D180
(Tier 2)

CRAWLER DOZER

Workshop manual

Print No. 604.02.390.01 English

THIS ALERT SYMBOL SIGNALS IMPORTANT MESSAGES INVOLVING YOUR SAFETY.

Read and heed carefully the safety instructions listed and follow the precautions recommended to avoid potential risks and to safeguard your health and your safety.

You will find this symbol in the text of this Manual referred to the following key words:

***WARNING* - Cautions directed to avoid improper repair interventions involving potential consequences for the safety of the personnel performing the repairs.**

***DANGER* - These warnings qualify specifically potential dangers for the safety of the operator or other persons directly or indirectly involved.**

IMPORTANT NOTICE

All maintenance and repair interventions explained in this Manual **must be performed exclusively by the Service Organisation of the Manufacturer**, observing strictly the instructions explained using, whenever necessary, the recommended specific tools.
Whoever performs the operations reported without following exactly the precautions is responsible on his own, for the damages that may result.

Neither the Factory nor any Organisations in its Distribution Network, including but not limited to national, regional or local distributors, are responsible for any liability arising from any damage resulting from defects caused by parts and/or components not approved by the Factory for use in maintaining and/or repairing products manufactured or merchandised by the Factory.
In any case, no warranty of any kind is made or shall be imposed with respect to products manufactured or merchandised by the Factory, when failures are caused by the use of parts and/or components not approved by the Factory.

SAFETY RULES

- Do not place the body, limbs or fingers into sharp articulation uncontrolled openings of the machine and without proper protections, unless they are blocked in a safe manner.

- Never perform interventions with engine running, except as called for in a Manual. Do not wear loose clothing or jewellery near moving parts.

- When servicing or maintenance require access to areas that cannot be reached from the ground, use a ladder or step platform that meet local and national regulations, to reach the service point. If such ladder or platform are not available, use the machine hand holds and steps as provided. Perform all service or maintenance carefully.

- Shop and/or field service platforms or ladders must be constructed and maintained in accordance with local and national regulations.

- Disconnect batteries and tag all controls according to current regulations to warn that work is in progress. Block machine and all attachments that must be raised according to current regulations.

  Due to the presence of flammable fluids, never check or fill fuel tanks, batteries, nor use starting fluid near lighted smoking materials or open flames.

- BRAKES ARE INOPERATIVE when manually released for servicing. Provisions must be made to maintain control of the machine by blocking or other means.

- The fuel filling nose must be kept constantly inside the filling neck. Keep this contact from the beginning to the end of the fuelling operation to avoid the possibility that sparks due to static electricity are generated.

- Use only designated towing or attaching points. Use care in making attachments. Make sure pins and/or locks are secure before pulling. Stay clear of drawbars, cables or chains under load.

- To move a disabled machine, use a trailer or a low-boy, if available. In case towing is needed , use all necessary signals required by local and national regulations, and follow the directions provided in this Manual.

- To load/unload a machine from transporter, choose a level surface ensuring firm support to the wheels of truck or trailer. Use strong access ramps, with adequate height and angle. Keep surface free of mud, oil or slippery materials.

- Anchor the machine securely to the bed of truck or trailer and block wheels or tracks with appropriate wedges.

- Never align holes with fingers or hands; always use appropriate aligning tools.

- Eliminate all sharp edges and burrs from re-worked parts.

- Use only approved grounded auxiliary power sources for heaters, chargers, pumps and similar equipment to reduce the hazards of electrical shocks.

- Lift and handle heavy parts with a lifting device of proper capacity. Be sure parts are supported by proper slings and hooks. Use lifting eyes if provided. Watch-out for people in the vicinity.

- Never pour gasoline or diesel fuel into open, wide and low containers. Never use gasoline, solvent or other flammable fluid to clean parts. Use exclusively qualified, non-flammable, non-toxic commercial solvents.

- When using compressed air for cleaning parts, use safety glasses with side shields or goggles. Limit pressure to 2 bar, in accordance with local and national regulations.

- Do not run the engine in closed areas without proper ventilation to remove deadly exhaust fumes.

- Do not smoke or permit any open flames or spark near when re-fuelling or handling flammable materials.

- Do not use an open flame as a light source to look for leaks or for inspection anywhere on the machine.

- Make sure that all mechanic's tools are in good conditions. NEVER USE tools with mushroomed heads or frayed. Always wear eye protections.

- Move with extreme care when working under the machine, its attachments and or on or near them. Always wear protective safety equipment as required, such as hard hat, goggles, safety shoes, ear plugs.

- When performing operations requiring running of the engine, have a qualified operator in the operator's seat at all times with the mechanic on sight. Place the transmission in neutral and set the brakes and safety lock.

- KEEP HANDS AND CLOTHING AWAY FROM MOVING PARTS.

- For field service, move machine to level ground, if possible, and block it. If work on an incline is absolutely necessary, first block machine and its attachments securely, than move it to level ground as soon as possible.

TECHNICAL DATA D180 (Tier 2)

ENGINE AND ACCESSORIES	Engine manufacturer		-	Cummins	
	Engine model		-	6CTAA - 8.3	
	Engine type: Direct injection, 4-stroke turbocharged, after-cooling				
	Bore and stroke		mm (in)	114 x 135 (4.5x5.3)	
	Total displacement		L (gal.)	8.3 (2.2)	
	Number of cylinders		-	6	
	D180 LT/XLT	**kW**		**HP**	
	Net power kW hp	rated @ 2000 rpm	peak @1700 rpm	rated @ 2000 rpm	peak @1700 rpm
	DIN 6270	136	142	182	190
	SAE J1349	134	140	180	187
	ISO9249	135	141	182	189
	EEC 80/1269	136	142	182	190
	D180 LGP	**kW**		**HP**	
	Net power kW hp	rated @ 2000 rpm		reted@ 2000 rpm	
	DIN 6270	147		197	
	SAE J1349	145		194	
	ISO9249	146		196	
	EEC 80/1269	147		197	
	Torque limit		deg	45	
	Fuel consumption (MAX. POWER)		kg/h (lb/h)	30.7 (67.7)	
	Starting capacity				
	Standard configuration		°C (°F)	-12 (10)	
	With cold starting system		°C (°F)	-25 (-13)	
	Electrical system				
	System voltage		Volt	24	
	Capacity of starter motor		kW (HP)	7.8 (10.5)	
	Capacity of alternator		Amp	70	
	Radiator				
	Dimensions of transmission heat exchanger		-	-	
	Dimensions of body (coolant)		mm (in)	454x1040x114 (18x41x4.5)	
	Material of body (Inclined and stacked brass tubes with copper fins)		-	-	
	No of tubes per line		-	6	
	Gauge of fins		mm (in)	3.5 (0.1)	
	Cap pressure		bar (psi)	1.0 (14.5)	
	Air radiator/air				
	Fan diameter		mm (in)	500 (19.7)	
	N. hoses			32	
	Pitch			2.8	
	Radiant surface		dm^2 (in^2)	31.3 (485.1)	
	Operating pressure		bar (psi)	2 (29)	

TECHNICAL DATA D180 (Tier 2)

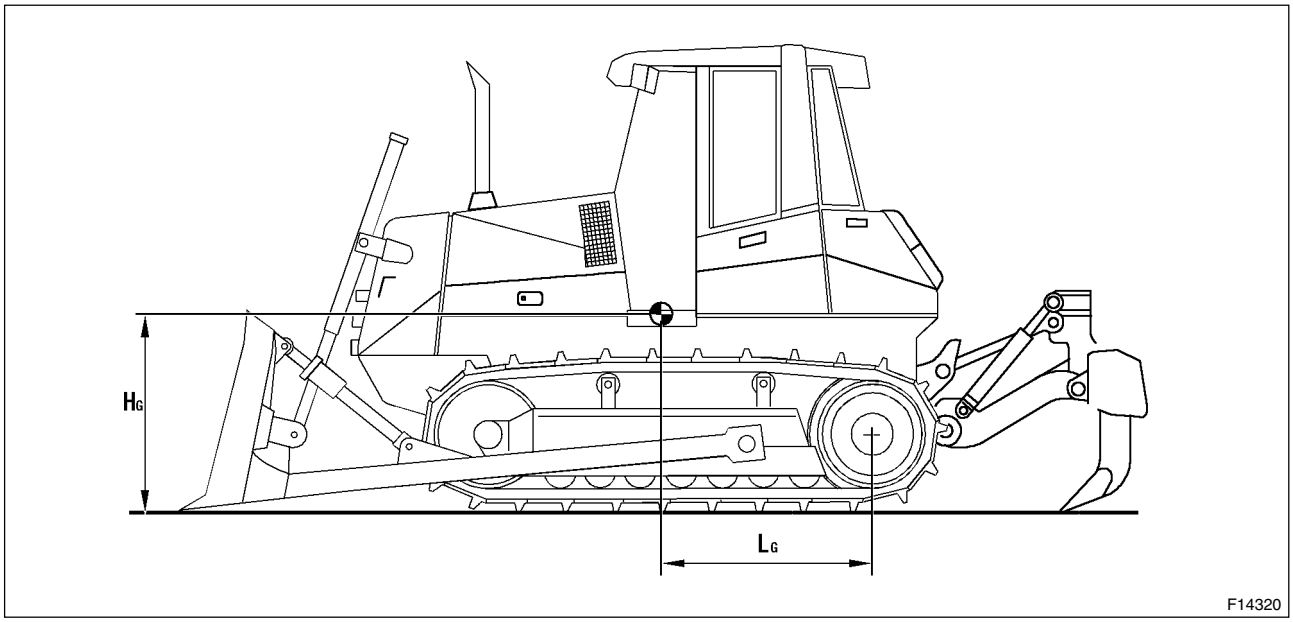
OPERATOR'S COMPARTMENT	**Condenser**		
	Size (front surface)	mm (in)	690 x 200 (27.2x7.9)
	No. of fans (type: SPAL VA 14-BP7/C-34A	-	3
	Fan diameter	mm (in)	-
	Fan size	kW (HP)	-
	Tilting system		
	Tilt cylinder Double stroke with stroke-end valves		
	Brand		Weber
	Diameter	mm (in)	45 (1.8)
	Hand pump		
	Double stroke with oil tank		
	Brand		Weber
	Nominal displacement	cm^3 (in^3)	3.6 (0.22)
ELECTRICAL SYSTEM	**Alternator**		
	Brand		Delco-Remy
	Model		EE9059
	Capacity		24 Volt-70 Amp
	Starter motor		
	Brand		Delco-Remy
	Model		ST 9099
	Capacity		42MT - 7.8 kW
	Batteries		
	No. of elements		2
	No. of connections		series
	Brand		Magneti Marelli
	Capacity	Amp h	160 - 12 Volt
	Discharge	Amp	650
	Lighting system		
	No. of elements		-
	2 front lights + 2 side work lights	(HP) W	70 (0.09)
	2 rear work lights	(HP) W	70 (0.09)
	Other main components		
	Main switch		manual
	Engine cut-off solenoid		FV 9187
	Link fuses	Amp	50 & 80
	Fuse boxes		2 x 11 fuses
	Four position key starter switch		-
	Monitor	24 Volt	MC Elettronica

CENTRE OF GRAVITY TABLE

Machine configuration:

	HG mm (in)	LG mm (in)
Basic machine + HSU blade + Ripper		
Blade on ground and ripper on ground	835 (32.87)	1285 (50.59)
Blade on ground and ripper at max. height	880 (34.64)	1320 (51.96)
Blade at max. height and ripper on ground	930 (36.61)	1270 (50)
Blade at max. height and ripper at max. height	980 (38.58)	1310 (51.57)
Basic machine + HA blade + Ripper		
Blade on ground and ripper on ground	780 (30.70)	1285 (50.59)
Blade on ground and ripper at max. height	965 (37.99)	1345 (52.95)
Blade at max. height and ripper on ground	812 (31.96)	1265 (49.80)
Blade at max. height and ripper at max. height	1020 (40.15)	1312 (51.65)
Basic machine + HSU blade		
Blade on ground	780 (30.70)	1575 (62)
Blade at max height	935 (36.81)	1565 (61.61)
Basic machine (no ripper no blade)	910 (35.82)	1230 (48.42)

Note: L_G = Horizontal distance from C/L sprocket
H_G = Ground clearance



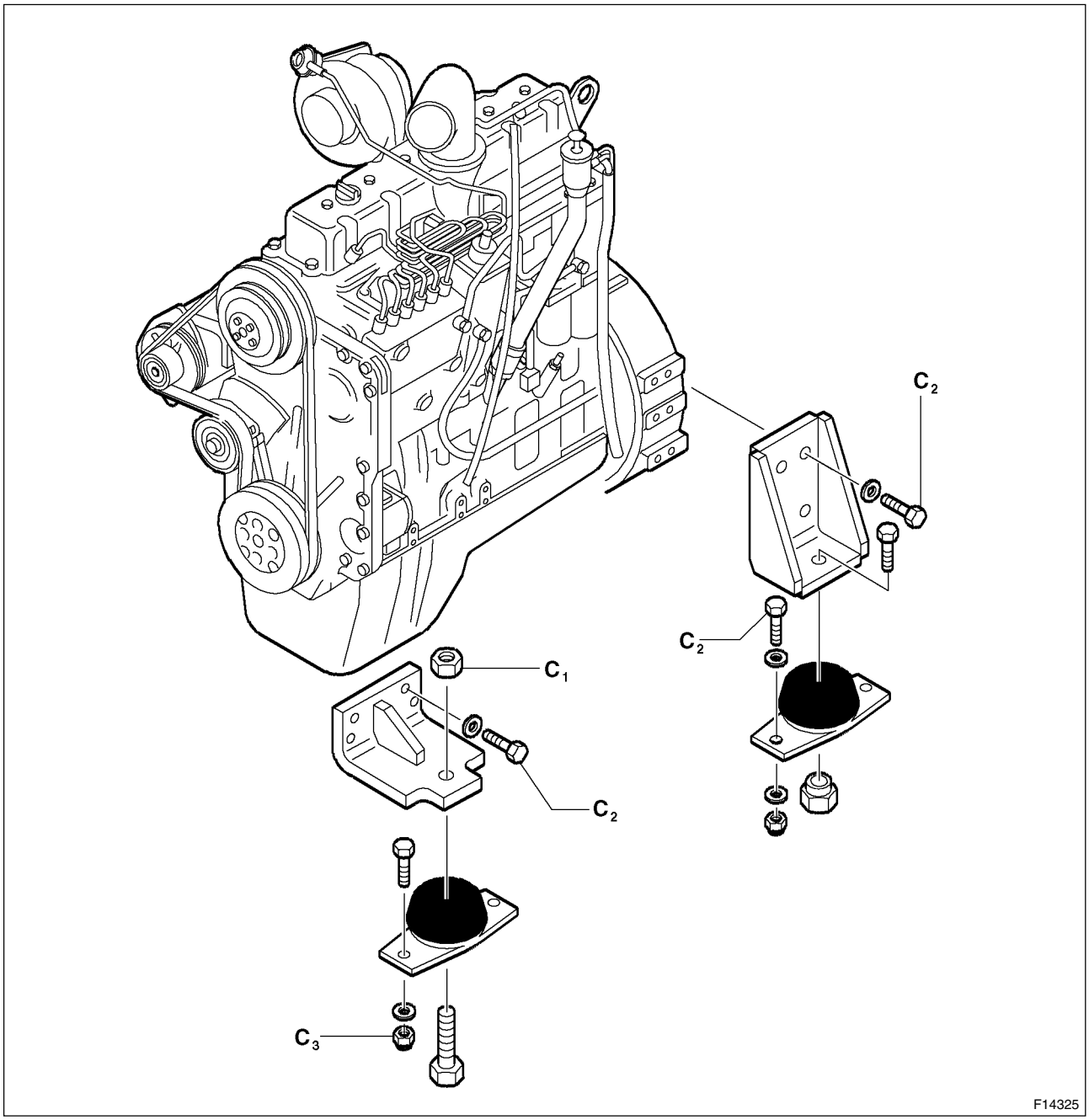
SECTION 1

ENGINE

TABLE OF CONTENTS

CHAPTER	SUBJECT	PAGE
1.1	GENERAL SPECIFICATIONS	1-3
1.2	SERIES "C" ENGINE DATA	1-5
1.3	DIAGRAMS OF SERIES "C" ENGINE	1-8
1.4	MOUNTING OF ENGINE ON FRAME	1-11
1.5	AFTERCOOLER FAN DRIVE SYSTEM	1-12
1.6	THROTTLE LINKAGE	1-14

1.4 MOUNTING OF ENGINE ON FRAME

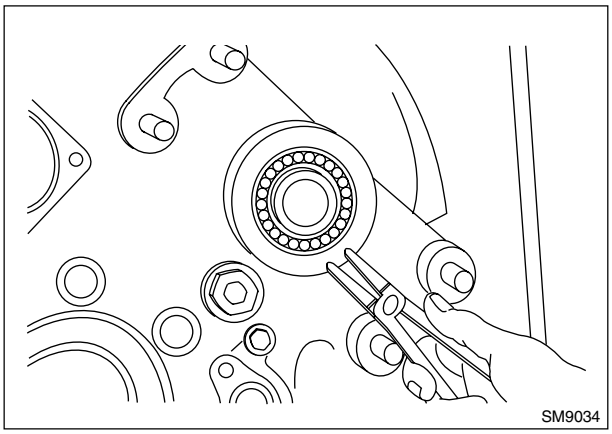


Tightening torques

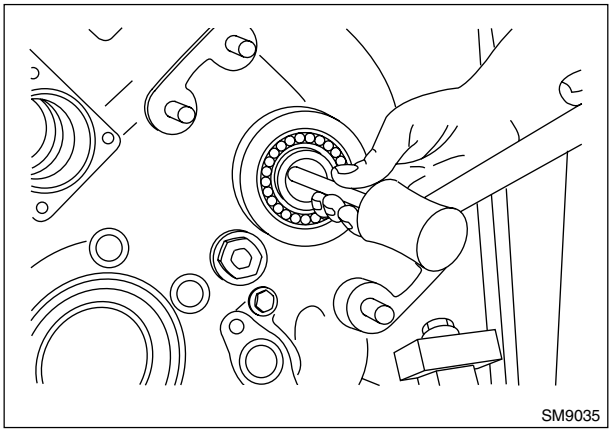
C_1. Self-locking nut M24 x 2 ..... 108 daNm (796.3 lbf.ft)
C_2. Screw TE M12 x 1.75 ..... 11 daNm (81.1 lbf.ft)
C_3. Self-locking nut M16 x 1.5 ..... 30 daNm (22.1 lbf.ft)

TROUBLE	PROBABLE CAUSE	TOOLS REQUIRED	TEST	SOLUTION
Transmission pressure normal; low power in certain speeds and oil overheating	Discs worn or warped			Replace defective components
Transmission pressure low in a given speed	Leakages in piping of defective speed		Check if seals or pipes are damaged	Overhaul the trans-mission and re-place defective parts
Engine oil level increases and transmission oil level drops			Together with trouble for low power output	Clean scavenger filter
	Crankshaft sealing ring damaged			Replace crankshaft sealing ring
				Replace pump

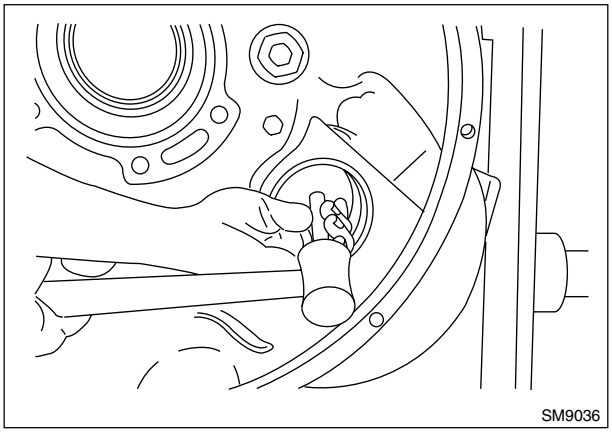
Remove the equipment pump drive shaft circlip.



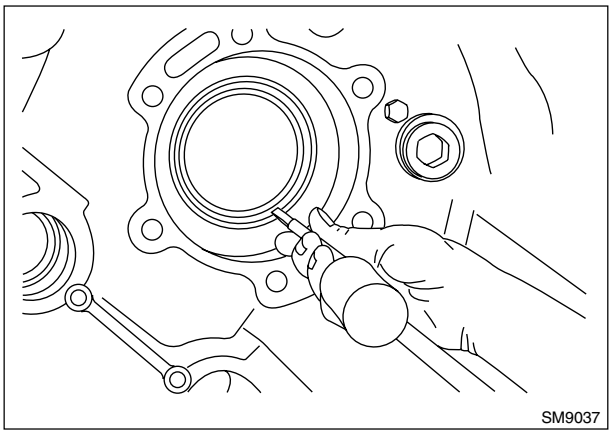
Pull-out the shaft and bearing from the housing.



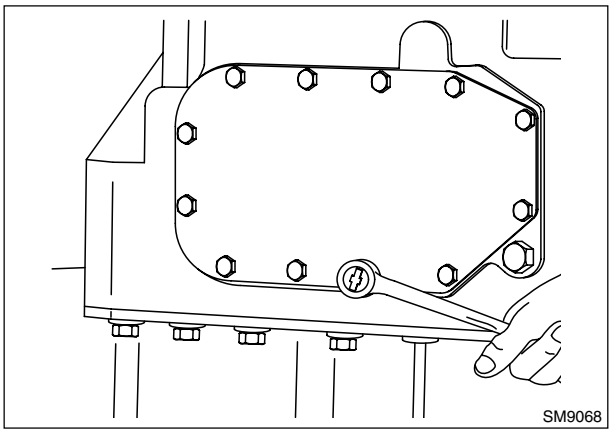
Pull-out the bearing left in the housing.



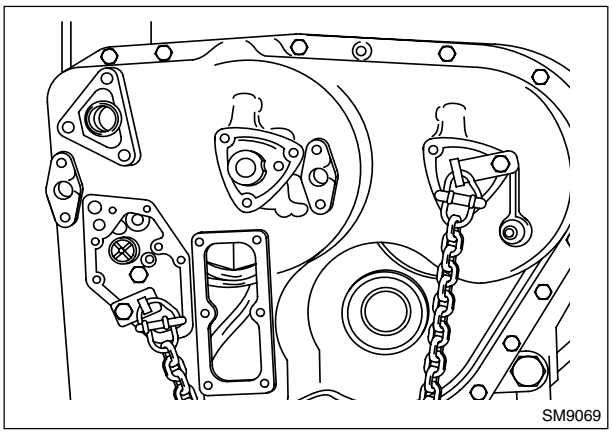
Pull-out the seal assembly from the housing.



Remove the side covers.


SM9068

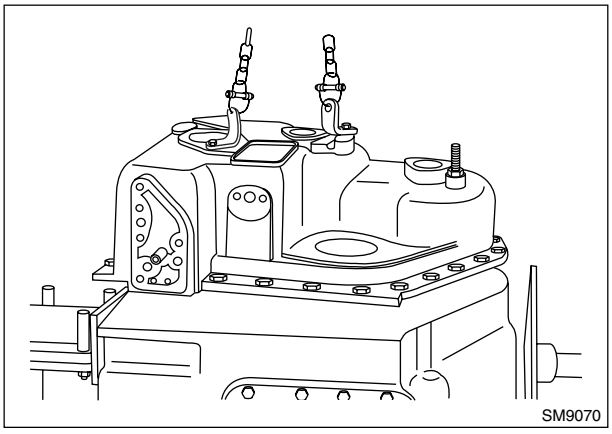
Remove the screws securing the front cover (please Note that 2 screws must be removed from the bottom).


SM9069

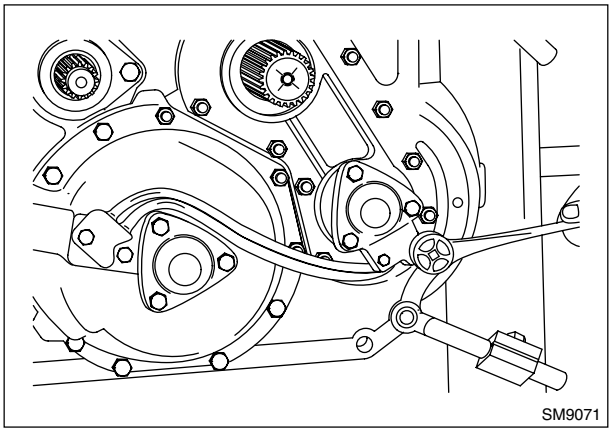
Remove the front cover of the housing, lifting it with an appropriate winch.

WARNING

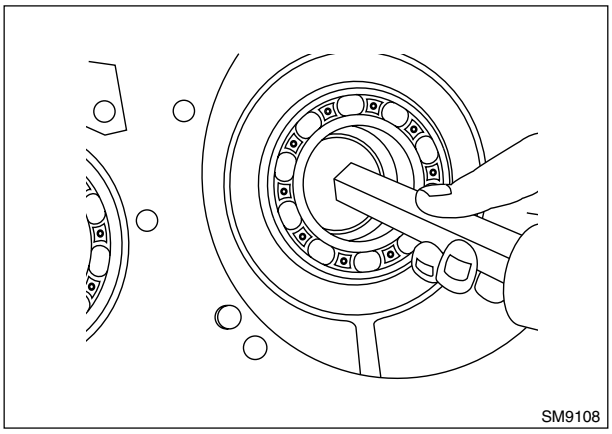
Lift and handle all heavy parts with a lifting device of appropriate capacity.
Make sure that the parts are secured by appropriate slings and hooks. Use the lifting eyes provided for this purpose.


SM9070

Turn the housing and remove the high range control and lube pipes.


SM9071

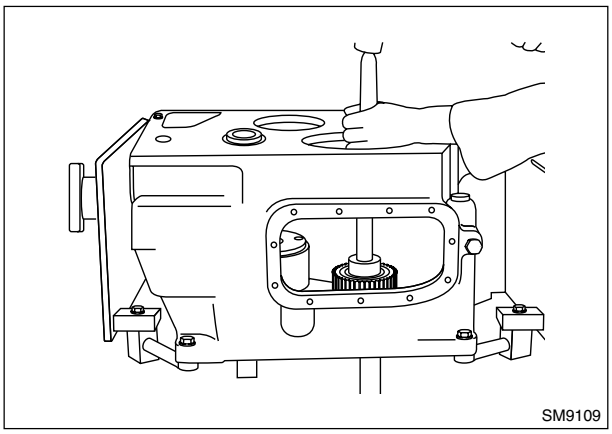
Remove the output shaft and the bearing using an appropriate punch.


SM9108

WARNING

It is dangerous hitting hardened steel parts with tools different from hammers made of mild steel or non ferrous metals. When these components are remove or installed, always wear safety glasses with side shields, heavy gloves etc., to reduce the chances of injuries.

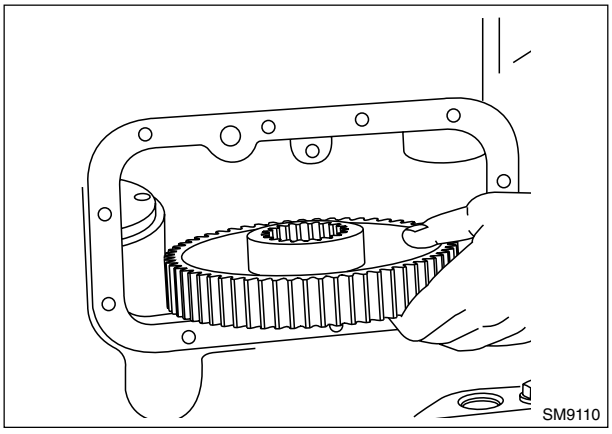
Using an appropriate punch, pull-out the output shaft through the bearing and the gear.


SM9109

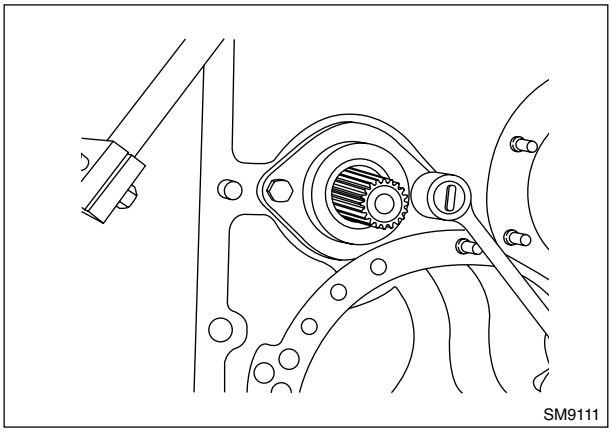
WARNING

It is dangerous hitting hardened steel parts with tools different from hammers made of mild steel or non ferrous metals. When these components are remove or installed, always wear safety glasses with side shields, heavy gloves etc., to reduce the chances of injuries.

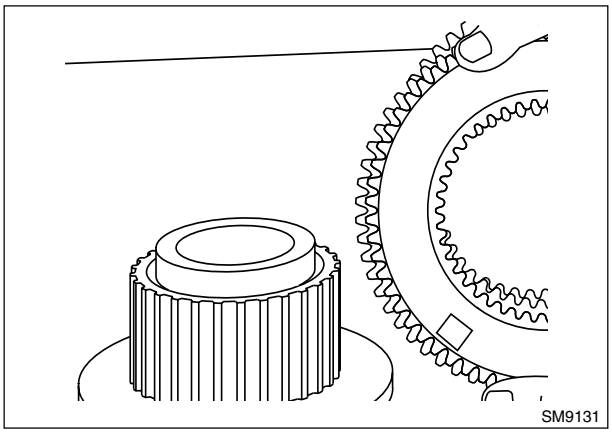
Remove the output shaft gear.


SM9110

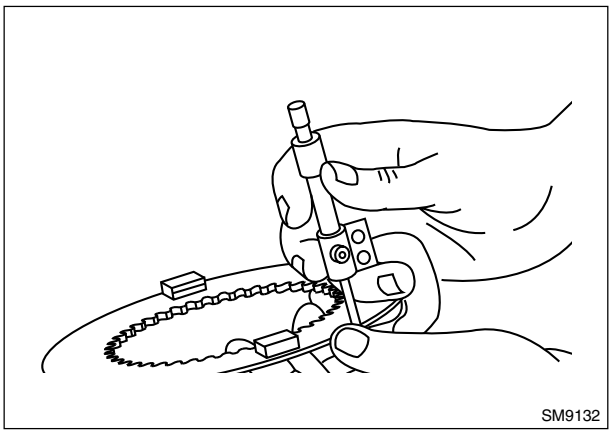
Remove the PTO shaft securing screws and seal holder.


SM9111

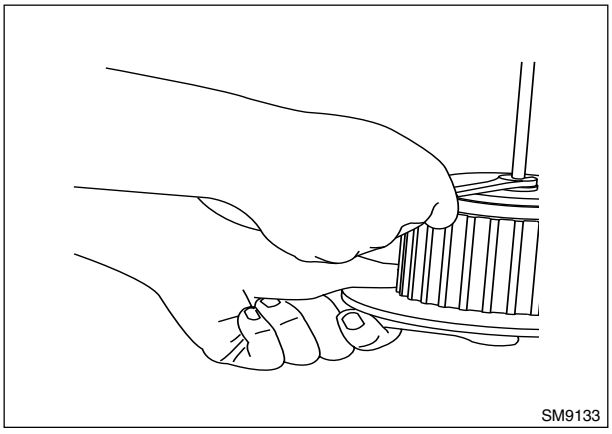
Remove the clutch pack from the hub.


SM9131

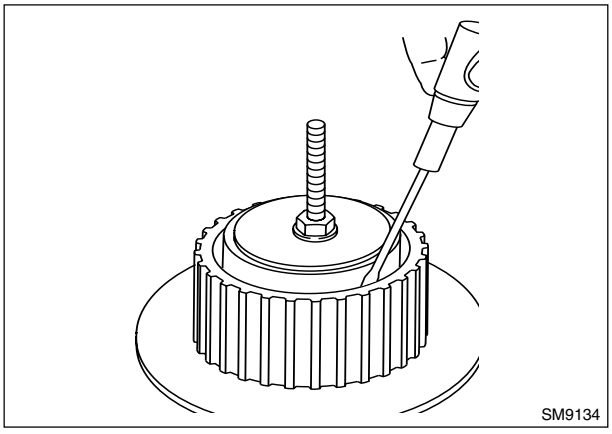
Measure the thickness of all the friction and steel discs; replace them if they are not within the tolerance limits.


SM9132

Press the return spring using the special tool (**P/N 380000972**).


SM9133

Remove the circlip.


SM9134

2.6.3 TRANSMISSION DATA

TRANSMISSION CLUTCHES

A	Ø Out. diameter of forward-reverse speeds and 1st - 2nd ranges clutches fixed piston (large)	169.894 to 169.957 mm (6.68 to 6.69 in)
	Ø Inner diameter forward speed mobile piston (large)	170.000 to 170.063 mm (6.69 to 6.695 in)
	Piston play	0.043 to 0.169 mm (0.0016 to 0.006 in)
B	Ø Out. diameter of forward-reverse speeds and 1st - 2nd ranges clutches fixed piston (small)	59.924 to 59.970 mm (2.35 to 2.36 in)
	Ø Out. diameter of forward-reverse speeds and 1st - 2nd ranges mobile piston (small)	60.000 to 60.046 mm (2.36 to 2.37 in)
	Piston play	0.030 to 0.122 mm (0.001 to 0.004 in)
C	Ø Outer diameter of 3rd range drive piston	194.600 to 194.700 mm (7.62 to 7.64 in)
	Ø Inner diameter of high range on 1st range gear piston	195.000 to 195.072 mm (7.66 to 7.68 in)
	Piston play	0.300 to 0.472 mm (0.01 to 0.018 in)
D	Ø Inner diameter of 3rd range drive piston	80.036 to 80.066 mm (3.15 to 3.152 in)
	Ø Out. diameter of high range on 1st, 2nd and 3rd ranges drive gear hub	79.940 to 79.970 mm (3.14 to 3.15 in)
	Piston play	0.066 to 0.126 mm (0.002 to 0.005 in)
E	Ø Outer diameter of clutch control spools	19.770 to 19.800 mm (0.78 to 0.79 in)
	Ø Inner diameter of clutches control spools	20.016 to 20.020 mm (0.79 to 0.791 in)
	Clearance between seat and spool	0.22 to 0.25 mm (0.008 to 0.009 in)
G	Specifications of clutch springs	
	Spring free length (3rd speed)	83.5 mm (3.3 in)
	Spring free length (1st, 2nd, FOR, REV)	83.0 mm (3.3 in)
	Press. load at 35 mm (1.378 in) 3rd	65.5 to 72.5 daNm (483 to 534.5 lbf.ft)
	Press. load at 65 mm (2.559 in) (1st - 2nd - FOR - REV)	315.5 to 348.5 daNm (2326.2 to 2570 lbf.ft)

DATA OF CLUTCH DISCS PACK ASSEMBLY

Clutch	(X) Piston stroke (*)	(Y) Clutch pack dimens. (**)
	mm	mm
FORWARD	From 4 to 5	From 60.4 to 60.8
REVERSE	From 3 to 4	From 48.25 to 48.65
1st SPEED	From 3 to 4	From 48.25 to 48.65
2nd SPEED	From 3 to 4	From 48.25 to 48.65
3rd SPEED	From 2 to 3	From 36.1 to 36.5

(*) Check by measuring the stroke of the mobile piston.

(**) Check pre-loading the clutch pack with a load of 197 daNm. When the discs are worn, spare discs are available to reastablish the setting, to be used in lieu of as many inner toothed discs.

SECTION 3

FINAL DRIVES

TABLE OF CONTENTS

CHAPTER	SUBJECT	PAGE
3.1	GENERAL DESCRIPTION	3-3
3.1.1	Final drive	3-4
3.2	REPAIR PROCEDURES	3-6
3.2.1	Final drive (removal / disassembly)	3-6
3.2.2	Pulling the housing cover	3-10
3.2.3	Driven gear (bearing removal)	3-11
3.2.4	Driving gear shaft (bearing removal)	3-11
3.2.5	Description of installation of front seals (long life)	3-12
3.2.6	Final drive (assembly)	3-13
3.3	SPECIFICATIONS AND DATA	3-22
3.3.1	Final drive shaft and bearing fittings	3-22
3.4	SPECIAL TOOLS	3-25

3.2.3 DRIVEN GEAR

Bearing removal

Pull-out the bearing races from each end of the gear shaft, using puller **E,** as illustrated in the figure.

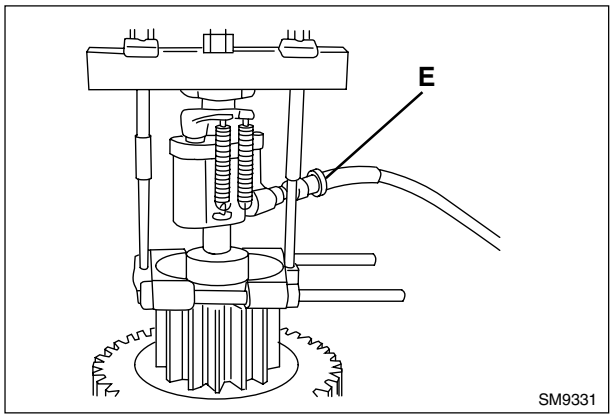


Fig. 3-19

Warm-up races **P** of the new bearings and install them on the shaft as illustrated.

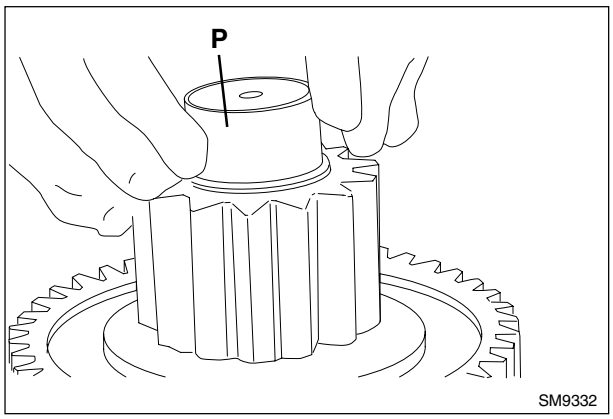


Fig. 3-20

3.2.4 DRIVING GEAR SHAFT

Bearing removal

Using an appropriate puller **E**, remove the bearing races from the driving gear shaft, as illustrated in the figure.

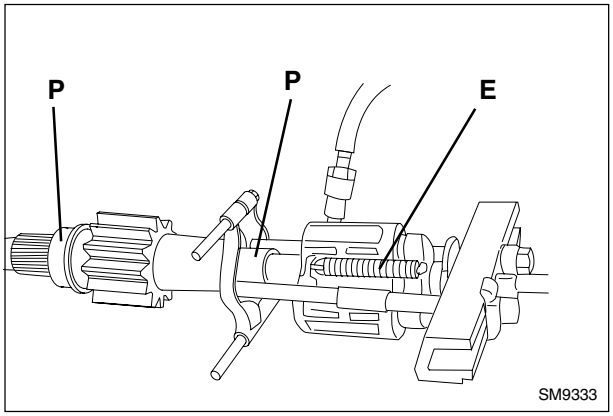


Fig.3-21

Warm-up the races of the new bearings and install them on the shaft as illustrated.

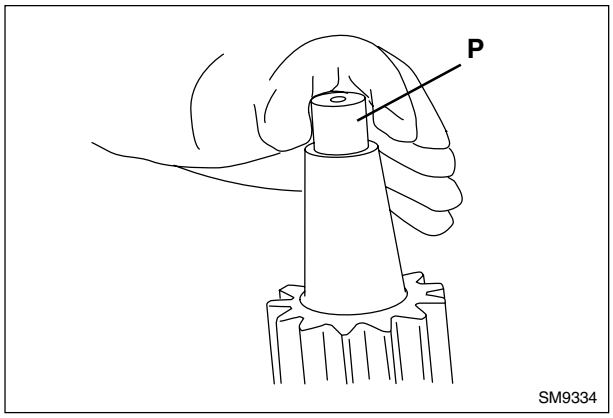
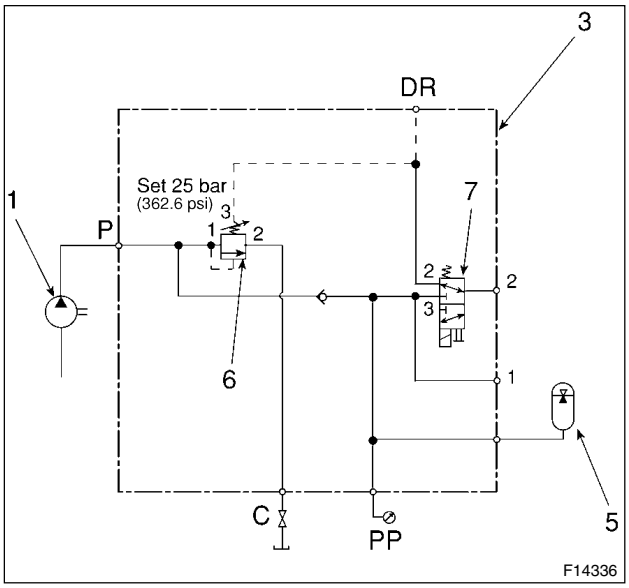


Fig. 3-22

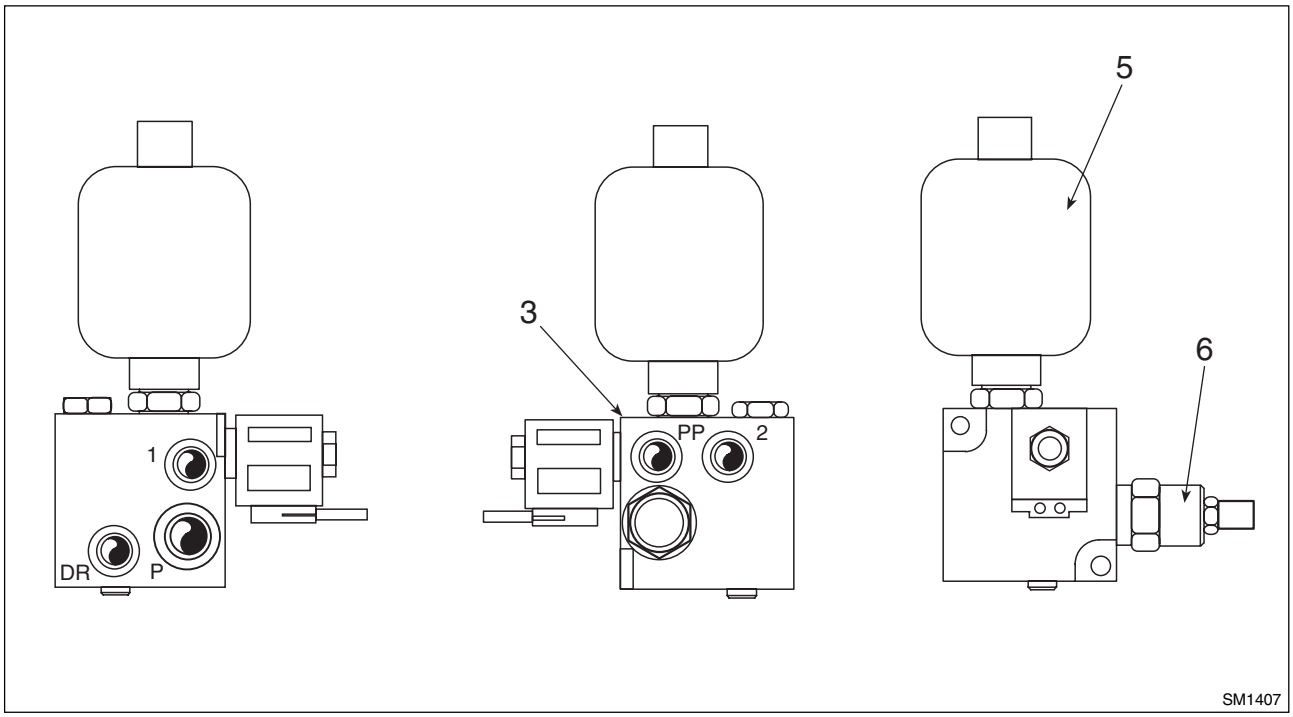
NOTES:

Brake powering valve block
(Ref. **3** brake hydraulic diagram)

The feeding valve block is mounted on the left side, under the cab. To reach it is just enough to open the left panel under the cab.



1. Brake powering pump
3. Powering valve block
5. Accumulator (pre-charge 13 bar) (188.5 psi)
6. Pressure relief valve (setting 25 bar) (362.6 psi)
7. Directional solenoid valve



Ports on block:

DR. Drainage
P. From power pump
C. Brakes lubrication
PP. Pressure pick-up
1. To brake pedal valve
2. To brake pedal valve

4.3.3 BRAKE PEDAL ADJUSTMENT

Position brake pedal (**1**) at dimension **L** = 175 mm (6.9 in) from the cab floor, actuating stop **2**.

Connect link (**3**) to fork (**4**).

Adjust the length of link (**3**) until it connects with lever (**5**) positioned at stroke end.

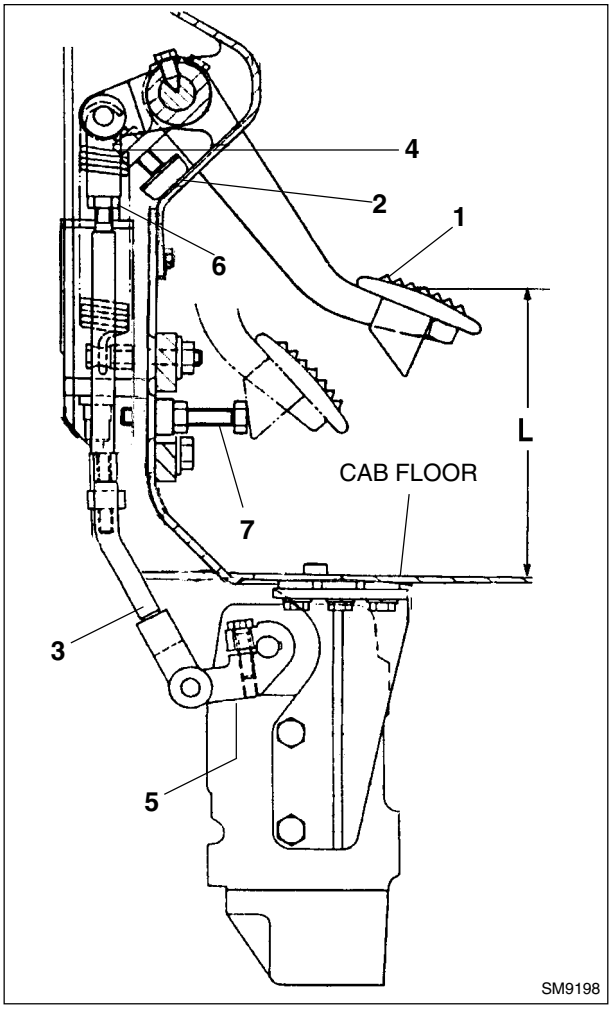
Tighten locknut (**6**).

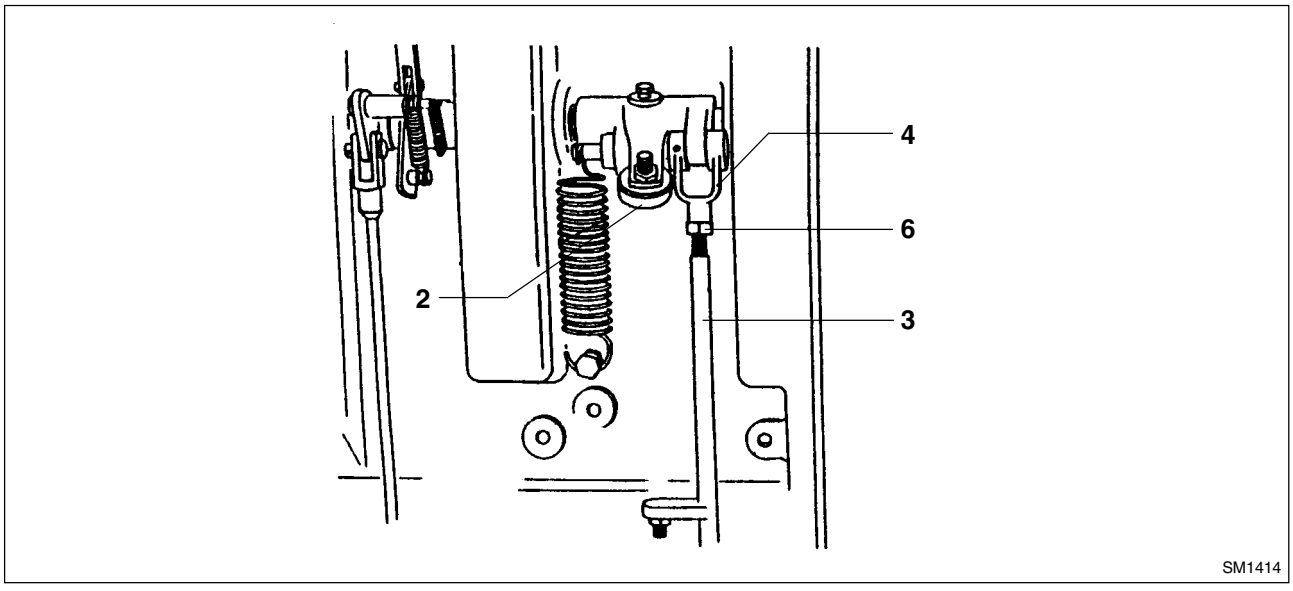
Loosen stop (**2**) until the pedal play is almost totally eliminated and lock it with the relevant nut.

Actuate brake pedal (**1**) full stroke avoiding forcing it beyond the lever stroke end (**5**).

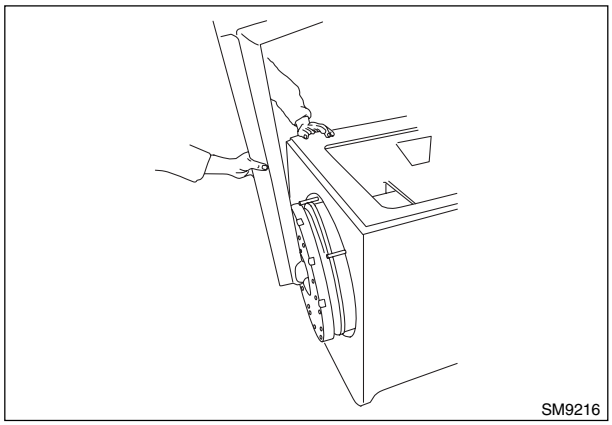
Bring screw (**7**) against brake pedal (**1**).

Release the brake pedal, loosen screw (**7**) two turns and lock the nut.





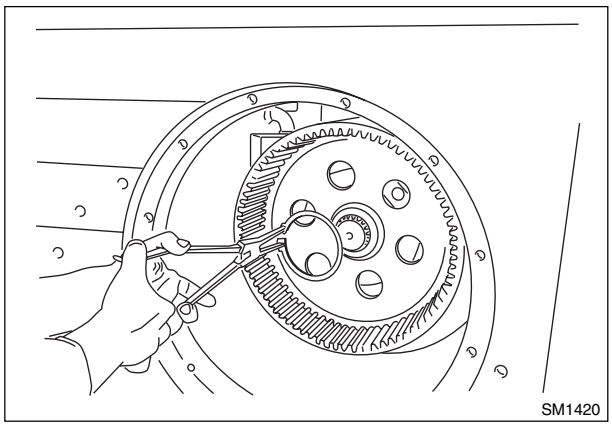
Install special tool (**P/N 380001348**) as indicated in the figure and pull-out the brakes/differential assembly from the housing.


SM9216

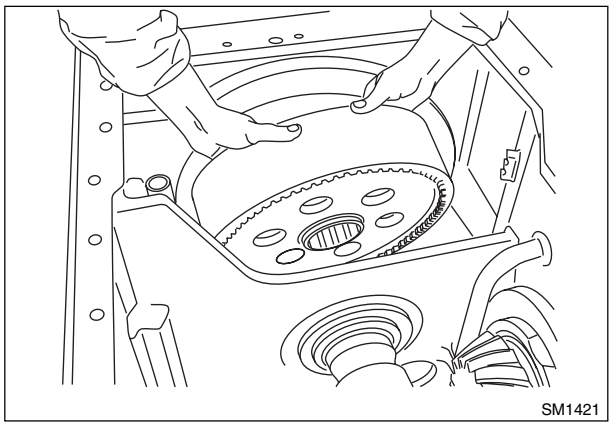
Place the brakes/differential assembly on a bench equipped with an adequate support to disassemble the components.

Removal of the ring gear

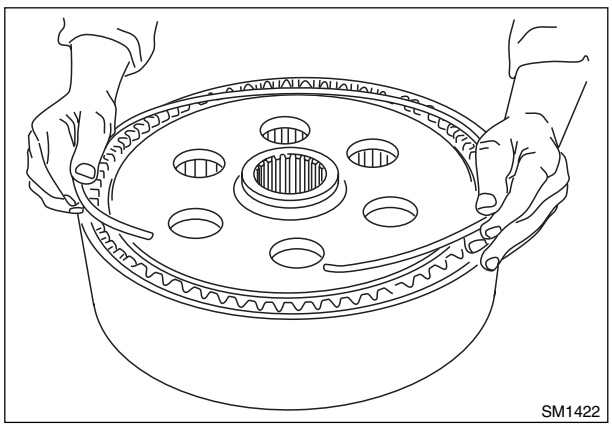
Pull-out the circlip from the ring gear support.


SM1420

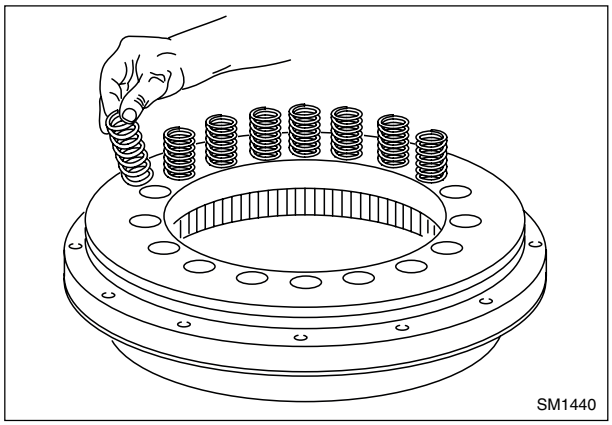
Pull-out the ring gear support from the upper part of the transmission housing.


SM1421

Pull-out the circlip from the seat of the ring gear.


SM1422

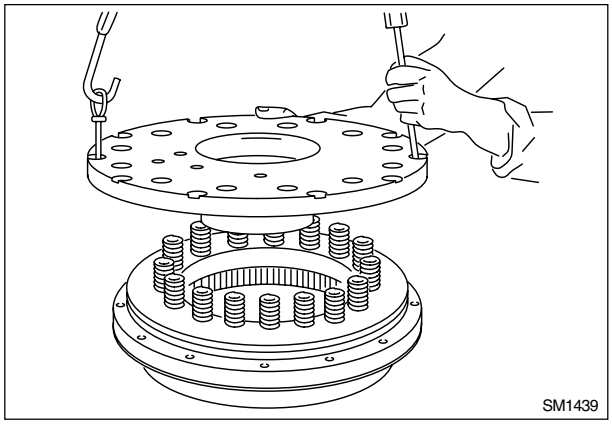
Insert the 20 springs into the seats of the piston.


SM1440

WARNING

Lift and handle all items with a hoist of appropriate capacity.
Make sure that all parts are held by appropriate slings and hooks.

Secure two eyes as illustrated, on the outer disc and, using a hoist equipped with hooks, lift the disc and place it on the piston assembly.
Guide the disc for a correct insertion, during the installation phase.

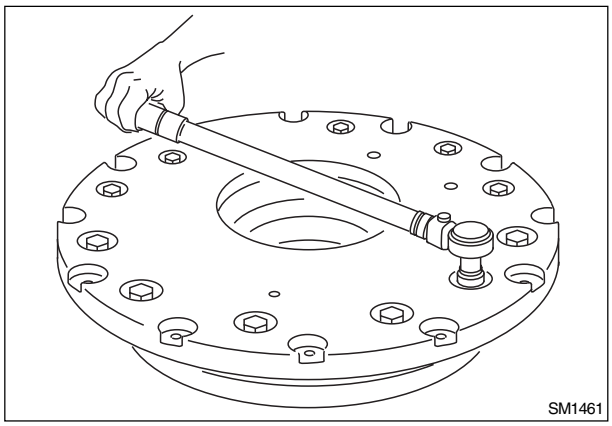

SM1439

Note – *During the installation, pay attention that the lube holes of the thrust disc and the piston coincide.*

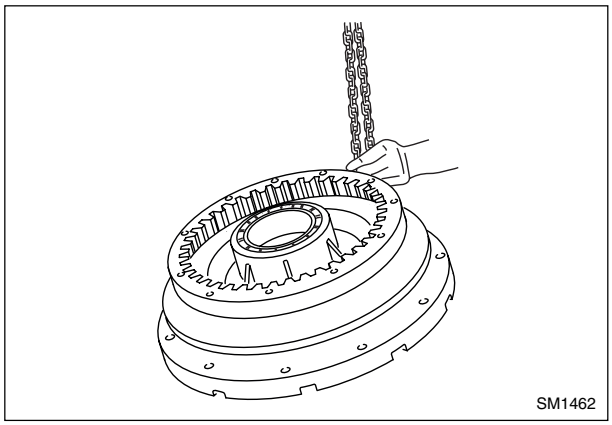
Initially, tighten the 3 longer screws so that the piston is hooked and press the springs.

Then, insert the other screws and remove the longer screws.

Install the remaining screws and tighten all of the to 11 daNm (81.1 lbf.ft).


SM1461

Turn the assembly upside down and arrange the installation of the brake discs.


SM1462

WARNING

The brakes have, inside, strongly compressed springs. Always follow the procedure recommended when installing or removing these clutches.

4.4.5 BEVEL GEAR SET (Removal/disassembly of pinion and bevel gear)

Preliminary operations:

WARNING

Make sure that the cables are hooked and that the hooking point is strongly enough to lift the expected load. Keep all bystanders away from the hooking point, cables or chains.

WARNING

Avoid twisting chains or metal cables. Always wear safety gloves to handle cables or chains.

Removal

Tilt the cab, as described in the **OPERATION AND MAINTENANCE** manual.
Remove the fuel and hydraulic tank, as described in **SECT. 6 - EQUIPMENT HYDRAULIC SYSTEM**, of this Manual.

Remove the transmission group, as described in **SECT. 2 - TRANSMISSION**.

Drain the oil from rear transmission housing, by removing the plug located at the bottom, as described in item 4.4.3.

REMOVE THE STEERING DIFFERENTIAL BRAKE GROUPS AS INDICATED IN ITEM 4.4.3 OF THIS SECTION.

4.4.6 PROCEDURE FOR THE SETTING OF THE BEVEL PINION BEARINGS PRE-LOAD

Set the pre-load of the bearing, complying with the phases as follows:

A. Install bevel pinion (**8**) on pinion housing (**5**) complete with bearings (**1** and **2**).

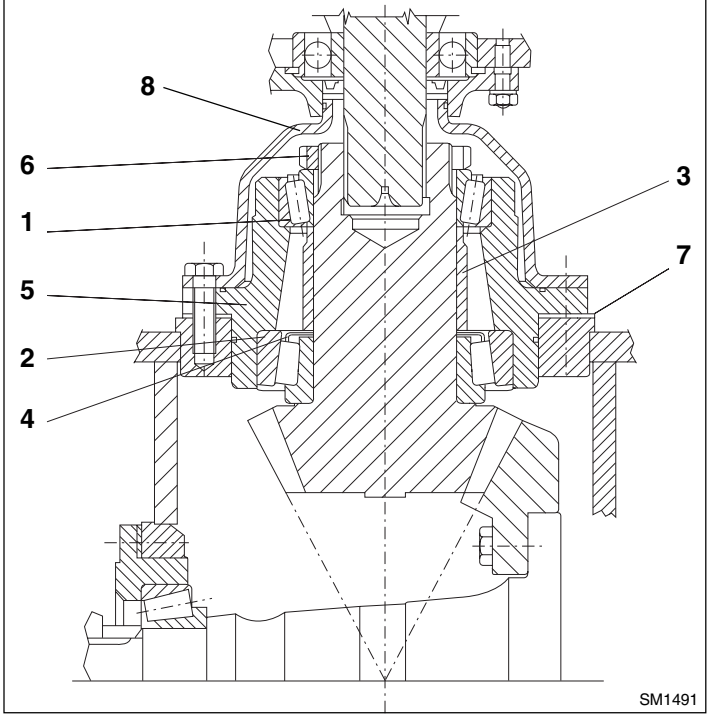
B. Insert spacer (**3**) and the sample ring 4 mm thick, the inner race of bearing (**1**) using a press, then tighten ring nut (**6**).

C. Holding pinion housing (**5**) still, measure the axial play of the pinion with a dial gauge located on the head or the tail of it.

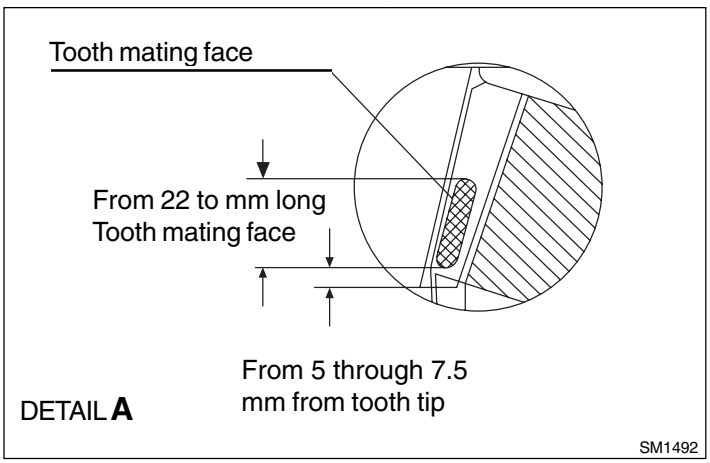
D. After reading the value, loosen the ring nut and pull-out bearing (**1**), remove spacer (**39** and the sample ring.
Deduct the value measured from the thickness of the sample ring (4 mm), then shim using shims (**4**), in the location indicated, for the resulting value. Insert spacer (**3**), half bearing (**1**) then tighten the ring nut to a torque of **130 to 150 daNm**.

E. Check that the rolling torque is included between **0.2 to 0.4 daNm**. Then bead the ring nut on the pinion. Otherwise, repeat the operation adding or removing shims to obtain the rolling torque indicated.

DETAILS OF PINION



1. Pinion half bearing
2. Pinion half bearing
3. Spacer
4. Bearing adjusting shims
5. Housing
6. Ring nut
7. Adjusting shims available:
   1 mm
   0.5 mm
   0.2 mm
8. Bevel pinion



SECTION 4 BIS

BRAKES AND STEERING CLUTCHES

D180 STEERING CLUTCH

TABLE OF CONTENTS

CHAPTER	SUBJECT	PAGE
4.1	GENERAL DESCRIPTION OF THE CIRCUIT	4-3
4.1.1	Brakes and steering clutches system hydraulic diagram	4-4
4.1.2	Main components of the hydraulic system	4-5
	Brakes and steering clutches feeding pump	4-5
	Feeding valve block	4-6
	Proportional solenoid valves block	4-7
	Brake and clucthes control valve	4-8
	Brake pedal valve	4-10
	Oil filters	4-12
	Rear transmission (Transmission side section)	4-14
4.2	TROUBLESHOOTING	4-16
4.2.1	Diagnosis on the display	4-17
4.3	TESTS	4-20
4.3.1	Pressure test of the brakes and steering clutches circuit	4-20
4.3.2	Brake pedal adjustment	4-22
4.3.3	Brake system pressure test	4-23
4.3.4	Feeding valve test and setting	4-24
4.3.5	Calibration of brakes/steering clutch levers	4-25
4.4	REPAIR PROCEDURES	4-27
4.4.1	Brake pedal valve (removal / disassembly)	4-27
4.4.2	Steering clutches and brake control feeding pump (removal / disassembly / reassembly)	4-28
4.4.3	Brakes and steering clutches (removal / disassembly of packs)	4-29
4.4.4	Bevel gear unit (removal / disassembly)	4-34
4.4.5	Bevel gear (re-assembly / installation)	4-38
4.4.6	Procedure for the setting of the pinion bearings pre-load	4-44
4.4.7	Procedure for the setting of the bevel gear unit	4-45
4.5	SPECIFICATIONS AND DATA	4-46
4.5.1	Bevel gear reduction unit	4-46
4.5.2	Steering clutches and brakes	4-48
4.5.3	Brake pedal valve	4-50
4.6	SPECIAL TOOLS	4-53

NOTE:

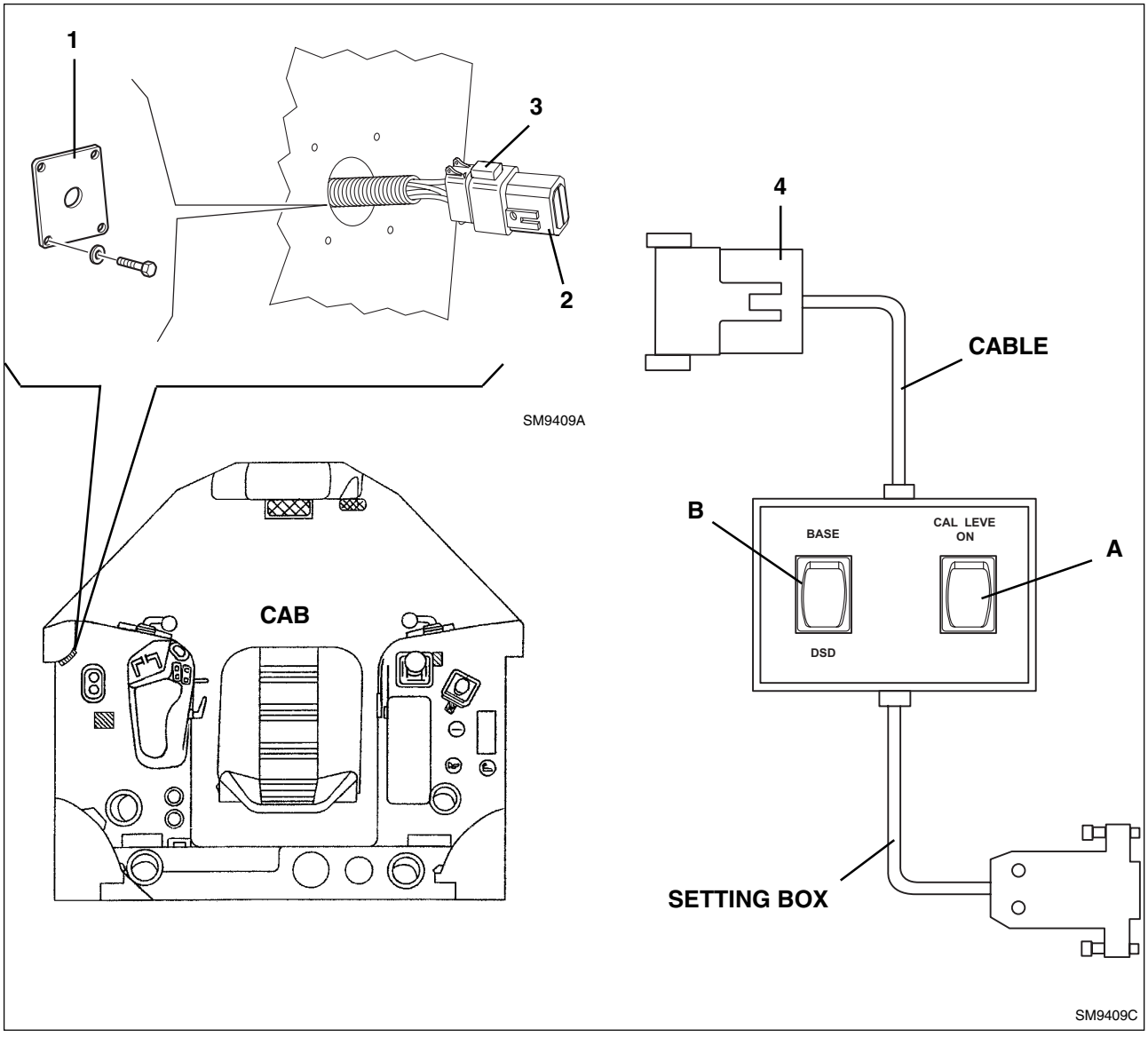
4.3.5 CALIBRATION OF BRAKES/STEERING CLUTCH LEVERS

The calibration procedure is carried out on the machine prior to any replacement or repair intervention involving the steering levers or the transmission/steering electronic unit.

In order to carry out the calibration, it is necessary to use the setting cable indicated.
For the connection to the instrumentation, follow the diagram illustrated in the figure, as indicated here below.

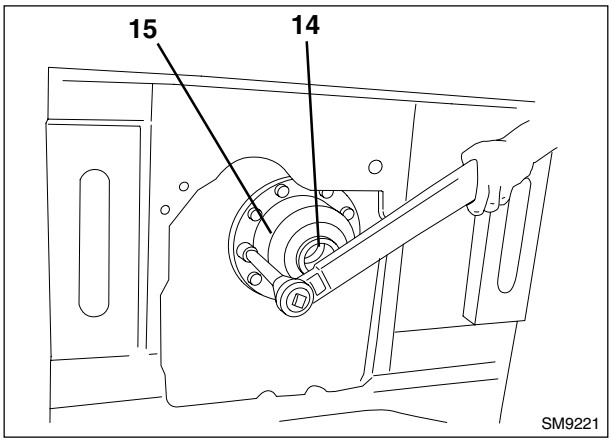
- Remove plate (**1**) from the cab front post and extract cap (**2**) installed on the pre-arranged electrical connector (**3**). Connect connector (**4**) of the setting box cable.

- Position the two switches on the setting box, as follows:
  - Switch **A** in position "**CAL**"
  - Switch **B** in position **"BASE**

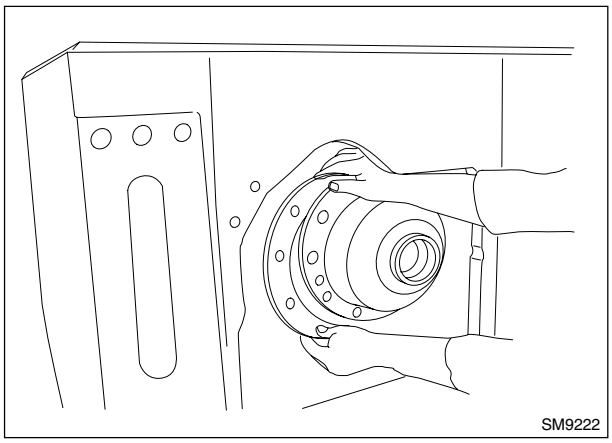


Then, proceed as follows:

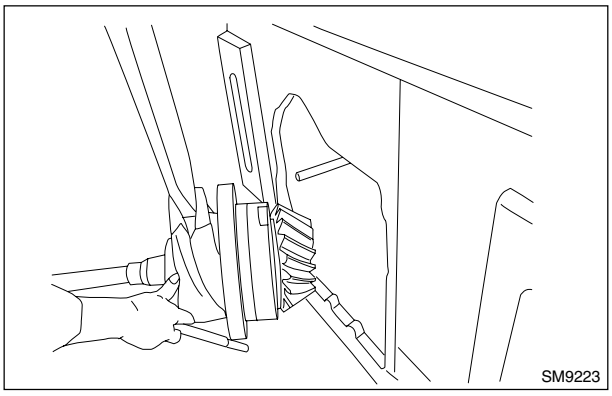
Remove cover (**15**), extract O-Ring (**14**)



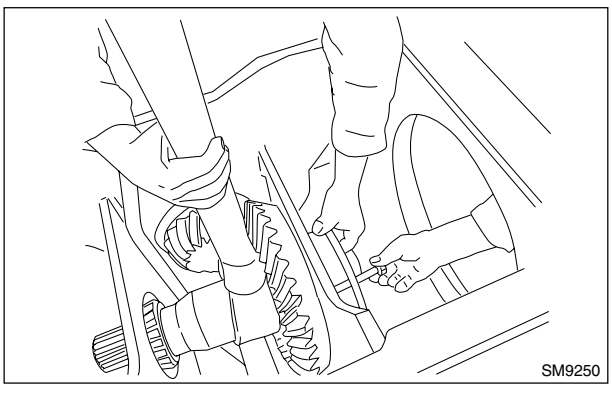
Pull-out the adjusting half shims (**16**); holding it with cables or belts, extract the bevel pinion support assembly, using puller screws.



Remove the bevel pinion from the housing.



Loosen screws (**20 - 21**) securing the housing.



4.4.7 PROCEDURE FOR THE SETTING OF THE BEVEL GEAR UNIT

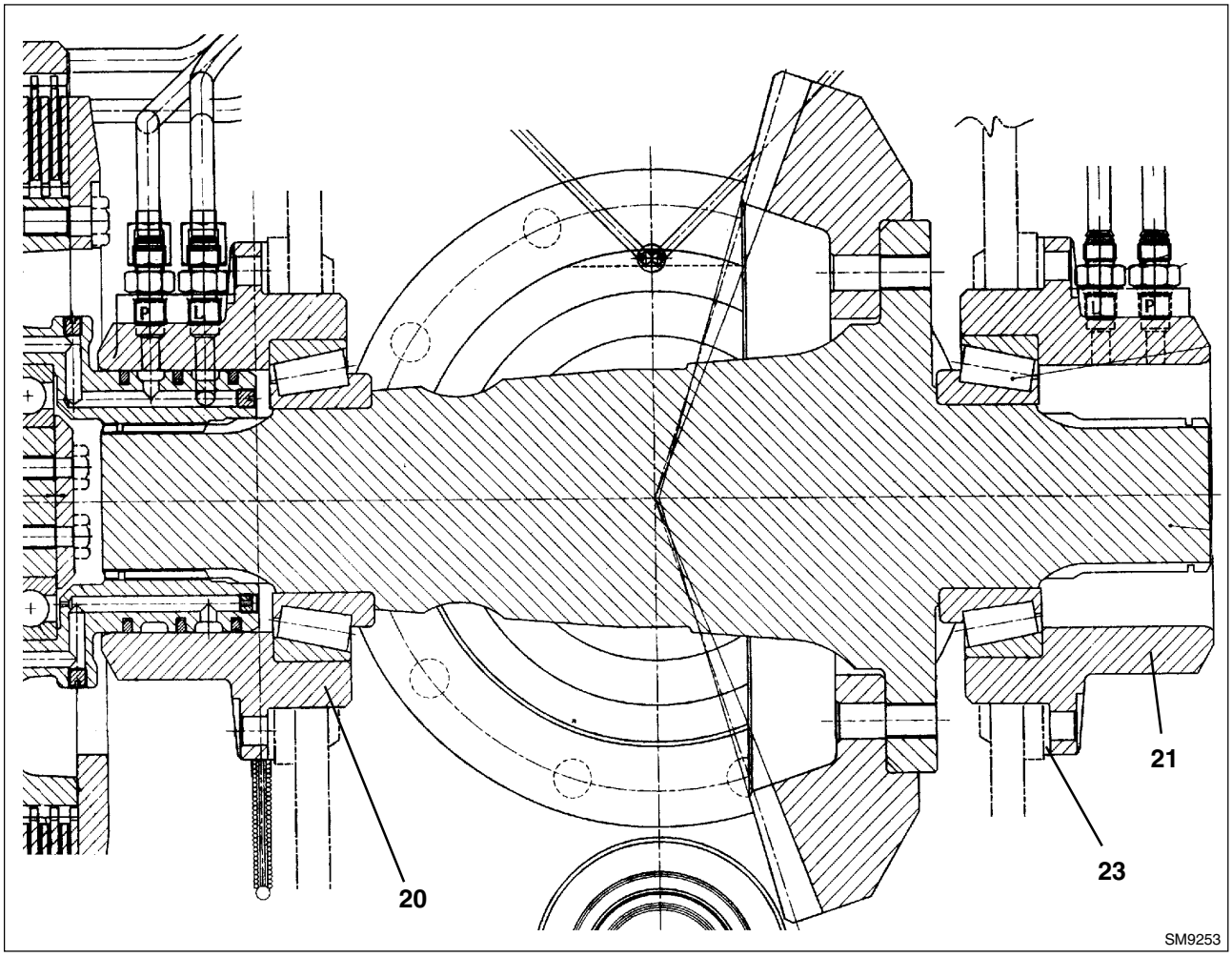
Perform the setting of the bearing pre-load, complying with the following phases:

A. Shim with rings (**23**) to obtain a rolling torque on the gear shaft (without pinion) equivalent to **0.4 ÷ 0.8** daNm (2.95 to 5.9 lbf.ft).

B. After pre-loading the gear shaft bearings as per item A, position pinion housing (**10**), using shims (**16**) (see page 4-44) until the mating pattern between the pinion / gear teeth is according to the indication of detail "A" (see the procedure for the setting of the bevel pinion bearing pre-load).

C. After obtaining the pattern prescribed in phase **B**, divide shims (**23**) between the two bearing housings (**20**) and (**21**) until a backlash equivalent to **0.25 ÷ 0.30** mm (0.010 to 0.012 in) between the pinion / gear teeth is obtained. Recheck that theteeth mating pattern and the preload of the bevel gear shaft are within the specifications of notes **A** and **B**.

D. Check that the total rolling torque measured on the pinion i equal to **0.35 ÷ 0.70** daNm (2.58 to 5.16 lbf.ft).



SECTION 5

UNDERCARRIAGE

TABLE OF CONTENTS

CHAPTER	SUBJECT	PAGE
5.1	GENERAL DESCRIPTION	5-3
5.1.1	Generalities	5-3
5.1.2	Main components	5-4
5.2	TROUBLESHOOTING	5-7
5.3	INSPECTIONS	5-8
5.3.1	Inspection and adjustment of track chains	5-8
5.3.2	Setting of the track tensioner pressure relief valve	5-9
5.4	REPAIR PROCEDURES	5-10
5.4.1	Track chain (removal / installation)	5-10
5.4.2	Replacing a damaged link and re-installation	5-12
5.4.3	Idler (removal / Re-installation / overhaul)	5-14
5.4.4	Track chain support rollers (removal / installation / overhaul)	5-17
5.4.5	Track chain bottom rollers (removal / installation / overhaul)	5-19
5.4.6	Track chain tensioner spring (removal / installation)	5-22
5.5	SPECIFICATIONS AND DATA	5-23
5.5.1	Idler	5-23
5.5.2	Sprockets	5-24
5.5.3	Track chains	5-24
5.5.4	Bottom rollers	5-25
5.5.5	Support rollers	5-26
5.5.6	Track tensioner device	5-27
5.5.7	Front cross-member pivots	5-28
5.5.8	Wear limits	5-32
5.6	SPECIAL TOOLS	5-33

Re-installation

WARNING

Handle all parts with extreme care. Never place hands and fingers between one piece and another. Wear approved personal protection equipment such as glasses, gloves and safety shoes.

1. Position the track chain so that the junction point is corresponding to the sprocket (fig. 5-9).

2. Start the machine and move it slowly forward, guiding, at the same time, the track chain over the sprocket, using a strong bar placed through the holes of a link.

3. Place a wooden block under the rib of the shoe nearest the junction point. Connect half links (**1**), install the master shoe and tighten the screws to the prescribed torque indicated in fig. 5-11.

Note – Before installing, degrease screws (**C**) and the treaded seats on master link (**1**).
Apply LOCTITE Super Rapid 242 on the screw thread and tighten to the prescribed torque. Lubricate with engine oil the other screws and tighten to the same torque.

Tighten the master link screws with the relevant shoes to a torque C = 30 daNm (221.3 lbf.ft), plus a further 180° (half turn).
For the screws securing the screws , tighten to a torque C_1 = 30 daNm (221.3 lbf.ft) plus a further 120° (1/3 turn).

4. Reset the correct track chain tension, making reference to item **5.3.1 INSPECTION AND ADJUSTMENT OF TRACK CHAINS.**

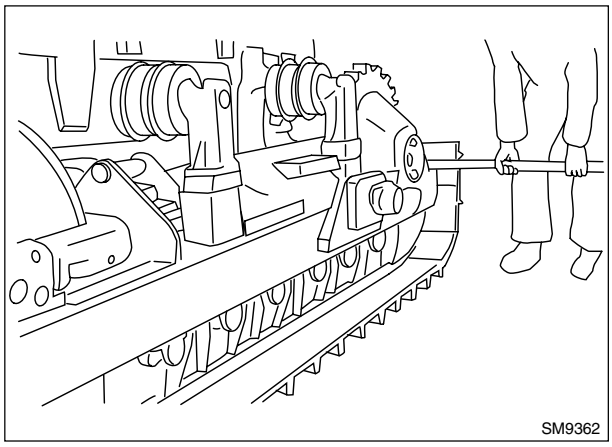


Fig. 5-9

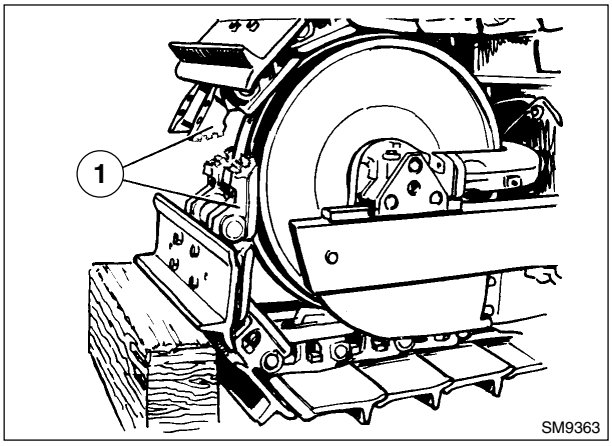


Fig. 5-10

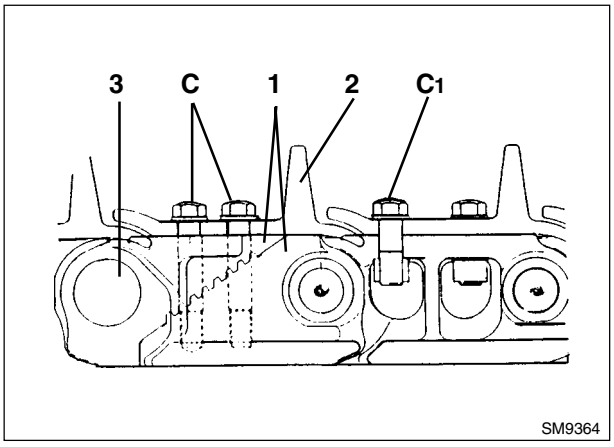


Fig. 5-11 Track chain master link

1. Master SPLIT link
2. Master shoe
3. Link pin
C. Master link hinging securing screws (30 daNm + 1/2 turn)
C_1. Shoe and split link securing screws (30 daNm + 1/3 turn)

6. Install new bushes into the relevant housings, operating as follows:
   - remove dowels (**3**, fig. 5-41) from the housing or, in case of necessity, cut them flat with the face;
   - press the new bushes into the housing so that, after pressing, lube holes (**F**) are coaxial with a maximum run-out of 2.5 mm (0.984 in).
   - drill two new holes for dowels (**3**) as far as possible from the lube holes. Press the dowels making sure that they don't protrude over the bush surface.

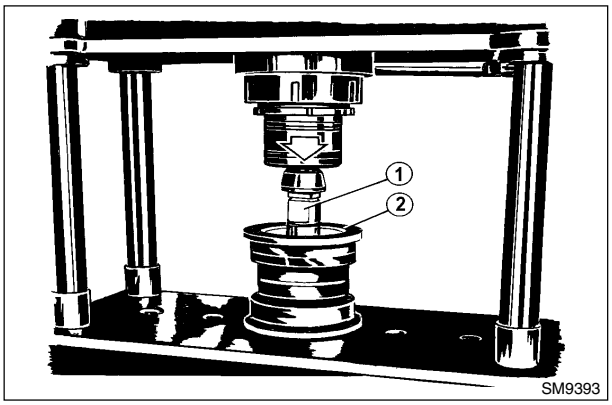


Fig. 5-40

7. Install O-Ring (*) (**1**, fig. 5-40) on bush housing (**2**).Press the first housing, using guide pins (**S**, fig. 5-42) to facilitate the alignment of the holes of the housing securing screws.

8. Install the roller shaft, press the second bush housing assembly and make sure that the shaft turns freely.
   Install and tighten to the prescribed torque screws (**1**, fig. 5-43) (**see 5.5.4 BOTTOM ROLLERS**).

9. Check the axial play of the roller shaft using dial gauge (**A**) as illustrated in fig. 5-43.
   Compare the value measured with the data of **5.5.4 BOTTOM ROLLERS.**

10. Re-install the front seals.

DEGREASE AND CLEAN THE FRONT SEAL SEATS. ELIMINATE ALL TRACES OF DUST OR IMPRINTS FROM THE SURFACES THEN COVER THEM WITH A THIN FILM OF OIL, MAKING SURE THAT THE OTHER SURFACES REMAIN DRY.

Install supports (**3**, fig. 5-37) on the shaft, pushing them fully to win the resistance provided by the front seals and hold the pack inserting securing plate (**2**, fig. 5-36) into its seat.

(*) It is recommended that the O-Rings are always replaced.

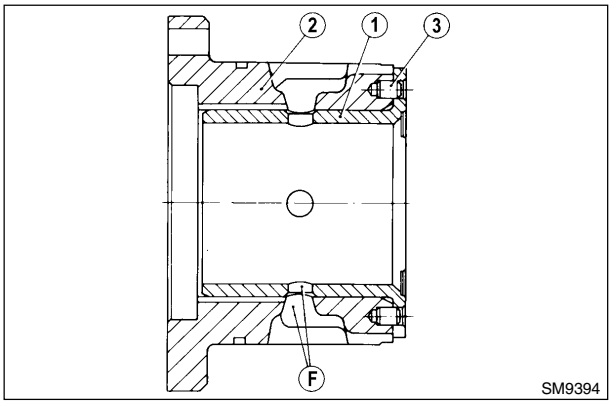


Fig. 5-41

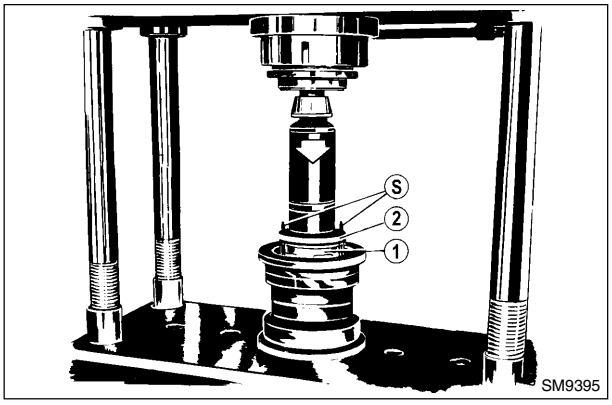


Fig. 5-42

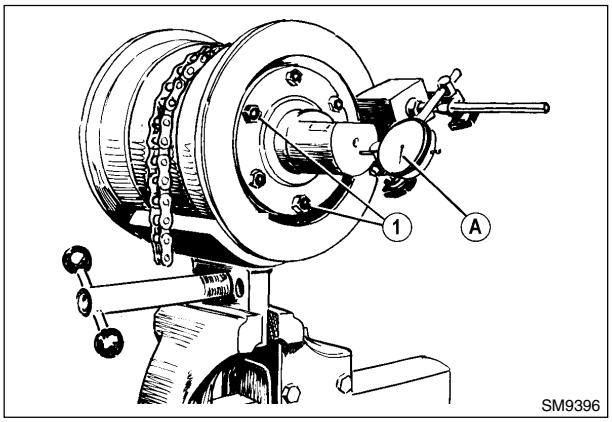


Fig. 5-43

CROSS-MEMBER SUPPORT

	(mm)	(in)
	Min. Max	**Min. Max**
D. Cross-member pivot support		
- Bush inner diameter	60.200 to 60.270	2.370 to 2.373
- Pin diameter	59.920 to 59.950	2.359 to 2.360
- Clearance	0.250 to 0.350	0.009 to 0.014
D_1. Cross-member pivot support		
- Bush outer diameter	71.970 to 72.000	2.833 to 2.835
- Support inner diameter	71.895 to 71.941	2.830 to 2.832
- Interference	0.029 to 0.105	0.001 to 0.004

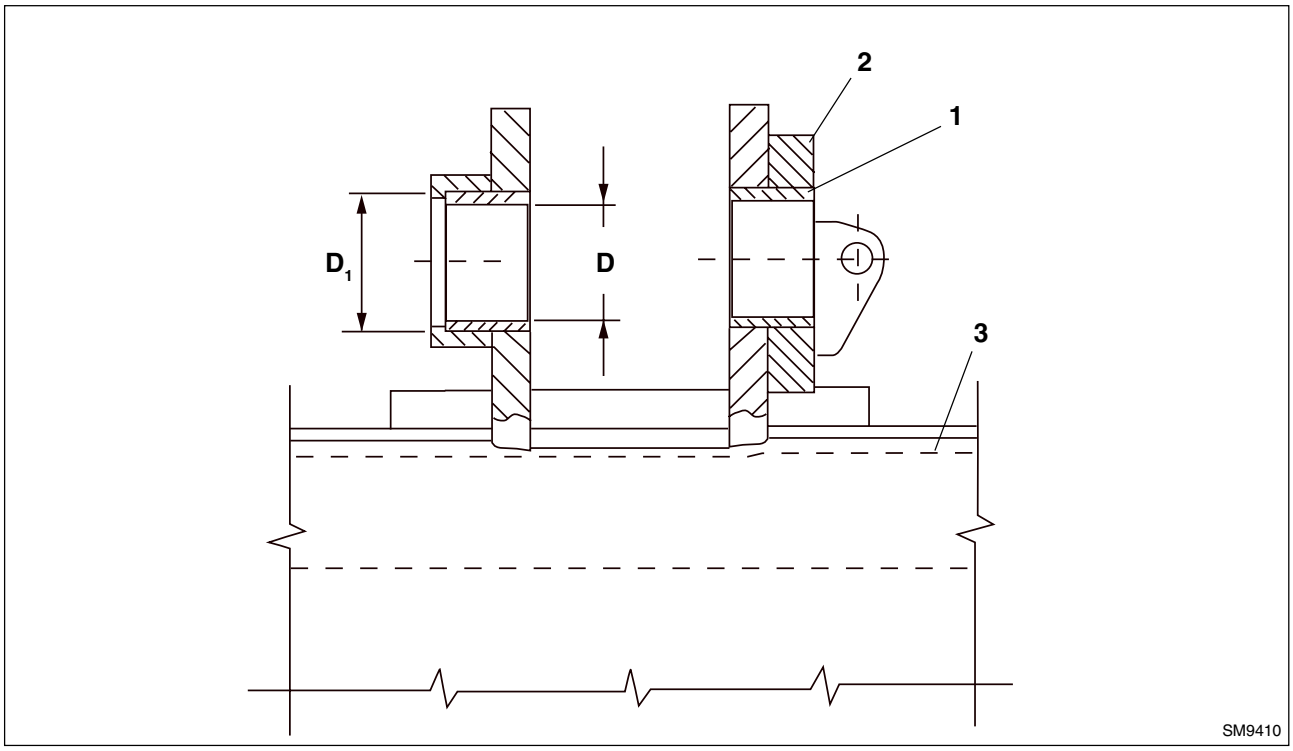


Fig. 5-58 Cross-member support

1. Bush
2. Cross-member support
3. Track frame body

– remove the two upper screws (**C**) securing the oil reservoir to the fuel reservoir;
– remove the three lower screws (**C1**) securing the reservoir to the frame;
– remove the reservoir using a handle welded to the rear side with an adequate lifting device.

DANGER

Make sure that the cables are secured and that the securing point is strong enough to hold the load applied.
Keep all by-standers away from the lifting point, the cables or chains.

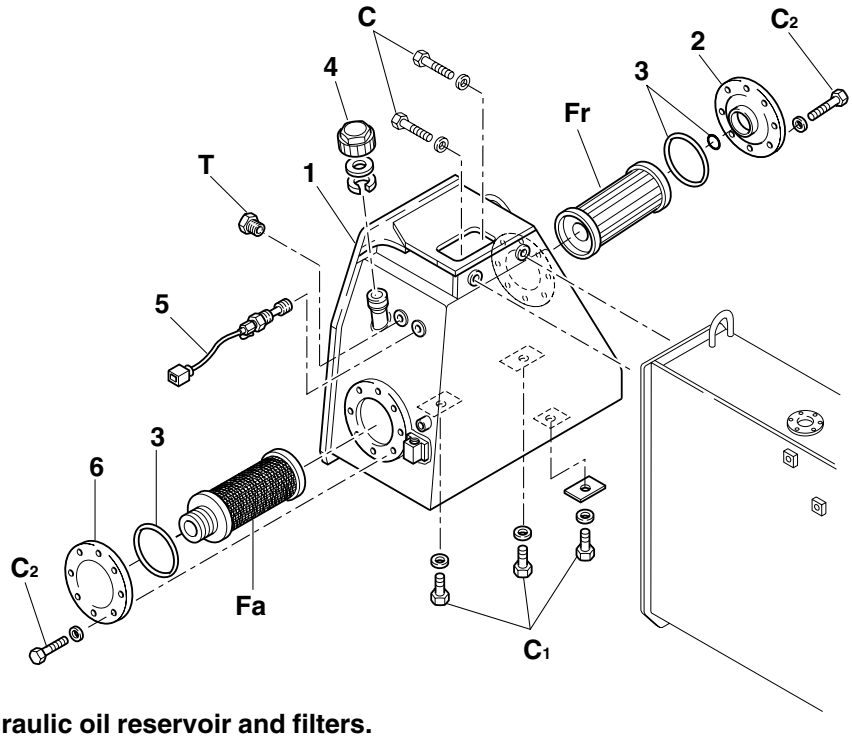


Fig. 9 - Hydraulic oil reservoir and filters.

1. Hydraulic oil reservoir; **2.** Return filter cover; **3.** O-Ring; **4.** Oil filler cap; **5.** Return oil filter clogging sensor; **C.** Reservoir upper securing screw (M14x2x45); **C1.** Reservoir lower securing screw (M14x2x45); **C2.** Cover securing screw; **Fa.** Suction filter; **Fr.** Return filter; **T.** Breather plug.

FILTERS

The purification of the equipment hydraulic oil is ensured by two separate full flow filters, located inside the hydraulic oil reservoir and precisely:
– filter (**Fa**, fig. 9) located on the pump suction with a metal mesh filtering element;
– filter (**Fr**) located on the pump return, equipped with a paper filtering element, with by-pass valve cuttingof the filter in case of clogging. Sender (**5**) signals the clogging of the filter by an indicator on the monitor.

Both filters are accessible by removing the relevant covers, loosening retaining screws (**C2**).
Filter (**Fa**) is cleaned using an appropriate solvent each time the hydraulic oil is changed (every 2000 hours) and must be replaced only when required.
Return filter (**Fr**) must be replaced periodically every 500 hours work, to avoid that the oil with a clogged filter is no longer filtered.

DANGER

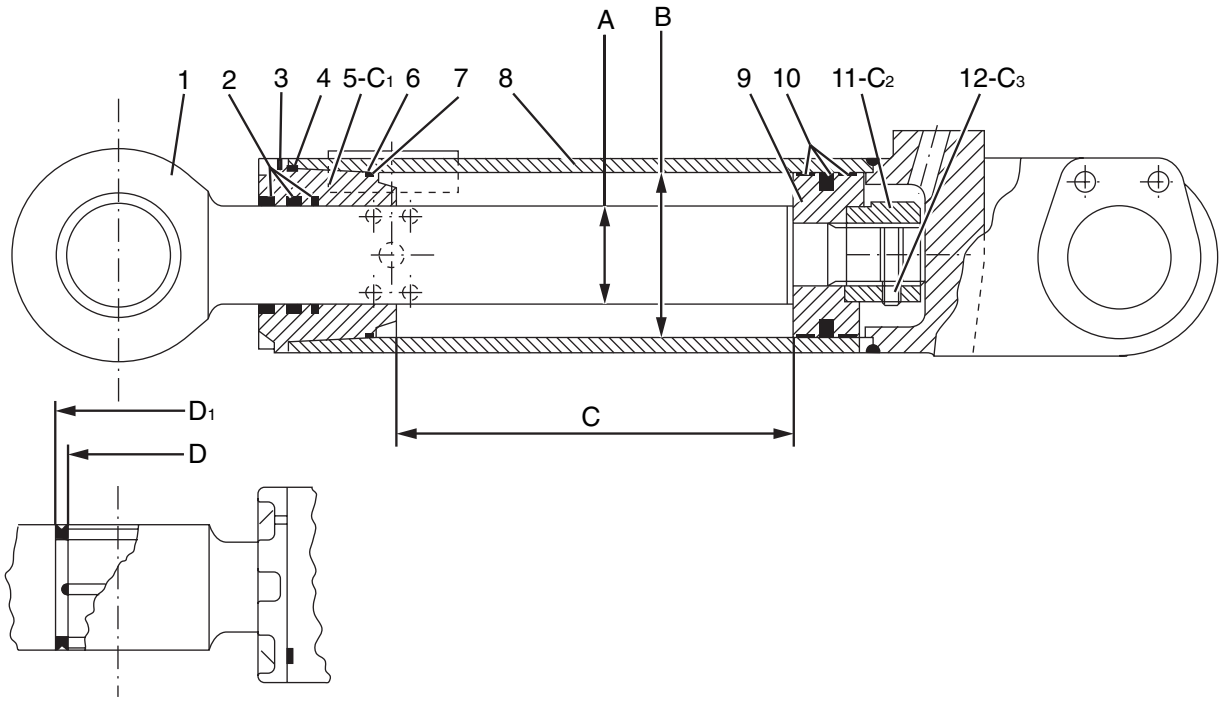
Never use gasoline, solvents or other flammable fluids to clean components. Use commercial non-toxic, non-flammable approved solvents only.

Re-installation of filters and reservoir

The re-installation of hydraulic oil filters and reservoir is done, reversing the removal sequence.

Note – *To fill the tank with oil, it is necessary to remove breathing plug T, to bleed the air trapped inside.*

6.4.7 RIPPER CYLINDER



SM9459

Fig. 19 - Section of ripper cylinder

A. Nominal diameter of rod ..... 56 mm (2.205 in)

B. Nominal diameter of piston ..... 100 mm (3.937 in)

C. Stroke of cylinder rod ..... 480 mm (18.898 in)

D_1. Outer diameter of rod bush ..... 78.070 to 78.100 mm (3.074 to 3.075 in)
Diameter of bush seat ..... 78.000 to 78.046 mm (3.071 to 3.073 in)
Installation interference ..... 0.034 to 0.100 mm (0.001 to 0.004 in)

D. Inner diameter of rod bush ..... 63.195 to 63.265 mm (2.488 to 2.491 in)
Diameter of bush seat ..... 62.954 to 63.000 mm (2.478 to 2.480 in)
Installation interference ..... 0.195 to 0.311 mm (0.007 to 0.012 in)

C_1. Tightening torque of sleeve ..... 133 to 147 daNm (981 to 1084.2 lbf.ft)

C_2. Tightening torque of rod securing nut ..... 110 to 121 daNm (811.3 to 892.4 lbf.ft)

C_3. Tightening torque of dowel ..... 3.4 to 3.8 daNm (251.1 to 28 lbf.ft)

1.	Sleeve ass.ly
2.	Rod ass.ly
3.	Plate
4.	O-Ring
5.	Front sleeve
6.	Anti-extrusion ring
7.	O-Ring
8.	Sleeve ass.ly
9.	Piston
10.	Seal kit
11.	Nut
12.	Dowel

6.2 TROUBLESHOOTING

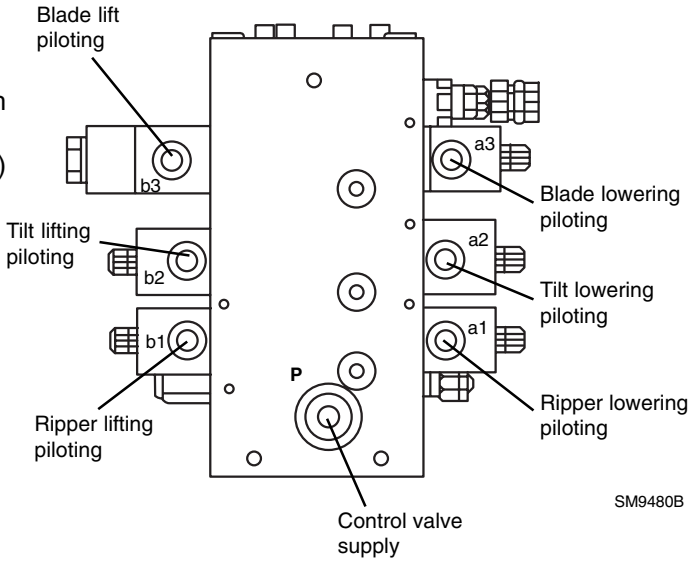
TROUBLE	POSSIBLE CAUSE	TOOLS REQ.ED	TEST	SOLUTION
All cylinders operate slowly	Worn pump		Perform test flow	If the test proves a pressure drop of 15% from no load through test load, replace the pump
	Main safety valve stuck open		Perform test flow	If the flow is very low and the pressure does not reach the prescribed values, reset the main pressure relief valve
	Control linkage out of adjustment		Perform test flow	Check and adjust the linkage for a precise spool stroke
A series of cylinders moves slowly	Control valve broken		Move the spool manually	Negative test, replace the valve
	Control valve stuck in its seat		Perform test flow	Replace the valve if spool stucks
	Safety valve stuck open		Perform test flow	Negative test, replace the valve
	Cylinder piston seal leaking			Negative test of cylinder, replace seal
The hydraulic oil overheats	Insufficient oil level	Operation and Maintenance Manual	Perform test flow	Refill equipment reservoir with oil of the prescribed type
	Suction filter clogged			Suction is clogged, clean suction filter
	Pump suction leaking		Perform test flow	Repair seal or tighten connections
	Main safety valve out of setting			Re-set at prescribed value

6.5 SPECIFICATIONS AND DATA

6.5.1 HYDRAULIC CONTROL VALVE

Single 3-spool control valve made by Kayaba

Max. operating pressure: 190 bar (2755.75 psi)
Oil temperature from -20 through 80° C (-4 through 176° F)
Recommended hydraulic oil HI-TECH 46 (ISO VG46)



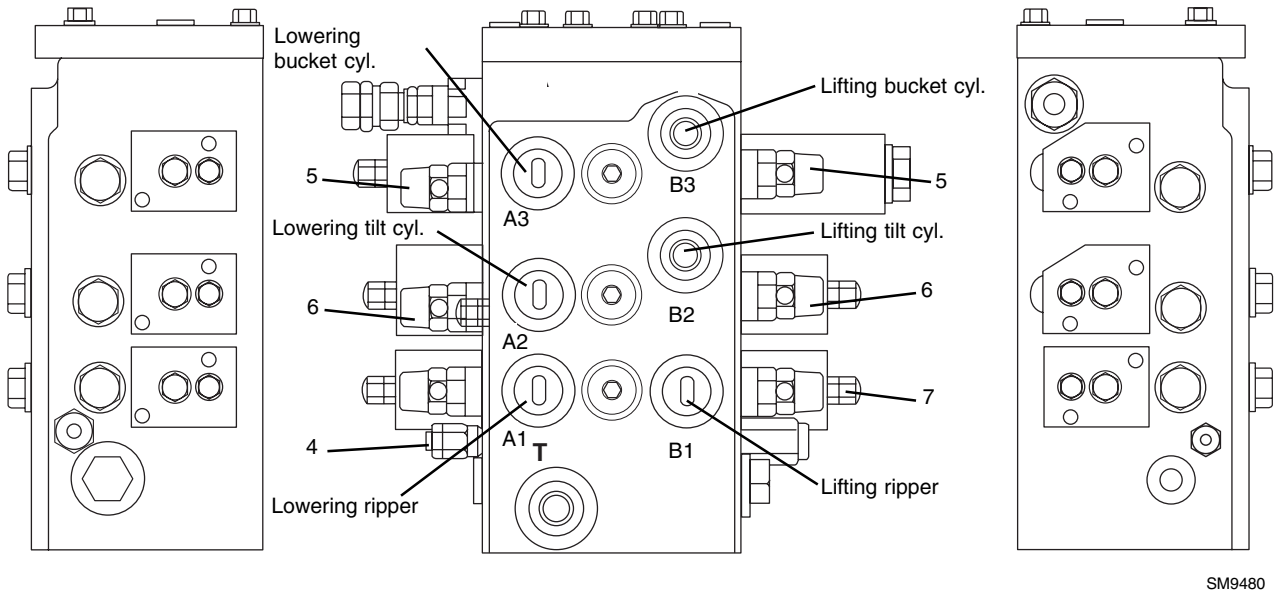


Fig. 17. Hydraulic valve control valve (Ref. hydraulic valve diagram)

4. Main pressure relief valve (set at 190 bar/2755.72 psi)
5. Blade spool safety valve (set at 230 ± 5 bar / 3335.87 ± 72.52 psi)
6. Tilt spool safety valve (set at 230 ± 5 bar / 3335.87 ± 72.52 psi)
7. Ripper spool safety valve (set at 230 ± 5 bar / 3335.87 ± 72.52 psi)

A_1- B_1
A_2- B_2 } Supply ports to cylinders
A_3- B_3
A = Lowering
B = Lifting

T. To hydraulic oil reservoir
P. From supply pump

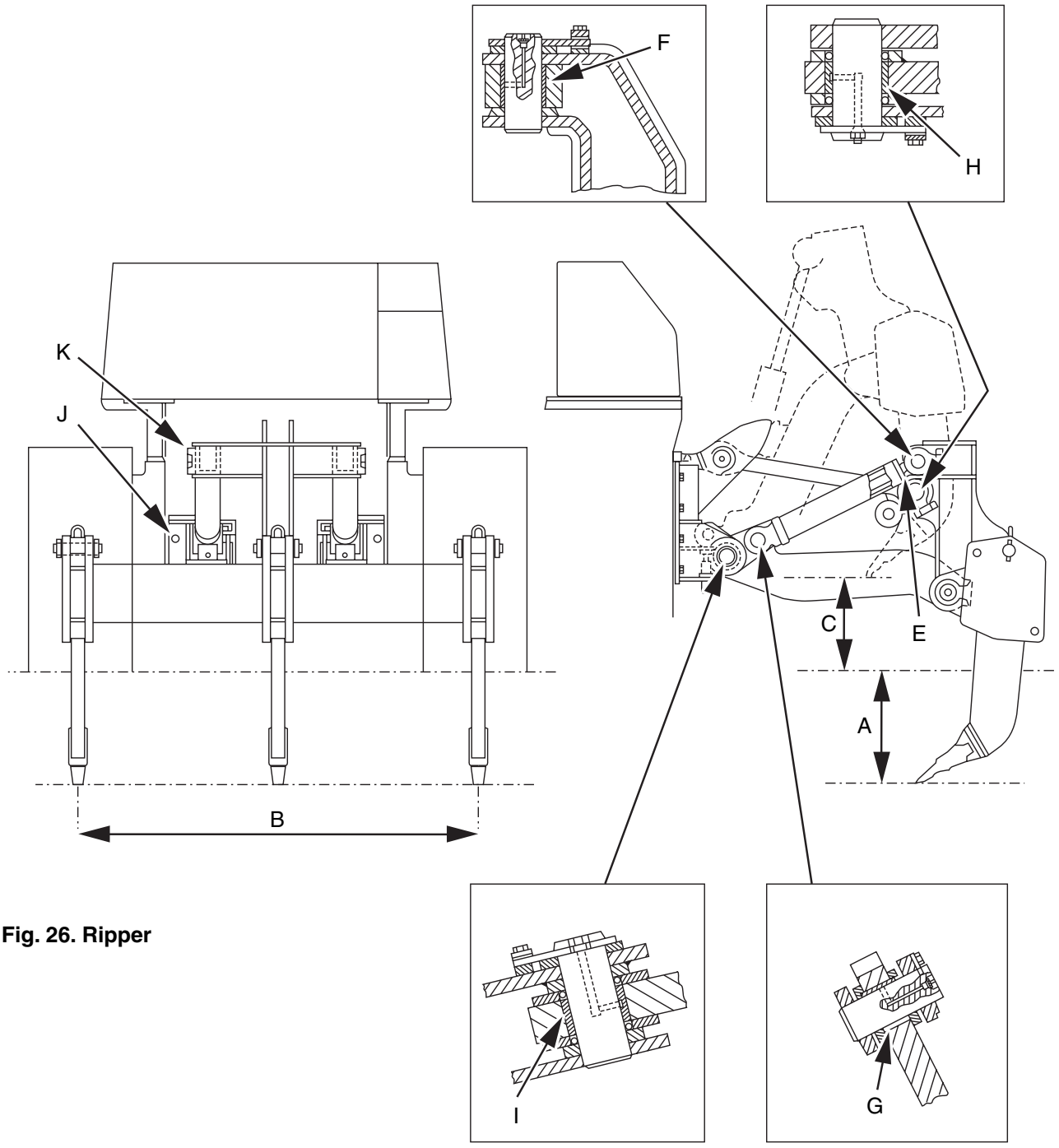


Fig. 26. Ripper

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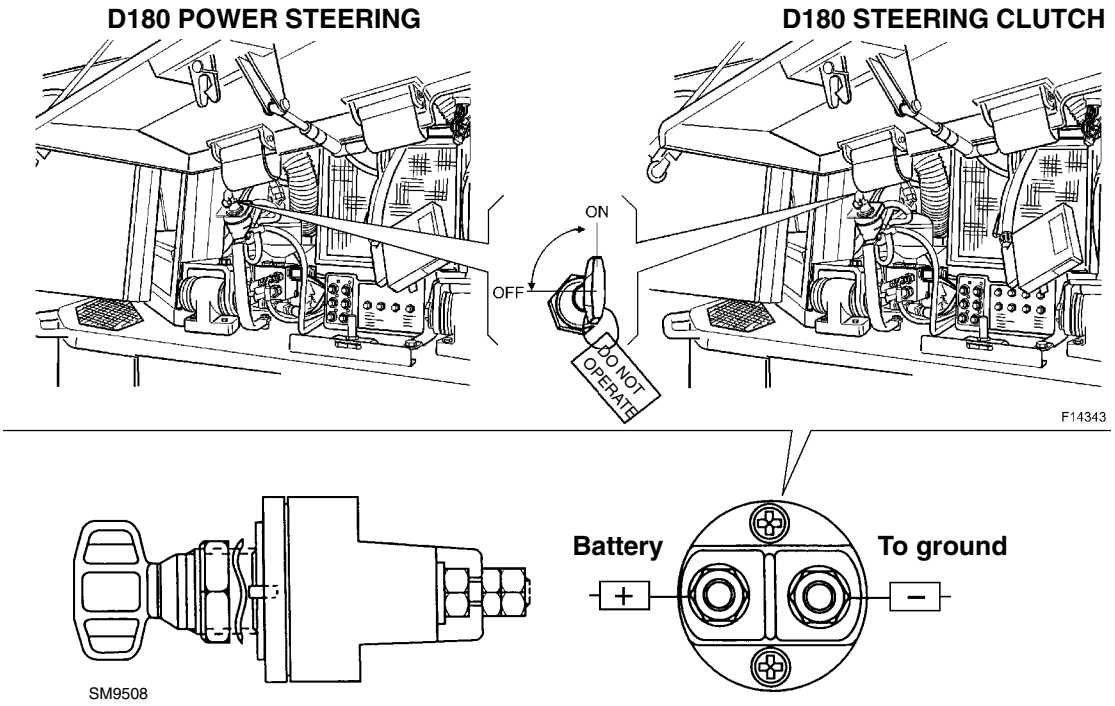
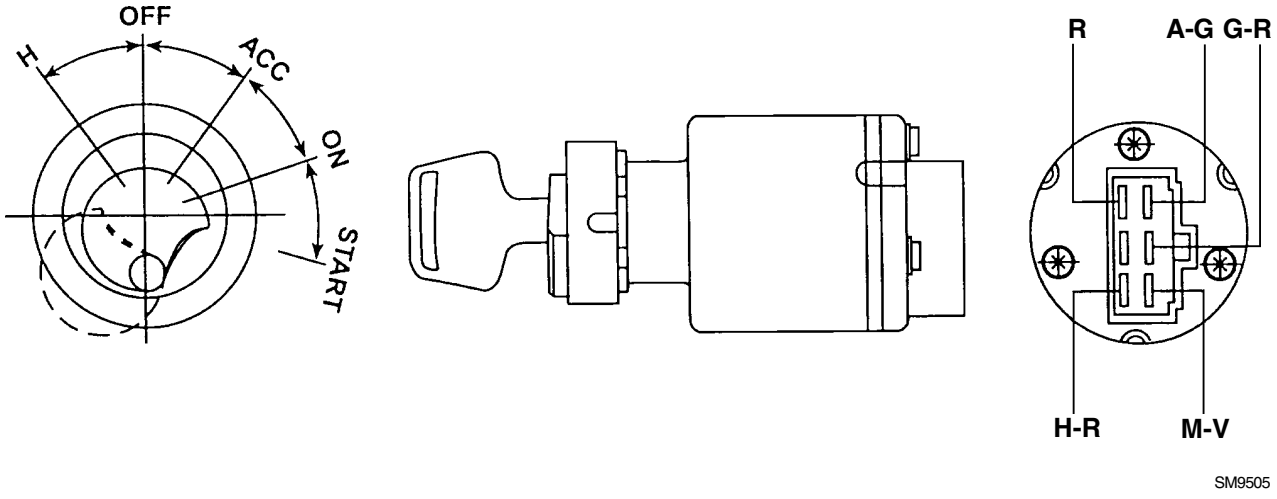
7.1.3 MAIN SWITCH

LOCATION - Inside the left panel, under the cab.



7.1.4 ENGINE STARTING SWITCH

LOCATION - Right console in the cab.

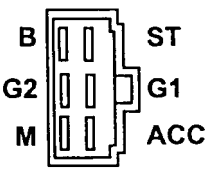


WIRES

Red	position "**B**"
Yellow/Red	position "**G1**"
Brown/Green	position "**ACC**"
Grey/Red	position "**M**"
Light blue/Yell	position "**ST**"

	B	G_1	G_2	ACC	M	ST
H	○—○					
OFF						
ACC	○—	—	—	○		
ON	○—	—	—	○	○	
START	○—	—	○	—	○	○

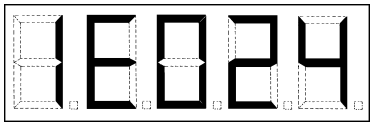
POSITION



Speed engaged signal + failure code

The first digit indicates the speed engaged (ex. 1st speed).

The second indicates (in case of failure) letter E.



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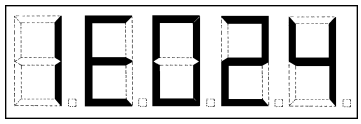
1st 2nd (digit)

The 3rd and 4th digits identify the failure code (ex. failure code No. 024).

When the components failed is one only, the codes listed in **TABLE 1** appear.

For each failure code, identify the corresponding component listed.



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3rd 4th 5th (digit)

TABLE 1	
Failed component	**Failure code**
Left proportional solenoid valve coil	**001**
Right proportional solenoid valve coil	**002**
Forward "F" speed solenoid	**004**
Rear "R" speed solenoid	**008**
1st speed solenoid	**016**
3rd speed solenoid	**032**
Left steering lever solenoid	**064**
Right steering lever solenoid	**128**

TABLE 2								
Failed component	**LH prop. sol. valve coil**	**RH prop. sol. valve coil**	**For. "F" speed solen.**	**Rev. "R" speed solen.**	**1st speed solen.**	**3rd speed solen.**	**LH steer. lever solen.**	**RH steer. lever solen.**
Left prop. solenoid valve coil	001	003	005	009	017	033	065	129
Right prop. solenoid valve coil		002	006	010	018	034	066	130
Forward "F" speed solenoid			004	012	020	036	068	132
Reverse "R" speed solenoid				008	024	040	072	136
1st speed solenoid					016	048	080	144
3rd speed solenoid						032	096	160
Left steering lever solenoid							064	192
Right steering lever solenoid								128

8.1 AIR CONDITIONING UNIT

8.1.1 OPERATING INSTRUCTIONS

The principle of operation can be summarised as follows: the refrigerant, Freon R134a, in its gaseous state, is sucked by the compressor at a pressure of 2 bar (29 psi) and taken to a final compression at a pressure of 19 to 25 bar (145 to 290 psi). The gas, heated by the compression to 89 to 100 °C (192 to 212 °F), flows, still in a gaseous state, into the condenser where, under the effect of the cooling provided by the air flowing through it by the action created by the fan, reaches the condensation point, passing into a liquid state at high pressure.
Subsequently, the refrigerant, at liquid state, reaches a dehydration filter, which has the function of capturing itself. Then, the Freon reaches the expansion thermostatic valve, which has the purpose of regulating the refrigerant flow into the evaporator at a pressure of 2 bar (29 psi), causing its passage from liquid to gaseous state. At the same time, the air flowing through the evaporator, under the action of the fan, having a temperature which is higher than the refrigerator contained by the evaporator itself, causing its boiling and full evaparation, releasing heat.
The air, being cooled, deposits on the fins of the evaporator parts of its moisture content, under the form of little drops, which drop into the tanks and are discharged outside the cab.
Air cooled and dehumidified, is sent into the cab. The refrigerant, at the outlet of evaporator, is sucked again by the compressor, beginning a new cycle.

8.1.2 TECHNICAL DATA

Heater group			
Efficiency		> 89%	
Capacity	micron	20	
Dimensions	cm^2 (in^2)	13680 (2120.4)	
Conditioner group			
Max gas charge	gr (lb)	1800 (3.97)	
Compressor			
Brand			
Model		SD7H1SMD7948	
Condenser			
Brand			
Air flow	m^3/h (gpm)	-1570 (-6912)	
No. of fans		-2	
Cab air flow	m^3/h (gpm)	≥ 400 (1761)	
Thermostatic valve	°C (°F)	Open	Closed
		≤ -2 (28.4)	≥ 2 (35.6)

6. Slowly open the manifold gauge's low pressure side valve to charge refrigerant from the low pressure side valve to charge refrigerant from the low pressure side.
7. Charge with refrigerant until the low pressure gauge reaches 2 bar (29 psi).
8. Close the manifold gauge's low pressure valve.

CAUTION

Do not overcharge the system.

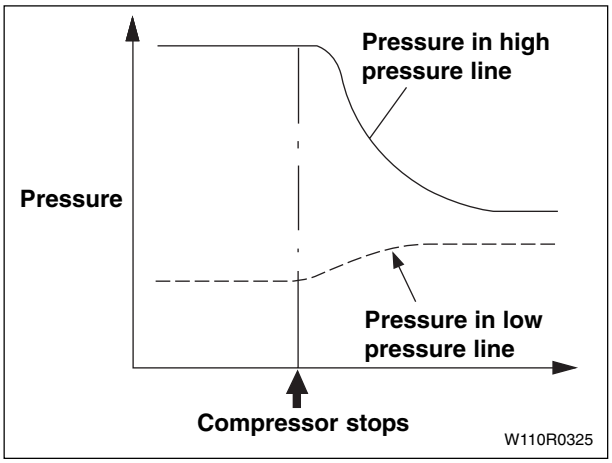

Fig. 8-11

Initial Leak check

Using the leak detector, check the system connection for leaks.

Note – *As the system pressure is not yet high, only large leaks can be detected at this time.*

Electronic leak detector
380001327

A22090

Fig. 8-10

8.1.9 LEAK INSPECTION

To facilitate refrigerant leak detection, operate the air conditioner at the full cooling setting with the fan running at maximum speed for at least 5 minutes.
Stop the engine and, using a leak detector, check for refrigerant leaks on the high pressure side.
This must be done immediately because when the refrigerant stops circulating, the high pressure decreases gradually, as shown in the graph, while the low pressure side pressure increases gradually.