



# **HINIKER ANHYDROUS AMMONIA MONITORING AND CONTROL SYSTEM**

## **OPERATORS'S MANUAL**

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

PART NUMBER 360-000-246 Rev. D

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# TABLE OF CONTENTS

360-000-246 Rev. D

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To The Purchaser .....	2
Safety .....	3
Characteristics of Ammonia .....	3
Basic Rules .....	5
General .....	6
Agricultural Applications .....	6
Decal Location .....	8
Operation .....	10
Component identification .....	10
System considerations .....	11
Operating considerations.....	12
System Operation.....	13
Installation .....	14
Plumbing Requirements .....	14
Heat Exchanger .....	15
Refrigerant Lines .....	16
Trouble Shooting .....	18
Warranty .....	Inside Rear Cover

## 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 one of the following Hiniker systems operating manuals.

Model	Operator Manual
8160	39300030
8150	393-000-015
8100	393-000-009
8200	393-000-010
8605	39300018

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 only covers heat exchanger 36013004. For older model heat exchangers refer to the Hiniker Anhydrous Ammonia Monitoring And Control System Revision C. Part No. 360-000-246.

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: \_\_\_\_\_

Machine Serial #: \_\_\_\_\_



# SAFETY

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**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 yellow 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.**

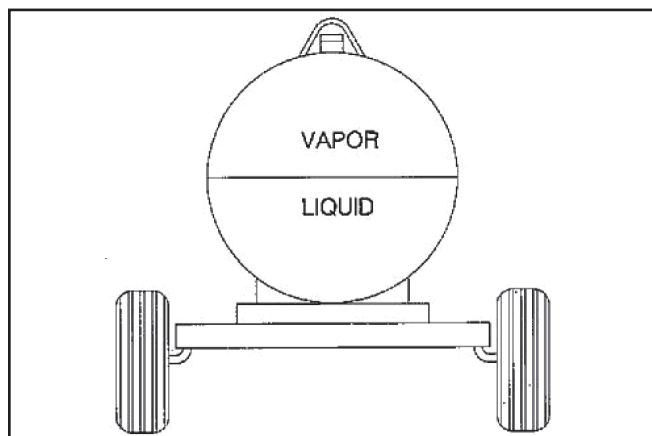
## CHARACTERISTICS OF AMMONIA

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 (NH<sub>3</sub>) and why is it so risky to handle? It is a chemical made up of one part nitrogen (N) and three parts hydrogen (H<sub>3</sub>). 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

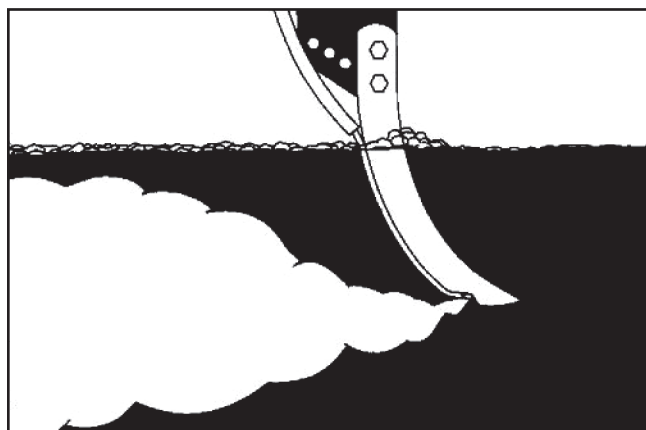
## CORROSIVE ACTION OF AMMONIA

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  $\text{NH}_3$ . These systems should be supplied with a valve after the safety disconnect coupling. Closing this valve shortens the time required to exhaust  $\text{NH}_3$  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  $\text{NH}_3$  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

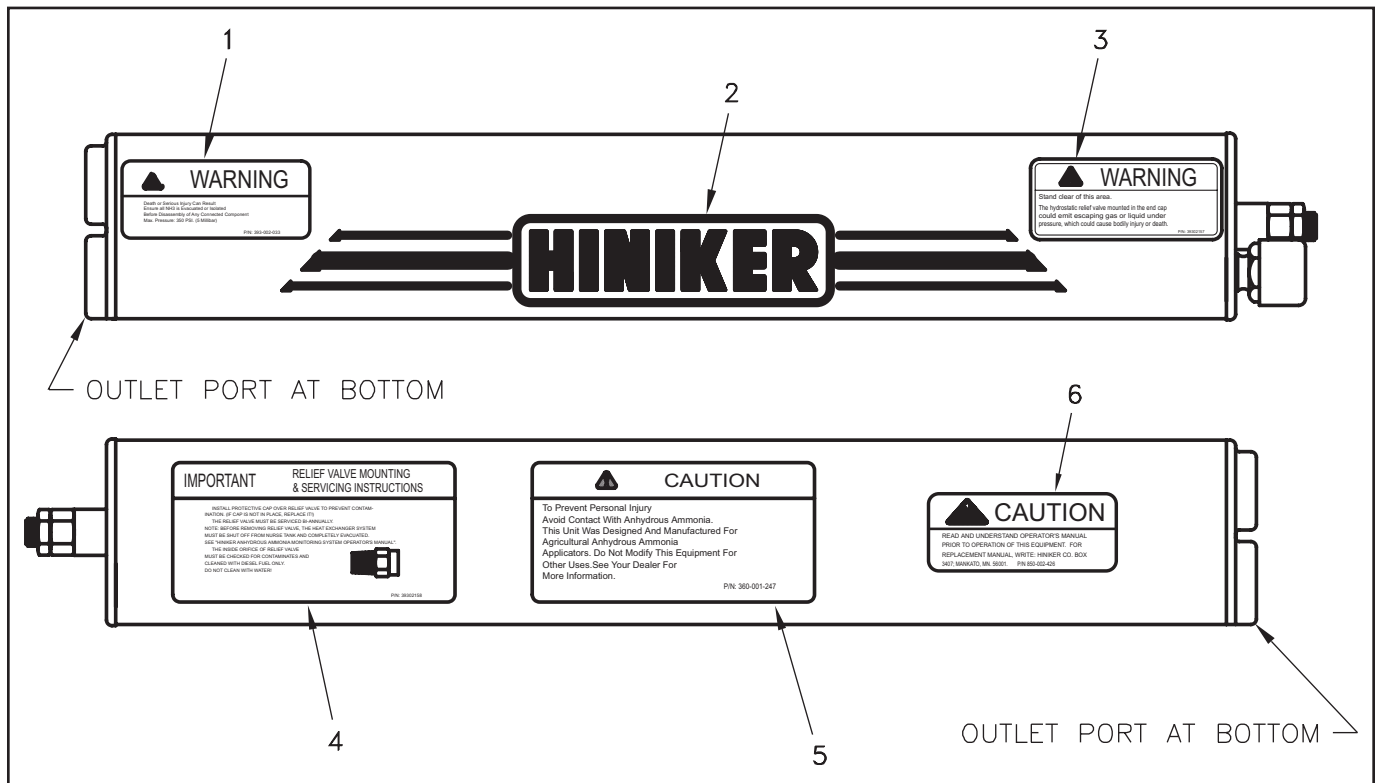
**REMEMBER-ACCIDENT PREVENTION IS PART OF YOUR JOB!**

## 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.



DWG. NO. 6300

Part number 39302156 Decal kit, contains 1 each of the following decals.

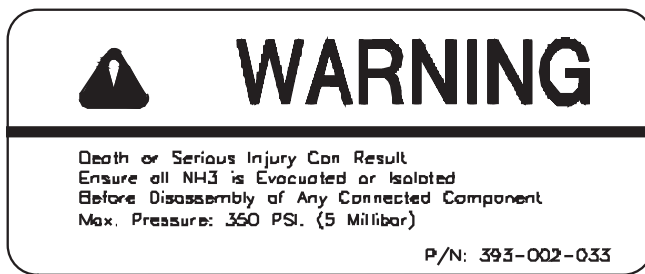


Figure 1, item 1, part number 393-002-033.

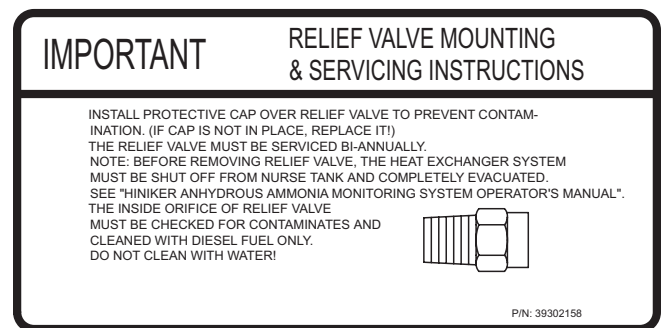


Figure 2, item 4, part number 39302158.



Figure 1, item 2, part number 36360160.

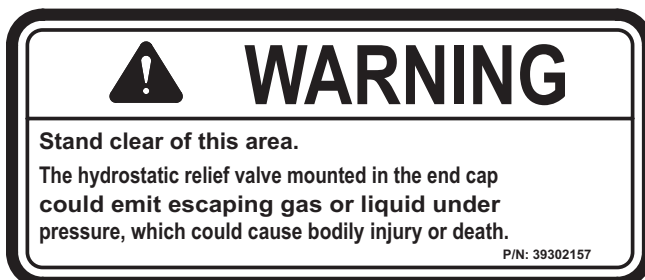


Figure 1, item 3, part number 39302157.

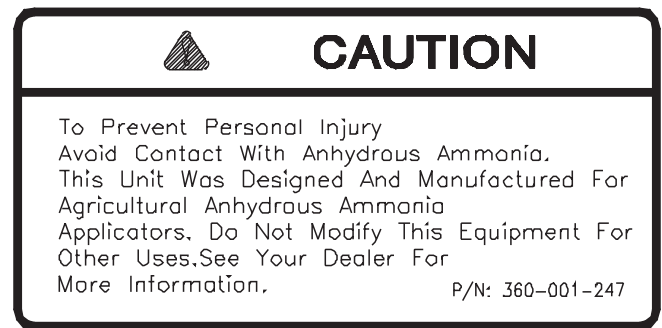


Figure 2, item 5, part number 360-001-247.



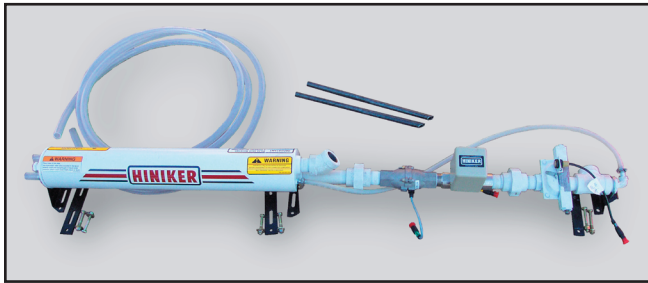
Figure 2, item 6, part number 850-002-426



# OPERATION

## COMPONENT IDENTIFICATION

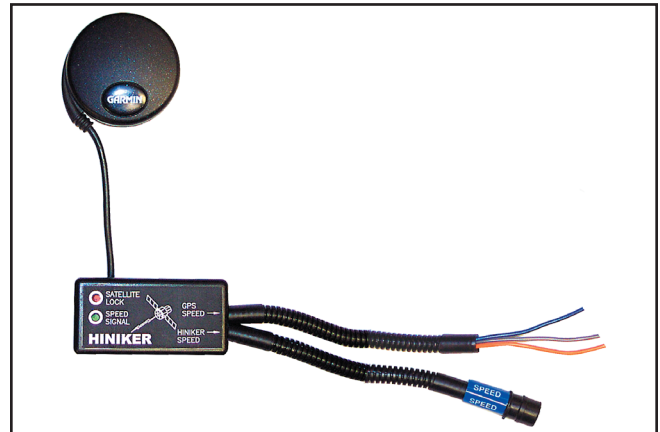
The Hiniker system consists of 5 primary components.



1. Heat Exchanger
2. Flow-meter
3. Servo Valve



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 NH<sub>3</sub> under varying conditions

NH<sub>3</sub> 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 NH<sub>3</sub> to liquid so it can be measured accurately. From there it is then measured by the flow meter. The servo valve is controlled by the console to adjust the flow rate as speed or pressures change to keep a constant application rate.

The console is the brains of 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.



## SYSTEM CONSIDERATIONS

Anhydrous Ammonia is liquid only when its temperature is less than  $-28^{\circ}\text{F}$  (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  $\text{NH}_3$  flows through the system. This is due to pressure drops caused by hoses, fittings and connectors. As the  $\text{NH}_3$  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. 8100, 8150 and 8160 system users program the Pulses Per Pound number into the console for NH<sub>3</sub> operation. 8605 system users program the Pulses Per Gallon number into the console for Anhydrous Ammonia application
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 NH<sub>3</sub>. 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 NH<sub>3</sub> 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.
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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 NH<sub>3</sub>. These systems should be supplied with a valve after the safety disconnect coupling. Closing this valve shortens the time required to exhaust NH<sub>3</sub> 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 the yes + and no - keys will open and close the servo valve when depressed. 8160 and 8605 systems users use the ↑ ↓ keys to open or close the servo when in manual. 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 NH<sub>3</sub> bleeding time.



**WARNING:** If an isolation valve is not installed all NH<sub>3</sub> must be removed from the heat exchanger before disconnecting any hoses.

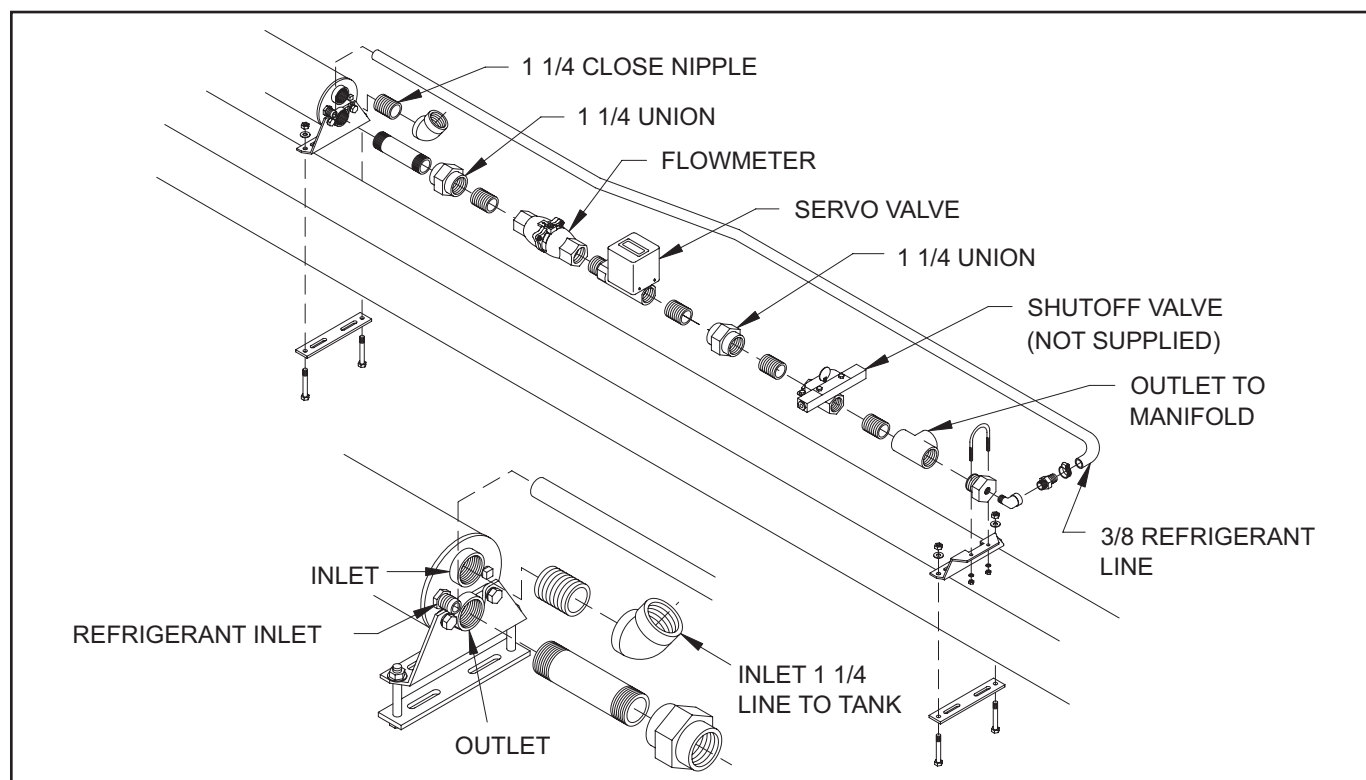


**CAUTION:** If two valves are installed so as to trap liquid NH<sub>3</sub> between them a hydrostatic relief valve must be installed to relieve pressure. The relief valve must vent to a safe area away from personnel.

Install an adequately sized NH<sub>3</sub> inlet hose between the safety disconnect coupling (after the isolation valve) and the heat exchanger inlet. See drawing 6289.



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



DWG. NO. 6289

## HEAT EXCHANGER

Refer to drawing 6289 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 6 x 1 1/4 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 servo valve onto the outlet end of the flow meter. Install the male half of a union fitting onto the outlet of the servo valve 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.

Install the 1 1/4 inch Tee to the outlet of the Shutoff valve. Normally the tee is pointing down.

If you are using two manifolds an additional tee and close nipple should be installed into the bottom port of the previously installed tee. See drawing 6304.

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

Locate an appropriate location 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 6289. 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.



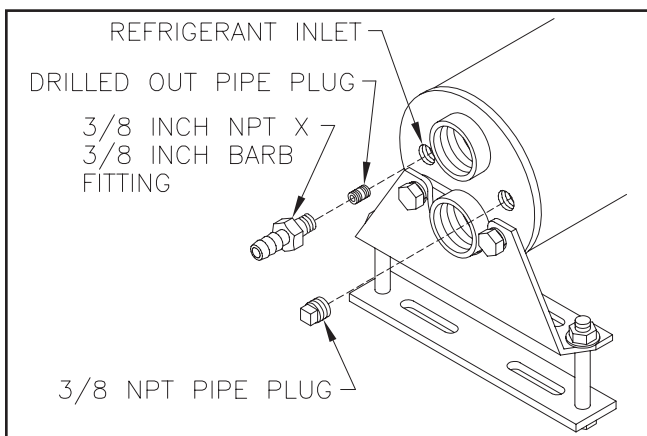
## REFRIGERANT LINES

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 3/8 inch line from the main line of flow downstream of the shutoff valve to the heat exchanger refrigerant inlet. This material has already been measured and will be exhausted into two knives.

Vapor material flows from the refrigerant outlets via the 3/4 inch hose and into the 3/4 inch tubes that are welded onto two standard knives.

An orifice installed into the refrigerant inlet controls the refrigerant flow. A .156 inch orifice has been installed into the refrigerant inlet and will work for the majority of applications. Two other size orifices (.125 and a .093) have also been included. The smallest orifice possible should be used to keep the refrigerant to a minimum while maintaining proper cooling. Generally speaking small applicators, low volume, and high tank pressure, are three indicators for a smaller orifice.

The 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

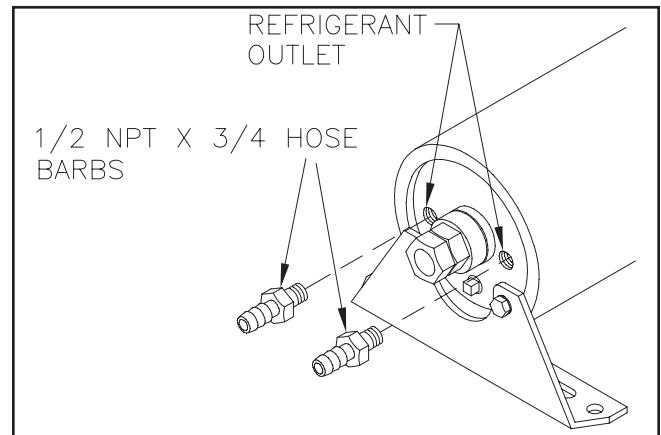
Install the 3/8 inch MNPT x 3/8 inch hose barb fitting in the refrigerant inlet. See drawing 6301.

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

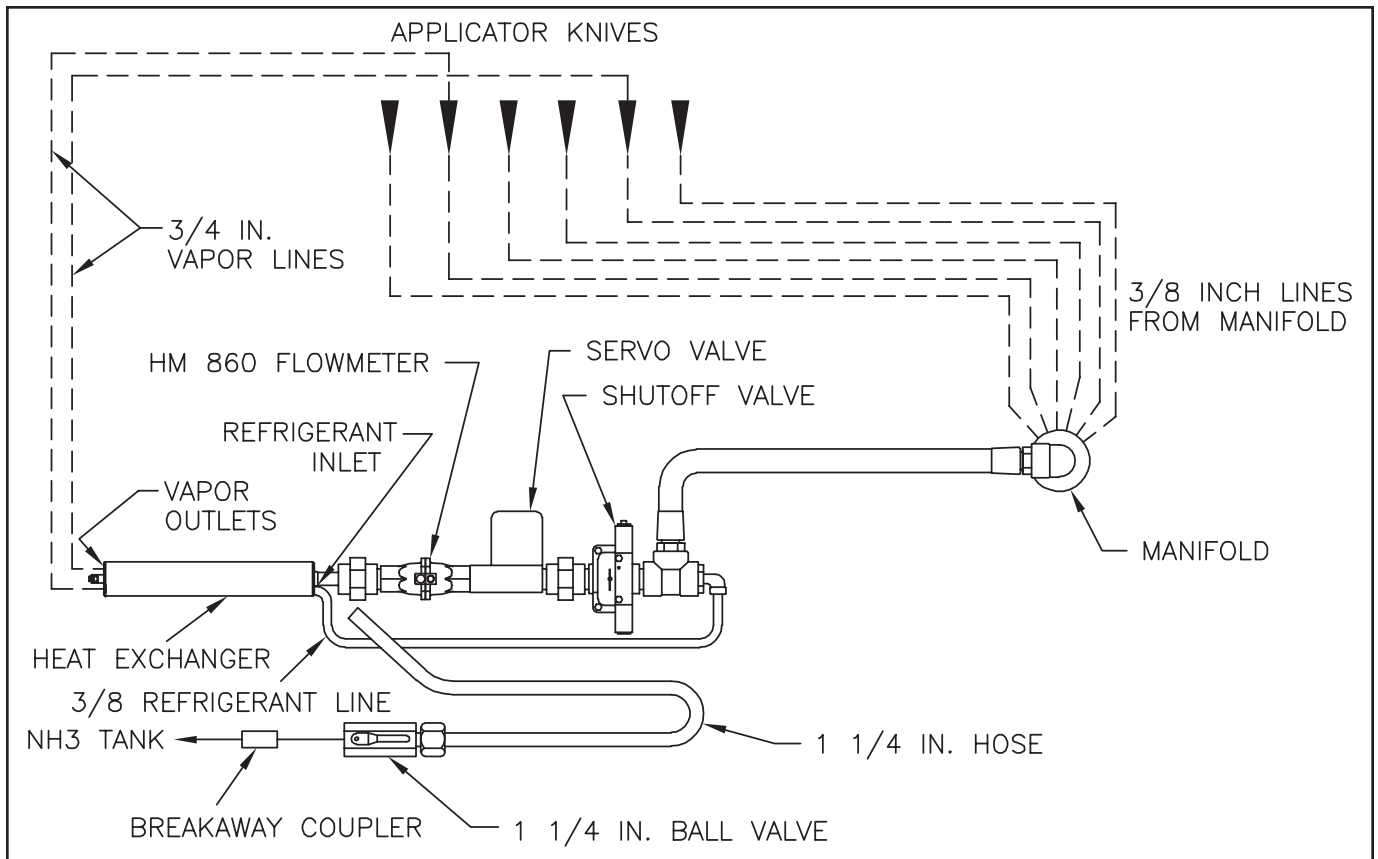
**NOTE:** The refrigerant line **MUST** be installed **AFTER** the shutoff valve or refrigerant will continue to flow with the valve shut off.

Install the 1/2 inch MNPT x 3/4 inch hose barb fittings to the refrigerant outlets on the Heat Exchanger. See drawing 6302.

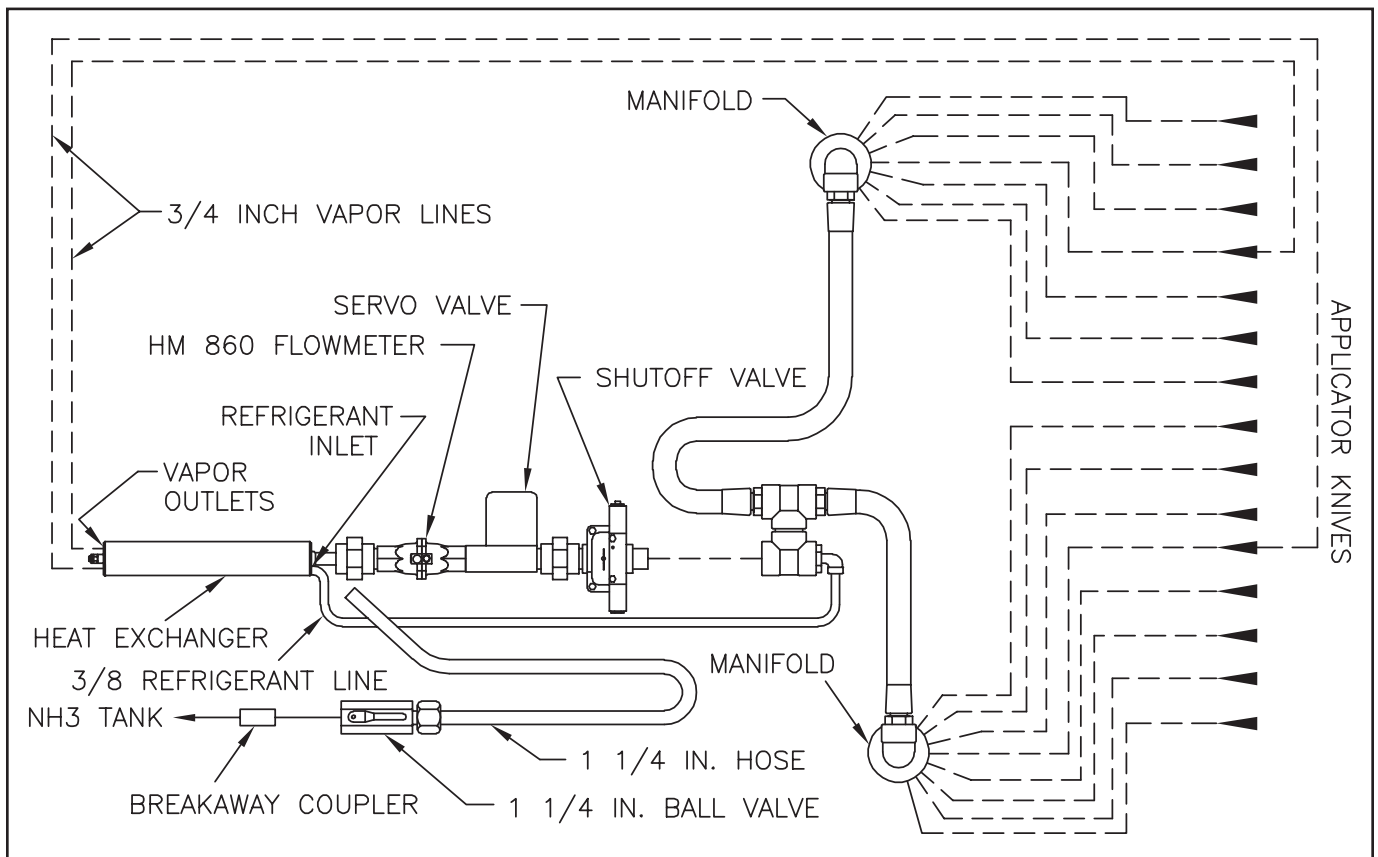
Connect the 3/4 inch hoses to the vapor outlet hose barbs on the Heat Exchanger and route to two or more vapor tubes, which have been welded onto the knives.



DWG. NO. 6302



DWG. NO. 6303



DWG. NO. 6304

## TROUBLE SHOOTING

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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 NH<sub>3</sub> 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

- 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.
- 
- 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.



## HINIKER WARRANTY

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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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