Vacuum Operated
Liquid Chemical Feed Systems

Instruction Manual

All HYDRO Chemical Feed systems are carefully designed and tested for years of safe, accurate field service. All HYDRO systems are 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.

The information contained in this manual was current at the time of printing. The most current versions of all Hydro Instruments manuals can be found on our website: **www.hydroinstruments.com**

Series LF Rev. 10/15/13

Liquid Chemical Feed Systems
Operation & Maintenance Manual

Table of Contents

GENERAL NOTES

1. **Torque Specifications:** The following table is a guideline for servicing this equipment.

Torque Specifications

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

2. **Lubricant:** Hydro Instruments recommends the use of fluorocarbon based lubricants. Such lubricant can be purchased from Hydro Instruments in 0.5 ounce portions under the part number 005-ORG.

3. **Each system consists of a minimum of the following:**

   a. The remote liquid flow meter to measure and control chemical feed rate.

   b. The Venturi nozzle that mounts directly to the pipeline, storage tank, wet well, or to a solution line.

   c. At lease one check valve to prevent backflow of water into the chemical storage drum.

   d. Sufficient vacuum tubing (minimum of 25 feet).

   e. An intake strainer, weight, and check valve assembly.

   f. Additional parts can be ordered through Hydro Instruments:

      - Secondary all-Teflon check valves.
      - Pressure and vacuum gauges.
      - Water and vacuum line valves.
      - Y-Strainers.
      - Repair kits, lubricant, and spare parts.

SECTION I: SAFETY INFORMATION

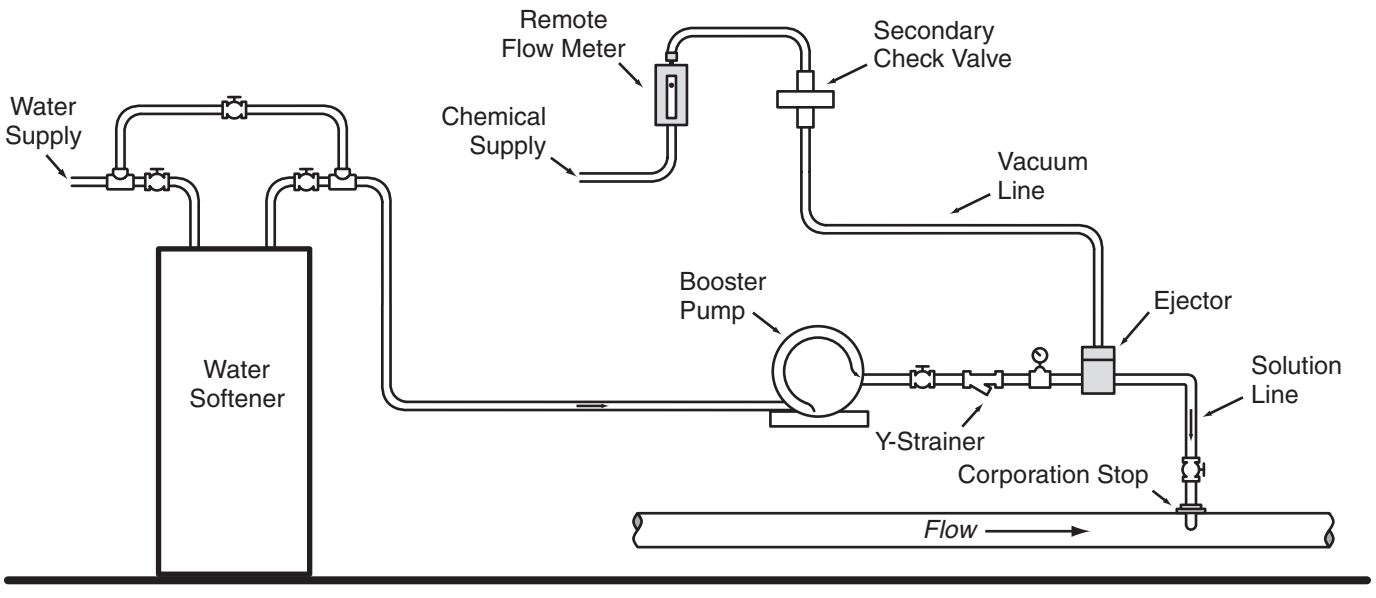
FOLLOW SAFETY PRECAUTIONS WHEN HANDLING CHEMICAL SOLUTIONS!

1. Always follow storage and handling instructions for chemicals.
2. Be sure to install an overflow pipe for each chemical storage drum.
3. Follow operation and preventive maintenance instructions.

SECTION II: DESIGN AND INSTALLATION NOTES

1. **ALL VACUUM SYSTEM:** Chemical feed will be stopped should the vacuum line be broken or if the vacuum is lost for any reason. This assumes that chemical is taken from the top of the storage drum.
2. **TOTAL BACK PRESSURE** is the pressure at the downstream side of the ejector. This "total back pressure" is comprised of the pressure in the pipeline to be treated plus the friction losses (head 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 and beyond 140 psig are available.
3. **SOLUTION LINES:** It is preferable to locate the ejector at the point of solution injection in order to eliminate the need for solution lines. The reasons are as follows:
    a. Solution lines carry **highly concentrated chemical solution** that is under pressure. This presents the possibility of dangerous leaks and also of clogging due to scaling.
    b. Friction losses in the solution line also **increase ejector back pressure.** To reduce friction losses, increase solution line diameter and reduce the number of flow restrictions and turns.

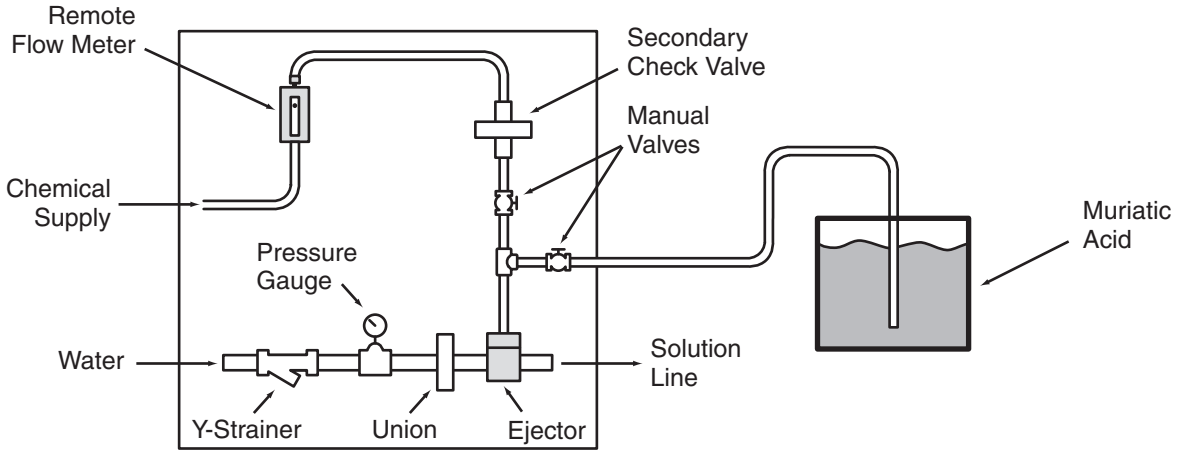
FIGURE 1
WATER SOFTENER



4. **SCALING:** Scaling and precipitation of minerals is a concern in the ejector and solution line. Scaling will eventually cause a loss of vacuum and chemical feed. If scaling occurs the solution line and ejector will need to be cleaned. If the process water has significant levels of calcium, magnesium, iron or other minerals then you should take steps to avoid this problem. Suggestions are as follows:
    a. **Dilution:** Using an oversized ejector will dilute the chemical concentration in the solution line and reduce the rate of precipitation and scaling. Often this is sufficient to solve the problem.
    b. **Water Softener:** If the ejector water supply is softened, this will generally avoid the problem altogether. *(See Figure 1)*
    c. **Acid Cleaning:** A bypass line can be installed to allow periodic feeding of muriatic acid through the ejector. This could be done as needed to remove scaling that builds up during chemical injection. Frequency and amounts will depend upon the installation. *(See Figure 2)*
5. **SOLUTION WITHDRAWAL:** Hydro Instruments recommends **withdrawal of chemical from the top of the storage drum.** Below are some **disadvantages of bottom feeding:**
    a. **Avoiding Storage Drum Leaks:** Drum fabricators recommend against installing bottom feed ports because they greatly increase the likelihood of drum leaks.
    b. **Chemical Withdrawal Line Leaks:** If the suction line carrying the chemical out of the storage drum is taken from the bottom, then at least some portion of that line will be under the hydrostatic pressure of the chemical in the drum. Therefore, if there is any break in this line, the chemical will leak out of the drum under gravity. This can be avoided by feeding from the top of the storage tank.
6. **FLEXIBLE TUBING LENGTH:** Up to 100 feet of polyethylene tubing is standard. For longer distances consult the factory.
7. **CHEMICAL SOLUTION LIFT:** There is a limitation to the height through which the chemical can be lifted. We recommend that a height of one building story (or about 15 feet) be used as the practical limit for systems with feed rates above 1 gallon/hour (24 gallons/day). For feed rates below 1 gph, the limit is estimated at 8 feet.

    Notes: The theoretical limit is less than 14.7 psia × 2.31 = 33.95 feet. However, in reality friction losses and especially the rate control valve restriction will significantly lower this value. (It should be noted that lift capability is proportional to the feed rate. This is because the rate valve creates a greater restriction for lower feed rates.)

FIGURE 2
MURIATIC ACID INJECTION



SECTION III: SYSTEM INSTALLATION

(I) INSTALLATION OF EJECTOR (EJ-1000, EJ-5000 and EJ-5000-375 Ejectors – Refer to Figure 3)

1. Installation of 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 3PS-214 O-Rings are on each side of nozzle and diffuser.
2. Testing of ejector:
   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 chemical is not re-circulated through the booster pump. *(Note: A minimum distance of 10 pipe diameters is recommended.)*
      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.

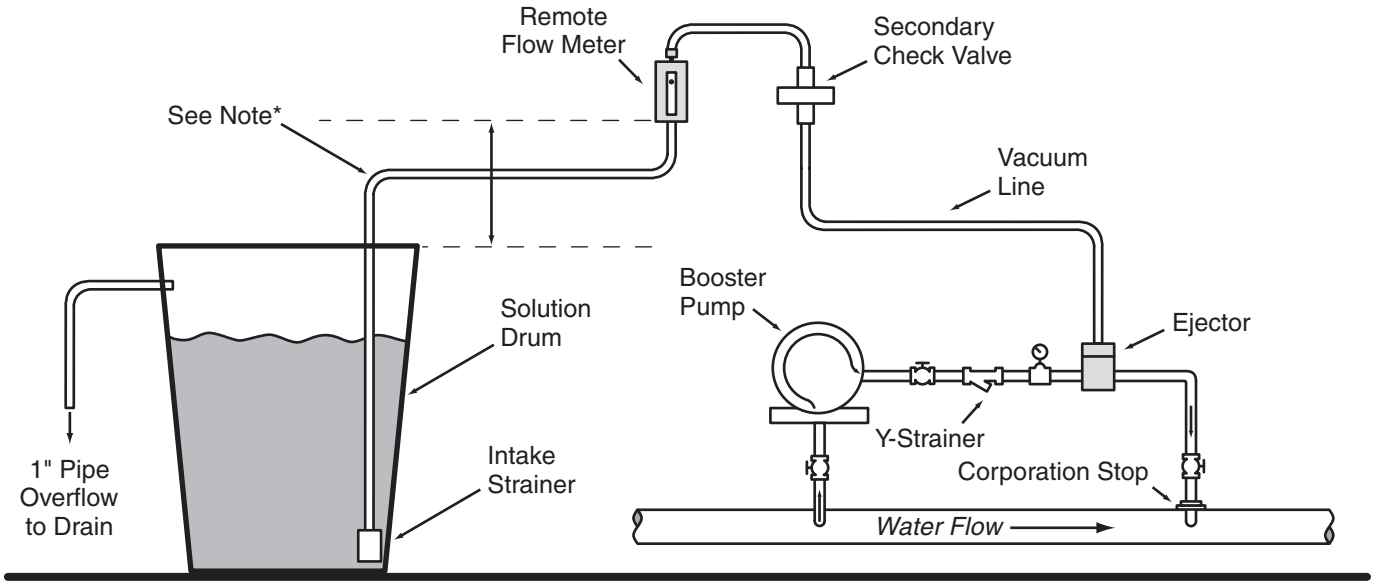
   ii. Testing for sufficient pump pressure to operate ejector. Also checking that booster pump (if applicable) operating in the proper direction.

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

   Note 2: When injecting 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 block of the ejector.
      b. If using a booster pump, open the water inlet valve to the ejector and the pressure gauge should indicate a boost of approximately 40 psi or greater than pressure supplied to the booster pump. If pump is operating in proper direction there should be a strong vacuum at the fitting on the top block of the ejector. Feel for suction (with your finger) at the fitting on the top block of the ejector.
      c. If the ejector has tested satisfactorily continue on to the next step.

FIGURE 3
TYPICAL RECOMMENDED INSTALLATION



** Vacuum tubing should exit the top of the storage drum. The Remote Meter should be mounted at a higher level. The tubing should travel only upwards or horizontally in order to allow any bubbles to travel toward the Remote Flow Meter.*

(II) INSTALLATION OF 2" FLANGED EJECTOR (EJH-2000-CL2 Ejector – Refer to Figure 3)

1. Installation of EJH-2000-CL2 Ejectors:
   a. The water inlet and outlet connections are 2" flanged, four bolt, 150 lb., Van Stone style in Schedule 80 PVC.
   b. The shorter end is the water inlet (nozzle side) and the longer end is the chlorinated solution outlet.
   c. Install both flanges carefully with new RH-308-000 gaskets from Hydro Instruments.
2. Testing of ejector. *(Note: The vacuum regulator should not be connected and the chlorine container valves should remain closed.)*
   i. Piping hook up to ejector (Refer to Figure 3):
      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 injecting 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 hand) at the gas intake 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 gas intake of the ejector. Feel for suction (with your hand) at the gas intake of the ejector.
      c. If the ejector has tested satisfactorily continue on to the next step (Installation of Floor Cabinet and/or Vacuum Regulator).

SECTION IV: START UP

1. 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.
2. Rate valve is not a shut off valve: it is a flow rate control valve. **To shut off chemical feed stop the water flow to the ejector.**

SECTION V: SHUT DOWN PROCEDURE

1. Shut down the water supply to the ejector.

SECTION VI: RATE VALVE OPERATION

The HYDRO rate valve is designed to give full capacity before the black knob on the rate valve reaches the top of the monel bonnet (which occurs at the 7th turn). Just beyond this point, the chemical feed rate will experience a 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 chemical feed. ***(See Appendix for servicing instructions.)***

Note: 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 which are not exercised frequently may experience a build up of materials which percipitate out of the chemical solution. 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 VII: TROUBLESHOOTING

(I) NO CHEMICAL FEED

Possible causes:

1. **No vacuum being produced by ejector.**
   a. Remove flexible tubing from the ejector fitting and place your finger on it; you should feel a strong 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. Take care not to scratch the orifice.

         (2) If there is a build-up of rust, iron, or manganese, place the nozzle in a muriatic acid for five minutes and then rinse with water. If you see a black, syrup-like substance you may find it necessary to clean the nozzle on a preventative maintenance schedule.

      ii. **Diffuser and Solution Line:** Before reinstalling the ejector, inspect the diffuser and the solution line for any scaling/buildup. If significant scaling is found, it must be removed either physically or with acid. *(Also, see Section II.4 of this manual.)*

      iii. Inlet Water Supply. (Supply pressure has dropped.)

      iv. Y-strainer requires 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. **Vapor Lock.** (Vapor bubbles caught in the vacuum lines.) At chemical feed rates below 0.5 gph (12 gpd), vapor can become trapped between the chemical storage drum and the intake of the remote flow meter. This is because the vacuum is of relatively low strength since the rate valve is nearly closed. To avoid this problem:
   a. Ensure that the line carrying the chemical from the drum to the remote meter only travels upward. Any high points will trap vapor and could prevent chemical from feeding. *(See Figure 3)*
   b. Increase the size of the piping or tubing to reduce the effects of surface tension and viscosity.

3. **Debris in the chemical feed lines.** If any debris or particles are drawn into the vacuum system, they can form a blockage that will prevent or diminish chemical feed. The primary source of such blockages is in the rate valve. In the rate valve, all of the chemical must flow through a small orifice and particles can become trapped there. Usually the problem is fixed temporarily by simply opening the rate valve and allowing the obstruction to pass through. However, to avoid this problem in the future the following steps should be considered:
   a. Avoid debris in the chemical storage drum.
   b. Install additional filtration devices to the chemical induction line.

APPENDIX: SERVICING THE HYDRO SYSTEM

This equipment should require little service when operated according to instructions. The following are recommended maintenance instructions.

Suggested Guidelines for Preventative Maintenance: See below for detailed instructions.

1. Service Rate Valves every 12 months.
2. Replace Rate Valve O-Ring every 12 months.
3. Service Flow Meter 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.

SECTION A-I: SERVICING FLOW METER ASSEMBLY (RML-10 and RML-28)

(Refer to appropriate parts diagram)

1. Disconnect the chemical drum from the remote meter.
2. Use ejector to remove solution from flow meter assembly.
3. Remove rate valve from bonnet. See Section III below for servicing rate valve and to remove bonnet and Rate Valve O-Ring.
4. Loosen the Inlet plug (FM-101A) 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.
5. If there is any buildup in the tube, remove the stops and ball, then soak the tube in water with a cleaner (muriatic acid) until the material is sufficiently removed from inside the tube.

   NOTE: Always follow safety precautions with muriatic acid and other cleaners.
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-lubricate O-Rings. Check O-Rings and if necessary replace them. Add some lubricant 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 by tightening the Inlet Plug. DO NOT OVERTIGHTEN.

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

(Refer to Figure 4)

1. Disconnect the chemical drum from the remote meter.
2. Use ejector to remove solution from flow meter assembly.
3. Turn off water supply to ejector.
   a. Remove the RATE VALVE and cleanse of any debris.
   b. Place piece of tape or cloth around monel bonnet, grip firmly with pliers, and turn counterclockwise.
   c. Under bonnet 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-III: SERVICING EJECTOR NOZZLE (EJ-1000, EJ-5000 and EJ-5000-375 Ejectors)

(Refer to appropriate parts diagram)

1. Evacuate chemical from the vacuum tubing carefully before removing the tubing from the Ejector.
2. Isolate the Ejector from main water lines before removing from the pipe line.
3. Remove the Ejector unit from the pipe line.
4. Unscrew the Nozzle and Diffuser from one another.
5. For the EJ-1000, the Nozzle is the longer piece. For the EJ-5000 and over, the Nozzle is the smaller piece.
6. Inspect for obvious damage and that the nozzle is not clogged with particles or any kind of deposit.
   NOTE: Do not attempt to re-drill the hole in any way.
7. 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.
8. It is recommended that the 3PS-214 O-Rings be replaced every 12-24 months or if they appear visibly deformed.
9. Reassemble the Ejector being careful to remember to use the Nozzle and Diffuser O-Rings.

SECTION A-IV: SERVICING EJECTOR CHECK VALVE ASSEMBLY (EJ-1000, EJ-5000 and EJ-5000-375 Ejectors)

(Refer to appropriate parts diagram)

1. Evacuate chemical from the vacuum tubing carefully before removing the black tubing from the Ejector.
2. Isolate the Ejector from main water lines before removing from the pipe line.
3. Remove the Ejector unit from the pipe line.
4. Remove the four bolts holding the two body parts together.
5. Lift the Top Body away from the Bottom Body.
6. The 3RS-203 O-Ring should be replaced. This is the seal for the check valve.
6. Inspect the SM-112 Diaphragm for damage (holes, excessive 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. Replace any parts necessary and reassemble.

SECTION A-V: SERVICING EJECTOR NOZZLE AND THROAT (EJH-2000-CL2 Ejector)

NOTE: Carefully follow shutdown procedures before performing this repair.

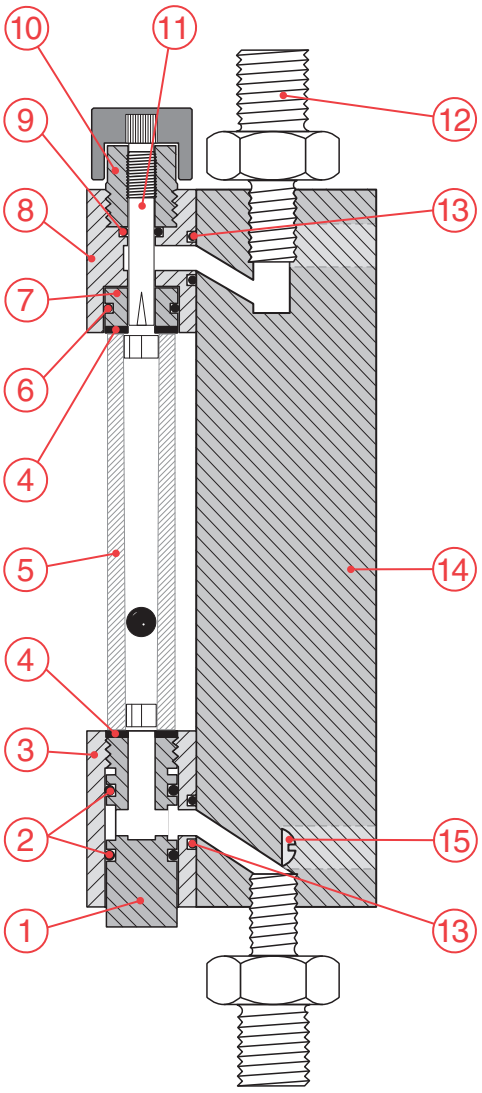
1. Be sure to isolate the ejector on both intake and outlet sides to prevent leakage of water or gases.
2. Disconnect the vacuum intake connection.
3. Disassemble both the intake and outlet water connection flanges and remove it from the water pipeline.
4. Remove the flanges from the Ejector Body EJH-169-000.
5. Unthread the nozzle and throat from the Ejector Body.
6. Slide the nozzle and throat out of their respective housings. Take care not to damage the threaded portion.
7. Inspect and clean the nozzle and throat interior. Soaking in Muriatic Acid is recommended if scale build-up is present. Replace them if necessary.

SECTION A-VI: SERVICING EJECTOR CHECK VALVE (EJH-2000-CL2 Ejector)

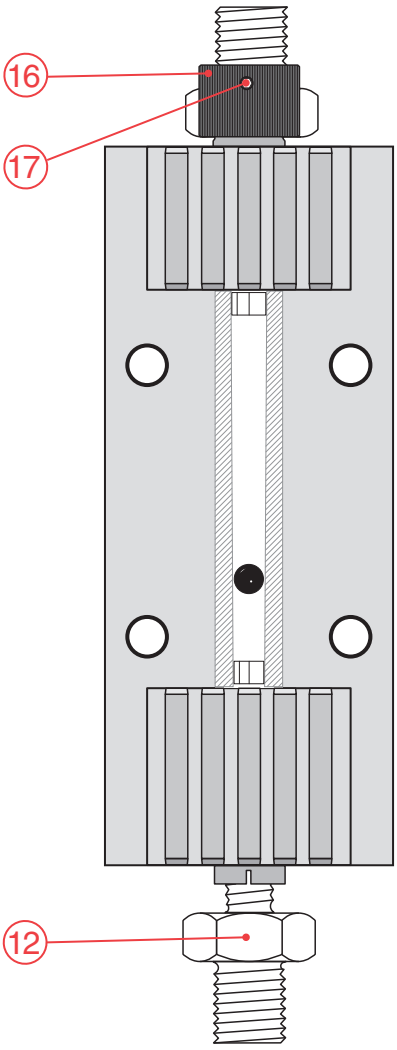
NOTE: Carefully follow shutdown procedures before performing this repair.

1. Remove the four bolts holding the two Check Valve Body parts together.
2. Lift the Check Valve Top Body away from the Check Valve Bottom Body.
3. The OH-CEM-214 O-Ring should be replaced. When installing a new OH-CEM-214, carefully ensure it is evenly seated in the groove. Lubricating the new OH-CEM-214 O-Ring with Fluorolube is recommended.
4. Inspect the DIH-116-000 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. The DIH-116-000 should be replaced every 12 to 24 months.
5. Replace the spring only if it is damaged.
6. Replace any parts necessary and reassemble.

SIDE VIEW



FRONT VIEW

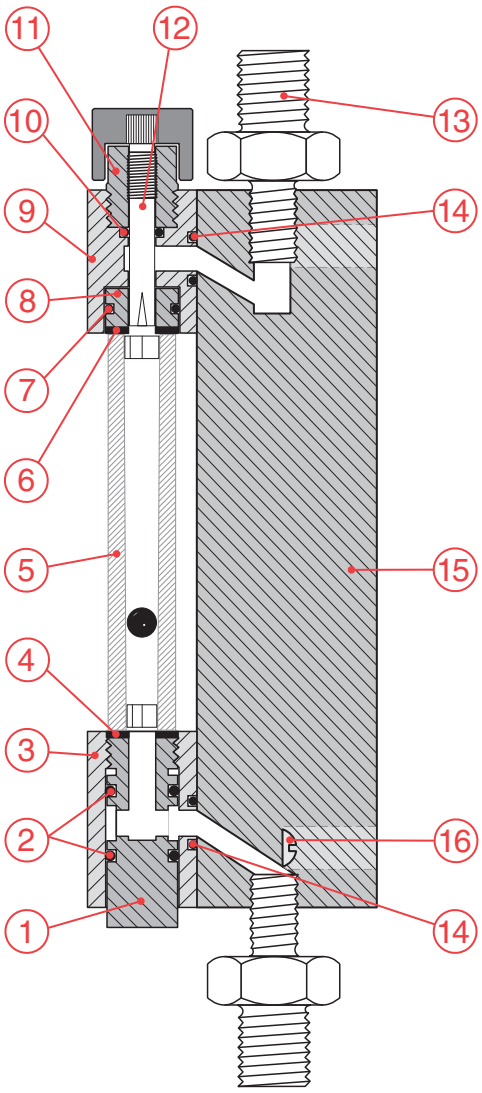


Item No.	Description	Quantity	Part No.
1	Inlet Plug	1	FM-101A
2	O-Ring	2	3PS-112
3	Bottom Meter Block	1	FM-103
4	Meter Gaskets (0.5 up to 10 GPH)	2	MG-001-025
5	Flow Meter (0.5 GPH)	1	MTB-11-L-0005
5	Flow Meter (1 GPH)	1	MTB-11-L-001
5	Flow Meter (4 GPH)	1	MTB-11-L-004
5	Flow Meter (10 GPH)	1	MTB-11-L-010
6	O-Ring	1	3RS-012
7	Rate Valve Seat	1	VT-104
8	Top Meter Block	1	FM-100B
9	O-Ring	1	3PS-106
10	Valve Bonnet	1	VB-100C
11	Rate Valve	1	VP-103C-100
12	Vacuum Tube Fitting	2	10-6-4
13	O-Ring	2	3PS-110
14	Back Body	1	RML-1-100
15	Remote Meter Block Screws (Monel)	4	#10-24 x 1-¼"
16	Rate Valve Knob	1	RV-100A
17	Rate Valve Knob Set Screw	1	#5-40 x ¼"

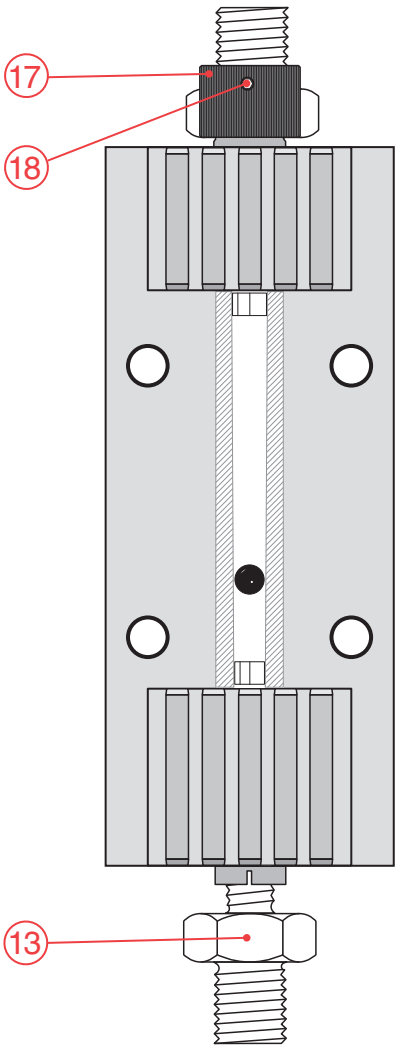
REMOTE FLOW METER

Date: September 2013
Scale: 75%
Dwg. No.: RML-10

SIDE VIEW



FRONT VIEW

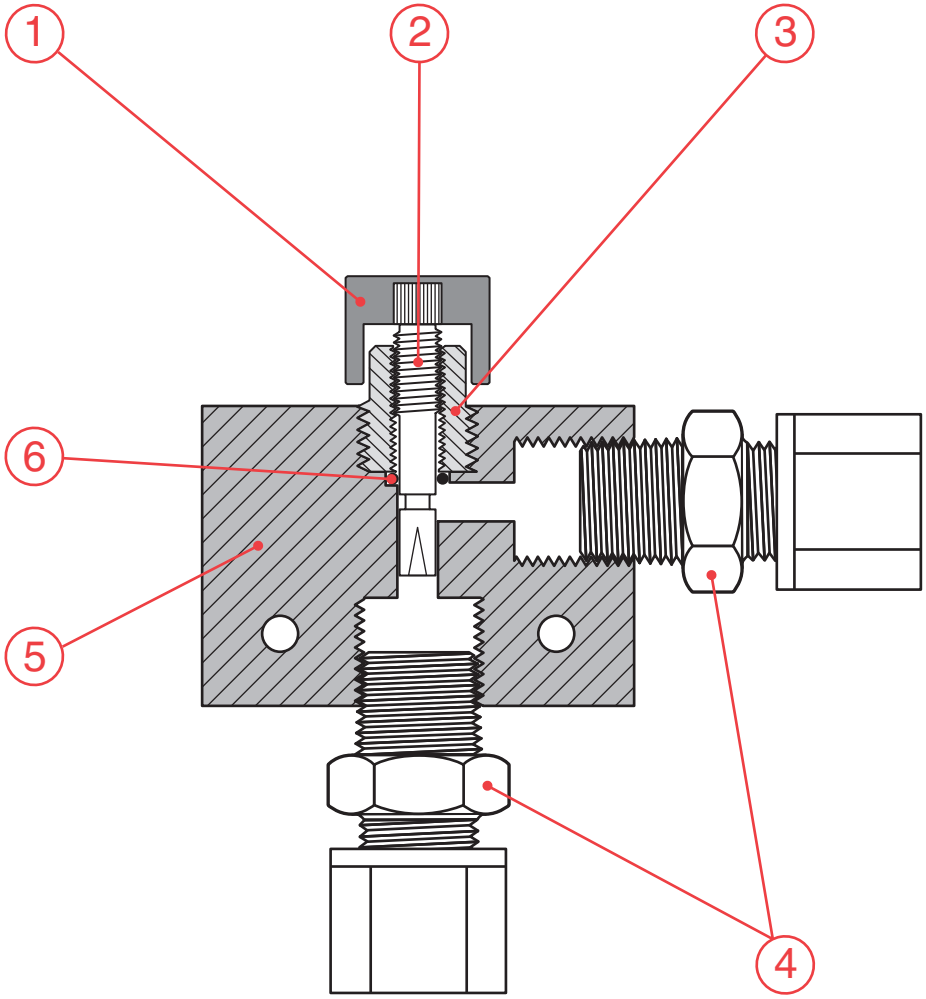


Item No.	Description	Quantity	Part No.
1	Inlet Plug	1	FM-101A
2	O-Rings	2	3PS-112
3	Bottom Meter Block	1	FM-203
4	Bottom Meter Gasket	1	MG-001-025
5	Meter Tube	1	MTB-11-L-028
6	Top Meter Gasket	1	MG-200B
7	O-Ring	1	3RS-016
8	Rate Valve Seat (Teflon)	1	VT-204
9	Top Meter Block	1	FM-200B
10	O-Ring	1	3PS-106

Item No.	Description	Quantity	Part No.
11	Valve Bonnet	1	VB-100
12	Rate Valve	1	VP-250
13	⅜" Tubing x ¼" NPT Tube Connector	2	10-6-4
14	O-Rings	2	3PS-110
15	Back Body	1	RML-1-100
16	Remote Meter Block Screws (Monel)	4	#10-24 x 1-¼"
17	Rate Valve Knob	1	RV-100A
18	Rate Valve Knob Set Screw	1	#5-40 x ¼"

28 GPH REMOTE METER

Date: September 2013
Scale: 75%
Dwg. No.: RML-28



Item No.	Description	Quantity	Part No.
1	Rate Valve Knob	1	RV-100A
2	Rate Valve	1	VP-103C
3	Valve Bonnet	1	VB-100C
4	Vacuum Tube Fitting	2	10-6-6
5	Rate Valve Body	1	RML-B
6	O-Ring	1	3PS-106

Capacity: 10 GPH (liquid) or 100 PPD (gas).

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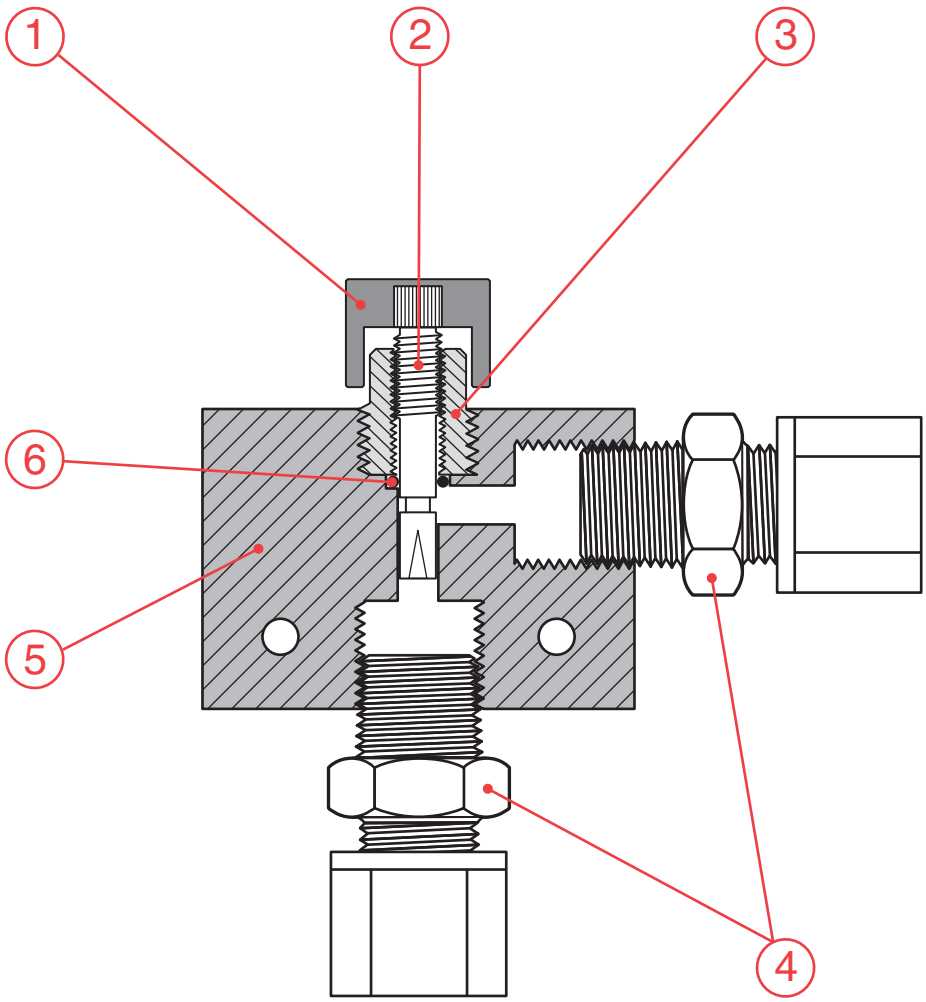
RATE VALVE

Date: December 2007
Scale: 100%
Dwg. No. RCV-10



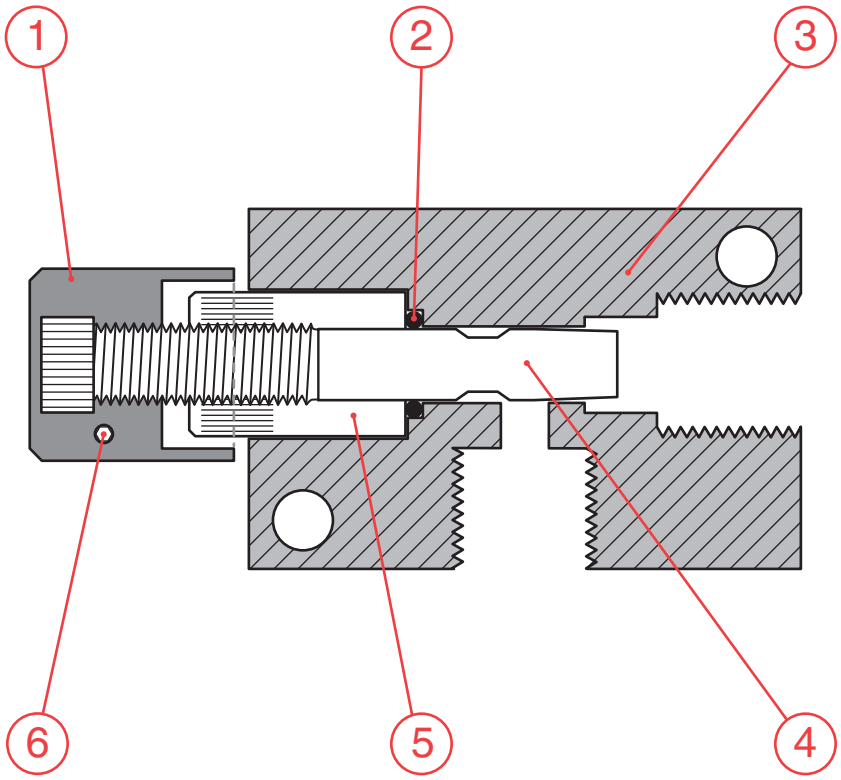
Item No.	Description	Quantity	Part No.
1	Rate Valve Knob	1	RV-100A
2	Rate Valve	1	VP-203C
3	Valve Bonnet	1	VB-100C
4	Vacuum Tube Fitting	2	10-6-6
5	Rate Valve Body	1	RML-B
6	O-Ring	1	3PS-106

Capacity: 28 GPH (liquid) or 250 PPD (gas).

hydro INSTRUMENTS

RATE VALVE

Date: December 2007
Scale: 100%
Dwg. No. RCV-28



Item No.	Description	Quantity	Part No.
1	Rate Valve Knob	1	S496
2	O-Ring	1	3RS-203
3	Rate Valve Body	1	RVB-700
4	Rate Valve	1	SA495
5	Valve Bonnet	1	S493
6	Rate Valve Knob Set Screw	1	#6-32 x 5/16"

Capacity: 240 GPH/4 GPM (liquid) or 500 PPD (gas).

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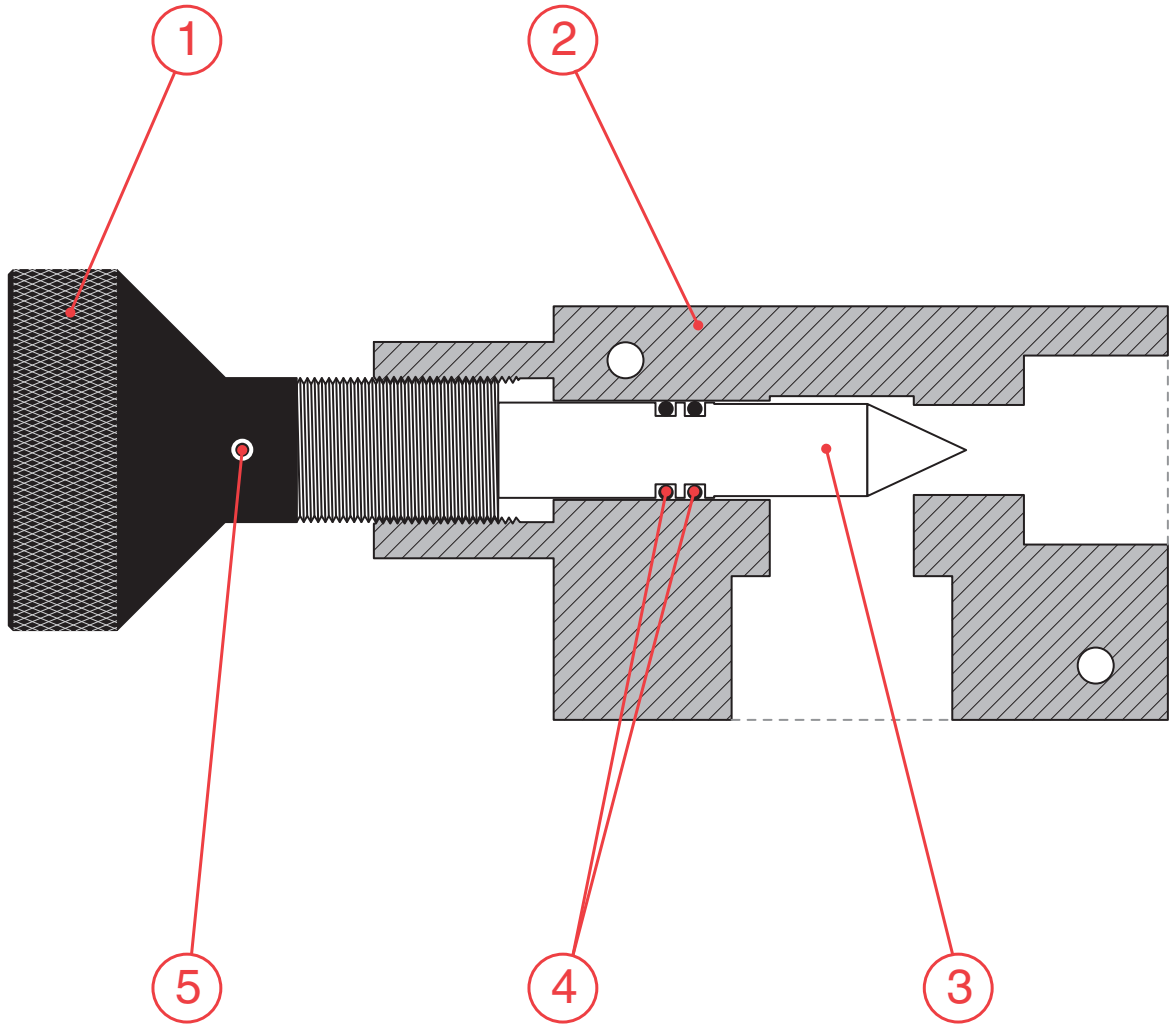
RATE VALVE

Date: December 2007
Scale: 100%
Dwg. No. RCV-240



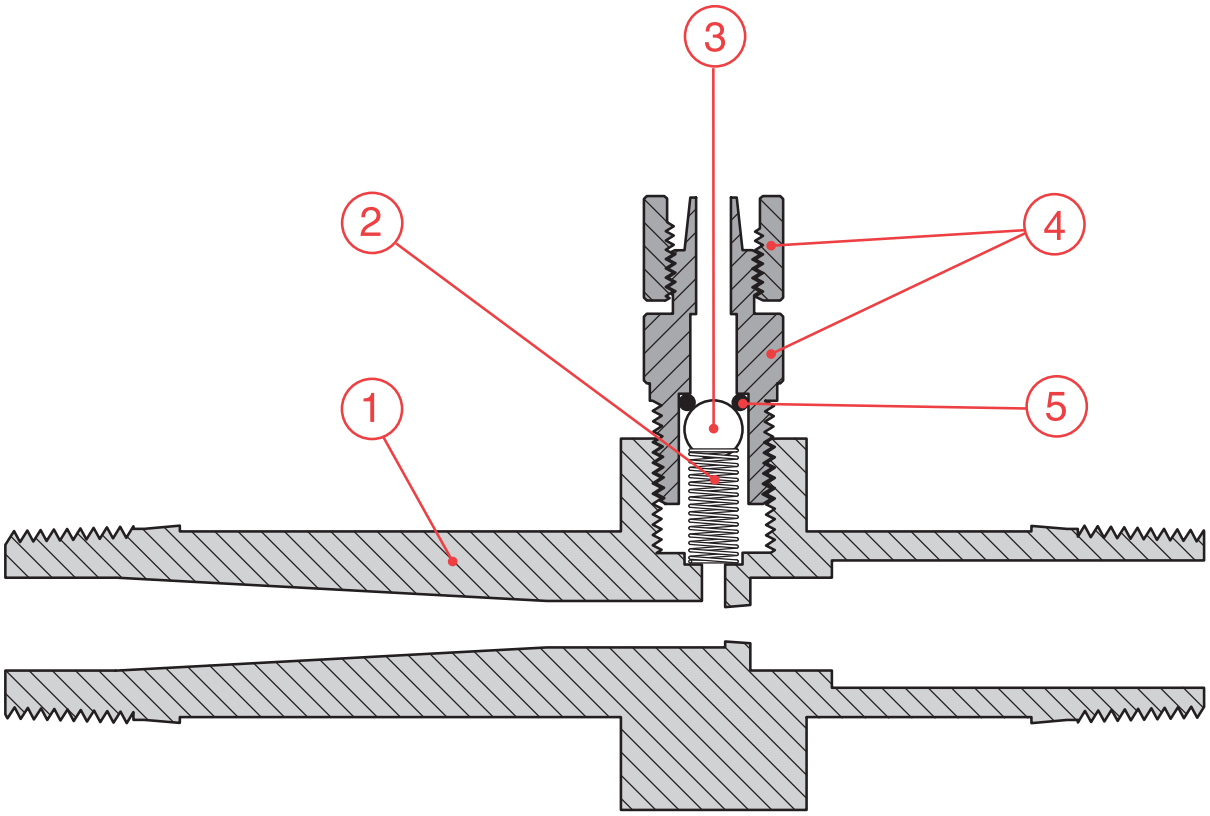
Item No.	Description	Quantity	Part No.
1	Rate Valve Knob	1	RVH-412-000
2	Rate Valve Body	1	RVB-3000
3	Rate Valve Stem	1	RVH-411-000
4	O-Ring	2	3PS-112
5	Rate Valve Knob Set Screw	1	#6-32 x 5/16"

Capacity: 600 GPH/10 GPM (liquid) or 2000 PPD (gas).

hydro INSTRUMENTS

RATE VALVE

Date: December 2007
Scale: 75%
Dwg. No. RCV-600



Item No.	Description	Quantity	Part No.
1	Compact Ejector Body (#4 shown)	1	CEB-4
2	Spring	1	SPH-520-001
3	Check Ball	1	CB-100
4	3/8" NPT x 3/8" Tube Connector	1	TCH-100-101
5	O-Ring	1	3RS-108

Note: When installing the HCE-1 with threaded fittings a union must be used on one side.

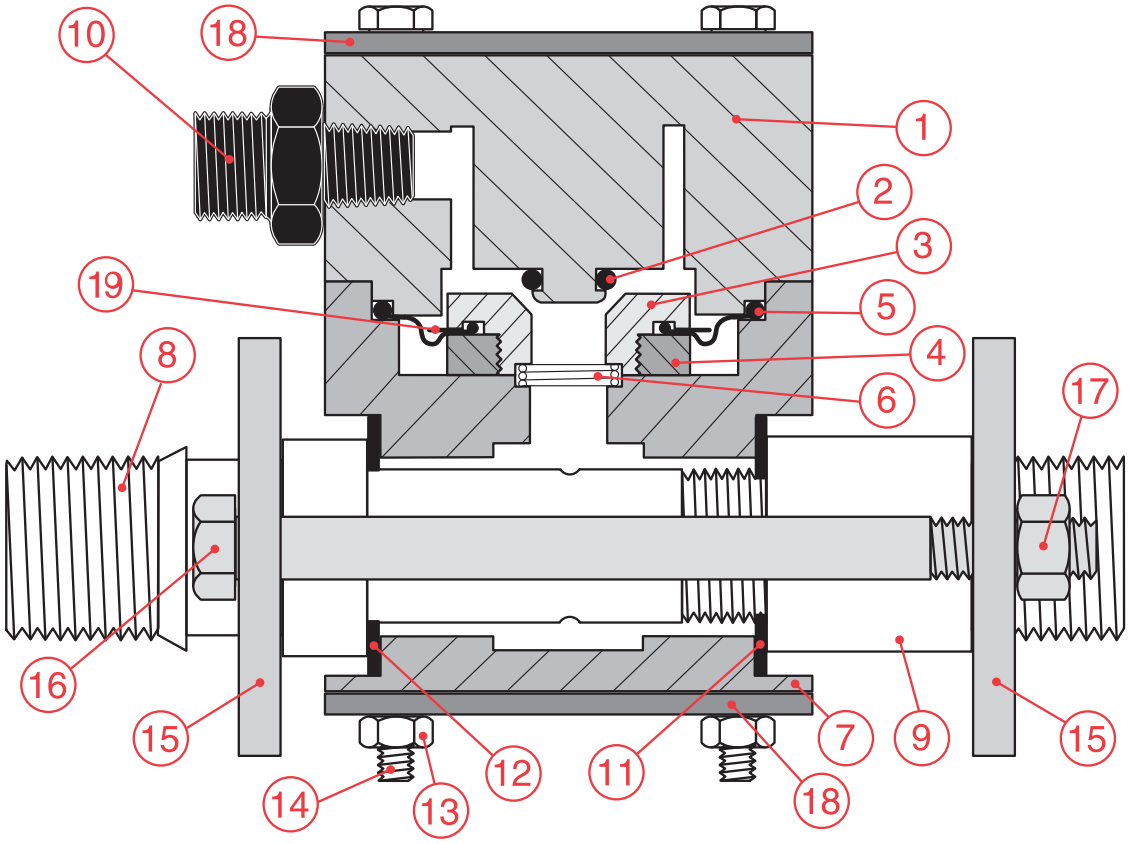
For correct nozzle size (2, 4 or 5), please indicate to Hydro the capacity of the application.
#4 nozzle shown above.

Nozzle Orifice Dimensions
CEB-5 (0.148") for 25 ppd gas feed
CEB-2 (0.186") for 100 ppd gas feed or 4 gph liquid feed
CEB-4 (0.211") for 100 ppd gas feed or 10 gph liquid feed

hydro INSTRUMENTS

COMPACT EJECTOR

Date: January 2008
Scale: 100%
Dwg. No. HCE-1



Item No.	Description	Quantity	Part No.
1	Top Body (250 PPD)	1	E-550-250
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	Universal Nozzle (4 GPH)	1	UN-101-3
8	Universal Nozzle (4 GPH Standard)	1	UN-101-5
8	Universal Nozzle (10 GPH Standard)	1	UN-101-2
9	Diffuser (Threaded)	1	E-1063
10	⅜" tube x ¼" NPT Tubing Connector	1	10-6-4
11	O-Ring	1	OH-BUN-214
12	O-Ring	1	OH-BUN-214
13	Nut 5⁄16-18 (stainless)	4	N-56
14	Bolt 5⁄16-18 x 4½" (stainless)	4	B-57
15	Nozzle/Diffuser Brackets	2	EJB-100
16	Bolt 5⁄16-18 x 5" (stainless)	2	B-60
17	Nut 5⁄16-18 (stainless)	2	N-56
18	Body Armor Plates	2	EJB-51
19	Support Diaphragm	2	KY-1

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

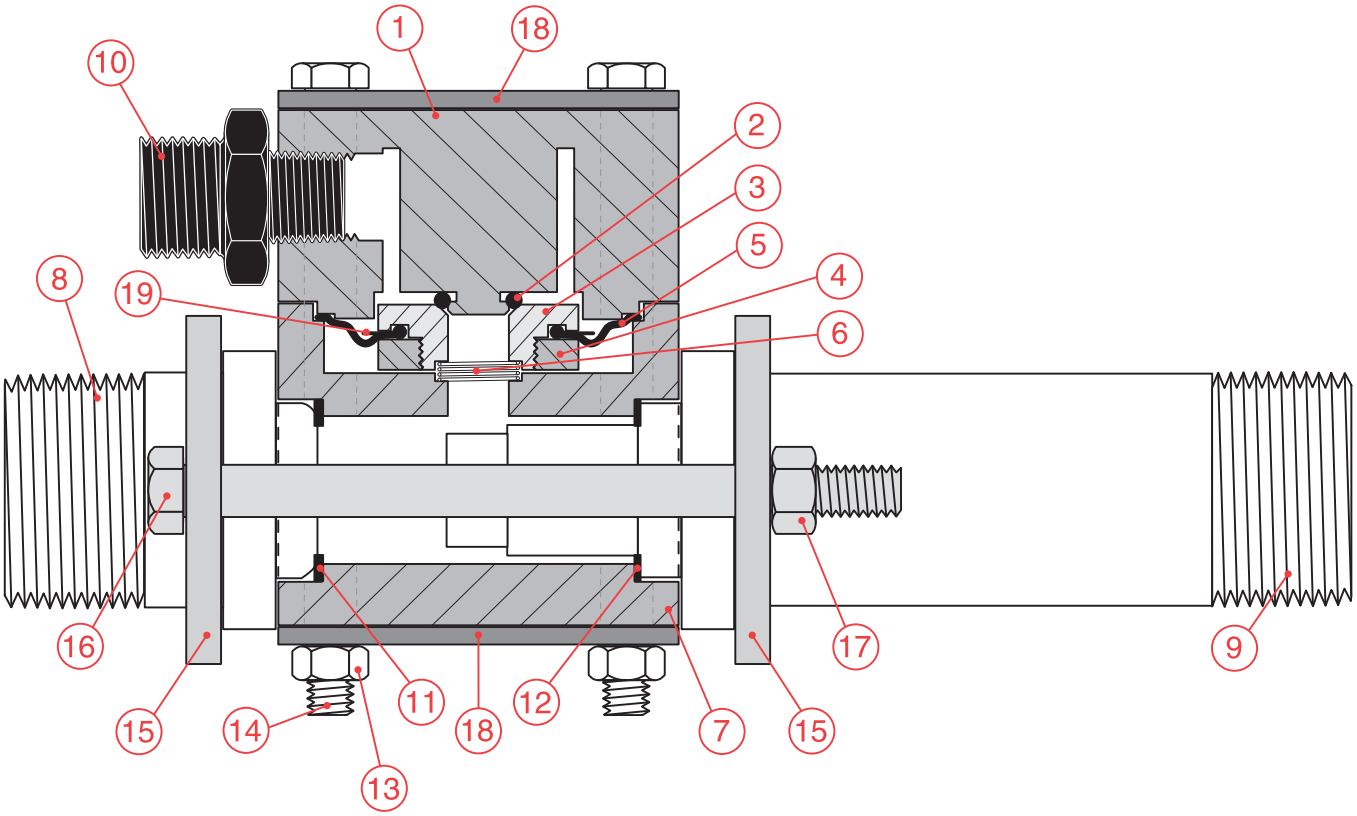
Note: For units using threaded nozzle and threaded diffuser, a union must be used on the nozzle side. On line pressure above 140 PSI, high pressure ejector must be used.

For correct number universal nozzle, please indicate to Hydro the capacity of the liquid feed system.

hydro INSTRUMENTS

EJECTOR

Date: August 2012
Scale: 90%
Dwg. No. EJ-1000-L



Item No.	Description	Quantity	Part No.
1	Top Body	1	E-550-500
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	Nozzle, 0.296 orifice, 1¼" NPT (1 GPM Standard)	1	EN-296
8	Nozzle, 0.375 orifice, 1¼" NPT (2 GPM Standard)	1	EN-375
*9	Diffuser, 1¼" NPT (1 GPM Standard)	1	EDT-380
*9	Diffuser, 1¼" NPT (2 GPM Standard)	1	EDT-560
10	⅝" tube x ½" NPT Tubing Connector	1	10-10-8
11	O-Ring	1	OH-BUN-214
12	O-Ring	1	OH-BUN-214
13	Nut ⅝-18 (stainless)	4	N-56
14	Bolt ⅝-18 x 4½" (stainless)	4	B-57
15	Nozzle/Diffuser Brackets	2	EJB-425
16	Bolt ⅜-16 x 5" (stainless)	2	B-59
17	Nut ⅜-16 (stainless)	2	N-58
18	Body Armor Plates	2	EJB-50
19	Support Diaphragm	2	KY-1

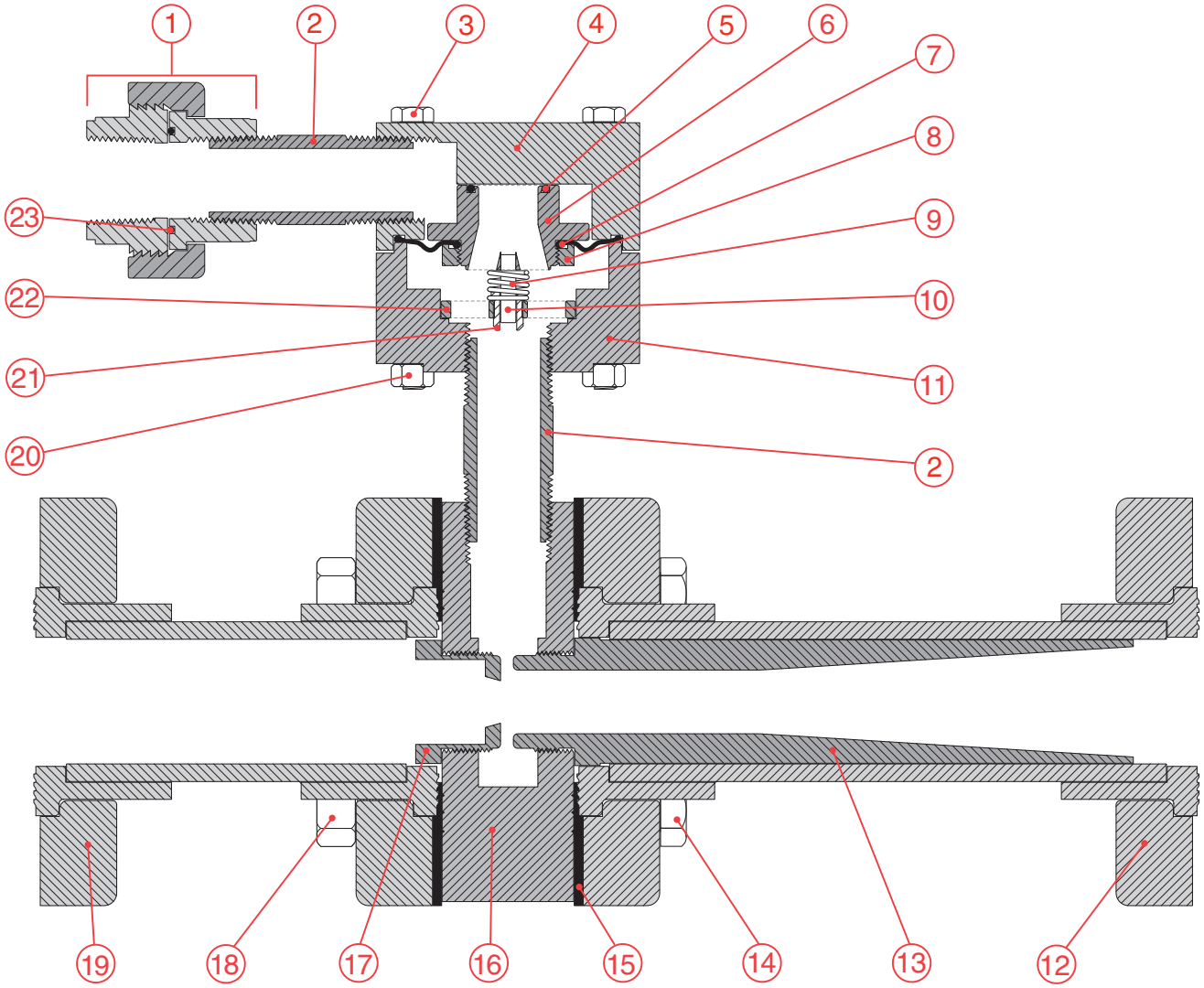
Items 18 are for EJ-5000HP High Pressure Ejector only (Required for line pressures over 140 PSI).

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

Hydro Instruments

EJECTOR

Date: August 2012
Scale: 75%
Dwg. No. EJ-5000-L



Item No.	Description	Qty	Part No.
1	1" Union Assembly	1	U-4475
2	1" PVC Nipple x 3"	2	RH-306-000
3	3/8"-16 x 4" Long Hex Bolt	4	NTH-STA-158
4	Ejector Check Valve Top Body	1	EJH-168-000
5	O-Ring	1	OH-CEM-214
6	Diaphragm Bolt (2" Ejector)	1	EJH-162-000
7	Diaphragm	1	DIH-116-000
8	Diaphragm Nut (2" Ejector)	1	EJH-163-000
9	Spring (2" Ejector)	1	SPH-110-000
10	Guide Pin (2" Ejector)	1	EJH-140-000
11	Ejector Check Valve Bottom Body	1	EJH-167-000
12	Throat Housing Assembly †	1	RH-890-000
13	Throat (0.562" Orifice)	1*	EJH-166-562
13	Throat (0.750" Orifice)	1*	EJH-166-750
13	Throat (0.937" Orifice)	1*	EJH-166-937

Item No.	Description	Qty	Part No.
13	Throat (1.125" Orifice)	1*	EJH-166-1125
14	Bolt, 5/8"-11 x 5 1/4" Long	4	BTH-STA-156
15	Gasket (2" Ejector)	2	RH-308-000
16	Ejector Body (2" Ejector)	1	EJH-169-000
17	Nozzle (0.375" Orifice)	1*	EJH-165-375
17	Nozzle (0.500" Orifice)	1*	EJH-165-500
17	Nozzle (0.625" Orifice)	1*	EJH-165-625
17	Nozzle (0.750" Orifice)	1*	EJH-165-750
18	Nut, 5/8"-11 Hex	4	NTH-STA-230
19	Nozzle Housing Assembly †	1	RH-891-000
20	Nut, 3/8"-16	4	NTH-STA-146
21	Pin Guide (2" Ejector)	1	EJH-151-000
22	Spring Retainer (2" Ejector)	1	EJH-164-000
23	O-Ring	1	OH-DEJ-126

* See Ejector performance curves to select Nozzle and Throat.

† Flanges are 2 inch, four bolt, 150 lb., S (Van Stone style) in Schedule 80 PVC.

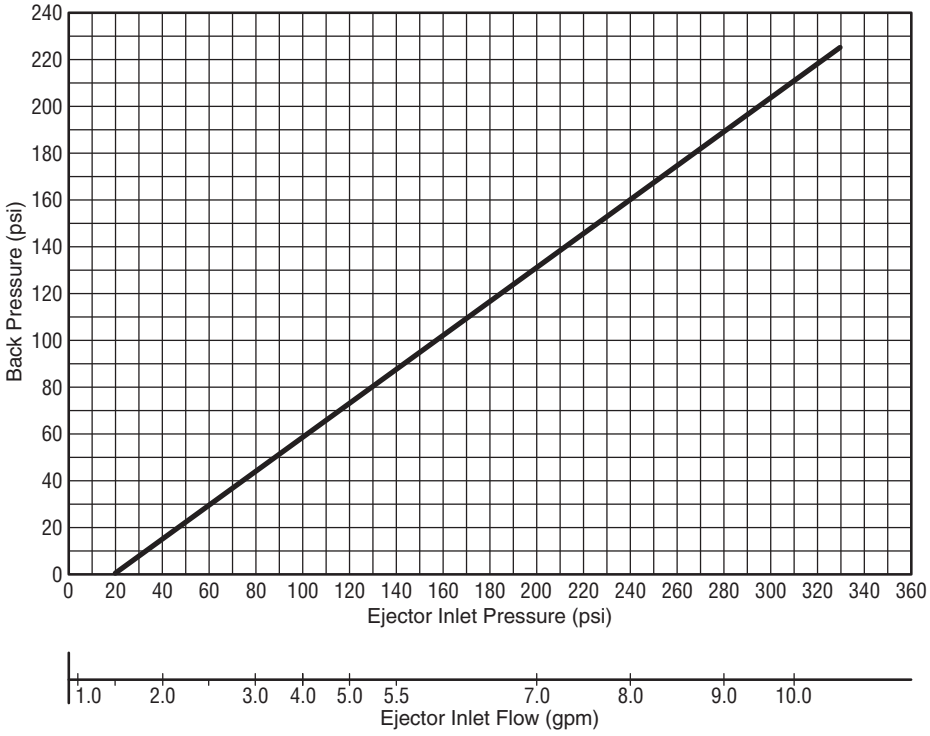
hydro INSTRUMENTS

2" FLANGED EJECTOR

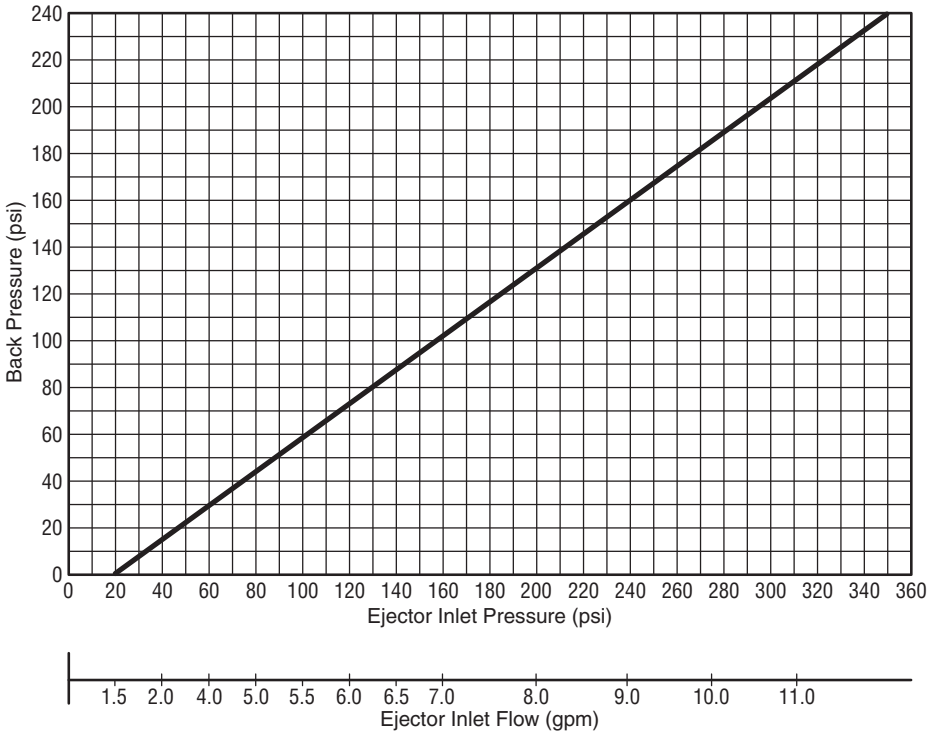
Date: September 2005
Scale: 40%
Dwg. No. EJH-2000-CL2

ALTERNATE NOZZLE SIZES

NOZZLE SIZING CHART (EJ-1000)
#3 Nozzle for 4 GPH



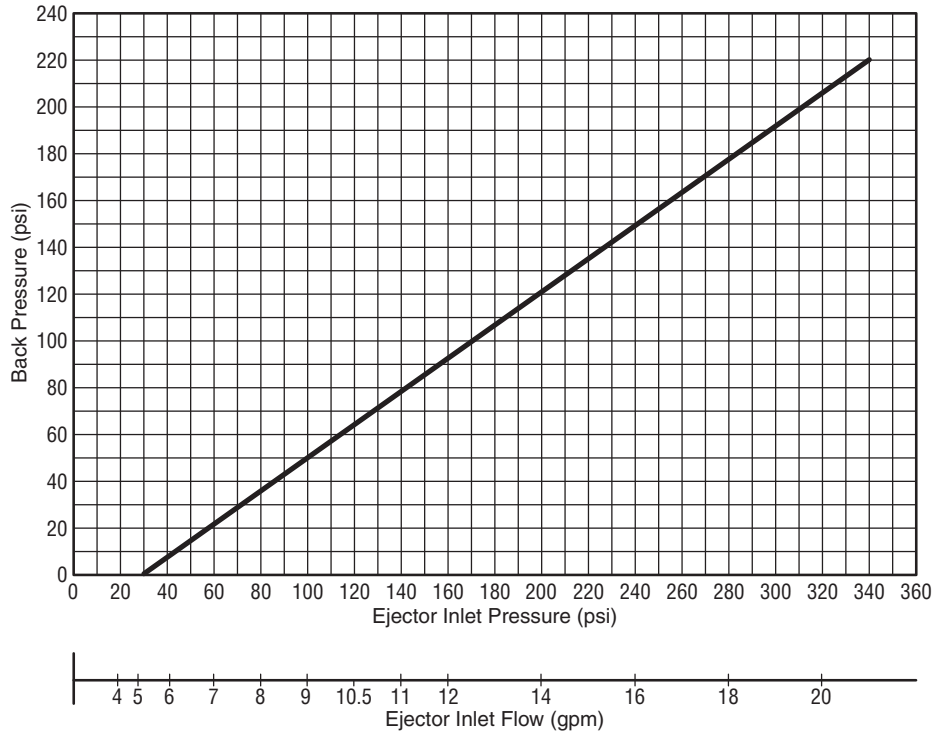
NOZZLE SIZING CHART (EJ-1000 or HCE-1)
#5 Nozzle for 4 GPH



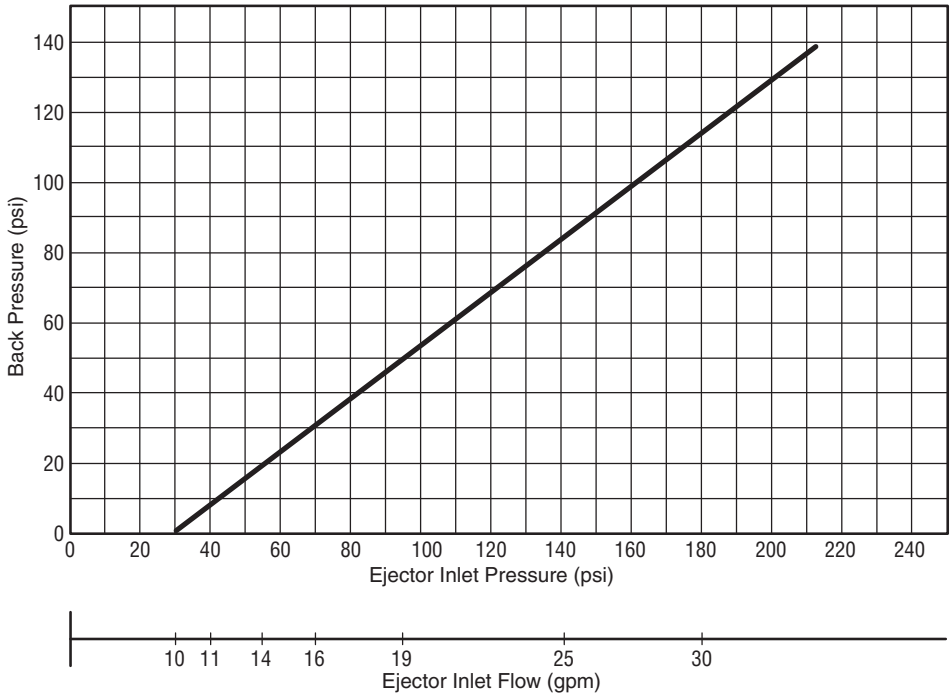
Note: Pressure combinations that plot below the line for any given nozzle are acceptable for operating that nozzle at the stated chemical feed rate for that chart. Pressure combinations that fall above the line for any given nozzle are not acceptable.

NS-4 Rev. 6/13/11

NOZZLE SIZING CHART (EJ-1000 or HCE-1)
#2 Nozzle for 10 GPH

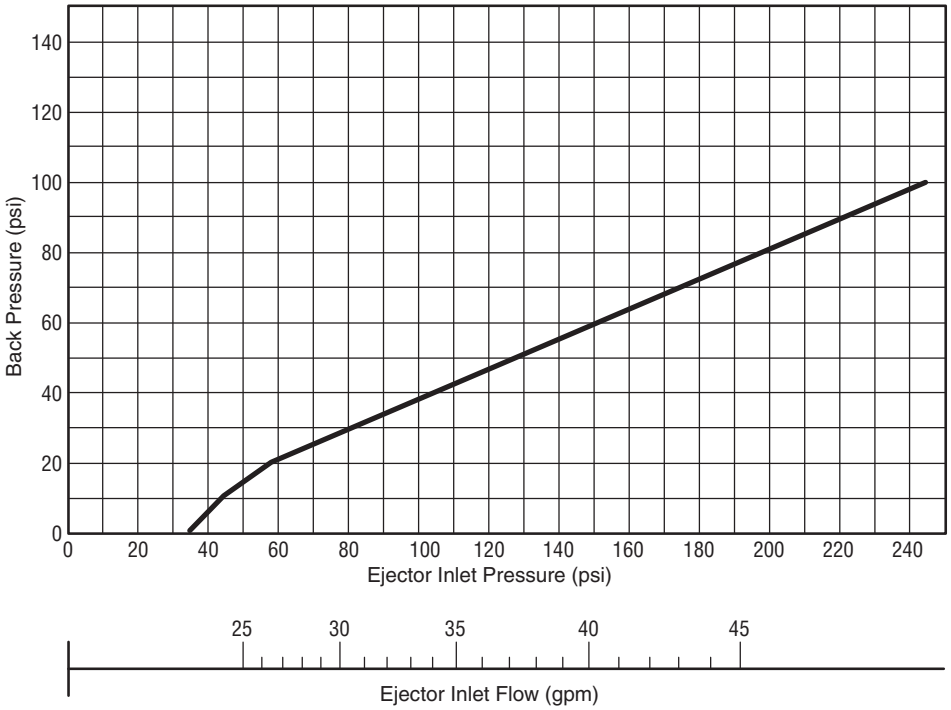


NOZZLE SIZING CHART (EJ-5000-296)
for up to 1 GPM (60 GPH)



Note: Pressure combinations that plot below the line for any given nozzle are acceptable for operating that nozzle at the stated chemical feed rate for that chart. Pressure combinations that fall above the line for any given nozzle are not acceptable.

NOZZLE SIZING CHART (EJ-5000-375)
for up to 2 GPM (120 GPH)



Note: Pressure combinations that plot below the line for any given nozzle are acceptable for operating that nozzle at the stated chemical feed rate for that chart. Pressure combinations that fall above the line for any given nozzle are not acceptable.

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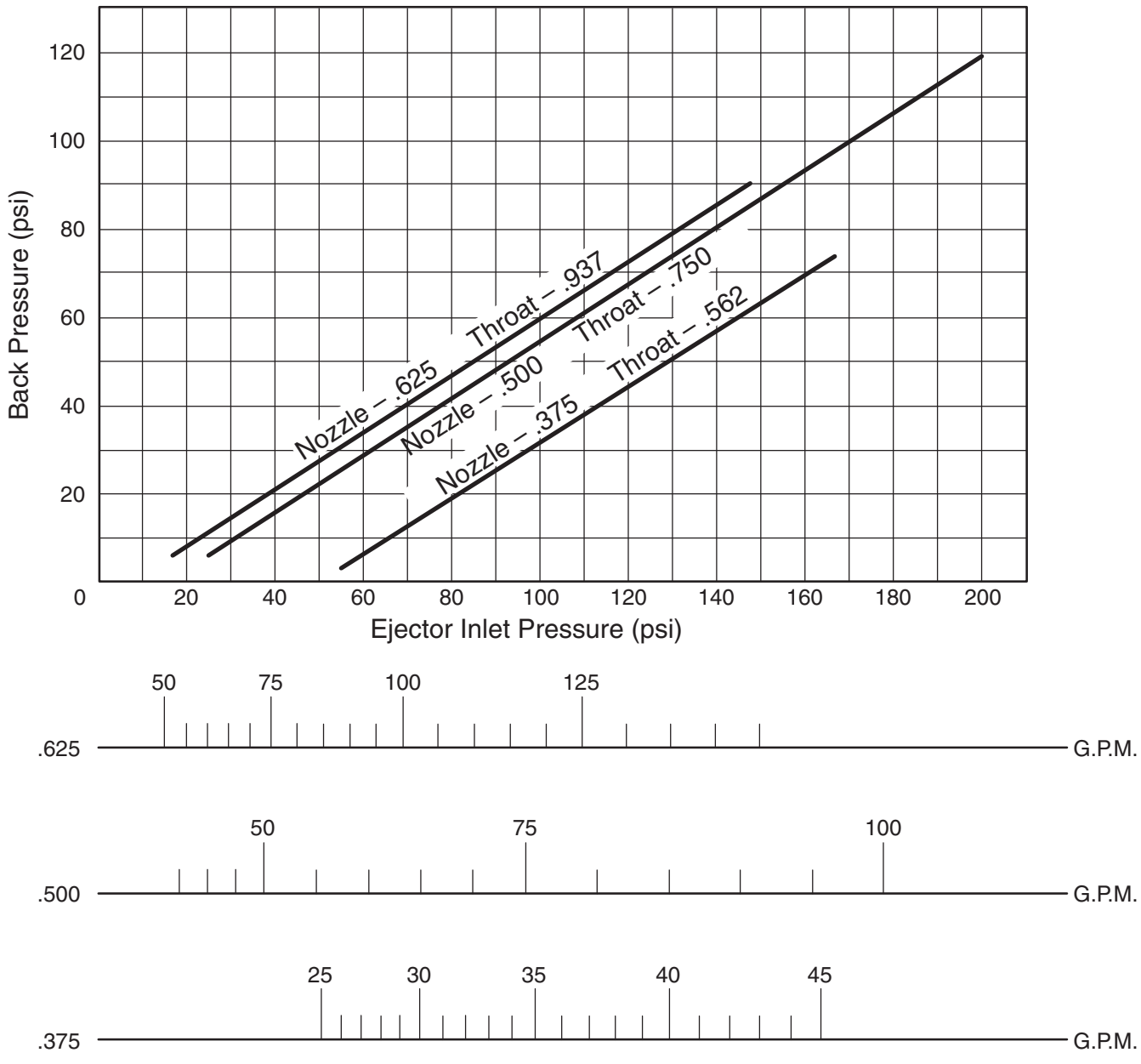
Toll Free: 1-888-38-HYDRO
Fax: 215-453-3106
E-mail: sales@hydroinstruments.com
Website: www.hydroinstruments.com

NOZZLE SIZING CHART
for 4 GPM (240 GPH)



Note: Pressure combinations that plot below the line for any given nozzle are acceptable for operating that nozzle at the stated chemical feed rate for that chart. Pressure combinations that fall above the line for any given nozzle are not acceptable.

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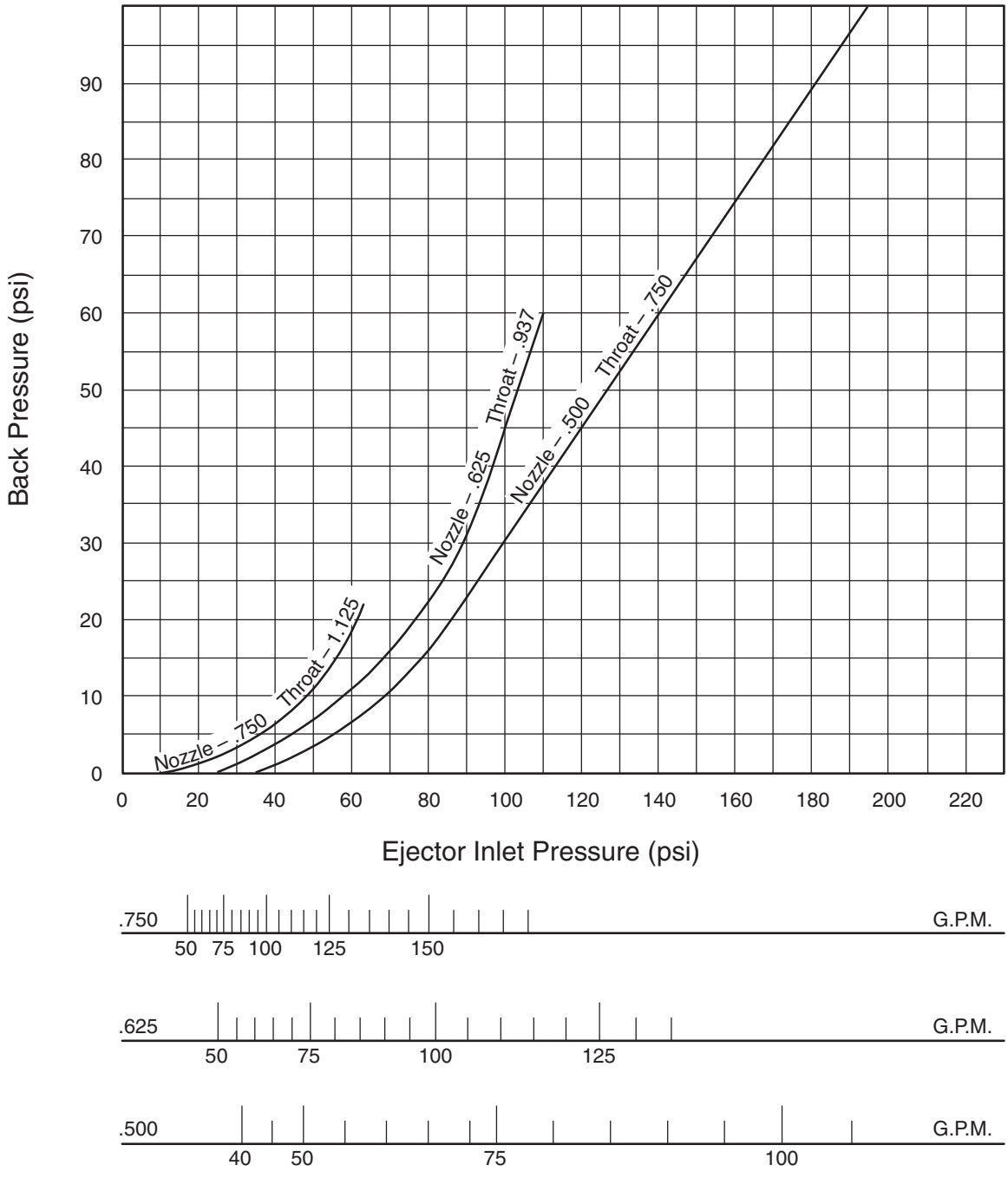
NOZZLE SIZING CHART
for 10 GPM (600 GPH)



Note: Pressure combinations that plot below the line for any given nozzle are acceptable for operating that nozzle at the stated chemical feed rate for that chart. Pressure combinations that fall above the line for any given nozzle are not acceptable.