

SECTION 1 - GENERAL INFORMATION

CYLINDER BLOCK

Taper of Cylinder Bore	0.025mm (0.001 in) Repair Limit 0.127mm (0.005 in) Wear Limit
Cylinder Bore out of Round	0.03mm (0.0015 in) Repair Limit 0.127mm (0.005 in) Wear Limit
Cylinder Bore Diameters	111.778-111.841mm (4.4007-4.4032 in)
Rear Oil Seal Bore Diameter	140.77-140.87mm (5.542-5.546 in)
Block to Head Surface Flatness	0.08mm (0.003 in) in any 152mm (6 in) 0.03mm (0.001 in) in any 25.40mm (1 in)

CYLINDER HEAD

Valve Guide Bore Diameter	9.469-9.495mm (0.3728-0.3738 in)
Head to Block Surface Flatness	0.03mm (0.001 in) in any 25.4mm (1 in), or 0.127mm (0.005in) overall limit

EXHAUST VALVES

Face Angle	44°15'-44°30' Relative to the Head of Valve
Stem Diameter	Std :9.401-9.421mm (0.3701-0.3709 in) 0.076mm (0.003 in) Oversize :9.477-9.497mm (0.3731-0.3739 in) 0.38mm (0.015 in) Oversize :9.781-9.802mm (0.3851-0.3859 in) 0.030 in (0.76mm) Oversize :10.163-10.183mm (0.4001-0.4009 in)
Head Diameter	42.88-43.13mm (1.688-1.698 in)
Stem to Guide Clearance	0.048-0.094mm (0.0019-0.0037 in)
Lash Clearance (Cold)	0.43-0.53mm (0.017-0.021 in)

INTAKE VALVES

Face Angle	29°15'-29°30' Relative to Head of Valve
Stem Diameter	Std :9.426-9.446mm (0.3711-0.3719 in) 0.076mm (0.003 in) Oversize :9.502-9.522mm (0.3741-0.3749 in) 0.381mm (0.015 in) Oversize :9.807-9.827mm (0.3861-0.3869 in) 0.762mm (0.030 in) Oversize :10.188-10.208mm (0.4011-0.4019 in)
Head Diameter	47.37-47.63mm (1.865-1.875 in)
Stem to Guide Clearance	0.023-0.069mm (0.0009-0.0027 in)
Lash Clearance (Cold)	0.36-0.46mm (0.014-0.018 in)

VALVE SPRINGS

Number per Valve	1
Free Length	60.7mm (2.39 in)
Length, loaded at 27.7-31.3kg (61.69 lb)	48.26mm (1.900 in)
Length, loaded at 61-69kg (135-153 lb)	35.69mm (1.405 in)

SECTION 2 - ENGINE

CYLINDER BLOCK

Taper of Cylinder Bore	0.025mm (0.001 in) Repair Limit 0.127mm (0.005 in) Wear Limit
Cylinder Bore out of Round	0.03mm (0.0015 in) Repair Limit 0.127mm (0.005 in) Wear Limit
Cylinder Bore Diameters	111.778–111.841mm (4.4007–4.4032 in)
Rear Oil Seal Bore Diameter	140.77–140.87mm (5.542–5.546 in)
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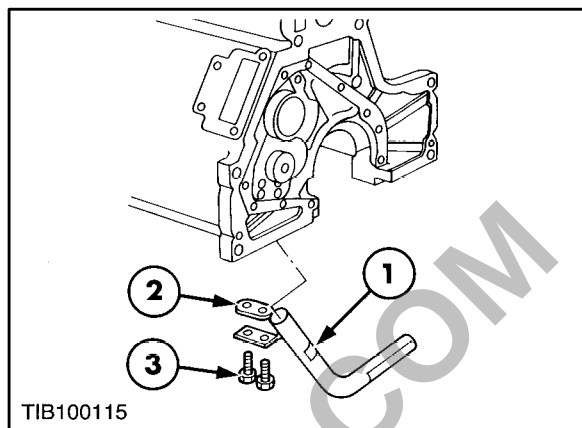
INTAKE VALVES

Face Angle	29°15'–29°30' Relative to Head of Valve
Stem Diameter	Std :9.426–9.446mm (0.3711–0.3719 in) 0.076mm (0.003 in) Oversize :9.502–9.522mm (0.3741–0.3749 in) 0.381mm (0.015 in) Oversize :9.807–9.827mm (0.3861–0.3869 in) 0.762mm (0.030 in) Oversize :10.188–10.208mm (0.4011–0.4019 in)
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VALVE SPRINGS

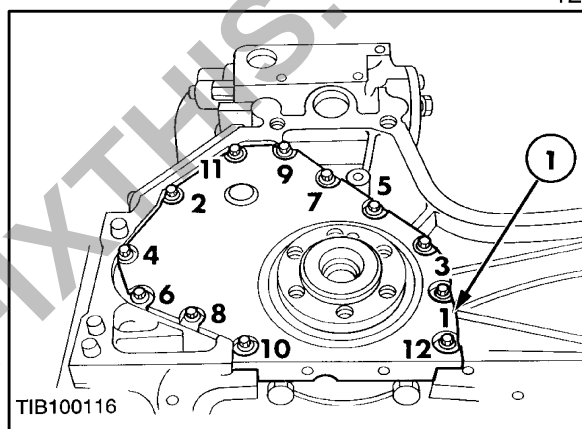
Number per Valve	1
Free Length	60.7mm (2.39 in)
Length, loaded at 27.7–31.3kg (61.69 lb)	48.26mm (1.900 in)
Length, loaded at 61–69kg (135–153 lb)	35.69mm (1.405 in)

3. Fit a new O-Ring to the output tube, lubricate and insert the pump into the block tightening to, 23.0–28.4Nm (17–21lbf ft).
4. Fit a new O-Ring into suction port. Lubricate and insert tube/screen assembly (1) into pump through bottom of engine. Fitting a new gasket (2), torque the attaching bolts (3) to, 27–34Nm (20–25 lbf ft).
5. Refit gears and check backlash as previously described, refer to chapter 1.



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6. Ensure the engine backplate is fitted correctly and the bolts are torqued up in sequence. Refer to chapter 1.

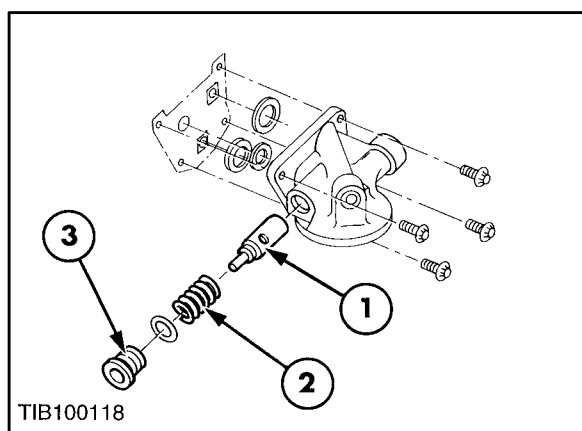


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Oil Filter Support Assembly

Removal

1. Unscrew and discard the old filter. Loosen the 4 attaching bolts and oil connections and remove the filter support assembly from the block. Discarding the O-Rings.
2. Clean the filter support in a suitable solvent.
3. Remove pressure relief valve plug (3), removing valve (1) and spring (2). To ensure correct operation of the pressure relief valve, check spring length,
Free length = 52.8mm (2.08 in).
Compressed length = 37.0mm (1.46 in) using a weight of 15.6 kgs (34.3 lbs).
4. Check the parts for damage, wear, and replace as necessary. Failure to do so could result in premature wear to the engine, due to oil bypassing the filter and returning back to the system.



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INSTRUMENT CONSOLE CONTROLS

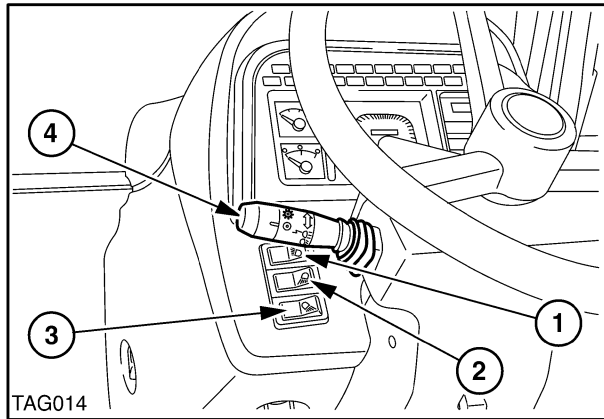


Figure 3 - Instrument Console - left-hand side

1. Work lamp switch - front, roof-mounted
2. Work lamp switch - front, low-mounted
3. Work lamp switch - rear
4. Multi-function switch

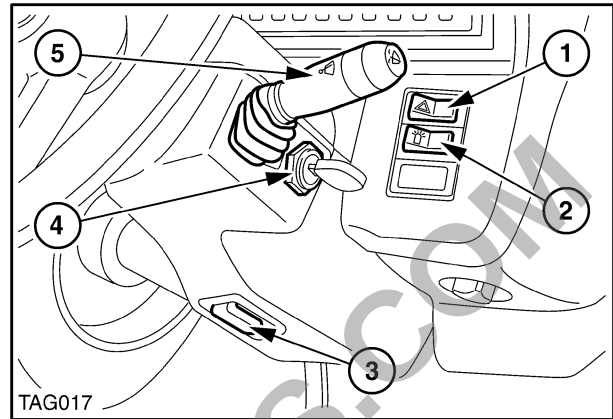


Figure 4 - Instrument Console - right-hand side

1. Hazard warning lights switch
2. Roof beacon switch (where fitted) *
3. Steering column clamp lever
4. Key-start switch
5. Windscreen wipe/wash control

* Tractors without cab may have the optional creeper gears switch in this location.

Refer to the Operators Manual for complete operating instructions.

INSTRUMENT PANELS

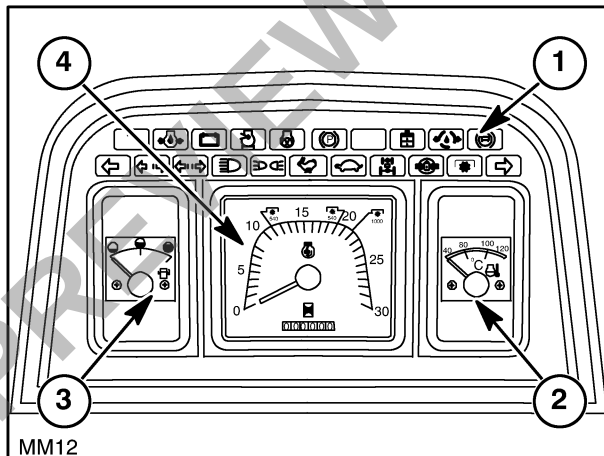


Figure 5 - Analogue Instrument Panel

1. Warning and indicator lights
2. Engine coolant temperature gauge
3. Fuel gauge
4. Proofmeter

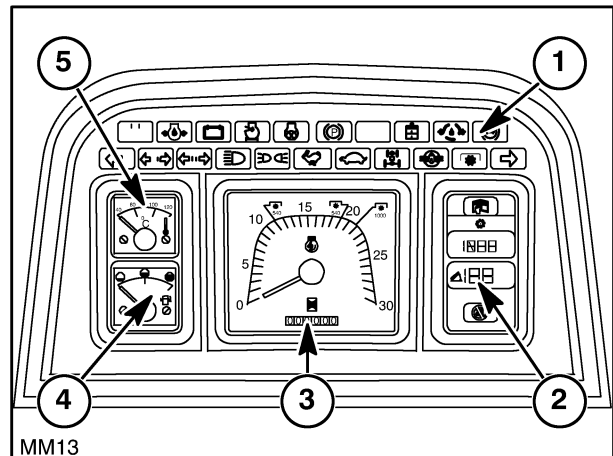
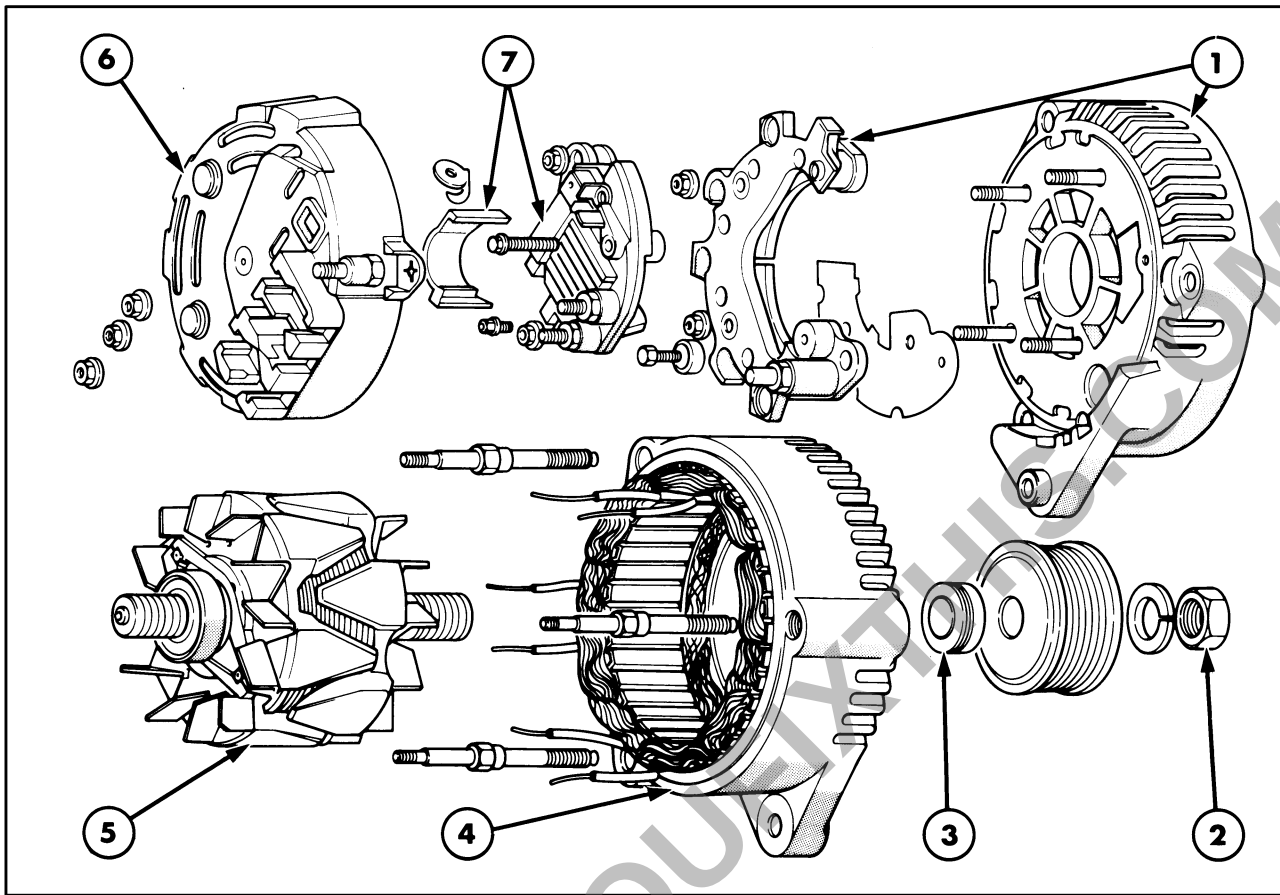


Figure 6 - Analogue/Electronic Instrument Panel

1. Warning and indicator lights
2. Liquid crystal display panel
3. Proofmeter
4. Fuel gauge
5. Engine coolant temperature gauge

Refer to Chapters 4 and 3 of this Section for full details



100 Amp Alternator Components

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1. Rectifier and Housing Assembly
2. Pulley Retaining Nut
3. Spacer

4. Stator and Housing Assembly
5. Rotor Assembly
6. End Cover

7. Regulator and Brushbox Assembly

Disassembly - 100 Amp Alternator

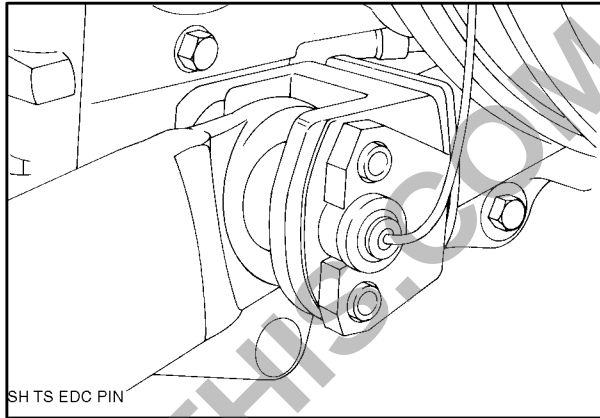
With reference to Figure 121

1. Remove the three nuts securing the plastic end cover.
2. Remove the nut securing the blue wire to the warning lamp terminal and disconnect the wire. Remove the two bolts and two nuts securing the regulator and brushbox assembly, withdraw the assembly from the alternator.
3. Using a suitable soldering iron, unsolder the six wires from the stator to rectifier.
4. Remove the three nuts securing the two halves of the outer casing. Mark each half of the casing to aid reassembly and carefully pull the casing apart, it may be necessary to gently tap the casing on the mounting lugs.
5. Remove the nut securing the pulley to the rotor shaft and withdraw the rotor from the casing.
6. It is not necessary to remove the rectifier from the casing as these are serviced as one unit.

8x2	12x12	24x24	16x16
		EDC	EDC

16. LOAD SENSING PINS

- 50 kN pins
- The fixing flange ensures correct pin orientation



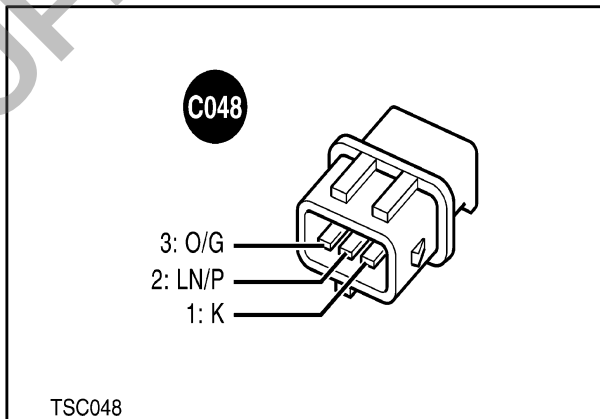
TEST PROCEDURE

Resistance

- 1 to 2 177 k Ω
- 1 to 3 8.9 k Ω
- 2 to 3 177 k Ω

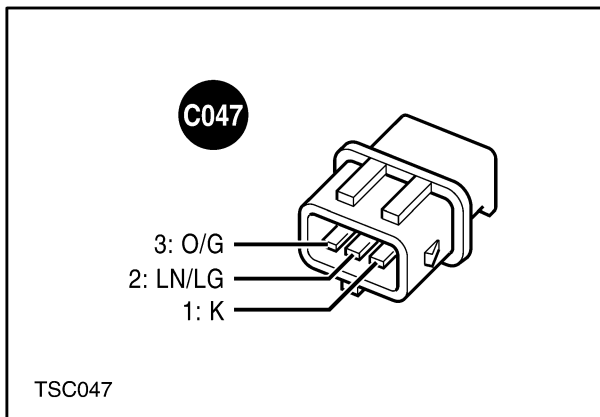
Voltage

8V at pin 1, **PINK** wire to **EARTH**.



ASSOCIATED ERROR CODES

- EDC 14 Right hand load sensing pin failure/circuit open or shorted to chassis.
- EDC 15 Right hand load sensing pin failure/circuit shorted to chassis.
- EDC 16 Left hand load sensing pin failure/circuit open or shorted to chassis.
- EDC 17 Left hand load sensing pin failure/circuit shorted to chassis.
- EDC 18 Both load sensing pins disconnected or open load sensing pin circuit.
- EDC 19 Load sensing pin supply voltage shorted to ground.
- EDC 20 Load sensing pin supply voltage shorted to battery.



PREVIEW - YOUFIXTHIS.COM

From Serial Number 086641B
TS 90, 100, 110. With cab Dual Command with EDC

EIC & SENSORS (continued)
line 2180–2530

(7A)

From Serial Number 086641B

TS 90, 100, 110. With cab Electroshift with EDC

With cab Dual Command with EDC

With cab Dual Command Less EDC

WIPERS AND WASHERS

line 5850–6210

(17)

TS SERIES

Electroshift Transmission, (16x16 with Power Shuttle) W/Cab,

SENSORS

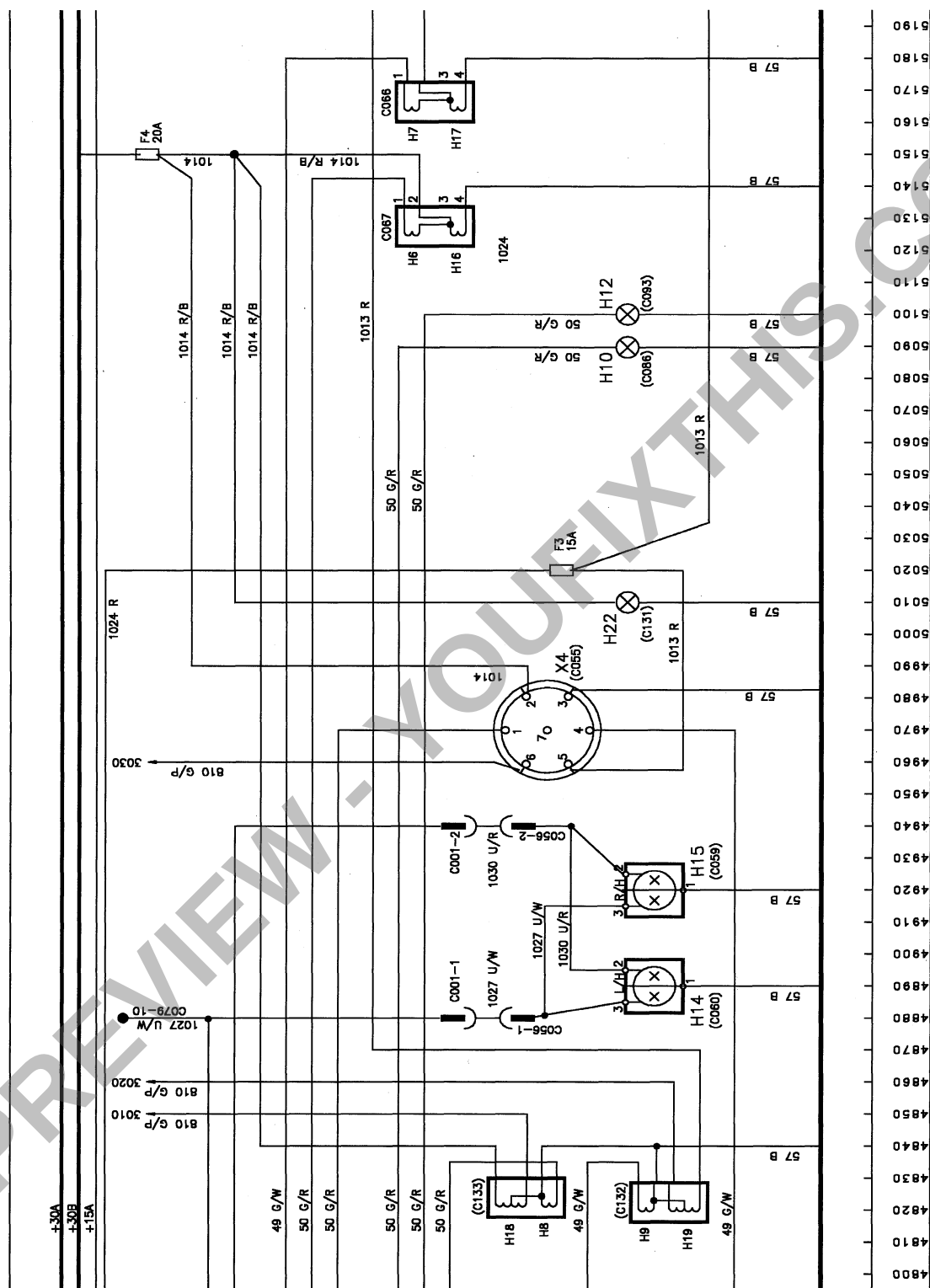
Line 6000-6390

B1	Engine oil pressure sender	S7	Steering pressure switch
B2	Engine coolant temperature sender	S8	Transmission pressure switch
B3	Fuel tank sender	S9	Transmission oil temperature switch
B4	Radar	S10	Handbrake switch
S3	Engine oil pressure switch	S11	Brake fluid level switch
S4	Low charge pressure switch (CCLS)	S12	Air filter vacuum switch
S5	Hydraulic oil temperature switch		
S6	Hydraulic filter blocked switch		

WIRE COLOUR CODES

B	Black	R	Red	LG	Light Green	K	Pink
N	Brown	O	Orange	U	Blue	W	White
LN	Light Brown	Y	Yellow	TQ	Turquoise		
S	Slate	G	Green	P	Purple		

SECTION 3 - ELECTRICAL SYSTEM



ELECTRICAL SYSTEM DIAGRAM

DUAL COMMAND MODEL

NOTES PAGE

Control of Variable Displacement Pump With Top Link Sensing Hydraulic Lift

With reference to Figure 33.

When a tractor installed with a variable displacement closed centre load sensing hydraulic pump is also fitted with a top link sensing hydraulic lift assembly, a special unload valve with a load sensing capability is installed on the hydraulic lift assembly.

This primary function of this valve is to signal the CCLS pump whenever the hydraulic demand of the hydraulic lift assembly changes.

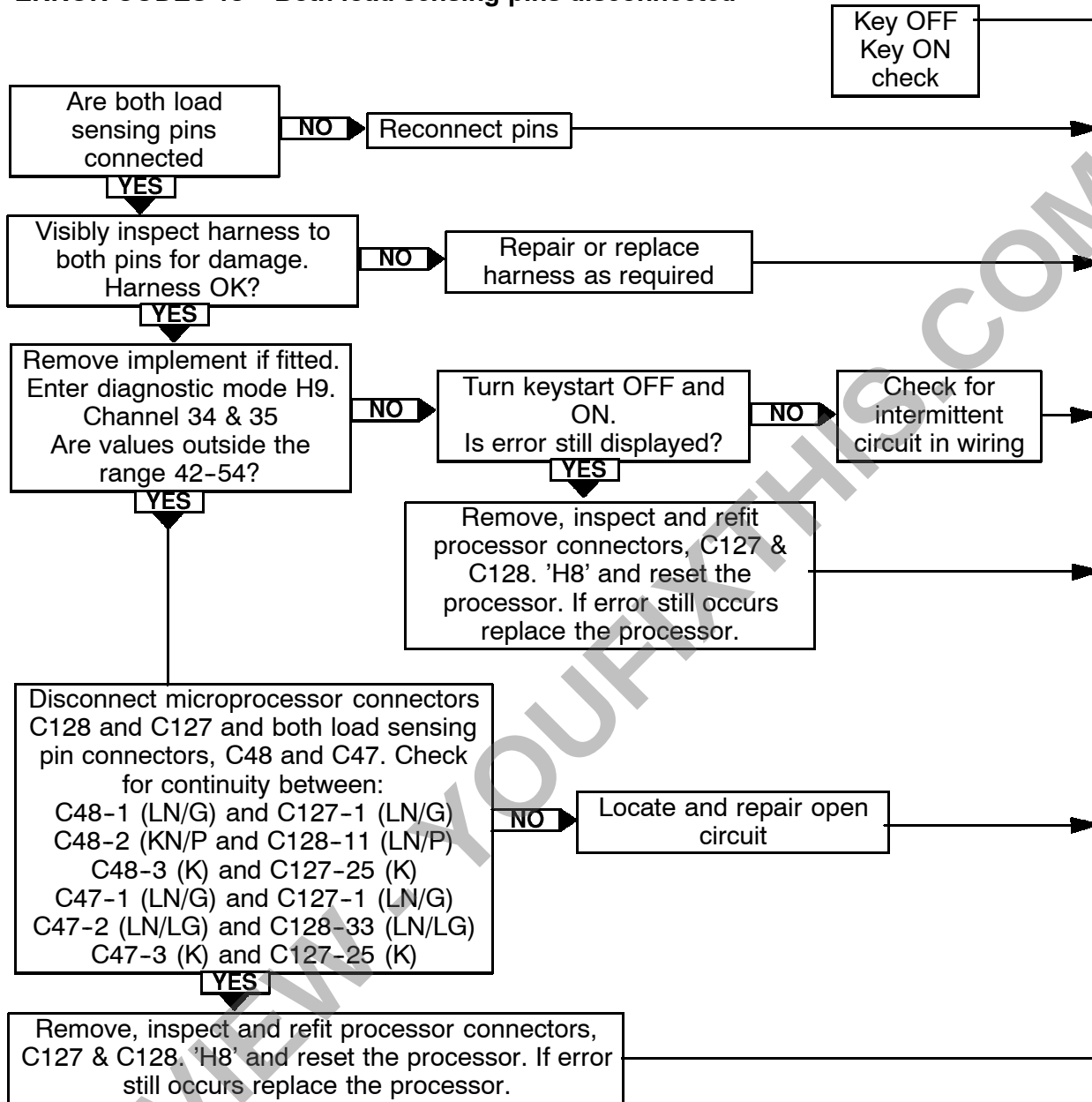
Figure 28 to Figure 32 illustrate the operation of the CCLS hydraulic pump when installed on a tractor with electronic draft control. The principle of operation of the pump when the tractor is installed with a top link sensing hydraulic lift assembly is exactly the same as that for the electronic draft control system. To illustrate the similarity Figure 33 shows the installation of the top link sensing unload valve instead of the EDC hydraulic valve shown previously.

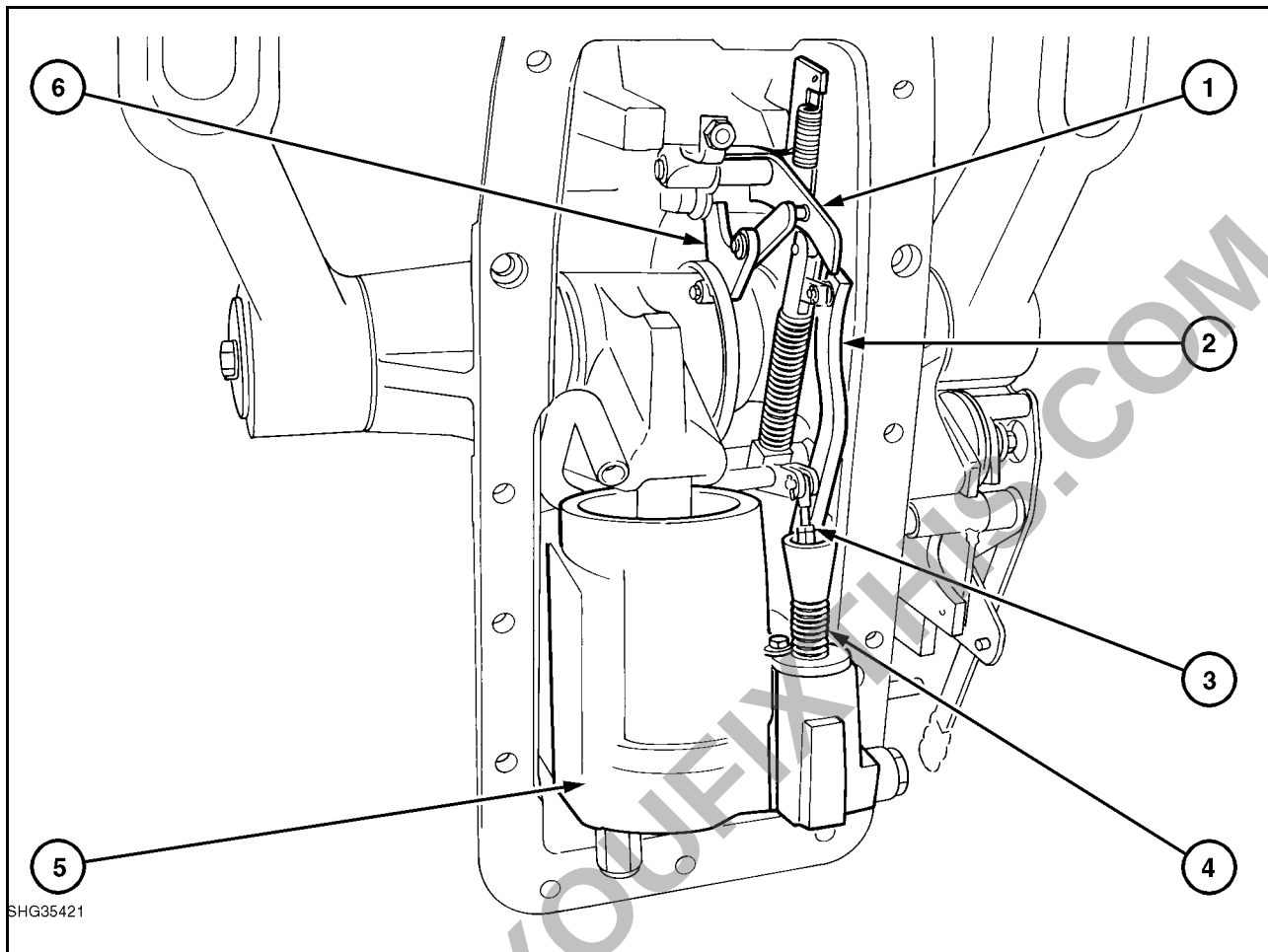
For the operation and overhaul of the top link sensing unload valve refer to the 'Hydraulic Lift Assembly With Top Link Sensing' Chapter in this Part of the Repair Manual.

Figure 33

Control of Variable Displacement Piston Pump with Top Link Sensing Hydraulic Lift Assembly Unload Valve (Fast Lift)

1. Top Link Sensing Hydraulic Lift Unload Valve
2. Load Sensing Line from Hydraulic Lift Unload Valve
3. Load Sensing Line from Remote Valves
4. Shuttle Valves
5. Flow Compensating Valve
6. Pressure Compensating Valve
7. Charge Pressure By-Pass Valve
8. Charge Pressure Filter
9. Charge Pressure Filter Dump Valve
10. Low Charge Pressure Switch
11. Oil Supply to Power Steering Motor, Oil Cooler, Transmission and P.T.O. Lubrication Circuits
12. Steering Pump
13. High Oil Temperature Switch
14. Steering Pump Inlet Filter
15. Steering Filter Low Temperature Switch
(Prevents Blocked Steering Filter Light Working when Oil Temperature Below 40°C, 104°F)
16. Blocked Steering Filter Vacuum Switch
17. Charge Pump Inlet Filter
18. Charge Pump
19. Pump Gear Drive Train
20. Variable Displacement Piston Pump
21. Trailer Brake Valve (where fitted)
22. Pressure Regulating Valve
23. Low Pressure Circuit Safety Valve
24. Low Transmission Oil Pressure Switch
25. Low Pressure Circuit Oil Supply to PTO, Differential Lock, Transmission Control Circuits and Four Wheel Drive
26. To Hydraulic Lift Cylinder
27. To Remote Valves
28. Load Sensing Line from Trailer Brake Valve
 - A Load Sensing Line from Hydraulic Lift, Trailer Brake and Remote Control Valve Circuits
 - B Return to Sump Gallery from Flow and Pressure Compensating Valves
 - C Gallery to Swash Plate Servo Piston from Flow and Pressure Compensating Valves
 - D System Pressure Sensing Gallery to flow and Pressure Compensating Valves

ERROR CODES 18 - Both load sensing pins disconnected



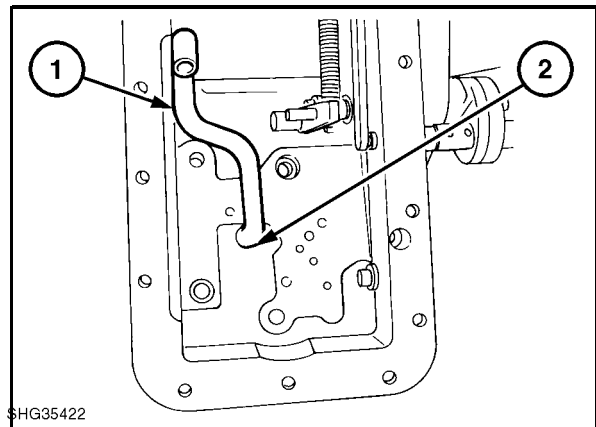
Hydraulic Lift Cover Internal Linkage

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1. Selector Link
2. Selector Arm
3. Control Valve Turnbuckle
4. Control Valve

5. Lift Cylinder
6. Position Control Link
7. Control Rod and Roller

3. Remove four bolts securing cylinder to lift cover.
4. Move lift arms to raised position and carefully remove cylinder from locating dowels. Refer to Figure 193.
5. Remove priority/unload valve return tube (1), Figure 194.
6. Referencing Figure 193 to Figure 200, disassemble the hydraulic lift assembly.



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Oil Flow With Cylinder Overload

With reference to Figure 322.

Under normal operating conditions excessive pressures in the remote circuits are protected by the detent regulating valve which returns the control valve spool to neutral when the external cylinder pressure becomes excessive or the cylinder reaches the end of its stroke. However if the operator overrides the detent allowing the pressure to become excessive due to an overload condition the circuit is protected as follows:–

Tractors with fixed displacement gear type pump:

When the hydraulic lift is raising and the remote valves are supplied by the auxiliary engine mounted pump, excessive cylinder pressure acting through the load sense line from drop port 'H' opens the integral combining valve relief valve reducing the pressure acting on the left hand end of the valve.

The combining valve now moves to the left, allowing the auxiliary and main hydraulic pump oil flow to return to sump, limiting maximum remote pressure to 2750 lbf/in² (192 bar).

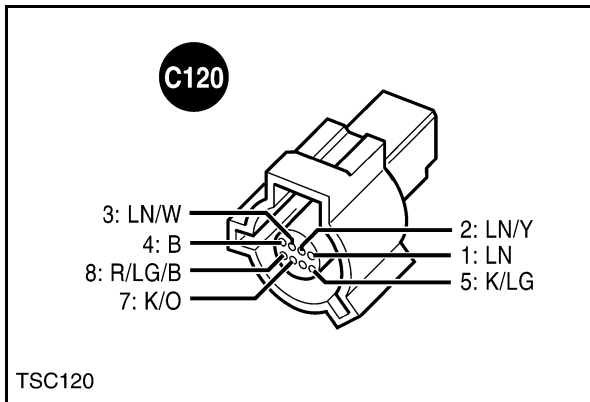
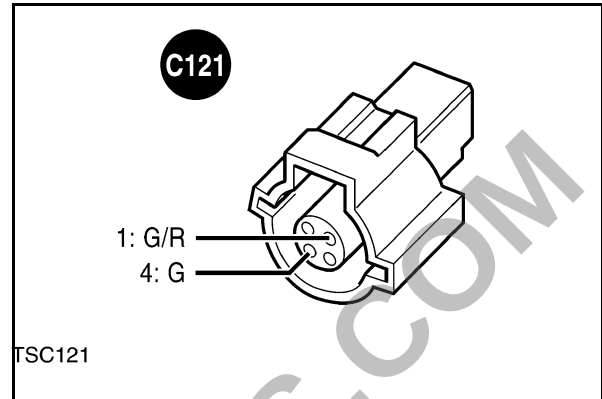
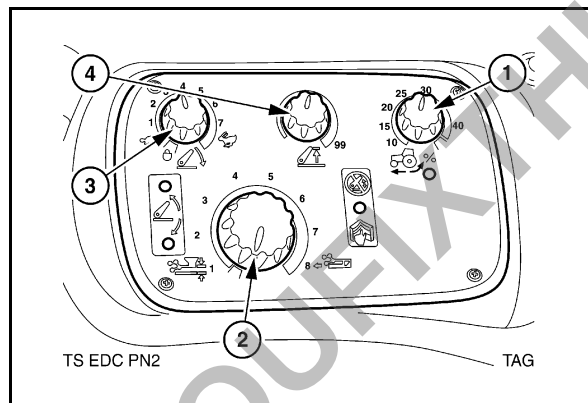
Tractors with variable displacement CCLS hydraulic pump:

Excessive pressures in the circuit are automatically protected by the pressure compensating valve in the hydraulic pump.

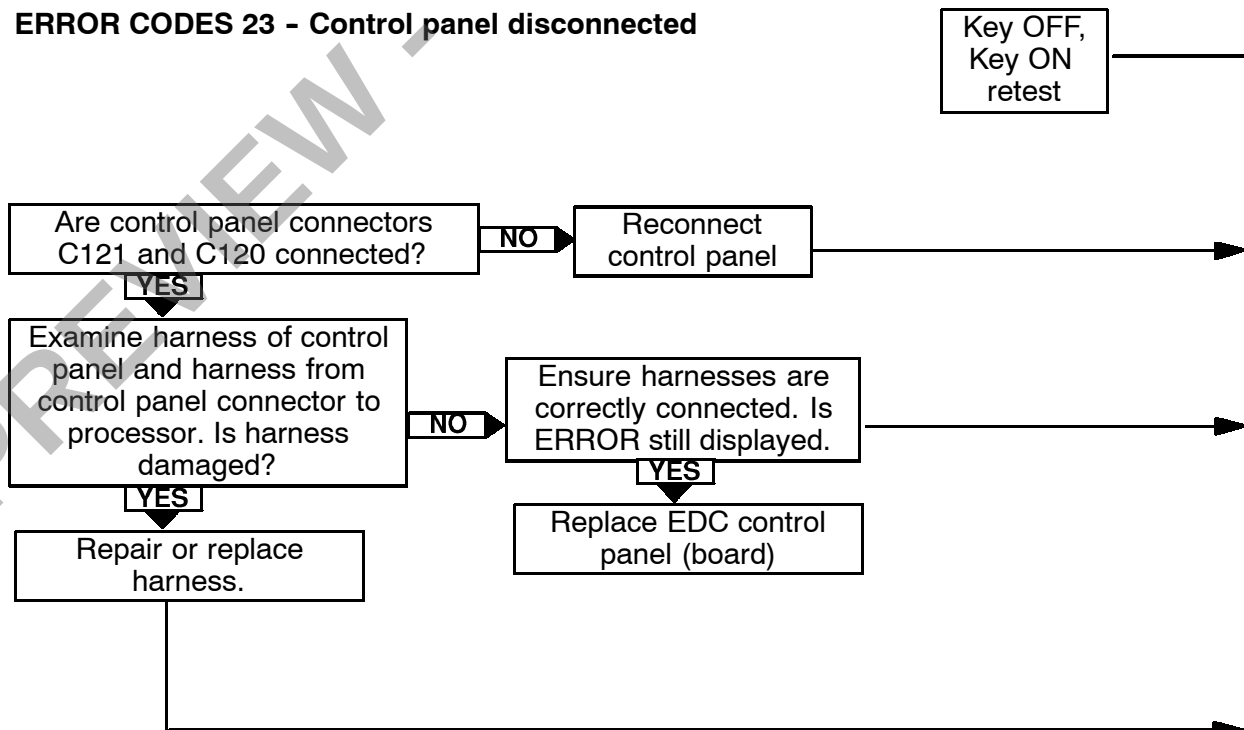
When the pressure in the load sensing line approaches 2700 lbf/in² (186 bar) the pressure compensating valve opens, allowing high pressure oil to be directed to the swash plate servo piston. The servo piston consequently changes the angle of the swash plate to reduce pump flow.

Refer to Chapter 2 in this part of the Repair Manual for the operation of the variable displacement CCLS hydraulic pump.

ERROR CODES 23 - Control panel disconnected

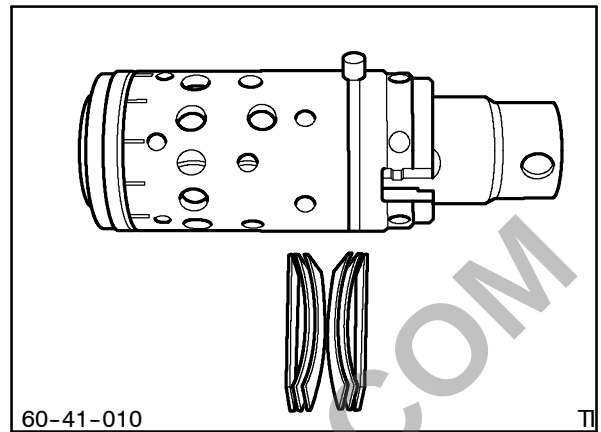


ERROR CODES 23 - Control panel disconnected

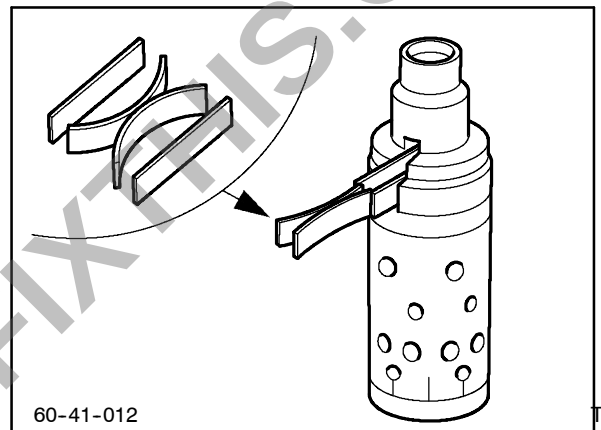


Re-Assembly

1. Assemble inner and outer sleeves so that the leaf spring slots align.
2. Install the drive pin, Figure 35.

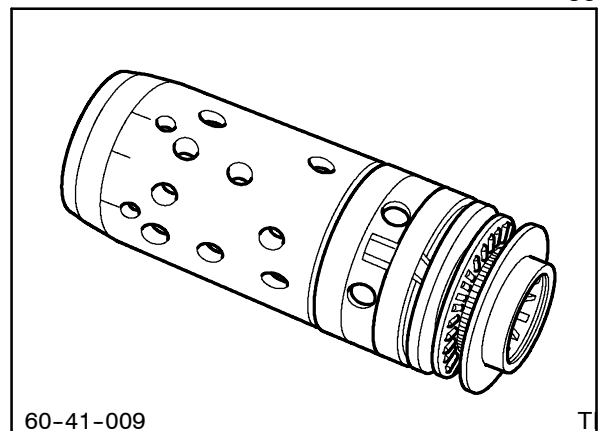


3. Install the leaf springs and push fully into position, Figure 36.

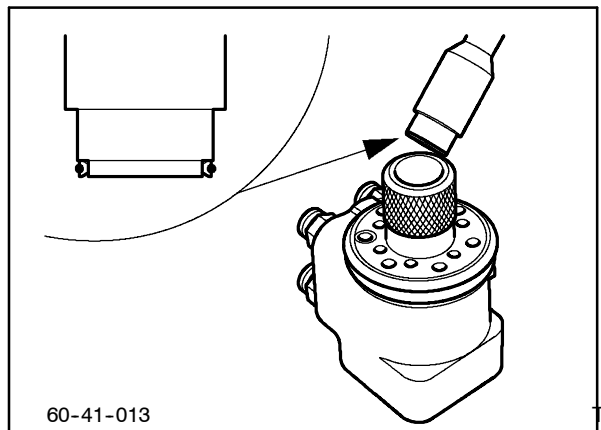


4. Install leaf spring retainer, and bearing, Figure 37.

NOTE: The inner bearing race must be positioned with the chamfer side facing the spool, Figure 32.



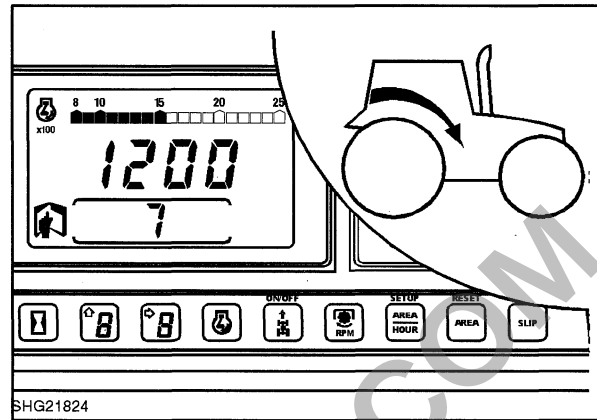
5. Apply a light coating of hydraulic oil onto the sleeve item 2 and insert into the steering motor body, item 3, Figure 38.
6. Coat the 'O' ring and back-up ring, item 4, Figure 38, with hydraulic fluid and position them onto the seal installer guide.
 - Use New Holland special tool No. 294056 to install oil seal type roto-glyd.



SECTION 6 – POWER TRAIN

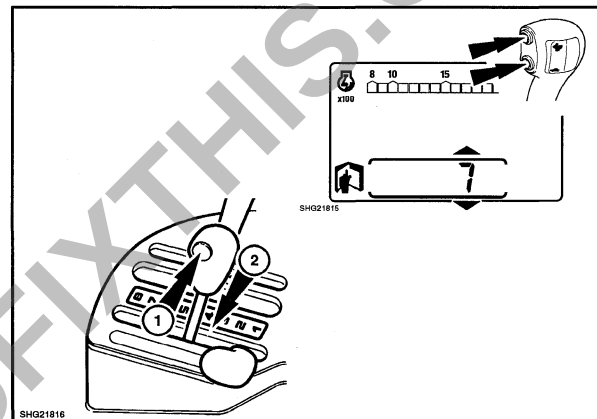
To test the quickfill setting, press and release the dump switch. The display will show 'Fill' and then briefly to the clutch selected then the quickfill setting.

As the dump switch is released the tractor should be felt to 'rock' as the clutch fills.



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Adjust the fill time until the rock is barely noticeable, then reduce the value by 2.



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SECTION 6 - POWER TRAIN

ERROR CODES

The transmission / EDC processor is able to create and store up to 30 error codes with the hours at which they occurred and with the number of incidences that a particular error code has occurred. Only error codes that prevent the tractor from driving will be displayed to the operator, other non disabling errors will be retrievable by a technician through the H menu mode of the tractor diagnostics.

It should be noted that the hours displayed is not related directly to the hour meter. For example if the occurrence hours shows '10' this indicates that the error occurred 10 hours ago, not at 10 hours of operation.

The following 'H' menu mode routines are provided to allow access to Error codes:

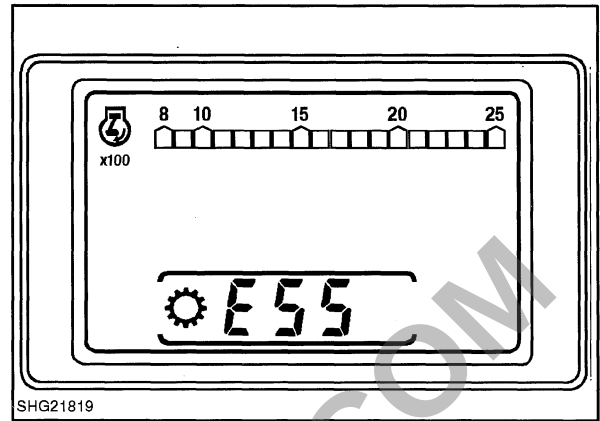
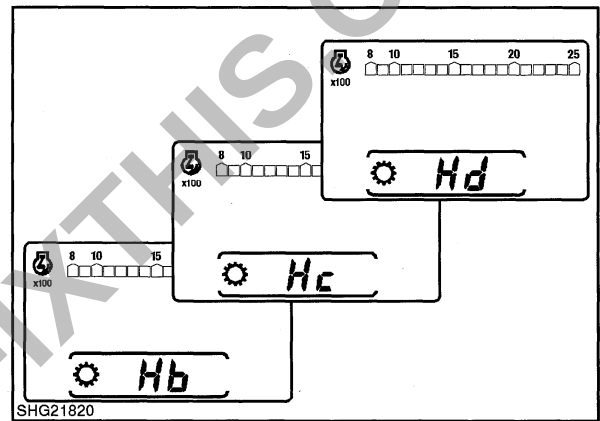
Hb - Retrieve error codes for viewing.

Hc - Clear processor memory of stored error codes

Hd - View error codes live. This allows normal operation of the tractor with error codes able to display as they occur.

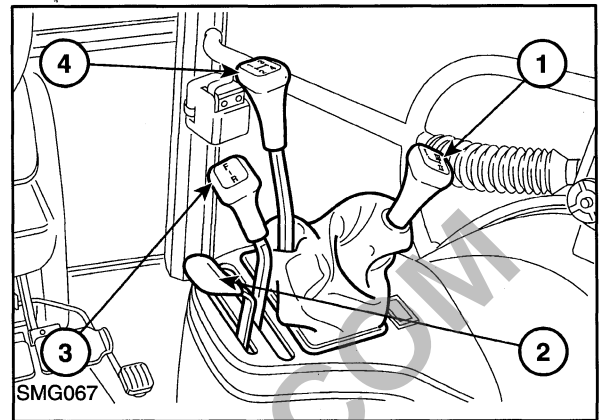
A full description of the 'H' menu routines can be found in Section 55.

It should also be noted that after installation of a new processor or after a non volatile memory reset operation ('H' menu mode, H8), that the processor defaults to a 'display all codes' mode for 6 minutes. If no error codes occur during this 6 minute period the processor then reverts to normal operation. If an error occurs during this period the processor will continue to display 'live' error codes until all the errors are removed.



SECTION 6 – POWER TRAIN

The three shift levers shown in Figure 2, control the selection of the 12 forward and 12 reverse ratios. Figure 1 shows the gear shift lever pattern. The main shift lever, reference 4 Figure 2, operates in a conventional H-pattern and, in conjunction with the clutch pedal, is used to select any of four gear ratios, whether the tractor is stationary or moving. The range lever, reference 1, Figure 2, in conjunction with the clutch pedal, is used to select one of three ranges. The shuttle lever (3) is used to select forward or reverse travel when any one of the twelve ratios is engaged, provided that the clutch pedal is depressed.



2

NOTE: An interlock mechanism prevents movement of the shuttle lever, unless the clutch pedal is depressed.

NOTE: A neutral start switch prevents operation of the starting motor unless the shuttle (forward/reverse) lever is in neutral.

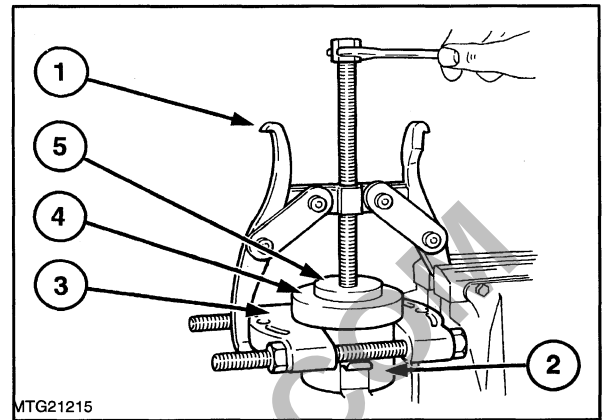
Drive is transmitted from the engine to the transmission by a conventional solid centre dry plate clutch assembly.

IMPORTANT: If it is necessary to tow the tractor, the range lever **must** be in the neutral position, otherwise damage to transmission components may occur.

It is permissible to tow start the tractor.

Oil supplied from the power steering motor, via the PTO valve and oil cooler, provides pressure lubrication for the synchronisers, bearings and output shaft. The transmission shares a common oil reservoir with the rear axle.

4. Examine the clutch release hub (2) and bearing (4) for excessive wear or damage. If necessary, remove the bearing from the hub with Pulling Attachment, Tool No. FNH09190 (3), Step Plate, Tool No. FNH09210 (5) and either a press or Puller, Tool No. FNH09198 (1), see Figure 122. Press a new bearing onto the hub ensuring the thrust face of the bearing faces away from the shoulder on the hub.
5. Pack the recess in the bearing hub bore with a high melting point grease.



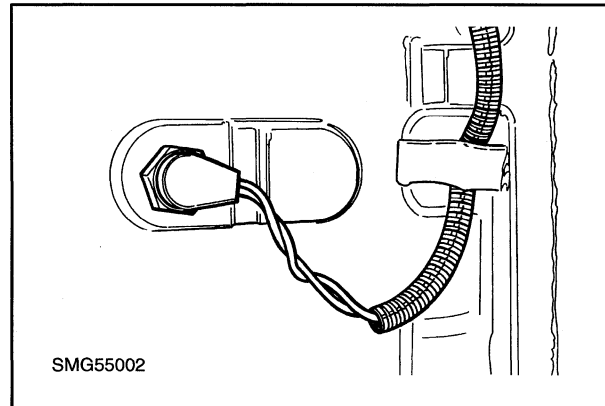
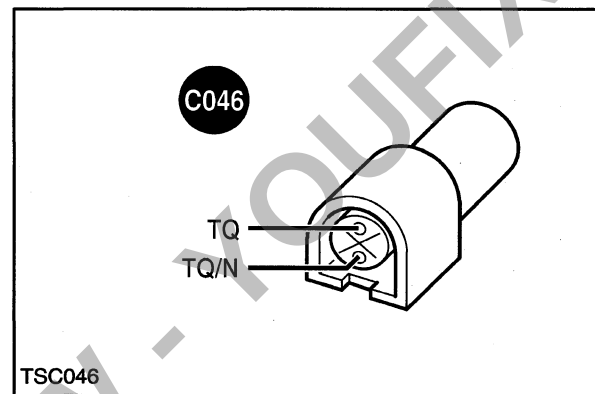
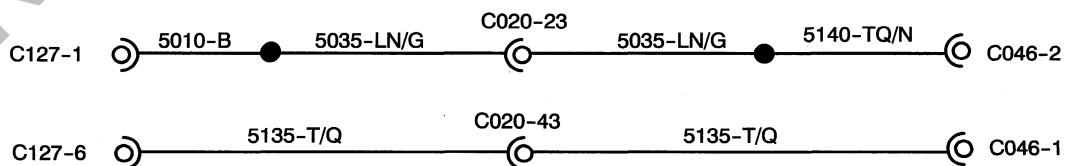
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6. Inspect the clutch release fork for cracks or excessive wear and replace as necessary.
7. Examine the cross-shaft and lever for distortion or excessive wear and install a new assembly, if damage is evident. Inspect the shaft bushings for excessive wear and replace if found to be defective. Bushings should be driven into the housing until they are flush with the outside edges of the cross-shaft locating bores.
8. Inspect the planetary cover for damage or distortion. Check the face of the cover and the mating surface for nicks or burrs and remove any imperfections with an abrasive stone.
9. Inspect the planetary carrier and gears, planetary shaft, pilot bearing and thrust washer for damage or wear. Install new parts where necessary.
10. Inspect the sun gear for excessive wear or damaged teeth.
11. Inspect the sealing rings from the rear hub of the direct drive clutch assembly for damage, distortion or cracks.

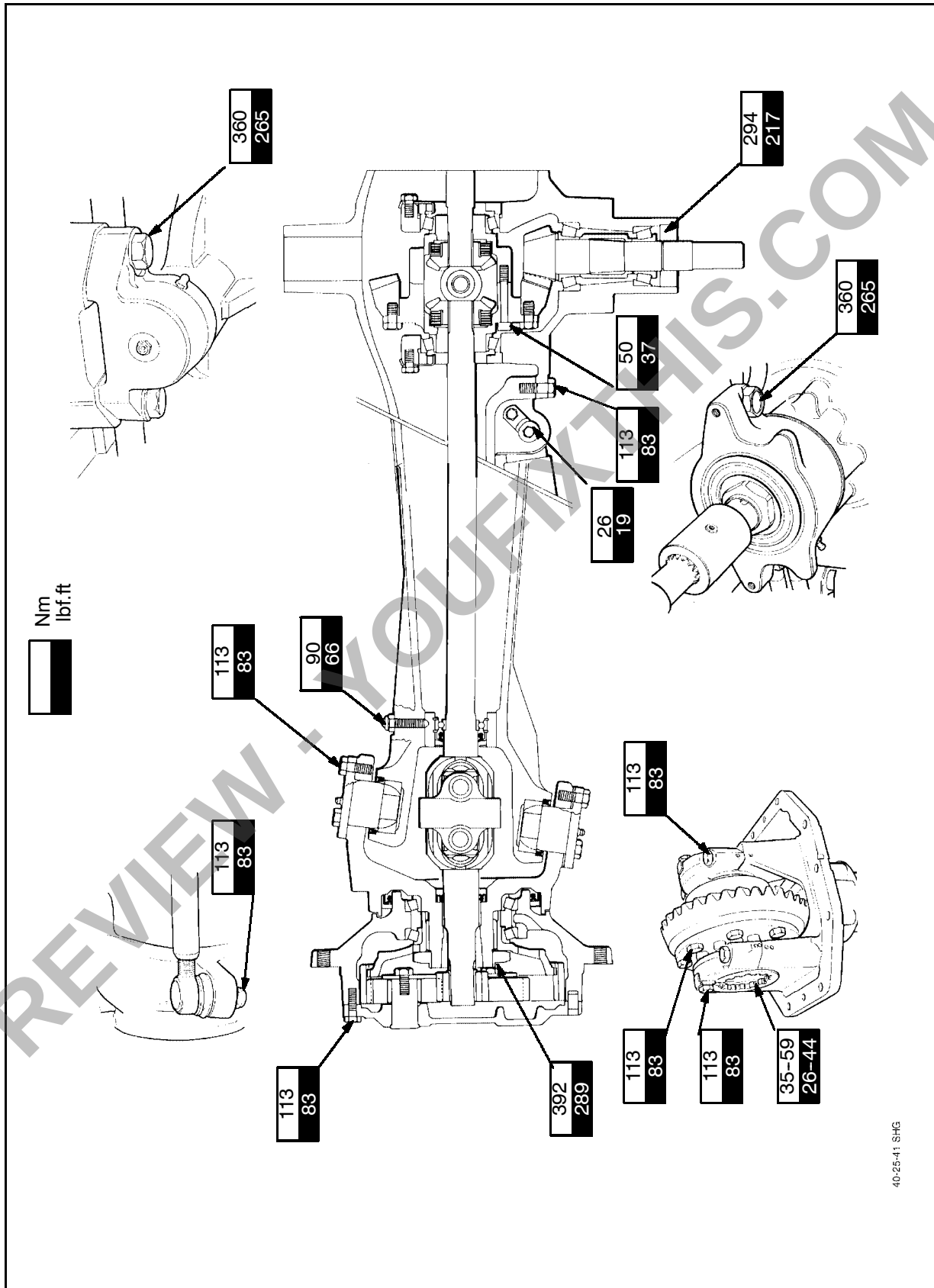
If new seals are to be installed, insert the seals in a 2.38 in. (60 mm) internal diameter test bore for a period of 10 minutes prior to assembly. This procedure ensures the seals obtain the correct amount of pre-tension to avoid damage on assembly. Install the new seals using a suitable grease to hold the seals in position during re-assembly and ensure the seals do not protrude above the lands of the direct drive housing.

12. Examine the bore in the hub of the planetary housing where the direct drive sealing rings locate. If wear or damage is evident the planetary housing must be replaced.

DIAGRAM 19 - Error Code E49



TORQUE SPECIFICATIONS



RE-ASSEMBLY

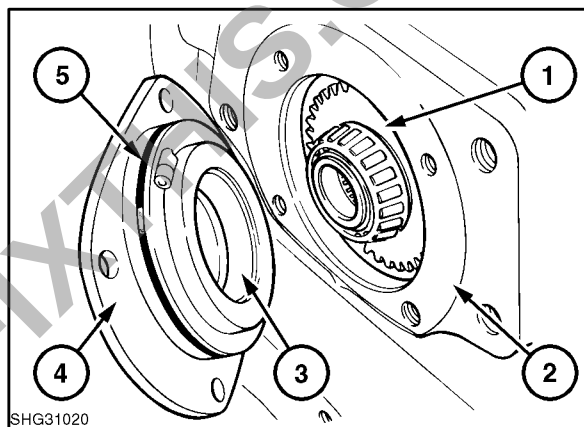
Re-assembly follows the disassembly procedure in reverse.

1. Apply sealant, New Holland Tread Lock and Seal, Part Number 82995773, to the rear shaft bearing retainer bolts and tighten to a torque of 50–60 lbf ft (65–85 Nm).
2. Tighten sump cover retaining bolts to a torque of 27–37 lbf ft (37–50 Nm)
3. Tighten the PTO shaft bearing retainer bolts to a torque of 140–170 lbf ft (190–230 Nm).

NON-SHIFTABLE TWO SPEED PTO SHAFTS AND GEARS

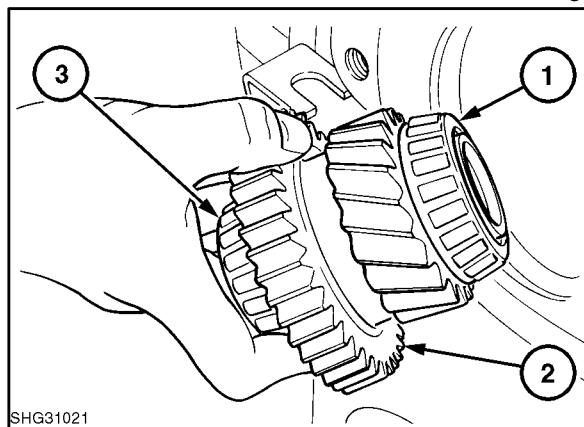
REMOVAL

1. Drain oil from rear axle/transmission.
2. Remove rear shaft bearing retainer (4), Figure 54.



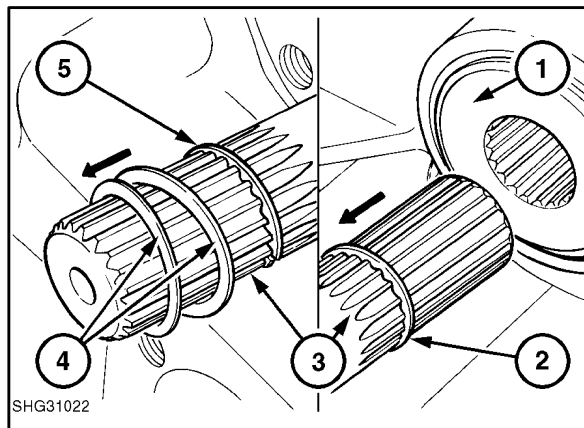
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3. Withdraw cluster gear (2), Figure 55.
4. Remove shims (4) from rear shaft (3) and pull shaft from tractor, Figure 56.
5. Where fitted remove drawbar/auto pick-up hitch.
6. Remove sump cover.



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7. Remove PTO output shaft.
8. Support the driven gears and remove output shaft sleeve and bearing assembly. Refer to Figure 59. Remove driven gears and thrust washers.
9. Remove output shaft front bearing.



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