Gleaner®

S68 / S78 / S88
Rotary Combine

SERVICE MANUAL
79036238C

CONTENTS

Part Number 79036238C (English)

Printed in U.S.A.
August 2014

SERIAL NUMBER DEFINITION

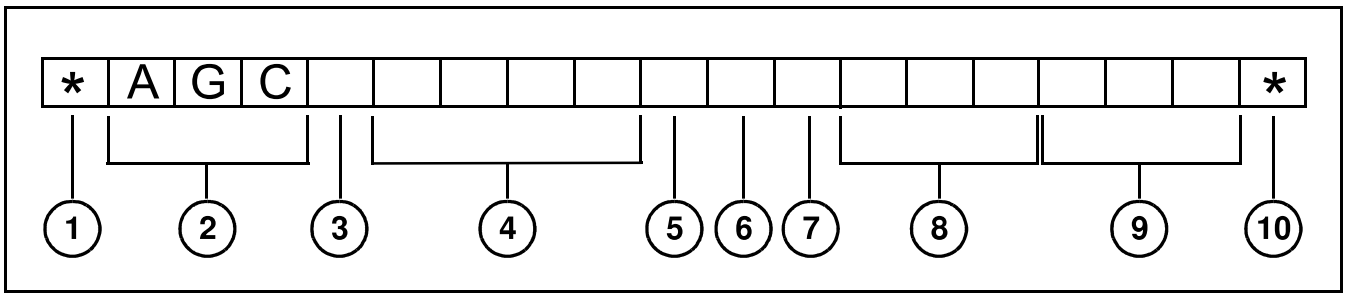


FIG. 58

FIG. 58: Definition of the serial number for model year 2010 and up.

(1) Beginning symbol

(2) World Manufacturer Code

(3) Brand Code

(4) Model Identifier (Model number)

(5) Check Letter (0 or used if model identifier is five digits)

(6) Model Year Code (A=2010, B=2011, C=2012, and on)

(7) Plant Code

(8) Family Code

(9) Unit Number for the Year

(10) Ending symbol

NOTE: For serial number breaks in this manual, only the information from the model year code and following will be given.

Thermostat

The thermostat is fitted in the coolant outlet on the engine. When coolant is cold, it is directed from the cylinder head through a bypass, to the water pump and does not pass through the radiator. As coolant warms up, the thermostat opens allowing coolant to flow to radiator as well as blocking the bypass passage to the water pump.

IMPORTANT: Do not operate the engine with thermostat removed as it is essential for proper circulation and efficient engine performance. Without the thermostat, the coolant can recirculate and bypass the radiator, causing the engine to overheat. A defective thermostat can not be repaired. It must be replaced.

Draining Cooling System

FIG. 120: A drain valve (1), located on bottom front of the radiator, is provided to drain the engine block and radiator. For complete system draining open the heater control valve in the cab and valves on the heater hose inlet and outlet hoses at the engine.

Park the machine on a level surface when draining the cooling system to make sure the system drains completely. Remove the expansion tank cap when draining the system and put the cap on the operator seat as a warning the engine contains no coolant.

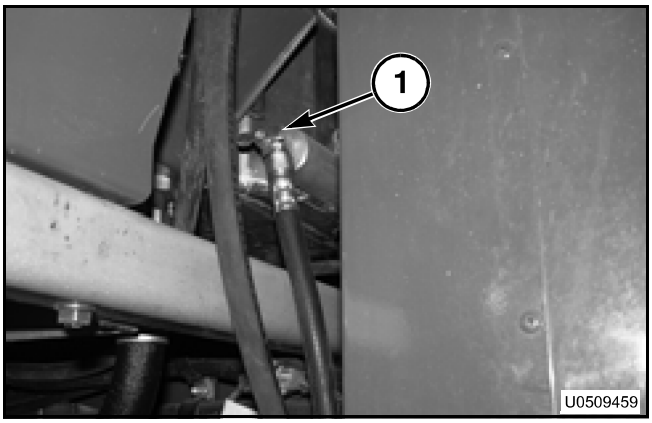


FIG. 120

Filling System

FIG. 121: Close the drain valve at bottom of the radiator. Fill the system slowly through the expansion tank opening (1) with the recommended coolant and water mixture until the radiator is full.

IMPORTANT: When filling the cooling system open the heater hose valves on the engine and turn the heater on in the cab to make sure all air is purged from cooling system. The thermostat housing is vented to the top tank on the radiator through a vent hose to make sure air is expelled from the head during initial fill or after draining.

Start and run the engine until the engine reaches operating temperature to expel any air trapped in the system.

Shut off the engine and allow the engine to cool. Add additional coolant as needed to maintain the level in the expansion tank. Install the expansion tank cap.

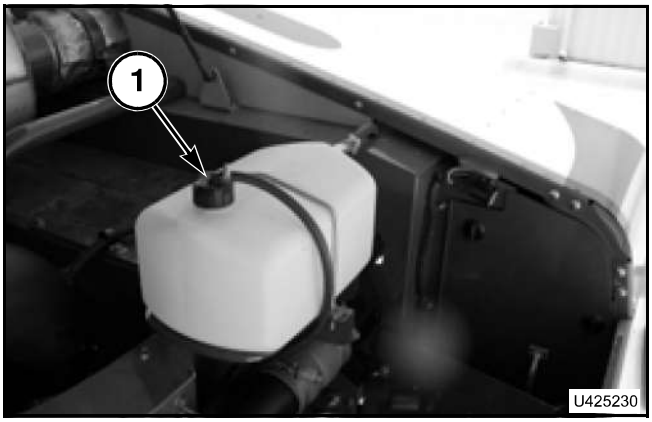


FIG. 121

Coolant System Monitoring

The analog display gauge and digital display, located on the electronic instrument panel, indicates temperature of coolant in the engine.

TABLE 14 Belt Moves and Vibrates (cont'd)

Symptom / Observation	Possible Causes	Corrections / Remedy
Belt vibrates.	Excessive radial or lateral run out of sheaves.	Replace sheaves with defects.
	Loose drive components.	Tighten the loose drive components.
	Belt profile does not equal the sheave groove profile.	Properly install a new original equipment belt and adjust the belt tensioner.

TABLE 15 Belt Top Surface Worn

Symptom / Observation	Possible Causes	Corrections / Remedy
Severe wear patterns on the top surface of belt.	Belt rubbing on the belt guides, shields, or other obstruction.	Adjust the belt guides, shields, or remove the obstruction. Align the sheaves. Properly adjust the belt tension.
	Back side idler sheave malfunction or damaged.	Replace the back side idler sheave.

TABLE 16 Belt Top Corners Worn

Symptom / Observation	Possible Causes	Corrections / Remedy
Top corners of the belt worn or frayed.	Worn sheaves (check with groove gauge).	Replace the worn sheaves. Properly install new belt and adjust the belt tension.
	Belt profile does not equal the sheave groove profile.	Properly install new belt and adjust the belt tension.

Inches		mm	Inches		mm
Fraction	Decimal		Fraction	Decimal	
-	0.2756	7.0	-	0.7283	18.5
9/32	0.281	7.144	47/64	0.734	18.653
-	0.2953	7.5	-	0.7480	19.0
19/64	0.297	7.541	3/4	0.75	19.05
5/16	0.312	7.938	49/64	0.7656	19.447
-	0.315	8.0	25/32	0.781	19.844
21/64	0.328	8.334	-	0.7874	20.0
-	0.335	8.5	51/64	0.797	20.241
11/32	0.344	8.731	13/16	0.8125	20.638
-	0.3543	9.0	-	0.8268	21.0
23/64	0.359	9.128	53/64	0.828	21.034
-	0.374	9.5	27/32	0.844	21.431
3/8	0.375	9.525	55/64	0.859	21.828
25/64	0.391	9.922	-	0.8661	22.0

Inches		mm	Inches		mm
Fraction	Decimal		Fraction	Decimal	
7/8	0.875	22.225	1-3/4	1.750	44.45
57/64	0.8906	22.622	-	1.7717	45.0
-	0.9055	23.0	1-25/32	1.781	45.244
29/32	0.9062	23.019	-	1.8110	46.0
59/64	0.922	23.416	1-13/16	1.8125	46.038
15/16	0.9375	23.813	1-27/32	1.844	46.831
-	0.9449	24.0	-	1.8504	47.0
61/64	0.953	24.209	1-7/8	1.875	47.625
31/32	0.969	24.606	-	1.8898	48.0
-	0.9843	25.0	1-29/32	1.9062	48.419
63/64	0.9844	25.003	-	1.9291	49.0
1	1.0	25.4	1-15/16	1.9375	49.213
-	1.0236	26.0	-	1.9685	50.0
1-1/32	1.0312	26.194	1-31/32	1.969	50.006
1-1/16	1.062	26.988	2	2.0	50.8
-	1.063	27.0	-	2.0079	51.0
1-3/32	1.094	27.781	2-1/32	2.03125	51.594
-	1.1024	28.0	-	2.0472	52.0
1-1/8	1.125	28.575	2-1/16	2.062	52.388
-	1.1417	29.0	-	2.0866	53.0

Specifications

WEIGHT

With Standard Tires ..... 14 288 kg (31 500 lbs)

CAPACITIES

Fuel Tank ..... 871 liters (230 gal)

Type of Fuel ..... Number 1 or 2 Diesel with a cetane rating above 40

DEF Storage Tank ..... 125 liters (33 gal)

Type of DEF ..... 32.5 percent Urea Solution

Engine Cooling System ..... 38 liters (10 gal)

Type of Coolant ..... Low-silicate Permanent Antifreeze

Engine Crankcase - Total System ..... 26.5 liters (28 qt)

Type of oil ..... 15W-40, API Classification of CJ4

Transmission ..... 8.5 liters (9.0 qt)

Type of fluid ..... AGCO® 715 / M1134 SAE 80W-90 Gear Lube

Hydraulic Brakes ..... 0.5 liters (1.0 pt)

Type of fluid ..... Heavy duty brake fluid spec. SAE J1703D or DOT3

Rotor Gearbox ..... 3.5 liters (3.7 qt)

Type of fluid ..... SAE 75W-90 Synthetic Gear

Feeder Reverser ..... 45 cc (1.6 oz)

Type of fluid ..... AGCO® 715 / M1134 SAE 80W-90 Gear Lube

Final Drives (Each) ..... 5.6 liters (6.0 qt)

Type of fluid ..... AGCO® 775 SAE 85W-140 gear oil

Hydraulic Reservoir ..... 43.5 liters (11.5 gal)

Type of fluid ..... Permatran® 821XL

Hydraulic System* (Complete, dry) ..... 79.5 liters (21.0 gal)

*NOTE: * - Fill to the full mark on the hydraulic fluid reservoir.*

GENERAL LUBRICATION

NOTE: When lubricating combine use multi-purpose lithium soap base grease, unless recommended otherwise.

Lubricant Grease for Ambient Temperature

Below 7 degrees C (45 degrees F) ..... N.L.G.I. No. 1

7 degrees C (45 degrees F) to 27 degrees C (80 degrees F) ..... N.L.G.I. No. 2

Consistently above 27 degrees C (80 degrees F) ..... N.L.G.I. No. 3

Unloader Swing In and Out Valve

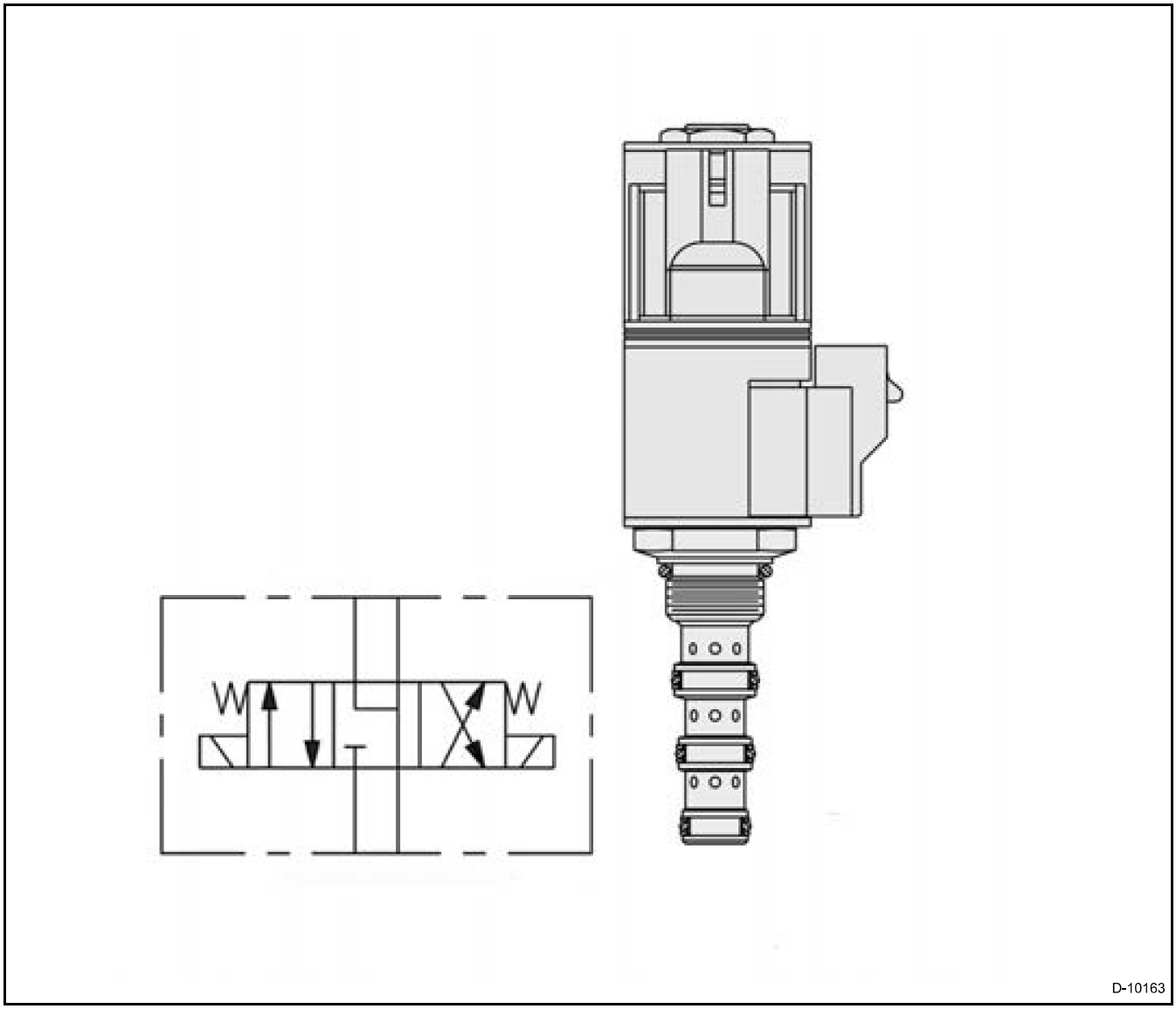


FIG. 29

FIG. 29: Unloader Swing In and Out Valve

Make.....HydraForce

Type.....3-Position 4-Way Spool Valve

Flow..... 11.4 l/min (3 gal/min)

Operating Pressure .....207 bar (3000 psi)

Duty Rating ..... Continuous

1.3 Engine construction

1.3.1 Engine construction overview

The 5th Generation engine series consists of water-cooled in-line diesel engines with three, four, six and seven cylinders. The turbocharged engines are equipped with wet, changeable cylinder liners.

All the engine types have a rigid and ribbed cylinder block. The crank mechanism is designed for supercharging. The cylinder liners are wet and supported at the middle. The cylinder head bolts are high tensile bolts.

1.3.2 Technical data

Principal dimensions and data

Engine type	33	44	49	66	74	84	98
Number of cylinders	3	4	4	6	6	6	7
Displacement (ltr)	3,3	4,4	4,9	6,6	7,4	8,4	9,8
Cylinder bore (mm)	108	108	108	108	108	111	111
Stroke (mm)	120	120	134	120	134	145	145
Combustion	Direct injection	Direct injection	Direct injection	Direct injection	Direct injection	Direct injection	Direct injection
Injection advance	Automatic adjusted	Automatic adjusted	Automatic adjusted	Automatic adjusted	Automatic adjusted	Automatic adjusted	Automatic adjusted
Valve clearance, intake and exhaust (mm)	0,35 (cold or hot)	0,35 (cold or hot)	0,35 (cold or hot)	0,35 (cold or hot)	0,35 (cold or hot)	0,35 (cold or hot)	0,35 (cold or hot)
Direction of rotation from the engine front	Clockwise	Clockwise	Clockwise	Clockwise	Clockwise	Clockwise	Clockwise

2.2 Tightening torques

Object	Nm
Cylinder head bolts	80 Nm + 90° + 90°
Main bearing screws	200
Connecting rod screws • M12 • M14	. • 40 Nm > 80 Nm + 90° • 40 Nm > 80 Nm + 90° + 90°
Crankshaft nut (33/44/49)	600
Crankshaft nut (66/74/84/98)	1000
Crankshaft pulley screws	30
Crankshaft pulley screws (74/84/98)	80
Flywheel screws	150
Flywheel screws (84/98)	200
Flywheel housing screws: • M12 • M10	. • 150 • 80
Idler gear screws : • M14 • M8	. • 180 • 32
Small idler gear screws (shaft, 2 pcs): M8	45
Small idler gear screws (thrust ring): M8	32
Camshaft gear nut	200
Rocker arm shaft bracket screw and nuts	45
Valve cover and frame screws	25
Piston cooling valve	30
Oil pump retaining screws	60
Oil sump drain plug M18	80
Oil cooler connecting piece	60
Coolant pump pulley screw • M10 • M12	. • 50 • 80

Before adjusting valves, at least the following parts need to be removed:

- Boost pipes of turbochargers
- Cooling pipe of the ICAC
- EGR actuator cooling pipe from upper end
- High pressure turbocharger actuator cooling pipe
- Low pressure turbocharger return oil pipe
- Pipe between the EGR cooler and inlet manifold
- Actuator of the high pressure turbocharger
- Support of the ICAC
- Support of the cooling pump

NOTE: *When fitting the support of the ICAC, make sure there is no tension between the supports of the ICAC and the turbochargers.*

After fitting all removed parts, remove the air from the cooling system by using the highest bleeding plug of the engine.

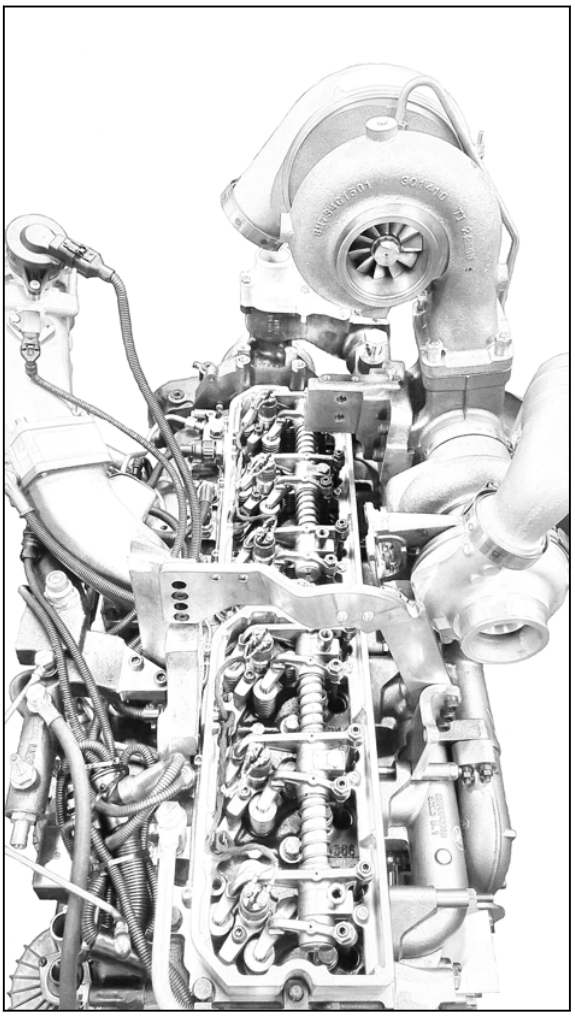


Fig. 35

3.4.4 Adjusting valves

NOTE:
See the valve clearances adjusting intervals in the maintenance chart.

The nominal clearance of both inlet and exhaust valves is 0,35 mm. The valve clearances can be checked regardless of whether the engine is cold or hot. The valve clearances of a certain cylinder can be adjusted when the piston is at its compression stroke top dead centre. The valves for different cylinders are adjusted in the same sequence as the order of injection.

Adjustment instructions

The Closed crankcase ventilation (CCV) filter is mounted on the rear end of inlet manifold. It is connected to valve cover, inlet manifold and inlet pipe. The CCV system includes also return oil pipe non-return valve, that is mounted on the engine oil pressure regulating valve cover.

Procedure

1. Mount the valve in vertical position as shown in the picture.

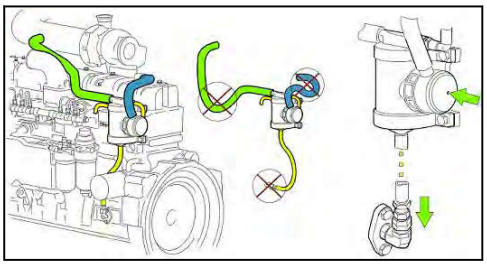


Fig. 82

2. When assembling CCV system hoses make sure that there are no unnecessary bends or creases on them.
3. The hose line must be straightforwardly ascending as shown in the picture.
4. The filter pressure regulator has a monitoring hole for ambient pressure. Make sure that the hole is not blocked.

Installing the closed crankcase ventilation system components

84 and 98 engines

The CCV filter is mounted on the rear end of cylinder block with a mounting bracket. Centrifugal filter is connected to engine oil circulation with a pipe. The ventilation gases are circulated from valve cover to inlet piping with rubber hoses.

Procedure

1. If the CCV filter has been removed, replace the mounting bracket O-ring and shaped gasket.

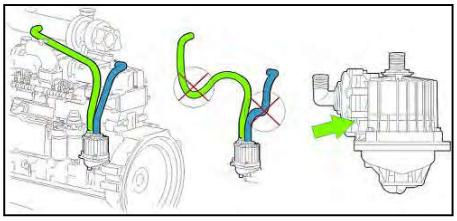


Fig. 83

2. When assembling CCV system hoses make sure that there are no unnecessary bends or creases on them.
3. The hose line must be straightforwardly ascending as shown in the picture.
4. The filter pressure regulator has a monitoring hole for ambient pressure. Make sure that the hole is not blocked.

Mounting: 3 sensors on the exhaust line, before the DOC catalytic converter, before and after the SCR catalytic converter.

- Thread: M14x1,5
- Torque: 40 Nm

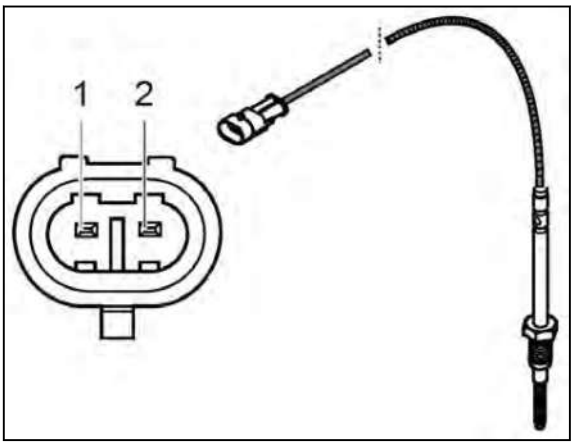


Fig. 119

FIG. 41: Remove the hardware fastening the rear step (1) to the hydrostatic pump support (2). Remove the rear step and locate the rear step out of the work area.

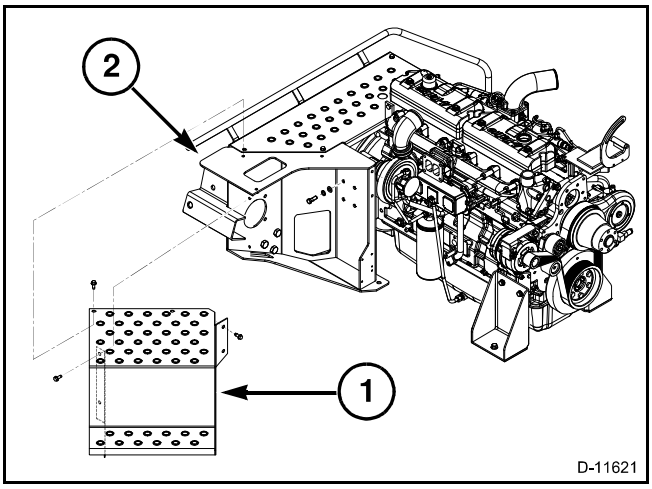


FIG. 41

FIG. 42: Remove the nut fastening the hydrostatic control cable swivel end stud (1) to the hydrostatic pump control arm.

Loosen the jam nuts (2) fastening the cable jacket to the hydrostatic pump support and remove the cable from the support.

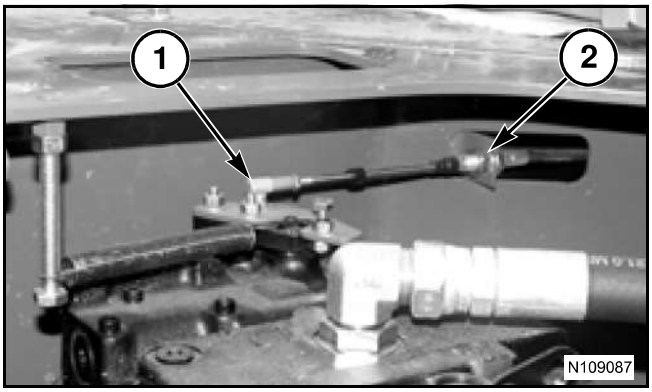


FIG. 42

FIG. 133: Support the PTO housing assembly by using a chain hoist with sling straps wrapped around the housing tube.

NOTE: When removing the output shaft assembly the sheave helps to balance the assembly.

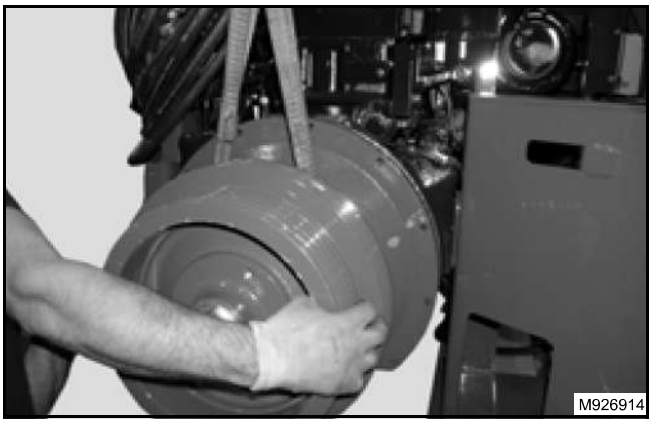


FIG. 133

FIG. 134: Remove the capscrews with lock washers (1) fastening the PTO housing assembly to the engine flywheel housing. Slide the assembly towards the left-hand side of the combine until the output shaft housing and output shaft are clear of the engine flywheel housing and flex coupling. Lift the assembly up and out of the rear of the engine compartment.

NOTE: Optional, A beam can be located across the hood section at the left-hand gas spring and the engine, with suitable lifting equipment used to support, lower the PTO assembly down between the left-hand combine frame and hood assembly to the ground.

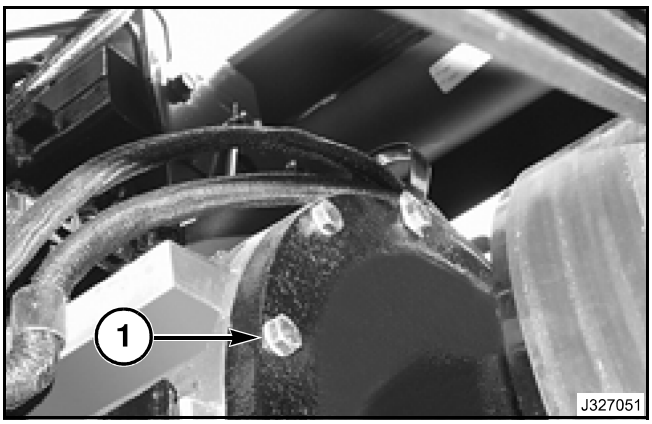


FIG. 134

FIG. 135: Remove the capscrews (1) fastening the flex coupling (2) to the engine flywheel and remove the flex coupling.

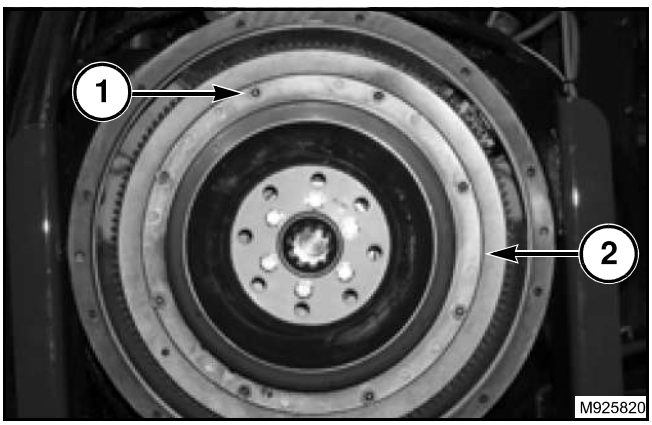


FIG. 135

FIG. 215: Lift the fuel tank cover (1) and right-hand fuel tank end cover (2) up and out of the grain bin and locate the fuel tank cover and right-hand fuel tank end cover out of the work area.

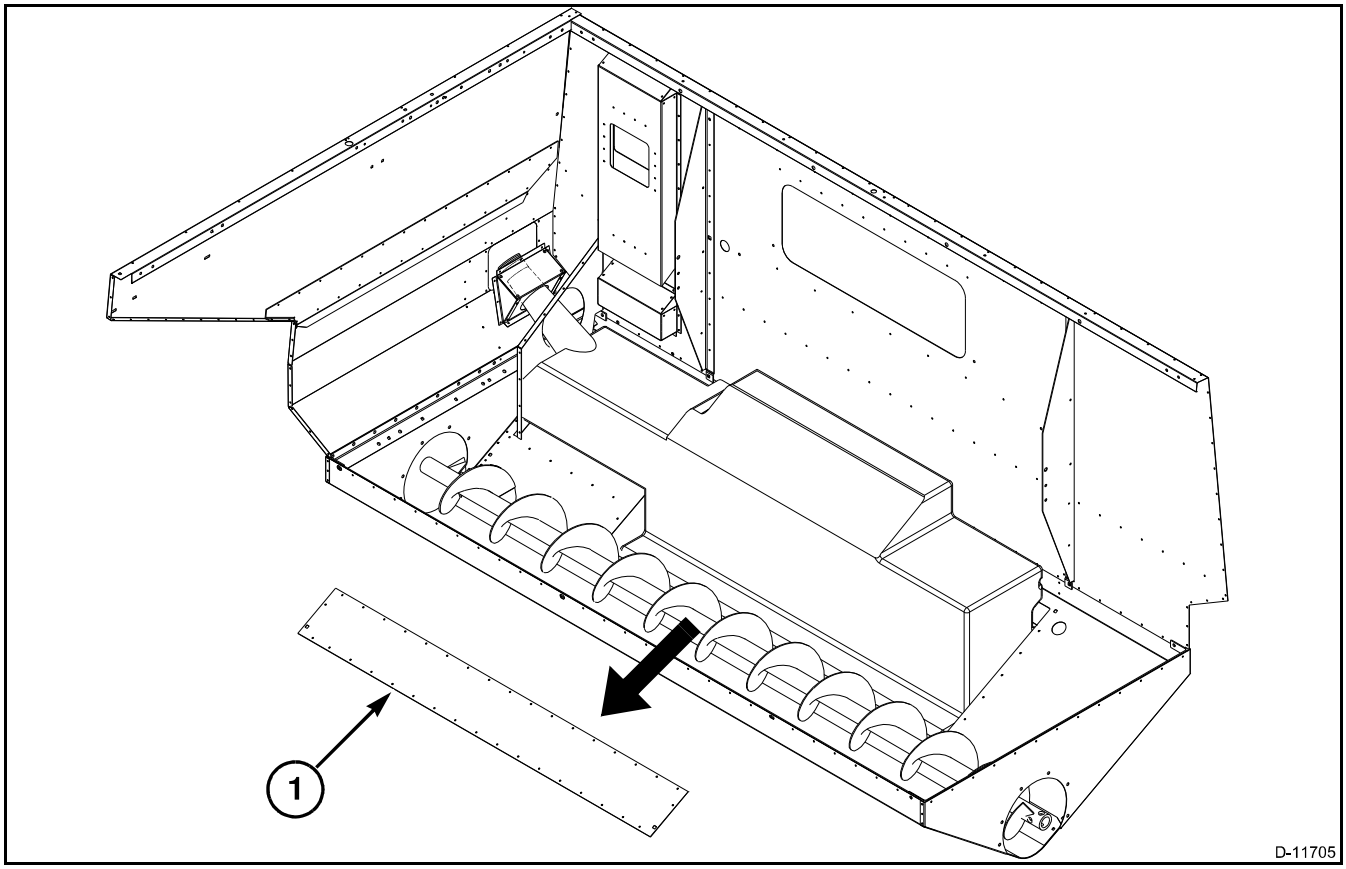


FIG. 216

FIG. 216: Using a suitable drill bit, remove the rivets fastening the fuel tank bottom cover (1) to the grain bin. Remove the fuel tank bottom cover from the grain bin and locate the fuel tank bottom cover out of the work area.

FIG. 217: With the fuel tank bottom cover removed, remove the fuel return line from the fitting (1) on the left-hand side of the fuel tank.

Cap or plug the fuel return line and fitting to prevent dirt from entering the fuel system.

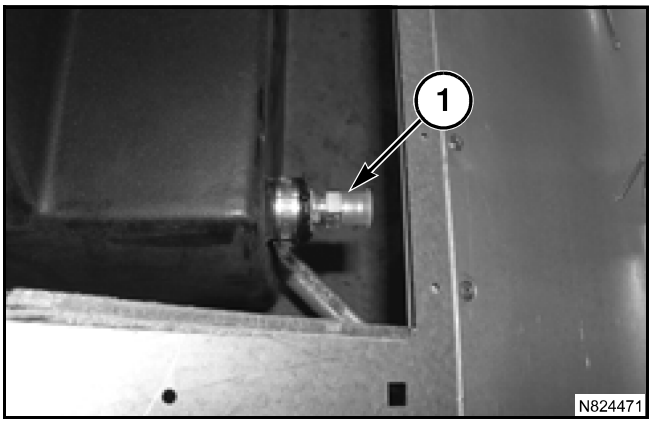


FIG. 217

Installation

FIG. 300: Locate the outer bearing (3) between the bearing flanges (2) on the support with the lock collar flange of the bearing located toward the inner bearing. Loosely fasten the bearing in location on the support with the hardware (1) removed during disassembly.

The hardware will be tightened later after the alignment procedure.

NOTE: After the alignment procedure rotate the rotary screen a small number of revolutions to align the bearings and tighten the hardware fastening the bearing in location between the bearing flanges.

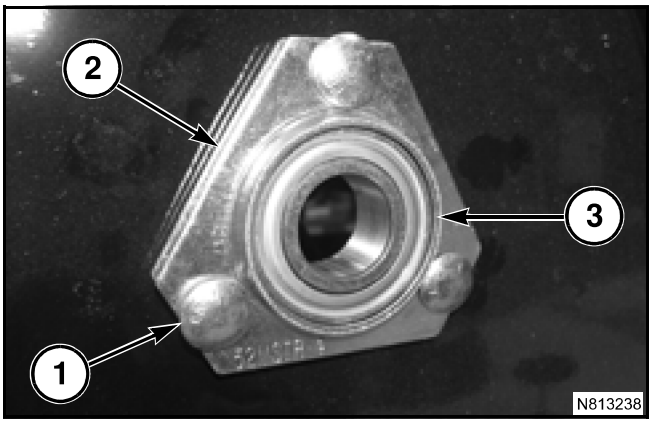


FIG. 300

FIG. 301: Locate the inner bearing (5) between the bearing flanges (4) on the bearing plate (2) with the lock collar flange located toward the outer bearing.

Loosely fasten the bearing in location on the bearing plate with the hardware (3) removed during disassembly. The hardware will be tightened later in the alignment procedure.

Locate the bearing plate and bearing assembly on the support. Using the hardware (1) removed during disassembly loosely fasten the bearing plate and bearing assembly to the support.

The hardware will be tightened later in the alignment procedure.

NOTE: After the alignment procedure rotate the rotary screen a small number of revolutions to align the bearings and tighten the hardware (3) fastening the bearing in location between the bearing flanges.

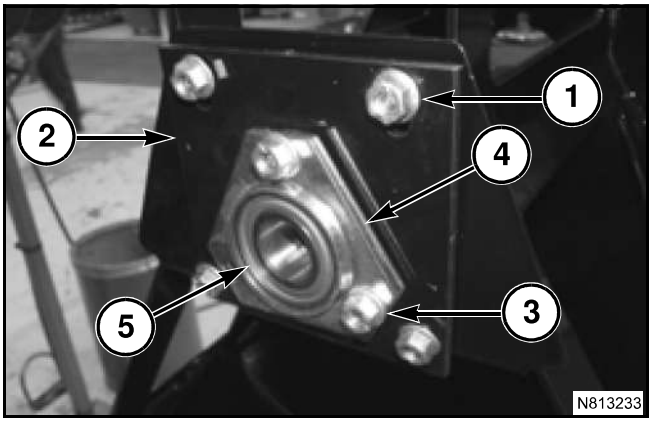


FIG. 301

FIG. 302: Slide the shaft (1) into the bearings.

FIG. 302

Installation

FIG. 26: Install the drive belt (1) onto the jackshaft drive sheave located to the inside of the main magnetic clutch (2).

Install the drive belt onto the driven sheave (3) and under the idler sheave (4).

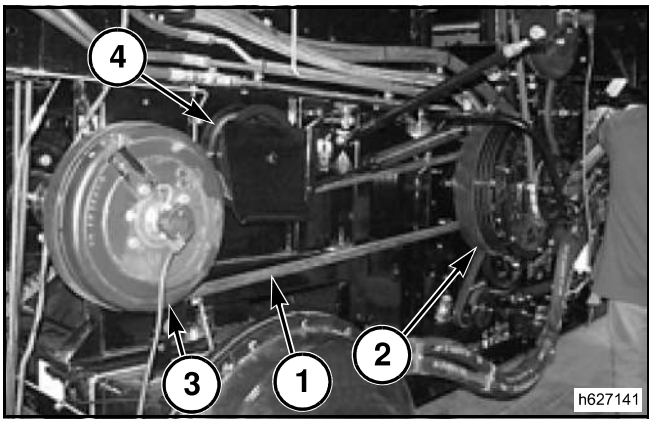


FIG. 26

FIG. 27: Adjust the idler draw bolt (1) to provide 24.0 mm (0.95 in) clearance (A) between the end of the spring plug and the inside of the spring anchor bracket. Lock the jam nut against the spring plug.

Install the main drive belt onto the main clutch shaft sheave as outlined in the Threshing and Separator division.

Install the bin unloader drive belt onto the drive sheave located to the outside of the main magnetic clutch as outlined in the Unloading Auger System section.

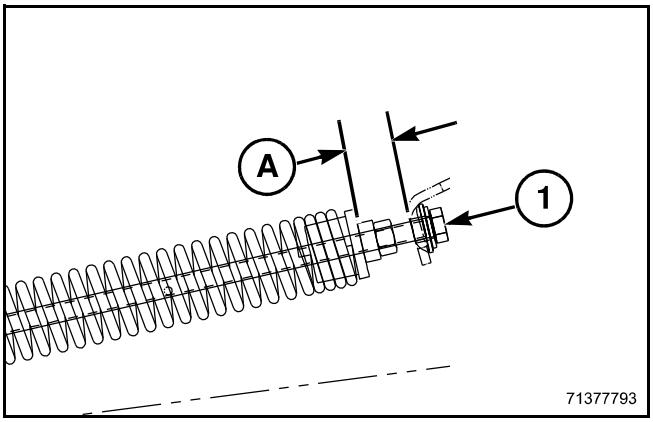


FIG. 27

FIG. 28: The same type of idler arm mounting plate (3) is used in many locations on the machine. The idler assembly is adjustable for better alignment of the idler (4).

Rotate the pivot jackshaft drive belt a small number of revolutions in both directions and check that the idler is in alignment with the other sheaves and the pivot jackshaft drive belt.

Loosen the jam nuts (1) and adjust the cap screws (2) to make alignment adjustments. Tighten the jam nuts. Rotate the pivot jackshaft drive belt a small number of revolutions and check that the idler sheave is in alignment with the other sheaves and the jackshaft drive belt.

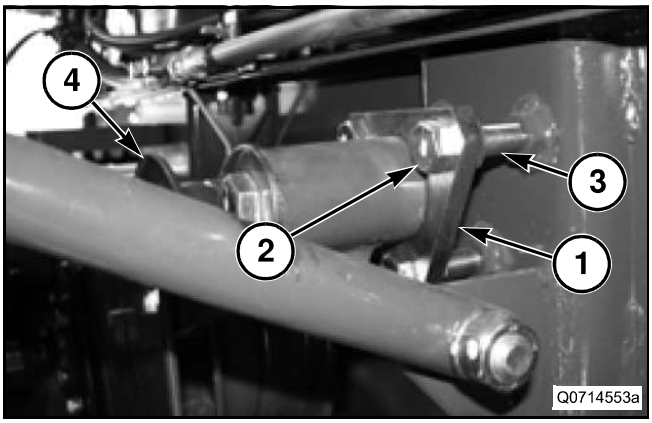


FIG. 28

FIG. 111: To check for the proper tension on the countershaft drive belt, actuate the variable header speed switch to provide the slowest header drive speed. Stop the header drive and the engine. Measure the distance (A) between the sheave halves in the header driven sheave (1) with a feeler gauge.

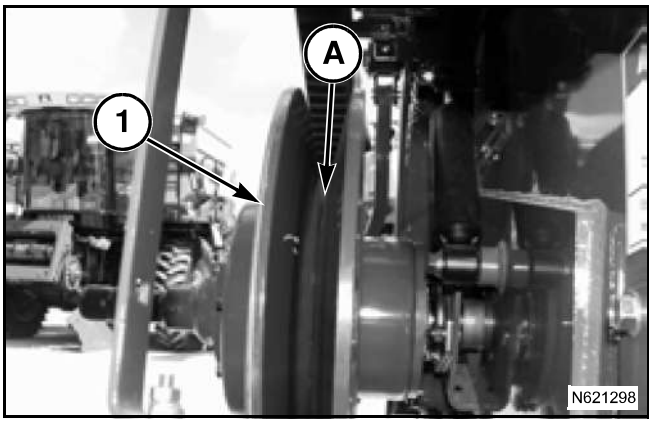


FIG. 111

FIG. 112: Move the header drive idler (1) up or down in the bracket (2) while rotating the drive by hand until the distance between the sheave halves is 2.3 to 3.3 mm (0.090 to 0.130 in).

Operate the drive with power for a few turns and recheck the dimension.

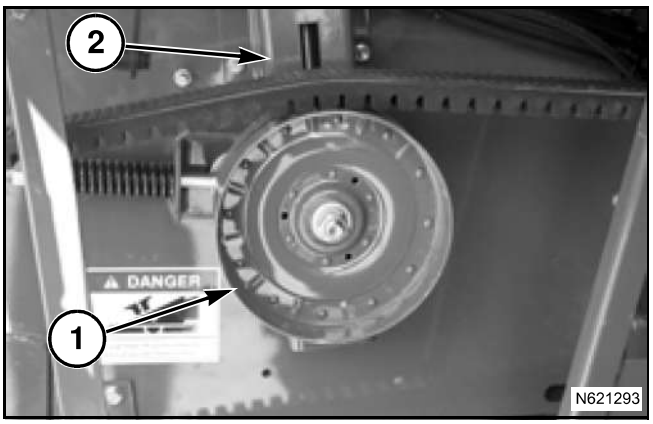


FIG. 112

FIG. 113: Remove the plug in the hose and the cap on the fitting in the rotary union (2). Install the hydraulic hose (1) onto the rotary union.

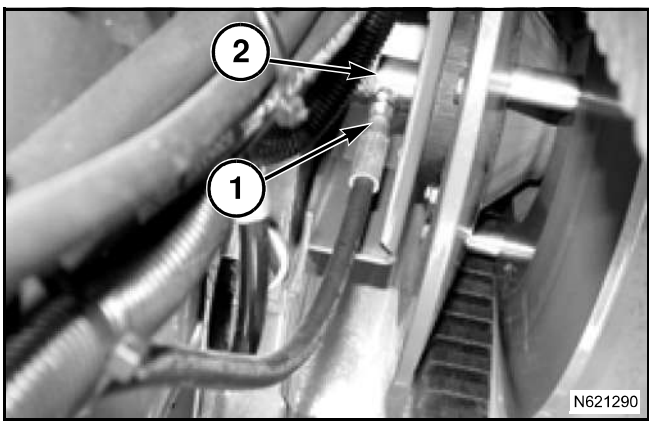


FIG. 113

FIG. 114: Install the lower cap screw securing the shield front support (1) to the feeder housing. Tighten the cap screw securely.

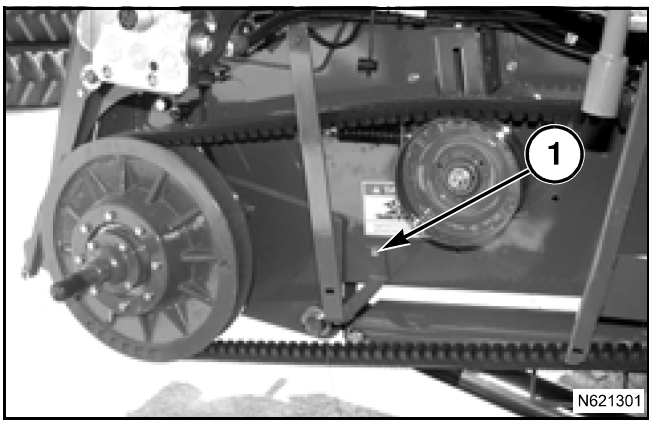


FIG. 114

Assembly and Installation

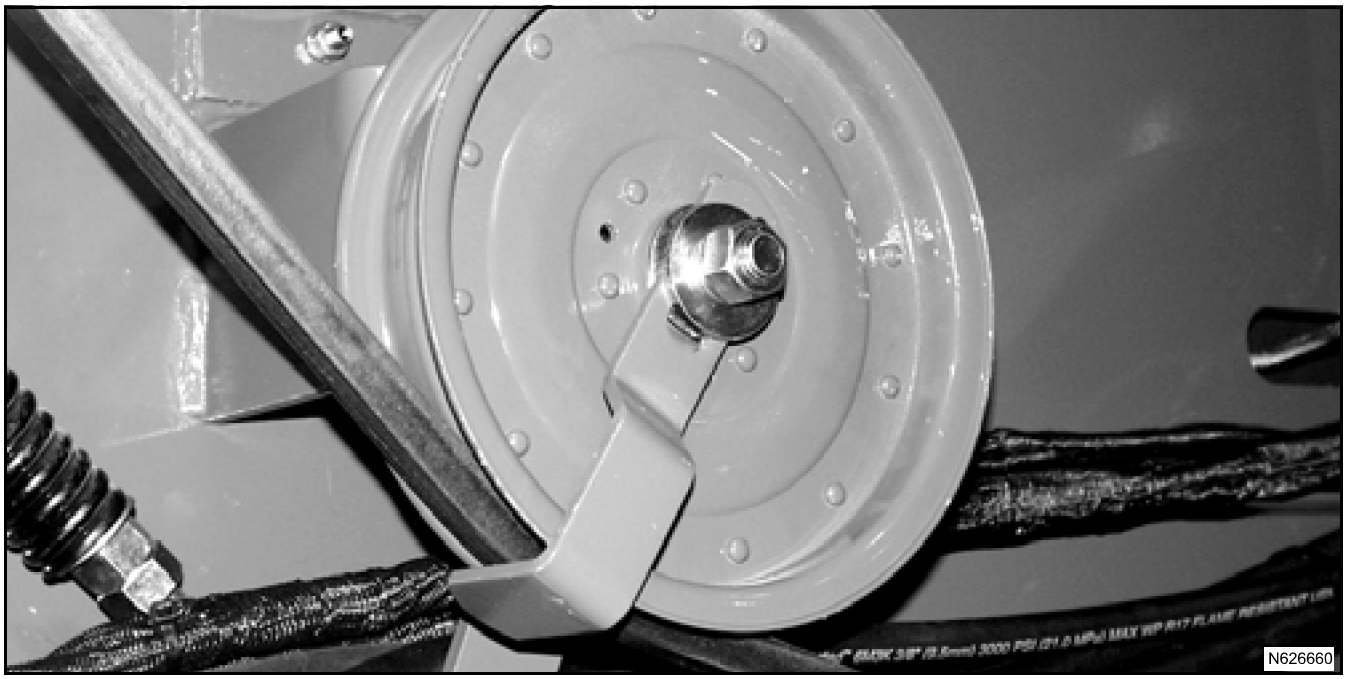


FIG. 203

FIG. 203: Front idler (Front).

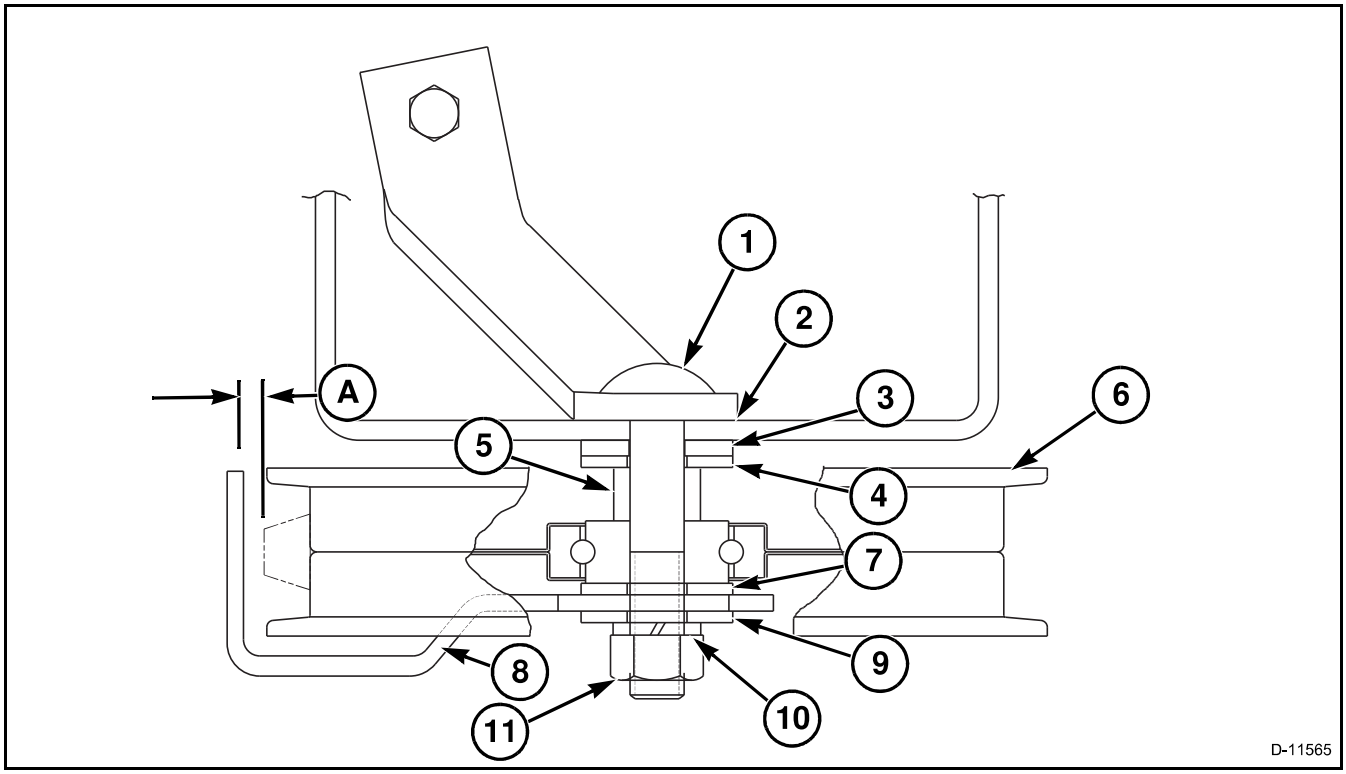


FIG. 204

FIG. 204: If the carriage bolt (1) was removed from the support bracket assembly (2) on the separator frame, install the carriage bolt.

FIG. 283: Release the pins and remove the shield assembly (1). Lower the shield until the cable tether supports the shield.

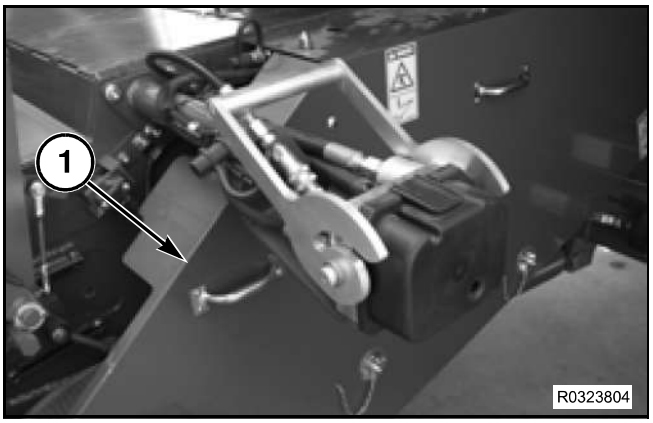


FIG. 283

FIG. 284: Put the feeder housing on the ground or fully extend the header lift cylinders. Position the header lift cylinder stop (1) so that the stop fully contacts and covers three sides the left-hand lift cylinder rod. Lower the feeder housing until the header lift cylinder stop contacts the end of the cylinder.

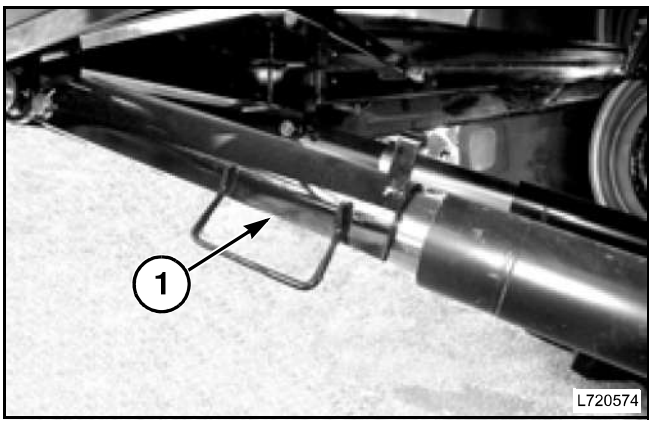


FIG. 284

FIG. 285: Remove the pivot jackshaft drive belt from the pivot jackshaft driven sheave using the required steps as outlined in the Pivot Jackshaft Drive Belt section.

NOTE: The pivot jackshaft drive belt does not have to be removed from the drive sheave on the main clutch shaft.

NOTE: The jackshaft assembly does not have to be removed to service the header clutch assembly at the left-hand end of the jackshaft.

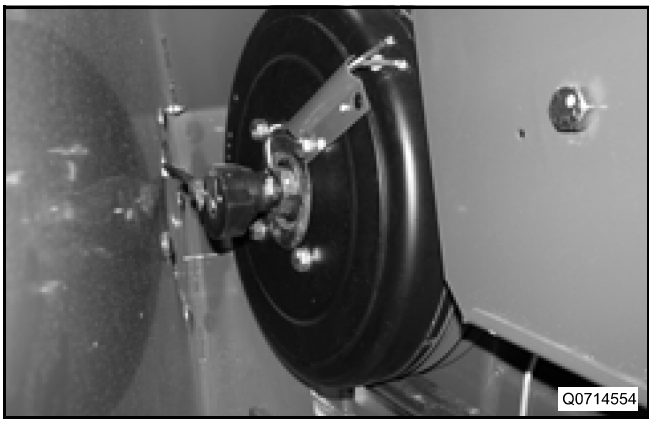


FIG. 285

FIG. 286: Loosen the nut (1) on the bolt fastening the flat idler (2). Turn the adjusting bolt (3) and move the flat idler completely down in the idler support.

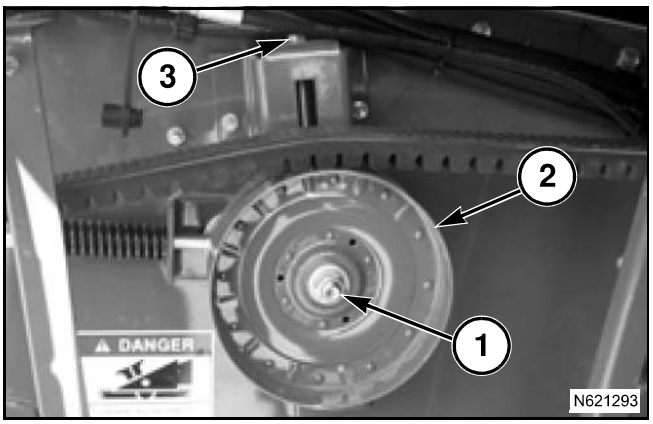


FIG. 286

FIG. 370: Remove the torque reaction plate (1) from the torque sensor.

FIG. 370

FIG. 371: Remove the cam cover (1) from the torque sensor.

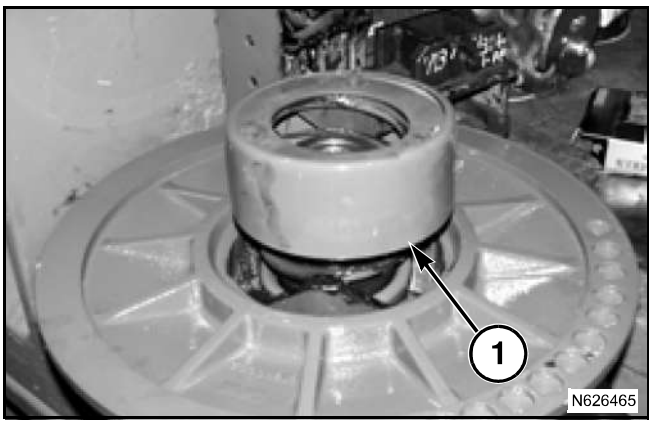


FIG. 371

FIG. 372: Remove the outer cam actuator (1) from the inner sheave half (2).

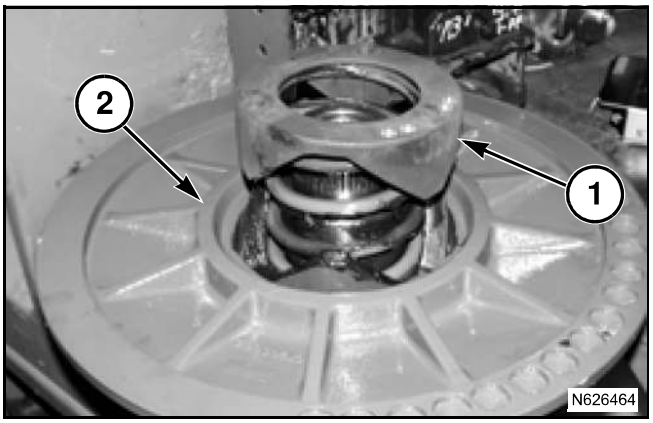


FIG. 372

FIG. 373: Remove the spring (1) from the inner cam actuator (2) and the thrust bearing assembly.

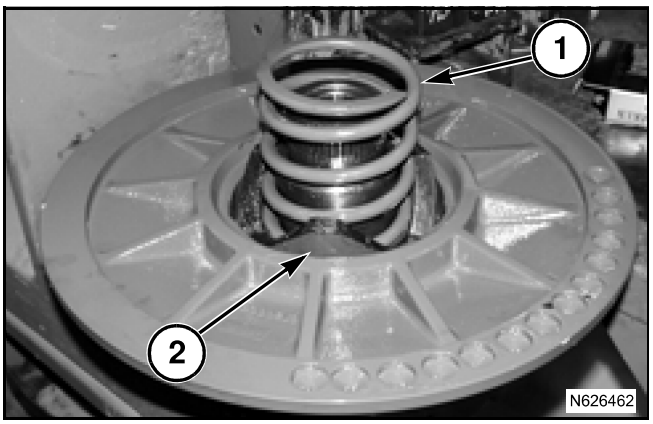


FIG. 373

FRONT FEED DRUM AND SHAFT

Removal

FIG. 468: To gain access for removal of the front drum, the header must be removed from the machine.

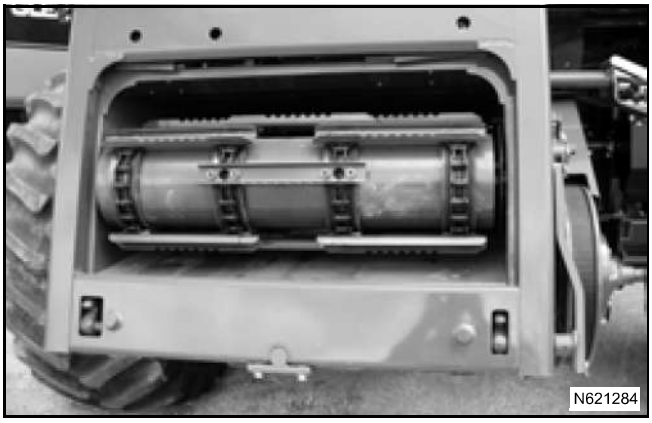


FIG. 468

FIG. 469: Put the feeder housing on the ground or fully extend the header lift cylinders. Position the header lift cylinder stop (1) so that the stop fully contacts and covers three sides the left-hand lift cylinder rod. Lower the feeder housing until the header lift cylinder stop contacts the end of the cylinder.

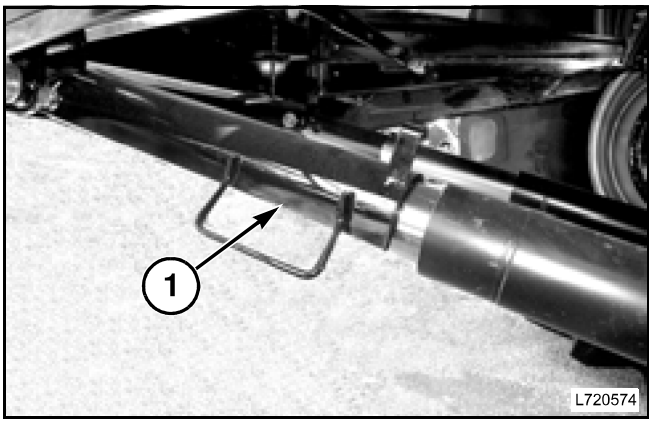


FIG. 469

FIG. 470: Release the pins and remove the shield assembly (1). Lower the shield until the cable tether supports the shield.

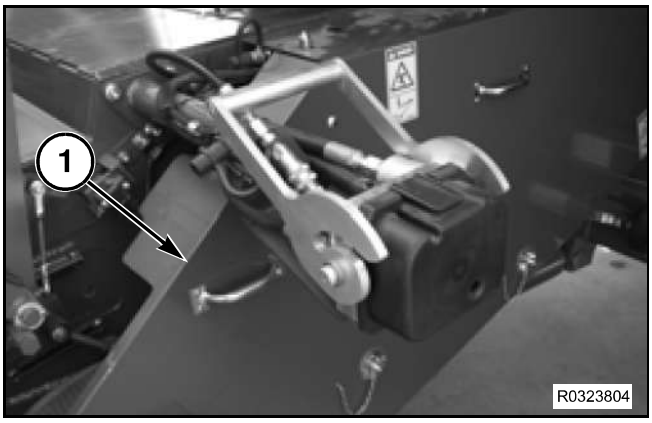


FIG. 470

FIG. 553: Remove the capscrew (14) and the special washer (15) from the right-hand end of the rear shaft.

NOTE: The capscrew has been locked with high strength permanent retaining compound. Heat the right-hand end of the rear shaft to melt the high strength permanent retaining compound.

Using a suitable puller, remove the drive hub (18) from the right-hand end of the rear shaft.

NOTE: General purpose retaining compound has been applied to the hub, shaft, and the key.

Remove the two hex nuts along with lock washers securing the shaft monitor bracket (17). Remove the shaft monitor bracket along with the speed sensor.

Remove the square key (13), the spacer (19), and the sensing wheel (4) from the right-hand end of the rear shaft.

Remove the four hex flange lock nuts and carriage bolts securing the bearing flange (5) and the shield weldment (2) to the support plate (7). Remove the outer bearing flange.

Using a suitable puller, remove the right-hand bearing (6) from the rear shaft. Remove the shield weldment and the support plate.

If the carriage bolts need to be replaced that secure the left-hand bearing flanges, remove the four hex nuts, lock washers, and carriage bolts securing the left-hand shield weldment (20).

Remove the self-tapping screws from the half shields (9). Remove the half shields.

Remove the hex lock nut and capscrew locating the left-hand and the right-hand sprockets (8). Remove the two setscrews securing each of the four sprockets. Remove the sprockets from the rear shaft.

NOTE: The setscrews and the sprockets have been locked with high strength permanent retaining compound. Heat the hub of the sprocket to melt the high strength permanent retaining compound.

Removal

FIG. 647: Remove the cotter pin and then the washer retaining the latch crank weldment (1).

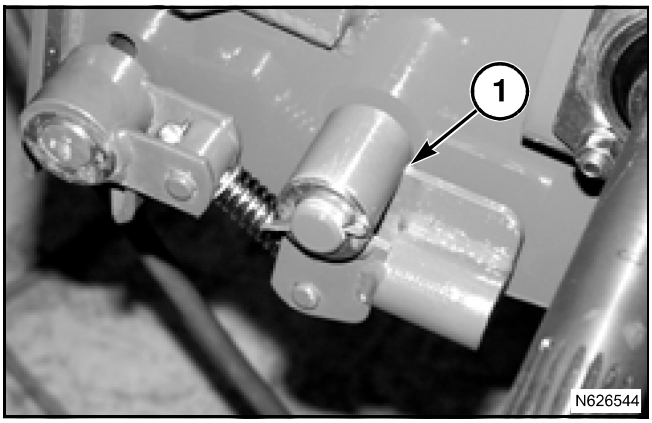


FIG. 647

FIG. 648: Remove the setscrew securing the crank assembly (1) to the header latch shaft.

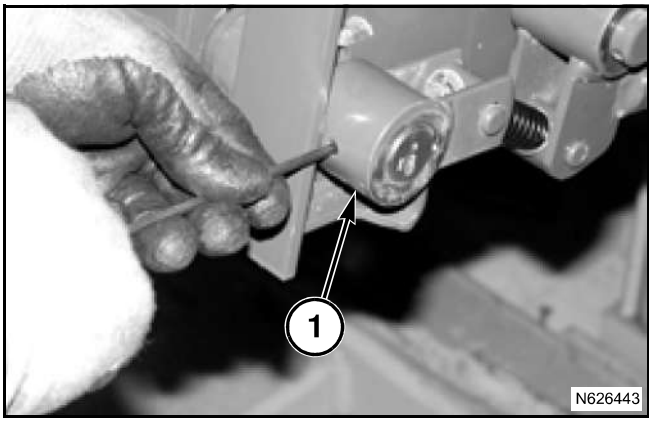


FIG. 648

FIG. 649: Remove the linkage assembly as a unit from the header latch shaft and the pivot shaft (1) welded into the feeder housing.

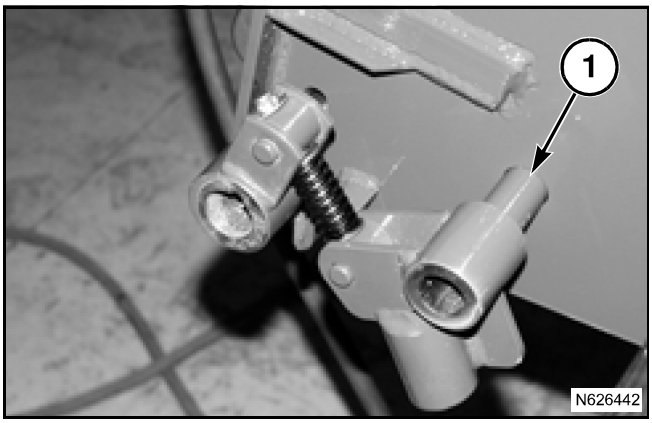


FIG. 649

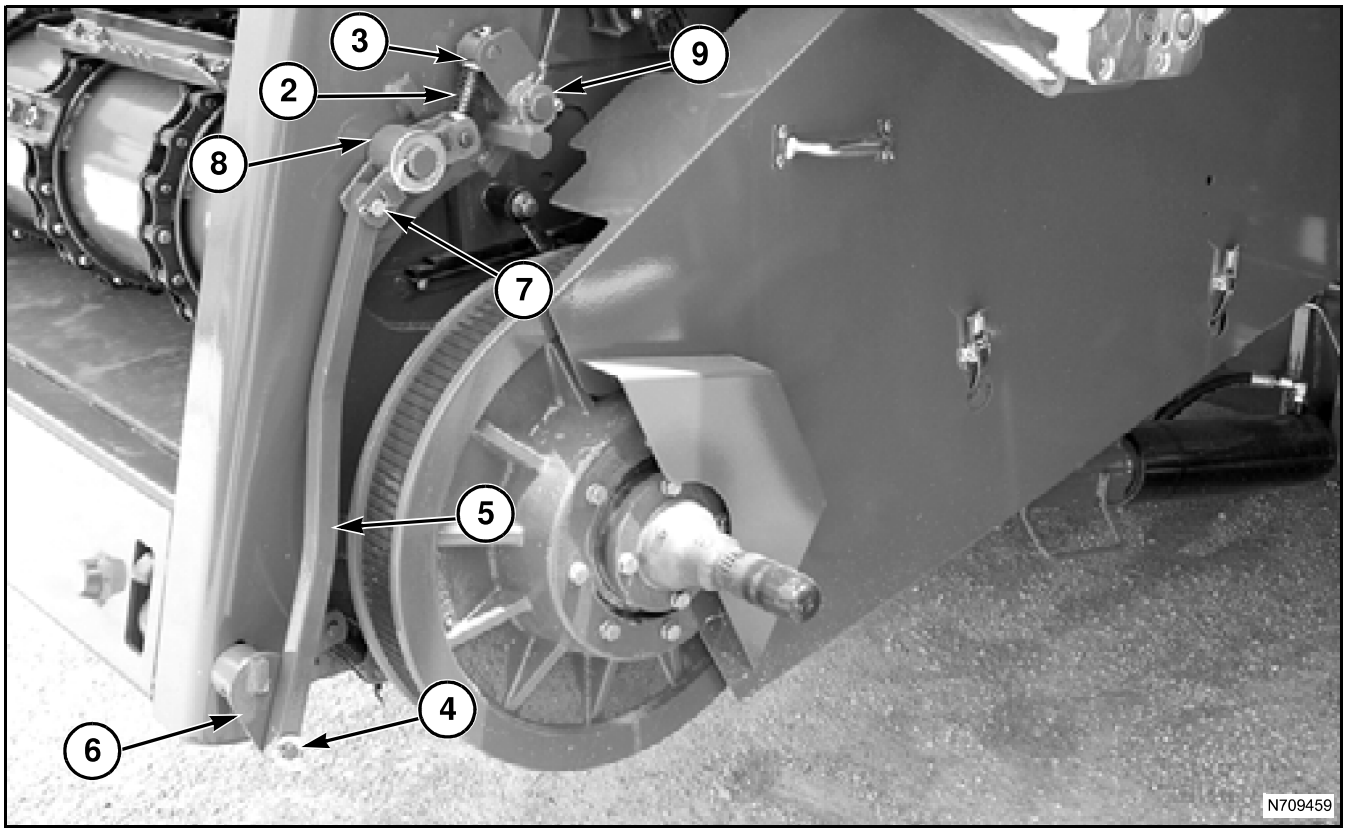


FIG. 743

FIG. 743: If the latch crank linkage assembly does not go over center or is not securely held over center by the latch spring (2), remove or add washers (3) until the latch spring securely holds the latch crank assembly linkage over center.

If the latch linkage system is being removed, remove the cotter pin and washer (4) securing the latch rod (5) to the hook crank weldment (6). Remove the cotter pin from the rod end pin (7). Remove the rod end pin and the latch rod from the lateral tilt frame.

Remove the cotter pin and then the washer retaining the bell crank weldment (8). Remove the cotter pin and then the washer retaining the latch crank weldment (9).

Remove the latch crank linkage assembly as a unit from the bell crank shaft and the pivot shaft welded into the lateral tilt frame.

To disassemble the linkage, compress the latch spring and remove the spring pin in the end of the spring shaft assembly.

Remove the three washers, the latch crank weldment (9), the latch spring, and the bell crank weldment (8) from the spring shaft assembly.

The crank hook weldment (6) can be removed from the latch pivot shaft by loosening the setscrew in the crank hook weldment. Using a suitable puller, pull the crank hook weldment from the latch pivot shaft.

ELEVATOR DRIVE JACKSHAFT

Removal

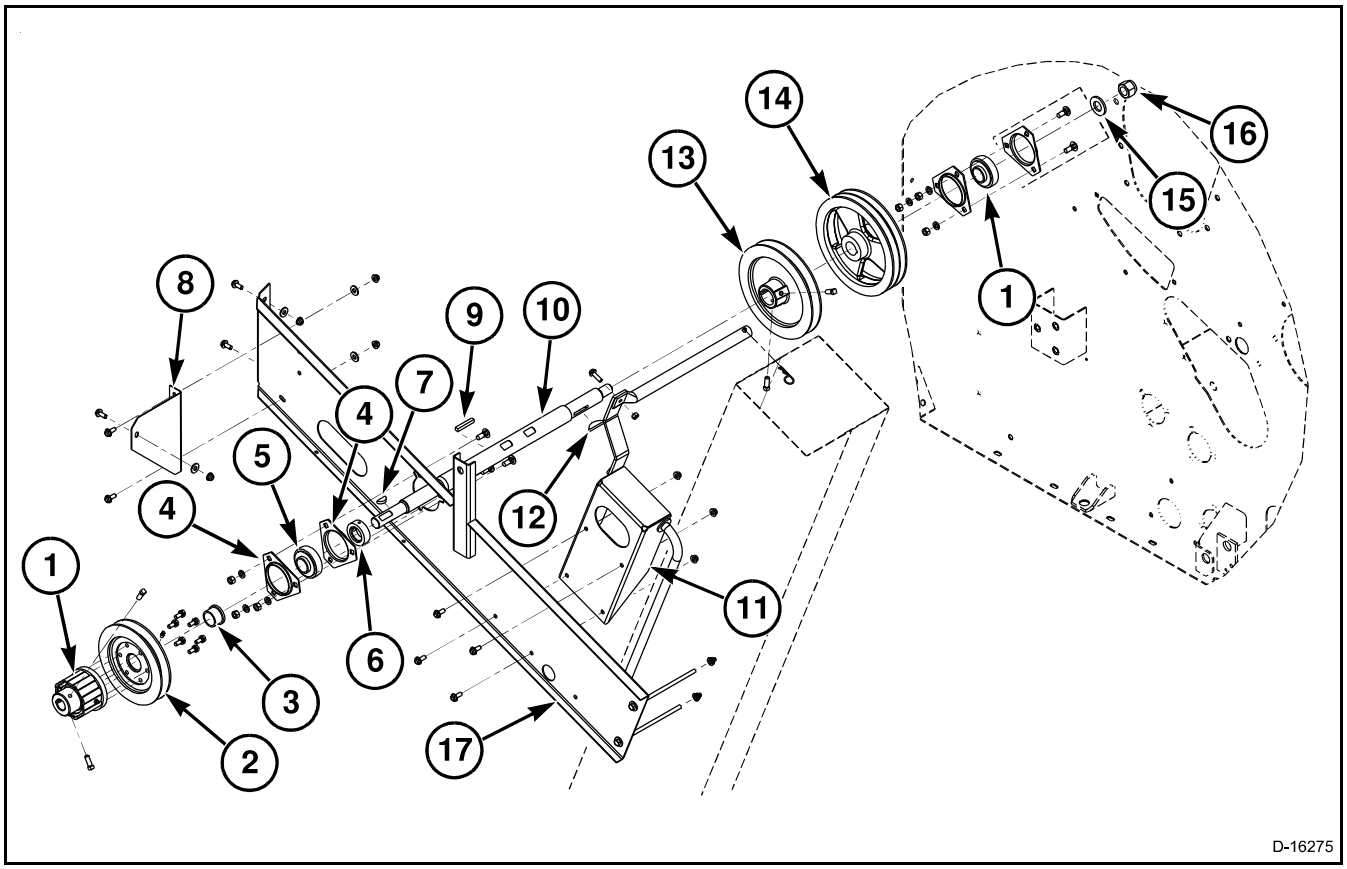


FIG. 817

FIG. 817: Exploded view of Elevator Drive Jackshaft Assembly.

(1) Torque Limiter
(2) Sheave - Grain Elevator
(3) Bearing
(4) Flange - Bearing
(5) Spherical Bearing
(6) Lock Collar
(7) Woodruff Key
(8) Gusset - Hood
(9) Key
(10) Jackshaft - Elevator Drive
(11) Lever Weldment - Cylinder Gear Box
(12) Woodruff - Key
(13) Sheave - Tailings
(14) Sheave - Jackshaft Drive
(15) Plain Washer - Hardened
(16) Hex Nut - Light Stop
(17) Support Weldment

FIG. 895: When installing the elevator chain paddles (1), make sure the paddles are installed with the concave side facing the direction of elevator chain travel.

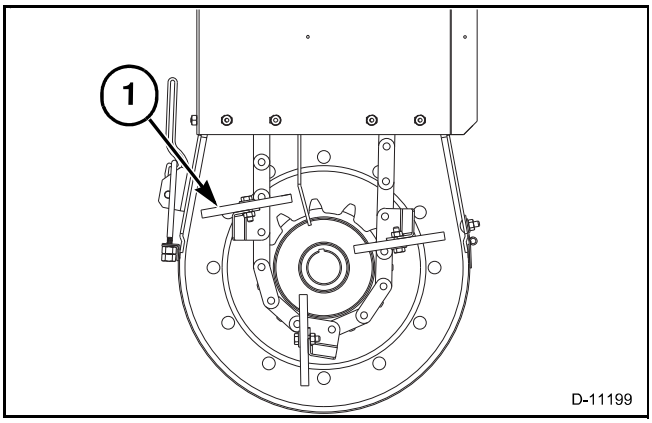


FIG. 895

FIG. 896: Be sure to use wide flat washers (2) and bolts (3) with lock nuts. Tighten the bolts until the outside surface of the washer is flush to 0.76 mm (0.03 in) below the surface of the rubber paddle (1).

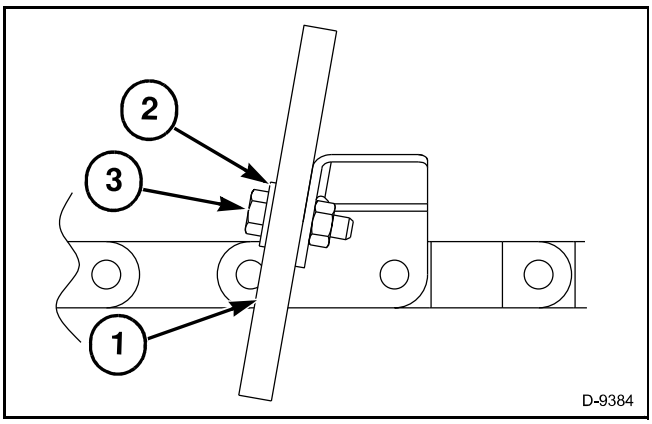


FIG. 896

Removal

FIG. 897: Right Hand Shields - Unlatch the swing-up shield (2) and (3) and raise the shields. Unhook the swing-down shield/step (1) and lower the shield/step.

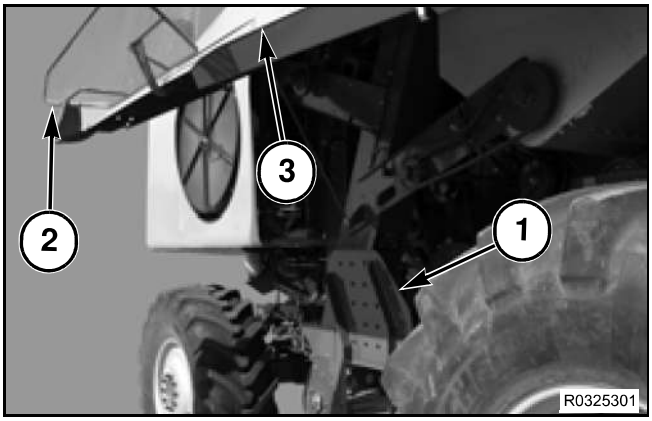


FIG. 897

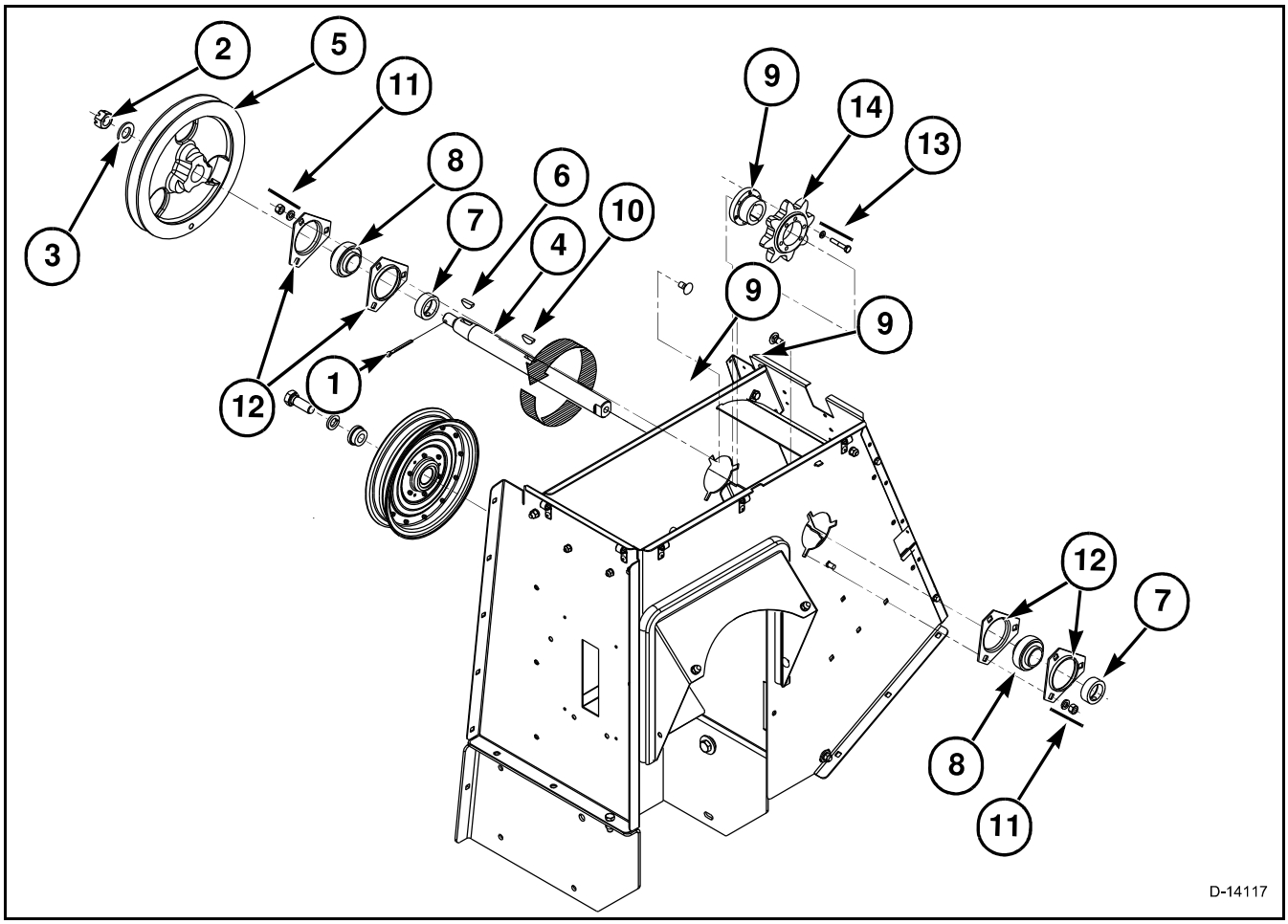


FIG. 984

FIG. 984: Remove the cotter pin (1) from the slotted hex nut (2). Remove the slotted hex nut and the flat washer (3) from the elevator head shaft (4).

Using a suitable puller, remove the driven sheave (5) and then the Woodruff key (6) from the elevator head shaft.

Loosen the set screws in the locking collars (7). Loosen the locking collars with a drift punch. Rotate the locking collars in the opposite direction of the shaft rotation until free from the bearing (8). Remove the locking collars from the bearings. Remove the left-hand locking collar from the elevator head shaft.

Remove the hardware (11) fastening the flangettes (12) and the bearings to the elevator head. Remove the flangettes and bearing from the elevator head shaft.

Remove the right-hand locking collar from the elevator head shaft.

Inspect the bearings for wear or damage and replace as required.

Remove the elevator head shaft and sprocket assembly from the elevator head. Remove the three capscrews and lock washers (13) securing the sprocket (14) to the taper bushing (9). Using the three capscrews as jack screws, thread the capscrews into the tapped holes in the sprocket and tighten evenly until the sprocket and the tapered bushing separate relieving the clamping load on the elevator head shaft. Remove the tapered bushing, sprocket, and the Woodruff key (10) from the elevator head shaft.

Inspect the sprocket for wear or damage and replace as required.

Elevator Drive Belt Adjustment

Tailings Elevator Drive Belt

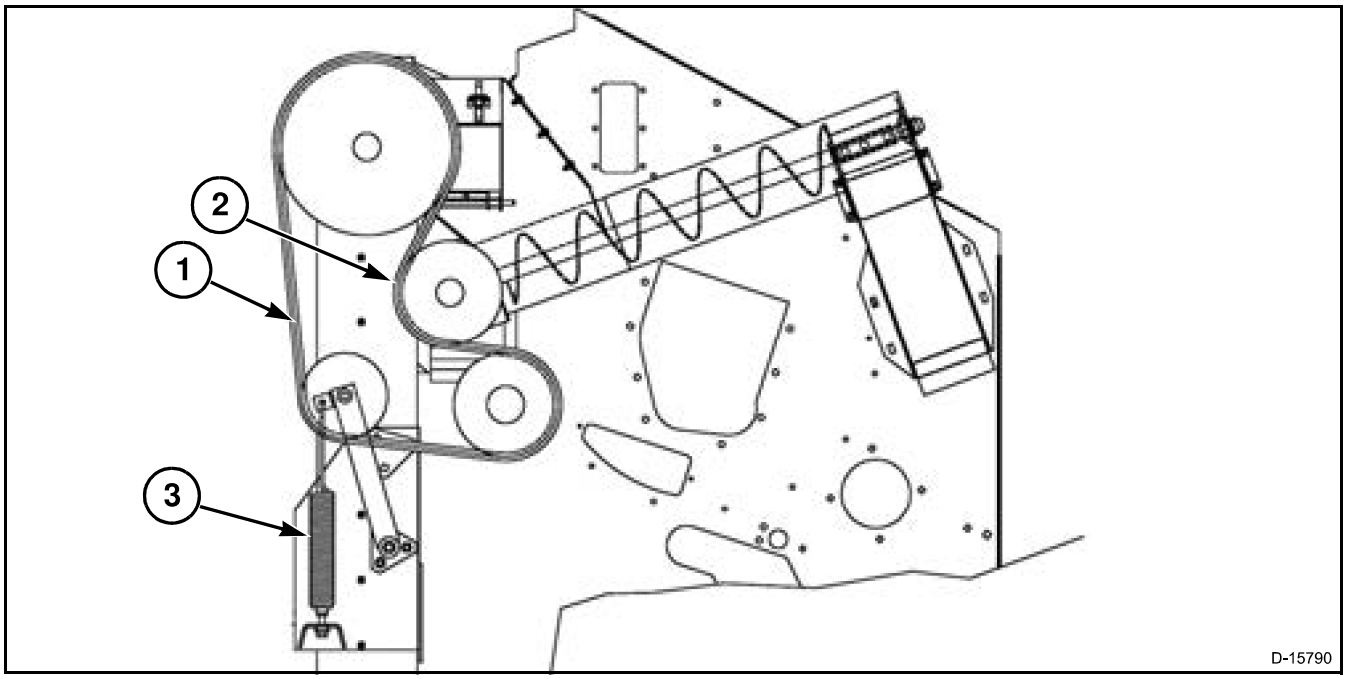


FIG. 1059

FIG. 1059: The tailings elevator and upper tailings conveyor drive belt (1) is tensioned utilizing the idler pulley (2) and the spring (3).

FIG. 1060: Adjust the draw bolt (4) to obtain a dimension (A) of 25.0 mm (1.0 in) between the end of the spring plug and the outside of the anchor bracket.

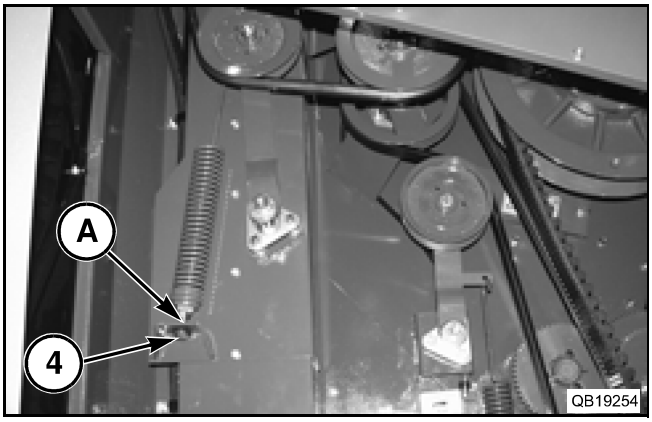


FIG. 1060

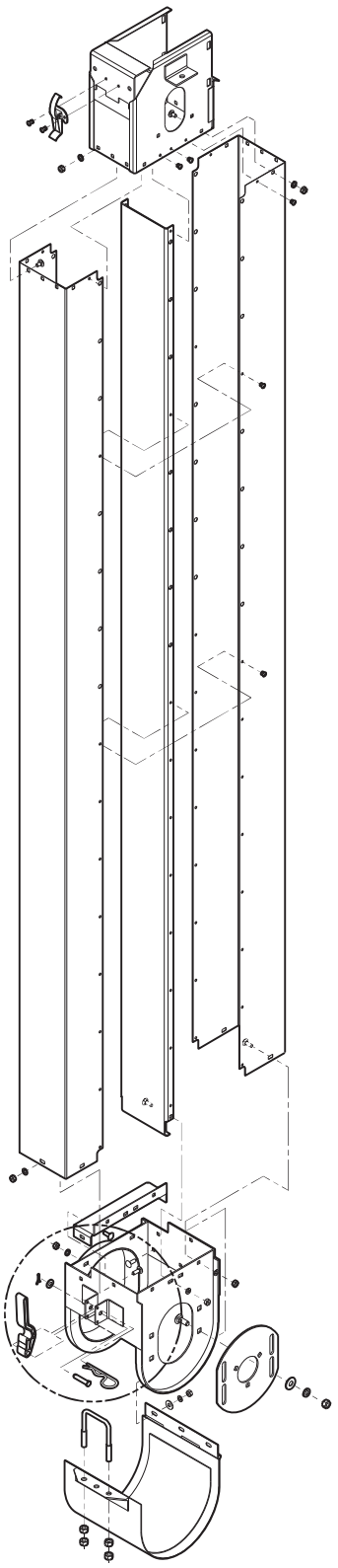


FIG. 1141

FIG. 1141: Exploded view of the body assembly for the return grain elevator.

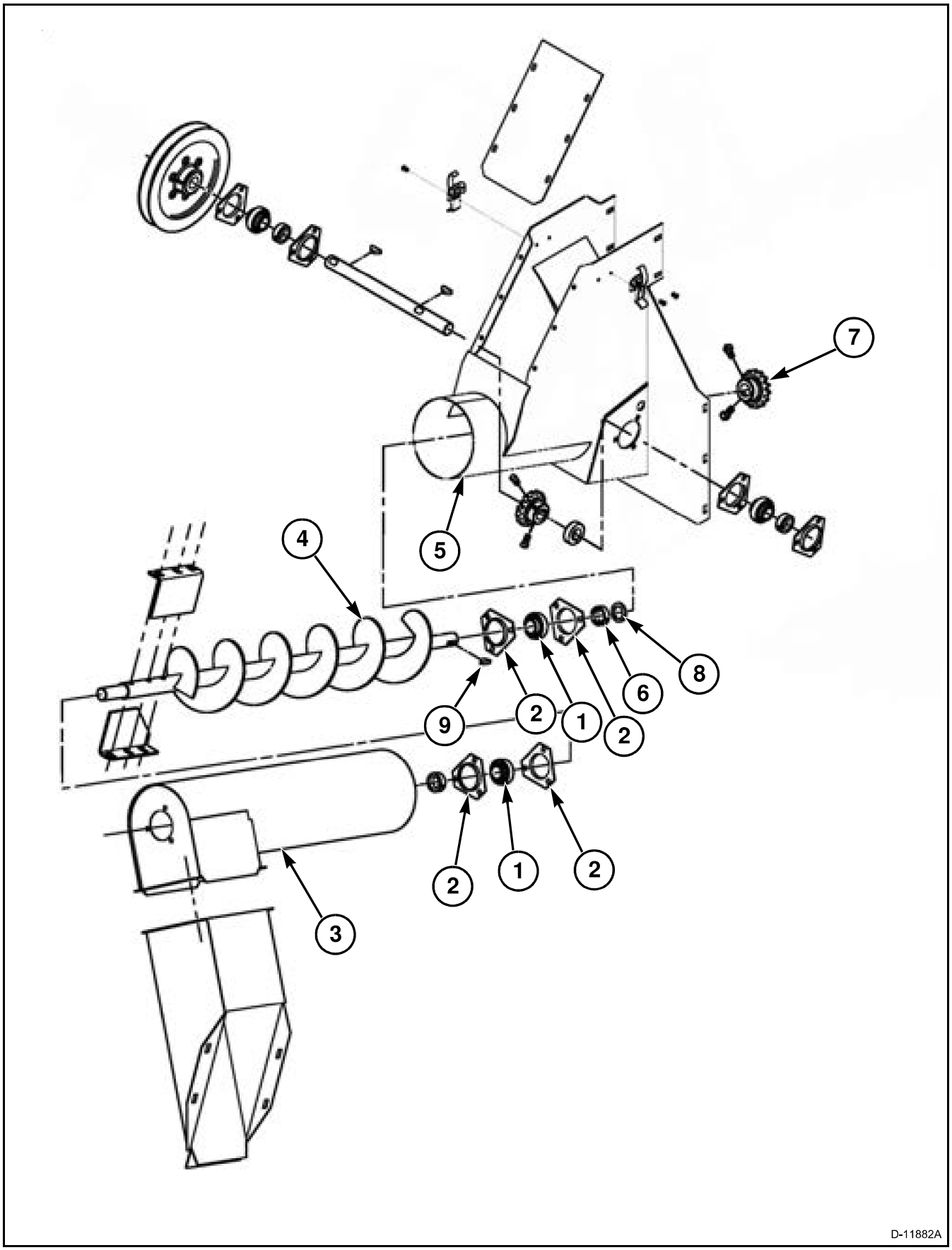


FIG. 1197

FIG. 1267: Loosen the nuts on the dampener rod (1) to release compression on the rubber bushing. Remove the cotter pin and washer fastening the dampener rod to the idler arm assembly.

Release the tension on the unloader drive belt (2) on the left-hand side of the machine using the draw bolt (3) and turning counterclockwise. Remove the drive belt from the idler and driven sheaves and leave the drive belt on the main drive sheave.

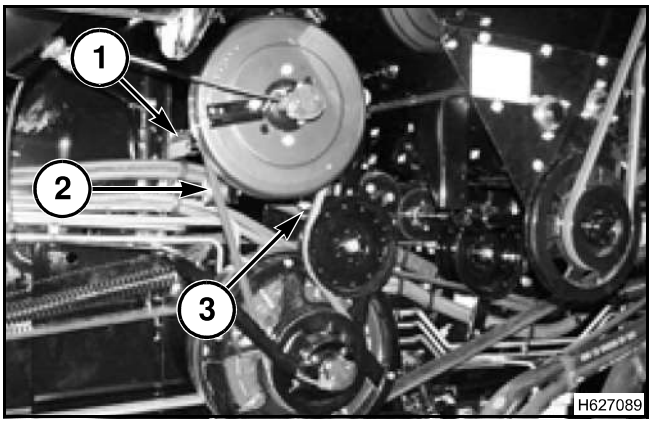


FIG. 1267

FIG. 1268: Remove the capscrews with lock washers fastening the clutch magnet (8) to the clutch hub (6) and remove the clutch magnet from the hub.

NOTE: Magnet and hub can be removed as a unit.

Loosen the setscrews in the clutch hub and remove the hub and Woodruff key from the left-hand end of the unloader shaft (1).

Remove the capscrews with lock washers fastening the armature assembly (4) to the sheave assembly (2) and remove the armature from the sheave.

NOTE: Armature and sheave can be removed as a unit.

Remove the outer shims (7) taking note of the number of shims in the stack.

NOTE: Fasten the outer shims together and label as outer shims for use during assembly.

Slide the sheave assembly (2) with bearings from the left-hand end of the unloader shaft.

Remove the inner shim stack (9) taking note of the number of shims in the stack.

NOTE: Fasten the inner shims together and label as inner shims for use during assembly.

Loosen the set screw in the locking collar and rotate the collar in the opposite direction of shaft rotation to unlock. Remove the carriage bolts, lock washers, and nuts fastening the bearing flanges and remove the bearing with locking collar from the left-hand end of the unloader shaft (1).

To continue for complete unloader drive shaft removal, remove the right-hand bearing assembly as shown under RIGHT-HAND BEARING REPLACEMENT… REMOVAL in this section of the manual.

Loosen the two capscrews in the wooden bearing blocks (3) and the two capscrews fastening the wood bearing bracket, (5). Remove the unloader shaft from either the right-hand or left-hand side of the machine.

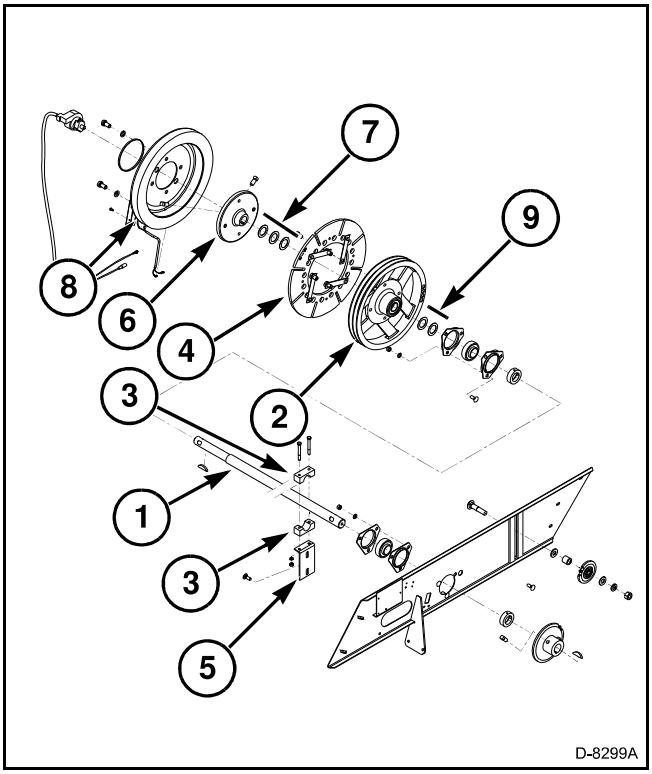


FIG. 1268

FIG. 1336: Fasten the lower cylinder end (3) to the unloader outer elbow assembly (4).

Install the castle nut (1) onto the socket assembly and torque to 150 Nm (110 lbf ft). Swivel the unloading auger in and out several times and torque the nut again. Tighten more if necessary to install a new cotter pin (2).

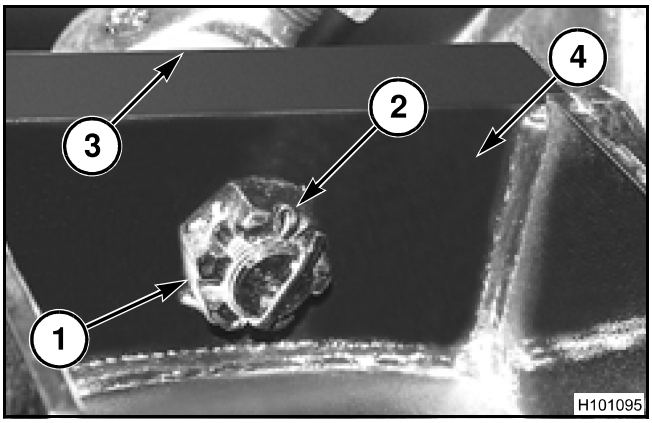


FIG. 1336

FIG. 1337: Install the unloader auger tube and auger as shown in UNLOADER AUGER TUBE in this section of the manual.

FIG. 1337

FIG. 67: Remove the snap rings (1) from all four bearing caps in the U-joint you are servicing.

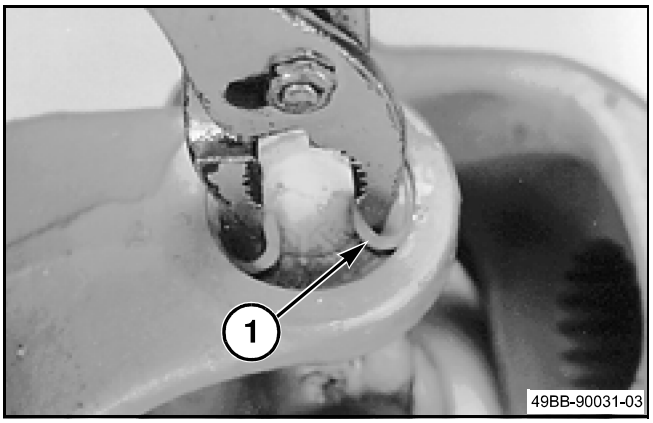


FIG. 67

FIG. 68: Use a suitable fixture to support the yoke (1). Press the yoke (2) down onto the cross as far as possible to drive the upper bearing cap part of the way out of the yoke (2).

Put the yoke (1) in the press so the other bearing cap in the yoke (2) is up. Press the yoke (2) down onto the cross as far as possible to drive the other bearing cap part of the way out of the yoke (2).

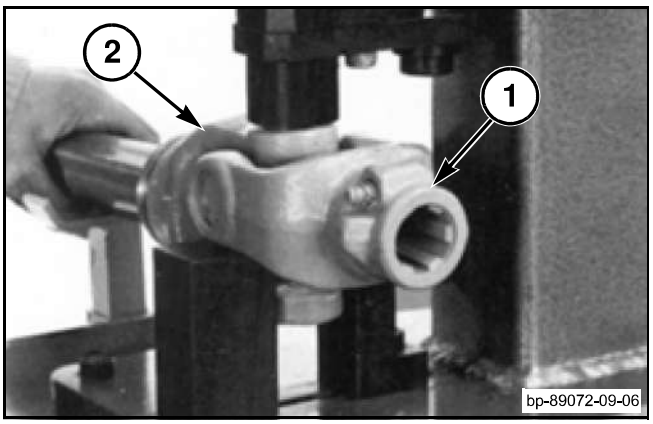


FIG. 68

FIG. 69: Fasten one of the bearing caps in a vise.

NOTE: Be sure the jaws of the vise are as close to the yoke as possible from which the bearing cap is being removed.

Hit the yoke to drive the joke up off of the bearing cap. Do not remove the other bearing cap from the yoke at this time.

NOTE: When hitting a yoke, never hit the area around the hole for the bearing cap. Distortion of the hole will make removal of the bearing cap difficult.

FIG. 69

FIG. 70: Remove the yoke from the cross.

FIG. 70

NOTES

DISCHARGE IMPELLER

Removal

FIG. 249: Remove the drive belt tension following the procedure found in Removal, Drive Belt section and remove the drive belt from the driven sheave.

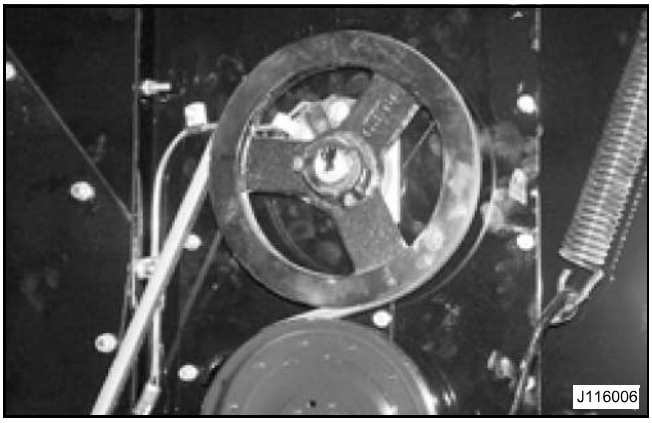


FIG. 249

FIG. 250: Loosen the two square head set screws (1) in the hub (2) of the driven sheave.

NOTE: The threads of the setscrews have been locked with medium strength thread locker.

Using a suitable puller, remove the driven sheave from the shaft of the discharge impeller.

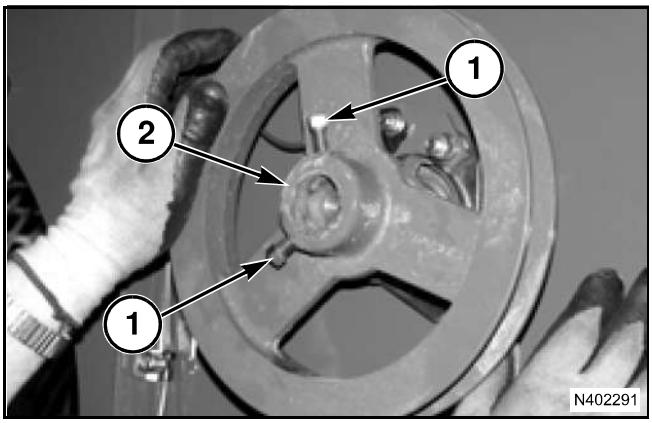


FIG. 250

FIG. 251: Remove the woodruff key (1) from the left end of the impeller shaft.

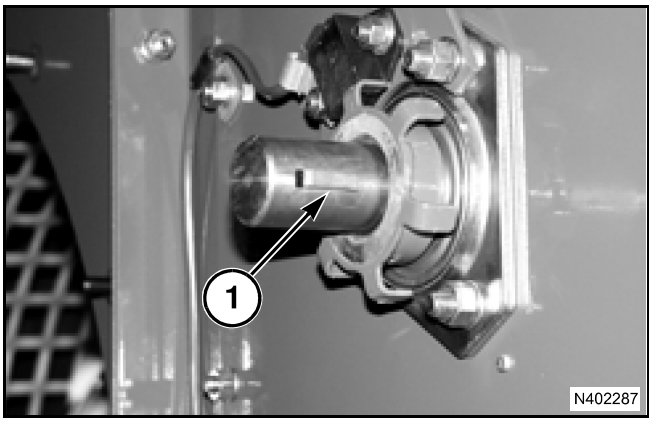


FIG. 251

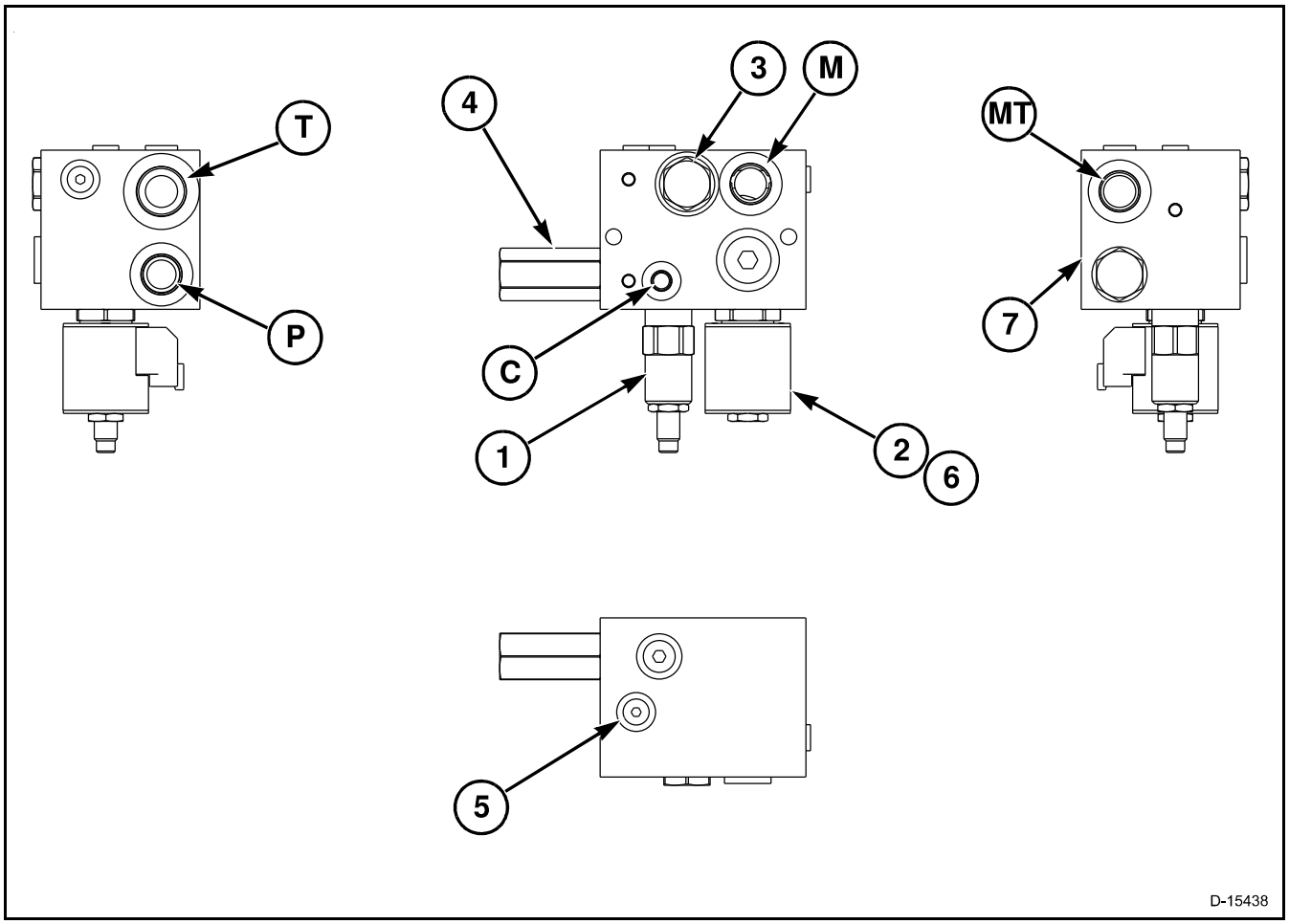


FIG. 322

FIG. 322: Valve Body Porting and Callouts.

(1) Relief Valve

(2) PWM Proportional Flow Control

(3) Check Valve - Motor Pressure Circuit (M)

(4) Compensator Spring

(5) Orifice Plug

(6) 12 VDC Dual Spade Coil

(7) Valve Body (Serviced as an Assembly)

(P) Pressure

(T) Reservoir

(C) Motor Case Drain

(MT) Motor Return

(M) Motor Pressure

FIG. 396: Place the support housing and motor assembly onto the under side of the spreader housing. Insert the four hex head cap screws from the top of the spreader housing. Install the four hex lock nuts (1) securing the hydraulic motor (2) and the support housing assembly (3) for the spreader disc. Tighten the hex lock nuts securely.

Repeat the procedure for the opposite side.

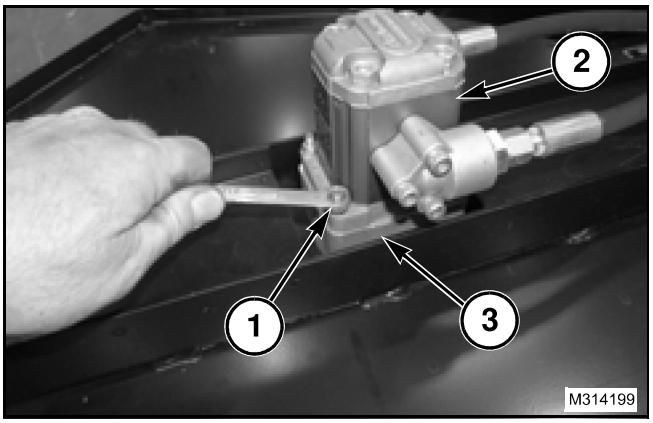


FIG. 396

FIG. 397: Install the parallel key (3) into the shaft (4) of the support block.

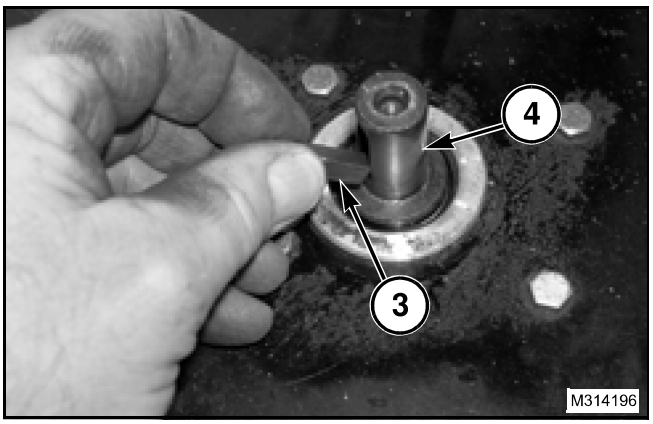


FIG. 397

FIG. 398: Place the hub (2) onto the shaft of the support block. Install the hex head cap screw, a lock washer, and a special flat washer (1) securing the hub to the shaft. Tighten the hex head cap screw securely.

Repeat the procedure for the opposite side.

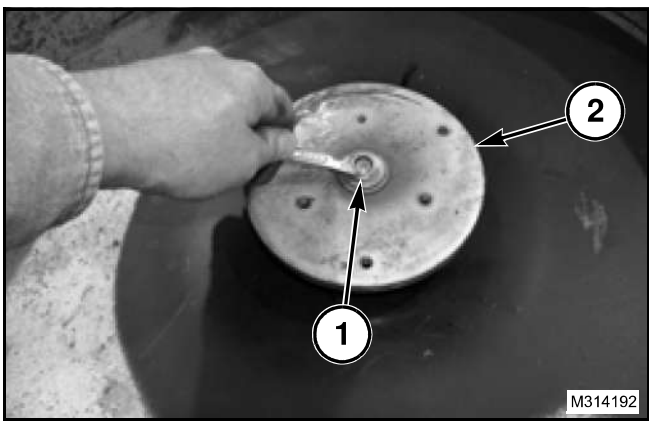


FIG. 398

FIG. 399: Position the spreader disc with the break in the trailing edge (1) facing the bottom of the spreader housing.

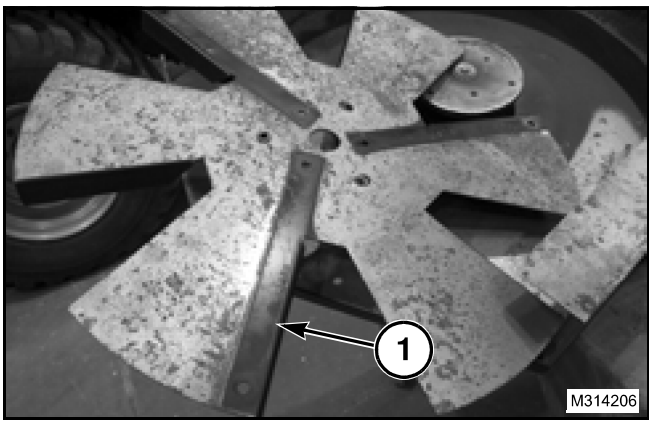


FIG. 399

AXLE ASSEMBLY AND INSTALLATION

Spindle Bushing Installation

FIG. 48: Position the spacer (4) so that the gap aligns with the lube fitting passage in the extension housing (2). Press the spacer to the center of the bore of the spindle housing in the extension assembly (1).

IMPORTANT: Be sure that the grease fitting and passage in the housing accept grease.

Position the bushings (3) into the bore so that the open end of the grease groove is toward the center of the housing as shown.

Press the bushings until flush with the bore of the spindle housing (2).

Repeat procedure for opposite side.

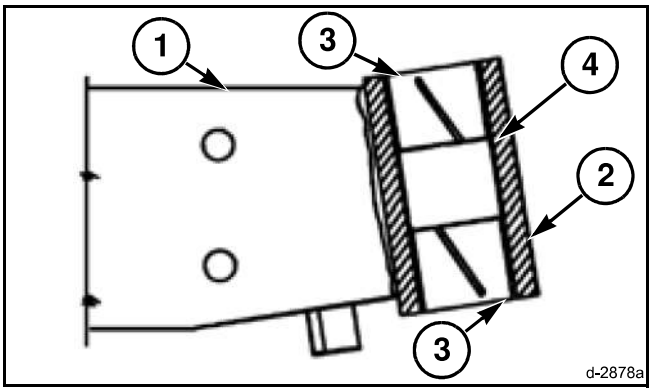


FIG. 48

Spindle Installation

FIG. 49: Right-Hand - Apply a light coating of grease to the spindle shaft (2) and the two thrust washers (14). Install the two thrust washers onto the spindle shaft.

IMPORTANT: Select the axle extension that puts the steering arm stop bolt in the end of the extension to the front when mounted in the machine.

Install the spindle assembly up into spindle housing of the axle extension assembly (1).

Install spindle retaining washer (11) with a capscrew and lock washer (10). Tighten the capscrew securely.

Lubricate the spindle housing until grease shows at the retaining washer and the thrust washers.

Repeat the procedure for the **left-hand side.**

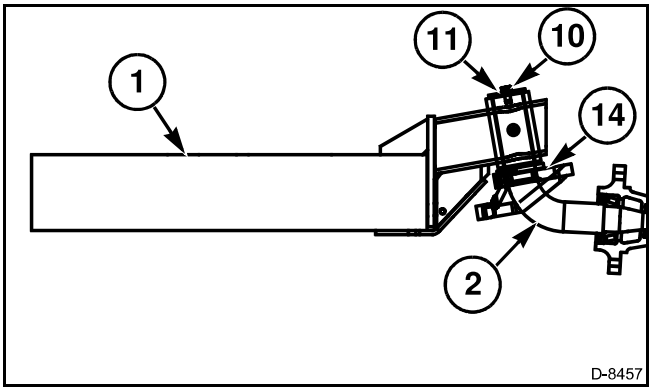


FIG. 49

FIG. 50: Position the axle center section weldment (17) with the pivot pin facing forward when the center section is put in the machine.

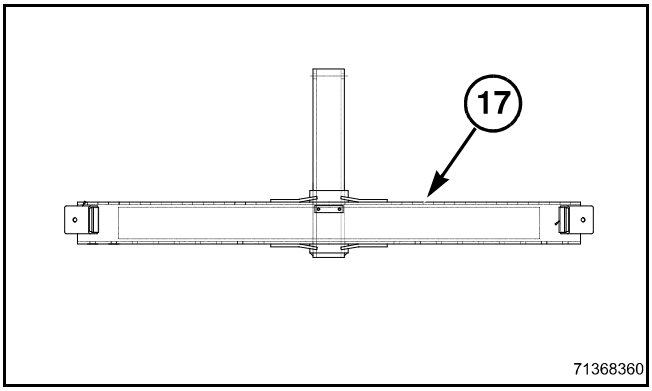


FIG. 50

FIG. 98: Steering cylinder hoses and wheel motor hoses have been furnished with an adequate length to accommodate the widest tread setting.

As the extensions are moved outward, the hoses gathered at the center of the axle allow the hoses to be uncoiled.

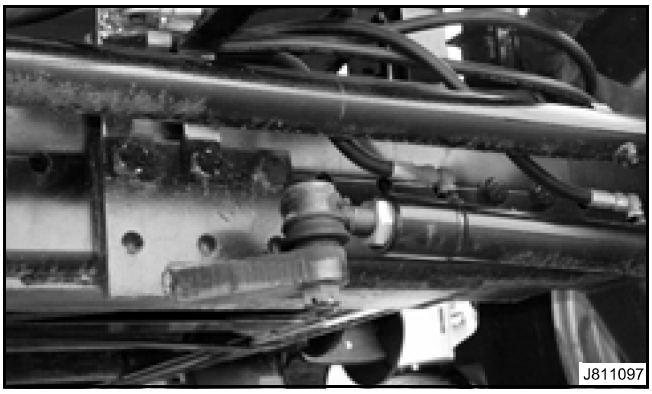


FIG. 98

FIG. 99: If the unit is equipped with Auto Guide 2, disconnect the harness (1) to the sensor.

Remove the hex nut, lockwasher, and ball joint end (2) from the sensor arm (3).

NOTE: Remove the sensor mount (4) when removing the right-hand steering cylinder anchor (5).

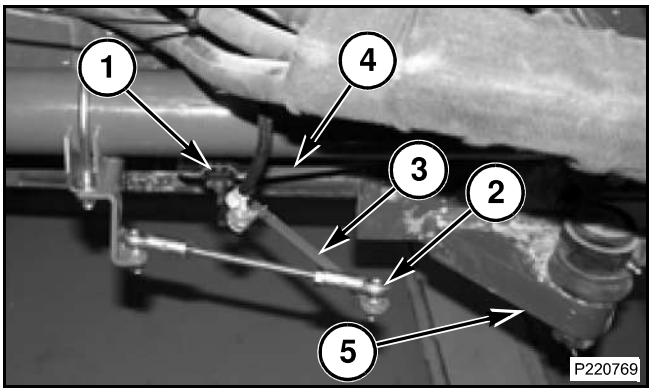


FIG. 99

FIG. 100: Right-Hand - Remove the two capscrews, two clamp washers, two spacers and the lock nuts (1) locking the adjustable link rod (2) in the outer tie rod tube (3).

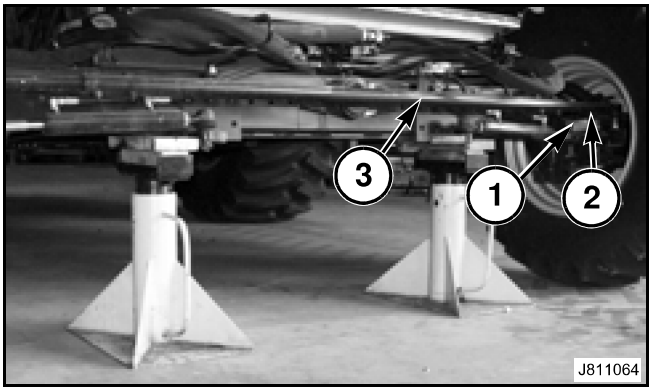


FIG. 100

FIG. 101: Right-Hand - Remove the three hex lock nuts, hardened spacers, and the cap screws (1) securing Right Hand cylinder anchor bracket (2), support bracket (3) for the steering hose bulk head fittings, and motor supply hose support/guide (4). Carefully lower the bracket and cylinder until weight is carried by outer socket assembly.

Remove the two remaining hex flange serrated lock nuts, hardened spacers, and the capscrews (5) from the rear side of the axle center section retaining the axle extension.

The axle extension and adjustable link rod can now be moved at three inch increments to get the desired tread width.

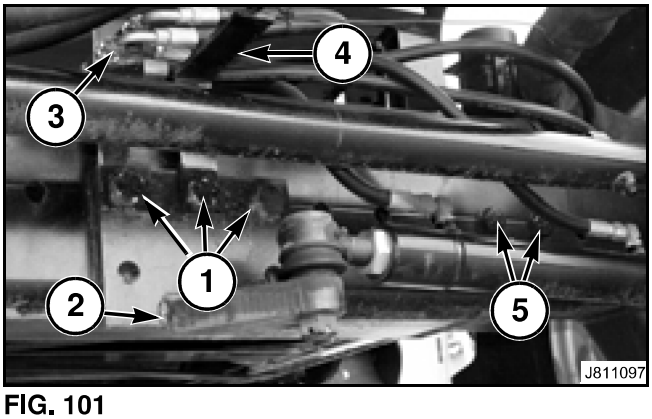


FIG. 101

FIG. 156: Remove the nut and disconnect the electrical circuit (1) from the solenoid (2) on the Equa-Trac II valve (3). Check and remove any wire ties that may be locating the wire on any of the axle components to be removed. Lay the wire out of the work area.

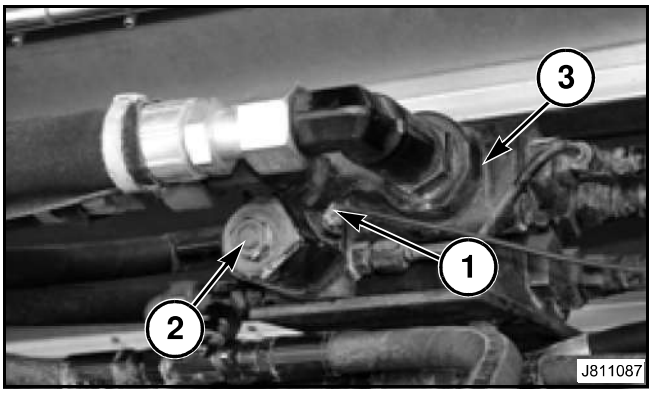


FIG. 156

FIG. 157: Identify the valve assembly supply hoses, reverse (1) and forward (2), and disconnect the hoses from the valve. The supply hoses will be removed from hose locators/guides as the axle is removed from the machine.

IMPORTANT: Cleanliness is essential when installing or servicing hydraulic components. When disconnecting hydraulic components, the area surrounding the connections should be steam cleaned or washed with solvent so that contamination will not enter the system. Always keep hoses, connections, and ports suitably capped or covered to keep contamination out of the system.

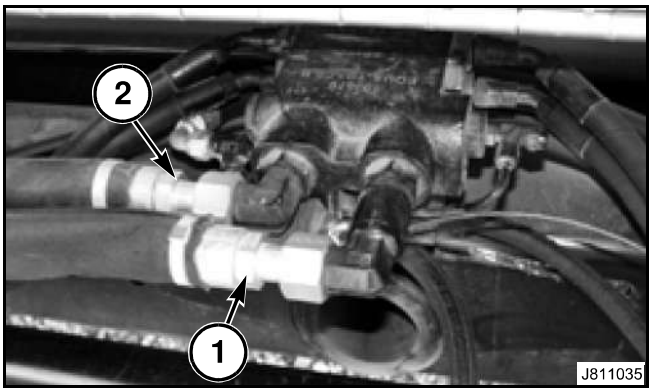


FIG. 157

FIG. 158: Locate the case drain to reservoir hose (1) and disconnect the hose from the valve. Remove the hose from the hose locator/guide and the work area.

NOTE: The hose will drain the hydraulic reservoir and must be capped.

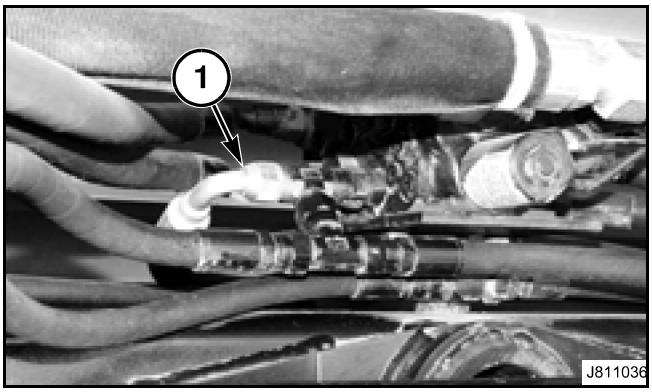


FIG. 158

FIG. 159: Locate the cooler to the motor flush line hose (1) at the hydro return filter. Disconnect the hose from the tee and remove the hose with the axle and valve assembly.

NOTE: The hose will drain the oil cooler when removed and the special tee must be capped.

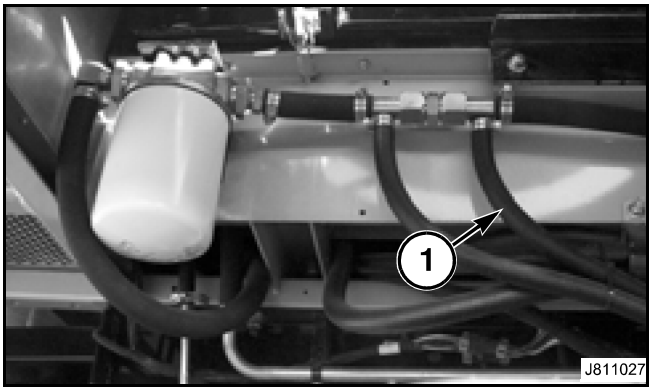


FIG. 159

FIG. 233: Put the snap ring retainer (1) on top of the snap ring spacer (2) as shown so that the retainer surrounds the snap ring. If the retainer does not easily fit around the snap ring, the snap ring is not properly seated.

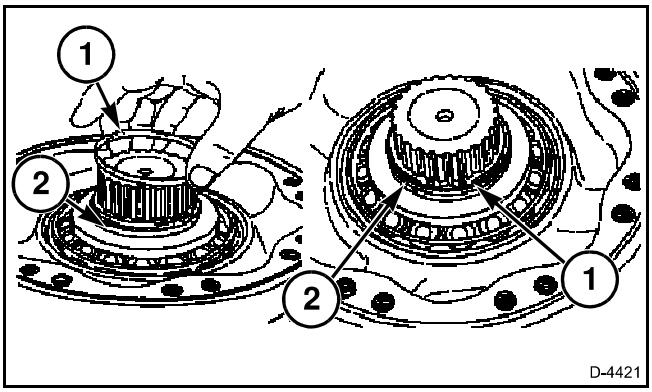


FIG. 233

Installation Of Cam Ring (O-Ring) Seals

FIG. 234: Apply a small amount of petroleum jelly or grease at several locations in the O-ring groove of the bearing support housing (1). Install the new O-ring seal into the groove as shown. Lightly coat the exposed surface of the O-ring with clean hydraulic oil to promote proper sealing.

Apply a small amount of petroleum jelly or grease at several locations in the O-ring groove of the distribution cover (2). Install the new O-ring seal (3) into the groove and lightly coat the O-ring with clean hydraulic oil.

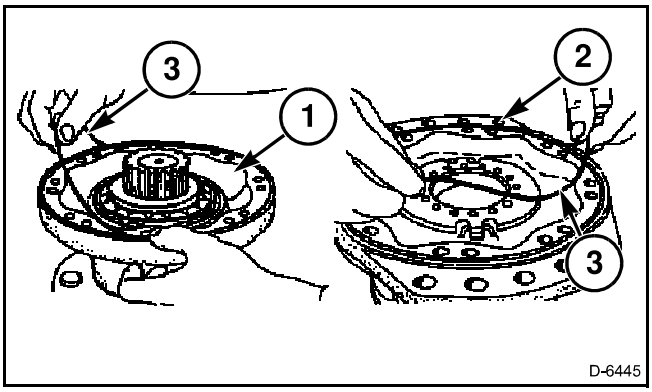


FIG. 234

FIG. 14: Attach the dampener rod (1) to the idler arm assembly using a plain washer and a cotter pin.

Compress the damper rubber bushing (2) to a total length (A) of 60 mm (2.4 in) with the nut (3) and tighten the jam nut.

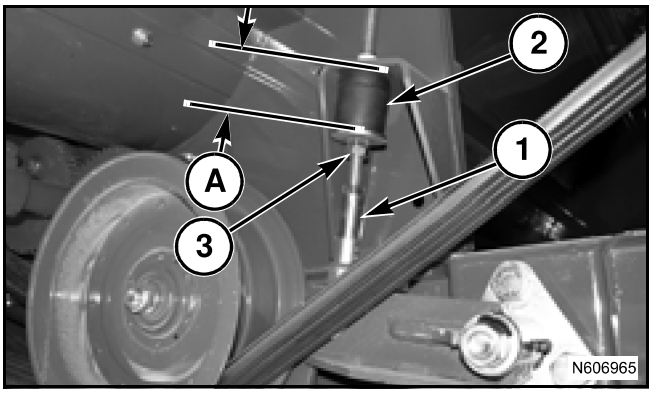


FIG. 14

FIG. 15: Using the jam nuts (1), adjust the belt guides (2) so there is 2 mm (0.08 inch) between each side of the belt and the belt guide.

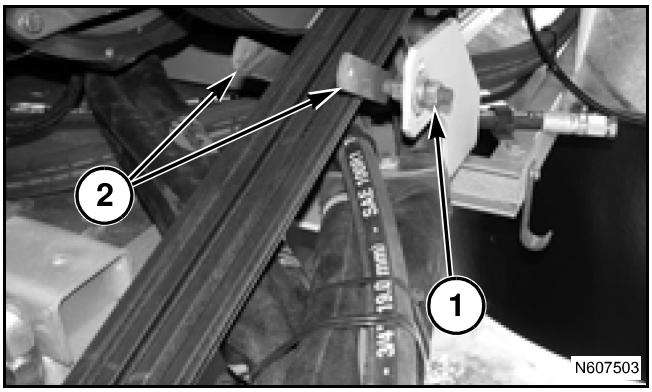


FIG. 15

FIG. 16: Install the bin unloader countershaft drive belt (1) following the procedure found in the Material Handling division, Swivel Unloading Auger, Drive Belt - Bin Unloader Countershaft.

Close all shields.

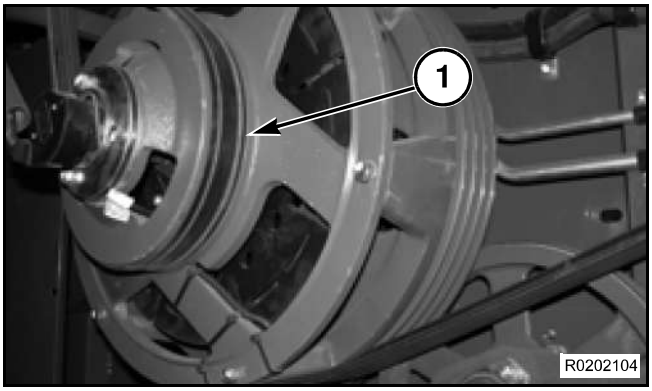


FIG. 16

VARIABLE SPEED CYLINDER DRIVE

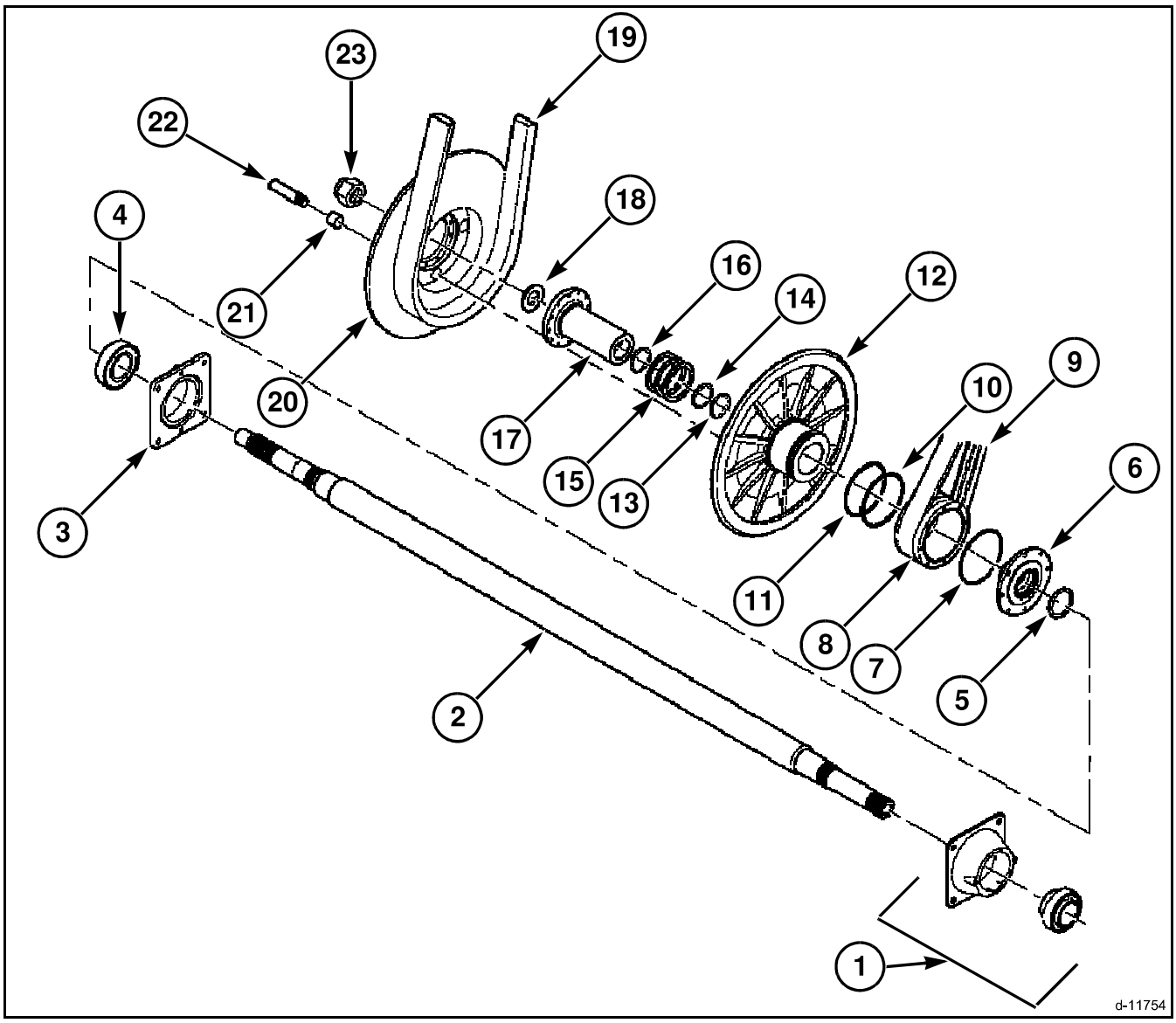


FIG. 104

FIG. 104: Disassembled view of the right-hand drive (Variable Speed Cylinder) and main shaft.

1. Left-hand Housing and Bearing Assembly
2. Main Clutch Shaft
3. Right-hand Bearing Housing
4. Bearing
5. O-ring
6. Separator Drive Sheave Hub
7. O-ring
8. Separator Drive Sheave
9. Separator Drive Belt
10. O-ring
11. Back Up Ring
12. Clutch Shaft Right-hand Inner Sheave
13. O-ring
14. Back Up Ring
15. Shim (As Required)
16. O-ring
17. Tube with Hub
18. Washer
19. Variable Speed Cylinder Drive Belt
20. Outer Sheave Assembly
21. Bushing
22. Stud
23. Heavy Jam Nylon Lock Nut

FIG. 193: Locate the inner cam cover (1) on the actuator cam (2).

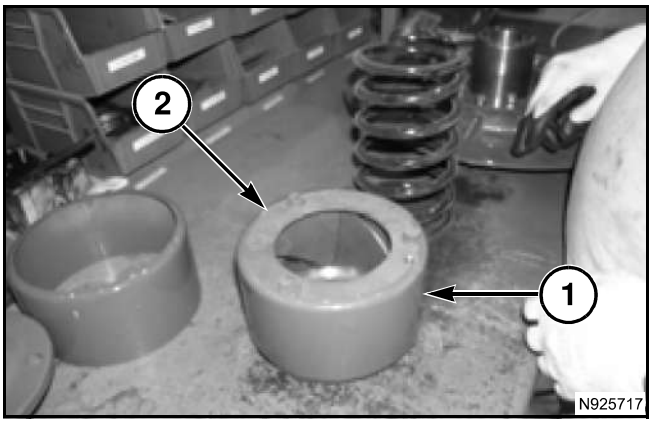


FIG. 193

FIG. 194: Locate the inner cam cover (1) and actuator cam (2) on the sliding hub. Make sure the drive lugs on the cam actuator fit properly in the sliding hub.

IMPORTANT: Make sure the inner cam cover does not catch on these drive lugs when the cam actuator is installed in the cover.

Generously grease the contact surface of the actuator cam.

Apply a layer of grease to the overlapping end of the inner cam cover to provide a dust seal after assembly.

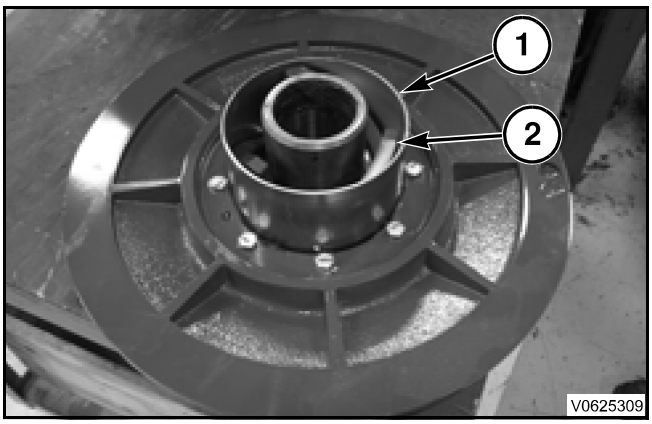


FIG. 194

FIG. 195: Generously lubricate the thrust washers and thrust bearing.

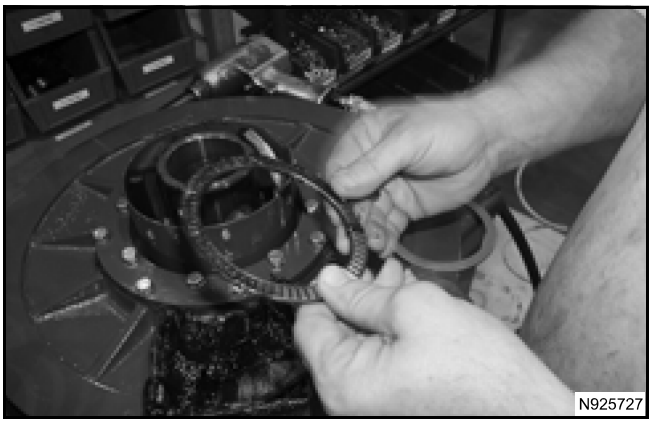


FIG. 195

FIG. 196: Locate the thrust washers and thrust bearing (1) on the tube of the inner sheave drive hub. Slide the thrust washers and thrust bearing down on the inner sheave drive hub toward the outer sheave half.

NOTE: Thrust races are stamped out and have one side with curved edges and one side with sharp edges. The sharp edges of the thrust races must face away from the thrust bearing which is located between the thrust races.

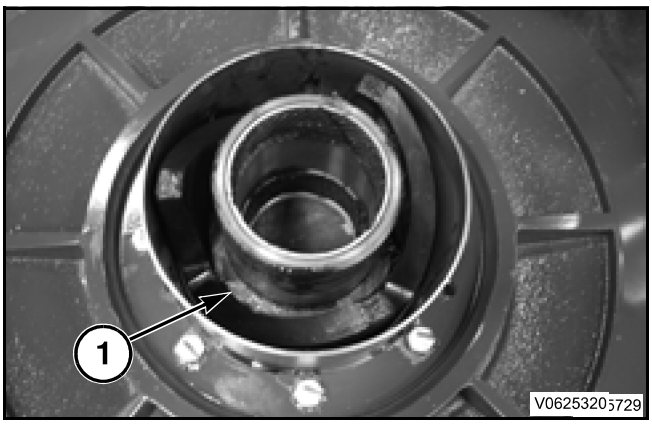


FIG. 196

Removal

FIG. 288: To access the stone trap door assembly open the transverse fan leaf screen (1).

Pull the release handle. The doors will open rapidly and automatically.

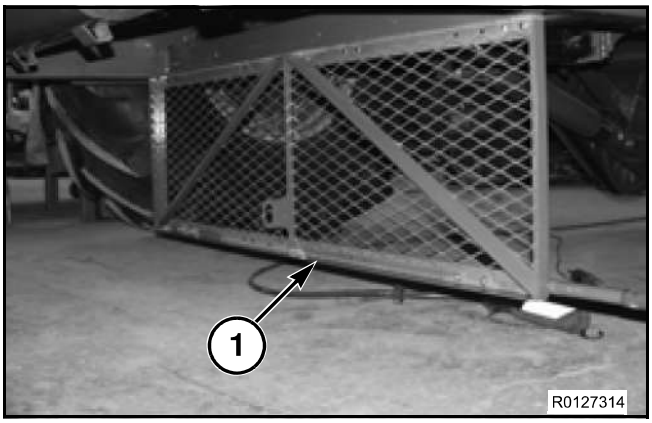


FIG. 288

FIG. 289: Empty the grain bin to uncover the right-hand separator cage access door (1). Open the door to access the left-hand stone trap door pivot shaft.

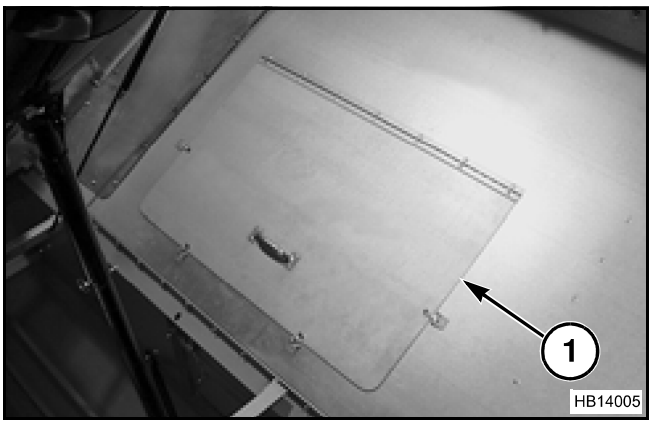


FIG. 289

FIG. 290: Remove the capscrew (1), three narrow plain washers, lock washer, and a nut (2) securing the actuating rod (3) to the upper stone trap arm (4).

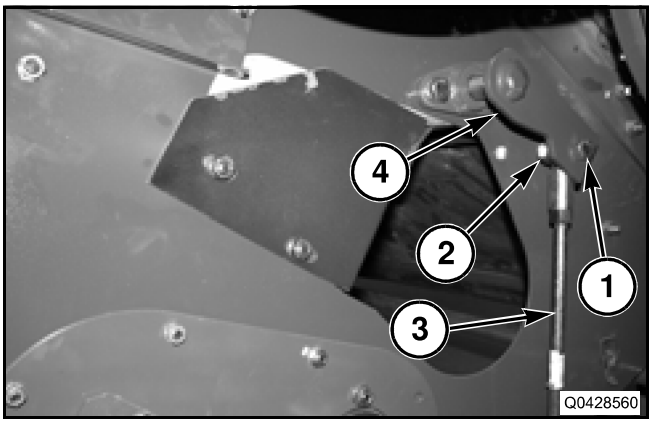


FIG. 290

FIG. 370: Remove the capscrews and hex lock nuts (1) securing the conveyor side cover (2) to the conveyor back cover (3).

Remove the conveyor side cover from the processor housing.

Remove the capscrew and hex lock nut (4) securing the back cover to the cage support (5).

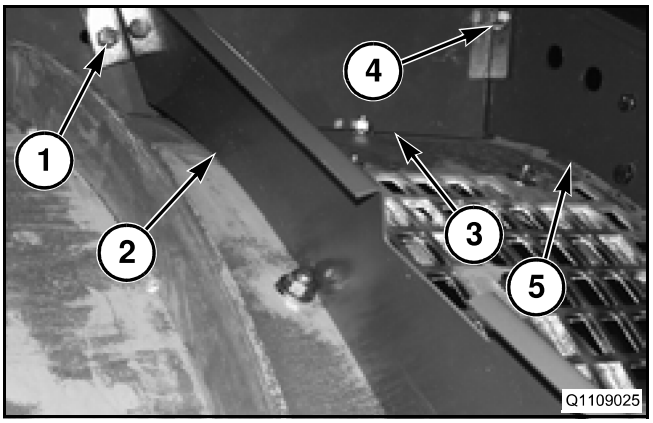


FIG. 370

FIG. 371: Remove the capscrews, flat washers, lock washers, and hex nuts (1) securing the conveyor back cover (2).

Remove the conveyor back cover from the processor housing.

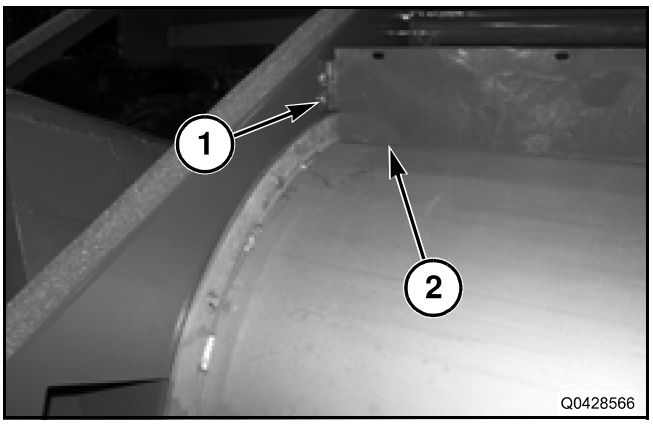


FIG. 371

FIG. 372: Remove the capscrews, lock washers, and hex nuts (1) securing the cage support (2) to the processor housing.

Remove the cage support from the processor housing.

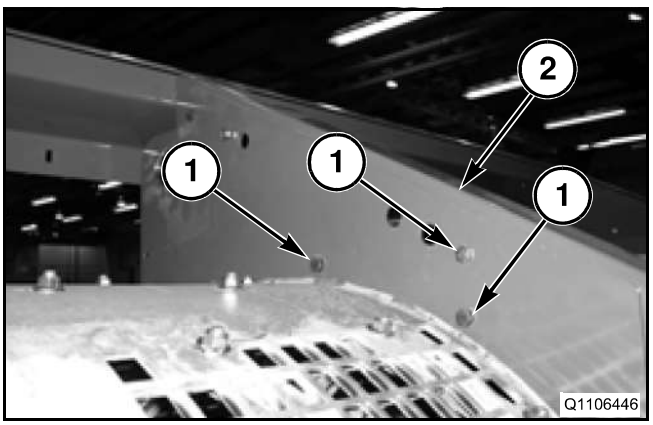


FIG. 372

FIG. 373: Support the thresher cage by locating forklift tines or boom inside of the cage. Use a chain to fasten the top of the cage to the tines or boom.

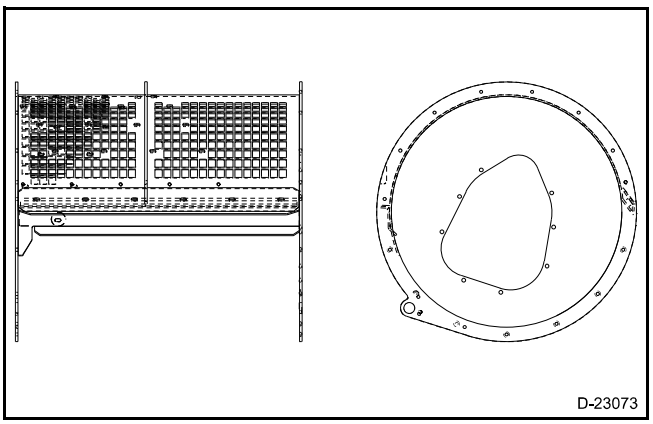


FIG. 373

FIG. 452: On the right-hand side of the machine install the separator drive belt (1) over the rear accelerator roll sheave (2).

Adjust the upper drawbolt of the separator drive idler to provide 25 mm (0.98 in), (A), clearance between the end of the spring plug and inside of the idler bracket.

Adjust the lower drawbolt of the separator drive idler to provide 249 mm (9.8 in), (B), clearance between the end of the spring plug and the inside of the mounting bracket.

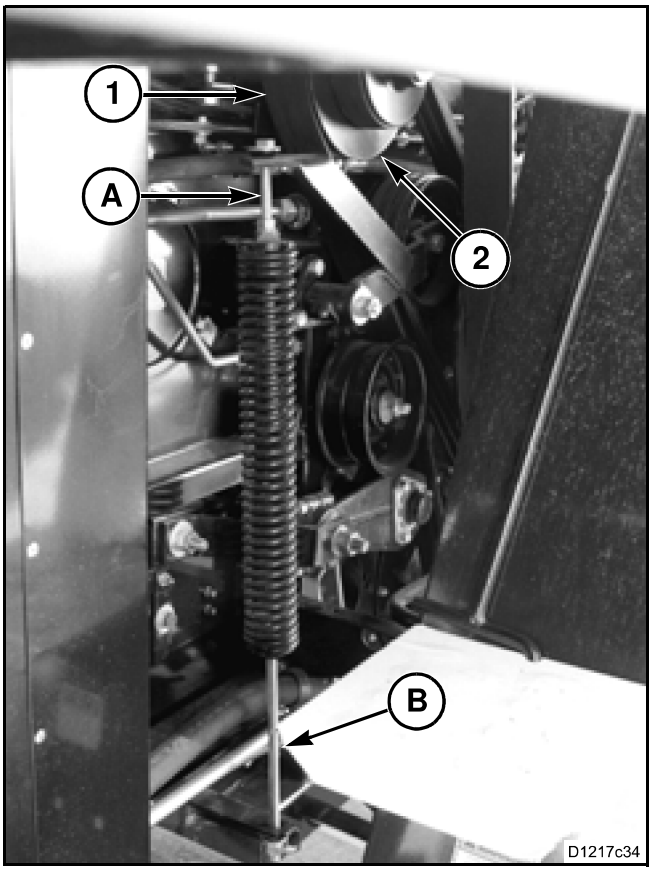


FIG. 452

FIG. 453: On the right-hand side of the machine install the elevator jackshaft drive belt (1) over the accelerator roll sheave (2).

Adjust the draw bolt of the jackshaft drive idler to 25.4 mm (1.0 in), (A), clearance between the end of the spring plug and the inside of the upper idler bracket.

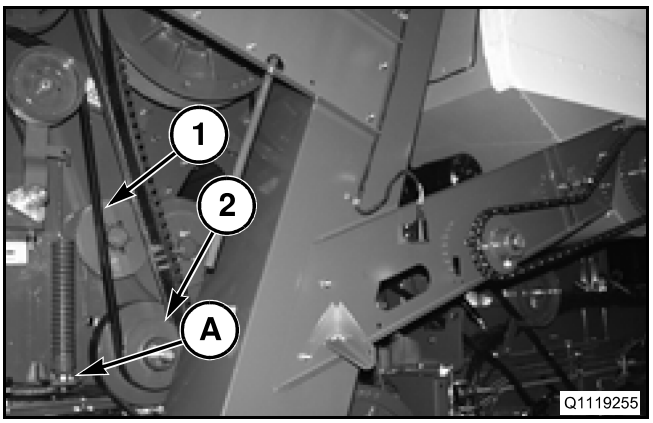


FIG. 453

FIG. 454: Install all access covers and shields that were removed.

CAUTION: Install shields and access doors before operating the machine.

FIG. 454

Fan Installation

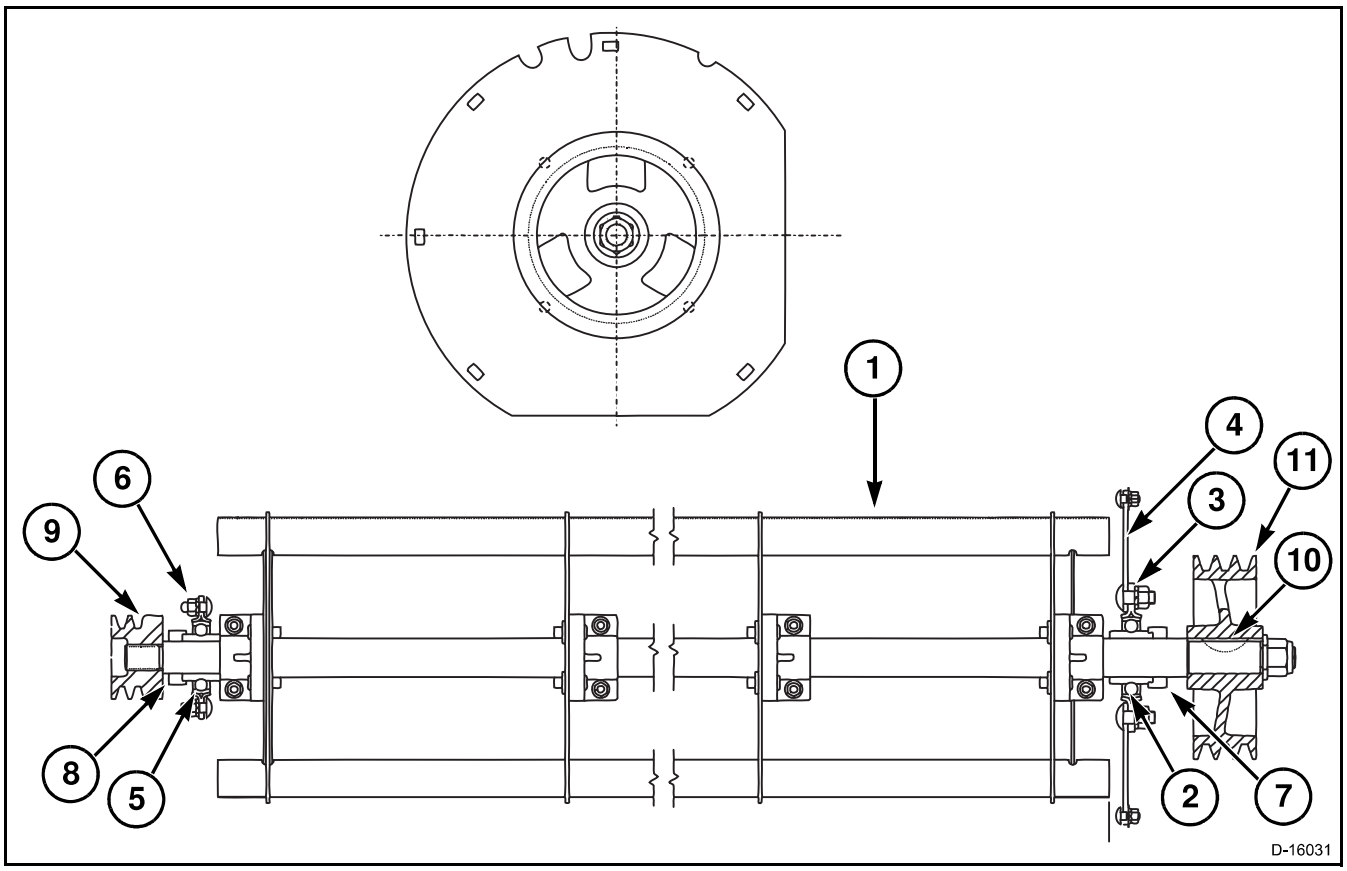


FIG. 535

FIG. 535: Place the fan assembly (1) into separator housing from the right-hand side of the machine.

IMPORTANT: Be very careful, Do Not damage the fan.

Install the right-hand bearing (2) with the locking collar flange outward, and the flanges (3) onto the fan cover plate (4). Loosely install four carriage bolts, lock washers, and nuts.

Slide the end cover with the bearing assembly facing outward over the right-hand end of the fan shaft. Secure the cover to the separator housing with six nuts, lock washers, and four plain washers. Tighten the hex nuts.

Slide the bearing (5), with locking collar flange outward, and flanges (6) onto the left-hand end of the fan shaft. Loosely install the bearing assembly to the separator housing using three carriage bolts, nuts and lock washers.

Turn the fan assembly a few revolutions by hand to align the bearings in the flanges. Tighten the right-hand and left -hand flange attaching bolts.

Locate the fan by sliding the fan assembly to the left until the shaft shoulder is against the inner race of the left-hand bearing.

With the fan assembly located against the left-hand bearing, install the right-hand and left-hand bearing locking collars. Tighten the collars in direction of shaft rotation. Tighten the set screws in the collars.

Thread the shoe eccentric drive sheave (9) onto the left-hand end of the fan shaft. Turn the sheave clockwise and tighten against the shoulder on the shaft.

Install the Woodruff key (10) into the right-hand end of the shaft. Install the drive sheave (11) onto the shaft. Locate the sheave against shoulder on the shaft. Secure the sheave with a lock nut and hardened washer. Tighten to 230 Nm (170 lbf ft).

Check the sheave alignments for the shoe and fan drive. Align the sheaves if necessary.

FIG. 592: Remove the pin (2) from the left-hand side of the chaff spreader (1). Swing the chaff spreader to the maintenance position.

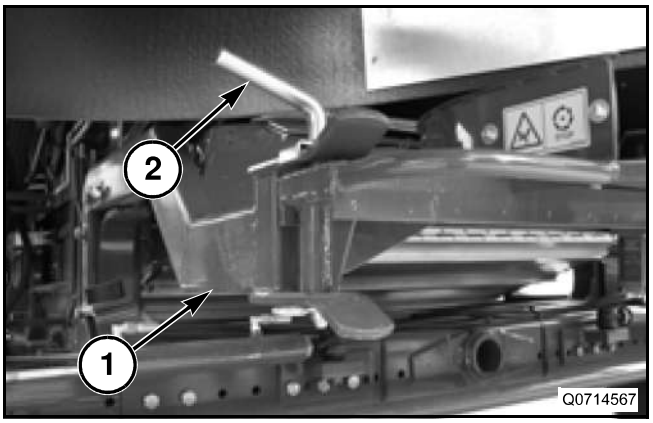


FIG. 592

FIG. 593: Remove the spreader shield curtain group from the machine.

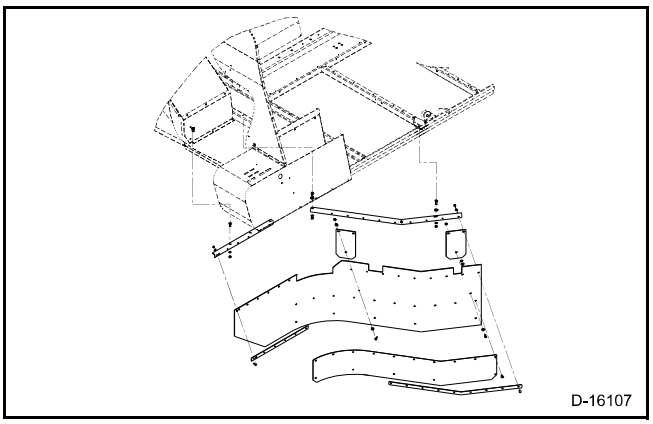


FIG. 593

FIG. 594: Remove the two capscrews, plain washers, and jam nuts (3) securing the spreader hub (1). Remove the spreader rotor (2) from the machine.

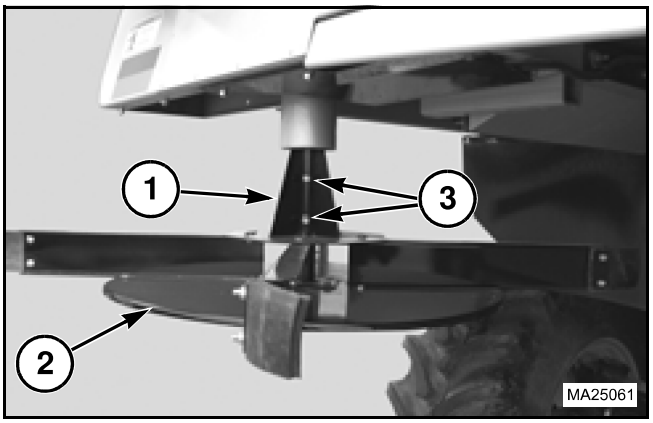


FIG. 594

FIG. 595: Disconnect the shoe magnetic pickup on the right-hand side of the machine. Remove the hardware securing the speed pickup bracket (1). Remove the bracket from the work area.

Loosen only the regular hex nut (2) on right-hand side securing the front chaffer rod to relieve the clamping force on the chaffer assembly. The left-hand end of the chaffer rod uses a self locking nut. Do not remove the nut.

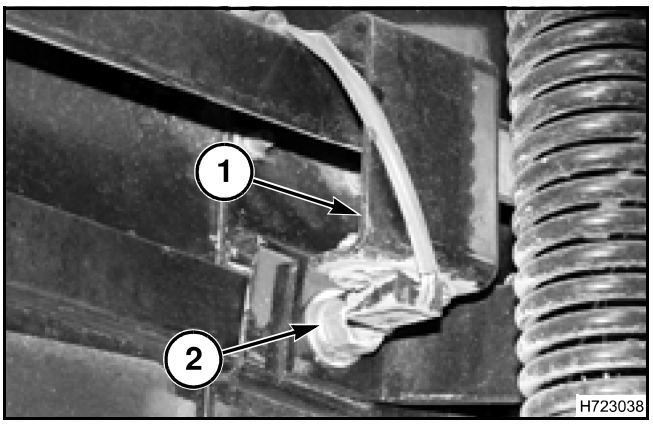


FIG. 595

Basic Operating Principles

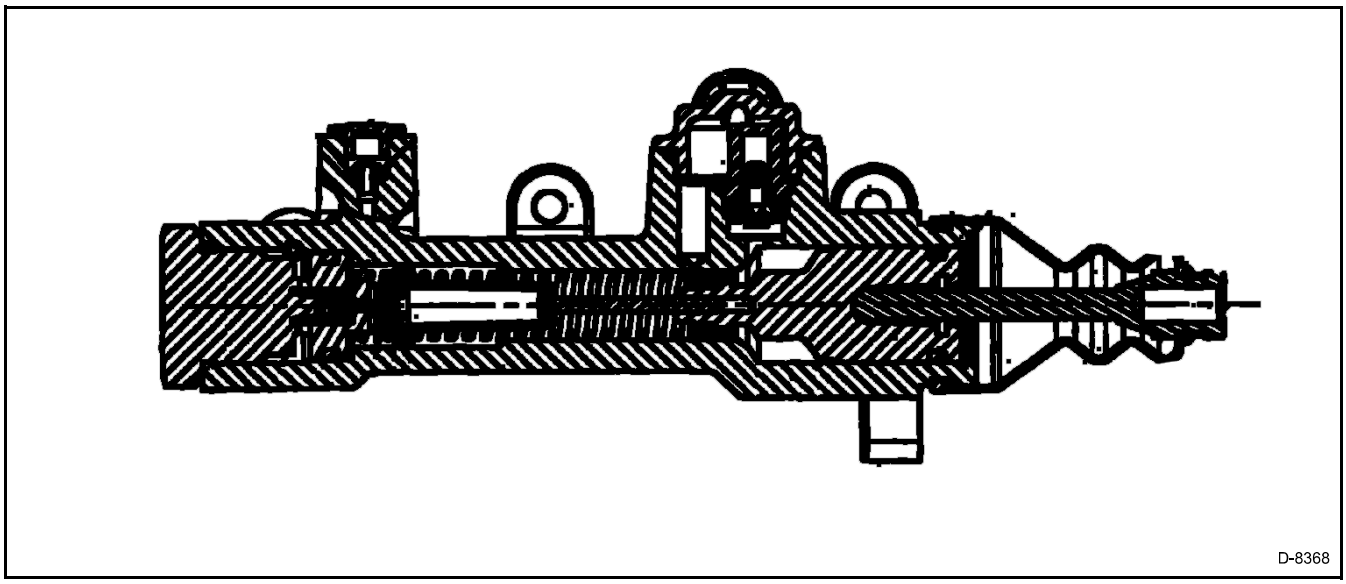


FIG. 4

FIG. 4: The hydraulic braking system operates as follows:

When not being used, the complete system, from the pistons in the master cylinder to the pistons in the wheel cylinders, is full of brake fluid. During an application of the brake pedal, fluid in front of the master cylinder piston is forced through the lines to the wheel cylinders. Here, the fluid forces the wheel cylinder pistons outward. The motion of the pistons is opposed by return springs mounted outside of the cylinders.

When the brake pedal is released, a spring located inside the master cylinder immediately returns the master cylinder pistons to the released position. The pistons contain check valves and the master cylinder has compensating ports drilled into the brake valve body. The ports are available when the pistons reach the released position. The piston check valves permit fluid to flow toward the wheel cylinders as the pistons move. Then, as the return springs force the brake shoes into the released position, any extra fluid flows to the reservoir through the compensation ports. During the time that the pedal is in the released position, any fluid that has leaked out of the system will be replaced through the compensating ports.

If both brake pedals are applied at the same time, the design of the master cylinder supplies equal pressure in each side of the master cylinder. With this design the left-hand and the right-hand brakes, while independent from each other, are applied equally to make sure that there is equal braking force at each wheel.

The hydraulic brake system can be checked for leaks by applying pressure to the pedal gradually and constantly. If the pedal lowers very slowly to the floor, the system has a leak. A soft feel is caused by compression of air within the lines. If the system leaks, there will be a gradual change in the position of the pedal with constant pressure.

Check for leaks along all lines and for leaks at the wheel cylinders. If no external leaks are seen, the problem is inside the master cylinder.

Cleaning and Inspection of Parts

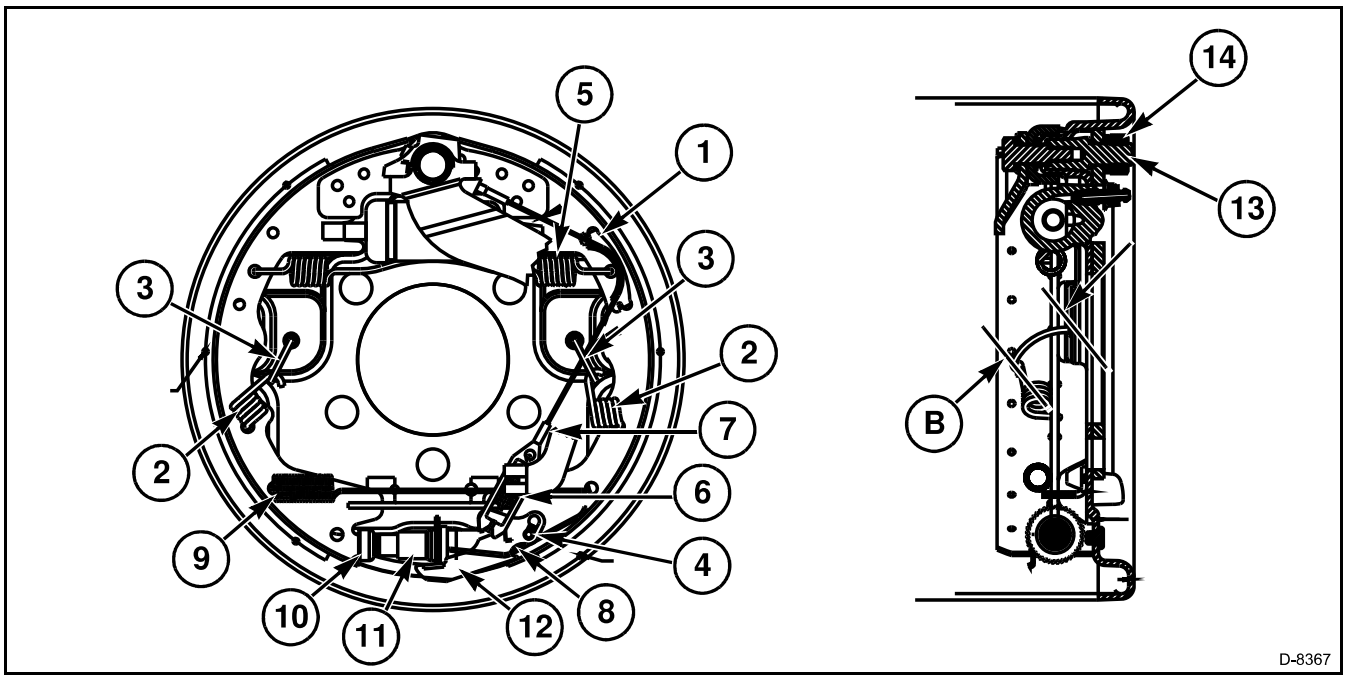


FIG. 81

FIG. 81: In addition to the shoe assemblies, other parts in the brake that are found to be bad, must also be replaced before the brake is assembled.

NOTE: If the linings have worn down to within 1.524 mm (0.060 in) of the shoe rim, the shoe and lining assembly must be replaced.

Brush dirt and lining dust from the backing plate and from the inside of the drum. Inspect the drums for scoring and cracks.

NOTE: If the drums are scored, turn the drums down to remove the score marks. The drum inside diameter must not be increased over 1.524 mm (0.060 in) from original diameter of 304.67 to 304.93 mm (11.995 to 12.005 in).

If the shoe and lining assemblies are not to be replaced, brush the dirt and lining dust from the shoes. Inspect the shoes to see if the linings are secure on the shoe rim and the web is not damaged at the anchor end of the shoes. On the secondary shoes, inspect the adjuster lever pin (4) to make sure the lever pin is fastened to the shoe web and is not bent. Also check the tabs on the cable guide (1) to make sure the guide is securely fastened to the shoe web.

Inspect the backing plate to make sure the anchor plug (13) is not loose in the formed anchor. Check the hex nut (14) to determine if this part is still tight on the anchor plug. Clean any rust from the shoe guide pads and add brake lubricant to the pads.

NOTE: Torque on the anchor bolt nut (14) is 113 to 136 Nm (1000 to 1200 lbf in).

Inspect the shoe hold down pins (3) for cracks or bending. The pin length (B) must be 34.8 mm (1.37 in).

Inspect the shoe to shoe springs (5) and (9) and the shoe hold down springs (2) for cracks or distortion.

Check the adjuster cable assembly (7) to make sure the end fittings are securely fastened to the cable. The over travel spring (6) must not be loose on the cable fitting.

Inspect the pivot screw (10) for damaged or rough threads. Clean the screw threads and add a light layer of graphite brake lubricant. Put a small amount of brake lubricant in the cup at the end of the pivot screw that contacts the brake shoe.

Check the adjusting nut (11) for worn, broken or bent teeth, and damaged or rough threads. Clean the screw threads and add a light layer of graphite brake lubricant. Put a small amount of brake lubricant in the cup at the end of the pivot screw that contacts the brake shoe.

The adjuster lever (12) must be flat with no signs of distortion. Inspect the adjuster lever spring (8) for cracks or distortion.

DISASSEMBLY OF FINAL DRIVE

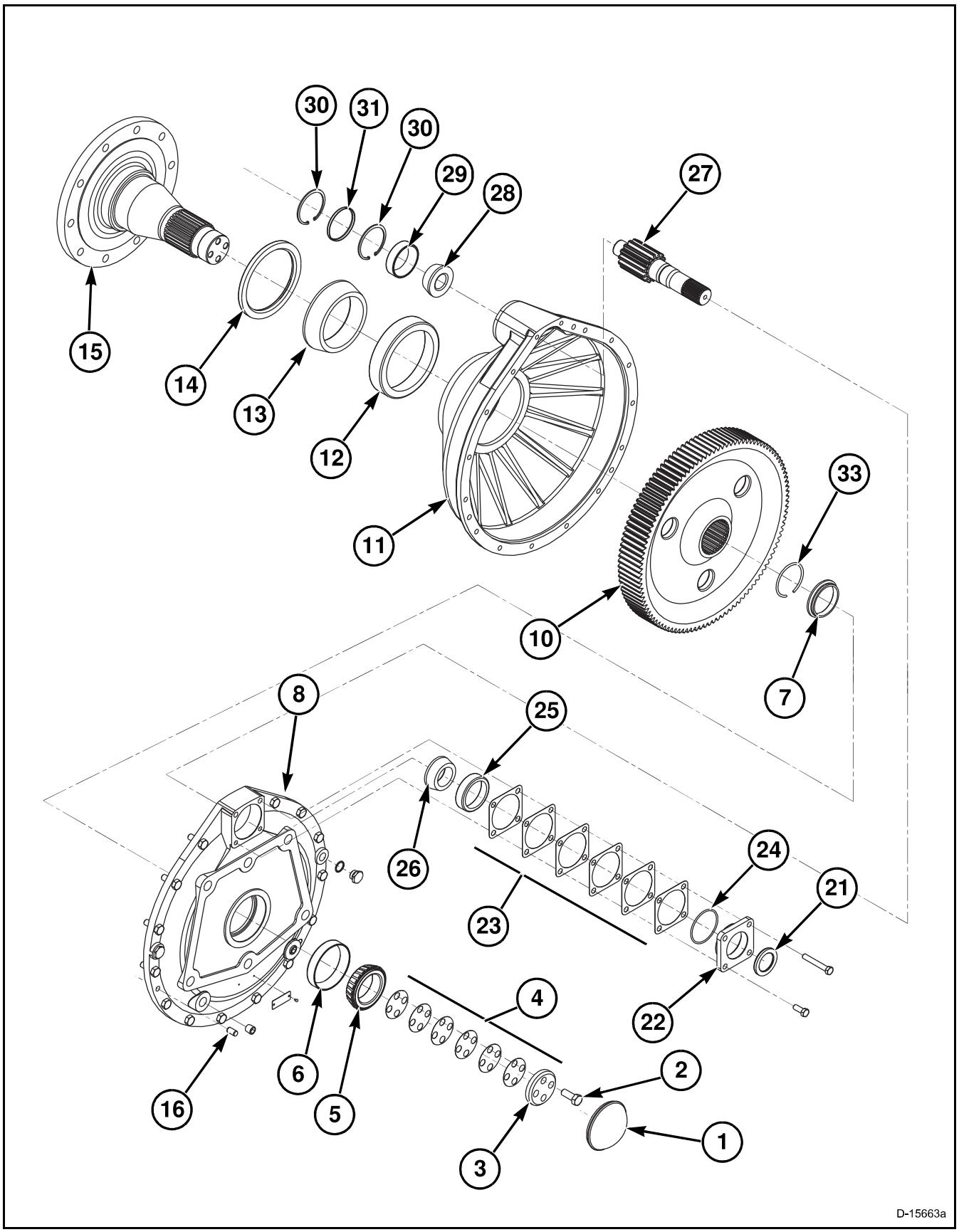


FIG. 159

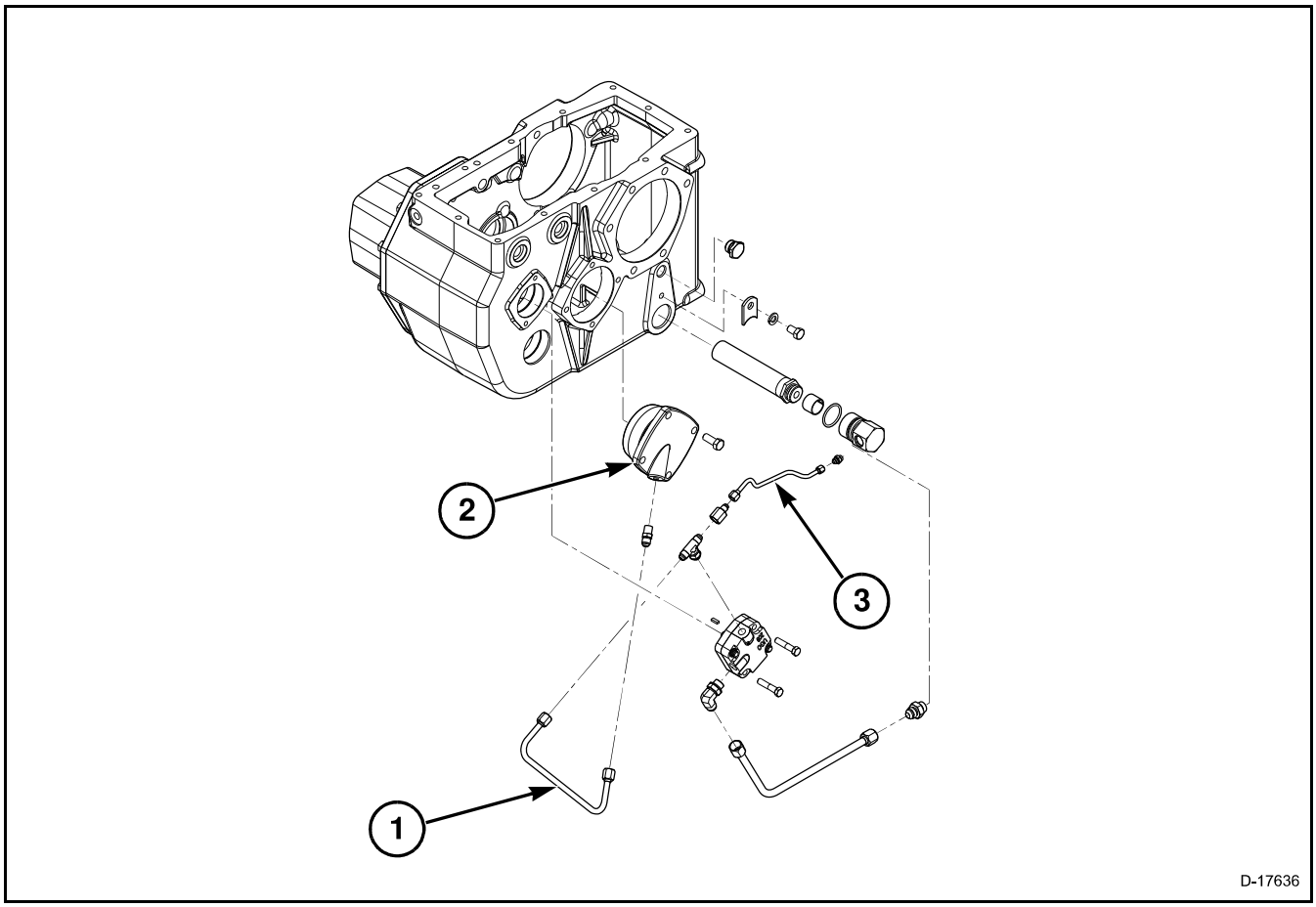


FIG. 237

FIG. 237: Disconnect the lube line (1) at the pump and the bearing main shaft carrier (2) fittings. Remove the line from the transmission.

Disconnect the lube line (3) to the differential bearing carrier.

Plug all of the lines and cap all of the fittings.

FIG. 238: Remove the two capscrews (1) fastening the pump to the transmission.

Remove the pipe plug (2) from the pump gauge port.

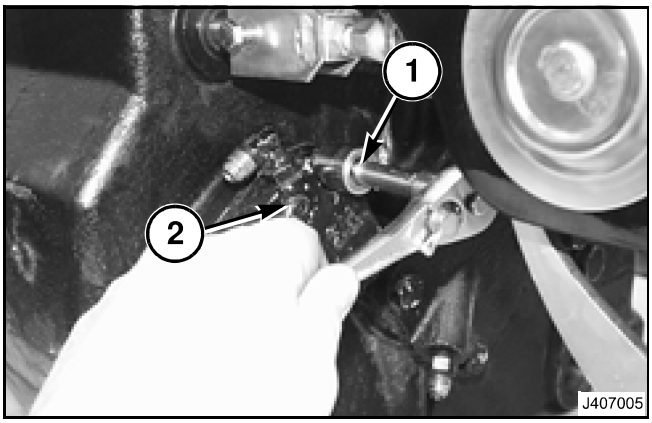


FIG. 238

Output Shaft and Differential Carrier

Disassembly

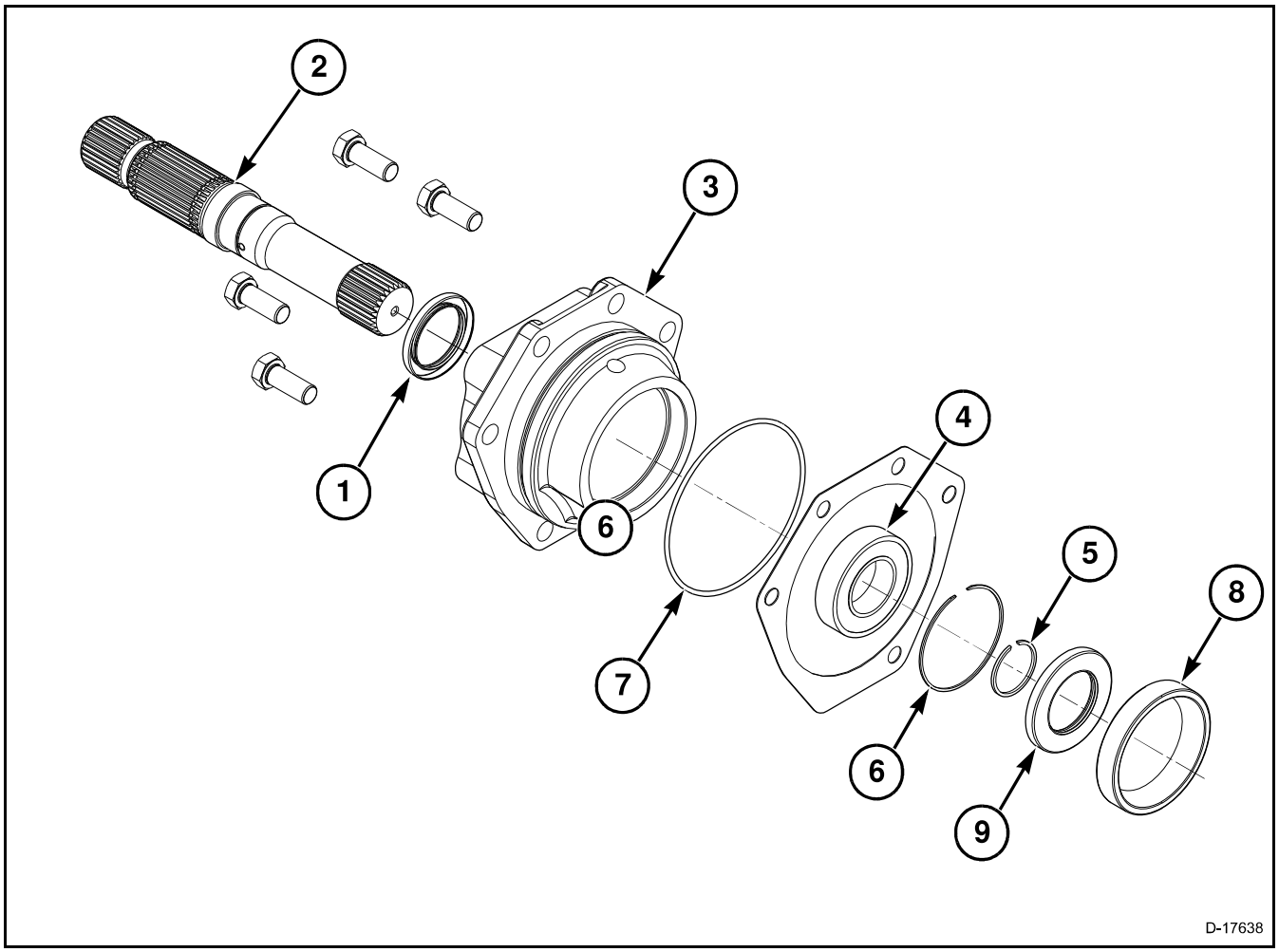


FIG. 329

FIG. 329: Pull the bearing cup (8) out of the rear of the bearing housing.

Pull the inner seal (9) out of the rear of the bearing housing.

Remove the inner retaining ring (6) and press the right-hand shaft (2) and the bearing (4) from the bearing housing (3).

Remove the retaining ring (5) from the shaft and press the shaft from the bearing.

Drive the seal (1) out of the front of the housing.

Remove the O-ring (7) from the carrier housing and discard the O-ring.

Contents

CLEANING THE HYDRAULIC RESERVOIR

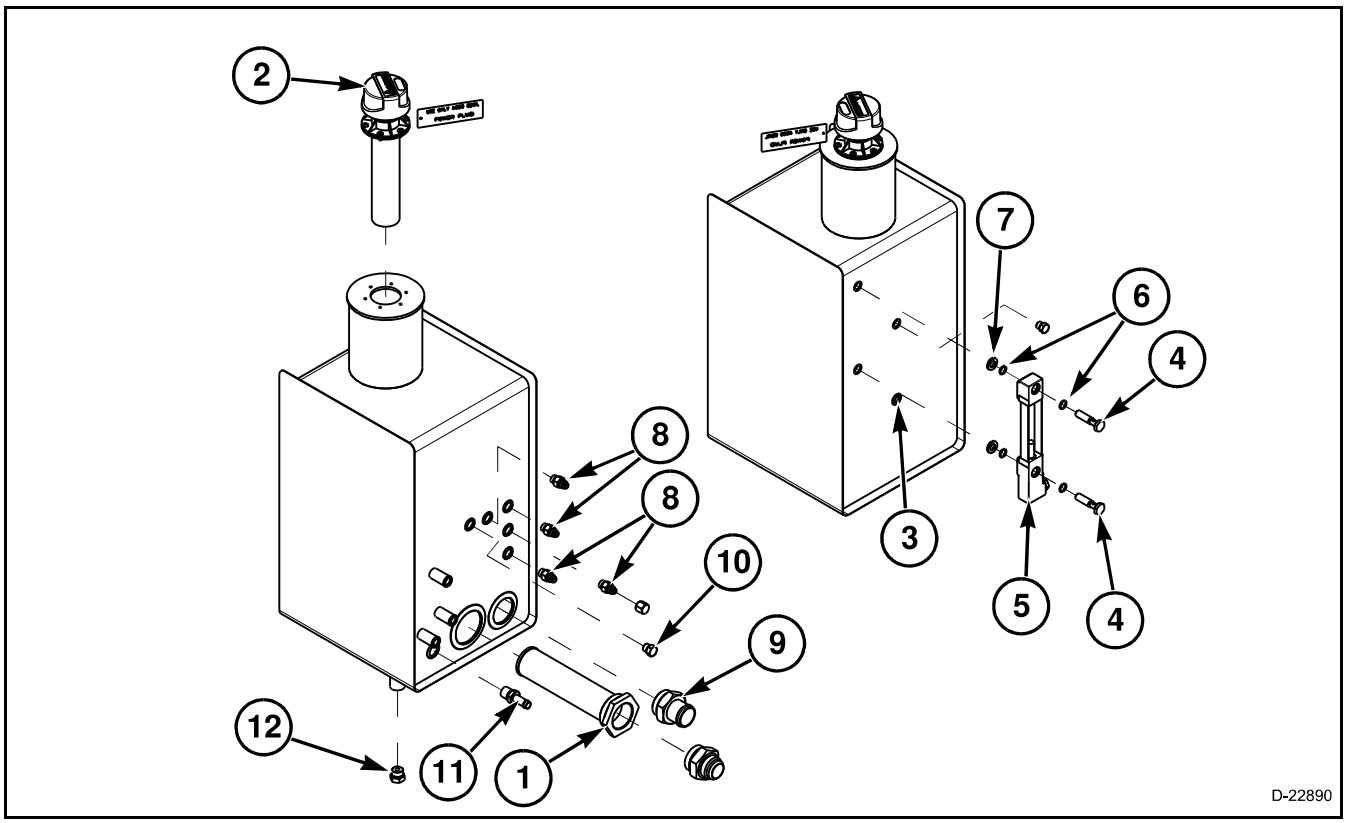


FIG. 27

FIG. 27: Drain and remove the reservoir from the machine referring to Draining and Removal in this section.

Thoroughly wash and clean the suction screen fitting, hydraulic fittings, return ports, and the surrounding area until completely free of dirt. Also, clean the area around the oil drain plug, oil filler cap, and the breather cap.

Remove and clean the strainer assembly (1) and the fitting as outlined in Cleaning The Strainer Assembly in this section.

Remove the breather/filler cap (2) from the top of the reservoir.

Remove the oil temperature sensor (not shown) from the O-ring boss (3) welded into the reservoir. Discard the O-ring.

Using a hex wrench, loosen the two hollow screws (4) securing the sight gauge assembly (5) to the reservoir. Remove the sight gauge assembly with the two hollow screws, the O-rings (6) and the rubber washers (7) from the reservoir.

NOTE: The sight gauge assembly incorporates an oil level sensor. The unit can be serviced as an assembly to service the oil level sensor or with a mount kit and a glass tube.

Remove the JIC X pipe thread male adapters (8) from the reservoir.

Remove the O-ring boss stem straight connector (9) from the reservoir. Discard the O-ring.

If equipped, remove a JIC X pipe thread male adapter in lieu of the plug (10) from the reservoir.

Remove the barb hose fitting (11) from the reservoir.

Remove the O-ring boss plug (12) from the drain tube in the reservoir. Discard the O-ring.

Flush the reservoir with cleaning solvent. After cleaning, blow the reservoir dry with clean dry air. Make a final flush with hydraulic fluid.

Install the strainer assembly and fitting as outlined in Cleaning the Strainer Assembly in this section.

Position the sight gauge assembly with the two hollow screws, the O-rings, and the two rubber washers onto the reservoir. Tighten the two hollow screws securing the sight gauge assembly to the reservoir.

Install a new O-ring (lubricated with hydraulic fluid) onto the temperature sensor. Install the oil temperature sensor in the reservoir.

Apply pipe thread sealer to the male threads of the barb hose fitting. Install the barb hose fitting in the reservoir.

NOTE: Apply white Teflon paste to all male pipe threads prior to assembly to the mating part. Prevent excess paste from entering the internal passages.

Hydraulic Control Valve

PROBLEM	POSSIBLE CAUSE	CORRECTION
Header will not hold and settles.	Cylinder seal leakage.	Visually inspect for external seal leakage. If not OK, refer to Header Lift Cylinders to replace seals. If OK, go to next step.
	Header lift check valve not closing, spring is broken, or O-rings and backup rings are cut.	Change out the header check valve with a new valve or exchange with feeder reverser check valve. Inspect the O-rings and backup rings for cuts or damage and inspect the bore for damage. If the problem follows the valve, replace the valve. If OK, go to the next step.
	Poppet for header lower solenoid valve not seating, spring broken, or O-rings and backup rings are cut.	Change out the header lower valve with a new valve or exchange with header raise or feeder reverser valve. Inspect the O-rings and backup rings for cuts or damage and inspect the bore for damage. If the problem follows the valve, replace the valve.
Header will not lower or lowers slowly. Review fault codes in Console Controller section of Electronics division.	Relay or 10 A fuse for Header HT/TILT circuit has failed.	Check and replace fuse if necessary. If OK, exchange header lower and raise relays. If the problem follows the relay, replace the relay. If not OK, go to the next step.
	Return line to reservoir is restricted or blocked.	Check return for pinched, kinked, or plugged hoses and lines. If OK, go to next step.
	Low voltage. Voltage must be at least 12 volts to properly open valve. Coil has failed.Control handle switch has failed. AHHC will not release to manual mode.	Check the voltage and the coil using the procedure in Solenoid Troubleshooting. If OK, go to the next step.
	Poppet for solenoid valve not moving or moving only part way.	Change out the header lower valve with a new valve or exchange with header raise or feeder reverser valve. Inspect the O-rings and backup rings for cuts or damage and inspect the bore for damage. If the problem follows the valve, replace the valve. If not OK, go to the next step.
	Restrictor not adjusted properly or contaminated.	Turn adjusting screw clockwise until fully seated to dislodge contamination. Adjust restrictor from fully closed, counterclockwise, 3/4 turns (flow specification is to lower header from full height to ground in 6 seconds). If not OK, replace with a new restrictor or the restrictor for header raise circuit. If problem follows the restrictor, replace the restrictor.

FIG. 96: Identify the speed increase connector (1) and the speed decrease connector (2).

Install the connectors into the coils.

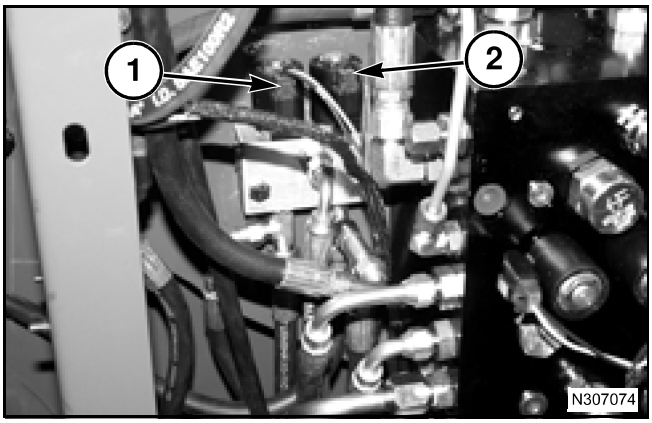


FIG. 96

FIG. 97: Fill the hydraulic reservoir with hydraulic oil to the specified level.

Start the engine at low idle speed and allow the engine to run for approximately 30 seconds. If there are no indications of pump cavitation, continue running the engine at low idle speed.

Operate the machine's threshing system, the cylinder variable speed control, hydro, and the turret unloader engage system (if equipped) to bleed the air from the system and until the functions respond normally.

Slightly loosen the ends of the hoses from the valve outlet pressure ports to the unloader engage cylinder and the variable sheave. Actuate the cylinder variable speed valve and the unloader engage valve allowing oil to escape slowly until air free oil appears and until the functions respond normally. Tighten the hose ends securely.

Stop the engine, remove the ignition key, and set the parking brake.

If necessary, refill the hydraulic reservoir with hydraulic oil to the specified level.

Install and close all shields.

FIG. 97

WARNING: Never operate the machine or allow others to operate the machine unless ALL SHIELDS supplied with the machine are PROPERLY IN PLACE.

The machine is now ready to return to service.

Flow Divider Cartridge

FIG. 161: The flow divider valve is a screw-in, cartridge-style, spool-type flow divider. In the dividing mode, the cartridge valve will divert the input flow from the port 3 (3) to the ports 2 (2) and 4 (4) in a 50:50 ratio, regardless of the operating pressure.

NOTE: Port 1 (1) is not used.

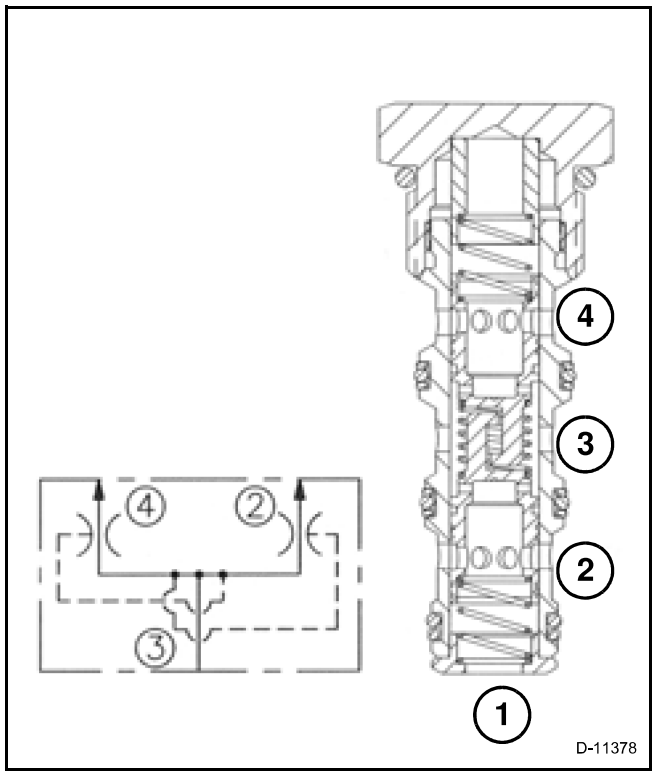


FIG. 161

FIXED PLATE (MACHINE)

Removal

FIG. 206: Before working around or under the machine:

WARNING: Put the machine on a flat, hard, level surface.

Put the transmission in neutral.

Set the parking brake.

Shut off the engine and remove the start key.

Put a chock in front of and a chock behind the front drive tires.

FIG. 206

FIG. 207: Follow these safety warnings before servicing the single point connector:

WARNING: The header must be lowered until the header is setting on the ground.

The reel lift rams (if equipped) are either fully retracted or have the reel lift ram stops properly engaged over the ram rods of the right-hand and left-hand reel lift rams.

The engine is stopped.

The brake is set.

The key is removed from the start switch.

OR

The header must be raised.

The cylinder stop is fully engaged on the header lift cylinder.

The reel lift arms (if equipped) are either fully retracted or have the reel lift ram stops properly engaged over the ram rods of the right-hand and left-hand reel lift rams.

The engine is stopped.

The brake is set.

The key is removed from the start switch.

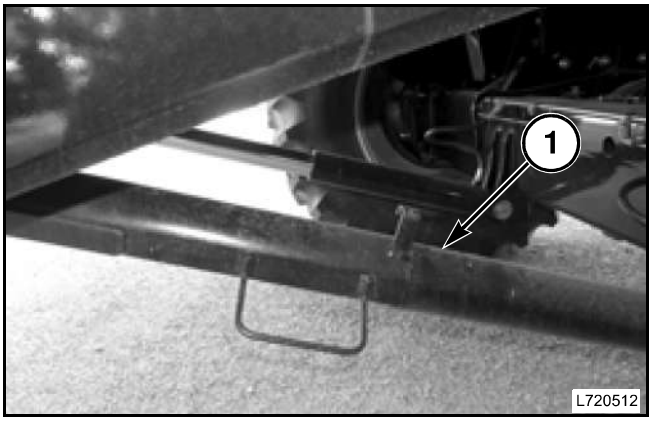


FIG. 207

A header lift cylinder stop (1) is supplied with the machine on the left side. Install the header lift cylinder stop to prevent lowering of the header. See the machine operation manual for the header lift cylinder stop operation.

REASSEMBLY

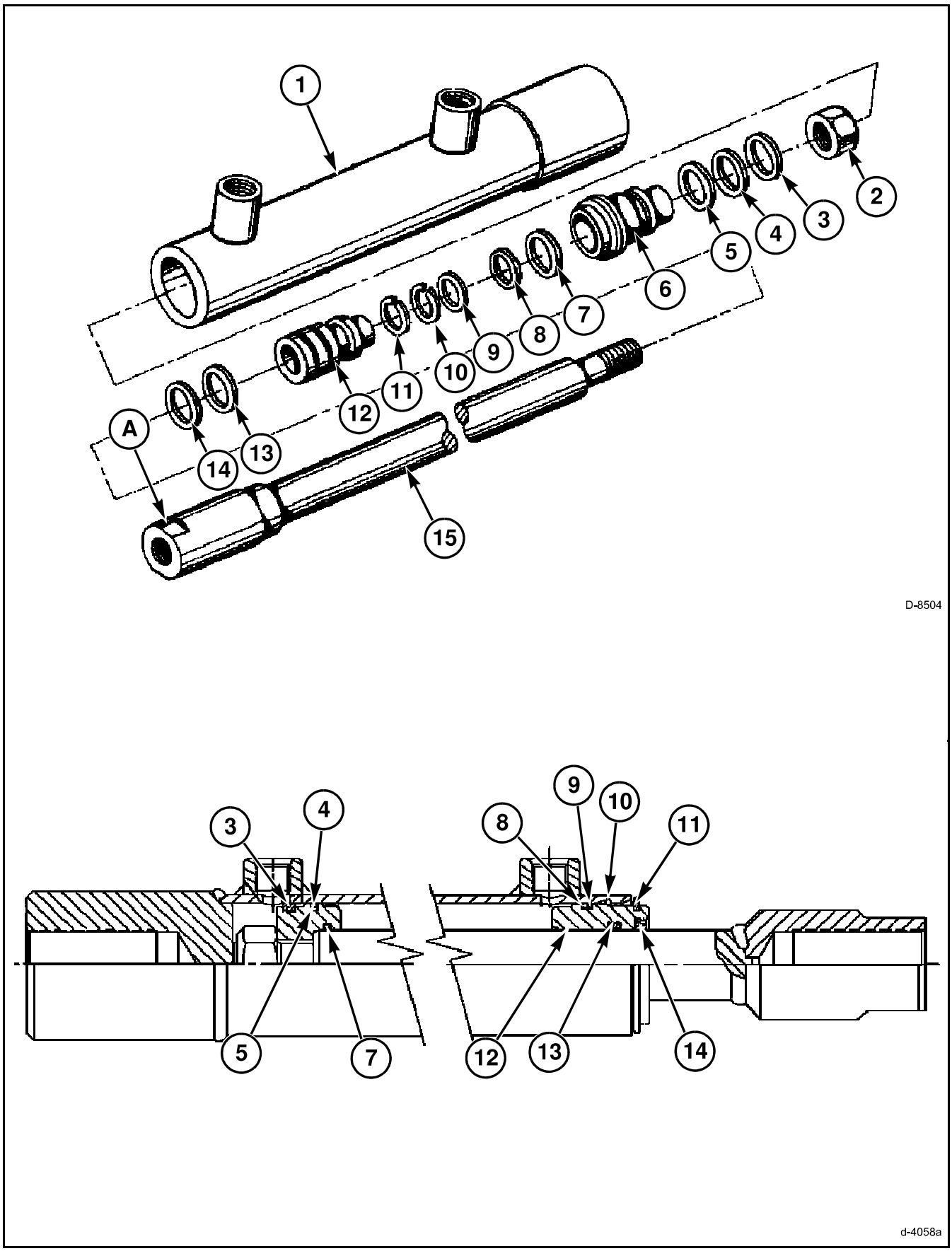


FIG. 253

REMOVAL

FIG. 296: Remove the header from the machine.

Lock Out the hydraulic accumulator by moving the valve handle (1) on the accumulator (2) to the closed position.

WARNING: To prevent personal injury from escaping high pressure oil, Lock Out the hydraulic accumulator. (See Accumulator section for Lock Out instruction.)

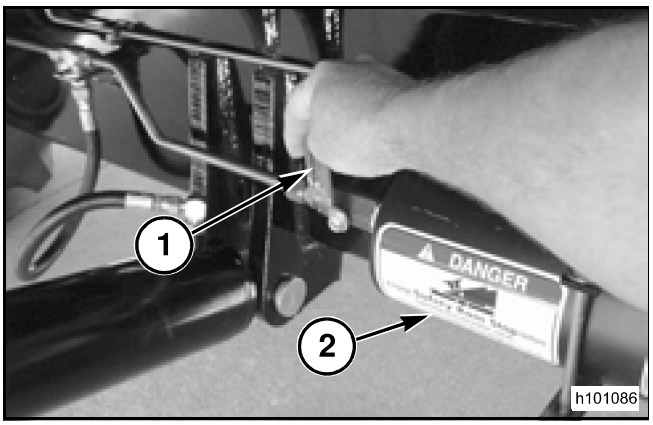


FIG. 296

FIG. 297: Raise the feeder house to the full up position and engage the header lift cylinder stop (1) over the lift cylinder rod (2).

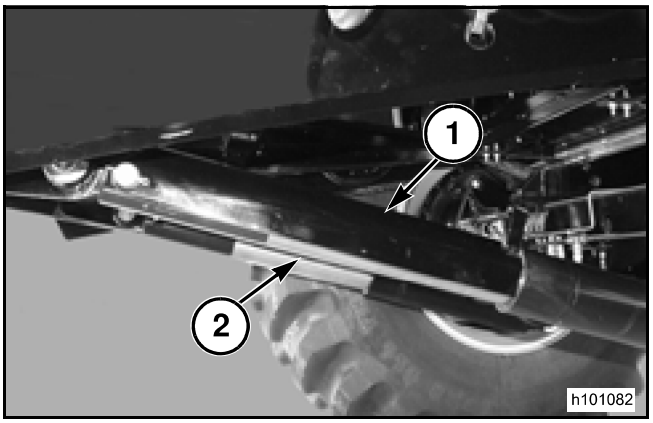


FIG. 297

FIG. 298: Block the feeder house cross member (1) in the position shown using a suitable stand (2).

WARNING: To prevent personal injury, remove the header, support the feeder housing with suitable stand and release any pressure in the hydraulic lines before removing the cylinder.

Place the lift cylinder stop in the storage position. Lower the feeder house onto the stand.

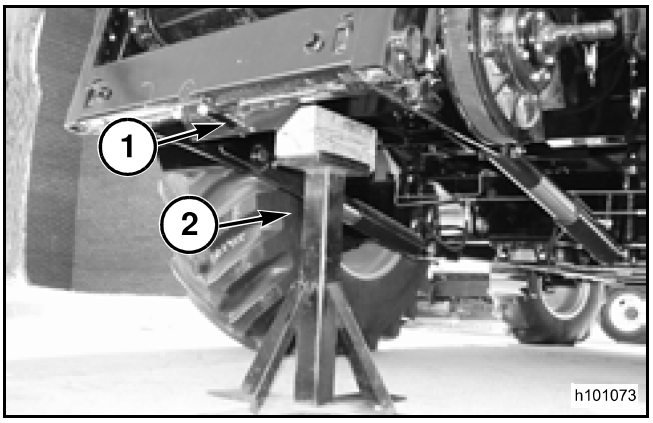


FIG. 298

Turn the T handle on the filler hose valve in (clockwise) very slowly and let nitrogen gas leak from the accumulator through the filler hose until the header lowers to 76 mm (3 in) above the ground.

WARNING: The nitrogen charge container and the accumulator contain nitrogen under very high pressure. Keep all released gas away from human tissue to prevent freezing or other injury. When draining gas from the accumulator, always position the filler hose valve on the accumulator filler valve and use the T handle to control the outlet as done in the step above.

At this point, turn the T-handle out again and remove the filler hose valve (F) from the accumulator filler valve. This procedure will position the piston in the accumulator in mid stroke for best accumulator performance.

NOTE: If the header drops below 76 mm (3 in) above the ground position when the accumulator shut off valve is opened, the nitrogen container did not have enough charge to properly fill the accumulator and the procedure will have to be repeated with a more fully charged container.

When charging is finished install the valve cap. Do not tighten the cap more than finger tight.

Install the protection bracket and the capscrews on the accumulator.

TO CHECK THE CHARGE AT ANY TIME

FIG. 363: With the accumulator shut off valve in the open position (1) (turned fully counterclockwise) and the machine on level ground, start the engine. Raise the header to the top position and hold the header lift switch in the raise position for five seconds.

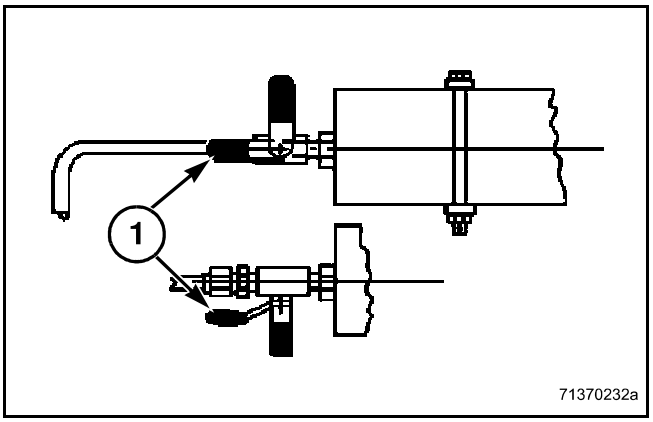


FIG. 363

GENERAL INFORMATION

The hydrostatic drive system consists of two major components:

1. A fixed displacement (drive) motor.
2. A variable displacement (propel) pump.

The Series 90 pump and motor are axial piston design units. The variable displacement pump incorporates a tiltable cradle swash plate to change the pump's displacement. The fixed displacement motor has a fixed swash plate.

The variable displacement pump is linked to the fixed motor by high-pressure lines (closed-center high-pressure circuit). The lines consist of high-pressure hoses to avoid transmitting torsion and jolts to the pump and motor flanges. This combined system provides a transfer and control of hydraulic power at an infinitely variable speed range between zero and maximum in both forward and reverse modes of operation.

The variable displacement pump is in neutral position when the control lever on the operator's console is in neutral. When the control lever is moved forward, or rearward from neutral, the pump provides hydraulic pressure to drive the hydrostatic motor. The hydrostatic motor drives the transmission that drives the final drives (front wheels) of the machine.

The propel pump is driven from the rear of the engine with a belt. The propel pump provides oil under high pressure to rotate the drive motor.

The output shaft of the drive motor is connected directly to the transmission gearbox.

The propel pump is variable displacement. The pump varies the amount of oil pumped to the drive motor to change the ground speed.

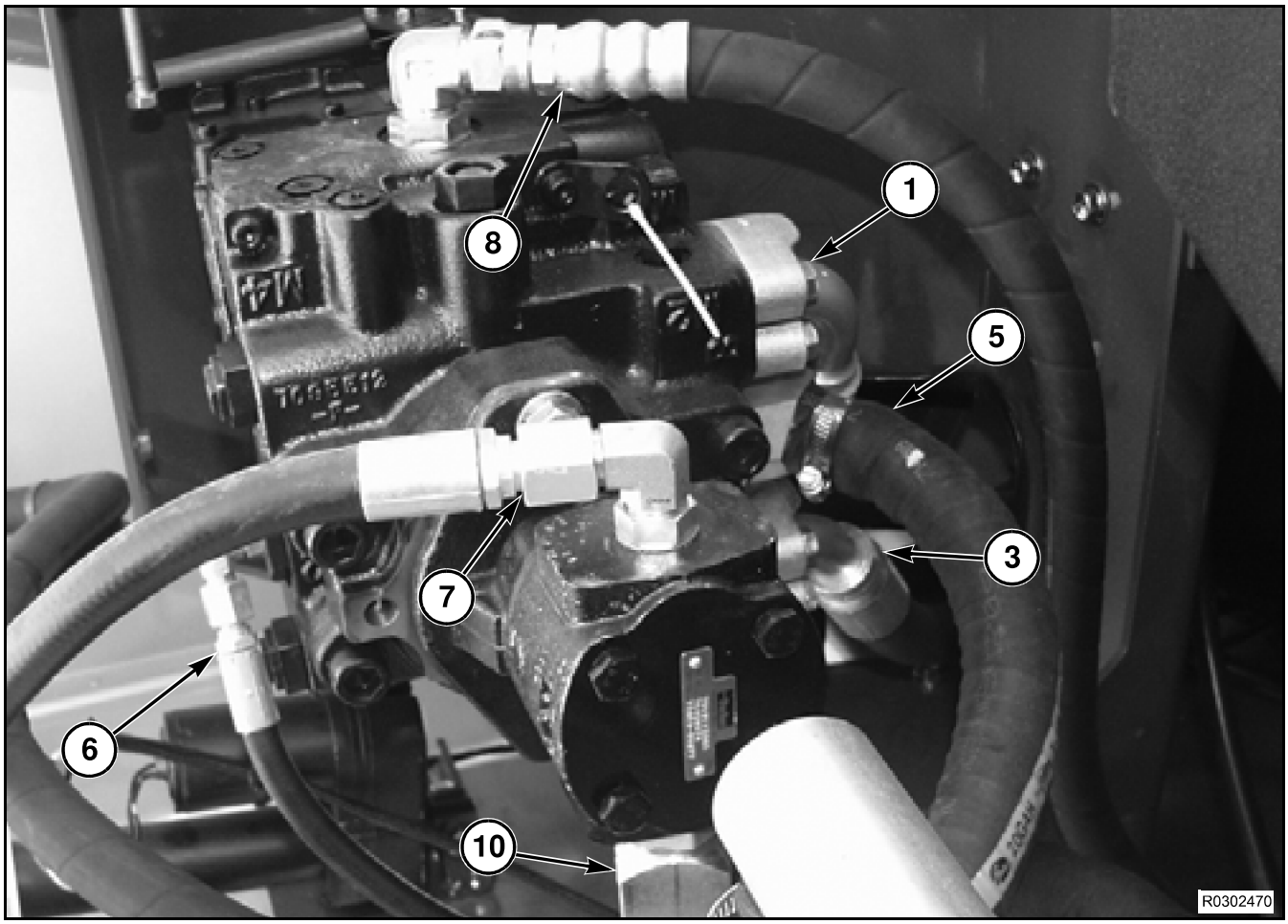


FIG. 457

FIG. 457: Enter the area rearward of the engine and identify the following hoses less RWA:

(1) Motor Port A to Pump Port B

(3) Motor Port B to Pump Port A

(5) Suction Hose, Propel Pump with Integral Charge Pump

(6) Charge Pressure to Cylinder Variable Speed Valve

(7) Pressure Hose to Straw Spreader Motor

(8) Case Drain to Oil Cooler (Cooler Bypass)

(10) Suction Hose, Straw Spreader Pump

Provide a suitable container to catch oil discharged from the hoses as the hoses are removed.

Cap or plug the ends of the hoses and the ports to the pumps to prevent contamination of the hydraulic system.

Input Shaft Seal

The 90 series pump uses a lip type input shaft seal. This seal can be replaced without major disassembly of the pump.

Removal

Drain the hydraulic oil from the pump and the reservoir.

FIG. 501: For an in machine seal replacement, the driven sheave (1) must be removed from the pump. Refer to the early portion of the procedure in Hydrostatic Drive System, Propel Pump, Removal section, and remove the driven sheave.

Remove the case drain lines from the pump. Cap or plug the lines and openings to keep oil from siphoning from the oil cooler. Drain the hydraulic oil from the pump.

For an out-of-machine seal replacement, continue the removal procedure and remove the pump.

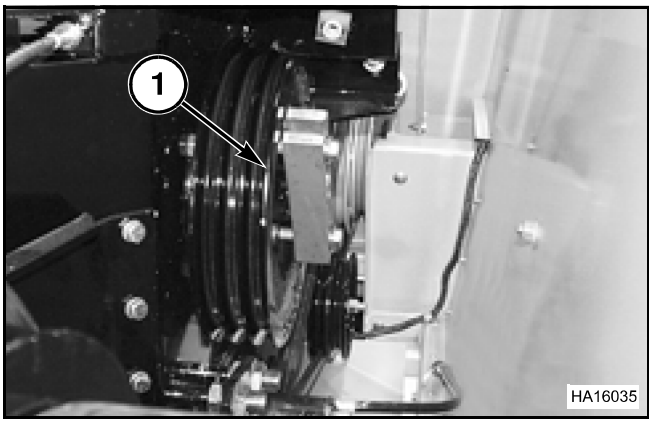


FIG. 501

FIG. 502: Remove the screws (1) securing the seal retainer plate (2) and the seal carrier to the pump housing.

Remove the retainer plate.

NOTE: After removing the screws, the seal carrier may move out of the bore by approximately 6 mm (1/4 in). An outward spring force on the shaft will tend to overcome the friction from the O-ring on the outside diameter of the seal carrier.

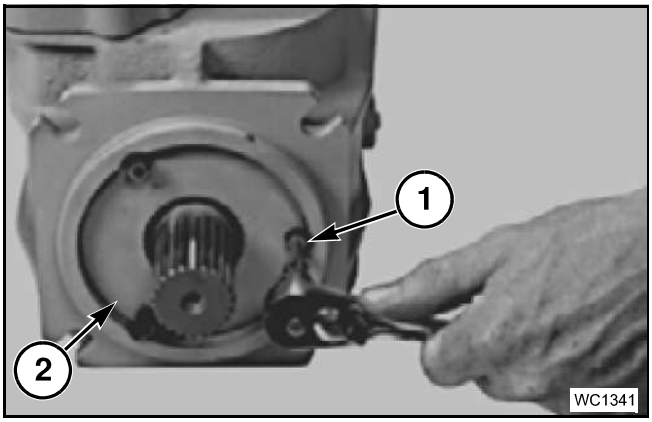


FIG. 502

FIG. 503: If the seal carrier (1) does not move from the bore upon removal of the screws, pry the seal carrier from the bore, or lightly tap the end of the shaft with a soft mallet.

IMPORTANT: After the seal carrier is removed, the input shaft and bearing assembly will be free in the pump housing. Do Not Remove The Input Shaft. If the shaft is removed, the cylinder block could move out of place, making the shaft installation difficult.

Remove the O-ring from the seal carrier.

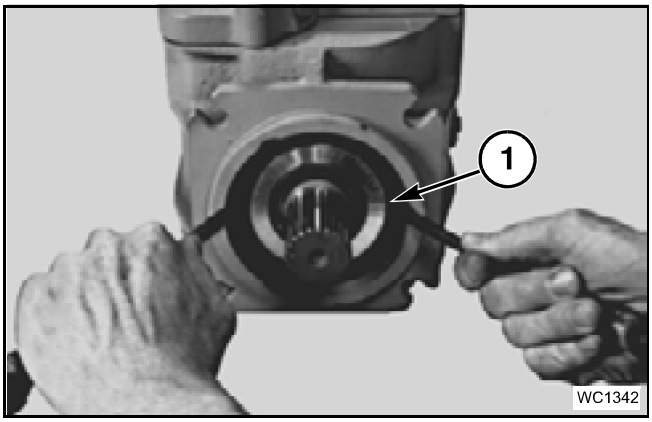


FIG. 503

FIG. 593: Position the slipper guide bearing (1) on top of the spacers and slipper guide as shown.

IMPORTANT: The split between the slipper guide bearing plates must be located in line with the swash plate arm. The bearing surface of the bearing plates must be located next to the slipper guide.

Install two new screws (2) (with locking compound) and flat washers (3) through the slipper guide bearing, and spacers. Finger tighten the screws into the swash plate.

NOTE: Inspect the flat washers (3) for raised edges or burrs. The smooth side of the flat washers must be installed next to the slipper guide bearing.

IMPORTANT: Always use new screws with the proper locking compound.

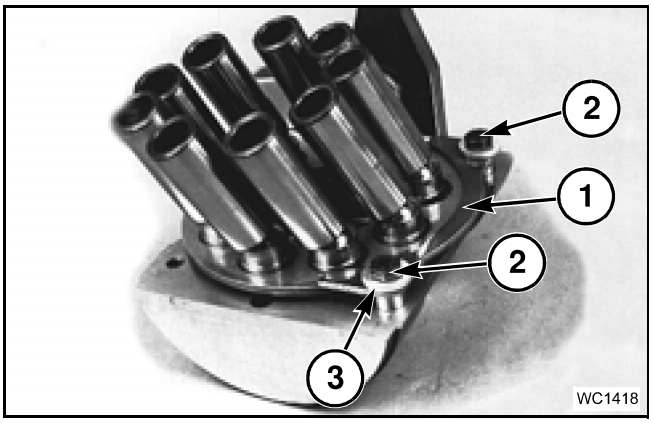


FIG. 593

FIG. 594: Assemble the other half of the fixed-clearance hold down mechanism in a similar manner.

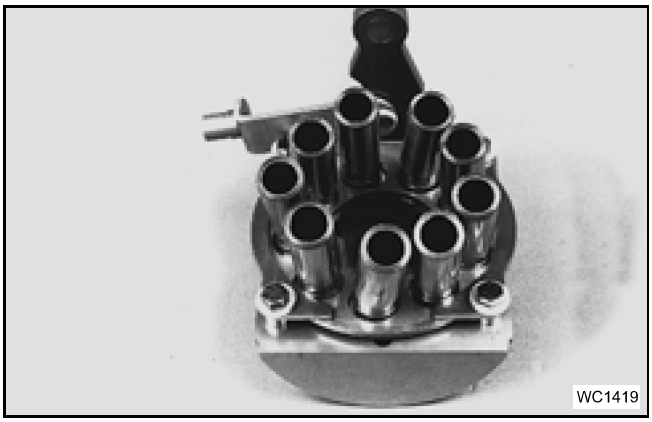


FIG. 594

FIG. 595: Tighten the hold down screws to 13.5 Nm (10 lbf ft) torque.

Check to be sure that the slipper guide and piston slippers slide freely on the swash plate.

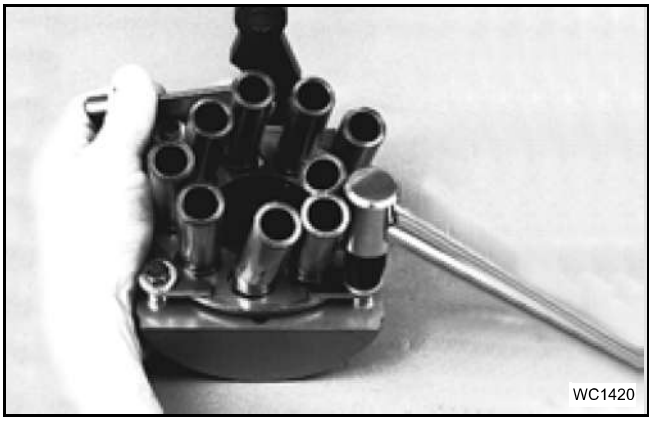


FIG. 595

FIG. 686: Solenoid Valve Coil - Remove the mating connector from the solenoid coil (1). Remove coil retaining nut (6) and then the coil from the solenoid valve cartridge.

Control Valve Assembly - Remove the four socket head screws (10) and then the motor displacement control valve (2) from the motor end cap. Remove o-ring (3) from the valve body and discard the o-ring.

Check Valves - Remove the check valves (4) and then the check valve seat (5) from the motor end cap.

Solenoid Valve Cartridge - The valve cartridge (9), control piston (7), and the pressure spring (8) are not serviceable and must not be removed. If replacement is necessary, the motor displacement control valve assembly (2) must be replaced.

Installation

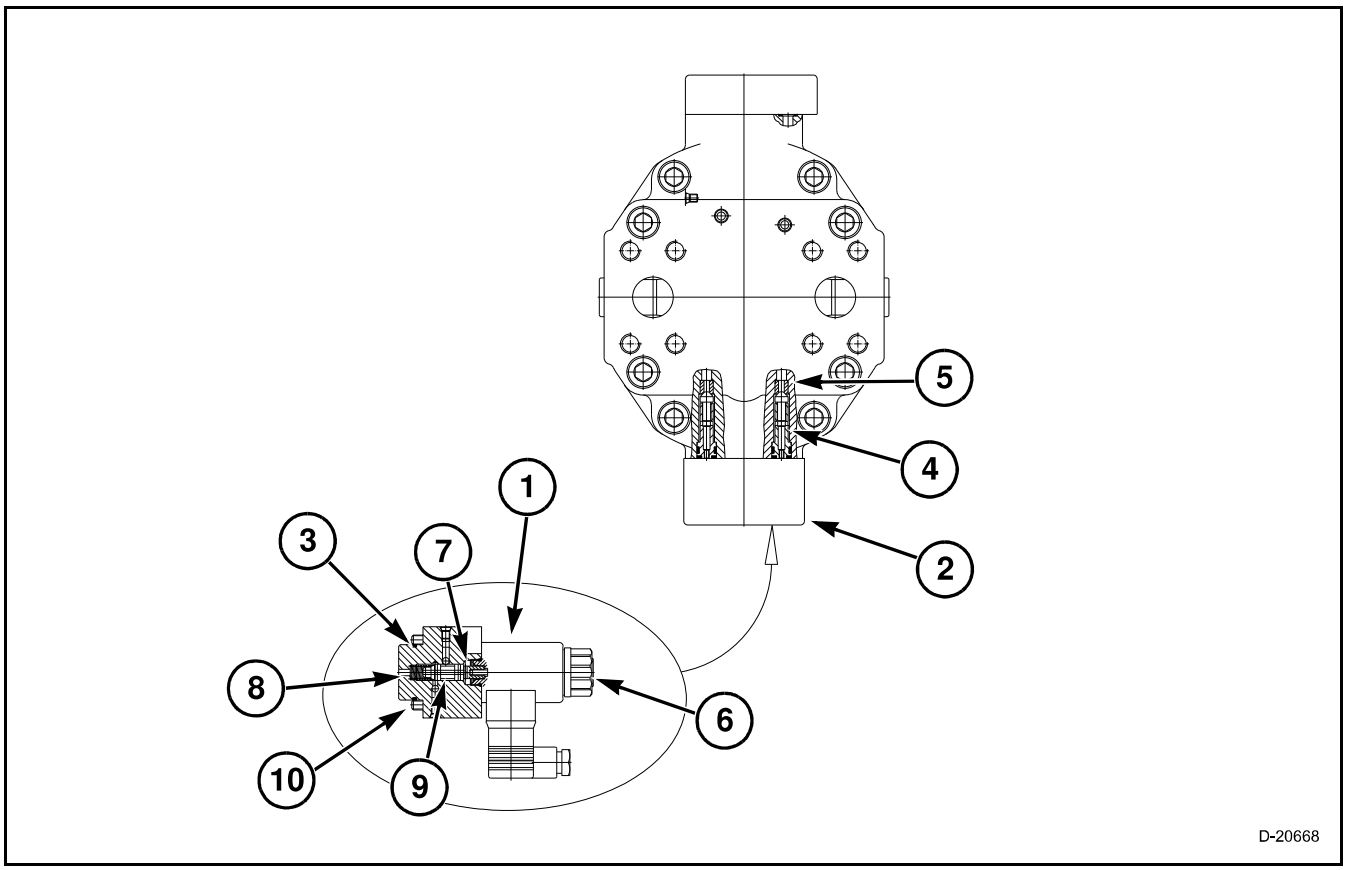


FIG. 687

FIG. 687: Check Valves - If removed, using a suitable arbor press new check valve seats (5) into the motor end cap. Dip the check valve and o-ring assemblies (4) in lubricant and install the check valves.

Load Sense (Flow Compensator) Valve Set Point

FIG. 739: Operate a load sense hydraulic function (reel drive, chaff spreader, steering, or header lift) that will demand approximately half of the pump flow but keep the system pressure below the pressure compensator set point of 183 to 190 bar (2655 to 2755 psi).

NOTE: The reel drive can take up to approximately 37.86 lpm (10 gpm).

The hydraulic function (rotary screen) is system actuated upon engine startup and will demand pump flow (approximately 11.36 lpm (3 gpm).

There are also two orifices in the system demanding some flow. One orifice is in the steering circuit providing warm oil to the steering control unit while in neutral to prevent thermal shock (maintaining 414 to 483 kPa (60 to 70 psi) on the load sense line). The other orifice is at the control valve to bleed down the pressure in the load sense line when the machine is shut down.

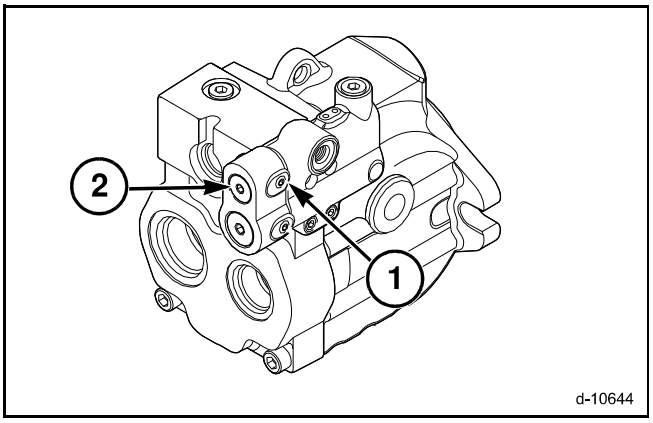


FIG. 739

To change the set point, loosen the load sense set screw (1).

While watching the two pressure gauges, turn the flow spool adjustment screw (2) until the desired pressure differential of 2400 to 2500 kPa (348 to 362 psi) is achieved.

NOTE: A clockwise rotation of the adjustment screw will increase the pressure setting and a counterclockwise rotation will decrease the pressure setting. The approximate gain is 1200 kPa (170 psi) per turn.

After the adjustment is complete, hold the adjustment screw stationary and tighten the setscrew to 7 to 11 Nm (6 to 8 lbf ft).

Again check the flow compensator setting. If the specification is correct, stop the engine and remove the start key. Go to the next adjustment and check the pressure compensator set point.

Pressure Compensator Valve Set Point

FIG. 740: With the engine running and the oil warmed up, press the button to raise the header and continue to hold the button after the header cylinders reach full stroke. The system pump outlet pressure will increase to the pressure compensator set point and the compensator will then destroke the pump. The system pressure at the diagnostic coupler must be 183 to 190 bar (2655 to 2755 psi).

To change the set point, loosen the pressure compensator set screw (1).

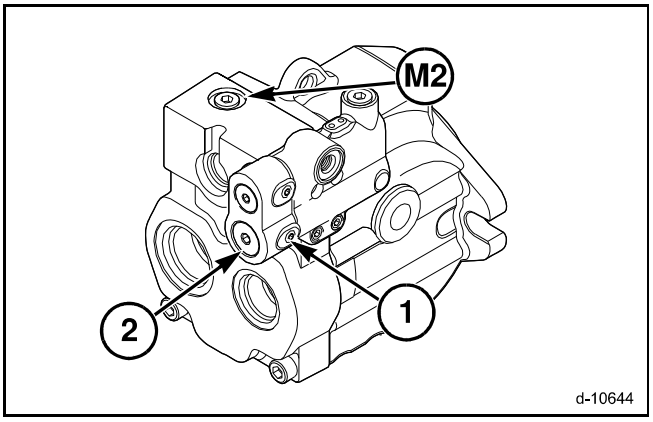


FIG. 740

INSTALLATION

FIG. 817: Install the inlet line (1) and the outlet line (2) fittings onto the motor ports.

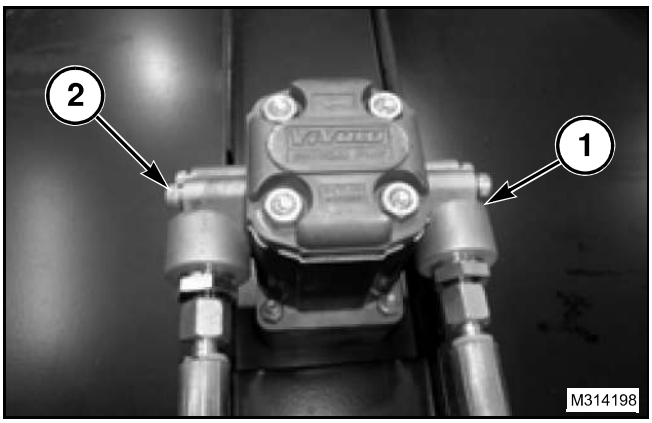


FIG. 817

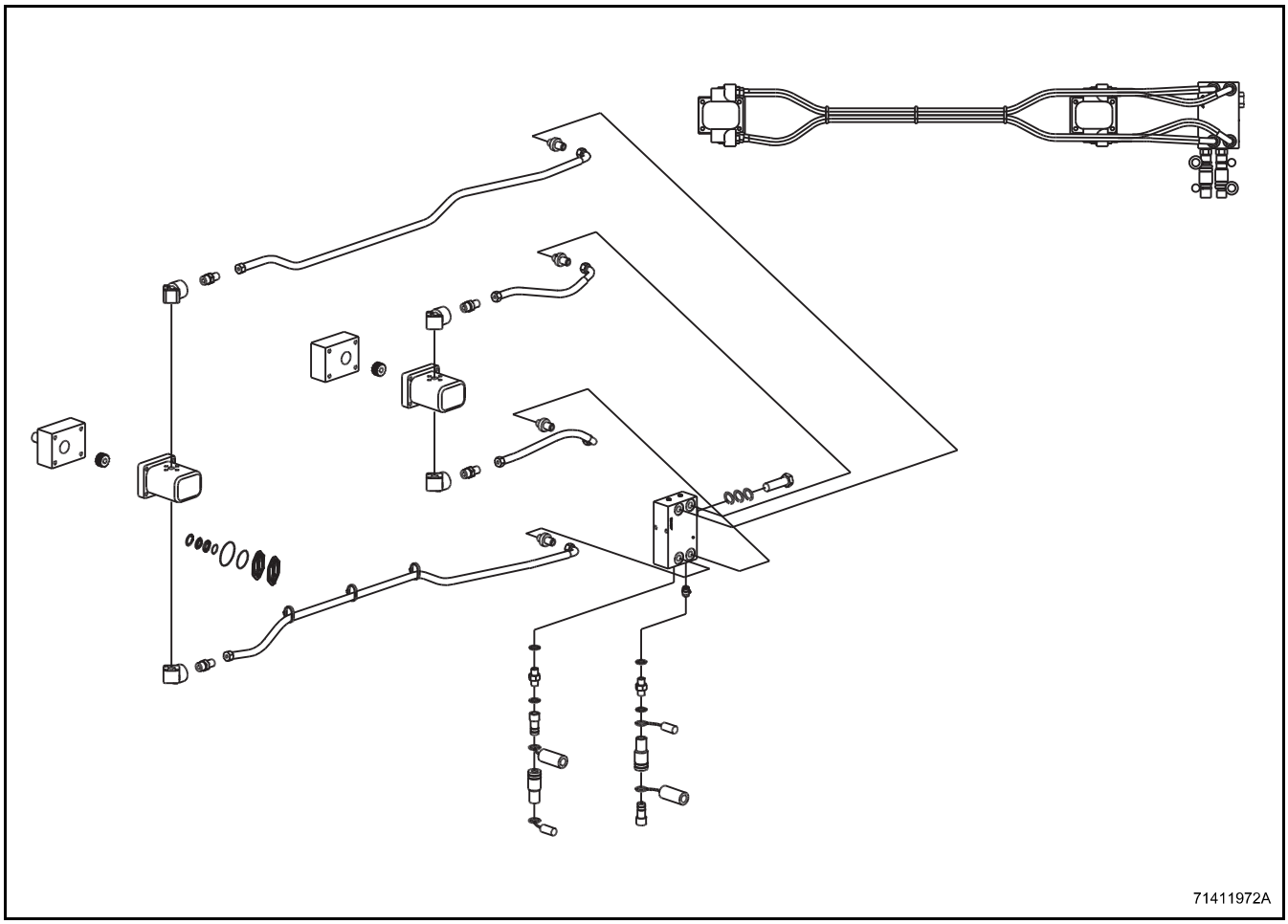


FIG. 818

FIG. 818: Refer to the Material Discharge section of the manual for installation instructions of the motor to the chaff spreader assembly.

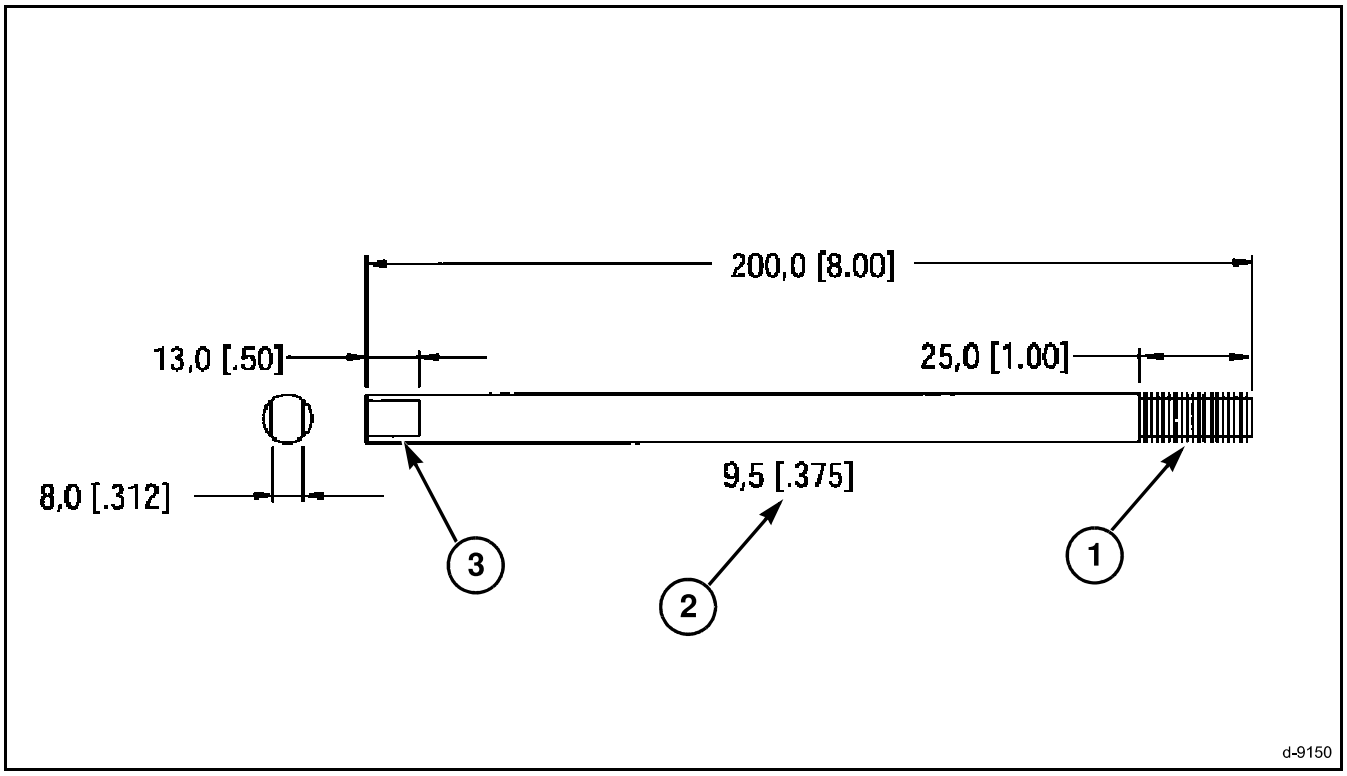


FIG. 882

FIG. 882: The alignment stud shown is not necessary for disassembly and assembly. Using two such studs can help. The measurements are given in mm (inches).

(1) 3/8-24 UNF Thread
(2) Diameter of Steel Rod
(3) Flat Areas Ground on each Side

FIG. 883: Put the motor in a vise with the output shaft down. Clamp across the mounting flange of the motor and not to the housing. Excessive clamping pressure will cause distortion. When clamping, use some protective equipment on the vise, such as special soft jaws, pieces of hard rubber or board.

NOTE: Not all illustrations show the motor in a vise. Keep the motor in the vise during disassembly and assembly. Follow the clamping procedures in the manual.

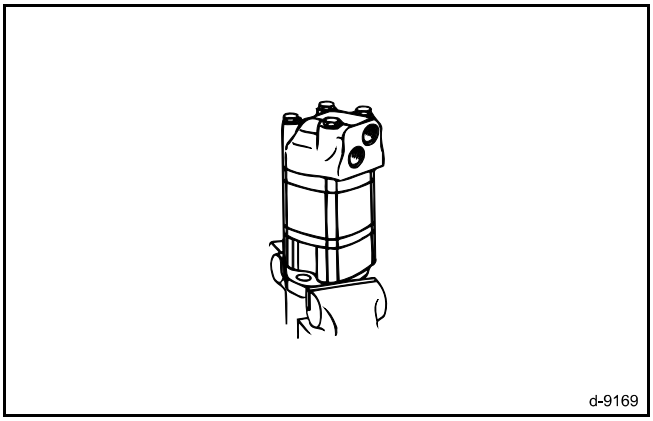


FIG. 883

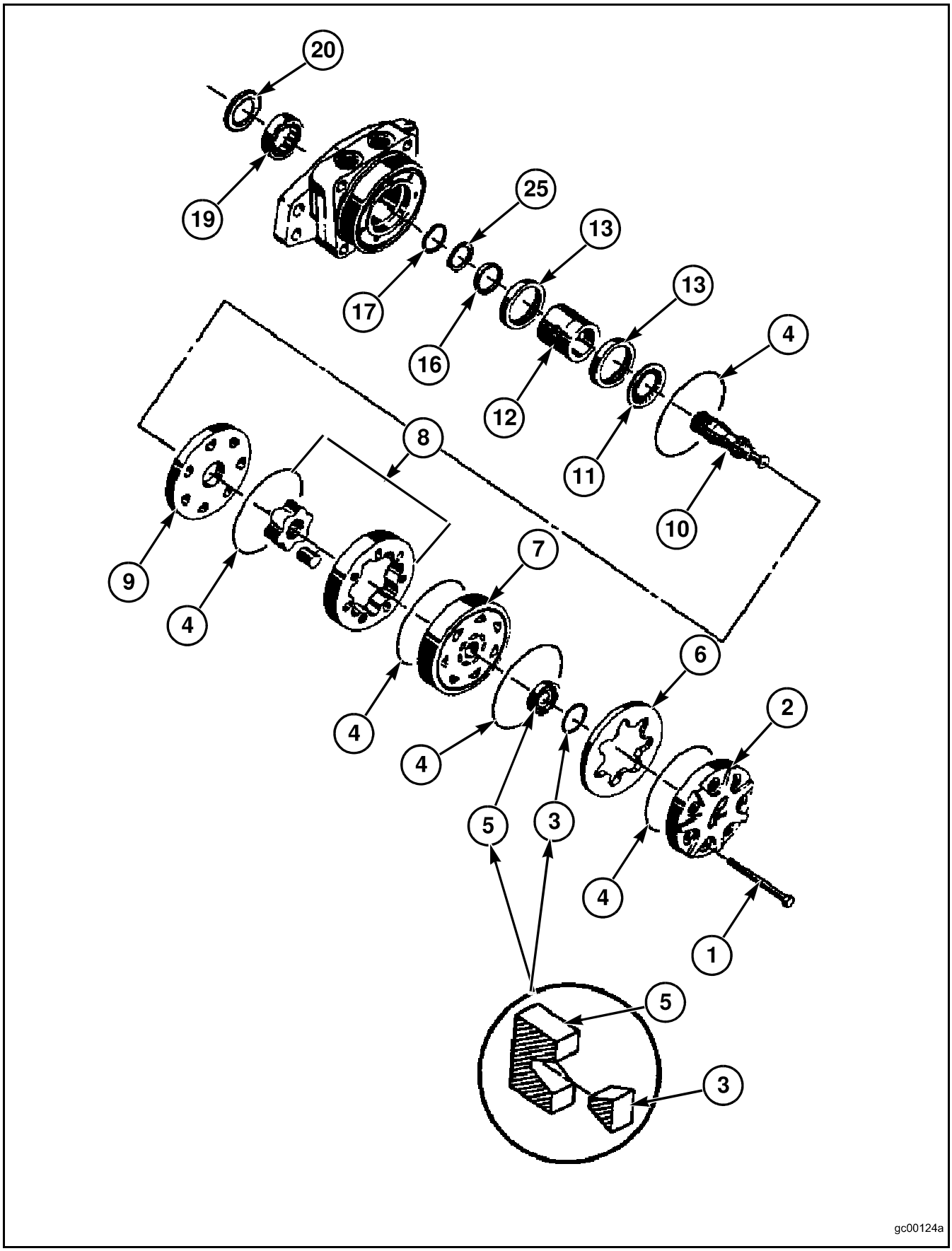


FIG. 924

Contents

FIG. 83: Identify the left (1) and the right (2) pedal weldments. The brake pedal latch (3) is retained in the left pedal weldment using a clevis pin (4). The brake pedal pad (5) prevents the clevis pin from backing out.

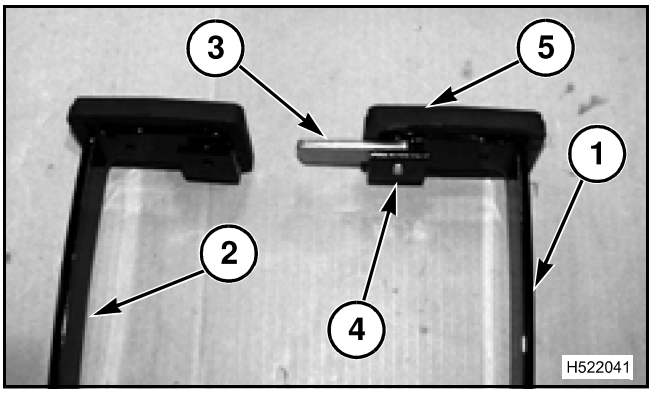


FIG. 83

FIG. 84: As the pedal weldments (1) are inserted through the cab floor, install a brake pedal seal assembly (2) onto each of the pedal weldments.

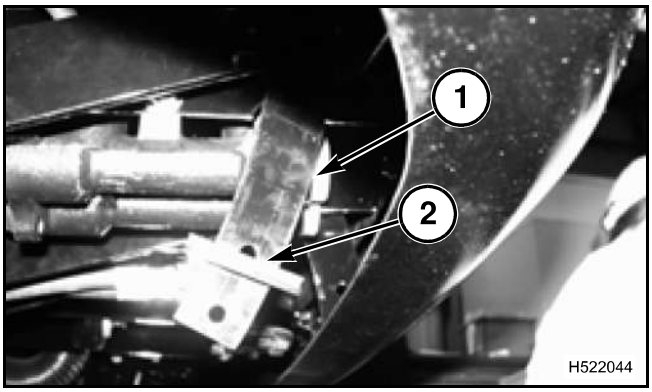


FIG. 84

FIG. 85: Put a narrow plain washer onto each of capscrews (1). Install the capscrews along with the narrow plain washers and hex flange self locking nuts securing the left (2) and right pedal weldments to the left (3) and right brake pedal arm weldments. Tighten the self locking nuts.

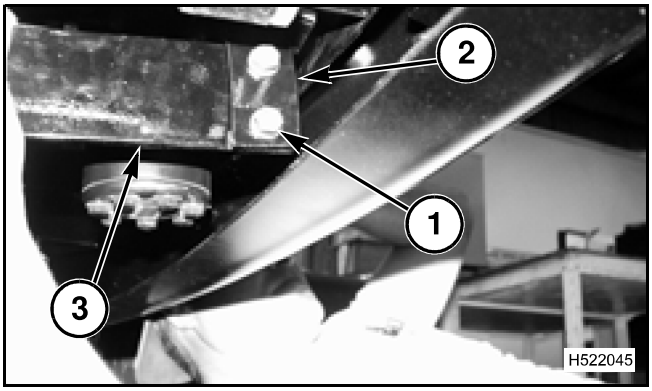


FIG. 85

FIG. 156: Left-Hand B-Pillar Cover (1).

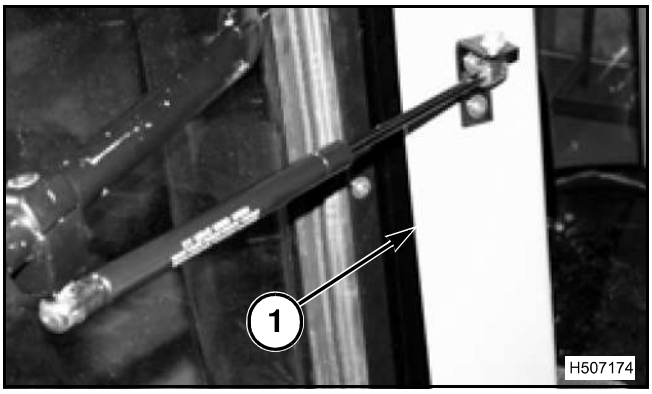


FIG. 156

FIG. 157: Right-Hand B-Pillar Cover (1).

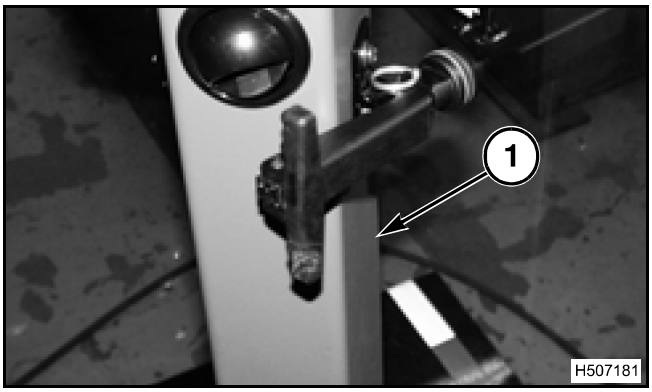


FIG. 157

FIG. 158: Left-Hand trim panel (1).

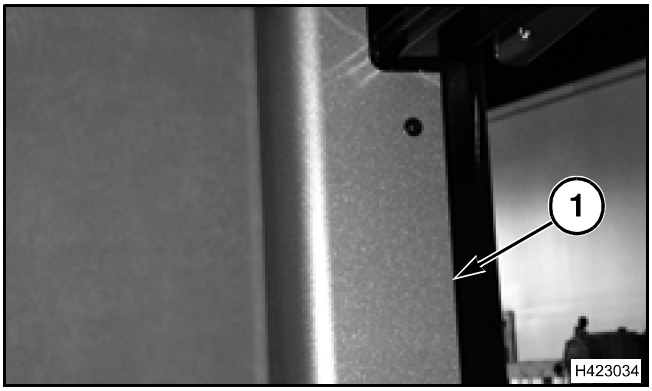


FIG. 158

FIG. 159: Electronic cabinet panel (1).

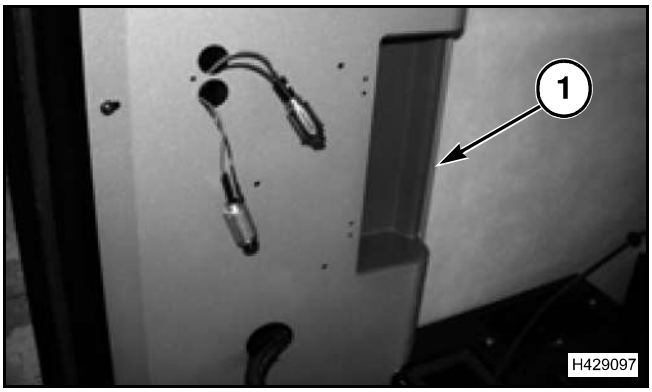


FIG. 159

FIG. 244: Move the panel to access the pan head tapping screws (1) that secure the side window hinge to the cab frame.

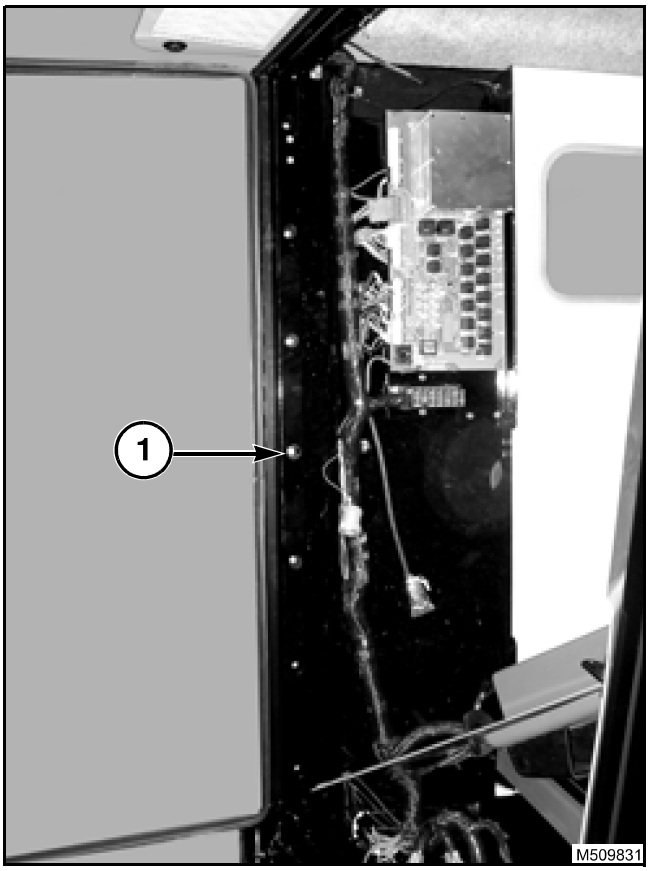


FIG. 244

FIG. 245: With an assistant support the side window while removing the screws (1) that secure the side window hinge to the cab frame.

With an assistant remove the side window making sure to support the window assembly.

IMPORTANT: Cab glass is easily broken and heavy, use care when handling the cab glass.

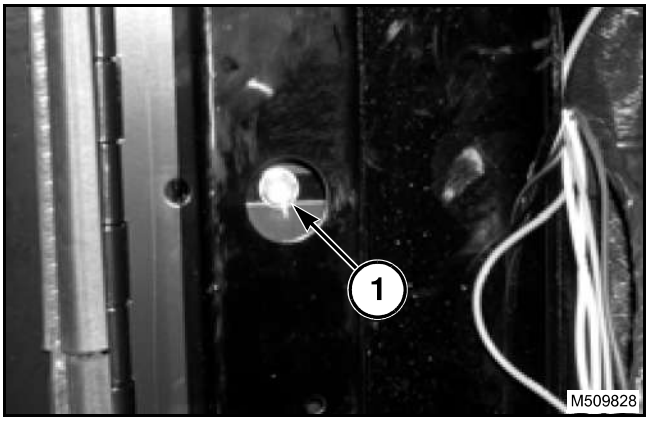


FIG. 245

FIG. 295: Wipe all the joints to remove oil and dirt. Many leaks at connections can be found visually because small amounts of oil are found on the connection. Oil at a connection indicates a leak. This leak can be seen on the bottom of the line. Very slow oil loss is permitted at the compressor seal.

Always move the detector under all the joints and connections, including the compressor, as R-134a is heavier than air.

High side leaks can be found while the unit is operating and air flowing across the condenser is decreased, or immediately after the engine is off, raising operating pressures above normal.

Low side leaks can be found when the unit is OFF, and pressures are equal which increases the low side pressure.

Leaks which have not been found will be seen when pulling down the system. The system will not hold a deep vacuum.

Repair the leaks, check, evacuate, and charge the unit.

IMPORTANT: Recover all the R-134a from the unit before starting the vacuum pump.

NOTE: There will be a very small refrigerant loss through the rubber hose walls. Loss will vary according to the condition and grade of hose. Since leakage is spread over the complete surface of the hose, the leak can be difficult to find even with a leak detector.

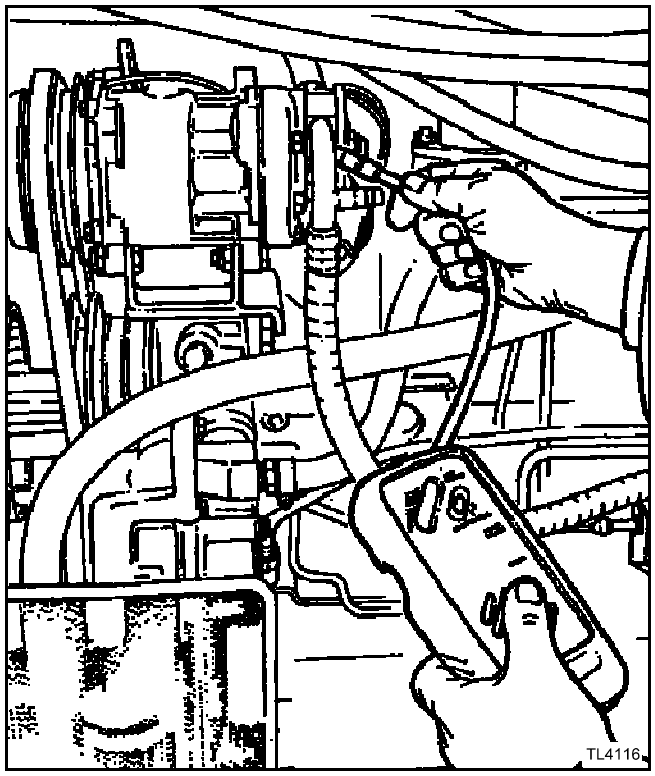


FIG. 295

Compressor Clutch Testing

These tests are done if the clutch does not operate. Check the wiring, temperature control system, high pressure switch, and low pressure switch first.

FIG. 296: Check the amperage and voltage. The current range specification is 3.6 Amps to 4.2 Amps at 12 volts. Note the following indications and corrections:

A very high current reading is a short circuit within the field coil.

No current reading is an open circuit in the winding.

An intermittent or poor system ground results in lower voltage at the clutch. Check for tight fit of the coil retaining ring. Check the ground return for an open circuit.

Replace the field coil if an open or short circuit is found.

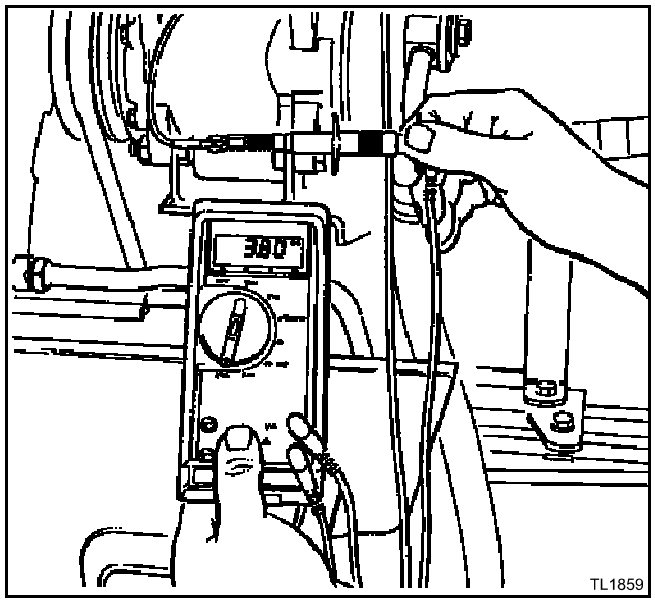


FIG. 296

COMPRESSOR CLUTCH

Electrical Check

FIG. 324: Check the ground wire on the compressor clutch terminal (1). The coil has insulation from ground and requires a ground wire.

Check the compressor clutch coil resistance.

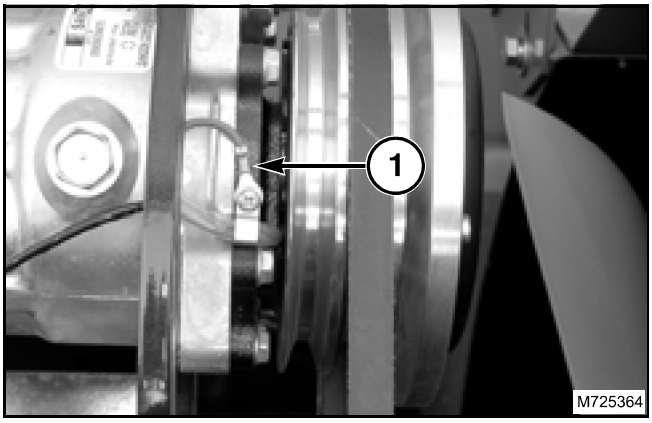


FIG. 324

Removal and Replacement

Special Tools:
Clutch retainer
Clutch plate installation tool
External retaining ring pliers
Internal retaining ring pliers
Handle
Puller sleeve
Puller pilot
Clutch plate puller
Bearing removal and replacement tool

TROUBLESHOOTING THE ANTI-ICING TEMPERATURE SENSOR - AUTOMATIC TEMPERATURE CONTROL

FIG. 407: Resistance values in relationship to temperature for anti-icing sensor testing.

Temperature	Resistance
Degrees C (Degrees F)	Ohms
-10 (14)	27.123
-7.5 (18.5)	23.693
-5 (23)	20.743
-2.5 (27.5)	18.199
0 (32)	16.000
2.5 (36.5)	14.096
5 (41)	12.443
7.5 (45.5)	11.006
10 (50)	9.753
12.5 (54.5)	8.659
15 (59)	7.702
17.5 (63.5)	6.863
20 (68)	6.126

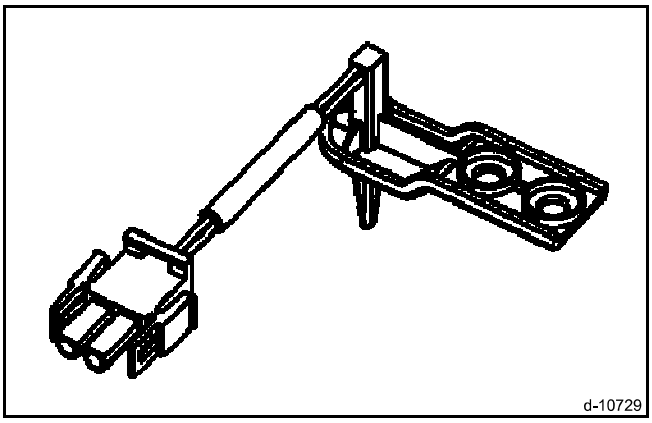


FIG. 407

INTERNAL AIR TEMPERATURE SENSOR - AUTOMATIC TEMPERATURE CONTROL

FIG. 408: Open the fuse panel door (1) to access the internal air temperature sensor.

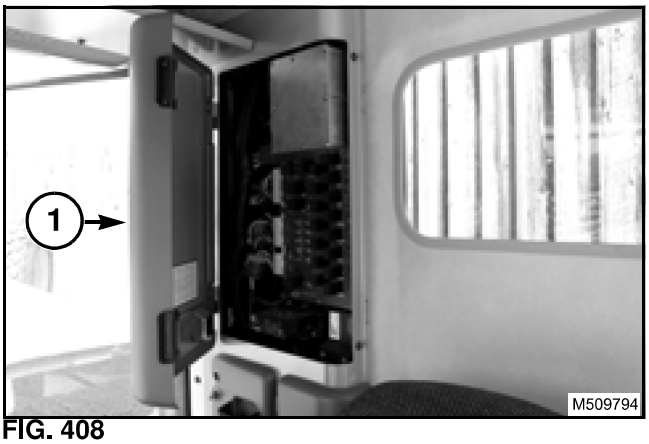


FIG. 408

FIG. 490: The heating and air conditioning harness (1) and motor ground (2) at the blower panel assembly.

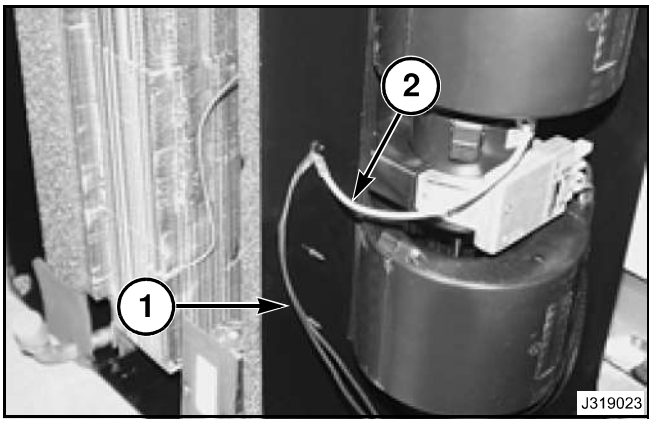


FIG. 490

TROUBLESHOOTING TEMPERATURE CONTROL SYSTEM

PROBLEM / EFFECT	POSSIBLE CAUSE	CORRECTION
Not able to control the cab temperature:	5 amp fuse in fuse block blown: - Air conditioning control thermostat location. - Wrong fuse. - Wire from the fuse block to the feeder harness connector pin has a short. - Wire from the feeder harness connector pin to the heating and air conditioning connector pin shorted. - Wire from the heating and air conditioning harness connector pin to the water control valve connector pin shorted. - Wire from the feeder harness connector pin to the control panel harness connector pin shorted. - Wire from the control panel harness connector pin to the temperature control harness connector pin has a short.	Replace the fuse. Repair damaged harness or replace the harness.
	Heater hoses not correctly connected: - Make sure the heater supply hose to the water control valve inlet is from the supply port on the engine. - Mechanical closing valve at the engine block is closed.	With a cold engine, remove both lines from the heater and put both ends of the lines into a container. Turn over the engine while watching the coolant lines (DO NOT start the engine). The line has a coolant discharge is the supply line. Connect this line to the valve inlet.

Contents

Engine Start / Run

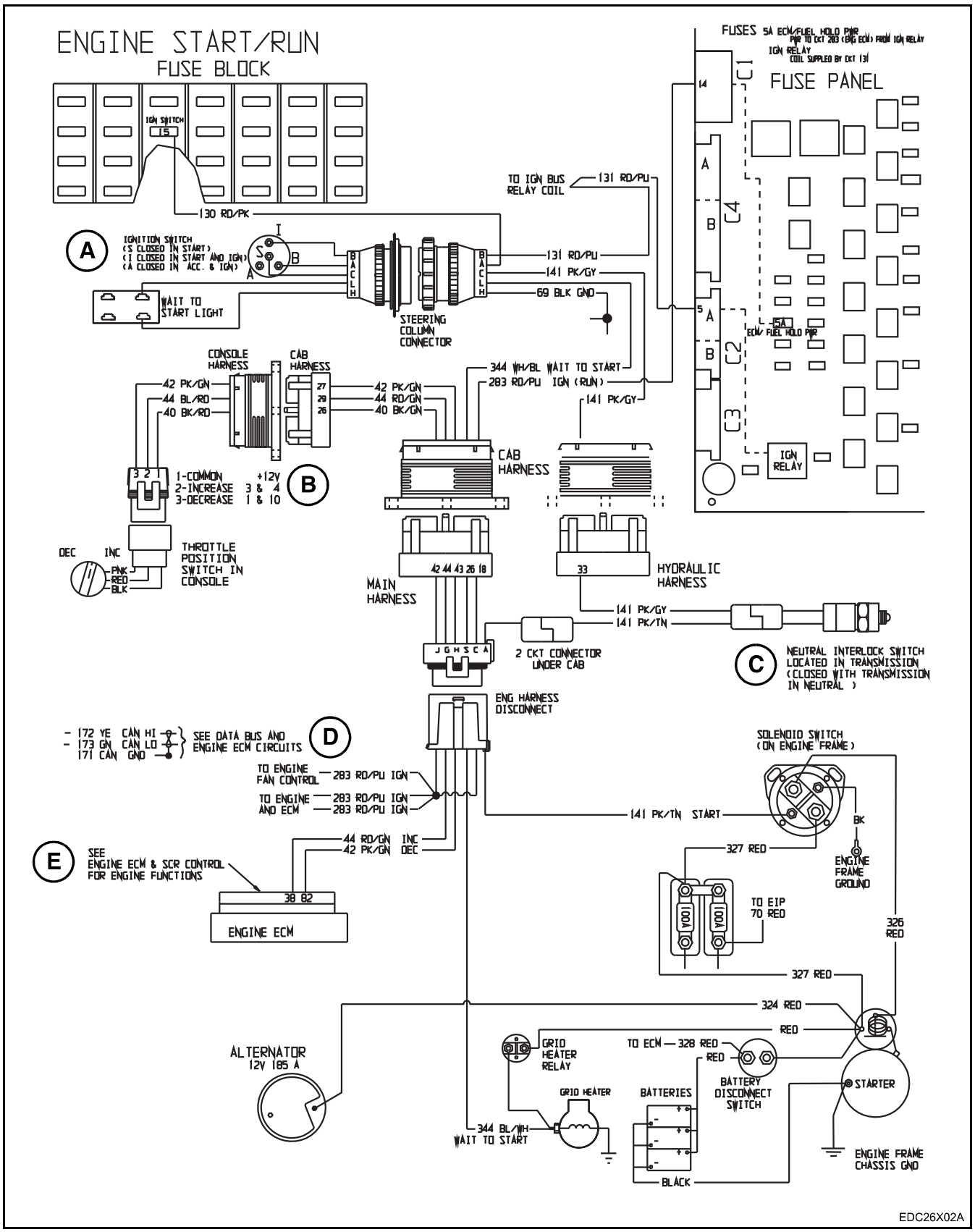


FIG. 59

FIG. 59: Engine Start/Run

Headlights, Taillights, Backup Lights, Panel Lights

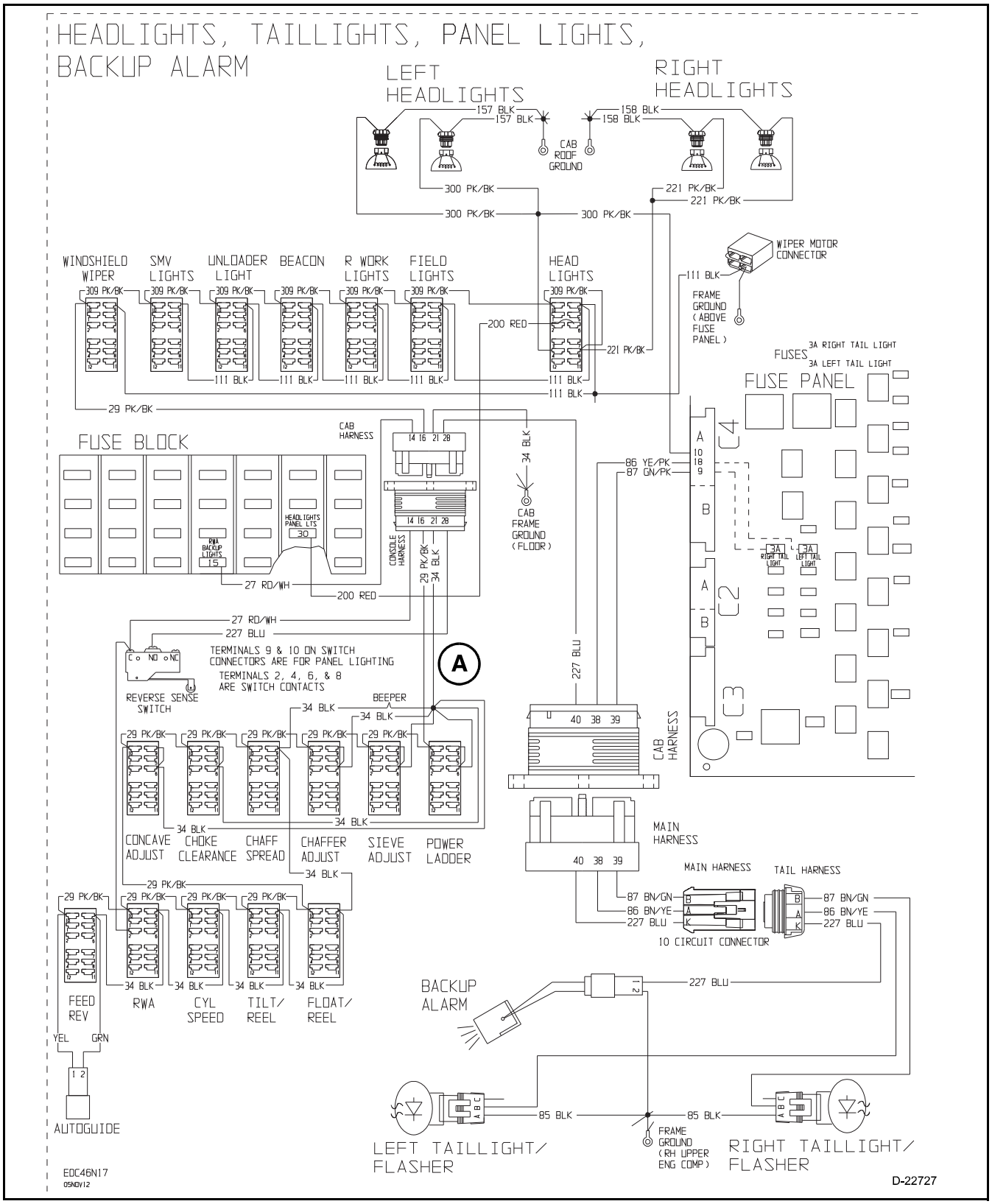


FIG. 75

FIG. 75: Headlights, Taillights, Backup Lights, Panel Lights

FIG. 125: Main thresher clutch (1).

Location:

Slightly above and forward of clutch assembly to bolt securing thresher clutch wire harness conduit.

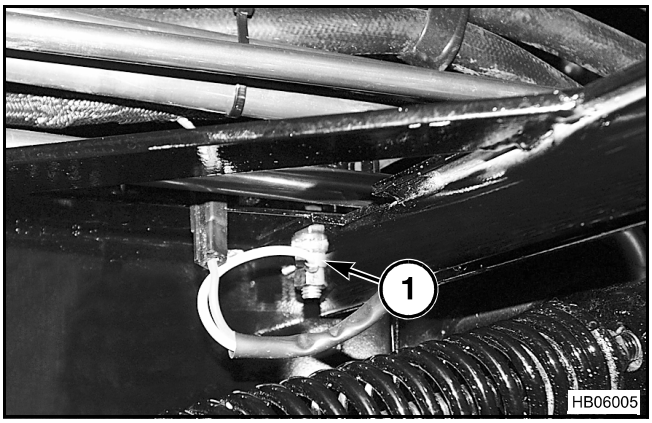


FIG. 125

FIG. 126: Header clutch (1).

Location:

To the rear of clutch assembly to separator frame.

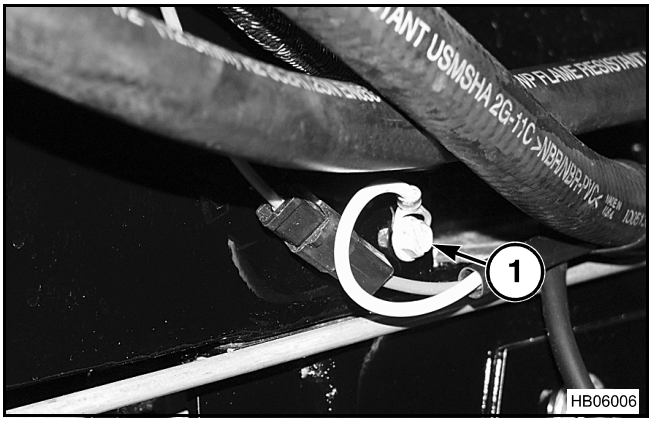


FIG. 126

FIG. 127: Battery ground (1).

Location:

Below starter to starter bolt.

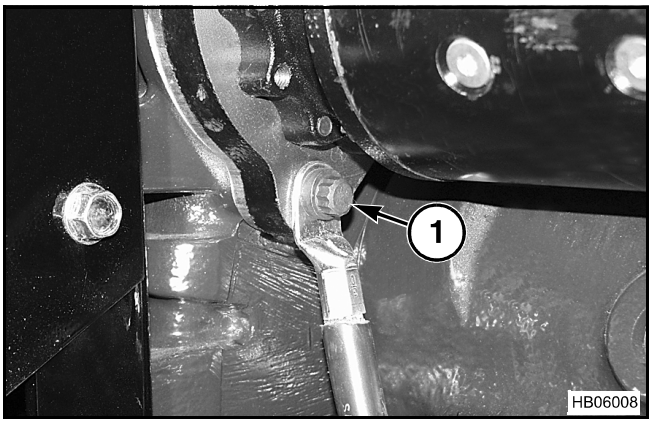


FIG. 127

Module Operator Inputs

FIG. 12: Operator inputs are:

NOTE: Function of operator inputs can be found in Operator's Manual.

(1) Momentarily push button (1) to toggle grain size.

(2) Mode switch (2) to select active grain sensor pads and test mode.

(3) Sensitivity setting (3) for grain sensor pads. clockwise is more sensitive.

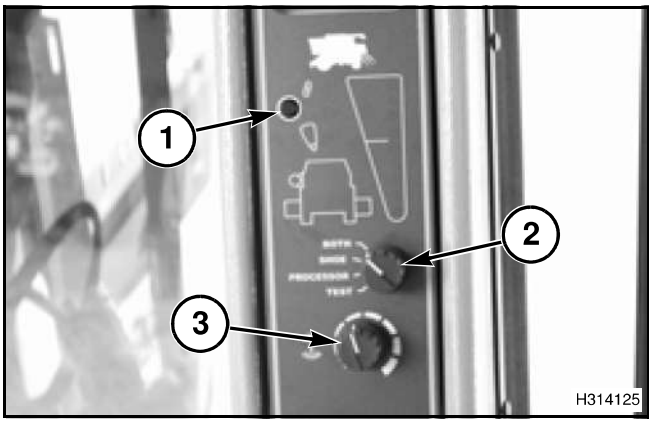


FIG. 12

Interface

FIG. 13: The data to drive the gauges (1) speed for the grain loss monitor (2) and the tachometer (3) is processed by the EIP and sent over the CAN data bus to the gauge cluster.

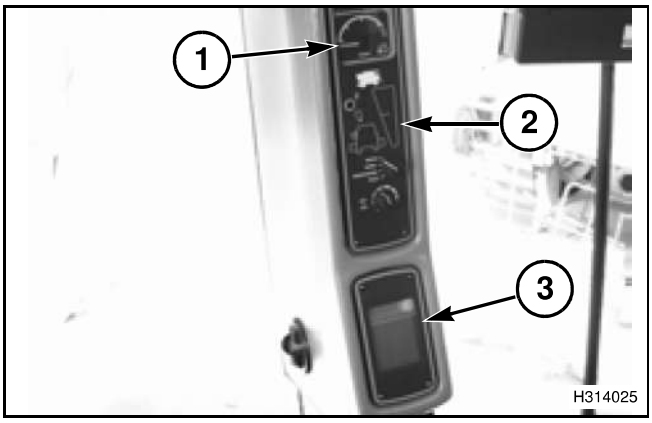


FIG. 13

FIG. 14: The gauge cluster module is programmable over the combine CAN data bus through a diagnostic connector (1) on the fuse panel.

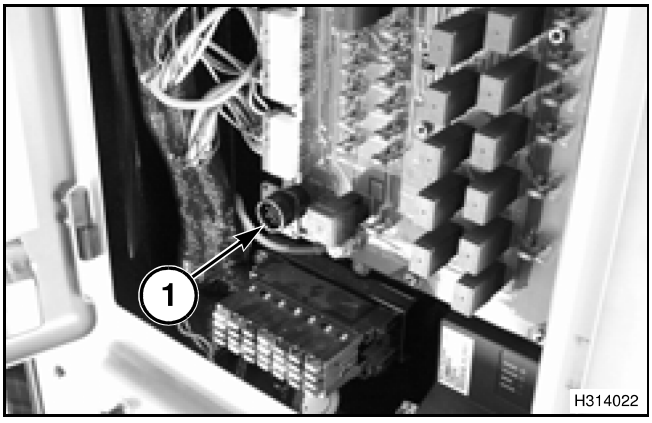


FIG. 14

Table-Class 2 Alarms

Battery Voltage	Chopper Speed	Cylinder Speed
Fuel Level	Header Control	Shoe Speed
Air Filter Switch	Engine Speed	Spreader Speed
Hydraulic Oil Level	Impeller Speed	Reel Speed
Stone Trap Door Switch	Grain Elevator Speed	Feeder Speed
Distribution Auger	Ground Speed	Return Elevator Speed

Class 3 Alarms

Class 3 alarms are silent.

NOTE: See individual inputs (section MEMBRANE SWITCHES) for LED and LCD operation.

This means there is no audible alarm when the input membrane switch is selected.

NOTE: If a class 3 alarm is requested while a class 1 or 2 alarm is in progress, the class 3 alarm will not be performed until all class 1 alarms are cleared and a class 2 audible alarm is not required.

Table-Class 3 Alarms

Concave Opening	Outside Temperature	Moisture Sensor
Cab Temperature	Chaffer/Sieve Opening	Fan Choke

Shaft Alarms

Shafts with an alarm will have a shaft speed ratio calculated by the EIP module when shaft rpm is present. The EIP calculates the shaft ratio by dividing the shaft rpm by the current engine rpm.

The shaft ratio is compared to the shaft alarm ratio. If the shaft is below the shaft alarm ratio and the thresher is engaged, then there will be a shaft alarm.

NOTE: No alarm will be triggered for any shaft where the shaft alarm ratio has not been set to a value other than zero. If the value is set at zero, the green LED for that shaft will blink continuously when the thresher clutch is engaged. Pressing the shaft switch and OK switch will acknowledge the zero speed ratio and turn off the blinking LED until the clutch is re-engaged.

FIG. 137: Pressing CLEAR button while the options value is displayed will abort any changes to the options value, resetting to the previous value.

Pressing CLEAR button when an option label is displayed will take the user to the previous option item.

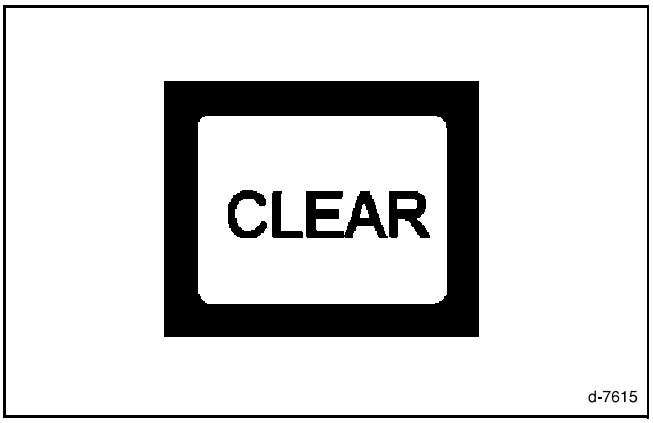


FIG. 137

SETUP 2 MENU

Software Version Numbers

FIG. 138: The LCD will show the current software versions for the CAN based controllers that are detected.

This option does not have a value that can be changed.

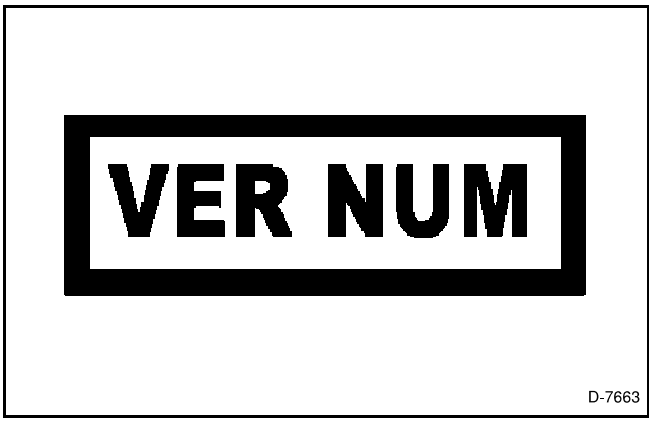


FIG. 138

FIG. 139: Pressing AREA, DIST button can be used to scroll through the list of version numbers for each of the CAN based controllers.

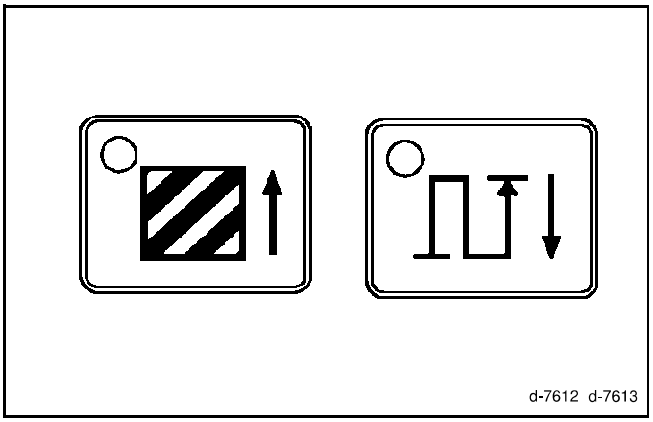


FIG. 139

FIG. 203: During the warm up process, the reel speed control should be turned fully clockwise to warm up the reel motor and oil lines.

When the system has reached a working temperature of 54.4 degrees C (130 degrees F) (recommended), calibration may be performed.

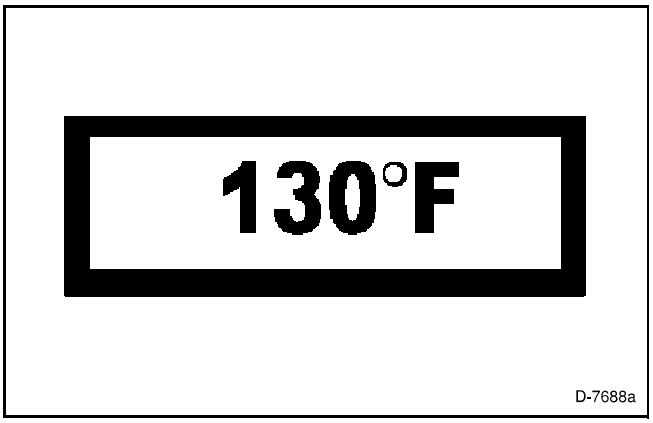


FIG. 203

FIG. 204: Reel speed is calibrated as follows:

1. The following conditions have to be met prior to entering calibration mode:

- Thresher and header should be on
- Engine speed should be at least 2000 rpm
- Ground speed should be 0 mph
- Reel speed mode button (1) in manual mode (auto LED (3) off)
- Reel speed knob (2) at full counterclockwise position

2. Press and hold the reel speed mode button (1) for at least five seconds until the auto LED (3) begins to flash.

   It flashes at 1 Hz with a 50% duty cycle.

3. Release the reel speed mode button (1).
4. Controller will gradually increase reel solenoid PWM by 1% per second until the speed sensor detects the minimum reel speed of 25 RPM.

   When the controller detects the minimum RPM, it will store the reel solenoid PWM duty cycle as the calibrated minimum duty cycle.

5. The auto LED will turn on (stops flashing) and reel speed control will transition into automatic mode.

Calibration is complete.

NOTE: If the auto LED does not stop flashing after several minutes, this is an indication that calibration has failed.

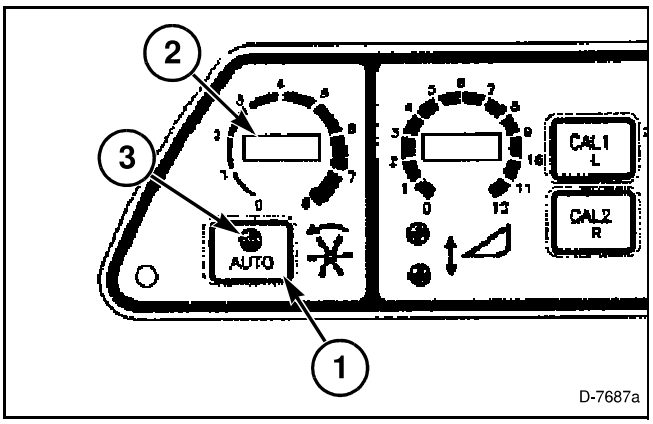


FIG. 204

FIG. 269: Fuse Panel - Using a digital voltmeter with the black lead on the +5VGND pin and the red lead on the TILT pin, measure voltage.

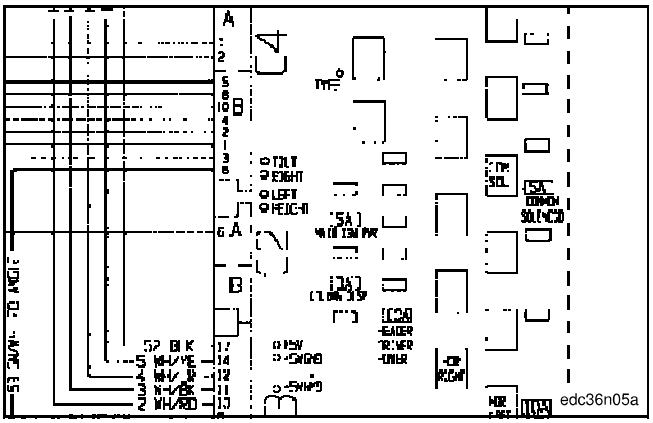


FIG. 269

FIG. 270: Feeder Housing height Sensor - Since the auto header height return to cut system depends on the function of the sensor and sensor linkage. The header height sensor must be checked/adjusted as outlined in this section.

IMPORTANT: Prior to setting the header height position sensor it is important the header be set so it is running parallel with the front axle of combine and on flat ground or a smooth surface.

CAUTION: DO NOT start engine! Engage combine parking brake

1. Adjustment of sensor linkage is not required. However, the sensor must be calibrated for each style (flex, rigid, or corn) header.
2. Ignition on.
3. Sensor linkage must have additional mechanical travel with header on ground and fully raised.

To check sensor voltage range, either the header diagnostic procedure in the EIP or the test points on the fuse panel can be used. Voltage readings must be between 1.0V and 4.0V. A minimum range of 0.75V (on ground to fully raised) is required for calibration.

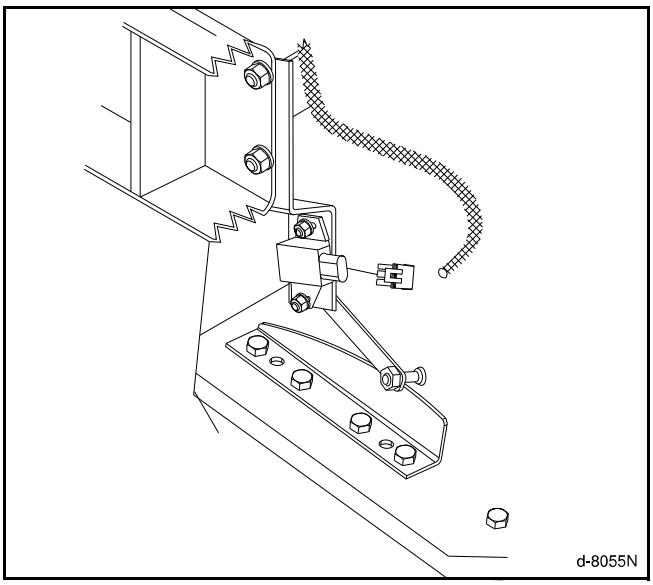


FIG. 270

FIG. 271: Fuse Panel - Using a digital voltmeter with the black lead on the +5VGND pin and the red lead on the HEIGHT pin, measure voltage.

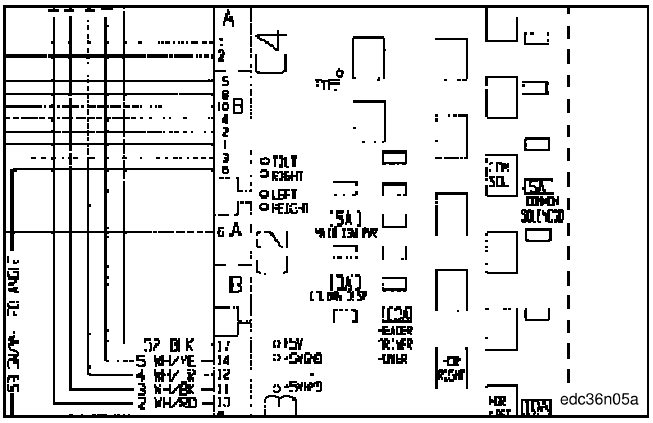


FIG. 271

Electrical Diagram

See Electrical division for header height/tilt wiring schematic.

FIG. 49: Select the desired brand name.

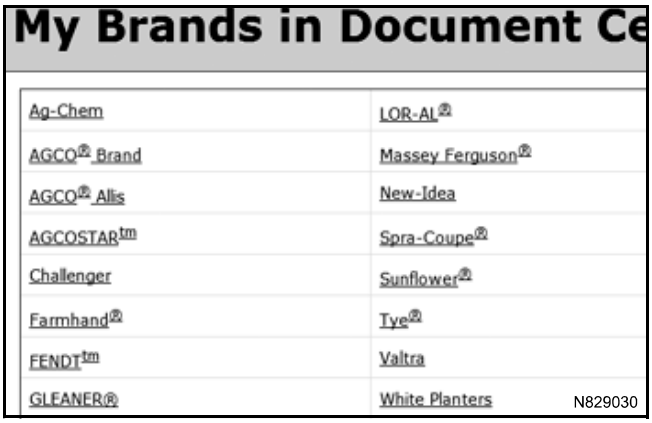


FIG. 49

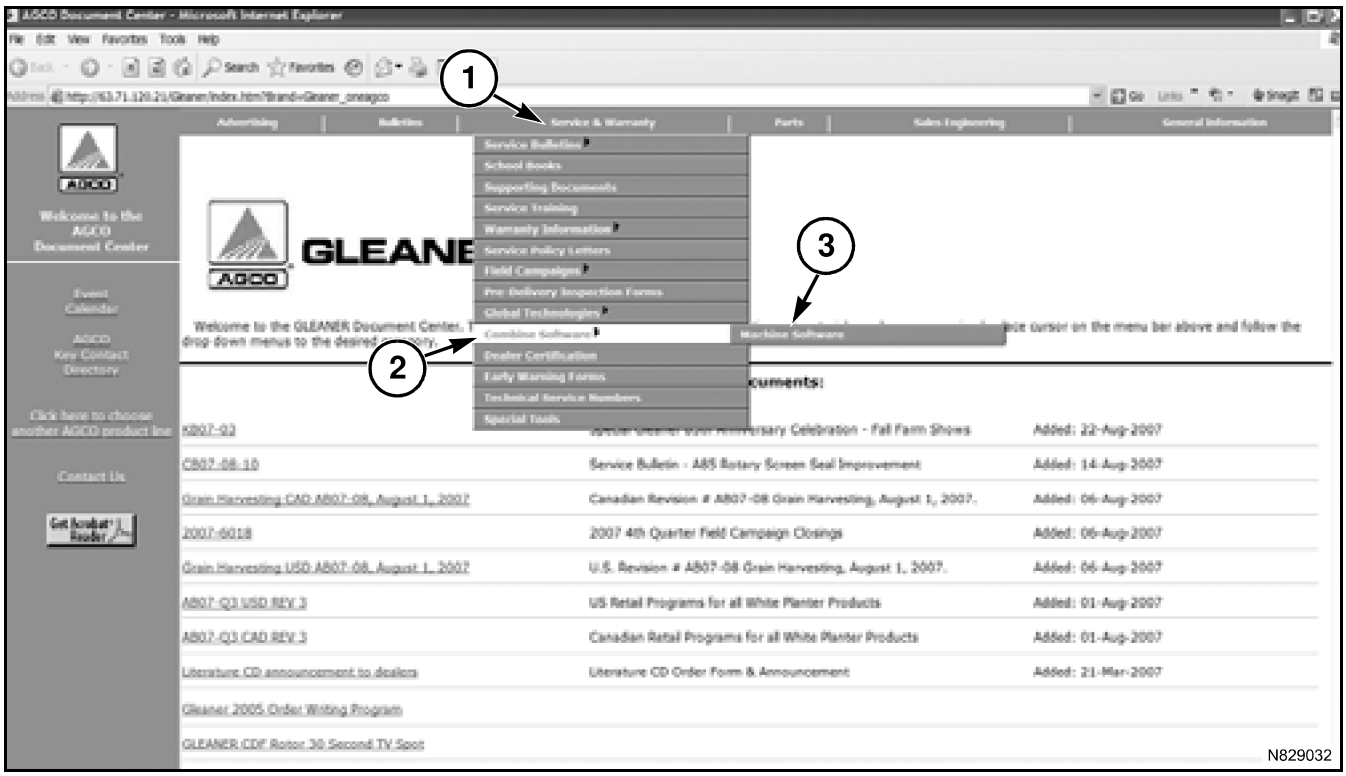


FIG. 50

FIG. 50: Go to the Service and Warranty tab (1), scroll down to Combine Software (2) and click on Machine Software (3).

PROBLEM/EFFECT	POSSIBLE CAUSE	CORRECTION
	Conditions: -Ignition key off -Disconnect header disconnect	
	Header harness status line continuity (open circuit) 1) Measure resistance of BK/GN (flex header) line from pin 7 of header disconnect to the flex header status line connector 2) Measure resistance of RD/GN (corn/rigid header) line from pin 6 of header disconnect to the corn/rigid status line connector 3) Measure resistance of GN/GY status line from pin 19 of header disconnect to status line connector.	1) If R = infinity, repair harness 2) If R = 0, go to step #2
		1) If R = infinity, repair harness 2) If R = 0, go to step 3.
		1) If R = infinity, repair harness 2) If R = 0, go to next step.
	Feeder harness failure (open circuit) 1) Disconnect 40 pin feeder house to cab harness connector -Measure resistance of feeder harness status line (#81) between pin 19 of header disconnect and pin #23 of 40 pin connector 3) Measure resistance of feeder harness supply line (#51) between pin 7 of header disconnect and pin #1 of 40 pin connector	1) If R > 0 or = infinity, check 40 pin connector and feeder harness for open or short circuit. 2) If R = 0, OK go to step #2
		1) If R > 0 ohms or = infinity, check 40 pin connector and feeder harness for open or short circuit. 2) If R = 0, OK go to step #3
		1) If R > 0 ohms or = infinity, check 40 pin connector and feeder harness for open or short circuit. 2) If R = 0 ohms, OK. Go to next cause.
	Cab harness failure (open circuit) 1) Disconnect 40 pin feeder house to cab harness connector -Measure resistance of cab harness status line (#81) between pin #23 of 40 pin connector and FP connector C4B pin 4. 2) Measure resistance of cab harness common line (#77) between pin #19 of 40 pin connector and ground 3) Measure resistance of cab harness supply line (#51) between pin #1 of 40 pin connector and FP connector C3 pin 8.	1) If R = infinity, check 40 pin connector, FP C4B connector and cab harness for open circuit. 2) If R = 0 ohms, OK. Go to step #2.
		1) If R = infinity, check 40 pin connector, FP C3 connector and cab harness for open circuit. 2) If R = 0 ohms, OK. Go to step #3.
		1) If R = infinity, check 40 pin connector, FP C3 connector and cab harness for open circuit. 2) If R = 0 ohms, OK. Replace FP header driver PCB module.

NOTE: The Fuse Panel Module (FP) checks voltage at fuse panel connector C4B pin #4. This voltage should be 5 VDC if a corn or rigid head is connected with sensors and 0 VDC if a flex header is connected with sensors. This check is made only if one or both of the header sensors is detected.

If no sensors are detected the voltage will be 2.5 VDC.

Reaction in EEM

FC is stored and oil pressure warning lamp is activated. Engine power will be reduced (Degradation Level 1). CAN message indicates active fault. Engine protection functions that depend on oil pressure are not active.

NOTE: Engine oil pressure protection is not active. The engine may damage, if oil pressure is too low.

Solution

First save the error log and then erase it. Restart the ECU after erasing the error log. If the fault occurs again during next driving cycle, check following paths:

- Check the oil pressure sensor wiring, connectors and contact surfaces of the connector pins (possible oxidation).
- Check the 5 V power supply to the sensor.
- Check the operation with another oil pressure sensor to see if oil pressure sensor is defective.

See *Oil pressure* (page 222) sensor for reference.

2.2.5 SPN 100, FMI 4, Oil pressure sensor voltage below normal

Description

The measured oil pressure signal is below the normal operating range (< 0,1 V). Possible causes are:

- The oil pressure sensor wiring is defective (Shorted to ground)
- Oil pressure sensor power supply is not correct
- The oil pressure sensor is defective

Reaction in EEM

FC is stored and oil pressure warning lamp is activated. Engine power will be reduced (Degradation Level 1). CAN message indicates active fault. Engine protection functions that depend on oil pressure are not active.

NOTE: Engine oil pressure protection is not active. The engine may damage, if oil pressure is too low.

Solution

First save the error log and then erase it. Restart the ECU after erasing the error log. If the fault occurs again during next driving cycle, check following paths:

- Check the oil pressure sensor wiring, connectors and contact surfaces of the connector pins (possible oxidation).
- Check the 5 V power supply to the sensor.
- Check the operation with another oil pressure sensor to see if oil pressure sensor is defective.

See *Oil pressure* (page 222) sensor for reference.

2.2.6 SPN 102, FMI 0, Boost pressure has reached maximum limit

Description

The measured boost pressure rises above the maximum limit during operation. Possible causes are:

- Too high fuel injection quantity (mg/str) for the engine type (tuning chip)
- Incorrect nozzles for the engine type
- Incorrect turbo charger for the engine type

EEM4 monitoring system has detected negative deviation on rail pressure. Measured rail pressure is not decreasing according the setpoint value to MPROP. Typically it is indicating clogged diesel fuel return line(to tank), leakage in the MPROP or MPROP stick with open condition.

Possible causes are:

- Fuel return line back to tank is clogged
- The high pressure pump is not working correctly
- The rail pressure sensor wiring is defective

Reaction in EEM

FC is stored and warning lamp is activated. Engine power is heavily reduced (Degradation Level 3). CAN message indicates active fault. Engine functions dependent on rail pressure are not active.

Solution

First save the error log and then erase it. Restart the ECU after erasing the error log. If the fault occurs again during next driving cycle, check following paths:

- A temporarily pressure peak (breakdown), during engine running. Example abnormal load drop/fuel quantity drop during running. If the fault do not activate within next 10 operating hours, probably reason was too sensitive diagnostic function.

Solution2:

Turn the ignition key off and back on. Start the engine; if the fault code is active always when engine is running, check the following paths:

- Check the fuel return line. During engine running, constant diesel fuel flow should return to fuel tank(minimum 3 L/h).

To detect possible return line problem:

- Return the diesel fuel temporarily to canister from engine return line connector. Check correct engine return line location from engine/vehicle service manual. If the fault do not activate anymore, probably reason is clogged return line.
- Check the high pressure pump: Look for possible high pressure pump faults and inspect accordingly (e.g. faults with wiring and connectors)
- Check the high pressure pump operation with Service Tool test function or have the pump inspected by an authorized Bosch service dealer
- Check the rail pressure sensor wiring, connectors and contact surfaces of the connector pins (possible oxidation).
- Check the 5 V power supply to the sensor.
- Check the operation with another rail pressure sensor to see if sensor is defective.
- In case of damaged high pressure pump, rail pressure sensor or wiring harness, replace damaged parts according service manual.

Solution3: valid only for 4-valve engines.

- Check the tightness of injectors side feed pipes. See correct tightening torque and operating instructions from engine repair manual.

See *Rail pressure* (page 229) sensor for reference.

2.2.72 SPN 157, FMI 2, Rail Pressure control: Pressure raw value is intermittent

Description

EEM4 monitoring system has detected pressure jumps in rail pressure. Possible cause:

- The rail pressure sensor connector is defective

2.2.143 SPN 3235, FMI 5, Downstream NOx sensor reports O2 open wire

Description

EEM4 monitoring system has detected O2 measurement open circuit in downstream NOx sensor. Open circuit is between NOx sensor and NOx sensors electronic control unit.

Possible causes are:

- The NOx sensor wiring is defective
- The NOx sensor is defective

Reaction in EEM

FC is stored and warning lamp is activated. CAN message indicates active fault.

NOTE: Present fault is classified as a emission related fault. Engine power will be reduced after certain time which is defined by authorities.

Solution

First save the error log and then erase it. Restart the ECU after erasing the error log. If the fault occurs again during next driving cycle, check following paths:

- Check the NOx sensor wiring, connectors and contact surfaces of the connector pins (possible oxidation).
- Check the operation with another NOx sensor to see if sensor is defective.

2.2.144 SPN 3349, FMI 8, Torque/Speed Control (TSC1) timeout

Description

EEM4 monitoring system doesn't receive a torque/speed demand within the required time. Possible causes are:

- The sending device which transmits TSC1 is defective.
- The CAN bus is defective

Reaction in EEM

FC is stored and warning lamp is activated. CAN message indicates active fault. Engine control unit will use secondary speed source, if available, or engine will be forced into low idle.

Solution

First save the error log and then erase it. Restart the ECU after erasing the error log. If the fault occurs again during next driving cycle, check following paths:

- Contact vehicle manufacturer.
- Check CAN bus opearation

2.2.145 SPN 3361, FMI 14, DEF dosing valve current abnormal behaviour

Description

EEM4 monitoring system has detected abnormal behaviour on DEF dosing valve current. Possible causes are:

- The DEF dosing valve wiring is defective.
- The DEF dosing valve is defective

Reaction in EEM

Solution

First save the error log and then erase it. Restart the ECU after erasing the error log. If the fault occurs again during next driving cycle, check following paths:

- Check the DEF supply module heater relay wiring, connectors and contact surfaces of the connector pins (possible oxidation). (see *Supply module* (page 235))
- Check the operation with another DEF supply module heater relay to see if relay is defective.
- Check the ECU operation with another EEM4 controller. If the system is functional and the fault is not active with the replacement ECU, then the original ECU is defective.

2.2.213 SPN 4344, FMI 4, DEF supply module heater control circuit short circuit to GROUND

Description

EEM4 monitoring system has detected short circuit on DEF supply module heater control circuit. Possible causes are:

- The DEF supply module heater relay wiring is defective. (Shorted to ground)
- The DEF supply module heater is defective

Reaction in EEM

FC is stored and warning lamp is activated. CAN message indicates active fault.

NOTE: Present fault is classified as a emission related fault. Engine power will be reduced after certain time which is defined by authorities.

Solution

First save the error log and then erase it. Restart the ECU after erasing the error log. If the fault occurs again during next driving cycle, check following paths:

- Check the DEF supply module heater relay wiring, connectors and contact surfaces of the connector pins (possible oxidation). (see *Supply module* (page 235))
- Check the operation with another DEF supply module relay to see if relay is defective.

2.2.214 SPN 4356, FMI 5, DEF supply module heater relay open circuit

Description

EEM4 monitoring system has detected open cicuit on DEF supply module heater relay. Possible causes are:

- The DEF supply module heater relay wiring is defective
- The DEF supply module heater is defective

Reaction in EEM

FC is stored and warning lamp is activated. CAN message indicates active fault.

NOTE: Present fault is classified as a emission related fault. Engine power will be reduced after certain time which is defined by authorities.

Solution

First save the error log and then clear it. After clearing restart the ECU, if the fault occurs again during next driving check following paths:

- Check the DEF supply module heater relay wiring, connectors and contact surfaces of the connector pins (possible oxidation). (see *Supply module* (page 235))

2.2.286 SPN 520228, FMI 12, ECU internal fault 0121

Description

EEM4 monitoring system has detected internal failure. Possible reason is ECU hardware defect.

Reaction in EEM

FC is stored and warning lamp is activated. CAN message indicates active fault.

Solution

First save the error log and then erase it. Restart the ECU after erasing the error log. If the fault occurs again during next driving cycle, check following paths:

- Check the ECU operation with another EEM4 controller. If the system is functional and the fault is not active with the replacement ECU, then the original ECU is defective.

2.2.287 SPN 520229, FMI 13, ECU internal fault 0122

Description

EEM4 monitoring system has detected internal failure. Possible reason is ECU hardware defect.

Reaction in EEM

FC is stored and warning lamp is activated. CAN message indicates active fault.

Solution

First save the error log and then erase it. Restart the ECU after erasing the error log. If the fault occurs again during next driving cycle, check following paths:

- Check the ECU operation with another EEM4 controller. If the system is functional and the fault is not active with the replacement ECU, then the original ECU is defective.

2.2.288 SPN 520230, FMI 31, Engine specification mismatch

Description

The engine specification number don't match with EEM software specification number. Possible causes are:

- The engine software is defective
- The control unit is defective

Reaction in EEM

FC is stored and warning lamp is activated. CAN message indicates active fault. Engine power and speed will be reduced.

Solution

First save the error log and then erase it. Restart the ECU after erasing the error log. If the fault occurs again during next driving cycle, check following paths:

- Download new software with correct specification number to the engine or activate the ECU.
- Check the ECU operation with another EEM4 controller. If the system is functional and the fault is not active with the replacement ECU, then the original ECU is defective.

2.2.349 SPN 521001, FMI 14, DEF heater relay shorted to battery

Description

EEM4 monitoring system has detected short circuit on DEF heater main relay. Possible causes are:

- The DEF heater main relay wiring is defective. (Shorted to high source)
- The DEF heater main relay is defective

Reaction in EEM

FC is stored and warning lamp is activated. CAN message indicates active fault.

NOTE: Present fault is classified as a emission related fault. Engine power will be reduced after certain time which is defined by authorities.

Solution

First save the error log and then erase it. Restart the ECU after erasing the error log. If the fault occurs again during next driving cycle, check following paths:

- Check the DEF heater main relay wiring, connectors and contact surfaces of the connector pins (possible oxidation).
- Check the operation with another DEF heater main relay to see if relay is defective.

2.2.350 SPN 521001, FMI 3, DEF heater main relay circuit short circuit to HIGH SOURCE

Description

EEM4 monitoring system has detected short circuit on DEF heater main relay. Possible causes are:

- The DEF heater main relay wiring is defective. (Shorted to high source)
- The DEF heater main relay is defective

Reaction in EEM

FC is stored and warning lamp is activated. CAN message indicates active fault.

NOTE: Present fault is classified as a emission related fault. Engine power will be reduced after certain time which is defined by authorities.

Solution

First save the error log and then erase it. Restart the ECU after erasing the error log. If the fault occurs again during next driving cycle, check following paths:

- Check the DEF heater main relay wiring, connectors and contact surfaces of the connector pins (possible oxidation).
- Check the operation with another DEF heater main relay to see if relay is defective.

2.2.351 SPN 521001, FMI 31, DEF heater relay powerstage over temperature

Description

EEM4 monitoring system has detected over temperature on DEF heater main relay. Possible causes are:

- The DEF heater main relay wiring is defective.
- The DEF heater main relay is defective
- The control unit is defective

Reaction in EEM

- (For 4-cyl engine see *4-cyl engine injector harness* (page 243)), (For 6-cyl engine see *6-cyl engine injector harness* (page 243)), (For 7-cyl engine see *7-cyl engine injector harness* (page 245)), (For 12-cyl engine see *12-cyl engine injector harness* (page 245))

2.2.424 SPN 654, FMI 5, Engine injector cylinder #4, Current below normal: Open circuit

Description

The EEM4 system has detected open circuit on engine injector cylinder #4. Possible causes are:

- The solenoid valve connector is defective
- The solenoid valve wiring is defective
- The solenoid valve is defective

Reaction in EEM

FC is stored and warning lamp is activated. CAN message indicates active fault. Engine power will be heavily reduced (Degradation Level 3).

Solution

First save the error log and then erase it. Restart the ECU after erasing the error log. If the fault occurs again during next driving cycle, check following paths:

- Check the solenoid valve wiring, connector and contact surfaces of the connector pins (possible oxidation).
- Measure between solenoid valve 4 connectors and ECU connector, to see if there is faul in cables.
- Check the operation with another diesel injector to see if diesel injector is defective.
- (For 4-cyl engine see *4-cyl engine injector harness* (page 243)), (For 6-cyl engine see *6-cyl engine injector harness* (page 243)), (For 7-cyl engine see *7-cyl engine injector harness* (page 245)), (For 12-cyl engine see *12-cyl engine injector harness* (page 245))

2.2.425 SPN 655, FMI 13, Engine injector cylinder #5, Calibration value missing

Description

The EEM monitoring system has detected that calibration is missing from engine injector cylinder #5.

Reaction in EEM

FC is stored and warning lamp is activated. Engine power is heavily reduced (Degradation Level 3). CAN message indicates active fault.

Solution

Contact a local representative service. New injection calibration can be done by engine service tool.

2.2.426 SPN 655, FMI 14, Engine injector cylinder #5, Short circuit

Description

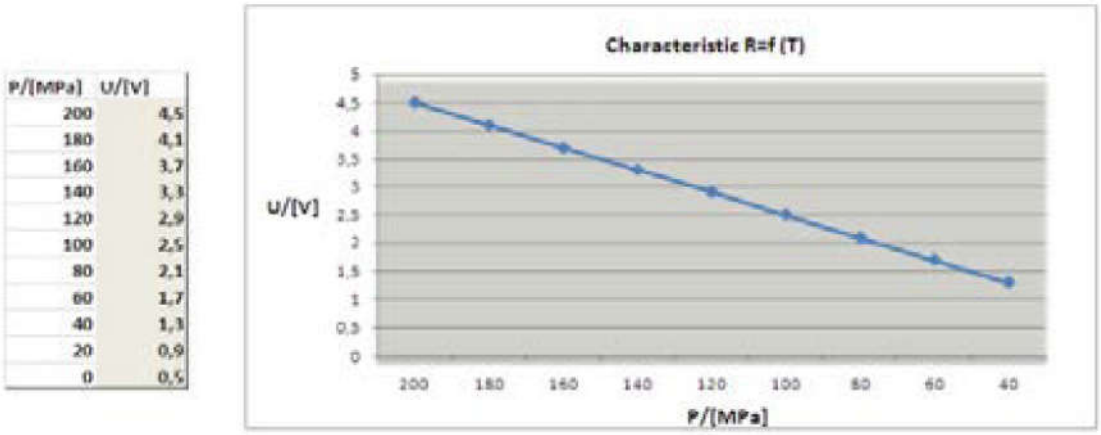
The EEM4 system has detected short circuit on solenoid valve 5 control. Possible causes are:

- The solenoid valve connector is defective
- The solenoid valve wiring is defective
- The solenoid valve is defective

Output voltage:

```
At 0 MPa = 0.5 V
At 200 MPa = 4.5 V
```

Rail pressure sensor characteristics *Characteristics, Rail pressure sensor* (page 230).



P/[MPa]	U/[V]
200	4,5
180	4,1
160	3,7
140	3,3
120	2,9
100	2,5
80	2,1
60	1,7
40	1,3
20	0,9
0	0,5

Figure 2.16: Characteristics, Rail pressure sensor

2.3.10 Water in fuel

Description

The water in fuel sensor detects water rate in the Pre-fuel filter.

ECU connection

Pin numbers at ECU:

```
EDC17CV41+      2.84 Supply voltage (wired through cross wiring connector)
EDC17CV41+      1.36 Input signal
EDC17CV41+      1.43 Ground
```

The water in fuel sensor is shown in figure *ECU connection EDC17CV41+, Water in fuel sensor* (page 231).

Characteristics

Output signal:

```
Open circuit when water is not detected
Output signal grounded when water is detected
```

2.3.11 Intake manifold temperature

Description