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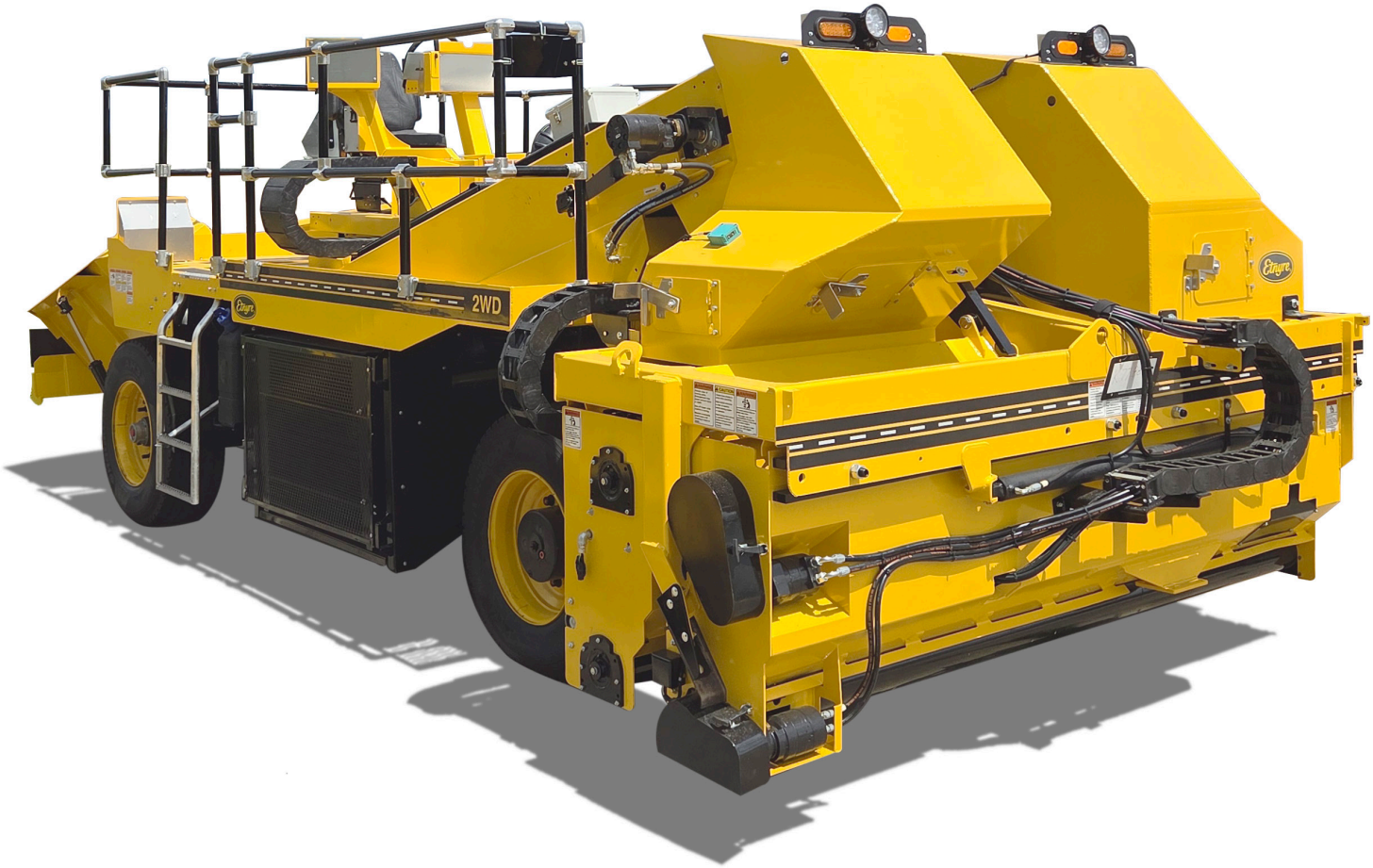
M-215-26

Starting with Serial Number K7793

ChipSpreader
with Touch Screen Controls

Standard and Variable Width Hopper



Operation - Maintenance - Safety

E.D. ETNYRE & CO. - 1333 S. Daysville Road - Oregon, Illinois 61061

Phone: 815-732-2116 or 800-995-2116 – Fax: 800-521-1107 – www.etnyre.com

Parts/Service: 888-586-1899 – CustomerService@etnyre.com

M-215-26

ChipSpreader Operation, Maintenance and Safety Manual

CHIPSPREADER
Fixed or Variable Width Hopper
with Touch Screen Controls

Starting with Serial Number K7793

WARRANTY

E. D. Etnyre & Co. warrants to the original Purchaser, its new product to be free from defects in material and workmanship for a period of twelve (12) months after date of delivery to original Purchaser. The obligation of the Company is limited to repairing or replacing any defective part returned to the Company and will not be responsible for consequential damages or any further loss by reason of such defect.

The company excludes all implied warranties of merchantability and fitness for a particular purpose. There are no warranties, express or implied, which extend beyond the description of the goods contained in this contract.

This warranty does not obligate the Company to bear the cost of machine transportation in connection with the replacement or repair of defective parts, nor does it guarantee repair or replacement of any parts on which unauthorized repairs or alterations have been made or for components not manufactured by the Company except to the extent of the warranty given by the original Manufacturer.

This warranty does not apply to:

(1) Normal startup services, normal maintenance services or adjustments usually performed by the selling dealer, factory service representative or customer personnel.

(2) Any product manufactured by E. D. Etnyre & Co. purchased or subjected to rental use.

(3) Any product or part thereof which shows improper operation, improper maintenance, abuse, neglect, damage or modification after shipment from factory.

(4) Any product or part thereof damaged or lost in shipment. Inspection for damage should be made before acceptance or signing any delivery documents releasing responsibility of the delivering carrier.

This warranty and foregoing obligations are in lieu of all other obligations and liabilities including negligence and all warranties of merchantability or otherwise, express or implied in fact or by law.

E. D. ETNYRE & CO., Oregon, Illinois 61061-9778
1333 South Daysville Road Phone: 800-995-2116 Fax: 8020-521-1107
www.etnyre.com

Safety Precautions, Hazard Seriousness Level

You will find safety information boxes throughout this manual. These boxes contain information alerting you to situations or actions to avoid.

Signal words (DANGER, WARNING and CAUTION) are used to identify levels of hazard seriousness. Their selection is based on the likely consequence of human interaction with a hazard. Definitions of hazard levels are as follows.

DANGER - Immediate hazards which **will** result in severe personal injury or death.

WARNING - Hazards or unsafe practices which **could** result in severe personal injury or death.

CAUTION - Hazards or unsafe practices which could result in minor personal injury or product or property damage.

CALIFORNIA

Proposition 65 WARNING

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

Please note this warning and remember -

Always start and operate the engine in a well ventilated area;

If in an enclosed area, vent the exhaust to the outside;

Do not modify or tamper with the exhaust system.

CAUTION

Before breaking the seal on all hydraulic fittings, fill caps, etc. be sure to clean around the connection. Failure to do so may cause contaminants to enter the hydraulic system causing damage to pumps, motors, etc.

WARNING

Do not use this machine for any operation which is not described in this manual.

If you have any questions about operation of this machine, contact the Etnyre Service Department at 1-800-995-2116 or 1-815-732-2116.

Operations that are not approved could cause serious injury or death.

WARNING

FLUOROELASTOMER HANDLING

Some O-rings and seals used in this vehicle are made from fluoroelastomers. When used under design conditions, fluoroelastomers do not require special handling. However, when fluoroelastomers are heated to temperatures beyond their design temperature (around 600° Fahrenheit), decomposition may occur with the formation of hydrofluoric acid. Hydrofluoric acid can be extremely corrosive to human tissue if not handled properly.

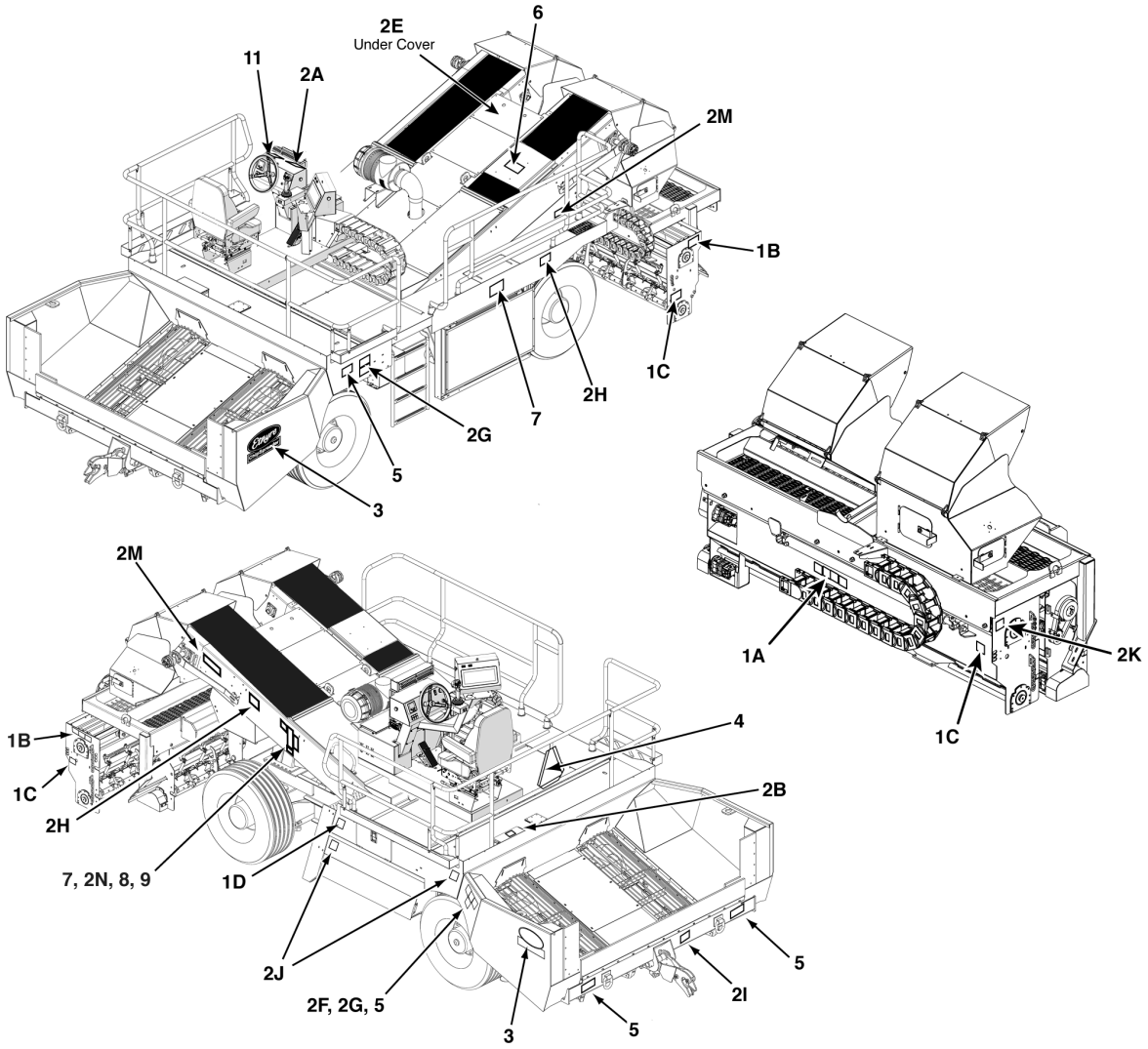
A degraded seal may appear as a charred or black sticky mass, Do not touch either the seal or the surrounding equipment without wearing neoprene or PVC gloves if degradation is suspected. Wash parts and equipment with 10% lime water (calcium hydroxide solution) to neutralize any hydrofluoric acid.

If contact with the skin occurs, wash the affected areas immediately with water. Then rub a 2.5 calcium gluconate gel into the skin until there is no further irritation, while seeking prompt medical attention.

Note to Physicians: For advice or treatment of HF burns, call the DuPont Medical Emergency number, 1-800-441-3637

Table of Contents

Warning and Instruction Plates



For operator safety and possible liability protection, all Safety and Instruction Plates should remain in place and be legible

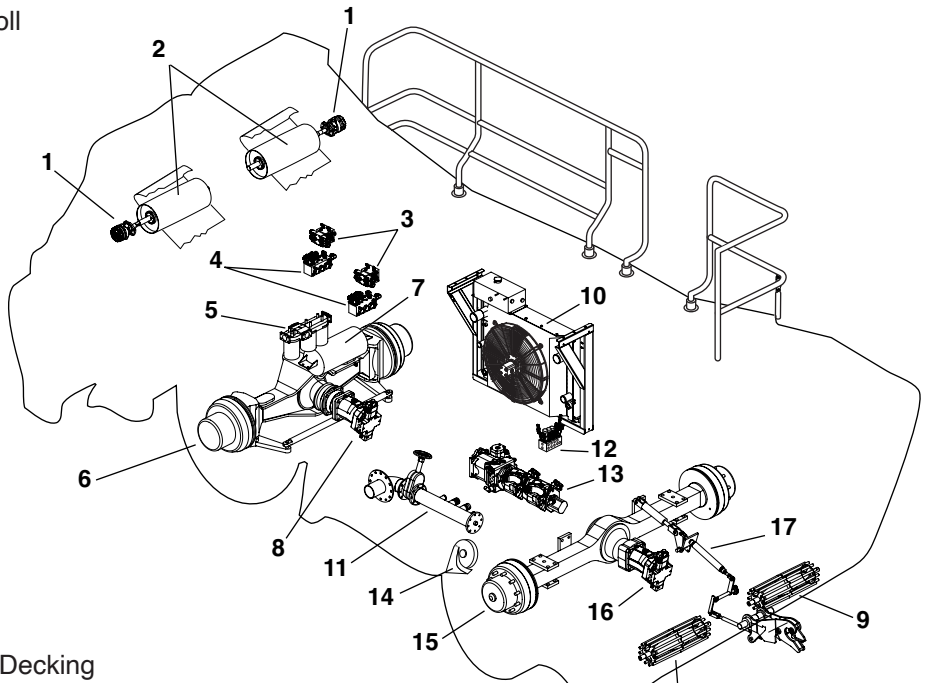
Should a plate be removed, lost, or become illegible, reorder and replace immediately

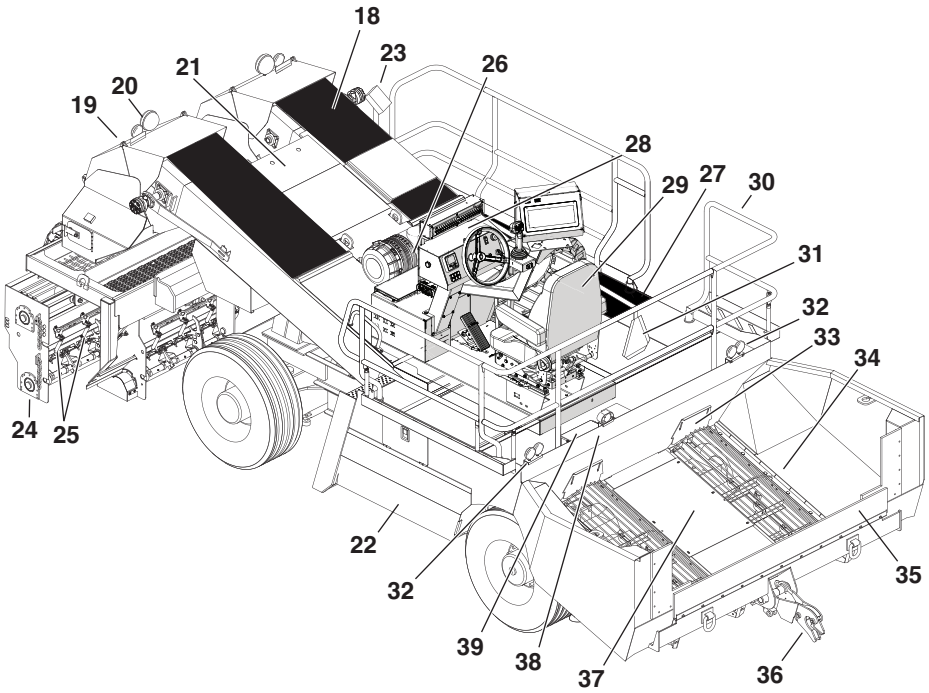
If plates become difficult to read because of material coating the surface, clean with solvent

REF	PART NO.	QTY	DESCRIPTION
1	3102067	1	Decal Set, Chips Hopper Var.
	3102067-A	1	Warning: Auger,read,Caution: Shield
	3102067-B	2	Warning: Auger, Clear, Caution: Shields
	3102067-C	6	Warning: Auger
	3102067-D	1	Lubrication Chart
2	3102065	1	Decal Set, Chipspreader Body
	3102065-A	1	Warning: Injury, Read, Brake
	3102065-B	1	Warning: Fuel Tank, Fill
	3102065-C	1	Warning: No Drill
	3102065-D	1	Warning: No Shift
	3102065-E	1	Anti-Freeze
	3102065-F	1	Proposition 65 Warning
	3102065-G	2	Warning: No Drill, Caution: Towing
	3102065-H	2	Warning: Clear, Caution: Towing
	3102065-J	2	Warning: Hydraulic Tank
	3102065-K	1	Warning: Clear, Caution: Shields
	3102065-L	1	Caution: Towing
	3102065-M	2	Grease Daily
	3102065-N	1	Caution: Valve
3	3101999	2	Decal-Chipspreader, Fwd
	3102000	2	Decal-Chipspreader, Quad
4	6000758	1	Emblem-Vehicle, Slow Moving
5	3102176	4	Decal-Warning, Pinch Point
6	3101717	1	Warning-Hoppers,Stay Off
7	3102205	2	Warning-No Passengers, No Handrails
8	3102346	1	Important-Hydraulic Bleed Valve
9	3103230	1	Notice-Emission Control Information
10	3102268	1	Warning-Ignition Switch
11	3190516	1	Caution-Traction Boost

General Identification

1 Conveyor Drive Motor
2 Head Pulley Asm
3 Gate/Hopper Manifold
4 Conveyor/Auger/Spreadroll Manifold
5 Return Filters
6 Front Drive Axle
7 Air Reservoir
8 Hydrostatic Motor
9 Tail Pulley Asm
10 Radiator Cooler
11 Suction Line to Pumps
12 Hitch/Pwr Steer/Brake Manifold
13 Hydraulic Pumps
14 Horn
15 Rear Drive Axle
16 Rear Hydrostatic Motor
17 Hitch Position Linkage
18 Conveyor Belt
19 Hoods
20 Left Head Light Asm
Right Head Light Asm
21 Engine/Conveyor Covers/Decking
22 Hydraulic Reservoir
23 Front Control Box Asm
24 Left Spread Hopper
25 Individual Gate Cylinders
26 Air Intake Asm
27 Rough Tread
28 Control Console Asm
29 Seat Assembly
30 Handrails
31 Slow Moving Emblem
32 Right Tail light Asm
Left Tail light Asm
33 Rear Hopper Flow Gate
34 Flashing
35 Rear Lining
36 Hitch
37 Rear Motor Access Panel
38 Back Up Alarm
39 Fuel Tank





INTRODUCTION

The Etnyre Variable Hopper Hydrostatic Chipspreader has been designed to improve the accuracy of chip spreading while improving productivity. This has been done by incorporating Application Rate capabilities using precise gate opening control and speed feedback in closed loop controls, and the ability to do most roads in a single pass.

It is especially important from the safety standpoint that this manual be thoroughly read and understood before performing any operational or maintenance function.

The information contained in this manual will enable you to better understand the operation and performance of the machine and thus better utilize it to obtain maximum performance from your Chipspreader.

WARNING

Unsafe operation of equipment may cause injury. Read, understand and follow the manuals when operating or performing maintenance

IMPORTANT

1. The front hoppers should be fully closed up and latched using the safety chains on the left side of the machine when the unit is traveling between job sites to avoid possible damage to the outer ends of the hoppers.

2. Keep machine on road or relatively uniform surface at all times to avoid loss of traction and/or possible damage to the front hoppers or rear of conveyors.

3. Place truck gearshift in neutral as soon as the truck is connected to the spreader.

4. Under most operating conditions the Chipspreader should be allowed to tow the truck. However, certain steep upgrade or downgrade conditions may require the truck to assist the Chipspreader. The Chipspreader must pull the truck even while the truck is assisting. Do not attempt to push the Chipspreader with the truck.

5. Do not tow or push the Chipspreader before reading the towing instructions contained in this manual as this may damage the hydraulic motors.

6. Never use the Chipspreader to dislodge a truck or other equipment which has become stuck in mud or soft shoulder conditions as this may cause damage to the hitch, which could fail later in normal operation.

7. Avoid roading the machine with material in the hoppers if at all possible. Added weight in either the front hoppers or the rear hopper increases stopping distance, and weight in the front hopper decreases available traction at the rear wheels.

8. After changing filters or working on the hydrostatic system, be sure to follow hydrostatic start up procedure to reduce the potential for damage to the hydrostatic system.

9. Always install locking control box cover & chock wheels when leaving machine unattended as protection against vandalism and accidental movement.

10. Before operating the Chipspreader, do an inspection of the machine for condition of the tires, fluid leaks, fluid levels, fuel level, loose bolts, improper hose routings etc. Be sure that the machine is in a safe condition to operate.

CAUTION

The front hoppers should be fully closed up and latched using the safety chains at the left side of the machine when the unit is traveling between job sites to avoid possible damage to the outer ends of the hoppers.

Reporting Safety Defects

If you believe that your vehicle has a defect which could cause a crash or could cause injury or death you should immediately inform the National Highway Traffic Safety Administration (NHTSA) in addition to notifying E. D. Etnyre & Co.

If NHTSA receives similar complaints, it may open an investigation, and if it finds that a safety defect exists in a group of vehicles, it may order a recall and remedy campaign. However, NHTSA cannot become involved in individual problems between you, your dealer, and E. D. Etnyre & Co.

Check Out

1. The following accessories are shipped with each Chipspreader: extra linkage rods for shortened truck hookup, parts book and operation, maintenance and safety manual, wiring and hydraulic diagrams, and engine parts and operator's manual.

2. Best performance for most operating conditions is achieved when tire pressures are set to 55 to 60 PSI in front and 60 to 65 PSI in rear. However, various

operating speeds, road bed conditions, truck pulling arrangements and other operating conditions may require different tire pressures.

⚠ WARNING

Never exceed the maximum inflation pressures indicated on the tire's sidewall.

3. Grease all fittings and check all reservoir oil levels in accordance with the Chipspreader Lubrication Chart on the side of the tool box prior to operation.

4. Check engine coolant and oil levels prior to operation. Refer to engine operator's maintenance manual for complete engine service requirements.

5. Hopper gate adjustment and spread roll straightness are established at the factory. However, to be sure adjustments or straightness were not altered during shipment and storage, the following gate and spread roll adjustment checks should be performed prior to operation:

Check that each gate opening cylinder rod clevis is fully screwed onto its respective cylinder rod.

With the hopper on the machine, start the engine and run it at a minimum of 2000 rpm and extend the hoppers fully. Depress and hold the left and right gate override push button switches until the gate position is at full opening. Release push button switches and gate position will return to full close. There should be 1/16" clearance between the gate and the spread roll. If this clearance is not constant across the full width of the hopper, it indicates that wear plates may need to be adjusted or the spread roll is not straight. Contact the factory for straightening instructions.

IMPORTANT

1. Since the Chipspreader is designed to operate on new sealcoat surfaces, all dynamic braking is being done by the hydrostatic system. With abrupt control inputs it is possible to "scuff" the road surface during starting or stopping. However, with smooth application of control inputs, very precise accelerations and decelerations can be made, giving the ability to outperform a conventional clutch/brake/gear combination.

2. Friction characteristics on both new sealcoat surfaces and other surfaces vary considerably. Therefore stopping distances must be watched carefully, particularly when towing a truck, going downhill or in stopping from higher travel speeds.

3. The larger the truck or steeper the grade, the longer the stopping distance.

4. Traveling with the front hoppers loaded removes weight from the rear wheels thus reducing the braking effectiveness of the rear wheels while the additional weight increases the braking forces required. Carrying material in the rear hopper also increases the braking forces required and consequently increases the required stopping distance from a given speed. It is therefore highly recommended to travel or "road" the machine in an empty condition.

5. When operating with the truck, in some cases, such as on steep downgrades, the truck should assist in braking. The truck should always set its own brakes after stopping, regardless of whether the combination is stopped on a downgrade, upgrade or level. The braking effort must be a coordinated effort when required. It is therefore important to have a clearly understood means of communication between the Chipspreader and truck. This may be done by radio, hand signals, horns etc. Each truck driver should know who is to give signals, where to look for the signal and the meaning of each signal.

⚠ WARNING

Stay off hopper while machine is moving. Machine movements could cause a fall resulting in injury or death.

⚠WARNING

NO PASSENGERS.

Operators only on machine when operating.

Driver only when traveling.

Sudden machine movement can cause falls, serious injury or death.

⚠WARNING

Do not sit on handrails.

Sudden machine movement can cause falls, serious injury or death.

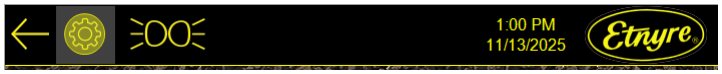
3102205

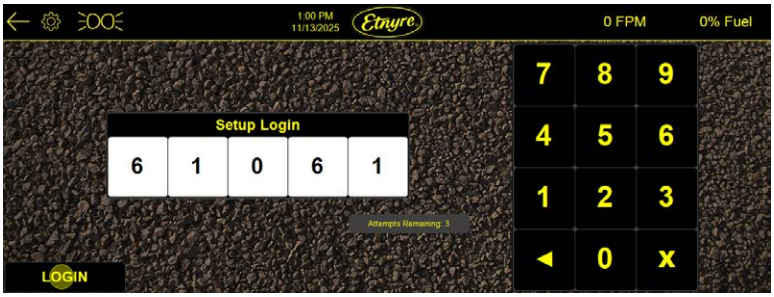
PREPARING FOR OPERATION

Setup Login

To get into machine Setup, tap the gear icon in the header, and then the Setup button. Enter the Setup password, and touch Login.

- Setup password: 61061 (Oregon, Illinois ZIP code)





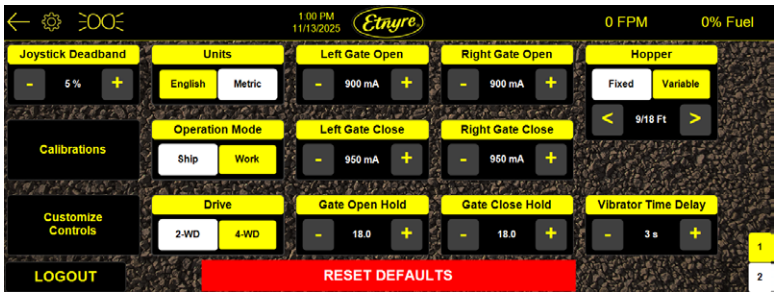
NOTICE

Be careful when entering the Setup password! Three consecutive login attempts with an incorrect password will lock the user out of setup for 5 minutes. Turning the display off will only reset this timer.

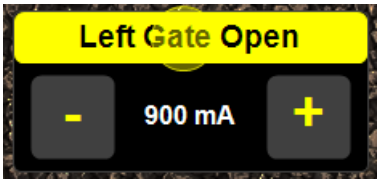
Setup Page 1

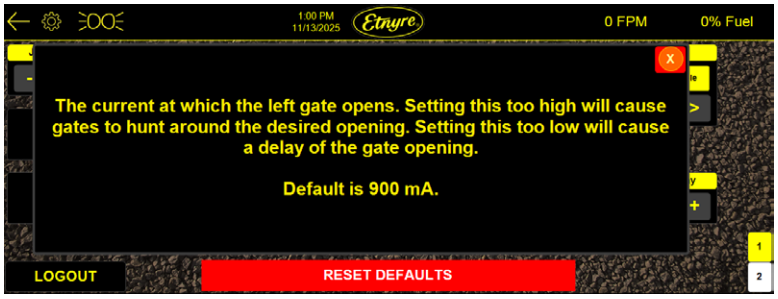
Settings

11 parameters are adjustable in Page 1 of the Setup screen.



Tapping the parameter name on its header shows a pop-up window describing that parameter. Exit by tapping anywhere on the pop-up window or the “X”.





- Joystick Deadband

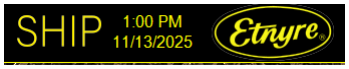
  The amount the joystick needs to move forward or backwards before the chipspreader drive goes out of neutral. Setting this too high may cause a delay in moving the machine. Setting this too low may cause a feeling of abrupt speed control.

  Default: 15%

- Operation Mode

  Ship Mode fixes the speed setpoint at 300 FPM. While in Ship Mode, “SHIP” is visible in the Header. Work Mode allows the operator to adjust the speed setpoint on the Home page. This toggle is saved on a power cycle.

  Default: Work Mode



- Drive

  Sets if the machine is four-wheel-drive (4WD) or two-wheel-drive (2WD). This should not be changed; however doing so may assist in certain troubleshooting scenarios.

  Default: 4WD

- Left Gate Open

  The current at which the left gate opens. Setting this too high will cause gates to hunt around the desired gate opening. Setting this too low will cause a delay of the gate opening.

  Default: 900 milliamps

- Right Gate Open

  The current at which the right gate opens. Setting this too high will cause gates to hunt around the desired gate opening. Setting this too low will cause a delay of the gate opening.

  Default: 900 milliamps

- Left Gate Close

  The current at which the left gate closes. Setting this too high will cause gates to hunt around the desired gate opening. Setting this too low will cause a delay of the gate closing.

  Default: 950 milliamps

- Right Gate Close

  The current at which the right gate closes. Setting this too high will cause gates to hunt around the desired gate opening. Setting this too low will cause a delay of the gate closing.

  Default: 950 milliamps

- Gate Open Hold (Variable Only)

  Sets the delay of the right gate opening after the left gate opens on a variable hopper. A value of 18 inches indicates the right gate is 18 inches behind the left gate. Increase this value if the right gate is opening too early. Decrease this value if the right gate is opening too late.

  Default: 18 inches

• Gate Close Hold (Variable Only)

Sets the delay of the right gate closing after the left gate closes on a variable hopper. A value of 18 inches indicates the right gate is 18 inches behind the left gate. Increase this value if the right gate is closing too early. Decrease this value if the right gate is closing too late.

Default: 18 inches

• Hopper

Sets the width and type (fixed or variable) of the front hopper.

• Vibrator Time Delay

Sets how long the vibrators stay on when activated in “AUTO” mode. This is adjustable between 1 and 10 seconds at 1 second increments.

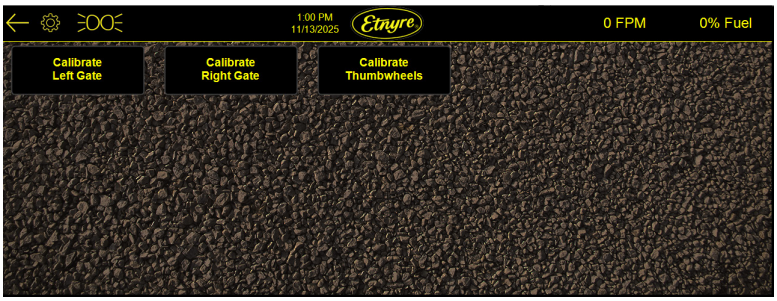
Default: 3 seconds

English and Metric units can also be switched. When Metric units are used, the yellow bar under the Header turns white.

Holding the red “RESET DEFAULTS” button for 3 seconds sets these parameters to their default values.

Calibrations

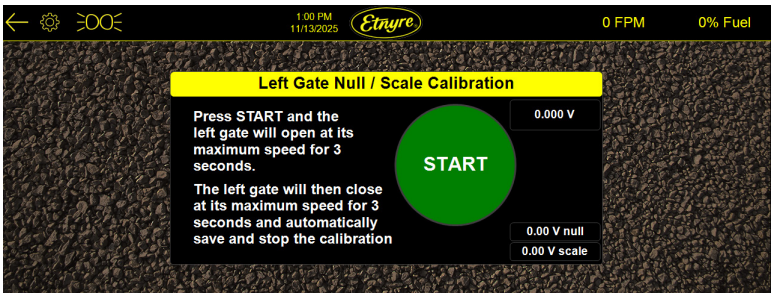
All calibrations can be accessed by tapping the “Machine Calibrations” button.



• Calibrate Left Gate

This calibrates the Left Gate Potentiometer null and scale values. **Gate potentiometer calibrations are very important for accurate gate control**.

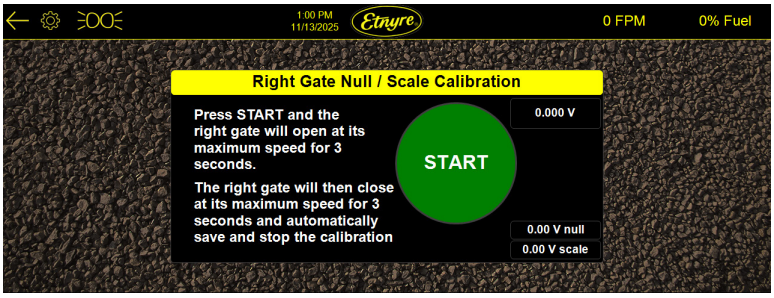
Pressing the green START button opens the left gate at its maximum speed for 3 seconds. The gate pot voltage in the open position is saved as **scale**. The left gate then closes for 3 seconds The gate pot voltage in the closed position is saved as **null**.



• Calibrate Right Gate

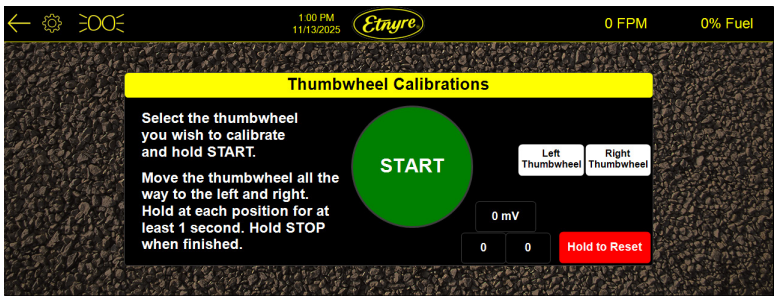
This calibrates the Right Gate Potentiometer null and scale values. **Gate potentiometer calibrations are very important for accurate gate control**.

Pressing the green “START” button opens the right gate at its maximum speed for 3 seconds. The gate pot voltage in the open position is saved as **scale**. The left gate then closes for 3 seconds. The gate pot voltage in the closed position is saved as **null**.



• Calibrate Thumbwheels

Select the thumbwheel you wish to calibrate and hold “START”. Move the thumbwheel across its entire range of motion and hold at the furthest position for at least one second. Hold “STOP” when completed.



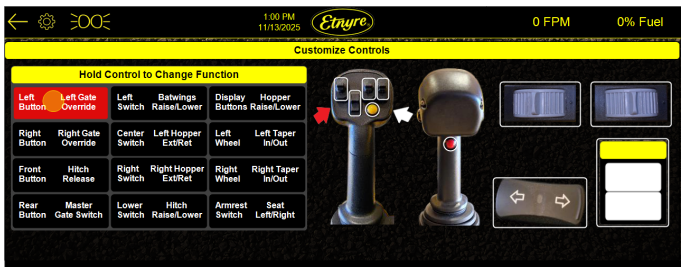
Customize Controls

A variety of controls on the joystick and operator station can be customized to control different functions on the machine. Four buttons can be assigned to button functions, and eight switches can be assigned to switch functions.

The main screen of the “Customize Controls” page shows which function is mapped to which control. The configurations are listed below:

Left Joystick Button	Left Gate Override
Right Joystick Button	Right Gate Override
Front Joystick Button	Hitch Release
Rear Joystick Button	Gate Power Toggle
Left Joystick Switch	Batwings Raise/Lower
Center Joystick Switch	Left Hopper Extend/Retract
Right Joystick Switch	Right Hopper Extend/Retract
Lower Joystick Switch	Hitch Raise/Lower
Left Thumbwheel Switch	Left Taper
Right Thumbwheel Switch	Right Taper
Display Buttons Switch	Hopper Raise/Lower
Rocker Switch	Seat Left/Right

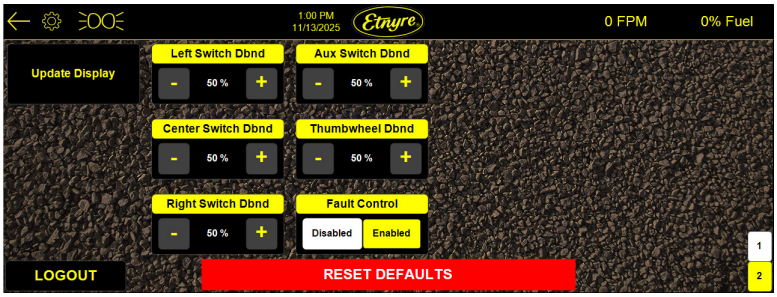
To change a control, hold the corresponding button for one second. The control is outlined red on the right side of the screen, and the currently assigned function is in red font instead of white font. Holding a function for one second assigns it to that control.



If any functions are mapped to duplicate controls, they are both in red font on the main screen. Edit the duplicated control to an unassigned function. Once no duplicates exist, the “HOLD TO SAVE” button must be held for 1 second to save the new configuration. “HOLD TO SAVE” can be held for 3 seconds to reset all controls to their default configuration.

Common modifications are to swap the hopper extend/retract switches with the taper switches, the hopper raise/lower switches with the batwing switches, or the hitch release button with the gate power toggle button.

Setup Page 2

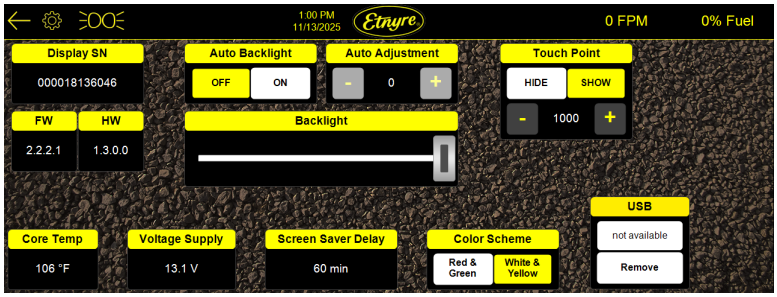


The deadband of any of the joystick switches or the thumbwheels can be adjusted. The default of each one is 50%.

Fault Control can be enabled or disabled. If disabled, faults continue to log in the display, but are not be shown on the “Faults” screen. After a power cycle, this always begins at Enabled. For safety purposes, fault control is automatically enabled 30 minutes after it is disabled. Fault control is also enabled with the “Reset Defaults” button in “Setup”. While fault control is disabled, a warning icon shows in the header.

Display

Display parameters and settings are shown and adjustable on this page.



Each touchscreen display has a unique Serial Number (SN). The display firmware (FW) and hardware (HW) versions are also shown. Display FW version may change with updated software. The hardware version on one display will never change.

Backlight

With Auto Backlight ON, the backlight slider is disabled, and display brightness is scaled to match ambient light conditions. The light sensor is on the top-left corner of the display, in the bezel. Auto Adjustment can be set to further refine the brightness. With Auto Backlight OFF, the backlight slider is enabled, and display brightness is set by the slider position.

Touch Point

The transparent yellow circle that indicates a touch point throughout this manual can be shown or hidden on the display. Its size can also be adjusted. This can be useful to troubleshoot issues in which it is not sure if the display has registered a touch.

Screen Saver

This sets the time, in minutes, the display waits to go into screen saver mode after not registering a touch point. This defaults to 60 minutes and can be adjusted by tapping the time and changing with the number pad. You can exit the screen saver by tapping anywhere in the display or after a power cycle.

Voltage / Temperature

Battery voltage supplied to the display is shown along with the internal display temperature. The maximum core temperature is rated for 185 °F (85 °C). Under normal operating conditions, the display is unlikely to reach this value, even if exposed to direct sunlight. If core temperature reaches 170 °F (75 °C), the display backlight is automatically dimmed to help prevent overheating.

Color Scheme

Color scheme can be adjusted between standard yellow/white or green/red. In the standard color scheme, a control that is “on” is yellow, and “off” is white. In the green/red color scheme, a control that is “on” is green, and “off” is red. This color scheme will also use yellow in cases where “auto” can be selected in addition to on or off.

USB

If a USB flash drive is inserted to the USB port, its folder name will be visible here and an icon will be visible in the header. To remove the flash drive, you must touch Remove and wait until the folder reads “not available,” or risk the display being unable to read another flash drive until after a power cycle. A flash drive can be used for display program updates or in certain data logging scenarios.

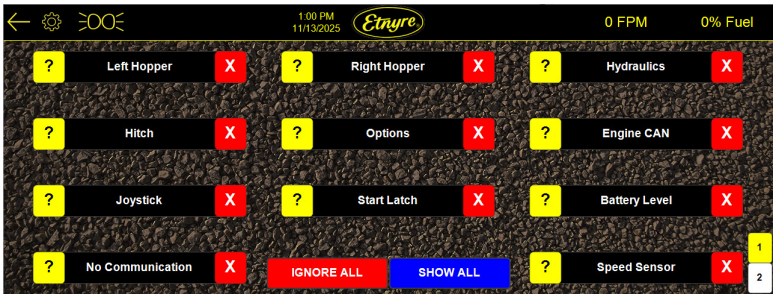
Faults

A chipspreader has twenty (20) unique faults that may be active at any time. While Fault Control (***Setup Page 2***) is active, whenever a new fault is active, the display will automatically go to this screen.

Newly-activated faults will flash their white title font at one-second intervals, for ten seconds, to indicate it is new. Newly-activated faults will also flash their yellow diagnostics button at one-second intervals until the diagnostics button is tapped, indicated the fault has gone undiagnosed.

To ignore the fault, press its red X button. The fault will be ignored on the display for 15 minutes and only reappear after that time if it is still active in the computer. “IGNORE ALL” will ignore all active faults for 15 minutes, while “SHOW ALL” will show all ignored faults.

Faults Page 1



- Left Hopper
  The Left Hopper Output Module has an error code, is not communicating on the CAN bus, or there is an error with the left gate potentiometer.
- Right Hopper
  The Right Hopper Output Module has an error code, is not communicating on the CAN bus, or there is an error with the right gate potentiometer.
- Hydraulics
  The Hydraulic Output module has an error code or is not communicating on the CAN bus.
- Hitch
  The Hitch Output module has an error code or is not communicating on the CAN bus.
- Options
  The Options Output module has an error code or is not communicating on the CAN bus.
- Engine CAN
  The Cummins Engine is not communicating to the computer on the CAN bus.
- Joystick
  There is no joystick CAN feedback to the computer.
  As a safety feature, the parking brake is automatically applied, and the engine is automatically shut down.
- Start Latch
  The chipspreader started with the park/drive switch in Drive and/or the joystick out of neutral.
  Put into Park and return the joystick to neutral to clear the error.
  Machine functions will not work until this error is cleared.

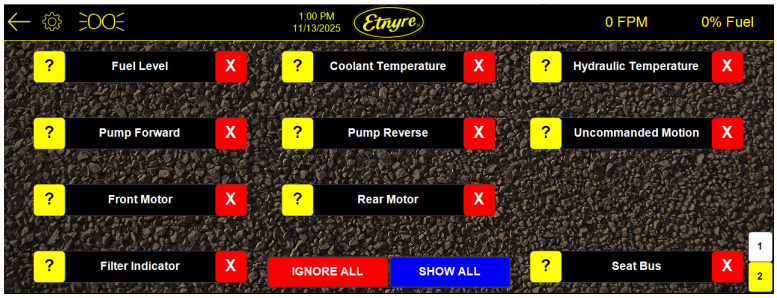
- Battery Level
  The chipspreader battery is under 8 volts.

  Start the engine to charge.
- No Communication

  There is no CAN communication between the display and the computer.
- Speed Sensor

  There is an error in the motor speed sensor or its feedback to the computer.

Faults Page 2



- Fuel Level
  The Chipspreader fuel tank is under 10% (double check this is correct) or there is an issue with the sensor feedback to the computer.
- Coolant Temperature
  Engine coolant temperature is above 240 °F.

  Stop operation immediately and determine cause of high coolant temperature.
- Hydraulic Temperature
  Hydraulic oil temperature is above 180 °F.

  Stop operation immediately and determine cause of high hydraulic oil temperature.
- Pump Forward
  There is an error in the pump forward computer output, or the pump itself.
- Pump Reverse
  There is an error in the pump reverse computer output, or the pump itself.
- Uncommanded Motion
  The engine UCMD (uncommanded motion detection) has detected the chipspreader is moving in a direction that is not commanded, or a speed that is not commanded.

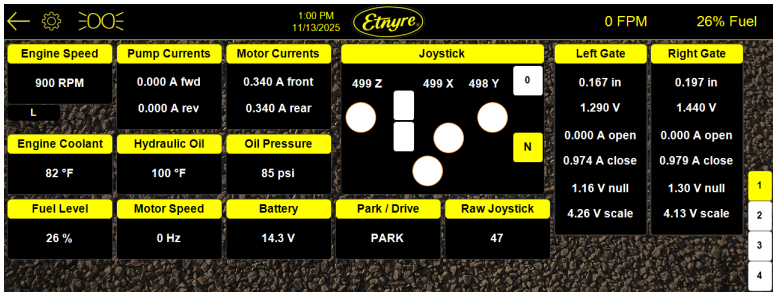
  This may be due to the parking brake not holding the machine on a hill.

  As a safety feature, the parking brake is automatically applied, and the engine is automatically shut down.
- Front Motor
  There is an error in the front motor computer output, or the motor itself.
- Rear Motor
  There is an error in the rear motor computer output, or the motor itself.
- Filter Indicator
  The charge pressure filter is likely clogged.
- Seat Bus
  CAN modules on the operators' station are not communicating with the computer.

Diagnostics

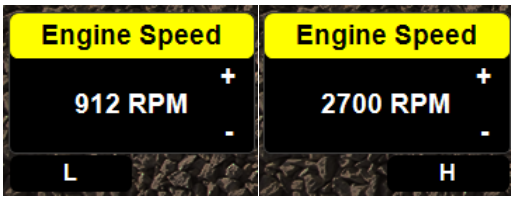
There are four pages to diagnostics that can be useful when troubleshooting a variety of scenarios.

Diagnostics Page 1

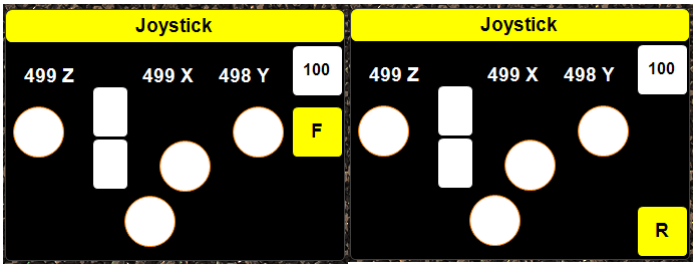


Page 1 is an overview of the battery, fuel tank, engine, drive system, joystick, and gates.

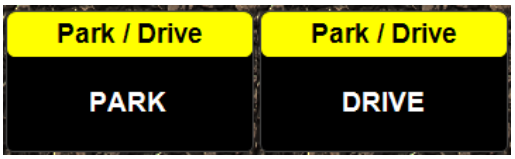
Engine speed will show whether it is in high idle or low idle by the H or L. The + or – is visible when engine speed is manually increased or decreased.



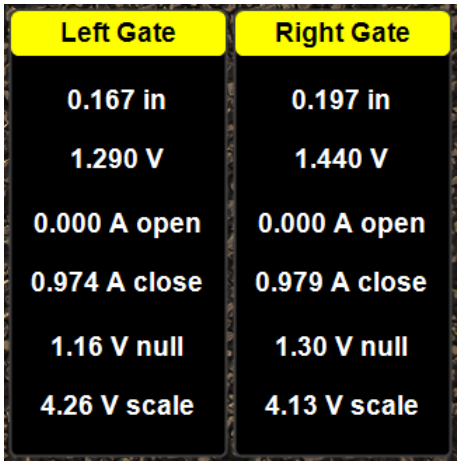
The raw joystick feedback, between 0 and 1000 in each direction, and whether it is physically neutral, forward, or reverse, is shown. Above this is the working joystick feedback and direction, after all deadbands and filters are applied.



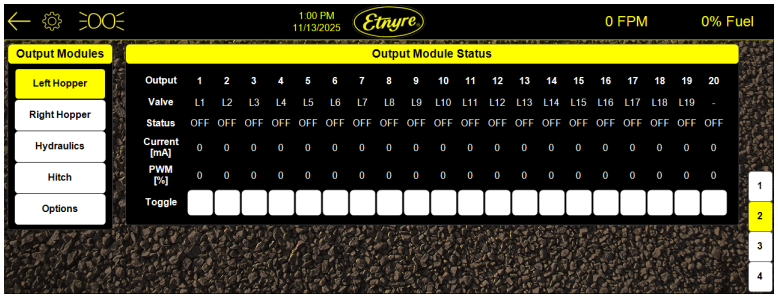
Park / Drive will show PARK when the Park/Drive Switch is in park, and DRIVE when the switch is in drive.



Gate diagnostics showing gate opening, gate pot voltage levels, open and close currents, and the null and scale calibrations will help troubleshoot any gate issues.

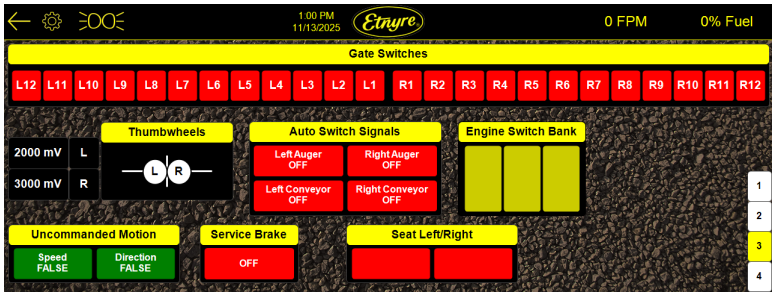


Diagnostics Page 2



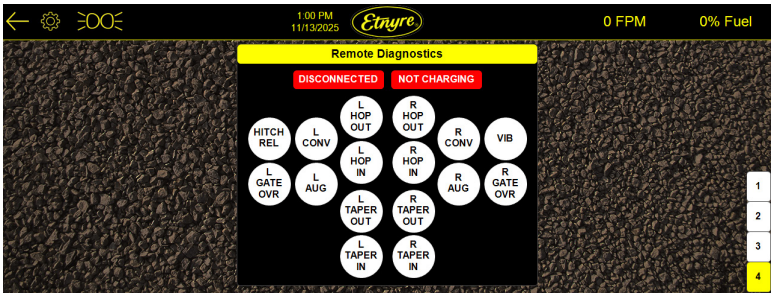
Page 2 shows status of the five output modules. Status of each output module can be viewed by pressing its corresponding button on the left-hand side. Each output module has 20 outputs that can be either digital ON/OFF or analog PWM (pulse width modulation). Under each output is an abbreviation of the valve or function it is controlling, whether it is commanded ON or OFF, current supplied at the output in milliamps [mA], and PWM duty cycle percentage. Each output can also be toggled on or off for testing purposes. Please refer to Appendix D on pages 50-51 to relate abbreviations to function names.

Diagnostics Page 3



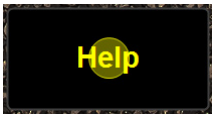
Page 3 has diagnostics for the thumbwheels, gate switches, auger and conveyor auto switches, engine switch bank, uncommanded motion control, service break, and seat switch. In general, a switch or control that is OFF is red, and a switch or control that is ON is green. For the engine switch bank, a switch in the “middle” position is yellow.

Diagnostics Page 4



Page 4 shows status of each control on the wireless remote. Each control is yellow if it is active on the remote. A status for whether the remote is connected or disconnected to its receiver, and charging on the pad, is also shown.

Help

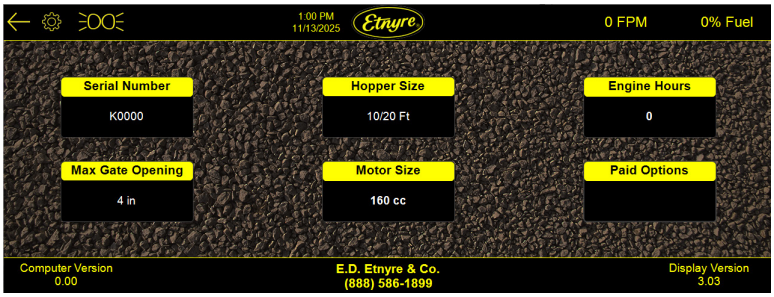


QR codes are shown that will take you to helpful documentation on the Etnyre website. These can be scanned to be taken to the Etnyre website where operator manuals, parts manuals, and help videos can be found.

The phone number to Etnyre Service Department is also given, (888) 586-1899.

Information

This shows a general overview of the chipspreader machine.



The serial number (SN) is shown in the top-left corner. Refer to this when contacting an Etnyre Service representative.

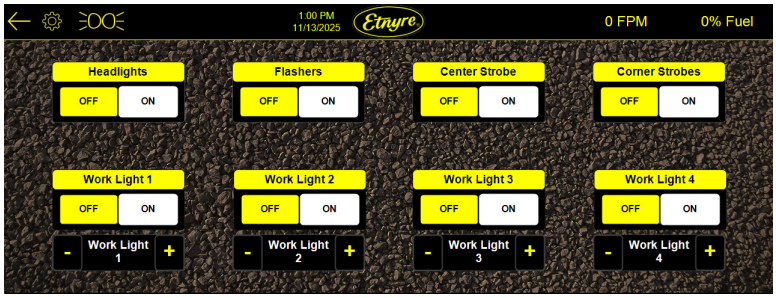
A key of all paid-for options is given in the bottom right. Please refer to Appendix D on pages 50-51 to relate abbreviations to options.

The computer and display versions are shown in the bottom left and right corners, respectively. These should always be the same.

The phone number to Etnyre Service Department is also given, (888) 586-1899.

Lights

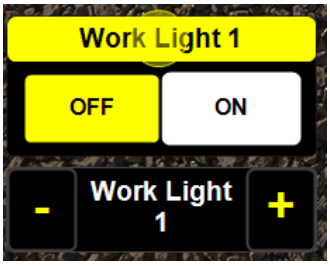
The “Lights” screen is accessible by tapping the lights icon button in the header.

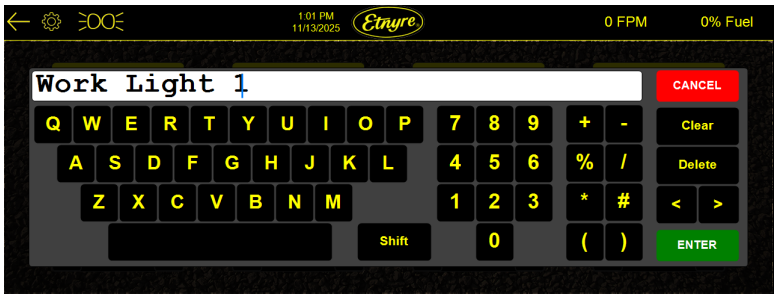


Most Etnyre ChipSpreaders have standard Headlights and Flasher lights. If Center Strobe, Corner Strobes, or Work Lights are equipped in Factory, these lights can also be controlled here.

Each Work Light, the Center Strobe, and Corner Strobe can draw a maximum of 3 Amps.

Each Work Light can be renamed by tapping the header to pull up the keyboard.





All lights are controlled by the Options output module. Refer to the Diagnostics section on page 17.

TOUCH SCREEN CONTROL PANEL

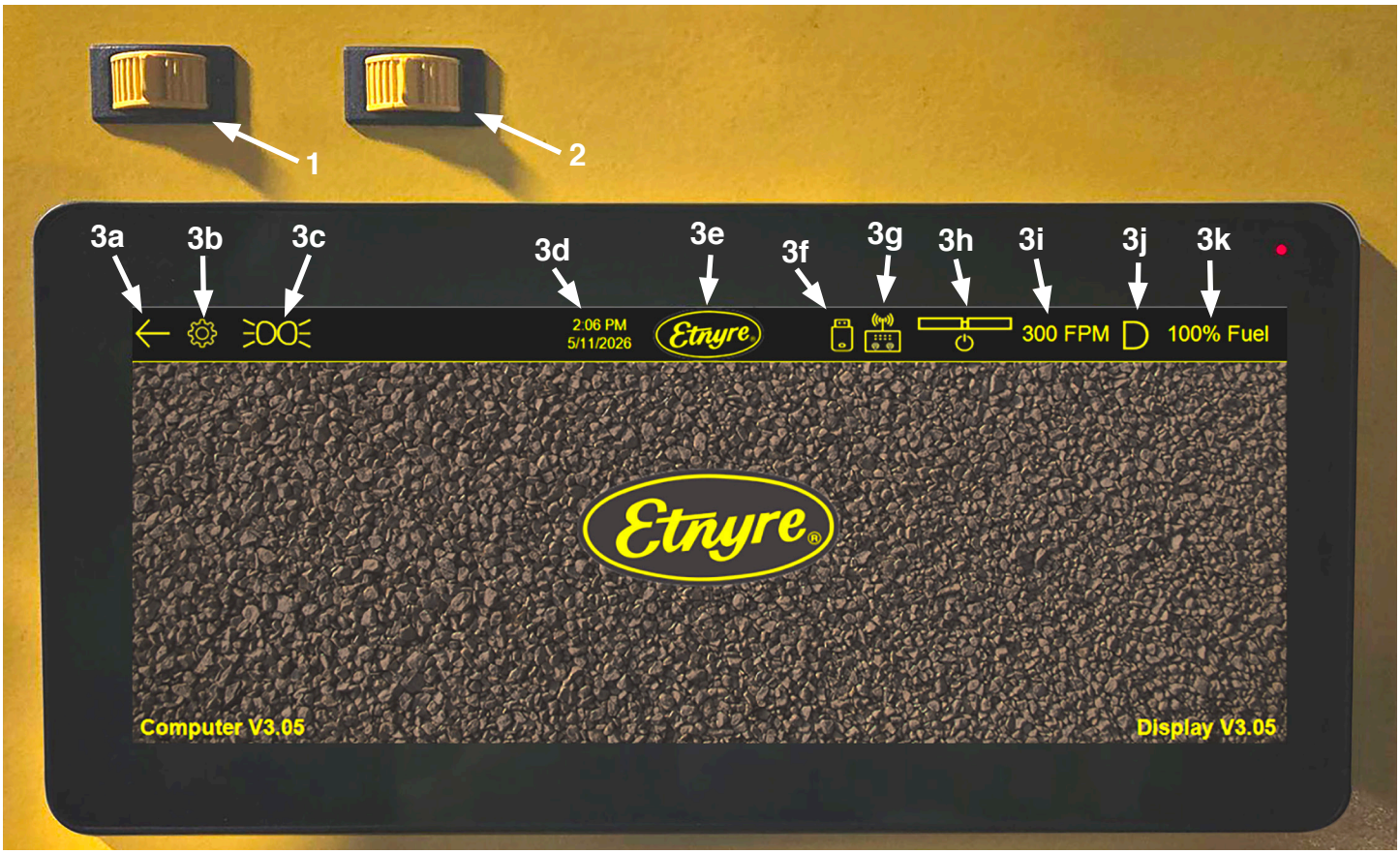


Figure 1. Touch Screen Control Panel

1. Left Taper

The left thumbwheel will move the left taper position in either direction.

2. Right Taper

The right thumbwheel will move the right taper position in either direction.

3. TOUCH SCREEN DISPLAY

a) Back Button
b) Gear Button
c) Lights Button
d) Clock
e) Home Button
f) USB Icon
g) Remote Icon
h) Gate Power/Spreader Icon
i) Machine Speed
j) Park/Drive/Neutral/Reverse Status
k) Fuel Level

Identification of Functions and Controls

Foot Pedal Brake **(Figure 2)**

The Foot Pedal Brake, or Service Brake, brings the chipspreader to a near-instant stop by closing the drive pumps. Engine and electrical power remain on while this is held.

Power/Ignition Key **(Figure 4)**

Rotating from OFF to ON supplies electric power to all systems and controls. Rotating further to the right against the spring to START engages the starter. Once the engine starts, release the key and the switch remains in the ON position.

Start the machine with the park/drive switch in park and the joystick in neutral. If not, the START LATCH fault will be visible on the display and the chipspreader will not move until the park/drive switch is in park and the joystick is in neutral.

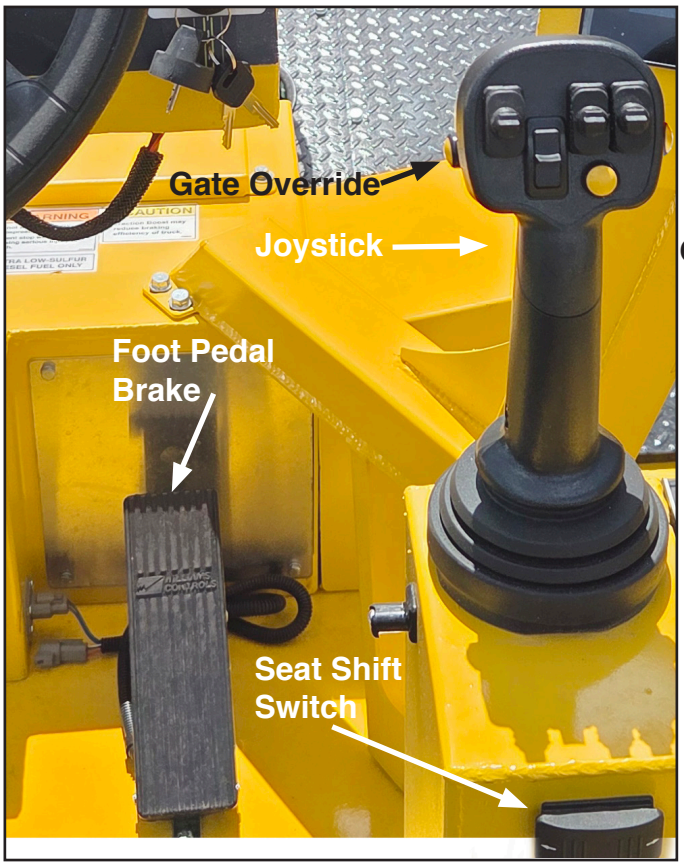


Figure 2. Driver Identifications

Figure 3. Gate Override

WARNING

All functions except power steering and rear brakes are electrically controlled.

Turning the key to OFF results in a violent stop.

WARNING

Shut machine off and wait for all movement to stop before leaving operator's seat or servicing.

Failure to do so could result in unexpected movement and cause serious injury or death.

Emergency Stop **(Figure 4)**

The Emergency Stop cuts engine power while maintaining all other electrical power. This brings the chip-spreader to a smooth and controlled stop when pressed in, regardless of joystick position. To restart the engine, the emergency stop must be released by turning the knob clockwise.

Computer Reset Switch **(Figure 4)**

This is a dual-action momentary switch that, while engaged, cuts electrical power to the computer and display but leaves the engine running. This is used to restart machine controls without shutting the engine off, or when the computer or display needs to be reset after a software update.

Engine Switch Bank **(Figure 4)**

There are three sets of switches on this switch bank controlling various engine features:

Park/Drive Switch

In PARK, the joystick is ignored and the parking brake is engaged. The chipspreader does not drive regardless of joystick position.

NOTE: **This should be in PARK before the chipspreader is started, or the START LATCH fault will appear on the display. The chipspreader will not move until this fault is cleared by switching to PARK and moving the joystick to neutral.**

In DRIVE, the parking brake releases when the joystick is moved out of neutral, resulting in forward or reverse motion.

WARNING

Switching to PARK while in motion results in a violent stop due to the engagement of the parking brake.
Do not select PARK unless the chipspreader is at a full stop, or risk damage to the parking brake.
Parking Brake meets SAE J1742
Parking Brake may not hold on grades steeper than 15%

Figure 4. Console Identification

Engine Throttle Run/Idle **(Figure 4)**

The engine should be started with this switch in the LOW IDLE position (“turtle” icon on switch). In this mode the engine runs at 900 RPMs.

When in HIGH IDLE (“rabbit” icon on switch), the engine runs at 2200 RPMs. The hydrostatic system is designed to run at high idle, thus the switch should be in this position to perform any work.

Engine Throttle Increase/Decrease **(Figure 4)**

This switch increases or decreases the engine speed in either high idle or low idle. Engine speed increases or decreases by 50 RPMs each time it is tapped, while holding will ramp the engine speed at 400 RPMs per second.

In high idle, engine speed is limited to the range of 1200 to 2200 RPM.

In low idle, engine speed is limited to the range of 900 to 1200 RPM.

Horn Button **(Figure 4)**

This momentary button operates the horn for signaling to the truck or warning of danger.

Joystick **(Figure 2)**

Speed and Direction

This controls the rate of speed in both forward and reverse directions. The friction-hold keeps the joystick in any position when released by the operator.

The joystick neutral position is defined both by a physical stop (detent) and an additional neutral dead-band set by Joystick Deadband in Page 1 of the Setup screen (page 9). While in neutral, the parking brake engages once the machine is stopped, regardless of the Park/Drive Switch state.

NOTE: This should be in neutral before the chipspreader is started, or the START LATCH fault will appear on the display. The chipspreader will not drive until this fault is cleared by putting the joystick to neutral and switching the park/drive switch to PARK.

Full forward movement gives 100% of the “Ground Speed Setpoint”. Full reverse movement of the joystick gives 100% of the “Ground Speed Setpoint” (Main Controls page 25) up to 1300 FPM. Speed is slowed at any time by moving the joystick towards neutral. Moving to neutral while in motion stops the machine at a rate much faster than the Emergency Stop Switch, but still slower than the Foot Pedal Brake.

Acceleration is also controlled by the joystick. If moved quickly, the chipspreader responds faster than if it is moved slowly.

Machine Functions

There are also customizable controls on the joystick that work different functions on the chipspreader. See the section “Customize Controls” (page 12) for the functions that can be mapped to the joystick’s buttons and switches. The default configuration of the joystick controls is as follows:

Left Joystick Button	Left Gate Override
Right Joystick Button	Right Gate Override
Front Joystick Button	Hitch Release
Rear Joystick Button	Gate Power Toggle
Left Joystick Switch	Batwings Raise/Lower
Center Joystick Switch	Left Hopper Extend/Retract
Right Joystick Switch	Right Hopper Extend/Retract
Lower Joystick Switch	Hitch Raise/Lower

Seat Shift Switch **(Figure 2)**

By default, this rocker switch controls the left-right movement of the operator station. Hold the switch left or right to move the operator station left or right. The moving seat is meant to be an operator convenience while chipping.

The switch and the seat left/right function can also be customized per the **Customize Controls** section.

Taper Switches **(Figure 1)**

By default, these two switches control the left and right taper position on the front hopper. The left taper switch controls the position of the left taper, and the right taper switch controls the position of the right taper. See the **Taper Switch** section of **Operate Page 3** (page 29).

These switches and the taper switch function can also be customized per the **Custom Controls** section (page 12).

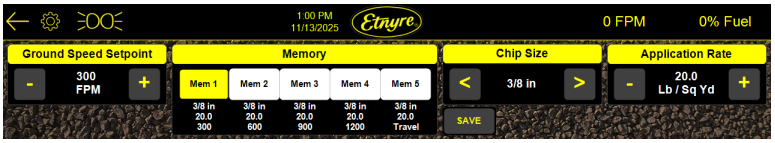
Remote Control

The remote control is designed for a secondary operator standing on the machine to control various functions:

- Left and Right Hopper extend and retract
- Left and Right Taper in and out
- Left and Right Conveyors, momentary ON
- Left and Right Augers, momentary ON
- Left and Right Gate Override
- Batwings raise and lower
- Hitch Release
- Vibrators

Refer to page 19 for Remote Control diagnostics.

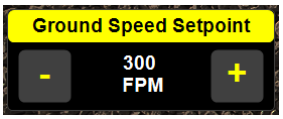
Main Controls



Every time the machine is powered on, the display begins on its Home screen. *Tapping the Etnyre oval logo always brings the display back to its Home screen page 1.*

The Home screen can be toggled between its three pages on the bottom right corner. Ground Speed Setpoint, Memory, Chip Size, and Application Rate are visible on all three pages.

Ground Speed Setpoint



Press the + (plus) and – (minus) buttons to adjust the ground speed setpoint. This can vary between 0 and 1,500 feet per minute (FPM).

If ground speed is set to 1,500 the next press of the + (plus) button sets the ground speed setpoint to the travel speed of 1750 fpm (20 mph), and “Travel” is shown instead of the speed setpoint. If ground speed is Travel, the next press of the – (minus) button sets the ground speed setpoint to 1500.

Travel speed is not intended to be used in standard operation and only when traveling between jobsites.

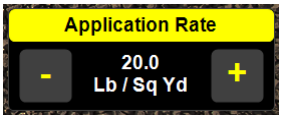
Chip Size

Press the < and > buttons to toggle between six choices of aggregate size:

- Sand
- 1/4” Chips
- 3/8” Chips
- 3/8” Gravel
- 5/8” Chips
- 1” Chips

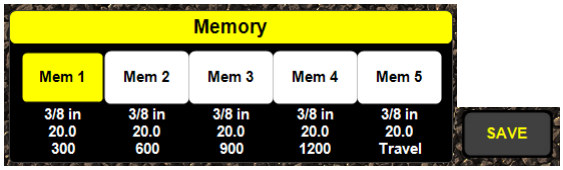
The amount of aggregate applied on the ground (application rate) is a function of the front hopper gate opening. The gate opening is determined by the selected aggregate (i.e. 3/8” chips) and the chipspreader speed. The computer controls the gate opening to maintain the application rate (i.e. 20.0 lbs / sq yds).

Application Rate



Press the + and – buttons to adjust the application rate setpoint. This can vary between 0 and 100 pounds per square yard [lbs / sq yd] in increments of 0.1 lbs / sq yd.

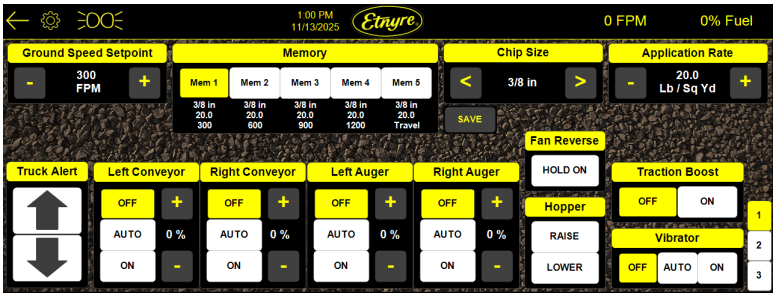
Memory



Ground Speed Setpoint, Chip Size, and Application Rate can be saved to one of five (5) memory slots. To save values to a memory slot, press the “SAVE” button. The button then reads “select memory…”. Tapping one of the five memory buttons saves the current values to that memory slot, and the button will go back to reading SAVE.

Tap any of the memory buttons to load that memory to the current values. Holding the memory button brings up a keyboard allowing the memory name to be changed.

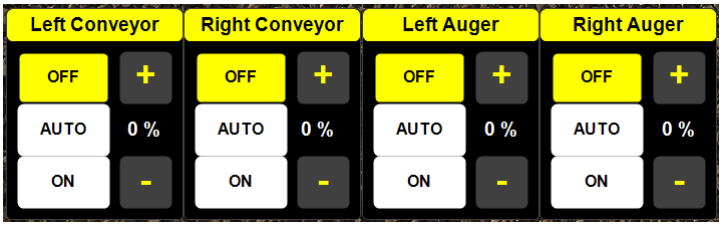
Operate Page 1



Truck Alert Light

For chipspreaders equipped with the operational Truck Alert Light, these buttons flash an “up” or “down” light at the dump truck operator indicating to raise or lower their dump truck into the batwings.

Conveyor and Auger Control



The left and right conveyors and augers can be set to ON, OFF, or AUTO, and at speed settings from 0% to 100% in increments of 5%. While ON, they are always running. While AUTO, they run if their ultrasonic sensor senses no material. While OFF, they remain off. The speed and on/off/auto settings are retained in memory over a power cycle.

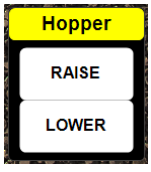
When properly adjusted, the conveyors should run approximately 80% of the time with the hopper at maximum width and the chipspreader traveling at the maximum speed for the particular job.

It is possible to run one conveyor or auger in one mode of control while running the other in a different mode if desired.

Fan Reverse (Optional)

For chipspreaders equipped with the Reversing Fan option, this momentary button reverses the direction of flow of the radiator fan, but only while the fan is currently running. This is useful to blow debris off the fan and radiator.

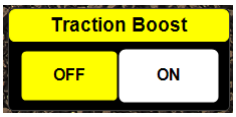
Hopper Raise/Lower



These buttons change the height of the hopper. “Hopper Raise” raises the hopper and “Hopper Lower” lowers the hopper.

This can be customized to control a different function on the Customized Control screen (page 12).

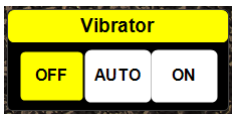
Traction Boost (Optional)



Turning Traction Boost ON will raise the hitch. When attached to a truck, this increases traction on the chipspreader's rear tires.

This switch should only be activated while attached to a truck and there will be no increase in traction while disconnected from a truck. The hitch release will not function while traction boost is active.

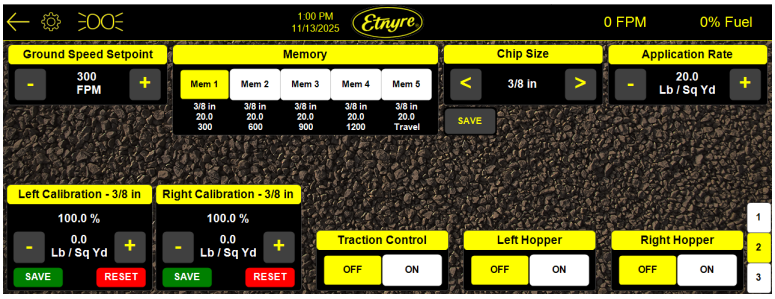
Vibrator (Optional)



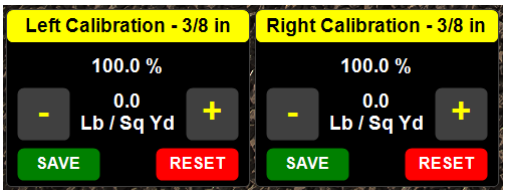
For chipspreaders equipped with a vibrator, it can be set to ON, OFF, or AUTO.

While in AUTO mode, the vibrators turn on with activation of the Gate Power Toggle for the time set on "Vibrator Time Delay" in "Setup". The vibrator is momentarily activated while ON is held.

Operate Page 2



Gate Calibration



Before calibrating a material, verify the spreadrolls are turning at 96 RPM. The chip size to be calibrated must be set on the display. Set the application rate to the desired value. The speed setpoint should be around 300 FPM. Place the supplied canvas on a flat surface leaving room for the chipspreader to get up to speed. With the joystick fully forward to assure constant speed, toggle the gates on to lay material over the canvas roughly 10 feet before the canvas, and toggle off once the canvas is covered. Weigh the material and canvas with the provided scale and subtract the weight of the canvas.

Compare the measured weight of the material to the application rate setpoint. If the material weighed in light, increase the gate calibration by the difference with the + button, and the gate percentage decreases. If the material weighed in heavy, decrease the gate calibration by the difference, and the gate calibration percentage increases. The calibration percentage is a density factory of that specific material size that serves as a reference to keep track of the calibration. Hold the Save button to write the percentage to memory. Holding Reset sets the percentage back to 100%

On a variable hopper, this needs to be done for both left and right gates. For better accuracy of either a standard or variable hopper, do this a minimum of three times.

While chipping, it may become evident one side appears heavier or lighter than the other. The calibration can be done again for further fine-tuning.

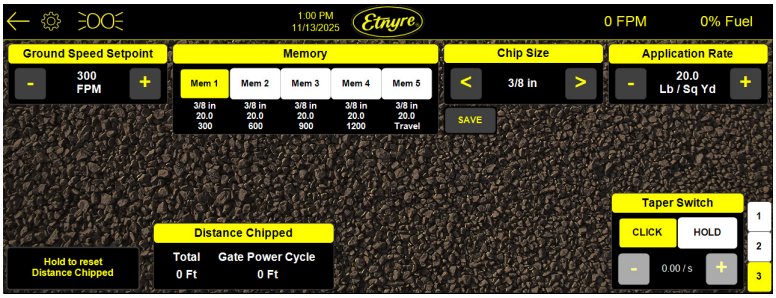
Traction Control (4WD Only)

The joystick must be in neutral to turn this ON; doing so transfers torque to the front axle and limits speed to 200 FPM. This is helpful for when the rear wheels are spinning and better traction is needed. Once traction control is turned off, the machine resumes its set speed point. This toggle saves on a power cycle.

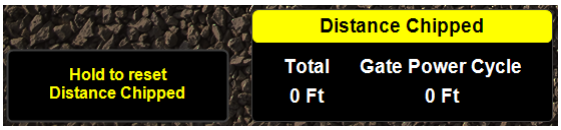
Hopper Power

When the Left Hopper and Right Hopper buttons are set to ON, this allows the gates to open and spreadroll to turn while spreading material. Shutting either of them OFF is helpful if only one side needs to be used.

Operate Page 3

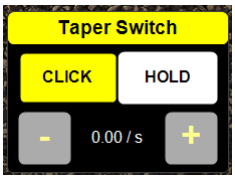


Distance Chipped



Distance Chipped accumulates while the chipspreader is chipping. The Total value is the distance chipped since the last reset. Gate Power Cycle is the distance chipped since the last time gate power has been toggled on, and is useful if needing to know the distance chipped of the recent stretch of road. Holding the reset button resets both values to 0.

Taper Switch



Taper Switch can be HOLD or CLICK and has an adjustable taper speed given in feet per second. If HOLD, holding a taper switch moves the taper position in the direction the switch is held at the given speed. If CLICK, the taper switch moves the taper position by one foot each time.

Taper switches are used as an additional method to open and close gates with the gate switches. There are two taper positions, left and right, on the hopper indicated on the gate switch module by BLUE LED. The taper position on the left gate can move to the right gate, and the taper position on the right gate can move to the left gate, but the two taper positions can never cross each other. All gates outside the taper positions are closed, regardless of if its gate switch is on or off. All gates at and inside the taper positions will open if the gate switch is on.

These can be customized to a new control with the Customize Controls page (page 12).

WARNING

Unsafe operation of equipment may cause injury. Read, understand and follow the manuals when operating or performing maintenance.

Never place hands between the spread roll or gate and rear of hopper. The gate could move at any time and cause severe injury.

Do not travel with the seat unlatched. Seat movement could occur causing disorientation and possible loss of control.

Remain clear of all moving parts.

WARNING

Always use steps, platforms and handrails provided.

Always have shields, covers and guards in place when operating.

Make certain everyone is clear of machine before starting or operating the machine.

Since all functions except power steering and brakes are electrically controlled, turning the ignition key to “off” results in a violent stop.

Keep loose clothing away from conveyor area when operating the conveyors.

WARNING

Unsafe operation of equipment may cause injury. Read, understand and follow the manuals when operating or performing maintenance.

Never put hands in between gate and spread roll or gate and rear of hopper. The gate could move at any time and cause severe injury.

Remain clear of all moving parts.

CAUTION

Always install locking control box cover and chock wheels when leaving machine unattended as protection against vandalism and accidental movement.

CAUTION

Before operating the Chipspreader, make an inspection of the machine to be sure that the machine is in a safe condition to operate.

IMPORTANT

Do not tow the Chipspreader before reading the towing instructions contained in this manual. Improper towing may damage the hydraulic motors.

Should a piece of foreign material become lodged in the gates, push the gate override pushbutton on the joy-stick **(Figures 2 & 3)** to open the appropriate gate above the set point to allow the piece to pass. Releasing the override will return the gates to the previously set position.

Adjust Chipspreader hitch height as necessary to accommodate different individual trucks.

Operate the conveyor belt switches so as to maintain an even distribution of aggregate in the front hopper.

The machine is equipped with conveyor belt speed controls. The rear conveyor gates should be set to deliver as much material as possible into the conveyor without spillage and then the conveyor speed should be adjusted to deliver slightly more aggregate to the front hopper than the amount being spread. When properly adjusted, the conveyors should run approximately 80% of the time with the hopper at maximum width and the Chipspreader traveling at maximum speed for the particular job.

Automatic Conveyor Control

In the middle position, power is supplied to the auto switch mounted on top of the conveyor hood. When this switch senses material, the conveyor will shut “off” and conversely when it no longer senses material it will start the conveyor attempting to fill the hopper. **(Figure 5)**

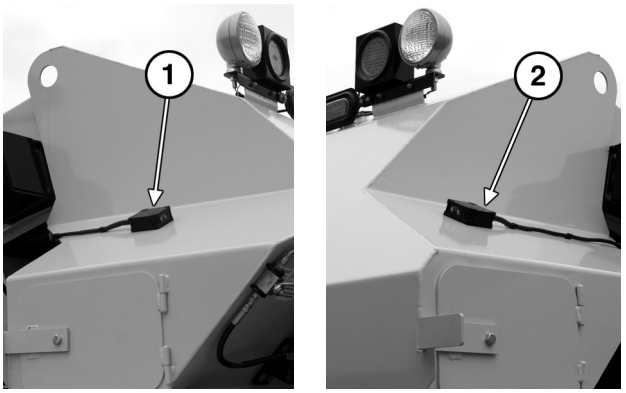


Figure 5. Conveyer Diaphragm Switches

1. Right Diaphragm Switch 2. Left Diaphragm Switch

Ultrasonic Sensors

The switching point of the ultrasonic switches can be changed to optimize flow of rock in hopper and hood. To change the switching point distance:

1) Turn key to the ON position and corresponding selector switch to AUTO position.
2) Hold A1 button until red light flashes.
3) Place object desired distance from switch.
4) Press A1 button to save.
5) Repeat steps 2-4 for A2 button.

WARNING

Unsafe operation of equipment may cause injury. Read, understand and follow manuals when operating or performing maintenance.

CAUTION

Setting switching point to close or changing mode from desired setting may cause automatic switches to function improperly.

CAUTION

Keep loose clothing away from conveyor area when operating conveyors.

Backup Alarm

The electric backup alarm is automatically actuated when the speed/direction control handle is pulled to the rear of neutral.

Hydraulic Powered Seat Assembly

A hydraulically powered seat positioner is operated by a spring centered toggle switch. The seat may be positioned wherever it is desired for operation.

Individual Gates (Figure 6)

These gates are turned on or off by air cylinders. The air cylinders either keep the gate closed, or when turned on, they open the gate up against the hydraulically positioned buss bar. The computer controls the position of buss bar according to the gate opening required. The buss bar is turned on/off by using the gate/spread roll thumb switch. For opening of all of the gates, the left and right gate power switches should be turned on and the left and right spread roll switches should be turned on. For normal operation, the Gate Master switch is turned on, and the switches for the individual gates are all turned on. When operated in this manner, the entire left and right hoppers will open across their full width. If the hoppers are fully extended, turning off individual switches on the outboard end will turn off 1 foot increments.

The normal operation would be to turn on the Master gate switch and also all of the individual switches. The gates would then be turned on or off from the thumb switch on the control handle. If it is desired to turn the gates off instantly in some operations, the Gate Master switch can be turned off before the thumb switch, and then the thumb switch turned off.

Be sure to turn the Gate Master Switch back on again before opening the thumb switch or no gates will open with the buss bar.

If it is desired to spread a couple of feet at the end of a hopper for either shoulder work or patching, it is recommended that the spread roll for the hopper be turned off to avoid unnecessary wear on the portion of the spread roll that is turning against the closed gates. If the spread roll is turned off, the application rate will be less than with the spread roll on, so it will be necessary to increase the application rate to get the same amount of material.

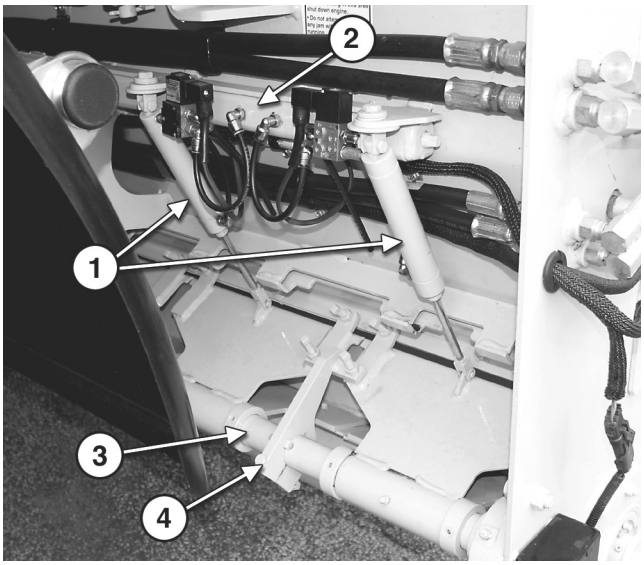


Figure 6. Individual Gates

1. Air Cylinder
2. Hydr Cylinder
3. Buss Bar
4. Buss Arm

Towing Instructions

Install a chain or strap around the front hydrostatic motor and parking brake assembly and secure the assembly to the front engine crossmember. Remove the four 16mm bolts that secure the parking brake to the front axle and pull the parking brake and motor assembly away from the front axle to disengage the spline. On a 4WD machine secure the rear motor to the frame crossmember and remove the motor in the same manner. The chipspreader should be towed to an area where it can be loaded onto a trailer. It is not recommended to tow the chipspreader for long distances. When the chipspreader is placed back in service, verify that the axle differential housings are filled with gear lube to the full level.

APPENDIX A

MAINTENANCE ADJUSTMENTS

WARNING

When two people are required to perform adjustments or maintenance operations or two people are simultaneously performing different operations, the work must be coordinated between the two people to avoid possible injuries.

WARNING

When two people are performing maintenance adjustments, do not start engine without assuring that the other person is clear of moving parts and out from under the machine. Be sure that the mode selector is in park and the control stick is in neutral before attempting to start engine.

Hopper Spread Roll Wear Plate Adjustment (Figure 7)

Turn the spread rolls and conveyors “off”.

1. Loosen all spread roll wear plate hold down bolts and adjust the wear plate until a nominal 1/16” clearance exists between the wear plate and the spread roll for the entire hopper width.

2. Re tighten all the hold down bolts.

3. When one side of a plate has worn excessively it is possible to turn the plate over and use the opposite side.

Hopper Gate Wear Plate Adjustment (Figure 8)

Turn spread roll and conveyors “off”.

1. Loosen wear plate hold down bolts and extend the plate 1/32” past the gate edge along the entire gate width.

2. Tighten hold down bolts.

3. As plate wear occurs, additional adjustment will be necessary.

4. When one side of a plate has been worn away it is possible to turn the plate over and use the opposite side.

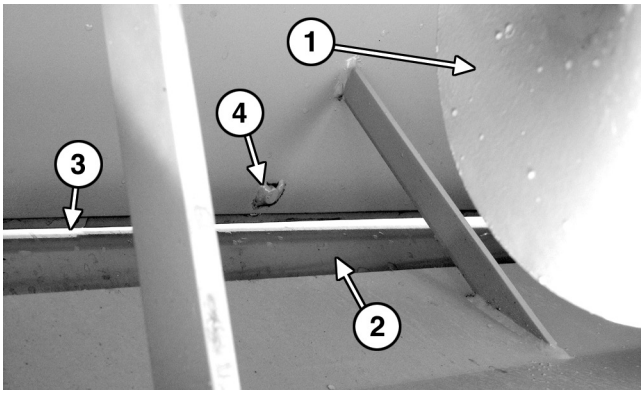


Figure 7. Spread Roll Wear Plate

1. Auger
2. Spread Roll
3. Spread Roll Wear Plate
4. Hold Down Bolts

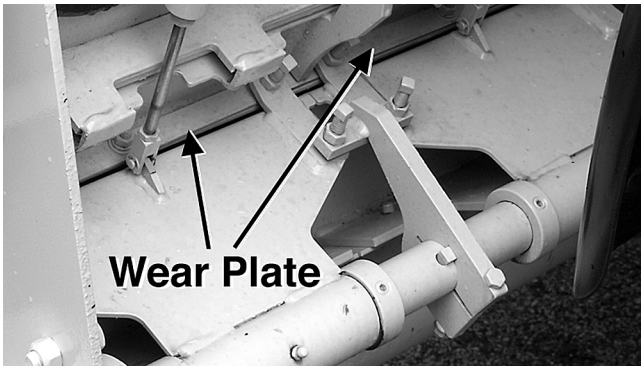


Figure 8. Hopper Gate Wear Plate

WARNING

Conveyor must be running during this procedure. To avoid personal injury, be sure to remain clear of moving belt.

Conveyor Belt Adjustment

1. If the conveyor belt tends to move towards one side of the conveyor, tighten tail pulley adjustment on that side until the belt is running in the center.

2. Should it be impossible to obtain centered belt operation by adjusting the tail pulley **(Figure 9)** it will then be necessary to adjust the head pulley as outlined on next page. **(Figure 10)**

For the right hand conveyor:

a) Loosen the four bolts holding the right hand side head pulley bearing.

b) Loosen adjusting bolt jam nuts.

c) Start conveyor at this time.

d) If belt runs to the right hand side of the conveyor, tighten the adjusting screws until the belt is centered on the head pulley.

e) If belt runs to the left hand side of the conveyor, loosen the adjusting screws until the belt is centered on the head pulley.

f) Re tighten adjusting screw jam nuts.

g) Stop the conveyor belt.

h) Tighten head pulley bearing bolts.

WARNING

Remain clear of all moving parts.

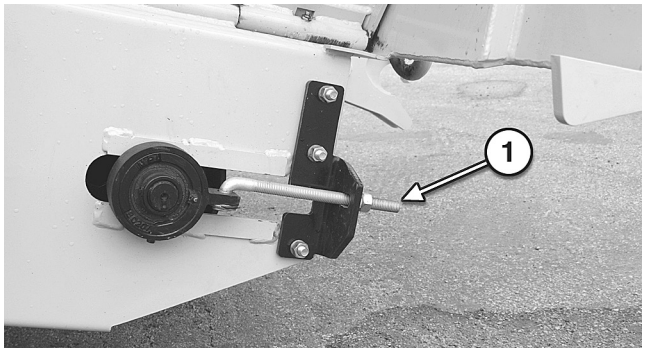


Figure 9. Conveyor Tail Pulley

1. Conveyor Belt Tail Pulley Adjustment Bolt (4 Places)

For left hand conveyor:

a) Loosen the four bolts holding the left hand side head pulley bearing.

b) Loosen the adjusting bolt jam nuts.

c) Start conveyor at this time.

d) If belt runs to the right side of the conveyor, loosen the adjusting screws until the belt is centered on the head pulley.

e) If belt runs to the left side of the conveyor, tighten the adjusting screws until the belt is centered on the head pulley.

f) Re tighten adjusting screw jam nuts.

g) Stop the conveyor belt.

h) Tighten head pulley bearing bolts.

NOTE: Only a small amount of head pulley adjustment should be necessary to center conveyor belts.

Conveyor belts should be sufficiently tight to prevent head pulley slippage when the belts are loaded and operating at full governed speed. It should be noted, however, that excessive belt tightness will result in shortened belt and pulley bearing life. It may be necessary to tighten the belts several times during the first few weeks of operation until most of the initial belt stretch has been removed. When doing so it is necessary to tighten each side equally to keep the belt running centered.

WARNING

The fuel tank is part of the crosswalk.
Do not drill or weld in this area.

CAUTION

To avoid potential damage to electrical components, disconnect batteries before welding.

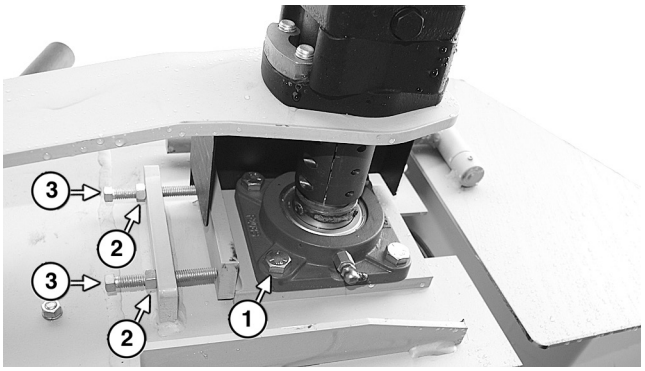


Figure 10. Conveyor Head Pulley Adjustment

(View from below, looking up)

1. Bearing Bolts
2. Jam Nut
3. Adjusting Screw

IMPORTANT

Do not tow the chipspreader before reading the towing instructions contained in this manual. Improper towing may damage the hydraulic motors and brakes.

APPENDIX B

SYSTEMS STARTUP AND ADJUSTMENTS

Hydrostatic System Startup

After any work has been done on the hydrostatic ground drive system which involved opening up the circuit in any way, the following startup procedure should be used.

1. Jack the machine up and securely support on stands with all four wheels off the ground.

2. Disconnect the 50 pin connector at the engine, so that the engine can only be cranked and cannot be started. **(Figure 12)**

3. Disconnect pump stroker at the pump

⚠ WARNING

Be certain that machine is securely supported on stands. Wheels will be rotating under power & if they contact the ground or debris becomes lodged between the wheels & ground, the chipspreader could drive off the stands.

4. Insert a 600 psi gage (with a size 10 male boss end) in port “G” on the drive pump **(Figure 20)**.

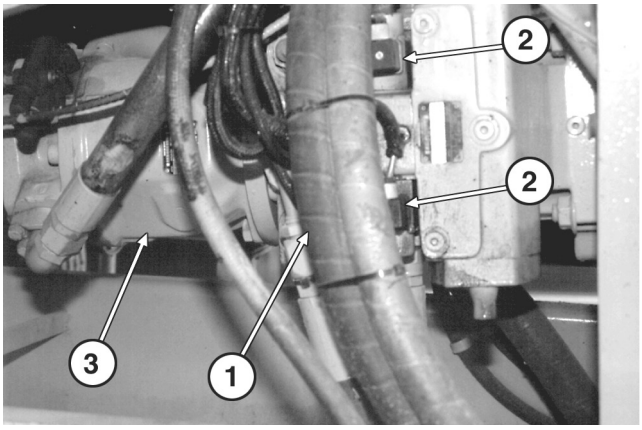


Figure 11. Hydrostatic Pump

1. Hydrostatic Pump
2. Fwd & Rev Solenoids
3. 1st Implement Pump

5. Make sure the gate valve, **(Figure 13)** in the suction tube is turned fully open (counterclockwise) with sleeve and handle installed. Do not attempt to start the engine with the gate valve closed. This will block the flow to the pumps and cause cavitation.

⚠ CAUTION

Do not crank engine with gate valve closed. Doing so will cause damage to the hydraulic pumps.

6. Turn ignition key “on” and place the throttle switch in the “idle” position. Turn key to “start” and crank engine with starter until seeing at least 40 to 60 psi on the charge pressure gauge.

DO NOT CRANK FOR MORE THAN 30 SECONDS.

Wait at least 2 minutes before cranking again. If no pressure reading can be obtained after 2 or 3 attempts, the starter may not be cranking the engine fast enough to develop charge pressure.

7. Hook up the 50 pin connector.

8. Turn ignition key to “start” and release, letting engine run at idle. Observe the charge pressure for a reading within 30 seconds. Once a reading is seen, allow the engine to idle for about 10 minutes.

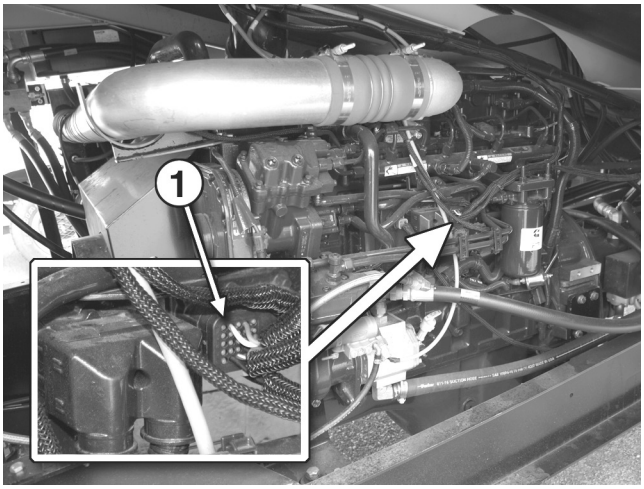


Figure 12. Engine Left Side

1. 50 Pin Connector

During filling of all lines and components, the charge pressure can surge between 50 and 500 psi. As the system fills, surging will decrease and the charge pressure should settle down to a steady reading.

WARNING

Be certain that machine is securely supported on stands. Wheels will be rotating under power.

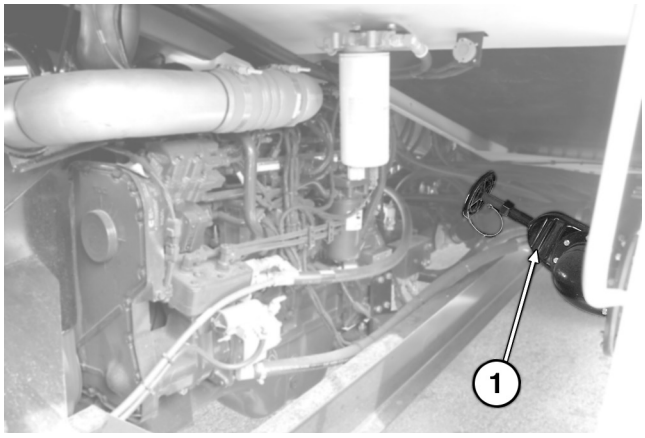


Figure 13. Gate Valve

1. Gate Valve

9. Shut down engine, remove all gages and replace all plugs or caps. Recheck fluid levels after 15 minutes and add as necessary to bring to level of the sight eye in the tank.

Gate Transducer Adjustment

1. Place the Drive/Park selector in “PARK”

2. Hold the CAL switch down and start the engine. Release the CAL switch once the computer beeps three times. This will access the computer set up screens.

3. Scroll down until the display reads RIGHT GATE NULL. This value should be around 0.0. If it is not, verify that the right gate is closed. There should be 1/16” between each gate and the spreadroll. If necessary, disconnect the connectors from the right gate valve and power the gate shut using the manual override. Once the gate is shut, press the CAL switch down to set the closed value (null).

4. Once the null is set, scroll down to the next screen, RIGHT GATE SCALE. Hold the right gate override pushbutton down and monitor the display. The display should show 4.00” while the override is activated. If it does not, verify that the gate is fully open. Once the gate is fully opened, press the CAL switch down while holding the override to set the opening to 4.00” When the gate override is released, the display should go back to 0.00”

5. Scroll down to the next screen, LEFT GATE NULL. Follow the procedure outlined above to set the null and the scale for the left gate.

6. Once both gates have been set, scroll down to the last screen of the set up screens and press the save pushbutton to save any changes that were made.

It is recommended to try and set the gates using the computer set up screens prior to physically making any adjustments to the potentiometer itself. If the gates cannot be set using the set up screens, or a new gate potentiometer is to be installed, the following procedure should be used. Refer to **Figures 14,15 & 16**.

1. Place the Drive/Park selector in “PARK”.

2. Start the engine and run it at about 1000 rpm.

3. Extend both hoppers approximately 2 feet each and shut the engine off.

4. To insure that the gates are fully closed, swap the connectors on the open and close solenoid valve **(Figure 15)** and restart the engine. Depress the gate override button which will fully close the gates. While holding the override button down, shut the engine off. There should be 1/16” between each gate and its spread roll.

5. Return the connectors to their correct positions.

6. Enter the Set up access screens by holding the “Cal” switch down while turning the key on. Do not start the engine. Scroll down to the left gate null setting, and set the null to zero by depressing the “Cal” switch. The screen should change to 0.0. Then scroll down to the save screen and save the value.

7. Using needle probes on a digital voltmeter, measure the voltage between the red and black wires at the gate transducer **(Figure 16)**. The value should be 5.0 volts DC. Next, check the voltage between the blue and black wires. This value should be between 0.5 and 1.5 volts DC.

8. If the value measured in step 7 is not within the specified tolerance, remove the transducer cover on the hopper.

9. Loosen the transducer mounting bolts and rotate the transducer as necessary to get the 0.5-1.5 volt DC reading.

10. Retighten the mounting bolts.

11. Recheck the reading.

12. Start the engine and depress the gate override button to fully open the gates. While depressing the override button, shut the engine off. The gates should remain fully open. Turn the key back on and measure the voltage between the blue and black wires. The voltage should be 3.5 to 4.5 volts DC. Restart the engine and let the gates close and recheck that the closed value is still within the specified range of 0.5 -1.5 volts.

If it is, enter the set up screens while starting the engine and scroll down to the appropriate gate scale screen.

13. Depress the override button to fully open the gates and then depress the cal switch. The reading should change to 4.00.

14. Release the override button and scroll up to the appropriate “Gate Null” screen to check the reading. If it is no longer at ”0”, depress the override button and scroll down to the appropriate “Gate Scale” screen. Depress the override button and while depressing the override button, depress the “Cal” button to set the scale.

15. Repeat these two steps as required until the readings get to “0” and “4” or until they no longer change.

16. Upon completion, scroll to the save screen and exit set up by depressing the “Save” button.

17. Repeat this procedure for the other gate, if its transducer has also been changed.

⚠ WARNING

Never put hands in between gate and spread roll or gate and rear of hopper to clear an obstruction. The gate could move at any time and cause severe injury.

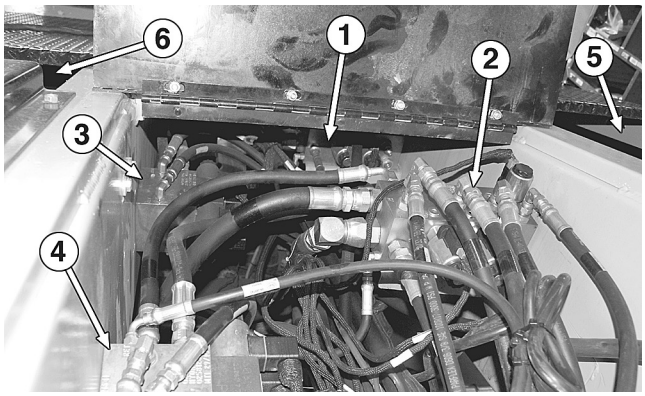


Figure 14. Gate/Hopper/Conveyor/Auger/Spreadroll Manifolds

1. Left Conveyor/Auger/Spreadroll
2. Right Conveyor/Auger/Spreadroll
3. Left Gate/Hopper Manifold
4. Right Gate/Hopper Manifold
5. Left Conveyor
6. Right Conveyor

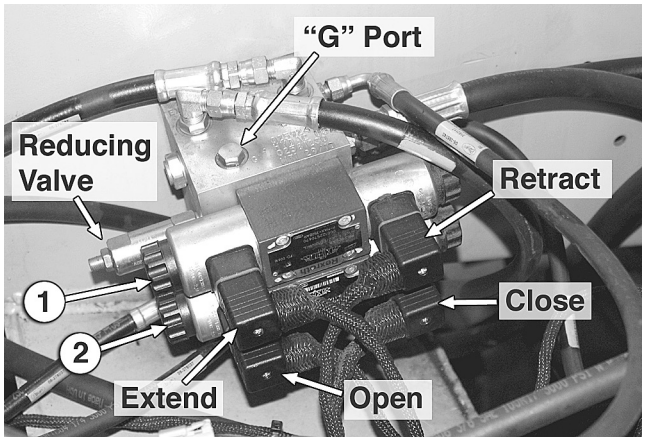


Figure 15. Right Gate Solenoid

1. Hopper Solenoid
2. Gate Solenoid Valve

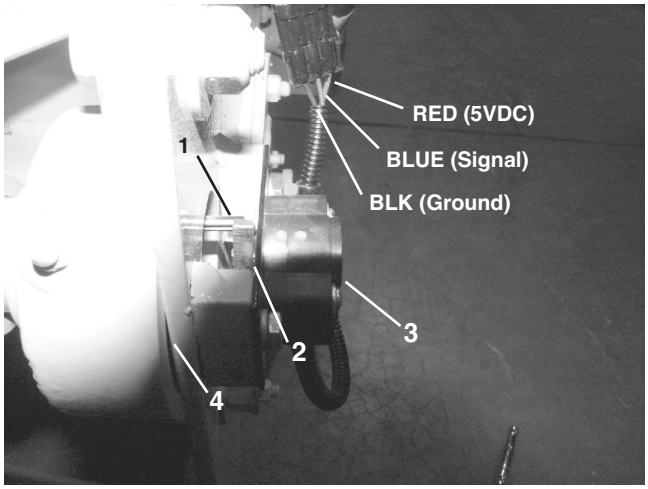


Figure 16. Left Hopper Transducer

1. Drive Pin
2. Lever Arm
3. Transducer
4. Bearing

Air Pressure Adjustments

1. Set the main pressure regulator at 80 psi. **(Figure 17)**

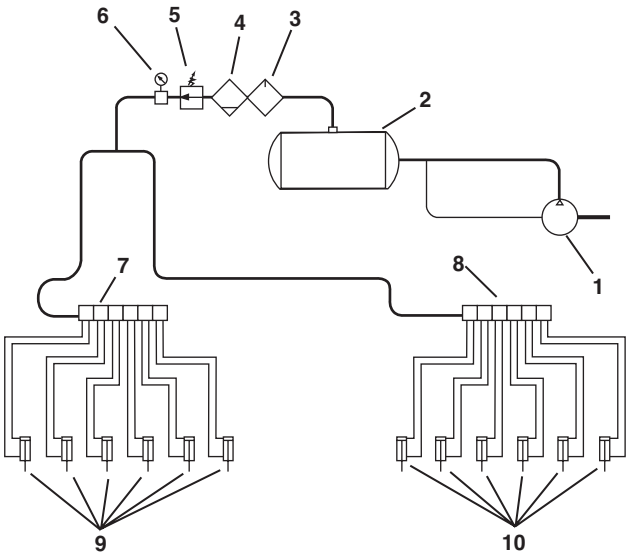


Figure 17. Air System

1. Compressor
2. Reservoir
3. Air Oiler
4. Water Separator
5. Main Regulator
6. Main Pressure Gage
7. Left Valve Bank
8. Right Valve Bank
9. Left 1 FT Gate Cylinders
10. Rt 1 FT Gate Cylinders

Pressure Adjustments

Pressure Settings For Hydrostatic Drive Pump (Rexroth AA4VG125 Pump)

The pressure settings consist of two (2) high pressure cross port relief valves (forward and reverse) and the pressure override for the AA4VG125 pump. The adjustment procedure is as follows:

1) Install 10,000 psi pressure gages in ports M_A and M_B located on the top side of the pump. These ports are -04 SAE O-ring. The pressure gages should be installed with enough hose to see the gage without getting under the machine.

WARNING

Do not go under the machine while the engine is running. The machine could move causing severe injury or death.

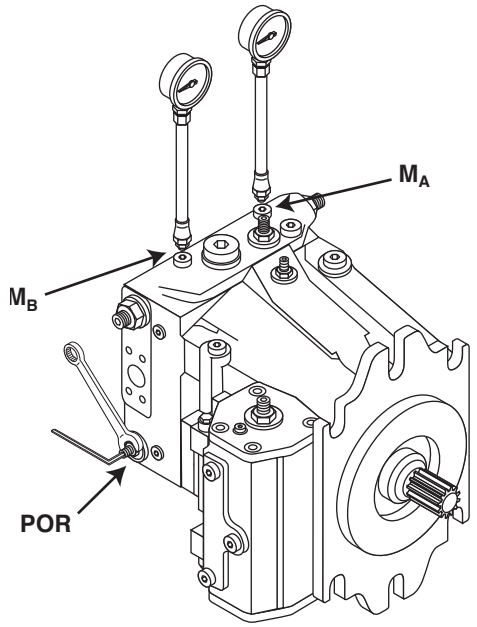


Figure 18. POR Setting

2) The pressure override (POR) should be turned all the way **IN** to be able to obtain the highest possible pressure cutoff setting. Turn screw in (clockwise) until resistance is encountered. Do not force the adjustment past this point. The POR adjustment is located below the curb side high pressure port. The adjustment will require a 4mm allen wrench and a 13mm box wrench. The protective plastic cover may have to be removed to gain access to the POR adjustment.

3) Set the forward and reverse high pressure cross-port relief valves (Relief valves A & B) to approximately 7,000 psi. To do this, first disable the parking brake release circuit by disconnecting the Weatherpack connector at the parking brake release solenoid. This solenoid is located on the hydraulic manifold under the center deck cover below the operator's station. The brake release solenoid is the forward most coil towards the curbside of the machine. Disabling this circuit will insure the chipspreader will not move while checking pressures. On 4WD units, the rear hoses must be capped to prevent the rear wheels from turning. Disconnect the two rear drive hoses at the drive pump and install 16MB caps on the adapters and 16MB plugs in the hose ends. Once the parking brake release has been disabled, unhook the brake pressure switch, if equipped. The switch is located on the hose coming from the foot pedal. Apply foot pedal brake and push joystick forward developing maximum system pressure. Check reading on gage in port M_A for forward high pressure. Should the pressure need adjusting, you may have to remove the protective plastic cover located above the high pressure port on the street side of the pump. Turn adjusting screw in (clockwise) to increase relief setting. This adjustment requires a 5mm allen wrench and a 17mm box wrench. Once forward cross-port relief valve (relief valve A) has been set to 7000 psi, repeat above procedure for reverse (relief valve B). Adjustment for this relief is located above the curb side high pressure port.

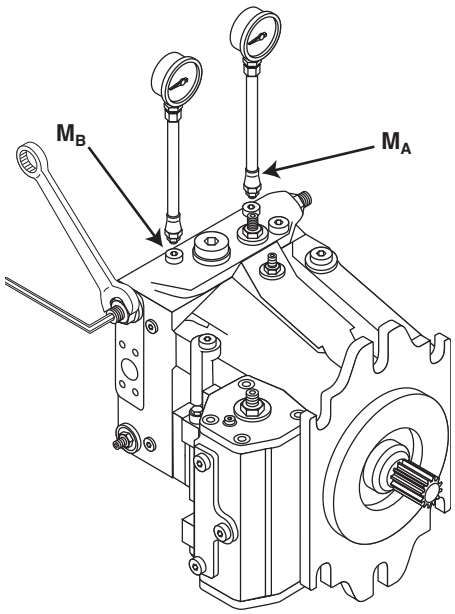


Figure 19. High Pressure Relief Setting

CAUTION

When setting the two high pressure cross-port relief valves **DO NOT** leave the pump on stroke for more than a few seconds at a time. The flow is being short circuited from the pump inlet and a lot of heat is being generated.

The Correct procedure is to:

Put the pump on stroke and see where the relief valve pressure setting is at but not leaving the pump on stroke for more than a few seconds.

Put the pump to neutral

Make an adjustment to the relief valve

Put the pump on stroke again and see where the pressure level is at.

Repeat the above process as many times as necessary until the correct pressure level is obtained.

4) Once the two high pressure relief valves set correctly for forward and reverse, set the Pressure Override Valve to 6500 psi. To do this, adjust the POR screw out (counter clockwise) until the high pressure reads 6500 psi. The POR adjustment is the same screw that was turned in full in step 2. There is only one setting for this relief that controls forward and reverse.

CAUTION

When making the pressure override adjustment, the pump should be put on stroke only for a few seconds at a time until you are sure that the pressure cutoff setting is **Below** the setting of the two high pressure cross-port relief valves.

Once the pressure override setting is below that of the two high pressure cross-port relief valves, the pump can be left on stroke without any problems as there will be no flow across the high pressure cross-port relief valves.

Remove the gages.

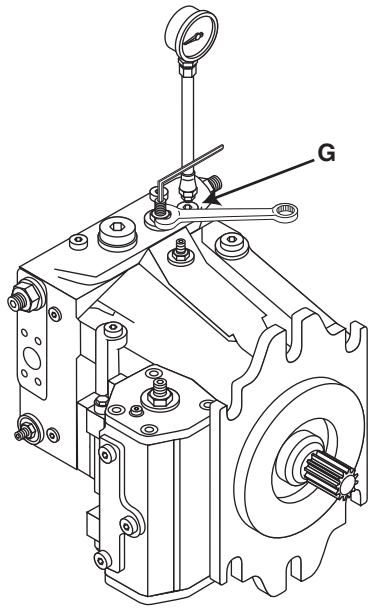


Figure 20. Charge Pressure Adjustment

Setting the Charge Pressure

1) Install 600 PSI gage in “G” port on the drive pump **(Figure 20)**. The gage will require a size 10 male boss end to plumb to the gage port. With engine at low idle, the charge pressure should read 400 psi.

2) If the pressure is below 380 or above 420, an adjustment should be made to the charge pressure relief valve. To access the relief valve adjustment, you may have to remove the protective plastic cap located on the top side of the pump beside the port marked “G”. Using a 17mm box wrench with a 5mm allen wrench, loosen the jam nut and turn set screw clockwise if the pressure is low. If the pressure is high, loosen the jam nut and turn set screw counter-clockwise. One turn is equal to 55 psi.

Remove the gage.

Pressure Settings For Auxiliary Pumps (Rexroth A10VO74 and AA10VO100D)

The variable hopper chipspreader utilizes two variable displacement pumps to supply flow to hydraulic functions. These pumps are mounted piggyback on the through drive of the hydrostatic drive pump. Flow for the right conveyor, right auger, right spreadroll, the right gate cylinder and the right hopper extend/retract cylinder is supplied by the front pump. Flow for the left functions and the hitch functions is supplied by the rear pump. The pumps each have an internal high pressure relief setting and a standby or margin pressure setting. The high pressure relief should be set to 3000 psi on both pumps. The standby pressure should be set to 400 PSI on both pumps.

Relief Valve Settings

Setting the Front Pump

1) Install a 1000 psi gage, with a shutoff valve in the port marked “G” on the right gate manifold located between the conveyors **(Figure 21)**. This port is SAE 04 and requires a 9/16” wrench to remove the plug.

2) Disconnect the electrical connectors from the gate valves **(Figure 23)**. Make sure that all conveyor, auger and spreadroll switches are all in the “off” position before starting the engine. Make sure the shutoff valve is shut. Failure to do so could result in a blown gage. back the standby pressure relief valve out 2 turns. Start the engine and run it at low idle. Open the shutoff and monitor the gage pressure.

3) To make an adjustment, use a 17mm wrench to remove protective cap from set screw located to the rear of each pump on the curbside of the chipspreader. The standby pressure adjustment is the higher of the two adjustments at the rear of the pump **(Figure 22 Ref 4)**.

4) Loosen the jam nut on the front pump and turn the set screw until the pressure reads 400 psi on the gage. Tighten the jam nut. Shut the engine off.

5) Install a 5000 psi gage in the port marked “G” on the right gate manifold **(Figure 23)** located between the conveyors. On the front pump back the high pressure relief valve out about 2 turns.

6) With the engine running at half throttle, press the right hopper retract switch to retract the hopper until it hits the stop. While holding the switch to the “IN” position monitor the gage pressure.

7) To make an adjustment, use a 17mm wrench to remove protective cap from relief set screw located to the rear and curbside of the pump. Of the two adjustments at this location, the high pressure relief is the lower one of the two **(Figure 22 Ref 1)**.

8) Loosen the jam nut and turn the set screw clockwise using a 5mm allen wrench until the pressure reads 3000 psi on the gage. Tighten the jam nut and replace protective cover once the pressure is set. shut off engine.

9) Remove gage and reinstall the 1000 psi gage with the shutoff closed. Restart engine and let it idle. Open the shutoff valve and verify that the standby pressure is still at 400 psi and adjust if necessary.

10) Reconnect the electrical connectors from the gate valves **(Figure 23)**.

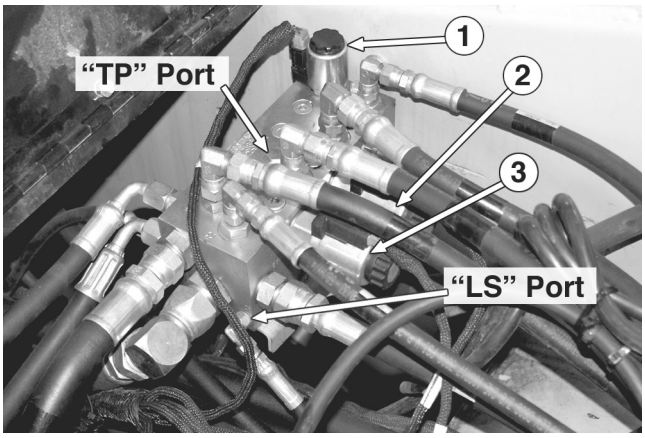


Figure 21. Conveyor/Auger/Spreadroll Manifold

1. Spreadroll Valve
2. Auger Valve
3. Conveyor Valve

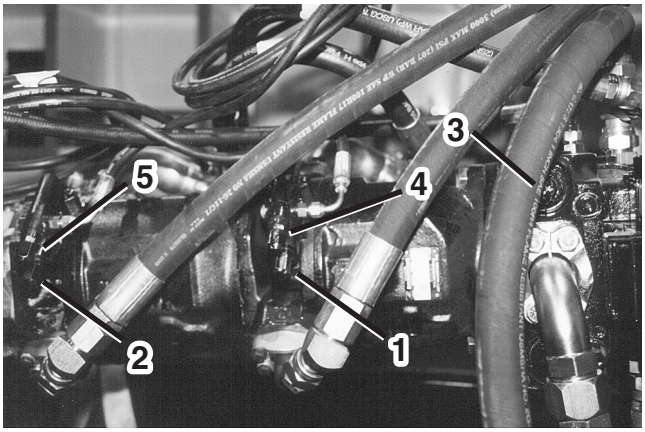


Figure 22. Pumps

1. Front Pump Relief Valve
2. Rear Pump Relief Valve
3. Main Hydrostatic Pump
4. Front Standby Pressure
5. Rear Standby Pressure

CAUTION

Do not set pressure above 3100 psi. The hydraulic components are rated for 3100 psi. Failure of these components could occur at system pressures above 3100 psi.

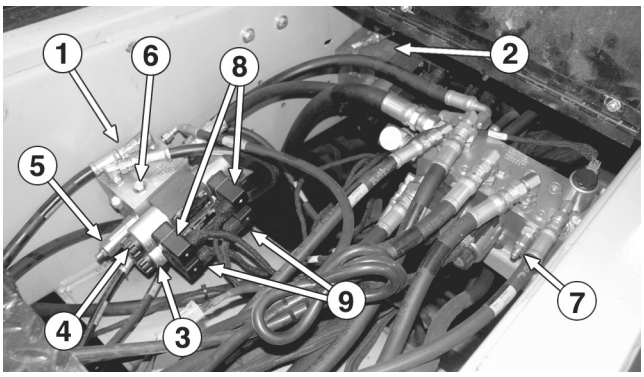


Figure 23. Gate/Hopper Manifolds

1.Right Gate/Hopper Manifold
2.Left Gate/Hopper Manifold
3. Gate Valve
4. Hopper Valve
5. Reducing valve
6. "G" Port
7. Spreadroll Speed Adjust
8. Elect Connectors - Hopper Vlv
9. Elect Connectors - Gate Valve

Setting the Rear Pump

1) Install a 1000 psi gage, with a shutoff valve in the port marked “G” on the left gate manifold (Fig 27) located between the conveyors. This port is SAE 04 and requires a 9/16" wrench to remove the plug.

2) Make sure that all of the conveyor, auger and spreadroll switches are all in the “OFF” position before starting the engine. Make sure the shutoff valve is shut. Failure to do so could result in a blown gage. Back the standby pressure relief valve on the pump out 2 turns.

Start the engine and run it at low idle. Open the shutoff and monitor the gage pressure.

3) To make an adjustment, use a 17mm wrench to remove protective cap from set screw located to the rear of the pump on the curbside of the chipspreader. The standby pressure adjustment is the higher of the two adjustments at the rear of the pump **(Figure 22, Ref 4)**

4) Loosen the jam nut on the rear pump and turn the set screw until the pressure reads 400 psi on the gage. Tighten the jam nut. Shut the engine off.

5) Install a 5000 psi gage in the port marked "G" on the left gate manifold **(Figure 23)** located between the conveyors. On the rear pump back the high pressure relief valve out about 2 turns.

6) With the engine running at half throttle, press the left hopper retract switch and monitor the gage.

7) To make an adjustment, use a 17mm wrench to remove protective cap from relief set screw located to the rear and curbside of the pump. Of the two adjustments at this location, the high pressure relief is the lower one of the two **(Figure 22, Ref 1)**.

8) Loosen the jam nut and turn the set screw clockwise using a 5mm allen wrench until the pressure reads 3000 psi on the gage. Tighten the jam nut and replace protective cover once the pressure is set. Shut off engine.

9) Remove gage and reinstall the 1000 psi gage with the shutoff closed. Restart engine and let it idle. Open the shutoff valve and verify that the standby pressure is still at 400 psi and adjust if necessary.

10) Remove gage and reinstall conveyor hose in A1 port of conveyor manifold.

Pressure/Flow Settings For Actuator Valving

(Functions supplied by pressure compensating auxiliary pump)

Note: Other than individual circuits which require reduced pressure for mechanical purposes, the main system relief is set at the pump.

Hopper Reducing Valves

The relief setting for the hopper reducing valves (left and right) should be set to 1300 psi.

1) Install 2000 psi gage in "G" port of hopper manifold (Fig 29) located between the conveyors (Fig 28). This port is SAE 04 MB and requires a 3/16 allen wrench to remove the plug.

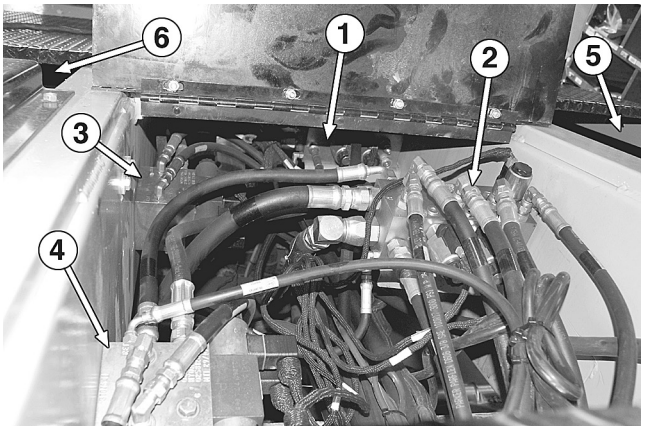


Figure 24.
Gate/Hopper/Conveyor/Auger/Spreadroll Manifolds

1. Left Conveyor/Auger/Spreadroll
2. Right Conveyor/Auger/Spreadroll
3. Left Gate/Hopper Manifold
4. Right Gate/Hopper Manifold
5. Left Conveyor
6. Right Conveyor

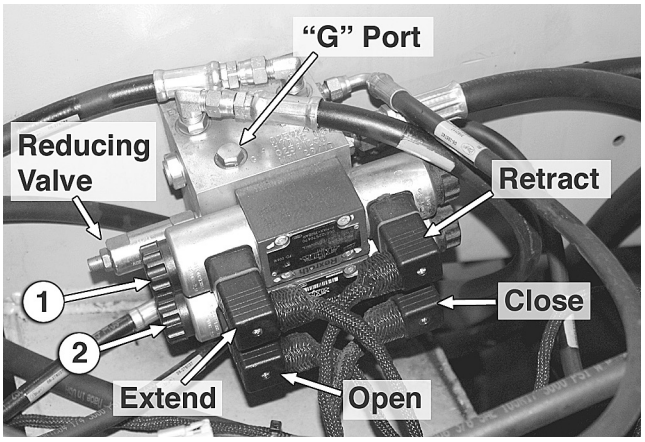


Figure 25. Hopper/Gate Manifold

1. Hopper Solenoid Valve
2. Gate Solenoid Valve

2) With engine at high idle, depress and hold the left gate override push-button and monitor pressure. If pressure is below 1200 or above 1400, an adjustment should be made.

3) To adjust pressure, use 3/4" box wrench to loosen jam nut on set screw located on the reducing valve **(Figure 25)** mounted between the conveyors **(Figure 24)**. If pressure is low, turn set screw clockwise. If pressure is high, turn set screw counterclockwise. Retighten jam nut.

4) Repeat above procedure for the right gate reducing valve **(Figures 24 & 25)**.

Spreadroll Speed Adjustment

The spreadrolls are each to be set at 96 rpm.

Right Spreadroll

1) Insure park/drive switch is in the park position and the right gate and right spreadroll power switches are on. With engine at high idle, push joystick slightly out of neutral and depress right side of thumb switch engaging the right gate/spreadroll circuit. Time the spreadroll with a stopwatch or a low speed tachometer to determine the revolutions per minute.

Figure 26. Conveyor/Auger/Spreadroll Manifold

Spreadroll Flow Control Valve

2) To adjust the speed, loosen the jam wheel on the spreadroll flow control valve **(Figure 26)** located between the conveyors **(Figure 28)**. Turn the adjusting knob clockwise to decrease the speed of the spreadroll, or counterclockwise to increase the speed. Retighten the jam wheel.

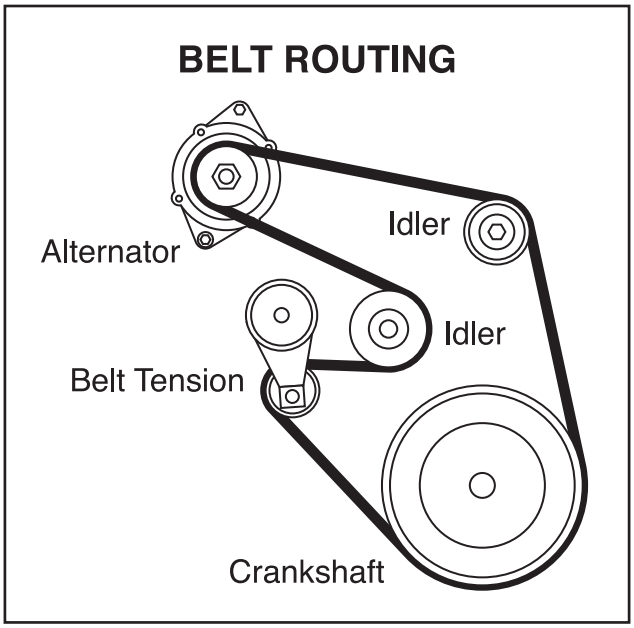


Figure 27. Engine Belt Routing

Left Spreadroll

1) Insure park/drive switch is in the park position and the left gate and left spreadroll power switches are on. With engine at high idle, push joystick slightly out of neutral and depress right side of thumb switch engaging the left gate/spreadroll circuit. Time the spreadroll with a stopwatch or a low speed tachometer to determine the revolutions per minute.

2) To adjust the speed, loosen the jam wheel on the spreadroll flow control valve **(Figure 26)** located between the conveyors **(Figure 28)**. Turn the adjuster knob clockwise to decrease the speed of the spreadroll, or counterclockwise to increase the speed.

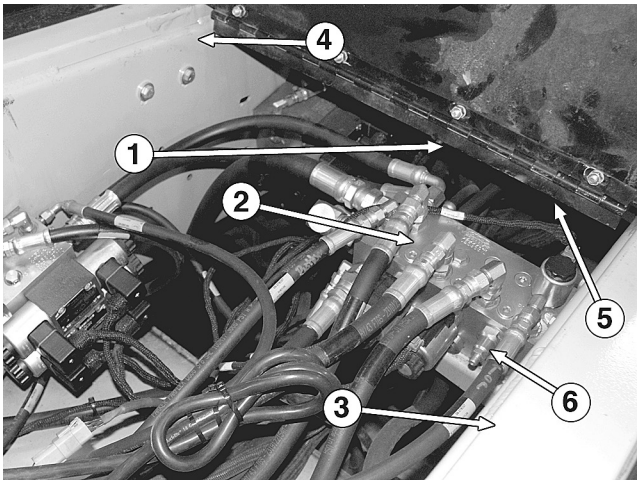


Figure 28. Spreadroll Speed Adjustment

1. Lt. Conveyor/Auger/Spreadroll
2. Rt. Conveyor/Auger/Spreadroll
3. Left Conveyor
4. Right Conveyor
5. Left Spreadroll Flow Control Valve
6. Right Spreadroll Flow Control Valve

Fixed Displacement Auxiliary Pump

The fixed displacement pump (gear pump) is mounted to the back of the pressure compensating auxiliary pump. This pump supplies flow for the power steering and fan. The gear pump does not have an internal relief and relies on external valving to govern relief pressure.

Pressure Settings For Actuator Valving Supplied By Rear Auxiliary Pump

Main Relief Pressure (MPT)

The main relief pressure should be set to 1200 psi. The steering motor operates at this pressure.

1) Install 3000 psi gage in port marked “MPT” on hitch manifold located under center deck cover below operators station. This port is SAE 04 MB and requires a 1/4” allen wrench to remove plug.

2) With engine at or above 1000 rpm, press the batwing lower switch until it hits the stop. While holding the switch in the "lower" position, monitor the gage pressure.

Note: Engine must not be running to adjust set screw. When cap is removed, oil will flow through valve and spray out top of valve. Shut the engine off before proceeding to make any adjustment.

3) If the pressure is low, remove cap from top of relief valve using vise grips **(Figure 29 Ref 3)** and adjust set screw clockwise using a 1/4” allen wrench. If pressure is high, adjust set screw counterclockwise.

Pilot Pressure (PP)

The pilot pressure should be set to 250 psi. The hitch raise/lower function operates at this pressure.

1) Install 600 psi gage in port marked “PP” on steering/hitch manifold. This port is SAE 04 MB and requires a 1/4” allen wrench to remove plug.

2) With engine at or above 1000 rpm, monitor pressure.

Note: Engine must not be running to adjust set screw. When cap is removed, oil will flow through valve and spray out top of valve. Shut the engine off before proceeding to make any adjustment.

3) If the pressure is low, remove cap from top of relief valve using vise grips **(Figure 29 Ref 4)** and adjust set screw clockwise using a 1/4” allen wrench. If pressure is high, adjust set screw counterclockwise.

4) Remove gauge.

Fan Valve Pressure Setting

The fan valve relief should be set to 2000 psi. The fan motor operates at this pressure.

1) Remove hose from “M” port on the fan valve located behind the cooler (Fig 34). Cap the end of the hose and install a 3000 psi gage into port “M” on the fan valve. This port is an SAE 16 and requires a 1 1/2” wrench for the hose and cap.

2) With engine at high idle, unplug connector at the fan valve, monitor pressure. If the pressure is below 1900 psi an adjustment should be made.

3) To adjust the pressure turn off engine and adjust relief set screw on fan valve. A 9/16" box wrench is required to loosen the jam nut and a 5/32" allen wrench is required to adjust the set screw. If the pressure is low turn the set screw clockwise. If pressure is high turn the setscrew counterclockwise.

4) Restart the engine and monitor pressure. Repeat step 3 as necessary to adjust the pressure in the range of 1900 psi to 2100 psi.

5) Shut engine off. Remove gage, reinstall hose and reconnect electrical connection on fan valve.

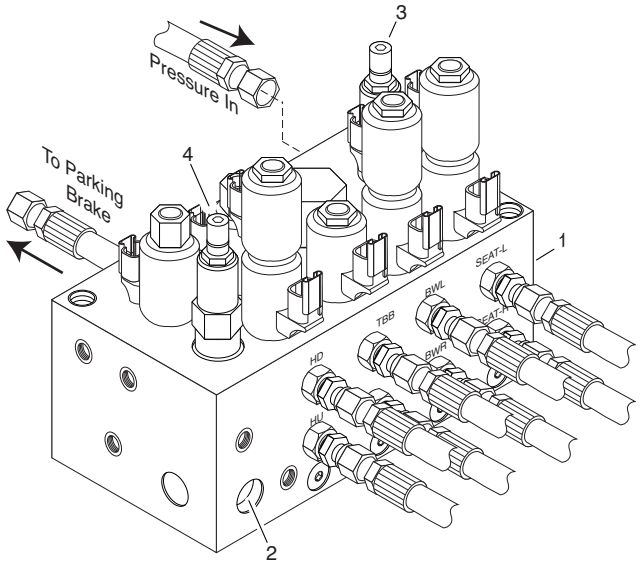


Figure 29. Hydraulic Control Assembly

1. Main Pressure Check Port
2. Pilot Pressure Check Port
3. Main Pressure Relief Valve
4. Pilot Pressure Relief Valve

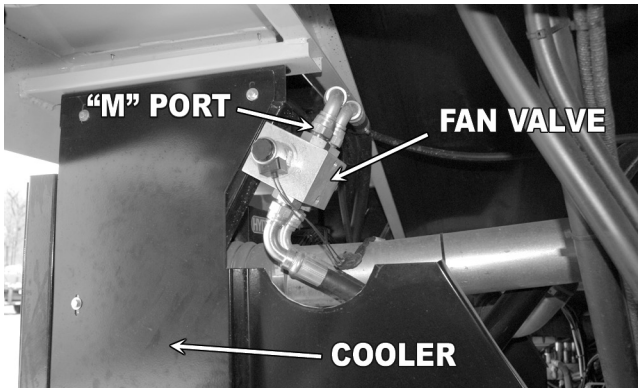


Figure 30. Fan Valve

APPENDIX C

Service Bulletin for Diesel Exhaust Fluid (DEF), Tier V

Service Bulletin

Service Bulletin Number: 4021566	**Released Date**: 27-aug-2012
Diesel Exhaust Fluid (DEF) Specifications for Cummins® Selective Catalytic Reduction (SCR) Systems	

Diesel Exhaust Fluid (DEF) Specifications for Cummins® Selective Catalytic Reduction (SCR) Systems

This document provides specifications, usage, and handling requirements of Diesel Exhaust Fluid (DEF). Other names for DEF are listed below.

- UreaAqueous
- Aqueous Urea Solution (AUS 32)
- AdBlue™
- NOx Reduction Agent
- Catalyst Solution
- Stableguard™ 32

The following topics are included in this document:

1. DEF Characteristics and Specifications
2. Handling, Storage, and Shelf Life of DEF
3. DEF Cleanliness Practices
4. Contamination and Incorrect Fluid
5. Testing
6. Disposal and Cleaning of DEF
7. First Aid

DEF used on Cummins® engines **must** meet the requirements as outlined in the specifications section of this document.

For further information, reference the DEF manufacturer's Material Safety Data Sheet.

Note : Cummins Inc. is **not** responsible for failures or damage resulting from what Cummins Inc. determines to be abuse or neglect, including but **not** limited to: operation without correctly specified DEF, lack of maintenance of the aftertreatment system, improper storage or shutdown practices, and unauthorized modifications of the engine and aftertreatment system. Cummins Inc. is also **not** responsible for failures caused by incorrect DEF or by water, dirt, or other contaminants in the DEF.

1. DEF Characteristics and Specifications

⚠ WARNING ⚠

Diesel exhaust fluid (DEF) contains urea. Do not get the substance in your eyes. In case of contact, immediately flush eyes with large amounts of water for a minimum of 15 minutes. Do not swallow internally. In the event the diesel exhaust fluid is ingested, contact a physician immediately.

Reference the Materials Safety Data Sheet (MSDS) for additional information.

⚠ CAUTION ⚠

Never attempt to create DEF by mixing agricultural grade urea with water. Agricultural grade urea does not meet the necessary specifications required and the aftertreatment system may be damaged.

DEF has the following characteristics:

- Nontoxic and nonpolluting
- Nonflammable
- Stable and colorless
- Odor of slight ammonia
- Composed of urea and water
- Biodegradable

The urea content of DEF solution **must** be 32.5 percent ± 0.7 percent by weight. It **must** meet the International Standard ISO 22241-1 for diesel engines. There is no acceptable substitute.

For engines using SCR operating in the United States and Canada, DEF certified by the American Petroleum Institute (API) is recommended for use. A symbol on the container or dispensing system will indicate certification. See image below.

11900149

Never add water, or any other unauthorized fluid, to the DEF tank. The Aftertreatment system may be damaged and the DEF solution quality will be compromised.

⚠ CAUTION ⚠

Do not add any chemicals/additives to the diesel exhaust fluid in an effort to prevent freezing. If chemicals/additives are added to the diesel exhaust fluid, the aftertreatment system may be damaged.

DEF freezes at approximately -11°C [12°F]. The DEF system is designed to accommodate these temperatures and does **not** require any intervention by the owner or operator.

2. Handling, Storage, and Shelf Life of DEF

For detailed information on handling, transportation, and storage of DEF, reference ISO 22241-3.

Handling:

DEF is **not** hazardous but short-term exposure can cause acute irritation. Proper personal protective equipment should be utilized when handling DEF. For more information, refer to the First Aid section of this document.

Select materials may become corroded if contact with DEF occurs for an extended period of time. See the list of materials below.

- Carbon steel, zinc coated carbon steel, and mild iron
- Nonferrous metals and alloys: copper, copper alloys, zinc, and lead
- Solder containing lead, silver, zinc, or copper
- Aluminum alloys
- Magnesium and magnesium alloys
- Plastics or metals coated with nickel

If material contact with DEF occurs, clean the surface immediately. Reference the Disposal, Cleaning and Contamination/ Incorrect Fluid of DEF section of this document for additional information.

Storage:

Only approved containers should be utilized to transport and store DEF. Containers made of polyethylene, polypropylene and stainless steel (Grade 316) are recommended.

Some DEF containers include a paper seal under the cap. The seal will degrade over time and will contribute to DEF contamination. These containers **must** be identified and inspected regularly once opened to prevent contamination.

Shelf Life:

Many factors effect DEF shelf life. Temperature and duration are major contributors. **Always** check the concentration of DEF or replace DEF with new if DEF quality or expiration are questionable.

DEF has an expected shelf life of 18 months minimum when stored under the following conditions.

- Storage temperature between -5°C to 25°C [23°F to 77°F]
- Sealed containers
- Avoiding direct sunlight

Shelf life is reduced by 6 months for each 5°C [9°F] increment above recommended temperatures. For example, 30°C [86°F] = 12 month shelf life, 35°C [95°F] = 6 month shelf life, etc.

Long term storage in a vehicle (in excess of 6 months) is **not** recommended. If long term storage is necessary, periodic testing of the DEF is recommended to make sure the concentration does **not** fall out of specification. See the Testing section of this document.

3. DEF Cleanliness Practices

Materials that come into contact with DEF **must** be free from any contamination, oil, fuel, dust, detergents, and any other chemicals.

Containers, funnels, and other equipment that will handle or store DEF should be cleaned before use. Wash thoroughly and rinse with distilled water. If distilled water is unavailable, rinse with tap water then rinse with DEF.

Follow these recommended practices to avoid contaminating DEF during routine maintenance tasks.

- Clean the DEF tank prior to opening the DEF tank for filling.
- Clean the dispensing nozzle prior to filling the DEF tank.
- Ensure the dispensing nozzle is kept in the DEF tank during filling to minimize drops and mishandling.
- Ensure proper filtration is used for DEF tank venting to atmosphere.
- Close DEF ports during operation or repair.
- Clean out dust and debris before using a coupler/insert connection.
- Ensure a proper DEF storage container is being utilized and inspected as necessary. Refer to Handling, Storage and Transporting of DEF section of this document.
- Conduct periodic inspections and eliminate areas where DEF has crystallized.

4. Contamination and Incorrect Fluid

Never add water, or any other unauthorized fluid, to the DEF tank. The Aftertreatment system may be damaged and the DEF solution quality will be compromised. This may effect DEF in the following ways.

- Change the DEF concentration levels
- Introduce contaminants
- Change DEF chemical properties
- Alter the freeze point of DEF
- Alter characteristics of the DEF solution

If an unauthorized fluid is added to the DEF tank, contact a local Cummins® Authorized Repair location to determine the appropriate repair direction.

If water has been added to the DEF tank perform the following steps.

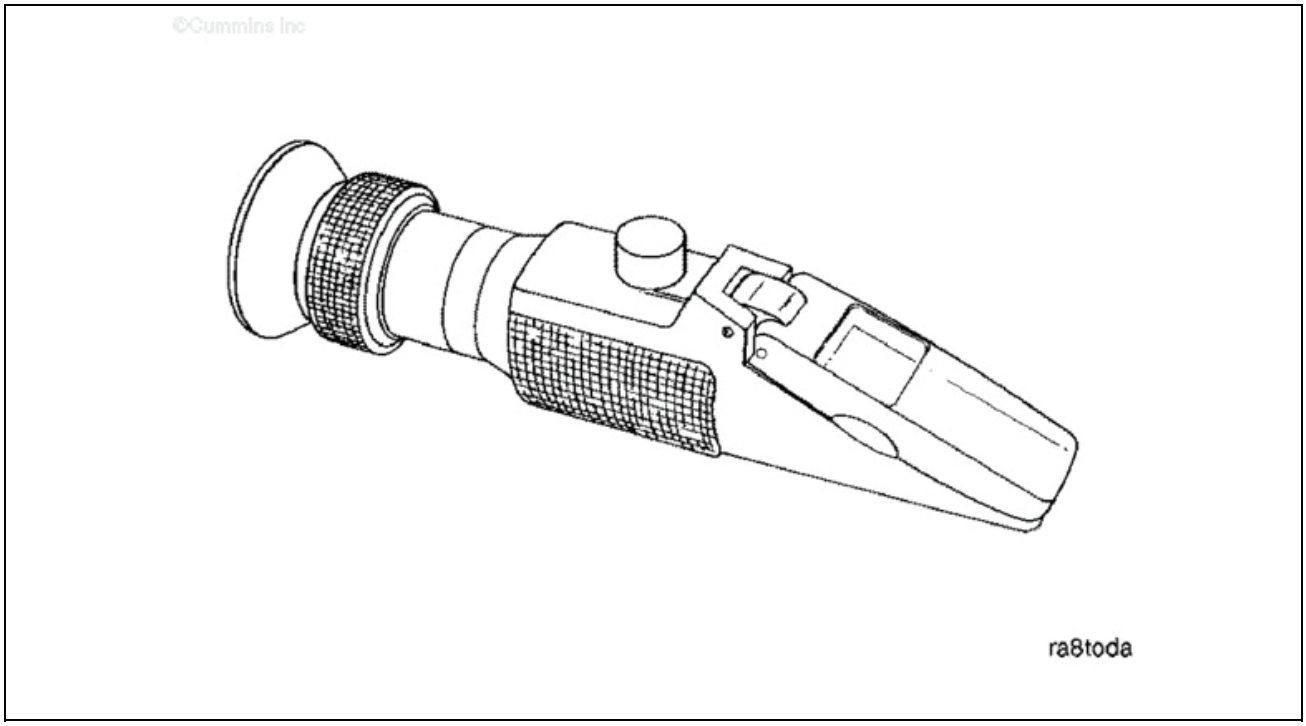
- Drain the DEF tank
- Flush with distilled water
- Refill the DEF tank with new or quality DEF
- Check the DEF concentration

5. Testing

The correct concentration of DEF is critical to engine and aftertreatment system health and performance.

To test the concentration of DEF, use Cummins® DEF refractometer, Part Number 4919554. Follow the instructions provided with the service tool.
For detailed instructions on testing DEF, reference ISO 22241-2.

Note : When using the Cummins® DEF refractometer service tool, the acceptable DEF measurement specification is 32.5 +/- 0.7 percent. This specification takes into consideration the refractometer tool tolerances, variability, and calibration when measuring DEF concentration.



6. Disposal and Cleaning of DEF

If a small amount of DEF is spilled, rinse and clean immediately with water. Spilled DEF, if left to dry or wiped away with a cloth, will leave a white residue. Failure to clean spilled DEF from a surface may result in an incorrectly diagnosed leak of the DEF dosing system.

If a large amount of DEF is spilled, perform one of the following.

- Transfer it into a suitable container. Label the container correctly.
- Cover it using an absorbent material.

Dispose of DEF according to local environmental regulations. Do **not** empty into the drainage system. Do **not** empty/release into surface water.

7. First Aid

Follow these recommended practices when working with DEF. For additional information regarding the proper handling of DEF, refer to the manufacturer’s Material Safety Data Sheet.

DEF is **not** hazardous but short-term exposure can cause acute irritation.

- Avoid breathing vapor or mist.
- Protect eyes. In case of contact with eyes, flush with water for a minimum of 15 minutes.
- Protect skin. In case of contact with skin, wash with soap and water.
- Do **not** ingest. If ingested, contact a physician immediately.

Document History

Date	Details
xxxx-xx-xx	Module Created
2012-3-5	QSOL Quick Fix|Reason: Spelling Error|Notes: none
2012-8-27	Urea content spec change
2015-1-8	Reformatted. Updated DEF cleanliness practices.
2015-2-5	none
2016-9-13	Updated Urea Solution (AUS 32) to Aqueous Urea Solution (AUS 32)
2021-1-22	Quick Fix application:

Last Modified: 22-Jan-2021

APPENDIX D

ABBREVIATIONS

Left Hopper

1. **L1** = Left Foot 1
2. **L2** = Left Foot 2
3. **L3** = Left Foot 3
4. **L4** = Left Foot 4
5. **L5** = Left Foot 5
6. **L6** = Left Foot 6
7. **L7** = Left Foot 7
8. **L8** = Left Foot 8
9. **L9** = Left Foot 9
10. **L10** = Left Foot 10
11. **L11** = Left Foot 11
12. **L12** = Left Foot 12
13. **L13** = Left Foot 13 (Standard Hopper only)
14. **L14** = Left Foot 14 (Standard Hopper only)
15. **L15** = Left Foot 15 (Standard Hopper only)
16. **L16** = Left Foot 16 (Standard Hopper only)
17. **L17** = Left Foot 17 (Standard Hopper only)
18. **L18 =** Left Foot 18 (Standard Hopper only)
19. **L19 =** Left Foot 19 (Standard Hopper only)
20. N/A = unused

Right Hopper

1. **R1** = Rear Tank
2. **R2** = Bar Latch
3. **R3** = Bar Circulate
4. **R4** = Right Foot 1 (inner)
5. **R5**= Right Foot 2
6. **R6** = Right Foot 3
7. **R7** = Right Foot 4
8. **R8** = Right Foot 5
9. **R9** = Right Foot 6
10. **R10** = Right Foot 7
11. **R11** = Right Foot 8
12. **R12** = Right Foot 9
13. N/A = unused
14. N/A = unused
15. N/A = unused
16. N/A = unused
17. N/A = unused
18. N/A = unused
19. N/A = unused
20. N/A = unused

Hydraulics

1. **RCO** = Right Conveyor
2. **RAU** = Right Auger
3. **RSR** = Right Spreadroll
4. **LCO** = Left conveyor
5. **LAU** = Left Auger
6. **LSR** = Left Spreadroll
7. **RHE** = Right Hopper Extend
8. **RHR** = Right Hopper Retract
9. **LHE** = Left Hopper Extend
10. **LHR** = Left Hopper Retract
11. **HR** = Hopper Raise
12. **HR** = Hopper Lower
13. N/A = unused
14. N/A = unused
15. N/A = unused
16. N/A = unused
17. N/A = unused
18. N/A = unused
19. N/A = unused
20. N/A = unused

Hitch

1. **HR** = Hitch Raise
2. **HL** = Hitch Lower
3. **HRI** = Hitch Release
4. **LV** = Load Valve
5. **PB** = Parking Brake
6. **SB** = Service Brake
7. **BWR** = Batwings Raise
8. **BWL** = Batwings Lower
9. T**B** = Traction Boost
10. **SRI** = Seat Release
11. **SR** = Seat Right
12. **SL** = Seat Left
13. **V** = Vibrator Relay
14. **RF**= Reversing Fan
15. **RA** = Reverse Alarm
16. **H** = Horn Output
17. **H** = Horn Output

APPENDIX D

ABBREVIATIONS

Options

1. **BL** = Brake Lights
2. **BL** = Brake Lights
3. **HL** = Head Lights
4. **HL** = Head Lights
5. **RF** = Right Flasher
6. **LF** = Left Flasher
7. **W1** = Work Lights 1
8. **W2** = Work Lights 2
9. **W3** = Work Lights 3
10. **W4** = Work Lights 4
11. **CeS** = Center Strobe
12. **CoS** = Corner Strobes
13. **WS** = Water Spray
14. **AL** = Auto Lube
15. **TLU** = Truck Light Up
16. **TLN** = Truck Light Neutral
17. **TLD** = Truck Light Down
18. N/A = unused
19. N/A = unused
20. N/A = unused

Paid Options

- **V** = Vibrators
- **W** = Work Lights
- **CeS** = Center Strobe
- **CoS** = Corner Strobes
- **WS**= Water Spray
- **FR** = Fan Reverse
- **TAL** = Truck Alert Lights
- **AL** = Auto Lube
- **TB** = Traction Boost
- **TC** = Traction Control

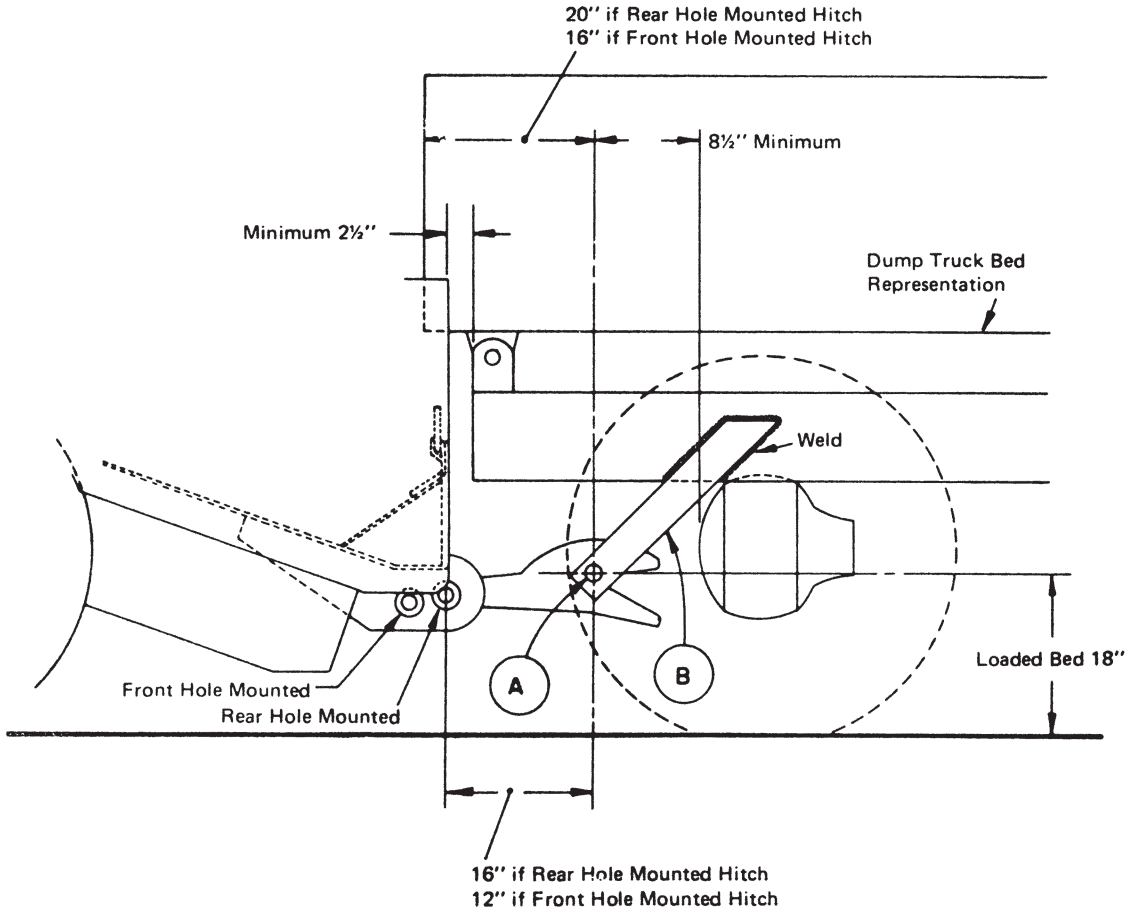
TRUCK HITCH ARRANGEMENT

1. Trucks ranging in size from four to ten yards are handled easily by an ETNYRE Chip-Spreader.

2. An apron on the rear of each truck will be quite helpful.

3. For truck hitch arrangement, see truck hitch tow bar illustration below.

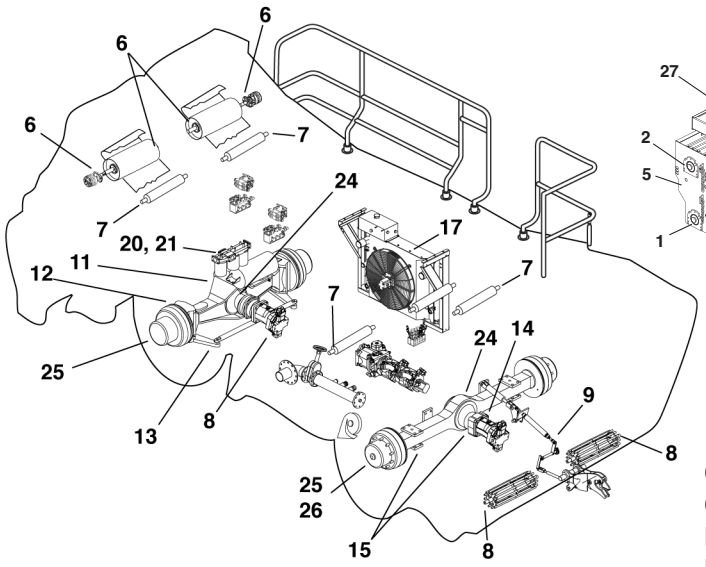
Truck Hitch Tow Bar Illustration

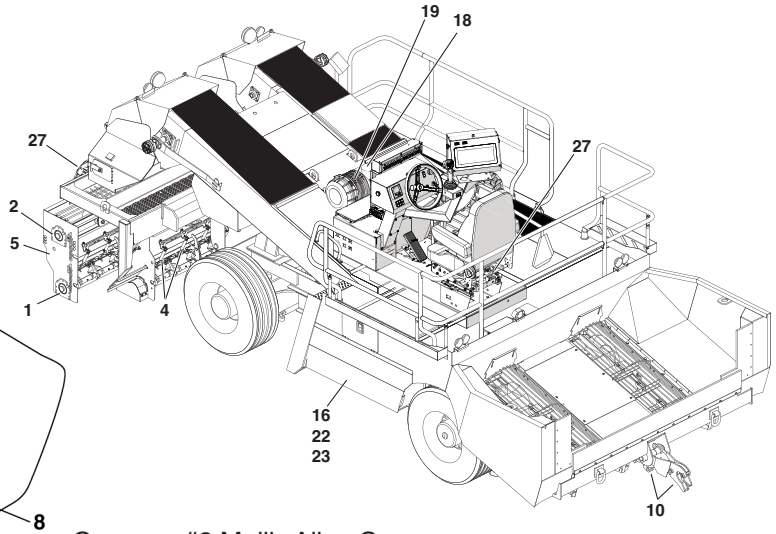


A. 3390451-Cold Rolled Round 1 3/4" dia. x 36" long

B. 3390450-Hot Rolled Flat 1/2" x 4" x 18" long (2) Req'd

LUBRICATION





Grease - #2 Molib-Alloy Grease
Gear Lube - SAE 90 API GL-5/MIL-L-2105 B Gear Lube
Hydraulic Oil - ISO VG 46 Hydraulic Oil
Lube Oil - #10 Non-Detergent Oil

Interval	Point	Identification	No. of Points	Lubricant	Quantity
	1	Bearing-Spreadroll (Both Ends)	4	Grease	Sparingly
	2	Bearing-Auger (Both Ends)	4	Grease	Sparingly
	3	Bearing-Hopper Gate (Both Ends)	4	Grease	Sparingly
	4	Bearing-Individual Gates	A/R	Grease	Sparingly
	6	Flange Bearing-Conveyors	4	Grease	Sparingly
	7	Flange Bearing-Return Idler	12	Grease	Sparingly
	8	Bearing-Tail Pulley	4	Grease	Sparingly
Weekly	9	Bearing-Hitch Levers	4	Grease	Sparingly
	10	Shaft-Truck Hitch	4	Grease	Sparingly
	11	Shaft-Front Axle Pivot	2	Grease	Sparingly
	12	Spindle-Front Axle	4	Grease	Sparingly
	13	Tie Rod-Front Axle	6	Grease	Sparingly
	14	Bearing-Slack Adjuster (2wd only)	2	Grease	Sparingly
	15	Bearing-Camshaft (2wd only)	4	Grease	Sparingly
	16	Hydraulic Reservoir	-	Hydraulic Oil	Add When Low
	17	Hydraulic Oil Cooler	-	-	Clean A/R
	18	Engine Oil Fill	1	Engine Original	Engine Manual
When Indicator Turns Red	19	Filter-Engine Air Intake	1	-	Filter Element
	20	Filter-Return*	2	-	Filter Element
	21	Filter-Suction*	2	-	Filter Element
	22	Magnet-Hydraulic Reservoir (In Tank) 1 - Clean A/R			
	23	Breather-Hydraulic Reservoir	1	-	Filter Element
Yearly	24	Differential Housing**	1 - 2wd	Gear Lube	Fill
			2 - 4wd	Gear Lube	Fill
	25	Planetary Wheel End**	2 - 2wd	Gear Lube	Fill
			4 - 4wd	Gear Lube	Fill
	26	Hub-Rear Axle (2wd only)**	2	Gear Lube	Fill
	27	Roller Chain-Power Seat (Optional)	2	Lube Oil	Sparingly

* On new machines change filter elements after first two weeks of operation. After initial change (two weeks) replace elements on an annual basis unless hydraulic system has been worked on and contamination introduced into the system. Change elements anytime it is possible that contamination has been introduced to the system.

** On new machines drain lubricant from axles after first 50 hours of operation and fill with SAE 90 API GL-5/MIL-L-2105 B gear lube. After initial change (50 hours) change lube on an annual basis.

List of Illustrations

Something Wrong with this manual?

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