CHIPSPREADER
OPERATION, MAINTENANCE and SAFETY MANUAL

Computerized
2WD and 4WD Hydrostatic Drive Units with Standard Spread Hopper

E.D. ETNYRE & CO., Oregon, Illinois 61061
## Safety Precautions

<table>
<thead>
<tr>
<th><strong>⚠️ CAUTION</strong></th>
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<tbody>
<tr>
<td>⚠️ Make certain everyone is clear of machine before starting engine or operation.</td>
</tr>
<tr>
<td>⚠️ Always use steps, platforms and handrails provided.</td>
</tr>
<tr>
<td>⚠️ Remain clear of moving or rotating parts.</td>
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<tr>
<td>⚠️ Always have shields, covers and guards in place when operating.</td>
</tr>
<tr>
<td>⚠️ Keep loose clothing away from conveyor area when operating conveyors.</td>
</tr>
<tr>
<td>⚠️ Always install locking control box cover and chock wheels when leaving machine unattended as protection against vandalism and accidental movement.</td>
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<tr>
<td>⚠️ Before operating the chipspreader, make an inspection of the machine to be sure that the machine is in a safe condition to operate.</td>
</tr>
<tr>
<td>⚠️ The seat must always be latched during travel.</td>
</tr>
<tr>
<td>⚠️ To avoid potential damage to electrical components disconnect batteries before welding.</td>
</tr>
<tr>
<td>⚠️ Since all functions except power steering and brakes are electrically controlled, turning the ignition key to “off” results in an emergency stop.</td>
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<tr>
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<td>⚠️ Unsafe operation of equipment may cause injury. Read, understand and follow the manuals when operating or performing maintenance.</td>
</tr>
<tr>
<td>⚠️ Remain clear of all moving parts.</td>
</tr>
<tr>
<td>⚠️ The fuel tank is part of the crosswalk. Do not drill or weld in this area.</td>
</tr>
<tr>
<td>⚠️ 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.</td>
</tr>
<tr>
<td>⚠️ Do not travel with the seat unlatched. Seat movement could occur causing disorientation and possible loss of control.</td>
</tr>
<tr>
<td>⚠️ Shift in and out of “travel” only while stopped or moving at a very slow rate of speed. Shifts between “2nd” and “travel” are very abrupt and could cause personal injury.</td>
</tr>
<tr>
<td>⚠️ 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.</td>
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<tr>
<th><strong>⚠️ IMPORTANT</strong></th>
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<td>⚠️ Do not tow the chipspreader before reading the towing instructions contained in this manual. Improper towing may damage the hydraulic motors.</td>
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Computerized CHIPSPREADER

OPERATION, MAINTENANCE AND SAFETY MANUAL

2WD and 4WD Hydrostatic Drive Units with Standard Spread Hopper

M-213-94

This manual covers standard features and options. If your unit incorporates custom features, some of the information contained in this manual may not apply. If you have any questions regarding this manual or your unit, contact your dealer or the E. D. Etnyre Service Department at 1-800-995-2116

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, or E. D. Etnyre & Co.

To contact NHTSA, you may either call the Auto Safety Hotline toll-free at 1-800-424-9393 (or 366-0123 in Washington, D. C. area) or write to: NHTSA, U. S. Department of Transportation, Washington, D. C. 20596. You can also obtain other information about motor vehicle safety from the hotline.

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E. D. ETNYRE & CO., Oregon, Illinois 61061
1333 South Daysville Road • Phone 815-732-2116 • Fax 815-732-7400
CAUTION

Unusually strong electromagnetic interference could cause the electronic controls on this equipment to temporarily mis-function. Test the effect of two way radios and similar equipment while operating in a safe area.

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.

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.

⚠️ 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.

⚠️ WARNING
Use manual travel mode when in confined spaces or loading on trailer. Failure to do so could result in unexpected movement and cause serious injury or death.

⚠️ WARNING
Do not operate on steep grades in auto travel mode. Auto may cause engine to stall. Engine stall could result in loss of control which may cause serious injury or death.

⚠️ WARNING
Parking brake meets SAE J1472.
Parking brake may not hold on grades steeper than 15%.
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GENERAL IDENTIFICATION

1. Conveyor Drive Assembly
2. Hydraulic Oil Coolers
3. Front Hydraulic Pump – Component System
4. Driveline – Hydraulic Pump
5. Power Gate Opener
6. Spread Roll Control Valve
7. Front Wheel Drive Motors-4WD
8. Front Axle ASM
9. Return Manifold
10. Filter – Return Line
11. Filter – Return Line
12. Reservoir – Hyd, Component System *
13. Rear Hydrostatic Pump – Drive System
14. Reservoir – Hyd, Drive System *
15. Filter – Suction
16. Hydrostatic Control Assembly
17. Rear Wheel Drive Motors
18. Conveyor Tail Pulley
19. Spread Hopper Gates
20. Lights
21. Conveyor Deflectors
22. Covers – Conveyor and Engine
23. Conveyor Control Valves
24. Air Filter ASM
25. Control Console
   Power/Ignition Switch
   Mode Selector – Manual/Auto
   Auto Speed Set
   Gate Opening Set Point
   Fuses
   Digital Instrument Panel
   Control Handle
   Gate/Spread Roll Switch
   Override Pedal
   Turn Signals, Hazard Flasher
   Headlights
   Hydraulic Tank Temperature Display
   Seat Shift
   Hitch Release
   Speed Range Selector
   Auto Speed Controller
   Conveyor Control Selectors
   Hitch Height Switch
26. Operator Seat ASM
27. Rear Deck Sections
28. Conveyor Flow Deflectors
29. Conveyor Flow Regulator Gates
30. Receiving Hopper
31. Truck Hitch
32. Fuel Tank
33. Conveyor Head Pulley
34. Spread Hopper
35. Segregator ASM
36. Gate Actuating Lever ASM
37. Hopper Material LVL Mechanism
38. Power Seat Motor
39. Brake Actuator,
   Front Brake Reservoir
40. Power Steering Motor
41. Gate Opening Transducer
42. Override Pedal
43. Hitch Raise Cylinder
44. Throttle
45. Rear Differential Lock (optional)
46. Front/Rear Differential
   Lock Valve (optional)
47. Shuttle Valve
48. Radar Speed Sensor
49. Valve – Front Drive Motors (optional)

*NOTE: 2WD units have one 60 gallon hydraulic reservoir located on the right side. 4WD units have two 30 gallon reservoirs.
INTRODUCTION

The Emyre Computer Controlled Hydrostatic chipspreader has been designed to improve the accuracy of chip spreading while improving productivity and simplifying the operation. This has been done by incorporating Application Rate capabilities using precise gate opening control and speed feedback in closed loop controls.

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 optional front hopper segregation screen should be up when the unit is traveling between job sites to avoid possible damage to the screen.

2. Keep the chipspreader on the road or relatively uniform surface at all times to avoid loss of traction and/or possible damage to the front hopper 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 hopper increases stopping distance, and weight in the front 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.

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.

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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.

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CHECK OUT

1. The following accessories are shipped with each chipspread: grease gun, extra linkage rods for shortened truck hook-up, agitator disconnect bolt, 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.

<table>
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<tr>
<td>Never exceed the maximum inflation pressures indicated on the tire’s sidewall.</td>
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</table>

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.

ATTACHING HOPPER TO UNIT

SAFETY PRECAUTIONS:

Before lifting hopper, check to ensure that adequate clearance will be maintained between the lifting machine and overhead electrical lines. you must maintain at least 10 feet of clearance.

Ensure that the hopper is well secured and rigged before starting any lifting operation.

Ensure that the area around the hopper is clear of personnel and equipment and only trained personnel are used to assist in installing the hopper.

Never let anyone go under the hopper while it is suspended.

Ensure that hands and feet are kept clear of the hopper and potential pinch points on front of the chipspreader during installation.

Attaching Hopper to Unit

1. By hooking a lifting sling into the rear lifting eye, the hopper can be tilted forward while being raised, allowing the hopper carrying shafts to engage the hopper carrying arms on the chipspreader. (Figure 1 & 2) Lower hopper slowly until lifting sling can be disconnected.

2. Attach lifting device to front lifting attachment and raise hopper to vertical position.

3. Install hopper pins, in front of latch arms, through pin catch.

4. Always install latch pin lock pins and snap down rings properly prior to releasing the lifting device.
5. Uncouple spread roll hoses and couple to hopper drive motor hoses. Use caution to wipe each half of each connector clean before connecting. **Dirt and contaminants can cause major damage to the hydraulic systems.**

6. Attach the hopper reach rod (see Figure 3).

7. 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 the gate opening cylinder rod clevis is fully screwed onto the cylinder rod.

With the hopper on the machine, start the engine and run it at a minimum of 2000 rpm. Set the gate opening to approximately 1 1/2 inch, and depress the right side of the "gate/spread roll" switch. Depress the left side of the "gate/spread roll" switch. There should be 1/16" clearance between the gates and the spread roll. If this clearance is not constant across the full width of the hopper, it indicates that 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 out-perform 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 hopper loaded removes weight from the rear wheels thus reducing the braking effectiveness of the rear motors, 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.

Identification and Function of Controls

Refer to figure 5 for identification of described features.

1. Power/Ignition Switch

Rotating from "off" to "on" supplies electric power to all systems and controls. Rotating the switch further to the right against the spring will engage the starter. When the engine runs, release the key and the switch will remain in the "on" position. SINCE ALL FUNCTIONS EXCEPT POWER STEERING, REAR BRAKES AND FRONT STEERING (2WD ONLY) ARE ELECTRICALLY CONTROLLED, TURNING THE KEY TO "OFF" RESULTS IN AN EMERGENCY STOP.

! WARNING

**Turning ignition switch to "off" results in emergency stop.**

2. Mode Selector-Manual/Park/Auto

A three position switch selects either "manual" or "auto" operation with a "park" position in between.

In "manual" mode, speed and direction are controlled by the handle, with full speed, as determined by the speed range selector, available in both forward and reverse directions.

In "auto" mode, the forward speed is controlled by the handle up to the set speed where the computer then maintains the set speed. The control handle must be pushed fully forward to "engage" the automatic speed holding feature of the computer. There is no preprogrammed rate of acceleration or deceleration. The chipspreader's acceleration will follow the rate of movement of the control handle up to the set speed. Likewise, it will decelerate, following the rate of movement of the handle. When in "auto", the chipspreader may be slowed with the control handle and then accelerated back to the full set speed at any time without affecting the set Application Rate. The computer will then re-engage the speed holding feature as long as the control handle is repositioned fully forward.

! WARNING

**Stay off hopper while machine is moving. Machine movements could cause a fall resulting in injury or death.**
Figure 5 Control Console Identification

1. Power/Ignition Switch
2. Speed Mode Selector-Manual/Park/Auto
3. Auto Speed Set Rocker Switch
5. Aggregate Set Rocker Switch
6. Fuses
7. Computer Display Screen
8. Screen Scroll Button
9. Speed/Direction Control Handle
10. Gate/Spread Roll Switch
11. Turn Signal Switch
12. Right Turn Signal Indicator
13. Left Turn Signal Indicator
14. Hazard Flasher Switch
15. Headlight Switch
16. Seat Shift Switch
17. Hitch Release Push-button
18. Throttle Lever
19. Speed Range Selector
20. Right Conveyor Control Selector
21. Right Conveyor On/Off Switch-Driver's
22. Left Conveyor Control Selector
23. Left Conveyor On/Off Switch-Driver's
24. Hitch Height Switch
25. Horn Button
26. Brake Release Switch (on trigger)
27. Computer (internal at front of control box)
28. Gate Override Button
29. Optional Limited Slip Valve Switches
30. Seat Lock Pin
In "Park" mode, the "speed/direction handle", (9) is disabled and the brakes are applied.

**CAUTION! ALWAYS PLACE THE MODE SELECTOR SWITCH IN THE "PARK" POSITION WHEN THE CHIPSREADER IS STOPPED TO AVOID ACCIDENTAL MOVEMENT OF THE MACHINE.**

**MODE OF OPERATION MUST BE SELECTED ONLY WITH MACHINE STATIONARY.**

**IF THE SELECTOR IS MOVED FROM "MANUAL" TO "AUTO" WHILE MOVING, THE CHIPSREADER COULD MAKE AN ABRUPT SPEED CHANGE TO THE SPEED SET BY THE "AUTO SPEED SET" ROCKER OR THE HIGHEST SPEED POSSIBLE IN THE RANGE SELECTED-WHICHEVER IS LOWER.**

**IF THE SELECTOR IS MOVED FROM "AUTO" TO "MANUAL" WHILE MOVING, THE PUMP CONTROL WILL SWITCH FROM THE DISPLACEMENT COMMANDED BY THE "AUTO SPEED SET" ROCKER TO THAT COMMANDED BY THE POSITION OF THE MANUAL HANDLE. IF THE TWO ARE NOT NEARLY MATCHED, AN ABRUPT SPEED CHANGE WILL OCCUR.**

**IN EITHER CASE THE COMMAND SIGNAL WILL BE MOMENTARILY DISCONNECTED FROM THE PUMP AND THE REAR PARKING BRAKE WILL MOMENTARILY BE APPLIED DURING THE ATTEMPTED SHIFT FROM MANUAL TO AUTO OR VICE VERSA. THIS WILL CAUSE A VERY ABRUPT STOP AND COULD CAUSE BODILY INJURY**

3. Auto Speed Set Rocker Switch

When in the "Auto" position, this rocker switch provides the command signal (or set point) to the computer. This rocker switch is used to set the desired chipsreader speed in feet per minute. Depressing the right side of the switch will increase the speed set point, while depressing the left side of the switch will decrease the speed set point. The computer display screen will display the set point until the control handle is moved out of neutral, and then it will display the actual speed. Once the speed is set, the chipsreader will repeat that speed any time the control handle is pushed fully forward with the speed range selector in the proper displacement for that speed (i.e. If the "auto speed is set for 700 fpm, the speed range control must be in Lo on a 2WD or 2nd on a 4WD) in order to reach 700 fpm. The computer will maintain the set speed of 700 fpm. The "Speed Set Rocker Switch" can be depressed to either increase or decrease the set point while the chipsreader is moving. When this is done, the chipsreader will smoothly transition to the new set point, and the display will display the set point rather than the actual speed. When the switch is released, the display will switch back to the actual speed.

As noted under "Speed Range Control" the maximum speeds recommended in "auto" are approximately 15% lower than those available in manual. These lower speeds allow the computer to have enough pump stroke left to compensate for normal engine governor droop. As an example-if a current Etnyre mechanical chipsreader (Eaton 4005A transmission and Spicer PR1300 axle) were operated in 2nd hi, the normal speed would be 346 fpm. However, when a hill was encountered, the increased load on the engine would cause the engine speed to decrease as much as 10% and the ground speed will fall to 311 fpm. Conversely when going downhill, the governor would allow the engine to increase speed by as much as 10% (although usually somewhat lower) thus the ground speed could become as high as 381 fpm.

The hydrostatic chipsreader, when in the manual mode, usually results in less than a 10% decrease or increase in vehicle speed, but it still has speed fluctuations similar to a mechanically driven chipsreader.

When the hydrostatic chipsreader is operated in the "auto" mode, the 15% lower recommended speeds allow the computer the added capacity to make up the decrease or increase in engine speed. When the hydrostatic chipsreader is operated at a speed of 330 fpm in "Lo" range it will typically maintain its speed within 5 to 6 fpm.(2%)

This is possible up to full engine horsepower available. If the required horsepower exceeds the available, the chipsreader will slow down and
then recover to the preset speed as load (horsepower required) decreases.

If the engine cannot maintain the chipspreader's speed on a steep hill, bring the control handle rearward toward neutral to slow the chipspreader down so that the engine can recover to high idle rpm, and when the steepness of the hill decreases, or the truck lightens up, push the control handle fully forward again to "engage" the automatic speed holding feature.

4. Aggregate Mode Selector.

This switch (4) selects the mode of operation for the gates.

When in "Manual" the gates will open to a specific opening when the Gate/Spread Roll switch (10) is turned on and will remain at that specific opening regardless of the chipspreader's speed. The computer display will show a gate set point in hundredths of an inch (i.e. 150 for 1 1/2 inches). The opening can be adjusted up or down by using the Aggregate Rocker switch as described below.

When in "Auto", the gates will open to an opening based on Application Rate in lbs/yd² and the computer will vary the gate opening depending on the chipspreader's speed, in order to maintain the set Application Rate. The computer display will show an aggregate set point in lbs/yd² (i.e. 20.0 lbs/yd²). The opening can be adjusted up or down by using the Aggregate Rocker switch as described below.

5. Aggregate Set Rocker Switch.

This control sets the position to which the gates will open. If the aggregate mode selector is set in "Manual", the set point is the actual position, in inches, that the gates will open to when the Gate/Spread Roll switch (10) is activated. If the aggregate selector switch is set in "Auto", the set point is the application rate, in lbs/ yd², that will be delivered when the Gate/Spread Roll switch (10) is activated. Depressing the right side of the switch will increase the set point while depressing the left side of the switch will decrease the set point. The set point can be changed at any time whether spreading aggregate or not.

6. Fuses.

Light fuse: Supplies power to all lights except brake lights.

Horn fuse: Supplies power to the horn, the hitch release, and the hitch height control.

Conveyor fuse: Supplies power only to the conveyors.

Pump fuse: Supplies power to the control handle, the brake lights, the backup alarm and the brake release valve.

Motor fuse: Supplies power to the rear motors, the front motor disengagement valve, the limited slip valves and also the powered seat valve.

Gate fuse: Supplies power to the computer, the gate valve, and the spread roll valve.
7. Computer Display Screens. (Fig.6)

OPERATOR SCREENS

FPM  300 SET MEM 4
3/8 CHIP 20.0 lb/yd

This screen shows the aggregate preset and the speed and application rate set points when standing still. The number to the right on the top line is the aggregate preset that is selected. The second line shows the size and type of aggregate and the aggregate application rate. If the application rate has been changed from that which was stored in the preset, a "+" or "-" will appear after the memory number. This indicates that the shown application rate is above or below the stored rate in that memory preset. The application rate will remain at this setting when the ignition is turned off.

The chipspreader uses a ground speed radar (Figure 8) to generate pulses which are then fed to the computer which then feeds the speed signal to the display.

The speed display changes to actual speed when the chipspreader starts moving. If manual gate operation is selected, the "App Rate" will display the gate set point in hundredths of an inch. (i.e. 147 = 1.47 inches)

This is the screen that will come up when the ignition is turned on and the engine is started. To move to the next screen, depress the scroll button just below the center of the digital display. Pressing it once will move the display to the next screen, while pressing it again will move to the third screen and so on until you return to the above screen.

TEMP  OIL  FUEL
195 F  60 PSI 35 %

This screen shows the engine coolant temperature on the left, the engine oil pressure in the center, and the fuel remaining in the fuel tank on the right.

If two tanks are selected the next screen will look like this.

<table>
<thead>
<tr>
<th>L TEMP</th>
<th>RPM</th>
<th>R TEMP</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 F</td>
<td>2340</td>
<td>100 F</td>
</tr>
</tbody>
</table>

This screen shows the hydraulic oil temperature in the left hydraulic tank on the left, the engine rpm in the center, and the hydraulic oil temperature in the right hydraulic tank on the right side.

If one tank is selected the next screen will look like this.

<table>
<thead>
<tr>
<th>RPM</th>
<th>R TEMP</th>
</tr>
</thead>
<tbody>
<tr>
<td>2340</td>
<td>100 F</td>
</tr>
</tbody>
</table>

This screen shows the engine rpm on the left and the hydraulic oil temperature in the right hydraulic tank on the right side.

<table>
<thead>
<tr>
<th>HOURS</th>
<th>VOLTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.7</td>
<td>14.1</td>
</tr>
</tbody>
</table>

This screen shows the hours on the machine on the left side, and the voltage coming into the control box on the right side. When the ignition key is turned on but the engine is not running, the hours will not accumulate since the hourmeter is started and stopped by an oil pressure switch. If the engine is shut down after running less than 6 minutes, the hourmeter will not increase, as it counts up only in 6 minute increments. The right side will display battery voltage when the ignition is on but the engine is not running. Once the engine is started, the hours will start to accumulate, and the voltage will increase to 13.5 to 15.0 volts as the output of the alternator supplies voltage to the system.
2 3/8 CHIP 22.1 lb
101.4% 2650 lb/yd^3

This screen shows the information contained in the current aggregate preset memory. If you do not want to change the aggregate preset or set up a new one, depressing the scroll button will bring you back to the first screen.

This method of selecting an aggregate is used primarily to set up a new aggregate and select it. The normal way to select an aggregate while operating is described under "Scroll Button".

The choices to be moved through by using the aggregate incr/decr switch would be "1, 2, 3, 4, 5, 6, Set up Memory Preset". Picking 1, 2, 3, 4, 5, or 6 will select the aggregate with all of its stored associated parameters. When the correct aggregate setting number has been selected, depress the scroll button to move to the "Speed/App Rate" screen. Selecting "Set up Memory Preset" will bring up the "Select Aggregate # to View or Change" screen. Use the Aggregate incr/decr switch to select the desired number to change. When the correct number has been selected, push the Scroll button to move to the "Application Rate" screen.

**APPLICATION RATE**
20 lb/yd^2

Set the application rate to the desired number using the Aggregate incr/decr switch. When the correct application rate has been set, push the scroll button to move to the "Aggregate Size" screen.

1 Aggregate Size
3/8"

The selected aggregate number appears on the screen to the left of "Aggregate Size".

To change the aggregate size, use the App Rate Incr/Decr switch to select the aggregate size (1/8 to 2 size in 1/8 increments). When the aggregate size has been selected, depress the scroll button to move to the next screen.

If you do not want to change the aggregate size from the one that comes up, depressing the scroll button will bypass this subroutine and take you directly to the "Aggregate Type" screen.

1 Aggregate Type
Chips

The selected aggregate number appears on the screen to the left of "Aggregate Type".

To change the aggregate type, use the App Rate Incr/Decr switch to select the aggregate type (sand, chips, gravel). When the aggregate type has been selected, depress the scroll button to move to the next screen.

If you do not want to change the aggregate type from the one that comes up, depressing the scroll button will bypass this subroutine and take you directly to the "Aggregate lb/yd^3" screen.

1 Aggregate
2460

The selected aggregate number appears on the screen to the left of "Aggregate lb/yd^3".

The aggregate must be weighed to determine the number to be entered here. Utilizing a box of dimensions of 1 ft wide by 1 ft long by 1 ft deep inside dimensions, fill it to level full - DO NOT PACK THE AGGREGATE IN - but merely strike it off flush with the top of the box. Weigh the full box and then empty the box and weigh the empty box. Subtract the empty box weight from the full box weight to determine the weight of one ft^3 of the aggregate. Multiply this number by 27 to calculate the aggregate weight per cubic yard and enter this number using the App Rate incr/decr switch. When this number has been set depress the scroll button to move to the next screen.

If you do not want to change the aggregate weight from the one that comes up, depressing the scroll button will bypass this subroutine and take you directly to the "CAL App Rate" screen.

13
1 CAL. App Rate
100.0% 25.0 aj 25.0sp

The chipsreader should be set at the speed and application rate which it is intended to be used at in order to obtain the best accuracy for this calibration. Make a pan 3 ft by 3 ft at least 4" deep inside dimensions. Place the pan on the ground and operate the chipsreader in the auto speed/auto gate modes. Leave enough room to accelerate to the set speed before getting to the pan. Push the control stick full forward to engage the auto speed mode and run across the pan dropping the aggregate. Depress the gate thumb switch about 10 ft before the pan to insure that the gate has opened to the proper setting before arriving at the pan. Weigh the material and the pan. Empty the pan and weigh the empty pan. Subtract the empty pan weight from the combined pan and material weight to determine the weight of material dropped per square yard. Repeat this process a minimum of three times. Average the weight and enter the averaged number using the App Rate incr/decr switch. When this calibration is complete, depress the scroll button to move to the "Save as aggregate #" screen.

If you do not want to change the Gate Calibration from the one that comes up, depressing the scroll button will bypass this subroutine and take you directly to the "Save as Aggregate #" screen.

SAVE AS AGGREGATE #

Use the App Rate incr/decr switch to select the memory location for this aggregate. If there is an aggregate in the selected memory number, it will automatically be replaced by the new settings and the old one will be lost, so it is important to keep a written copy of all of the aggregates so that if one is inadvertently overwritten it can be reset. Once the address has been selected, depress the scroll button to move to the next screen.

EXIT = PUSH APP INCR
SAVE = PUSH APP DECR

To exit without saving the data and thereby leave it as it was before you got into the routine, depress the App Incr switch. To save all of the settings, depress the App Decr switch. If only one item was changed, you must "Save" as you exit or the change that was just made will be ignored. This will bring up the original screen.

FPM 300 SET MEM 4
3/8 CHIP 20.0lb/yd

When the computer is shut off, the current selected aggregate and application rate will be retained to be used upon restart.

A series of alarm functions are built into the computer. If an item sensed by the computer reaches its programmed alarm condition, the appropriate item will appear and flash on the screen, regardless of what screen is currently displayed. In addition, an output is sent to the beeper and also to the warning light mounted in the upper part of the control box. For instance, the normal use will be to have the first screen displayed (FPM & LBS/SQ. YD) - this will automatically be displayed on starting the engine. If the fuel level gets down to the alarm level (approximately 10% or 7 gallons), the word "fuel" will flash, the beeper will sound and the warning light below the steering wheel will come on. The same is true for any of the items monitored which have alarm points. The alarm points are as follows:

- low oil pressure: 5 PSI
- high water temperature: 240 F
- low fuel: 10%-7 Gal.
- high hydraulic oil temp.: 180 F.
- low voltage: 11 volts
- high voltage: 15 volts
8. Screen Scroll Button

This push-button is used to scroll the screen from its current display to the next screen in the series. It will always change the screen to its next screen in a predetermined order.

An aggregate preset may be selected to run from any screen by the following method. Depress and hold down the scroll button for more than 3 seconds. At first, the screen will move to the next screen, but after 3 seconds the screen will change to the currently selected aggregate and will appear as:

2 3/8 CHIP 22.1 lb  
101.4% 2650 lb/yd³

Momentarily depressing the scroll button will scroll through all 6 memory presets. When the desired preset has been selected, say number 4, the computer screen will look like:

4 1/2 CHIP 18.0 lb  
97.6% 2700 lb/yd³

When this has been left up on the screen for more than 10 seconds, the computer will switch to the new preset and the screen will change back to:

FPM 300 SET MEM 4  
1/2 GRAV 18.0 lb/yd

When the computer is shut off, the current selected aggregate will be retained as the one to be used upon restart and application rate will be retained if it had been adjusted.

9. Speed/Direction Control Handle (Figure 7)

The control handle controls both direction (forward, neutral, reverse) and rate of speed.

In the "manual" mode, the handle gives the maximum speed available in the selected speed range when pushed full forward or full reverse.

In the "auto" mode, full reverse movement will give the maximum speed in reverse for the speed range which is selected. Full forward movement will give 100% of the selected speed set point. The computer will activate the speed holding feature only if the control handle is fully forward. It can be slowed down at any time by pulling the handle back towards neutral and reactivated by pushing the handle fully forward at any time. The control handle controls the rate of acceleration and deceleration in both "manual" and "auto" modes of operation. If the handle is moved quickly, the chipspreader will respond quickly. If the control handle is moved slowly, the chipspreader will respond slowly.

Figure 7 Speed/Direction Control Handle
9. Control Handle  10. Gate/Spread Roll Switch  
26. Brake Release Switch
The control handle also incorporates a neutral safety start switch, automatic application of the rear brakes and brake lights when placed in neutral, and activation of the backup alarm. These functions occur regardless of the mode of operation (i.e. "auto" or "manual"). The handle has a detent in the neutral position and an adjustable friction drag for holding at any desired position other than neutral.

Decelerating is always accomplished by moving the handle toward neutral. The pump displacement control follows the handle position with no lag, therefore smooth movements are recommended to change speed, but rapid speed changes including coming to a complete halt may be accomplished with care. Upon reaching the neutral position of the handle, the rear brakes will normally be automatically applied. They will lock the rear wheels with very rapid handle movement into neutral from higher travel speeds, therefore a brake release switch has been provided on the control handle trigger, which will keep the brakes from being applied as long as the trigger is depressed. Releasing the trigger with the control handle in neutral will apply the brakes. The brake override switch is useful when making quick stops smoothly or when attempting to stop on a steep hill.

With the mode selector in "auto", the control handle will operate as follows: moving the handle rearward out of the neutral position approximately 3 degrees will activate the backup alarm and release the brakes. Moving the handle further rearward will increase the reverse speed proportionate to the handle movement until full reverse speed for the selected speed range is achieved with the handle in the full reverse position. Moving the handle forward out of the neutral position approximately 3 degrees will release the brakes and begin to increase the forward speed until at the full forward position of the handle the chipspreader will be at 100% of the set point speed and the computer will maintain the set speed. If the set speed is 200 fpm, the handle must be moved fully forward to obtain 200 fpm. If the set speed is 500 fpm, the handle must be fully forward to reach 500 fpm. The rate of acceleration, to the set speed, is always controlled solely by how fast the handle is moved from neutral to the full forward position. The speed range control must be appropriately set in order to be able to reach the desired speed. Adjustments to the set point speed are made using the "Auto Speed Set" rocker switch. A change in the speed setpoint may be made at any time using the "Auto Speed Set" rocker switch. The speed may be decreased at any time by moving the handle rearward toward neutral without changing the set point and then be brought back up to the set point by moving the handle fully forward again. The Aggregate Application rate is automatically maintained when either of these methods is used to adjust the travel speed as long as the Aggregate Mode selector is in the Auto mode.

With the mode selector in "manual", moving the handle out of neutral 3 degrees in either direction will release the brakes and begin to increase the speed in the direction the handle is being moved. Further movement in either direction will increase the speed up to the full speed available in the selected speed range.

**Stopping is always accomplished by returning the handle to neutral**

10. Gate/Spread Roll Switch. (Figure 7)

This rocker switch (10) activates the spread roll and also the command circuit for the gates. The gate opening is set by the aggregate set rocker switch (5) to the desired opening. The gates are then opened or closed with the gate/spread roll switch. Depressing the left side of the switch closes the gates, while depressing the right side opens the gates. When used this way the gates will go from closed to the preset opening or from the preset opening to closed.

If the gate mode selector is in the "auto" position, the computer display will read in lb/yd², and the gate opening will vary, depending on the forward speed of the chipspreader, to maintain the set application rate. In this mode, the gate switch may be turned on at any time. If the speed is too slow for the size aggregate the computer display will read "ERROR LOW" in place of the speed, but the gates will be open to an opening dependent on the speed, and as the speed increases, the gates will continue to open further to maintain the Application Rate selected. When the speed has become high enough to exceed the minimum opening for the aggregate selected, the
display will return to showing the actual speed. If the speed is increased or decreased using either the
Speed Set Rocker Switch or the control handle, the gates will open or close as necessary to maintain the
set application rate. When the chipspreader has come to a halt, depress the left side of the rocker switch to
close the gates. The gates will close automatically when the chipspreader’s speed is less than 30 rpm
even if the switch is left on and will remain closed in neutral and reverse without being turned off,
however, if they were not turned off, they will immediately begin to open whenever the forward
speed exceeds 30 rpm.

If the gate mode selector is in "manual", the gate set
point will be displayed in inches and the gates will
open to that setting and hold that setting any time the
gate rocker switch is depressed, regardless of the
chipspreader speed. The gates will not vary with
speed but will stay at the set opening. The aggregate
application rate will therefore vary with speed when
the Aggregate Mode selector is in the manual mode.

11,12,13. Turn Signal Switch and Indicators.
(Figure 9)

Push the switch to the right to signal a right turn, and
to the left to signal a left turn.

CAUTION: Turn signals are not self canceling

14. Hazard Flasher Switch (Figure 9)

Pull up for "on" and push down for "off".

15. Headlight Switch (Figure 9)

Pull out for "on" and push in for "off".

<table>
<thead>
<tr>
<th>WARNING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check local regulations and codes to determine the lighting and marking requirements for your usage.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CAUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>The seat must always be latched during travel</td>
</tr>
</tbody>
</table>

Before using, be sure seat is unlatched. Hold the
switch right or left to move seat to the desired
position. The moving seat is meant to be an operator
convenience during chipping. This switch only
receives power when the speed range selector is in
either Lo or 2nd (if it is a 4WD machine). Before
traveling the machine, the seat must be moved to
either the full left or right position and the seat latch

![Figure 8](image)

1. Ground speed radar unit.

![Figure 9. Control Panel](image)

11. Turn Signal Switch
12. Rt Turn Signal Ind
13. Lt turn Signal Ind
14. Hazard Flasher Switch
15. Headlight Switch
16. Seat Shift Switch (optional)
17. Hitch Release Push-button

Pin inserted into the lock socket in the deck of the
vehicle. Failure to do this may result in inadvertent
movement of the seat assembly during acceleration
and deceleration.

THE SEAT MUST ALWAYS BE LATCHED
DURING TRAVEL.

17. Hitch Release Push-button (Figure 9)

Push the hitch release push-button to disengage the
chipsreader from the supply truck. There must be some "slack" in the hitch (between the chipsreader and supply truck) in order for the latch to release. While pushing the hitch release push-button, one should momentarily pull the control handle rearward slightly to slow the chipsreader. This will cause the required "slack". The control stick should then be pushed forward again, while still depressing the hitch release push-button. Once the truck has separated from the chipsreader, the hitch release push-button can be released. A second hitch release push-button is provided at the front operator's controls.

It is possible to stop with no "slack" in the hitch (between the chipsreader and supply truck). If this happens, the chipsreader must be backed up slightly to create the necessary "slack" and then driven forward while pushing the hitch release push-button.

In order to hook up to a supply truck, momentarily depress the hitch release push-button to open the hitch if it is not already open, and back into the truck. The hitch automatically closes and locks when it contacts the back of the truck.

18. Hand Throttle Lever. (Figure 5)

Push down to increase engine RPM, pull upward to decrease RPM. Under certain conditions it may be desired to have an intermediate RPM setting, however the hydrostatic system is designed to be run with the engine running at full governed RPM. Therefore whenever chipping at normal spreads (i.e. anything over 80 FPM) the engine should be run at governed RPM.

19. Speed Range Selector. (Figure 10)

2WD UNITS
A two position switch selects the vehicle speed range by changing the rear motors' displacement from full to half. On optional powered seat swing equipped units, this switch also supplies power to the seat shift switch only in Lo.

4WD UNITS
A three position switch selects the vehicle speed range by changing the rear motors' displacement from full to half and disengages the front wheels for the travel range. On optional powered seat swing equipped units, this switch also supplies power to the seat shift switch only in Lo or 2nd.

The speed ranges are approximately:

**Manual Operating Ranges**

<table>
<thead>
<tr>
<th>Mode</th>
<th>Speed Range</th>
<th>Gear</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>LO</td>
<td>0-730 FPM (8.3 MPH, 13.3 KPH)</td>
<td>2 WD</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TRAVEL 0-1470 FPM (16.7 MPH, 26.7 KPH)</td>
<td>2 WD</td>
<td></td>
</tr>
<tr>
<td>LO</td>
<td>0-540 FPM (6.1 MPH, 9.8 KPH)</td>
<td>4 WD*</td>
<td></td>
</tr>
<tr>
<td>2nd</td>
<td>0-730 FPM (8.3 MPH, 13.3 KPH)</td>
<td>4 WD*</td>
<td></td>
</tr>
<tr>
<td>TRAVEL</td>
<td>0-1650 FPM (18.8 MPH, 30.2 KPH)</td>
<td>4 WD*</td>
<td></td>
</tr>
</tbody>
</table>

**Actual Maximum Speed Possible**

<table>
<thead>
<tr>
<th>Mode</th>
<th>Speed Range</th>
<th>Gear</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>LO</td>
<td>760 FPM (8.6 MPH, 132.8 KPH)</td>
<td>2 WD</td>
<td></td>
</tr>
<tr>
<td>TRAVEL</td>
<td>1530 FPM (17.4 MPH, 27.8 KPH)</td>
<td>2 WD</td>
<td></td>
</tr>
<tr>
<td>LO</td>
<td>560 FPM (6.4 MPH, 10.2 KPH)</td>
<td>4 WD*</td>
<td></td>
</tr>
<tr>
<td>2nd</td>
<td>760 FPM (8.6 MPH, 13.8 KPH)</td>
<td>4 WD*</td>
<td></td>
</tr>
<tr>
<td>TRAVEL</td>
<td>1750 FPM (19.9 MPH, 31.8 KPH)</td>
<td>4 WD*</td>
<td></td>
</tr>
</tbody>
</table>

All reverse speeds are 10 to 15% lower due to preferential rotation of the hydraulic drive motors.

Auto Operating Range

<table>
<thead>
<tr>
<th>Mode</th>
<th>Speed Range</th>
<th>Gear</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-700 FPM (8.0 MPH, 12.8 KPH)</td>
<td>2 WD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-700 FPM (8.0 MPH, 12.8 KPH)</td>
<td>4 WD*</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* if so equipped

Since there are differences in operating characteristics between 2 and 4 WD machines, we will cover each in a separate paragraph below.

2 WD Only

The shift from "Lo" to "Travel" should be made only after positioning the seat full left or full right and the latch pin inserted since electric power is not available to move the seat after the switch has been positioned to "Travel". It is recommended that upshifts and downshifts be made only at very low speeds.
THE CHIPSPREADER SHOULD BE SHIFTED ONLY WHILE STOPPED OR MOVING AT A VERY SLOW RATE OF SPEED (i.e. under 100 FPM).

⚠️ WARNING

Shift in and out of "travel" only while stopped or moving at a very slow rate of speed. Shifts between "Lo" and "travel" are very abrupt and could cause personal injury.

The optional rear side/side flow divider valve may be used to reduce the possibility of rear wheel spin. Use "Travel" only for moving the chipspreader by itself - never attempt to pull a truck in "Travel".

4 WD Only

The shift from "2nd" to "Travel" should be made only after positioning the seat full left or right and the latch pin inserted since electric power is not available to move the seat after the switch has been positioned to "Travel". It is recommended that upshifts and downshifts between "Lo" and "2nd" be made only at very low speeds.

THE CHIPSPREADER SHOULD BE SHIFTED ONLY WHILE STOPPED OR MOVING AT A VERY SLOW RATE OF SPEED (i.e. under 100 FPM).

⚠️ WARNING

Shift in and out of "travel" only while stopped or moving at a very slow rate of speed. Shifts between "2nd" and "travel" are very abrupt and could cause personal injury.

The shift from "2nd" to "travel" disengages the front wheels to a free wheeling mode. The engagement valve must shift very quickly by necessity of function. This results in an abrupt shift which is particularly evident when high flow rates are in use. It also causes high pressure spikes to occur in the hydrostatic system which can cause eventual damage. These upshifts and downshifts between "2nd" and "travel" are very abrupt and could cause personal injury.

Selection of speed range should be based on the desired operating speed - generally you should use the lowest speed range that will give the desired operating speed (i.e. if the desired speed is 540 FPM or less, use "Lo"). If the desired operating speed is 680 FPM use "2nd". When operating in "Lo" there is more torque available and the torque split is 47/53 allowing the use of the optional front/rear flow divider valve in addition to the optional rear side/side flow divider valve, thus reducing the possibility of wheelspin. Use "travel" only for moving the chipspreader by itself - never attempt to pull a truck in "travel".

30. Application Rate Computer. (Figure 5)

The ground speed radar (Figure 8) feeds a pulse speed signal to the computer. The gate position feedback transducer feeds a gate position signal to the computer. The computer compares the speed feedback signal to the set point and sends the appropriate signal to the pump to maintain the set speed if the Speed Mode selector is in the "Auto" position. If the Gate Mode Selector is in the "Auto" position, the computer also calculates the required gate opening for the set application rate and opens and closes the gates to maintain the application rate. If the Speed Mode Selector is in the "manual" position, the computer does not maintain a constant ground speed, but will still control the gates to maintain the application rate if the Gate Mode selector is in the "auto" position.

Normal spreading operation in auto speed and auto gate would be done as follows:

a) Put the Speed Mode selector in "auto".

b) Put the Gate Mode selector in "auto".

c) Place the control handle in neutral.

d) Set the desired speed using the Speed Set Rocker Switch (3).

e) Set the speed range selector (19) appropriately ("Lo" or "2nd") to reach the desired speed.
f) Turn the gate/spread roll switch (10) "off".

h) Push the speed/direction handle (9) forward smoothly to the full forward position to accelerate to the speed set point.

j) Upon reaching the ending line, center or depress the left side of the gate/spread roll switch fully (10) to shut the gates "off".

k) Return the control handle to neutral.

Speed changes may be made while moving by using the Speed Set Rocker Switch to set a new speed. The chipspreader will change speed to the new speed. The application rate will remain the same as long as the chipspreader is within the limits of gate opening for the particular aggregate selected.

If a speed is reached which requires a gate opening less than the lower limit for the aggregate selected, the message "ERROR LOW" will appear in the display, but the gate will still be open as long as the speed is above 30 fpm.

If a speed is reached which requires a gate opening greater than that available for the aggregate selected, or than the hopper has available, the message "ERROR HIGH" will appear in the display. The gates will remain open but the chipspreader will not be able to maintain the set application rate.

20. Right Conveyor Selector (Figure 10)

In the rearward position, power is supplied to the driver's "on/off" selector switch (21) allowing the driver to turn the conveyor "on" or "off".

In the center position power is supplied to the front operator's "on/off" selector switch allowing the front operator to turn the conveyors "on" or "off".

In the forward position, power is supplied to the auto paddle switch mounted below and along the inboard side of the conveyor hood. (See fig. 15) When this switch is tripped by material moving the paddle, the conveyor will shut off and conversely when it is untriped by a lack of material it will start the conveyor attempting to fill the hopper.

22. Left Conveyor Selector. (Figure 10)

Same operation as above except for left conveyor and its associated switch (23), and left conveyor auto paddle switch.

Since both conveyors are independently controlled, it is possible to run one conveyor in one mode of control while running the other conveyor in a totally different mode if so desired.

24. Hitch Height Switch. (Figure 10)

Push forward to raise the hitch, push rearward to lower the hitch. When the switch is released, the cylinder will hold the hitch at a given height, about which it is free to float up and down on a spring to provide vertical articulation between the chipspreader the truck.

28. Gate Override Push-button (Figure 5)

Push down to momentarily fully open the hopper gate to clear a jam. Upon releasing the button, the gate will return to its original set point.

THE FOLLOWING ITEMS ARE LOCATED AT THE FRONT OPERATOR'S STATION ON TOP OF THE RIGHT CONVEYOR.

31. Left Conveyor Switch

When the driver has selected "front" on the left conveyor selector switch (22) this switch will turn the left conveyor "on" or "off".
32. Right Conveyor Switch

When the driver has selected "front" on the right conveyor selector switch (20) this switch will turn the right conveyor "on" or "off".

33. Hitch Release Push-button

Push the hitch release push-button to disengage the supply truck from the chipspreader. (See item 17 of main control panel description)

![Figure 10. Conveyor Control](image)

- 2. Speed Mode Selector
- 3. Auto Speed Set Rocker Switch
- 4. Aggregate Mode Selector
- 10. Gate/Spread Roll Switch
- 20. Right Conveyor Control Selector
- 21. Right Conveyor On/Off Switch
- 22. Left Conveyor Control Selector
- 23. Left Conveyor On/Off Switch
- 24. Hitch Height Switch
- 28. Gate Override Switch

### OPERATION

⚠️ WARNING

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

⚠️ IMPORTANT

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

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

Should a piece of foreign material become lodged in the gates, push the gate override push-button (Ref.28, Fig.10) to open the 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.

Conveyor flow deflectors should be used to achieve the desired material distribution in the front hopper (Fig.11).

Conveyor hoods should be used to adjust the distribution to the front hopper, primarily to control the amount of material in the front hopper in the area in front of the conveyor. The amount of material in front of the conveyor will affect when the auto conveyor switch is tripped to shut off the conveyor. Generally, the larger the stone, the further forward the hood should be positioned. Approximately 1 1/2" gap is a good starting point for 3/8" to 1/2" chips.

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. (Fig.12)

The operator may wish to disengage the front hopper agitator while spreading clean dry aggregate. This operation is performed by removing the agitator disconnect bolt. This will prevent unnecessary wearing of the agitator.

Control Box

The control box may be slid fore and aft approximately 4" by loosening the 4 bolts under the mounting plate and repositioning to the desired position and then re tightening the bolts.

Tilt Wheel (Figure 13)

The steering wheel can be placed in any of its 6 positions by removing the 2 bolts completely, positioning the wheel to the desired position, lining up the new set of holes and inserting the bolts. Be sure to torque the bolts to the proper value.

Automatic Conveyor Control (Figure 5)

In the forward position power is supplied to the auto paddle switch mounted below and along the inboard side of the conveyor hood. When this switch is tripped by material moving the paddle, the conveyor will shut "off" and conversely when it is untripped by lack of material it will start the conveyor attempting to fill the hopper. (Fig. 15)
Belt Speed Controls (Figure 16)

This feature allows the operator located on the right catwalk to vary the speed of each conveyor independently to provide a uniform distribution of material to the front hopper. Valves for this operation are incorporated in the integrated circuit block on top of the right conveyor, outboard of each conveyor’s solenoid valve. Each valve has an adjustment knob and a locking ring.

With the knob screwed fully out, the conveyor will run at its highest speed. Screwing the knob clockwise to its full in position will slow the conveyor down to a stop. The knob may be positioned anywhere in between and locked at the desired speed with the lock ring.

This feature is particularly useful in doing shoulder work or in operations requiring less than full hopper width. It is also useful in trying to smooth out delivery of material to match the rate being spread. (Fig.16) When properly adjusted, the conveyors should run approximately 80% of the time with the hopper at maximum width and the chip spreader traveling at maximum speed for the particular job.

⚠️ CAUTION
Keep loose clothing away from conveyor area when operating conveyors

Horn (Fig.17)

The horn is operated by depressing the push-button on the control panel.

Backup Alarm

The electric backup alarm is automatically actuated when the speed/direction control handle (Fig. 17) is pulled to the rear of neutral.
Figure 15 Material Level Paddle
1. Left Paddle
2. Right Paddle

Figure 17 Control Panel
1. Gate Override
2. Speed/Direction Handle
3. Horn Push-button
4. Rear Flow Divider Switch
5. Front/Rear Flow Div Switch

Optional Equipment

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

Rear Flow Divider Valve (Limited Slip) (Figure 17, Ref 4)
An electrically controlled flow divider valve is operated by a toggle switch on the control panel. When the switch is "on", the difference in rotational speed between the two rear wheels cannot exceed 10 to 15%. This action is similar to a limited slip differential in a mechanical rear axle.

This feature functions only in "Lo" and/or "2nd" ranges, it is automatically switched off in the "Travel" range.

On 2WD machines this feature is automatically switched off in the reverse direction.
Front/Rear Flow Divider Valve (Limited Slip) (Figure 17, Ref 5)

An electrically controlled flow divider valve is operated by a toggle switch on the control panel. When the switch is "on", the difference in rotational speed between the front wheels and the rear wheels cannot exceed 15%. This action is similar to the limited slip transfer case in a full time four wheel drive vehicle.

This feature is only operable in "Lo" range forward direction only and is automatically switched off in reverse, "2nd" and "Travel" ranges.

⚠️ WARNING
Do not travel with the seat unlatched.
Seat movement could cause disorientation and possible loss of control.

Electro-hydraulic Powered Seat Assembly

An electrically controlled hydraulically powered seat positioner is operated by a spring centered toggle switch (Fig. 9 Ref 16). The seat has a manually operated lock pin securing the seat either in the full left or right positions. The lock pin must be released and locked in the up position before using the electric switch. This is done by pulling up on the "tee" handle behind the seat raising the pin against the spring and bringing the roll pin through the slot, and then turning the pin a quarter turn before releasing. The engine must be on and running near its governed RPM in order to have oil flow, and the range selector must be in either "Lo" or "Lo and "2nd" to have electric power to the switch. The seat may then be positioned wherever it is desired for operation. Before shifting to "Travel", the seat must be positioned either full left or full right and the lock pin inserted in the hole in the deck.

Extra Agitator

When sand or other small aggregate is being spread, an optional second agitator may be placed in the hopper so as to greatly reduce the possibility of bridging. This agitator should be disengaged normally and only used when bridging has been experienced.

Segregation Screen

When the aggregate is not of a uniform size, the optional front hopper segregation screen may be used to place larger chips on the asphalt ahead of smaller chips and fines. This helps prevent the smaller chips and fines from blotting out the larger material (Figure 18).
OPERATING RANGES

For Standard
2WD

ChipSpreader

with

152 HP Cummins 6BT Engine
142 HP CAT 3208 Engine

ChipSpreader can be operated anywhere to the lower left of the appropriate gross weight curve.

LO RANGE

PV24, 116 CID REAR 2WD
6BT CUMMINS, 152 HP @ 2200 RPM
3208 CAT, 142 HP @ 2200 RPM

TRAVEL RANGE

PV24, 58 CID REAR 2WD
6BT CUMMINS, 152 HP @ 2200 RPM
3208 CAT, 142 HP @ 2200 RPM
OPERATING RANGES

For 2WD
ChipSpreader
with
190 HP Cummins 6BTA Engine

ChipSpreader can be operated anywhere to the lower left of the appropriate gross weight curve.

2WD LO RANGE
PV24, 116.8 CID REAR 2WD
6BTA CUMMINS, 190 HP @ 2200 RPM

2WD TRAVEL RANGE
PV24, 58.3 CID REAR 2WD
6BTA CUMMINS, 190 HP @ 2200 RPM
OPERATING RANGES

For 2WD
ChipSpreader
with
210 HP Cummins 6CT Engine

ChipSpreader can be operated anywhere to the lower left of the appropriate gross weight curve.
OPERATING RANGES

For 2WD

ChipSpreader

with

234 HP Cummins 6CTA Engine

ChipSpreader can be operated anywhere to the lower left of the appropriate gross weight curve.
OPERATING RANGES
For 4WD ChipSpreader with

190 HP Cummins 6BTA Engine
165 HP CAT 3208 Engine

ChipSpreader can be operated anywhere to the lower left of the appropriate gross weight curve.

LO RANGE
PV24, 76 CID FRONT
85 CID REAR
6BTA CUMMINS, 190 HP @ 2200 RPM
3208 CAT, 165 HP @ 2200 RPM

2ND RANGE
PV24, 76 CID FRONT
43 CID REAR
6BTA CUMMINS, 190 HP @ 2200 RPM
3208 CAT, 165 HP @ 2200 RPM

TRAVEL
PV 24, 43 CID REAR 2WD
6BTA CUMMINS, 190 HP @ 2200 RPM
3208 CAT, 165 HP @ 2200 RPM
OPERATING RANGES
For 4WD ChipSpreader with
210 HP Cummins 6CT Engine
219 HP CAT 3208T Engine
ChipSpreader can be operated anywhere to the lower left of the appropriate gross weight curve.

LO RANGE
PV24, 76 CID FRONT
85 CID REAR
6CT CUMMINS, 210 HP @ 2200 RPM
3208 CAT, 219 HP @ 2200 RPM

2ND RANGE
PV24, 76 CID FRONT
43 CID REAR
6CT CUMMINS, 210 HP @ 2200 RPM
3208 CAT, 219 HP @ 2200 RPM

TRAVEL
PV 24, 43 CID REAR
6CT CUMMINS, 210 HP @ 2200 RPM
3208 CAT, 219 HP @ 2200 RPM
OPERATING RANGES

For 4WD ChipSpreader with

234 HP Cummins 6CTA Engine
234 HP CAT 3208T ENGINE

ChipSpreader can be operated anywhere to the lower left of the appropriate gross weight curve.

LO RANGE
PV24, 76 CID FRONT
85 CID REAR
6CTA CUMMINS, 234 HP @ 2200 RPM
3208T CAT, 234 HP @ 2200 RPM

2ND RANGE
PV24, 76 CID FRONT
43 CID REAR
6CTA CUMMINS, 234 HP @ 2200 RPM
3208T CAT, 234 HP @ 2200 RPM

TRAVEL
PV 24, 43 CID REAR
6CTA CUMMINS, 234 HP @ 2200 RPM
3208T CAT, 234 HP @ 2200 RPM
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.

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.

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

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

**CAUTION**

Always use steps, platforms and handrails provided.

Make certain everyone is clear of machine before starting engine or operation.

Keep loose clothing away from conveyor area when operating conveyors.

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

Rear Hopper Flow Gate Adjustment (Fig. 12)

Turn spread roll and conveyors "off".

1. Loosen flow gate retaining bolts.
2. Raise gate to increase conveyor flow to front hopper.
3. Lower gate to decrease conveyor flow to the front hopper.
4. Re tighten flow gate retaining bolts.

Hopper Spread Roll Wear Plate Adjustment

Turn spread roll 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 been worn away it is possible to turn the plate over and use the opposite side.

Figure 19. Spread Roll Wear Plate
(Viewed from top of hopper looking down)
1. Hold Down Bolts
2. Spread Roll Wear Plate
Hopper Gate Wear Plate Adjustment (Fig. 20/21)

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.

Hopper Gate Linkage Adjustment

1. Loosen gate adjustment screw jam nuts.

2. With hopper removed from the spreader or the reach rod disconnected, each gate adjustment screw should be set so as to maintain 1/16" clearance between the gate wear plate and spread roll. (Ref 2, Fig 20/21)

3. Tighten gate adjustment screw jam nuts.

4. Adjust the gate linkage length by turning the control lever ball joint connector "in" or "out" until the control lever just touches the actuator bar stop while maintaining the 1/16" gate clearance. (Ref 7, Fig 22)

Conveyor Belt Adjustment

<table>
<thead>
<tr>
<th>WARNING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conveyor must be running during this procedure. To avoid personal injury, be sure to remain clear of moving belt.</td>
</tr>
</tbody>
</table>

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 (Fig. 23) it will then be necessary to adjust the head pulley as outlined below. (Fig. 24)

For the right hand conveyor:

a) Loosen the four bolts holding the left 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, loosen the adjusting screws until the belt is centered on the head pulley.

e) If belt runs to the left hand 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.

For left hand conveyor:

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

b) Loosen the adjusting bolt jam nuts.

c) Start conveyor at the time.

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

3. 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.

---

**Figure 22 Hopper**

1. Reach Rod  
2. Jam Nut  
3. Ball Joint  
4. Control Arm and Shaft  
5. Gate actuator Bar  
6. Bar Spacer Block  
7. Ball Joint Connector and Locknut

**Figure 23 Conveyor Tail Pulley**

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

---

**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 24 Conveyor Head Pulley Adjustment
1. Left Conveyor 4. Bearing Bolts
2. Jam Nut 5. Hood Adjustment
3. Adjusting Screw 6. Hood Adjustment Set Screws

COMPUTER SET UP

The computer must be set up and the various sensors calibrated for the particular chipspreader that the computer is installed in. This is normally done at the factory, and the settings are retained in the computer's non volatile memory. Normally an entire set up does not have to be done in the field, but if a radar were remounted or a gate transducer changed, etc. that particular item would have to be re calibrated. In the case of a gate transducer, it should be mechanically set using the procedure described under "Hopper Gate Transducer Adjustment" before recalibrating the computer. In order to do that, you must enter the set up screens and follow through the various screens as described below. If an item is already properly set you can just scroll by it to the next item, until you get to the one that needs to be re calibrated. If any one item is changed, you must save it using the procedure described at the end of the various screens.

SET UP SCREENS

The following screens are entered by depressing and holding down the scroll button while turning the ignition key on.

IMPORTANT: The setup of the computer should be performed with the ignition key on, but the engine not running, except for calibrating the gates and the radar.

CAUTION

Always place the mode selector switch in the "park" position when the chipspreader is stopped to avoid accidental movement of the machine.

These screens are used to configure the computer to the particular chipspreader and to calibrate the radar, control stick, gates, and application rate. The speed set point and the Application Rate set point can be adjusted while in these screens, when on the "Speed-App Rate" screen. The interlocks are turned off when in these screens and the gates may be opened to a setting in the "Manual" mode while standing still. Be sure the hopper is empty before opening the gates.

Setup Mode
Press Scroll

Depress the scroll button to move to the next screen

TO CAL SPEED
PRESS APP INC

If you do not want to calibrate the radar, depressing
the scroll button will bypass this subroutine and take you directly to the "Units" screen.

If radar calibration is required, pressing the Application increment (right) side of the Application Rate switch will bring up the next screen.

**MEASURE OFF 300 FT THEN PRESS APP DECR**

Layout a 300 ft straight measured strip on the ground with enough space in front of it to accelerate to 300 fpm and enough space after the measured strip to stop the chipsreader. Press App Decr to move to the next screen.

**TIME IN SEC 300 FT THEN PRESS SPEED INC**

With the chipsreader set at 300 fpm, run the chipsreader in Auto travel Mode through the course and measure the time in seconds that it takes to cover the 300 ft. Press Speed Inc to move to the next screen.

**ENTER XX.X SEC USING SPEED INC/DEC**

When you touch either the speed incr or speed decr, the initial setting of 60.0 sec will appear, displayed as 600. If you measured a time of 58.4 sec, to enter this time, press speed decr until the 600 becomes 584. When this is set to the number that you measured, depress the scroll button to move to the next screen.

**ENGLISH UNITS DECREASE TO CHANGE**

Pressing the App Decr switch will change the display to metric units and then pressing App Incr will change the display back to English units. When the units are on the desired setting, depress the scroll button to move to the next screen.

**STANDARD HOPPER INCREASE TO CHANGE**

Pressing the App Incr switch will change the display and machine configuration to a variable hopper and then pressing App Decr will change it back to a standard or fixed hopper. When the hopper is set to Standard Hopper, depress the scroll button to move to the next screen.

**CUMMINS ENGINE DECREASE TO CHANGE**

Pressing the App Decr switch will change the display and tachometer calibration to a Caterpillar engine and then pressing App Incr will change the display and tachometer calibration back to a Cummins engine. When the engine is set to the type on the chipsreader, depress the scroll button to move to the next screen.

**EDC THRESHOLD 1 8**

Pressing the Speed Decr/Incr switch will change the threshold current to the EDC (electronic displacement control) on the pump. A setting above 10 or 11 may not allow the pump to come to neutral and may cause a jerk in the start of the machine and should not be used. A setting much lower than 6 may not allow enough pump current to allow the computer to lock onto the set speed. Unless some special conditions apply, do not use a setting other than 8 here. When the EDC threshold is set to 8, depress the scroll button to move to the next screen.

<table>
<thead>
<tr>
<th>CAUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Always place the mode selector switch in the &quot;park&quot; position when the chipsreader is stopped to avoid accidental movement of the machine.</td>
</tr>
</tbody>
</table>

**TO CALIBRATE FNR PRESS APP INCREMENT**

If you do not want to calibrate the control stick (Forward, Neutral, Reverse, (FNR for short)), depressing the scroll button will bypass this subroutine and take you directly to the "Cal Gates" screen.

If the control stick requires calibration, pressing the Application increment (right) side of the Application Rate switch will bring up the next screen.

<table>
<thead>
<tr>
<th>WARNING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do not perform the control stick calibration with the engine running</td>
</tr>
</tbody>
</table>
PUSH FNR FULL AHEAD
THEN PRESS APP DECR

Push the control stick to the full forward position and then press the Aggregate decrement switch.

PULL FNR FULL BACK
THEN PRESS SPEED INC

Pull the control stick to the full reverse position and then press the Speed increase switch.

PUT FNR IN NEUTRAL
THEN PRESS SPEED DEC

Push the stick forward into the neutral detent. When the control stick is in neutral, the computer will automatically move to the next screen.

TO CALIBRATE GATES
PRESS APP INCREMENT

If you do not want to calibrate the gates (Closed, Full open), depressing the scroll button will bypass this subroutine and take you directly to the "Speed Set" screen.

If you want to calibrate the gates you must start the engine at this time. To calibrate the gates on a standard hopper machine the engine must be run at high idle. (full rpm)

<table>
<thead>
<tr>
<th>WARNING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never put hands in between gate and spread roll or gate and rear of hopper to clear obstruction. The gate could move at any time and cause severe injury.</td>
</tr>
</tbody>
</table>

Pressing the Application increment (right) side of the Application Rate switch will start the computerized gate calibration routine. The computer will find the fully closed position of the gates and then it will find the fully open position of the gates and the it will wait there for you to take an actual measurement of the gates and it will bring up the next screen.

GATE OPENING CALIBRATION TABLE

<table>
<thead>
<tr>
<th>OPENING</th>
<th>CALIBRATION NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 5/8</td>
<td>362</td>
</tr>
<tr>
<td>3 11/16</td>
<td>369</td>
</tr>
<tr>
<td>3 3/4</td>
<td>375</td>
</tr>
<tr>
<td>3 13/16</td>
<td>381</td>
</tr>
<tr>
<td>3 7/8</td>
<td>388</td>
</tr>
<tr>
<td>3 15/16</td>
<td>394</td>
</tr>
<tr>
<td>4</td>
<td>400</td>
</tr>
<tr>
<td>4 1/16</td>
<td>406</td>
</tr>
<tr>
<td>4 1/8</td>
<td>412</td>
</tr>
<tr>
<td>4 3/16</td>
<td>419</td>
</tr>
<tr>
<td>4 1/4</td>
<td>425</td>
</tr>
<tr>
<td>4 5/16</td>
<td>431</td>
</tr>
</tbody>
</table>

Enter Gate Opening
Next = Scroll 388

Using the App Rate decr/incr switch, adjust the right hand number to the value that you measured for the gates. If you measured 3 7/8 for instance adjust the right hand number to 388. (see calibration table) When the number is adjusted correctly depress the Scroll button to move to the next screen.

When you press the "Scroll" button, you will return to the following screen with the words "Setup Mode" flashing to remind you that you are still in the setup mode and the interlocks are not enabled.

FPM 300 SET MEM 4
3/8 CHIP 20.0lb/yd

This screen will flash to

SETUP MEM 4
MODE 20.0lb/yd

and back to the other screen.

Depressing the scroll button will bring up the next screen

Two Hydraulic Tanks
Decrease to Change

Push the app rate decrease switch to change to one tank and the App rate increase switch to change back to two tanks. When the setting has been placed on the correct number of tanks, depress the scroll button to move to the "Gate Oper" screen.
GATE OPER FWD ONLY 
DECREASE TO CHANGE

Push the App rate decrease switch to change to gate operation to both forward and reverse and the App rate increas switch to cange back to forward only gate operation. When the setting has been placed for the desired mode of operation, depress the scroll button to move to the "Exit/Save" screen.

EXIT = PUSH APP INCR
SAVE = PUSH APP DECR

To save all of the settings, depress the App Decr switch. To exit without saving the data and thereby leave it as it was before you got into the routine, depress the App Incr switch.

If only one item was changed, you must "Save" as you exit or the change that was just made will be ignored. When you "Exit" or "Save" you will return to the following screen.

FPM 300 SET MEM 4
3/8 CHIP 20.0lb/yd

<table>
<thead>
<tr>
<th>CAUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Always place the mode selector switch in the &quot;park&quot; position when the chip spreader is stopped to avoid accidental movement of the machine.</td>
</tr>
</tbody>
</table>

RELIEF AND REDUCING VALVE PRESSURE ADJUSTMENTS

Before making any relief valve adjustments check to insure that there is sufficient oil in the hydraulic reservoirs and that all the filter elements are free of contamination. All pressures are to be set with an oil temperature of at least 110 degrees.

1. Hopper Spread Roll Relief Valve (Figure 25)

a) With engine off, uncouple the quick disconnects and install a 3000 psi gage with necessary adapters to hook to 3/4" female quick disconnect. (Ref. 5, Fig. 25).

b) Leave the quick couplers uncoupled.

c) Run the engine at governed RPM (approximately 2300 RPM)

d) Use the manual override to actuate the valve. (Fig. 25, Ref. 1)

e) Loosen locknut and using allen wrench, set the pressure to 1500 psi and re tighten the locknut.

f) If relief pressure cannot be obtained, shut down the engine and remove the hopper relief valve cartridge and check for contamination. Clean or replace as necessary.

g) Remove gage and reconnect the quick couplers to their respective hoses.

2. Power Gate Relief Valve (Figure 28A without power seat)

a) With the engine off, remove cap (1) (Fig. 28A) and install a 3000 psi gage with necessary adapters to hook to a 1/2" JIC (08 MJ) male fitting. Disconnect the reach rod from the cylinder under the right catwalk.

b) Disconnect the orange wire from one solenoid and the brown wire from the other solenoid.

c) Loosen locknut on relief valve (2).

d) Start the engine and run at 2300 RPM (governed speed)

e) Use the manual override button to activate the valve (Fig.28A, Ref. 3)

f) Use a box wrench to adjust the cartridge in valve (2). This relief valve pressure should be set at 900 psi. Re tighten the locknut to hold the setting.

g) If relief pressure cannot be obtained, shut down the engine and remove power gate relief valve cartridges and check for contamination. Clean or replace as necessary.

h) Shut engine off.

i) Remove gage and reinstall cap.

j) Reconnect the electrical connectors and reconnect the reach rod.
2A. Power Gate Relief Valve (Figure 28B with power seat)

a) With the engine off, remove plug (1) at port "G1" and (2) at port "G3" and install 3000 psi gages with the necessary adapters to hook to 1/4" SAE O ring port (04MB). Disconnect the reach rod from the cylinder under the right catwalk.

b) Disconnect the orange wire from one solenoid and the brown wire from the other solenoid of the forward valve on the outboard (nearest to catwalk) integrated circuit.

c) Loosen locknuts on relief valves (4, 5).

d) Start the engine and run at 2300 RPM (governed speed)

e) Turn the relief valve (5) all the way in.

f) Use the manual override button to activate the valve (Fig. 28B, Ref. 7)

g) Use a box wrench to adjust the cartridge in valve (4). This relief valve pressure should be set at 1500 psi at G1. Re tighten the locknut to hold the setting.

h) Use a box wrench to adjust the cartridge in valve (5). This relief valve pressure should be set at 900 psi at G3. Re tighten the locknut to hold the setting.

i) If relief pressure cannot be obtained, shut down the engine and remove power gate relief valve cartridges and check for contamination. Clean or replace as necessary.

j) Shut engine off.

k) Remove gages and reinstall plugs.

l) Reconnect the electrical connectors and reconnect the reach rod.
2B. Power Seat Relief Valve (Figure 28B)

a) With the engine off, remove plug (3) and install a 3000 psi gage with the necessary adapters to hook to 1/2" SAE O ring port (08MB).

b) Start the engine and run it at full rpm. Place the speed range selector in either Lo or 2nd and then use the seat switch to position the seat either full left or right and insert the seat lock pin into the hole in the walkway.

c) Loosen locknut on relief valve (6).

d) Use the manual override button to activate the valve (Fig. 28B, Ref. 8)

e) Use a box wrench to adjust the cartridge in valve (6). This relief valve pressure should be set at 1200 psi at port "G2". Re tighten the locknut to hold the setting.

f) If relief pressure cannot be obtained, shut down the engine and remove power gate relief valve cartridges and check for contamination. Clean or replace as necessary.

g) Shut engine off.

h) Remove gage and reinstall plug.

Use caution when doing this operation. Be sure the wrench is securely positioned on the U-joint and rotated by hand against supporting steel so it cannot rotate further.

![Figure 28A Conveyor and Gate Controls](image)

| 1. Pressure Check Port | 6. Left Conveyor Control Valve |
| 2. Power Gate          | 7. Right Conveyor Relief Valve |
| 3. Pwr Gate Relief Valve | 8. Right Conveyor Control Valve |
| 4. Lt Conveyor Relief Valve | 9. Right Conveyor Gage Port "GR" |
| 5. Lt Conveyor Gage Port "GL" |

3. Left Conveyor Relief Valve (Figure 28A, Ref. 4)

a) With engine off remove plug (5) at port "GL" and install a 3000 psi gage with necessary adapters to hook to a 1/4 SAE O ring port (04 MB).

b) Hold (lock) the left conveyor head pulley with a pipe wrench or other suitable tool. (Fig. 27)

Use caution when doing this operation. Be sure the wrench is securely positioned on the U-joint and rotated by hand against supporting steel so that it cannot rotate any further.

c) The engine should be run at governed speed (approximately 2300 RPM).

d) Use the manual override to actuate the valve (Fig. 28A Ref. 6).
e) Adjust this relief valve (Fig 28A, Ref 4) to a setting of 2100 psi.

f) If relief pressure cannot be obtained, shut down the engine and remove left conveyor relief valve cartridge and check for contamination or damaged cartridge pieces. Clean and replace as necessary.

g) Shut engine off.

h) Remove gage and reinstall plug.

c) The engine should be run at governed speed (approximately 2300 RPM).

d) Use the manual override to actuate the valve (Fig. 28A Ref. 8).

e) Adjust this relief valve (Fig 28A, Ref 7) to a setting of 2100 psi.

f) If relief pressure cannot be obtained, shut down the engine and remove left conveyor relief valve cartridge and check for contamination or damaged cartridge pieces. Clean and replace as necessary.

g) Shut engine off.

h) Remove gage and reinstall plug.

5.) Power Steering Relief Valve (At Hydraulic Control Assembly) (Fig 29A, Ref 1) (Fig 29B, Ref 1)

a) With engine "off", remove plug (2) at port "MP" on integrated control circuit and install a 3000 psi gage with necessary adapters to hook up to a 1/4" SAE O ring port (04 MB).

b) The engine must be run at or above 950 RPM.

c) Turn the front wheels full left or right until the wheels are against the stops (2WD) or the cylinder is fully stroked (4WD).

d) While holding the wheels full left or right set the relief valve (1) pressure to 1800 psi.

e) If the relief valve pressure cannot be reached, the secondary relief valve within the pump may be set at or too close to 1800 psi. In order to verify and set this relief valve, the relief valve on the integrated circuit must be screwed all the way in and then the relief valve at the pump may be adjusted to 2250 psi by referring to (Fig. 26). Remove cap (5), loosen locknut (6) and adjust relief valve (7) to 2250 psi (Fig. 26) while holding the wheels full left or right.

f) Return to the relief valve at the hydraulic control integrated circuit (Fig 29A, Ref 1) and repeat steps 4b, c and d. If the pressure cannot be set at 1800 psi
without the control pressure dropping below 250 psi then set this pressure lower than 1800 psi but not lower than 1650 psi.

g) If relief pressure cannot be obtained at either cartridge, shut down the engine, remove the appropriate cartridge and check for contamination or damaged cartridge pieces. Clean or replace as necessary.

h) Shut engine off.

i) Remove gage and reinstall plug.

6.) Hydraulic Control Pressure Relief (Fig 29A, Ref 3) (Fig 29B, Ref 3)

a) With the engine off, remove plug (4) at port "PP" and insert a 3000 psi gage with adapters to hook to a 1/4" SAE O ring port (04MB).

b) Run the engine at idle RPM.

c) Loosen locknut and adjust pressure to approximately 600 psi (Fig 29A, Ref 3)

d) Shut engine down, remove 3000 psi gage, and install 1000 psi gage.

e) Restart engine and run at or above 950 RPM.

f) Adjust relief valve to 250 psi and retighten locknut.

g) If relief pressure cannot be obtained, shut down the engine and remove the control pressure relief valve cartridge and check for contamination or damaged cartridge pieces. Clean or replace as necessary.

h) Shut engine off.

i) Remove gage and reinstall plug.

7.) Hitch Release Pressure Reducing Valve (Fig 29A, Ref 5)

a) With the engine off, remove plug (6) and insert a 1000 psi gage with the necessary adapters to hook to a 1/4" SAE O ring port (04MB).

b) Run the engine at idle RPM.

c) Loosen locknut and set reduced pressure to 100 psi (Fig 29A, Ref 5). You may not be able to get as low as 100 psi due to back pressure. If this is the case, reduce the pressure to its lowest point and then go back up 10-15 psi.

d) If reduced and/or relief pressures cannot be set, shut down engine and recheck hydraulic control pressure to be sure it is at 250 psi. If it is, shut down engine and remove the reducing valve or relief valve cartridge and check for contamination or damaged cartridge pieces. Clean or replace as necessary.

e) Shut engine off.

f) Remove gage and reinstall plug.

Figure 29A Hydraulic Control Assembly

2 WHEEL DRIVE

1. Power Steering Relief Valve
2. Power Steering Check Port "MP"
3. Hydraulic Control Pressure Relief Valve
4. Hydraulic Control Pressure Check Port "PP"
5. Hitch Release Pressure Reducing Valve
6. Hitch Release Pressure Check Port "RP"
7. Plug (Pressure Check Port)
8. Brake/Motor Shift Block
Hydrostatic System Start Up

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

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

2. Disconnect the fuel solenoid wire at the engine, so that the engine can only be cranked and cannot be started. (Fig 30, Ref 1)

3. Disconnect pump stroker at the pump.

4. Insert a 600 psi gage in the charge pressure gage port on the left side of the pump.

5. Remove suction filter elements; fill with hydraulic oil and reinstall. (Fig 31)

6. Remove cap on tee on high side drain hose on pump and fill pump case with hydraulic oil. If a fill tank is used to supply oil, it should be positioned higher than the hydraulic tanks. If this is done, the entire system can be filled from this one location.
7. Turn ignition key "on" and retard throttle to idle. Turn key to "start" and crank engine with starter until seeing at least 40 to 60 psi on the charge pressure gage.

**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.

8. Hook up fuel solenoid valve.

9. 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. 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 between 150 and 300 psi.

10. The pump stroker (Fig 32) null or zero should now be centered using the following procedure. This step only needs to be done if the pump or stroker has been changed.

---

**WARNING**

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

---

a) Loosen the null adjust locknut.

b) Using a 3/16 hex key, slowly turn the null adjust screw clockwise until the charge pressure begins to decrease (indicating the pump is going on stroke in one direction). Slowly turn the null adjuster counterclockwise while counting the number of turns until the charge pressure begins to decrease (indicating the pump is going on stroke in the opposite direction).

c) Turn the null adjuster clockwise half the amount observed in step b. This should be the center of neutral.

---

d) Hold the null adjuster with the hex key and tighten the locknut to a torque of 14-18 ft-lbs.

11. Check fluid levels in reservoirs and add if necessary.

12. Run the engine at 1000 to 1200 RPM. Charge pressure should be 200 to 300 psi and steady. Case pressure should be 15 to 30 psi. Return engine to idle and shut it down.

13. Place range selector in low; place auto/manual selector in manual and reconnect the pump stroker.

14. Check for debris under any wheel.

15. Start engine and run at 1000 to 1200 RPM. Observe charge and case pressure. Charge pressure should be 190 to 230 psi above case pressure. Move the handle slowly to the full forward position and then full reverse. Repeat this cycle for about 5 minutes. When the pump is on stroke in either direction, the charge pressure should be 160 to 200 above the case pressure. In all cases, the difference between charge pressure and case pressure should be greater when in neutral than when the pump is on stroke in forward or reverse.

---

**Figure 31. Hydrostatic Pump**

1. Null Adjuster
2. Hydrostatic Pump
16. Slowly, in steps, run the engine up to full RPM while observing the charge pressure. Repeat step 15 with the engine at full RPM. At any sign of unsteadiness in the charge pressure, shut the engine down immediately and check for problems in the suction part of the system, such as clogged filter, leaks or blockage.

17. 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 sight eyes in each tank.

8. Check the resistance across sockets 12 and 13. This value should be between 950 and 1200 ohms. Check the resistance across sockets 12 and 11, it must be approximately 110 ohms. The actual values are not critical as long as the value changes immediately upon movement of the transducer pot. As long as the values are near these values you can reconnect the 37 pin connector.

9. Reconnect the 37 pin connector to the main control box.

If the values measured across the sockets 12 and 13 in step 8 above were within the acceptable range, skip steps 10 through 14 and proceed directly to step 15.

<table>
<thead>
<tr>
<th>WARNING</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
</tr>
</tbody>
</table>

10. Open up the hinged engine cover.

11. Remove the transducer cover.

12. Loosen the locking bolt on the gate shaft until the pin plate can be rotated against the position feedback pot.

13. Rotate the pin against the position feedback pot to obtain a reading within the range and re tighten the locking bolt.

14. Recheck the reading and reconnect the 37 pin connector.

15. Reinstall the transducer cover.

**Brake Adjustment**

Front Brake Adjustment (2 WD Only)

Before beginning any adjustments to the operating mechanism under this section, the front wheel brake
shoes must be adjusted for a slight drag on each front wheel. This is done by first jacking up and supporting the chipspreader securely on stands. (Fig.34)

1. Remove oblong rubber caps and use brake adjusting tool to rotate ratchet wheel until a slight drag is felt when the wheel is rotated by hand. Adjust both front wheels to about the same drag.

2. Bleed the front brake lines.

3. Bleed the slave cylinder (Fig. 34, Ref. 2)

4. Refill the reservoir to the proper level as required (Fig. 34, Ref. 1)

5. Place range selector switch in "Lo" (Fig. 5, Ref. 19)


7. Start & run engine at about 950 RPM.

8. Open flow control on rod end of slave cylinder fully.

9. Adjust flow control so that slave cylinder takes 2 to 3 seconds to extend. Its retract speed is not adjustable.

10. Remove stands and test drive Chipspreader. With rapid movement of the stick into neutral, the pump should destroke before the front brakes come on. However, the front brakes should come on as soon as practical after the Chipspreader has stopped.

1. Remove left floor plate alongside pivot arm.

2. Loosen locknuts and adjust jackscrew to adjust chain for proper tightness.

3. Re tighten nuts and reinstall floor plate.

Seat Chain Adjustment (Fig. 35)
SERVICE SCREENS

The following screens are entered by depressing and holding down the App Incr switch while turning the ignition key on. The first four screens are the same as the "Operator Screens described under "OPERATOR SCREENS" but will be repeated here. The speed set point and the Application Rate set point can be adjusted while in the service screens.

CAUTION: When in the service screens, all interlocks are disabled and it is possible to open the gates while standing still or moving in reverse.

FPM 300 SET MEM 4
3/8 CHIP 20.0lb/yd

This screen shows the aggregate preset and the speed and application rate set points when standing still. The number to the right on the top line is the aggregate preset that is selected. The second line shows the size and type of aggregate and the aggregate application rate. If the application rate has been changed from that which was stored in the preset, a "+" or "-" will appear after the memory number. This indicates that the shown application rate is above or below the stored rate in that memory preset. The application rate will remain at this setting when the ignition is turned off.

The chipspreader uses a ground speed radar (Figure 8) to generate pulses which are then fed to the computer which then feeds the speed signal to the display.

The speed display changes to actual speed when the chipspreader starts moving. If manual gate operation is selected, the "App Rate" will display the gate set point in hundredths of an inch. (i.e. 147 = 1.47 inches)

This is the screen that will come up when the ignition is turned on and the engine is started. To move to the next screen, depress the scroll button just below the center of the digital display. Pressing it once will move the display to the next screen, while pressing it again will move to the third screen and so on until you return to the above screen.

TEMP       OIL       FUEL
195 F       60 PSI    35 %

This screen shows the engine coolant temperature on the left, the engine oil pressure in the center, and the fuel remaining in the tank on the right.

<table>
<thead>
<tr>
<th>L TEMP</th>
<th>RPM</th>
<th>R TEMP</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 F</td>
<td>2340</td>
<td>100 F</td>
</tr>
</tbody>
</table>

This screen shows the hydraulic oil temperature in the left hydraulic tank on the left, the engine rpm in the center, and the hydraulic oil temperature in the right hydraulic tank on the right side.

If one tank is selected the next screen will look like this.

<table>
<thead>
<tr>
<th>RPM</th>
<th>R TEMP</th>
</tr>
</thead>
<tbody>
<tr>
<td>2340</td>
<td>100 F</td>
</tr>
</tbody>
</table>

This screen shows the engine rpm on the left and the hydraulic oil temperature in the right hydraulic tank on the right side.

<table>
<thead>
<tr>
<th>HOURS</th>
<th>VOLTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.7</td>
<td>14.1</td>
</tr>
</tbody>
</table>

This screen shows the hours on the machine on the left side, and the voltage coming into the control box on the right side. When the ignition key is turned on but the engine is not running, the hours will not move as it is started and stopped by an oil pressure switch. If the engine is shut down after running less than 6 minutes, the hour meter will not increase, as it counts up only in 6 minute increments. The right side will display battery voltage when the ignition is on but the engine is not running. Once the engine is started, the hours will start to accumulate, and the voltage will increase to 13.5 to 15.0 volts as the output of the alternator supplies voltage to the system.

| 2 3/8 CHIP 22.1lb |
| 101.4% 2650 lb/yd |

This screen shows the selected aggregate to run as described in the operator screens. Push the scroll button to move to the next screen.

Note: Aggregate selection may be made by holding the scroll button down for more than 3 seconds as described under "Scroll Button"
SET ACT ERR
300 0 0

This screen shows the speed set point on the left, the instantaneous actual speed in the center, and the error on the right side. Push the scroll button to move to the next screen.

HANDLE% SAVE% VALVE
0 0 0

This screen shows the % the handle is moved out of neutral on the left under "handle". The second number from the left is a code that shows what mode of operation the computer is in. "0" means that the computer is in open loop acceleration towards the set point, "1" means that the computer is operating in closed loop constant speed, and "2" means that the stick has been moved rearward from the full forward position and the computer is operating open loop deceleration. The 3rd number from the left shows the % handle at which the computer went into closed loop operation. The number on the far right show the current in the EDC loop. Depress the scroll button to move to the next screen.

GSET A/D2 SEN INT
1.20 847 0 0

This screen shows the manual gate setting on the far left, the actual A/D count for the current position of the gate, the actual position of the gate ("48" =0.48 inches), and on the far right the integrator value for the gate. Depress the scroll button to move to the next screen.

DRV0 DRV1 ERR0 SENLT
500 500 0 0

This screen shows the output to two solenoids of the left gate in % on the left side ("500" = 50%). DRV0 is the "open" solenoid and DRV1 is the "close" solenoid. These readings should always be around 500 when the gate is at the desired or commanded position. The 3rd number from the left shows the error in inches that the gate is away from the set point ("1" = .01 inches). The number on the right shows the actual position of the left gate ("138" = 1 3/8 inches). Depress the scroll button to move to the next screen.

Fixed Hopper cl/open
854 11

This screen shows the A/D count for the gate in its fully closed position on the left. The next number is the A/D count for the gate in its wide open position.

Volume Gate opening
5034 175

This screen shows a calculated number based on application rate and actual speed and is of little value other than to determine that the computer is actually recomputing the required gate opening as the speed changes or the selected aggregate is changed. Depressing the scroll button will bring up the "Max Gate Opening" screen.

Max Gate Opening
388

This screen shows the maximum gate opening, minus .06".
TOWING INSTRUCTIONS

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

**CAUTION**
The following procedure will release the brakes and may allow the chipspreader to roll! The chipspreader must be hooked to the tow vehicle or otherwise secured before proceeding further.

If the engine is runable and charge pressure is available, place the auto/manual selector in "manual" place the range selector in "travel", start the engine and push the stick out of neutral slightly in the direction to be towed, in order to release the brakes. The chipspreader should only be towed to the side of the road or onto a trailer.

There must be electric power to the control box in order to freewheel the front motors. If the chipspreader batteries are dead, an auxiliary battery must be hooked to them in parallel to provide electric power to the control box.

If the engine is not runable, there is no power steering or charge pressure. The key must be turned on to provide electric power, the range selector must be in "travel" to free wheel the front motors, auto/manual must be in "manual", the control handle must be out of neutral and the rear brakes must be released by the following procedure.

Place a strongback with a 5/8" hole in its center across the outer diameter of the brake housing.

Screw a 16 mm bolt, with a nut on top of the strongback, into the hole in the center of the back of the brake. This hole is located on the inboard end of each rear motor. The bolt must be screwed in until it contacts the brake piston and then the nut should be turned on top of the strongback to pull the housing out at least 1/16" to fully release the brake.

The towing capabilities of the machine are not intended for any appreciable distance, but to be able to move it to a safely parked location where it may be worked on or from which it may be loaded onto a trailer for transportation to a suitable shop.
Hydraulic Pressure Settings
Hydrostatic Chipspreader with standard hopper

Spread Roll set - 1,500 psi
Front Pump Relief - 2,200 psi

Steering set - 1,950 psi
Pilot set - 250 psi
(Hydraulic Control Pressure)

Hitch Release set 90 to 100 psi

Charge Pressure - 470 psi neutral
440 psi on stroke

Main System Pressure Relief set
5,000 psi (forward)
5,000 psi (reverse)

Gates set - 900 psi
Seat set - 1,200 psi

Right Conveyor set - 2,100 psi
Left Conveyor set - 2,100 psi

(Transparent View)

(Shell View)
### LUBRICATION

*Note: 2WD units have one 50 gallon hydraulic reservoir located on the right side. 4WD units have two 30 gallon reservoirs located one on the left side and one on the right.*

**Weekly**

<table>
<thead>
<tr>
<th>Interval</th>
<th>Point Description</th>
<th>No. of Points</th>
<th>Lubricant</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bearing – Disconnect</td>
<td>1</td>
<td>#2M-AG</td>
<td>Sparingly</td>
</tr>
<tr>
<td>2</td>
<td>Front Hopper Gates</td>
<td>A/R</td>
<td>#2M-AG</td>
<td>Sparingly</td>
</tr>
<tr>
<td>3</td>
<td>Return Idler Flange Bearing (Both Conveyors)</td>
<td>4</td>
<td>#2M-AG</td>
<td>Sparingly</td>
</tr>
<tr>
<td>4</td>
<td>Seat Pivots</td>
<td>2</td>
<td>#2M-AG</td>
<td>Sparingly</td>
</tr>
<tr>
<td>5</td>
<td>Universal Joints – Pump Driveshaft</td>
<td>4</td>
<td>#2M-AG</td>
<td>Sparingly</td>
</tr>
<tr>
<td>6</td>
<td>Tail Pulley Bearings (Both Conveyors)</td>
<td>4</td>
<td>#2M-AG</td>
<td>Sparingly</td>
</tr>
<tr>
<td>7</td>
<td>Flange Bearings (Both Conveyors)</td>
<td>4</td>
<td>#2M-AG</td>
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<tr>
<td>8</td>
<td>Double Universal Joint (Both Sides)</td>
<td>4</td>
<td>#2M-AG</td>
<td>Sparingly</td>
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<tr>
<td>9</td>
<td>Rear Hitch Levers</td>
<td>2</td>
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<td>Sparingly</td>
</tr>
<tr>
<td>10</td>
<td>Rear Hitch</td>
<td>4</td>
<td>#2M-AG</td>
<td>Sparingly</td>
</tr>
<tr>
<td>11</td>
<td>Tie Rod</td>
<td>2</td>
<td>#2M-AG</td>
<td>Sparingly</td>
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<tr>
<td>12</td>
<td>Center Axle Pivot Shaft</td>
<td>1</td>
<td>#2M-AG</td>
<td>Sparingly</td>
</tr>
<tr>
<td>13</td>
<td>Spindle Assembly (Both Sides)</td>
<td>4</td>
<td>#2M-AG</td>
<td>Sparingly</td>
</tr>
<tr>
<td>14</td>
<td>Cartridge Bearing (Both Ends)</td>
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</tr>
<tr>
<td>15</td>
<td>Cartridge Bearing (Both Ends)</td>
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</tr>
<tr>
<td>16</td>
<td>Battle Shaft (Both Hoods)</td>
<td>2</td>
<td>#2M-AG</td>
<td>Sparingly</td>
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<tr>
<td>17</td>
<td>Gate Latch Control Handle (AJR)</td>
<td>1</td>
<td>#2M-AG</td>
<td>Sparingly</td>
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<tr>
<td>18</td>
<td>Engine Battery</td>
<td>1</td>
<td>Water</td>
<td>Add When Low</td>
</tr>
<tr>
<td>19</td>
<td>Engine Oil</td>
<td>1</td>
<td>Engine</td>
<td>Engine Manual</td>
</tr>
</tbody>
</table>

**Check Weekly**

<table>
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<tr>
<th>Interval</th>
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<th>Lubricant</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>Master Brake Cylinder – 2WD only</td>
<td></td>
<td>Brake Fluid</td>
<td>Type HD46</td>
</tr>
<tr>
<td>21</td>
<td>Hydraulic Reservoirs</td>
<td></td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>22</td>
<td>Hydraulic Oil Coolers</td>
<td></td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

**1 Year**

<table>
<thead>
<tr>
<th>Interval</th>
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<th>Lubricant</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>24</td>
<td>Wheel Bearings Front – 2WD only</td>
<td></td>
<td>#90M-ATG</td>
<td>Fill To Bottom Oil Plug</td>
</tr>
<tr>
<td>25</td>
<td>* Return-Filter</td>
<td></td>
<td>1</td>
<td>Filter Element</td>
</tr>
<tr>
<td>26</td>
<td>* Suction-Filter *on left reservoir 4WD units, 2WD on right reservoir</td>
<td></td>
<td>2</td>
<td>Filter Element</td>
</tr>
</tbody>
</table>

**When Indicator Turns Red**

<table>
<thead>
<tr>
<th>Interval</th>
<th>Point Description</th>
<th>No. of Points</th>
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</thead>
<tbody>
<tr>
<td>27</td>
<td>Engine Air Filter</td>
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<td>-</td>
<td>Filter Element</td>
</tr>
</tbody>
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**Yearly**

<table>
<thead>
<tr>
<th>Interval</th>
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<th>Lubricant</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>28</td>
<td>Reservoir Breather</td>
<td></td>
<td>-</td>
<td>Filter Element</td>
</tr>
</tbody>
</table>

*On new machines change return line 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 filter elements anytime it is possible that contamination had been introduced into the system.**

*Brake Fluid conforming to DOT 3, DOT 4, DOT 5, or SAE J-1703. Manufacturers include Dow Corning and Wagner.*

---

Type HD46 – Texaco HD46, Sump 46 Transmission Fluid, or equivalent

#90M-ATG – #90 Molub-Alloy Transmission Lubricant

#2M-AG – #2 Molub-Alloy Grease
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

- 20" if Rear Hole Mounted Hitch
- 16" if Front Hole Mounted Hitch

Minimum 2½"

8¼" Minimum

Dump Truck Bed Representation

Loaded Bed 18"

16" if Rear Hole Mounted Hitch
12" if Front Hole Mounted Hitch

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
CAUTION 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.

<table>
<thead>
<tr>
<th>REF.</th>
<th>PART NO.</th>
<th>QTY.</th>
<th>DESCRIPTION</th>
<th>DESCRIPTION</th>
<th>REF.</th>
<th>PART NO.</th>
<th>QTY.</th>
<th>DESCRIPTION</th>
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