



# Model VR4 Vacuum Regulator

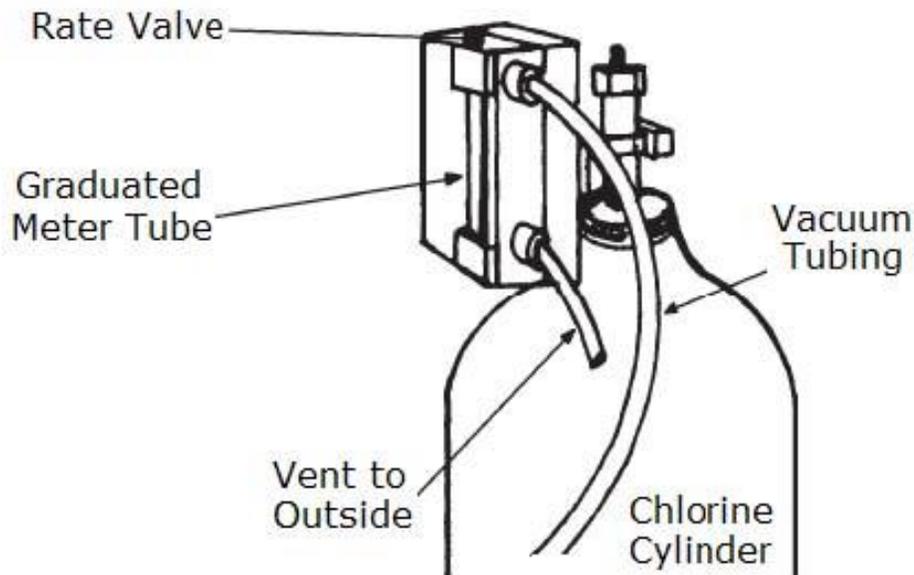
## Installation, Operation & Maintenance

**General:** The Archer Instruments Model VR4 vacuum regulator is designed for use in vacuum gas feed systems. The VR4 incorporates an integral graduated meter tube, which provides a local indication of gas flow rate. The VR4 can be provided with or without an integral rate control valve. \*Note: For systems using an automatic switchover module, the VR4 vacuum regulator should be plugged (rate valve removed) as the integral rate valve can cause improper switchover operation.

### **Safety:**

When working with chlorine, always use caution and follow applicable safety procedures. General safety considerations:

- \* Store chlorine separately from ammonia.
- \* When using chlorine, avoid locations that expose the cylinder and equipment to direct sunlight.
- \* Do not apply heater or heat source directly to chlorine cylinders.
- \* 150lb (upright) cylinders: Always keep cylinders upright and ensure the steel valve cap is in place when moving cylinders. Once cylinder is in place, a safety chain should be used to secure the cylinder.
- \* Ton Containers: Use appropriate handling equipment when moving ton containers. When readying ton container for use, ensure valves are aligned vertically. The top valve accesses gaseous chlorine and the bottom valve accesses liquid chlorine. The bottom valve should never be touched unless your system employs a chlorine heat exchanger (evaporator) designed expressly for use with liquid chlorine. When drawing gas from ton containers an appropriate ton container adapter & drip leg must be used (also available from Archer Instruments).



## Installing the Model VR4:

- 1) Carefully inspect the cylinder valve outlet surfaces and vacuum regulator inlet capsule surfaces for damage or debris prior to installation.
- 2) Note that the inlet port on the VR4 regulator ships with a filter cartridge installed. Do not remove this filter, as doing so will bring on maintenance requirements.
- 3) Always use a new lead gasket when connecting the vacuum regulator to a chlorine cylinder valve.
- 4) Holding the VR4 vacuum regulator upright, settle it over the cylinder valve and fit the inlet capsule into the cylinder valve outlet port.
- 5) Using a 3/8" wrench, tighten the yoke assembly "half-dog" set screw so that the lead gasket is crushed between the valve and the inlet capsule.
- 6) Connect the vent and vacuum tubing to the VR4 regulator (these are labeled). See figure below:

**NOTE:** Vent tubing should always be connected and run to a safe location (outside of any building). A vent bug cap (provided with every Archer Instruments vacuum regulator) should be fitted over the end of vent tubing to prevent insects from entering the equipment.

## **Operating the Model VR4:**

- 1) Prior to placing the VR4 vacuum regulator into operation, it is important to carefully test the lead gasket seal. A small squeeze bottle (provided with every Archer Instruments vacuum regulator) should be partially filled with ammonia. Squeezing the bottle allows the ammonia fumes to be used to test for chlorine leaks. A leak is detected by a visible light gray / white gas cloud when the two fumes interact. To test for leaks, open the cylinder valve ¼ turn and then close immediately. This pressurizes the lead gasket seal but ensures the full cylinder of chlorine is isolated during leak testing. Use ammonia fumes around the cylinder valve and lead gasket to check for any signs of leaking gas. If a leak is found, this must be addressed before placing the unit into operation.
- 2) After confirming no leaks exist, open the chlorine cylinder valve 1/3 of a turn. This is fully open and there is no need to open the valve further.
- 3) If the Model VR4 is not equipped with a rate valve (if this is plugged), no further action is needed.
- 4) If the VR4 is equipped with a rate valve, adjust the rate valve knob until the desired feed rate is indicated on the graduated meter tube.

## **Maintaining the VR4:**

Recommended Maintenance Frequency: Archer Instruments recommends yearly routine maintenance of the VR4 vacuum regulator.

-Refer to the following parts diagram when performing maintenance on the VR4.

- 1) To disassemble the VR4, remove the two BTA-129 yoke screws and pull the yoke & inlet assembly out of the back of the vacuum regulator.
- 2) Remove the BTA-130 body screws and separate the VR4 front and back bodies. The diaphragm assembly can then be removed. Take care to not lose the vent spring, which is located between the diaphragm assembly and the front body.
- 3) If the VR4 has a built-in rate valve, unscrew the rate valve & knob from the RVA-349 valve bonnet until it can be gently pulled straight up and out.
- 4) Remove the RVA-349 rate valve bonnet (or the PLA-430 bonnet plug if the VR4 is plugged) by unscrewing it from the top meter block using a pair of pliers. Note: The RVA-349 contains two OA-VIT-008 o-rings, which should be removed and replaced.
- 5) Next remove the glass meter tube by pushing the tube up against the sleeve until enough space allows the tube to be removed.
- 6) Once the glass meter tube is out, remove the rate valve sleeve by pushing it down (from above) and out.

- 7) The RVA-351 rate valve sleeve (Teflon sleeve used on units 25 PPD & below only) may or may not need to be replaced. If the rate valve stem fits loosely into the seat, replace the sleeve. If it feels snug the seat can be reused.
- 8) Remove the seal cover assembly from the front body by unscrewing the three seal cover screws (BTA-157).
- 9) To disassemble the seal cover assembly, unscrew the (VRA-153) guide pin from the spring retainer (VRA-352).
- 10) Inspect the sealing diaphragm (DIA-102) for wear or tears. Replace if needed.
- 11) The diaphragm back plate VRA-328 and diaphragm front plate (VRA-325) are threaded together and can often be unscrewed by hand. If they will not unscrew by hand, it may be necessary to use a vice and / or channel locks.
- 12) Whenever routine maintenance is being performed, all parts should be thoroughly cleaned. It is recommended that all o-rings (with the exception of the OA-VIT-325) be replaced.
- 13) When reassembling, new o-rings should be given a thin film of the Fluorolube grease.

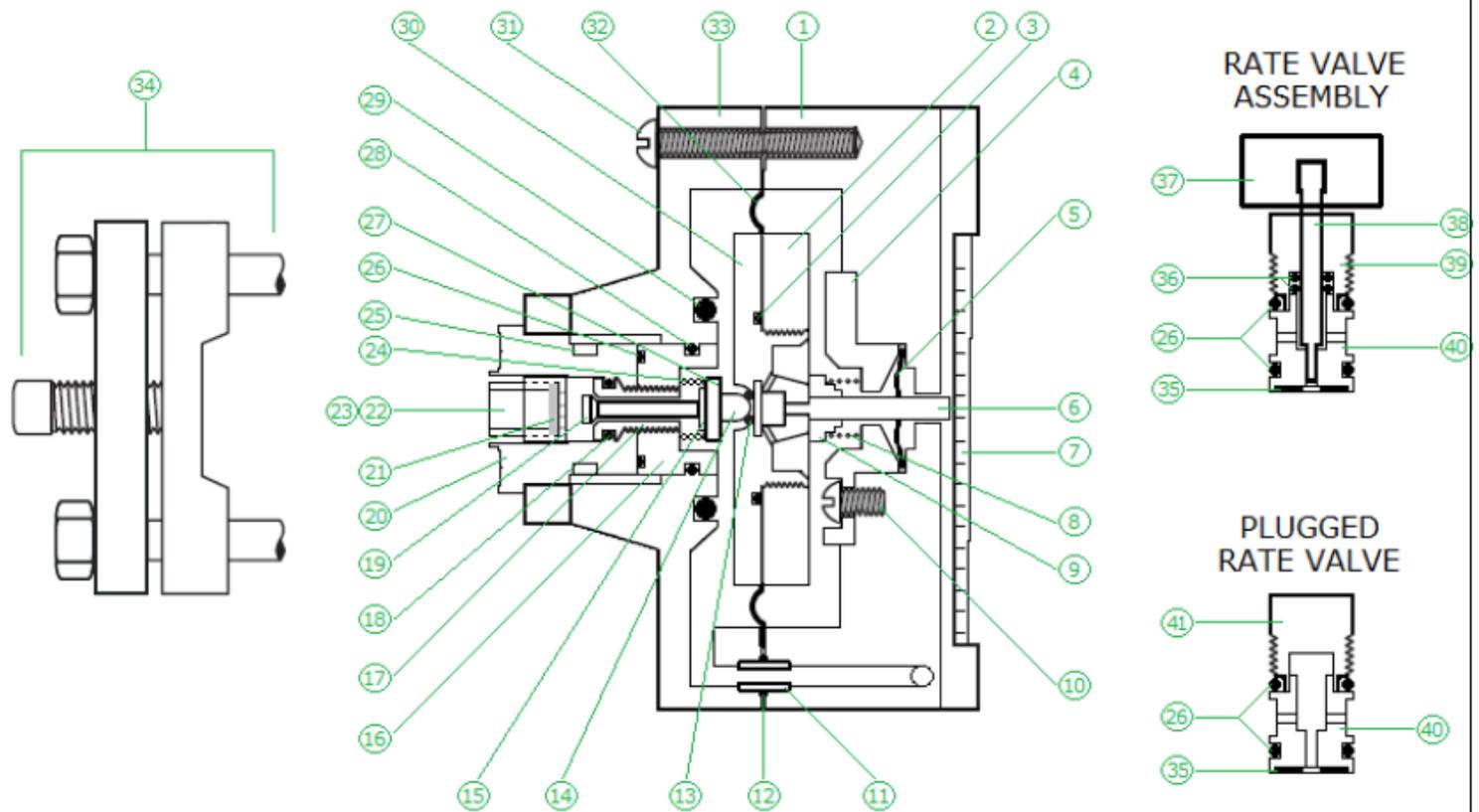
**NEXT:** The inlet assembly is a critical component of the VR4. Improper handling or reassembly can result in dangerous leakage of chlorine gas.

**Archer Instruments recommends that only trained personnel or those familiar with vacuum regulator maintenance service the inlet assembly.**

To service the inlet assembly:

- 1) Remove the inlet assembly from the yoke plate by sliding the VRA-142 retainer clip off of the inlet capsule.
- 2) Remove the inlet filter from the inlet capsule. The inlet filter cartridge (FCA-1 & FCA-2) can be removed using any ¼-20 threaded bolt or screw. The VR4 body screws and yoke screws are ¼-20 thread. Unscrew the FCA-2 from the FCA-1 and replace the filter.
- 3) The inlet assembly can now be disassembled by using a small flathead screwdriver to unscrew the inlet valve (VRA-112) from the vent plug (VRA-111). Be careful when disassembling as the inlet assembly is under spring tension and small parts could be lost.
- 4) Once the inlet valve, vent plug, spring, spring holder and spring retainer are removed, the seal plug (VRA-182) and inlet capsule (VRA-141) can be unscrewed.
- 5) The inlet valve seat (VRA-110) can be removed by pressing it up and through the inlet capsule. The inlet valve seat is a maintenance part and once removed should never be reused.
- 6) Carefully clean the inlet capsule, seal plug, inlet valve stem, vent plug, spring holder, spring retainer and spring. NOTE: The VRA-112 inlet valve stem must be cleaned using a non-abrasive cloth (or Scotch-Brite pad).
- 7) Using a new inlet valve seat and new o-rings (with a thin film of the grease provided on each o-ring), reassemble the inlet assembly in reverse order.

*-Should you have any questions during maintenance of your VR4 vacuum regulator, please contact your local service provider or Archer Instruments for support.*

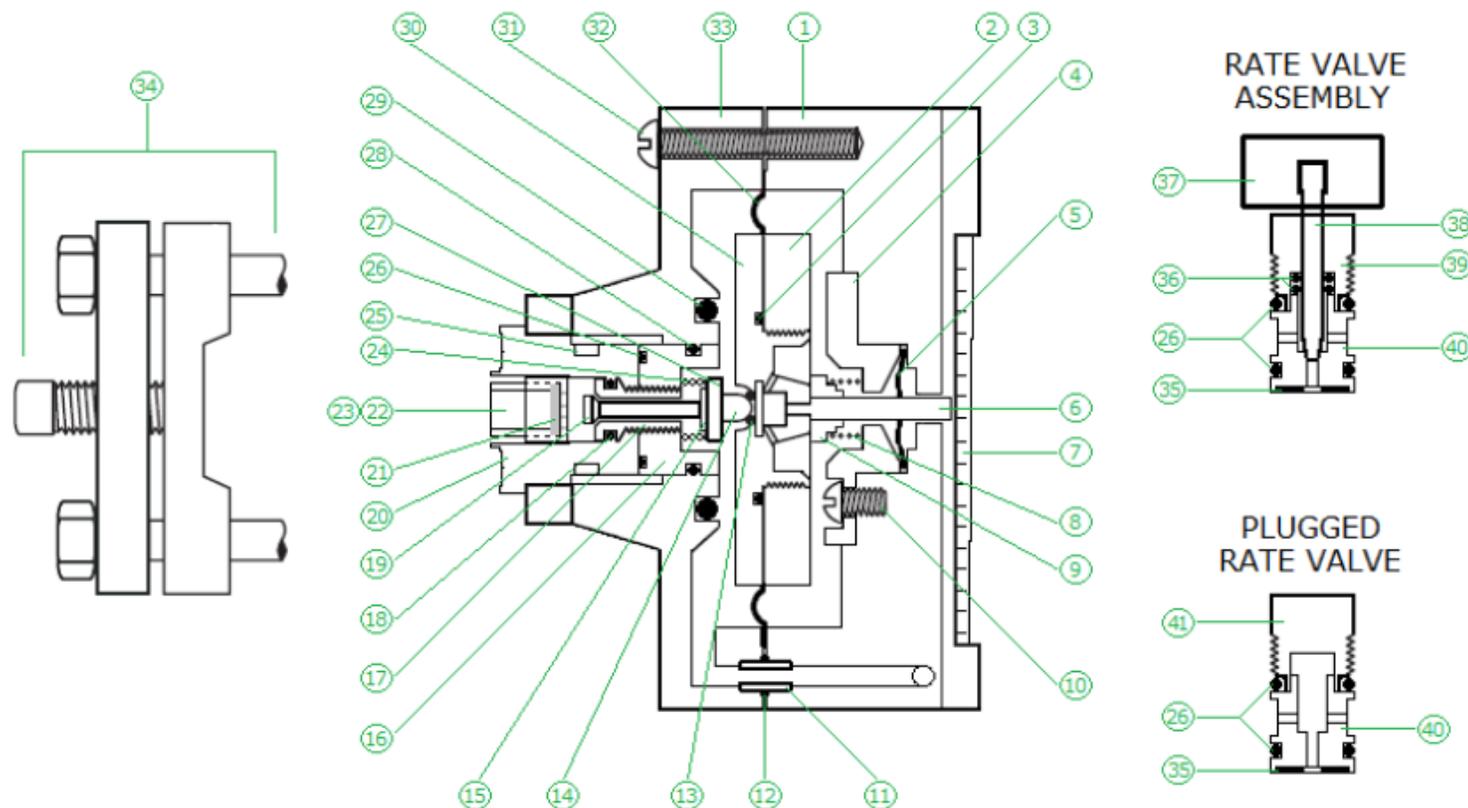


Item#	Qty.	Part #	Description	Item#	Qty.	Part #	Description
1	1	VRA-822	Front Body	22	1	FCA-1	Filter Cartridge Base *with one OA-VIT-011
2	1	VRA-325	Diaphragm Front Plate	23	1	FCA-2	Filter Cartridge Body
3	1	OA-VIT-126	O-Ring	24	1	SPA-104	Inlet Spring
4	1	VRA-351	Seal Cover	25	1	VRA-142	Retainer Clip
5	1	DIA-102	Sealing Diaphragm	26	3	OA-VIT-112	O-Ring
6	1	VRA-153	Guide Pin	27	1	VRA-183	Spring Retainer
7	1	MTA-108-XXX	Meter Tube (with ball & stops) 004 / 010 / 025 = PPD	28	1	OA-VIT-212	O-Ring
8	1	SPA-100	Vent Spring	29	1	OA-VIT-325	O-Ring
9	1	VRA-352	Spring Retainer	30	1	VRA-328	Diaphragm Back Plate
10	3	BTA-157	Seal Cover Screw	31	6	BTA-130	¼-20 x 1-1/4" Screw (Body Screw)
11	1	VRA-162	Flow Tube	32	2	DIA-108	VR4 Diaphragm
12	1	OA-VIT-012	O-Ring	33	1	VRA-198	Back Body
13	1	OA-VIT-009	O-Ring	34	1	VRA-365	Yoke Assembly
14	1	VRA-111	Vent Plug	35	2	MGA-X 1 / 2	Meter Gasket 10, 25 PPD
15	1	VRA-113	Inlet Spring Holder	36	2	OA-VIT-008	O-Ring
16	1	VRA-182	Seal Plug	37	1	RVA-402	Knob
17	1	VRA-110	Inlet Valve Seat	38	1	RVA-418	Rate Valve Stem
18	2	OA-VIT-011	O-Ring	39	1	RVA-349	Rate Valve Bonnet
19	1	VRA-112	Inlet Valve Stem	40	1	RVA-351	Rate Valve Sleeve (25 PPD & below)
20	1	VRA-141	Inlet Capsule	41	1	PLA-430	Bonnet Plug
21	1	VRA-5010	Filter Membrane	42	2	BTA-129	¼-20 x 2-1/4" Screw (Yoke Screw)

**Notes:** Vacuum & vent tubing are 3/8" (two TCA-64 tube connectors – not shown).



Date: Oct 2014  
Drawing #: VR4-025



Item#	Qty.	Part #	Description	Item#	Qty.	Part #	Description
1	1	VRA-822	Front Body	22	1	FCA-1	Filter Cartridge Base *with one OA-VIT-011
2	1	VRA-325	Diaphragm Front Plate	23	1	FCA-2	Filter Cartridge Body
3	1	OA-VIT-126	O-Ring	24	1	SPA-104	Inlet Spring
4	1	VRA-351	Seal Cover	25	1	VRA-142	Retainer Clip
5	1	DIA-102	Sealing Diaphragm	26	3	OA-VIT-112	O-Ring
6	1	VRA-153	Guide Pin	27	1	VRA-183	Spring Retainer
7	1	MTA-108-XXX	Meter Tube (with ball & stops) 050 / 100 = PPD	28	1	OA-VIT-212	O-Ring
8	1	SPA-100	Vent Spring	29	1	OA-VIT-325	O-Ring
9	1	VRA-352	Spring Retainer	30	1	VRA-328	Diaphragm Back Plate
10	3	BTA-157	Seal Cover Screw	31	6	BTA-130	¼-20 x 1-1/4" Screw (Body Screw)
11	1	VRA-162	Flow Tube	32	2	DIA-108	VR4 Diaphragm
12	1	OA-VIT-012	O-Ring	33	1	VRA-198	Back Body
13	1	OA-VIT-009	O-Ring	34	1	VRA-365	Yoke Assembly
14	1	VRA-111	Vent Plug	35	2	MGA-3	Meter Gasket (50 & 100 PPD)
15	1	VRA-113	Inlet Spring Holder	36	2	OA-VIT-008	O-Ring
16	1	VRA-182	Seal Plug	37	1	RVA-402	Knob
17	1	VRA-110	Inlet Valve Seat	38	1	RVA-665	Rate Valve Stem
18	2	OA-VIT-011	O-Ring	39	1	RVA-349	Rate Valve Bonnet
19	1	VRA-112	Inlet Valve Stem	40	1	RVA-350	Rate Valve Sleeve (50 & 100 PPD)
20	1	VRA-141	Inlet Capsule	41	1	PLA-430	Bonnet Plug
21	1	VRA-5010	Filter Membrane	42	2	BTA-129	¼-20 x 2-1/4" Screw (Yoke Screw)

**Notes:** Vacuum & vent tubing are 3/8" (two TCA-64 tube connectors – not shown).



Date: Oct 2014  
Drawing #: VR4-100