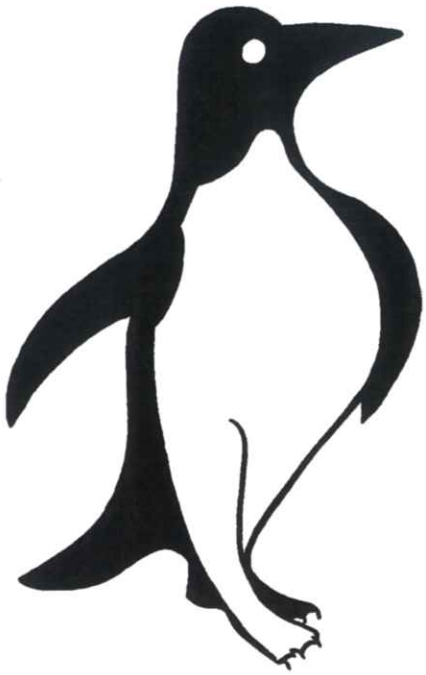
PENGWYN



SW Series

Spreader Control with Optional Alarms and Wetting System

Technical Manual

03/01

Limited Warranty

PENGWYN warrants the SW Series components to be free of defects in material and workmanship, under normal use and service for a period of two (2) years from date of shipment. PENGWYN's obligation under this warranty is limited to repairing or replacing, at its factory or other location designated by PENGWYN, any part or parts thereof which are returned within thirty (30) days of the date when failure occurs or defect is noted, with transportation charges prepaid, and which upon examination appears to PENGWYN's satisfaction to have been defective. **Such free repair or replacement does not include transportation charges, or the cost of installing the new part or any other expense incident thereto. PENGWYN will not be liable for other loss, damage, or expense directly or indirectly arising from the use of its products, nor will PENGWYN be liable for special, incidental or consequential damages.**

Ordinary wear and tear, and damage from abuse, misuse, neglect or alteration are not covered by this warranty. PENGWYN assumes no liability for expenses incurred or repairs made outside PENGWYN's factory except by written consent. PENGWYN's warranty also does not cover the requirement of control box programming. All control box programming is to be performed by the end user after receiving training and with the use of the technical manual. This warranty is null and void if instructions and operating procedures are not followed.

Equipment or parts not manufactured by this company, but which are furnished in connection with PENGWYN products, are covered directly by the warranty of the manufacturer supplying them. However, PENGWYN will assist in obtaining adjustment on such equipment or parts when necessary.

It is recommended that spare parts be purchased for critical items to allow continued operation of equipment during the inspection, evaluation, or repair/replacement process.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES EXPRESSED OR IMPLIED INCLUDING ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE AND OF ANY OTHER OBLIGATION OR LIABILITY OF PENGWYN.

PRODUCT IMPROVEMENT LIABILITY DISCLAIMER

PENGWYN reserves the right to make any changes in or improvements on its products without incurring any liability or obligation whatever and without being required to make any corresponding changes or improvements in products previously manufactured or sold.

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CAUTIONS

DISCONNECT THE AMPHENOL PLUG FROM THE MANIFOLD AND REMOVE CONTROL CONSOLE FROM THE CAB BEFORE WELDING ON THE TRUCK.

TURN THE CONTROL CONSOLE POWER SWITCH OFF BEFORE CONNECTING AND DISCONNECTING BATTERY CABLES, BATTERY CHARGERS, OR JUMPING THE BATTERY.

DO NOT DRILL HOLES IN OR MOUNT AUXILIARY SWITCHES TO THE CONTROL CONSOLE. THIS WILL VOID THE WARRANTY. USE THE CONTROL CONSOLE MOUNTING BRACKET FOR THIS PURPOSE.

DO NOT OVER TIGHTEN SOLENOID COIL NUT, THE COIL SPINDLE IS HOLLOW AND EASILY DAMAGED. BE CAREFUL NOT TO PINCH WIRES UNDER COIL WHEN INSTALLING.

Introduction

Thank you for choosing the PENGWYN SW Series ground-oriented hydraulic spreader control. PENGWYN's goal has always been to provide great customer service and a safe, reliable product that emphasizes:

- **simplicity of operation**
- **operator safety**
- **management control**
- **reduced operating costs**
- **year-round usage**

In order to reach the goal of reliability, the PENGWYN system uses a series of poppet-style solenoid cartridge valves. Poppet valves are "bang-bang" solenoid devices which means they are either on or off. They are reliable, dirt tolerant, inexpensive to repair, contain only static seals, and are not damaged by long periods of sitting idle. These features, as well as the testing done on each system before it leaves the factory, contribute to overall dependability.

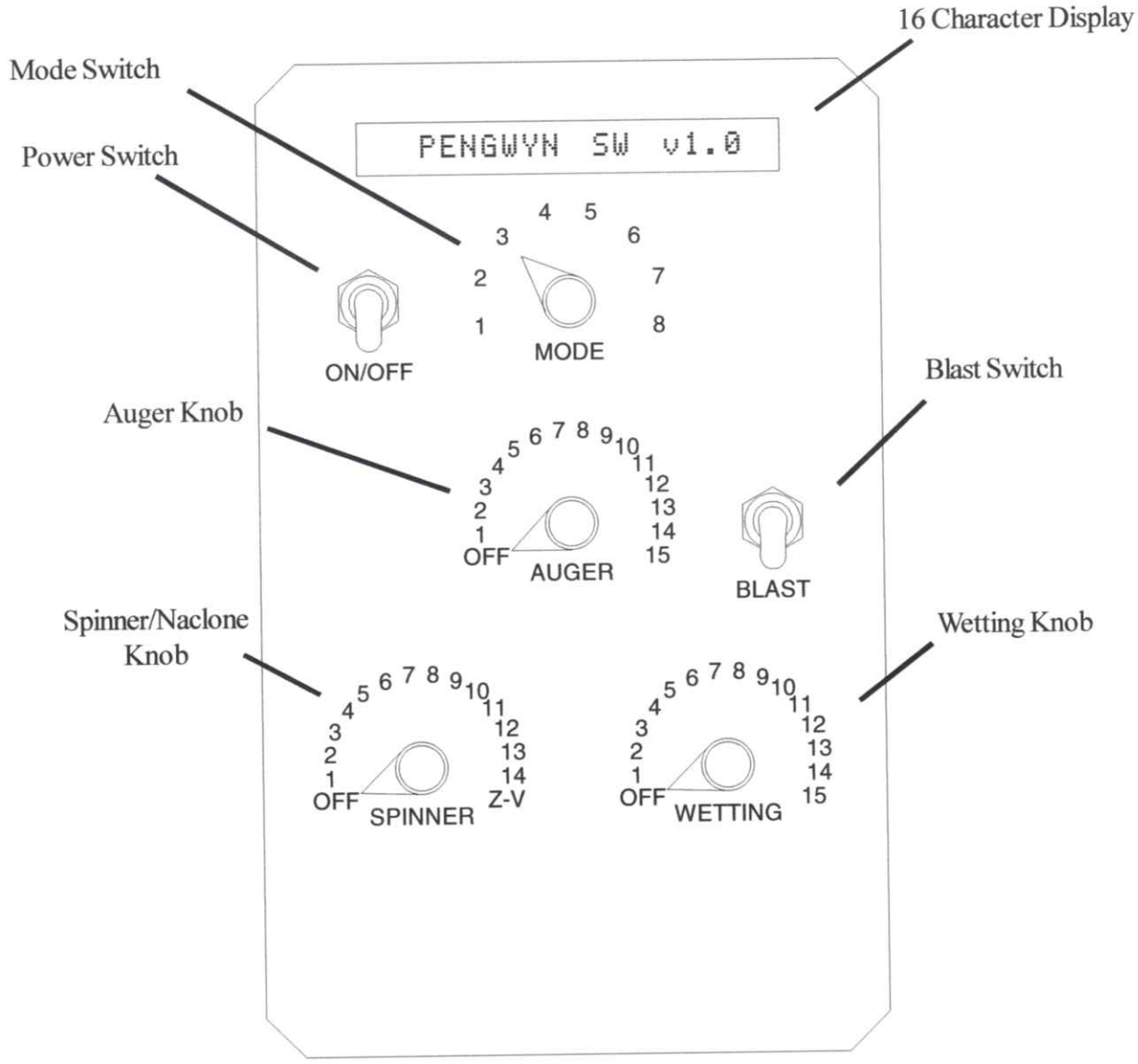
Not only is the system reliable, but it has been designed to be safe and easy for the operator, as well as for the maintenance personnel. The operator has complete control of all the spreader functions with the touch of a switch or dial on the control console. This allows the operator to concentrate on the road. Another feature to help the operator is the available optional warning alarms. The alarms alert the operator to any problems with low material, auger/conveyor jams, high oil temperature, low oil level, and internal faults. This keeps the operator from diverting his attention from the roadway. Another safety consideration is having all the hydraulic hoses on the exterior of the cab away from the operator.

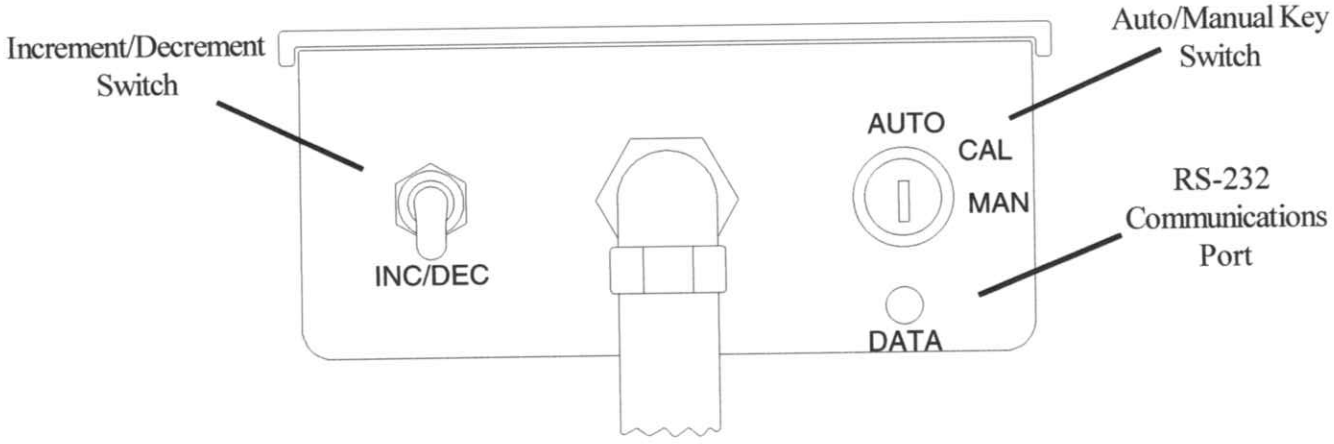
Other features of the PENGWYN system include the ability of running hydraulic tools off the system and allowing management to program spreader constants. The system is cost effective and lowers de-icing material usage. Lowered material usage not only allows money to be used for other things, but it helps to limit the damage done to the environment.

Please look to this manual for information on the major system features, calibration of the system, and troubleshooting guidelines. This manual will help you calibrate, operate, and maintain the new spreader system.

PENGWYN does offer training. If you have a problem, we are available by calling 1-800-233-7568.

Control Console





Operation of Control Console

Main Power

ON/OFF

When the power switch is in the ON position, the panel will light up and the display will come on. The display will briefly show the system number and then the information dictated by the mode selected.

INC/DEC Switch

INC/DEC

The increment/decrement switch (INC/DEC) is located on the bottom left side of the control console. This switch is used to make necessary calibration adjustments to the control console. This switch has no hydraulic function and is used for calibrating only.

Automatic/Manual Lockout Keyswitch

The Automatic/Manual lockout key switch position allows the user to set the system into **Automatic** or **Manual** for material spreading. When the key is turned to **Calibrate**, all of the constants in the control box can be calibrated.

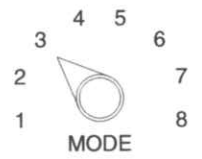
When the key is set to the 12:00 position the box is ready to spread material in ground oriented automatic mode. All 15 settings of the auger will be programmed for spread rates in pounds per mile.

When the key is set to the 1:30 position the box can be calibrated using the Increment/Decrement switch to change the values on the display. To maintain the most accuracy possible, PENGWYN recommends recalibrating the control box once every fall before use.

When the key is set to the 3:00 position, the hydraulic system will spread material in the Manual Mode. The control box will send a fixed displacement of oil to the auger circuit depending on the selected auger setting. Example: If the Auger Position knob is in position **5**, the Auger will receive 5 gallons of hydraulic oil per minute continuously regardless of the speed of the truck.

Operation of Control Console (Cont'd)

Display Mode Selection Switch



The selection of the mode dial indicates the type of information shown on the display. The following shows the information displayed at each selection of the dial.

	Position	Type of Information
MILES/HOUR XX.X	1	**Vehicle speed in miles per hour (MPH)** Should closely match truck speedometer.
POUNDS/MI XXXX	2	**Pounds per mile material output** Number shown is material output if the truck is driven at the current speed for one full mile.
MON 11:38 AM	3	**Day and Time**
DISTANCE 32 FT	4	**Distance Measured in Feet** By turning to **MODE 4** and toggling the **INC/DEC** switch UP, the display will show the distance as the vehicle is moving.
TOOL MODE	or	With the spreader keyswitch turned to Manual, this position will read **TOOL MODE** and the alarms will be off, allowing tools to be run off the PENGWYN system without nuisance alarms if the optional alarms feature is present.
DISTANCE 0.3 MI	5	**Distance Measured in Miles**
XXX.X M XXXXX P	6	**Total miles traveled and total pounds of material spread** The control console stores the total pounds of material spread and the total miles traveled when the key switch is in either automatic or manual. Data accumulation stops when the **Power Switch** is turned **OFF,** but continues when it is turned back **ON.** The data is added to that in memory. The information can be downloaded into a computer for display of graph and table information. To reset the values stored in memory, turn to **MODE 6** and push the **INC/DEC** switch **UP** and hold until the values are reset. Once the values have been reset, the data is no longer retrievable.

Operation of Control Console (Cont'd)

Display Mode Selection Switch (cont'd)

Modes 7 and 8 are functional with the purchase of the optional alarms package.

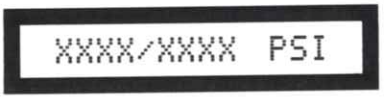
Position	Type of Information

7 **Temperature in degrees Fahrenheit**

To read the temperature:

1. Operate hydraulic system for several minutes.
2. Turn **MODE** switch to position **7**.

The display will show " FLUID TEMP XXX°F ".



8 **Pressure in pounds per square inch (psi)**

The PENGWYN displays two pressure readings. The first reading is the high pressure. The second reading is differential pressure. To read pressure:

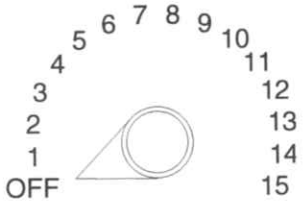
1. Turn the **MODE** switch to position **8**.
2. Start engine and run at approx. 1500 RPM.
3. Operate any hydraulic function.
   The display will show " XXXX / XXXX ".

The pressure required to operate that function will be displayed on the left side of the display. By running cylinders to the end of their stroke, the displayed pressure on the left side will be the pressure setting of the relief valve.

See Pressure Adjustments section for more information.

Operation of Control Console (Cont'd)

Auger Knob

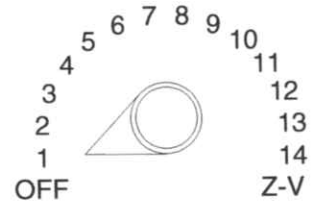


AUGER

The auger has 15 settings. If the Auto/Manual key switch is on **MANUAL,** each numerical position sets the flow to the auger circuit in GPM. Position **1** will indicate that one GPM of hydraulic oil is moving through the auger circuit and so on up to 15 GPM at position **15**. Flow to the auger circuit in **MANUAL** is constant and not ground oriented.

If the Auto/Manual key switch is on **AUTOMATIC** then the positions will output preprogrammed values in pounds per mile (lbs/mi). This will be ground oriented and depends on truck speed. Position **1** will output the amount that is programmed into it, such as 100 lbs of material per mile. Position **2** may be set for 200 lbs of material and so on up to position **15**. These programmable constants will be determined by managment. The PENGWYN increases/decreases hydraulic flow to the auger so the operator will have an even spread rate throughout the whole speed range of the truck and maintain the output of lbs/mi that the operator has selected. When the truck is stopped, the auger will also stop.

Spinner Knob

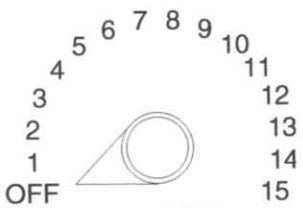


SPINNER

The spinner has fifteen settings. When the spreader switch is in **AUTOMATIC** or **MANUAL**, settings **1** through **14** increase hydraulic flow to the spinner by one GPM for each setting. The flow is not ground oriented and the spinner will continue to turn even when the truck stops. In position **Z-V** with the spreader key switch in **AUTOMATIC** only, the spinner is ground oriented and flow is determined by the speed of the truck. When the truck is stopped and the spinner is in position **Z-V** the circuit has a minimum flow of 5 GPM. Position **Z-V** is used for zero velocity only. The spinner is not effected by the blast switch unless Z-Blast is turned ON. Z-Blast is intended for use only with zero-velocity.

Operation of Control Console (Cont'd)

Wetting Knob



WETTING

Liquid chemical wetting is an optional feature. For those trucks equipped with this option, liquid chemical wetting pumps liquid from an on board storage tank onto the granular material at the spinner. In the automatic spreader mode, the output is ground oriented and is controlled in a gallons per ton ratio of liquid to granular material. The maximum gallons per ton ratio is a number selected and programmed into the console by the customer (see programming sections). The liquid chemical wetting output control switch is used to vary the output ratio. The numbers on this switch represent the percent of maximum gallons per ton ratio number programmed into the console. For example, assume that the maximum ratio number is 10 gallons per ton. Position **0** would be 0% of maximum and no liquid flow would occur. Position **1** would be 10% of maximum and a ratio of 1 gallon per ton would occur. The increase in ratio would progressively continue up to position **10** in the automatic spreader mode, and will not give any further increase in wetting to granular ratio. In automatic, the wetting system also incorporates chemical pump slip compensation. When operating the spreader in manual, the position numbers of the liquid chemical wetting switch are equal to the amount of hydraulic flow, in gallons per minute (GPM), being sent to the wetting system. For example, position **1** would be 1 GPM, position **2** would be 2 GPM, and so on up to 15 GPM. In manual, the wetting output is no longer ground oriented. Wetting can also be applied through a spray bar system in a gallon per mile application. For this type of application the Auger and Spinner knobs must both be set to OFF. The wetting knob would then be set to the appropriate pre-programmed spread rate.

Blast Switch

BLAST

The blast switch is designed to allow maximum material output when going through intersections, over bridges, or wherever a higher application rate may be needed.

The blast switch is a momentary toggle switch that is used to override the setting of the auger switch in either the automatic or manual mode of operation. When activated, the blast switch energizes all the auger/conveyor valves, sending maximum hydraulic flow to the auger/conveyor drive motor. The auger/conveyor will put out maximum material when the blast switch is activated. When released, the switch returns to its **OFF** position and the spreader returns to the material output as set by the auger switch.

Operation of Control Console (Cont'd)

Hydraulic Tool Mode

In order to run tools off of the PENGWYN system, you must connect the pressure hose of the tool to the pressure side of the auger circuit and the return hose of the tool to the return side of the spinner circuit. The keyswitch should be in **MANUAL** and the mode knob should be on position **4**. The display will read **TOOL MODE**. Bring the truck engine speed up to approximately 1000 RPM. The **AUGER KNOB** will allow you to select the gallons per minute needed for the tool. Each position on the dial is equal to the gallons per minute. Therefore, position **1** gives one gallon per minute of flow and so on.

Warning Alarms (Optional Alarms Package)

There are four warning alarms that include:

- Low hydraulic fluid
- High hydraulic fluid temperature
- Spreader alert
- Spreader jam

Low Fluid

If the Auto/Manual key switch is in the **MANUAL** or **AUTO** position, the control box will produce an audible beep to warn about low fluid.

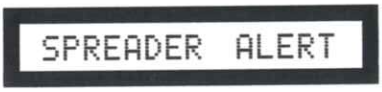
This warning indicates that the hydraulic fluid in the reservoir tank is low. This will not interrupt the functions of the system, as long as there is hydraulic fluid in the reservoir. The hydraulic pump should be turned **OFF** and the truck should return to the shop for maintenance immediately.

High Temperature

This warning indicates that the temperature has exceeded the maximum recommended operating temperature. The control box will produce an audible beep and the display will flash **"FLUID HOT".** By selecting **MODE 7** on the control box the current hydraulic fluid temperature will be displayed. The truck should be returned to the shop for maintenance immediately.

Operation of Control Console (Cont'd)

Spreader Alert
(Auger Unload Fault)

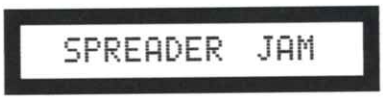


If there is an audible beep and the control box display flashes **"SPREADER ALERT"**, there is little or no material being ejected by the spreader.

Spreader Alert indicates that there has been a reduction of the load on the drive motor. Generally, this is caused when the spreader is out of material. Other causes include:

- Tunneling/bridging of the material
- A broken mechanical connection between the drive motor and the auger/conveyor
- A blown hose on the auger/conveyor drive motor
- A drive motor with reduced efficiency

Spreader Jam
(Auger Jam Fault)



Spreader Jam will cause an audible beep and the control box display will flash **"SPREADER JAM"**. This indicates that no material is being ejected by the spreader system. It may be caused by a material jam at the auger/conveyor or the quick disconnect to the auger/conveyor may be disconnected.

Very Cold Temperature Operation

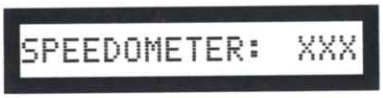
During extremely cold weather with the spreader off the hydraulic fluid viscosity may become so thick the cylinder functions become very sluggish. To remedy this, two procedures will help.

1. Turn the auger switch to **0** and the **SPINNER** switch to **2.** This will allow continuous circulation of the pump with the spreader off.
2. If more rapid hydraulic fluid warming is desired, hold the plow **UP** for a minute or two; dead heading the plow cylinder and forcing the oil over the plow relief valve. This will warm the oil approximately five to 10 degrees per minute.

Control Console Programming

Caution: Always return the Auto/Manual key switch to the automatic or manual position before turning the console power switch or the truck key off. Turning the power off while leaving the key in calibrate position may cause the loss of some of the newly programmed numbers. By turning the key to the AUTO or MAN position, any programmed constants will be saved to the PENGWYN memory and the control box will be returned to normal hydraulic operating mode.

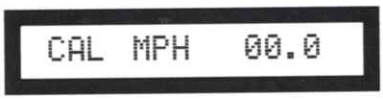
Setting the Speedometer Type



The type of speedometer is now selected in the calibration procedure. The two choices include SINE which is for all manual transmissions and SQR for trucks with an electronic or Allison World Transmission.
To select the appropriate setting:

1. Turn Auto/Manual Key Switch to **CAL.**
2. Turn the **MODE** switch to position **1.**
3. Push the **BLAST** switch **UP** and hold.
4. Use the **INC/DEC** switch to toggle between the two settings.

Setting the Speed Constant



To set the speed constant:

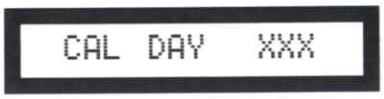
1. Jack the rear axle of the truck up and block the front wheels.

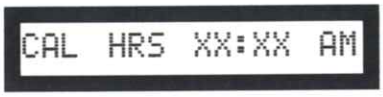
OR

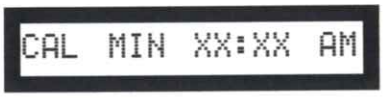
1. Be prepared to drive the truck.
2. Turn the Auto/Manual key switch to **CAL.**
3. Turn the **MODE** switch to position **1.**
   The display will read "CAL MPH 0".
4. Operate the truck at a constant speed (30 MPH or more).
5. Compare the truck speedometer to the speed shown on the control console display.
6. Using the **INC/DEC** switch adjust the control console speed to match the truck speedometer.
7. Turn the Auto/Manual key switch to **AUTO** or **MAN** to save.

Control Console Programming (Cont'd)

Setting the Day and Time



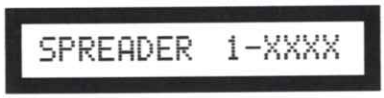




To set the day and time:

1. Turn the Auto/Manual key switch to **CAL**.
2. Turn the **MODE** switch to position **3**.
   The display will read "CAL DAY XXX".
3. Use the **INC/DEC** switch to toggle through the days of the week to the correct day.
4. Turn the **MODE** switch to Position **4**.
   The display will read "CAL HRS XX:XX AM".
5. Use the **INC/DEC** switch to change the displayed hours and the displayed AM or PM.
6. Push and hold the **BLAST** switch.
   The display will read "CAL MIN XX:XX AM"
7. Use the **INC/DEC** switch to change the displayed minutes.
8. Turn the Auto/Manual key switch to **AUTO** or **MAN** to save.

Setting the Spread Rate



When operating the spreader in automatic, positions **1** through **15** on the augerswitch determine the spreader output rate in pounds per mile. Each position must have the desired output rate programmed into it. The number programmed into each setting determines the available spreader rates in pounds per mile (lbs/mi) the operator has to choose from. It is up to the end user to determine the programmed rates they wish to make available to the operator. To program spread rates:

1. Turn the Auto/Manual key switch to **CAL**.
2. Turn the **MODE** knob to position 2.
3. Turn the **AUGER** knob to the position to be programmed (**1-15**).
   Each position can be programmed. The display will read "SPREADER 1- XXXX" "SPREADER 2- XXXX", etc.
4. Push the **INC/DEC** switch **UP** to increase the setting or **DOWN** to decrease the setting.
5. Turn the Auto/Manual key switch back to **AUTO** or **MAN** to save.

Control Console Programming (Cont'd)

Finding the Spreader Constant (auger)

To find the spreader constant, material must be in the bed of the truck and the spreader system must be attached and operational. The procedure is set up to find the ratio of hydraulic oil to salt in pounds. When this value is obtained the control box will have a reference for turning on the required number of valves to obtain the requested amount of salt per lane mile. A watch with a minute display, a empty 5 gallon container and a scale will be required to do this calibration.

To setup to find the spreader constant:

1. Position an empty 5 gallon container under the output of the auger/conveyor to catch the material.
2. Ensure that there is enough salt in the bed to keep the auger/conveyor full during the calibration.
   With a V-box hopper, the gate opening must be adjusted to the position in which it will be operated. If the gate opening is changed at any time a new spreader constant must be obtained.
3. Turn the Auto/Manual key switch to **MAN**.
4. Turn **AUGER** knob to position **1** and catch the material in the container previously placed under the spreader output for **1 minute.**
5. Weigh the material in the container and record the value.
6. Repeat procedure **4** and **5** with the **AUGER** knob set to position **2**.
7. Subracting the weights **AUGER 1** from **AUGER 2** will result in the spreader constant for that truck. Record this value for your records.

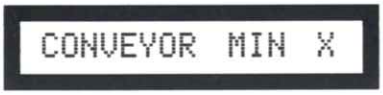
Setting the Spreader Constant

To input the spreader constant into the control box:

1. Turn the Auto/Manual key switch to **CAL**.
2. Turn the **MODE** switch to position **2**.
3. Turn the **AUGER** knob to position **OFF**.
   The display will read "CAL SPREADER XXX".
4. Push the **INC/DEC** switch **UP** to increase the value and **DOWN** to decrease the value.
5. Turn the Auto/Manual key switch to **AUTO** or **MAN** to save.

Control Console Programming (Cont'd)

Conveyor Minimum Value



When operating in the automatic mode, the PENGWYN system is set up to send a minimum flow rate to the auger/conveyor drive motor, regardless of the amount of material output requested. This is to compensate for volumetric inefficiencies of the drive motor and assure that the system puts out material when starting the truck from a dead stop.

To set the minimum value:

1. Turn the Auto/Manual key switch to **CAL** and the **MODE** switch to position **8**.
   The display will read "CONVEYOR MIN X".
2. Push the **INC/DEC** switch to the **UP** position to increase the displayed number or **DN** to decrease the displayed number.
   The minimum value number is adjustable from 0 to 5 in 1 gallon increments. A setting of 1 is recommended for single axle trucks and a setting of 2 for tandem axle trucks.

Control Console Programming (Cont'd)

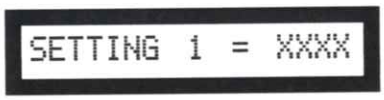
ALARM PACKAGE CALIBRATIONS (Optional)

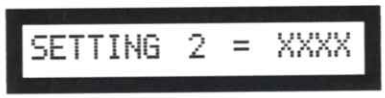
Setting Spreader Alert

This procedure should be repeated occasionally as a standard maintenance check to adjust for auger/conveyor or motor wear. The procedure should also be done any time the auger/conveyor motor is changed or the design of the spreader is changed. This is to prevent nuisance spreader alert alarms. To set the spreader alarm:

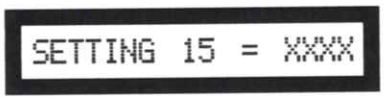
1. Spreader must be empty of material and ready to operate.
2. Warm hydraulic fluid to 80 degrees by holding plow up to relief pressure. The temperature can be monitored on **MODE 7**.
3. Turn Auto/Manual key switch to **CAL**.
4. Turn **MODE** switch to position **2**.
5. Turn **AUGER,SPINNER,WETTING** knobs to **OFF**.
6. Bring truck engine speed to **1500 RPM**.
7. Push **BLAST** switch **UP** and hold.
8. Push **INC/DEC** switch **UP** and hold. Calibration of auger will start. Both the **BLAST** and the **INC/DEC** switches must be held throughout the calibration cycle.
9. The control box will display "SETTING 1 = XXX", "SETTING 2 = XXX", and so on up to "SETTING 15 = XXX".
10. When the display reads "TURN SPREADER OFF" release the **BLAST** and **INC/DEC** switches.
11. Reduce engine speed.
12. Turn Auto/Manual key switch to **AUTO** or **MAN**. The spreader alert is now set.

There will be a short delay before the control box starts through the settings.





Thru...



Setting the Spreader Drag

The spreader drag determines the amount of material remaining in the spreader when the alarm is sounded. The number is shown as a pressure in PSI above the empty auger pressure as set above during "Setting the Spreader Alert". To set the spreader drag:

1. Turn the Auto/Manual key switch to **CAL**.
2. Turn the **MODE** switch to position **8**.
3. Push the **BLAST** switch up and hold. The display reads "CAL DRAG XX". The value should be set between 50 and 100. The higher the number the sooner the alarm will go off. The lower the number the later the alarm will go off.
4. Push the **INC/DEC** switch **UP** or **DOWN** to change the setting.
5. Turn the Auto/Manual key switch to **AUTO** or **MAN** to save.

Control Console Programming (Cont'd)

WETTING PACKAGE CALIBRATIONS (Optional)

Wetting Constant

This value indicates the gallons of wetting solution pumped for each gallon of hydraulic fluid supplied to the hydraulic drive motor. Slippage of the wetting pump needs to be accounted for over the range the pump is going to be used . The factory default is 0.40. The number can range from 0.1 to 5.00. To set the wetting constant:

1. Turn the programming key to **CAL**.
2. Turn **MODE** switch to position **6.**
3. Activate the **BLAST** switch.
4. Use the **INC/DEC** switch to increase or decrease the number.

Wetting Pump Slip

The pump slip constant provided sufficient hydraulic motor speed to overcome wetting pump slippage. This number can be increased to compensate for any wear on the pump. The constant is adjustable from 0 to 3. The factory default is 1. To set this value:

1. Turn programming key to **CAL**.
2. Turn **MODE** switch to position **7.**
3. Activate the **BLAST** switch.

Wetting Maximum

This value indicates the maximum amount of a liquid to be pumped for every ton of salt. This number can range between 1 and 255. To set the wetting maximum:

1. Turn the programming key to **CAL**.
2. Turn **MODE** switch to position **6**.
3. Activate the **BLAST** switch up and **HOLD**.
4. Use **INC/DEC** switch to increase and to decrease.

Wetting Spread Rates
(Spray Bar Application)

These spread rates are similar to the Auger/Conveyor spread rates and are used in a spray bar type application of liquid only. To pump liquid in gallons per mile the **Auger** and **Spinner** must be set to position **OFF**. To set the wetting spread rates:

1. Turn the Auto/Manual key switch to **CAL**.
2. Turn the **MODE** switch to position **7**.
3. Turn the Wetting Knob to positions 1-15.
   The display will read " Wetting 1 - 5 ", "Wetting 2 - 10 ".
4. Use **INC/DEC** switch to increase and to decrease the gallon per mile spread rates .

Control Console Programming (Cont'd)

ZERO VELOCITY CALIBRATIONS (Optional)

Setting the *NaCl*one™ Zero-Velocity Ejector Constant

This is an option that may not be used on all trucks. If your truck uses a conventional broadcast type spinner, ignore this programming procedure. The CAL SPIN setting is the truck speed at which the zero-velocity ejector achieves maximum hydraulic flow when the spinner setting is set to **Z-V**. This speed must be programmed into the console. To check for the correct setting the first time the truck is programmed:

1. Decide what the desired maximum spreading speed will be.
2. Program value into control box
3. Do a trial run to see if maximum effectiveness is achieved.
4. Record the number for your records.

To set the ground oriented ***NaCl*one™** :

1. Turn Auto/Manual key switch to **CAL**.
2. Turn the **MODE** switch to position **5.**
   The display will read "CAL SPIN XX.X".
3. Push the **INC/DEC** switch **UP** to increase the number or **DN** to decrease the number.
   Once the desired number is set, this setting is complete.
4. Return the Auto/Manual key switch to **AUTO** or **MAN** to save.

Zero-Velocity Blast

This is used only with zero-velocity. The spinner will receive maximum hydraulic flow when the blast switch is activated to prevent clogging of the ejector. The factory default is **OFF**, but should be changed to **ON** if zero-velocity is an option on the truck. To change the setting:

1. Turn Auto/Manual key switch to **CAL**.
2. Turn the **MODE** switch to position **5**.
3. Activate the **BLAST** switch and hold.
4. Use the **INC/DEC** switch to toggle **ON** or **OFF**.

Control Console Programming (Cont'd)

Changing Control Consoles

If it is necessary to change the control console, the only programming test that is required to be repeated is the spreader alert. All other programming numbers can be directly plugged into the console based on the numbers that were recorded during the initial setup. If using a laptop, all constants including spreader alert can be loaded into the new control box.

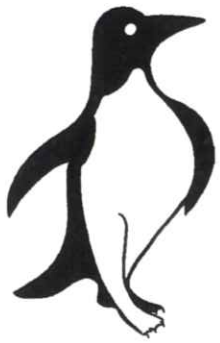
Resetting PENGWYN Factory Constants

In the rare event that the constants that are saved in the memory of the control box become scrambled, it is recommended that you:

1. Turn the Auto/Manual key switch to **CAL**.
2. Turn the **MODE** switch to position **3**.
3. Push the **BLAST** switch up and hold.

The display will read: "RESET CONSTANTS ?" push the **INC/DEC** switch up to reset constants. The original constants for the truck can now be reprogrammed back into the control box.

See the Pre-Winter Checklist at the back of this manual for a quick reference guide to programming the PENGWYN in the field.



Laptop Programming and Data Logging

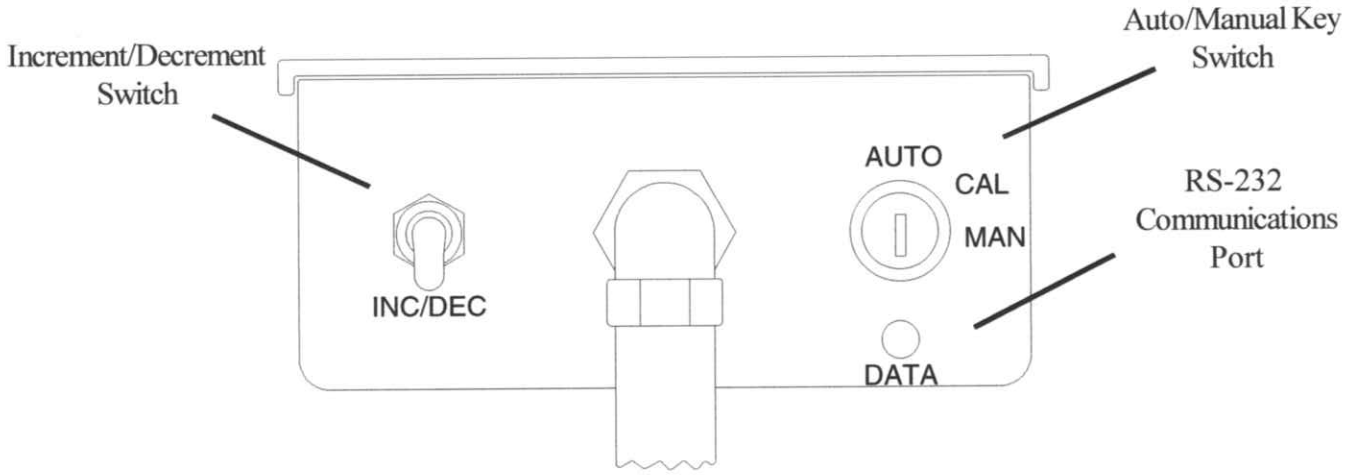
Laptop Communication Software

Software is available so that the accumulated data can be downloaded into a Windows 95-based laptop PC or a desktop PC. This is done through the RS-232 communications port. The data can be presented in a log summary as follows:

- Total miles driven with the spreader on
- Total miles driven with the spreader off
- Average spread rate
- Peak speed spreader on
- Total miles traveled
- Peak spread rate
- Total material spread
- Peak speed spreader off

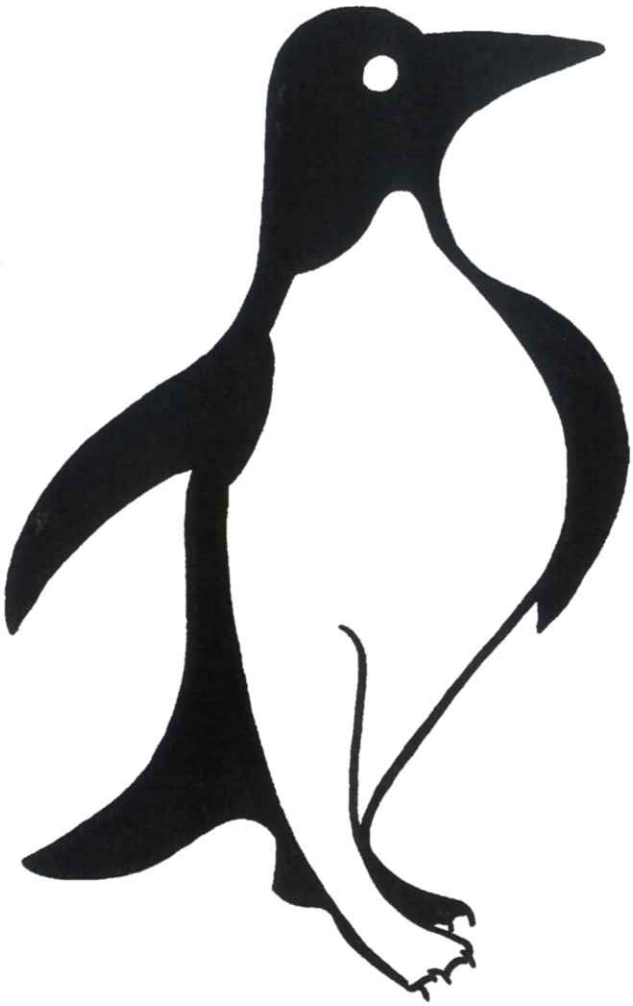
Please contact a PENGWYN representative for more information on Laptop Communication Software.

Control Console



NOTES

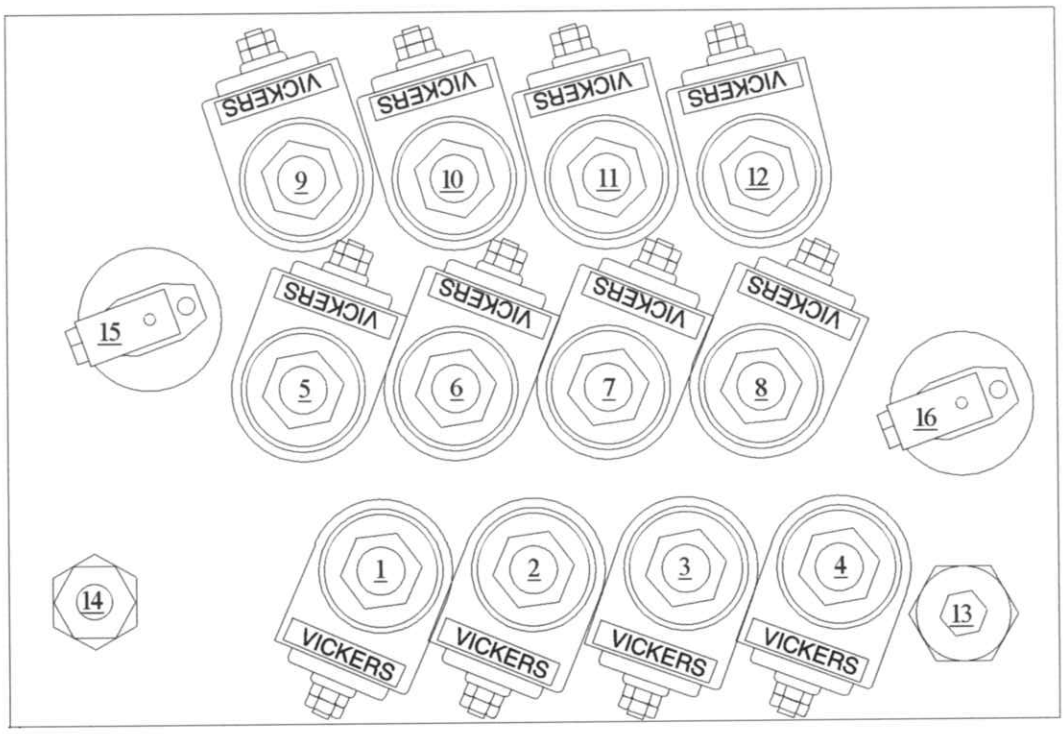
Maintenance



Charts and Diagrams

Valve Function Diagram

As viewed inside cab facing rearward



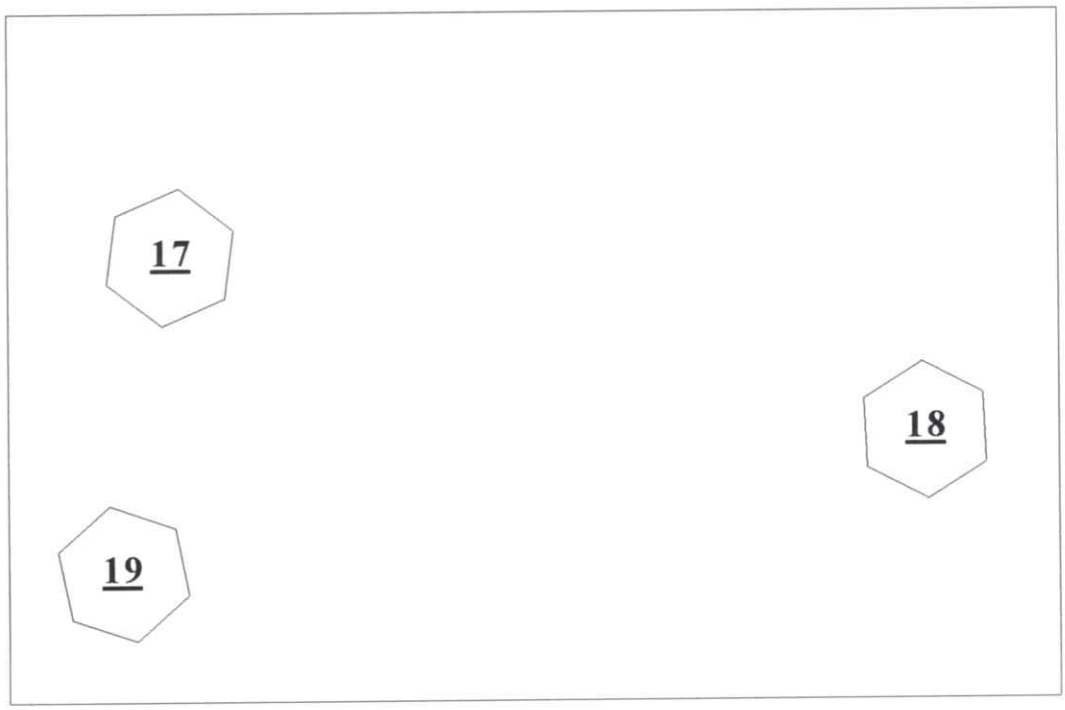
FLAG #	FUNCTION	WIRE COLOR
1	Auger 1 GPM	White
2	Auger 2 GPM	White/Yellow
3	Auger 4 GPM	White/Green
4	Auger 8 GPM	White/Blue
5	Spinner 1 GPM	White/Orange
6	Spinner 2 GPM	White/Brown
7	Spinner 4 GPM	White/Purple
8	Spinner 8 GPM	White/Blue
9	**Wetting 1 GPM***	Pink
10	**Wetting 2 GPM***	White
11	**Wetting 4 GPM***	White/Yellow
12	**Wetting 8 GPM***	White/Green
13	Relief Valve set @ 2500 psi	White
14	**Thermistor****	White/Black
15	**Pressure Transducer (Low)****	Orange
16	**Pressure Transducer (High)****	White/Blue

***OPTIONAL WETTING CONTROL**

****OPTIONAL ALARMS PACKAGE**

Valve Function Diagram

As viewed from outside facing rear cab wall



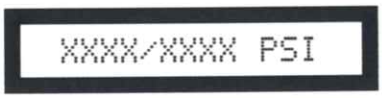
Parts List for Manifold Assembly

FLAG #	PART NUMBER	PART NUMBER
1-12	Normally Closed Solenoid Valve, Size 10	DS-101C or SV101
13	Main Relief Valve, 2500 psi	RD2500
14	Thermistor Assembly	TC-101
15,16	Pressure Transducer w/ Plug	X5000-P or E5000-P
17,18,19	Compensator	CP-702

Pressure Adjustments

The SW Series manifold system incorporates one relief valve. PENGWYN tests each manifold for function and sets the relief valve prior to shipping. After manifold installation, the relief valve pressures should be checked and, if necessary, set to the pressures recommended by the equipment manufacturers. (See: Valve Function Diagram for location of valves)

Main Relief

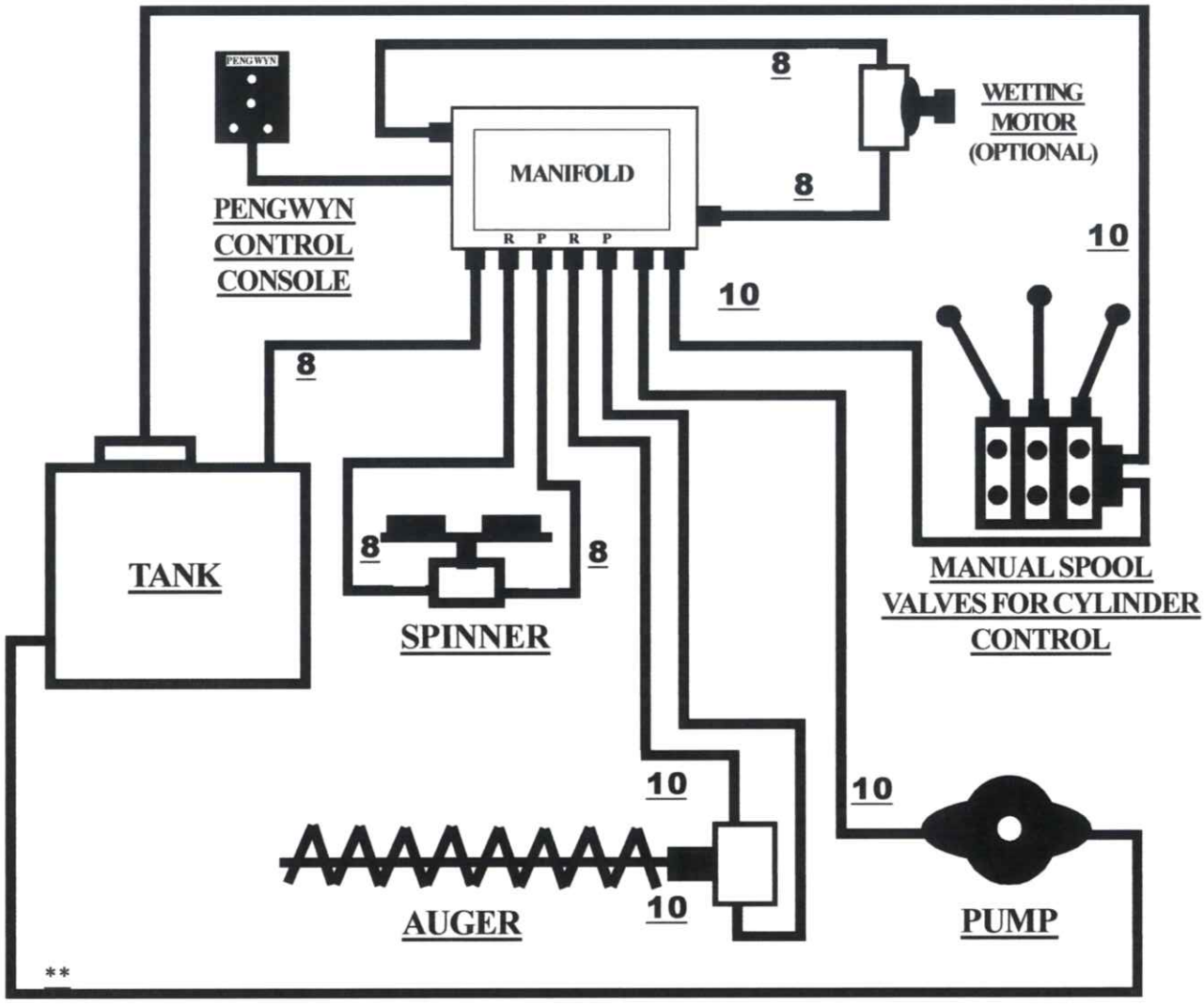


1. Start engine and bring engine speed to 1500 rpm.
2. Turn the programming key to **RUN** and the **MODE** switch to position **8.**
3. Disconnect the auger pressure hose quick disconnects.
4. Turn **AUGER** to position **0** and hit blast.
5. Read the pressure on the display. (example: 2580/0450) The Pengwyn display will flash Spreader Jam every few seconds while blast is held. The first number is the High Pressure reading and the second number is the differential pressure reading.
6. Turn engine off.
7. Remove cap from main relief (some reliefs have an external adjustment screw with locking nut).
8. Use an allen wrench to adjust the internal/external screw. Rotate it clockwise to increase the pressure setting or counter clockwise to decrease the pressure setting.
9. Replace cap or tighten lock nut.
10. Repeat above procedure until proper setting is achieved.

If the alarm package was not purchased the relief valve cannot be set using the PENGWYN display as in Step 5. For systems without alarms plug a 5000 psi pressure gauge into the **Auger Pressure Disconnect** to set the relief valve.

Plumbing Diagram

As viewed from rear of truck

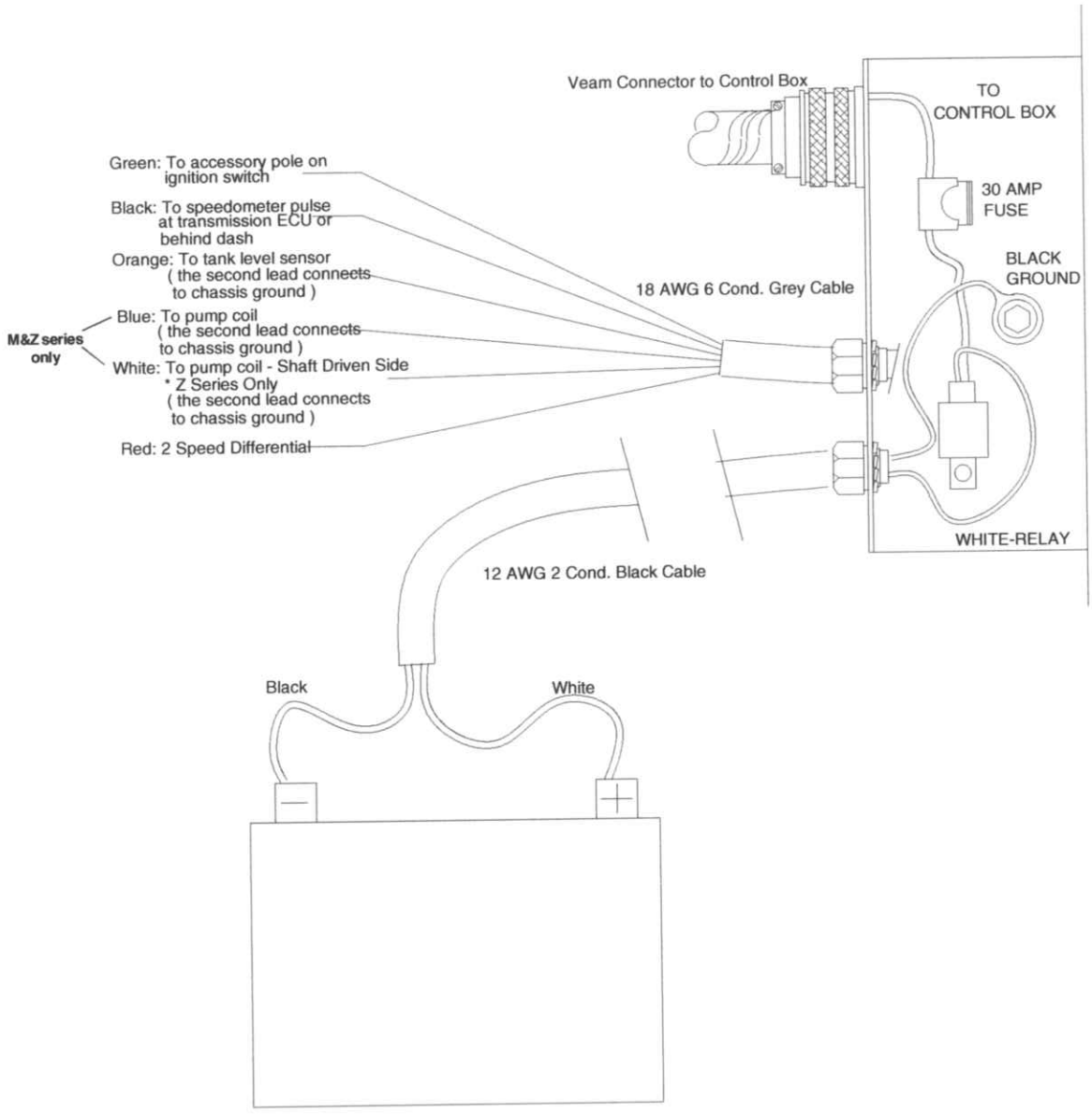


Minimum Hose Size Requirements

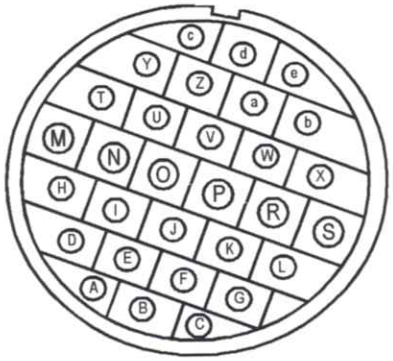
6 = 3/8" I.D. HOSE
8 = 1/2" I.D. HOSE
10 = 5/8" I.D. HOSE
12 = 3/4" I.D. HOSE
16 = 1" I.D. HOSE
**= SUCTION SIZE AS RECOMMENDED BY PUMP MANUFACTURER

Truck Wiring

Manifold Wiring Bracket



Amphenol Connector



FUNCTION	WIRE COLOR	PIN LETTER
SPINNER 8	WHITE/BLUE	B
N/A	N/A	C
AUGER 1	WHITE	D
AUGER 2	WHITE/YELLOW	E
AUGER 4	WHITE/GREEN	F
AUGER 8	WHITE/BLUE	G
N/A	N/A	H
SPINNER 1	WHITE/ORANGE	I
SPINNER 2	WHITE/BROWN	J
SPINNER 4	WHITE/PURPLE	K
N/A	N/A	L
FUSE HOLDER	N/A	M
HIGH PRESSURE	BLACK 22-2	N
GROUND	GREEN	O
LOW PRESSURE	BLACK 22-2	P
N/A	N/A	R
HIGH PRESSURE	WHITE 22-2	S
WETTING 4	WHITE/YELLOW	U
WETTING 8	WHITE/GREEN	V
N/A	N/A	W
N/A	N/A	X
WETTING 1	PINK	Y
WETTING 2	WHITE	Z
THERMISTOR TO MANIFOLD	WHITE 22-2	a
THERMISTOR TO MANIFOLD	WHITE 22-2	d
LOW PRESSURE	GREEN	e

Troubleshooting

Caution

Disconnect amphenol plug from manifold and remove the control console from the cab before welding on the truck.

Do not over tighten solenoid coil nut - the coil spindle is hollow and easily damaged.

Be careful not to pinch wires under the coil when installing.

Turn the control console power switch off before connecting and disconnecting battery cables, battery chargers or jumping the battery.

Do not drill holes in or mount auxiliary switches to the control console. This will void warranty. Use the control console mounting bracket for this purpose.

Always be sure to carefully wipe off all auger and spinner disconnects before hooking up the spreader.

If the spreader is hooked up and the disconnects are dirty, the dirt could lodge in the valves downstream from the disconnects and causes the auger and spinner compensators to close. This results in the fluid being blocked from any downstream functions. This disables all the bed and plow functions.

Checking Energization

To check if a function is operating properly, touch the 1/2"-20 nut at the top of the coil with a steel tool, such as a screwdriver, while actuating the function on the control console. You should be able to feel the magnetism generated by the coil when it is energized. This is usually done with the ignition switch on and the engine not running.

The following solenoid charts show which solenoids are energized with each function.

When the auger and the spinner are disconnected from the truck, the spreader material output selection switch and the spinner/ *NaCl*one™ speed control switch must be set at position OFF. The exception to this is when using the control console for pressure measuring.

For safety, operate the power switch only when all the toggle switches are in the off position.

Solenoid Energization Charts

Auger (Manual)

E = the coil should be energized

	Solenoid Number					
Rate	**1**	**2**	**3**	**4**	**PUMP**	**GPM**
0					E	0
1	E				E	1
2		E			E	2
3	E	E			E	3
4			E		E	4
5	E		E		E	5
6		E	E		E	6
7	E	E	E		E	7
8				E	E	8
9	E			E	E	9
10		E		E	E	10
11	E	E		E	E	11
12			E	E	E	12
13	E		E	E	E	13
14		E	E	E	E	14
15	E	E	E	E	E	15

Spinner (Manual)

E = the coil should be energized

	Solenoid Number					
Rate	**5**	**6**	**7**	**8**	**PUMP**	**GPM**
0					E	0
1	E				E	1
2		E			E	2
3	E	E			E	3
4			E		E	4
5	E		E		E	5
6		E	E		E	6
7	E	E	E		E	7
8				E	E	8
9	E			E	E	9
10		E		E	E	10
11	E	E		E	E	11
12			E	E	E	12
13	E		E	E	E	13
14		E	E	E	E	14
15	E	E	E	E	E	15

Solenoid Energization Charts (Con't)

OPTIONAL
Wetting (Manual)

E = the coil should be energized

	Solenoid Number					
Rate	**9**	**10**	**11**	**12**	**PUMP 2**	**GPM**
0					E	0
1	E				E	1
2		E			E	2
3	E	E			E	3
4			E		E	4
5	E		E		E	5
6		E	E		E	6
7	E	E	E		E	7
8				E	E	8
9	E			E	E	9
10		E		E	E	10
11	E	E		E	E	11
12			E	E	E	12
13	E		E	E	E	13
14		E	E	E	E	14
15	E	E	E	E	E	15

Troubleshooting Chart

Before troubleshooting the PENGWYN system, check all quick disconnects to be sure that they are connected properly. This is a common problem.

PROBLEM	CAUSE	SOLUTION
Solenoid valve stays open or closed all the time.	Coil nut too tight and cartridge spindle has been stretched.	Replace cartridge.
Noisy pump.	Low on fluid.	Add hydraulic oil.
Pump noisy all the time especially under a load.	Pump solenoid valve stuck.	Clean valve and check operation electrically while removed from pump then reinstall.
	Main poppet stuck.	Carefully clean poppet bore with fine emery cloth. Check for free movement with fingers.
	Suction line or strainer plugged.	Clean suction line and sump strainer.
Pump noisy, oil aerated.	Pump solenoid cartridge loose allowing air in.	Tighten pump solenoid cartridge.
	Pump check-valve cartridge loose.	Tighten pump check-valve cartridge.

Troubleshooting Chart (Cont'd)

PROBLEM	CAUSE	SOLUTION
Pump noisy, oil aerated. (Cont'd)	Shaft seal leaking. Suction line loose.	Replace shaft seal. Tighten suction line.
	Dump hoist vent leaking.	Clean, repair, or replace vent.
No pump effect.	Bad pump coil or wiring.	Repair or replace.
Solenoid does not magnetize when turned on.	Bad electrical ground.	Remove cartridge carefully, punch threads to make ground, and replace cartridge.
Auger does not change speeds smoothly.	One of the auger solenoids not working.	Turn manual key on then set auger switch to (1), (2), (4), and (8) to find the bad valve. Clean valve or change coil.
Auger runs all the time.	Dirt holding one of the auger solenoid valves open.	Clean solenoid valve.
Auger turns on and off but runs too fast when empty and stalls when loaded.	Dirt in auger-compensator spool.	Remove auger-compensator spool on outside of truck. Clean and reinstall.
	Compensator spool too tight.	Loosen spool slightly.

Troubleshooting Chart (Cont'd)

PROBLEM	CAUSE	SOLUTION
Spinner turns on and off but runs too fast when empty and stalls when loaded.	Dirt in spinner-compensator spool.	Remove spinner-compensator spool on outside of truck. Clean and reinstall.
	Compensator spool too tight.	Loosen spool slightly.
Spinner does not change speeds smoothly.	One of the spinner solenoids not working.	Set spinner switch to (1), (2), and (4) to find bad valve. Clean valve or change coil as needed.
Spinner runs all the time.	Dirt holding one of the spinner solenoid valves open.	Clean solenoid valve.
Hydraulic fluid too hot.	Low fluid level.	Add hydraulic fluid.
Beeper comes on too often in spreader alert.	Auger drag set too high.	Lower auger drag constant (See: Setting the Spreader Drag in Control Console Programming)
	Material is bridging across the auger.	Break salt bridge.

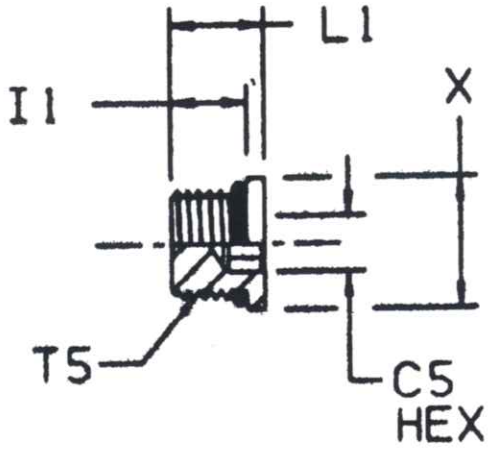
Troubleshooting Chart (Cont'd)

PROBLEM	CAUSE	SOLUTION
Auger will not turn when fully loaded but oil is heard in manifold.	Main relief is set too low.	Check pressures and reset pressure relief.
Auger is in blast in automatic.	Spreader constant calibration is on "0".	Change calibration to correct number (See: **"Setting the Spreader Constant"** in Control Console Programming)
Pump operates about 2 minutes and quits then starts again in a few minutes.	Short in pump wiring.	Fix wiring.
	Bad pump coil.	Replace pump coil.

Feel free to call PENGWYN for telephone support.

(800)-233-7568

Torque Specs & O-Ring Numbers



C5—ACROSS INTERNAL HEX FLATS

Use a removable thread locker, such as Loctite 545.

TUBE FITTING PART #	T5 PORT THD UN / UNF-2A	C5 HEX	I1	L1	X DIA.	ASSEMBLY TORQUE FT. LBS	O-RING NUMBERS
#02 SAE O-Ring Boss	5/16-24	1/8	.30	.39	.44	3 ± .5	902
#03 SAE O-Ring Boss	3/8-24	1/8	.30	.39	.50	5 ± .5	903
#04 SAE O-Ring Boss	7/16-20	3/16	.37	.46	.56	11 ± 1	904
#05 SAE O-Ring Boss	1/2-20	3/16	.37	.46	.63	15 ± 1	905
#06 SAE O-Ring Boss	9/16-18	1/4	.40	.49	.69	18 ± 1	906
#08 SAE O-Ring Boss	3/4-16	5/16	.44	.57	.88	46 ± 2	908
#10 SAE O-Ring Boss	7/8-14	3/8	.50	.63	1.00	75 ± 5	910
#12 SAE O-Ring Boss	1 1/16-12	9/16	.59	.75	1.25	85 ± 5	912
#14 SAE O-Ring Boss	1 3/16-12	9/16	.59	.75	1.38	130 ± 6	914
#16 SAE O-Ring Boss	1 5/16-12	5/8	.59	.75	1.50	135 ± 6	916
#20 SAE O-Ring Boss	1 5/8-12	3/4	.59	.75	1.88	225 ± 12	920

NOTES

Programming Constants

Record your programming constants below for future reference. It is important to keep this record in the event of a control box change.

Base Calibration

Speedometer Type SQR SINE

Cal Spreader _____

Cal Drag _____

Spread Rate

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____
15. _____

Optional Zero-Velocity and Wetting Calibration

Cal Spin _____

Z-blast _____

Wet Constant _____

Pump Slip _____

Wetting MAX _____

Wetting Rates

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____
15. _____

PENGWYN

SW Series Pre-Winter Check List

INC/DEC SWITCH

By moving the INC/DEC switch UP the values on the display will increase. Moving the switch DOWN will decrease the value on the display.

Tag Number: _____
Software Version: _____
Equipment Number: _____
Manifold S.N.: _____
Control Box S.N.: _____
Date Tested / By: _____ / _____

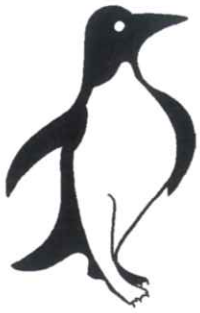
KEY SWITCH

Always turn the key switch back to AUTO or MAN after making changes to calibrations.

CONSTANT SETTING	NOTES	MODE POSITION	KEY POSITION	BLAST POSITION	INC/DEC POSITION	OTHER SWITCH	DISPLAY READS	VALUE
Speedometer Type	SINE = Manual SQR = Automatic	1	CAL	UP	UP = Increase DWN = Decrease		SPEEDOTYPE:	
Calibrate MPH	Run truck at a constant 30 mph. Match CAL MPH speed to speedometer on truck	1	CAL		UP = Increase DWN = Decrease		CAL MPH	
Auger/Conveyor Spread Rates	These are the spread rates that are assigned for each auger setting (1-15) in pounds per mile.	2	CAL		UP = Increase DWN = Decrease	Auger 1 Auger 2 Auger 3 Auger 4 Auger 5 Auger 6 Auger 7 Auger 8 Auger 9 Auger 10 Auger 11 Auger 12 Auger 13 Auger 14 Auger 15	SPREADER 1 SPREADER 2 SPREADER 3 SPREADER 4 SPREADER 5 SPREADER 6 SPREADER 7 SPREADER 8 SPREADER 9 SPREADER 10 SPREADER 11 SPREADER 12 SPREADER 13 SPREADER 14 SPREADER 15	

CONSTANT SETTING	NOTES	MODE POSITION	KEY POSITION	BLAST POSITION	INC/DEC POSITION	OTHER SWITCH	DISPLAY READS	VALUE
Auger/Conveyor Constant	The weight of the material from Auger setting 1 for 60 Seconds in manual	2	CAL		UP = Increase DWN = Decrease	Auger OFF	CAL SPREADER	
Auger/Conveyor Minimum Value	The minimum amount of hydraulic fluid sent to the auger motor when the truck is moving. Automatic mode only.	8	CAL		UP = Increase DWN = Decrease		CONVEYOR MIN	
Spreader Alert	Automatically takes pressure readings from spreader. Spreader must be hooked up and empty. Fluid should also be warmed to 80 degrees and truck RPM to 1500.	2	CAL	UP and HOLD	UP and HOLD	Auger OFF Spinner OFF Wetting OFF	SETTING 1 XX SETTING 2 XX SETTING 3 XX Make sure all values increase	
Spreader Drag	Determines amount of material left in spreader when alarm is sounded.	8	CAL	UP	UP = Increase DWN = Decrease		CAL DRAG	
Contants Reset	Allows constants to be reset to factory defaults.	3	CAL	UP	UP		CONSTANTS RESET	
Calibrate Day	Sets the day of the week.	3	CAL		UP = Increase DWN = Decrease		CAL DAY	
Calibrate Hours	Sets the hour.	4	CAL		UP = Increase DWN = Decrease		CAL HRS	
Calibrate Minutes	Sets the minutes.	4	CAL	UP	UP = Increase DWN = Decrease		CAL MIN	
Calibrate Spinner *Zero-Velocity Only*	Sets the maximum speed that the zero-velocity will operate	5	CAL		UP = Increase DWN = Decrease		CAL SPIN	
Zero-Velocity Blast *Zero-Velocity Only*	Sends maximum hydraulic flow to ZV spreader when the blast switch is activated	5	CAL	UP	UP		Z-BLAST	

CONSTANT SETTING	NOTES	MODE POSITION	KEY POSITION	BLAST POSITION	INC/DEC POSITION	OTHER SWITCH	DISPLAY READS	VALUE
Wetting Constant (Pre-Wetting)	The ratio of a pumped liquid to hydraulic fluid	6	CAL		UP = Increase DWN = Decrease		WET CONST	
Wetting Maximum (Pre-Wetting)	Maximum gallons of wetting solution pumped per ton of salt.	6	CAL	UP	UP = Increase DWN = Decrease		WETTING MAX	
Wetting Spread Rates (Anti-Icing)	Gallon Per Mile spread rates for spray bar application	7	CAL		UP = Increase DWN = Decrease	Wetting 1 Wetting 2 Wetting 3 Wetting 4 Wetting 5 Wetting 6 Wetting 7 Wetting 8 Wetting 9 Wetting 10 Wetting 11 Wetting 12 Wetting 13 Wetting 14 Wetting 15	WETTING 1 WETTING 2 WETTING 3 WETTING 4 WETTING 5 WETTING 6 WETTING 7 WETTING 8 WETTING 9 WETTING 10 WETTING 11 WETTING 12 WETTING 13 WETTING 14 WETTING 15	
Calibrate Wetting (Anti-Icing)	Same as "WETTING CONSTANT" but used for spray application.	7	CAL		UP = Increase DWN = Decrease	Wetting 0	CAL WETTING	
Pump Slip	Used to overcome wetting pump slippage.	7	CAL	UP	UP = Increase DWN = Decrease		PUMP SLIP GPM	



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