OP. 10 001 10
ENGINE

REMOVAL - INSTALLATION

DANGER

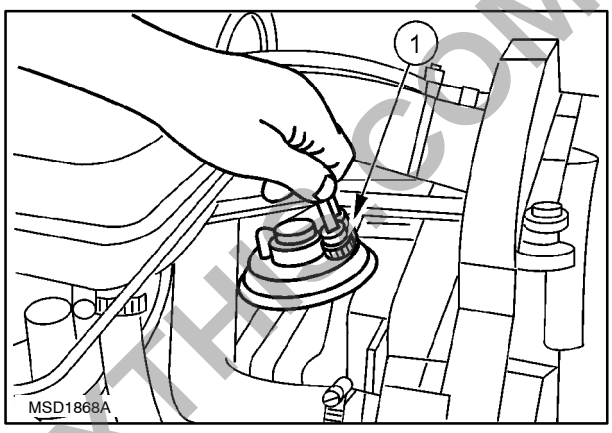
Lift and handle all heavy parts using suitable lifting equipment.
Make sure that assemblies or parts are supported by means of suitable slings and hooks. Ensure that no-one is in the vicinity of the load to be lifted.

ATTENTION

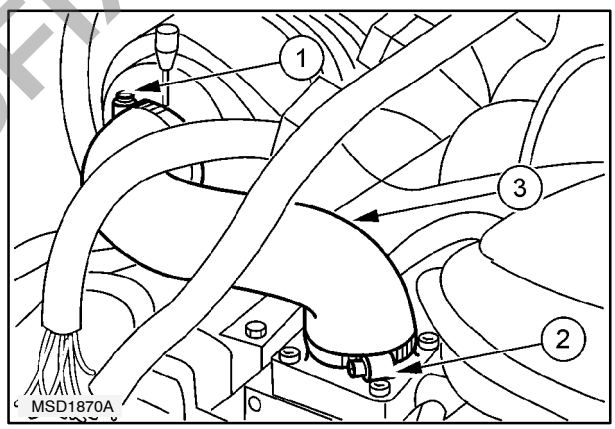
Use suitable tools to align the holes. NEVER USE FINGERS OR HANDS.

Proceed as follows.

1. Carry out operation **18 110 10** Clutch, only removal (see Sect. 18).
2. Disconnect the horn electrical connections (1).
3. Unscrew clamps (1, 2) and remove the intake sleeve (3).

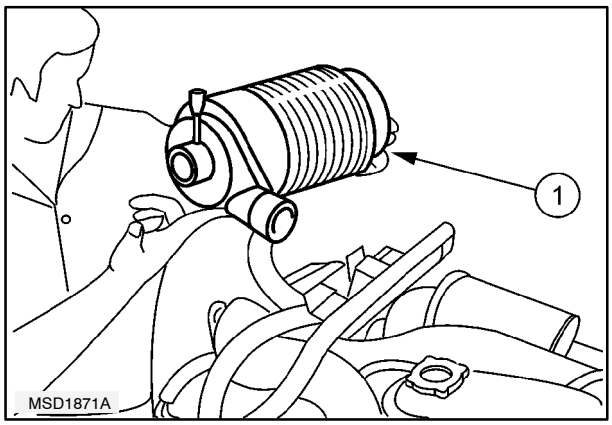


12



13

4. Remove the air intake filter (1).



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TORQUE WRENCH SETTINGS

PARTS TO BE TIGHTENED	Thread	Tightening torque	
		Nm	kgm
Cylinder head bolts (1)	M10 X 1.25	85.3 to 91.2	8.7 to 9.3
Connecting rod cap retaining bolts (1)	M9 x 1.0	44.1 to 54.0	4.5 to 5.5
Flywheel retaining bolts (1)	M10 X 1.25	83.4 to 88.3	8.5 to 9.0
Main bearing cap retaining bolts (1)	M12 x 1.5	96.1 to 100.1	9.8 to 10.2
Crankshaft V pulley retaining bolts (1)	M 14 x 1.5	112.8 to 122.6	11.5 to 12.5
Injector nuts (2)	M6 x 1.0	6.9 to 8.8	0.7 to 0.9
Automatic advance retaining nuts (2)	M12 x 1.75	58.9 to 68.7	6.0 to 7.0
Regulator centrifuge weights support nut (2)	M12 x 1.25	44.1 to 49.1	4.5 to 5.0
Fuel high pressure pipe sleeve retaining nut (2)	M12 x 1.5	29.4 to 34.3	3.0 to 3.5
Hex bolt (4T) and nut (2) (3)	M6 x 1	9.8 to 11.8	1.0 to 1.2
	M 8 x 1.25	22.6 to 28.4	2.3 to 2.9
	M10 x 1.5	44.1 to 54.0	4.5 to 5.5
	M12 x 1.75	78.5 to 98.1	8.0 to 10.0
PT caps (2)	1/8”	9.8	1.0
	1/4”	19.6	2.0
	3/8”	29.4	3.0
	1/2”	58.9	6.0
Pipe union bolts (2)	M8	12.8 to 16.7	1.3 to 1.7
	M12	24.5 to 34.3	2.5 to 3.5
	M14	39.2 to 49.1	4.0 to 5.0
	M16	49.1 to 54.0	5.0 to 5.5

(1) Parts smeared with lubrication oil.

(2) Parts not smeared with lubrication oil.

(3) a. When fitting aluminium parts, tighten the bolts to 80% of the torque indicated in the table.

b. 4T bolts and locknuts must be tightened to 60% of the torque indicated in the table.

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ENGINE TROUBLESHOOTING

Problems	Possible Causes	Solutions
Engine does not start.	1. Battery partially discharged.	Check and recharge batteries. Replace if necessary.
	2. Battery terminal connections corroded or loose.	Clean, inspect and tighten terminal nuts. Replace terminals and nuts if excessively corroded.
	3. Circuit open.	Reset continuity.
	4. Intake/exhaust valve incorrect clearance.	Adjust valve clearance.
	5. Intake/exhaust valve seized.	Renew.
	6. Piston rings seized or broken.	Replace piston ring.
	7. Piston rings and cylinders worn.	Hone and use oversize parts.
	8. Main journal and bearings seized.	Repair or replace.
	9. Foreign body inside combustion chamber.	Disassemble and repair the chamber. Remove the foreign body.
	10. Incorrect timing of the inlet/exhaust valves.	Adjust valve clearance and check the inlet/exhaust valves timing.
	11. Injection pump timing incorrect.	Adjust injection pump timing on the engine.
	12. Impurities or water in fuel lines.	Disconnect fuel lines from injection pump and clean thoroughly. If necessary clean and dry the fuel tank.
	13. No fuel in tank.	Fill tank.
	14. Fuel supply pump malfunction.	Check and replace pump if necessary.
	15. Air in fuel system.	Check fuel lines, unions, supply pump, filters and injection pump for air, then bleed system; then bleed the air from the circuit.
	16. Starter motor faulty.	Repair or replace starter motor.
	17. Thermostarter faulty.	Check and replace thermostarter if necessary.

(continued)

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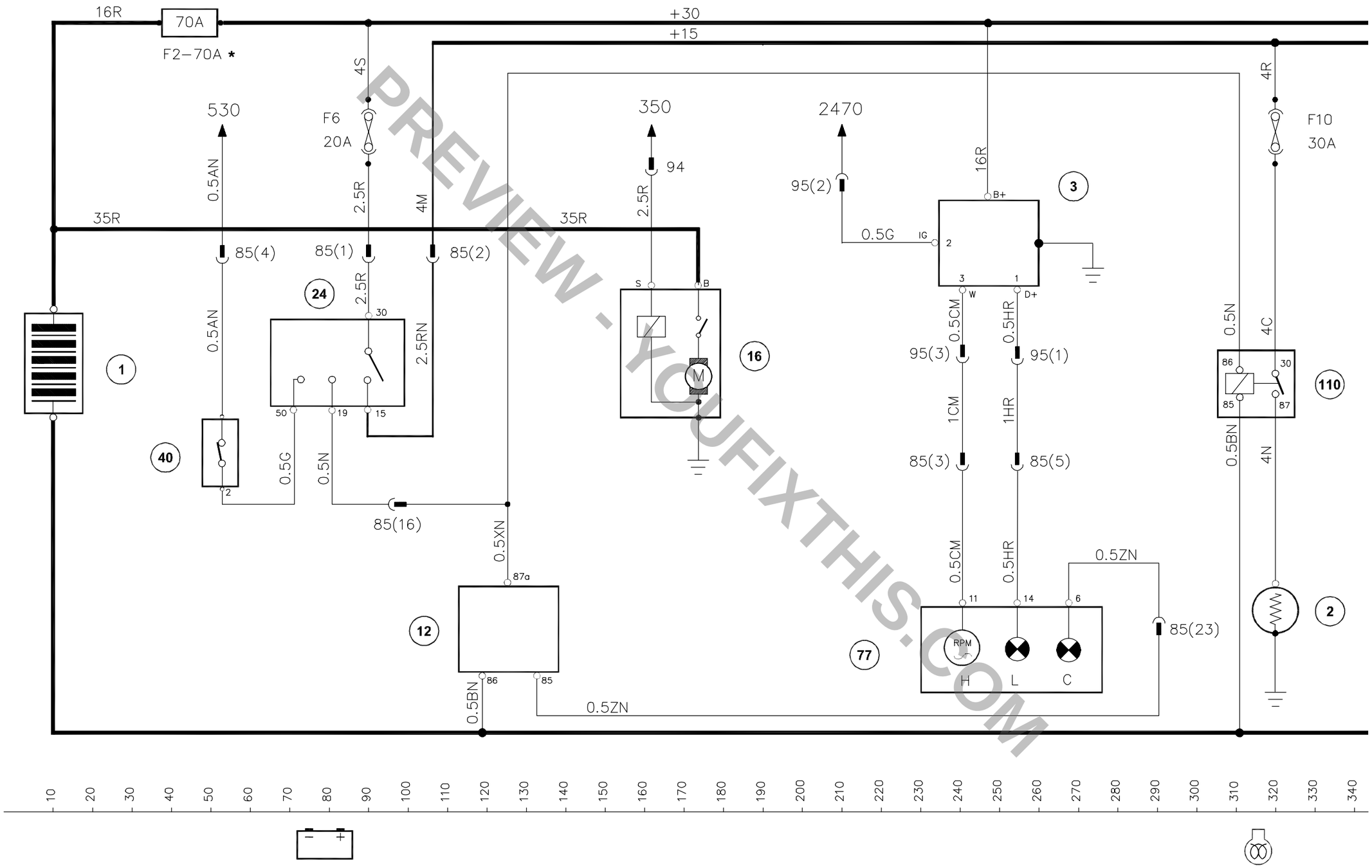
INSTRUMENT ERROR INDICATOR DIAGNOSTICS TABLE

No	Blinks No.	item	Error conditions	Behaviour in an error condition	actions/ conditions for resetting	location
1	**4**	coolant temperature sensor error.	sensor voltage < 0.2 sensor voltage > 4.8 (V)	- the engine keeps on turning with a coolant temperature of 86 °F (30 °C) - the engine turns with the same limits as for “EGR valve error”.	correct the error.	always enabled.
2	**5**	throttle sensor error.	sensor voltage < 0.2 sensor voltage > 4.8 (V)	-without the aid of the optional throttle sensor: The engine turns at 1500 rpm (speed settings can change) -with the optional auxiliary throttle sensor: activate it and the engine will have no limits. (in the event of a fault with the optional auxiliary sensor the engine turns at 1500 rpm and the speed settings can be changed).	correct the error.	normal-ly enabled.
3	**6**	speed sensor error.	-engine ignition signal (E8) on, but engine speed equal to zero. -engine speed skipped to a certain limit.	engine stops. -with the optional auxiliary speed sensor: activate the auxiliary sensor and there will be a limit of 1800 rpm (the speed settings can be changed) -if the auxiliary sensor breaks the engine will stop.	turn off the engine.	always enabled.
4	**7**	metering device position sensor error.	the position of the metering device in relation to its output voltage is out of tolerance.	the engine runs at limited speed, between 1.5 x slow idle speed and 0.8 x fast idle speed The metering device position control is on, while the speed sensor is off.	switch off the engine.	always enabled.
5	**8**	metering device error.	-the metering device output is out of tolerance. -the engine accelerates even if the metering device output is at minimum. -the engine stalls when the metering device position sensor malfunctions.	engine stops.	switch off the engine.	always enabled.

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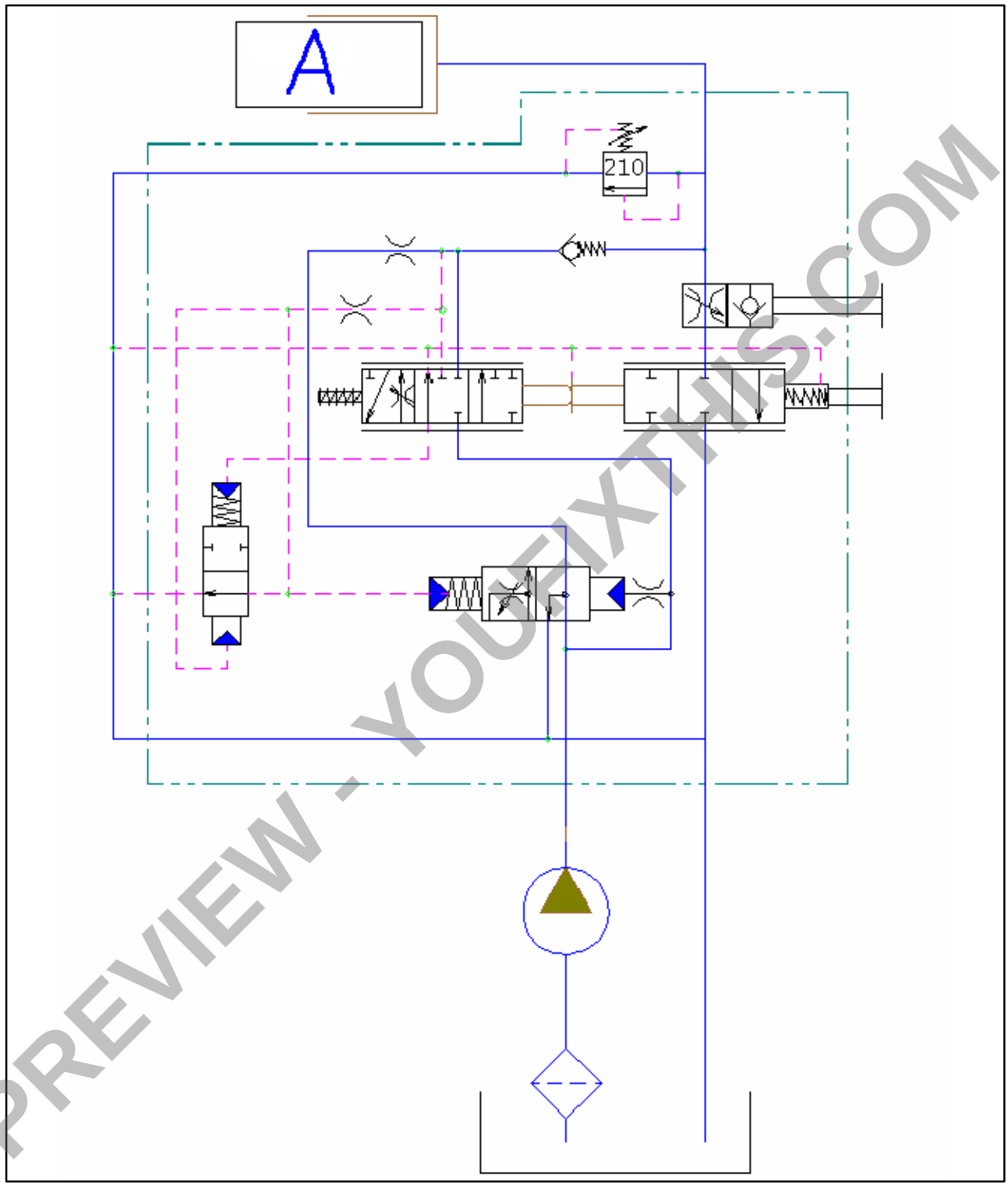
STARTING, RECHARGING, PRE-HEATING CIRCUIT (Diagram A)



MPN0975A

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HYDRAULIC CIRCUIT DIAGRAM



16

A = cylinders.

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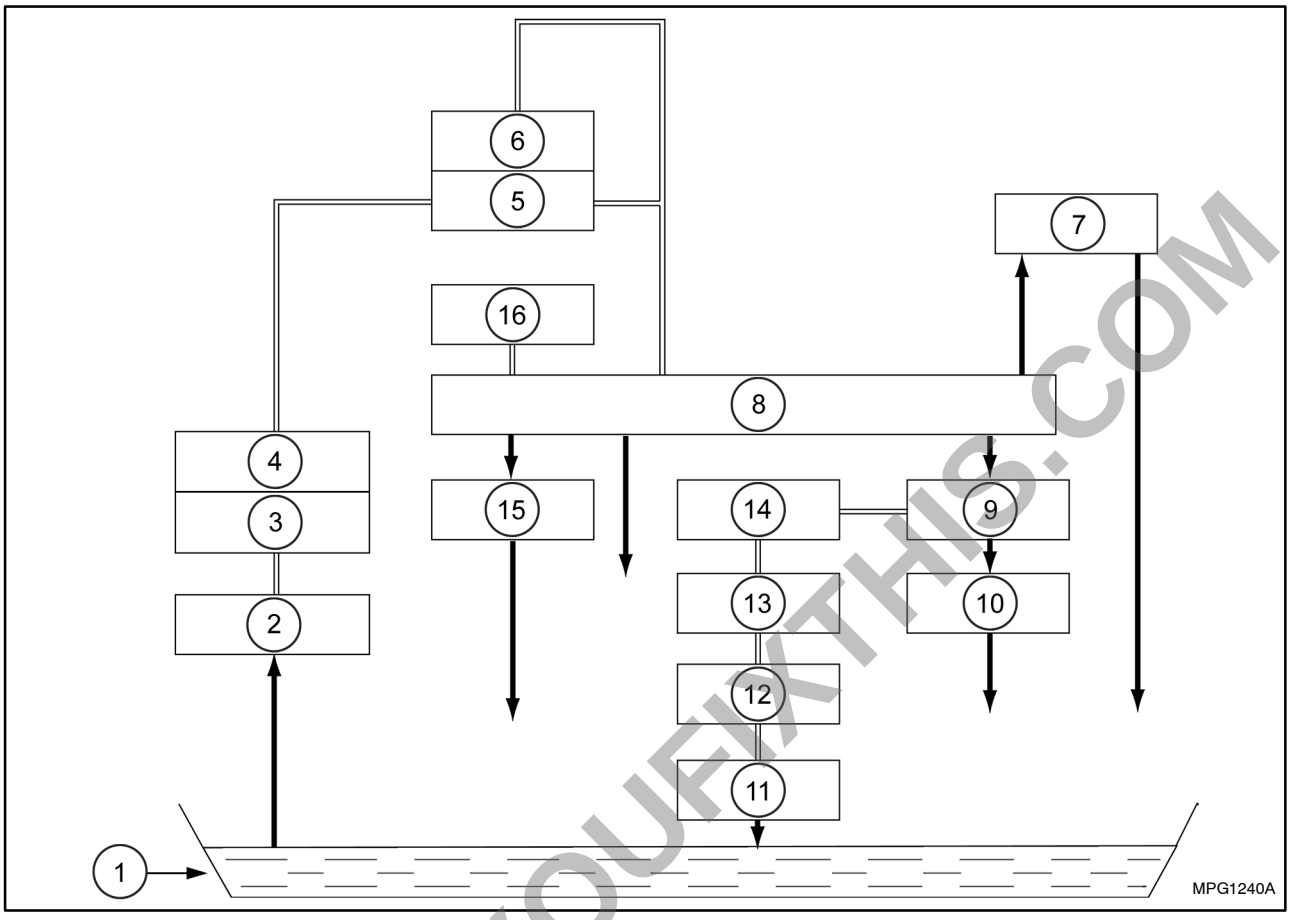
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LUBRICATION, COOLING AND FUEL SUPPLY CIRCUITS DIAGRAMS



9

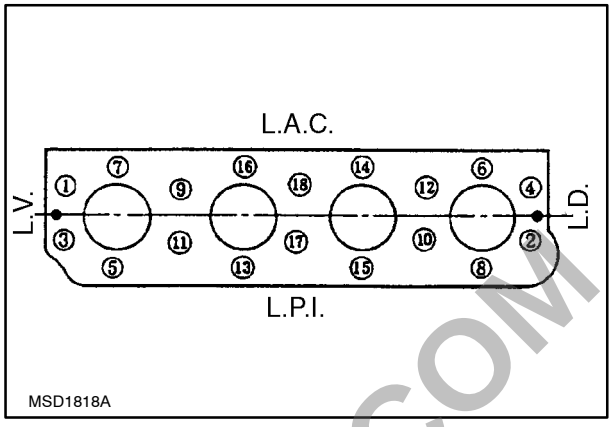
Engine cooling system circuit diagram.

1. Oil sump
2. Inlet pipe
3. Oil pump
4. Pressure control valve
5. Bypass valve
6. Oil filter
7. Fuel injection pump
8. Cylinder block main line
9. Main bearing
10. Connecting rod bearing
11. Tappets/cam surfaces
12. Rocker arm
13. Rocker arm pin
14. Camshaft bearing
15. Intermediate gear pin
16. Pressure switch

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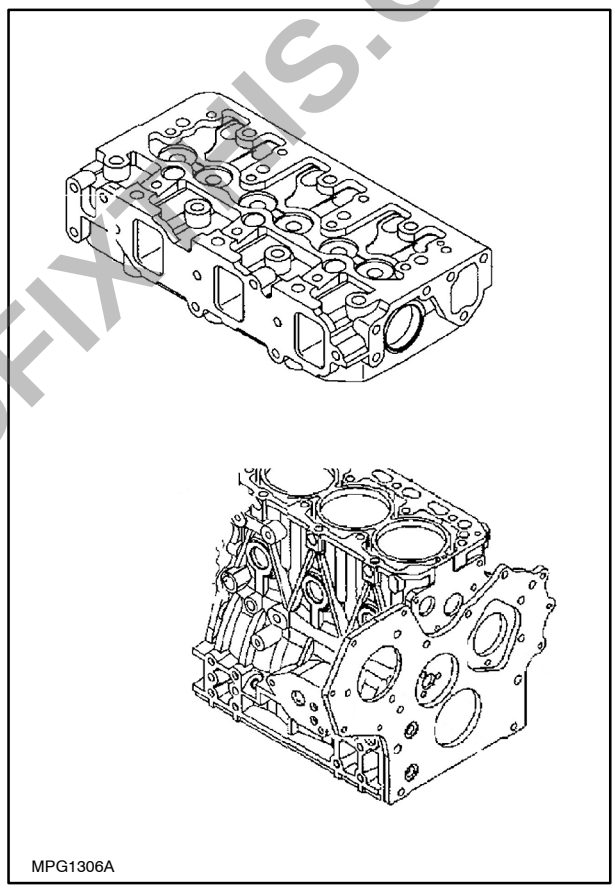
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- in fig. 58 for 4-cylinder engines (Mod. T3020 - T3030 - T3040).



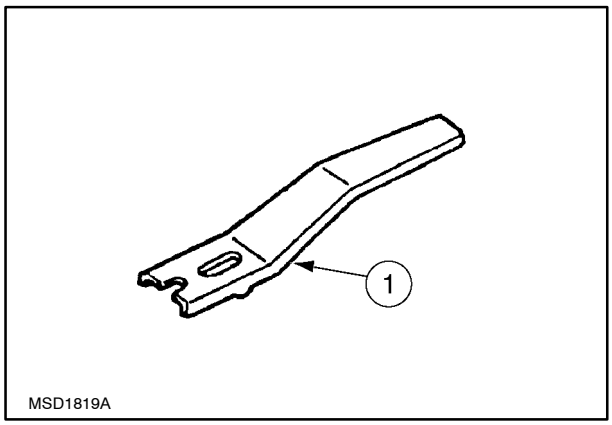
58

22. Remove the cylinder head unit.
23. Remove the head gasket.



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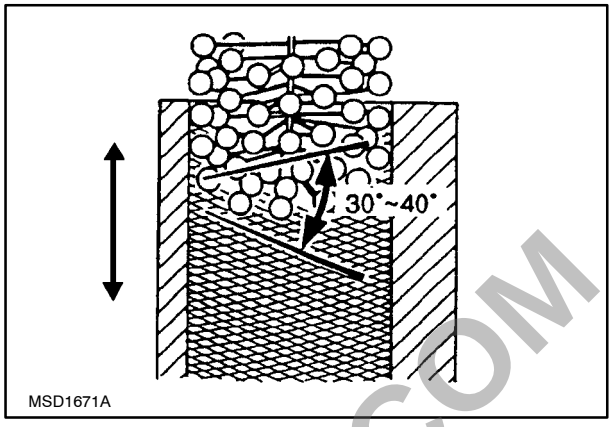
24. Remove the intake/exhaust valves from the cylinder head (4, fig. 61) proceeding as follows.
   - Using compression device **380000184** (1) for the valve spring, compress the spring (3, fig. 61) and remove the cotters (1, fig. 61).



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2. **Method of use**
    1. Apply the honing liquid on the flexible brush for precision finishing.
    2. Rotate the brush and introduce in the cylinder, moving up and down for approx. 30 seconds at an angle of 30 to 40˚, as indicated in the sectioned part of the drawing.
    3. Extract the brush from the cylinder whilst still rotating.



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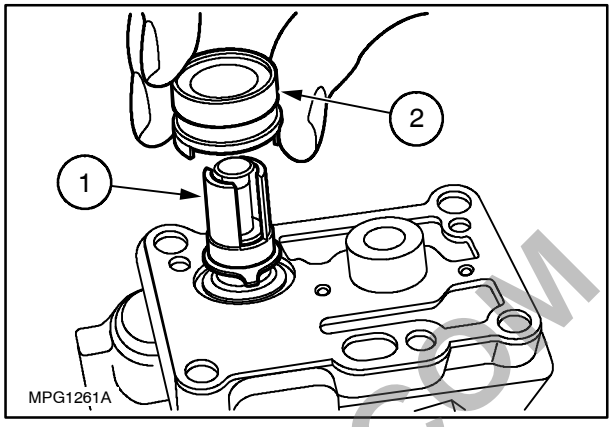
DANGER

- Use the flexible brush for precision finishing t a speed of 300 to 1200 rpm. Using the brush at higher speeds may be dangerous.
- Never introduce or extract the brush from the cylinder when the electric drill is switched off.

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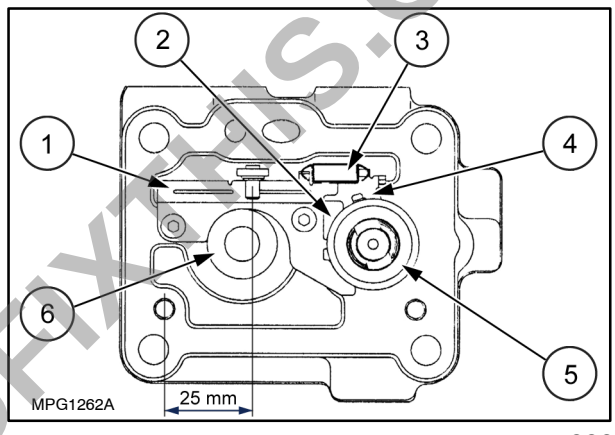
- Position the control sleeve (1) and the spring guide (2).



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- Position the control rod of the control sleeve and the stop plate as shown in the figure.

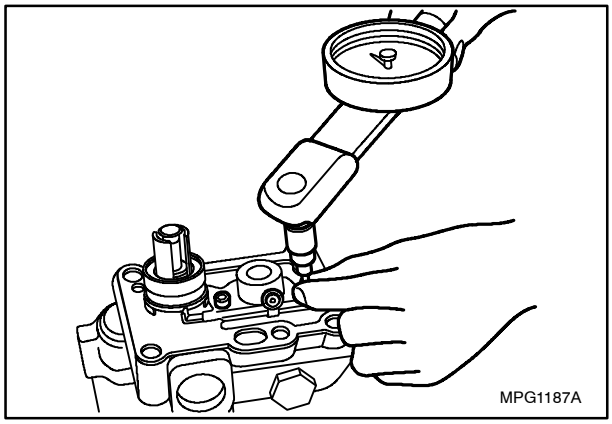
Key
1. Stop plate
2. Control sleeve
3. Spring
4. Control rod
5. Spring guide
6. Control Valve Sleeve



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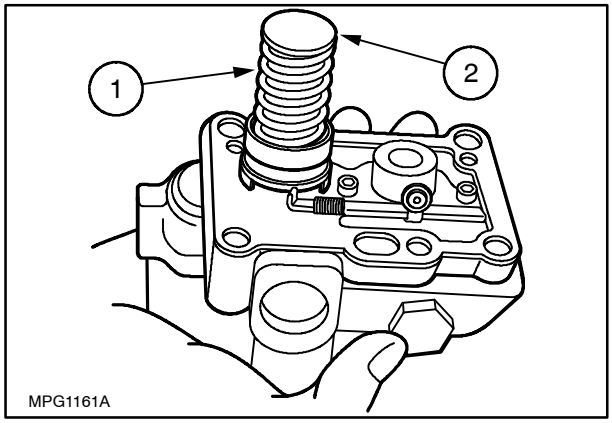
- Tighten the retaining bolts of the stop plate to the prescribed torque of:

  3.9 to 4.9 Nm



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- Fit the spring (1) and the stop plate (2).



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40. To refit the engine to the clutch casing, proceed as follows:

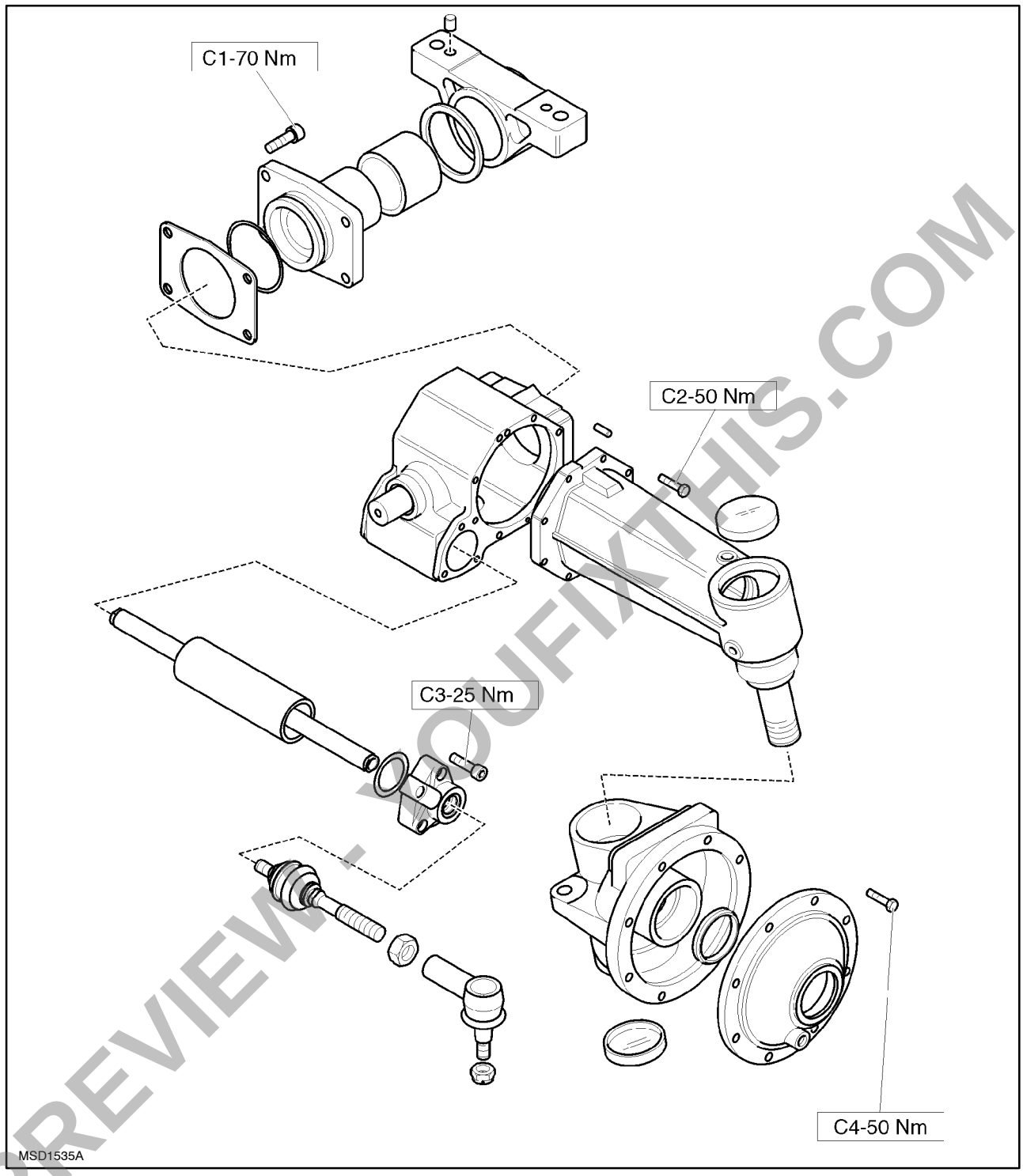
CAUTION

Use suitable tools to align the holes. NEVER USE FINGERS OR HANDS.

- Respect the tightening torques prescribed on page 1.
- Before refitting the engine to the clutch box carefully clean the mating surfaces and apply sealing compound (2 mm diameter), according to the diagram shown on page 5.
- Use tool **380000191** to refit the clutch to the engine flywheel.
- Using tool **380000191** and spider **380000453** adjust the clutch control lever to obtain a clearance of = 0.1 mm between the end of the lever and the spider.
- Using a hoist, position the engine-front axle assembly and secure in position.
- Attach the fuse box to the retaining brackets.
- Connect the oil delivery pipe union from the pump to the lift control valve and auxiliary control valve.
- Connect the gear lubrication piping union and tighten the transmission lubrication oil intake pipe clamps.
- Attach the power steering control valve pipes. Attach the front ballast too.
- Attach the front left-hand grille of the engine and attach the exhaust silencer including the pipe.
- Connect the main electrical connection. Using its retaining bracket, connect the differential lock solenoid valve with the related delivery pipe to the differential lock of the front axle and reconnect its electrical connection.
- Restore the oil levels of the gearbox-transmission casing (see page 6, Sect. 00 for the prescribed product and quantity).
- Position the tank in its seat and secure it to the related retaining bracket. Fasten the three brackets of the electrical system at the rear of the tank.
- Fasten the fuse box and fasten the bonnet opening/support bracket in its seat.
- Connect the hoses and the float electrical connection to the tank.
- Connect the electrical connections of the instrument and lights switch assembly and reconnect the upper instrument panel screwing the fixing screws back on.
- Attach the steering wheel and the hand throttle in their seats on the instrument panel.
- Position the platform and secure it.
- Connect the lift levers to the relative controls on the lift body.
- Connect the rigid pipe to the hose for the oil flow from the pump to the auxiliary control valves at the rear of the platform, connect the two rear pipes for the front PTO and lift control (where applicable), and the hose for the flow to the rear lift.
- Fit the rear roll bar and connect the electrical connection of the rear light and number plate light.
- Position and secure the seat in place.
- Fit the tie-rod of the parking brake under the platform on the left-hand side.

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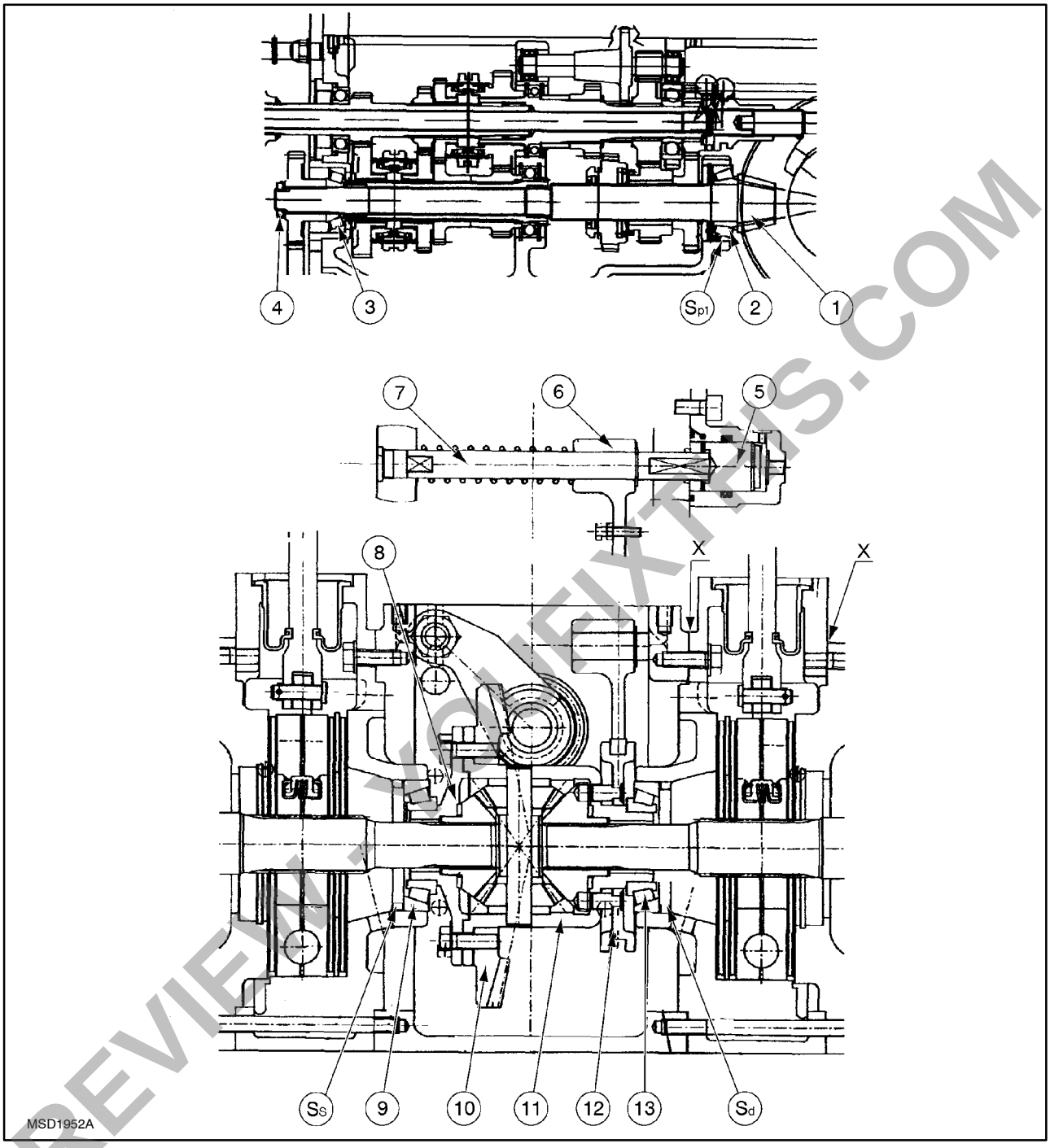
1

TORQUE SETTINGS

PARTS TO TIGHTEN	Tightening torque	
	Nm	kgm
Retaining bolt securing pinion support to the central casing (C1)	70	7.15
Retaining bolt securing lateral reduction unit casing to the central casing (C2)	50	5.10
Steering cylinder cover retaining bolt (C3)	25	2.55
Retaining bolt securing hub to stub axle pin (C4)	50	5.10

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CROSS-SECTIONAL VIEWS



2

Cross-sectional view of gearbox-rear transmission

S_d Adjusting shim.
S_{p1} Adjusting shim.
S_s Adjusting shim.
1. Bevel pinion.
2. Taper bearing.
3. Taper bearing.
4. Nut.
5. Differential lock hydraulic actuator.
6. Differential lock fork.
7. Differential lock rod.
8. Flange.
9. Taper bearing.
10. Bevel gear.
11. Differential housing.
12. Differential lock ring.
13. Taper bearing.

NOTE: *On assembly apply a bead of sealing compound to the surfaces **X** as indicated on page 8.*

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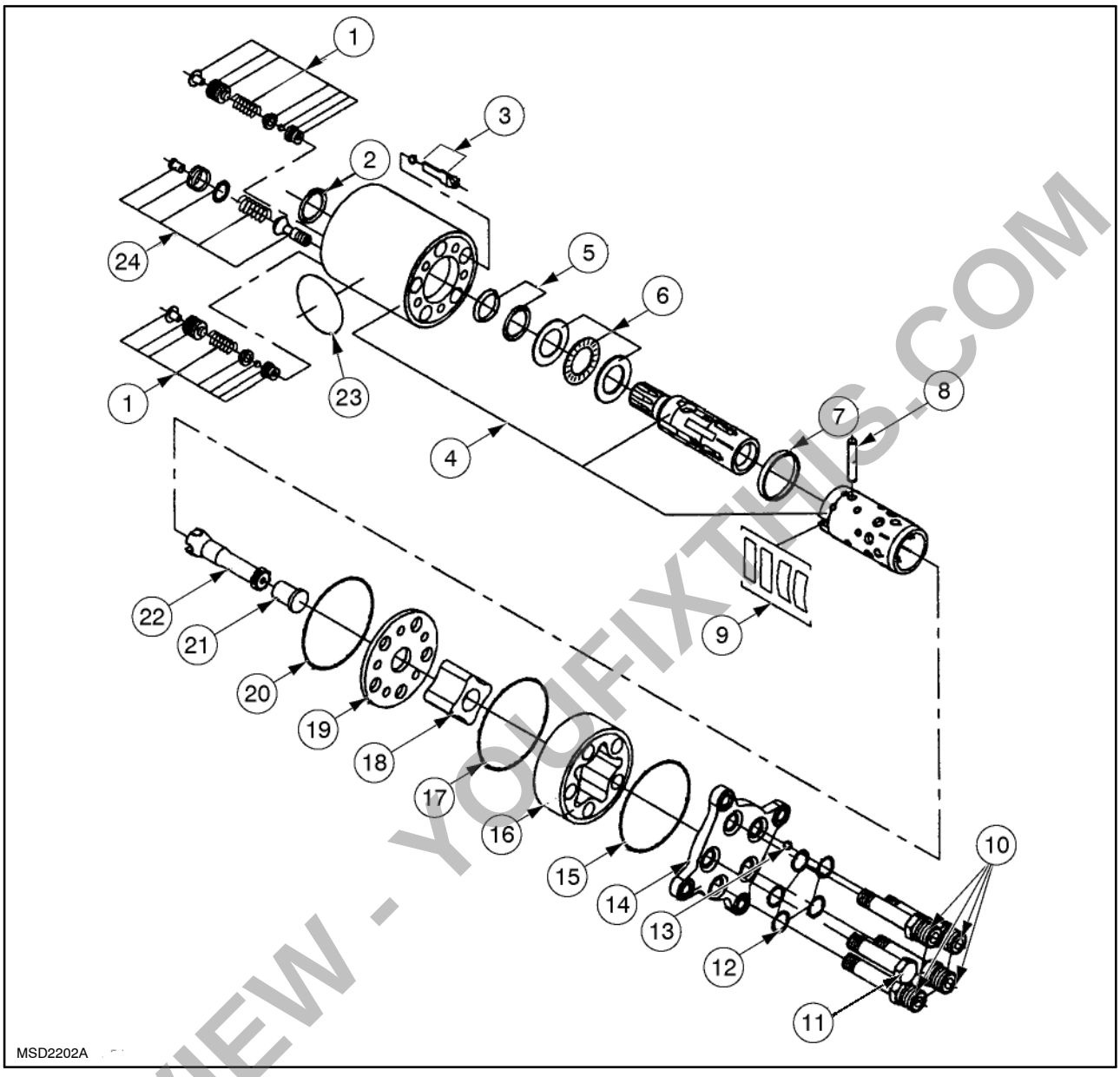
BRAKE TROUBLESHOOTING

Problems	Possible causes	Solutions
Brake pedals hard to operate.	Flexible cable stiff.	Release and, if necessary, replace the flexible cable.
The brakes stick when the pedals are released.	Flexible cable seized.	Replace the flexible cable.
Noisy brakes.	Friction material on brake disks worn.	Replace the brake disks.
Pedal stroke too long.	Flexible cable not adjusted.	Adjust correctly.
Unbalanced braking.	1. Incorrect tyre pressure.	Inflate the tyres to the correct pressure.
	2. Flexible cable not adjusted.	Adjust correctly.
	3. Friction material on brake disks worn on one side.	Replace the disks.
Inefficient braking.	1. Friction material on brake disks worn.	Replace the brake disks.
	2. Flexible cable not adjusted.	Adjust correctly.
Parking brake does not lock.	1. Brake control incorrectly adjusted.	Adjust correctly.
	2. Friction material on brake disks worn.	Replace the brake disks.
The tractor remains braked when the parking brake is disengaged.	1. Control return stroke obstructed.	Remove obstructions.
	2. Flexible cable seized.	Replace the flexible cable.

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CROSS SECTIONS AND EXPLODED VIEWS



1

1. Cylinder safety valve
2. Dust ring
3. Backflow valve
4. Control valve body, rotating valve and rotating valve seat sleeve
5. Seal
6. Thrust bearing
7. Spring retaining ring
8. Rotor drive shaft - sleeve trim pin
9. Springs for returning sleeve to **neutral position**
10. Oil infeed/outfeed unions
11. Retaining bolt
12. O-ring
13. Check valve
14. Cover
15. O-ring
16. Fixed ring for rotor
17. O-Ring
18. Rotor
19. Shim ring
20. O-Ring
21. Spacer
22. Rotor drive shaft
23. Identification plate
24. Pressure relief valve

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CAUTION

During these operations, follow the safety instructions and instructions for use described at the start of Section 50.
Handle all parts with great care, always use safety goggles, gloves and shoes.

REFRIGERANT RECOVERY-RECYCLING AND EVACUATION-CHARGING STATIONS

CAUTION

Do not use recovery/recycling and system emptying/charging machines which are designed for use with a refrigerant type other than that used in the system. Different types of refrigerant have different chemical compositions and are incompatible.

RECOVERY AND RECYCLING STATION (380000315)

Description

The machine is designed to recover and recycle the refrigerant used in air conditioning systems.

Recovered refrigerant is first subjected to an evaporation process in a special chamber to remove any oil.

In the filter section, the acidity is neutralised, moisture is absorbed and solid particles are screened out.

The decontaminated refrigerant is then stored in the metering cylinder.

EVACUATION/CHARGING STATION (380000315)

Description

The machine is designed for emptying and charging air conditioning systems with refrigerant.

The emptying stage is necessary to remove any moisture and impurities from the system.

The refrigerant drawn from the external cylinder is transferred to a graduated cylinder, from which it subsequently pumped into the air conditioning system.

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ATTENTION

During these operations, follow the safety instructions and instructions for use described at the start of Section 50.
Handle all parts with great care, always use safety goggles, gloves and shoes.

RECOVERY-RECYCLING AND EVACUATION-CHARGING STATIONS OF THE AIR CONDITIONING SYSTEM

ATTENTION

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DESCRIPTION AND OPERATION

The type of starting system installed depends on the type of gearbox fitted on the tractor. All systems consist of an ignition key-switch, heavy-duty wiring, a starter motor with an electromagnet, a starter relay and gear, range gear and PTO control lever switches. These are the basic circuit components used on models with a mechanical gearbox.

A 1.2 kW starter motor is series installed. This motor has four poles, four brushes with integrated electromagnet and positive mesh engagement control.

The electromagnet consists of two parallel-connected coils. The low resistance intake coil is grounded via the engine, whilst the high resistance hold coil is grounded via the electromagnet body.

When the key-switch contact is closed (with the gear and range gear in neutral and the PTO disengaged) the coils are energised and the plunger is magnetically drawn into the electromagnet. This movement, transmitted by an adjustable joint mechanism, makes the driving pinion engage the flywheel rim gear. When the pinion makes contact with the rim gear, the plunger closes a series of contacts in order to directly power-up all four field coils, thereby supplying full power to the starter motor.

At this stage, one end of the intake coil is connected to the positive battery pole through the starter switch, whilst the other end is connected to the positive battery pole through the solenoid valve contacts. In this manner the intake coil is by-passed, without absorbing power, and the hold coil exclusively maintains the electromagnet plunger in position.

The starter motor includes a series of contacts and a two-part electromagnet plunger that totally closes the contacts, even if the pinion teeth are not perfectly in line with the rim gear. When this happens, a clutch spring compresses the pinion, forcing it to engage completely as soon as the starter motor begins to turn over.

When the key-switch is released, power to the electromagnet and motor is cut off. The electromagnet return spring, acting on the adjustable joint mechanism, frees the driving pinion from the gear and re-opens the solenoid valve contacts.

A roller-type clutch mechanism is incorporated in the driving pinion unit. This prevents the pinion from overspeeding if it remains engaged in the flywheel rim gear after the engine has started.

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STARTING, RECHARGING, PRE-HEATING CIRCUIT (Diagram A)

1 Battery
2 Cold starting aid (thermostarter)
3 Alternator
12 Pre-heating timer
16 Starter motor
24 Ignition key
40 Shuttle microswitch
77 Instrument
- C Glow plug pre-heating warning light
- H Engine speed instrument
- L Alternator warning light (D+)

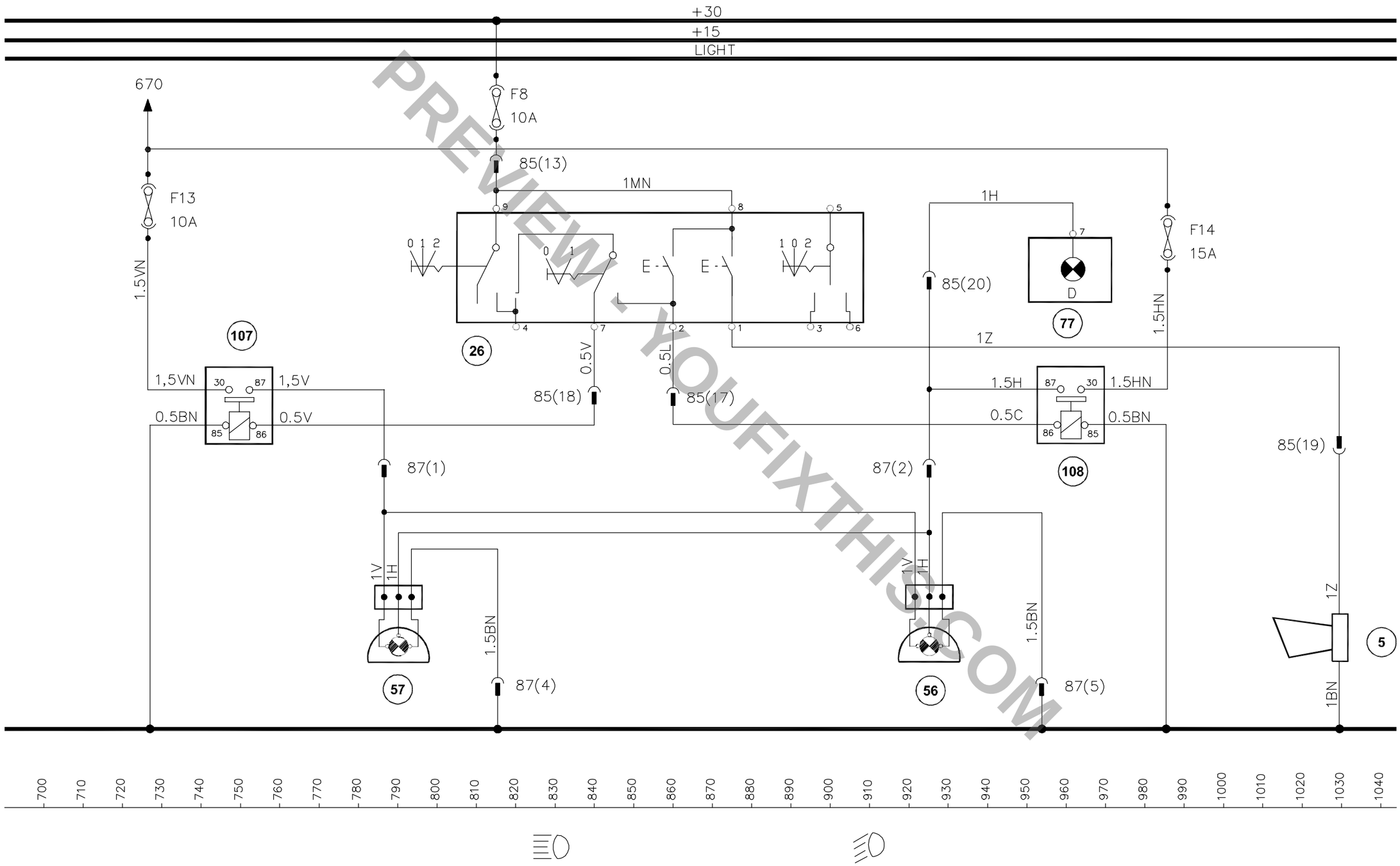
85 Dashboard cable connection - front
95 Alternator control interface connection
110 Pre-heating relay

F2 Main power supply fuse (70A up to chassis no. HSSN19539) - (*= 75A from chassis no. HSSN19539 onwards) - (50A version without cab)
F6 Starting fuse
F10 Pre-heating fuse

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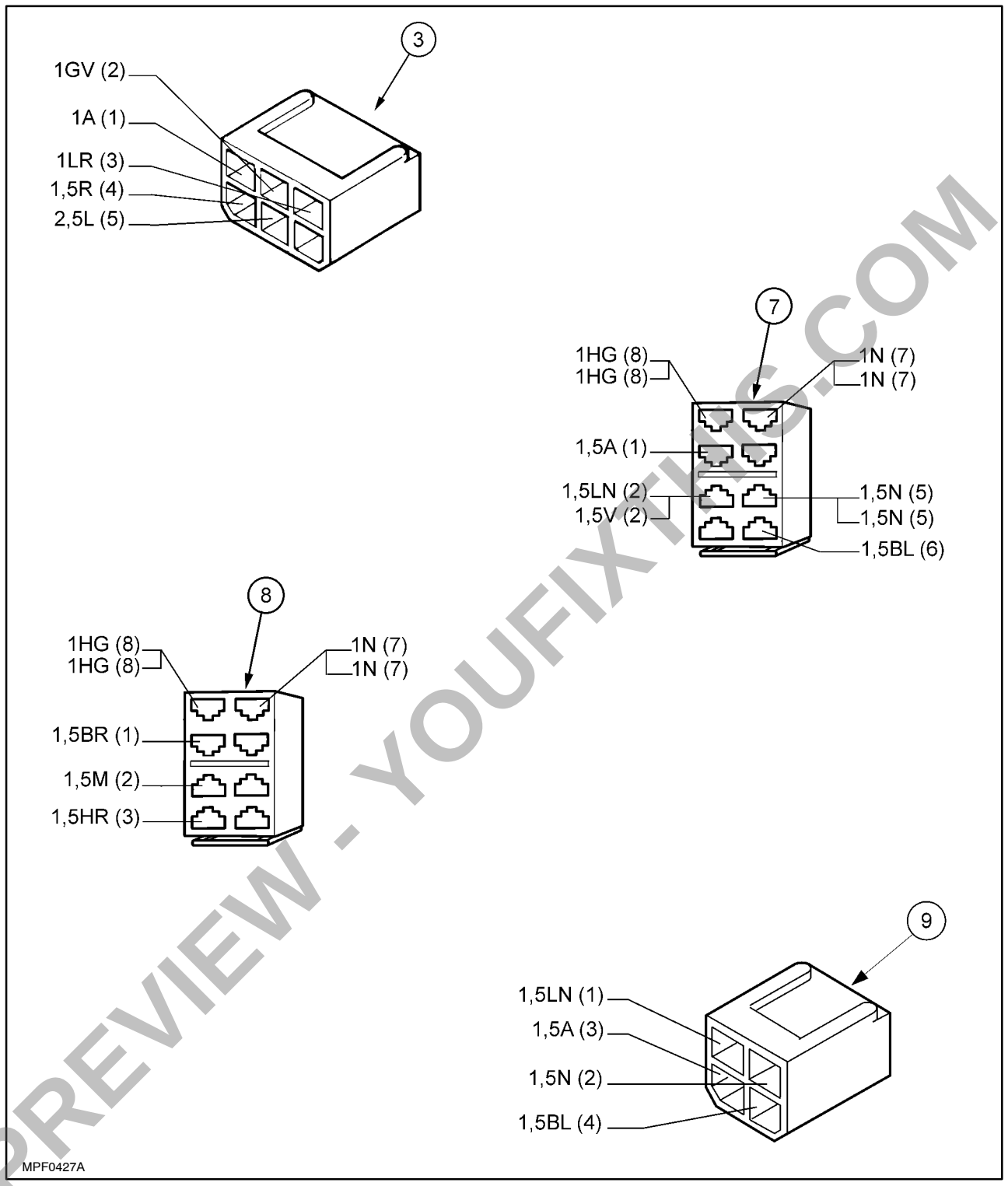
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FULL/DIPPED BEAM HEADLIGHTS, HORN CIRCUIT
(Diagram C)



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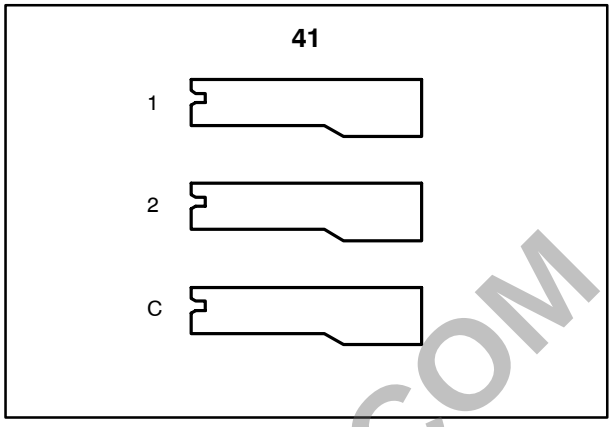


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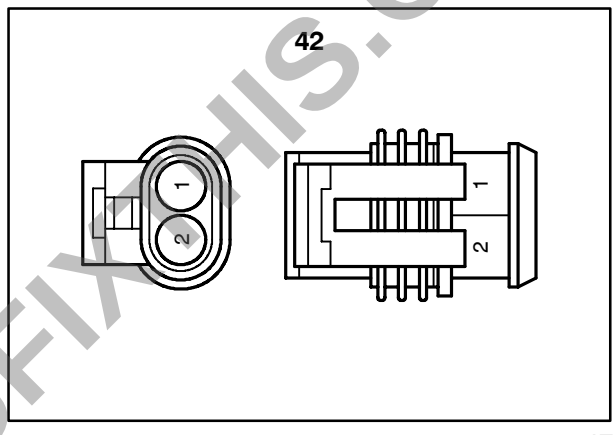
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Pin	Col.	Sect.	Pin	Col.	Sect.
1	SN	0,5	C	CB	0,5
2	BG	0,5	-	CB	0,5



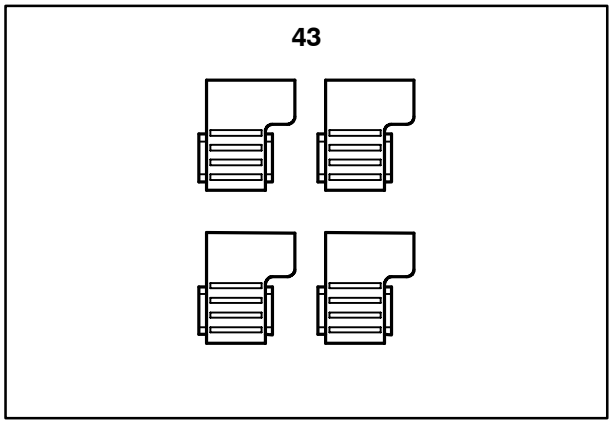
46

Pin	Col.	Sect.	Pin	Col.	Sect.
1	HB	0,5	2	B	0,5



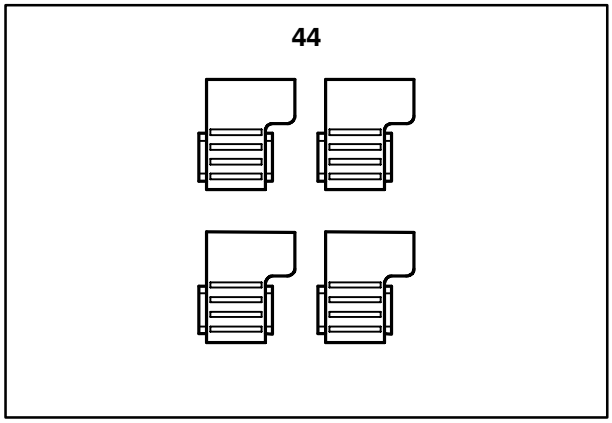
47

Pin	Col.	Sect.	Pin	Col.	Sect.
1	LR	0,5	1	R	1
1	AR	1	1	GR	0,5



48

Pin	Col.	Sect.	Pin	Col.	Sect.
1	AR	0,5	1	R	1
-	AR	1	1	LR	0,5
1	AR	0,5	-	-	-



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ELECTRICAL CIRCUITS

DESCRIPTION	DIAGRAM
Power circuit of lines for cab roof - Work lights - Interior lighting - Windshield washer	A
Air-conditioner - Radio - Window-wiper circuit	B

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