Winnipeg

Batts Inc. Runway De-Icer Pro

Shop Unit # 36

2,000 Gal. 55 ft Booms

Date: 12/13

INTRODUCTION

This manual incorporates operation and parts identification information for the Batts De-Icer Pro unit and replaces all previously issued manuals on this equipment in their entirety.

It is a compilation of the best information available at the time of writing.

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NOTICE
TO MAINTENANCE AND OPERATION PERSONNEL

A thorough understanding of the SCS 440 Application Rate Control manual is essential for the proper application of de-icer liquid chemicals. All maintenance and operation personnel should be familiar with the SETUP, OPERATION, MAINTENANCE, and TROUBLESHOOTING sections of the SCS 440 manual prior to the operation of the BATTS DE-ICER PRO.

If service information is needed after business hours, representatives of Batts, Inc may be contacted at the following telephone numbers:

Chris Cravens ..... (317)435-1455

Josh Batts ..... (317) 626-0641

CAUTION:

To prevent reactive chemical combinations from becoming hazardous, all De-Icer users should thoroughly clean and rinse the unit after use and before storage. Cleaning the inside of the De-Icer Pro tank, the pumping system, the boom plumbing, as well as the exterior of the unit will keep it looking and performing well.

Clean all outside surfaces of the tank, booms, pumping system, and running gears with a mild detergent. Rinse with clean water.

Clean the inside of the product tank and pumping system with clean water. Agitate at least one complete tank of water through the product tank. Reset the valvae handles to spray and alternate spraying water through the booms and nozzles, flushers, and the hose reel.

When the product tank is empty or spraying is complete, drain the pumping system. Drain the Y-Strainers by removing Y-Strainer caps and screens. Drain the booms, flusher, and hose reel assemblies. At the base of the product pump, open the small valve and drain the pumping assembly. Leave the Load On and the Load Off valves open.

During storage, the pumping system valves should remain open and the plumbing system empty. Open the Load On valve, the Load Off valve, the Bypass valve, and all drain valves to allow the pumping system and product tank to vent to the atmosphere.

GENERAL INFORMATION AND OPERATING INSTRUCTIONS
TABLE OF CONTENTS

OPERATION

1. General

This section provides information on operational checks, operator actions employed during the use of the De-Icer unit, and safety precautions which must be adhered to in order to prevent injury to operation and maintenance personnel and damage to equipment.

2. Safety Precautions

Personnel operating and maintaining the Batts De-Icer Pro unit, as well as other personnel in the near vicinity, must always be aware of certain hazardous actions and conditions possible and exercise care in the following:

WARNING: TO PREVENT PERSONAL INJURY OR PROPERTY DAMAGE, CLEAR AREA OF ANY UNAUTHORIZED PERSONNEL OR EQUIPMENT WITHIN FIFTY (50) FEET OF THE DE-ICER PRO UNIT.

WARNING: PERSONAL INJURY OR PROPERTY DAMAGE MAY INCUR AS A RESULT OF DISCONNECTION OR REMOVAL OF SAFETY EQUIPMENT, SHIELDS, GUARDS, HOUSINGS, OR LIMITING DEVICES USED TO ENCLOSE OR CONTROL MOVING PARTS.

WARNING: KEEP HANDS AND CLOTHING AWAY FROM ROTATING OR MOVING PARTS. NEVER ATTEMPT TO MAKE ADJUSTMENTS WHILE THE UNIT IS IN OPERATION. SERIOUS INJUR MAY RESULT FROM UNSAFE PRACTICES.

WARNING: BEWARE OF PINCH POINTS WHEN EXTENDING OR STOWING THE BOOM AND RACK ASSEMBLY. LOSS OF DIGITS OR EXTREMITIES CAN RESULT FROM UNSAFE OPERATION.

WARNING: NEVER LOWER OR RAISE RACK UNTIL BOOMS ARE FULLY EXTENDED. SERIOUS PROPERTY DAMAGE OR PERSONAL INJURY MAY RESULT.

WARNING: ANY TIME DE-ICING FLUIDS OR CHEMICAL LIQUIDS OTHER THAN DE-ICING FLUIDS ARE OFF-LOADED OR DRAINED FROM THE DE-ICER UNIT, USE SUITABLE STORAGE CONTAINERS FOR EACH LIQUID. DO NOT MIX DIFFERENT LIQUIDS OR CHEMICALS IN STORAGE CONTAINERS. SERIOUS INJURY CAN RESULT FROM UNSAFE STORAGE PRACTICES.

WARNING: DURING STORAGE, GASES CAUSED BY REACTIVE CHEMICALS LEFT IN THE PUMPING SYSTEM MAY PRODUCE PRESSURE. THE COMPLETE DE-ICER SYSTEM SHOULD REMAIN EMPTY. OPEN THE LOAD ON VALVE, THE LOAD OFF VALVE, THE BYPASS VALVE, AND ALL DRAIN VALVES TO ALLOW THE PUMPING SYSTEM AND PRODUCT TANKN TO VENT TO THE ATMOSPHERE.

CAUTION: In temperatures below 32°f, run the hydraulic system in idle for 20 to 30 minutes or until the hydraulic oil temperature reaches 100°f.

CAUTION: Read engine manuals and unit placards carefully before using ether or other explosive engine starting fluids. Engine damage can result (voiding manufacturer's warranty) from improper use of starting fluids.

CAUTION: Never engage the hydraulic pump when engine speed is more than 1200 rpm.

CAUTION: If, at any time, an arc welder is used on the vehicle or if anything of an electrical nature is connected to the vehicle, disconnect all power and ground leads which provide power for this system. Failure to do so can result in damaged electronic components, in which case, the warranty will be void. Transient voltages can damage internal electronic components.

CAUTION: Do not run the product pump dry. Excessive heat and component wear will cause pump failure.

DESCRIPTION

1. General

The Batts De-Icer Pro is a self-contained de-icing unit designed for heavy duty use in winter weather conditions. The unit consists of a tandem axle, six wheel drive truck chassis, and a Batts De-Icer Pro spray system. The unit may be operated in the processes of ice removal from roadways, runways, and ground support areas. All steel components used in the production of the unit are cleaned, primed, and painted to prevent deterioration.

2. Major Assemblies (See Figure 1)

A. Truck

The Batts De-Icer Pro Uses a truck supplied by the customer.

B. De-Icer Pro System

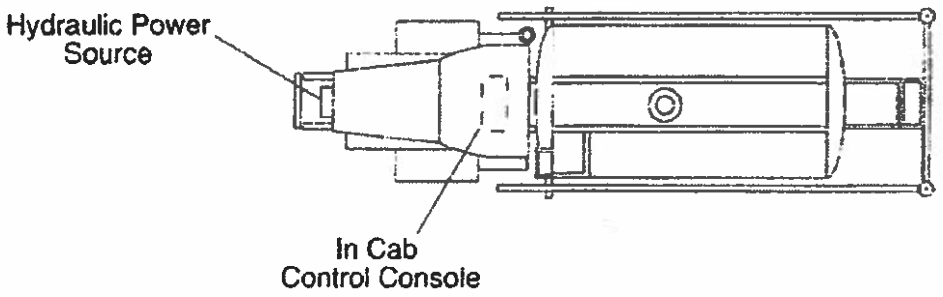
The Batts De-Icer Pro consists of a product tank, pumping system, de-icer spray bar, in-cab control console, and a hydraulic power source. All of the components combine to provide an accurate, economical application of de-icing chemicals.

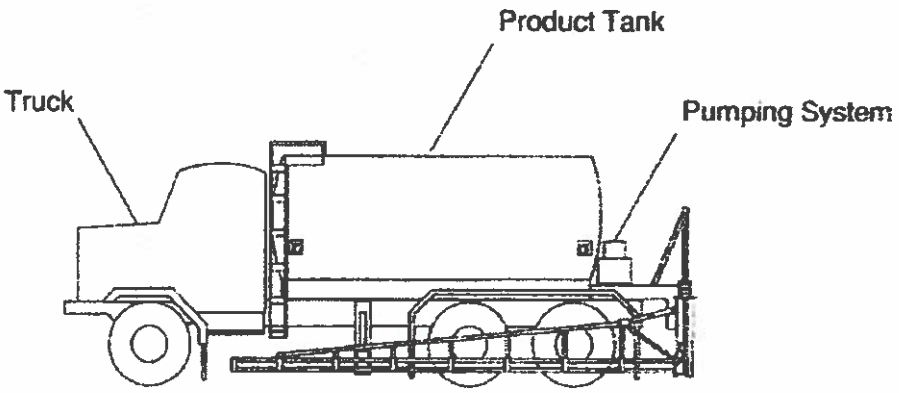
1) The product Tank is constructed of stainless steel and is attached to the truck chassis by self-aligning brackets.

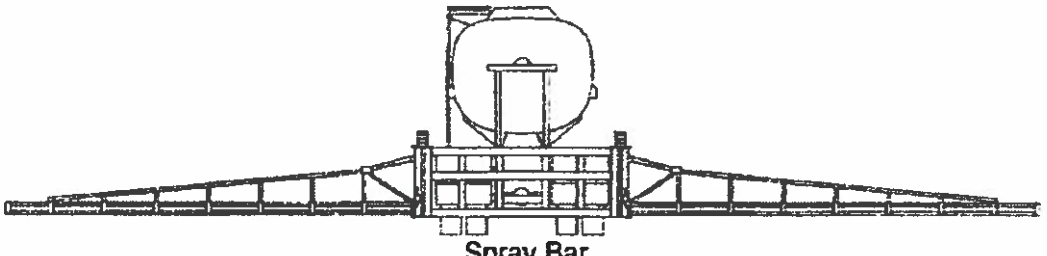
2) The pumping system is constructed of stainless steel and is located directly behind the product tank. A centrifugal pump supplies the liquid product to the spray bar. The pump is powered by a hydraulic motor.

3) The spray bar is located at the rear of the vehicle. The sprayer consists of left and right side booms and a center rack. Each boom and center rack is operated independently for extension, retraction, height adjustment, and spray application.

4) All operations of the unit are accomplished by a hydraulic power source. The hydraulic pump is driven by the vehicle engine equipped with an electromagnetic clutch assembly. The hydraulic pump supplies power to the components through two hydraulic circuits. The primary hydraulic circuit provides power to the product pump motor. The secondary provides power for all boom operations.







Spray Bar
(Shown with the booms extended.)

5) The in-cab control console consists of two sections (See Fig 2). The Batts control console operates the boom and rack functions, the individual valve functions of the spray bar. The Batts Inc. sprayer control regulates the application rate by coordination of the spray bar pressure with the vehicle ground speed.

C. SCS 440 Liquid Sprayer Control and Monitor System

The following information has been obtained in part from the SCS 440 LIQUID SPRAYER CONTROL SYSTEM INSTALLATION and OPERATING MANUAL.

1. The SCS 440 Sprayer Control System was designed to maximize the efficiency of a sprayer operation. The SCS 440, with its microprocessor based electronics, provides total automatic control of the spraying operation. Once the desired application rate has been entered into the system's memory, the system locks it in. The flow of chemical varies automatically in proportion to changes in ground speed. Spraying automatically starts when the vehicle begins to move and stops when the vehicle stops. Application rate will be controlled when the vehicle ground speed is within the specified speed range.

2. The SCS 440 sprayer control system consists of six major components; a control console, a monitor, a hydraulic servo control valve and hydraulic servo driver, a speedometer drive sensor and an application rate sensor. The control console which is installed within the vehicle cab near the operator's station receives signals from the speedometer drive sensor and application rate sensor. The console compares these input signals to a desired application rate (which is entered by the operator) and provides an output which drives the hydraulic servo control valve in the direction required (increase or decrease product flow to the nozzles) to maintain a uniform application rate.

3. Control Console (See Figure 3)

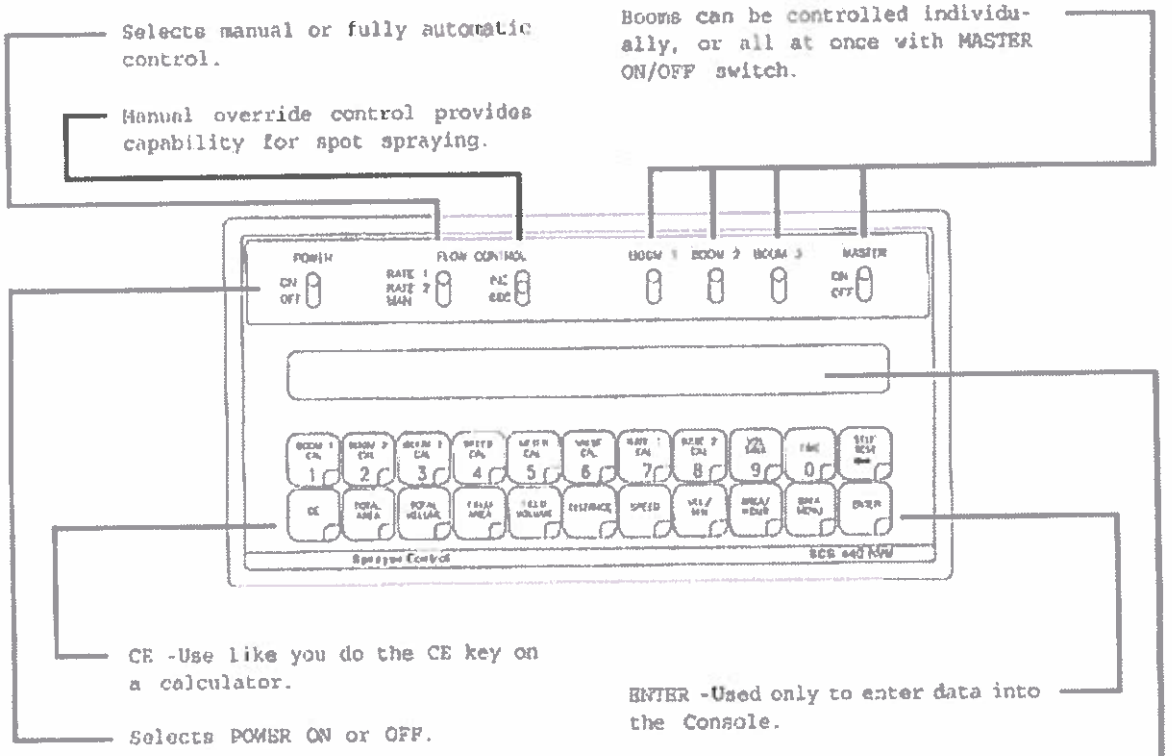
a) The SCS control console features a large, easy-to-read four digit display and easy-to-operate controls. There is a push button control that allows the operator to display the operational ground speed range, the computer application rate, nozzle pressure, via a bar graph. If, for any reason, the control console cannot maintain the user entered application rate, the operator will be warned. A message will be flashed on the display and an alarm will sound to inform the operator of the nature of the error condition.

Cab Control Console Assembly
Figure 3

C.

CONSOLE FEATURES

IMPORTANT: This Console requires selection of **US (VOLUME PER ACRE), SI (VOLUME PER HECTARE),** or **TU (1,000 SQ. FT.)** area; **SP1 WHEEL DRIVE,** or **SP2 RADAR SPEED SENSOR;** and **C-SD STANDARD VALVE, C-F FAST VALVE, C-FC FAST CLOSE VALVE, C-P PWM VALVE** or **C-PC PWM CLOSE VALVE.** Hold SELF TEST key to view selections.



CALIBRATION KEYS -- Used to enter data into the Console to calibrate the system.

BOOM 1 CAL	--	Length of Boom 1
BOOM 2 CAL	--	Length of Boom 2
BOOM 3 CAL	--	Length of Boom 3
SPEED CAL	--	Determined by Speed Sensor
METER CAL	--	Meter Calibration Number
VALVE CAL	--	Valve Response Time
RATE 1 CAL	--	Target Application Rate
RATE 2 CAL	--	Target Application Rate
SELF TEST	--	Simulates Vehicle Speed

FUNCTION KEYS -- Used to Display Data

TOTAL AREA	--	Total Area Applied
FIELD AREA	--	Field Area Applied
FIELD VOLUME	--	Volume Applied to Field
DISTANCE	--	Distance Traveled
SPEED	--	Speed of Vehicle
VOLUME/TANK	--	Volume Remaining in Carrier Tank
TIME	--	24 Hour Clock (Military Time)
DATA MENU	--	Printer Option

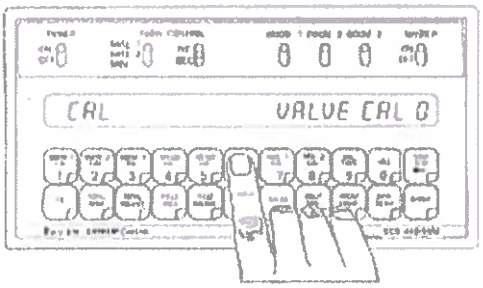
CALIBRATION KEYS	Used to enter data into the Console to calibrate the system
BOOM 1 CAL	Length of Boom 1
BOOM 2 CAL	Length of Boom 2
BOOM 3 CAL	Length of Boom 3
SPEED CAL	Determined by Speed Sensor
METER CAL	Meter Calibration Number
VALVE CAL	Valve Response Time
RATE 1 CAL	Target Application Rate
RATE 2 CAL	Target Application Rate
SELF TEST	Simulates Vehicle Speed

FUNCTION KEYS	Used to Display Data
TOTAL AREA	Total Area Applied
FIELD AREA	Field Area Applied
DISTANCE	Distance Traveled
SPEED	Speed of Vehicle
VOLUME / TANK	Volume Remaining in Carrier Tank
TIME	24 Hour Clock (Military Time)
DATA MENU	Printer Option

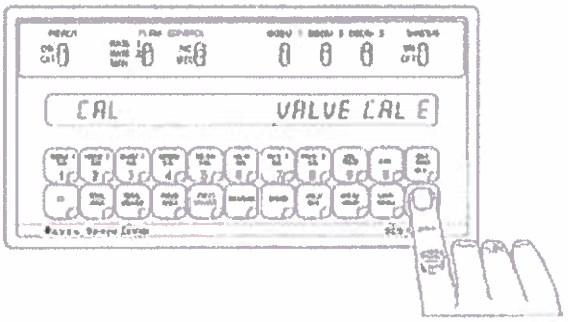
CONSOLE PROGRAMMING

When entering data into the Console, the entry sequence is always the same.

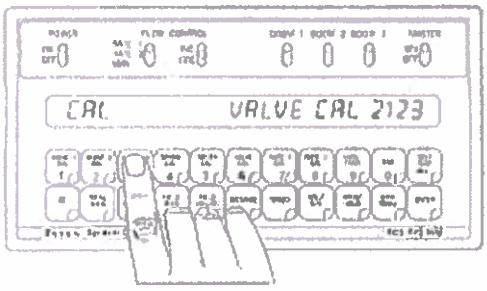
NOTE: DATA MUST BE ENTERED INTO KEYS 1 THRU 8.



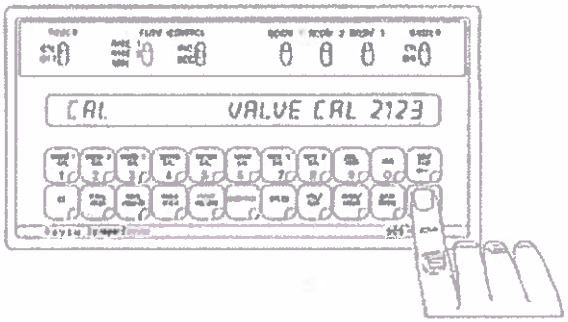
Depress the key in which you wish to enter data.



Depress the ENTER key. An "E" will illuminate in the display.



Depress the keys corresponding to the number you wish to enter (i.e. "2","1","2","3"). The numbers will be displayed as they are entered.



Complete the entry by again depressing the ENTER key.

1. INITIAL CONSOLE PROGRAMMING

When Console power is turned on, after all installation procedures have been completed, the Console will flash CAL and US VOLUME PER ACRE. This means the console must be "calibrated", or programmed, before it can be operated. This is a one-time operation which does not have to be repeated. Turning OFF the POWER ON/OFF switch does not affect the Console memory. All data is retained.

NOTE: If an entry selection error is made during steps 1-6, place the power ON/OFF switch to OFF. Depress [«] and hold while placing the power ON/OFF switch to ON. This will reset the console.

The display will show CAL US VOLUME PER ACRE. The following steps must be followed:

1) Display US-VOLUME PER ACRE, SI-VOLUME PER HECTARE, or TU-VOLUME PER 1000 SQ FT.

   a) Depressing momentarily [«] steps the display from US-VOLUME PER ACRE to SI-VOLUME PER HECTARE.

   b) Depressing momentarily [«] steps the display from SI-VOLUME PER HECTARE to TU-VOLUME PER 1000 SQ FT.

   c) Depressing momentarily [«] steps the display from TU-VOLUME PER 1000 SQ FT to US-VOLUME PER ACRE.

2) Selecting US, SI, or TU.

   a) To select US, SI, or TU, step [«] until the desired code is displayed.

   b) Momentarily depress [ENTER], the display will now display CAL SP1-WHEEL DRIVE.

3) Display SP1-WHEEL DRIVE or SP2-RADAR SPEED SENSOR.

   a) Depressing momentarily [«] steps the display from SP1 to SP2.

   b) Depressing momentarily [«] steps the display from SP2 to SP1.

4) Selecting SP1 or SP2.

   a) To select SP1 or SP2, step [«] until desired code is displayed.

   b) Momentarily depress [ENTER], the display will now display CAL C-SD-STANDARD VALVE.

5) Display C-SD-STANDARD VALVE, C-F-FAST VALVE, C-FC-FAST CLOSE VALVE, C-P-PUM VALVE, or C-PC-PUM CLOSE VALVE.

   a) Depressing momentarily [«] steps the display from C-SD to C-F.

   b) Depressing momentarily [«] steps the display from C-F to C-FC.

c) Depressing momentarily [C] steps the display from C-FC to C-P.

d) Depressing momentarily [C] steps the display from C-P to C-PC.

e) Depressing momentarily [C] steps the display from C-PC to C-SD.

6) Selecting C-SD, C-F, C-FC, C-P or C-PC.

a) To select C-SD, C-F, C-FC, C-P or C-PC, step [C] until desired code is displayed.

b) Momentarily depress [ENTER], the display will now display CAL SELF TEST 0.0.

7) Enter width in inches [cm] of BOOM 1 in the [BOOM 1 CAL 1].

8) Enter width in inches [cm] of BOON 2 in [BOOM 2 CAL 2].

If there is only one boom, enter a "0" for width of BOOM 2.

9) Enter width in inches [cm] of BOOM 3 in [BOOM 3 CAL 3].

If there is only one or two booms, enter a "0" for width of BOOM 3.

10) Enter SPEED CAL calibration number in [SPEED CAL 4].

11) Enter the METER CAL calibration number in [METER CAL 5].

12) Enter appropriate VALVE CAL calibration number (2123, 743, or 43) in [VALVE CAL 6].

13) Enter the target RATE 1 (GPA) [lit/ha] {GPK} in [RATE 1 CAL 7].

14) Enter the target RATE 2 (GPA) [lit/ha] {GPK} in [RATE 2 CAL 8].

(If a second rate is not used, enter the same rate as RATE 1 CAL).

NOTE: RATE 2 should not be more than 20% different from RATE 1 or else spray pattern may suffer.

PROGRAMMING THE CONSOLE IS NOW COMPLETED.
The flashing "CAL" will now extinguish. If not, repeat procedure starting at Step 7. After the console is programmed, if there is a need to change initial console programming (working units, speed sensor programs, or valve drivers), hold [SELECT] for 30 seconds. The display will flash the current program setting. Press [▲] to switch to the desired selection. Press [ENTER] to complete entry. Repeat procedure as necessary for speed (SP1, SP2) and valve driver selections (C-SD, C-F, C-FC, C-P, C-PC).

ENTERING ADDITIONAL DATA:

Data may be entered in the [VOL. TANK 9] and [INC. 0] although it is not required for the operation of the system.

1) **ENTERING VOLUME:**
Enter the estimated VOLUME in the TANK in [VOL. TANK 9]. Each time the tank is refilled, this number must be re-entered.

2) **ENTERING TIME, DATE, AND POWER DOWN:**
Definition of Time, Date, and Power Down Key:

[INC. 0] Depressing this key displays selected Time.
EXAMPLE: Display will display RATE 0.0 and TIME 0:00.

[INC. 0] Depressing this key again after selecting TIME increments through desired features.
EXAMPLE: TIME, MONTH, DAY, YEAR, and POWER DOWN DAY.

3) **Enter TIME**
a) Select TIME
b) Enter TIME when display shows RATE 0.0 TIME 0:00.

> **NOTE:** This is a 24 hour clock. Therefore, all time after 12:59 p.m., add 12 hours. Thus, 8:30 a.m. is entered as 8:30, but 1:30 p.m. is entered as 13:30 in the keyboard.

4) **Enter MONTH**
   a) Select MONTH
   b) Enter MONTH when display shows *RATE 0.0 MONTH 1.*

5) **Enter DAY**
   a) Select DAY
   b) Enter DAY when display shows *RATE 0.0 DAY 1.*

6) **Enter YEAR**
   a) Select YEAR
   b) Enter YEAR when display shows *RATE 0.0 YEAR 00.*

7) **POWER DOWN FEATURE**

If the Console is not used for 10 days, it will go into a power down (low power) mode of operation. In this mode, all data will be retained, but the time of day clock will reset to 0:00. The delay time is initially set at 10 days, but can be changed by the user.

   a) Enter POWER DOWN
      1) Select POWER DOWN
      2) Enter POWER DOWN when display shows *POWERDOUN DAY 10.*

2. OTHER DISPLAY FEATURES

1) To display TOTAL AREA covered, momentarily depress  .

   To "zero out" this total at any time, enter a

2) To display TOTAL VOLUME sprayed, momentarily depress  .

   To "zero out" this total at any time, enter a "0" in this key.

3) To display FIELD AREA covered, momentarily depress  .

   To "zero out" this total at any time, enter a "0" in this key.

4) To display FIELD VOLUME sprayed, momentarily depress  .

   To "zero out" this total at any time, enter a "0" in this key.

5) To display DISTANCE (feet) [meters] traveled, momentarily depress  . To "zero out" this total at any time, enter a "0" in this key.

6) To display SPEED, momentarily depress  .

7) To display VOL/MIN, momentarily depress  .

8) To display AREA/HOUR, momentarily depress  . This is an actual calculation of AREA/HOUR at the present speed you are going. It is not an average over a period of time.

9) To display US, SI, or TU; SP1 or SP2; and C-SD, C-F, C-FC, C-P or C-PC after being selected, depress  .

3. SELF TEST FEATURE

SELF-TEST allows speed simulation for testing the system while vehicle is not moving. Enter the simulated operating speed in  . If 6 MPH [10 km/h] is desired, enter 6.0 [10.0]. Verify SPEED by depressing  . The SELF-TEST speed will clear itself when motion of vehicle is detected by the Speed Sensor. A SPEED CAL value of 900 [230] or greater is recommended when operating in this mode.

NOTE: To prevent nuisance clearing of self-test speed, disconnect speed connector on back of Console when Radar Speed Sensors are used.

INITIAL SYSTEM SET-UP

1) Fill tank with water only. (If positive displacement pump is used, open pressure relief valve, PRV).

2) Place MASTER ON/OFF switch to ON and BOOM ON/OFF switches to OFF.

3) Place RATE 1/RATE2/MAN switch to MAN

4) Place POWER ON/OFF switch to ON.

5) Verify that Boom Widths, SPEED CAL, METER CAL, VALVE CAL, and RATE CALS have been entered correctly into the console. In SELF TEST mode, enter the normal sprayer operating sped.

6) Run pump at normal operating RPM

7) If centrifugal pump is used, proceed with Step 8. If positive displacement pump is used, set pressure relief valve (PRV) to 6 PSI [450 kPa].

8) Verify that boom valves operate and that no nozzles are plugged by operating the BOOM ON/OFF switches.

9) Place all BOOM ON/OFF switches to ON.

10) Hold the FLOW CONTROL switch to INC position until pressure is at its maximum. This assures that the motorized Control Valve is fully open. Verify maximum pressure and RATE. (Pressure gauge is not supplied).

NOTE: A pressure gauge MUST be installed to properly monitor the system.

11) Adjust agitator line hand valve for desired agitation. Verify maximum pressure is still present.

12) Hold the FLOW CONTROL switch to DEC position until pressure is at its minimum. This assures that the motorized Control Valve is fully closed. Verify minimum pressure and RATE.

INITIAL SYSTEM FIELD TEST

1) Drive down field or road at target speed with sprayer booms off, to verify SPEED readout on Console

2) Turn on sprayer and booms and place the RATE 1/RATE 2/ MAN switch to RATE 1. Increase or decrease speed by one MPH [2 km/h]. The system should automatically correct to the target application rate.

3) If, for any reason, the system is unable to correct to the desired RATE, check for an empty tank, a plugged line, a malfunctioning pump, improper vehicle speed, or a defect in the system.

4) If the system does not appear to be correcting properly, first review INITIAL SYSTEM SET-UP, then refer to TROUBLESHOOTING GUIDE.

5) At the end of each row, switch the MASTER ON/OFF to OFF to shut off flow. This also shuts off the area totalizer.

6) Verify area covered and volume used.

PREVENTIVE MAINTENANCE

Preventive maintenance is most important to assure long life of the system. The following maintenance procedures should be followed on a regular basis:

1) Flush entire system with water after use of suspension type chemicals. Failure to clean system can result in the crystallization of chemicals which may plug the flow meter, lines, and/or tips.

2) Flush and drain sprayer before storing. **FREEZING TEMPERATURES MAY DAMAGE FLOW METER IF WATER IS NOT DRAINED.**

3) Remove flow meter at the end of each spraying season. Clean flow meter turbine and inlet hub. Clean off all metal filings and wet table powders which have hardened on the plastic and metal parts. Check the inlet hub and turbine assembly for worn or damaged turbine blades and bearings. Flush flow meter with clear water and drain.

KEEP FROM FREEZING

4) Remove console when not in use for extended periods.

PRE-OPERATION PROCEDURE

1) Fill the Product Tank

   a. Using a Bulk Storage Facility (In-Plant, See Figure 9)

      i. Connect the fill hose to the Suction Valve.

      ii. Place the manifold system valves in the (In-Plant) On Load and Off Load positions:

VALVE A.	BYPASS	SILVER	CLOSED
VALVE B.	SUMP	RED	OPEN
VALVE C.	SUCTION	BLUE	OPEN
VALVE D	PRESSURE	BLACK	CLOSED

      iii. Fill the tank to the desired quantity and close the Suction Valve.

   b. Using the De-Icer Pro unit Pumping System to On Load (See Figure 10)

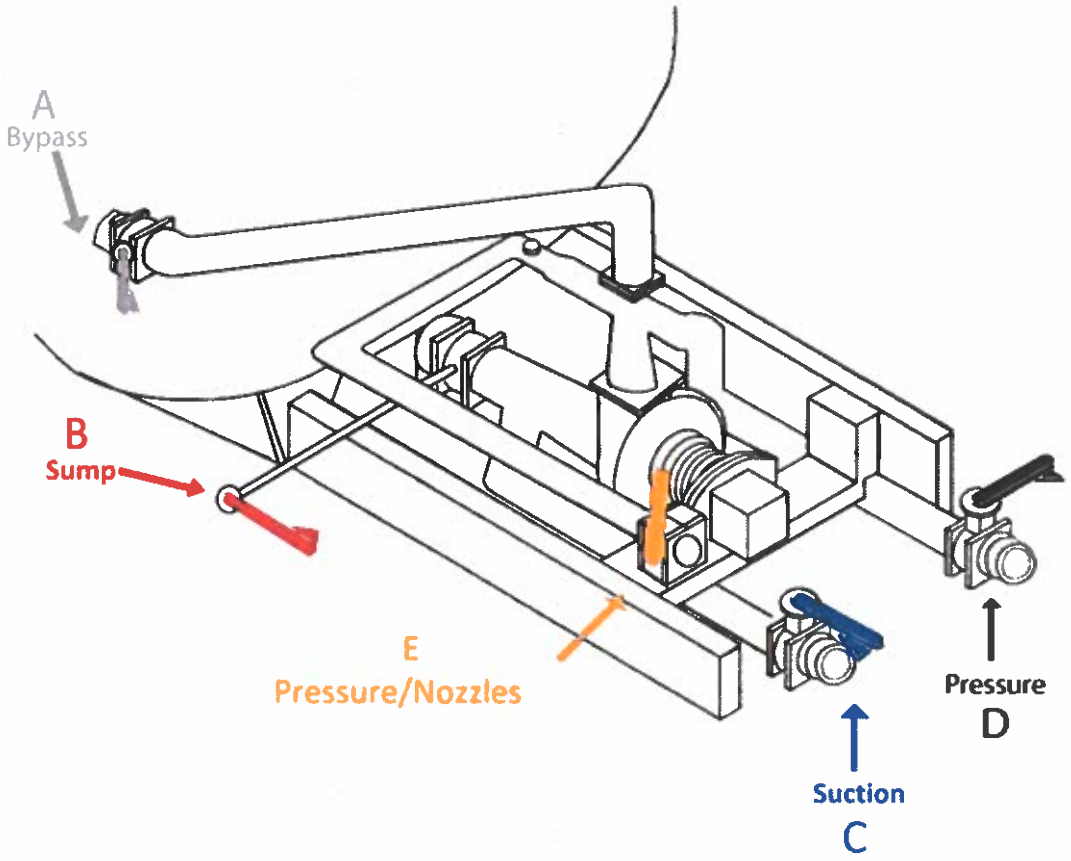
      i. Connect the fill hose to the Suction Valve

      ii. Place the manifold system valves in the On Load positions

VALVE A.	BYPASS	SILVER	OPEN
VALVE B.	SUMP	RED	CLOSED
VALVE C.	SUCTION	BLUE	OPEN
VALVE D	PRESSURE	BLACK	CLOSED

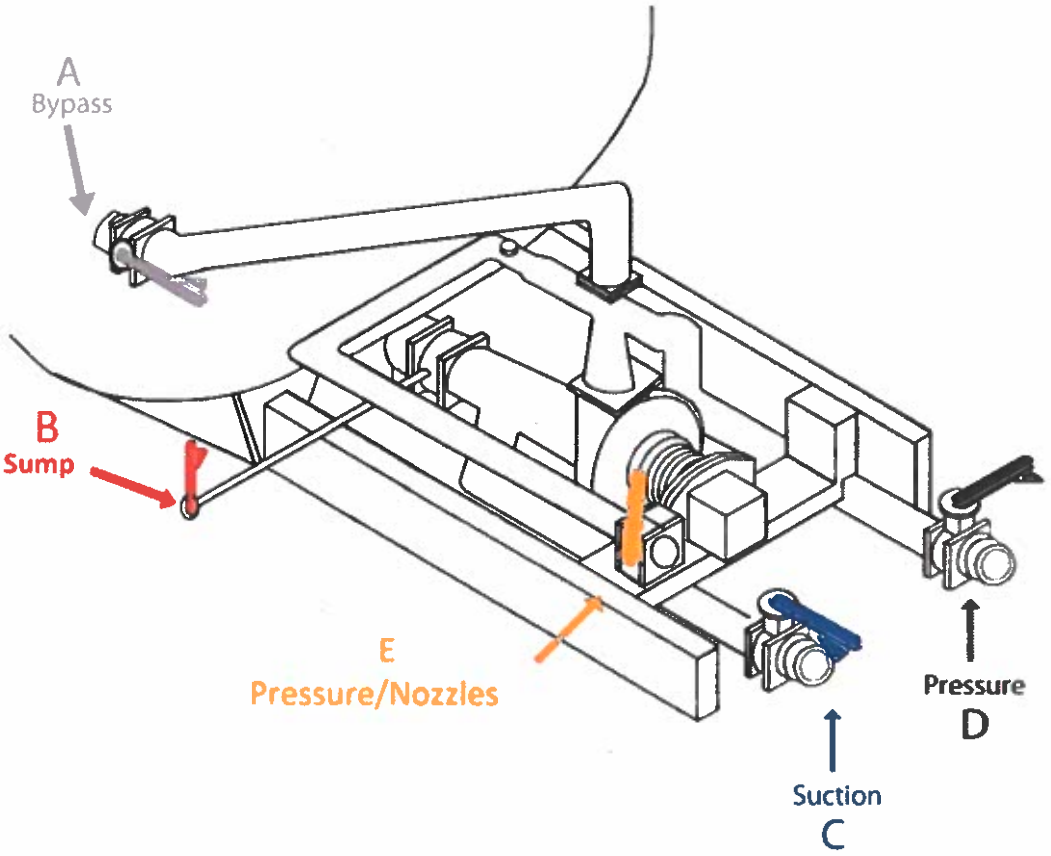
CAUTION: Do not run the product pump dry. Excessive heat and component wear will cause pump failure.

CAUTION: Never engage the hydraulic pump when engine speed is more than 1200 rpm.



Valve Positions for Load-On(In-Plant)

Valve A	Bypass	Closed
Valve B	Sump	Open
Valve C	Suction	Open
Valve D	Pressure	Closed
Valve E	Pressure/Nozzles	Closed



Valve Positions for Load-On

Valve A	Bypass	Open
Valve B	Sump	Closed
Valve C	Suction	Open
Valve D	Pressure	Closed
Valve E	Pressure/Nozzles	Closed

iii. Switch product pump switch to on if applicable. Turn hydraulic pump switch on.

iv. On the Computer Console, turn the Master Switch on. Hold the Increase/Decrease switch in the increase position.

v. Increase the engine speed to operating RPM

Note: The product pump speed varies directly with the vehicle engine RPM.

vi. When the tank is filled to the desired quantity, release the Increase/Decrease switch and close the suction valve.

2) Test the Spray Pattern

a. Remove "Safety Pins" from the boom transport rack.

b. Fully extend Left and Right Booms.

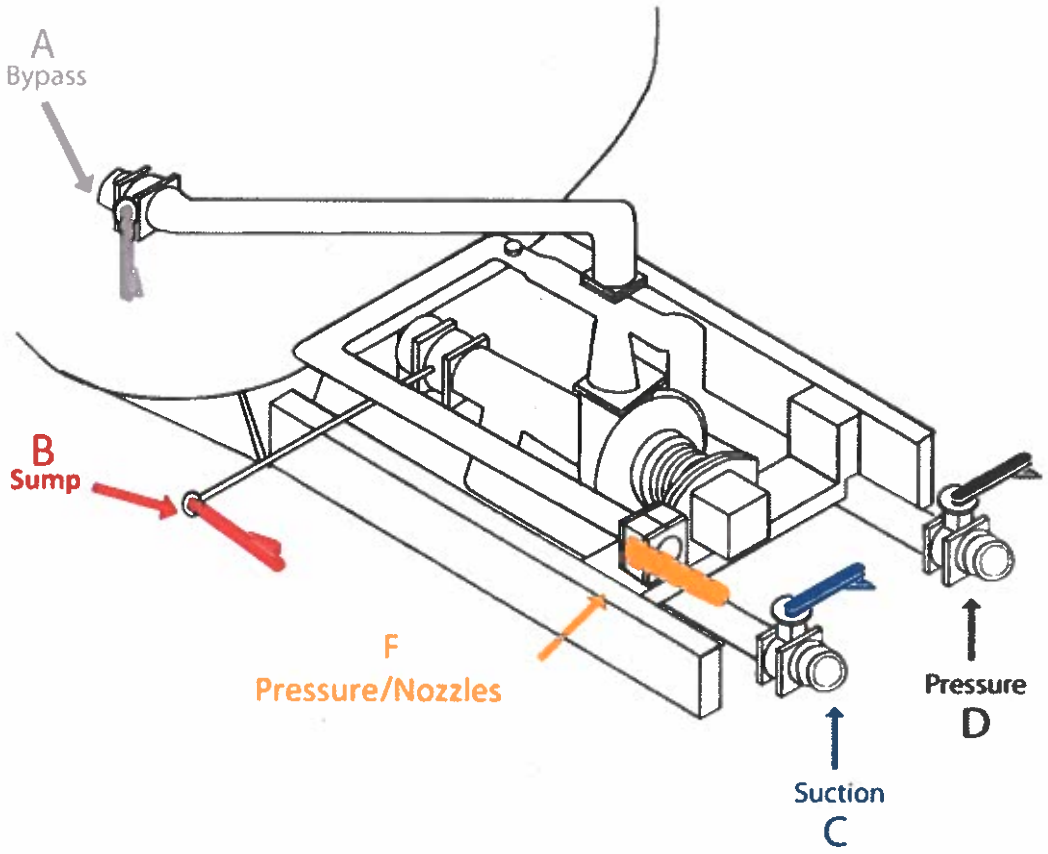
c. Place the manifold system valves in the De-Icing positions (See Figure 11)

VALVE A.	BYPASS	SILVER	CLOSED
VALVE B.	SUMP	RED	OPEN
VALVE C.	SUCTION	BLUE	CLOSED
VALVE D	PRESSURE	BLACK	CLOSED

d. Start the hydraulic pump/product pump and listen for unusual noises or excess vibration. Shut down immediately if the unit operates abnormally.

i. Switch product pump switch to on if applicable. Turn hydraulic pump switch on.

ii. On the Computer Console, turn on the Master Switch and hold the Increase/Decrease switch in the Increase position.



Valve Positions for De-Icing

Valve A	Bypass	Closed
Valve B	Sump	Open
Valve C	Suction	Closed
Valve D	Pressure	Closed
Valve E	Pressure/Nozzles	Open

iii. Increase the engine speed to operating RPM.

e. Open the boom nozzle switches and inspect all of the nozzles for an uninterrupted flow. Clean nozzles if necessary.

f. Turn the Boom switches and the Master switch off.

g. Retract the Left and Right Booms.

h. Turn the Hydraulic Pump switch to Off.

3) Placing Unit in Operation

a. Pre Startup Checklist

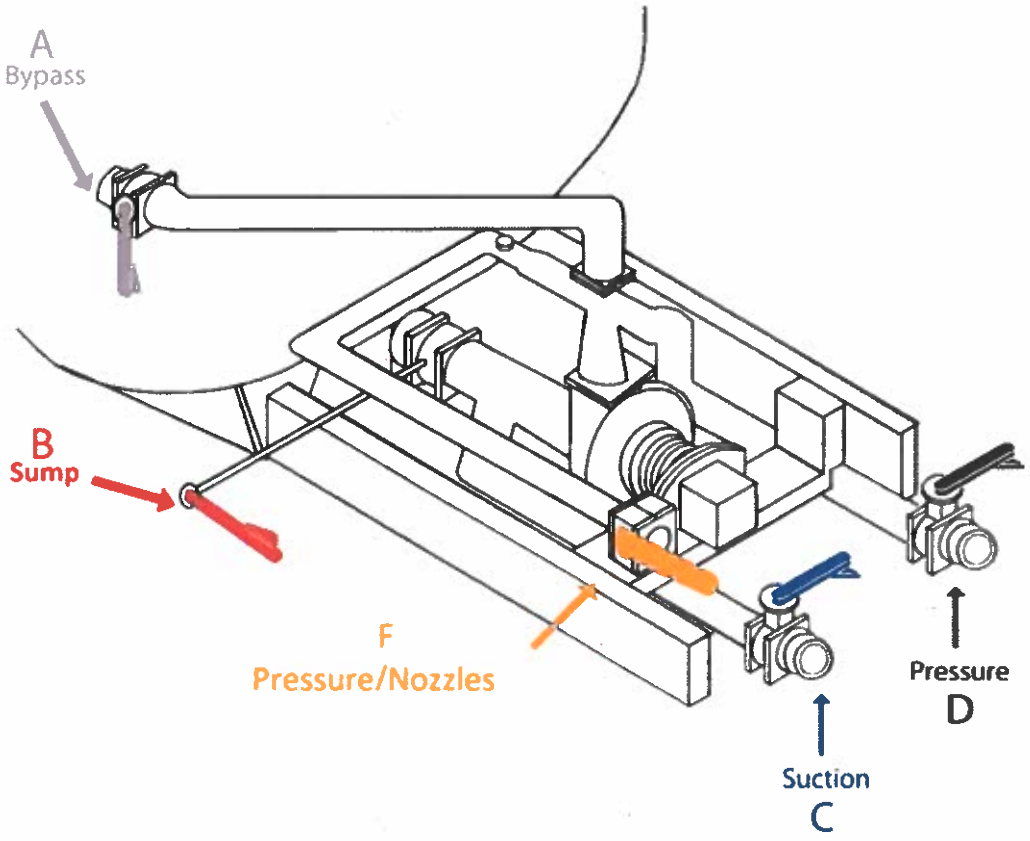
WARNING: THE OPERATOR MUST HAVE A FULL UNDERSTANDING OF THE PROCEDURES DESCRIBED IN SECTION 2: OPERATIONS; PART 2: SAFETY PRECAUTIONS; AND PART 3: DE-ICER UNIT SETUP; OF THIS MANUAL.

CAUTION: In temperatures below 32°F, run the hydraulic system in idle for 20 to 30 minutes or until the hydraulic oil temperature reaches 100°F.

1. Place the manifold system valves in the De-Icing positions (See Figure 11)

VALVE A.	BYPASS	SILVER	CLOSED
VALVE B.	SUMP	RED	OPEN
VALVE C.	SUCTION	BLUE	CLOSED
VALVE D	PRESSURE	BLACK	CLOSED

2. Select the desired Application Rate using the Application Rate toggle switch on the Computer Console.



Valve Positions for De-Icing

Valve A	Bypass	Closed
Valve B	Sump	Open
Valve C	Suction	Closed
Valve D	Pressure	Closed
Valve E	Pressure/Nozzles	Open

3. Select the proper gear to maintain engine RPM between 1800 and 2100 RPM.

B. Startup Instructions:

1. Consult the Truck Chassis Operator Manual for startup instructions.

2. Start the vehicle engine and turn on all safety equipment present on the vehicle (Beacon Lights, Boom Marker Lights, Boom Spot Lights, Tank Spot Lights, and Arrow Boards, etc).

3. Drive the De-Icer Pro to the work area.

4. To Spray De-Icing Product:

   a. De-Icer Boom Sprayer Position

      i. Remove "SAFETY PINS" from slider rack and/or boom transport racks or unlock booms by pushing the boom lock toggle to the Off position.

CAUTION: Never engage the hydraulic pump when engine speed is more than 1200 rpm.

      ii. Turn the HYDRAULIC PUMP switch to ON. Red light appears when hydraulic pump is ON.

      iii. Fully extend the Right Boom

      iv. Fully extend the Left Boom.

      v. Raise or lower the Boom and Center Rack to the desired spray height.

   b. De-Icer Boom Nozzle Operation (See Figure 8)

      i. All Nozzle Valves on: Push De-Icer nozzles to ON.

      ii. If only a specific area of nozzles is to be used, the nozzle valves may be used independently. Use switches for left nozzle, right nozzle, or center nozzle as desired.

c. Shutdown Procedure

i. De-Icer

1. To stop spraying, turn the Boom switches and Master Switch off on the De-Icer Pro Computer Console.

2. Nozzles, De-Icer Push nozzle switches to Off.

3. Booms

a. Raise or lower the Rack completely to its Transport Position

b. Retract and Swing in the Right Boom and engage the transport bracket.

c. Retract and Swing in the Left Boom and engage the transport bracket.

d. Replace the safety pin(s) in Slider Rack and/or Boom Transport Racks.

e. Turn off the Beacon Lights, Boom Marker Lights, Boom Spot Lights, and Tank Spot Lights as needed.

ii. Turn the hydraulic pump switch Off.

iii. Truck

Turn off the Beacon Lights, Boom Marker Lights, Boom Spot Lights, and nonessential truck lights as needed.

Note: An alarm sound and an Inaccurate Application Indicator (lights while spraying) warns of an inaccurate application of the de-icer liquid product, where spraying is not proportional to vehicle ground speed. The inaccurate application may be caused by one of the following conditions:

- Excessive vehicle ground speed
- Vehicle gearing too high
- Hydraulic pump not engaged
- Excessive sparging

- Pump rpm not sufficient to supply adequate flow and pressure to the system
- De-Icer liquid product tank empty.
- Position of valves on pumping system incorrect.

3. De-Icer Parking Shutdown Procedures

1. Unloading the Product Tank (if necessary)

1. Using Bulk Storage (In Plant) Pumping System

a. Connect a discharge hose to the Suction Valve.

b. Place the manifold system valves in the (In Plant) On Load and Off Load positions (See Figure 9).

VALVE A.	BYPASS	SILVER	CLOSED
VALVE B.	SUMP	RED	OPEN
VALVE C.	SUCTION	BLUE	OPEN
VALVE D	PRESSURE	BLACK	CLOSED

c. Off load Product Tank to desired capacity.

2. Using De-Icer unit Pumping System to Off Load

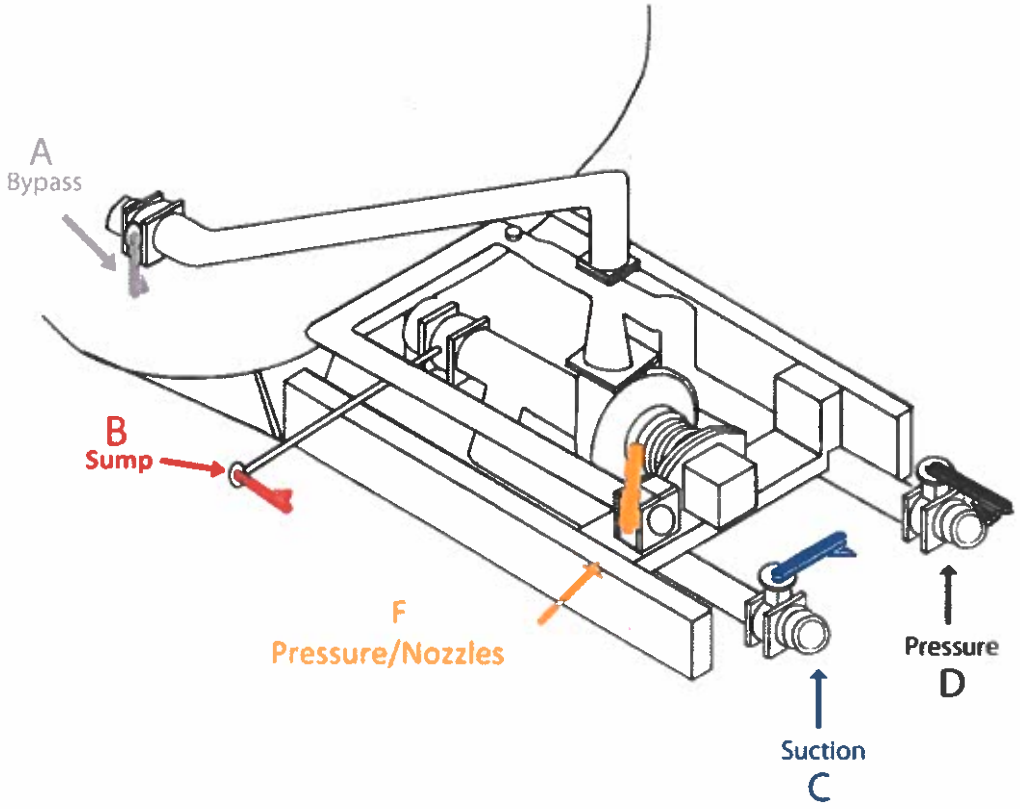
a. Connect a discharge hose to the Pressure Valve.

b. Place the manifold system valves to Off Load (See Figure 12).

VALVE A.	BYPASS	SILVER	CLOSED
VALVE B.	SUMP	RED	OPEN
VALVE C.	SUCTION	BLUE	CLOSED
VALVE D	PRESSURE	BLACK	OPEN

c. Procedure

CAUTION: Never engage the hydraulic pump when engine sped is more than 1200 rpm.



Valve Positions for Unloading

Valve A	Bypass	Closed
Valve B	Sump	Open
Valve C	Suction	Closed
Valve D	Pressure	Open
Valve E	Pressure/Nozzles	Closed

1. Switch hydraulic pump switch to On.

CAUTION: Do not run the product pump dry. Excessive heat and component wear will cause pump failure.

2. Switch product pump switch to On if applicable

3. On the Computer Console, hold the Increase/Decrease Switch in the Increase position. The system will begin pumping at the spray bar.

4. Increase the engine speed to operating RPM.

Note: The Product pump speed varies directly with the vehicle engine RPM

5. Off Load the tank to the desired quantity.

d. When Off-Loading is complete, release the Increase/Decrease Switch and turn off the Master Switch to stop the product pump.

e. Close the Pressure manifold Valve

2. Truck

1. Turn off all lights (as needed).

2. Consult the Truck Chassis Operator Manual for truck shutdown procedure.

3. Checklist

1. VERIFY that all procedures in "Shutdown Procedures" have been performed.

2. Inspect the exterior of the De-Icer unit for:

a. Structural wear or damage.

b. Rust.

c. Hydraulic oil leaks

d. Failure of exterior electrical components.

e. Failure of exterior mechanical components

3. NOTE any operational malfunctions in:

a. Batts De-Icer Pro computer system

b. Batts De-Icer Pro electrical, hydraulic, pneumatic, and mechanical systems

c. Truck Chassis

4. REPORT all operational malfunctions and structural problems to the maintenance department IMMEDIATELY.

4. Cleaning the De-Icer Pro Unit

1. General

All De-Icer users should clean and rinse the unit thoroughly after working and before storage. Cleaning the inside of the tank, the pumping system, the boom plumbing, as well as the exterior of the unit will keep it looking and performing well.

The De-Icer unit might be used to spray de-icing chemicals of different manufacturers or liquids other than de-icing chemicals. The De-Icer unit should be cleaned between uses of different chemicals (i.e. fertilizers, derubberizing solutions, deicing fluids) to prevent reactive chemical combinations from becoming hazardous.

2. Empty the Unit

WARNING: ANY TIME DE-ICING FLUIDS OR CHEMICAL LIQUIDS OTHER THAN DE-ICING FLUIDS ARE OFF-LOADED OR DRAINED FROM THE DE-ICER UNIT, USE SUITABLE STORAGE CONTAINERS FOR EACH LIQUID. DO NOT MIX DIFFERENT LIQUIDS OR CHEMICALS IN STORAGE CONTAINERS. SERIOUS INJURY CAN RESULT FROM UNSAFE STORAGE PRACTICES.

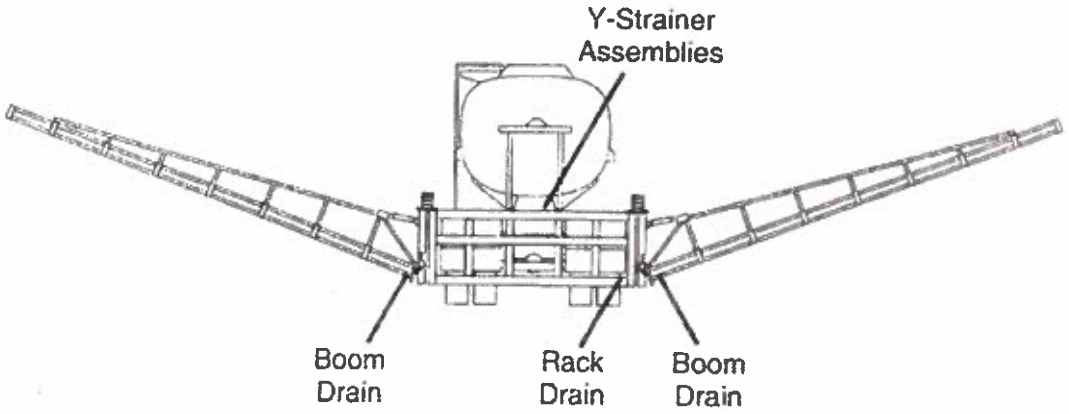
WARNING: NEVER PERFORM ADJUSTMENTS OR REPAIRS ON THE DE-ICER UNIT WHILE THE HYDRAULIC PUMP, CLUTCH, OR HYDRAULIC MOTOR IS OPERATING. SERIOUS INJURY CAN RESULT FROM UNSAFE PRACTICES.

WARNING: BEWARE OF PINCH POINTS WHEN EXTENDING OR STOWING THE BOOM AND RACK ASSEMBLY. SERIOUS PROPERTY DAMAGE OR PERSONAL INJURY MAY RESULT.

WARNING: NEVER LOWER OR RAISE RACK UNTIL BOMS ARE FULLY EXTENDED. SERIOUS PROPERTY DAMAGE OR PERSONAL INJURY MAY RESULT.

WARNING: DURING STORAGE, GASES CAUSED BY REACTIVE CHEMICALS LEFT IN THE PUMPING SYSTEM MAY PRODUCE PRESSURE. THE COMPLETE DE-ICER SYSTEM SHOULD REMAIN EMPTY. OPEN THE ON-LOAD VALVE, THE OF-LOAD VALVE, THE BY-PASS VALVE, AND ALL DRAIN VALVES TO ALLOW THE PUMPING SYSTEM AND PRODUCT TANK TO VENT TO THE ATMOSPHERE.

1. Off-Load the product tank (if necessary).
2. At the base of the product pump, open the small valve and drain the pumping assembly.
3. Drain the Booms (See Figure 13)
    a. From the control console, open the boom shut-off valves.
    b. On a level surface, extend the booms and raise them slightly.
    c. At the hinge end of each boom, open the small valve and drain the boom hoses.
    d. At the end of the rack, open the small valve and drain the rack hose.
4. Drain the Y-Strainers by removing Y-Strainer caps and screens and reinstall.
5. Drain the Hose Reel assembly.
6. Drain the Flusher Assembly
    a. From the control console, open the flusher valves and drain the flusher assembly.
    b. Open the small valves on the flusher manifolds and drain the manifolds.



Drain the Booms
Figure 13

7. Close all of the drain valves.

3. Clean the Unit

Consult the manufacturer of de-icing chemicals or liquids other than de-icing chemicals about the reactive status of those chemicals. Use each chemical manufacturers' recommended guideline (detergents or methods) for cleaning equipment of their chemical.

1. Fill the product tank with the specific chemical manufacturers' cleaning solution.

2. Agitate the cleaning solution through the product tank.

a. Set the De-Icer unit Valve Handle Positions to Agitate liquids (See Figure 14)

VALVE A.	BYPASS	SILVER	OPEN
VALVE B.	SUMP	RED	OPEN
VALVE C.	SUCTION	BLUE	CLOSED
VALVE D	PRESSURE	BLACK	CLOSED

b. Procedure

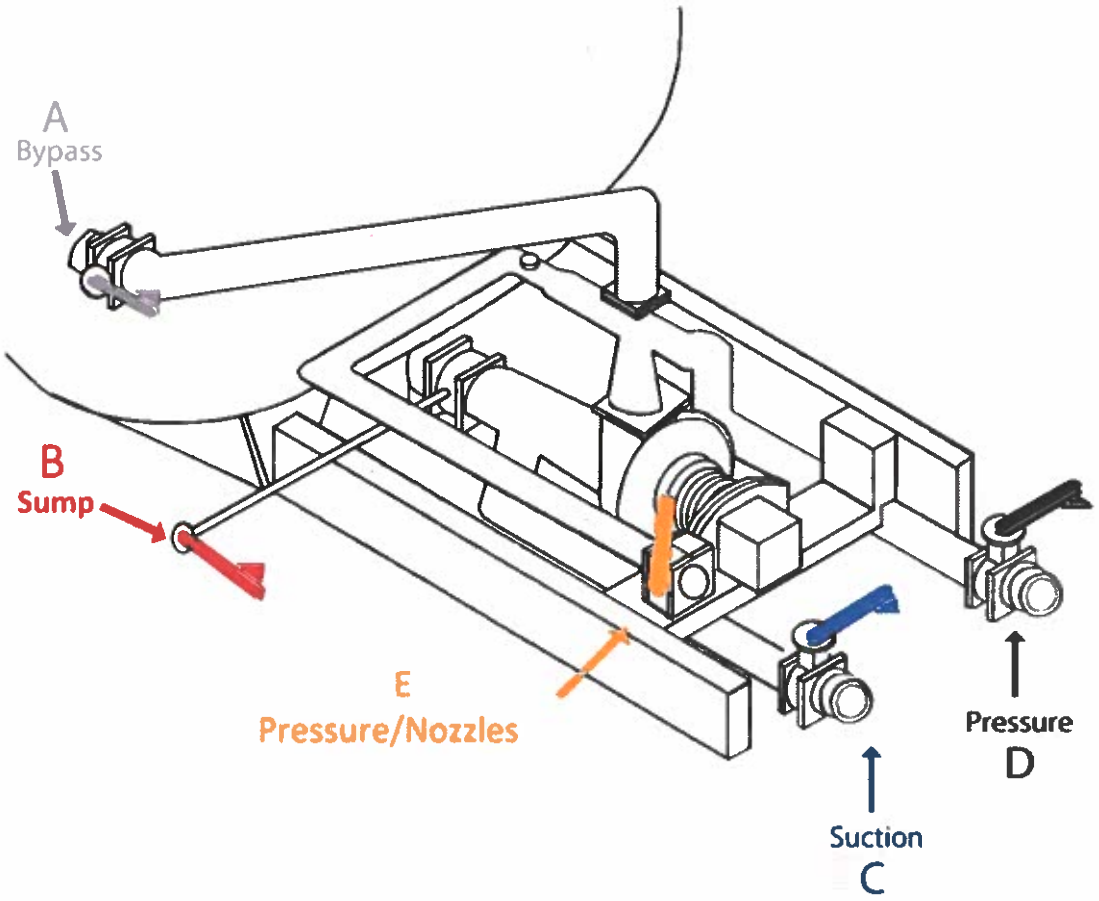
CAUTION: Never engage the hydraulic pump when engine speed is more than 1200 rpm.

1. Switch hydraulic pump switch to On.

CAUTION: Do not run the product pump dry. Excessive heat and component wear will cause pump failure.

2. Switch product pump switch to On if applicable.

3. On the Computer Console, Hold the OFF/AUTO/FLUSH switch in the FLUSH position and press the OPER/SET UP touch switch. This will lock the control system in the FLUSH mode until the OFF/AUTO/FLUSH switch is set to the OFF position. The system will begin pumping at the spray bar pressure entered as the FLUSH PRESSURE Constant.



Valve Positions For Agitation

Valve A	Bypass	Open
Valve B	Sump	Open
Valve C	Suction	Closed
Valve D	Pressure	Closed
Valve E	Pressure/Nozzles	Closed

4. Increase the engine speed to operating RPM

Note: The Product pump speed varies directly with the vehicle engine RPM.

3. Reset the Valve Handles to spray and alternate spraying the cleaning solution through the booms and nozzles, flushers, and the hose reel.

4. When the product tank is empty or spraying is complete, release the Increase/Decrease Switch and turn off the Master Switch.

4. Rinse the Unit using only water

To prevent detergent residue from drying or crystallizing in the system, one or more complete tanks of clean water should be flushed through the unit.

1. Fill the product tank with clean water.

2. Agitate water through the product tank.

3. Reset the Valve Handles to Spray and alternate spraying at least one complete tank of water through the booms and nozzles, flushers, and the hose reel.

4. When the product tank is empty or spraying is compete, shut down the unit.

5. Empty all water from the unit.

1. Off-Load the product tank (if necessary).

2. At the base of the product pump, open the small valve and drain the pumping assembly.

3. Drain the Y-Strainers by removing Y-Strainer caps and screens and reinstall.

4. Drain the Booms, Flusher Assembly and the Hose Reel Assembly as needed.

5. Leave the On-Load valve and the Off-Load valve open.

6. During storage, the pumping system valves should remain open and the plumbing system empty. Open the On-Load valve, the Off-Load valve, the By-Pass valve and all drain valves to allow the pumping system and product tank to vent to the atmosphere.

7. Use a high pressure washer with detergent to clean all outside surfaces of the tank, booms, pumping system, and running gears.

SHIPPING

1. Shipment

   1. General

      Batts De-Icer Pro units are usually shipped assembled and ready to place into operation. Some fixtures such as mud flaps and boom nozzles are sometimes shipped loose, boxed or banded to the unit. Ensure that the fixtures are received for the unit. Remove any excess packing materials, strapping or tape.

   2. Preparation

      a. Empty De-Icer product tank

      b. Perform periodic maintenance

      c. Secure booms and rack in normal transport position and install safety pins in boom transport brackets, rack and all cylinders.

      d. Inspect and tighten if necessary all connections for:

         Tank mounting brackets

         Break backs

         Rack U – bolts

         Flange hardware

         Hydraulic connections

         Boom transport brackets

      e. Remove boom nozzles and store in cab or ship separately.

2. Loading and Unloading

   WARNING: NEVER ATTEMPT TO LIFT DE-ICER UNIT WHEN PRODUCT TANK IS FULL. DANGER TO LIFE AND PROPERTY MAY EXIST.

WARNING: LIFTING STRAPS ON PRODUCT TANK WALKWAY ARE NOT DESIGNED TO LIFT THE ENTIRE UNIT. DO NOT ATTEMPT TO LIFT THE DE-ICER UNIT BY THE TANK STRAPS OR DE-ICER ASSEMBLY SUBFRAME.

CAUTION: EXERCISE EXTREME CAUTION DURING THE UNLOADING PROCESS. KEEP ALL NONESSENTIAL PERSONNEL CLEAR OF THE UNLOADING AREA AT ALL TIMES.

CAUTION: IF ANYTIME THE DE-ICER UNIT IS LIFTED, NONE OF THE DE-ICER ASSEMBLY COMPONENTS I.E. BOOMS, RACK, TANK, TRANSPORT BRACKETS, ARE TO BE USED AS LIFT POINTS. THE COMPLETE NONLOADED UNIT SHOULD BE LIFTED BY A SECURED PLATFORM OR NETTED. LIFTING EQUIPMENT SUCH AS CRANES, HOISTS, OR ELEVATING PLATFORMS SHOULD HAVE A MINIMUM CAPACITY OF 50,000 POUNDS.

A. General

Once the De-Icer unit is loaded on the transport platform, the following procedures must be followed.

B. Tie Down

WARNING: DO NOT USE DE-ICER ASSEMBLY COMPONENTS I.E. TANK, SUBFRAME, RACK, BOOMS, AS TIE DOWN POINTS. IF DE-ICER ASSEMBLY COMPONENTS ARE USED AS TIE DOWN LOCATIONS, SERIOUS PERSONAL INJUR AND PROPERTY DAMAGE MAY RESULT.

1. Set Parking Brakes
2. Block Tires

WARNING: DO NOT USE DE-ICER ASSEMBLY COMPONENTS I.E. TANK, SUBFRAME, RACK, BOOMS, AS TIE DOWN POINTS. IF DE-ICER ASSEMBLY COMPONENTS ARE USED AS TIE DOWN LOCATIONS, SERIOUS PERSONAL INJUR AND PROPERTY DAMAGE MAY RESULT.

3. Secure tie downs to truck chassis, tow hooks, axles, or permanent tie down loops.
4. Attach proper flags and "OVERSIZE LOAD" signage as necessary.

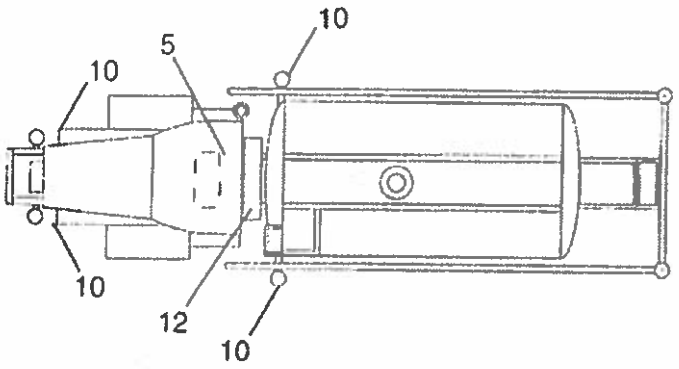
3. Receipt Inspection

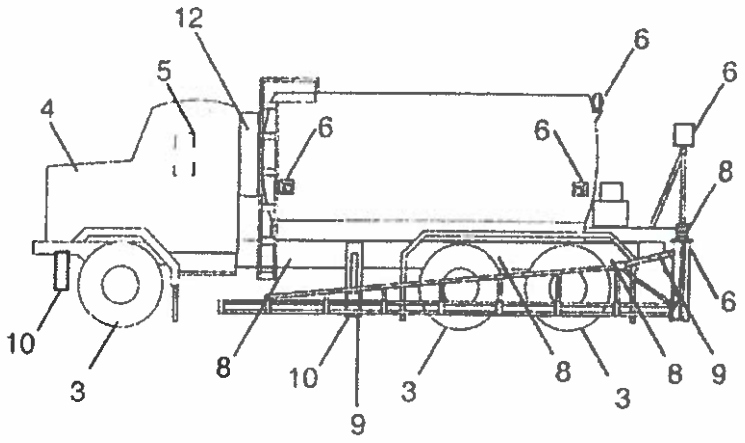
A. Inspect newly arrived De-Icer units immediately for shipping damage. Note any damages or shortages on the shipping documents. Follow the inspection checklist below before putting the unit into operation.

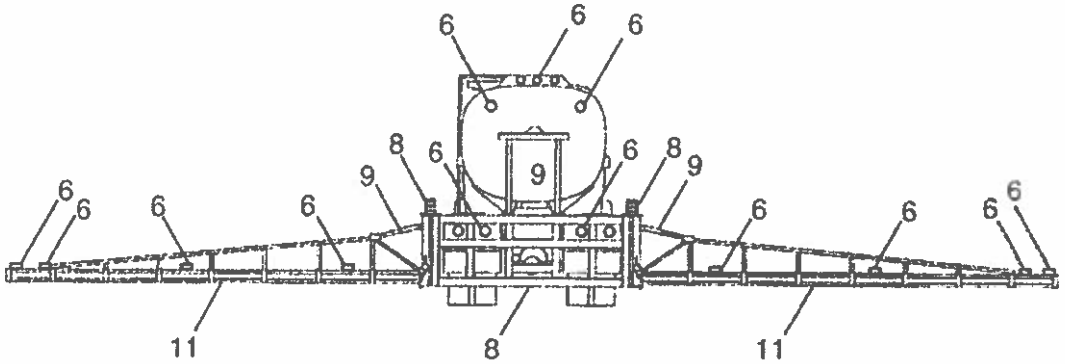
B. Once the De-Icer unit has been shipped to the job site, a suitable level area should be chosen for setup preparation.

C. The Batts De-Icer Pro is usually shipped completely assembled, however, the following procedures should be completed upon delivery to ensure proper operation.

1. Strict compliance to all warnings and cautions stated in Safety Precautions is required.
2. Check unit for obvious structural damage.
3. Check tires for damage and proper inflation, and check lug bolts for tightness.
4. Check engine compartment for obvious damage, loose nuts, or loose fittings.
5. Inspect unit control console for damage or loose fasteners.
6. Check unit for damage to lamps, reflectors, or lenses.
7. Consult the chassis manufacturers' operator and service manuals for delivery setup operations, checklists, and operations procedures.
8. Inspect and tighten, in necessary, all bolted connections for:
    i. Mounting brackets
    ii. Break backs
    iii. Rack U-bolts
    iv. Flange hardware at manual and pneumatically actuated valves
    v. Boom transport brackets
    vi. Mounting hardware on product pump, hydraulic pump, and hydraulic motor







Inspection Points
Figure 15

9. Inspect boom transport brackets and hydraulic cylinders for proper safety pins.

10. Adjust all spray bar nozzles for proper pattern and install all check valves if needed.

11. Inspect and fill hydraulic reservoir to proper level.

12. Inspect hydraulic hoses and fittings for leaks and tighten if necessary.

13. Inspect all tank and boom marker lights, tank and boom spot lights, and all safety lights for proper connection and operation.

NOTE: The above checklist is strictly adhered to and acted upon prior to initial delivery from the factory. However, vibration and general "ROAD WEAR" due to lengthy transport distances, requires execution of this list upon delivery.

STORAGE

1. General

   This section provides directions for extended storage for the Batts De-Icer Pro unit.

2. Lubrication

   Lubricate according to the Periodic Maintenance Table 1.

3. Engine

   Preserve the engine using the procedures outlined in the appropriate engine manuals.

4. Truck Chassis

   Preserve the Truck Chassis in accordance with the procedures outlined in the approximate truck & engine manuals.

5. Finish

   Touch up or repaint worn or damaged paint.

6. Controls

   Cover the control panel with a suitable water repellent covering to protect it from water condensation damage.

7. Tires

   Fill tires to manufacturers' recommended air pressure.

8. Antifreeze

   Drain and flush cooling system and replace antifreeze to accommodate temperatures of geographic location.

9. Hydraulic Tank

   Fill hydraulic tank and cover with a suitable water repellent covering to protect it from water and airborne particle infiltration.

10. Fuel Tanks

Fill fuel tanks to prevent damage from water and condensation.

11. Filters

A. Drain control console air filter.

B. Change hydraulic suction and return line filters as described in the period maintenance schedule, TABLE 1.

12. Cleaning the De-Icer Pro Unit

A. General

All De-Icer users should clean and rinse the unit thoroughly after working and before storage. Cleaning the inside of the tank, the pumping system, the boom plumbing, as well as the exterior of the unit will keep it looking and performing well.

The De-Icer unit might be used to spray de-icing chemicals of different manufacturers or liquids other than the de-icing chemicals. The De-Icer unit should be cleaned between uses of different chemicals (i.e. fertilizers, derubberizing solution, deicing fluids) to prevent reactive chemical combinations from becoming hazardous.

B. Empty the Unit

WARNING: ANY TIME DE-ICING FLUIDS OR CHEMICAL LIQUIDS OTHER THAN DE-ICING FLUIDS ARE OFF-LOADED OR DRAINED FROM THE DE-ICER UNIT, USE SUITABLE STORAGE CONTAINERS FOR EACH LIQUID. DO NOT MIX DIFFERENT LIQUIDS OR CHEMICALS IN STORAGE CONTAINERS. SERIOUS INJURY CAN RESULT FROM UNSAFE STORAGE PRACTICES.

WARNING: NEVER PERFORM ADJUSTMENTS OR REPAIRS ON THE DE-ICER UNIT WHILE THE HYDRAULIC PUMP, CLUTCH, OR HYDRAULIC MOTOR IS OPERATING. SERIOUS INJURY CAN RESULT FROM UNSAFE PRACTICES.

WARNING: BEWARE OF PINCH POINTS WHEN EXTENDING OR STOWING THE BOOM AND RACK ASSEMBLY. SERIOUS PROPERTY DAMAGE OR PERSONAL INJURY MAY RESULT.