HINIKER

HINIKER ANHYDROUS AMMONIA VARIABLE ORIFICE DISTRIBUTOR (V.O.D.)

OPERATOR'S MANUAL

DO NOT USE OR OPERATE THIS EQUIPMENT UNTIL THIS MANUAL
HAS BEEN READ AND THOROUGHLY UNDERSTOOD

PART NUMBER 39300035 Rev. B

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39300035 Rev. B **8/15** **Manual/39300035RevB**

TO THE PURCHASER

Congratulations for joining the ranks of Agribusiness men whom acknowledge the importance of accurate Anhydrous Ammonia applications.

The purpose of this manual is to list safety precautions and minimize the hazards of handling Anhydrous Ammonia, to describe the physical characteristics of Anhydrous Ammonia, and to provide installation and operating instructions used in conjunction with following Hiniker system operating manual. When used with other manufactures control systems, make sure to follow their operator's manual instructions.

Model	Operator Manual
8160	39300030

This product is designed and manufactured to give years of dependable service when properly maintained and used for the purpose for which it is intended. Never allow anyone to operate this equipment until they fully understand the complete contents of this manual. It is the responsibility of owner's who do not operate this equipment, to insure the operator is properly instructed and is fully aware and understand the contents of the manual. It is also the owner's responsibility to insure that anyone operating this equipment is mentally and physically capable of so doing.

This manual covers the Variable Orifice Distributor (VOD) part number 36020000.

Important information is contained in this manual to help insure safe and efficient operations.

If you have any questions about this manual, or equipment discussed therein, contact your HINIKER dealer.

THIS IS THE SAFETY ALERT SYMBOL. IT ALERTS AN OPERATOR TO INFORMATION CONCERNING PERSONAL SAFETY. ALWAYS OBSERVE, AND HEED THESE INSTRUCTIONS, OTHERWISE DEATH, OR SERIOUS INJURY CAN RESULT.

ALWAYS OBTAIN ORIGINAL HINIKER SERVICE PARTS BECAUSE SUBSTITUTE PARTS COULD ADVERSELY AFFECT EQUIPMENT PERFORMANCE AND WARRANTY.

Record the following information for later reference when obtaining service parts:

Purchase Date:_____

Purchaser's Name:_____

Dealer's Name:_____

VOD Serial #:_____

The 17 port VOD controls anhydrous flow by simultaneously varying the orifice opening at all 17 distribution ports, maintaining pressure all the way to the distribution point.

A typical NH3 rate control system uses a ball valve or butterfly valve to regulate flow prior to the point of distribution. The pressure drop created at the outlet of the pressure valve can allow anhydrous ammonia to flash into a vapor, creating an erratic mix of liquid and vapor. This varying mixture then flows to a manifold for distribution to each knife. By comparison, the Hiniker VOD system eliminates the pressure reducing ball or butterfly valve from the process. The result is near tank pressure with a liquid state maintained all the way to the point of distribution, allowing more consistent distribution and superior knife-to-knife accuracy, all without the need for a pressure pump.

The Hiniker VOD includes 17 outlet ports—unused ports can be blocked off for use with smaller applicators. It is pre-wired to connect to the Hiniker 8160 controller system. Interface cables are available to connect to Raven, GreenStar, Ag Leader and various other control systems.

SAFETY

THIS IS THE SAFETY ALERT SYMBOL. IT ALERTS AN OPERATOR TO INFORMATION CONCERNING PERSONAL SAFETY. ALWAYS OBSERVE, AND HEED, THESE SYMBOLS AND INSTRUCTIONS, OTHERWISE DEATH, OR SERIOUS INJURY CAN RESULT!

Operator safety is a principal concern in equipment design and distribution. However, many accidents occur because a few seconds of thought, and a more careful approach to handling, were ignored.

ACCIDENTS CAN BE AVOIDED BY KNOWING, AND FOLLOWING, THE PRECAUTIONS CITED IN THIS MANUAL.

Replace any decals that are not readable, or missing. Their ordering numbers and proper location are shown in the DECAL LOCATION section of this manual. Keep decals free of dirt, grease, etc.

Throughout this manual and on all safety related decals, a safety alert symbol, along with the signal word CAUTION, WARNING, or DANGER will be found. These are defined as follows:

CAUTION: A reminder for proper safety practices and directs attention to following them. Decals of this class are yellow and black.

WARNING: A reminder for proper safety practices and what can happen if they are ignored. This has a more serious consequence than CAUTION. Decals of this class are orange and black.

DANGER: Denotes a most serious safety hazard. It is a reminder for observing the stated precautions and what can happen if they are Ignored. Decals of this class are red and white.

CAUTION: For your own protection we very strongly recommend that you read, understand, and heed the following information.

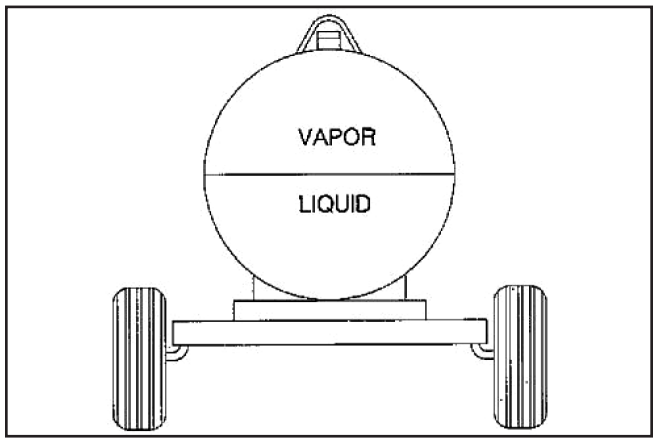
CHARACTERISTICS OF AMMONIA

Anhydrous ammonia is one of the most efficient and widely used sources of nitrogen for plant growth. The advantages of ammonia's relatively easy application and ready availability have resulted in a large increase in its use as a fertilizer on farms today.

There are also disadvantages involved in handling anhydrous ammonia. It must be stored and handled under high pressure, which requires specially designed and well-maintained equipment. In addition, to ensure operator safety, workers must be adequately trained and protected to handle this product as well as to follow strict work procedures.

What is Anhydrous Ammonia (NH3) and why is it so risky to handle? It is a chemical made up of one part nitrogen (N) and three parts hydrogen (H3). Since a nitrogen atom is 14 times heavier than a hydrogen atom, ammonia contains 82% nitrogen by weight.

The properties of this fertilizer make it one of the most potentially dangerous chemicals handled on the farm. Under atmospheric temperature and pressure it is a colorless gas with a sharp penetrating odor. For use as an agricultural fertilizer it is compressed into a liquid resembling water. In the liquid state, under pressure, it is stored in specially constructed tanks strong enough to withstand internal pressures of a minimum of 250 pounds per square inch (psi).



DWG. NO. 2737

Anhydrous ammonia is compressed into a clear colorless liquid resembling water when used for an agricultural fertilizer.

The pressure required to liquefy ammonia gas varies with temperature (boiling point). As the outside temperatures increase, the temperature of the liquid in the tank increases. This is due to a combination of expansion and boiling off of some of the liquid. For example, at 60 degrees F, the Anhydrous Ammonia will boil until the pressure in the tank reaches 93 psi, at which point it stops boiling and is said to be in equilibrium.

The density of liquid ammonia also varies as function of temperature. Some of the information is shown in the following table.

	PSI	Density (Pounds Nitrogen Per Gallon)
-28	0	4.69
0	15.7	4.55
32	47.6	4.39
40	58.6	4.35
50	74.5	4.29
60	92.9	4.25
70	114.1	4.18
80	138.3	4.13
90	165.9	4.07
100	197.2	4.00
130	315.6	3.82

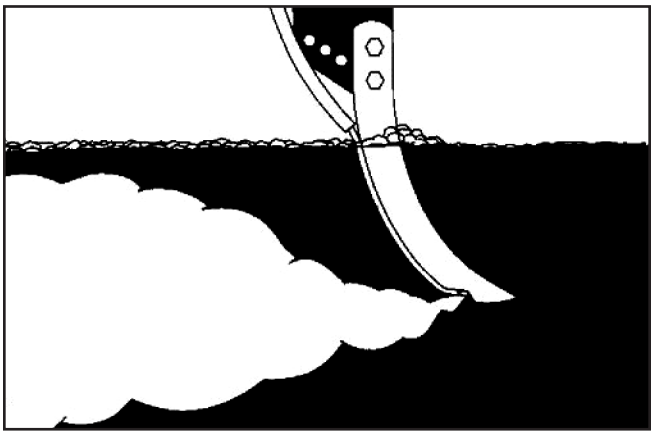
CORROSIVE ACTION OF AMMONIA

Common metals are normally not affected by dry anhydrous ammonia, but ammonia is normally shipped with some water content. Aqueous ammonia, while it will not corrode iron or steel, will react with metals such as copper, silver, zinc, and their alloys. Because of this, GALVANIZED, BRASS OR BRONZE FITTINGS SHOULD NOT BE USED TO HANDLE AMMONIA. Nitrogen stabilizers may have an affect on certain aluminum alloys.

When a hose is filled with ammonia, vapor will slowly migrate through the tube stock. Ammonia hose covers are somewhat porous to allow this vapor to escape and cause no damaging blisters. Older hoses may appear to be okay but could swell on the inside causing a flow restriction.

PHYSIOLOGICAL PROPERTIES

To protect yourself and other workers you must be aware of the destructive properties of anhydrous ammonia. Anhydrous means without water; consequently, when anhydrous ammonia comes in contact with moisture they rapidly combine. When it is injected into the soil the liquid ammonia expands into a gas and is rapidly absorbed in the soil moisture. Similarly, the liquid or gas making contact with the tissues of the body will cause dehydration and cell destruction because it combines with the moisture of the body.



Anhydrous ammonia expands into a gas as it is injected into the soil and is absorbed into the soil moisture.

Anhydrous ammonia boils at minus 28 F. It must be kept under pressure to be stored as a liquid above this temperature. At this subzero temperature, liquid ammonia striking the skin can freeze exposed tissues instantly.

Anhydrous Ammonia is caustic and can cause severe chemical burns. Body tissues containing a lot of moisture, such as the eyes, skin and respiratory tract, are very susceptible to burns. Victims exposed to even small amounts of ammonia require immediate treatment to avoid injury.

Competent medical assistance must be obtained for any person who has been burned or overcome by ammonia.

First aid for ammonia victims consists of fresh air and plenty of water for affected areas. Contact your physician for detailed medical instructions.

The following table is an indication of the average person's response to ammonia vapor.

PHYSIOLOGICAL RESPONSE TO AMMONIA
Least perceptible odor ..... 5 ppm
Readily detectable odor.....20-50 ppm
No discomfort or impairment of health for prolonged exposure .....50-100 ppm
General discomfort and eye tearing; no lasting effect on short exposure .....150-200 ppm
Severe irritation of eyes, ear, nose, throat; no lasting effect on short exposure .....400-700 ppm
Coughing, bronchial spasms .....1,700 ppm
Dangerous, less than 1/2 hour exposure may be fatal .....2,000-3,000 ppm
Serious edema, strangulation, asphyxia, Rapidly fatal .....5,000-10,000 ppm
Immediately fatal .....10,000 ppm

NOTE: Concentrations are for ammonia in air by volume. Parts per million, 10,000 PPM = 1%. Exposure levels which are tolerated by average persons, may produce respiratory damage in others.

SUMMARY

Anhydrous ammonia is perhaps the most dangerous chemical handled on the farm.

Ammonia is not considered toxic, but large doses can cause strangulation by swelling the windpipe. Ammonia acts as its own warning agent by violent irritation of the nose and throat. However, it is a proven fact that Anhydrous Ammonia can be handled and used safely with the proper equipment, proper care, and precautions. Anyone handling and using ammonia is obligated to see that all phases of his operations are conducted in a safe manner.

BASIC RULES

Any person engaged in handling ammonia can help to avoid serious accidents by following a few basic rules:

1. Know the product, its characteristics and behavior.

2. Use only equipment suitable for Anhydrous Ammonia service, and make sure it is properly installed - never try to get by.

3. Make regular inspections, repair and maintenance of equipment.

4. Use and maintain standard protective equipment necessary for safe handling of Anhydrous Ammonia.

5. Obtain proper training in handling and in application of Anhydrous Ammonia.

6. If the Operator's Manual is missing from this equipment, obtain a replacement from your HINIKER dealer. If you sell this equipment, insure the new owner acknowledges receipt of this manual.

7. Read this manual thoroughly. Make sure the operator understands it and knows how to operate this equipment safely. Farm equipment can kill or injure an untrained or careless operator.

8. Do not attempt to handle and service this equipment, or direct others to do the same, unless you know how to do it safely.

9. Don't be in a hurry.

GENERAL

For the sake of safety, Anhydrous Ammonia should be stored and handled in accordance with state and local regulations. The following checklist will help insure safe operations when used at frequent intervals and corrective measures taken when necessary.

1. Where no state or local regulations exist, use only equipment that is constructed in accordance with The Fertilizer Institute Standards.

2. Make sure all ammonia is out of the system before disconnecting or disassembling any part. Frost on any component positively indicates trapped liquid ammonia that is vaporizing. Depressurize all hoses when not in use. Hoses should be exposed to system pressure only when transferring ammonia.

3. Always repair ammonia leaks immediately. Procedures are available for detecting leaks that are not readily evident.

4. Don't leave transfer hoses on the ground where they may be damaged or dirt can get into the fitting openings.

5. Don't rack or store hoses in such a way that they will kink.

6. Inspect hoses thoroughly before commencing a new season or when the hose has been subjected to abnormal abuse. The hose should be pressure tested by the user. Also check for breaks or softening in the cover, blistering, swelling, coupling slippage or damage to the hose reinforcement. These defects should be corrected or the hose should be retired from service.

7. Always pick up the hose by the valve body or coupling, never by the valve handwheel.

8. When necessary to vent ammonia from the hose, point the valve opening away from you in the downwind direction and slowly open the valve.

9. Never overfill a tank.

10. Always stay clear of the valve or hose openings, particularly safety relief valves.

11. Always use proper capacity safety relief and excess flow valves; do not tamper with them or other safety devices.

12. Never use wrenches in closing handwheel operated valves.

13. Always stand on the upwind side of ammonia transfer operations.

14. Always wear proper safety equipment when working with Anhydrous Ammonia.

15. Always make sure no person is in the line of discharge before opening any ammonia valve to the air.

16. Do not use ammonia equipment for storing and handling nitrogen or other liquid fertilizers. Most fertilizer solutions are corrosive to iron or steel.

17. Never leave ammonia transfer operations unattended.

18. All valves should be closed and hoses disconnected when transfer operations are suspended or unattended.

19. An automatic liquid relief (Hydrostatic) valve must be installed wherever there is a possibility of liquid anhydrous ammonia being trapped. This valve must open at a safe pressure and discharge into a safe direction.

AGRICULTURAL APPLICATION

The following contains general safety information related to anhydrous ammonia applicators. Procedures specified by the manufacturer should always be followed.

1. Test the safety disconnect coupling before each season and CAREFULLY exercise it several times during the season.

2. Maintain and store all ammonia delivery parts per manufacturer recommendations. Contact your supplier for specific instructions.

3. Use the following procedure to change nurse tanks:

   * Put on gloves and goggles

   * Have emergency water available

   * Close all valves

   * Carefully vent all ammonia trapped in the coupling area

Some applicators, such as heat exchanger equipped systems, can retain a considerable amount of NH_3. These systems should be supplied with a valve after the safety disconnect coupling. Closing this valve shortens the time required to exhaust NH_3 from the nurse tank coupling.

NOTE: Installation of the valve may necessitate the installation of a hydrostatic relief valve - see Item 19 under General Handling Safety.

* Disconnect the Acme coupling

* Inspect the replacement coupling before connecting

4. Use the following sequence to turn on the ammonia to your applicator:

   Put on gloves and goggles, and have emergency water available.

   * With all valves closed

   * Open the nurse tank valve

   * Allow the hose to fill

   * Close the nurse tank valve

   * Open all delivery valves (not the shutoff valve) beginning with the end of the nurse tank hose

   * If the delivery system is OK - open the nurse tank valve

   Always open or close valves slowly but completely.

5. Never open the outlet valve with the applicator out of the ground especially with a hydraulically operated shut-off valve. If the engine dies or hydraulics are lost for any reason, you may be unable to shut off the flow of ammonia or put the knives safely in the ground.

6. Always make sure your NH_3 equipment is properly equipped with an approved emergency water supply in good operating condition. First aid for ammonia requires plenty of water so always be sure the water tank is full of fresh clean water.

7. Ammonia vapor causes involuntary closing of the eyes. Carry a “squeeze” bottle of water on your person for emergency use in restoring vision.

For additional safety information of the storage and handling of anhydrous ammonia, write to:

The Fertilizer Institute
820 5th St. N.E.
Washington, D.C. 20002

or

Compressed Gas Association, Incorporated
4221 Walney Rd.
Chantilly, VA 20151

or

American National Standards Institute, Inc.
25 West 43 St.
New York, NY 10036

REMEMBER-ACCIDENT PREVENTION IS PART OF YOUR JOB!

DECAL LOCATION

It is the owner's and dealer's responsibility to insure clear, complete decals are maintained on equipment, whether operating or offered for sale.

Information herein is provided for proper decal ordering and placement.

Decal surfaces should be free of dirt, grease, etc. Temperatures should be above 50 F. To apply, remove the smaller part of the decal backing paper and apply this part of the exposed adhesive to the desired location. Peel the other part of the backing paper slowly off and smooth out the entire decal.

FIGURE 1

Figure 1, item 1, part number 39302182.

Figure 1, item 2, part number 393-002-013.

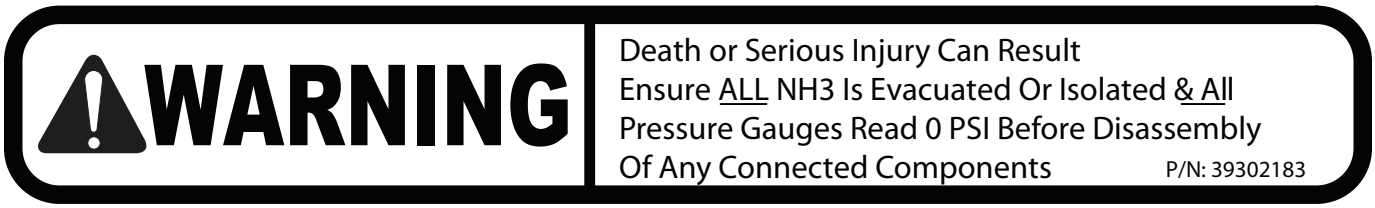


Figure 1, item 3, part number 39302183.

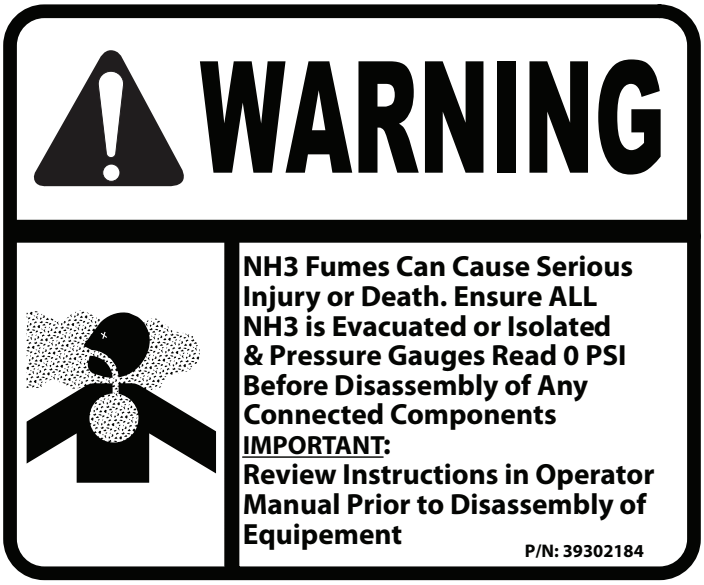


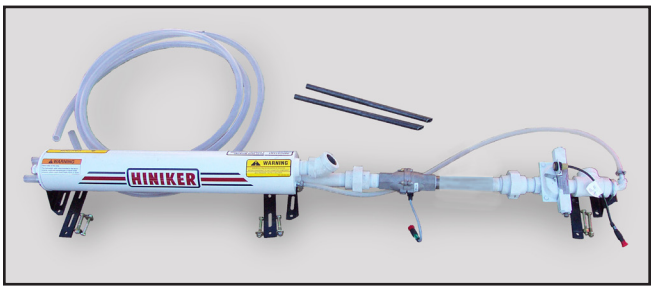
Figure 1, item 4, part number 39302184.

OPERATION

COMPONENT IDENTIFICATION

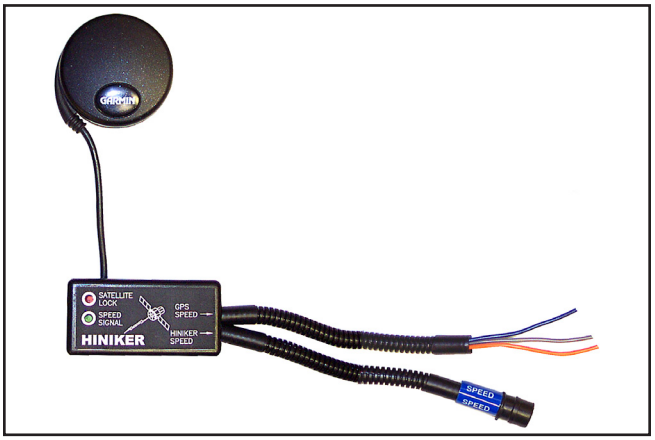
The Hiniker system consists of 5 primary components.

1. Variable Orifice Distributor (VOD)



2. Heat Exchanger
3. Flow-meter

4. Typical Console



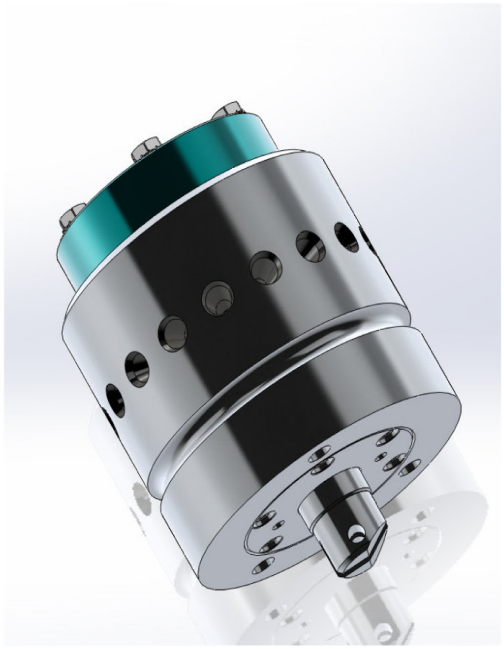
5. Speed Sensor (GPS1 Speed Sensor shown)

The basic Hiniker control system uses these 5 components to accurately control the application of NH3 under varying conditions

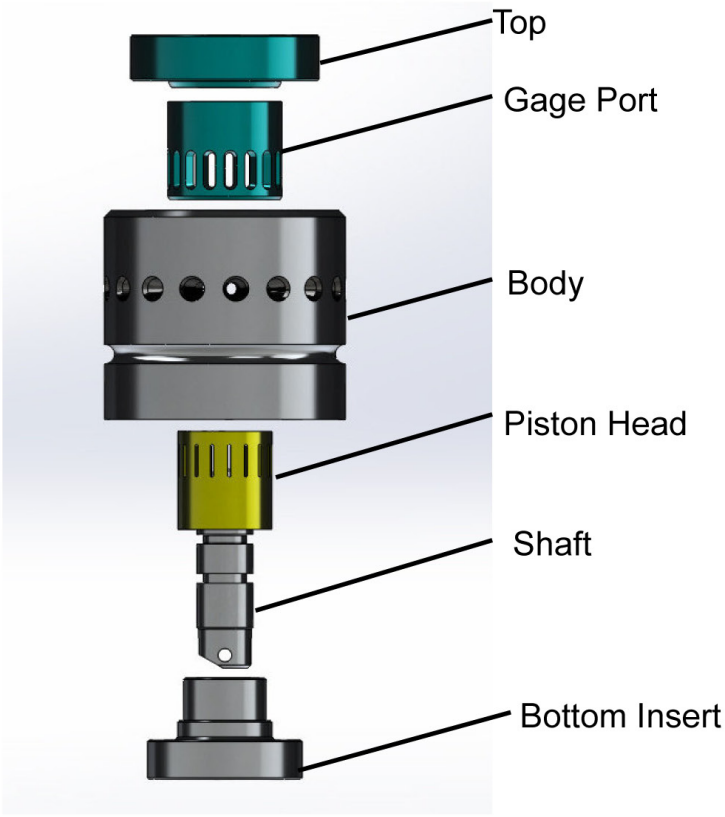
NH3 travels through the plumbing from the tank through the strainer to the input of the Heat Exchanger. The purpose of the Heat Exchanger is to convert the vapor within the NH3 to liquid so it can be measured accurately. From there it is then measured by the flow meter. Next, the liquefied anhydrous ammonia enters the Variable Orifice Distributor where its flow rate is adjusted by the Control Console. This adjusted flow rate is then uniformly distributed to each of the exit ports in the manifold. This precise flow rate is continuously being adjusted to ensure a constant application rate.

The console controls the system and acts as the operator interface. It receives information from the operator and system components and makes the necessary changes to keep a constant application rate.

VARIABLE ORIFICE DISTRIBUTOR
COMPONENT IDENTIFICATION



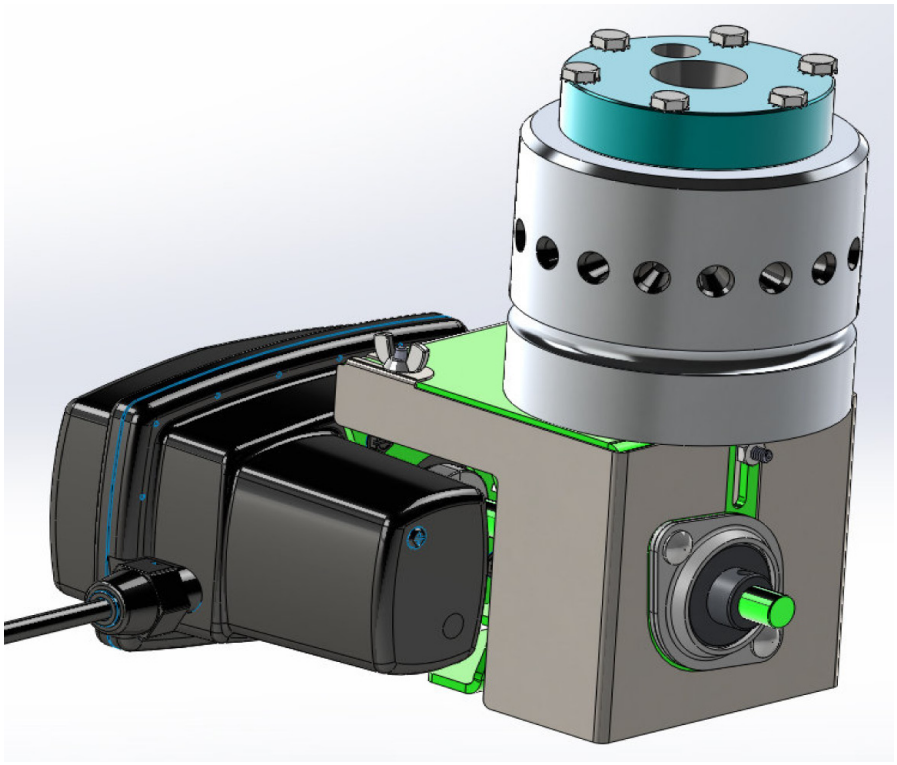
Variable Orifice Distributor Assembly



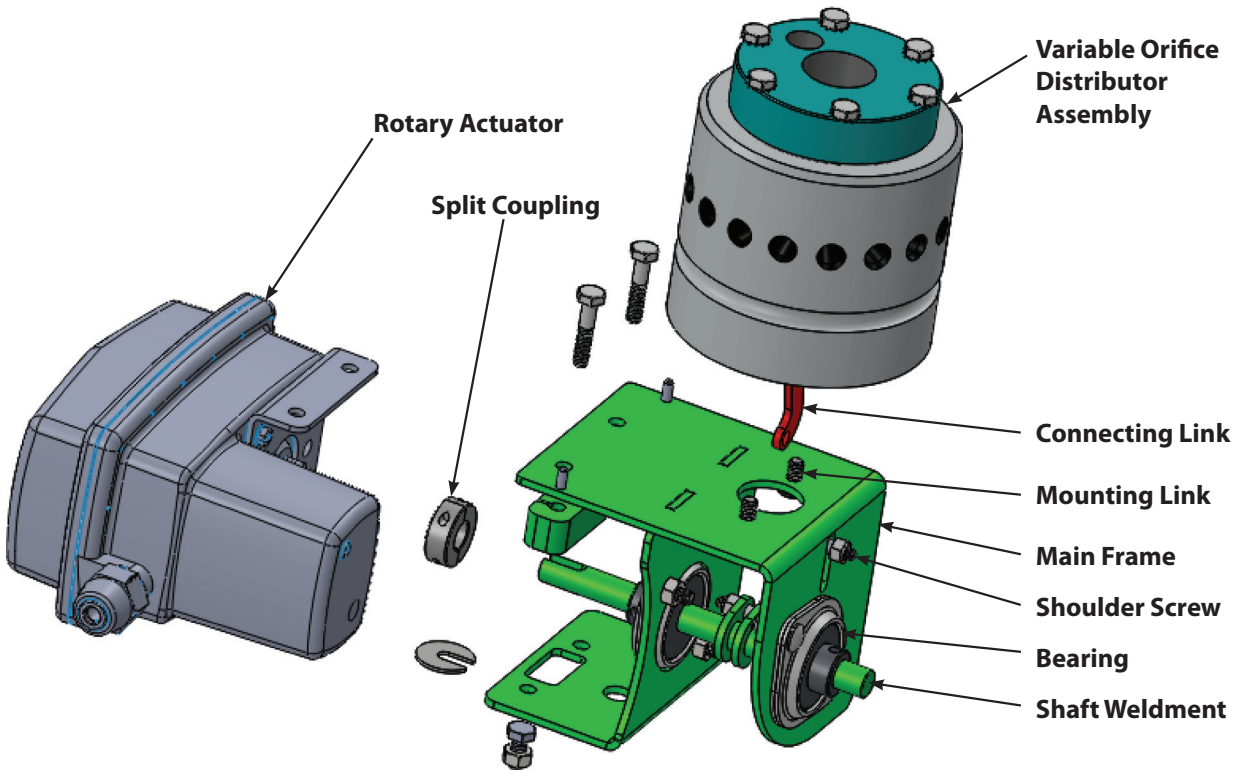
Variable Orifice Distributor Components
(exploded view)

Variable Orifice Distributor, (VOD)
(shown without Actuator)

Variable Orifice Distributor (Shown With Actuator)



Variable Orifice Distributor System Components



SYSTEM CONSIDERATIONS

Anhydrous Ammonia is liquid only when its temperature is less then –28 degrees F (at 1 atmosphere) or when it is compressed in a pressurized tank. The pressure required to keep the Anhydrous Ammonia liquid is dependent on the temperature of the Anhydrous Ammonia. The colder the Anhydrous Ammonia, the lower the required pressure is to keep it in a liquid state. As tank temperature drops the vapor condenses to a liquid and the pressure drops due to a drop in volume. As the temperature increases the liquid boils until the required pressure is reached to stop the boiling and keep the rest in a liquid state.

If you allow Anhydrous Ammonia to boil by reducing the pressure, the temperature of the remaining liquid will decrease. This is due to the energy transferred during boiling. This heat energy is carried away in the vapor.

The Hiniker Heat Exchanger uses this characteristic of Anhydrous Ammonia. A small amount of Anhydrous Ammonia is allowed to expand and is then used as a coolant. This coolant is used to reduce the temperature of the main flow to a point where its vapor becomes a liquid.

Tank suppliers usually pressurize the tank to a pressure higher than what is required to keep the Anhydrous Ammonia in a liquid state. This higher pressure is needed to obtain higher flow rates and keep it liquid as it flows through the system.

As the Anhydrous Ammonia flows from the tank the pressure drops in the tank. The liquid boils in the tank due to the reduced pressure until it once again stabilizes at the pressure required keeping it a liquid. The colder the Anhydrous Ammonia, the lower the required pressure is to keep it liquid.

The pressure on the liquid is also reduced as the NH3 flows through the system. This is due to pressure drops caused by hoses, fittings and connectors. As the NH3 flows to regions of lower pressure it boils violently. This creates a two-phase (part liquid and part vapor) material that is very hard to measure accurately on the fly. The vapor portion only contains about 1/200 of actual nitrogen by volume compared to liquid Anhydrous Ammonia. The flow meter cannot tell the difference between the liquid and the vapor. The console assumes all liquid is being measured. The presence of vapor results in less nitrogen being applied than expected. Tank weights will indicate an under application. Surges of vapor through the Flow meter will cause erratic readings and poor flow control.

The Heat Exchanger is used to rid the system of vapor until it can be accurately measured. The Heat Exchanger uses a small portion of Anhydrous Ammonia that has already been measured as a refrigerant. This refrigerant is allowed to expand inside the cooling chambers of the Heat Exchanger. The resulting cooling effect reduces the temperature of the Anhydrous Ammonia flowing through the Heat Exchanger. This causes any vapor to return to a liquid state. The Anhydrous Ammonia is then measured as it exits the Heat Exchanger. The refrigerant vapor is exhausted to two or more vapor tubes that have been welded behind two or more knives.

To obtain the desired application rates and have proper control it is necessary to take certain things into consideration.

1. Use 1 1/4 inch plumbing on the delivery system, including tank valves.

2. Keep the tank hose to a safe minimum length.

3. Use a new style higher capacity breakaway coupler.

4. Eliminate unnecessary plumbing, avoid 90 degree fittings when possible.

5. Select the right size strainer. Too fine will cause excessive pressure drop. Typically 20-30 mesh size is adequate.

6. Perform regular maintenance on the flow meter.

7. Check for outdated hoses. Hoses can collapse on the inside restricting flow.

8. If the application rate demands maximum output, consider pulling two tanks and use two Heat Exchangers

OPERATING CONSIDERATIONS

Refer to the operating manual of the controller you are using for proper calibration and operation for your particular control console.

The following are things to pay special attention to get the best result from your control system.

1. Each Flow meter has a Pulses Per Gallon and Pulses Per Pound calibration number. 8160 system users program the Pulses Per Pound number into the console for NH3 operation.

2. It is usually preferred to view the “Rate” (Pounds Per Acre) on the display. When vapor is present in the flow meter, the “Rate” (Pounds Per Acre) will fluctuate wildly and control will be very poor. This will stop when the system is working properly.

   IMPORTANT: The Hiniker consoles measure and display actual pounds of nitrogen not total pounds of NH3. To compare the VOLUME reading of the console to the total weight of the material in your tank you must multiply the tank weight by .82. This gives you pounds of actual nitrogen in the tank.

3. Special procedures are necessary to obtain an accurate indication of total pounds of nitrogen being applied, because of the inability of the heat exchanger to remove all the vapor for all conditions. During start up, there is a five to ten second delay before adequate cooling occurs. Also when the tank is nearly empty, more vapors are produced than the heat exchanger can handle. Since the flow meter measures both gas and liquid, it will count much more material than has actually been applied. This count affects the accuracy of the TOTAL POUNDS READING (VOLUME).

   Allow the heat exchanger to reach operating temperature before clearing the TOTAL POUNDS READING (VOLUME) to zero. The Console will accurately display VOLUME as long as the heat exchanger is kept cold enough for proper operation.

   When vapor is present in the flow meter, the RATE will fluctuate wildly. This will stop when the system is working properly. As noted previously, there will be vapor during start up and toward the end of a tank.

4. There are two main causes that affect the application rate. One of these is a change in applicator speed. Any variation in speed will cause a corresponding change in the application rate. The console will faithfully indicate the instantaneous application rate which means the display will vary with ground speed. The other cause of change is your applicator delivery system. It is important to have all the components of your delivery system sized to handle the expected delivery rate. Your system components will limit the maximum flow of NH3 at a given temperature and pressure. You may have to slow down during cold/low pressure situations.

   The HINIKER anhydrous ammonia control is a tool to aid you, the operator, to achieve accurate applications. It is the ultimate responsibility of the operator to be aware and monitor how good of a job is being done. The operator should monitor the following.

TANK WEIGHT ACTUAL “N”= 82% OF MATERIAL WEIGHT.
PERCENT GAUGE READING ON TANK ACRE READING
TANK PRESSURE
MANIFOLD PRESSURE

WARNING: Your safety and the safety of those around you depend upon your using care and good judgement in the operation of this equipment. Know the positions and functions of all controls before attempting to operate.

SYSTEM OPERATION

CAUTION: For your own protection we very strongly recommend that you read, understand, and heed the information in the Safety section of the manual

Use the following procedures to change nurse tanks:

CAUTION: Put on gloves and goggles, have emergency water available.

CAUTION: Always work upwind. Carry hose only by the valve body or coupling, never by the valve handle.

* Close all valves.

* Carefully vent all ammonia trapped in the coupling area.

Some applicators, such as Heat exchanger equipped systems, can retain a considerable amount of NH3. These systems should be supplied with a valve after the safety disconnect coupling. Closing this valve shortens the time required to exhaust NH3 from the nurse tank coupling. NOTE: Installation of this valve may necessitate the installation of a hydrostatic relief valve-see Item 19 under General Safety.

* Disconnect the Acme coupling

* Inspect the replacement coupling before connecting.

CAUTION: Put on gloves and goggles, have emergency water available.

CAUTION: Always work upwind.

CAUTION: Carry hose by the valve body or coupling, but never by the valve handle.

* With all valves closed.

CAUTION: Check that all bleed valves are closed before opening valves for application.

Use the following sequence to turn on the ammonia to your applicator:

* Open the nurse tank valve.

* Allow the hose to fill.

* Close the nurse tank valve.

* Open all delivery valves (not the shutoff valve), beginning with the end of the nurse tank hose.

* If the delivery system is OK - open the nurse tank valve.

Always open or close valve slowly but completely.

WARNING: Never open the outlet valve with the applicator out of the ground especially with a hydraulically operated shut-off valve. If the engine dies or hydraulics are lost for any reason, you may be unable to shut off the flow of ammonia or put the knives safely in the ground.

Program the control console using the Calibration Section of the systems operator manual.

NOTE: Make sure you program pounds of actual nitrogen.

Start with the console rate switch in the manual position. When in manual 8160 system users use the ⇧ ⇩ keys to open or close the Variable Orifice Distributor. Once the speed and flow have stabilized, switch to Rate 1 or Rate 2 for automatic operation.

The console must be switched to Hold when the anhydrous is turned off.

DANGER: Do not use the remote run hold switch when wired to an electric shutoff valve for anhydrous ammonia applications. Unintentional activation of the remote switch could cause a discharge of ammonia.

IMPORTANT: Do not run the tanks completely empty. The pounds per acre reading will begin to fluctuate when the liquid level in the tank has dropped below the withdrawal tube. Failure to change tanks at this point could result in inaccurate readings and applications, damage to the flow meter, and plugging of screens couplers and valves.

INSTALLATION

CAUTION: Personnel installing or modifying anhydrous ammonia equipment must practice all the proper procedure.

CAUTION: Inspect all parts for safe operating condition before using. Install hoses carefully using proper routing techniques. (No kinks, rubbing, or stretching.)

This manual describes only the installation of anhydrous ammonia components. Please reference the systems manual for console, speed sensor, and optional equipment installation.

PLUMBING REQUIREMENTS

All plumbing (hose, piping, tubing, fittings, and valves) must have adequate pressure rating and be chemically compatible with anhydrous ammonia and any expected additives.

Threaded pipe and fittings must be schedule 80, black (not galvanized) meeting ASTM A53 specifications. Cast fittings shall be a non-brittle material suitable for low temperature, high pressure, high vibration operation. Brass, bronze, or other copper bearing metals must not be in contact with anhydrous ammonia or used as part of any sealing device e.g. hose collars. Plumbing shall be adequately supported and protected from accidental damage. Allowance must be made for expansion, contraction, shock and vibration.

Hoses subject to tank pressure must meet the joint Rubber Manufacturers Association and The Fertilizer Institute* “Hose Specification For Anhydrous Ammonia”. Discharge hoses must be suitable for low temperature operation.

To achieve maximum flow capability 1 1/4 inch hose, fittings, couplers, and valves should be used on the input side of the heat exchanger.

Avoid using 90° pipe elbows as this restricts flow. A short piece of hose with a gradual curve is less restrictive.

We strongly recommend that an Isolation Valve be installed after the safety disconnect coupling. This valve is closed while changing nurse tanks to reduce the NH3 bleeding time.

WARNING: If an isolation valve is not installed all NH3 must be removed from the heat exchanger before disconnecting any hoses.

CAUTION: If two valves are installed so as to trap liquid NH3 between them a hydrostatic relief valve must be installed to relieve pressure. The relief valve must vent to a safe area away from personnel.

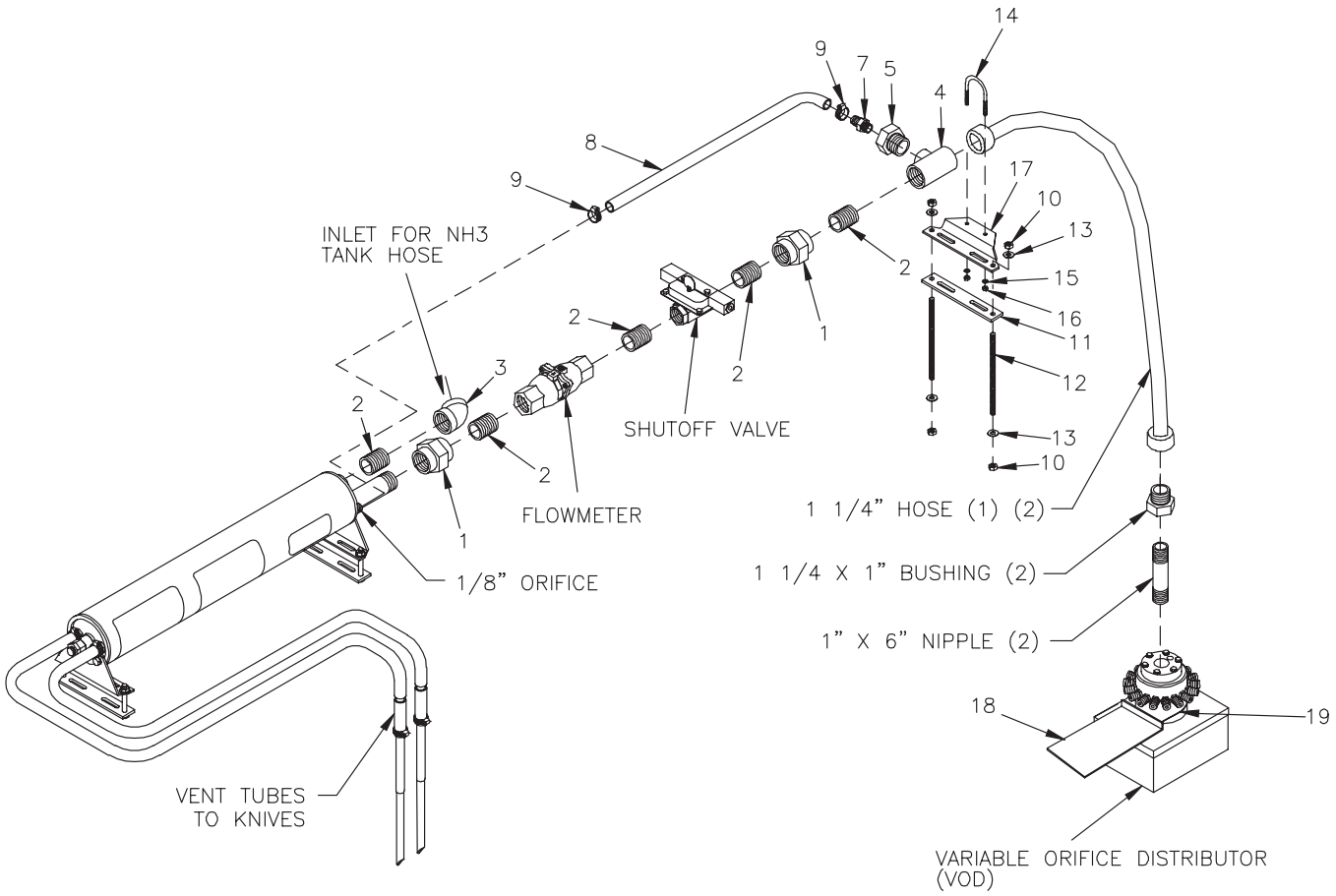
Install an adequately sized NH3 inlet hose between the safety disconnect coupling (after the isolation valve) and the heat exchanger inlet. See drawing 6847.

CAUTION: Be certain the safety connect coupling is free to operate properly.

The following are general recommendations for proper installation of the Anhydrous Ammonia System components.

The distribution manifold should be mounted level and slightly lower than the Heat Exchanger. This will assist in purging the system of NH3 quickly when needed. Ensure that all hose barbs are of equal inside diameter. All vapor hoses connecting to the knife injector tubes should be of equal length. All liquid NH3 supply hoses connecting to the knife injector tubes should be of equal length. Excess hose should be wrapped in horizontal coils no smaller than 1-1/2 foot in diameter and laid flat on top of the applicator. Verify that all of the orifice openings are not obstructed and of the same diameter. Tubes/knives from different manufactures may have different size inside diameters is may cause uneven distribution.

NH3 CONVENIENCE PLUMBING PACKAGE



(1) CUT HOSE TO FIT; USE ONLY NH3 APPROVED HOSE
(2) THESE PART NOT SUPPLIED

DWG. NO. 6847

REF. NO.	PART NUMBER	DESCRIPTION	QTY.	REF. NO.	PART NUMBER	DESCRIPTION	QTY.
1	39216024	1 1/4 NPT Swivel Union 3000#	2	11	360-000-225	Mount Strap	1
2	394-002-121	Nipple 1 1/4 x 2 Schedule 80	5	12	360-000-226	Mount Stud	2
3	39216025	1 1/4 NPT 45° Elbow 3000#	1	13	952-002-003	Flat Washer 3/8 Wrt	4
4	39216026	1 1/4 NPT Tee 3000#	1	14	394-002-013	U-Bolt 1/4-20 x 2	1
5	39216027	1 1/4 NPT x 3/8 NPT Hex Bushing 3000#	1	15	952-001-001	Lock Washer 1/4 Med Split SAE	2
6	39216028	3/8 NPT 90° Street Elbow 3000#	1	16	951-001-003	Hex Nut 1/4-20	2
7	392-016-003	3/8-18 MNPT To 3/8 Hose Barb Ad	1	17	39515003	Support Bracket	1
8	39216053	3/8 ID EVA Tubing 4' High Pressure	4	18	36518014	Manifold Mounting Plate	1
9	958-025-002	Clamp-Hose 1/2 SS	2	19	39218000	U-Bolt 5/16-18 x 4 1/2 Center	1
10	951-002-003	Hex Flanged Whiz Lock Nut 3/8-16	4				

HEAT EXCHANGER

Refer to drawing 6847 and install the Heat Exchanger mount brackets to the Heat Exchanger using 3/8-16 x 3/4 hex head bolts and lock washers.

NOTE: USE TEFLON PIPE SEALANT TAPE ON ALL PIPE CONNECTIONS. CHECK ALL HOSES AND FITTINGS FOR SLAG OR CONTAMINATION PRIOR TO ASSEMBLY. SLAG AND PIPE SEALANT (TAPE) ARE A MAJOR CAUSE OF FLOWMETER PROBLEMS.

Install the 1 1/4 x 6 inch pipe into the outlet port (bottom hole) of the heat exchanger. Install the male half of a union fitting onto the 6 inch pipe. Install the female half of the union fitting onto the inlet of the flow meter using a 1 1/4 inch close nipple. Install the male half of a union fitting onto the outlet of the flow meter using a 1 1/4 inch close nipple. This will prevent the assembly from being reinstalled wrong if removed for maintenance. Install the female half of the union onto the customer supplied shutoff valve. See drawing 6847.

Install the 1 1/4 inch Tee to the outlet of the Shutoff valve.

Install the 1 1/4 NPT x 3/8 NPT hex bushing reducer and 3/8 hose barb into the Tee connected to the Shutoff valve. Connect the 3/8 high pressure tubing from the hose barb to the hose barb on the refrigerant input of the Heat Exchanger

Locate an appropriate area on your applicator to mount the Heat Exchanger/Plumbing assembly. Bolt the unit down using four mount straps, four mount studs, eight flat washers, and eight 3/8-16 nuts.

Locate the mounting bracket under the plumbing as shown in drawing 6847. Mount the plumbing to the bracket using the U-bolt and two 1/4 inch nuts and washers.

Secure the unit to the tool bar using the mount strap, two mount studs, four flat washers, and four 3/8-16 nuts.

REFRIGERANT LINES

The heat exchanger uses a small portion of the anhydrous ammonia as a refrigerant. The least complicated and the most efficient way to deliver the refrigerant to the heat exchanger is to route one high pressure 3/8 inch line from the main line of flow downstream of the shutoff valve to the heat exchanger refrigerant inlet (See Drawing 6847). This material has already been measured and will be exhausted into four or more knives.

An orifice installed into the refrigerant inlet limits the refrigerant flow. If you are installing the VOD on a unit which has a 2007 or later Hiniker Heat exchanger, a .156 orifice was installed in the refrigerant inlet at the factory. The .156 orifice must be replaced with a smaller orifice. Always start with the smallest orifice. (Reference DWG. No. 6301) Three orifice sizes are included with the VOD (.063,.093,and .125) Install the 1/16 (.063) inch orifice.

Other heat exchanger systems are not supported by this operator's manual. Generally speaking The VOD will increase the efficiency of a heat exchanger by maintaining a higher pressure on the refrigerant circuit as compared to a standard ball valve or butterfly valve control system. Therefore a small orifice is needed in the refrigerant inlet to minimize the amount of NH3 being exhausted out of the vapor tubes. Also slower speeds and lower rates can increase the amount of NH3 being exhausted from the vapor tubes causing a decrease in row to row distribution accuracy.

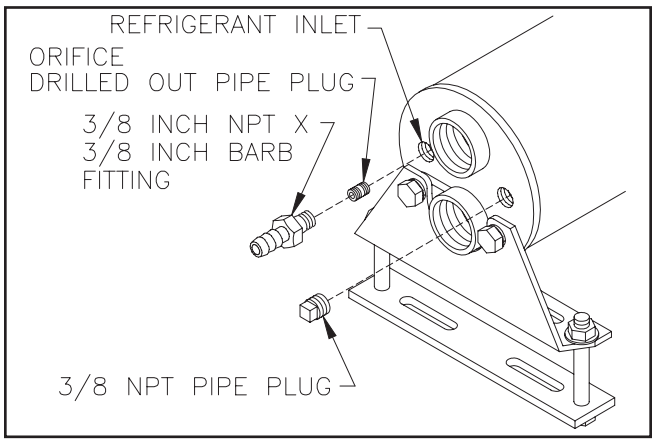
This information supersedes all other information previously or currently published by Hiniker including but not limited to the Heat exchanger operators manual.

Troubleshooting:

If the orifice is Too small for the application or plugged with debris The rate per acre reading on the monitor will fluctuate and the end result will be an under application.

NOTE: Many controllers have a display smoothing or rate smoothing feature if this is set too high you may not see the fluctuation. For example, Raven display smoothing on = 10%. Meaning the Raven SCS controller will not display a rate per acre other than the target rate unless the calculated rate deviates by more than 10%.

A custom orifice may be made by drilling a hole through a standard 1/8 inch pipe plug which threads into the refrigerant inlet prior to threading in the 3/8 hose barb fitting.



DWG. NO. 6301

Install the 3/8 inch MNPT x 3/8 inch hose barb fitting in the refrigerant inlet. See drawing 6301.

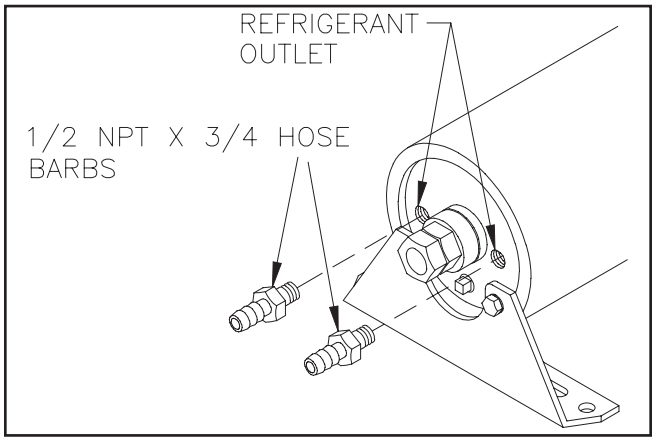
Route the 3/8 inch high pressure hose from downstream of the shutoff valve to the refrigerant inlet hose barb fitting.

NOTE: The refrigerant line MUST be installed AFTER the shutoff valve or refrigerant will continue to flow with the valve shut off.

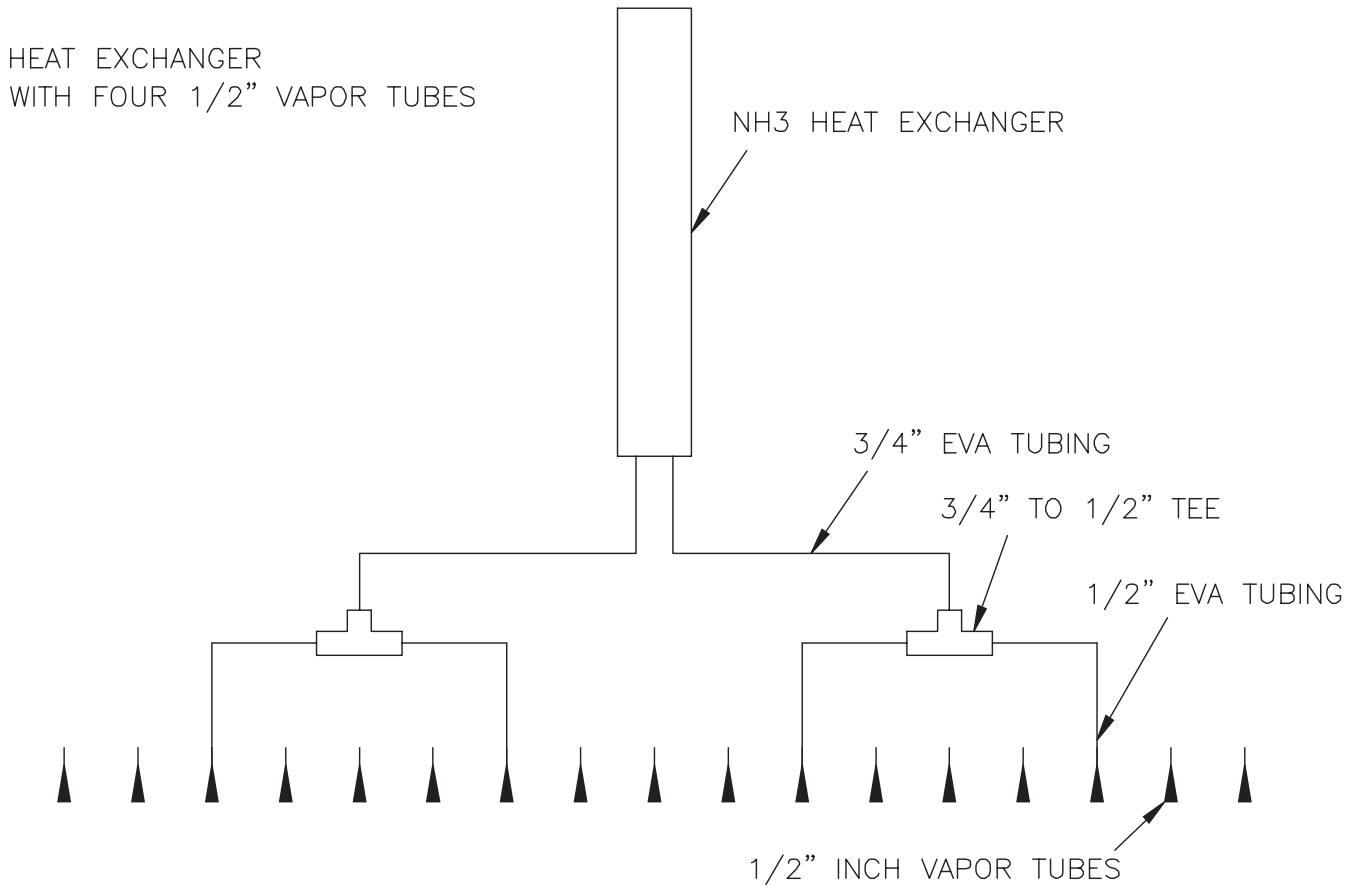
Install the 1/2 inch MNPT x 3/4 inch hose barb fittings to the refrigerant outlets on the Heat Exchanger. (See drawing 6302). Connect 3/4" hoses to the vapor outlet hose barbs on the Heat Exchanger and route as shown on drawing 6854.

NOTE: When exhausting the spent NH3 vapors from the Heat Exchanger, it is best to spread the vapors across as many knives as possible. This will result in a more uniform distribution of the vapors. A minimum of four vapor injection points are recommended. Refer to drawing 6854 for typical vapor plumbing schematics.

This drawing shows the recommended four injection point method. Hiniker offers a vapor distribution package that includes all the components needed for the four injection point method. This package is Hiniker package number 8181. The 8181 vapor distribution and pressure gauge package consist of all the components needed to plumb the vapor lines to four knives.



DWG. NO. 6302



TYPICAL 17 KNIFE APPLICATION WITH 4 VAPOR TUBES

DWG. NO. 6854

MOUNTING THE VARIABLE ORIFICE DISTRIBUTOR (VOD)

The distributor is designed to be mounted to the structural members of the tool bar. The distributor has an “L” shaped mounting bracket that is designed to fit a wide variety of tool bar shapes and sizes. Simply bolt the long side of the bracket to the tool bar frame using square shaped bolts (not included) and attach the distributor body to the bracket’s short side using the supplied U-bolt, (see figure 10.1)

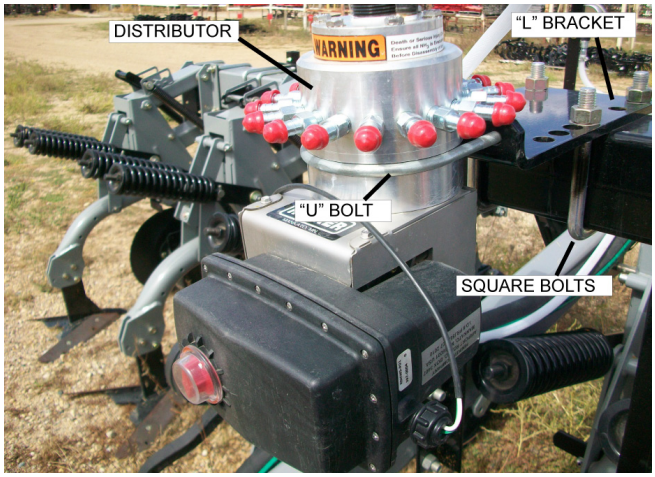


Figure 10.1

It is important to mount the distributor in a location on the tool bar that positions the distributor symmetrically relative to the knives that it will be supplying product.

The distributor should be located in the center of the tool bar.

The distributor should be mounted and plumbed as level to the ground as possible. Each distributor is equipped with 17 ports. For applications that require less than 17 ports, simply plug any unused ports. When plugging unused ports, make sure to do so in a symmetrical way. Always try to plug ports furthest away from one another. Never block off two adjacent ports. The symmetrical plugging of ports will help to ensure uniformed distribution across the remaining non-plugged ports. (See Figure 10.2)

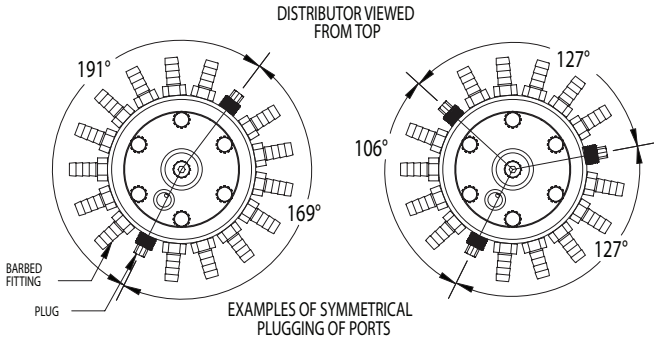


Figure 10.2

CONNECTING THE KNIFE HOSES

NOTE: Always use hose and/or tubing that is compatible and recommended for use with Anhydrous Ammonia. Also, make sure that the hose and tubing meet the systems operating pressure requirements.

It is very important to make sure the lengths of all hoses that are exiting the distributor and supplying product to the knives are of equal length. This is a must to ensure equal line pressure resistance is created by each of the hoses. Any excess hose should be coiled up and loosely “zip-tied”. Also, all hoses exiting the distributor should lay level to the ground prior to attaching them to the knives’ feed tubes. After all knife hoses are installed, use plastic “zip-ties” to loosely fasten the hoses to the top of the tool bar frame. **Note:** make sure not to tighten the “zip ties” too tight, since this may collapse the hoses and restrict flow of product to the knives.

CONNECTING THE DISTRIBUTOR'S IN-FEED HOSE

The distributor's top is designed with a 1" NPT female threaded inlet. A 1" rigid pipe nipple (not supplied) should be used to feed the distributor. The length of the 1" nipple should be at least 6 inches long. This feed nipple length is necessary to reduce the possibility of turbulent flow entering the inlet of the distributor. **NOTE:** A longer 1" nipple may be used as well.

It is recommended to use a 1-1/4" diameter flexible feed hose on the upstream side of the nipple. This 1-1/4" hose will supply the cooled liquid anhydrous ammonia from the heat exchanger discharge into the distributor. A flexible hose at this location in the system will help in facilitating dis-assembly of the distributor when performing routine maintenance on the system. The 1-1/4" feed hose should be cut to a length that fits the application. Also, a "T" should be installed in the "Main Supply Line" and a high pressure "Refrigerate Line" should be plumbed back to the "Refrigerate Inlet" on the "Heat Exchanger" (see figure 10.3)

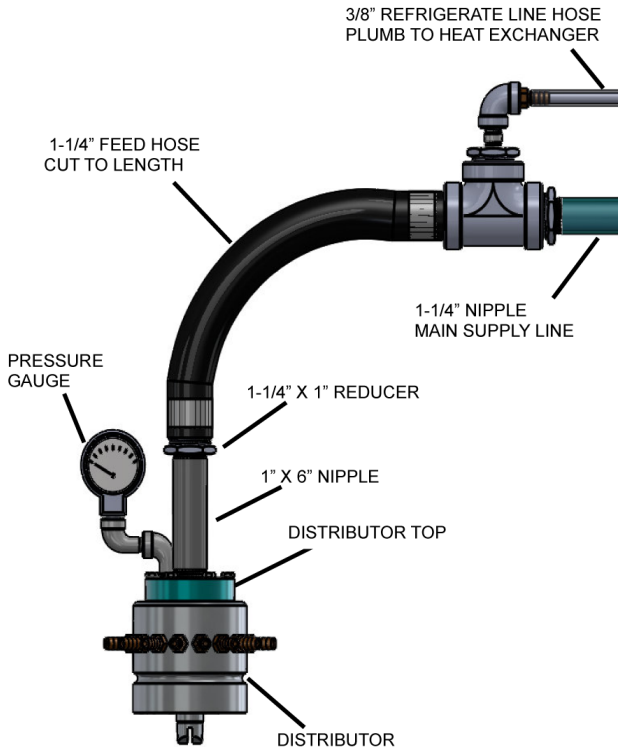


Figure 10.3

NOTE: A 30 mesh inline basket or "Y" strainer should be installed downstream from the nurse tank safety disconnect valve and prior to feeding the Hiniker Anhydrous Ammonia System.

This will help in minimizing the chance of fouling the system with contaminates. Rust and other foreign particles in the product flow can foul the distributor's metering slits which could cause non-uniform distribution of product to the knives.

CONNECTING THE ELECTRICAL CONTROL CABLE

Now that the distributor has been mounted to the tool bar and plumbed, it is time to connect the electrical cables that power the distributor. A 12 volt rotary actuator is utilized to control the amount of product flowing out of the distributor. This is accomplished by moving the "Piston Head" up and down within the "Gage Port". This up and down motion in turn opens and closes the metering orifices that feed each of the discharge ports.

When the "Piston Head" is pushed all the way up or into the "Manifold Body" the flow rate is minimized. Likewise, when the "Piston Head" is pulled all the way down or out of the "Manifold Body" the flow rate is maximized.

NOTE: the Variable Orifice Distributor (VOD) is NOT intended to be used as a system "SHUT-OFF" valve. The primary design intent of the VOD distributor is to deliver a uniform and metered flow of product to each of the exiting ports on the distribution manifold.

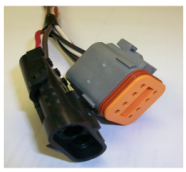
The rotary actuator has a 3 pin connector plug on the end of the control wires. When installing this distributor in conjunction with a Hiniker control system, simply plug the VOD control wires into the servo connector on the Hiniker control system.

If the VOD distributor is connected to a controller other than a Hiniker control system, an electrical adapter cable will need to be installed between the controller and the 3 pin connector plug on the rotary actuator.

Below is a list of the available electrical adapters and their part numbers for various controllers other than Hiniker:

2 pin flat *Raven* adapter
Hiniker adapter P/N: 38815030

4 pin Conxall *Raven* adapter
Hiniker adapter P/N: 38815032



AG Leader adapter
Hiniker adapter P/N: 38815027
(see below NOTE)

JD GreenStar adapter
Hiniker adapter P/N: 38809036
(see below NOTE)

NOTE: If installing the Hiniker VOD distributor on to an existing AG Leader or a JD GreenStar control system, the following program modifications will be required:

For a AG Leader system; make the following modifications:

AG Leader valve cal starting point
set as fast valve
valve 1 = 40% allowable error = 2%
valve 2 = 10% response threshold =20

For a JD GreenStar system; make the following modifications:

JD rate control flex box
set as fast valve
start at 333
turn rate smoothing ON

1. For all applications; if the valve overshoots too much make sure the Output “Dead-band”(Y) is 1,2, or 3 (start with 3) then reduce the Gain (X).
2. For all applications; if the valve is sluggish, increase the Gain (X) (533). If still sluggish reduce the Gain and increase the Output “Deadband”(Y) (343).

   The below table is to be used as a reference only, actual values may vary depending on the application. It is best to start with a “Calibration Number” of 433.

Condition	Step 1	Step 2	Step 3
Overshot	333	233	133
Sluggish	533	433	343

For a Raven system NO programing modifications are necessary.

NOTE: When reviewing the Hiniker 8160 Console “Operator Manual”; the word “SERVO VAVLE” is synonymous to the word “VARIABLE ORFICE DISTRIBUTOR” (VOD) throughout the manual.

MAINTENANCE

MAINTENANCE (ASSEMBLY INSTRUCTIONS)

As with any piece of equipment, it is always important to maintain the equipment in its best working condition, The Variable Orifice Distributor (VOD) is design to easily come apart for maintenance and cleaning.

IMPORTANT: Prior to performing any maintenance activities on the distributor it is important that the person performing the work thoroughly understand the safety aspects of working with anhydrous ammonia systems.

WARNING: Prior to performing maintenance on the distributor, the system must be COMPLETELY vented to ensure that ALL anhydrous ammonia has been purged from the system. Also, the system pressure gauges MUST indicate that system pressure is at 0 psi. Failure to do so could result in great bodily injury or death!

During the use of this equipment there will be times when the distributor will need to be cleaned and basic maintenance will need to be performed. One of the main areas of interest will be cleanliness of the orifice slits in the piston head. These slits should be cleaned on a regular basis. This will help ensure an equal and uniformed distribution of NH3 to all exiting ports in the manifold. It is recommended that these slits be thoroughly clean at the beginning of every season. A 30 mesh inline basket strainer should be installed upstream of the heat exchanger main inlet from the nurse tank. This will help in minimizing the chance of fouling the slits due to contamination coming from the nurse tank. This inline strainer should also be clean at the beginning of every season and on a per-need basis.

NOTE: Use the VOD images on the preceding pages as a reference, (**NOTE:** Numbers in parenthesis refer to item numbers called out in the VOD “Exploded View” image; Drawing No. 6850 located in the back of the manual.

CLEANING PISTON HEAD ORIFICES

A. Steps needed for cleaning piston head: dis-assembly process:

1. **IMPORTANT!! Close main shut-off valve on supply hose from nurse tank.**

2. **IMPORTANT!! Vent ALL residual anhydrous ammonia from system and make sure ALL system pressure gauges read 0 psi.**

3. Loosen the six 1/4-20 bolts (9) that fasten the top (4) of distributor to the manifold body (1); see Figure 11- D.4

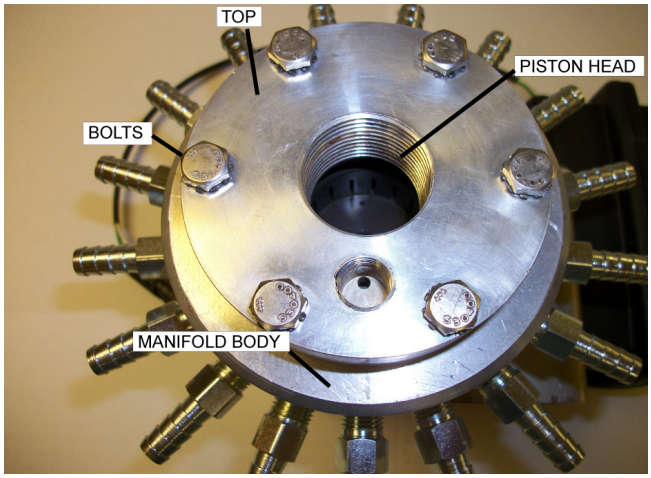


Figure 11-D.4

4. With the bolts completely loose, slightly lift up on the top (4). Remove both the in-feed supply nipple and the top (4) from the manifold body (1), this can be accomplished with the in-feed supply nipple still attached to the top (4), (NOTE: making sure not to lose or damage the “O” ring (5) that is located between the top (4) and the manifold body (1). Set these pieces off to the side on a clean surface. The inside of the distributor will now be exposed; see Figure 11-D.5

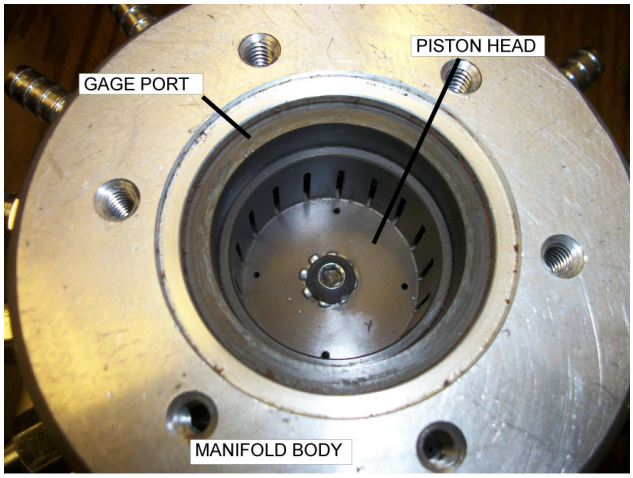


Figure 11-D.5

5. Now using a 5/32” Allen wrench, loosen and remove the 1/4-20 screw (13) that secures the piston head to the top of the piston shaft,

NOTE: Making sure not to lose or damage the 1/4 external toothed washer (8) that is located between the screw (13) and the piston head (12); see Figure 11-D.6.

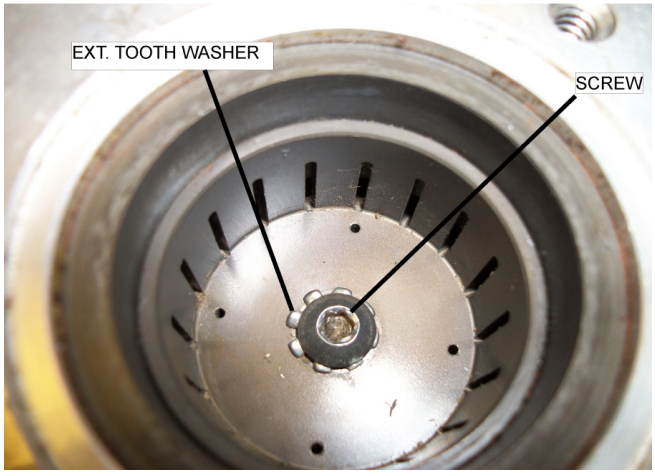


Figure 11-D.6

6. Place both the 1/4-20 screw (13) and external toothed washer (8) on a clean surface.

7. Place your fingers inside the piston head and slowly lift upward on the piston head until it comes free from the piston shaft (11), see Figure 11-D.9

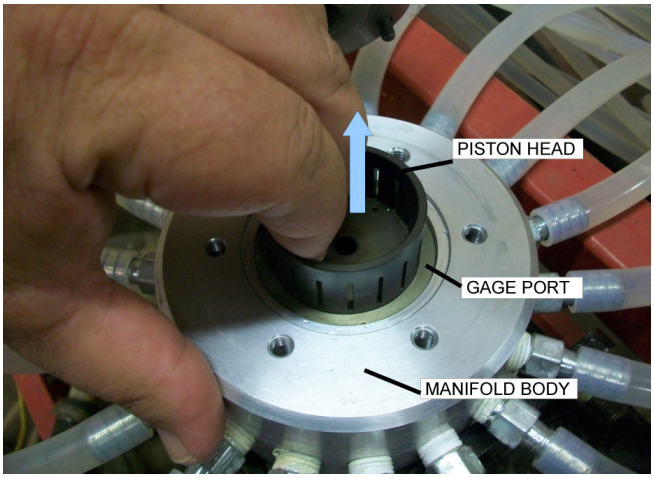


Figure 11-D.9

8. Continue to lift up on the piston head (12) until it has completely slid free from the gage port (3), (**NOTE:** Making sure not to lose or damage the small 1/8 x 1/4 dowel pin (15) that is located between the bottom of the piston head (12) and the top of the piston shaft (11). If dowel pin (15) has become loose from the end of the piston shaft (11), replace it in the hole on the top of the piston shaft (11) and press the pin firmly into the hole in the piston shaft (11); see, Figure 11-D.10

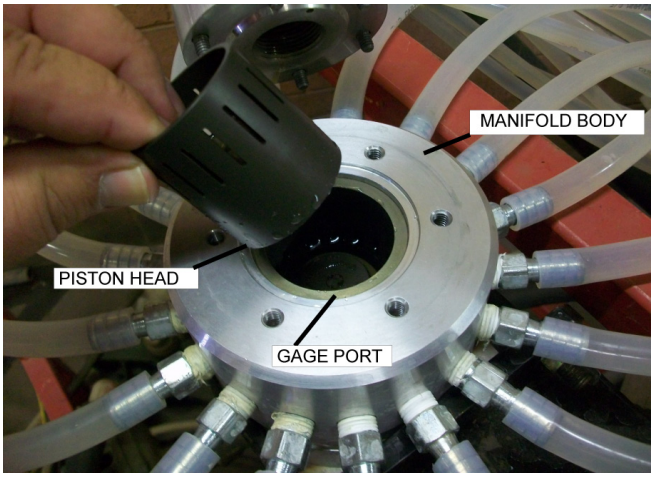


Figure 11-D.10

9. Now that the piston head (12) has been removed from the distributor, you will be able to thoroughly clean the piston head (12) and its vertical orifice slits; see Figure 11-D.11

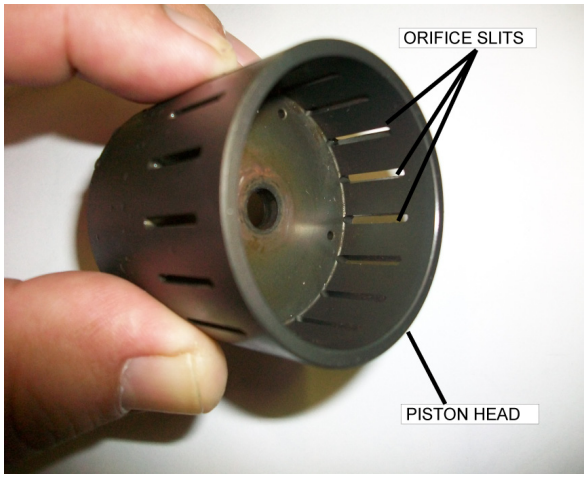


Figure 11-D.11

10. Soak the piston head (12) in the detergent or solvent solution for about 30 minutes.

11. It is best to use a mild grease cutting detergent or solvent when cleaning the piston head (12).

12. Remove the piston head (12) from the cleaning solution and use a clean “lint free” cloth to wipe any foreign matter or residue build-up from the piston head (12) surfaces, it is also OK to use a “soft” brush to assist with cleaning the piston head(12). NEVER use anything abrasive to scrape the surfaces of the piston head (12), such as metallic tools or sand paper, since these will permanently damage the piston head (12).

13. Compressed air can also be used to thoroughly clean out the piston head’s (12) orifice slits, as well as, assist with drying the piston head (12) prior to re-assembly.

14. Compressed air can also be used to blow the inside of the gage port (3) cavity out prior to the re-assembly process. Make sure to remove dowel pin (15) from top of piston shaft (11) prior to blowing out the cavity and replace the dowel pin (15) prior to re-assembly.

IMPORTANT: The gage port (3) is designed with an interference press-fitted with the manifold body and will NOT be able to be removed from the manifold body for cleaning. NEVER try to remove the gage port (3) from the manifold body.

RE-ASSEMBLY PROCESS

1. Check to see that dowel pin (15) is located in the hole in the top of piston shaft (11) and firmly pressed into place; see Figure 11-R.1

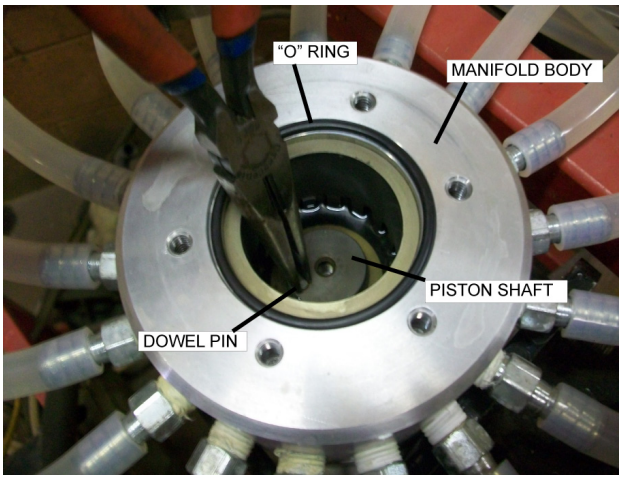


Figure 11-R.1

2. With dowel pin holes in piston shaft (11) and piston head (12) “slightly” out of “angular” alignment, re-insert the piston head (12) into gage port (3) and slide the piston head (12) down until the bottom surface of piston head (12) hub has made contact with top of 1/8 x 1/4 dowel pin (15).

3. While applying a constant downward pressure on the piston head (12), slowly rotate the piston head (12) until you feel the piston head (12) move further downward as the dowel pin hole in the piston head (12) hub mates with the dowel pin located in the top of the piston shaft (11); see Figure 11-R.3a, Figure 11-R.3b.

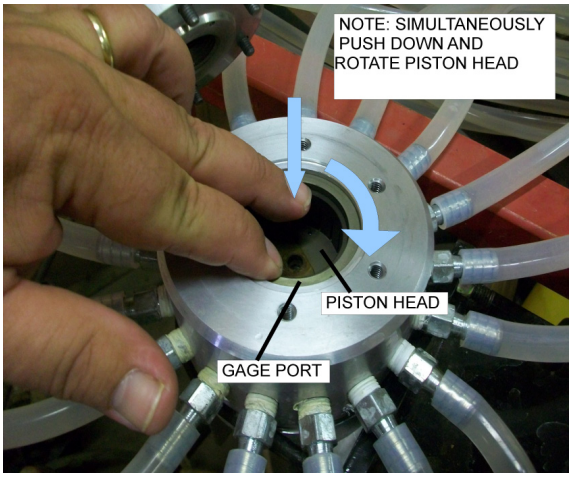


Figure 11-R.3a

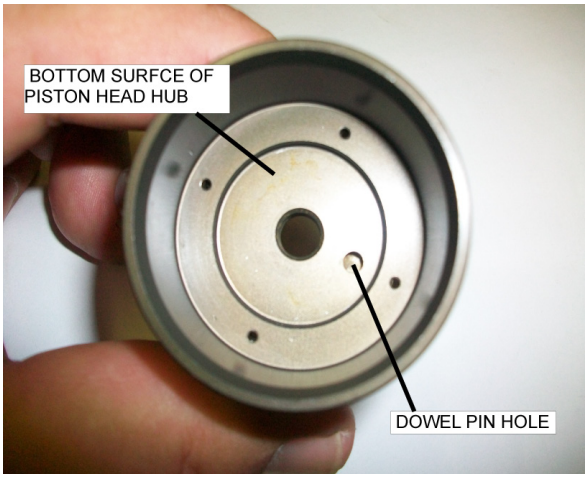


Figure 11-R.3b

****(VERY IMPORTANT:** The dowel pin (15) MUST fit into both the dowel pin hole in the piston head (12) hub and the dowel pin hole in the piston shaft (11) end to ensure that the orifice slits in the piston head (12) are in proper "angular" alignment with the ports in the gage port (3).

4. Place the 1/4-20 screw (13) with the external toothed washer (8) into the hole in the center of the piston head (12).

5. Using your finger gently thread the 1/4-20 screw (13) into the thread end of the piston shaft(11).

6. Once the 1/4-20 screw (13) has been seated on the piston head (12), use a 5/32" Allen wrench to securely tighten the screw (13), (**NOTE:** Do not over tighten this screw (13), since thread damage may occur to the tapped threads in the piston shaft (11) end); see Figure 11-R.6

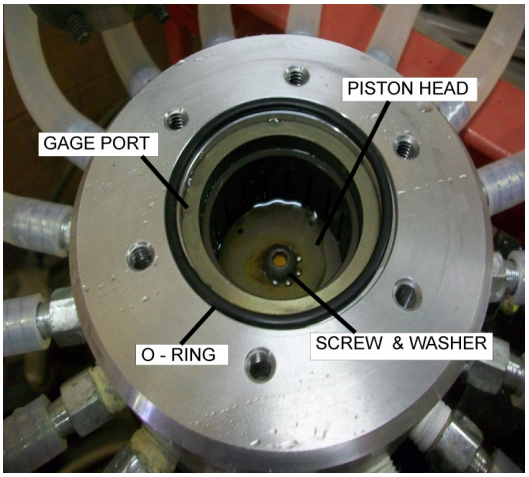


Figure 11-R.6

7. Energize the system's rotary actuator to ensure smooth upward and downward motion of the piston head (12). Also using your fingers, check to see that dowel pin (15) has mated with both holes in the piston head (12) and piston shaft (11) and that the piston head (12) is not free to rotate relative to the piston shaft (11). (**NOTE:** When dowel pin is properly seated in both the piston head (12) and piston shaft (11) holes the top of the piston head and the gage port will be flush when the actuator pushes the piston head all the way into the distributor.

8. With all components properly installed, it is now time to re-install the in-feed supply line and top (4) portion of the manifold.

9. Prior to re-installing the in-feed supply line and top (4) portion of the manifold, you will need to re-install the "O" ring (5) that is located between the top (4) and the manifold body (1).

10. With a thin film of petroleum jelly applied to the "O" ring (5), center the "O" ring (5) into the recessed cavity located on top of the manifold body (1). Press firmly into place, (**NOTE;** The jelly will help hold the "O" ring (5) in place while the top (4) is re-fitted to the manifold body (1).

11. Carefully re-install the in-feed supply line and top portion of the manifold onto the manifold body (1). Make sure that the "O" ring (5) remains firmly in place in the manifold's top cavity; see Figure 11-R.11.

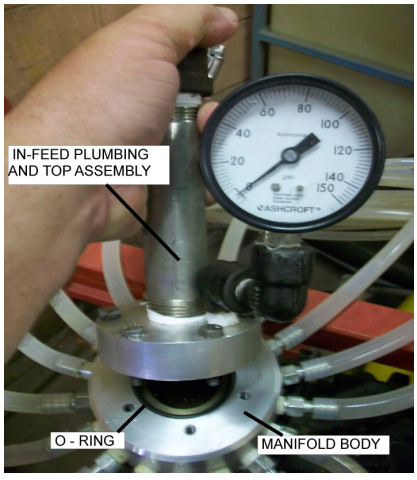


Figure 11-R.11

12. With the in-feed supply line and top portion of the manifold in place. Insert the six 1/4-20 bolts (9) along with the external toothed washers (8) into the holes in the top (4) and finger tighten the bolts.

13. Now using a 7/16" box end wrench, tighten the six 1/4-20 bolts (9) using an alternating crossing pattern, (**NOTE:** do not over tighten these bolts, since thread damage may occur to tap threads in manifold body (1).

COMPLETE REBUILDING OF VOD MANIFOLD

The VOD manifold will periodically need to have the "O" rings replaced. Replacement of the "O" rings can be performed very easily by following the below instructions.

1. **IMPORTANT!! Turn off valve on main supply hose from nurse tank.**

2. **IMPORTANT!! Vent ALL residual anhydrous ammonia from system,(NOTE: ALL gauges MUST read 0 psi).**

3. Loosen the in-feed supply hose that feeds the top (4) of the distributor.

4. Remove the VOD assembly from the implement.

5. Place the VOD assembly on work bench in clean area.

6. Now remove the long shoulder screw that attaches the top hole in the connecting link (14).

7. Unscrew the main frame mounting screws from the bottom of the manifold body (1). (See note below).

IMPORTANT: Prior to removing the VOD manifold from the main frame; with a permanent marker, "match-mark" the orientation of the VOD manifold assembly relative to the main frame. This will insure that the VOD manifold will be positioned in the proper orientation to the main frame when reassembling the VOD as a unit.

8. Remove the VOD manifold from the main frame and set on a clean work bench for further dis-assembly.

NOTE: In general, it is always good practice to "match-mark" ALL mating parts prior to disassembling them. This will ensure correct fit-up during the reassembly process.

9. Loosen the six 1/4-20 bolts (9) that hold the top (4) of distributor to the manifold body (1).

10. With the bolts completely loose, remove the top (4) from the manifold body (1).

11. Remove the large "O" (5) from cavity in the top of manifold body (1) and discard.

12. Now remove the piston head (12) and the piston shaft (11) together by sliding them out the top of the manifold body. (**NOTE:** It is not necessary to disassemble the piston head (12) from the piston shaft (11). (Match mark pieces prior to removal).

13. Remove the two small "O" rings (7) from the piston shaft (11) and discard.

14. Now remove the six socket head cap screws (10) that fasten the bottom insert (2) to the bottom of the manifold body (1). (Match mark pieces prior to removal).

15. Remove the bottom insert (2) from the manifold body (1) and remove the large "O" ring (6) and discard.

16. Using a mild grease cutting detergent or solvent soak all components in the cleaning solution for approximately 12 hours to help loosen any trapped particles.

17. Remove the VOD parts from the cleaning solution and use a clean and "lint free" cloth to wipe any foreign matter or residue build-up from the part's surfaces, (it is also OK to use a "soft" brush to assist with cleaning the parts. NEVER use anything abrasive to scrape the parts, since this will damage the parts).

18. Using compressed air, thoroughly blow off any residual cleaning solution and/or foreign matter. Lay parts out on clean cloth and let parts dry prior to re-assembly.

19. In the reverse order, install a new large “O” ring into the cavity on the bottom of the manifold body (1). (**Note:** Prior to installing the “O” ring, apply a thin film of petroleum jelly to the “O” ring. This will help hold the “O” ring in place during the re-assembly process.

20. With the large “O” ring in place, insert the bottom insert (2) into the manifold body (1).

21. Insert the six socket head cap screws (10) into the holes in the bottom of the insert (2).

22. Rotate the bottom insert (2) till the hole in the bottom insert (2) line up with the holes in the manifold body (1). Using your finger, gently thread the six socket head cap screws (10) into the holes in the bottom of the manifold body (1).

23. Using a 5/32” Allen wrench securely tighten the six socket head cap screws (10), (**NOTE:** do not over tighten these screws (10), since thread damage may occur to tap threads in the manifold body (1).

24. Now install the two new small “O” rings (7) into the relief grooves on the piston shaft (11).

25. Next inset the piston head (12) and piston shaft (11) sub-assembly into the manifold body (1). (**NOTE:** Use the “match-marks” to angular align the piston head (12) and piston shaft (11) sub-assembly to the manifold body (1). **VERY IMPORTANT:** Make sure that the piston is in proper “angular” alignment with the Manifold Body. **NOTE:** The sloped surface on the end of the Piston Shaft **MUST** be facing away from the small indexing mark on the Manifold Body. This will ensure proper align of the slits on the Piston Head with the slots of the Gage Ports.

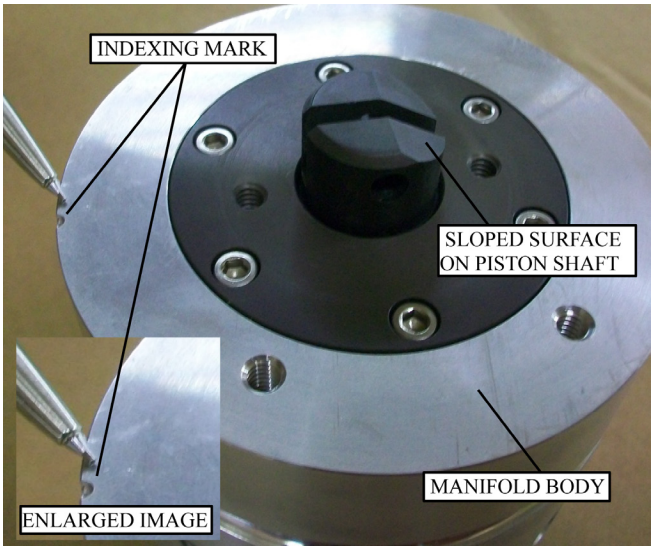


Figure 12.25

26. Install a large “O” ring (5) into the cavity on the top of the manifold body (1). (**Note:** prior to installing the “O” ring, apply a thin film of petroleum jelly to the “O” ring. This will help hold the “O” ring in place during the re-assembly process.

27. Carefully place the top (4) on to the manifold body (1). Make sure that the “O” ring (5) remains firmly in place in the manifold’s top cavity.

28. With the top (4) in place. Insert the six 1/4-20 bolts (9) along with the external toothed washers (8) into the holes in the top (4) and finger tighten the bolts.

29. Now using a 7/16” box end wrench, tighten the six 1/4-20 bolts (9) using an alternating crossing pattern, (**NOTE:** Do not over tighten these bolts, since thread damage may occur to the tapped threads in manifold body (1).

30. Re-install the VOD manifold onto the main frame. (**NOTE:** Once again use the “match-marks” to angular align the VOD manifold to the main frame.

31. Use the main frame mounting screws to fasten the VOD manifold to the main frame and tighten screw finger tight.

32. Using a 5/32” Allen wrench, securely tighten the two main frame mounting screws , (**NOTE:** Do not over tighten these screws, since thread damage may occur to threads in the bottom insert (2).

33. Re-install the long shoulder screw that attaches the top hole in the connecting link (14) to the hole in the bottom of the piston shaft (11). Install lock nut onto long shoulder screw and secure tightly.

34. Using a 12 volt power source, check operation of VOD unit prior to placing it back in service. Make adjustments if needed.

35. Once all is in good working order, re-install VOD unit on implement toolbar and re-attach all hoses and wires.

36. This completes the rebuilding process.

TROUBLE SHOOTING

The systems manual thoroughly describes how to locate and remedy a faulty component. The following information describes how certain problems on an anhydrous applicator can affect the Hiniker system and application rates.

CAUTION: Follow all Safety rules.

In NH3 applicators BIGGER is better when it comes to hoses and fittings. When replacing these items it is strongly recommended that you install 1-1/4 inch (NPT) parts. Always use hoses and fittings approved for agricultural ammonia applications. Any restriction in the delivery system will cause more vapor to be produced and will slow your application rate. This is particularly troublesome during cold weather operation.

Restrictions can generate more vapor than what the heat exchanger can convert. The result is under application, inaccurate or fluctuating readings on the console.

Potential Restrictions

- Undersized breakaway coupler.
- Debris caught in breakaway coupler, usually on tank side.
- Worn breakaway coupler, does not open completely when coupled together.
- Breakaway coupler has damaged spring or snap ring. When coupled together causes the internal mechanism to cock or tilt.
- Undersized hose, too small for expected application.
- Defective hose. When a hose is filled with ammonia, vapor will slowly migrate through the tube stock. Ammonia hose covers are somewhat porous to allow this vapor to escape and cause no damaging blisters. Older hoses may appear to be okay but could swell on the inside causing a flow restriction.
- Screens plugged, fine mesh screens can cause a flow restriction with a small amount of debris on them.
- Tank valve, globe valve, gate valve, electric or hydraulic shutoff valve defective or not opening up all the way.
- Excess flow valve on tank closed or defective. The result is little or no flow. The excess flow valve closes automatically as a result of flow and pressure differential. This can occur during start up when all applicator lines and heat exchanger is empty.
- Too much plumbing. Elbows cause restrictions, avoid using where possible. A length of hose with a sweeping curve is less restrictive. Old regulator left on the machine especially troublesome in cold weather.

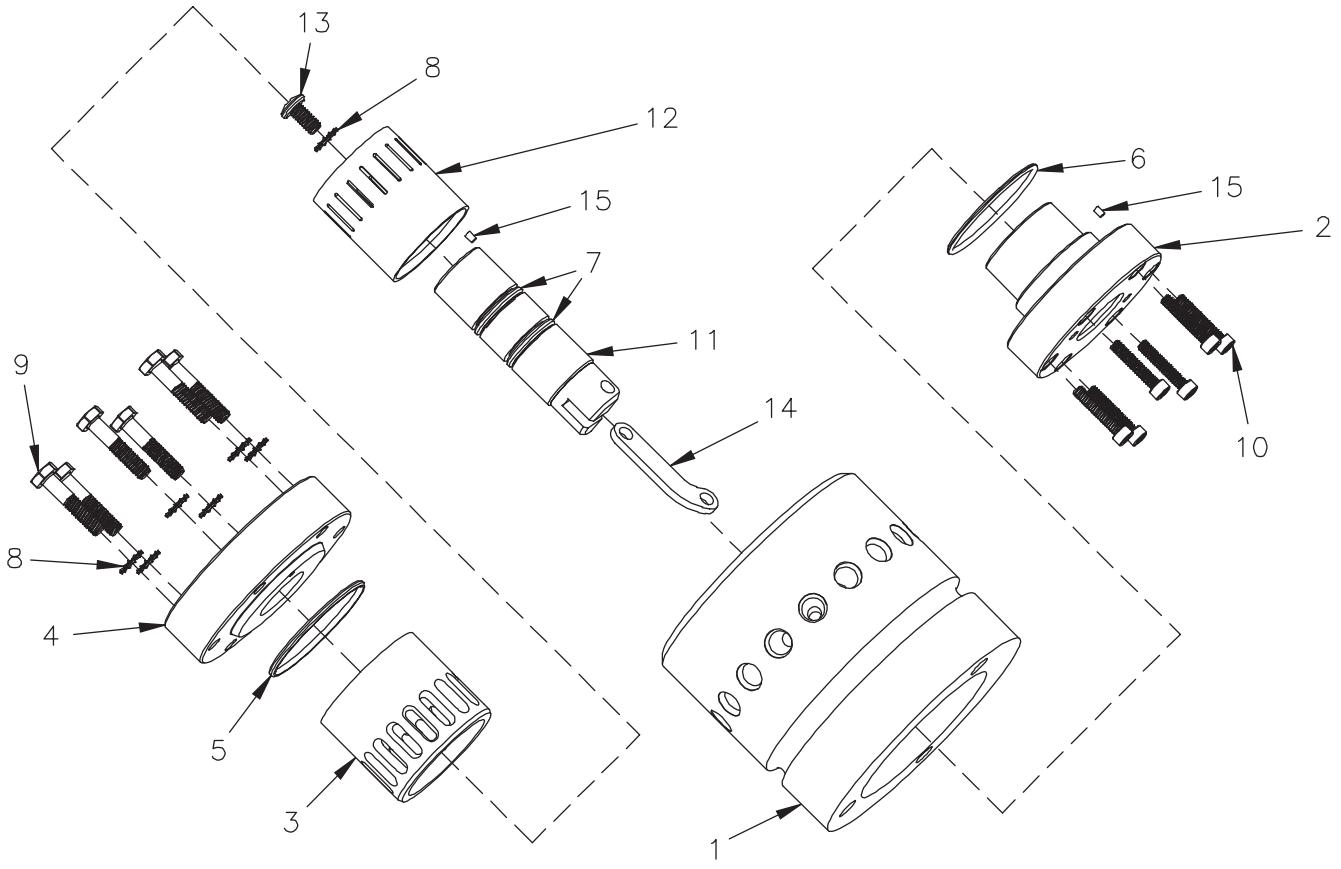
TROUBLE SHOOTING

PROBLEM	POSSIBLE CAUSE	REMEDY
NH3 Not Flowing	Nurse Tank Valve Closed	Open Nurse Tank Valve
	Shut-Off Valve Closed	Check Shut-Off Valve Operations
	Distributor Not Opening	Check Power To Distributor
Console Does Not Light Up	Blown Fuse, Poor Power Connections Or Ground	Check Fuses And Replace Check Power Connections And Ground
No Flow Indicated On Console	No Signal From Flow Meter	Check Connection From Flow Meter
	Flow Meter Stuck	Check And Clean Flow Meter
NH3 Flow Not Steady On Console	Nurse Tank Pressure Too Low	Re-Fill Nurse Tank
	In-Feed Strainer Plugged	Clean Strainer
	Heat Exchanger Orifice Plugged	Clean Heat Exchanger Orifice
	Flow Meter Fouled	Check And Clean Flow Meter
	Distributor Orifices Plugged	Clean Distributor Orifices
	Too Small Of Orifice Being Used *	Install Larger Orifice
	Refrigerate Line Kinked Or Pinched	Check Refrigerate Line For Damage
NH3 Leaks Visible On Plumbing	Loose Plumbing Fittings	Tighten All Fittings
NH3 Leaks Visible On Distributor	Loose Plumbing Fittings & Components	Tighten All Fittings & Components
	“O” Rings Not Seating Properly	Replace “O” Rings
Non-Uniform Flow Of NH3 To Knives	Different Length Of Distribution Hoses	Make All Hoses Same Length
	Fouled Orifices On Distribution Piston	Clean Orifices On Piston Head
	Distribution Hose Kinked Or Pinched	Check Distribution Hoses For Damage

* For Large GPM Flow Applications

Service Parts

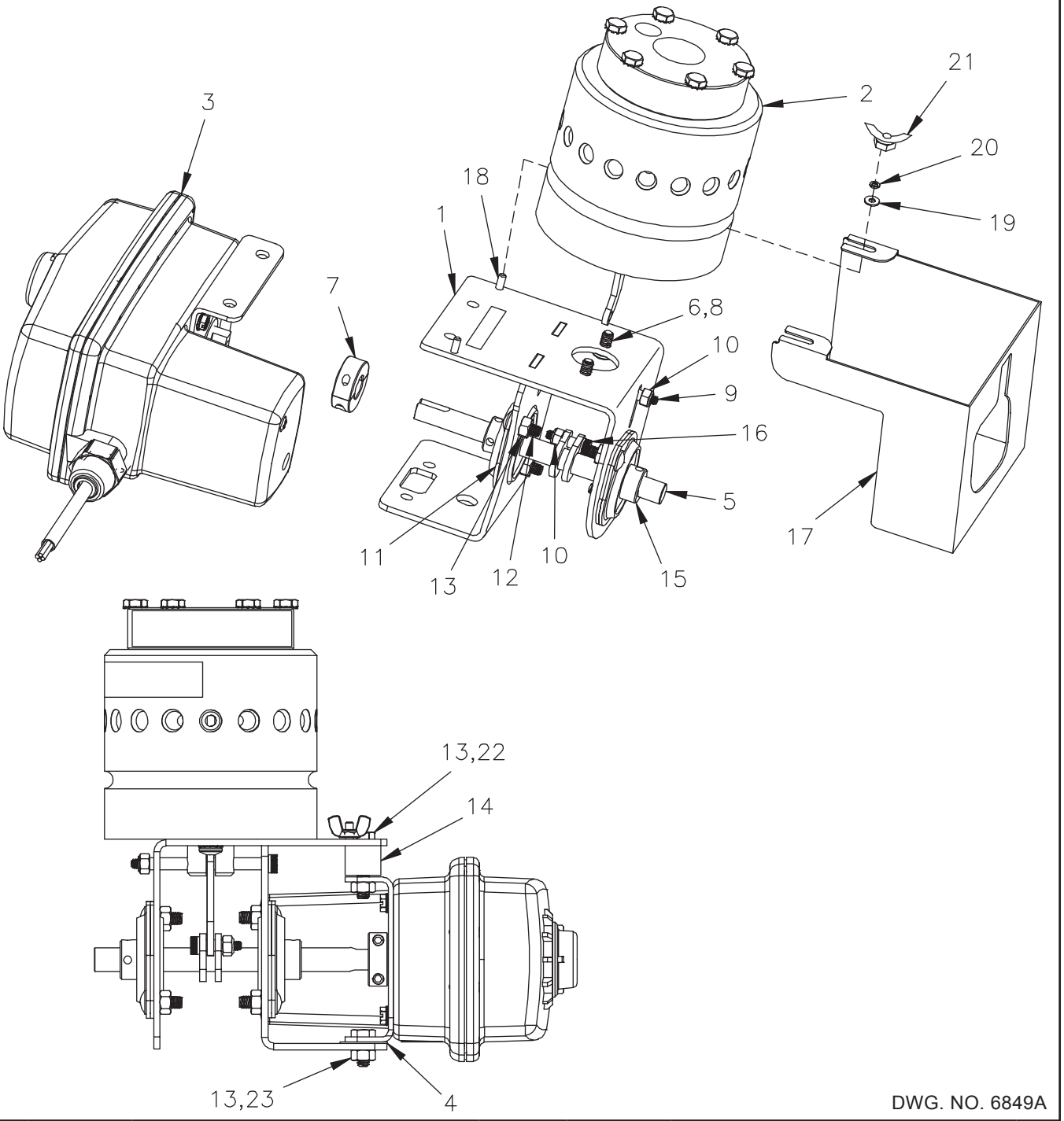
VARIABLE ORIFICE DISTRIBUTOR (VOD)
EXPLODED VIEW



DWG. NO. 6850

REF. NO.	PART NUMBER	DESCRIPTION	QTY.	REF. NO.	PART NUMBER	DESCRIPTION	QTY.
1	36518006	Manifold Body	1	9	950-001-329	Hex Head Cap Screw 1/4-20 x 1-1/4 SS	6
2	36518007	Bottom Insert Manifold	1	10	950-004-119	Socket Head Cap Screw 10-24 x 1 SS	6
3	36518008	Gage Port	1	11	36518010	Shaft- Piston	1
4	36518009	Manifold Top	1	12	36518011	Piston Head	1
5	394-002-115	O-Ring #139-70 Buna-N	1	13	950-004-121	Button Head Cap Screw 1/4-20 x 3/4 SS	1
6	36719000	O-Ring 134-70	1	14	36518016	Link- Connecting Dog-Leg	1
7	36719001	O-Ring 211-70	2	15	36610001	Dowel Pin 1/8 Diameter x 1/4 Long SS	2
8	952-004-081	Lock Washer 1/4 Inch Ext Tooth, SS	7				

NH3 MANIFOLD ASSEMBLY WITH ROTARY ACTUATOR



DWG. NO. 6849A

REF. NO.	PART NUMBER	DESCRIPTION	QTY.	REF. NO.	PART NUMBER	DESCRIPTION	QTY.
1	36518000	Frame Weldment	1	13	060954	Lock Nut 1/4-20 Nylon Insert	7
2	36421000	Assembly Metering Manifold 17P	1	14	36515017	Shim Mount Actuator	1
3	39412012	Actuator W/3 Pin Sure Seal	1	15	36610000	Insert Bearing 1/2 Flangette Style	2
4	36518019	Shim 1/4 x .060	2	16	950-006-009	Hex Socket Head Shoulder Bolt 10-24 x 1/2	1
5	36518017	Shaft Weld VOD	1	17	36518013	Cover Manifold	1
6	950-004-120	Button Head Cap Screw 1/4-20 x 1/2 SS	2	18	62501318	Stud #8-32 x 1/2 SS	2
7	36518005	Collar-Split 2 Pc 1/2 ID Zinc	1	19	952-003-008	Washer Flat #8 (164) SAE	2
8	952-004-081	Lock Washer External Tooth SS 1/4	2	20	952-001-011	Washer Lock #8 (164) Med Split SAE	2
9	950-006-007	Hex Socket Head Shoulder Bolt 10-24 x 2 1/2	1	21	951-005-086	Wing Nut #8-32 Steel Zinc	2
10	392-010-010	Lock Nut 10-24 Nylon Insert	2	22	950-001-329	Hex Head Cap Screw 1/4-20 x 1 1/4 SS	2
11	80302057	Flangette, Painted	4	23	950-001-334	Hex Head Cap Screw 1/4-20 x 3/4 SS	1
12	950-003-065	Carriage Bolt 1/4-20 x 5/8 Gr. 5	4				

HINIKER WARRANTY

The only warranty Hiniker Company (Hiniker) gives and the only warranty the dealer is authorized to give is as follows:

We warranty new products sold by Hiniker or authorized Hiniker dealers to be in accordance with our published specifications or those specifications agreed to by us in writing at time of sale. Our obligation and liability under this warranty is expressly limited to repairing or replacing, at our option, within one year after date of retail delivery, to the original purchaser, any product not meeting the specification. **WE MAKE NO OTHER WARRANTY, EXPRESS OR IMPLIED AND MAKE NO WARRANTY OF MERCHANTABILITY OR OF FITNESS FOR ANY PARTICULAR PURPOSE.** Our obligation under this warranty shall not include any transportation charges or costs or any liability for direct, indirect or consequential damage or delay. If requested by Hiniker Company, products or parts for which a warranty claim is made are to be returned freight prepaid to our factory. Any improper use, operation beyond rated capacity, substitution of parts not approved by Hiniker Company, or any alteration or repair by others in such manner as in our judgement affects the product materially and adversely shall void this warranty. **NO EMPLOYEE OR REPRESENTATIVE IS AUTHORIZED TO CHANGE THIS WARRANTY IN ANY WAY OR GRANT ANY OTHER WARRANTY.**

HINIKER reserves the right to make improvement changes on any of our products without notice.

HINIKER does not warrant the following:

1. Used products

2. Any product that has been repaired modified or altered in a way not approved by Hiniker Company.

3. Depreciation or damage caused by normal wear, lack of reasonable and proper maintenance, failure to follow Operator Manual Instructions, misuse, lack of proper protection during storage, or accident.

4. Parts replacement and service necessitated by normal wear or maintenance including, but not limited to, belts, cutting parts, and ground engaging parts.

A DELIVERY REPORT FORM must be filled out and received by HINIKER COMPANY to initiate the warranty coverage.

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