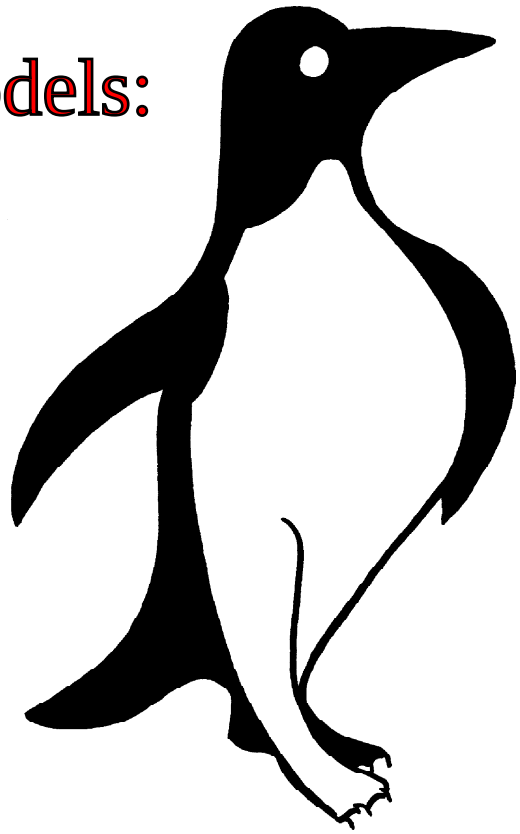
M & Z

Series

MW Models:

MW-00
MW-01
MW-02
MW-03
MW-04
MW-05

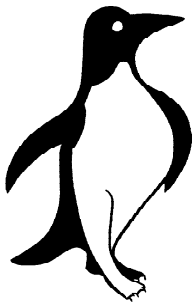


Z Models:

Z97
Z98
Z99
Z00
Z01
Z02
Z03
Z04
Z05

Technical Manual

10/2003



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10/2003

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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, and**
- **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 or dial 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 low material, jams, high oil temperature, low oil level, and internal faults. 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. Lowered material usage not only allows money to be used for something else, but helps to limit the damage done to the environment.

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

CAUTION

DISCONNECT VEAM OR AMPHENOL CONNECTOR FROM MANIFOLD AND REMOVE 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 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 THE WARRANTY. USE THE CONTROL CONSOLE MOUNTING BRACKET FOR THIS PURPOSE.

LIMITED WARRANTY

Pengwyn warrants M & Z 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.

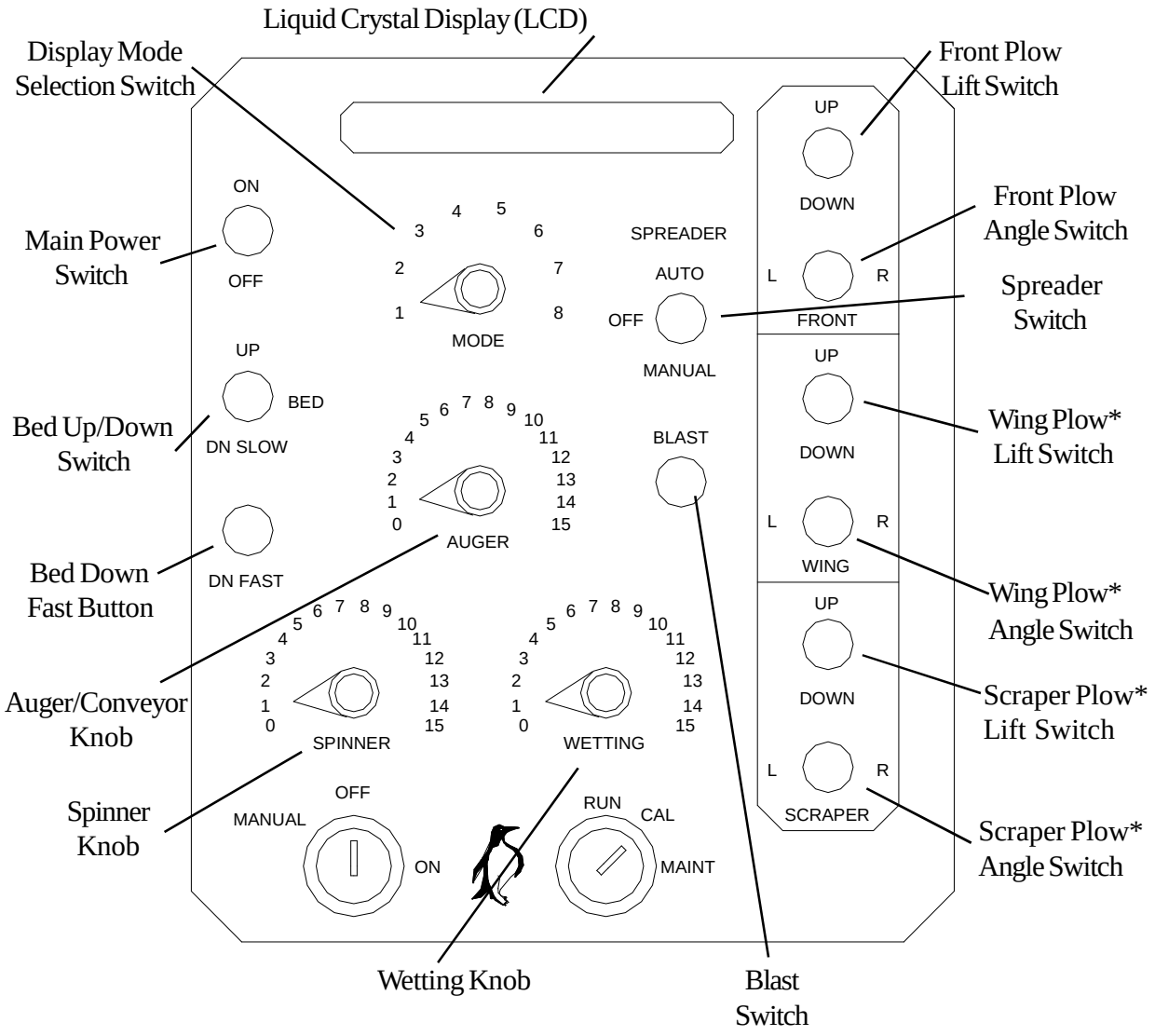
It is recommended that spare parts be purchased for critical items to allow continued operation of equipment during the inspection, evaluation, or repair/replacement process.

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.

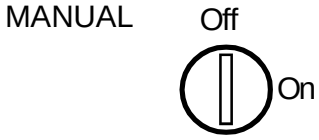
Control Console Front Panel



*** Z and MZ SERIES ONLY**

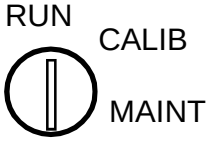
Operation of Control Console

Manual Lockout Keyswitch



The manual lockout keyswitch position determines whether the system's manual control of the auger and/or spinner is available. If the key is in the off position, no power will be sent to the auger/spinner coils when the spreader switch is in **MANUAL**.

Programming and Maintenance Keyswitch



The programming and maintenance keyswitch has three settings. They are run, calibrate, and maintenance. **RUN** is at 12:00, **CALIB** is at 1:30, and **MAINT** is at the 3:00 position. Each setting will be discussed in more depth where they apply.
The programming and maintenance keyswitch must always be returned to the **RUN** position before the truck is returned to the operator for everyday use. If the key position is left in **CALIB** or **MAINT**, not all of the hydraulic functions will work correctly until the key is turned back to **RUN**.

Main Power

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.

Bed Switches

There is a bed switch and a bed down fast button. The switch controls raising the bed and lowering it slowly. When the bed switch is in the down position and the bed down fast button is pushed at the same time the bed is lowered more quickly.

Spreader Switch

The spreader switch has three positions: **AUTOMATIC**, **OFF**, and **MANUAL**. The manual position is only active if the manual lockout keyswitch is turned to **ON**.

Operation of Control Console (Cont'd)

Front Plow Switches

The front plow switches are located in the upper right hand of the control console. The top switch controls the up and down movement of the plow. The lower switch controls the plow angle to the right or left.

Wing Plow Switches (optional feature Z series only)

The wing plow switches are the two middle switches on the far right of the control console. The first switch controls the up and down movement of the wing plow. The second switch controls the angle of the plow. If the truck is not equipped for a wing plow application, the switches will still be on the control box, but will not activate any hydraulic functions when the switches are engaged.

Underbody Scraper Plow Switches (optional feature Z series only)

The underbody scraper plow switches are found on the lower right of the control panel. The first switch controls the up and down movement of the scraper. The second switch controls the angle of the plow to the left or right.

Counterbalance for front plow (optional feature)

If the truck is equipped with a front plow counterbalance circuit, then the "Counterbalance" switch on the control box is used to turn the function "On" and "Off". Because of road contours, occasionally the plow will need "refreshed" to obtain the correct plow ride height. The operator can counterbalance the plow to desired height, then turn the Counterbalance switch "Off". This will eliminate the creeping up action of the plow over uneven pavement. Or, the operator can leave the Counterbalance switch "On" during plowing operations to continuously refresh the circuit. In this operation, the plow may need to be lowered occasionally if creeping up occurs.

Road Temperature Sensor (optional feature)

If the truck is equipped with a Road Temperature Sensing unit plugged into the RS-232 Data Port, it can be read on the control box display. With spreader switch in the "Off" position, turn the Mode knob to Mode 7. Then use the Blast switch to toggle into RTS mode, toggling the Blast switch again will display the hydraulic fluid temperature.

Operation of Control Console (Cont'd)

Liquid Chemical Wetting (optional features)

Gallons Per Ton Wetting

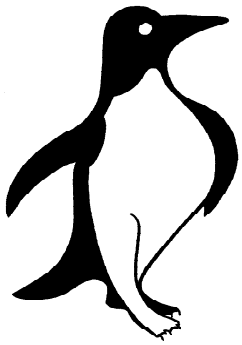
Liquid chemical wetting is an optional feature. Trucks equipped with this option, liquid wetting (such as calcium chloride or salt brine) is pumped from an on-board storage tank onto the granular material at the spinner. The wetting knob represents the percentage of the maximum gallons per ton ratio number programmed into the console. To do this put the spreader switch in automatic mode, the auger knob 1-15, spinner knob 1-15 and the wetting knob at the desired 1-10 setting. If the maximum ratio is 10 gallons per ton then position 10 equals 10 gallons per ton. Position 1 would be 10 percent of the maximum ratio and on up to position 10 being 100 percent maximum ratio.

Gallons Per Mile Wetting

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

Spreader In Manual Wetting

When operating the spreader in manual, the position numbers are equal to the amount of hydraulic flow in gallons per minute (GPM) being sent to the wetting system. Position 1 would be 1 GPM and on up to position 15 which would send 15 GPM of flow.

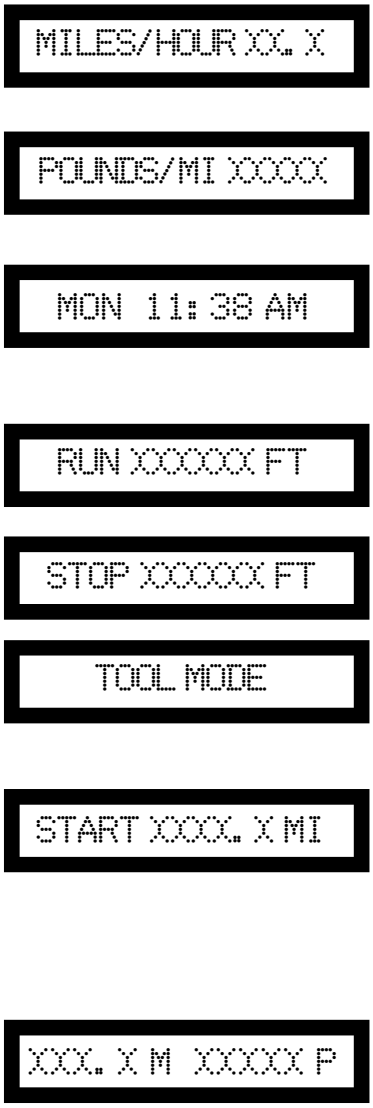


Operation of Control Console (Cont'd)

Mode Selection Switch

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

Position	Type of Information
1	**Vehicle speed in miles per hour (MPH)** Should closely match truck speedometer.
2	**Pounds per mile of material output at the spreader** Number shown is material output if the truck is driven at the current speed for one full mile.
3	**Day and Time**
4	**Distance measured in feet** When the spreader is **OFF** this will measure distance in feet. Press blast and the distance will be displayed with the screen "RUN XXXXXX FT". Press blast again and the count will stop. The display will read "STOP XXXXXX FT". With the spreader turned ON in Manual, this position will read **TOOL MODE** and the alarms will be off, allowing the tools to be run off the Pengwyn system without nuisance alarms.
5	**Distance measured in miles** This is the same as mode 4 but shows the distance measured in miles.
6	**Total miles traveled and total pounds of material** The control console stores the total pounds of material spread and the total miles traveled when the spreader switch is **ON(Automatic or Manual).** Data accumulation stops when the spreader switch is turned **OFF,** but continues when it is turned back **ON.** The data is added to that in memory. When the spreader is off, the blast switch is depressed, and this display is selected; the display values and datalog will be reset to 0. The information can be downloaded into a computer for display of graph and table information.



Operation of Control Console (Cont'd)

Mode Selection Switch (cont'd)

7 Fluid temperature

Displays the hydraulic reservoir temperature in Fahrenheit degrees.

The Pengwyn control console will read and display the hydraulic reservoir temperature. To read the temperature:

1. Turn mode switch to position **7.**
2. Start engine and run at idle.

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

3. Push the spreader switch to **MANUAL.**
4. Wait 10 seconds.
5. Turn spreader switch **OFF.**

This allows the pump to circulate hydraulic fluid from the reservoir through the manifold to the temperature sensor. It will now display the actual temperature.

8 Pressure

Displays the hydraulic system pressure in pounds per square inch (psi). Both the high and the differential pressure readings are shown. The first reading is the high pressure (taken from the pressure side of the auger compensator) and the second reading is the differential pressure (taken from the return side of the auger after the pressure drop of the 80 psi compensator).

The Pengwyn control console will read and display the hydraulic system pressure. To read system pressure:

1. Turn the mode switch to position **8.**

The display will show PRESSURE = XXXX. The pressure displayed is the pressure required to push pump flow through the manifold, compensator valves, pump bypass valve, and return line hosing.

2. Start engine and run at approx. 1500 RPM.
3. Operate any hydraulic function (normally used for relief valve pressure settings - see: Pressure Adjustments section for more information).

The pressure required to operate that function will be displayed. By running the cylinders to the end of their stroke or disconnecting the spreader system quick disconnects, the pressure setting of the relief valve protecting the specific function will be displayed.

Operation of Control Console (Cont'd)

Auger Switch (Spreader Material Output Selection Switch)

The auger has 15 settings. If the spreader switch is on **MANUAL** and the manual lockout keyswitch is turned **ON** then 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** 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**. The Penwyn 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 Switch (Spinner / *NaCl*one™ Speed Control Selection Switch)

The spinner has fifteen settings. Position 0 is off. When the spreader switch is in **AUTOMATIC** or **MANUAL**, settings **2** through **14** increase hydraulic flow to the spinner by one gallon per minute for each setting. 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** 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 **15** the circuit has a minimum flow of 1 GPM. Position **15** is used for zero velocity. 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. In **MANUAL** none of the eight positions are ground oriented.

Blast Switch

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

The blast switch is a spring return to neutral 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, and or wetting valves, sending maximum hydraulic flow to the auger/conveyor drive motor and or wetting pump. The auger/conveyor will put out maximum material and or wetting 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 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 manual lockout key will be in the **ON** position and the dial labeled mode should be on position **4**. The display will read TOOL MODE. 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 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

There are five warning alarms that include:

- Low fluid
- High temperature
- Spreader alert
- Spreader jam
- Internal fault

Low Fluid

If the spreader switch is in the **MANUAL** or **AUTO** position, the control box will produce an audible beep to warn about low fluid. The display will flash "LOW FLUID" even if the spreader switch is in the **OFF** position.

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 spreader switch should be turned to the **OFF** position 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 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 drive motor may not be connected.

Internal Fault

If there is an internal software failure, "INTERNAL FAULT" will flash on the screen. The control box may need repaired. The fault may be related to electronic noise from other devices in the cab. In this case, turn the control box off and back on.

Operation of Control Console (Cont'd)

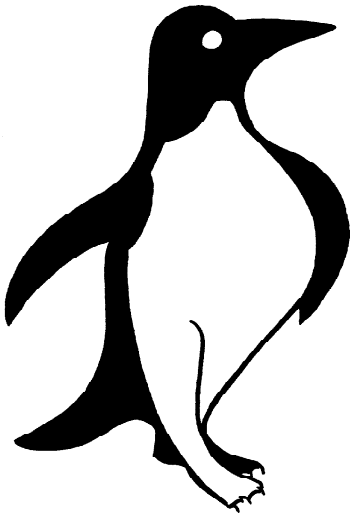
Retracting the Plow Cylinder

The M & Z Series plow circuits are basically a single acting circuit which utilizes the plow's weight to retract the cylinder or lower the plow; however, for hook up purposes only, we borrow some oil from the bed down circuit to retract the plow cylinder. This is accomplished by simultaneously operating the plow down and the bed down switches. This will hydraulically retract the plow cylinder.

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,** the **SPINNER** switch 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 10 degrees per minute.



Control Console Programming

Caution: Always return the programming key to the RUN position before turning the console power switch or the truck key off. Turning the power off before resetting the programming key (turning it back to RUN) may cause the loss of some of the newly programmed numbers. By turning the key to the RUN position any programmed constants will be saved to the Pengwyn memory and the control box will be returned to normal hydraulic operating mode.

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 Allison World Transmission. To select the appropriate setting:

1. Turn program key to **CALIB.**
2. Turn the **MODE** switch to position **1.**
3. Push front **PLOW** lift **UP** and hold.
4. Use the **BED** switch to toggle between the two settings.

Setting the Speed Constant

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

OR

1. Be prepared to drive the truck.
2. Turn the programming key to the **CALIB** position.
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).

Use the truck speedometer, not the control console, to determine truck speed.

5. Compare truck speedometer to speed shown on control console display.

The speed constant and the distance measuring constant method can both be used to program the control console to the truck's peedometer.Using the surveyed mile method is recommended because it is the most accurate.

To adjust the speed of the console to match the speed of the truck speedometer:

1. In **MODE 1**, push the bed switch to the **UP** position to increase the displayed console speed.
2. Push the **BED** switch to the **DN SLOW** position to decrease the displayed console speed.
3. Turn programming key to **RUN** position to save.

The speedometer setting is now complete.

4. Turn the **MODE** switch to position **4.**
5. Turn programming key to **CALIB** position.
6. Record the pulse count shown for your records.
7. Return programming keyswitch to **RUN**.

Control Console Programming (Cont'd)

Setting the Distance Measuring Constant (using a surveyed mile)

To set the distance measuring constant using a surveyed mile:

1. Turn the programming key to the **RUN** position.
2. Turn the **MODE** switch to position **4.**

The display will read "START XX FT".

3. Drive the truck toward the starting point of the measured mile.
4. Push up on 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 push up on 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

$$\frac{\text{Measured Distance (from control box)}}{\text{Actual Distance Traveled (ft)}} \times \text{(Pulses from Control Box)} = \text{New Pulse Constant to be Programmed}$$

This calculation can be used for any measured distance over 400 ft.

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

Use steps below to program new pulse number into control box.

To find the pulse or if setting the constant with a known constant:

1. Turn the programming key to the **CALIB** position.
2. Turn the **MODE** switch to position **4.**

The display will read "PULSES/.1MI XXXX". The XXXX indicates some number that could be anything from 0 to 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:

3. Push the **BED** switch to the **UP** position to increase the number displayed.
4. Push the **BED** switch to the **DN SLOW** position to decrease the number displayed.

Control Console Programming (Cont'd)

Calculation for Setting the Distance Measured Constant (Cont'd)

If a large number change must be made, pushing the **BED DOWN FAST** button to the **DN** position while simultaneously pushing 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.

5. Turn the programming key to the **RUN** position to save the settings.

Fluid Temperature

To read the fluid temperature:

1. Turn the programming key to **RUN.**
2. Turn the **MODE** switch to **7.**

This is not a programming number that is saved in memory. It is used only as a gauge of current temperature.

Cylinder Selection for Plow and Bed

S = single acting
D = double acting

In this setting specify whether the plow, bed, or both are single/double acting. To change the setting:

1. Turn the program keyswitch to **CALIB.**
2. Turn **MODE** switch to **8.**
3. Push front **PLOW** angle switch to **LEFT** and hold.
4. Push the **BED** switch **UP** or **DN** to toggle through the settings.

Beeper Option:

It is now 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. Turn the programming key to **CALIB.**
2. Turn the **MODE** switch to **1.**
3. Push the front **PLOW** lift switch to **DN** and hold.
4. Push the **BED** switch **UP** or **DN** to toggle through the settings.
5. Return the Programming key to **RUN** to save.

Control Console Programming (Cont'd)

Checking the Spreader Alert

To assure the spreader alert programming numbers were maintained in memory, the program numbers should be reviewed. To review these numbers:

1. Turn the programming key switch to **CALIB.**
2. Turn the mode switch to position **1.**
3. Push and hold the front **PLOW** angle switch to the **RIGHT** position and hold.

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

4. Check these to the numbers that were written down. If they match the numbers were held. If the numbers are not the same, repeat the spreader alert procedure.

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. Turn the **MODE** switch to position **7**.
4. Read the temperature on the display.
5. If temperature is below 80° then warm up the hydraulic oil to at least 80°.

To warm up the hydraulic oil:

1. Bring truck engine speed to 1500 rpm.
2. Push the **PLOW UP**, or **PLOW DN.**
3. Bottom out plow cylinder.
4. Turn to **MODE 7** and read temperature.

Once the proper temperature is achieved continue to set the spreader alarm:

6. Release the plow switch.
7. Maintain 1500 rpm engine speed.
8. Turn the programming key to **MAINT.**
9. Turn the auger switch and the spinner switch to **0.**

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

Control Console Programming (Cont'd)

Spreader Alert Calibration (Cont'd)

10. Push the spreader switch to **AUTO.**

As the automatic spreader alert settings advance.

11. 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 "START UNLOAD CAL" and then "SETTING 1 = XXX", "SETTING 2 = XXX" and so on. The displayed pressure readings should slightly increase for each progressive setting. This will continue automatically up to SETTING 15 = XXX. The display will then read "FINISHED" and then "TURN SPREADER OFF".

12. Turn the spreader **OFF.**
13. Lower the engine speed.
14. Turn the programming key to **RUN** to save constants.

The spreader alert is now set.

Setting the Spreader Drag

The spreader 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. Turn the programming key to the **CALIB** position.
2. Turn the **MODE** switch to position **2.**
3. Push the front **PLOW** angle switch to the **LEFT** position and hold.

The display will read "CAL 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.

4. Hold the front **PLOW** angle **LEFT** switch and push the bed switch to the **UP** position to increase the setting or switch to the **DN SLOW** position to decrease the setting (using the down fast button will change the number in increments of 10).
5. Record the spreader drag number for your records.
6. Return programming key to the **RUN** position to save the constant.

Control Console Programming (Cont'd)

Setting the Spreader Jam

Spreader 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. It should be set at 200 psi below the main relief valve setting. To set this number:

1. Turn the programming key to the **CALIB** position.
2. Turn the **MODE** switch to position **2.**
3. Push the front **PLOW** angle switch to the **RIGHT** position and hold.

The display will read "CAL JAM XXXX".

4. While holding the front **PLOW** switch to the **RIGHT**, push the **BED** switch to the **UP** position to increase the setting OR switch to the **DN SLOW** position to decrease the setting.

The numbers will change in increments of 10. When the bed down fast button is used with the bed switch the numbers will change in increments of 100.

5. Record the spreader jam number for your records.
6. Turn programming key to **RUN** to save constant.

Setting the Day and Time

1. Turn the programming key to the **CALIB** position.
2. Turn the **MODE** selection switch to position **3.**

The display will read "CAL DAY XXX". The XXX represents the day, i.e. SUN, MON, etc.

3. Push the **BED** switch to the **UP** or **DN** position until the correct day is shown.
4. Push the front **PLOW** angle switch to the **LEFT** position and hold.

The display will read "CAL HRS XX:XXAM".

5. Hold the front **PLOW LEFT** switch and push the bed switch to the **UP or DN** position to change the displayed hours and the displayed AM or PM (using the bed down fast button with the bed down switch will speed up the display).

This works on a 24 hour clock and is set the same as a digital watch. When this is set correctly:

6. Push the **PLOW** angle switch to **RIGHT** and hold.

The display will read "CAL MIN XX:XXAM".

7. Hold the front **PLOW RIGHT** switch and push the bed switch to the **UP** position to change the displayed minutes.

This works on a 60 minute clock and is set the same as a digital watch. When this is set correctly, the day and time settings are complete.

Control Console Programming (Cont'd)

Conveyor (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. Turn the programming key to the **CALIB** position and the **MODE** switch to position **2**.
2. Push the front **PLOW** lift switch to the **UP** position and hold. The display will read "CONVEYOR MIN X".
3. Push **BED SWITCH** to the up position while holding the front plow lift switch to increase the displayed number or **DN** to decrease the displayed number.
4. 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.

Blast Hold (Programmable)

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. Turn the programming key to the **CALIB** position and the **MODE** switch to position **2**.
2. Push the front **BLAST** switch to the **UP** position and hold. The display will read "BLAST HOLD".
3. Push **BED SWITCH** to the up position while holding the front plow lift switch to increase the displayed number or **DN** to decrease the displayed number.

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 operating.

To set up 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/conveyor to catch the material.
3. Ensure that material is distributed evenly over entire spreader box or conveyor belt.

With a V-box hopper, the gate opening must be adjusted to the position in which the truck will be operated. If the gate opening is changed, the new constant number must be found or the spreader system will no longer be accurate.

To find the spreader constant:

4. Turn the manual key to the **ON** position and the **MODE** switch to position 2.
5. Turn the programming key to the **RUN** position.
6. Start the engine and bring the engine speed to 1500 RPM.
7. Turn the **AUGER** switch to position 1.
8. Turn the **SPINNER** switch to position 0.

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. Repeat the procedure with the **AUGER** switch in position
14. Subtract value measured at auger 1 from auger 2.
15. Record this number for your records.

120	**Auger 2**
60	**Auger 1**
60	**Spreader Constant**

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

Control Console Programming (Cont'd)

Setting the Spreader Constant (auger)

To insert the spreader constant into the control console:

1. Turn the programming key to **CALIB.**
2. Turn the **MODE** switch to position **2.**
3. Turn the **AUGER** switch to position **0.**

The display will read "CAL SPREADER XX".

4. Push the **BED** switch to **UP** to increase the number or push the **BED** switch to **DN SLOW** to decrease the number (when also pushing bed down fast the display will increase/decrease the number in increments of 10).

When the number on the display matches the spreader constant number this procedure is finished.

5. Return the programming key to **RUN** to save.

Setting Spread Rate (auger)

When operating the spreader in automatic, positions **1** through **15** on the auger switch 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:

1. Turn the programming key to the **CALIB** position.
2. Turn the **MODE** switch to position **2.**
3. Turn the auger switch to the position to be programmed (**1** through **15**).

Each position will have to be set. The display will read "SPREADER 1 - XXXX". (SPREADER 2 - XXXX. etc...)

4. Push the bed switch to the **UP** position to increase the setting.
5. Push the **BED** switch to the **DN SLOW** position to decrease the setting.

The numbers will change in increments of 10. When pushing the bed down fast button while using the bed switch the numbers will change in increments of 100.

6. Record the spreader settings for each position for your records.

If 0 is programmed into any setting, the auger/conveyor will not turn when that setting is selected. To find the spreader constant, material must be in the bed of the truck and the spreader system must be attached and operating.

Control Console Programming (Cont'd)

High Temperature

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

1. Turn programming key to **CALIB.**
2. Turn **MODE** switch to **6.**
3. Push the **FRONT PLOW** lift switch **UP** and hold.
4. Push the **BED** switch **UP** to increase the number or **DN** to decrease the number.

Low Temperature

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

1. Turn programming key to **CALIB.**
2. Turn **MODE** switch to **6.**
3. Push the **FRONT PLOW** lift switch **DN** and hold.
4. Push the **BED** switch **UP** to increase the number or **DN** to decrease the number.

Temperature Alarm

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

1. Turn programming key to **CALIB.**
2. Turn **MODE** switch to **6.**
3. Push the front **PLOW** angle switch to **RIGHT** and hold.

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

Control Console Programming (Cont'd)

Wetting Maximum

WETTING MAX X.XX

The wetting maximum is set to a number between 1 and 255 gallons per ton. This number will determine the output for positions 1 to 10 on the wetting knob. The maximum gallons per ton is setting 10 on the wetting knob, therefore 1-9 are lesser percentages of the maximum 10 setting. Example: if setting 10 is equal to 10 gallons, setting 1 is 1 gallon per ton, setting 5 is 5 gallons per ton. Determine the maximum desired gallons per ton and program the number into the control console. To program the number:

1. Turn the programming key to **CALIB**.
2. Turn **MODE** switch to position 7.
3. Press **PLOW** switch **DOWN** and hold.
4. Press **BED** switch **UP** to increase and **DOWN** to decrease, to get to the wetting maximum.

GALLONS/TON CONSTANT

GAL/TON XX.XX

This value indicates the gallons of wetting solution pumped for each gallon of hydraulic fluid 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 5.00 in .02 increments. To set the wetting constant:

1. Turn the programming key to **CALIB**.
2. Turn **MODE** switch to position **7.**
3. Activate the **BLAST** switch.
4. Press the **BED** switch **UP** to increase the number or **DOWN** to decrease the number.

GALLONS/MILE CONSTANT

GAL/MILE XX.XX

This function allows for 1 to 100 gallons of wetting solution pumped for each mile traveled. This constant is used when the PENGWYN control box is controlling a wetting spray bar only (no granular material being spread). This is a constant value and is the ratio of the hydraulic motor to the liquid pump and it ranges from 0.02 to 5.00 in .02 increments. When operating in this mode, the auger/conveyor and spinner knob should be turned to "0" and the display in Mode "2" will read "GAL/MILE". To set the GAL/MILE constant:

1. Turn the programming key to **CALIB**.
2. Turn **MODE** switch to position **7.**

Control Console Programming (Cont'd)

GALLONS/MILE CONSTANT
(Cont'd)

3. With the Wetting Rotary Switch at position 0, display should read "**CAL WETTING**". This value will be the ratio of the liquid pump to the hydraulic motor. This value is adjusted with the **BED** Switch. To get the "Cal Wetting", take the displacement of the liquid pump divided by the displacement of the hydraulic motor. Cal wetting for the Oberdorfer 3000 is set at 0.32 and the Oberdorfer 7000 is set at 0.88.
4. Wetting rotary positions 1 thru 15 will hold the desired gal/mile settings. These settings are also adjusted with the **BED** Switch.
5. Move the FRONT PLOW Switch to the **UP** position to display "**PUMP SLIP**". This value should be set to 1 and is adjusted with the **BED** Switch.

Wetting Pump Slip

The pump slip constant ensures that hydraulic flow is always sent to the wetting pump. 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. Turn programming key to **CALIB**.
2. Turn **MODE** switch to position **7.**
3. Push the front **PLOW** lift switch **UP** and hold.
4. Press the **BED** switch **UP** to increase the number or **DOWN** to decrease the number.

Control Console Programming (Cont'd)

Setting the *NaCl*one™ 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. Plug this number into the console.
3. Do a trial run to see if maximum effectiveness is achieved.
4. Record the number for your records.

To set the ground oriented NaClone™:

1. Turn the programming key to the **CALIB** position.
2. Turn the **MODE** switch to position **2.**
3. Push the front plow lift switch to the **DN** position and hold.

The display will read "CAL SPIN XX.X".

4. Hold the front plow lift switch and push the bed switch to the **UP** position to increase the number.
5. Hold the front plow lift switch and push the bed switch to the **DN SLOW** position to decrease the number.

Once the desired number is set, this setting is complete.

6. Return the programming key to **RUN** to save.

This determines the minimum hydraulic flow to the spinner in

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, but should be changed to **ON** if zero-velocity is an option on the truck. To change the setting:

1. Turn programming key to **CALIB**.
2. Turn the **MODE** switch to position 8.
3. Activate the **BLAST** switch and hold.
4. Press the **BED** switch **UP** or **DOWN** to change the setting.

Control Console Programming (Cont'd)

NaClone Minimum Value (Spinner Minimum)

NACLONE MIN: X

automatic. It should be set at 3 for zero velocity or at 0 for a conventional spreader. To change the setting:

1. Turn the programming key to **CALIB.**
2. Turn the **MODE** switch to **1.**
3. Push the front **PLOW** lift switch to **DN** and hold.
4. Push the **BED** switch **UP** to increase the setting and **DN** to decrease the setting.
5. Return the programming key to **RUN** to save.

Scraper Period (Z Series only)

SCRAPER PERIOD XX

This value can be set between 0 and 90 seconds. The default is 15 seconds.
With the value set at 0 the system will not recharge the scraper plow. If no scraper plow is used on the truck, be sure the value is set at 0.
To change the setting:

1. Turn the programming key to **CALIB.**
2. Turn **MODE** switch to position **8.**
3. Press the front **PLOW** lift switch **UP** and hold.
4. Press the **BED** switch **UP** to increase the number or **DOWN** to decrease the number.

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

Scraper Pulse (Z Series only)

SCRAPER PULSE X

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. Turn programming key to **CALIB**.
2. Turn the mode switch to position **8.**
3. Push front **PLOW** lift switch **DOWN** and hold.
4. Push the **BED** switch **UP** to increase the number or **DOWN** to decrease the number.

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

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. (See laptop software manual)

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. Turn the Programming key to **CALIB**.
2. Turn the **MODE** switch to 3.
3. Push the **BLAST** switch **UP**.

The display will read: "CONSTANTS RESET"
The old constants for the truck can now be reprogrammed back into the control box.

Laptop Programming and Data Logging

Data Storage

The Pengwyn control console is equipped with an RS-232 data communications port. The storage capacity affords retrieval of 42 hours of operating information depending on spreader usage, including:

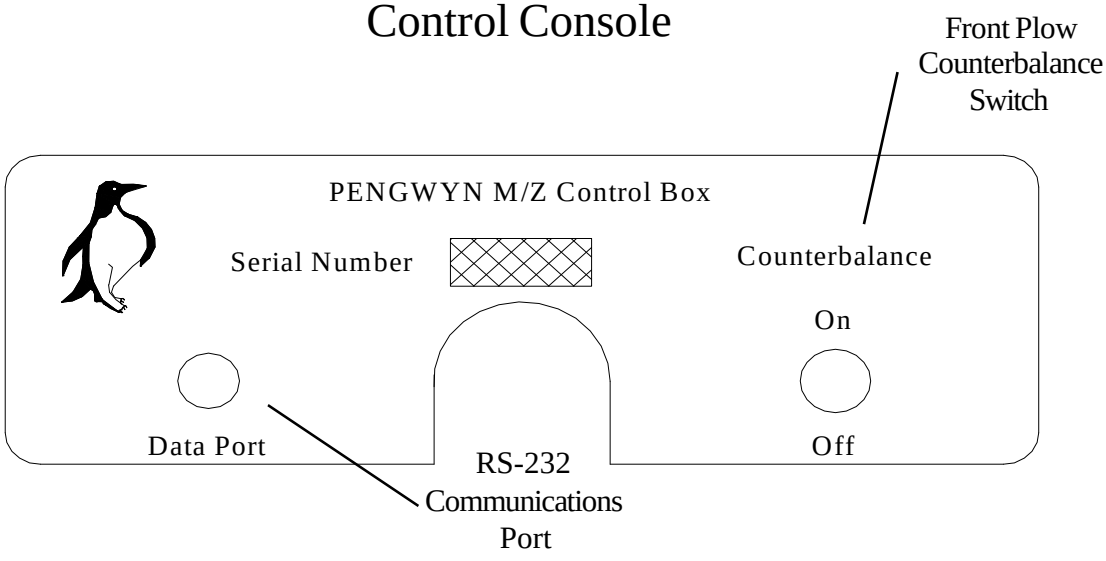
- Time control console is turned on
- Truck speed
- Miles driven with the spreader on
- Miles driven with the spreader off
- Time the truck idles
- Material spread rates

Laptop Communications / Software

Software is provided so that the accumulated data can be downloaded into a Windows 95 and 98 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 itemizing all spreader on and off times and all truck idle times to give a total account of:

- 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

Control Console



Laptop Programming and Data Logging (Cont'd)

Laptop Communications / Software (Cont'd)

The provided software will also plot a graph similar to the example below.

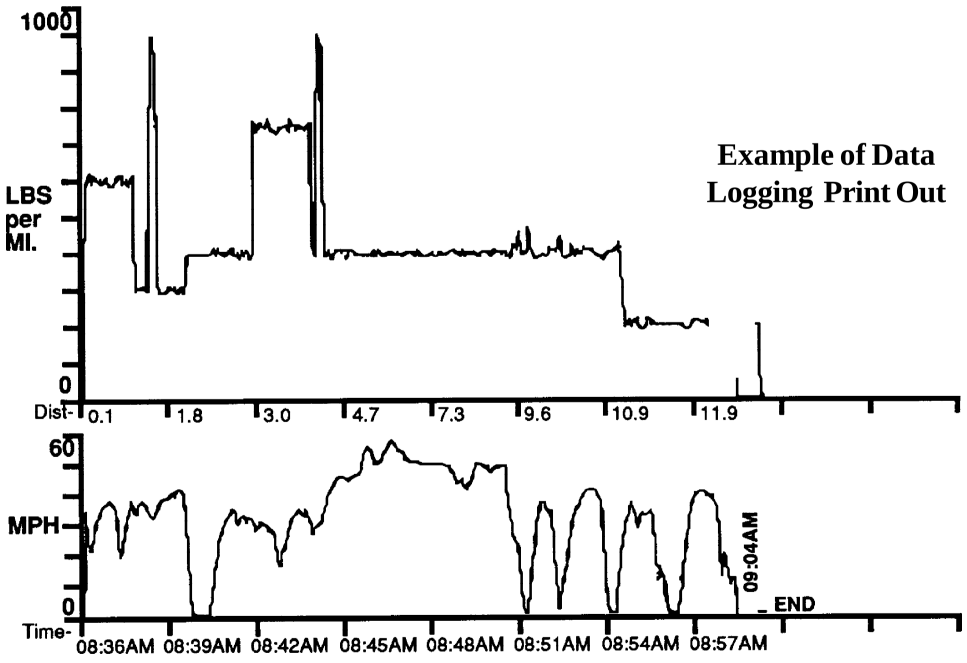
Programming and calibration of the Pengwyn control console can be done directly from the laptop computer through the software. Programming values can be individually changed by moving through (use the TAB key) a displayed table on the laptop screen and typing in the desired value(s). If several trucks are to be programmed with the same values, a calibration log can be created in the laptop and then the complete log transferred to the control console by doing the following:

- Plug into the RS-232 port
- Call up the input screen on the laptop
- Press ENTER

The entire file is transferred to the control console.

Additional Information

For more information on this feature please contact Pengwyn.



Example of Data Logging Print Out

Unit ID	#	DT 632	SPEED		SPREAD		Estimated	
Filename		07150904	Max.	Avg.	Max.	Avg.	Miles	Lbs.
Scale Hrs	=	0.5	59	33	1087	421	12.5	5320

Pressure Adjustments

The M & Z Series manifold system incorporates three relief valves. Pengwyn tests each manifold for function and sets each 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. Turn manual keyswitch to **ON.**
4. Disconnect the auger pressure hose quick disconnects.
5. Turn **SPREADER** switch to **MANUAL.**
6. Turn **AUGER** to position **0** and hit blast.
7. 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.
8. Turn engine off.
9. Remove cap from main relief (some reliefs have an external adjustment screw with locking nut).
10. 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.
11. Replace cap or tighten lock nut.
12. Repeat above procedure until proper setting is achieved.

Bed Up / Plow Up Relief

1. Start engine and bring engine speed to 1500 rpm.
2. Turn maintenance key to **RUN** and the **MODE** switch to position **8.**
3. Turn manual keyswitch to **ON.**
4. Turn **SPREADER** switch to **MANUAL.**
5. Push front plow lift switch to **UP** and extend cylinder until it bottoms out.
6. Read the pressure on the display. The first number will be the high pressure reading and the second number is the differential pressure reading.

Pressure Adjustments (Cont'd)

Bed Up / Plow Up Relief (Cont'd)

7. Turn engine off.
8. Remove cap from bed up/plow up relief (some reliefs have an external adjustment screw with locking nut).
9. Use an allen wrench to adjust the internal/external screw clockwise to increase pressure setting and counter clockwise to decrease pressure setting.
10. Replace cap and tighten lock nut.
11. Repeat the above procedure until proper setting is achieved.
12. Return manual key switch to **OFF** when finished.

Bed Down Relief (for double acting only)

1. Start engine and bring engine speed to 1500 rpm.
2. Turn the maintenance key to **RUN** and the **MODE** switch to position **8.**
3. Turn manual keyswitch to **ON.**
4. Turn spreader switch to **MANUAL.**
5. Push bed switch to **DN SLOW.**
6. When the bed is all the way down read the pressure on the display. The first number will be the high pressure reading and the second number is the differential pressure reading.
7. Turn engine off.
8. Remove cap from bed down relief (some reliefs have an external adjustment screw with a locking nut).
9. Use an allen wrench to adjust the internal/external screw clockwise to increase pressure setting and counter clockwise to decrease pressure setting.
10. Replace cap or tighten lock nut.
11. Repeat above procedure until proper setting is achieved.
12. Return the manual key switch to **OFF** when finished.

Pressure Adjustments (Cont'd)

Plow Counterbalance Pressure Adjustment

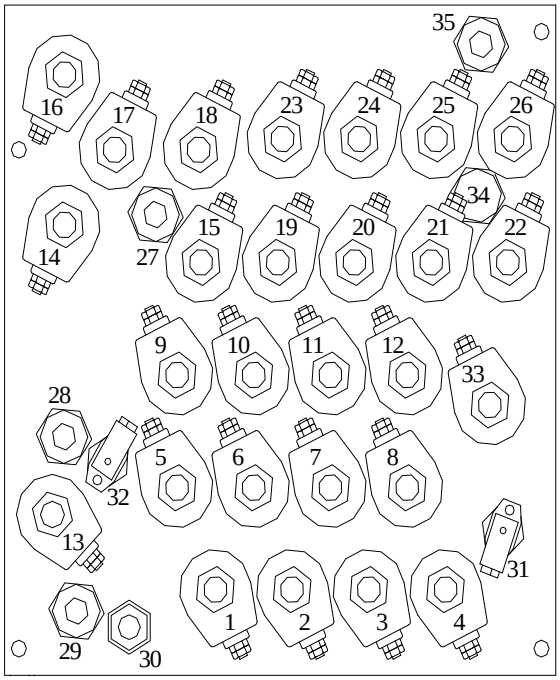
For trucks equipped with this optionthe amount of counterbalance desired can be adjusted using the plow counterbalance relief valve To change the setting:

1. Start engine and bring engine speed to 1500 RPM.
2. Activate plow counterbalance. On some trucks this may be done by use of the SCRAPER DOWN switch or an auxillary switch on or near the control console.
3. Loosen locknut on plow counterbalance relief valve.
4. Increase the amount of counterbalance pressure by turning the relief valve clockwise.
5. Decrease the amount of counterbalance by turning the relief valve counter-clockwise.
6. Once the desired amount of counterbalance is reached tighten the locknut on the counterbalance relief valve.
7. The amount of counterbalance pressure may be different for every truck. The pressure cannot be read using the PENGWYN control console. A hydraulic pressure gauge can be inserted at the plow lift port if a pressure reading is desired.

M Valve Function Diagram

As viewed inside cab facing rearward

MW VALVE FUNCTION DIAGRAM



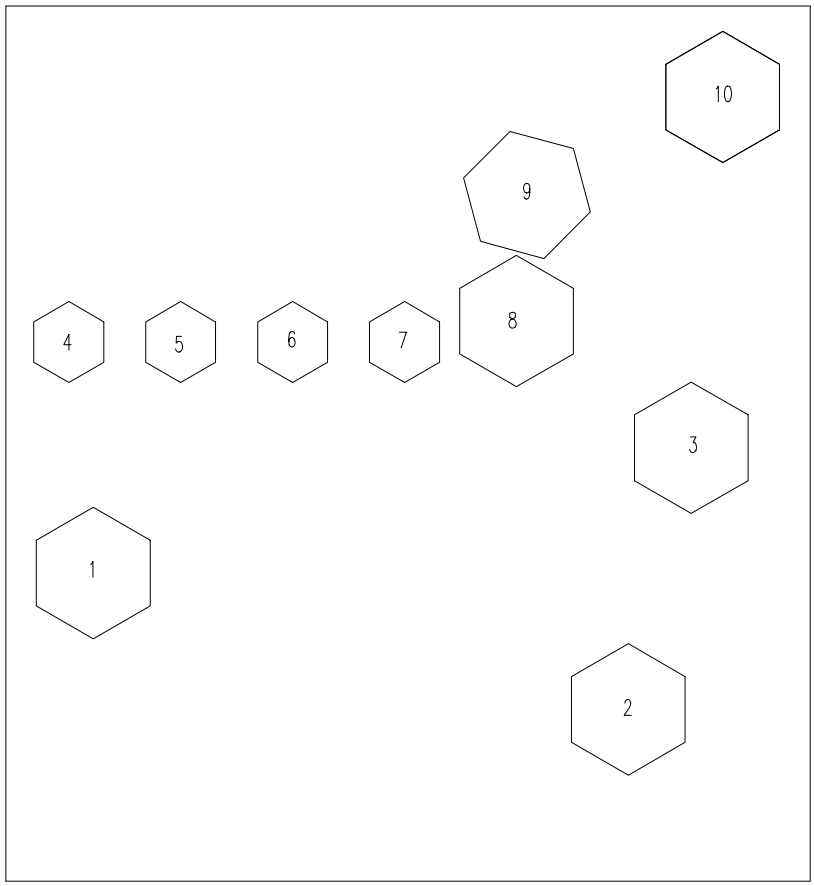
FLAG NUMBER	FUNCTION	WIRE COLOR
1	Auger 1	White
2	Auger 2	White/Yellow
3	Auger 4	White/Green
4	Auger 8	White/Blue
5	Spinner 1	White/Orange
6	Spinner 2	White/Brown
7	Spinner 4	White/Purple
8	Spinner 8	White/Blue
9	Wetting 1	Pink
10	Wetting 2	White
11	Wetting 4	White/Yellow
12	Wetting 8	White/Green
13	Pump Bypass Valve	White/Black
14	Bed Down	White/Red
15	Bed Down	White/Red
16	Bed Up	Orange
17	Bed Up	Orange
18	Bed Down Fast	Yellow
19	Plow Left, Pressure	Grey
20	Plow Right, Pressure	Purple
21	Plow Up, Pressure	Brown
22	Plow Down, Pressure	White/Grey
23	Plow Right, Tank	Grey (OC), Purple (CC)
24	Plow Left, Tank	Purple (OC), Grey (CC)
25	Plow Down, Tank	Brown
26	Plow Up, Tank	Brown
27	Bed Down Relief	N/A
28	Bed/Plow Up Relief	N/A
29	Main Relief	N/A
30	Thermistor	N/A
31	High Pressure Transducer	N/A
32	Low Pressure Transducer	N/A
33	Plow Counter Balance Solenoid	Blue
34	Plow Counter Balance Check Valve	N/A
35	Plow Counter Balance Relief	N/A

M Parts List for Manifold Assembly

FLAG NUMBER	FUNCTION	PART NUMBER
1-12,15,19-26,33	NORMALLY CLOSED SOLENOID VALVE SIZE 10	DS101C OR SV-101
14,16,17,18	NORMALLY CLOSED SOLENOID VALVE SIZE 16	DS161C OR SV-401
13	NORMALLY OPEN SOLENOID VALVE SIZE 16	DS161N OR SV-301
29	MAIN RELIEF	RD-2500
28	BED/PLOW RELIEF	RD-2500
27,35	BED DOWN RELIEF/ COUNTERBALANCE RELIEF	RD-0800
31,32	PRESSURE TRANSMITTER W/PLUG	X5000-P
30	THERMISTOR ASSEMBLY	TC-101
34	CHECK VALVE	CV103P
NO FLAG	MOLDED COIL (PARKER)	RC-101P
NO FLAG	MOLDED COIL (VICKERS)	RC-102
NO FLAG	MOLDED COIL (VICKERS CAN STYLE)	RC-101

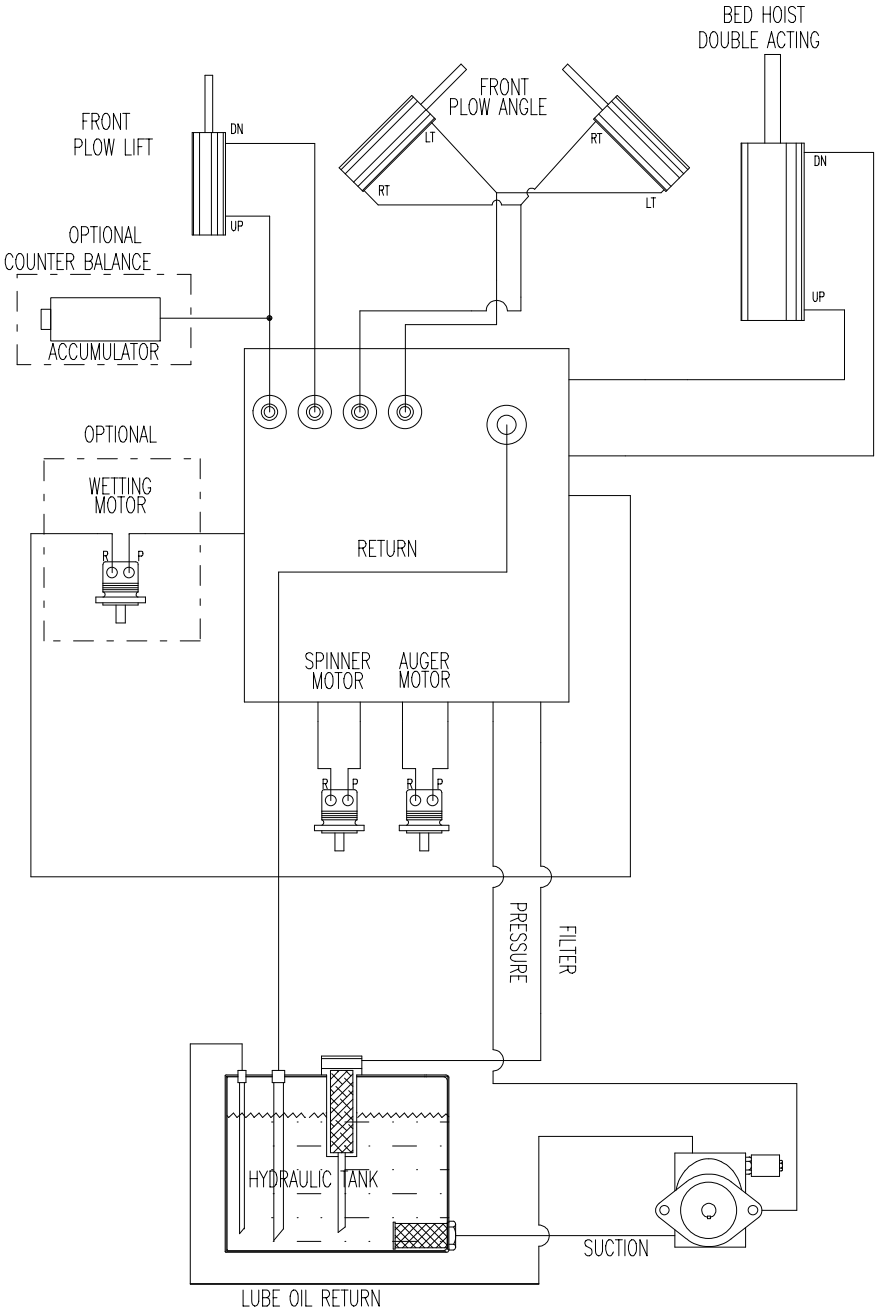
M Valve Function Diagram

As viewed from outside facing rear cab wall



FLAG NUMBER	FUNCTION	PART NUMBER
1,2,3	AUGER, SPINNER, WETTING COMPENSATOR	CP702
4,5,6,7	PLOW CHECK VALVES	CV103P
8	BED DOWN COMPENSATOR 15 GAL.	PC-501
9	BED DOWN FAST COMPENSATOR 30 GAL.	PC-601
10	BED CHECK VALVE	CV161P

M Plumbing Diagram



HOSE SIZE REQUIREMENTS

6 - 3/8" ID - Lube oil return for Autosucker
8 - 1/2" ID - Plow Hoist/Angle, Spinner and Wetting Motors
10 - 5/8" ID - Bed Hoist and Auger Motor
12 - 3/4" ID - Pump Pressure and Tank Returns
24 - 1 1/2" ID - Pump Suction

Z Valve Function Diagram

As viewed inside cab facing rearward

D=Deflector Block

NW=NaClone/ Wetting Block

By-Pass Block

"L" Bed Block

"R" Bed Block

U=Underbody or 2=Wing Plow "L" Block

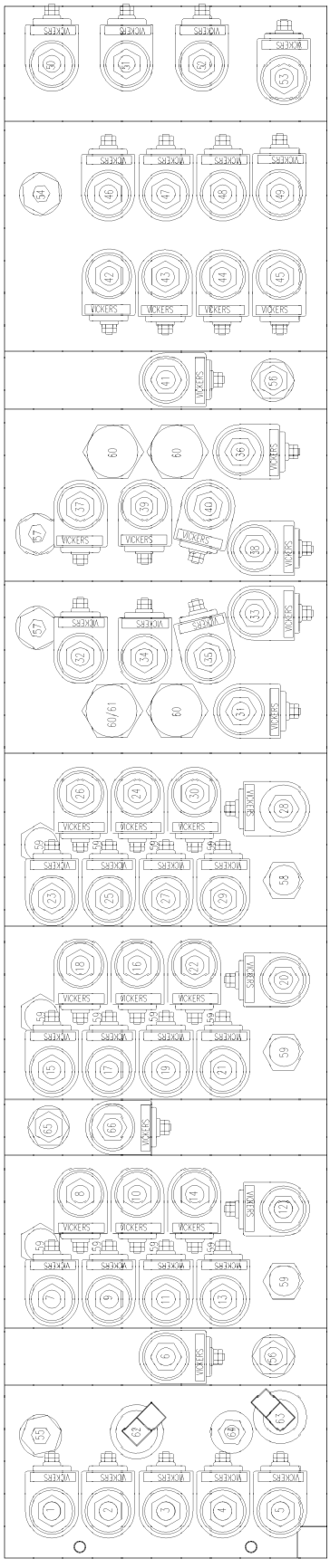
1=Wing Plow "R" Block

C=Counterbalance Block

F=Front Plow Block

By-Pass Block

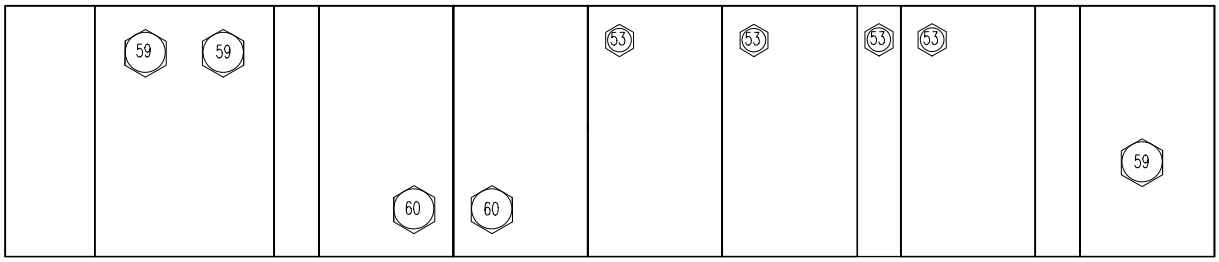
C=Conveyor/Auger Block



FLAG #	FUNCTION	WIRE COLOR
1	Auger .5 GPM	Pink
2	Auger 1 GPM	White
3	Auger 2 GPM	White/Yellow
4	Auger 4 GPM	White/Green
5	Auger 8 GPM	White/Blue
6	Pump Bypass	White/Black
7	Front plow left (pressure)	Gray
8	Front plow left (tank)	Gray (OC)/Purple (CC)
9	Front plow right (pressure)	Purple
10	Front plow right (tank)	Purple (OC)/ Gray (CC)
11	Front plow up (pressure)	White/Gray
12	Front plow up (tank)	White/Gray
13	Front plow down (pressure)	Brown
14	Front plow down (tank)	Brown
15	Wing plow left (pressure)	Gray
16	Wing plow left (tank)	Gray
17	Wing plow right (pressure)	Purple
18	Wing plow right (tank)	Purple
19	Wing plow up (pressure)	White/Gray
20	Wing plow up (tank)	White/Gray
21	Wing plow down (pressure)	Brown
22	Wing plow down (tank)	Brown
23	UB plow left (pressure)	Gray
24	UB plow left (tank)	Gray
25	UB plow right (pressure)	Purple
26	UB plow right (tank)	Purple
27	UB plow up (pressure)	White/Gray
28	UB plow up (tank)	White/Gray
29	UB plow down (pressure)	Brown
30	UB plow down (tank)	Brown
31	Bed up "R" (pressure)	Orange
32	Bed up "R" (tank)	Orange
33	Bed down "R" (pressure)	White/Red
34	Bed down slow "R" (tank)	White/Red
35	Bed down fast "R" (tank)	Yellow
36	Bed up "L" (pressure)	Orange
37	Bed up "L" (tank)	Orange
38	Bed down fast "L" (pressure)	White/Red
39	Bed down fast "L" (tank)	Yellow
40	Bed down fast "L" (tank)	Yellow
41	Pump Bypass (w/Bed "L" only)	White/Black
42	Spinner 1 GPM	White/Orange
43	Spinner 2 GPM	White/Brown
44	Spinner 4 GPM	White/Purple
45	Spinner 8 GPM	White/Blue
46	Wetting .5 GPM	Pink
47	Wetting 1 GPM	White
48	Wetting 2 GPM	White/Yellow
49	Wetting 4 GPM	White/Green
50	Left Deflector	White
51	Right Deflector	White/Black
52	Left Vane	Orange
53	Right Vane	White/Blue
54	Relief Valve set @ 2750 psi	
55	Relief Valve set @ 2300 psi	
56	Relief Valve set @ 1800 psi	
57	Relief Valve set @ 900 psi	
58	Relief Valve set @ 500 psi	
59	Check Valve	
60	Bed Down Flow control 30 GPM	
61	Bed Down Flow control 15 GPM	
62	Pressure Transducer (High)	
63	Pressure Transducer	
64	Thermistor	
65	Relief Valve set @ approx 300psi	
66	Plow Counterbalance	Brown

Valve Function Diagram

As viewed from outside facing rear cab wall

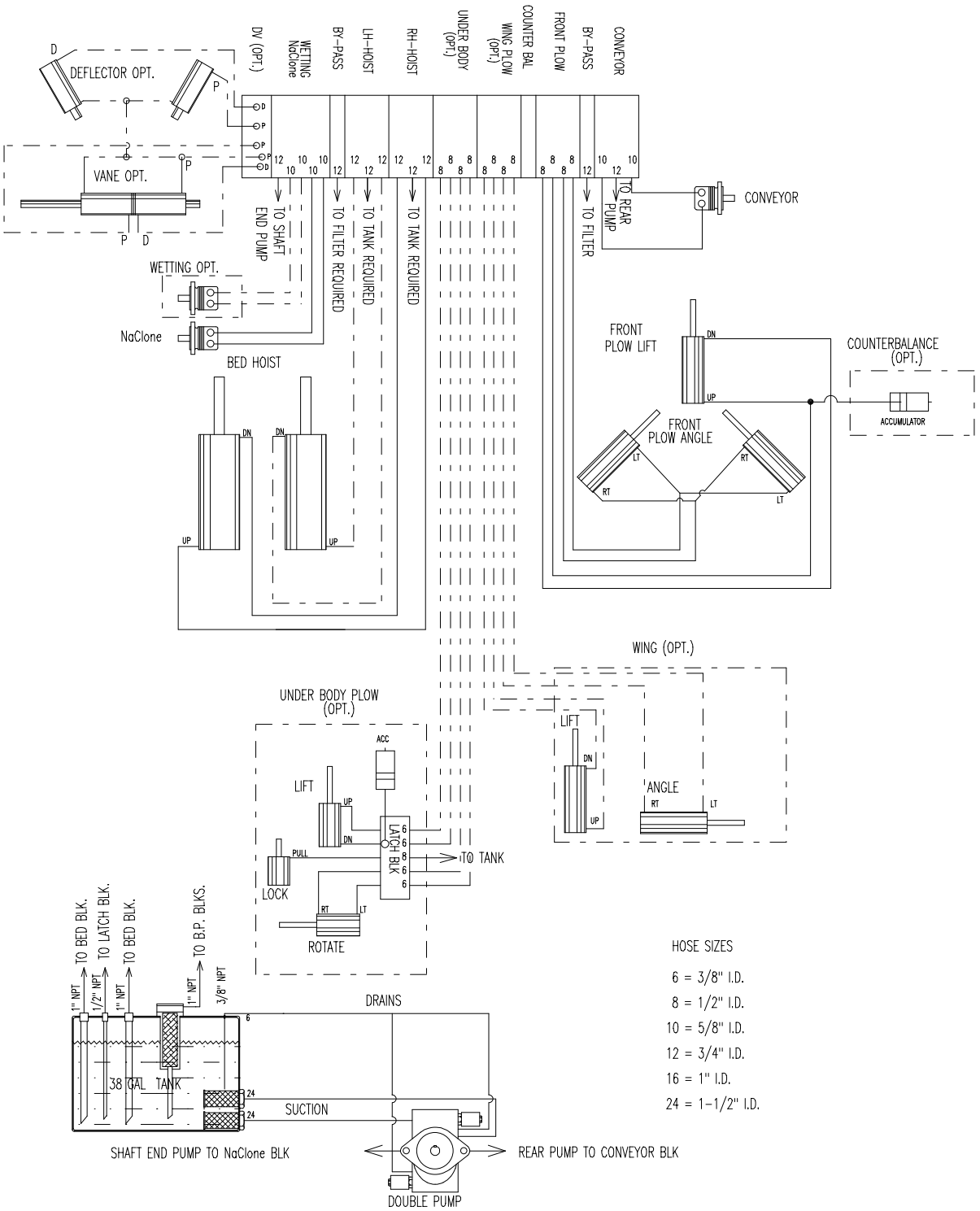


Parts List for Manifold Assembly

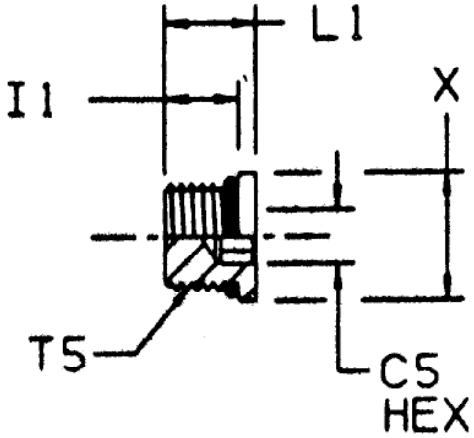
Flag Number	Description	Part Number
1-5, 7, 8*, 9, 10*, 11-14, 15-22, 23-30, 42-49	Normally closed solenoid valve, size 10	DS-101C or SV-101
8**,10**	Normally open solenoid valve, size 10	DS-101N or SV-201
50	Main relief valve	RD-2500
58	Thermistor Assembly	TC-101
56,57	Pressure transducer with plug	X5000-P
6, 41	Normally open solenoid valve, size 16	DS-161N or SV-301
51	Bed up/plow relief valve	RD-2500
52	Bed down relief valve	RD-0800
60	Check valve, size 16	CV-161P
53	Check valve, size 10	CV-103P
31-40	Normally closed solenoid valve, size 16	DS-161C or SV-401
55	Bed down slow compensator valve	PC-501
54	Bed down fast compensator valve	PC-601
59	Auger/wetting/spinner compensator valve	CP-702
No Flag	Molded Coil (Parker)	RC-101P
No Flag	Molded Coil (Vickers)	RC-102
No Flag	Molded Coil (Vickers Can Style)	RC-101

*** Front plow closed center system** **** Front plow open center system**

Z Plumbing Diagram



Torque Specs & O-Ring Numbers

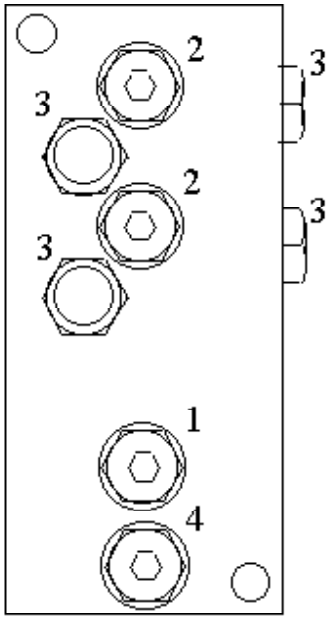


C5—ACROSS INTERNAL HEX FLATS

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

Underbody Latch Block Valve Diagram

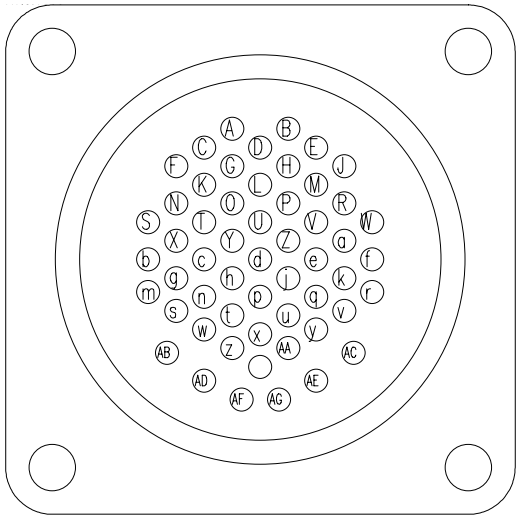


Flag Number	Function
1	Underbody Down Relief
2	Lock Sequence Valve
3	Check Valve
4	Underbody Up Relief

Underbody Latch Block Parts List

Flag Number	Description	Part Number
1,4	Underbody Relief Valve	RV-902
2	Lock Sequence Valve	RV-901
3	Check Valve	CV103P

M & Z Veam Wiring and Diodes



	Function	Color	Pin #
*	Auger .5 GPM	Pink	A
	Auger 1 GPM	White	B
	Auger 2 GPM	White/yellow	C
	Auger 4 GPM	White/green	D
	Auger 8 GPM	White/blue	E
	Bed up "R"	Orange	F
	Bed down slow	White/red	G
	Bed down fast	Yellow	H
	Pump	Black	J
	Spinner 1 GPM	White/orange	K
	Spinner 2 GPM	White/brown	L
	Spinner 4 GPM	White/purple	M
	Spinner 8 GPM	White/blue	N
	Front plow up	White/gray	O
	Front plow down	Brown	P
	Front plow left	Gray	R
	Front plow right	Purple	S
	Wetting .5 GPM	Pink	T
	Wetting 1 GPM	White	U
	Wetting 2 GPM	White/yellow	V
	Wetting 4 GPM	White/green	W

Function	Color	Pin #	
Pump bypass	White/black	X	
Bed up "L"	Orange	Z	*
Wing plow left	Gray	a	*
Wing plow right	Purple	b	*
Wing plow up	White/gray	c	*
Wing plow down	Brown	d	*
Underbody plow left	Gray	e	*
Underbody plow right	Purple	f	*
Underbody plow up	White/gray	g	*
Underbody plow down	Brown	h	*
Low oil	Orange (18/6)	r	
Thermistor - positive	#3-2cond. White	s	
Thermistor - negative	#3-2cond. Black	t	
Low pressure	#2-2cond. White	u	
High pressure	#1-2cond. Black	v	
2 Speed Transmission	Red (18/6)	y	
Tachometer	Black (18/6)	z	
12 Volt DC	White (12/2)	p	
Ground	Black (12/2)	q	

*** Z Series Only**

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, dirt can lodge in the valves downstream from the disconnects and cause the auger and/or spinner compensators to hang up. 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.

Solenoid 6 (the pump bypass valve for Z's) or solenoid 13 (the pump bypass valve for M's) are not required to operate the auger and the spinner. 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 0. The exception to this is when using the control console for pressure measuring. At this time the spreader switch should also be in the OFF position.

For safety, operate the power switch only when all the toggle switches are in the off position. Do not hold the bed and plow switches for long periods after their respective cylinders are completely extended unless warming up the hydraulic fluid for calibration purposes.

M Series
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

Bed (Double Acting)

E = the coil should be energized

	Solenoid Number						
	13	**14**	**15**	**16**	**17**	**18**	**PUMP**
Up	E			E	E		E
Down Slow	E	E	E				E
Down Fast	E	E	E			E	E

M Series
Solenoid Energization Charts (cont'd)

Front Plow (open center)

E = the coil should be energized

	Solenoid Number									
	13	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**PUMP**
Up	E			E					E	E
Down	E				E			E		E
Left	E	E				E				E
Right	E		E				E			E

Front Plow (closed center)

E = the coil should be energized

	Solenoid Number									
	13	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**PUMP**
Up	E			E					E	E
Down	E				E			E		E
Left	E	E					E			E
Right	E		E			E				E

Wetting - Optional (Manual)

E = the coil should be energized

	Solenoid Number					
Rate	**9**	**10**	**11**	**12**	**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

Note: On models equipped with plow counterbalance the **SCRAPER DOWN** switch may be used to activate the plow counterbalance solenoid (#33).

Z Series
Solenoid Energization Charts

Auger (Manual)

E = the coil should be energized

	Solenoid Number					
Rate	**2**	**3**	**4**	**5**	**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	**42**	**43**	**44**	**45**	**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

Bed-Single (Double Acting)

E = the coil should be energized

	Solenoid Number						
	6	**31**	**32**	**33**	**34**	**35**	**PUMP**
Up	E	E	E				E
Down Slow	E			E	E		E
Down Fast	E			E	E	E	E

Z Series
Solenoid Energization Charts (cont'd)

Bed -Double

E = the coil should be energized

	Solenoid Number							
	41	**36**	**37**	**38**	**39**	**40**	**PUMP 2**	
Up	E	E	E				E	
Down Fast	E			E	E	E	E	

Front Plow (open center)

E = the coil should be energized

	Solenoid Number									
	6	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**PUMP**
Up	E					E	E			E
Down	E							E	E	E
Left	E	E	E							E
Right	E			E	E					E

Front Plow (closed center)

E = the coil should be energized

	Solenoid Number									
	6	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**PUMP**
Up	E					E	E			E
Down	E							E	E	E
Left	E	E			E					E
Right	E		E	E						E

Wing Plow

E = the coil should be energized

	Solenoid Number									
	6	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**PUMP**
Up	E					E	E			E
Down	E							E	E	E
Left	E	E	E							E
Right	E			E	E					E

Underbody Plow

E = the coil should be energized

	Solenoid Number									
	6	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**PUMP**
Up	E					E	E			E
Down	E							E	E	E
Left	E	E	E							E
Right	E			E	E					E

Note: On models equipped with plow couonterbalance the **SCRAPER DOWN** circuit may be used to activate the plow counterbalance solenoid (#66).

Z Series
Solenoid Energization Charts (cont'd)

Wetting (Manual)

E = the coil should be energized

	Solenoid Number					
Rate	**46**	**47**	**48**	**49**	**PUMP 2**	**GPM**
0					E	0
1	E				E	.5
2		E			E	1
3	E	E			E	1.5
4			E		E	2
5	E		E		E	2.5
6		E	E		E	3
7	E	E	E		E	3.5
8				E	E	4
9	E			E	E	4.5
10		E		E	E	5
11	E	E		E	E	5.5
12			E	E	E	6
13	E		E	E	E	6.5
14		E	E	E	E	7
15	E	E	E	E	E	7.5

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.
Pump noisy, oil	Shaft seal leaking.	Replace shaft seal.

Troubleshooting Chart (Cont'd)

PROBLEM	CAUSE	SOLUTION
Pump noisy, oil aerated.	Shaft seal leaking.	Replace shaft seal.
	Suction line loose.	Tighten suction line.
	Dump hoist vent leaking.	Clean, repair, or replace vent.
Nothing works, pump runs.	Out of fluid.	Add hydraulic oil. Check for leaks.
	Solenoid bad on pump bypass valve.	Replace coil.
	Suction poppet stuck.	Clean suction poppet.
	Bypass coil nut over tightened.	Replace bypass cartridge.
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 as needed.

Troubleshooting Chart (Cont'd)

PROBLEM	CAUSE	SOLUTION
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.
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.
Bed won't go up.	Bed down valve stuck open.	Clean bed down valves.
	Bed up solenoid failed.	Replace bed up coil.

Troubleshooting Chart (Cont'd)

PROBLEM	CAUSE	SOLUTION
Bed won't go up. (Cont'd)	Bed-up coil nut over tightened.	Replace bed-up cartridge.
	Pump bypass valve not operating.	Clean or replace.
	Auger or spinner valve leaking when spreader disconnected.	Clean or replace.
Bed goes up when plow up is operating.	Dirt in bed-up solenoid valve.	Clean valve.
Bed drifts down.	Dirt in any one of the lift-port valves.	Clean all valves. Check poppets for spring action.
Bed will only creep down. (no high speed)	Bed-compensator cartridge bad.	Replace bed-compensator cartridge.
Bed chatters down.	Compensator cartridge bad.	Replace bed-compensator cartridge.
Plow won't go up.	Plow-down valve stuck open.	Clean valve.
	Plow-up valve failed.	Clean or replace valve.

Troubleshooting Chart (Cont'd)

PROBLEM	CAUSE	SOLUTION
Plow won't go up. (Cont'd)	Plow relief set too low.	Adjust bed/plow relief.
	Plow-up coil nut over tightened.	Replace plow-up cartridge.
Plow drifts down.	Dirt in plow-up valve.	Clean valve.
	Dirt in plow-down valve.	Clean valve.
	Plow-down coil over tightened.	Replace plow-down cartridge.
Plow will go up, but will not go down.	Faulty plow quick disconnect.	Clean or replace as necessary.
Hydraulic fluid too hot.	Low fluid level.	Add hydraulic fluid.
	Bypass valve stuck closed.	Clean valve.
	Bypass coil nut over tightened.	Replace bypass cartridge.
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.
Bed/plow will not raise but oil is heard in manifold.	Bed/plow relief is set too low.	Check pressures and reset pressure relief.

Troubleshooting Chart (Cont'd)

PROBLEM	CAUSE	SOLUTION
Bed will not lower when all the way up but oil is heard in manifold.	Bed down 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 "**Finding the Spreader Constant**" in Control Console Programming).
Control will turn off and turn on automatically.	Circuit breaker is in the main power feed.	Take circuit breaker out and replace it with a 30 amp fuse.
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.
Plow will angle in one direction but not in the other.	Hot shuttle valve too tight.	Loosen valve slightly.
	Faulty disconnect.	Replace quick disconnect.
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.

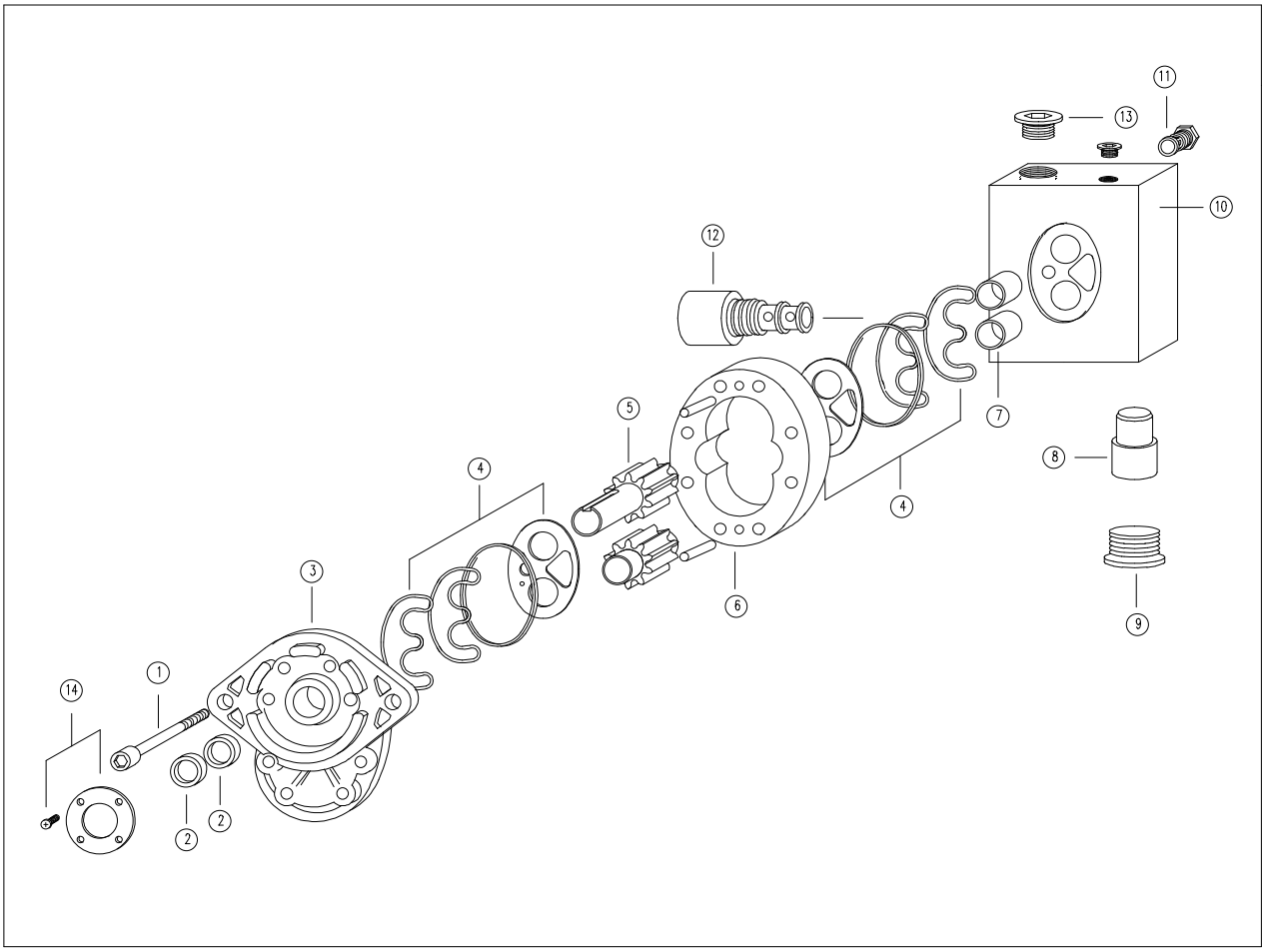
Troubleshooting Chart (Cont'd)

PROBLEM	CAUSE	SOLUTION
Spinner speed is not adequate.	Spinner may be in mode 7.	Change to mode 6.
Spreader switch will not stay on AUTO or MANUAL.	The rubber boot may have shrunk due to temperature.	Stretch or shave the rubber boot to allow for full motion of the switch.
Spinner is effected by pressing the blast switch.	Z-Blast is turned on.	See: the Pre-Winter Checklist for steps to turn this function off. This is used only with zero-velocity for the Z Series.

Miscellaneous Parts List

Description	Part Number
Console mounting nut kit	CN-101
Control console	MZ-00
Double pump adapter kit	PA-102
Tank filter, suction	TF-101
Double Autosucker™ pump assembly	AS-237/237-LH
Intank immersed filter, return line	IT-2010
Replacement filter element w/o'ring	FE-202
***NaCl*one™** drive motor	NA-110A
Seal kit for ***NaCl*one™** motor	SK-2263
O-ring boss seal kit	SK-ORB
***NaCl*one™** belt, 142 1/4"	NC-105
***NaCl*one™** pulley assembly	NC-104

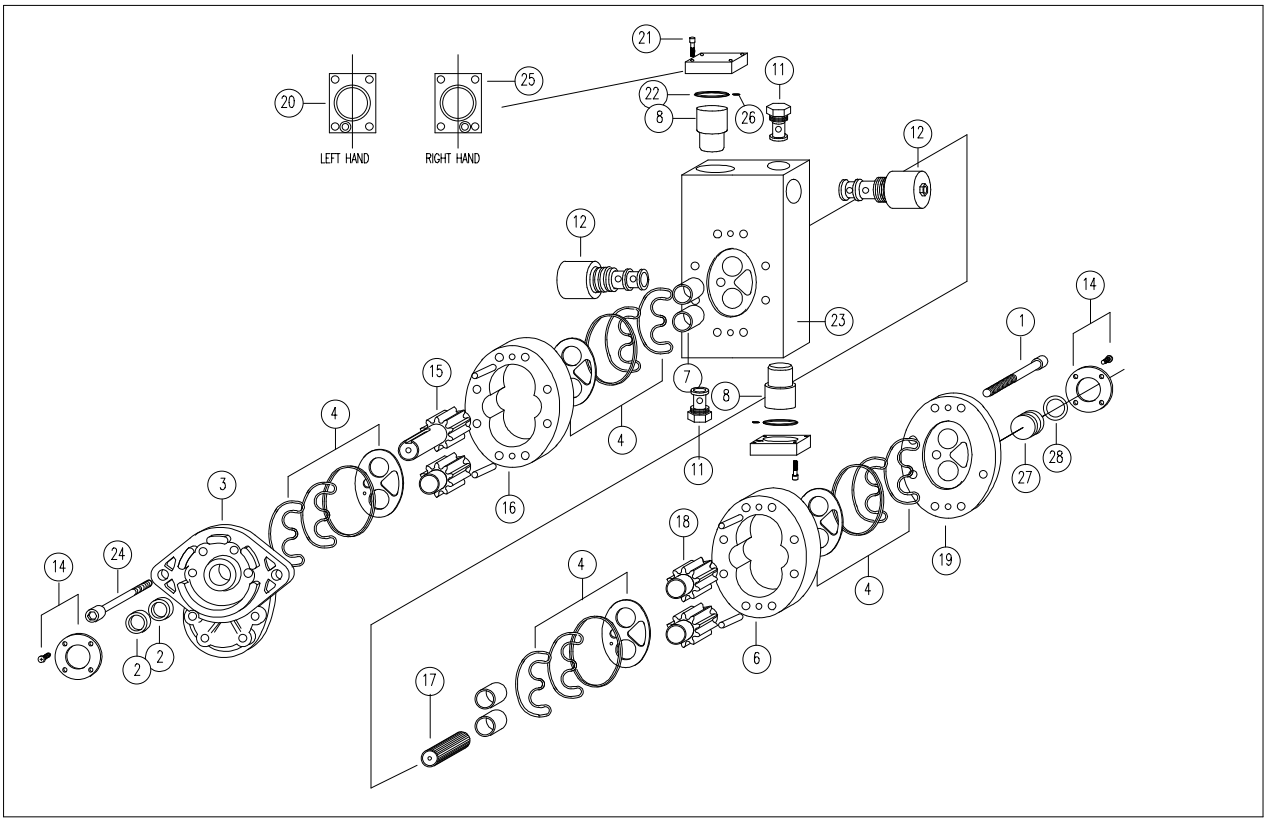
Parts Drawing
Single Autosucker™ Pump



Parts List for Single Autosucker™ Pump

1.	Bolt Kit (8 pieces)		A-237-10
2.	Shaft Seal		A-20
3.	Freont Cover		A-LH-30
4.	Wear Plate Kit		A-40
		Pre-Load Seal	A-45
		Load Seal	A-46
		Seal Ring	A-47
		Wear Ring	A-48
5.	Gear Set		A-237-50
6.	Gear Housing		A-237-60
7.	Shaft Bearing Kit (2 pieces)		A-70
8.	Suction Poppet		A-80
9.	Suction Poppet Cap		A-90
10.	Back Cover		AS-100
11.	Check Valve		AS-110
12.	Solenoid Valve Assembly		A-120
		Coil Only	A-125
		Nut Only	A-126
		Valve Only	A-127
13.	Plug		A-150
14.	Seal Retainer and Screws (4 pieces)		SRSTB-4
		Seal Retainer	SR-11394
		Screws (4 pieces)	STB-4-1420
Double Shaft Seal and Retainer Kit			ASRK-237
Seal Kit			A-140

Parts Drawing
Double Autosucker™ Pump

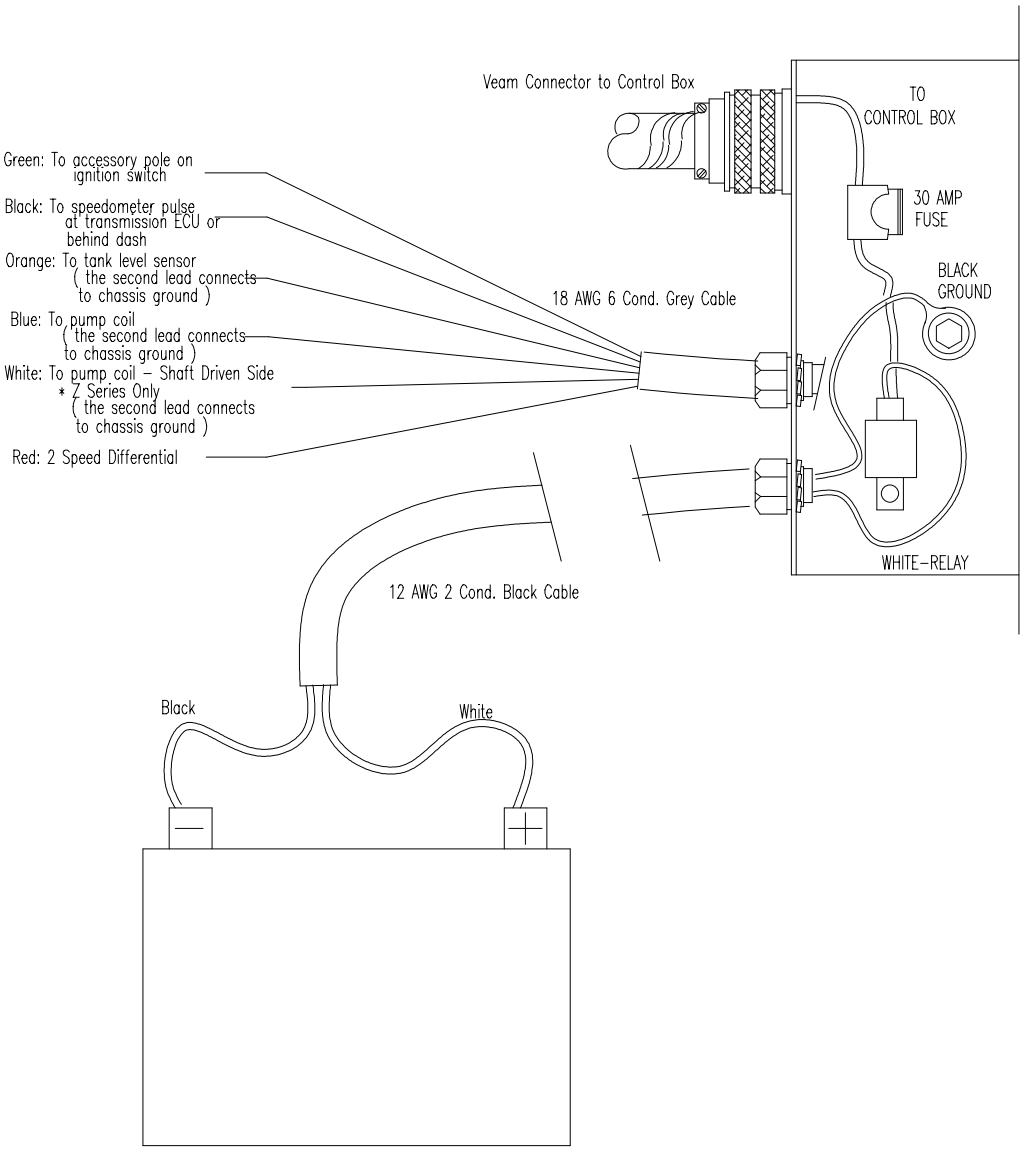


Parts List for Double Autosucker™ Pump

1.	Bolt kit (8 pieces)	A-237-10
2.	Shaft Seal	A-20
3.	Front Cover	A-LH-30
4.	Wear Plate Kit	A-40
	Pre-load Seal	A-45
	Load Seal	A-46
	Seal Ring	A-47
	Wear Plate	A-48
6.	Gear Housing	A-237-60
7.	Shaft Bearing Kit (2 pieces)	A-70
8.	Suction Poppet	A-80
11.	Check Valve	A-110
12.	Solenoid Valve Assembly	A-120
	Coil Only	A-125
	Nut Only	A-126
	Valve Only	A-127
14.	Seal Retainer and Screws (4 pieces)	SRSTB-4
	Seal Retainer	SR-11394
	Screws (4 pieces)	STB-4-1420
15.	Drive Gear Set - Front Section	A-237-50
16.	Gear Housing - Front Section	A-237-60
17.	Spline Coupler	A-160
18.	Idler Gear Set - Rear Section	A-237-55
19.	Rear Cover Assembly	A-170
20.	Poppet Cover Left Hand	A-180-LH
21.	Cap Screws (4)	A-190
22.	O-Ring Seal	A-185
23.	Center Section	AS-200
24.	Bolt Kit - Front Section	A-237-10
25.	Poppet Cover Right Hand	A-180-RH

Truck Wiring

PENGWYN
WIRING
BRACKET



Programming Constants

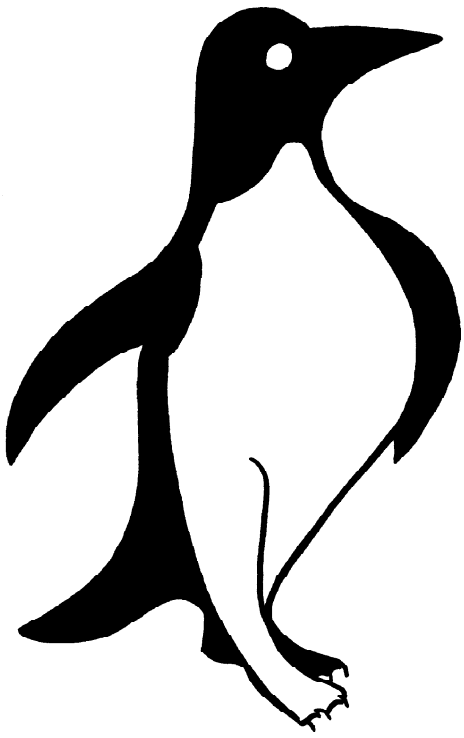
Record your programming constants below for future reference. It is important to keep this record in the event of a control box change.

SPEEDOMETER _____
CAL SPREADER _____
CAL SPIN _____
CAL DRAG _____
CAL JAM _____
CYLINDER PLOW/BED _____
BEEPER OPTION _____
CONVEYOR MIN _____
NACLONE MIN _____
FLUID TYPE _____
HIGH TEMP _____
LOW TEMP _____
ALARM _____
PULSES/.1MI _____
SPREADER 1 _____
2 _____
3 _____
4 _____
5 _____
6 _____
7 _____
8 _____
9 _____
10 _____
11 _____
12 _____
13 _____
14 _____
15 _____

Form A

Programming Constants (CON'T)

GAL./MILE CONSTANT		_____
WETTING MAX		_____
GAL/TON CONSTANT		_____
PUMP SLIP		_____
GAL/MILE SETTINGS	1	_____
	2	_____
	3	_____
	4	_____
	5	_____
	6	_____
	7	_____
	8	_____
	9	_____
	10	_____
	11	_____
	12	_____
	13	_____
	14	_____
	15	_____



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