



1st Edition
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Truck ID #	
User	
Manifold #	
Pump #	
Control Box #	
Valve Driver #	
S.O. #	
P.O. #	

485 2P CONTROL BOX Technical Manual



PENGWYN
2550 W. FIFTH AVENUE
COLUMBUS, OH 43204



PENGWYN
CENTRAL HYDRAULIC SYSTEMS

485-2P CONTROL BOXES

PENGWYN
2550 West Fifth Avenue Columbus, OH 43204
Customer support: Phone 800.233.7568 • Fax 614.488.0019
www.pengwyn.com

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Introduction

Thank you for choosing our ground-oriented central hydraulics system. Our 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 our goal of reliability, your new Pengwyn system uses the rugged Autosucker™ on-demand pump. It has a dry valve design with fixed displacement that generates hydraulic flow to 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 facility, contribute to the overall dependability.

Not only is your new system reliable, but it has been designed to be safe and easy for the operator, as well as the maintenance personnel. The operator has complete control of all the functions with the touch of a switch on the control console. This allows the operator to concentrate on the road. Another feature to help the operator is the system of alarms. The alarms alert the operator to any problems with a jam on the conveyor, low material on the conveyor, high hydraulic fluid temperature, and low hydraulic fluid level. This again keeps the operator from diverting attention from the roadway. Another safety consideration includes having all the hydraulics on the exterior of the cab and away from the operator.

Other features of your Pengwyn system include running hydraulic tools off the system itself and allowing for management programming of spreader constants. By allowing for management control and year round utilization, your system is cost effective and lowers de-icing material usage.

Please look to this manual for information on the major features, calibration of the system, and troubleshooting guidelines. This manual will help you operate and maintain your system. Pengwyn does offer training. We are available by calling 1-800-233-7568. Please call if you have a problem. We are here to help you.

Caution

DISCONNECT ALL CONNECTORS FROM THE PENGWYN MANIFOLD, REMOVE PENGWYN CONTROL CONSOLE FROM THE CAB, AND DISCONNECT TRUCK BATTERY 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 COIL WHEN INSTALLING.

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

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

DO NOT EXPOSE THE PENGWYN CONTROL BOX TO MOISTURE. THIS INCLUDES PRESSURE WASHING INSIDE THE CAB AND WILL VOID THE WARRANTY. WATER CAN CAUSE CIRCUIT BOARDS TO FUNCTION ERRATICLY AND CAN LEAD TO INJURY OR DEATH.

Limited Warranty

Pengwyn warrants 485 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.

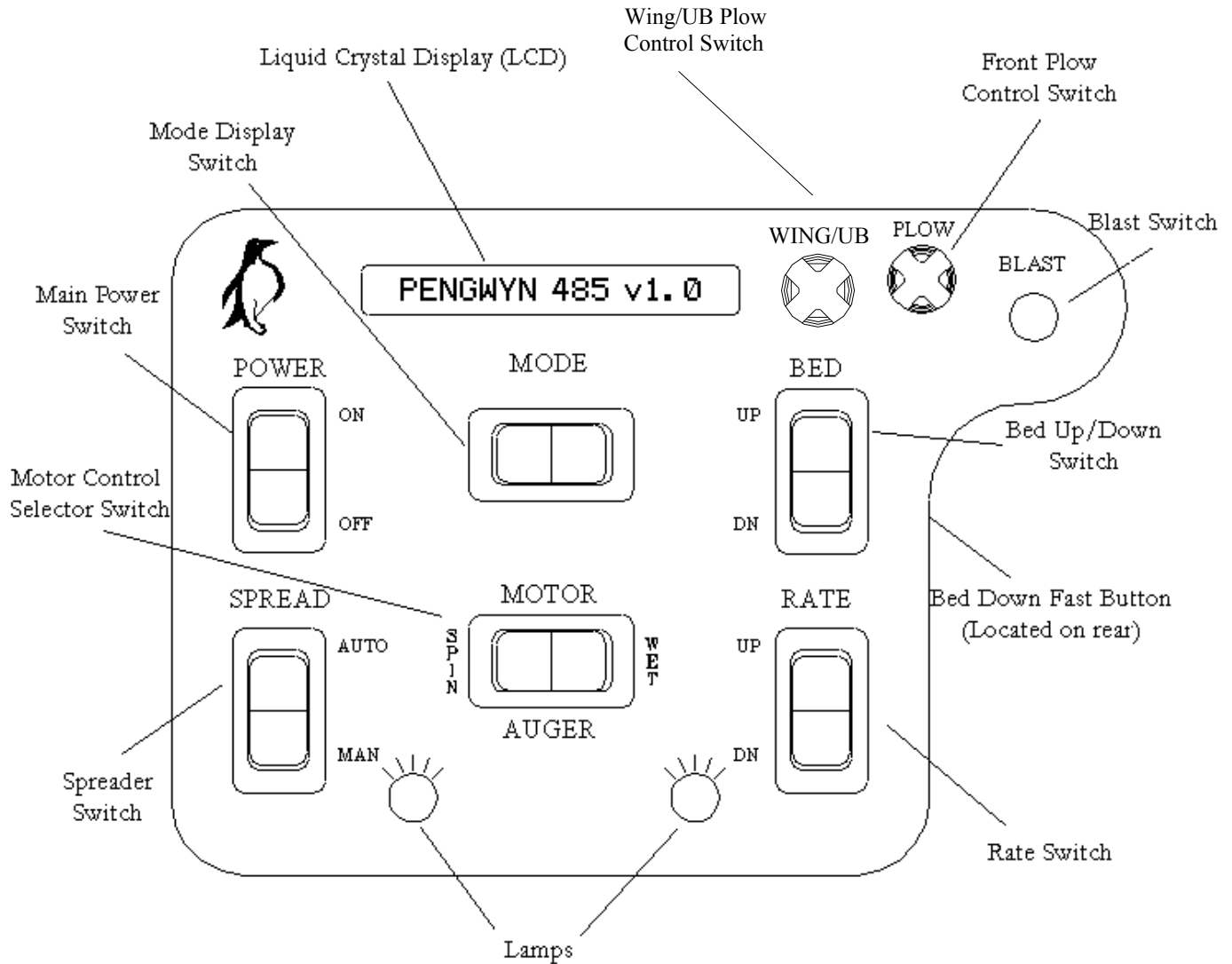
It is recommended that spare parts be purchased for critical items to allow continued operation of equipment during the inspection, evaluation, or repair/replacement process.

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.

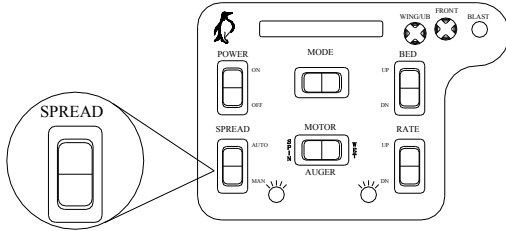
Control Box Layout



Switch Layout

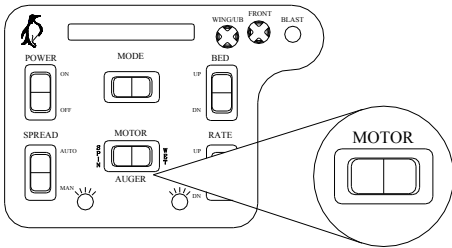
Spreader Controls

Spreader Switch



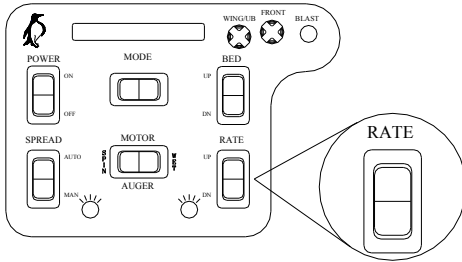
The spreader switch has three positions: AUTOMATIC, OFF, and MANUAL. The manual position is only active if the manual setting is enabled in Calibrate Mode. When in automatic mode, hydraulic flow to the auger motor is ground oriented. If the spreader is switched off no motors receive hydraulic flow. For information on these settings, refer to the Operation section of this manual.

Motor Select Switch



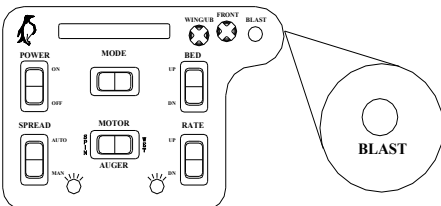
This three-position toggle switch is used to select the motor (Auger, Spinner, Wetting) you wish to control using the Rate Switch described below. For information on these settings, refer to the Operation section of this manual.

Rate Switch



When pressed this toggle switch changes the rate of a hydraulic motor selected by the Motor Select Switch by a value of one (1).

Blast Switch

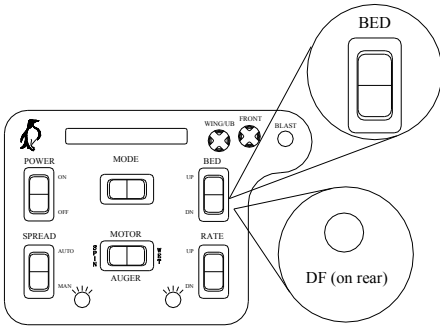


The blast switch is a normally open push button switch mounted on the top right of the back of the console. This button is used to override the setting of the auger in any mode of operation. When activated, the blast switch energizes all the auger and/or wetting valves, sending maximum hydraulic flow to the auger drive motor and/or wetting pump. The auger and/or wetting unit 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 previous output setting. This is only intended to be used sparingly when going through intersections, over bridges, or wherever a higher application rate may be needed.

Bed/Plow Controls

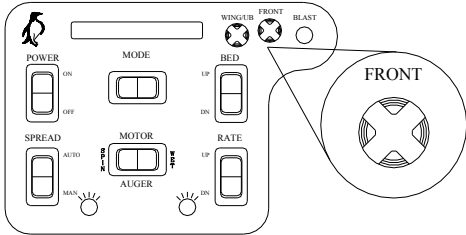
Bed Switches

There is a bed rocker switch and a bed down fast button. The rocker switch controls raising the bed and lowering it slowly. To lower the bed at a faster rate press the bed down switch and the Down Fast button at the same time.



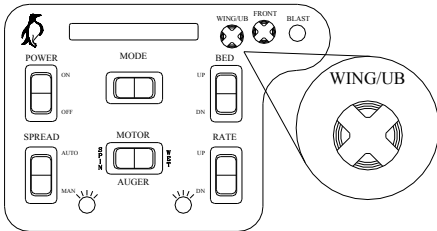
Front Plow Switch

The front plow switch is located in the upper right hand of the control console. The five-position thumb switch controls plow movement up and down as well as the plow angle left and right.



Wing/UB Plow Switch

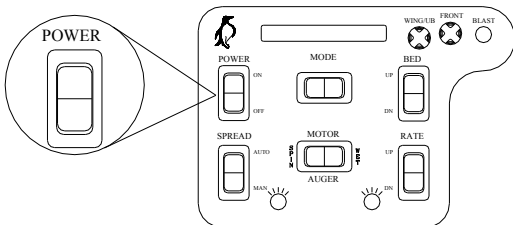
The wing or underbody plow switch is located in the upper right hand of the control console., just to the left of the front plow switch. The five-position thumb switch controls wing or underbody plow movement up and down as well as left and right.



User Interface Controls

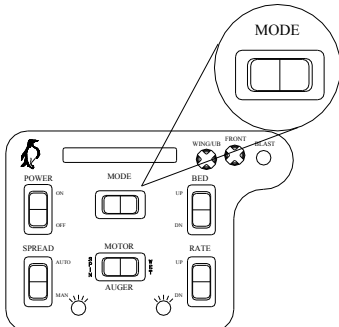
Main Power Switch

When the power switch is first flipped to the ON position, the panel will light up and the display will come on. The system will initialize and run several communication checks with the Valve Driver board. The display will briefly show the system number and then switch to Miles/Hr readout. If your control console does not complete this sequence, have the system checked by maintenance.



Mode Selection Switch

The Mode selection switch is centered about the control underneath the 16-character display. The switch is a 3 position momentary type that allows the user to “scroll” through from left to right the available display modes. As you scroll through the available modes, the display will briefly read “LCD MODE XX”, whereby “XX” is the corresponding mode number.



Modes

MILES/HOUR 35.9

LCD MODE 1: Displays the current speed of the truck in miles per hour.

LBS/MI. 85

LCD MODE 2: Displays the current spreading rate of the truck in lbs of material per mile.

WED 4:00 PM

LCD MODE 3: Displays the day of the week and the time of day.

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LCD MODE 4: Displays the calendar information.

TOOL MODE

LCD MODE 5: This position differs based on the Spreader setting. In manual, this is TOOL MODE, allowing hydraulic tools to be run off the Pengwyn manifold without nuisance temperature and pressure alarms. This is described in detail below. With the Spreader in Automatic, there is no applicable function. If the spreader is switched off, this mode may be used for distance measuring feature in FEET. Use the blast button to Start/Stop measuring.

TOOL MODE

LCD MODE 6: This position differs based on the Spreader setting. In manual, this is TOOL MODE, allowing hydraulic tools to be run off the Pengwyn manifold without nuisance temperature and pressure alarms. This is described in detail below. With the Spreader in Automatic, there is no applicable function. If the spreader is switched off, this mode may be used for distance measuring feature in MILES. Use the blast button to Start/Stop measuring.

In order to run tools off 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. Manual Mode must be enabled and TOOL MODE must be displayed. Bring the truck engine speed up to approximately 1000 RPM. The dial labeled auger will allow you to select the gallons per minute needed for the tool. Each setting is equal to the gallons per minute. Therefore, position 1 gives one gallon per minute of flow and so on. Keep in mind that alarms are deactivated in Tool Mode.

5.7M 538P

LCD MODE 7: Displays the distance traveled in miles and material usage in pounds for each trip. It can be reset by turning the spreader switch off and hitting the blast button.

Spin 4 Aug 6 Wet 5

LCD MODE 8: Displays the current setting for the Spinner, Auger, Wetting motors.

1200/898 PSI

LCD MODE 9: Displays the hydraulic pressure in pounds per square inch (PSI). High-pressure sensor readings are on the left while a differential pressure reading is on the right.

TEMPERATURE 94°F

LCD MODE 10: Displays the hydraulic fluid temperature in degrees Fahrenheit.

Calibrate Mode?

LCD MODE 11: Used for gaining access to the calibration mode. Access by pressing the blast button while the spreader switch is in the off position, enter the 4 digit pass code using the plow switch, then press the blast button again.

LCD MODE 12: Used for gaining access to settings that do not require a pass code. These settings include turning on/off counterbalance and broom mode. It also has the option to turn on speed simulation from 0-60 MPH in 5 MPH increments. This can be used to simulate automatic while the truck sits still. Press the blast switch to enter user settings and also use blast to exit and save any changes.

Alarms

There are five warning alarms that include:

Low Fluid This warning indicates that the hydraulic fluid in the reservoir tank is low. The display will flash “**LOW FLUID**” and create an audible beep. Also, all spreader functions will be disabled. The bed and plow functions will remain in operation as long as there is some fluid in the tank. If the fluid level is low the truck should return to the shop for maintenance immediately. To override a faulty low oil alarm and enable spreader functions, turn to mode 8 with the spreader switch off and hit the blast switch.

Fluid Hot 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**”. The current hydraulic fluid temperature can be displayed by scrolling to **LCD MODE 10** on the main menu. The truck should be returned to the shop for maintenance immediately.

Spreader Alert (auger unload fault)

If there is an audible beep and the control box display flashes “SPREADER ALERT”, material load on the auger has reached a preset minimum.

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

- Tunneling/bridging of the material
- A broken mechanical connection between the drive motor and the auger/conveyor
- Blown hose on the auger/conveyor drive motor

Spreader Jam

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 drive motor may not be connected.

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. Set the **AUGER** to **0**, the **SPINNER** to **2**, and the **spreader switch** to **AUTO**. This will allow continuous circulation of the pump with the spreader off.
2. If more rapid hydraulic fluid warming is desired, hold the plow switch **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 ten degrees per minute.

Spreader Operation

Auger

The auger has 15 settings. If the spreader switch is on **MANUAL** and manual mode is enabled, each numerical position sets the flow to the auger circuit. Position **1** will indicate that one GPM of hydraulic oil is moving to 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 spreader switch is on **AUTOMATIC** the positions will output preprogrammed values in pounds per mile (lbs/mi). This will be ground oriented, flowing more with higher 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**. 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. Management will determine these constants and maintenance will program them in.

Spinner/*NaClone*[™]

The spinner has 15 settings. If the spreader switch is on **MANUAL** and manual mode is enabled, each numerical position sets the flow to the spinner circuit. Position **1** will indicate that 1 GPM of hydraulic oil is moving to the spinner circuit and so on up to 15 GPM at position **15**. The flow rate is always half of the setting number. Flow to the spinner circuit in **MANUAL** is constant and not ground oriented.

In **AUTOMATIC**, spinner settings **2** through **14** operate just as in **MANUAL** mode. The flow is not ground oriented and the spinner will continue to turn even when the truck stops. In position **15** with the spreader switch in **AUTOMATIC**, 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 **15** the circuit has a minimum flow of .5 GPM. Position **15** is used for zero velocity *NaClone*[™] operation only. The blast switch does not affect the spinner unless Z-Blast is turned ON. Z-Blast is intended for use with zero-velocity only.

Wetting

Liquid wetting (such as calcium chloride or salt brine) is pumped from an on-board storage tank onto the granular material at the spinner. When operating the spreader in manual, the setting numbers correspond to the amount of hydraulic flow in gallons per minute (GPM) being sent to the wetting system. Position **1** would be 1.0 GPM and so on up to position **15** which would send the maximum value, 15 GPM of flow.

Gallons per Ton Wetting

The wetting system is based on the percentage of the maximum gallons per ton ratio number programmed into the console. To control the wetting system put the spreader switch in automatic mode, set the auger and spinner as desired and the wetting at the desired 1-10 setting. If the wetting maximum is set to 100 gallons per ton then position **10** equals 100 gallons of wetting solution per ton of salt. Position **1** would be 10 percent of the maximum ratio, or 10 gallons per ton. Position **2** would be 20 gallons per ton, and so on.

Gallons per Mile Wetting

The second wetting feature is a spray bar application that is used in a gallons/mile ratio. To do this put the spreader switch in automatic mode, set auger and spinner to 0 and the wetting as desired. Each of the 1-15 wetting settings can be set between 1 - 100 gallons per mile. If setting **1** is 20 gallons, setting **2** is 40 gallons, etc.

Control Console Calibration

Calibration Mode is used to monitor and change constants vital to the operation of each individual unit. Different models of trucks and spreader combinations will require different values.

Caution: Always exit Calibrate mode before turning the console power switch or the truck key off. Turning the power off before exiting Calibrate mode will cause the loss of some of the newly programmed numbers. Exiting Calibrate mode will save all programmed constants to the Pengwyn memory.

Enter Calibration Mode by pressing the Blast Switch at the prompt (“LCD MODE 11”) and entering the passcode (see end of manual for default passcode). Menus are navigated with the front plow switch. Left/right toggle through the main categories (Adjust Speed, Adjust Auger, etc) while up/down toggle the subcategories of each. Exit Calibrate Mode to save constants into the control console memory.

Calibration Map

The following page is a representation of the Calibration Menu of the Pengwyn 485 Series control console. Navigate through the submenus using the controls shown on the following page.

FORMAT:

Calibration Heading

CALIBRATION VALUE
CALIBRATION VALUE
CALIBRATION VALUE
CALIBRATION VALUE
CALIBRATION VALUE
CALIBRATION VALUE

FRONT



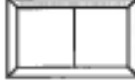
PRESS FRONT PLOW SWITCH 1
LEFT OR RIGHT TO SCROLL
CALIBRATION HEADINGS

FRONT



PRESS FRONT PLOW SWITCH 1
DOWN TO SCROLL AVAILABLE
CALIBRATION VALUES

BED



PRESS BED UP/DN SWITCH
TO ADJUST VALUES

BED DOWN FAST



HOLD DOWN FAST AND BED TO
CHANGE VALUES AT A FASTER
RATE

Adjust Speed

CAL MPH	XXX	XXX	Adjust Auger	Adjust Wetting	Adjust Clock
SPEEDOMETER:	XXX	XXXX	CAL AUGER	WETTING MAX	SET HOURS
PULSE/ .1 MI	XXXX		AUGER JAM	PUMP SLIP	SET MIN
			AUGER MIN	GPT CONST	SET AM/PM
			AUGER DRAG	DIR APP SLIP	SET DAY
			BLAST HOLD	GAL/GAL CST	SET DATE
			BLAST TIMEOUT	G/MI RATE	SET MONTH
			SPREADER ALERT VALUES		SET YEAR

Adjust Spinner

SPINNER_ON:	XXX	UNIT:	Adjust Misc.	Adjust Bed/Plow	Reset Constants?	Maintenance Mode
Z-BLAST:	XXX	LOW TEMP =	XXXXXX	PLOW CYL: XXXXXX	BLAST TO EXIT	BLAST TO ENTER
NACLONE MIN:	X	HIGH TEMP =	XX F	BED CYL: XXXXXX		
CAL SPIN	XX.X	ALARM TEMP =	XXXX F	SHAKER		
		BEEP OPTION:	XXXX	SCRAP PERIOD		
		MAUNAL MODE:	XXX	SCRAP PULSE		
		SET PASS #	XXXX	PLOW CB PULSE		
		XXXX X MILES XXXX TONS		PLOW INVERT:		

Calibration Settings

Adjust Speed

Speed Constant: The speed constant must be correct in order to achieve maximum effectiveness of the Pengwyn system. The control console must read the same speed as the truck speedometer. To ensure the operation is correct:

1. Jack rear axle of truck up and block the front wheels or be prepared to drive the truck.
2. Refer to the Calibration Map at the beginning of this chapter and locate **CAL MPH** under the **Adjust Speed** heading.
3. Operate the truck at a constant speed (30 MPH or more).
4. Compare truck speedometer to speed shown on control console display.
5. Use **Bed Up/Down** switch to synchronize control console to truck speedometer.
6. Scroll to **PULSE/.1MI** under the **Adjust Speed** menu.
7. Record the pulse count shown for your records.
8. Exit Calibrate Mode to save values.

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

1. Refer to the calibration map at the beginning of this chapter and locate SPEEDOMETER under the Adjust Speed heading.
2. Use the BED switch to toggle between the two settings.
3. Exit Calibrate Mode to save values.

Distance Measuring Constant (using a surveyed mile): To set the distance measuring constant using a surveyed mile:

1. Enter **RUN** mode with the spreader **OFF**.
2. Toggle the Display Mode Switch until you see “**START XX FT**”. This is mode 5.
3. Drive the truck toward the starting point of the measured mile.
4. Press the **blast switch** when at the starting point.

The display will instantaneously show “**RUN XX FT**” and then will begin increasing as the truck continues toward the mile marker.

5. Bring the truck to a stop at the end of the measured distance and press the **blast switch** when the end of the measured mile is reached.

The display will now show “**STOP XX FT**”. **XX** will be the feet the console counted over the measured distance.

6. Record the number shown for your records (this number will be needed for a later calculation).

Calculation for Setting the Distance Measured Constant: Use this formula to determine the new pulse constant to be programmed into the console. This calculation can be used for any measured distance over 400 ft.

$$\frac{\text{Measure distance (from control box) X (Pulses from control box)}}{\text{Actual distance traveled}}$$

Once the MPH calibration is completed for a truck the pulse constant will always remain the same for the life of that truck.

Adjust Speed continued..

Pulse Constant: If the pulse constant is known, it may be programmed into the control console. To program a pulse constant:

1. Refer to the Calibration Map at the beginning of this chapter and locate **PULSES/.1MI XXXX** under the **Adjust Speed** heading.

The display will read **"PULSES/.1MI XXXX"**. The **XXXX** indicates a number between 0 and 5000. If the correct pulse count is known, this number can be directly inserted without having to drive the truck. If the correct pulse is not known record the pulse for the calculation that must be computed, otherwise:

2. Use the **Bed Switch** to change this value.

If a large number change must be made, pressing and holding the **DOWN FAST** button while simultaneously pressing the bed switch **UP** or **DN SLOW** will change the displayed number in increments of 100. When the correct number is achieved, the speedometer setting is complete.

3. Exit Calibrate Mode to save the settings.

Adjust Auger

Finding the Spreader Constant: To find the spreader constant, material must be in the bed of the truck and the spreader system must be attached and operating. To find the spreader constant:

1. Weigh an empty bucket capable of holding 30 to 90 lbs of your granular deicing material.
2. Position bucket under output of the auger to catch the material.
3. Ensure that material is distributed evenly over entire spreader box or conveyor belt.
4. Ensure Manual Mode is enabled.
5. In RUN Mode, start the engine and bring the speed to 1500 RPM. Warm the hydraulic fluid to operating temperature (80°).
6. Turn Spreader Switch to OFF.
7. Set the Spinner to 0.
8. Set the Auger to 1.

You will need a stop watch to time the procedure.

9. Push the Spreader Switch to MANUAL and start timing.
10. Allow the system to run for 1 minute.
11. Turn the spreader switch OFF.
12. Weigh the bucket of material.
13. Empty the bucket of material.
14. Repeat steps 4-12 with the Auger switch in position 2.
15. Subtract value measured at Auger 1 from Auger 2.
16. Record this number for your records.

The resulting number is the spreader constant. You may want to turn through this procedure twice, in order to double check the values.

Adjust Auger continued..

Setting the Spreader Constant (Auger): To insert the auger constant into the control console:

1. Refer to the Calibration Map at the beginning of this chapter and locate **Cal Auger XX** under the **Adjust Auger** heading.
2. Push the **Bed Switch** to the **UP** position to increase the setting or switch to the **DN** position to decrease the setting (using the **down fast** button in addition to the direction will change the number in increments of 10)
3. Record the auger constant number for your records.
4. Exit Calibrate mode to save constants.

Setting the Spreader Rate (Auger lbs/mile): The spreader rate is the amount of material you want to use when the console is in automatic mode. The material is calculated in pounds per mile and the default value is 50 lbs/mile per auger setting. To change the values in the control console:

1. Refer to the Calibration Map at the beginning of this chapter and locate **Cal Auger XX** under the **Adjust Auger** heading.
2. Push the **Rate** switch to the **UP** position to choose auger settings 1 through 15. Stop on any of these settings to make an adjustment.
3. Push the **Bed Switch** to the **UP** position to increase the setting or switch to the **DN** position to decrease the setting (using the **down fast** button in addition to the direction will change the number in increments of 10)
4. Exit calibrate mode to save constants.

Spreader Alert Calibration: Unless loading previous constants from a laptop, this procedure must be done if a control box is changed. The 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. Have the engine running.
2. Have the spreader box or conveyor belt empty.
3. Toggle the Display Mode Switch to Temperature Mode.
4. If temperature is below 80°, then warm up the hydraulic oil to at least 80° by running truck at 1500 rpm and hold plow in any direction.
5. Maintain 1500 rpm engine speed.
6. Refer to the Calibration Map at the beginning of this chapter and locate **Maintenance Mode**.
7. Press Blast to enter Maintenance Mode.
8. Set both the Auger and Spinner to 0.
9. Put spreader switch into auto position.
10. Write down the settings so they can be checked in the next programming step.

The display will read “**SPREADER CALIBRATE**” and “**PRESSURE CALIBRATE**”, as it tests the pump pressure. The display then will read “**START UNLOAD CAL**” and then “**SETTING 1 = XXX**”, “**SETTING 2 = XXX**” and so on. The displayed pressure readings should increase for each setting. This will continue automatically up to **SETTING 15 = XXX**. The display will read “**FINISHED**” and then “**TURN SPREAD OFF**”. If any pressure errors are encountered, the system will not run the test. These errors include:

ZERO PRES. ERROR - Check pump coil operation.

HIGH PRES. ERROR - Check hydraulic connections for blockage.

LOW PRES. ERROR - Check hydraulic circuit for open connection.

11. Turn the spreader **OFF**.
12. Lower the engine speed.
13. Exit Maintenance mode and calibrate mode to save constants.

Adjust Auger continued..

Auger Jam: Auger jam is the pressure setting at which the control box will alert the operator that the auger/conveyor has jammed or locked up. Spreader jam is factory set at 2500 psi. It should be set at 200 psi below the main relief valve setting. To set this number:

1. Refer to the Calibration Map at the beginning of this chapter and locate **AUGER JAM XXX** under the **Adjust Auger** heading.
2. Push the **Bed Switch** to the UP position to increase the setting or switch to the DN position to decrease the setting (using the down fast button in addition to the direction will change the number in increments of 10).
3. Record the spreader jam number for your records.
4. Exit Calibrate to save constants.

Auger Minimum Value: When operating in the automatic mode, the PENGWYN system is setup 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 the hydraulic motors inefficiency which would otherwise result in low material output when starting the truck from a dead stop. To set the minimum number:

1. Refer to the Calibration Map at the beginning of this chapter and locate **Auger Min X** under the **Adjust Auger** heading.
The minimum value number is adjustable from 0 to 5 in 1 gallon increments. A setting of one is recommended for single axle trucks and a setting of two for tandem axle trucks.
2. Push the **Bed Switch** to the UP position to increase this number or DN to decrease.
3. Exit Calibrate Mode to save constants.

Auger Drag: The auger drag setting determines the amount of material remaining on the auger or conveyor when the spreader alert alarm goes off. The number shown is the pressure above the empty auger fault where the Pengwyn sounds the alarm. To set the spreader drag:

1. Refer to the Calibration Map at the beginning of this chapter and locate **AUGER DRAG XXX** under the **Adjust Auger** heading.
2. The display will read "**AUGER DRAG XXX**". This number will usually be set between 50 and 120. This number varies with the type and make of the spreader used on the truck.
3. Push the **Bed Switch** to the UP position to increase the setting or switch to the DN position to decrease the setting (using the down fast button in addition to the direction will change the number in increments of 10).
4. Record the spreader drag number for your records.
5. Exit Calibrate to save constants.

Blast Hold Adjustment: When the BLAST switch is engaged, it can be released and the PENGWYN will hold the Blast function for a predetermined amount of time (between 1-30 seconds).

1. Refer to the Calibration Map at the beginning of this chapter and locate **BLAST HOLD XX** under the **Adjust Auger** heading.
2. Push the **Bed Switch** to the UP position to increase this number or DN to decrease.
3. Exit Calibrate Mode to save constants.

Blast Timeout: The Blast Timeout is the number of seconds that an operator may hold down the blast button before it will timeout and de-energize the blast circuit. The default value is 5 seconds. To change this value:

1. Refer to the Calibration Map at the beginning of this chapter and locate **BLAST TIMEOUT XX** under the **Adjust Auger** heading.
2. Press the **Bed Switch** UP to increase the number or DN to decrease the number.
3. Exit Calibrate Mode to save constants.

Checking the Spreader Alerts

1. Refer to the Calibration Map at the beginning of this chapter and locate **LO TEMP: XX** under the **Adjust Auger** heading.

The display will show low and high temperatures, alarm settings and then all the spreader alert programming numbers will flash across the display.

Adjust Wetting

Wetting Maximum: The wetting maximum is set to a number between 1 and 200 gallons per ton. This number will determine the maximum output for the wetting system. Example: if setting 10 (maximum) is equal to 100 gallons, setting 1 is 10 gallon per ton, setting 5 is 50 gallons per ton. Determine the maximum desired gallons per ton and program the number into the control console. To program the number:

1. Refer to the Calibration Map at the beginning of this chapter and locate **Wetting MAX** under the **Adjust Wetting** heading.
2. Push the **Bed Switch** UP to increase the number or DN to decrease the number. Holding **DNFST** along with these will change the rates faster.
3. Exit Calibrate Mode to save constants.

Pump Slip: The pump slip constant ensures that hydraulic flow is always sent to the wetting pump for pre-treating with salt. This number can be increased to compensate for any pump wear. The constant is adjustable from 0 to 3 GPM of hydraulic fluid. The factory default is 1. To set this value:

1. Refer to the Calibration Map at the beginning of this chapter and locate **Pump Slip X** under the **Adjust Wetting** heading.
2. Press the **Bed Switch** UP to increase the number or DOWN to decrease the number.
3. Exit Calibrate Mode to save constants.

GPT Constant: This value indicates the gallons of wetting solution pumped for each ton of salt by accounting for slippage of the wetting pump. The factory default constant of the Oberdorfer 3000 is 0.32 and the Oberdorfer 7000 is 0.88. The number can range from 0.02 to 2.40 in .02 increments. To set the wetting constant:

1. Refer to the Calibration Map at the beginning of this chapter and locate **GPT Constant** under the **Adjust Wetting** heading.
2. Push the **Bed Switch** UP to increase the number or DN to decrease the number. Holding **DNFST** along with these will change the rates faster.
3. Exit Calibrate Mode to save constants.

Direct Application Slip: The direct application slip constant ensures that hydraulic flow is always sent to the wetting pump when being used for direct application. This number can be increased to compensate for any wear on the pump. The constant is adjustable from 0 to 3 GPM of hydraulic fluid. The factory default is 1. To set this value:

1. Refer to the Calibration Map at the beginning of this chapter and locate **Dir App Slip** under the **Adjust Wetting** heading.
2. Push the **Bed Switch** UP to increase the number or DN to decrease the number.
3. Exit Calibrate Mode to save constants.

Gallon/Gallon Constant: This value indicates the gallons of wetting solution for each gallon of hydraulic fluid by accounting for the slippage of the wetting pump. The factory default constant is 5.4 and can range from 0.1 to 24.0 in 0.1 increments. To set the constant::

1. Refer to the Calibration Map at the beginning of this chapter and locate **Gal/Gal Constant** under the **Adjust Wetting** heading.
2. Push the **Bed Switch** UP to increase the number or DN to decrease the number.
3. Exit Calibrate Mode to save constants.

Gallon/Mi Rate: This value indicates the gallons of wetting solution for each mile traveled during direct application. The factory default constant is 10 gallons per setting and maxes out at 100 on settings 10-15. To change these values::

1. Refer to the Calibration Map at the beginning of this chapter and locate **G/Mi Rate** under the **Adjust Wetting** heading.
2. Push the **Mode** UP to select which wetting rate you would like to adjust (1-15).
3. Push the **Bed Switch** UP to increase the number or DN to decrease the value.
4. Exit Calibrate Mode to save constants.

Adjust Clock

Setting the Day and Time (and other clock settings)

1. Refer to the Calibration Map at the beginning of this chapter and locate **Set Hours** under the **Adjust Clock**. The time will be displayed.
2. Push the **Bed Switch** to the UP or DN position until the correct hour is shown.
3. Follow this procedure to set the minutes, AM/PM, day of the week, date, month and year. All are under the **Adjust Clock** Menu.
4. Exit Calibrate Mode to save settings.

Adjust Spinner

Spinner_On: This calibration setting will allow the spinner to run without being in automatic or manual. The default value is OFF. To adjust this value:

1. Refer to the Calibration Map at the beginning of this chapter and locate **Spinner_On** under the **Adjust Spinner** heading.
2. Use the **Bed Switch** to toggle ON/OFF.
3. Exit Calibrate Mode to save constants.

Zero Velocity Blast: This is used only with zero-velocity. The spinner and auger both receive maximum hydraulic flow when the blast switch is activated. The factory default is OFF.

1. Refer to the Calibration Map at the beginning of this chapter and locate **Z-BLAST** under the **Adjust Spinner** heading.
2. Use the **Bed Switch** to toggle ON/OFF.
3. Exit Calibrate Mode to save constants.

Spinner Minimum Value: This determines the minimum hydraulic flow to the spinner in automatic. It should be set at 3 for zero velocity or at 0 for a conventional spreader. To change the setting:

1. Refer to the Calibration Map at the beginning of this chapter and locate **NaClone Min** under the **Adjust Spinner** heading.
2. Press the **Bed Switch** UP to increase the number or DOWN to decrease the number.
3. Exit Calibrate Mode to save constants.

NaClone Zero Velocity Spinner 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 at 15. 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. Refer to the Calibration Map at the beginning of this chapter and locate **CAL SPIN** under the **Adjust Spinner** heading.

Press the Bed Switch UP to increase the number or DN to decrease the number.

Exit Calibrate Mode to save constants.

Do a trial run to see if maximum effectiveness is achieved.

Record the number for your records.

Adjust Bed/Plow

Cylinder Selection for Plow and Bed: In this setting specify whether the plow, bed, or both are single/double acting. To change the setting:

1. Refer to the Calibration Map at the beginning of this chapter and locate **Plow CYL: or Bed CYL** under the **Adjust Bed/Plow** heading.
2. Use **Bed Switch** to toggle between Single/Double. (*Process is the same for both Plow and Bed adjustment.*)
3. Exit Calibrate Mode to save the settings.

Plow CB Pulse: The Plow CB Pulse determines the amount of time in seconds the Counter Balance circuit will operate after the plow down is activated. The CB relief valve in the manifold will limit the plow lift force. Default value is '0'. To change this value:

1. Refer to the Calibration Map at the beginning of this chapter and locate **PLOW CB PULSE XX** under the **Adjust Bed/Plow** heading.
2. Press the **Bed Switch** UP to increase the number or DN to decrease the number.
3. Exit Calibrate Mode to save constants.

Shaker Pulse: The Shaker Pulse is available to turn on the vibrator for a specific amount of time when "Spreader Alert" comes on. The default setting is off and it calibrated for up to 10 seconds. To change this value:

1. Refer to the Calibration Map at the beginning of this chapter and locate **SHAKER PULSE: XX** under the **Adjust Bed/Plow** heading.
2. Press the **Bed Switch** UP to adjust the setting.
3. Exit Calibrate Mode to save constants.

Plow Invert: It is possible to invert the front, scraper, and wing plow vertical controls. Default value is 'NO'. To change this value:

1. Refer to the Calibration Map at the beginning of this chapter and locate **PLOW INVERT?: XX** under the **Adjust Bed/Plow** heading.
2. Press the **Bed Switch** UP to alternate the setting.
3. Exit Calibrate Mode to save constants.

Adjust Bed/Plow continued..

Scraper Period: This is the number of seconds between scraper recharges and can be set between 0 and 90 with a default of 15. With the value set at 0 the system will not recharge the scraper plow. To change the setting:

1. Refer to the Calibration Map at the beginning of this chapter and locate **Scrap Period** under the **Adjust Spinner** heading.
2. Press the **Bed Switch** UP to increase the number or DOWN to decrease the number.
3. Exit Calibrate Mode to save constants.

SET TO ZERO IF THERE IS NO UNDERBODY SCRAPER AVAILABLE ON TRUCK.

Scraper Pulse: This can be set from 0 to 4 seconds with a default of 1 second. This will determine the length of time the scraper down function is refreshed. To change this value:

1. Refer to the Calibration Map at the beginning of this chapter and locate **Scrap Pulse** under the **Adjust Spinner** heading.
2. Press the BED switch UP to increase the number or DOWN to decrease the number.
3. Exit Calibrate Mode to save constants.

SET TO ZERO IF THERE IS NO UNDERBODY SCRAPER ON TRUCK.

Resetting 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. Enter Calibrate Mode
2. Scroll to **RESET CONSTANTS?**
3. Press and hold the **Blast Switch** and **Bed Switch** UP simultaneously.
4. Exit Calibrate Mode to save constants.

Adjust Miscellaneous

Low Temperature: This is factory set at 60° and should not be changed unless necessary. To change setting:

1. Refer to the Calibration Map at the beginning of this chapter and locate **LOW TEMP** under the **Adjust Misc.** heading.
2. Push the **Bed Switch** UP to increase the number or DN to decrease the number.
3. Exit Calibrate Mode to save constants.

High Temperature: This is factory set at 120° and should not be changed unless necessary. To change setting:

1. Refer to the Calibration Map at the beginning of this chapter and locate **HIGH TEMP** under the **Adjust Misc.** heading.
2. Push the **Bed Switch** UP to increase the number or DN to decrease the number.
3. Exit Calibrate Mode to save constants.

Alarm Temperature: This is factory set at 160° and should not be changed unless necessary. To change setting:

1. Refer to the Calibration Map at the beginning of this chapter and locate **ALARM TEMP** under the **Adjust Misc.** heading.
2. Push the **Bed Switch** UP to increase the number or DN to decrease the number.
3. Exit Calibrate Mode to save constants.

Beep Option: It is possible to specify how the alarm system should go off. If **ONCE** is selected then the alarm beeps the first time the alarm message is shown, but not again. If **CONT** is selected the alarm sounds every time the alarm flashes on the screen. **OFF** disables the beeper completely, but the alarm message will flash on the screen. To set Beeper option:

1. Refer to the Calibration Map at the beginning of this chapter and locate **BEEP** under the **Adjust Misc.** heading.
2. Use **Bed Switch** to toggle between the options.
3. Exit Calibrate Mode to save the settings.

Manual Mode: Manual operation mode is enabled through Calibrate Mode. To change this setting:

1. Refer to the Calibration Map at the beginning of this chapter and locate **Manual Mode** under the **Adjust Misc.** heading.
2. Use **Bed Switch** to toggle between the options.
3. Exit Calibrate Mode to save the settings.

Passcode: A passcode is required to enter Calibration mode. The default passcode is “4321”. Follow the steps below to change the passcode to enter calibrate mode:

1. Refer to the Calibration Map at the beginning of this chapter and locate **SET PASS XXXX** under the **Adjust Misc.** heading.
2. Push the **Bed Switch** to the UP position to increase the setting, and the DN position to decrease the setting. When pushing the **Bed Down Fast** button along with the **Bed Switch** the numbers will change in increments of 100.
3. Exit Calibrate Mode to save constants.

Record the passcode for your records. If your passcode is lost, Contact Pengwyn Technical Support.

Distance/Material Usage: These values are separated from the trip values on LCD Mode 7 with the intent of keeping track for longer than a trip. It can be reset by pressing and holding the **Blast Switch** and when prompted “Reset Datalog?” press the **Bed Up Switch**. It will display “Datalog Reset” to confirm and reset to the values to zero.

Troubleshooting Chart

PROBLEM	CAUSE	SOLUTION
Stops at LCD check	485 cable has a loose connection	Repair/replace cable
Display has 8 blocks, everything works	LCD has a loose connection	Repair connection/replace LCD
Will not hold date/time at all	Clock crystal and/or battery failing	Replace crystal and/or battery
Will not hold date/time with the power off	Battery back up is failing	Replace battery
Won't initialize, lights up with a blank screen	No program	Reprogram
	Not communicating with driver board	Repair circuit board
Can't change auger/spinner rate	Control box is in 'Broom Mode'	Remove from broom mode
Nothing energizes, driver board relay constantly resets	Poor ground connection	Repair ground connection as necessary
Auger, spinner, wetting, will not come on. Box reads low fluid when it is not low	Low level sensor failing	Replace low level sensor, check wiring
Manual does not work	Manual shut off in calibration mode	Turn manual mode on in calibration mode
Box reads spreader jam even with the truck off	Pressure transducer failing	Check transducer wiring, repair/replace
Spreader alert keeps going off	Box needs calibrated with the truck	Run spreader fault calibration
Fluid hot always on	Thermistor failing	Check thermistor connections, repair/replace

Programming Constants Table

Setting	Default Value	Calibrated Value
CAL AUGER	61	
AUGER MIN	1	
CAL DRAG	50	
CAL JAM	2500	
BLAST TIMEOUT	5	
BLAST HOLD	OFF	
CYLINDER PLOW/BED	DBL/DBL	
PLOW INVERT	NO	
SCRAP PERIOD	15	
SCRAP PULSE	1	
PLOW CB PULSE	OFF	
PASSCODE	4321	
BEEP OPTION	ONCE	
SPEEDOMETER	SQR	
NACLONE MIN	5	
Z-BLAST	OFF	
SPINNER_ON	OFF	
SHAKER	OFF	
CAL SPIN	45	
HIGH TEMP	120	
LOW TEMP	60	
ALARM	160	
PULSES/.1MI	3000	
MANUAL MODE	ON	

SETTING	DEFAULT VALUE	CALIBRATED VALUE
AUGER SETTINGS		
1	50	
2	100	
3	150	
4	200	
5	250	
6	300	
7	350	
8	400	
9	450	
10	500	
11	550	
12	600	
13	650	
14	700	
15	750	
GAL/GAL CONSTANT	5.4	
WETTING MAX	10	
GAL/TON CONSTANT	0.78	
PUMP SLIP	1	
DIR/APP SLIP	1	
G/MI RATE 1	10	
2	20	
3	30	
4	40	
5	50	
6	60	
7	70	
8	80	
9	90	
10	100	
11	100	
12	100	
13	100	
14	100	
15	100	

PENGWYN
CENTRAL HYDRAULIC SYSTEMS

485-2P CONTROL BOXES

PENGWYN
2550 West Fifth Avenue Columbus, OH 43204
Customer support: Phone 800.233.7568 • Fax 614.488.0019
www.pengwyn.com