

# TeeJet®

## 45900 NH<sub>3</sub> Application Kit



### Installation and Operating Guide 98-70018-R0

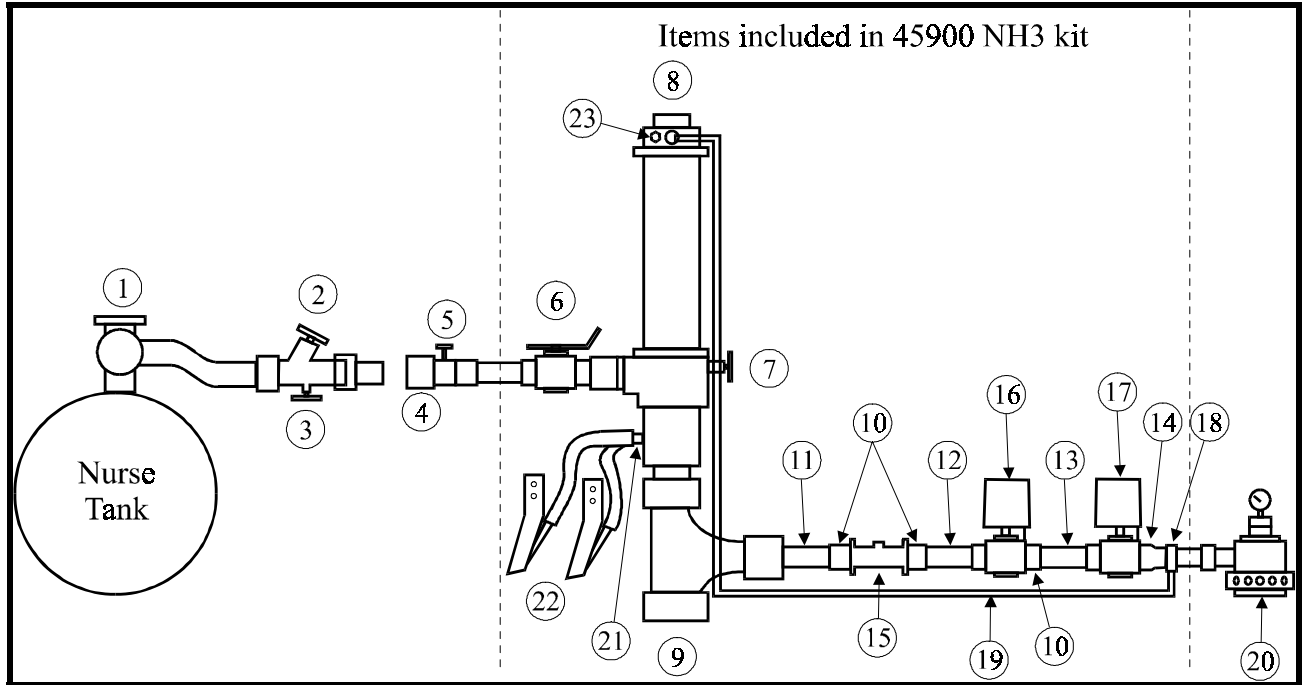


# Introduction

Thank you for choosing the TeeJet NH<sub>3</sub> Application Kit for your fertilizer application. This kit combines TeeJet electronics sprayer control expertise with Continental NH<sub>3</sub> Products expertise to provide you with the most advanced, precise NH<sub>3</sub> application system on the market. The TeeJet NH<sub>3</sub> Application Kit is designed to easily integrate with either the TeeJet 844 or 855 Sprayer control system.

**We recommend that you read this supplement, the TeeJet sprayer control owners manual and the Continental EQ-2000 Equalizer information completely before attempting installation, programming and using the TeeJet NH<sub>3</sub> Application Kit. The kits performance will depend on its proper installation and programming, along with planned preventative maintenance of all included components.**

# Installation



- |                                    |  |                                      |
|------------------------------------|--|--------------------------------------|
| 1. Nurse Tank Shut Off Valve       | 8. EQ-2000 Equalizer Heat Exchanger                | 17. Electric Shut Off Valve          |
| 2. Hose End Valve                  | 9. Tool Bar Weld Adapter                           | 18. Vapor Charge (A-416) Adapter     |
| 3. Bleeder Valve on Hose End Valve | 10. 1 1/4" Coupler                                 | 19. Manifold Pressure Feed Back Line |
| 4. Safety Quick Coupler            | 11. 8" Schedule 80 Pipe                            | 20. Distribution Manifold            |
| 5. Bleeder Valve on BAW            | 12. 4" Schedule 80 Pipe                            | 21. Vapor Outlet Hose Shanks         |
| 6. Manual Ball Valve w/check valve | 13. 2" Schedule 80 Pipe                            | 22. Vapor Knives                     |
| 7. Bleeder Valve on Equalizer      | 14. Bell Reducer                                   | 23. Metering Orifice                 |
|                                    | 15. 1" Stainless Steel Graphite Bearing Flow Meter |                                      |
|                                    | 16. Electric Regulating Valve                      |                                      |

The TeeJet NH<sub>3</sub> Application Kit should be installed as shown above. It may be necessary to customize the installation to accommodate your specific application. However, the components must be in the order shown above to ensure safety and component performance. Distances before and after the flow meter can be lengthened, but should not be shorter than indicated.

LP grease should be used to seal all pipe thread fittings. A tube has been included with your kit. Additional LP grease may be necessary and can be found at most hardware stores.

The vapor knives (22) included with the kit should be welded behind the two application knives closest to the center of your applicator. These knives should then be connected to the vapor outlet hose shanks (21) as shown.

Please note that a distribution manifold is not included in the TeeJet NH<sub>3</sub> Application Kit. As there are several possible configurations for distribution manifolds, it is impossible to standardize on a single model. If your applicator tool bar does not currently contain a distribution manifold, one can be obtained through most NH<sub>3</sub> product dealers or you could contact Continental direct. Reference the phone number on the cover of the Continental manual.

**Note: When operating conditions are less than ideal, the systems minimum capacity may increase and its maximum capacity may decrease.**

## Setup

For setup of the TeeJet 844 or 855 sprayer control, refer to the appropriate sprayer control manual. Following are programming areas that require special attention:

### Target Application Rate

The application rate should be entered as lbs. N/acre (kg N/ha), NOT lbs. NH<sub>3</sub>/acre (kg NH<sub>3</sub>/ha). Use the following formula to convert lbs. NH<sub>3</sub> to lbs. N (kg NH<sub>3</sub> to kg N).

$$\begin{aligned}(\text{lbs. NH}_3) \times (0.82) &= \text{lbs. N} \\ (\text{kg NH}_3) \times (0.82) &= \text{kg N}\end{aligned}$$

**Example:** (150 lbs. NH<sub>3</sub>/acre) X (0.82) = 123 lbs. N/acre  
(168 kg. NH<sub>3</sub>/ha) X (0.82) = 137 kg N/ha

### Flow Meter Pulses

As the sprayer control manual indicates, use the factory calibrated flow meter pulse number. The flow meter tag number is calibrated for applications at 60° F (16° C). The temperature of anhydrous ammonia at the flow meter is approximately 10 degrees lower than at the tank. At temperature extremes, the change of NH<sub>3</sub> density can cause inaccuracies in the application. The following chart can be used to adjust the flow meter pulses programming step in these cases. **Keep in mind the factory calibrated pulse number will be correct within 2 ½ % from 40° F (4° C) to 80° F (27° C).** Therefore, in most instances, the flow meter pulse number will not need to be changed.

Properties Of Liquid Ammonia At Various Temperatures

Temperature		Pressure		Liquid Density				Flow Meter
°F	°C	PSI	bar	NH3 lbs/gal	NH3 Kg/L	N lbs/gal	N Kg/L	Conversion Factor
0	-18	15.7	1.1	5.53	0.66	4.54	0.54	0.93
10	-12	23.8	1.6	5.47	0.66	4.49	0.54	0.94
20	-7	33.5	2.3	5.41	0.65	4.44	0.53	0.95
30	-1	45.0	3.1	5.34	0.64	4.37	0.53	0.97
40	4	58.6	4	5.28	0.63	4.33	0.52	0.97
50	10	74.5	5.1	5.21	0.63	4.27	0.52	0.99
60	16	92.9	6.1	5.14	0.62	4.22	0.51	1.00
65	18	103.1	7.1	5.11	0.61	4.19	0.5	1.01
70	21	114.1	7.9	5.08	0.61	4.17	0.5	1.01
75	24	125.8	8.7	5.04	0.6	4.13	0.49	1.02
80	27	138.3	9.5	5.01	0.6	4.11	0.49	1.03
85	29	151.7	10.5	4.97	0.6	4.08	0.49	1.03
90	32	165.9	11.4	4.94	0.59	4.05	0.48	1.04
95	35	181.1	12.5	4.90	0.59	4.02	0.48	1.05
100	38	197.2	13.6	4.87	0.58	3.99	0.47	1.06

1. Read the nurse tank pressure or temperature gauge and round down to the nearest pressure or temperature listed in the above table. As mentioned on the previous page, the temperature of anhydrous ammonia at the flow meter is approximately 10 degrees lower than at the tank. Use this adjusted temperature when referencing the chart.
2. Obtain the flow meter conversion factor from the table using the appropriate column.
3. Multiply the original flow meter tag number by the conversion factor to determine the adjusted flowmeter tag number.
4. Enter the adjusted flow meter tag number in the appropriate programming step for the TeeJet 844/855.

Changes in temperature or pressure within the shaded area will likely NOT require a flow meter pulses change. Accuracy will be within 2 ½% in that range.

**Example 1:** Nurse Tank Temperature = 35° F (2° C); Flow meter tag # = 629

1. 35° F(2° C) - 10° = 25° F (-8° C)
2. Select 20° F (-7° C) from the table. Follow that row to the right to determine flow meter conversion factor of 0.95
3. 629 (old number) X 0.95 = 598 (new number)
4. Enter 598 in the appropriate flow meter pulses programming step for the 844/855.

**Example 2:** Nurse Tank Temperature = 62° F (17° C); Flow meter tag # = 629

1. 62° F (17° C) - 10° = 52° F (7° C)
2. Select 50° F (10° C) from the table.
3. Table indicates that no change is necessary.

### **Regulating Valve Speed**

If you are using the TeeJet NH<sub>3</sub> Application Kit with the TeeJet 855 Sprayer Control, a regulating valve speed of 30 is recommended. This can be found in programming step P\_13. Reference the 855 Sprayer Control manual for more information.

If you are using the kit with the TeeJet 844 Sprayer Control, a regulating valve speed of 2.1 is recommended. This can be found in the System Setup Mode of the 844. Reference the 844 Sprayer Control manual for more information.

Please keep in mind that the above recommendations are based on tests conducted under ideal conditions. Installations and conditions will likely vary. We suggest you use the recommendations above as a starting guide line for the regulating valve speed settings. However, this programming step may have to be adjusted to match your application.

If your sprayer control does NOT lock onto the target application rate, but continues to adjust just above and below the rate, the valve speed must be lowered to slow the regulating valve down. Keep in mind that small fluctuations will occur with slight speed changes.

If it takes several seconds for the sprayer control to reach the target application rate after you have reached normal operating speed, the valve may be too slow. The regulating valve speed would have to be increased.

### **Liquid Density**

The Liquid Density programming step for the TeeJet 844/855 should be set at 1.00 when applying NH<sub>3</sub>. Any density changes in NH<sub>3</sub> due to temperature changes should be corrected by adjusting the flow meter pulses programming step as indicated above.

### **Metering Orifice Selection**

After all systems have been installed you must determine which metering orifice (23) will meet your application needs. Use the formula below to determine your application rate in lbs. N/hour (kg N/hr). Reference p. 6 of the Continental manual to determine which metering orifice will be required.

$$\text{Lbs. N/Hour (kg N/hr)} = \frac{(\text{Application Rate}) (\text{Speed}) (\text{Width})}{\text{Constant}}$$

- Application Rate in lbs. N/acre (kg N/ha)
- Speed in MPH (KPH)
- W is width of applicator **in inches (cm)**
- English constant = 99 (Metric constant = 1000)

# System Check

- ① Secure all hoses, fittings and mounting bolts.
- ② Attach the 844/855 Sensor End Cable to the flow meter and speed sensor.
- ③ Attach the 844/855 Valve End Cable to the electric regulating valve and the electric shut off valve. Reference the appropriate sprayer control manual for wiring diagrams and pin-out information.

**Note: The 344AEC electric shut off valve is a 4 wire valve and should be wired as follows; the red lead should be wired to a permanent 12v+ (battery +), the black and the yellow/black lead should be wired to ground (battery -), the yellow/red lead connects to the Valve End Cable (see appropriate sprayer control manual for color/boom section references).**
- ④ Turn console Master Boom switch OFF.
- ⑤ Open completely the manual Equalizer ball valve (6).
- ⑥ Close all bleed ports.
- ⑦ Connect and secure nurse tank hose to implement.
- ⑧ Slightly open the nurse tank shut off valve (1) and hose end valve (2).
- ⑨ Inspect the system for leaks. If leaks are present, close nurse tank shut off valve (1) and hose end valve (2). Open bleed ports to exhaust all NH<sub>3</sub> in the lines. After all links have been completely exhausted, disconnect nurse tank hose. Correct leaks and repeat above steps.
- ⑩ After ensuring no leaks are present, fully open nurse tank shut off valve (1) and hose end valve (2).

# Operation

- ① Set Master Boom Switch to OFF position.
- ② Set Auto/Man switch to Man position.
- ③ Turn on the corresponding individual boom section switch for the electric shut off valve (dependent on how wired in step 3 of system check). Begin driving in the field.
- ④ Put applicator knives in the ground. Verify speed read out on the console.

- ⑤ Turn Master Boom switch ON
- ⑥ Manually adjust the flow to the Target Application Rate using the pressure adjust switch (855)/buttons (844).



- ⑦ Leave the system in manual mode for approximately 2 minutes to allow the system to fill with NH<sub>3</sub> and to allow the Equalizer to begin cooling the NH<sub>3</sub>. Erratic operation maybe experienced if Auto is selected before operating temperature is reached.
- ⑧ Switch the Auto/Man switch(855)/button(844) to Auto position. System will now automatically maintain the Target rate regardless of vehicle speed. (For TeeJet 855, ensure the correct Target Select button has been selected for the desired application)
- ⑨ If an additive such as N-Serve<sup>®</sup> (Dow Chemical) is used, refer to the maintenance section of the Continental manual for proper care.

### **Boost Mode**

As indicated in your 844/855 Sprayer Control manual, the application rate can be temporarily adjusted while moving through the field using the + or - buttons while in Auto mode. Both the 844 and 855 will boost the application rate in 10% increments either up or down. Refer to your sprayer control manual for more information.

## **Trouble Shooting and Maintenance**

Reference the appropriate sprayer control manual (844 or 855) trouble shooting section for information on trouble shooting the console and sprayer control components. Reference the Continental EQ-2000 Equalizer manual maintenance section for proper care of and maintenance to the heat exchanger and related components.

### **Flow Meter Adjustments**

Installation and variations in NH<sub>3</sub> applicators can cause some error. This could cause application rates to be off by a small percentage. To correct for these errors, the flow meter pulses tag number can be adjusted by the same percentage of error. To determine the error, use an accurate weight of the first tank or portion of the tank, and an accurate acre reading to determine what percent, if any, the control system over or under applied. Then determine the new flowmeter pulses number as follows:

New Flow Meter Pulses # = (old flow meter pulses) X  $\frac{\text{Target Application Rate}}{\text{Actual Application Rate}}$

**Example:** Target application rate is 150 lbs./acre (168 kg/ha). You discover your actual application rate is 145 lbs./acre (162 kg/ha). Your flow meter pulses tag currently reads 630 pulses.

$$(630 \text{ pulses}) \frac{150 \text{ lbs./acre (168 kg/ha)}}{145 \text{ lbs./acre (162 kg/ha)}} = 652 \text{ New flow meter pulses value}$$

Remember that ½% - 2 ½% of the NH<sub>3</sub> leaving the tank is used by the heat exchanger to convert the remaining NH<sub>3</sub> to liquid for flow meter measurement. This ½% - 2 ½% will never be measured by the flow meter. Therefore, you can expect that your actual application rate will be slightly higher on a consistent basis.

- Flow Meter pulses value should be increased to increase the actual amount of material being applied.
- Flow Meter pulses value should be decreased to decrease the actual amount of material being applied.

If you experience application rate errors greater than 10%, you should trouble shoot the system thoroughly before adjusting the flow meter pulses value.

### **Low NH<sub>3</sub> Tank Level**

If the flow rate begins to climb for no apparent reason, vapor bubbles are present in the system. In hilly or rough conditions the nurse tank dip tube will not remain submerged, allowing extra vapor in the system. This vapor is too much for the heat exchanger to condense and the system will exhibit erratic operation. If the dip tube remains out of liquid, operation may appear to be normal, but the system will be metering vapor. If the system is metering vapor, you will notice extremely low manifold pressure. Change tanks before the NH<sub>3</sub> level is low enough to cause these problems.

# Safety

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. Watch for frosting which positively indicates trapped liquid ammonia which is vaporizing. De-pressure all hoses when not in use.
3. Use only equipment suitable for anhydrous ammonia service.
4. Make regular inspection, repair and maintenance of equipment.
5. Use and maintain standard protective equipment necessary for safe handling of anhydrous ammonia.
6. Know the product, its characteristics and behavior.
7. Always repair ammonia leaks immediately.
8. Don't kink hoses.
9. Inspect hoses thoroughly before each session or when the hose has been subjected to abnormal abuse. Check for breaks or softening in the cover, blistering, swelling, loose couplings or damage to the hose reinforcement. These defects should be corrected or the hose should be retired from service. Replace hoses as recommended by the manufacturer.
10. Always pick up a hose by the valve body or coupling, never by the valve hand wheel.
11. Always stay clear of valve or hose openings, particularly safety relief valves.
12. Always use proper capacity safety relief and excess flow valves; do not tamper with them or other safety devices.
13. Never use wrenches in closing hand wheel operated valves.
14. Always stand on the upwind side of ammonia transfer operations.
15. Always wear tight fitting safety goggles or a full-face shield and protective gloves made of rubber or other material impervious to anhydrous ammonia when transferring ammonia.
16. Always make sure no person is in the line of discharge before opening any ammonia valve to the air.
17. All valves should be closed and hoses disconnected when transfer operations are suspended or unattended.
18. An automatic liquid relief valve must be installed wherever there is a possibility of liquid anhydrous ammonia being trapped. This must open at a safe pressure and discharge into a safe location.