector.
   d. Wait 5 to 10 minutes with water supply off. The reset knob should turn freely all the way around and the indicator should continue to show red. (If red continues to show, the system is vacuum tight.)
   e. If the system is vacuum tight proceed to the next step.
   f. Disconnect vacuum tubing at top of vacuum regulator to allow air to enter the system. Reconnect tubing.
   (1) Turn the reset on the front of the vacuum regulator and it should not show red.

SECTION V: START UP OF CHLORINATION

Material necessary: *A small plastic squeeze bottle, 1/3 full of household ammonia, for detecting chlorine leaks. When ammonia fumes contact chlorine gas a visible white smoke-like gas is produced. (Wipe up any splashed liquid ammonia.)*

1. Open chlorine cylinder valve 1/4 turn and **close immediately.**
2. Squeeze ammonia bottle (ammonia fumes, not liquid) at gasket and yoke assembly area and around rate valve bonnet: if no smoke appears the seals are tight and it is OK to proceed to the next step.
3. Open chlorine cylinder valve 1/4 turn, leave open, and **recheck for chlorine leaks.** (1/4 turn open of the cylinder valve is all that's required. The reason we specify 1/4 turn is that when you turn it off you know it should close with 1/4 turn. In an emergency you can shut it off quickly and safely. The wrench stays on the cylinder valve while cylinder is open.)
4. Turn on water supply or booster pump to ejector and set rate valve to desired flow rate. Read flow rate at center of ball on meter tube scale.
5. Rate valve is not a shut off valve: it is a flow rate control only. **To shut off chlorine feed close the chlorine cylinder valve.**

SECTION VI: SHUT DOWN PROCEDURE

1. Close the chlorine cylinder valve while pump is still running.
2. Wait for ball to rest at bottom of meter tube and flag to show red.
3. Break vacuum by removing the tubing at the vacuum regulator and reattach. (Repeat at least 2 times for more complete removal of gas from the system.)
4. Shut down the water supply to the ejector.

This procedure of shut down must be followed before a vacuum regulator is removed from a cylinder.

NOTE: After installing the vacuum regulator with a new lead gasket on the new cylinder, the vacuum tubing on the output fitting should be removed to allow air to enter the system and break the vacuum. ***Not releasing vacuum and turning on cylinder will slam the diaphragm forward and could cause damage to the diaphragm assembly.*** *You can also accomplish breaking the vacuum by turning the rate valve out of the bonnet. Either way is acceptable.*

SECTION VII: RATE VALVE OPERATION

After 7 turns, the gas feed rate will experience an approximately 20% drop as an air passage is opened through the hole in the monel bonnet. Further turns will completely remove the rate valve from the flow meter tube, which will cause a loss of gas feed. ***(See Appendix for servicing instructions.)***

The O-ring seal for the rate valve is locked in place under the valve bonnet and does not come out when the rate valve is pulled out of the bonnet.

PREVENTATIVE MAINTENANCE NOTE: Rate valves that are not exercised frequently may experience a build up of a white powdery substance which precipitates out of the chlorine gas. In order to avoid this build up, which can cause the rate valve to become stuck in place, it is recommended that the rate valve be periodically exercised. See Appendix for rate valve maintenance instructions.

SECTION VIII: TROUBLESHOOTING

(I) PRESSURIZED LEAKS

1. Pressurized chlorine leaks are a safety hazard to life and equipment and should be corrected immediately. When searching for this type of leak there are basic safety rules to follow.
   a. Air breathing pack should be readily available and personnel should know how to use it properly.
   b. Exhaust fan switch should be located near outside entrance with an additional alternate outside switch appropriately located.
   c. Chlorine cylinder wrench should remain on the cylinder whenever cylinder is open.
   d. Plastic squeeze bottle $^1/_3$ full of household ammonia.
   e. Buddy system used (two people capable of operating system).
2. If a leak is detected the following should be checked first:
   a. The **lead gasket** between the chlorine cylinder valve and the vacuum regulator inlet assembly.
      i. Tighten the half dog screw on the vacuum regulator yoke assembly which is used to secure the inlet assembly to the chlorine cylinder valve. (Do not use excessive force.)
      ii. Always use a new lead gasket. It is recommended to obtain gaskets through HYDRO to be certain of size and quality.
   b. **Chlorine cylinder valve packing.**
      i. Tighten the cylinder valve with care, not excessively! Close the valve if problem persists and notify your chlorine supplier.
      ii. If valve is the problem try to move cylinder with a high degree of safety to an outside location. (**Never** attempt to place cylinder in water as this will only increase the leak and the cylinder may float to the surface.)
   c. Chlorine leaking out the vent due to **the inlet safety shut off valve** having dirt on the valve seat.
      i. Close the **chlorine cylinder valve.**
      ii. Wait until the metering ball drops to zero on the flow tube.
      iii. Turn off water supply to ejector.
      iv. Now remove the vacuum regulator from the cylinder valve provided that the red indicator is showing no chlorine pressure. (Red should be showing.)

v. See Appendix for inlet safety shut off valve servicing instructions.

vi. After servicing and remounting vacuum regulator with a new lead gasket, pull a vacuum test **before** you turn on the chlorine cylinder valve. ***See "Chlorination System Vacuum Test" (Section IV).***

(II) NO CHLORINE FEED

Possible causes:

1. No vacuum being produced by ejector.
   a. Remove poly tubing from ejector fitting and place your finger on it; you should feel a suction.
   b. If you feel no suction (vacuum) check in this order:
      i. **Nozzle *(See Appendix)*:** Turn off water supply and remove nozzle from ejector.
         (1) It may be clogged with a stone or other foreign matter. Flush out or run pipe cleaner through only.
         (2) If there is a build-up of rust, iron, or manganese, place the nozzle in a Muriatic acid for five minutes and rinse with water. If you see a black syrup substance you may find it necessary to clean the nozzle on a preventative maintenance schedule.
      ii. **Inlet Water Supply.**
      iii. Reduced city water pressure.
      iv. Y strainer needs cleaning.
      v. Booster pump cavitating (lost its prime).
      vi. Booster pump insufficient boost due to wear or single phasing due to loss of one leg of power.
      vii. Booster pump may have flooded suction.
2. Chlorine flow blocked at vacuum regulator inlet assembly.
   a. The **Inlet filter could be clogged.**
3. **Out of Chlorine.**
   a. The scale would read 150 lbs. lighter than when cylinder was new.
   b. Flow ball would be at zero and RED indicated on front of vacuum regulator.

APPENDIX: SERVICING THE HYDRO SYSTEM

HYDRO vacuum regulators require little service when operated according to instructions. The following are recommended maintenance instructions.

NOTE: All HYDRO systems come with a three year limited warranty. Hydro does repair and refurbish used units. The repaired and retested units are shipped from Hydro within 48 hours of arrival at the factory with a one year warranty.

Guidelines for Preventative Maintenance: See below for detailed instructions.

1. Service Rate Valves every 4 months.
2. Replace Rate Valve O-ring every 12 months.
3. Service Flow Meter (of vacuum regulators as well as remote meters) every 12 months.
4. Service Ejector every 12 months.
5. Replace vacuum tubing every 12-18 months.
6. Replace vacuum tubing fittings every 18-24 months.

CAUTION: Use all recommended precautions when using chemicals of any kind, including goggles, gloves, face shields, etc.

After any of the listed repair procedures, it is necessary to go through the Start-Up including vacuum test again!

SECTION A-I: CLEANING THE SAFETY SHUT OFF VALVE AND SEAT

1. Remove the two screws holding the metal yoke plate to the vacuum regulator body.
2. Grasp the metal yoke and with a slight turning motion pull it out of the vacuum regulator body.
3. Remove the 3PS-214 O-Ring from the Seal Plug.
4. Pull the KFH-100 Filter Holder (and/or the filter) out of the Seal Plug.
5. Using a short flat head screwdriver and a pair of pliers unscrew the YM-100A Inlet Valve Stem from the YM-102A Vent Plug.

   NOTE: Protect the YM-102A Vent Plug from the pliers with a cloth or paper.

   NOTE: This should be done with the Seal Plug installed in the Yoke Assembly unless the Yoke Assembly is being replaced.
6. Now the YM-100A, YM-101A, YM-102A, YP-100, and YM-103 should all be removed and cleaned.

   NOTE: Especially clean the YM-100A in the region where it meets the YP-101A to form the seal. This surface should be polished as smooth as possible.
7. Using a rod of 0.250" diameter, the YP-101A Inlet Valve Seat can be pressed out of the Seal Plug from the spring side. The YP-101A should be cleaned and carefully inspected for scratches or cuts especially where it is to seal with the YM-100A.

   NOTE: Sometimes the YP-101A will be cut or deformed such that it cannot seal. If you perform this service and the Vacuum Regulator is still leaking to vent, then the YP-101A should be replaced with a new one.

8. Clean the Seal Plug thoroughly before reassembling the unit in the following order:
   a. Lubricate O-Rings with Flurolube™ grease.
   b. Insert the new or cleaned YP-101A with O-Ring 3RS-010.
   c. Insert and retighten the YM-100A, YM-101A, YP-100, YM-103 and YM-102A as shown in the drawing.
      NOTE: DO NOT USE EXCESSIVE FORCE IN TIGHTENING the YM-100A to the YM-102A. These threads can break if over-tightened.
   d. Insert a new Filter Cartridge.
   e. Install a new 3PS-214 O-Ring on the Seal Plug.

SECTION A-II: SERVICING FLOW METER ASSEMBLY

1. Close chlorine cylinder valve. Follow shut down procedures before performing repairs.
2. Wait for the ball to drop in the meter tube and for the vacuum regulator flag to show red.
3. Remove rate valve from bonnet. See Section A-III below for servicing rate valve and to remove bonnet and Rate Valve O-Ring.
3. Loosen the Inlet plug about 2 to 3 turns being careful not to let the meter tube fall as it becomes loose. Remove the meter tube, being careful not to loose the top and bottom stops or the meter tube ball.
4. If there is any buildup in the tube, remove the stops and ball and soak the tube in water with a cleaner like Lime Away or Muriatic Acid until the white material is sufficiently removed from inside the tube.
   NOTE: Always follow safety precautions with Muriatic Acid and other cleaners.
5. If the markings on the tube are faded, then go over the markings with a permanent marker and then wipe the excess on surface with a dry cloth.
6. If the meter gaskets have not yet been changed then they can be turned over. If the meter gaskets have been reused already then replace with new gaskets.
7. Remove the Inlet Plug completely from the Bottom Meter Block in order to change or re-grease O-Rings. Check O-Rings and if necessary replace them. Add some grease to the inside walls of the Meter Block where it contacts these O-Rings.
8. Replace the ball and stops in the tube and put the tube back into position securing it by tightening the Inlet Plug. DO NOT OVERTIGHTEN.

SECTION A-III: REPLACING RATE VALVE O-RING AND SERVICING RATE VALVE

1. Close chlorine cylinder valve. Follow shut down procedures before performing repairs.
2. Wait for the ball to drop in the meter tube and for the vacuum regulator flag to show red.
3. Turn off water supply to ejector.
   a. Remove the Rate Valve and clean thoroughly.
   b. Place piece of tape or cloth around monel bonnet, grip firmly with pliers, and turn counterclockwise.
   c. Under bonnet you just removed is the Rate Valve O-Ring. Remove and replace with new O-Ring, seating with the (clean) eraser side of a pencil.
   d. Replace monel bonnet (turn snug) and install rate valve. DO NOT OVERTIGHTEN (can crack the block).

SECTION A-IV: DISASSEMBLY OF VACUUM REGULATOR UNIT

1. Follow the usual shut down procedure carefully before removing any vacuum regulator from the gas bottle.
2. Follow Appendix Section I to remove the Yoke assembly from the vacuum regulator body.
3. Unscrew the four body bolts from the Back Body.
4. Pull the Back Body directly away from the Front Body until they separate.
5. Carefully take the diaphragm assembly and pull it directly away from the Front Body (the two are pin connected by the guide pin).
6. To disassemble the diaphragm, grasp the front and rear plates and turn them apart (they are threaded together and may require use of a vice).
7. Inspect all O-Rings and replace if necessary.
8. Remove the Pin Guide (FB-104) by carefully pushing it from the face plate side of the Front Body. Be careful not to damage the center hole.
9. After inspection and replacement of parts or O-Rings, reassemble unit in reverse order.

   NOTE: DO NOT FORGET THE VENT SPRING (DM-100).

SECTION A-V: SERVICING EJECTOR NOZZLE

1. Follow the usual shut down procedure carefully before removing the black tubing from the Ejector.
2. Remove the Ejector unit from the pipe line.
3. Unscrew the Nozzle and Diffuser from one another.
4. For up to 100 PPD, the Nozzle is the longer piece. For 250 PPD and over, the Nozzle is the smaller piece.
5. Inspect for obvious damage and that it is not clogged with particles or any kind of deposit.

   NOTE: Do not attempt to re-drill the hole in any way.
6. If there is any kind of buildup (Iron, Calcium, etc.) in the Nozzle, soak it a Muriatic Acid bath for at least 5 to 10 minutes or until it is clean.

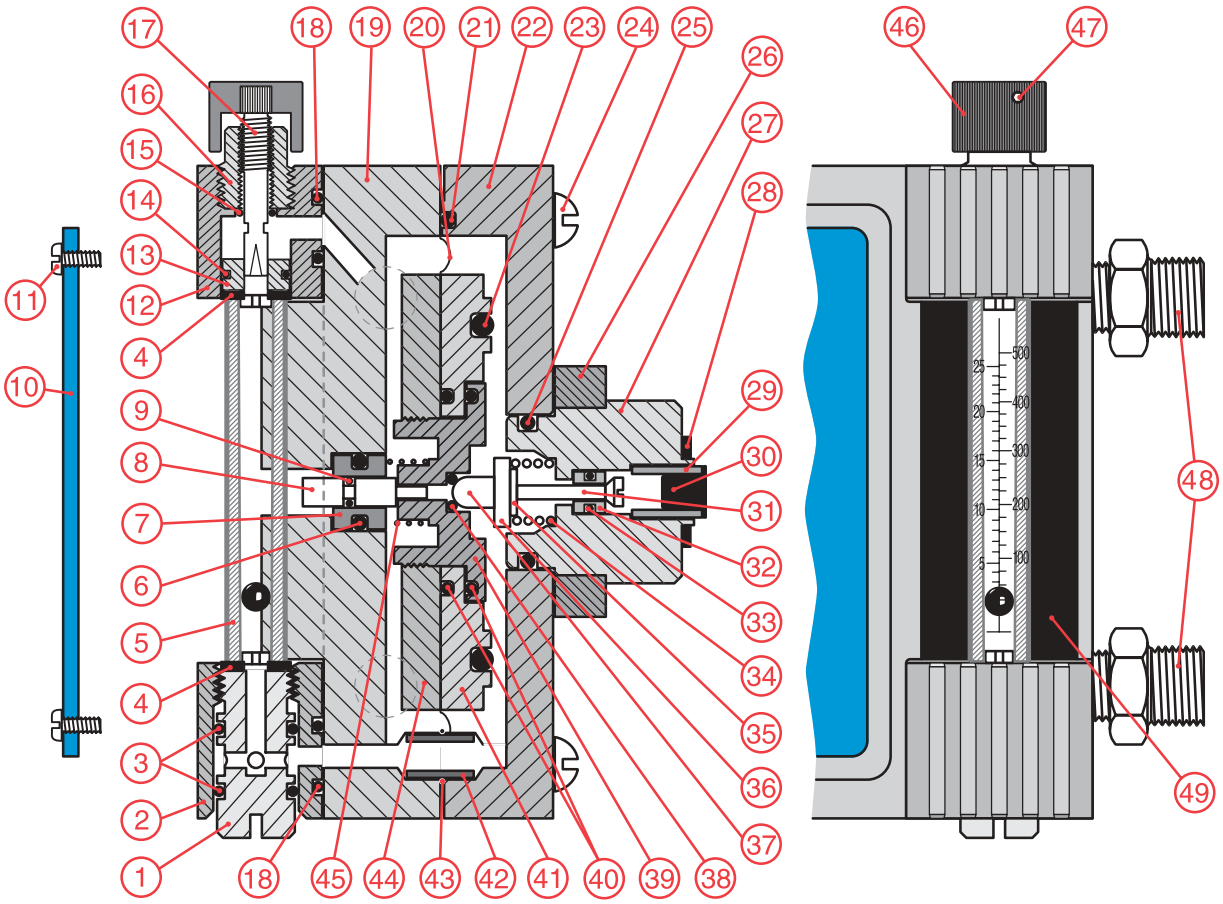
   NOTE: Always follow safety precautions with Muriatic Acid and other cleaners.
7. It is recommended that the gaskets are replaced each time the Nozzle and Diffuser are disassembled for maintenance, especially when the gaskets are visibly deformed.
8. Reassemble the Ejector being careful to remember to use the Nozzle and Diffuser gaskets.

SECTION A-VI: SERVICING EJECTOR CHECK VALVE ASSEMBLY

1. Follow the usual shut down procedure carefully before removing the black tubing from the Ejector.
2. Remove the Ejector unit from the pipe line.
3. Remove the four bolts holding the two body parts together.
4. Lift the Top Body away from the Bottom Body.
5. The 3RS-203 O-Ring should be replaced.
6. Inspect the SM-112 Diaphragm for damage (holes, cracking, etc.). If necessary, unscrew the diaphragm nut and bolt, preferably using a Spanner wrench and tongue and groove pliers. Use care not to snap the nut.
7. The Spring holds a lifetime guarantee and should not need replacement.
8. Replace any parts necessary and reassemble.

SECTION A-VII: SERVICING SWITCHOVER MODULE

1. Follow the usual shut down procedure carefully before removing the black tubing from the Switchover.
2. Remove the four bolts on each side which hold on the End Caps (SM-107).
3. Remove the two diaphragm assemblies. Inspect for obvious damage.
   NOTE: When replacing the SM-112 Diaphragm the side of the inside hole which is raised should be against the Diaphragm Nut which has a groove for this purpose.
4. Inspect all O-Rings (especially the 3RS-203 O-Rings).
5. Check to make sure that the Pivot Arm assembly does switch freely.
6. If not, remove the Top Block by unscrewing the four bolts which hold it to the Center Body.
   NOTE: If you lay the Center Body with bracket holes down, the Top Cap fitting should be to the left.
7. Remove the Pivot Arm assembly and inspect for obvious damage.
8. Inspect and replace any O-Rings before reassembling.
9. Be careful about orientation of the Top Cap and the Pivot Arm assembly when reassembling.
   CAUTION: When replacing the Top Cap there will be compression of the YM-103 Spring and the Silver Spring Guide Pin (SM-105) will slide into the Spring Pivot (SM-103). If the Pin binds in the guide and you continue to tighten the bolts, the pin will be bent and will require replacement.
   NOTE: When replacing the Top Cap also be sure that the 3RS-023 O-Ring stays in place. The Top Cap will crush this O-Ring if tightened when the O-Ring is out of the groove and cause a leak.
10. Reassemble the diaphragms and replace in the Center Body.
    NOTE: Make sure that the diaphragm ears are aligned on the sides of the Pivot Arm to avoid interference.
11. Replace the End Caps after all parts have been replaced.



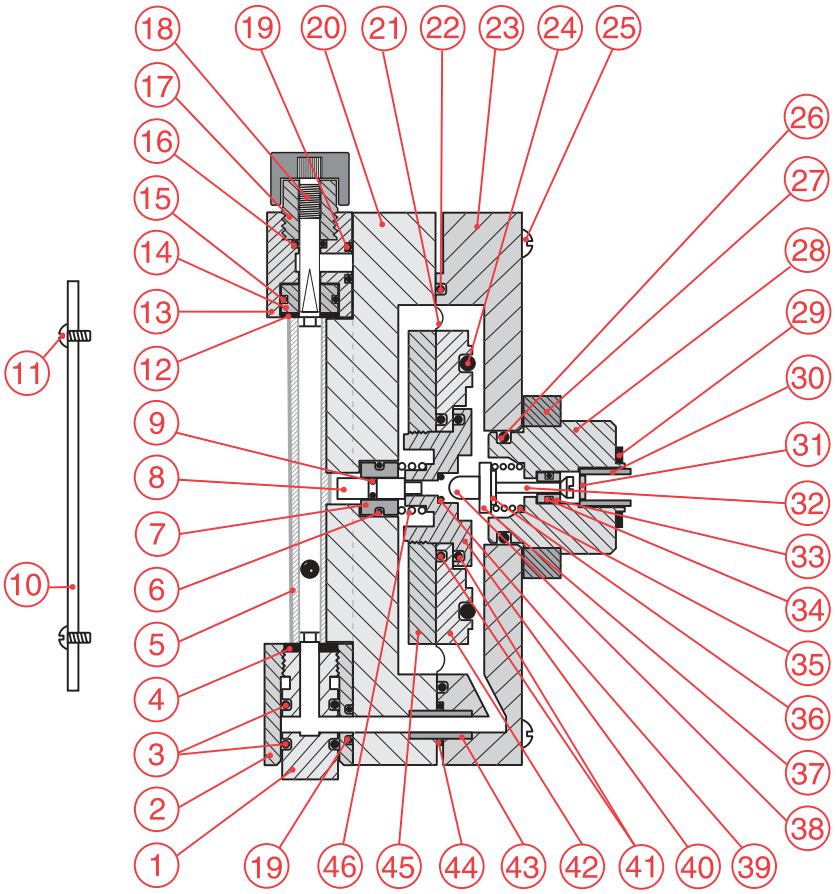
Item No.	Description	Quantity	Part No.
1	Inlet Plug	1	FM-101A
2	Bottom Meter Block	1	FM-103
3	O-Rings	2	3PS-112
4	Meter Gaskets	2	MG-001
5	Flow Meter	1	MT-B-11
6	O-Ring	1	3RS-014
7	Pin Guide	1	FB-104
8	Guide Pin	1	DM-101A
9	O-Ring	1	3RS-006
10	Cover Plate	1	FB-105
11	Cover Plate Screws (Nylon)	2	#6-32 x 5/16"
12	Top Meter Block	1	FM-100B
13	Rate Valve Seat	1	VT-104
14	O-Ring	1	3RS-012
15	O-Ring	1	3PS-106
16	Valve Bonnet	1	VB-100C
17	RateValve	1	VP-103C
18	O-Rings	2	3PS-110
19	Front Body	1	FB-100A
20	Double Diaphragm	1	DP-103
21	O-Ring	1	3PS-156
22	Back Body	1	BB-100A
23	O-Ring	1	3PS-332
24	Body Screws (Monel)	4	1/4-20 x 1 1/2"
25	O-Ring	1	3PS-214
26	Back Plate	1	YM-105A
27	Seal Adapter	1	SAWS
28	Lead Gasket	1	LG-100
29	Filter Holder	1	KFH-200

Item No.	Description	Quantity	Part No.
30	Teflon Filter	1	T-210
31	Inlet Valve	1	YM-100A
32	Inlet Valve Seat	1	YP-101A
33	O-Ring	1	3RS-010
34	Inlet Spring	1	YM-103
35	Bearing Washer	1	YM-101A
36	Spring Retainer	1	YP-100
37	Vent Plug	1	YM-102A
38	O-Ring	1	3RS-009
39	Diaphragm Vent Bolt	1	DP-102A
40	O-Rings	2	3PS-029
41	Rear Diaphragm Plate	1	DP-101A
42	Tube Connector	1	FB-106
43	O-Ring	1	3RS-012
44	Front Diaphragm Plate	1	DP-100A
45	Vent Spring	1	DM-100
46	Rate Valve Knob	1	RV-100A
47	Rate Valve Knob Set Screw	1	#5-40 x 1/4"
48	3/8" Vent & Vacuum Fitting	2	F-104
49	Meter Shield	1	
*	Meter Block Screws (Monel)	4	#10-24 x 1"
*	Yoke Screws (Monel)	2	1/4-20 x 1 7/8"

* Not shown.

VACUUM REGULATOR

Date: December 2002
Scale: 67%
Dwg. No. Series 500★



Item No.	Description	Quantity	Part No.
1	Inlet Plug	1	FM-101A
2	Bottom Meter Block	1	FM-203
3	O-Rings	2	3PS-112
4	Bottom Meter Gasket	1	MG-200B
5	Flow Meter Tube (200 PPD)	1	MTB-11-200
6	O-Ring	1	3RS-014
7	Pin Guide	1	FB-104
8	Guide Pin	1	DM-101A
9	O-Ring	1	3RS-006
10	Cover Plate	1	FB-105
11	Cover Plate Screws (Nylon)	2	#6-32 x 5/16"
12	Top Meter Gasket	1	MG-200T
13	Top Meter Block	1	FM-200B
14	Rate Valve Seat	1	VT-204
15	O-Ring	1	3RS-016
16	O-Ring	1	3PS-106
17	Valve Bonnet	1	VB-100C
18	Rate Valve (200 PPD)	1	VP-203C
19	O-Rings	2	3PS-110
20	Front Body	1	FB-100A
21	Double Diaphragm	1	DP-103
22	O-Ring	1	3PS-156
23	Back Body	1	BB-100A
24	O-Ring	1	3PS-332
25	Body Screws (Monel)	4	1/4-20 x 1 1/2"
26	O-Ring	1	3PS-214
27	Back Plate	1	YM-105A
28	Seal Adapter	1	SAWS
29	Ton Ironwork Inner Lead Gasket	1	G-332

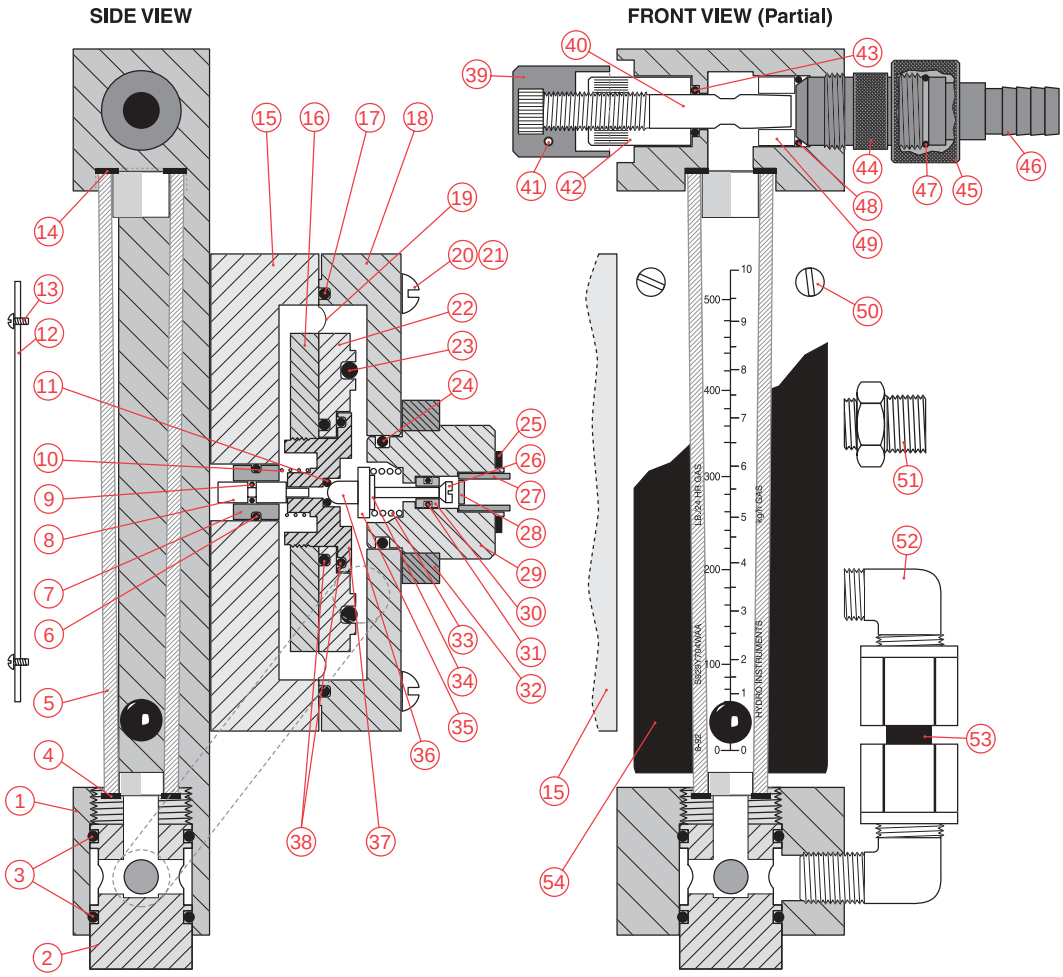
Item No.	Description	Quantity	Part No.
30	Filter Holder	1	KFH-200
31	Silver Screen & Hat	1	S-275
32	Inlet Valve	1	YM-100A
33	Inlet Valve Seat	1	YP-101A
34	O-Ring	1	3RS-010
35	Inlet Spring	1	YM-103
36	Bearing Washer	1	YM-101A
37	Spring Retainer	1	YP-100
38	Vent Plug	1	YM-102A
39	O-Ring	1	3RS-009
40	Diaphragm Vent Bolt	1	DP-102A
41	O-Rings	2	3PS-029
42	Rear Diaphragm Plate	1	DP-101A
43	Tube Connector	1	FB-106
44	O-Ring	1	3RS-012
45	Front Diaphragm Plate	1	DP-100A
46	Vent Spring	1	DM-100
*	Meter Block Screws (Monel)	4	#10-24 x 1"
*	Yoke Block Screws (Monel)	2	1/4-20 x 1 7/8"
*	Vent Fitting 3/8"	1	F-104
*	Vacuum to Ejector Fitting 1/2"	1	F-106

* Not shown.

hydro INSTRUMENTS

VACUUM REGULATOR

Date: December 2002
Scale: N.T.S.
Dwg. No. Series W200★



Note: See IW-1★ drawing for ironwork parts.

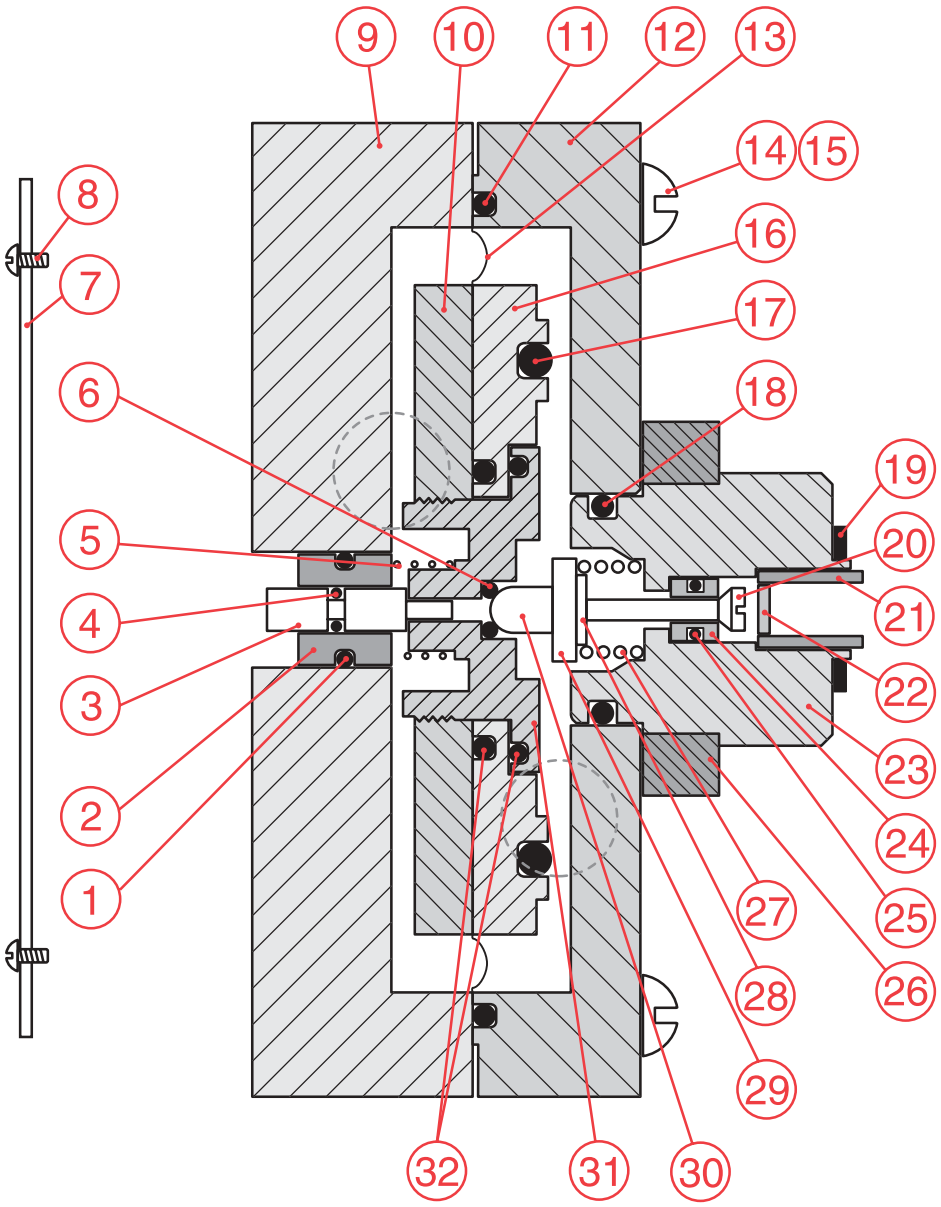
Item No.	Description	Quantity	Part No.
1	Flow Meter Body	1	TFM-500
2	Inlet Plug	1	IP-498
3	O-Rings	2	3RS-212
4	Bottom Meter Gasket	1	G-162
5	Flow Meter Tube	1	MT-678
6	O-Ring	1	3RS-014
7	Pin Guide	1	FB-104
8	Guide Pin	1	DM-101A
9	O-Ring	1	3RS-006
10	Vent Spring	1	DM-100
11	O-Ring	1	3RS-009
12	Face Plate	1	FB-105-700
13	Cover Plate Screws (Nylon)	2	#6-32 x 5/16"
14	Top Meter Gasket	1	G-161
15	Front Body	1	FB-5A
16	Front Diaphragm Plate	1	DP-100A
17	O-Ring	1	3PS-156
18	Back Body	1	BB-5A
19	Double Diaphragm	1	DP-103
20	Body Screws (Monel)	4	1/4 -20 x 1 1/2"
*21	Back Plate Screws (Monel)	2	1/4 -20 x 1 7/8"
22	Rear Diaphragm Plate	1	DP-101A
23	O-Ring	1	3PS-332
24	O-Ring	1	3PS-214
25	Lead Gasket	1	LG-100
26	Inlet Valve	1	YM-100A
27	Filter Holder	1	KFH-200
28	Silver Screen & Hat	1	S-275
29	Seal Adapter	1	SAWS
30	Inlet Valve Seat	1	YP-101A
31	O-Ring	1	3RS-010
32	Back Plate	1	YM-105A
33	Inlet Spring	1	YM-103
34	Bearing Washer	1	YM-101A
35	Spring Retainer	1	YP-100
36	Vent Plug	1	YM-102A
37	Diaphragm Vent Bolt	1	DP-102A
38	O-Rings	2	3PS-029
39	Rate Valve Knob	1	S496
40	Rate Valve	1	SA495
41	Rate Valve Knob Set Screw (stainless)	1	#6-32 x 5/16"
42	Valve Bonnet	1	S493
43	O-Ring	1	3RS-203
44	Rate Valve Seat Retainer	1	S494
45	Knurled Fitting (nut)	1	EJF-2
46	Gray Tubing Connector	1	EJF-3
47	O-Ring	1	3RS-114
48	O-Ring	1	3RS-114
49	Rate Valve Seat	1	S497
50	Panel Screws (Monel)	4	#10-24 x 1/2"
51	Vent Fitting (3/8")	1	F-104
52	1/2" Tube x 3/8" NPT Male Elbow	2	40-8-6
53	500 PPD Tube Connector	1	FB-106-500
54	Meter Shield	1	MS-700

* – Not shown.

hydro INSTRUMENTS

VACUUM REGULATOR

Date: December 2002
Scale: 49%
Dwg. No. Series 750★



Note: See YA-1 drawing for yoke assembly parts.

Item No.	Description	Quantity	Part No.
1	O-Ring	1	3RS-014
2	Pin Guide	1	FB-104
3	Guide Pin	1	DM-101A
4	O-Ring	1	3RS-006
5	Vent Spring	1	DM-100
6	O-Ring	1	3RS-008
7	Face Plate	1	FB-105-700
8	Cover Plate Screws (Nylon)	2	#6-32 x 5/16"
9	Front Body	1	FB-5A
10	Front Diaphragm Plate	1	DP-100A
11	O-Ring	1	3PS-156
12	Back Body	1	BB-5A
13	Double Diaphragm	1	DP-103
14	Body Screws (Monel)	4	1/4 -20 x 1 1/2"
*15	Back Plate Screws (Monel)	2	1/4 -20 x 1 7/8"
16	Rear Diaphragm Plate	1	DP-101A
17	O-Ring	1	3PS-332
18	O-Ring	1	3PS-214
19	Lead Gasket	1	LG-100
20	Inlet Valve	1	YM-100B

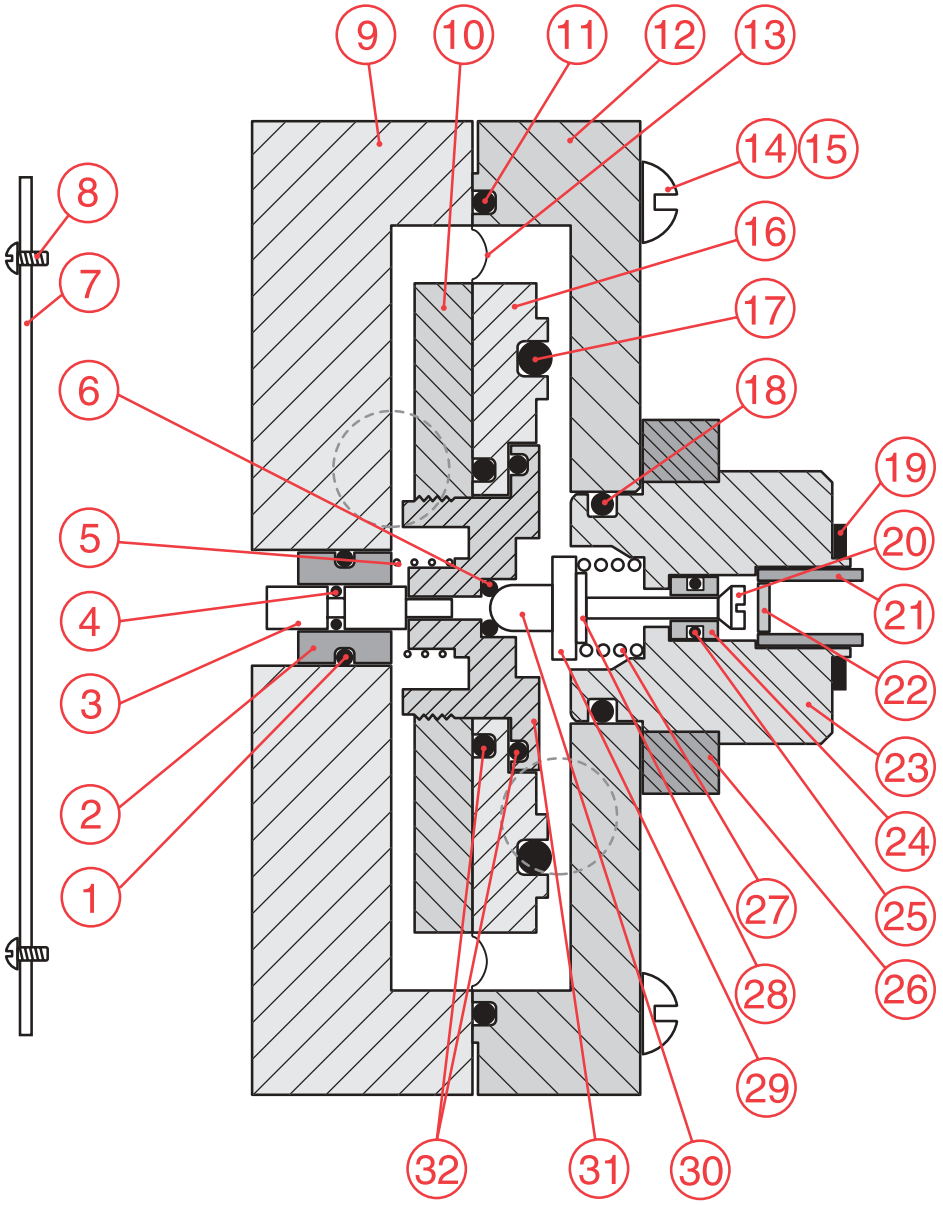
Item No.	Description	Quantity	Part No.
21	Filter Holder	1	KFH-100
22	Silver Screen	1	S-275
23	Seal Adapter	1	SAWS
24	Inlet Valve Seat	1	YP-101B
25	O-Ring	1	3RS-010
26	Back Plate	1	YM-105A
27	Inlet Spring	1	YM-103
28	Bearing Washer	1	YM-101A
29	Spring Retainer	1	YP-100
30	Vent Plug	1	YM-102A
31	Diaphragm Vent Bolt	1	DP-102A
32	O-Rings	2	3PS-029
*33	Vent Fitting (3/8")	1	F-104
*34	1/2" Tube x 3/8" NPT Fitting	2	10-10-6

* – Not shown.

Wilkerson INSTRUMENTS

VACUUM REGULATOR

Date: May 2002
Scale: Actual size
Dwg. No. Series W-20★



Note: See YA-1 drawing for yoke assembly parts.

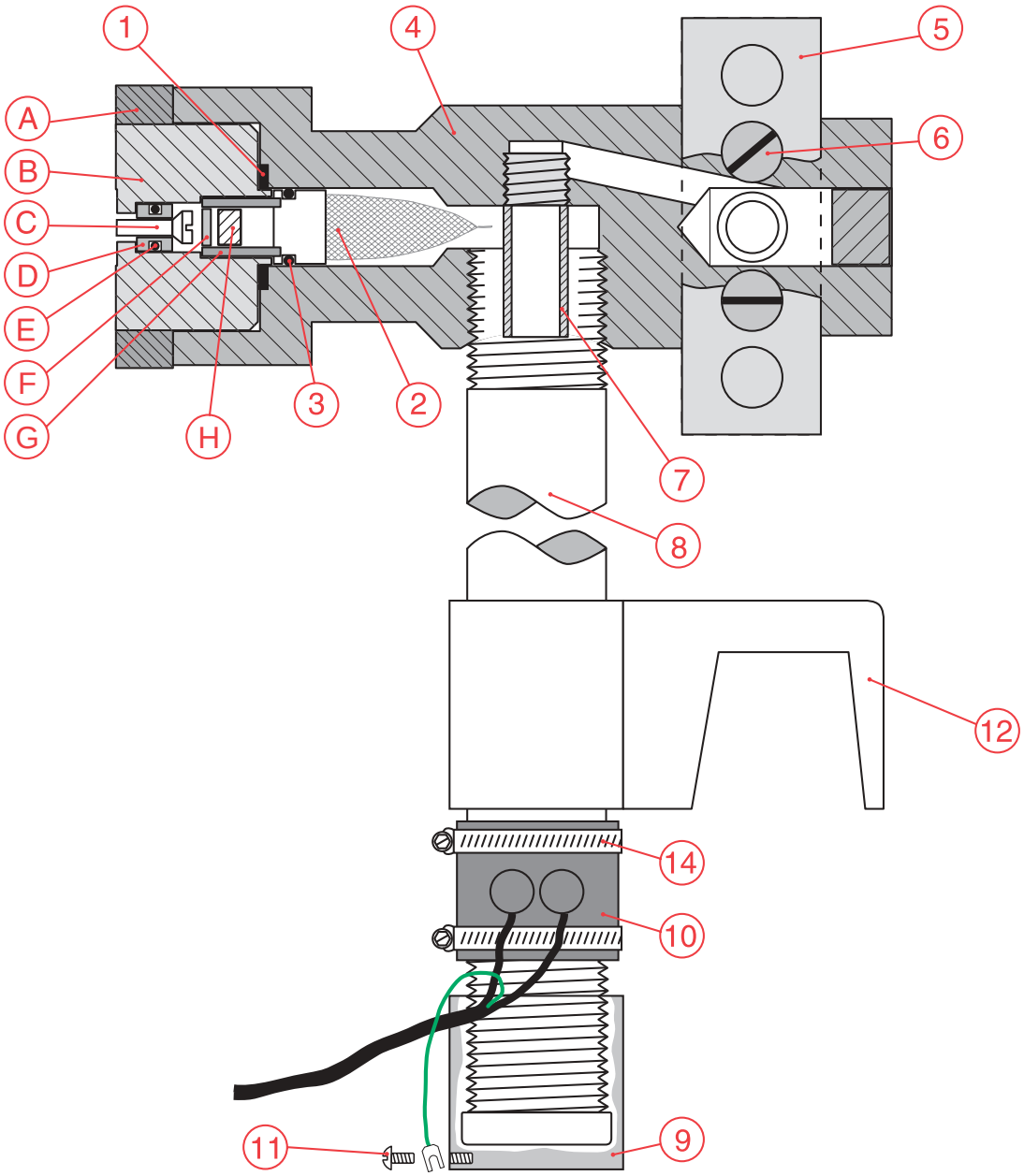
Item No.	Description	Quantity	Part No.
1	O-Ring	1	3RS-014
2	Pin Guide	1	FB-104
3	Guide Pin	1	DM-101A
4	O-Ring	1	3RS-006
5	Vent Spring	1	DM-100
6	O-Ring	1	3RS-009
7	Face Plate	1	FB-105-700
8	Cover Plate Screws (Nylon)	2	#6-32 x 5/16"
9	Front Body	1	FB-5A
10	Front Diaphragm Plate	1	DP-100A
11	O-Ring	1	3PS-156
12	Back Body	1	BB-5A
13	Double Diaphragm	1	DP-103
14	Body Screws (Monel)	4	1/4-20 x 1 1/2"
*15	Back Plate Screws (Monel)	2	1/4-20 x 1 7/8"
16	Rear Diaphragm Plate	1	DP-101A
17	O-Ring	1	3PS-332
18	O-Ring	1	3PS-214
19	Lead Gasket	1	LG-100
20	Inlet Valve	1	YM-100B

Item No.	Description	Quantity	Part No.
21	Filter Holder	1	KFH-200
22	Silver Screen & Hat	1	S-275
23	Seal Adapter	1	SAWS
24	Inlet Valve Seat	1	YP-101B
25	O-Ring	1	3RS-010
26	Back Plate	1	YM-105A
27	Inlet Spring	1	YM-103
28	Bearing Washer	1	YM-101A
29	Spring Retainer	1	YP-100
30	Vent Plug	1	YM-102A
31	Diaphragm Vent Bolt	1	DP-102A
32	O-Rings	2	3PS-029
*33	Vent Fitting (3/8")	1	F-104
*34	5/8" Tube x 3/8" NPT Fitting	2	10-10-6

* – Not shown.

VACUUM REGULATOR

Date: December 2002
Scale: Actual size
Dwg. No. Series W-40★



Item No.	Description	Quantity	Part No.
A *	Back Plate	1	YM-105A
B *	Seal Adapter	1	SAWS
C *	Inlet Valve	1	YM-100A
D *	Inlet Valve Seat	1	YP-101A
E *	O-Ring	1	3RS-010
F *	Silver Screen	1	S-275
G *	Filter Holder	1	KFH-100
H *	Fiberglass Filter	1	FBG-500
1	Ton Ironwork Inner Lead Gasket	1	G-332
2	Filter Screen Holder and Screen (assembly)	1	S581/560
3	O-Ring	1	3RS-012
4 ✓	Ton Ironwork Inlet Assembly	1	TI-100
5	Yoke Assembly (for ton unit only)	1	YA-123
6	Screws for YA-123 (Monel)	2	1/4-20 x 1"
7 ✓	Monel Drip Tube	1	DT-112
8 ✓	Monel Drip Leg	1	DL-134
9 ✓	Drip Leg Cap	1	DCM-15
10	25 Watt Heater (120 or 240V)	1	84A
11	Ground Screw (stainless)	1	#10-32 x 1/4"
12 ✓	Drip Leg Bracket	1	DBR-1
13 †	Screws for TI-100 (Monel, hex head)	2	3/8-16 x 15/16"
14	#12 Heater Clamps	2	C-12
15 †	Lead Gasket (TI-100 to ton container cylinder valve)	1	LG-100

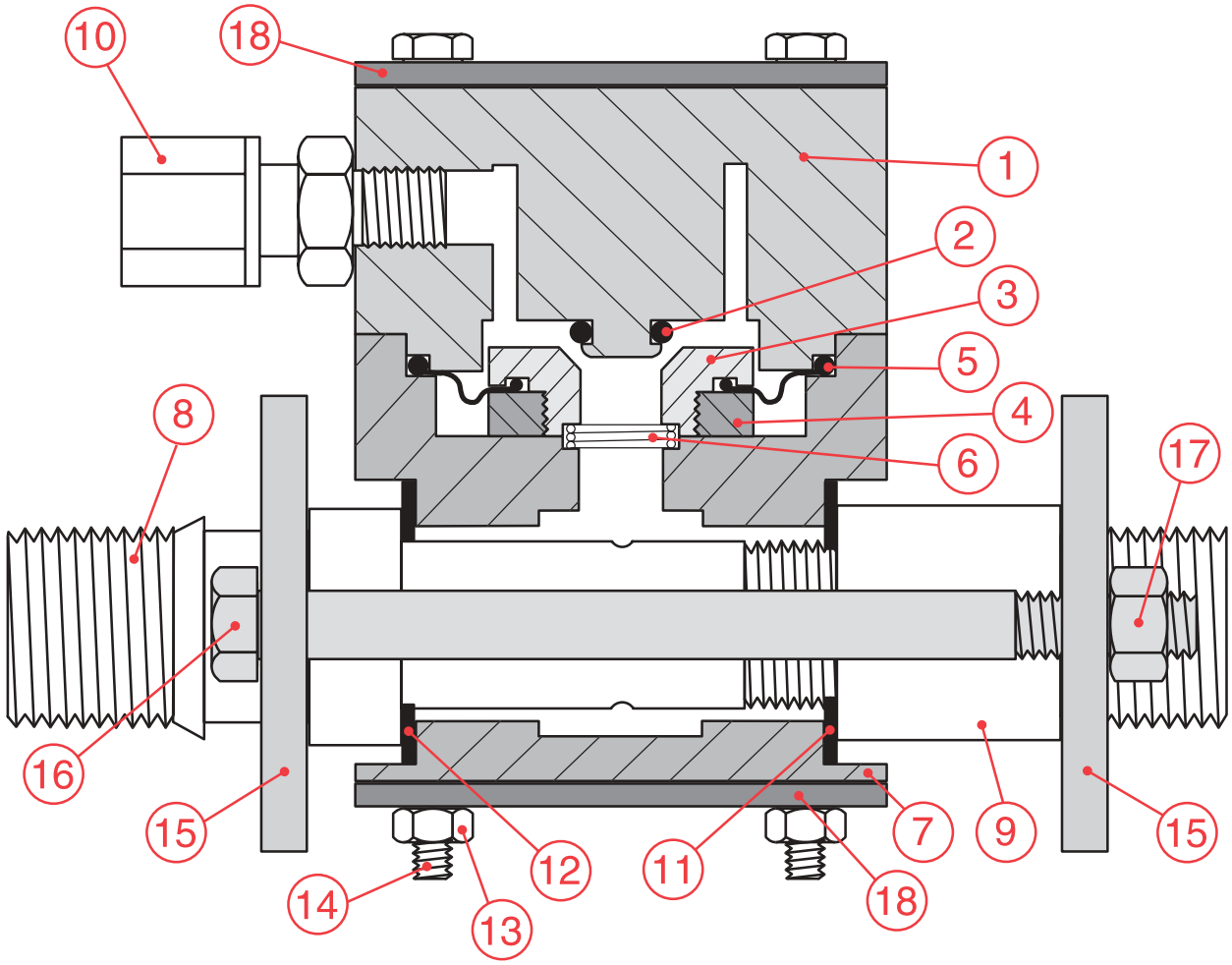
* Not part of ton ironwork; shown only as reference. (see chlorinator drawing)

† Not shown.

✓ Not sold separately.

TON IRONWORK

Date: February 2003
Scale: 80%
Dwg. No. IW-1★



Item No.	Description	Quantity	Part No.
1	Top Body	1	E550
2	O-Ring	1	3RS-203
3	Check Assembly Bolt	1	E553
4	Check Assembly Nut	1	E552
5	Rolling Diaphragm	1	SM112
6	Spring	1	S145
7	Bottom Body	1	E551
8	Universal Nozzle (Threaded or Hose)	1	UN101
9	Diffuser	1	E1063
10	3/8" Tubing Connector Fitting	1	10-6-6
11	O-Ring	1	3RS-214
12	O-Ring	1	3RS-214
13	Nut 5/16"-18	4	N56
14	Bolt 5/16"-18	4	B57
15	Nozzle/Diffuser Brackets	2	EJB-100
16	Bolt 3/8"- 16	2	B-59
17	Nut 3/8"- 16	2	N-58
18	Body Armor Plates	2	EJB-51

Items 15, 16, 17, and 18 are for High Pressure Ejector only.

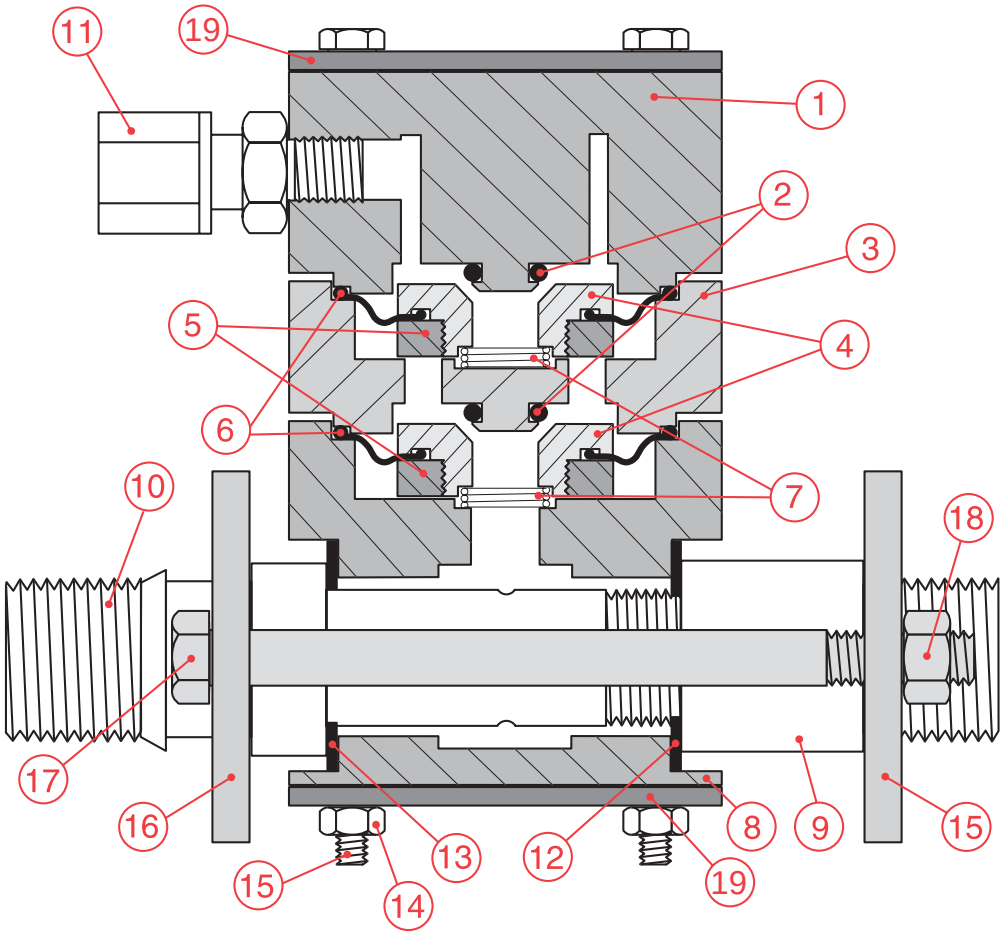
Note: For units using threaded nozzle and threaded diffuser, a union must be used on the nozzle side. On line pressure above 100 PSI, high pressure ejector must be used.

For correct number universal nozzle, please indicate to Hydro the capacity of the chlorinator.

hydro INSTRUMENTS

EJECTOR

Date: April 2001
Scale: 100%
Dwg. No. EJ-1000



Item No.	Description	Quantity	Part No.
1	Top Body	1	E550
2	O-Ring	1	3RS-203
3	Middle Body	1	E554
4	Check Assembly Bolt	1	E553
5	Check Assembly Nut	1	E552
6	Rolling Diaphragm	1	SM112
7	Spring	1	S145
8	Bottom Body	1	E551
9	Universal Nozzle (Threaded or Hose)	1	UN101
10	Diffuser	1	E1063
11	3/8" Tubing Connector Fitting	1	10-6-6
12	O-Ring	1	3RS-214
13	O-Ring	1	3RS-214
14	Nut 5/16"-18	4	N56
15	Bolt 5/16"-18 x 5 3/4"	4	B56
16	Nozzle/Diffuser Brackets	2	EJB-100
17	Bolt 3/8"- 16	2	B-59
18	Nut 3/8"- 16	2	N-58
19	Body Armor Plates	2	EJB-51

Items 16, 17, 18, and 19 are for High Pressure Ejector only.

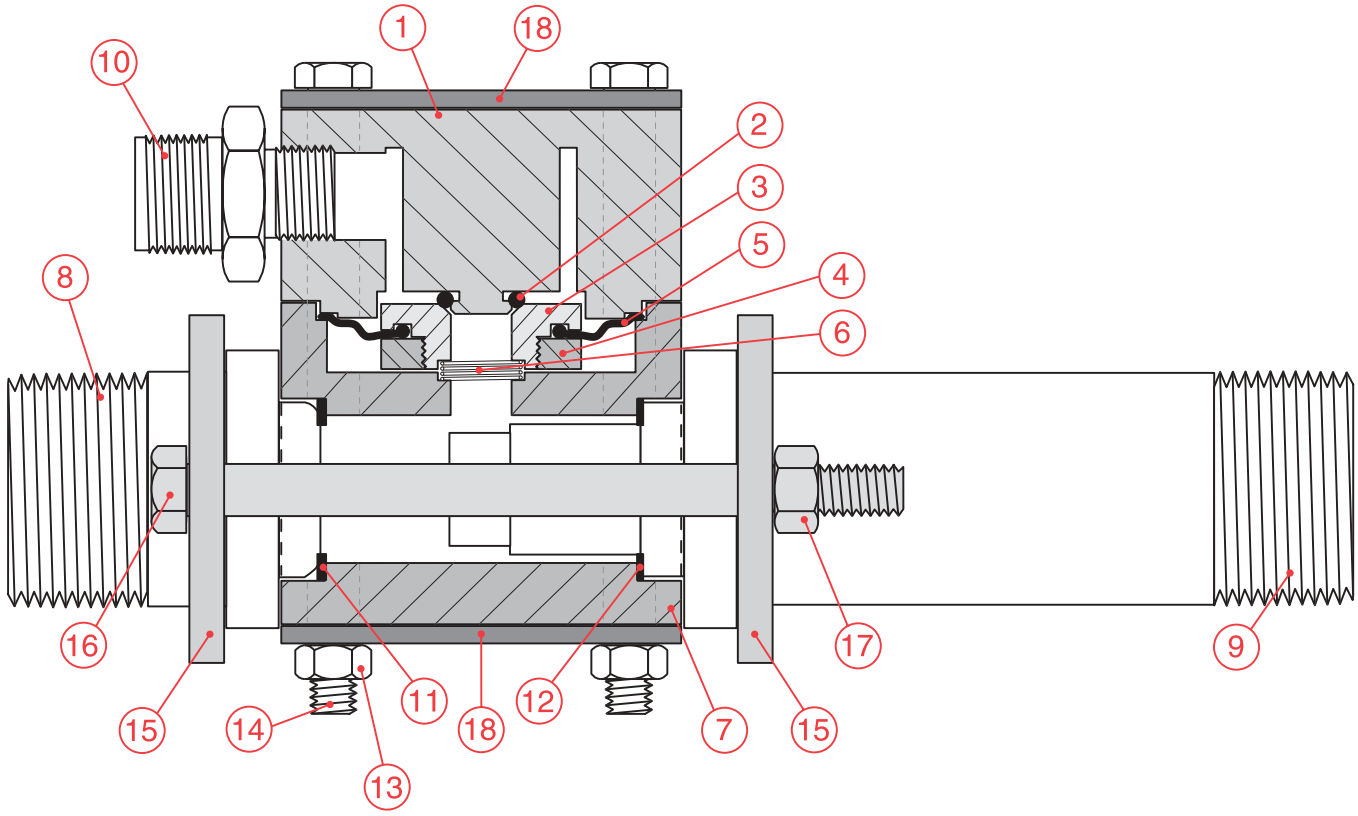
Note: For units using threaded nozzle and threaded diffuser, a union must be used on the nozzle side. On line pressure above 100 PSI, high pressure ejector must be used.

For correct number universal nozzle, please indicate to Hydro the capacity of the chlorinator.

hydro INSTRUMENTS

EJECTOR

Date: May 2001
Scale: 80%
Dwg. No. EJ-1000DC



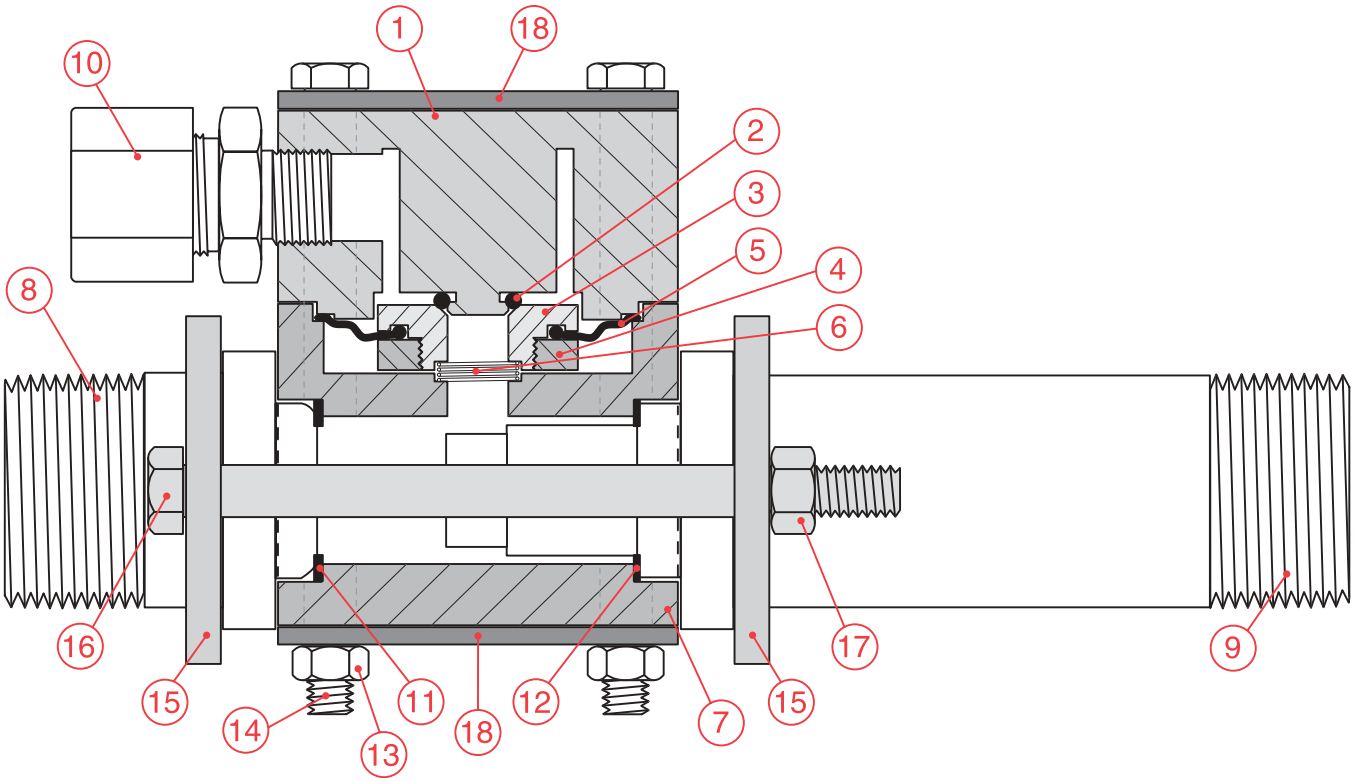
Item No.	Description	Quantity	Part No.
1	Top Body	1	E550
2	O-Ring	1	3RS-203
3	Check Assembly Bolt	1	E553
4	Check Assembly Nut	1	E552
5	Rolling Diaphragm	1	SM112
6	Spring	1	S145
7	Bottom Body	1	E551
8	Nozzle	1	EN-275
*9	Diffuser for 1 1/4" NPT (standard)	1	EDT-380
10	1/2" Tubing Connector Fitting	1	10-8-6
11	O-Ring	1	3RS-214
12	O-Ring	1	3RS-214
13	Nut 5/16"-18	4	N-56
14	Bolt 5/16"-18	4	B-57
15	Nozzle/Diffuser Brackets	2	EJB-425
16	Bolt 3/8"-16	2	B-59
17	Nut 3/8"-16	2	N-58
18	Body Armor Plates	2	EJB-51

Items 18 are for EJ-2000HP High Pressure Ejector only

*9 Optional Diffuser for 1 1/2" Hose = Part No. EDH-380

Hydro Instruments
EJECTOR

Date: Sept. 2002
Scale: 75%
Dwg. No. EJ-2000



Item No.	Description	Quantity	Part No.
1	Top Body	1	E550-5
2	O-Ring	1	3RS-203
3	Check Assembly Bolt	1	E553
4	Check Assembly Nut	1	E552
5	Rolling Diaphragm	1	SM112
6	Spring	1	S-145
7	Bottom Body	1	E-551
8	500 PPD Ejector Nozzle 1¼" NPT	1	EN-296
*9	Diffuser for 1¼" NPT (standard)	1	EDT-560
10	⅝" Tubing Connector Fitting	1	10-10-6
11	O-Ring	1	3RS-214
12	O-Ring	1	3RS-214
13	Nut ⅝"-18 (stainless)	4	N-56
14	Bolt ⅝"-18 (stainless)	4	B-57
15	Nozzle/Diffuser Brackets	2	EJB-425
16	Bolt ⅜"-16	2	B-59
17	Nut ⅜"-16	2	N-58
18	Body Armor Plates	2	EJB-50

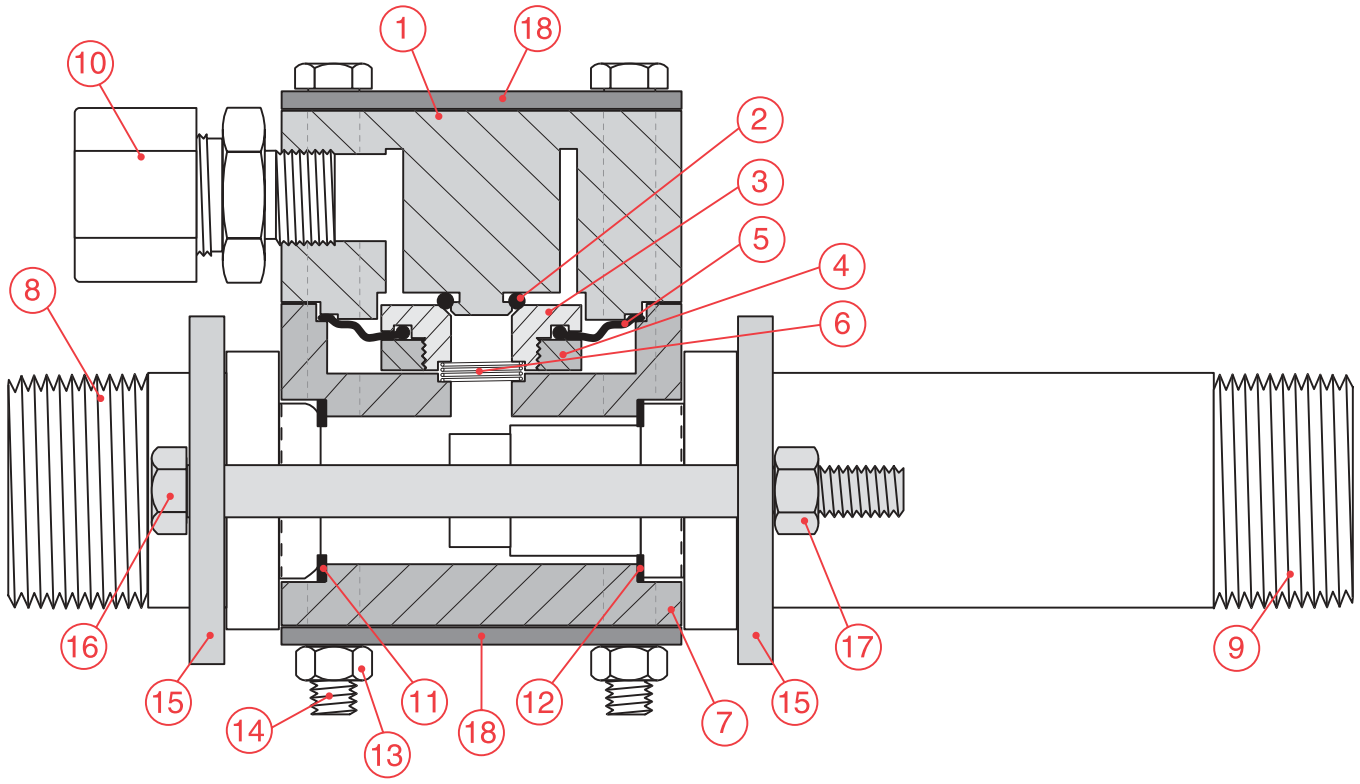
Items 18 are for EJ-5000HP High Pressure Ejector only

*9 Optional Diffuser for 1½" Hose = Part No. EDH-560

hydro INSTRUMENTS

EJECTOR

Date: Sept. 2002
Scale: 75%
Dwg. No. EJ-5000



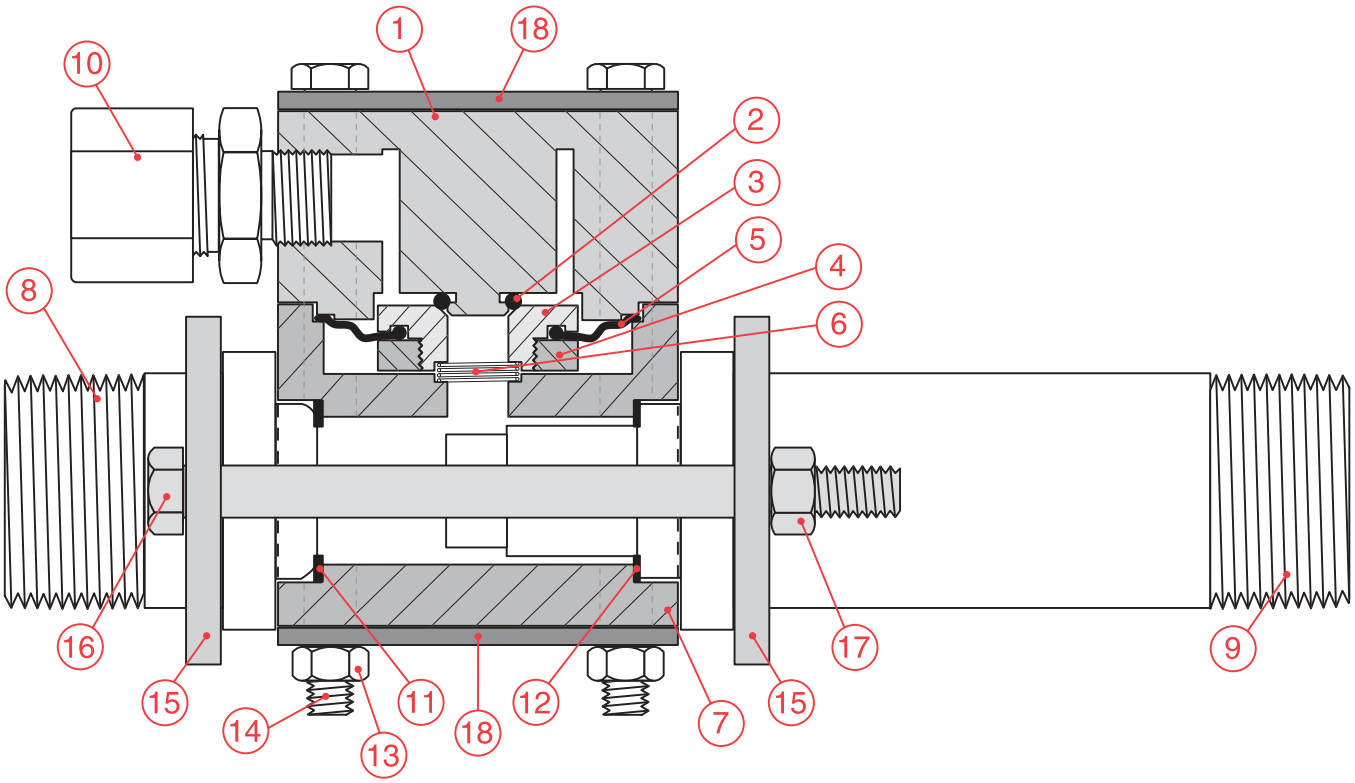
Item No.	Description	Quantity	Part No.
1	Top Body	1	E-550-5
2	O-Ring	1	3RS-203
3	Check Assembly Bolt	1	E-553
4	Check Assembly Nut	1	E-552
5	Rolling Diaphragm	1	SM-112
6	Spring	1	S-145
7	Bottom Body	1	E-551
8	Ejector Nozzle 1 1/4" NPT	1	EN-296
*9	Diffuser for 1 1/4" NPT (standard)	1	EDT-560
10	5/8" Tubing Connector Fitting	1	10-10-6
11	O-Ring	1	3RS-214
12	O-Ring	1	3RS-214
13	Nut 5/16"-18 (stainless)	4	N-56
14	Bolt 5/16"-18 (stainless)	4	B-57
15	Nozzle/Diffuser Brackets	2	EJB-425
16	Bolt 3/8"-16	2	B-59
17	Nut 3/8"-16	2	N-58
18	Body Armor Plates	2	EJB-50

Items 18 are for EJ-20HP High Pressure Ejector only

*9 Optional Diffuser for 1 1/2" Hose = Part No. EDH-560

hydro INSTRUMENTS
EJECTOR

Date: Sept. 2002
Scale: 75%
Dwg. No. EJ-20



Item No.	Description	Quantity	Part No.
1	Top Body	1	E-550-5
2	O-Ring	1	3RS-203
3	Check Assembly Bolt	1	E-553
4	Check Assembly Nut	1	E-552
5	Rolling Diaphragm	1	SM-112
6	Spring	1	S-145
7	Bottom Body	1	E-551
8	Ejector Nozzle 1 1/4" NPT	1	EN-296
*9	Diffuser for 1 1/4" NPT (standard)	1	EDT-560
10	5/8" Tubing Connector Fitting	1	10-10-6
11	O-Ring	1	3RS-214
12	O-Ring	1	3RS-214
13	Nut 5/16"-18 (stainless)	4	N-56
14	Bolt 5/16"-18 (stainless)	4	B-57
15	Nozzle/Diffuser Brackets	2	EJB-425
16	Bolt 3/8"-16	2	B-59
17	Nut 3/8"-16	2	N-58
18	Body Armor Plates	2	EJB-50

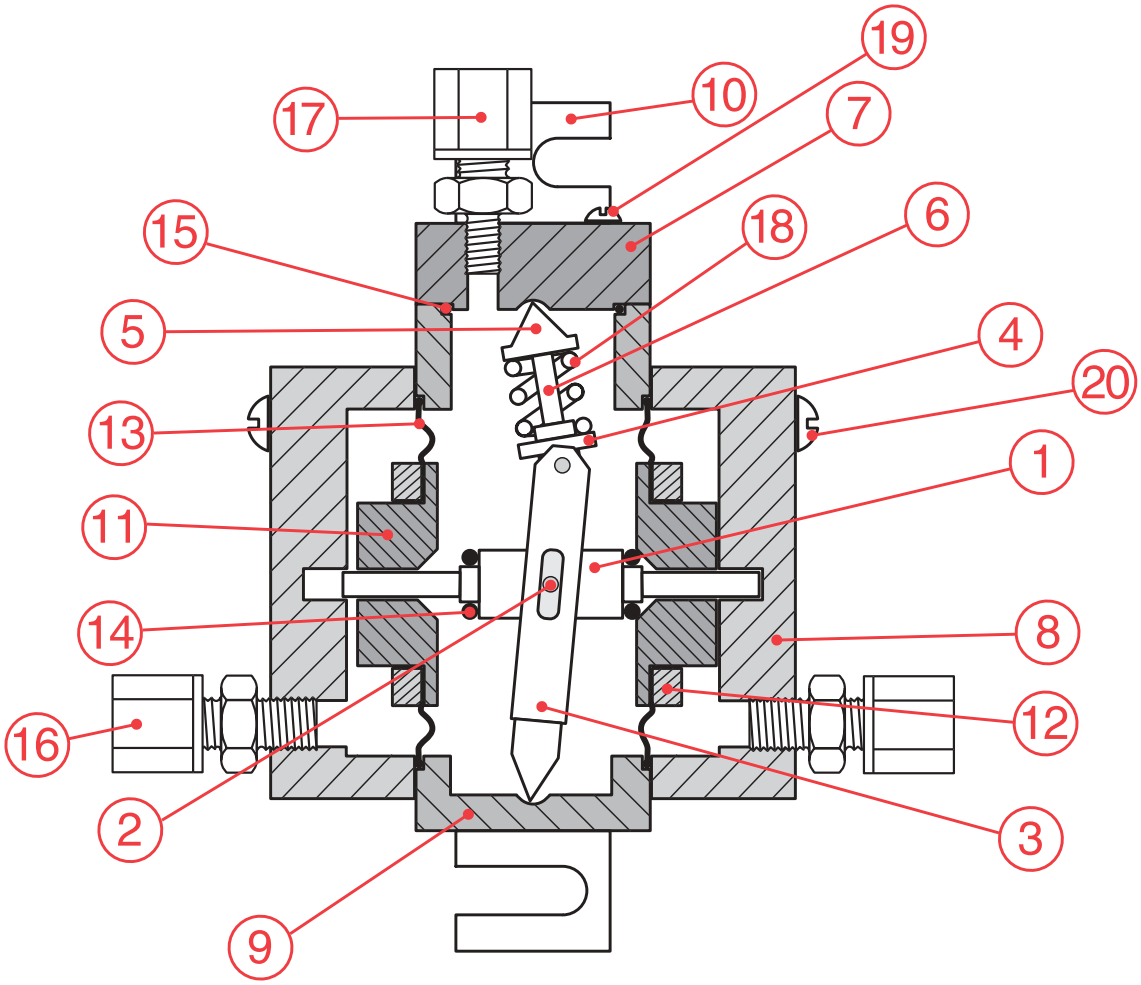
Items 18 are for EJ-40HP High Pressure Ejector only

*9 Optional Diffuser for 1 1/2" Hose = Part No. EDH-560

hydro INSTRUMENTS

EJECTOR

Date: Sept. 2002
Scale: 75%
Dwg. No. EJ-40



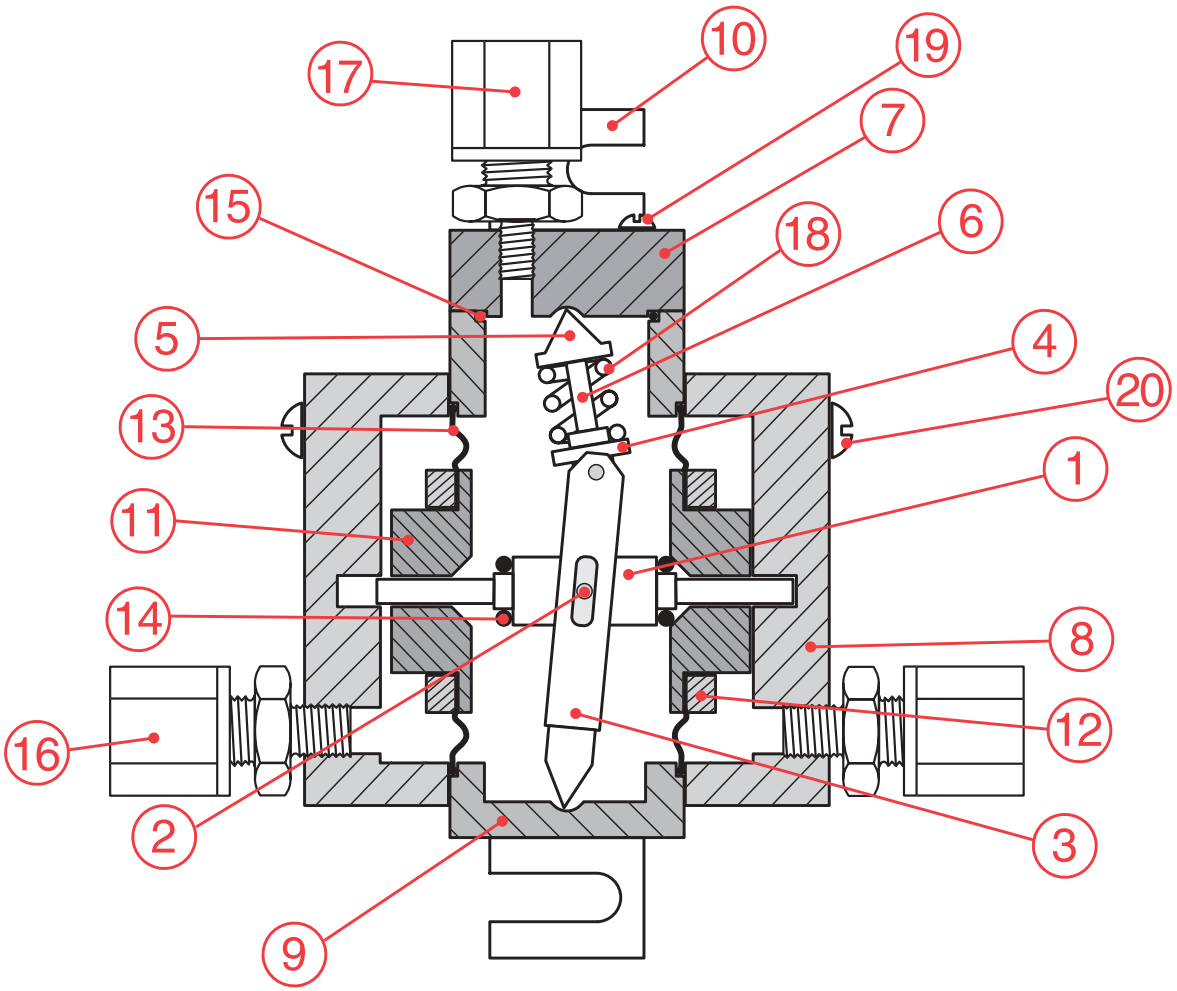
Item No.	Description	Quantity	Part No.
1	Valve Plug	1	SM-100
2	Hinge Pin	2	SM-101
3	Pivot Arm	1	SM-102
4	Spring Pivot	1	SM-103
5	Spring Pin Guide	1	SM-104
6	Spring Guide Pin	1	SM-105
7	Top Cap	1	SM-106
8	End Cap	2	SM-107
9	Center Body	1	SM-108
10	Mounting Bracket	1	SM-109
11	Diaphragm Bolt	2	SM-110
12	Diaphragm Nut	2	SM-111
13	Rolling Diaphragm	2	SM-112
14	O-Ring	2	3RS-203
15	O-Ring	1	3RS-023
16	3/8" tube x 3/8" NPT Tubing Connector	2	10-6-6
17	3/8" tube x 1/4" NPT Tubing Connector	1	F-104 (10-6-4)
18	Spring	1	YM-103
19	#10-24 x 1" Top Cap screws (Monel)	4	#10-24 x 1"
20	1/4-20 x 1 1/2" End Cap screws (Monel)	8	1/4-20 x 1 1/2"

Note: Items #1, 2, 3, and 4 sold only as an assembly with silver pins installed.

Specify PPD when ordering.

SWITCHOVER MODULE

Date: May 1999
Scale: N.T.S.
Dwg. No. SP-100



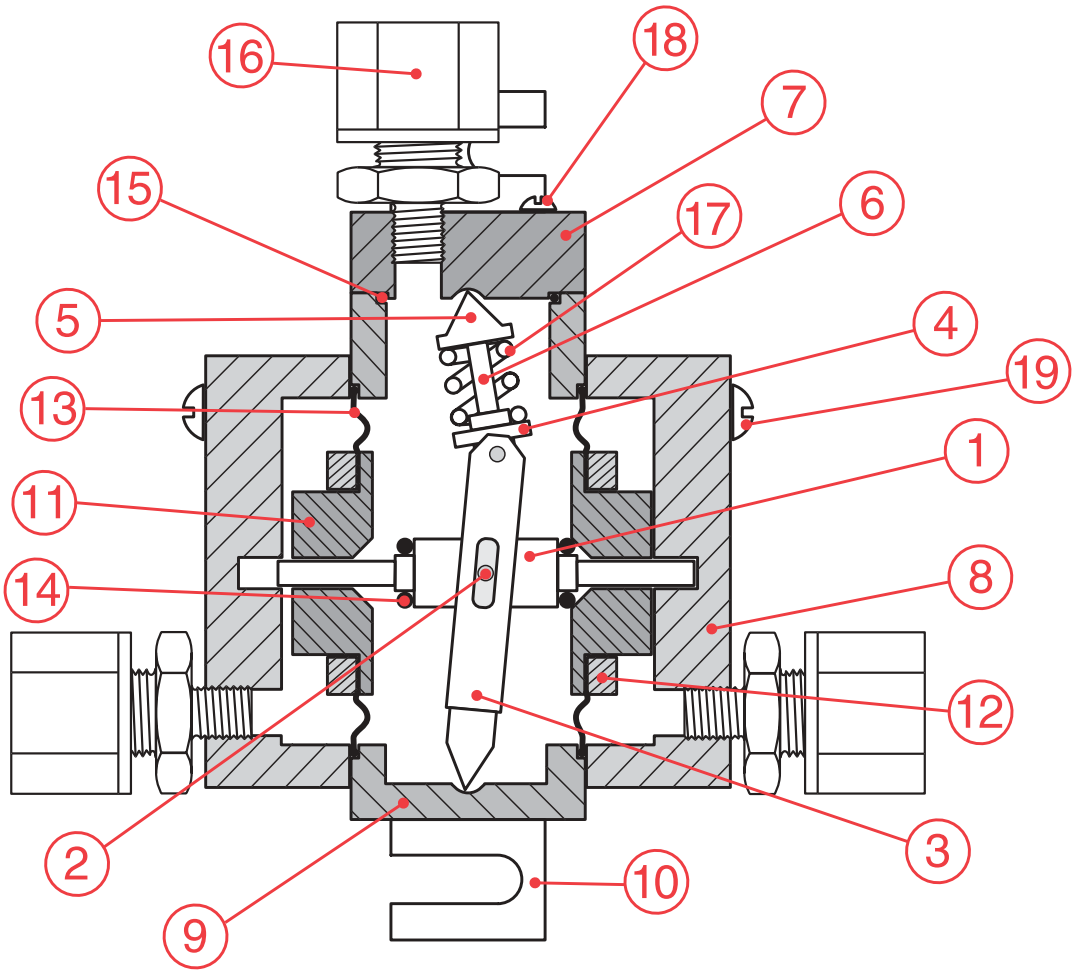
Item No.	Description	Quantity	Part No.
1	Valve Plug	1	SM-100
2	Hinge Pin	2	SM-101
3	Pivot Arm	1	SM-102
4	Spring Pivot	1	SM-103
5	Spring Pin Guide	1	SM-104
6	Spring Guide Pin	1	SM-105
7	Top Cap	1	SM-106
8	End Cap	2	SM-107
9	Center Body	1	SM-108
10	Mounting Bracket	1	SM-109
11	Diaphragm Bolt	2	SM-110
12	Diaphragm Nut	2	SM-111
13	Rolling Diaphragm	2	SM-112
14	O-Ring	2	3RS-203
15	O-Ring	1	3RS-023
16	1/2" tube x 3/8" NPT Tubing Connector	2	10-8-6
17	1/2" tube x 1/4" NPT Tubing Connector	1	F-106 (10-8-4)
18	Spring	1	YM-103
19	#10-24 x 1" Top Cap screws (Monel)	4	#10-24 x 1"
20	1/4-20 x 1 1/2" End Cap screws (Monel)	8	1/4-20 x 1 1/2"

Note: Items #1, 2, 3, and 4 sold only as an assembly with silver pins installed.

Specify PPD when ordering.

SWITCHOVER MODULE

Date: May 1999
Scale: N.T.S.
Dwg. No. SP-200



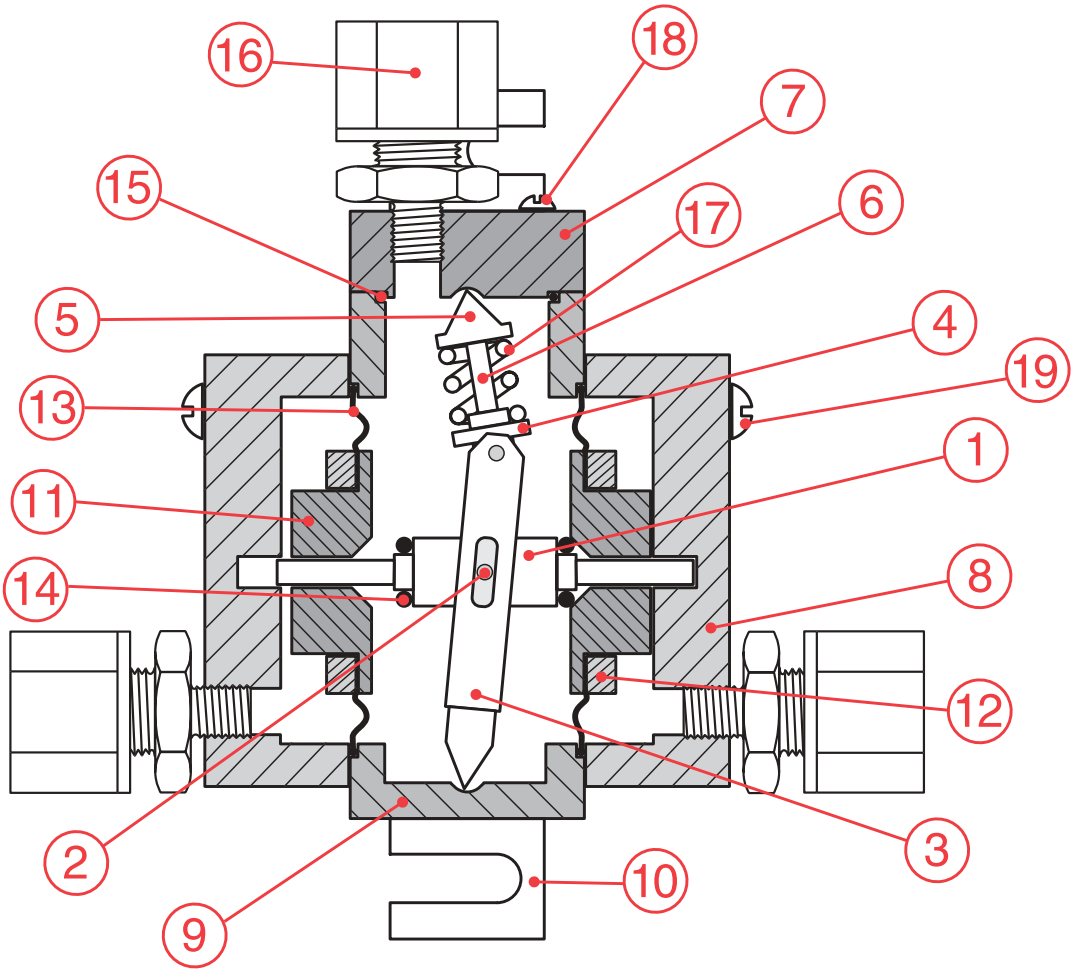
Item No.	Description	Quantity	Part No.
1	Valve Plug	1	SM-100
2	Hinge Pin	2	SM-101
3	Pivot Arm	1	SM-102
4	Spring Pivot	1	SM-103
5	Spring Pin Guide	1	SM-104
6	Spring Guide Pin	1	SM-105
7	Top Cap	1	SM-106
8	End Cap	2	SM-107
9	Center Body	1	SM-108
10	Mounting Bracket	1	SM-109
11	Diaphragm Bolt	2	SM-110
12	Diaphragm Nut	2	SM-111
13	Rolling Diaphragm	2	SM-112
14	O-Ring	2	3RS-203
15	O-Ring	1	3RS-023
16	$^{5}/_{8}$" tube x $^{3}/_{8}$" NPT Tubing Connector	3	F-108 (10-10-6)
17	Spring	1	YM-103
18	#10-24 x 1" Top Cap screws (Monel)	4	#10-24 x 1"
19	$^{1}/_{4}$-20 x 1$^{1}/_{2}$" End Cap screws (Monel)	8	$^{1}/_{4}$-20 x 1$^{1}/_{2}$"

Note: Items #1, 2, 3, and 4 sold only as an assembly with silver pins installed.

Specify PPD when ordering.

SWITCHOVER MODULE

Date: May 1999
Scale: N.T.S.
Dwg. No. SW-500

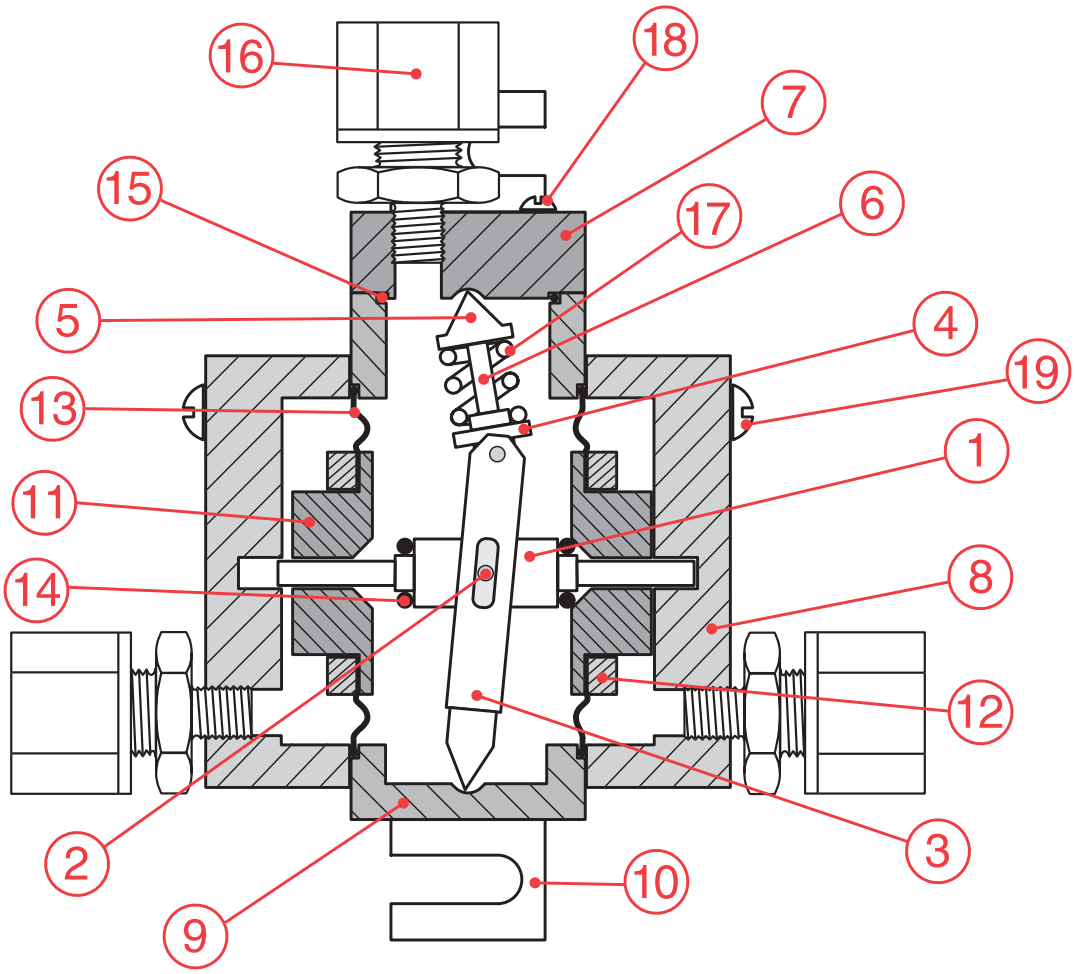


Item No.	Description	Quantity	Part No.
1	Valve Plug	1	SM-100
2	Hinge Pin	2	SM-101
3	Pivot Arm	1	SM-102
4	Spring Pivot	1	SM-103
5	Spring Pin Guide	1	SM-104
6	Spring Guide Pin	1	SM-105
7	Top Cap	1	SM-106A
8	End Cap	2	SM-107
9	Center Body	1	SM-108
10	Mounting Bracket	1	SM-109
11	Diaphragm Bolt	2	SM-110A
12	Diaphragm Nut	2	SM-111
13	Rolling Diaphragm	2	SM-112
14	O-Ring	2	3RS-203
15	O-Ring	1	3RS-023
16	5/8" tube x 3/8" NPT Tubing Connector	3	F-108 (10-10-6)
17	Spring	1	YM-103
18	#10-24 x 1" Top Cap screws (Monel)	4	#10-24 x 1"
19	1/4-20 x 1 1/2" End Cap screws (Monel)	8	1/4-20 x 1 1/2"

Note: Items #1, 2, 3, and 4 sold only as an assembly with silver pins installed.

SWITCHOVER MODULE

Date: June 2002
Scale: N.T.S.
Dwg. No. SW-20



Item No.	Description	Quantity	Part No.
1	Valve Plug	1	SM-100
2	Hinge Pin	2	SM-101
3	Pivot Arm	1	SM-102
4	Spring Pivot	1	SM-103
5	Spring Pin Guide	1	SM-104
6	Spring Guide Pin	1	SM-105
7	Top Cap	1	SM-106A
8	End Cap	2	SM-107
9	Center Body	1	SM-108
10	Mounting Bracket	1	SM-109
11	Diaphragm Bolt	2	SM-110A
12	Diaphragm Nut	2	SM-111
13	Rolling Diaphragm	2	SM-112
14	O-Ring	2	3RS-203
15	O-Ring	1	3RS-023
16	$^{5}/_{8}$" tube x $^{3}/_{8}$" NPT Tubing Connector	3	F-108 (10-10-6)
17	Spring	1	YM-103
18	#10-24 x 1" Top Cap screws (Monel)	4	#10-24 x 1"
19	$^{1}/_{4}$-20 x 1$^{1}/_{2}$" End Cap screws (Monel)	8	$^{1}/_{4}$-20 x 1$^{1}/_{2}$"

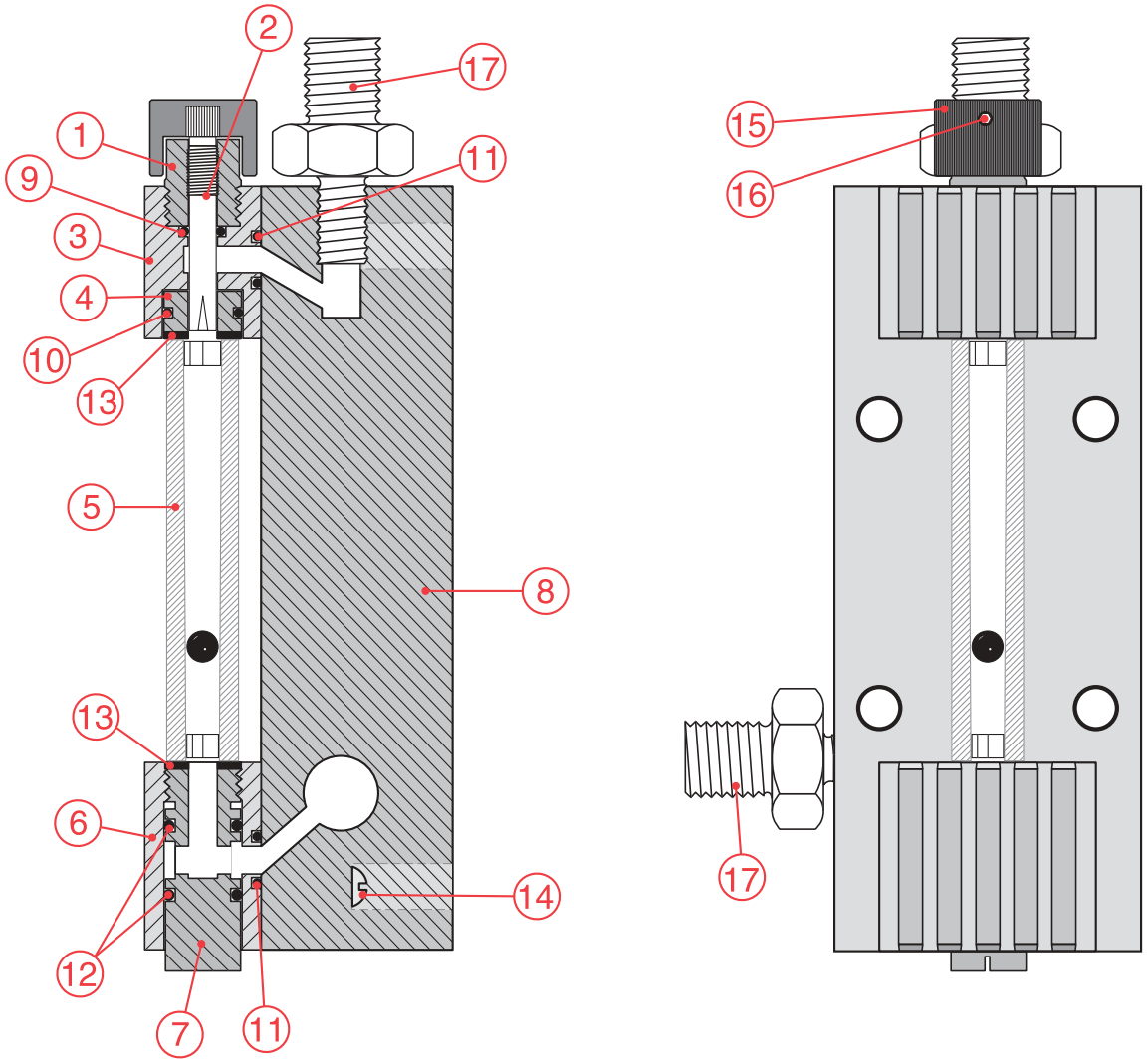
Note: Items #1, 2, 3, and 4 sold only as an assembly with silver pins installed.

SWITCHOVER MODULE

Date: June 2002
Scale: N.T.S.
Dwg. No. SW-40

SIDE VIEW

FRONT VIEW



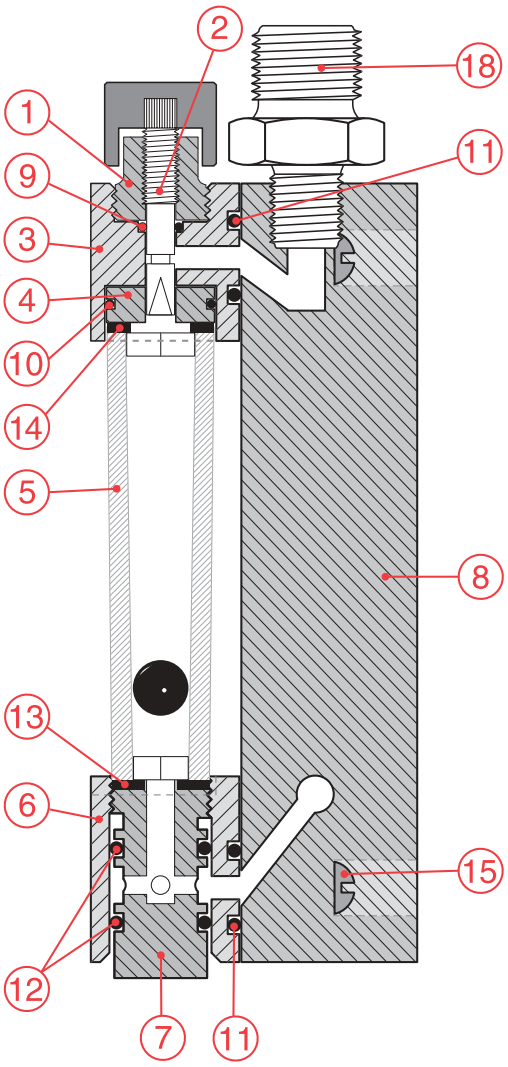
Item No.	Description	Quantity	Part No.
1	Valve Bonnet	1	VB-100C
2	Rate Valve	1	VP-103C
3	Top Meter Block	1	FM-100B
4	Rate Valve Seat	1	VT-104
5	Flow Meter	1	MT-B-11
6	Bottom Meter Block	1	FM-103
7	Inlet Plug	1	FM-101A
8	Back Body	1	RM-1 (100 PPD)
9	O-Ring	1	3PS-106
10	O-Ring	1	3RS-012
11	O-Ring	2	3PS-110
12	O-Ring	2	3PS-112
13	Meter Gasket	2	MG001-RM
14	Remote Meter Block Screws (stainless)	4	#10-24 x 1-1/4"
15	Rate Valve Knob	1	RV-100A
16	Rate Valve Knob Set Screw	1	#5-40 x 1/4"
17	Vacuum Tube Fitting	2	F104

hydro INSTRUMENTS

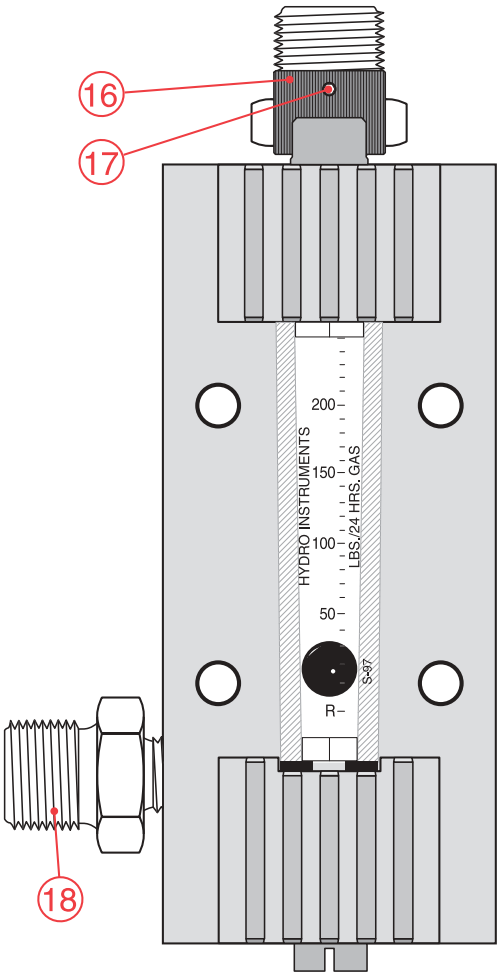
100 PPD REMOTE METER

Date: Nov. 1999
Scale: 83%
Dwg. No. RM-401

SIDE VIEW



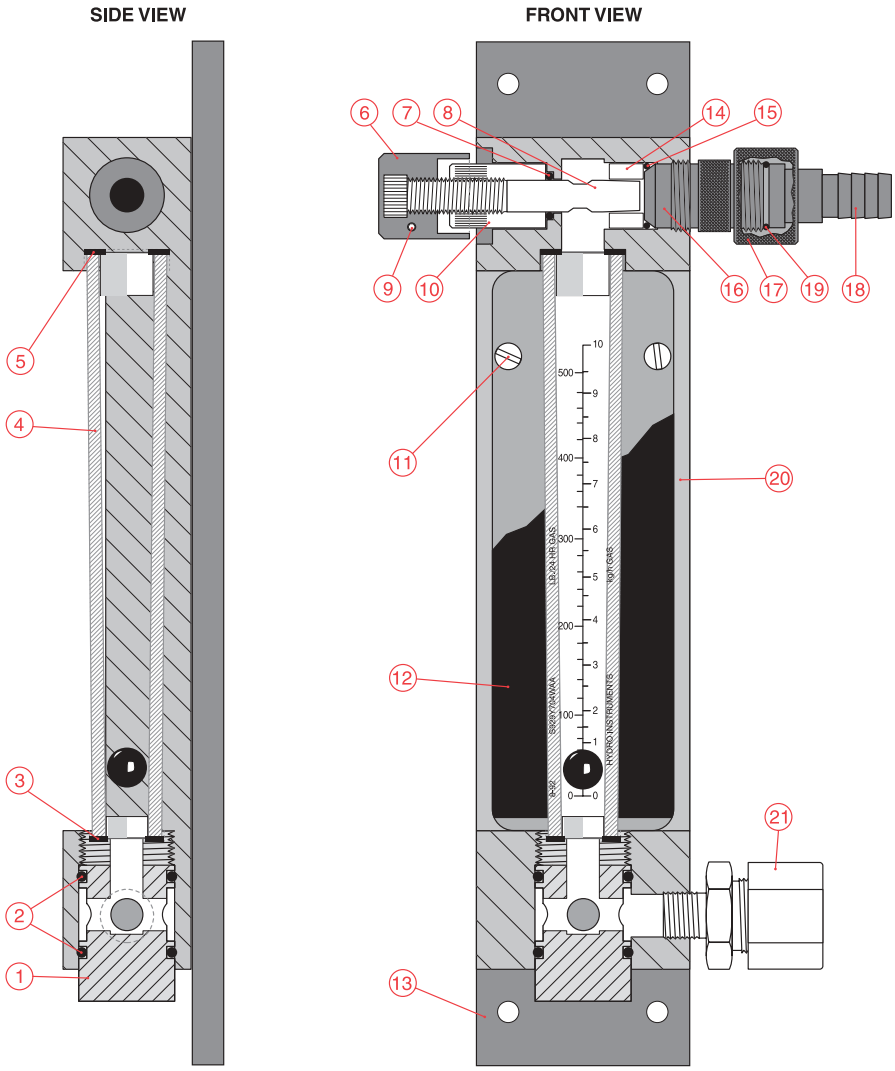
FRONT VIEW



Item No.	Description	Quantity	Part No.
1	Valve Bonnet	1	VB-100C
2	Rate Valve	1	VP-203C
3	Top Meter Block	1	FM-200B
4	Rate Valve Seat (Teflon)	1	VT-204
5	Meter Tube	1	MTB-11-200
6	Bottom Meter Block	1	FM-203
7	Inlet Plug	1	FM-101A
8	Back Body	1	RM-1-200
9	O-Ring	1	3PS-106
10	O-Ring	1	3RS-016
11	O-Rings	2	3PS-110
12	O-Rings	2	3PS-112
13	Bottom Meter Gasket	1	MG-200B
14	Top Meter Gasket	1	MG-200T
15	Remote Meter Block Screws (stainless)	4	#10-24 x 1 1/4"
16	Rate Valve Knob	1	RV-100A
17	Rate Valve Knob Set Screw	1	#5-40 x 1/4"
18	1/2" Tubing x 1/4" NPT Tube Connector	2	F-106

200 PPD REMOTE METER

Date: Nov. 1999
Scale: 80%
Dwg. No. RM-200

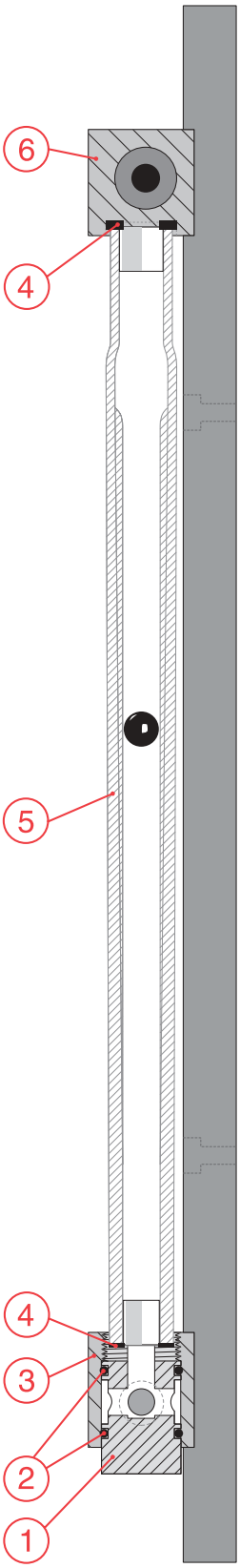


Item No.	Description	Quantity	Part No.
1	Inlet Plug	1	IP-498
2	O-Rings	2	3RS-212
3	Bottom Meter Gasket	1	G-162
4	Flow Meter Tube	1	MT-678
5	Top Meter Gasket	1	G-161
6	Rate Valve Knob	1	S-496
7	O-Ring	1	3RS-203
8	Rate Valve	1	SA-495
9	Rate Valve Knob Set Screw (stainless)	1	#6-32 x 5/16"
10	Rate Valve Bonnet	1	S-493
11	Remote Meter Block Screws (stainless)	4	#10-24 x 5/8"
12	Meter Shield	1	MS-700
13	Remote Meter Wall Mounting Panel	1	MP-500
14	Rate Valve Seat	1	S-497
15	O-Ring	1	3RS-114
16	Rate Valve Seat Retainer	1	S-494
17	Knurled Fitting (nut)	1	EJF-2
18	Gray Tubing Connector	1	EJF-3
19	O-Ring	1	3RS-114
20	Meter Body	1	TFM-500
21	5/8" Tubing x 3/8" NPT Tube Connector	1	10-10-6

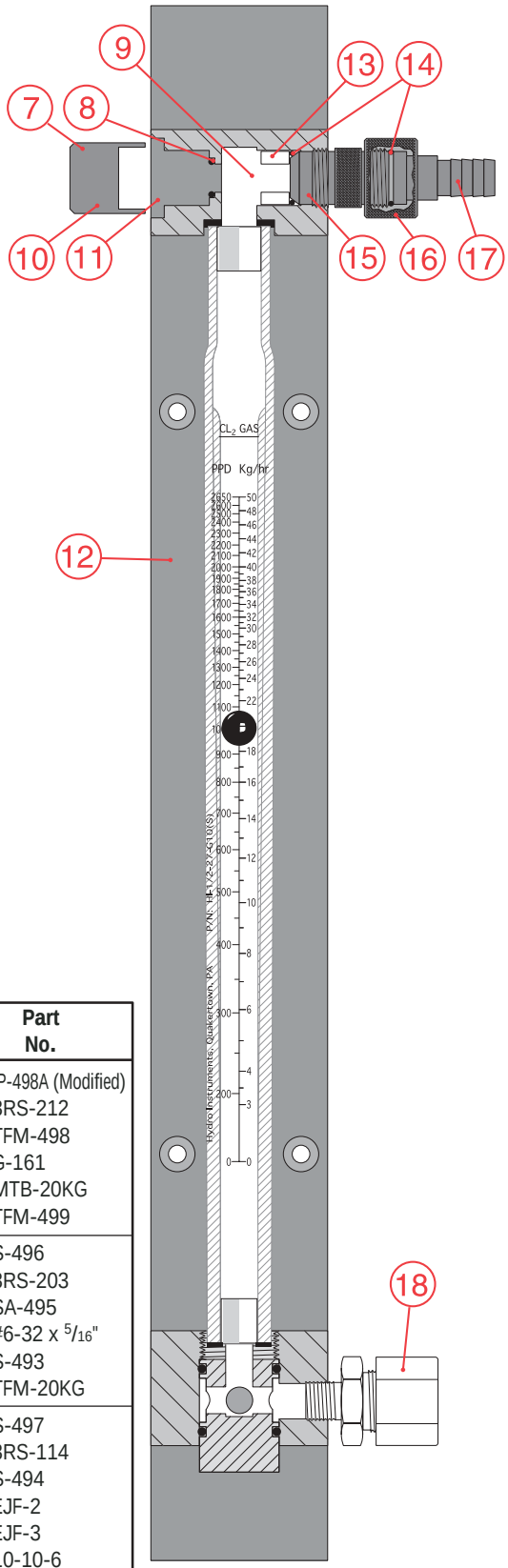
500 PPD REMOTE METER

Date: Sept. 1999
Scale: 46%
Dwg. No. RM-701

SIDE VIEW



FRONT VIEW



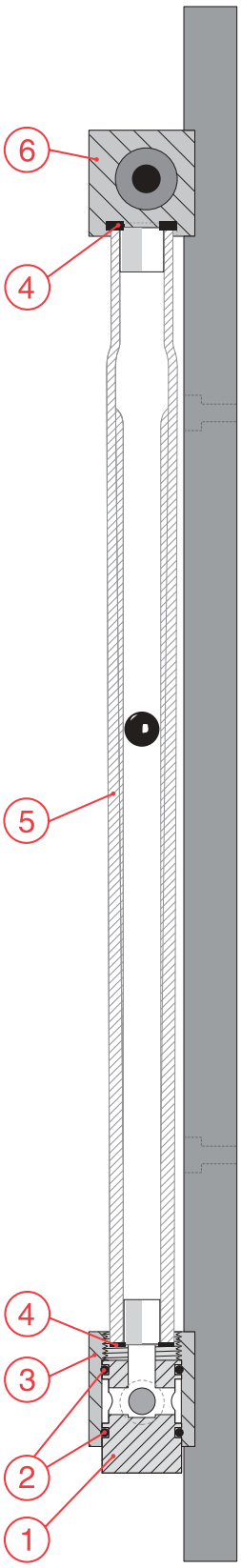
Item No.	Description	Quantity	Part No.
1	Inlet Plug	1	IP-498A (Modified)
2	O-Rings	2	3RS-212
3	Bottom Meter Block	1	TFM-498
4	Meter Gaskets	2	G-161
5	Flow Meter Tube	1	MTB-20KG
6	Top Meter Block	1	TFM-499
7	Rate Valve Knob	1	S-496
8	O-Ring	1	3RS-203
9	Rate Valve	1	SA-495
10	Rate Valve Knob Set Screw (stainless)	1	#6-32 x 5/16"
11	Rate Valve Bonnet	1	S-493
12	Meter Panel	1	TFM-20KG
13	Rate Valve Seat	1	S-497
14	O-Rings	2	3RS-114
15	Rate Valve Seat Retainer	1	S-494
16	Knurled Fitting (nut)	1	EJF-2
17	Gray Tubing Connector	1	EJF-3
18	5/8" Tubing x 3/8" NPT Tube Connector	1	10-10-6

hydro INSTRUMENTS

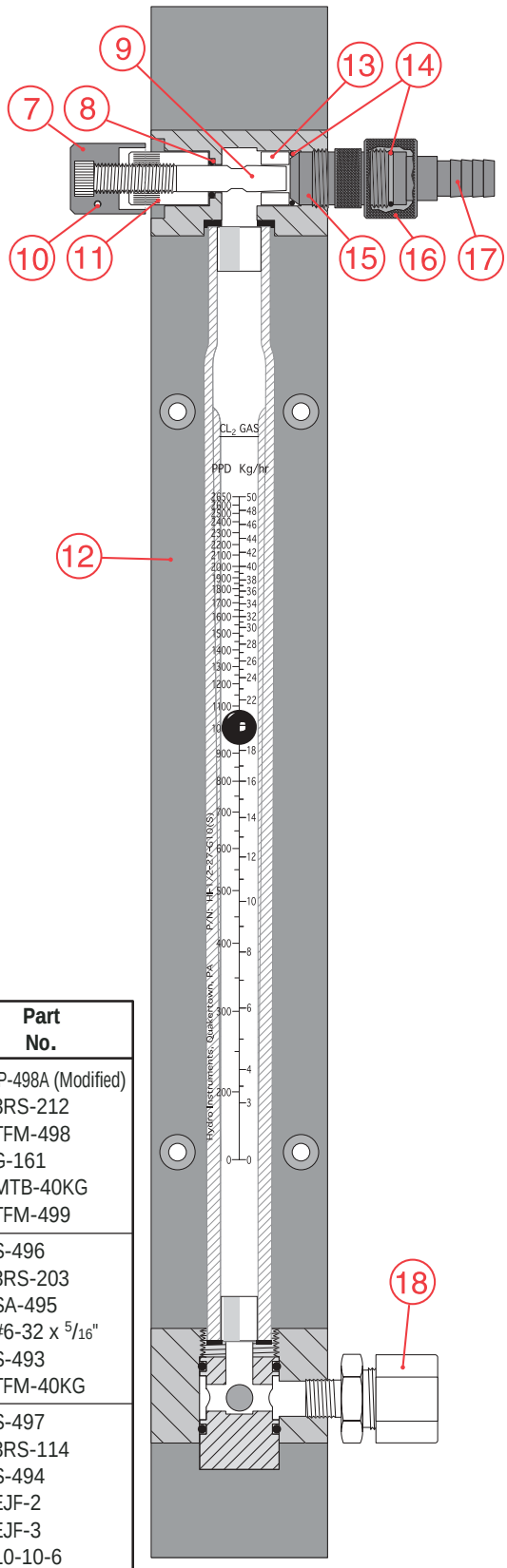
1000 PPD REMOTE METER

Date: Sept. 2002
Scale: 40%
Dwg. No. RM-20

SIDE VIEW



FRONT VIEW



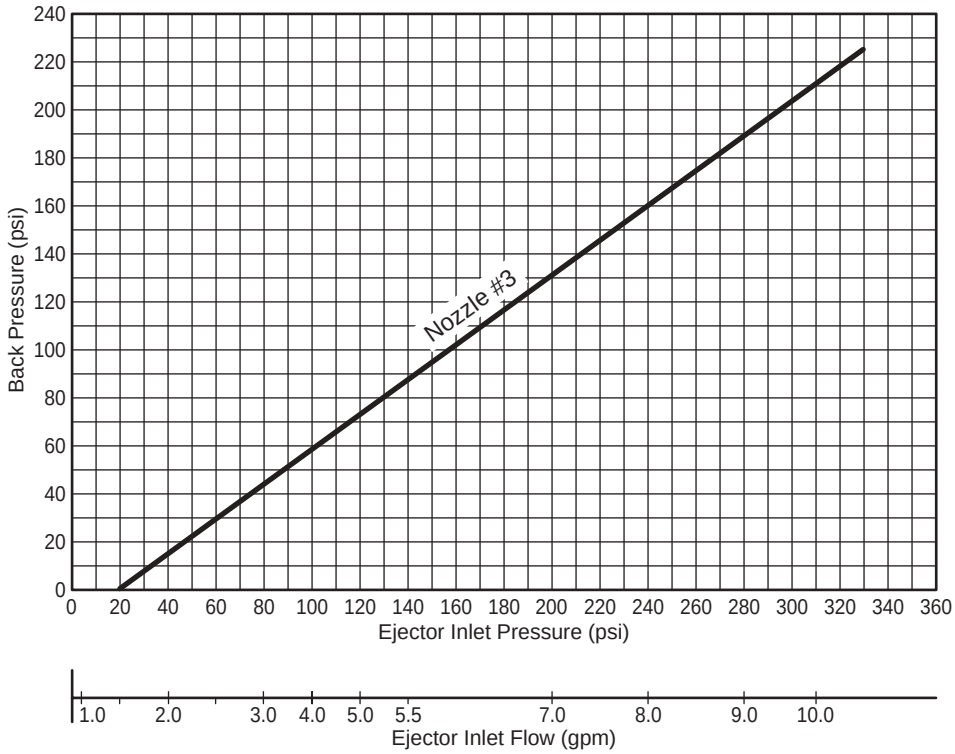
Item No.	Description	Quantity	Part No.
1	Inlet Plug	1	IP-498A (Modified)
2	O-Rings	2	3RS-212
3	Bottom Meter Block	1	TFM-498
4	Meter Gaskets	2	G-161
5	Flow Meter Tube	1	MTB-40KG
6	Top Meter Block	1	TFM-499
7	Rate Valve Knob	1	S-496
8	O-Ring	1	3RS-203
9	Rate Valve	1	SA-495
10	Rate Valve Knob Set Screw (stainless)	1	#6-32 x $^{5}/_{16}$"
11	Rate Valve Bonnet	1	S-493
12	Meter Panel	1	TFM-40KG
13	Rate Valve Seat	1	S-497
14	O-Rings	2	3RS-114
15	Rate Valve Seat Retainer	1	S-494
16	Knurled Fitting (nut)	1	EJF-2
17	Gray Tubing Connector	1	EJF-3
18	$^{5}/_{8}$" Tubing x $^{3}/_{8}$" NPT Tube Connector	1	10-10-6

Hydro Instruments

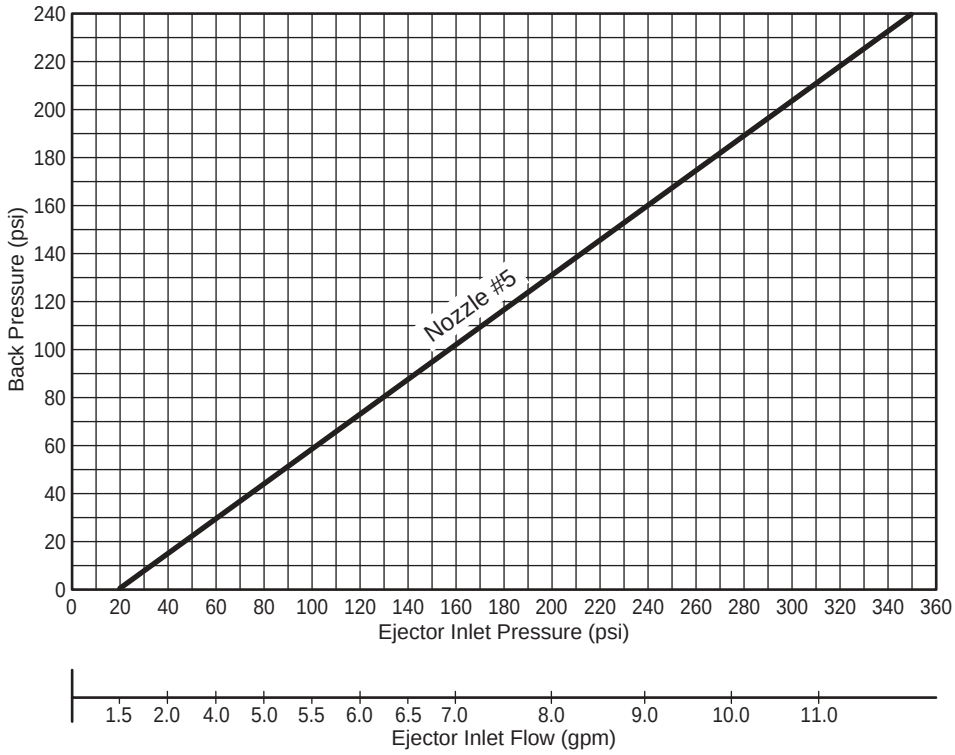
2000 PPD REMOTE METER

Date: May 2000
Scale: 40%
Dwg. No. RM-40

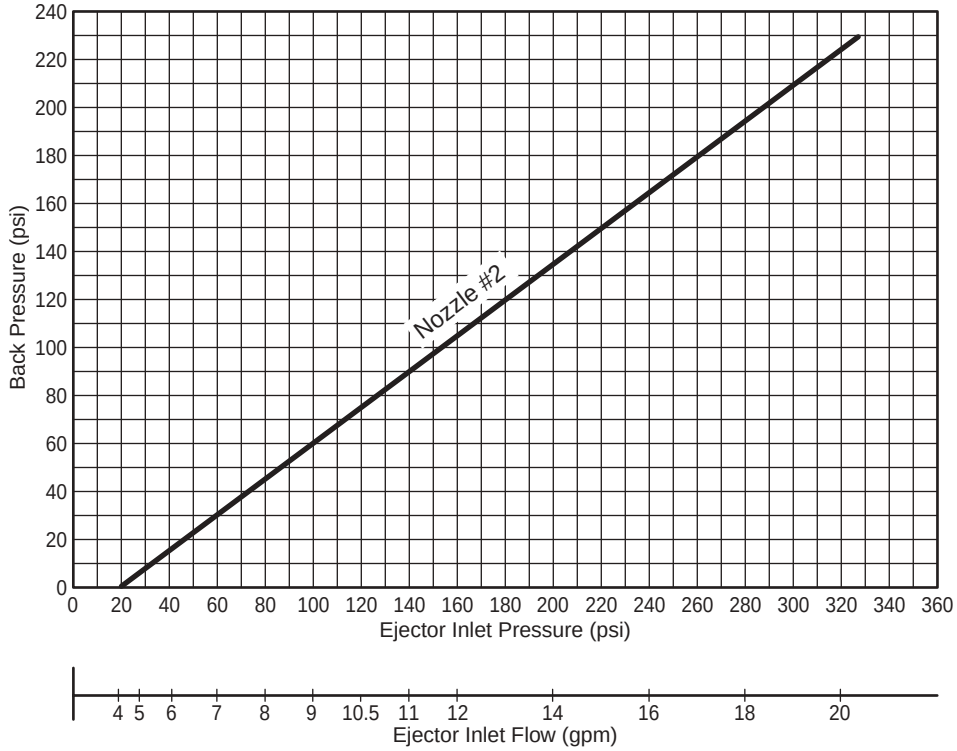
NOZZLE SIZING CHART (10 PPD)



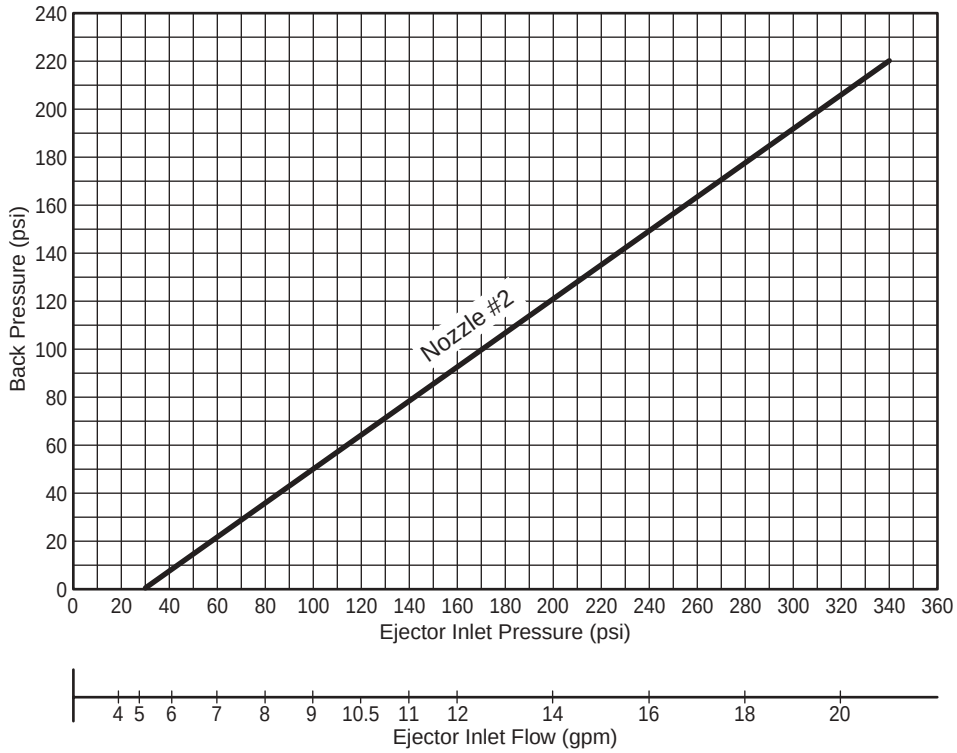
NOZZLE SIZING CHART (25 PPD)



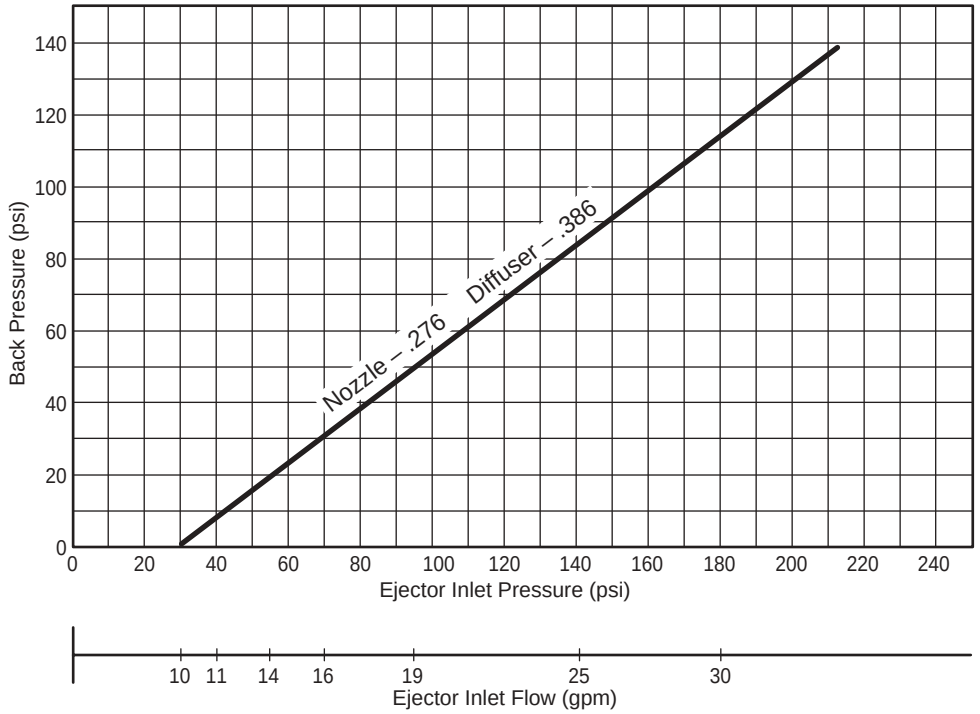
NOZZLE SIZING CHART (50 PPD)



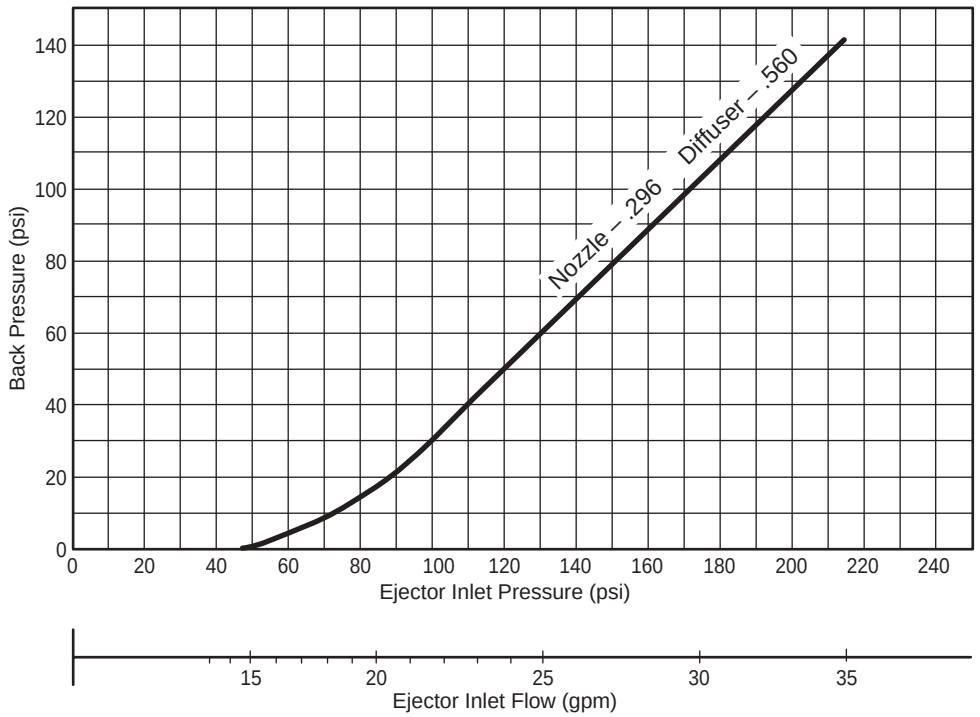
NOZZLE SIZING CHART (100 PPD)



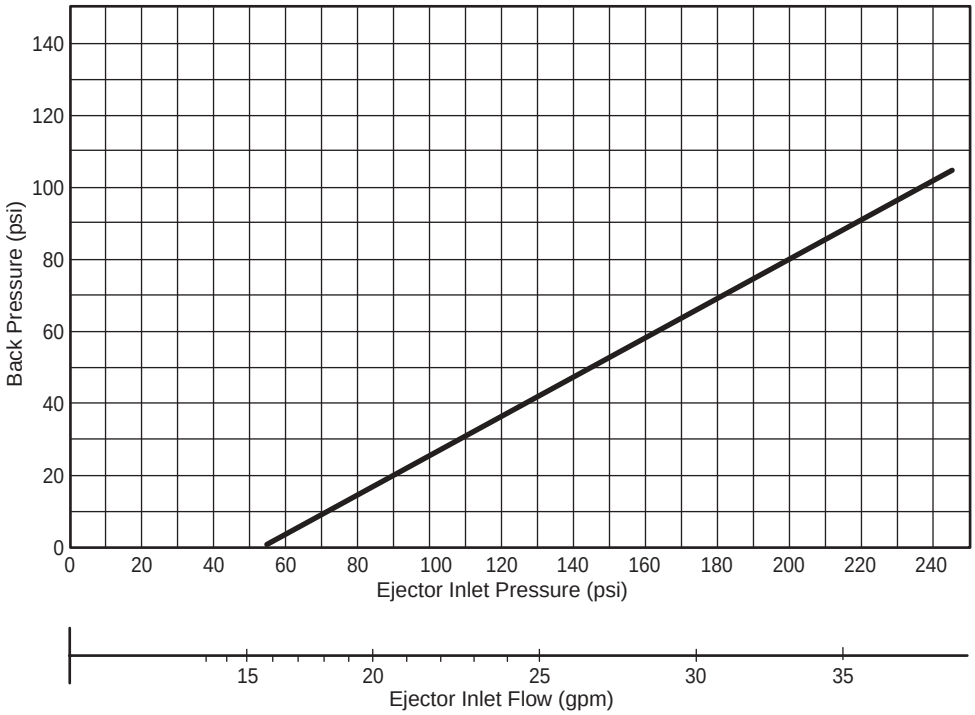
NOZZLE SIZING CHART (250 PPD)



NOZZLE SIZING CHART (500 PPD)



NOZZLE SIZING CHART (1000 PPD)



NOZZLE SIZING CHART (2000 PPD)