CHIPSPREADER OPERATION, MAINTENANCE and SAFETY MANUAL

Computerized Variable Hopper

for Computer Controlled Hydrostatic Drive ChipSpreaders with Variable Width Spread Hoppers

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

<table>
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<tr>
<th><strong>CAUTION</strong></th>
</tr>
</thead>
<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>
</tr>
<tr>
<td>Always have shields, covers and guards in place when operating.</td>
</tr>
<tr>
<td>Keep loose clothing away from conveyor area.</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>
</tr>
<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>
</tr>
<tr>
<td>Do not transport ChipSpreaders with Variable Width Hoppers without mechanically securing the two movable hoppers.</td>
</tr>
<tr>
<td>Extraordinary contamination of the hydraulic system may allow system oil leakage resulting in possible movement of the hopper sections.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>WARNING</strong></th>
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<tr>
<td>Stay off hopper while machine is moving. Machine movements could cause a fall resulting in injury or death.</td>
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</tr>
<tr>
<td>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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</table>

<table>
<thead>
<tr>
<th><strong>IMPORTANT</strong></th>
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<tbody>
<tr>
<td>Do not tow the chipspreader before reading the towing instructions contained in this manual. Improper towing may damage the hydraulic motors.</td>
</tr>
</tbody>
</table>
Computerized Variable Hopper
CHIPSPREADER
Operation, Maintenance and Safety Manual
for Hydrostatic Drive Units with Variable Width Hopper

M-215-94

WARRANTY

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

THE COMPANY EXCLUDES ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THERE ARE NO WARRANTIES, EXPRESS OR IMPLIED, WHICH EXTEND BEYOND THE DESCRIPTION OF THE GOODS CONTAINED IN THIS CONTRACT.

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

This warranty does not apply to:

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

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

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

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

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

E.D. ETNYRE & CO., Oregon, Illinois 61061-9778
1333 South Daysville Road • Phone: 815/732-2116 • Fax: 815-732-7400 • Telex: MCI 6505104321
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 provided below.

⚠️ 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.

REPORTING SAFETY DEFECTS

If you believe that your vehicle has a defect which could cause a crash, 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. If it finds 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 call the Auto Safety Hotline toll-free at 1–800–424–9393 (or 366–0123 in the Washington D.C. area). Or, you may write to: U.S. Department of Transportation, Washington, D.C. 20696. You may also obtain other information about motor vehicle safety from the Auto Safety Hotline.

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<td>Hydraulic Oil Coolers</td>
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<td>Valve-Front Drive Motors</td>
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<td>Gate Actuating Cylinder</td>
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<td>Upper Valve Plate ASM</td>
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<td>Side Valve Plate ASM</td>
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<td></td>
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<td></td>
<td>Engine Radiator</td>
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<td>49</td>
<td></td>
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</table>
INTRODUCTION

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

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

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

<table>
<thead>
<tr>
<th>WARNING</th>
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<tbody>
<tr>
<td>Unsafe operation of equipment may cause injury.</td>
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</table>

**Important**

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

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

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

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

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

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

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

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

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

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

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

**INITIAL START-UP**

**CHECK OUT**

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

2. Best performance for most operating conditions is achieved when tire pressures are set to 55 to 60 PSI in front and 60 to 65 PSI in rear. However, various operating speeds, road bed conditions, truck pulling arrangements and other operating conditions may require different tire pressures.

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

<table>
<thead>
<tr>
<th>Safety Precautions</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
</tr>
</tbody>
</table>

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 two rear lifting eyes, 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. Connect all hopper hoses per the parts book diagram. Use caution to wipe each half of each connector clean before connecting. **Dirt and contaminants can cause major damage to the hydraulic systems.**

6. Install hoods and connect electrical connections (Figure 3)

7. Connect the transducer electrical connectors the other connectors for the auto features and headlights.

8. Hopper gate adjustment and spread roll straightness are established at the factory. However, to be sure adjustments or straightness were not altered during shipment and storage, the following gate and spread roll adjustment checks should be performed prior to operation:
Check that each gate opening cylinder rod clevis is fully screwed onto its respective cylinder rod.

With the hopper on the machine, start the engine and run it at a minimum of 2000 rpm and extend the hoppers fully. Set the gate opening to approximately 1 1/2 inch, turn both spread roll arming switches "on" 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 gate and the spread roll. If this clearance is not constant across the full width of the hopper, it indicates that either the gate and/or the spread roll is not straight. Contact the factory for straightening instructions.

**Important**

1. Since the Chipspreader is designed to operate on new sealcoat surfaces, all dynamic braking is being done by the hydrostatic system. With abrupt control inputs it is possible to "scuff" the road surface during starting or stopping. However, with smooth application of control, inputs very precise accelerations and decelerations can be made, giving the ability to 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 hoppers 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 chipper and truck. This may be done by radio, hand signals, horns etc. Each truck driver should know who is to give signals, where to look for the signal and the meaning of each signal.

**WARNING**

| Stay off hopper while machine is moving. Machine movements could cause a fall resulting in injury or death. |
Identification and Function of Controls

Refer to figure 4 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, AND REAR BRAKES ARE ELECTRICALLY CONTROLLED, TURNING THE KEY TO "OFF" RESULTS IN AN 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.

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![Control Box Identification](figure4.jpg)

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 Selector
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. Left Gate Override Button
28r. Right Gate Override Button
29. Optional Limited Slip Valve Switches
30. Hopper Control Panel
31. Seat Lock Pin
32. Alarm Indicator Light
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 chipsreader'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 chipsreader 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.

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 THE 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 2nd 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 chipspreader, 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 chipspreader.

When the hydrostatic chipspreader 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 chipspreader 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 chipspreader 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/\text{yd}^2 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/\text{yd}^2 (i.e. 20.0 lbs/\text{yd}^2). 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/\text{yd}^2, 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 radar, 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 valves, and the spread roll valves.
7. Computer Display Screen  (Fig 5)

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.

<table>
<thead>
<tr>
<th>TEMP</th>
<th>OIL</th>
<th>FUEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>195 F</td>
<td>60 PSI</td>
<td>35 %</td>
</tr>
</tbody>
</table>

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.

<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.

<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\text{lb}
101.4\% 101.2\% 2650\text{lb}

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/\text{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/\text{yd}^3" screen.

1 **Aggregate**

lb/\text{yd}^3

2460

The selected aggregate number appears on the screen to the left of "Aggregate lb/\text{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\textsuperscript{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 Left" screen.
The chipspreader 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 chipspreader in the auto speed/autogate 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 Right 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 

1

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 1
3/8 CHIP 20.0lb/yd

When the computer is shut off, the current selected aggregate will be retained as the one 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 22.1lb
101.4% 101.2% 2650lb
```

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 18.0lb
97.6% 98.8% 2700lb
```

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 18.0lb/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.

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 (Figures 4 & 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/yrd², 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 fpm 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 fpm.

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 Selector 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".
18. Hitch Release Pushbutton (Figure 9)

Push the hitch release push-button to disengage the chipspreader from the supply truck. There must be some "slack" in the hitch (between the chipspreader 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 chipspreader. 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 chipspreader, 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 chipspreader and supply truck). If this happens, the chipspreader must be backed up slightly to create the necessary "slack" and then driven forward while pushing the hitch release push-button.

17. Hitch Release Pushbutton (Figure 9)

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.

16. Seat Shift Switch (Figure 7)

The seat must always be latched during travel.

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. Before traveling the machine, the seat must be moved to either the full left or right position and the seat latch 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 Pushbutton (Figure 9)

Push the hitch release push-button to disengage the chipspreader from the supply truck. There must be some "slack" in the hitch (between the chipspreader 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 chipspreader. 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 chipspreader, 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 chipspreader and supply truck). If this happens, the chipspreader must be backed up slightly to create the necessary "slack" and then driven forward while pushing the hitch release push-button.

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 4)

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**

LO  0-540 FPM (6.1 MPH, 9.8 KPH) 4 WD  
2nd  0-730 FPM (8.3 MPH, 13.3 KPH) 4 WD  
TRAV 0-1650 FPM (18.8 MPH, 30.2 KPH) 2 WD

**Actual Maximum Speed Possible**

LO  560 FPM (6.4 MPH, 10.2 KPH) 4 WD  
2nd  760 FPM (8.6 MPH, 13.8 KPH) 4 WD  
TRAV 1750 FPM (19.9 MPH, 32.0 KPH) 2 WD

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

**Auto Operating Range**

0-700 FPM (8.0 MPH, 12.8 KPH) 4 WD

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 CHIPSREADER 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 chipsreader by itself—never attempt to pull a truck in "travel".

**30. Application Rate Computer (Figure 4)**

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".

g) Set the desired application rate using the Aggregate Set Rocker Switch (5).

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

i) Upon reaching the starting line of spreading, depress the right side of the gate/spread roll switch (10) fully to turn the gates "on".

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 4)

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. 16) When this switch is tripped by material moving the paddle, the conveyor will shut off and conversely when it is untripped by a lack of material it will start the conveyor attempting to fill the hopper.

22. Left Conveyor Selector (Figure 4)

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 4)

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.

28L. Left Gate Override Pushbutton (Figure 4)

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

28R. Right Gate Override Pushbutton (Figure 4)

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

ITEMS 33 THRU 41 ARE LOCATED IN THE SMALL CONTROL BOX ATTACHED TO THE DRIVER'S LEFT ARM REST.

33. Left Hopper Switch (Figure 10)

Push left to extend the left hopper and push right to retract the left hopper.
34. Right Hopper Switch (Figure 10)

Push right to extend the right hopper and push left to retract the right hopper.

35. Both Hopper Switch (Figure 10)

Push up to simultaneously extend both hoppers and down to simultaneously retract both hoppers.

36. Left Spread Roll Arm Switch (Figure 10)

This switch connects or disconnects the left hopper’s spread roll and gate to the "gate/spread roll" switch (Item 10). When connected, the hopper is then turned "on" or "off" using the "gate/spread roll" switch.

37. Right Spread Roll Arm Switch (Figure 10)

This switch connects or disconnects the right hopper’s spread roll and gate to the "gate/spread roll" switch (Item 10). When connected the hopper is then turned "on" or "off" using the "gate/spread roll" switch.

38. Left Auger Selector (Figure 10)

In the rearward position, power is supplied to the driver’s "on/off" switch (39) allowing the driver to turn the left auger "on" or "off".

39. Left Auger Switch (Figure 10)

When the left auger selector switch is (38) is in the rearward position, this switch allows the driver to turn the left auger "on" or "off".

In the center position, power is supplied to the front operator’s "on/off" switch allowing the front operator to turn the left auger "on" or "off".

In the forward position, power is supplied to the auto switch located at the outboard end of the left hopper (See fig. 11). When this switch is tripped by material moving the spring finger, the auger will shut off and conversely when it is untripped by a lack of material, it will start the auger attempting to fill the outer end of the hopper.

40. Right Auger Selector (Figure 10)

In the rearward position, power is supplied to the driver’s "on/off" switch (41) allowing the driver to turn the right auger "on" or "off".

In the center position, power is supplied to the front operator’s "on/off" switch allowing the front operator to turn the right auger "on" or "off".

In the forward position, power is supplied to the auto spring switch located at the outboard end of the right hopper (See fig 11). When this switch is tripped by
material moving the spring finger, the auger will shut off and conversely when it is untripped by a lack of material, it will start the auger attempting to fill the outer end of the hopper.

41. Right Auger Switch (Figure10)

When the right auger selector switch (40) is in the rearward position, this switch allows the driver to turn the right auger "on" or "off.

---

**WARNING**

Auger may start automatically at any time! Do not attempt to clear any jam with the engine running.

---

ITEMS 42 THRU 49 ARE LOCATED IN THE FRONT OPERATOR'S CONTROL BOX (Figure 12)

42. Left Hopper Switch (Figure12)

Push left to extend the left hopper and push right to retract the left hopper.

43. Right Hopper Switch (Figure12)

Push right to extend the right hopper and push left to retract the right hopper.

44. Both Hopper Switch (Figure12)

Push up to simultaneously extend both hoppers and down to simultaneously retract both hoppers.

45. Left Conveyor Switch (Figure12)

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

46. Right Conveyor Switch (Figure12)

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

47. Hitch Release Push-button (Figure 12)

Push the hitch release push-button to disengage the supply truck from the chipspreader. (See item 17 "Hitch Release Push-button, operator's control panel)

48. Leftt Auger Switch (Figure12)

When the driver has selected "front" on the left auger selector (38), this switch will turn the left auger "on" or "off".

---

**WARNING**

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

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

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

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

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

Remain clear of all moving parts.

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

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

Should a piece of foreign material become lodged in the gates, push the gate override push-button (Ref. 28L or 28R Fig.) to open the appropriate gate above the set point to allow the piece to pass. Releasing the override will return the gates to the previously set position.

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

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

The machine is equipped with conveyor belt speed controls. The rear conveyor gates should be set to deliver as much material as possible into the conveyor without spillage and then the conveyor speed should be adjusted to deliver slightly more aggregate to the front hopper than the amount being spread. When properly adjusted, the conveyors should run approximately 80% of the time with the hopper at maximum width and the chipspreader traveling at maximum speed for the particular job. (Fig.13)
The operator may wish to disengage the front hopper agitators while spreading clean dry aggregate. This operation is performed by removing the agitator drive chain (Fig. 14) on each hopper. 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**

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.
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.17) 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.

**CAUTION**

Keep loose clothing away from conveyor area when operating conveyors.

**Horn (Figure 18)**

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

**Backup Alarm**

The electric backup alarm is automatically actuated when the speed/direction control handle (Fig.18, Ref. 2) is pulled to the rear of neutral.

**OPTIONAL EQUIPMENT**

**WARNING**

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

Rear Flow Divider Valve (Limited Slip) (Figure 18, 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 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 "2nd" ranges, it is automatically switched off in the "Travel" range.

Front/Rear Flow Divider Valve (Limited Slip) (Figure 18, Ref 6)

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 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.
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.

**WARNING**

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

**Rear Hopper Flow Gate Adjustment (Fig. 13)**

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 (Figure 20)**

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 worn excessively it is possible to turn the plate over and use the opposite side.

**Hopper Gate Wear Plate Adjustment (Fig. 20)**

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.
Conveyor Belt Adjustment

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

2. Should it be impossible to obtain centered belt operation by adjusting the tail pulley (Fig. 21) it will then be necessary to adjust the head pulley as outlined below. (Fig. 22)

![Figure 21 Conveyor Tail Pulley](image)

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

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.

![WARNING]

Remain clear of all moving parts.

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 side of the conveyor, loosen the adjusting screws until the belt is centered on the head pulley.

f) Re tighten adjusting screw jam nuts.

g) Stop the conveyor belt.

h) Tighten head pulley bearing bolts.

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 this time.

![WARNING]

Remain clear of all moving parts.

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

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

f) Re tighten adjusting screw jam nuts.

g) Stop the conveyor belt.

h) Tighten head pulley bearing bolts.

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

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.

<table>
<thead>
<tr>
<th>WARNING</th>
</tr>
</thead>
<tbody>
<tr>
<td>The fuel tank is part of the crosswalk. Do not drill or weld in this area.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CAUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>To avoid potential damage to electrical components, disconnect batteries before welding</td>
</tr>
</tbody>
</table>

![Figure 22 Conveyor Head Pulley Adjustment](Image)

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

**COMPUTER SET UP SCREENS**

The computer must be set up and the various sensors calibrated for the particular chipsreader 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 re calibrating the computer. In order to do that, you must enter the set up screens and follow through the various screen 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.

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.

<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>

These screens are used to configure the computer to the particular chipsreader 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 chipspreader. Press App Decr to move to the next screen.

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

With the chipspreader set at 300 fpm, run the chipspreader 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.

**VARIABLE HOPPER DECREASE TO CHANGE**

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

**EDC THRESHOLD I 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.

**CAUTION**

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

**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.

---

**WARNING**

Do not perform the control stick calibration with the engine running

---

**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- App Rate" screen.

If you want to calibrate the gates you must start the engine at this time. To calibrate the gates on a variable hopper machine the engine can be left a little above low idle.

---

**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.

---

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 it will wait there for you to take an actual measurement of the right and left 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 Right Opening**

Done= Speed 842 394

Using the App Rate decr/incre switch, adjust the right hand number to the value that you measured for the right gate. If you measured 3 15/16 for instance, adjust the right hand number to 394. (see calibration table) When the number is adjusted correctly depress the Speed decr switch to move to the next screen.

**Enter Left Opening**

Done= Scroll 862 406

Using the App Rate decr/incre switch, adjust the right hand number to the value that you measured for the
left gate. If you measured 4 1/16 for instance adjust the right hand number to 406. (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**
1/2 GRAV 18.0lb/yd

This screen will flash to

**SETUP MEM 4**
MODE 18.0lb/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 two 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 increase switch to change 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**
1/2 GRAV 18.0lb/yd

---

**RELIEF AND REDUCING VALVE PRESSURE ADJUSTMENTS**

---

**CAUTION**

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

---

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 the oil temperature of at least 110 degrees.

---

1. **Left Hopper Spread Roll Relief Valve** *(Figure 23)*

   a) With engine off remove plug (2) and install a 3000 psi gage with necessary adapters to hook to a 1/4 SAE O ring port (04 MB). Disconnect quick coupler (7)

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

   c) Use the manual override to actuate the valve. (Fig 23, Ref 3)

   d) Adjust this relief valve (Fig 23, Ref 1) to a setting of 2000 psi.

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

   f) Shut engine off.

   g) Remove gage, reinstall plug and reconnect quick disconnect.
3. Left Auger Relief Valve (Figure 23)

a) With engine off remove plug (9) and install a 3000 psi gage with necessary adapters to hook to a 1/4 SAE O ring port (04 MB). Disconnect quick coupler (14)

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

c) Use the manual override to actuate the valve (Fig. 23, Ref 10)

d) Adjust this relief valve (Fig 23, Ref 8) to a setting of 2000 psi.

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

f) Shut engine off.

g) Remove gage, reinstall plug and reconnect quick disconnect.

3. Left Auger Relief Valve (Figure 23)

a) With engine off remove plug (6) and install a 3000 psi gage with necessary adapters to hook to a 1/4 SAE O ring port (04 MB). Disconnect the 2nd from the bottom quick coupler on the right side of the chipsreader.

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

c) Use the manual override to actuate the valve (Fig. 23, Ref 5)

d) Adjust this relief valve (Fig 23, Ref 4) to a setting of 2000 psi.

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

f) Shut engine off.

g) Remove gage, reinstall plug and reconnect quick disconnect.

### WARNING

Auger may start automatically at any time! Do not attempt to clear any jam with the engine running.

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

c) Use the manual override to actuate the valve (Fig. 23, Ref. 12).

d) Adjust this relief valve (Fig 23, Ref 11) to a setting of 2000 psi.

f) Shut engine off.

g) Remove gage, reinstall plug and reconnect quick disconnect.

5. Right Hopper Positioning Relief Valve (Figure 24)

a) With the engine off, remove plugs (1) and (2) and...
install 3000 psi gages with the necessary adapters to hook to 1/4" SAE O ring port (04MB).

b) Disconnect quick coupler (9).

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. 24, Ref. 7)

g) Use a box wrench to adjust the cartridge in valve (4). This relief valve pressure should be set at 2300 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 2000 psi at G3. Re tighten the locknut to hold the setting.

i) If relief pressure cannot be obtained, shut down the engine and remove hopper in/out 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 quick coupler.
**6. Left Hopper Positioning Relief Valve (Figure 24)**

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). Disconnect quick couplers (10) and (11).

b) Start the engine and run it at full rpm.

c) Loosen locknout on relief valve (6).

d) Use the manual override button to activate the valve (Fig. 24, Ref. 8).

e) Use a box wrench to adjust the cartridge in valve (6). This relief valve pressure should be set at 2000 psi. Re tighten the locknout to hold the setting.

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

g) Shut engine off.

h) Remove gage and reinstall plug.

i) Reconnect quick couplers

---

WARNING

Remain clear of moving parts

---

**7. Right Hopper Gate Relief Valve (Figure 24)**

a) With the engine off, remove plugs (12) and (13) and install 3000 psi gages with the necessary adapters to hook to 1/4" SAE O ring port (04MB).

b) Disconnect the 1/4" quick couplers on the right side of the chipspreader and also disconnect the 3 pin electrical connector on the right side of the chipspreader.

c) Loosen locknuts on relief valves (15, 16).

d) Start the engine and run at 1000 RPM.

e) Turn the relief valve (16) all the way in.

f) Use the manual override button to activate the valve (Fig. 24, Ref. 18), if the valve is not already activated due to the disconnection of the 3 pin connector.

g) Use a box wrench to adjust the cartridge in valve (15). This relief valve pressure should be set at 1250 psi at G1. Re tighten the locknout to hold the setting.

h) Use a box wrench to adjust the cartridge in valve (16). This relief valve pressure should be set at 900 psi at G3. Re tighten the locknout to hold the setting.

i) If relief pressure cannot be obtained, shut down the engine and remove hopper 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 1/4" quick couplers and the 3 pin connector.

**8. Left Hopper Gate Relief Valve (Figure 24)**

a) With the engine off, remove plug (14) and install a 3000 psi gage with the necessary adapters to hook to 1/2" SAE O ring port (08MB). Disconnect quick couplers (19) and (20) and the 3 pin connector on the left side of the chipspreader.

b) Start the engine and run it at 1000 rpm.

c) Loosen locknout on relief valve (17).

d) Use the manual override button to activate the valve (Fig. 24, Ref. 19) if the valve is not already activated due to disconnecting the 3 pin connector.

e) Use a box wrench to adjust the cartridge in valve (17). This relief valve pressure should be set at 900 psi. Re tighten the locknout to hold the setting.

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

g) Shut engine off.

h) Remove gage and reinstall plug.

i) Reconnect quick couplers (19) and (20) and the 3 pin connector on the left side of the chipspreader.

9. Left Conveyor Relief Valve (Figure 25, Ref. 4)

a) With engine off remove plug (5) 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 wrench is securely positioned on U-Joint and rotated by hand against supporting steel so it cannot rotate further.

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

d) Use the manual override to actuate the valve (Fig. 25, Ref. 8).

e) Adjust this relief valve (Fig 25, 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.

11. Powered Seat Relief Valve (Fig. 25)

a) With the engine off remove cap (1) (Fig. 25) and install a 3000 psi gage with necessary adapters to hook to 1/2" JIC (08 MJ) male fitting.

b) Run the engine at its governed speed, 2300 RPM. Position the seat full left or right, and insert the lock pin.

c) Use the manual override button to actuate the valve (Fig.25, Ref. 3)

d) Use a box wrench to adjust the cartridge. This relief valve should be set to 1200 psi. (Fig. 25, Ref. 2)
e) If relief pressure cannot be obtained, shut down the engine and remove the relief valve cartridge and check for contamination or damaged cartridge. Clean or replace as necessary.

12. Power Steering Relief Valve (At Hydraulic Control Assembly (Fig. 28 Ref. 1))

a) With engine "off", remove plug (2) 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 cylinder is fully stroked.

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 28, 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 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.

13. Hydraulic Control Pressure Relief Valve (Fig 28 Ref. 3)

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

b) Run the engine at idle RPM.
c) Loosen locknut and adjust pressure to approximately 600 psi (Fig. 28, 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 re tighten 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.

14. Hitch Release Pressure Reducing Valve
(Fig 28 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 or above 950 RPM.

c) Loosen locknut and set reduced pressure to 100 psi (Fig.28, 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 27 Lock Left Conveyor Head Pulley**

1. Large Pipe Wrench Secured Against Unit Frame

---

**Figure 28 Hydraulic Control Assembly**

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 (Charge Pressure Check Port)
8. Brake/Motor Shift Block
15. Rear Pump Built in Relief Valve  
(Fig. 29, Ref 2)

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

b) Disconnect the input hose to the rear integrated circuit (Fig. 24, Ref. 21), cap the adapter in the integrated circuit and insert an adapter with cap in the hose end.

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

d) Set the relief valve pressure to 2000 psi.

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

Hydraulic 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 startup procedure should be used.

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

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

3. Disconnect pump stroker at the pump.

4. Remove 1/4" plug (Ref 7, Fig 28) on the brake/motor shift block on the hydraulic control plate on the inboard side of the right conveyor and insert a 600 psi gage with the necessary adapters to hook to a 1/4" male JIC (04MB).

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. 29 Ref 1) 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.

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.

Figure 30. Engine Left Side
1. Fuel Solenoid

Figure 31 Suction Filters
1. Suction Filters
2. Hydraulic Reservoir

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

16. Slowly, in steps, run the engine up to full RPM while observing the charge pressure. Repeat step 16 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.

**VARIABLE HOPPER GATE TRANSDUCER ADJUSTMENT**

1. Place the auto/park/manual selector in "PARK"

2. Disconnect the ground wire from each solenoid of both gate valves.

   **WARNING**

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

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

4. Using the manual overrides on each gate solenoid valve, close the gates fully. There should be 1/16" between each gate and the spread roll.

5. Shut the engine off and install a 1500 psi gage in each gate circuit.

6. Reconnect the ground wire to each solenoid of the gate valves.

7. Disconnect the rearmost 37 pin connector from the main control box.

   ![Figure 32 Gate Solenoids](image)

8. Check the resistance across sockets 2 and 3. This value should be between 950 and 1200 ohms. Check the resistance across sockets 2 and 1, it must be approximately 250 ohms. The actual values are not critical as long as the value changes immediately upon movement of the transducer pot. Check the resistance across sockets 4 and 5, this value should be between 950 and 1200 ohms. Check the resistance across sockets 5 and 6, it must be approximately 250 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 sockets 1 and 2, and
sockets 6 and 5 in step 8 above were within the acceptable range, skip steps 10 through 14 and proceed directly to step 15.

**WARNING**

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

10. Start the engine and run it at full rpm. Extend both hoppers approximately 2 feet each and shut the engine down.

11. Remove the transducer covers on each hopper.

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 both halves of each transducer cover.

---

**Seat Chain Adjustment**

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.

---

**Service Screens**

*Computer Display Screen. (Fig 5)*

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.
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.

<table>
<thead>
<tr>
<th>TEMP</th>
<th>OIL</th>
<th>FUEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>195</td>
<td>60</td>
<td>35 %</td>
</tr>
</tbody>
</table>

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.

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 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 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% 101.2% 2650lb |

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".

<table>
<thead>
<tr>
<th>SET</th>
<th>ACT</th>
<th>ERR</th>
</tr>
</thead>
<tbody>
<tr>
<td>300</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>HANDLE%</th>
<th>SAVE%</th>
<th>VALVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

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 SENLFT 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 left gate, the actual position of the left gate ("48" =0.48 inches), and on the far right the integrator value for the left 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.

GSET A/D1 SENRHT INT
1.20 843 0 0

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

DRV2 DRV3 ERR1 SENRT
500 500 0 0

This screen shows the output to two solenoids of the right gate in % on the left side ("500" = 50%). DRV2 is the "open" solenoid and DRV3 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 right gate is away from the set point ("1" =.01 inches). The number on the right shows the actual position of the right gate ("125" = 1 1/4 inches). Depress the scroll button to move to the next screen.

LT cl/open RT cl/open
852 120 838 112

This screen shows the A/D count for the left gate in its fully closed position on the left. The next number is the A/D count for the left gate in its wide open position. The 3rd number from the left is the A/D count for the right gate in its closed position and the number on the far right is the A/D count for the right gate in its wide open position.

Volume Gate opening
5045 178

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 lesser of the two maximum gate openings, minus .06".
TOWING INSTRUCTIONS

⚠️ Important

Do not tow the chip spreader 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 chip spreader to roll! The chip spreader 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 chip spreader 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 chip spreader 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.
Relief and Reducing Valve Pressures

Front Pump Secondary Relief - 2250 psi
Rear Pump Relief Valve - 2000 psi
Charge Pressure - 470 Neutral
440 On Stroke
Power Steering Relief - 1800 psi
Hitch Release Pressure - 100 psi
Hydraulic Control Pressure Relief - 400 psi

Lt. Gate Relief - 900 psi
Rt. Gate Relief - 900 psi
Lt. Hopper Positioning - 2000 psi
Rt. Hopper Positioning - 2000 psi
Hopper Gate Relief - 1250 psi
Rt. Conveyor Relief - 2100 psi
Powered Seat Relief - 1200 psi
Lt. Conveyor Relief - 2100 psi

Lt. Spread Roll - 2000 psi
Rt. Spread Roll - 2000 psi
Rt. Auger - 2000 psi
Lt. Auger - 2000 psi
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**

- Minimum 2½”
- 8½” Minimum
- 20” if Rear Hole Mounted Hitch
- 18” if Front Hole Mounted Hitch
- 16” if Rear Hole Mounted Hitch
- 12” if Front Hole Mounted Hitch

---

A. 3390451-Cold Rolled Round 1 3/4” dia. x 38” long
B. 3390450-Hot Rolled Flat 1/2” x 4” x 18” long (2) Req’d
CAUTION and INSTRUCTION PLATES
VARIABLE WIDTH HOPPER

⚠️ 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.

---

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51
## LUBRICATION

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*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.

HD46 - Transmission Fluid
Texaco HD46, Sunvis 40 or equal

#2M-AG — #2 Molub-Alloy
#90M-ATG — #90 Molub-Alloy
Transmission Lubricant