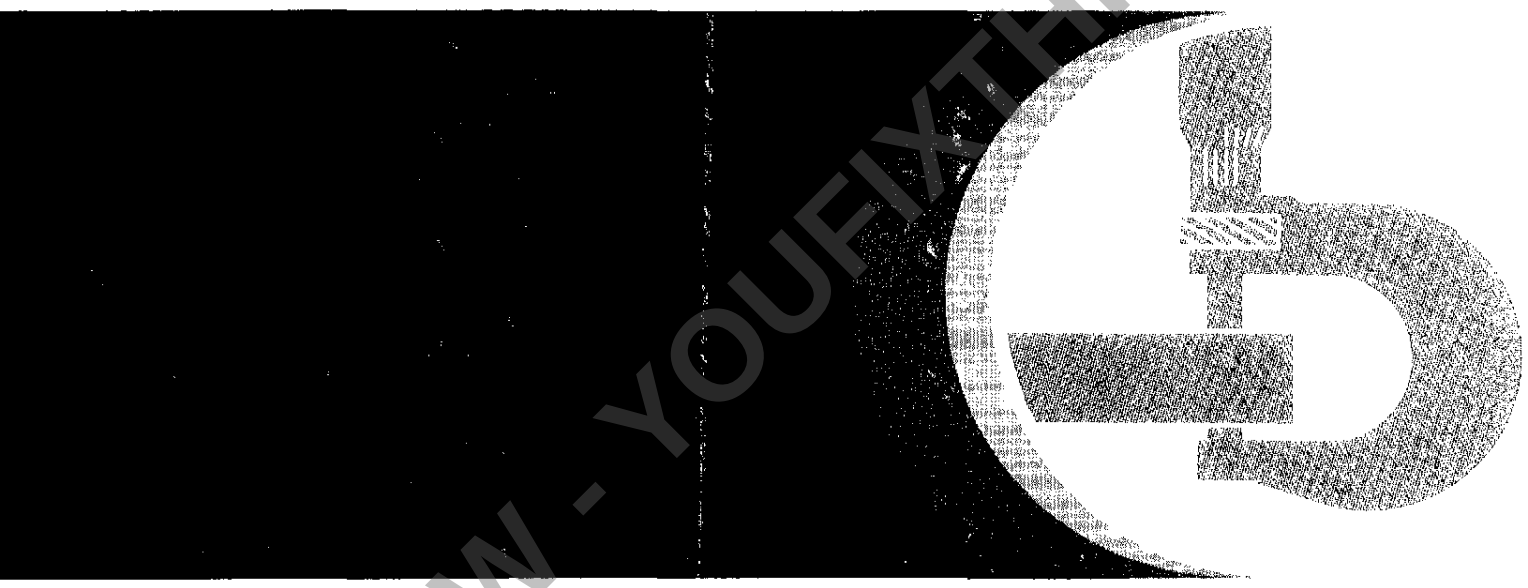
1350, 1550, 1750, 1850, 1850N, 1950, 1950N, 2250, 2450, 2650, 2650N, 2850, 3050, 3350 and 3650 Tractors



John Deere Werke Mannheim
TM4446
Printed in Germany (English)

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1350 TO 3650 TRACTORS TECHNICAL MANUAL TM4446 (AUG-90)

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40 – Collar shift transmission and transmission oil pumps
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50 – Final drives
55 – Independent PTO's
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SAFETY AND YOU

This is the safety-alert symbol. When you see this symbol on the machine or in this manual, be alert to the potential for personal injury.



T 81389

T81389,053,TMSAFE 19 07OCT85

IMPORTANT

The IMPORTANT message identifies potential problems which may cause consequential damage to machine. Following recommended procedure will instruct technician how to avoid problem.

A68;N01;0000 19 U 05NOV82

NOTES

The word NOTE is followed by a statement that identifies a qualification or exception to a previous statement. A "NOTE" may also identify nice-to-know information pertinent to, but not directly related to previous statement.

A68; N01;0000 19 V 05NOV82

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PARTS DESIGNATIONS IN ELECTRICAL CIRCUIT AND WIRING DIAGRAMS

A 1 Alternator (S1; K1)
A 2 Starting motor (S1, S1A; K1)
A 3 Batteries (S1, S1A)
A 4 Alternator indicator light (S1, S1A, S12; K4)
A 5 Fuse 10 (S1, S1A, S12, S12A, S12B; K4)
A 6 Start safety switch (S1, S1A; K10)
A 7 Fuse for start safety switch (S1, S1A; K4)
A 8 Starter relay (S1, S1A; K4)
A 9 Diode for starter relay (S1, S1A; K4)
A10 Main switch (S1, S1A; K4)
A11 Starter switch (S1, S1A; K4)
A12 Push-button for Ether starting aid (A2; K8)
A13 Relay for electric starting aid (A2; K1)
A14 Glow plug for electric starting aid (A2; K1)
A15 Solenoid for Ether starting aid (A2; K1)
A16 Fuse 1 (S4; K4)
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A18 Turn signal indicator light, right-hand (S4; K4)
A19 Turn signal light, front right-hand (S4; K16)
A20 Turn signal light, front left-hand (S4; K16)
A21 7-terminal socket (S4, S6, S9, S10, S12B; K19)
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A28 Diode (S4; K4)
A29 Turn signal light switch (S4; K4)
A30 Turn signal indicator light (S4; K4)
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A32 Fuse 2 (S5; K5)
A33 Cab relay (S5, S5A; K18)
A34 Shift console light (S5, S10; K18)
A35 Plug; radio (K18)
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A38 Switch for cab heater and fan (S5, S5A; K18)
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A41 Fan (S5, S5A)
A42 Thermal fuse* (S5; K1)
A43 Compressor (S5; K1)
A44 Windshield washer switch (S5; K18)
A45 Windshield washer pump (S5; K18)
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A47 Stop light switch (S6; K4)
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A49 Stop light, left-hand (S6, S12B; K17)
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A75 Worklight, front right-hand (S8; K13)
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A79 Clearance light, left-hand (S9; K16)
A80 Tail light, right-hand (S9; K17)
A81 Tail light, left-hand (S9; K17)
A82 Clearance light, right-hand (S10; K16)
A83 Diode (S10)

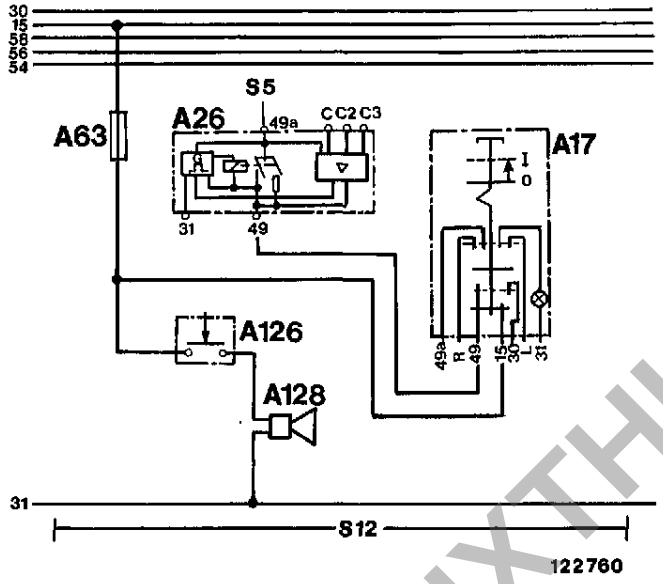
* Up to Tractor Serial No. 649 949L

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S12 – ELECTRICAL CIRCUIT DIAGRAM (Horn and Turn Signal Light)



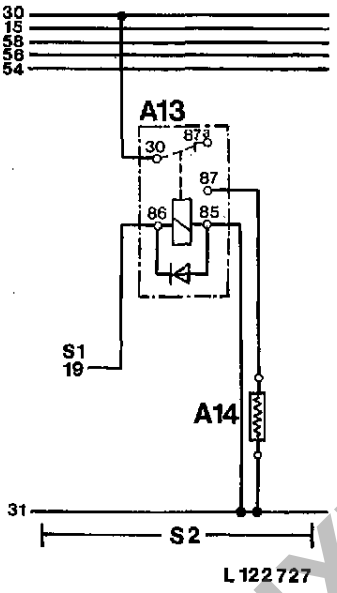
A 3 Batteries
A10 Main switch
A17 Hazard warning light switch
A26 Flasher
A 63 Fuse 13
A126 Horn button
A128 Horn
A147 21-pin plug (connecting point – engine)

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S2 – CURRENT CIRCUIT
(Electrical Cold Weather Starting Aid)



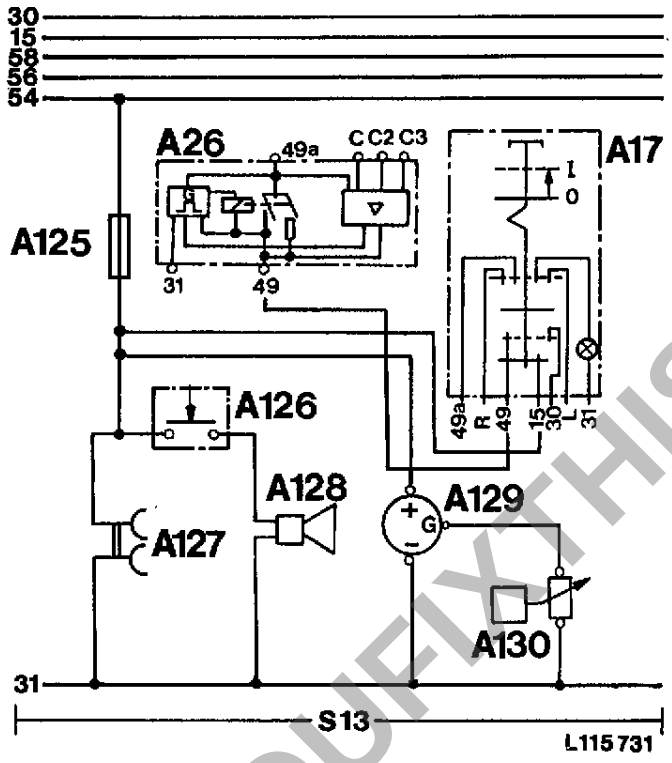
A 3 Batteries
A10 Main switch
A11 Starter switch
A 13 Electrical starting aid relay
A 14 Electrical starting aid glow plug
A147 21-pin plug (connecting point – engine)

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S13 – ELECTRICAL CIRCUIT DIAGRAM (Horn, Outlet Socket and Speed Meter)



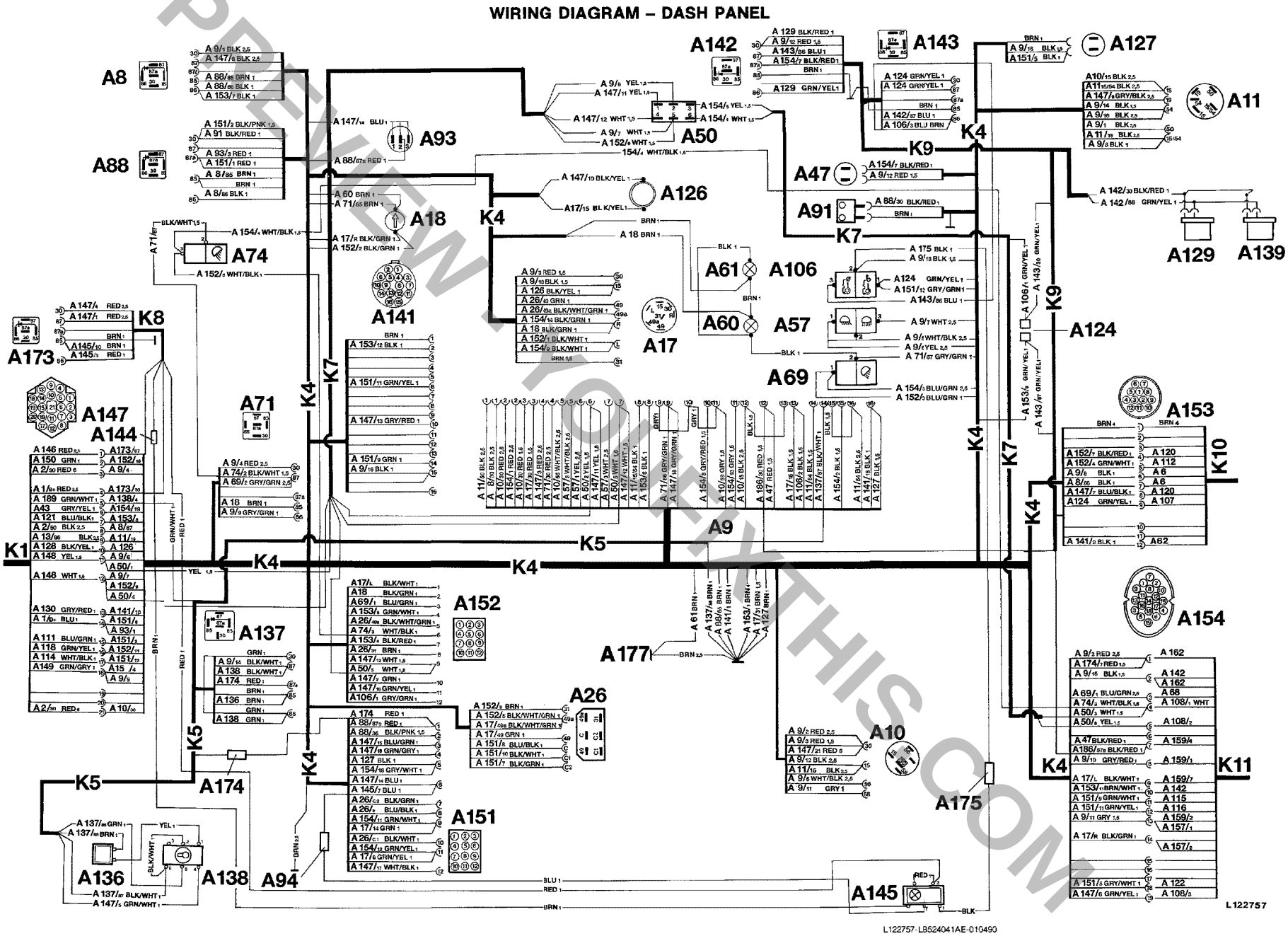
A 3 Batteries
A 10 Main switch
A 11 Starter switch
A 17 Hazard warning light switch
A 26 Flasher
A125 Fuse 11
A126 Horn button
A127 Socket for handlamp
A128 Horn
A129 Speed meter
A130 Magnetic sending unit for speed meter
A147 21-pin plug (connecting point – engine)
A151 12-pin plug (connecting point – dash panel – right, right-hand)
B151 12-pin plug (connecting point – dash panel – right, left-hand)

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WIRING DIAGRAM – DASH PANEL



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FUNCTION OF STARTING MOTOR

PHASE I – PINION TOOTH MESHES INTO RING GEAR TOOTH SPACING

Pull-in and hold-in windings are energized. Pinion meshes immediately. This condition exists shortly before main current is switched on.

Shift lever shifts drive hub forward (axial movement).

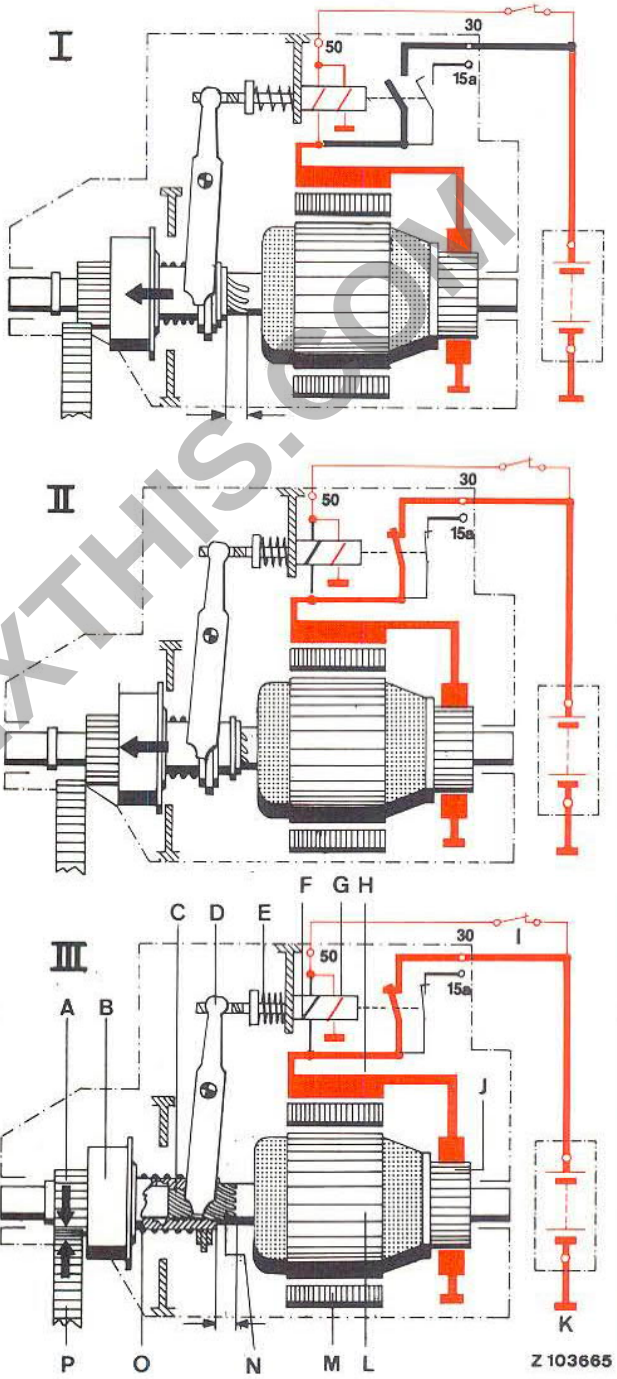
PHASE II – PINION TOOTH AND RING GEAR TOOTH BUTT

Shift lever is in end position, engaging spring is compressed, pull-in winding is not energized; main current is flowing, armature is turning, while pinion teeth are waiting for spaces between ring gear teeth to mesh completely; engine is cranked.

PHASE III – ENGINE IS CRANKED

Shift lever is in end position, pull-in winding is not energized; main current is flowing, pinion is completely intermeshed, engine is being cranked.

Drive hub is shifted forward by armature rotation (helical movement).

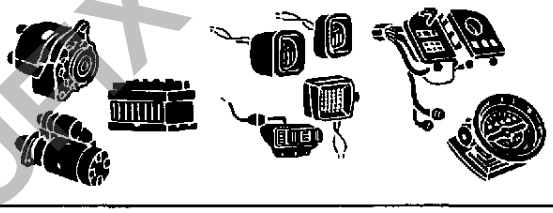
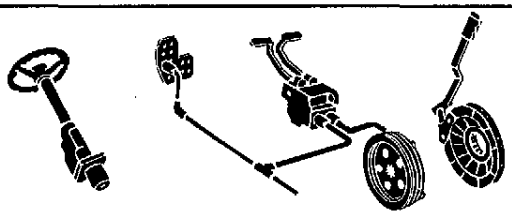
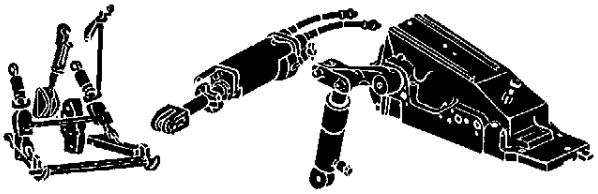
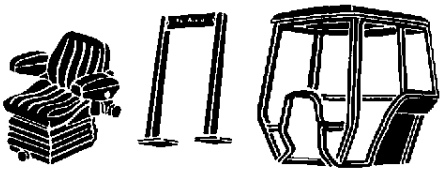


A–Pinion
B–Overrunning clutch
C–Drive hub
D–Engaging lever
E–Return spring
F–Pull-in winding
G–Hold-in winding
H–Field coil
I–Starter switch
J–Commutator
K–Battery
L–Armature
M–Pole shoe
N–Armature shaft
O–Engaging spring
P–Ring gear

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40 – CIRCUIT DIAGNOSIS (With SG2 Cab)

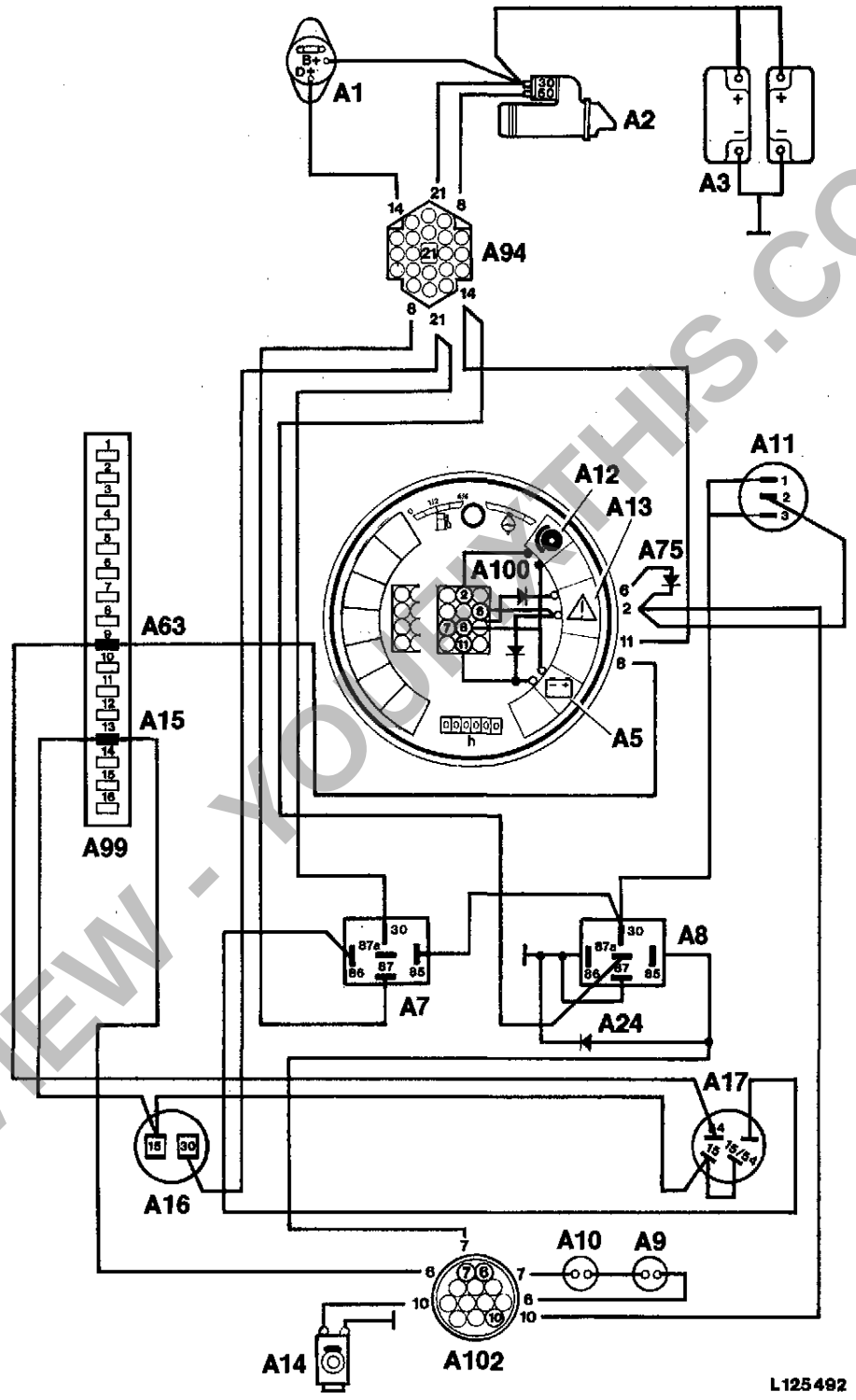
		1350	1550	1750	1850	1850N	1950	1950N	2250	2450	2650	2650N	2850	3050	3350	3650
Special tools	40-1								x	x	x		x	x	x	x
Starting motor and charging circuit																
S1–Electrical circuit diagram	40-2								x	x	x		x	x	x	x
S1–Current circuit	40-3								x	x	x		x	x	x	x
S1A–Electrical circuit diagram	40-4								x	x	x		x	x	x	x
S1A–Current circuit	40-5								x	x	x		x	x	x	x
Cold weather starting aids																
S2–Electrical circuit diagram	40-6								x	x	x		x	x	x	x
S2–Current circuit	40-7								x	x	x		x	x	x	x
Fuel preheater																
S3–Electrical circuit diagram	40-8								x	x	x		x	x	x	x
S3–Current circuit	40-9								x	x	x		x	x	x	x
Hazard warning and turn signal lights																
S4–Electrical circuit diagram	40-10								x	x	x		x	x	x	x
S4–Current circuit	40-11								x	x	x		x	x	x	x
Blower fan, air conditioning system, windshield washer system and radio																
S5–Electrical circuit diagram	40-12								x	x	x		x	x	x	x
S5–Current circuit	40-13								x	x	x		x	x	x	x
Blower fan, windshield wipers and radio																
S5A–Electrical circuit diagram	40-14								x	x	x		x	x	x	
S5A–Current circuit	40-15								x	x	x		x	x	x	
Stop lights																
S6–Electrical circuit diagram	40-16								x	x	x		x	x	x	x
S6–Current circuit	40-17								x	x	x		x	x	x	x
High and low beam headlights																
S7–Electrical circuit diagram	40-18								x	x	x		x	x	x	x
S7–Current circuit	40-19								x	x	x		x	x	x	x
Parking lights, instrument lighting and worklights																
S8–Electrical circuit diagram	40-20								x	x	x		x	x	x	x
S8–Current circuit	40-21								x	x	x		x	x	x	x
Left-hand clearance light, right-hand tail light and 7-terminal socket																
S9–Electrical circuit diagram	40-22								x	x	x		x	x	x	x
S9–Current circuit	40-23								x	x	x		x	x	x	x
Right-hand clearance light, left-hand tail light, shift console light and emergency lighting																
S10–Electrical circuit diagram	40-24								x	x	x		x	x	x	x
S10–Current circuit	40-25								x	x	x		x	x	x	x
Front PTO																
S11–Electrical circuit diagram	40-26								x	x	x		x		x	x
S11–Current circuit	40-27								x	x	x		x		x	x

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S1 – CURRENT CIRCUIT*

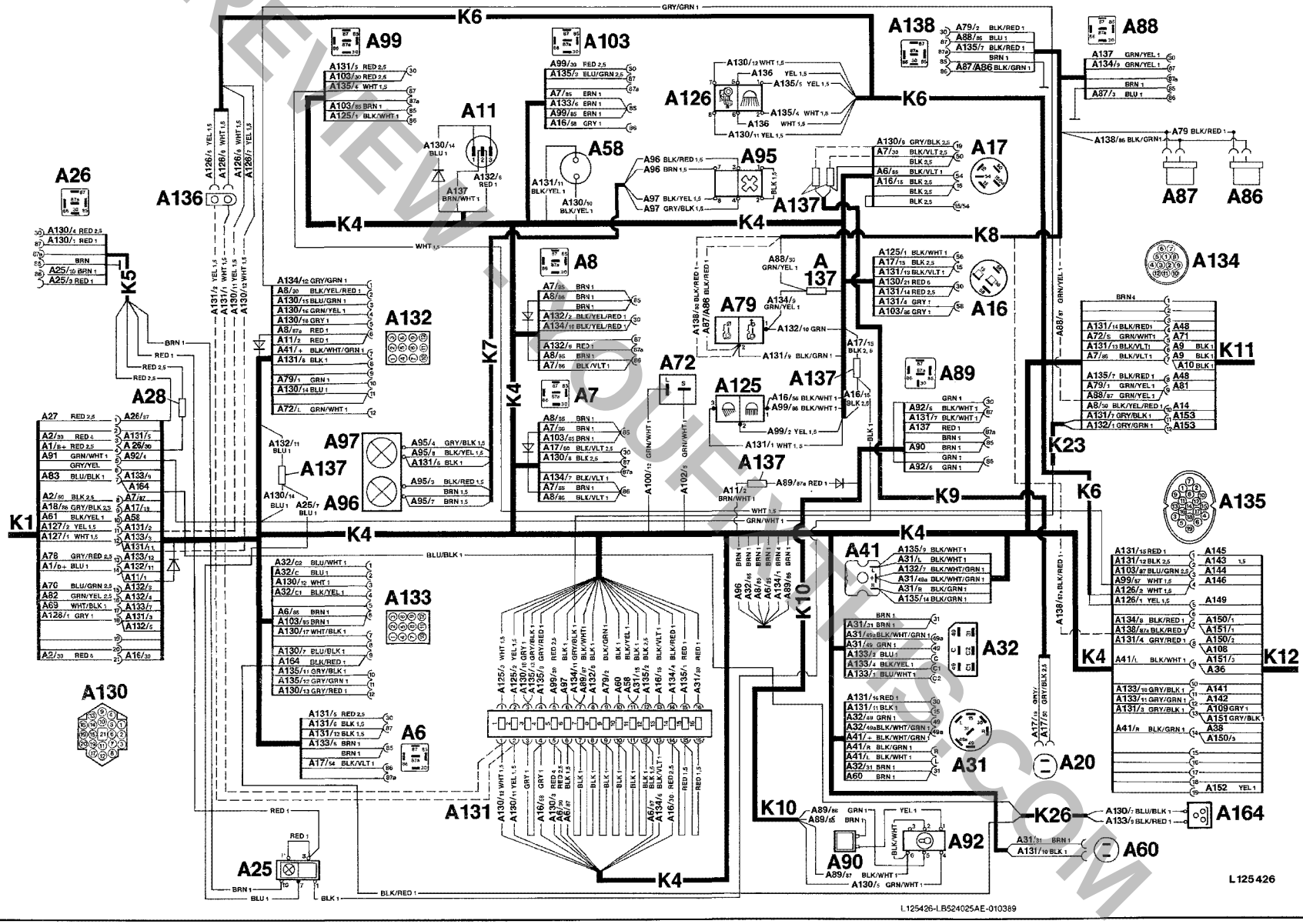


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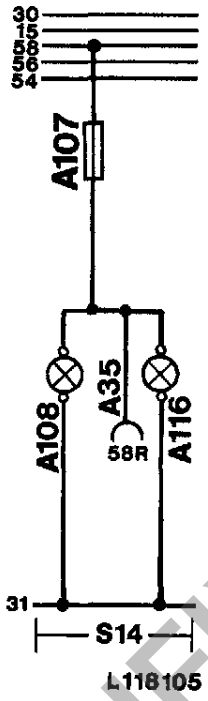
WIRING DIAGRAM – DASH PANEL



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S14 – ELECTRICAL CIRCUIT DIAGRAM
(Left-Hand Clearance Light, Right-Hand Tail Light and 7-Terminal Socket)



A 2 Starting motor
A 3 Batteries
A 16 Main switch
A 35 7-terminal socket
A107 Fuse 4
A108 Clearance light, left-hand
A116 Tail light, right-hand
A130 21-pin plug (connecting point – engine)
A131 Fuse box
A135 19-pin plug (connecting point – cab)
A150 4-pin plug (connecting point – tail, stop and turn signal light, right-hand)

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PIN ASSIGNMENT – DASH PANEL, LEFT-HAND

Pin Housing (A):

1 Warning light

2 Handbrake indicator light

3 Engine oil pressure warning light

4 Instrument lighting

5 Positive terminal

6 Alternator indicator light

7 Trailer turn-signal indicator light

8 Turn-signal indicator light

9 PTO indicator light (1000 rpm)

10 Trailer turn-signal indicator light

11 PTO indicator light (540 rpm)

12 Air cleaner restriction indicator light

Socket Housing (B):

1 Turn-signal switch (Terminal L) and turn-signal indicator light

2 Turn-signal switch (Terminal R)

3 Worklight indicator light, rear

4 Time delay relay (Terminal 5)

5 Turn-signal switch (Terminal 49a)

6 Worklight indicator light, front

7 Fuel gauge (sending unit)

8 Ground

9 High beam indicator light

10 Engine oil temperature gauge* (sending unit)

11 Coolant temperature gauge (sending unit)

12 Front wheel drive indicator light

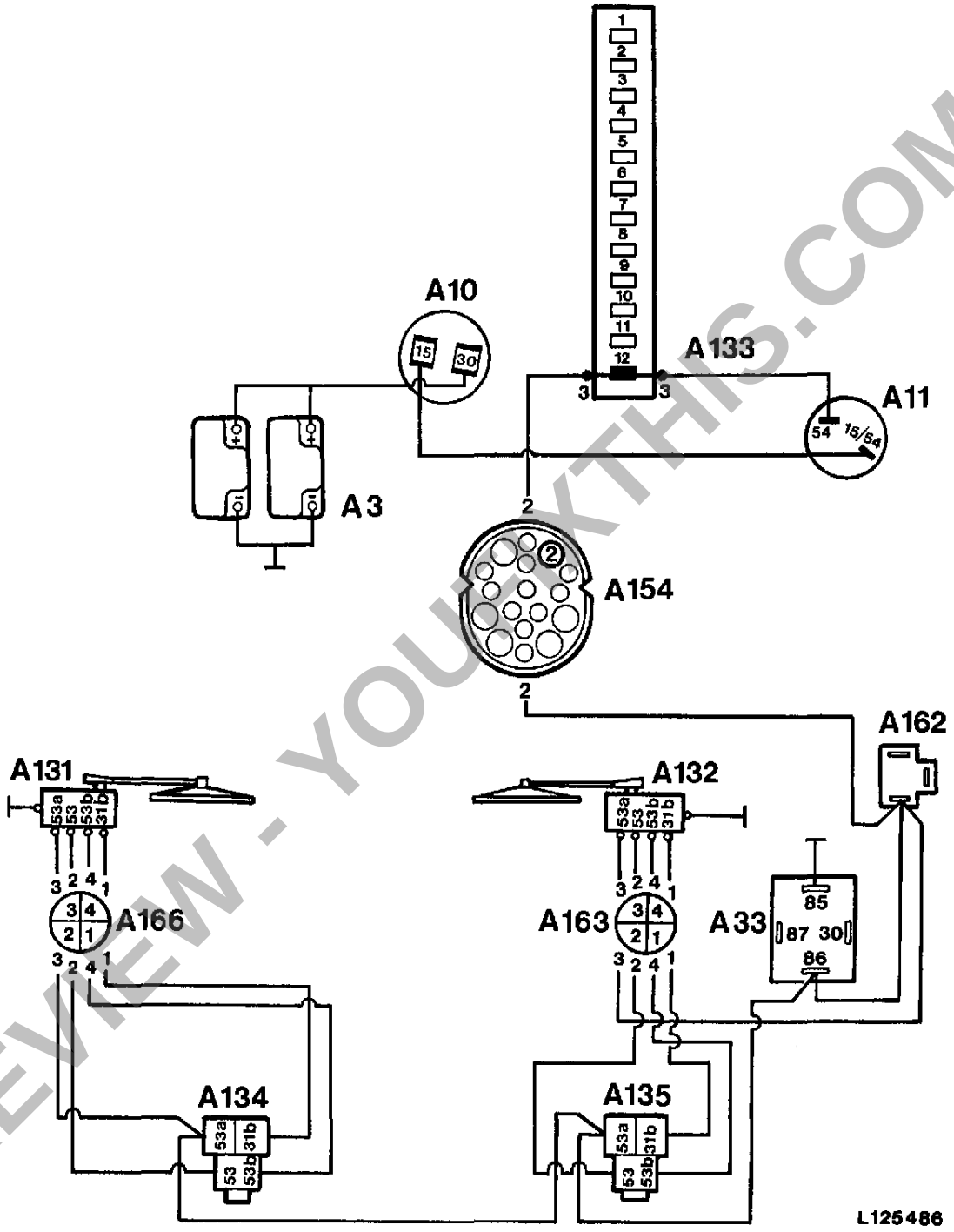
* When equipped

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S14 – CURRENT CIRCUIT*

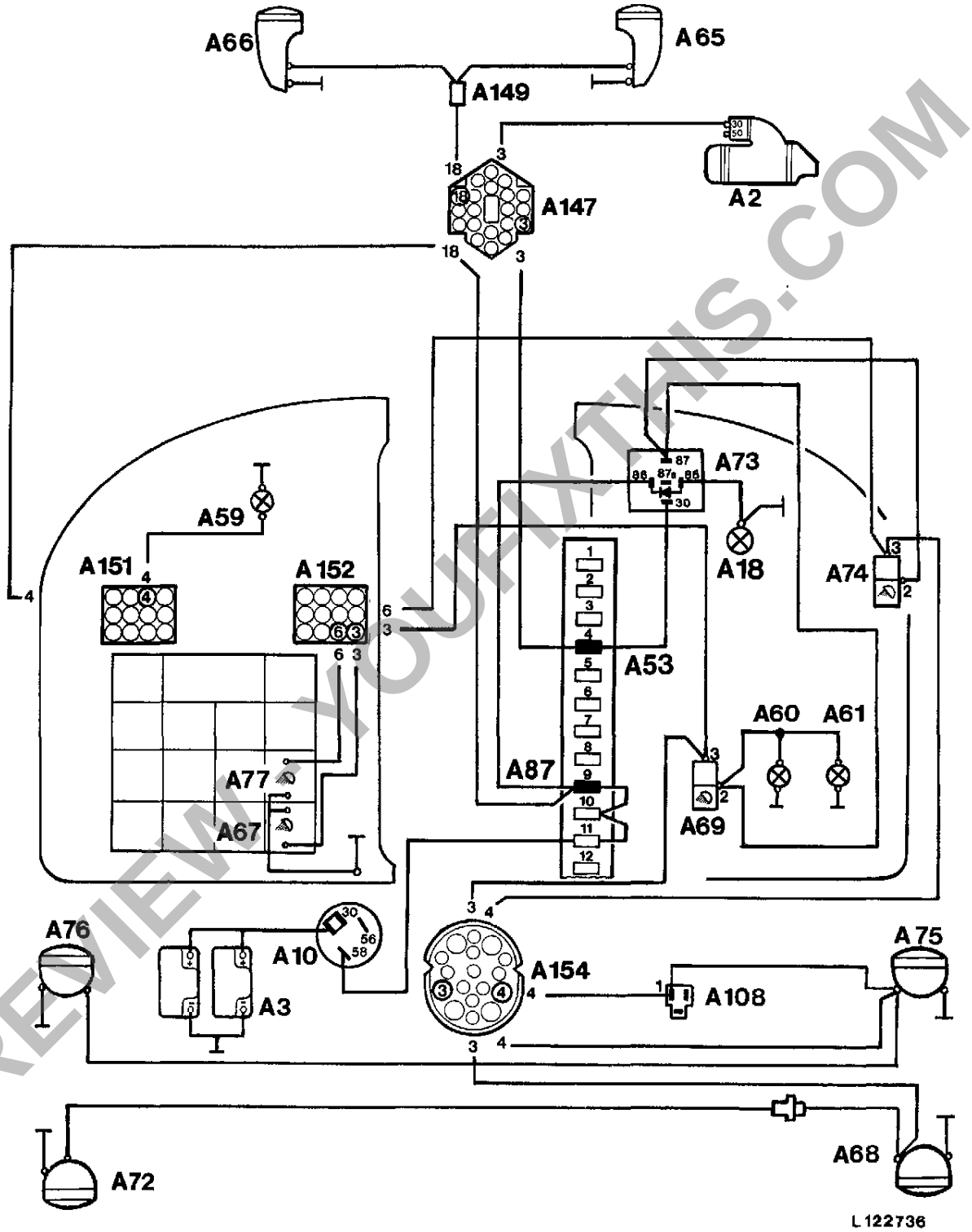


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S6 – CURRENT CIRCUIT



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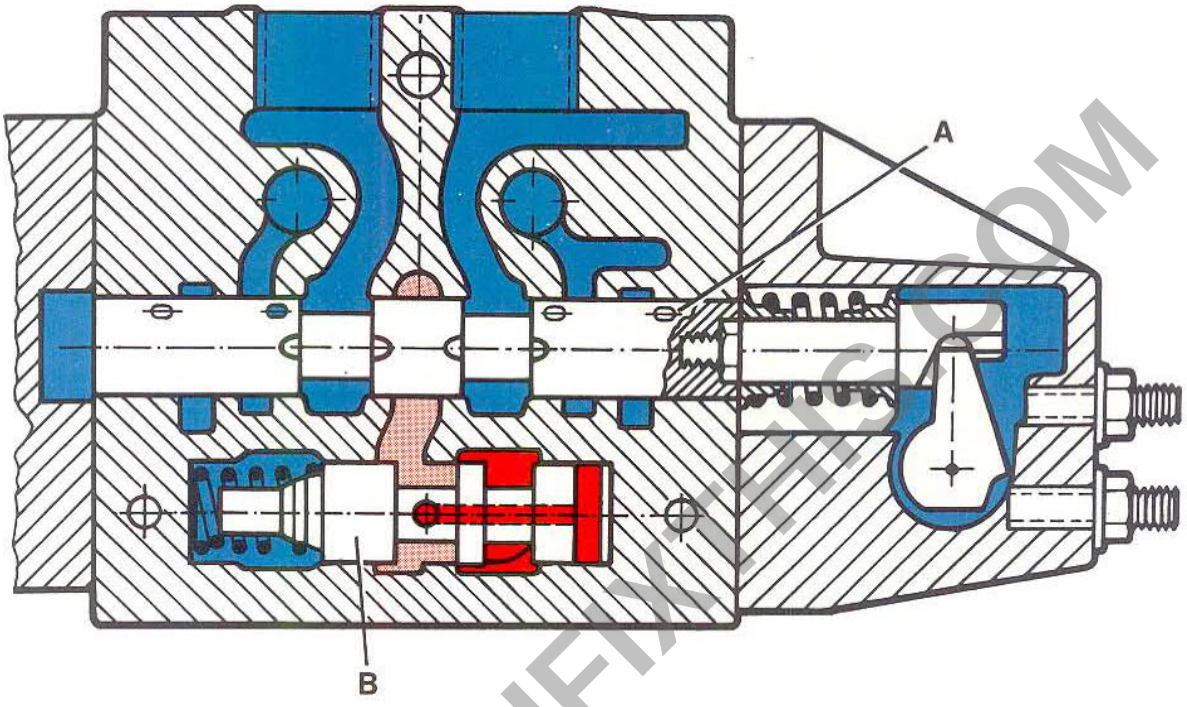
		1350	1550	1750	1850	1850N	1950	1950N	2250	2450	2650	2650N	2850	3050	3350	3650
30 – TRANSMISSION SHIFT LINKAGES																
Operation of console shift linkage	30-1								x	x	x		x	x	x	x
Operation of center shift linkage	30-2	x	x	x	x	x	x	x	x	x	x	x	x	x	x	
35 – SYNCHRONIZED TRANSMISSION AND TRANSMISSION OIL PUMP																
Description	35-1	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Operation of transmission oil pump	35-2	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Lubrication system	35-3	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Operation of synchronized transmission	35-4	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Power flow in the individual gears	35-5	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Power flow – range II	35-6	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Power flow – range I	35-6	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Power flow – reverse range	35-6	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Synchronization	35-7	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Towing the tractor	35-9	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Towing the tractor to start	35-9	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Diagnosing malfunctions	35-10	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
40 – COLLAR SHIFT TRANSMISSION AND TRANSMISSION OIL PUMPS																
Description	40-1	x	x	x	x	x			x	x	x					
Operation of internal gear transmission oil pump	40-2	x	x	x	x	x			x	x	x					
Operation of external gear transmission oil pump	40-3	x	x	x	x	x										
Lubrication system	40-4	x	x	x	x	x			x	x	x					
Operation of collar shift transmission	40-5	x	x	x	x	x			x	x	x					
Power flow in the individual gears	40-6	x	x	x	x	x			x	x	x					
Towing the tractor	40-7	x	x	x	x	x			x	x	x					
Towing the tractor to start	40-7	x	x	x	x	x			x	x	x					
Diagnosing malfunctions	40-8	x	x	x	x	x			x	x	x					

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DIRECTIONAL CONTROL VALVE IN NEUTRAL POSITION



L 121990

A–Main spool
B–Pressure compensator

C–High-pressure oil
D–Low-pressure oil
E–Return oil

With creeper transmission disengaged and potentiometer in position "0", main spool (A) of directional control valve is in neutral position, shutting off the oil flow.

Pressure compensator (B) located ahead of directional control valve comes into operation.

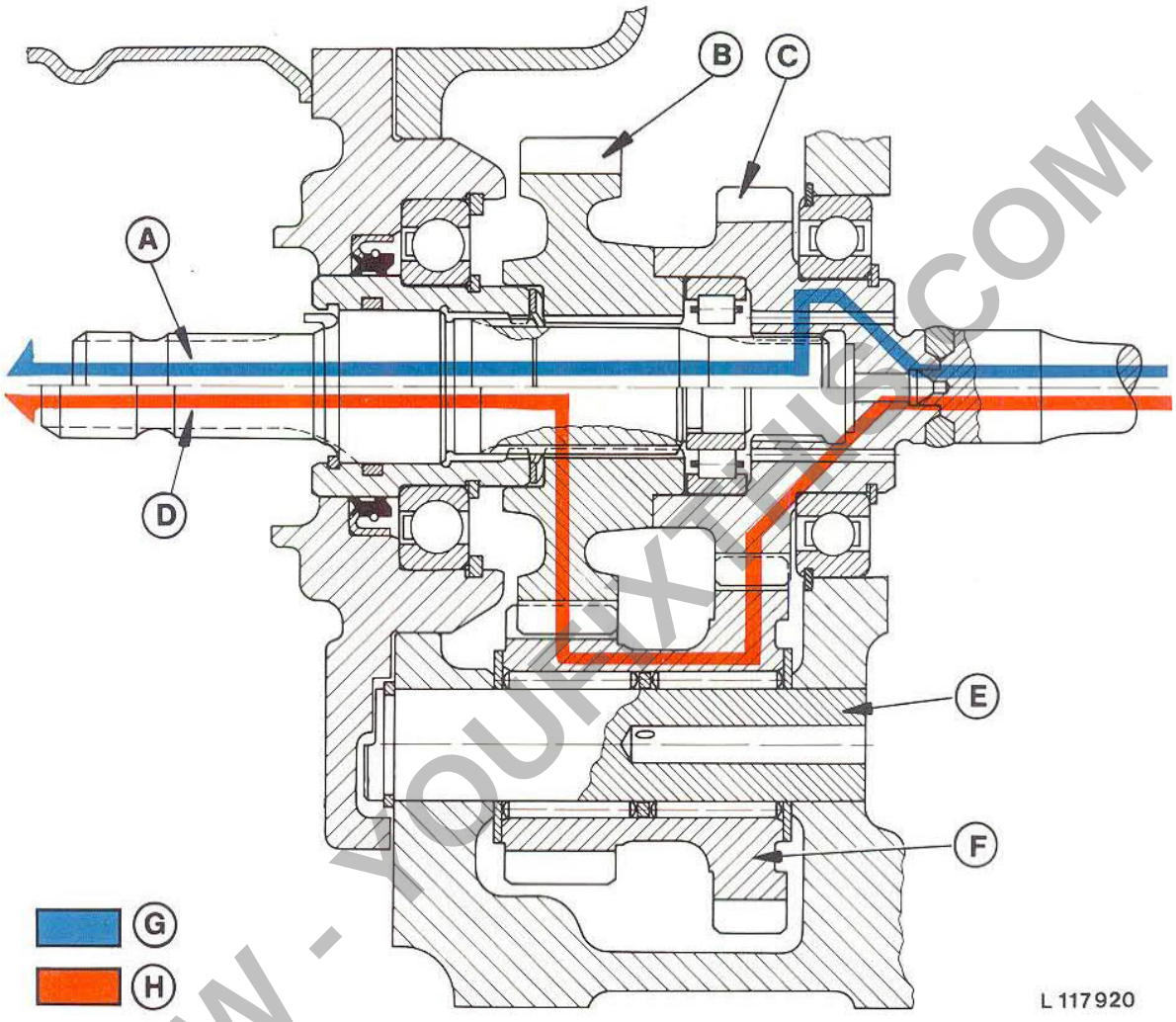
The oil flows through the oil passage inside the main spool and presses the spool to the left, over coming the force of the spring, and shuts off the oil flow to the directional control valve.

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POWER FLOW IN PTO COUNTERSHAFT (INTERCHANGEABLE STUB SHAFT)



A–1000 rpm stub shaft
B–Drive gear
C–PTO shaft with gear
D–540 rpm stub shaft
E–Countershaft
F–Double gear
G–Power flow at 1000 rpm
H–Power flow at 540 rpm

Conversion of PTO speed is effected by installing the stub shaft required. When installing 1000 rpm PTO stub shaft (A), splines of PTO shaft with gear (C) engage directly in splines of PTO stub shaft (A). Both shafts turn at the same speed.

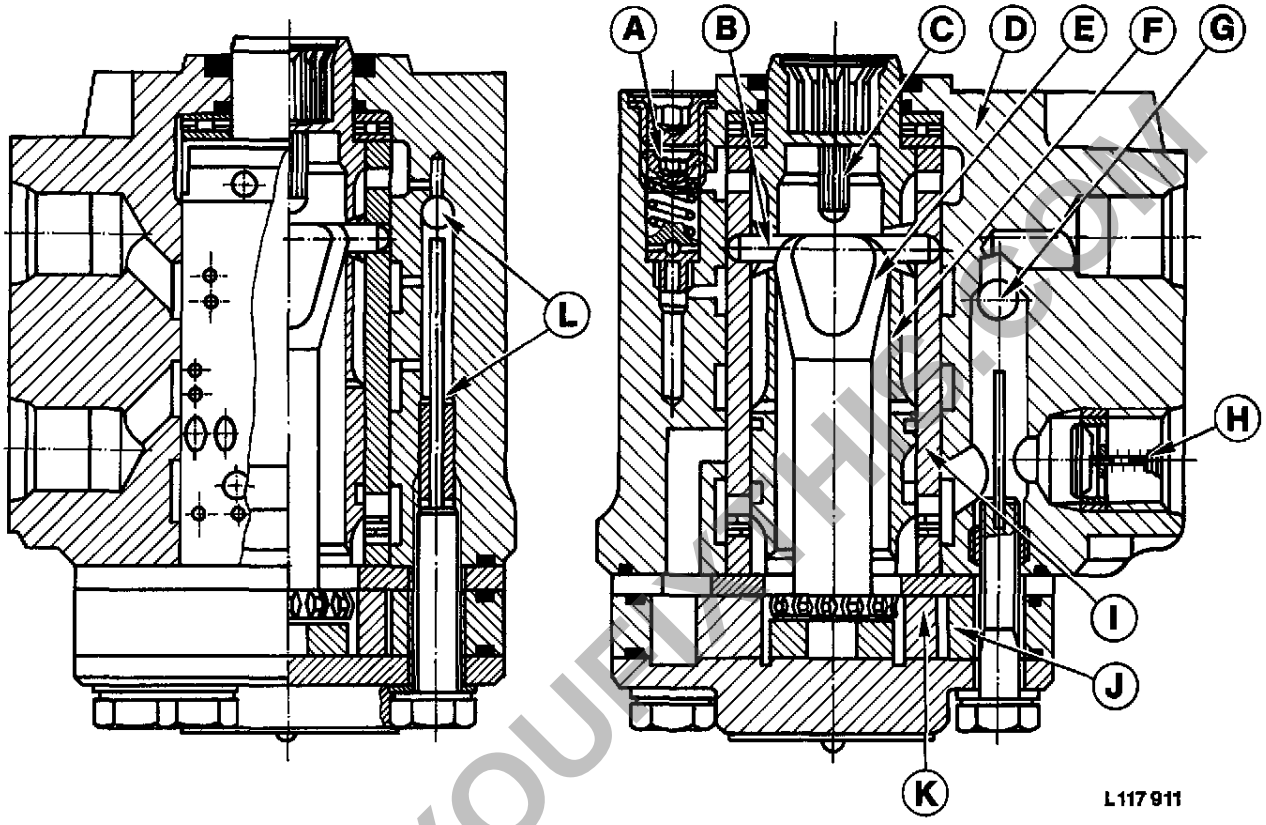
When installing 540 rpm stub shaft (D), PTO speed is reduced as splines of PTO stub shaft engage in splines of drive gear (B).

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STEERING VALVE ASSEMBLY, SECTIONAL VIEW



A–Shock valve (2 used)
B–Cross pin
C–Leaf springs (6 used)
D–Steering valve housing
E–Rotor (drive) shaft
F–Valve spool
G–Check valve
H–Check valve
I–Valve sleeve
J–Stator
K–Rotor
L–Suction valve (2 used)

FUNCTION OF SAFETY VALVES

The shock valves (A) act as relief valves should one of the front wheels strike a solid object. The piston of the relevant cylinder is thereby forced to one side by the piston rod and greatly increases the pressure in the steering oil lines. The suction valve (L) on the pressure side closes immediately. The pressure-loaded shock valve opens at 21000 kPa (210 bar; 3050 psi) and allows oil to flow into the return oil channel.

At the same time the suction valve on the opposite (unloaded) side opens. Now the steering cylinder piston draws oil from the return line and thereby prevents a shortage of oil in the steering cylinder.

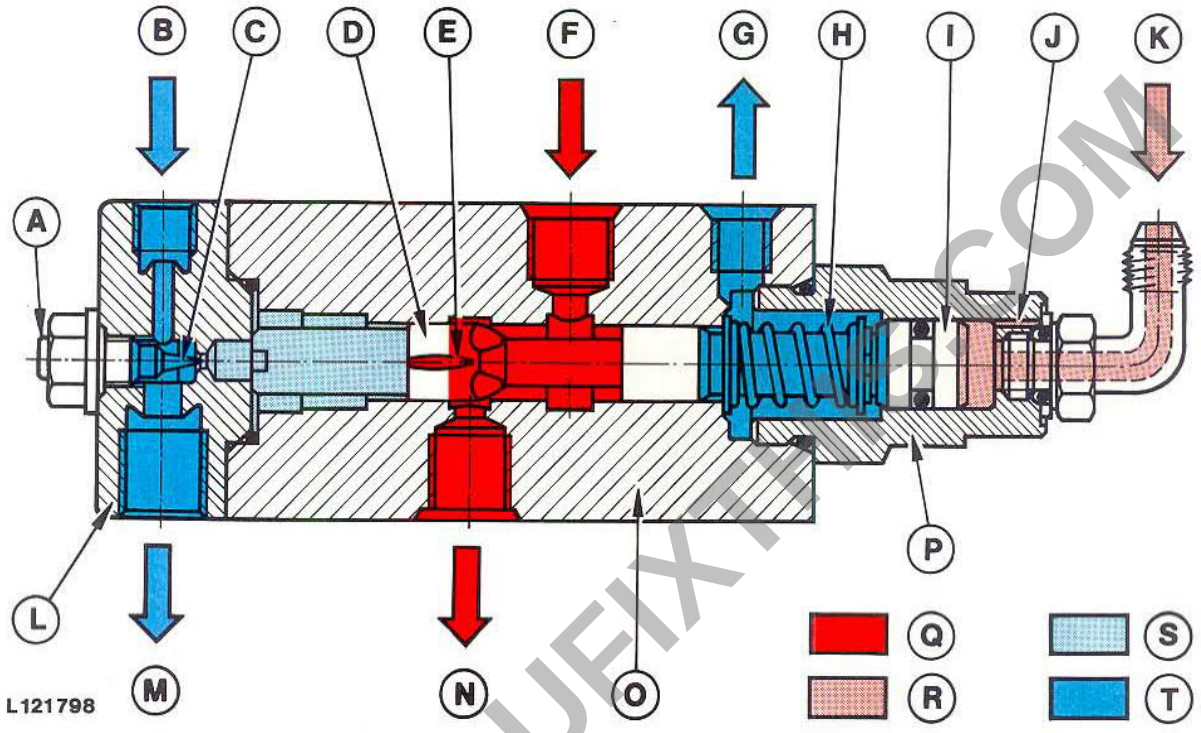
The check valve (H) prevents return oil flowing through the steering valve, as this would cause jerky impacts on the steering wheel. This valve also prevents oil returning to the main hydraulic pump when it is not operating.

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OIL FLOW IN BRAKE VALVE
(From Tractor Ser.No. 632 322L to 692 738L)



A–Throttle screw
B–Leak-off inlet line from pressure reduction valve
C–Throttle screw cone point
D–Spool
E–Spool oil groove
F–Pressure line from pressure reduction valve
G–Leak-off line
H–Pressure spring
I–Piston
J–Bleeding orifice
K–Control line
L–End cap
M–Return and leak-off line to transmission case
N–Pressure line to quick coupler
O–Brake valve housing
P–Spring cap
Q–High-pressure oil
R–Low-pressure oil
S–Variable pressure oil
T–Pressure-free oil

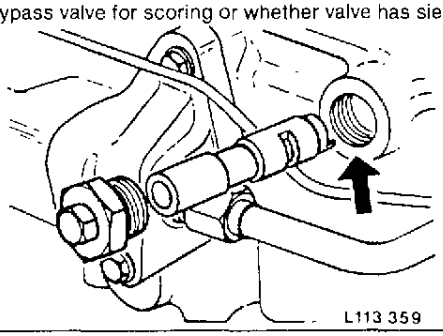
When foot brakes are applied, pressure oil from foot brake circuit is forced behind piston (I) and pushes spool (D) to the left after having overcome the pressure of spring (H), thereby opening oil channel leading to pressure oil line (N) of quick coupler. At the same time, pressure oil flows through the three grooves (E) in spool to throttle screw (A), which delays the return of oil to the transmission casing, and thus prevents sudden braking of the trailer.

When the braking operation is completed, pressure spring (H) moves spool (D) to the right back into neutral position. The spool opens the pressure oil channel to the quick disconnect coupler at a pressure of 400 kPa (4 bar; 60 psi).

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Transmission oil pump output too low (Contd.)	1. Check size of bore in filter bypass valve in transmission case. Specification is 20.65 ± 0.025 mm dia. (0.813 ± 0.001 in.). 2. Check filter bypass valve for scoring or whether valve has siezed.  	
	Separate tractor between transmission case and clutch housing. Check the following areas: 1. Pump inlet and discharge tube O-rings and packings for deterioration. 2. Pump body screws for proper torque. 3. Pump body and gears for excessive wear or scoring. 4. Oil lines for cracks. 5. O-rings between transmission case and clutch housing.	**Repair,** **Then...** **Repeat** ❻

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RAISING WITH DEPTH CONTROL (MIN)

Move selector lever 24 to position MIN. This moves load selector link and roller 16 to the top of cam follower 17. To raise the lift arms, pull rockshaft control lever 23 to the rear. Cam 15 then rotates counterclockwise, pressing valve linkage 14 against pressure valve 12, which is raised from its valve seat 11. Pressure oil from flow control valve 8 flows through pressure valve 12 into the rockshaft cylinder after ball 13 of the check valve has lifted from its seat.

The oil now forces piston 3 rearward, causing piston rod and crank arm to rotate the rockshaft and lift the arms upward.

On tractors with increased lifting capacity oil is supplied through pressure line 4 at the same time to the additional lift cylinders 20 which support and therefore increase the lifting action.

As the rockshaft rotates, the rockshaft cam 2 moves the cam follower 17 and load selector link and roller 16 forward. This motion is transmitted through the valve linkage, closing the pressure valve 12 and completing the raise cycle.

Full upward rockshaft movement is limited by a linkage which is dealt with on page 270-20-14.

On 1350 to 1850 tractors full upward rockshaft movement is limited when rockshaft crank arm 1 lies against the rockshaft housing.

Pressure valve 12 does not close abruptly, since there is a pressure differential between the front and rear of damping sleeve 10. As pressure oil flows through an orifice in the sleeve, pressure is built up gradually behind the damping sleeve and moves the control valve toward the valve seat 11 until it closes. This controlled pressure build-up behind the sleeve results in smooth, precise rockshaft control.

Discharge valve 5 and check valve ball 13 trap oil in the rockshaft cylinder to prevent lift arms from lowering when rockshaft is in its neutral position.

1–Rockshaft crank arm
2–Rockshaft cam
3–Rockshaft piston
4–To additional lift cylinders*
5–Discharge valve
6–Rate-of-drop valve
7–Surge relief valve*
8–Flow control valve*
9–Oil inlet
10–Damping sleeve
11–Valve seat
12–Pressure valve
13–Check valve
14–Valve linkage
15–Cam
16–Load selector link with roller
17–Cam follower
18–Adjusting screw of cam follower
19–Rockshaft
20–Additional lift cylinder*
21–Load control arm
22–Load control shaft
23–Control lever
24–Selector lever
25–High-pressure oil
26–Pressure-free oil

* When equipped

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TEMPERATURE CONTROL SWITCH

Temperature control switch setting	
Evaporator refrigerant temperature	
Contact points open (low limit)	−1°C (30°F)
Contact points close (high limit)	+3°C (37°F)

COMPRESSOR

Compressor relief valve opens at	3000 kPa (30 bar; 440 psi)
Full charge of oil (new or service exchange compressor, Frigidaire oil 525 or Reniso type KM)	312 cm^3 (11 fl.oz.)

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TORQUES FOR HARDWARE

High-pressure or low-pressure switch to refrigerant line	14 Nm (10 ft-lb)

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