Doosan Infracore

SSL 601

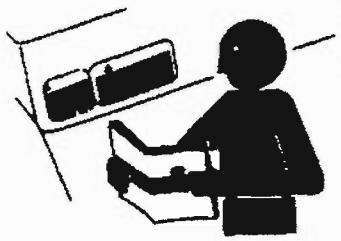
Serial Number --------

Shop Manual

PB502000E02
December 1998

⚠ WARNING SAFETY INSTRUCTIONS

Carefully read all safety messages in this manual and all safety labels on your machine. Keep safety labels in good condition. Replace missing or damaged safety labels. Be sure new equipment components and repair parts include the current safety labels. Learn how to operate the machine and how to use controls properly. Do not let anyone operate the machine without instruction. Keep your machine in proper working condition. Unauthorized modifications to the machine may impair operator safety and well being and/or machine life and function.



⚠ DANGER SAFETY RULES

- ONLY trained and authorized personnel should operate and maintain the machine.
- Use common sense and follow all safety rules, precautions and instructions when operating or performing maintenance on the machine.
- When working with another person, be sure all hand signals to be used are understood.
- Certain operating conditions may require reference to applicable ANSI, ISO, EEC or other local and national regulations. Consult your supervisor or safety coordinator to be sure all applicable standards are being followed, and for special operating conditions.
- Never operate equipment under the influence of drugs or alcohol. Certain prescription and over-the-counter medications can affect alertness and coordination. Follow instructions on labels and/or consult your physician. Notify your supervisor or consult your physician for clarification.

⚠ WARNING

The proper maintenance procedures for this machine, recommended by DAEWOO, are outlined in the OPERATION & MAINTENANCE MANUAL for this machine.

Improper performance of service, lubrication or maintenance procedures is dangerous and could result in injury or death. Read and understand the OPERATION & MAINTENANCE MANUAL before performing any service, lubrication or maintenance.

Because of the size of some of the machine components, the serviceman or mechanic should check the weights noted in this Manual. Use proper lifting procedures when removing any components.

Following is a list of basic precautions that should always be observed.

1. Read and understand all Warning plates and decals on the machine before operating, lubricating or repairing it.

2. Always wear protective glasses and protective shoes when working around machines. Do not wear loose-fitting or torn clothing. Remove all jewelry when working on machinery.

3. Do not work on any machine that is supported only by jacks or hoist. Always use jack stands to support the machine before performing any disassembly. Never use concrete blocks.

4. Lower the bucket or other implements to the ground before performing any work on the machine. If this cannot be done, make sure the bucket or other implements are blocked correctly to prevent them from dropping unexpectedly.

⚠ WARNING

Do not operate this machine unless you have read and understand the instructions in the OPERATION & MAINTENANCE MANUAL. Improper machine operation is dangerous and could result in injury or death.

5. Use steps and grab handles (if applicable) when mounting or dismounting a machine. Clean any mud or debris from steps before using. Always face machine when using steps.

6. To avoid back injury, use a hoist when lifting components which weigh 23 kg (50 lb.) or more. Make sure all chains, hooks, slings, etc., are in good condition and are of the correct capacity before a lifting operation.

00.1 GENERAL

1-5 Sleeveless cylinder

1-5.1 Features of sleeveless construction

(1) Improved reliability for tightness of combustion gas, cooling water, and lubricating oil.
The sleeveless design permits tightening a cylinder head gasket evenly between the flat surface of the cylinder block and of the cylinder head, thereby improving tightness.
(2) The sleeveless design has eliminated increase in lubricating oil consumption and blow-by caused by deformed or defective sleeves, thus assuring stabilized engine performance.
(3) "Sleeveless" cooling improves the cooling efficiency of the piston and ring, with enhanced engine durability.

1-5.2 Durability of the sleeveless engine

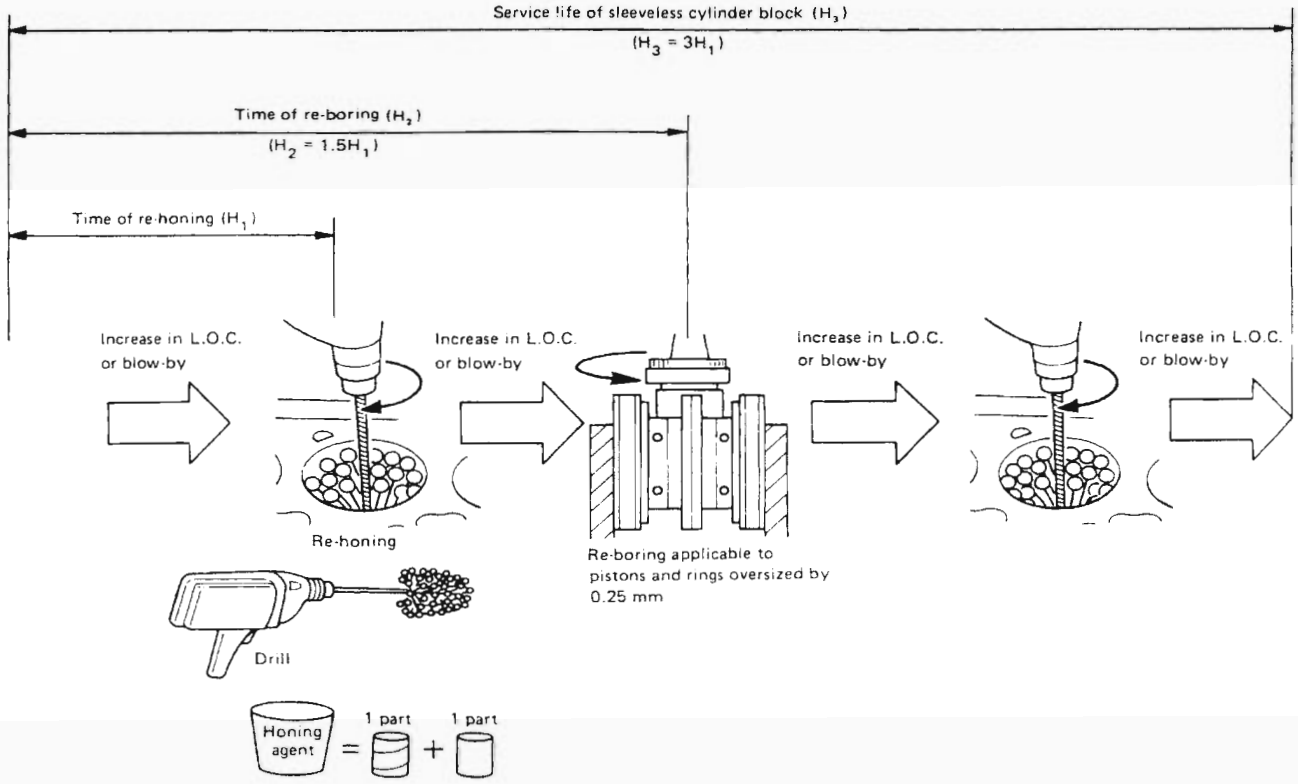
The conventional models of engine (T and TH Series) are equipped with wet liners or sleeves to the standard specification. Tests in Yanmar Laboratory have proven that the sleeveless engine is improved in wear resistance by about 20% as compared with the conventional T and TH Series engine, which have long and widely been used and marked fair durability in the market.
A decision should be made as to whether the sleeveless engine requires overhauling by checking increase in lubricating oil consumption or blow-by indicates rapid change.

1-5.3 Overhaul procedure

Following figure shows the time of the first to third overhauling and, the service life of the sleeveless cylinder together with necessary honing or boring.

(1) How to re-hone the sleeveless cylinder
Prepare a motor-driven drill, "Flex-Hone", and honing fluid.

Overhaul of Cylinder

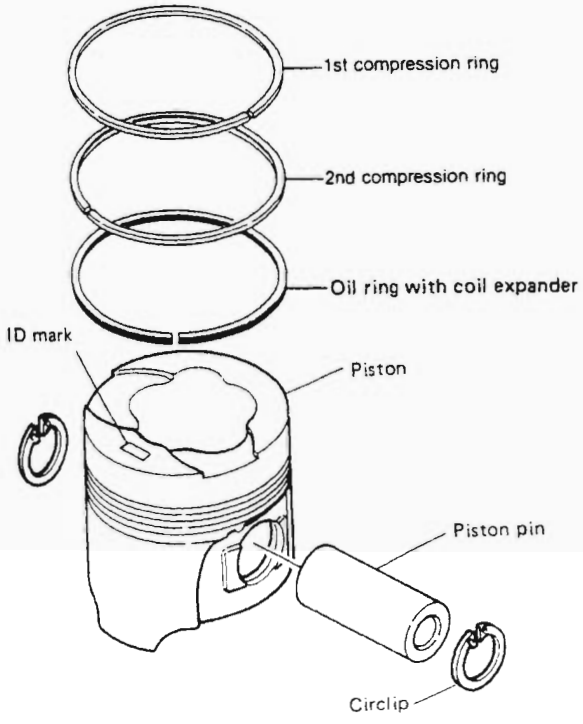


00.2.3 Piston and Piston Pin

The piston is made up of an aluminum alloy with less thermal expansion.
There is a clearance between the outside diameter of the piston and the inside diameter of the cylinder. The clearance is an important factor that has influence on the lubricity between the piston and cylinder, lubricating oil consumption, the noise level of the cylinder.
In Yanmar engines, both piston and cylinder have identification marks to ensure proper clearance between the piston and cylinder on respective top surfaces.
In Yanmar factory, the piston is assembled into the cylinder block with the same identification mark.
The following shows combinations of identification marks for the piston and cylinder block.

		Identification of piston			
		L	ML	MS	S
Cylinder block	L	O	O	X	X
	M	X	O	O	X
	S	X	X	O	O

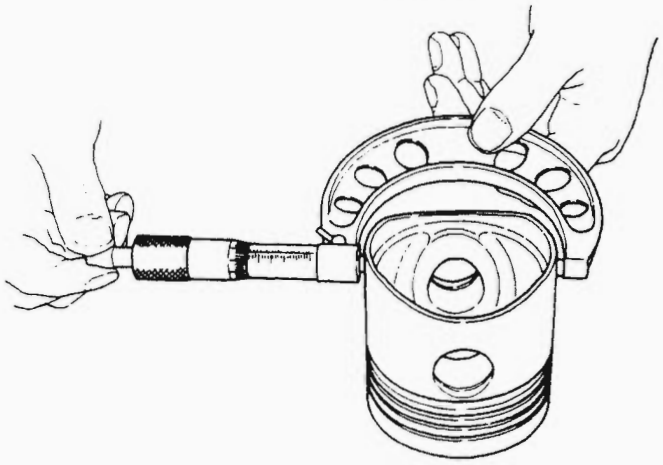
Note 1: O. . . . . Fixed
X. . . . . Do not fix

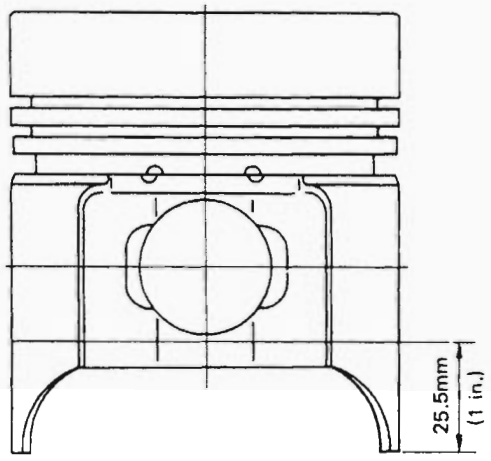


3-1 Piston

3-1.1 Piston head and combustion surface
Remove the carbon that has accumulated on the piston head and combustion surface, taking care not to scratch the piston. Check the combustion surface for any damage.

3-1.2 Measurement of piston outside diameter/inspection
(1) Replace the piston if the outside of the piston or ring grooves are worn.
(2) Measure the piston O.D. of location "A" from the bottom at right angles to the piston pin.



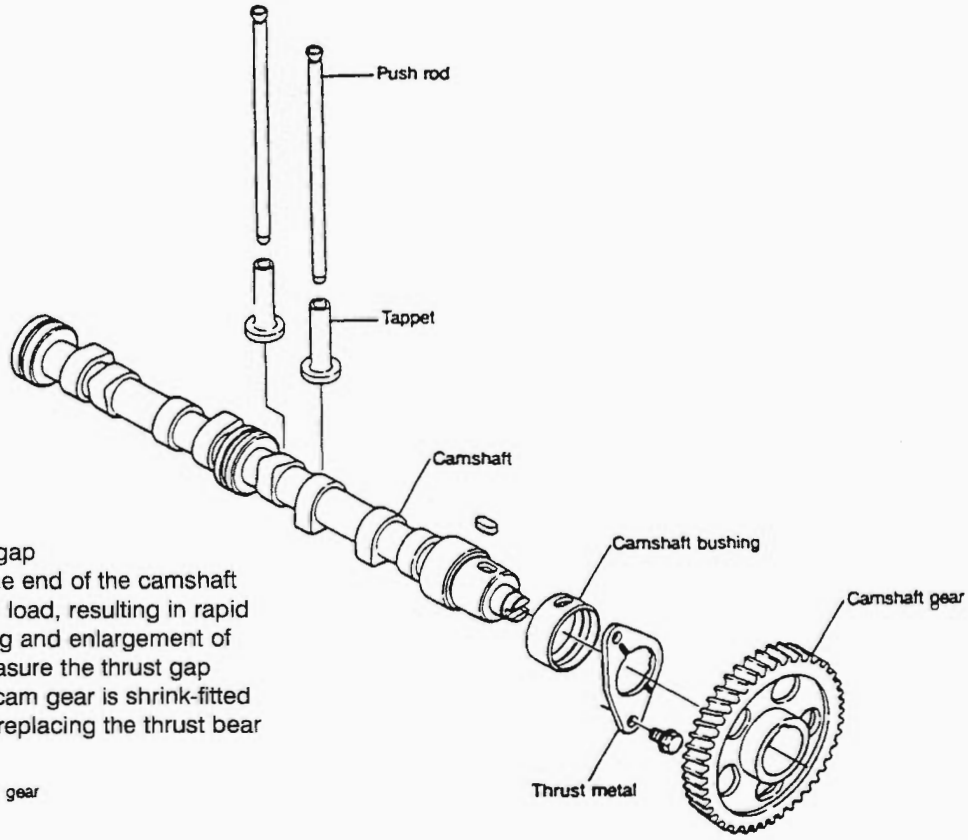


mm (in.)	
Standard	Wear limit
See separate service data (Page 2-31, 32)	

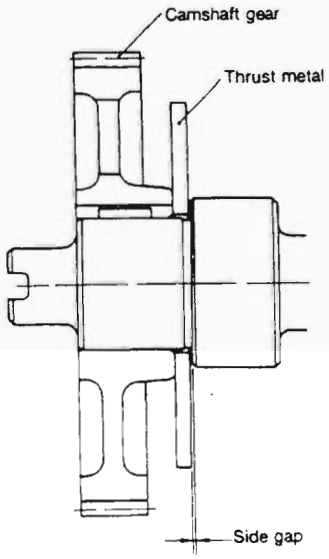
00.2.6 Camshaft and Tappets

6-1 Camshaft

The camshaft is normalized and the cam and bearing surfaces are surface hardened and ground. The cams have a curve that minimizes the repeated shock on the valve seats and maximizes valve seat life.



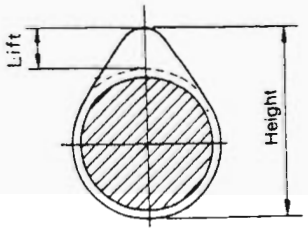
(1) Checking the camshaft side gap
The standard bearing near the end of the camshaft by the cam gear receives the load, resulting in rapid wear of the end of the bearing and enlargement of the side gap. Therefore, measure the thrust gap before disassembly. As the cam gear is shrink-fitted to the cam, be careful when replacing the thrust bear ing.



mm (in.)

	Standard	Wear limit
Camshaft side gap	*See separate service data (Page 2-32, 33)*	

(2) Measure the camshaft height, and replace the cam if it is worn beyond the limit.



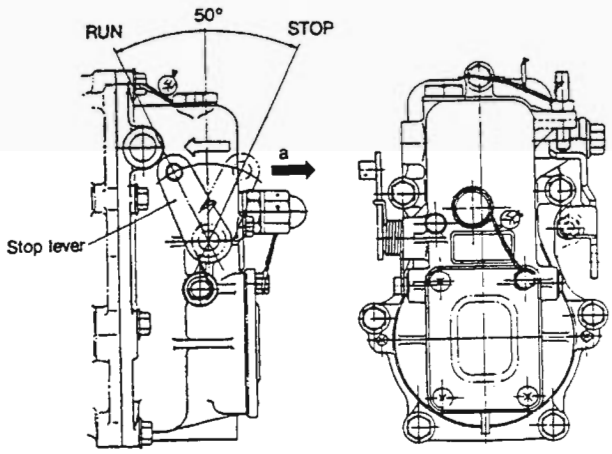
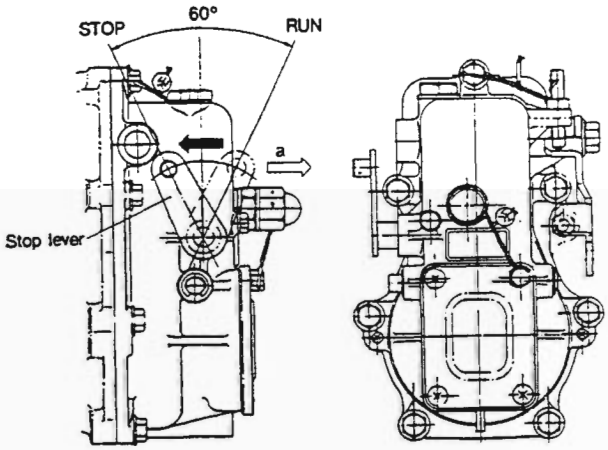
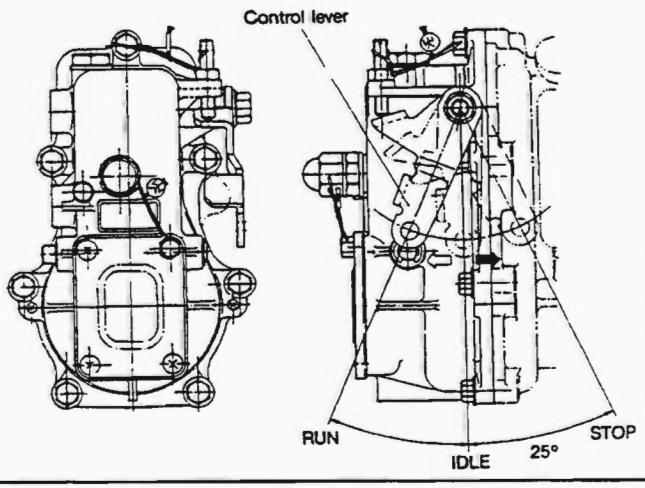
mm (in.)

Camshaft height	Standard	Wear limit
Intake cam	*See separate service data (Page 2-32, 33)*	
Exhaust cam		

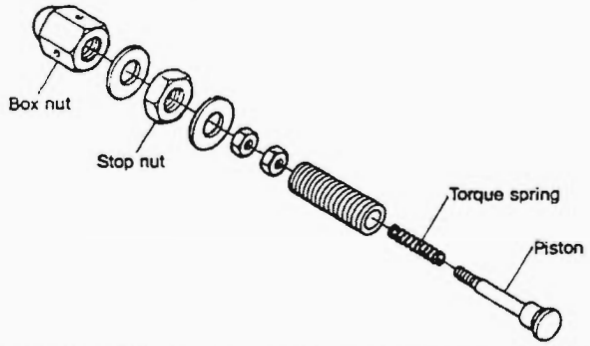
Timing gear				
Item		Unit	Standard	Wear limit
• Camshaft gear	No. of teeth		56	
	Face width		18	
	Helical angle		left	
	Backlash between		0.04 - 0.12	0.2
	camgear and idle gear		(0.0016 - 0.0047)	(0.0079)
• Idle gear	No. of teeth		43	
	Face width		18	
	Helical angle		right	
	Backlash between idle		0.04 - 0.12	0.2
	gear and crankshaft gear		(0.0016 - 0.0047)	(0.0079)
• Crankshaft gear	No. of teeth		28	
	Face width		40	
	Helical angle		left	
	Backlash between			
	crankshaft gear and		0.04 - 0.12	0.2
	oil pump gear		(0.0043 - 0.0075)	(0.0079)
• Lubricating oil pump gear	No. of teeth		29	
	Face width		8	
	Helical angle		right	
• Idle gear	No. of teeth		43	
	Face width		18	
	Helical angle		right	
	Backlash between idle		0.04 - 0.12	0.2
	gear and fuel injection		(0.0016 - 0.0047)	(0.0079)
	pump			
• Fuel injection pump gear	No. of Teeth		56	
	Face width		10	
	Helical angle		left	

(2) Engine stop device

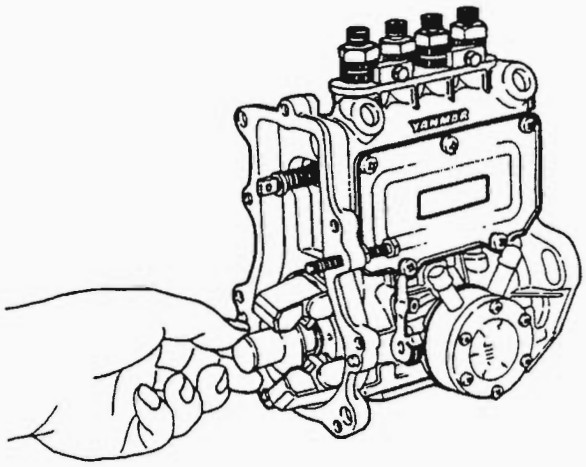
The stop lever can be operated by a push-pull cable, magnetic solenoid or a stop motor. The governor is equipped in one of three designs depending on the intended purpose.

A		The engine can be stopped by pulling the stop lever in direction A either manually or electrically with a: (1) Push-pull cable. (2) Stop motor. (3) Magnetic solenoid.
B		This method always requires an electromagnetic solenoid. The engine is started by pulling in direction toward A, which is opposite that in method A above. When the engine current ceases, the engine is stopped automatically by the solenoid return spring.
C		This is one lever control method has no stop lever. The engine is stopped only by returning the control itself from the idle position. (The idling adjustment mechanism must be installed outside of the governor.)

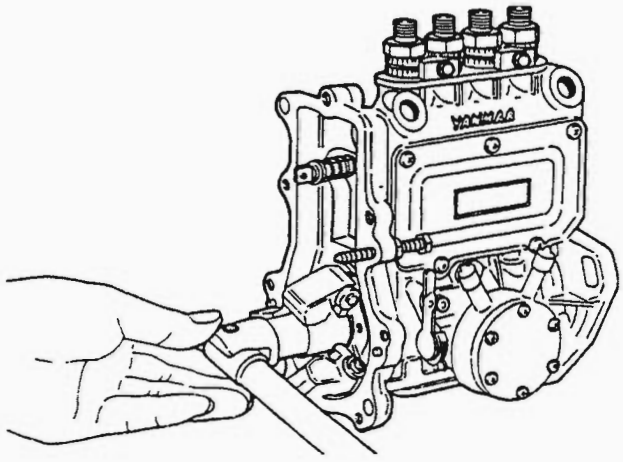
2. On models with torque springs, first remove the box nut and stop nut, and then the torque spring assembly.



(14) Pull out the governor sleeve on the end of the fuel camshaft by hand.

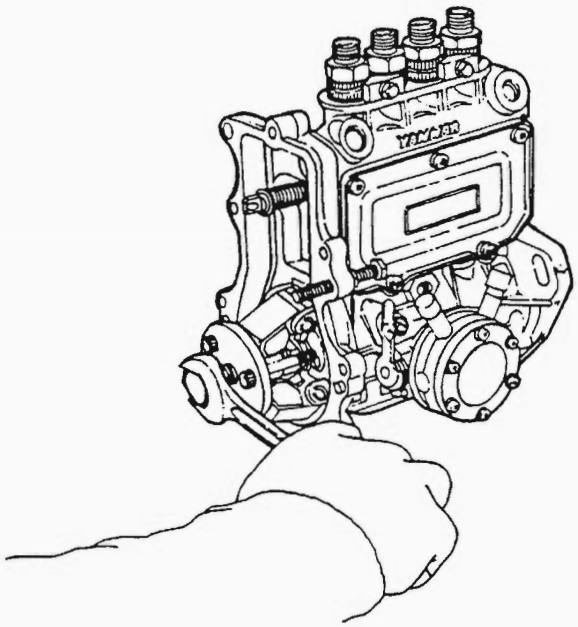


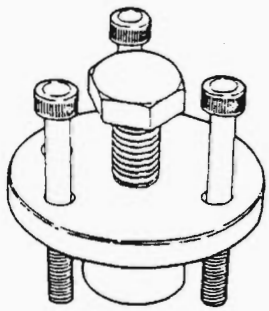
(15) Turn the governor weight with a box spanner two or three times to loosen it, stopping it with the hole in the fuel coupling ring or holding the coupling with a vise.

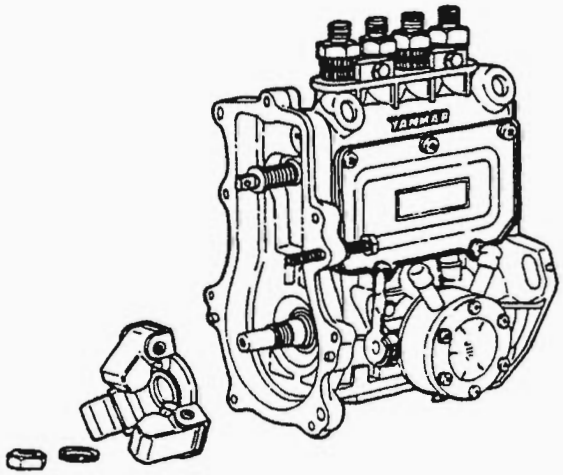


NOTE: When the taper fit comes apart after you have removed the nut, the governor weight may fly out --Be Careful.

(16) Remove the governor weight assembly from the fuel pump cam using the governor weight pulling tools.





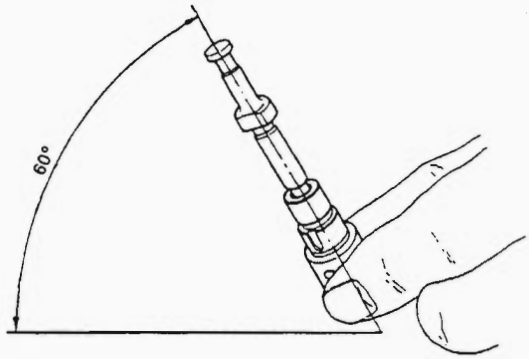


NOTE: The governor weight assembly is made up of the governor weight, support and pin. Do not disassemble.

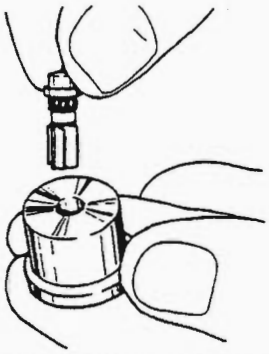
3-2 Inspection of fuel injection pump

(1) Inspection of plunger

1) Thoroughly wash the plungers, and replace plungers that have scratches on the plunger lead or are discolored.
2) The plunger is in good condition if it slides down smoothly when it is tilted about 60%. Repeat this several times while turning the plunger. Repair or replace if it slides down too quickly or if it stops part way.



(2) Inspection of delivery valve



1) Replace as a set if the delivery valve suck-back collar or seat is scratched, scored, scuffed worn, etc.
2) The valve is in good condition if it returns when released after being pushed down with your finger (while the holes in the bottom of the delivery guide seat are covered). Replace if necessary.
3) Likewise, the valve should completely close by its own weight when you take your finger off the holes in the bottom of the delivery guide sheet.

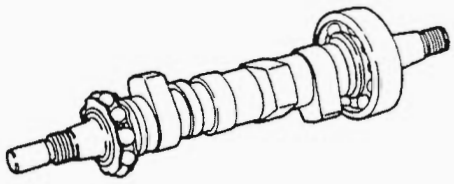
NOTE: When fitting new parts, wash with diesel oil and perform the above inspection.

(3) Inspection of pump

1) Inspect for extreme wear or roller guide sliding surface. Scratches on the roller pin sliding surface are not a problem.
2) Inspect the plunger barrel seat.
   If there are burrs or discoloration, repair or replace as this will lead to dilution of the lubricant.

(4) Inspection of fuel camshaft and bearings

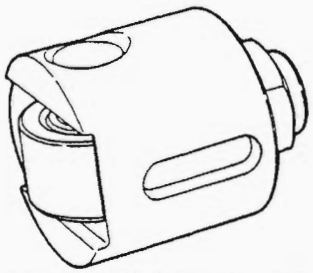
1) Fuel camshaft
   Inspect for scratches or wear of camshaft, deformation of key grooves and deformation of screws on both ends, and replace if necessary.
2) Bearings
   Replace if the taper rollers or outer race surface is flaked or worn.



NOTE: Replace fuel camshafts and bearings together.

(5) Inspection of roller guide assembly

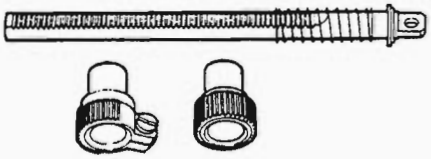
1) Roller



   Replace if the surface is worn or flaked.
2) Roller Guide
   Replace if the outer roller pin hole is extensively worn or there are many scratches.
3) Replace if the play of the roller guide assembly pin/roller is 0.2mm (0.0078in.) or more.
4) Injection timing adjustment bolt
   Replace if the surface in contact with the plunger side is unevenly or excessively worn.

(6) Inspection of rack and pinion

1) Rack



   Inspect for bending of rack and wear or deformation of fit with pinion.
2) Pinion
   Inspect for wear or deformation of fit with rack.

NOTE: If the tooth surface or sliding surface is not in good working order, rack resistance increases, affecting the condition of the engine (rough rpm, over running, etc.).

(7) Inspection of plunger spring and delivery spring

Inspect springs for scratches, cracks, breakage, uneven wear and rust.

(2) Measure the injection volume while lowering the governor control lever to the idling position, and adjust the position of the control lever with the idling adjustment bolt to bring it to specified valve.

Measuring stroke	*See separate service data (Page 3-51)*
Idling injection volume	

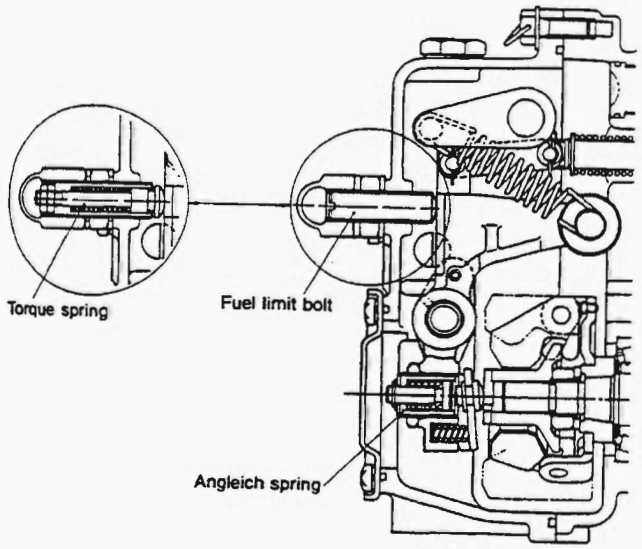
4-7.4 Check injection volume when starting

(1) Make sure the control rack moves smoothly while gradually reducing idling rpm.
(2) Next, fix the governor control lever at full load position with the pump at specified rpm (N_4). Make sure that control rack is at maximum rack position.
Measure the injection volume and check to make sure it is within the specified value.

Pump rpm (N_4)	200 rpm
Rack indicator scale	11.5 ~ 12.5mm (0.4527 ~ 0.4921in.)
Measuring stroke	1000st
Injection volume	*See separate service data (Page 3-51)*

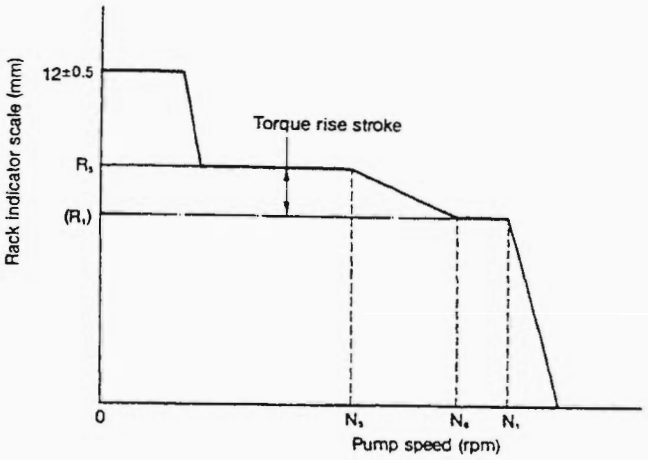
4-8 Adjustment of torque rise

There are some models which obtain torque rise with angleich and torque springs incorporated in the fuel injection pump as an injection volume increasing mechanism.



4-8.1 Models with angleich spring

For models with angleich spring, perform, this adjustment after finishing speed limit bolt adjustment.
(1) The angleich spring is used as an assembly.
(2) Bring the governor control lever to the full load position, and keep pump speed at the specified peak torque (N_5).
(3) Remove governor case cover in this state and screw angleich spring assembly to tension lever. Screw in from contact position with governor lever (when control lever starts to move), so that injection volume at torque rise is within specified values (0 deg.)



(4) After completing above, tighten lock nut to specified torque, and mount governor case cover.

kg-m (lb-ft)

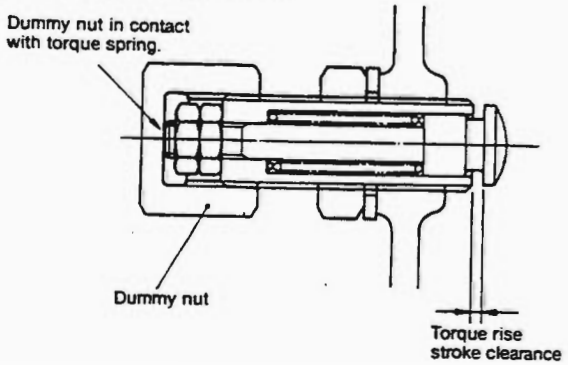
Lock nut tightening torque	2.5 ~ 3.0 (18.08 ~ 21.69)

NOTE: Make sure that the angleich bolt does not turn with the locknut when tightening it.

(5) Bring fuel injection pump to rated speed again, make sure that control rack smoothly displaces torque rise stroke, and that rack position (R_1) and injection value are with inspecified value at (N_1) rpm.

4-8.2 Models with torque spring

The torque rise spring is corporated in the fuel limit bolt, and is used as an assembly.



Use the dummy nut during adjustment as shown in fig., without torque rise stroke, and remove it after completing adjustment.

Check injection stop
Drive the pump at rated rpm (N_1) and standard rack position (R_1) with governor control lever at full load position, operate the stop lever on the back of the governor case, and make sure that injection to all cylinders is stopped.

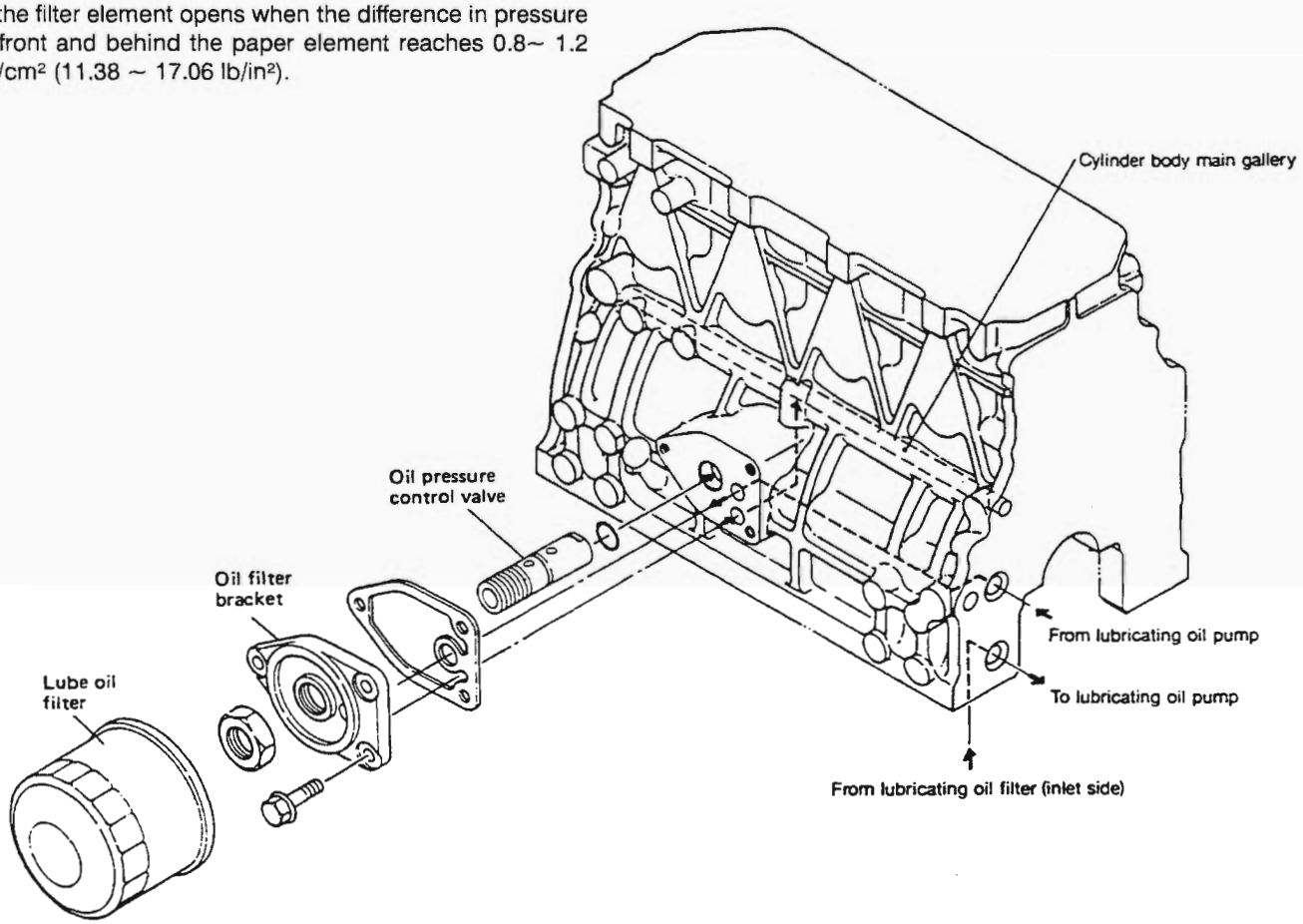
NOTE: Be sure to remove the rack fixing bolt when doing this.

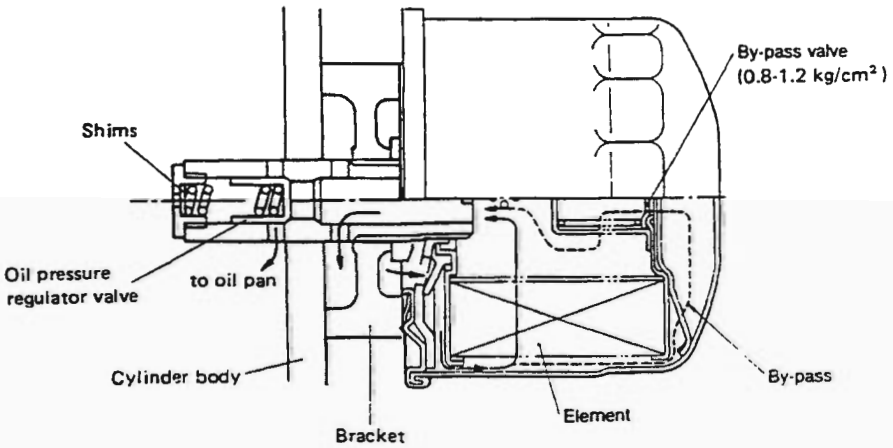
Fault		Cause	Remedy
3. Engine's output is insufficient.	Defective injection timing, and other failures.	(1) Knocking sounds caused by improper (too fast) injection timing.	Inspect ans adjust
		(2) Engine overheats or emits large amount of smoke due to improper (too slow) injection timing.	Inspect and adjust
		(3) Insufficient fuel delivery from feed pump.	Repair or replace
	Nozzle movement is defective	(1) Case nut is loose	Inspect and retighten
		(2) Defective injection nozzle performance.	Repair or replace nozzle
		(3) Nozzle spring is broken.	Replace
		(4) Excessive oil leaks from nozzle.	Replace nozzle assembly
	Injection pump is defective	(1) Max. delivery limit bolt is screwed in too far.	Adjust
		(2) Plunger is worn.	Replace
		(3) Injection amount is not uniform.	Adjust
		(4) Injection timings are not even.	Adjust
		(5) The 1st and 2nd levers of the governor and the control rack of the injection pump are improperly lined up.	Repair
		(6) Delivery stopper is loose.	Inspect and retighten
		(7) Delivery packing is defective.	Replace packing
		(8) Delivery valve seat is defective.	Repair or replace
		(9) Delivery spring is broken.	Replace
4. Idling is rough.		(1) Movement of control rack is defective.	
		1) Stiff plunger movement or sticking.	Repair or replace
		2) Rack and pinion fitting is defective.	Repair
		3) Movement of governor is improper.	Repair
		4) Delivery stopper is too tight.	Inspect and adjust
		(2) Uneven injection volume.	Adjust
		(3) Injection timing is defective.	Adjust
		(4) Plunger is worn and fuel injection adjustment is difficult.	Replace
		(5) Governor spring is too weak.	Replace
		(6) Feed pump can't feed oil at low speeds.	Repair or replace
		(7) Fuel supply is insufficient at low speeds due to clogging of fuel filter.	Disassemble and clean, or replace element
5. Engine runs at high speeds, but cuts out at low speeds.		(1) The wire or rod of the accelerator is caught.	Inspect and repair
		(2) Control rack is caught and can't be moved.	Inspect and repair
6. Engine doesn't reach max. rpm.		(1) Governor spring is broken or excessively worn.	Replace
		(2) Injection performance of nozzle is poor.	Repair or replace
7. Loud knocking.		(1) Injection timing is too fast or too slow.	Adjust
		(2) Injection from nozzle is improper. Fuel drips after each injection.	Adjust
		(3) Injection nozzle starting pressure is too high.	Adjust
		(4) Uneven injection.	Adjust
		(5) Engine overheats or insufficient compression.	Repair
8. Engine emits too much smoke.	When exhaust smoke is black:	(1) Injection timing is too fast.	Adjust
		(2) Air volume intake is insufficient.	Inspect and repair
		(3) The amount of injection is uneven.	Adjust
		(4) Injection from nozzle is improper.	Repair or replace
	When exhaust smole is white:	(1) Injection timing is too slow.	Adjust
		(2) Water is mixed in fuel.	Inspect fuel system, and clean
		(3) Shortage of lube oil in the engine.	Repair
		(4) Engine is over-cooled.	Inspect

00.4.3 Lube Oil Filter & Oil Pressure Control Valve

3-1 Lube oil filter construction

The lube oil filter is a full-flow paper element type, mounted to the side of the cylinder body with the filter bracket. It is an easy to remove cartridge type filter.
To prevent seizure in the event of the filter clogging up, a bypass circuit is provided in the oil filter. The bypass valve in the filter element opens when the difference in pressure in front and behind the paper element reaches 0.8~ 1.2 kg/cm² (11.38 ~ 17.06 lb/in²).





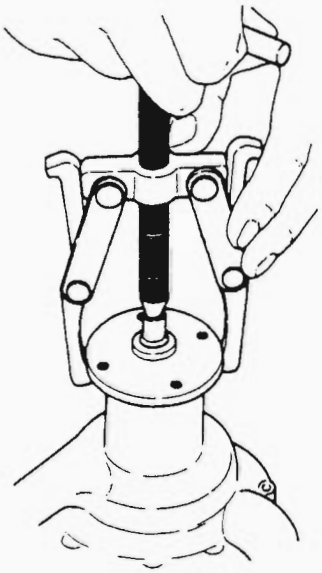
5-2 Water pump disassembly

(1) Remove the water pump
(2) Remove the impeller using a gear puller.

Removing impeller

(3) Remove the mechanical seal.
(4) Remove the fan pulley flange using a gear puller.

Removing pulley flange



(5) Remove the snap ring.
(6) Press the pump shaft and bearing assembly out from the impeller end to the fan pulley end.
(7) Reassemble in the reverse order of disassembly.
(8) Install the water pump.

2-3 Adjustment and performance test

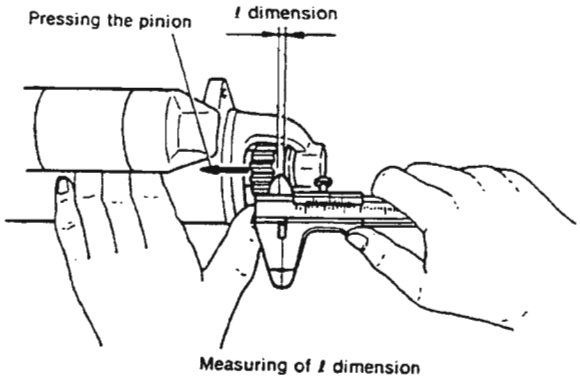
2-3.1 L-size measurement (gap between pinion and pinion stopper)

[Conventional starter motor]

When the pinion is at the projected position, measure gap between pinion and pinion stopper. This check should be made with the pinion pressed back lightly to take up any play in the engagement linkage.

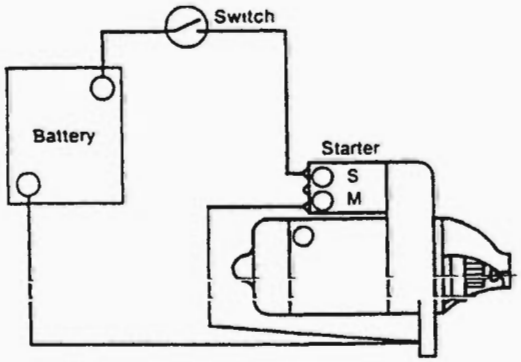
mm (in.)

Starter motor	ℓ dimension
See separate service data (Page 7-38)	



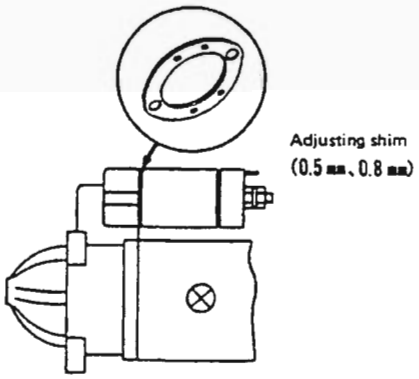
2-3.2 Pinion movement

After complete assembly of the starter motor, connect up the motor as in following figures.



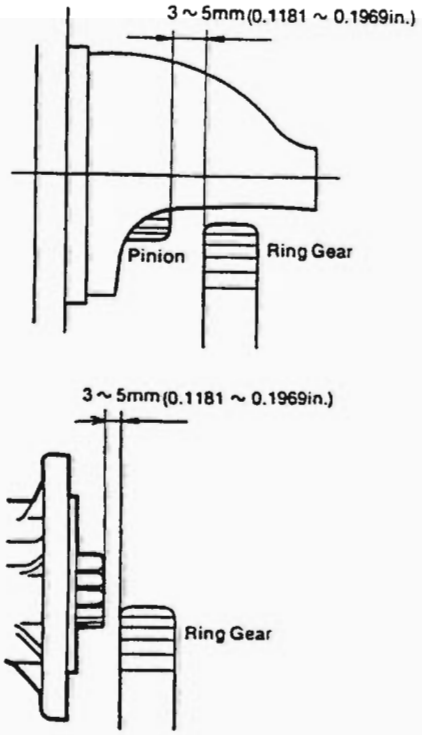
2-3.3 Plunger movement

Adjustment made by adjusting stroke of magnetic plunger to the prescribed value. Adjust the ℓ dimension installing shim (Adjust plate) at the magnetic switch section.
There are two kind of shim [Thickness 0.5 mm (0.0197 in.), 0.8mm (0.0315 in.)]



2-3.4 Mesh clearance

Mesh clearance is the distance between the flywheel ring gear and starter motor pinion in the rest position. This clearance should be between 3mm (0.1181in.)to 5mm (0.1969in.).



00.7.3 Charging Equipment

[A] Alternator (12V-20A/12V-35A)

The alternator serves to keep the battery constantly charged. It is installed on the cylinder block by a bracket, and is driven from the V-pulley at the end of the crankshaft by a V-belt.

The type of alternator used in this engine is ideal for high speed engines with a wide range of engine speeds. It contains diodes that convert AC to DC, and an IC regulator that keeps the generated voltage constant even when the engine speed changes.

3-1 Features

The alternator contains a regulator using an IC, and has the following features.

(1) The IC regulator is self-contained, and has no moving parts (mechanical contact points). It therefore has superior features such as freedom from vibration, no fluctuation of voltage during use, and no need for readjustment.
Also, it is of the over-heating compensation type and can automatically adjust the voltage to the most suitable level depending on the operating temperature.

(2) The regulator is integrated within the alternator to simplify external wiring.

(3) It is an alternator designed for compactness, lightness of weight, and high output.

(4) A newly developed U-shaped diode is used to provide increased reliability and easier checking and maintenance.

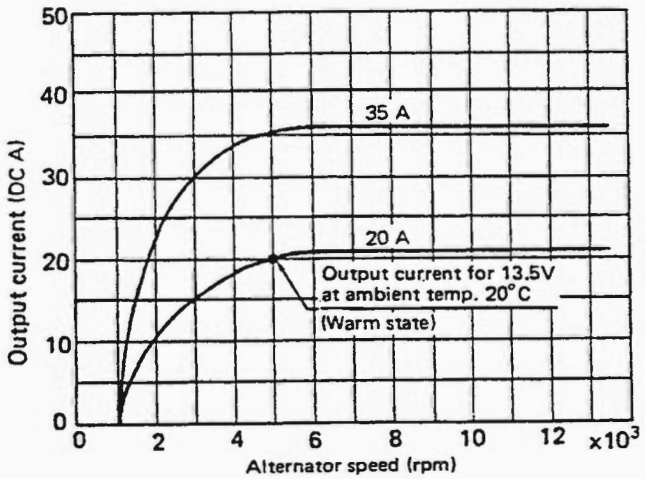
3-2 Specifications

Model of alternator	LR120 - 15C	LR135 - 91
Model of IC regulator	TRIZ - 63	TRIZ - 63
Battery voltage	12 V	12 V
Nominal output	12 V / 20 A	12 V / 35 A
Earth polarity	Negative earth	Negative earth
Direction of rotation (Viewed from pulley end)	Clockwise	Clockwise
Weight	3.4 kg	3.5 kg
Rated speed	5000 rpm	5000 rpm
Operating speed	1000 - 13500	1000 - 13500
Speed at 13.5 V	1000 or less	1000 or less
Output current at 20°C	over 20 A	35 ± 2 A
Regulated voltage	14.5 ± 0.3 V (Standard temperature voltage gradient, -0.01/°C)	
Permissible ambient	-30°C- +80°C (-22°F - 176°F)	

Pulley ratio

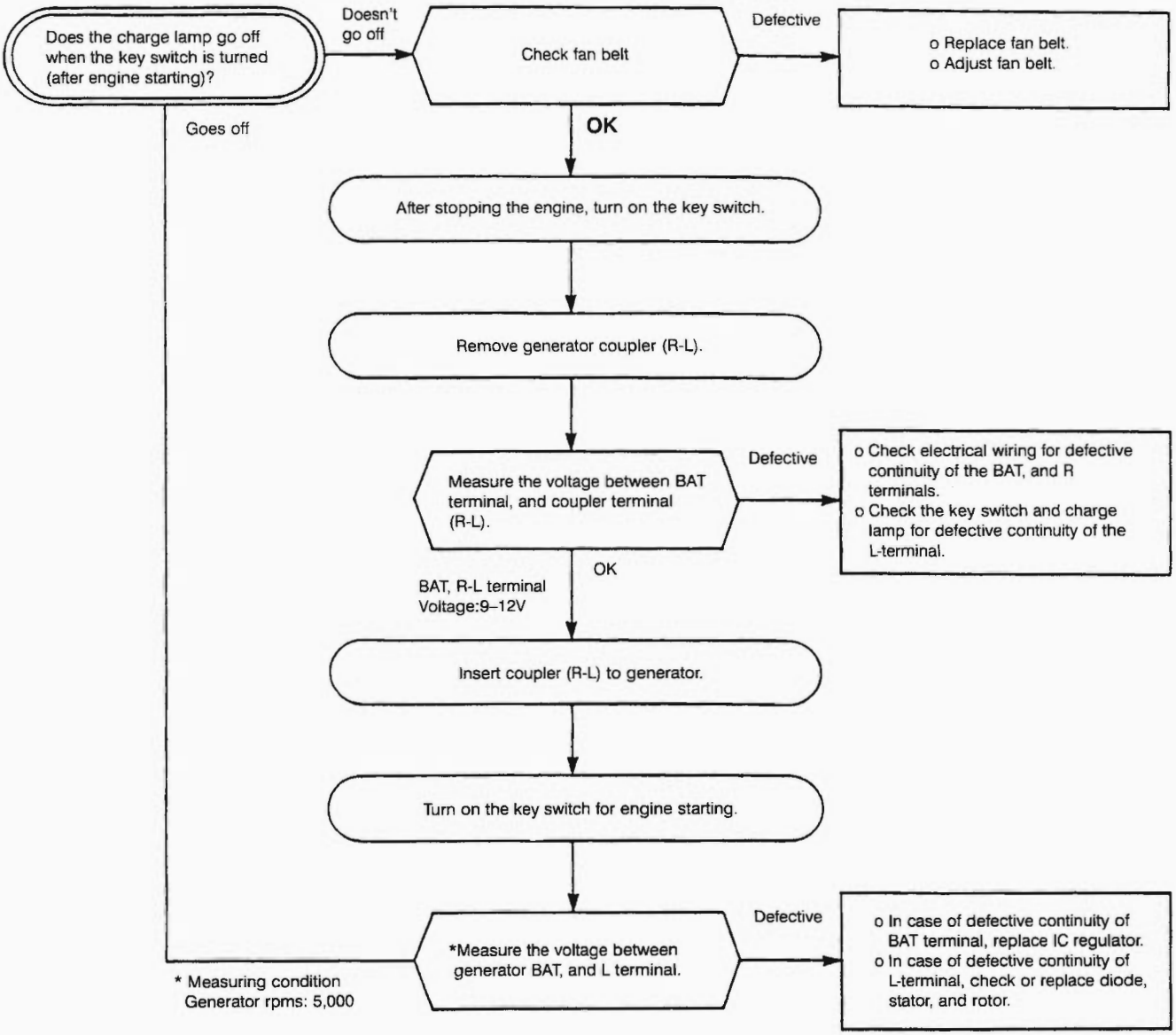
Specification		Pulley ratio
4TN84E	G1	1.76

3-3 Characteristics

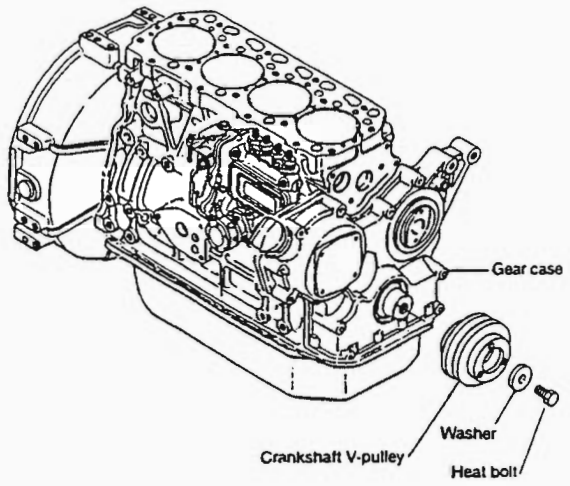


3-11 Troubleshooting

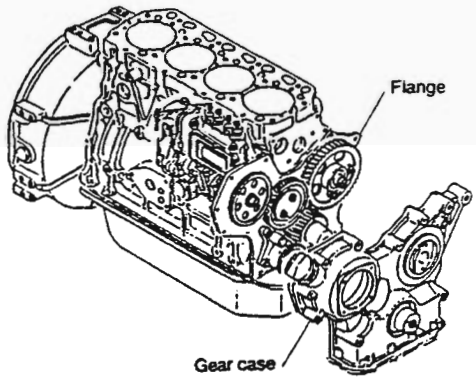
(1) Charging failure



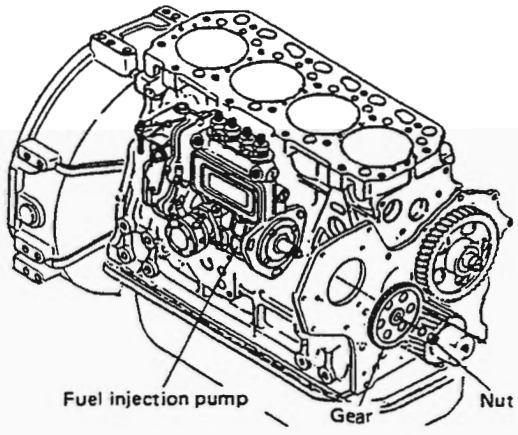
(16) Removing the crankshaft V-pulley
Remove the hex bolts holding the crankshaft V-pulley, and remove the crankshaft V-pulley with an extraction tool.



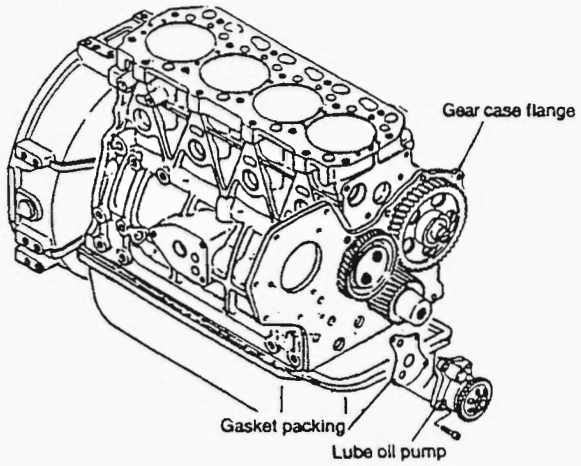
(17) Removing the gear case
Remove the gear case mounting bolts, and remove the gear case from the cylinder block.



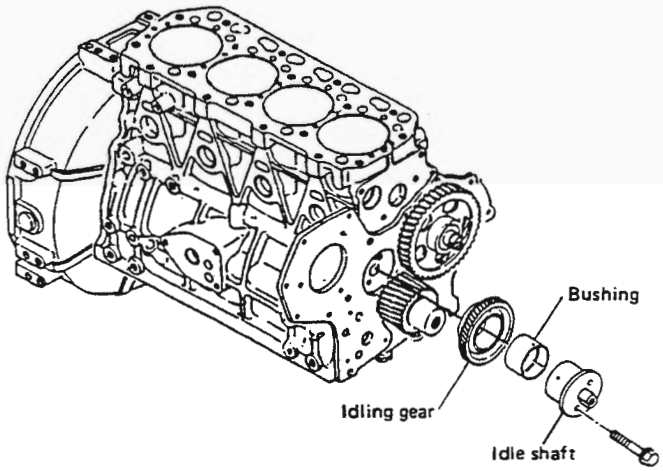
(18) Removing the fuel injection pump
1) Remove the nut, and pull out the fuel injection pump driving gear with an extraction tool.
2) Remove the fuel injection pump and O-ring from the gear case flange.



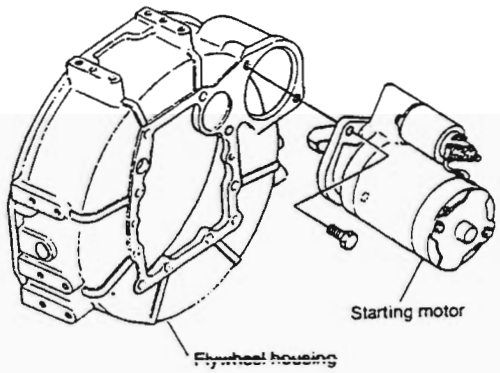
(19) Removing the lube oil pump
Remove the lube oil pump and gasket packing from the gear case flange.

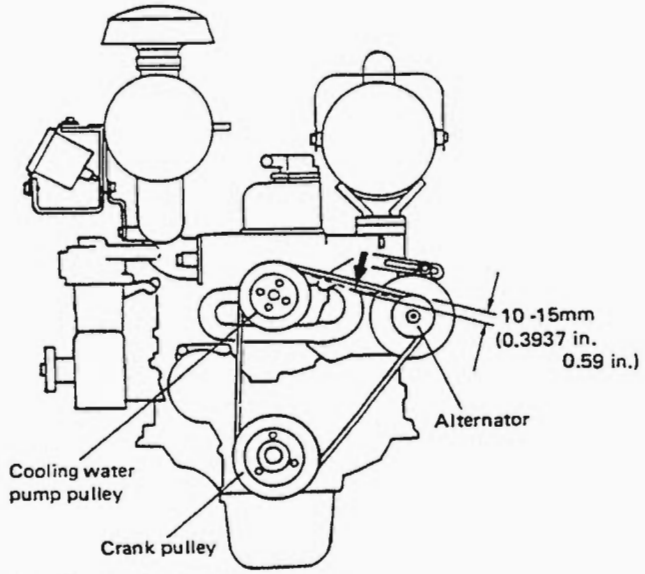


(20) Removing the idling gear
Remove the two hex bolts holding the idling shaft, and pull out the idling gear and idling shaft.



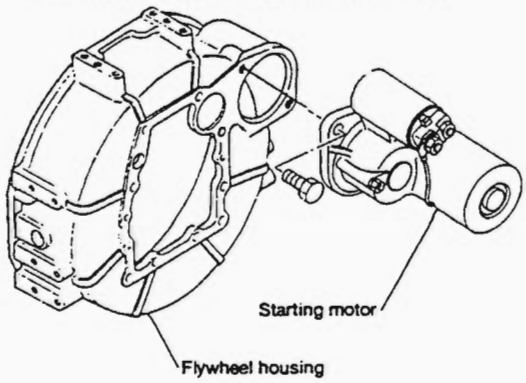
(21) Removing the starting motor
Remove the starting motor from the flywheel housing.





(25) Mounting the starting motor

Fit the starting motor in the flywheel housing.



(26) Mounting the fuel oil filter & fuel oil pipe

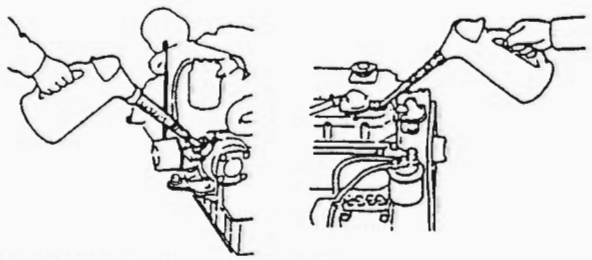
(27) Mounting the turbocharger

(28) Filling with lube oil

Fill the engine with lube oil from the filter port on top of the gear case.

l (in.^{3})

Lube oil capacity	See separate service data (Page 1-2)

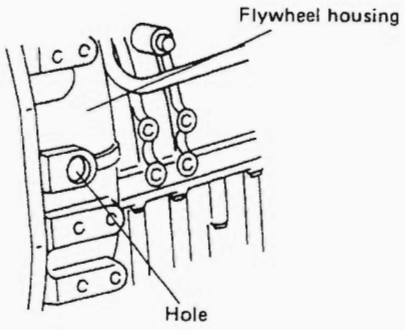


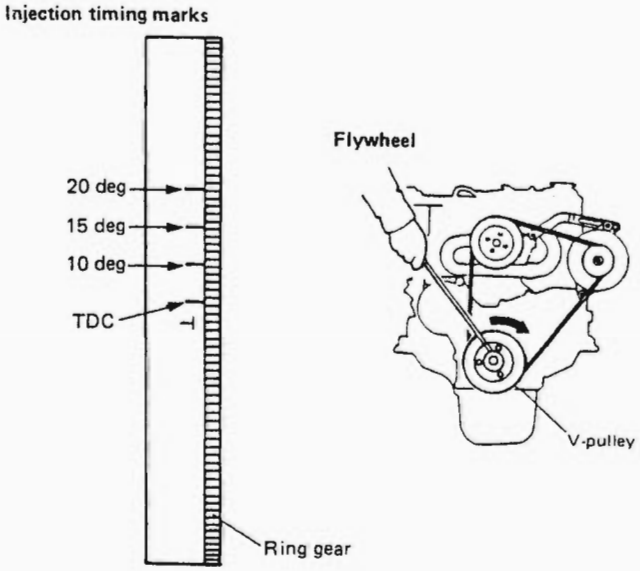
(29) Filling with cooling water

1) Open the radiator cap and fill with water.
2) Fill with water until the level in the sub tank is between the full and low marks.

(30) Check the fuel injection timing

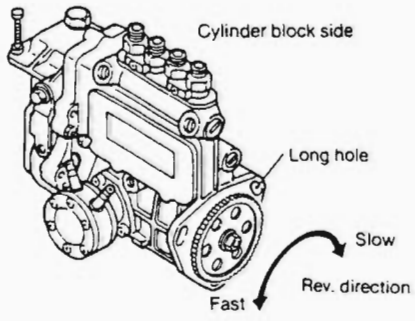
1) Check injection timing by turning the flywheel and looking through the inspection hole in the flywheel housing.





2) If injection timing is off, change the mounting position using the long hole in the injection pump mounting flange.
Turning the fuel feed pump towards the cylinder block slows timing down, while movement in the other direction makes it faster.

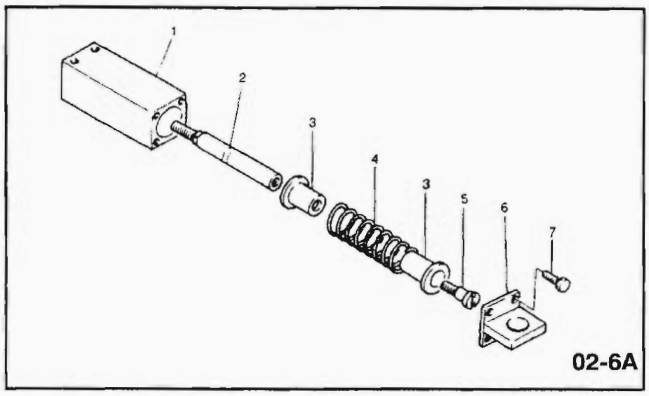
Fuel injection timing (FID)	See separate service data (Page 1-2)



Unit	To convert	Into	Multiply by	Reference
Pressure and stress	kgf/cm^2	Bar	0.98066	1 at = 1 kgf/cm^2
	kgf/cm^2	N/m^2 (Pa)	98066.5	1 Pa = 1 N/m^2
	kgf/cm^2	$lbf/in.^2$	14.2233	10 m H_2O = 1 kgf/cm^2
	$lbf/in.^2$	Bar	0.0689	1 mmHg = 1 Torr
	$lbf/in.^2$	N/m^2 (Pa)	6894.76	
	Bar	kgf/cm^2	1.01972	
	N/m^2 (Pa)	kgf/cm^2	1.0197×10^{-5}	
	$lbf/in.^2$	kgf/cm^2	0.07031	
	Bar	$lbf/in.^2$	14.5037	
	N/m^2 (Pa)	$lbf/in.^2$	1.4504×10^{-4}	
Energy	J	kcal	238.8×10^{-6}	
	J	kwh	277.8×10^{-9}	
	J	BTU	$947.8\ 10^{-6}$	
	kcal	BTU	3.9683	
	BTU	kcal	0.252	
Work	kgf-m	N-m	9.80665	
	lbf-ft	N-m	1.356	
	kgf-m	lbf-ft	7.233	
	lbf-ft	kgf-m	0.138	
	N-m	kgf-m	0.102	
	N-m	lbf-ft	0.738	
Power	kw	PS	1.3596	1PS = 75 kg-m/sec
	kw	HP	1.3410	1HP = 550 lb-ft/sec
	PS	kw	0.7355	
	HP	kw	0.7457	
	PS	HP	0.98632	
	HP	PS	1.01387	
Velocity	m/sec	ft/min	196.86	
	ft/min	m/sec	0.0051	
	km/h	mile/h	0.62137	
	mile/h	km/h	1.09361	
Acceleration	m/sec^2	ft/sec^2	3.281	
	ft/sec^2	m/sec^2	0.3048	
Fuel consumption	g/PS-h	g/kw-h	1.3596	
	g/HP-h	g/kw-h	1.3410	
	lb/PS-h	g/kw-h	599.96	
	lb/HP-h	g/kw-h	608.277	
	g/kw-h	g/PS-h	0.7355	
	g/kw-h	g/HP-h	0.7457	
	g/kw-h	lb/PS-h	0.00167	
	g/kw-h	lb/HP-h	0.00164	
Temperature	° C	° F	C = 5/9 (F - 32)	
	° C	K (Kelvin)	C = K - 273.15	
	° F	° C	F = 1.8 x C + 32	
	° F	° R (Rankine)	F = R - 459.67	
	K	° C	K = C + 273.15	
	° R	° F	R = F + 459.67	

01 Fuel System

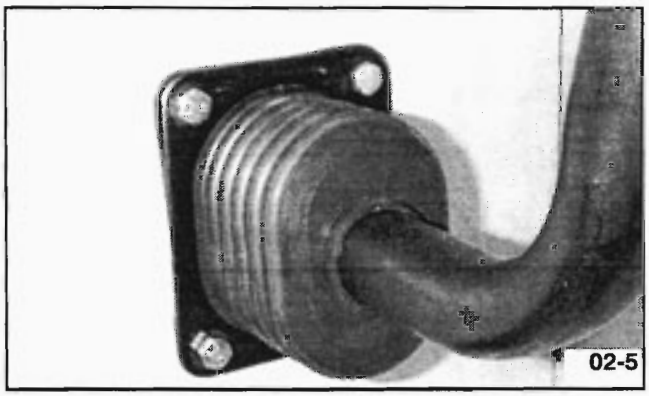
2-3.3 Disassemble the centering control assembly.



1) Housing
2) Rod
3) Guide
4) Spring
5) Bolt
6) Cover
7) Bolt M6-1.0x14 10.9 YZ

1) Refer to the exploded view and parts list above.

2-3.4 Remove the drive control lever assembly. (Do for each side.)



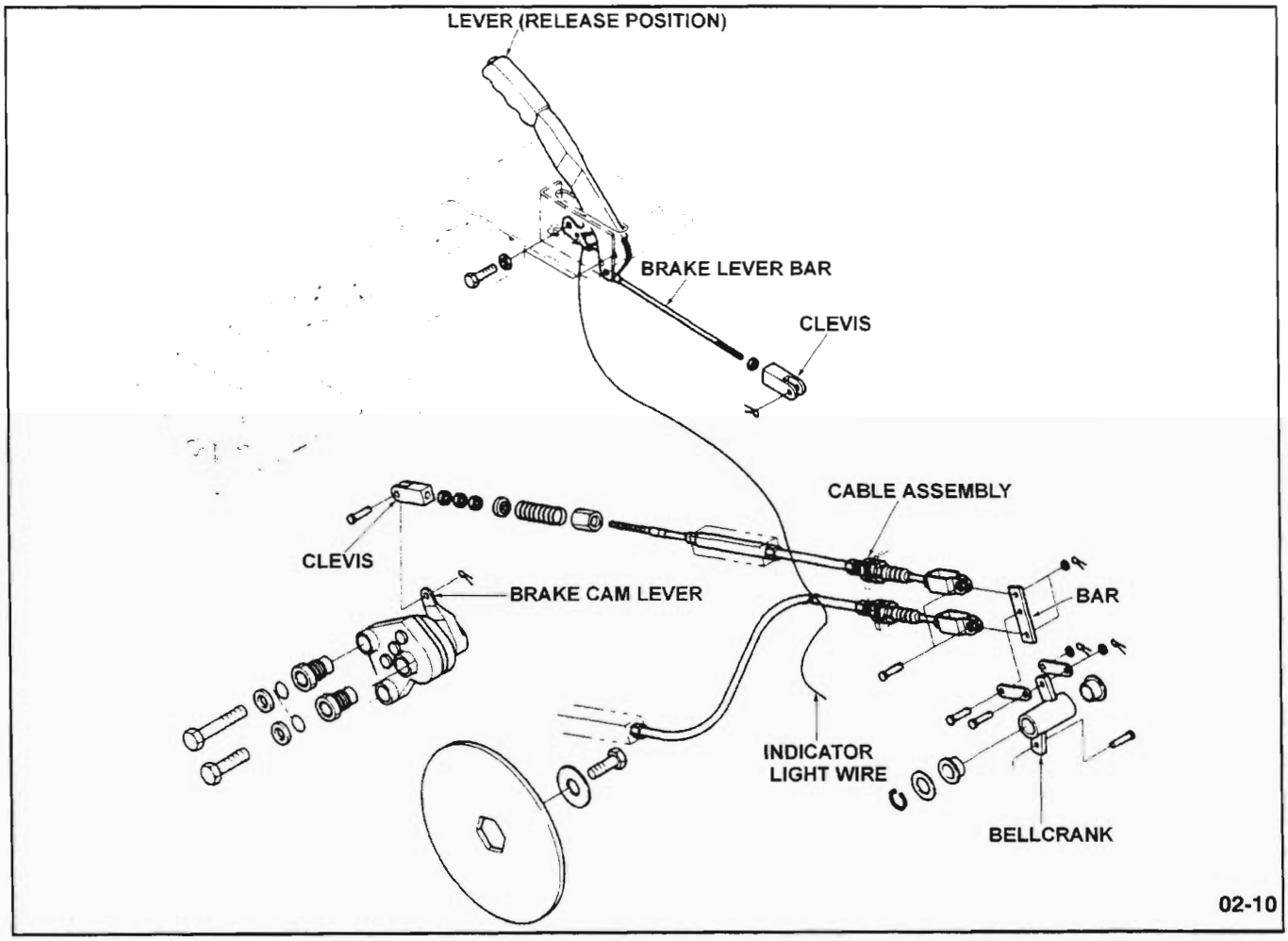
1) Remove the two nuts, washers, and bolts that mount the end of the shaft assembly to the upper plate.
2) Remove the 4 bolts that mount the boot and plate to the upper plate. Work the boot and plate back through the hole in the upper plate.
3) Free the lever assembly from the "U" bracket on the upper plate and pull the handle out through the hole.

2-10 Parking brake system installation and adjustment - earlier models

⚠ WARNING

Function and adjustment of the parking brake should be checked on a routine basis to maintain proper operation at all times.

2-10.1 Install and adjust the bottom of the cable assembly (at the parking brake).



1) With the forward chain case covers removed, feed the cable assembly into the frame and install the spacer, spring, spring guide and set nuts.
2) Screw the clevis onto the end of the cable approximately 12mm of thread depth.
3) Attach the clevis to the parking brake cam lever with the clevis pin and cotter pin.
4) Adjust the spring length at the cable end by rotating the adjustment nut. Spring length should be:
   RH assembly = 65mm
   LH assembly = 60mm

Check that the actuating arm on the caliper is in contact with the actuating pins on the caliper. If the arm does not contact the pins, loosen the lock nut on the cable clevis. Loosen the spring retaining nut to relieve spring tension on the cables. Remove the clevis pin from the cable clevis and remove the cable from the actuating arm. Align the arm to the initial point of contact with the pins and align the cable clevis to to the proper position by rotating the threaded portion of the cable. Install the clevis pin and tighten the lock nut.

2-10.2 Install and adjust the upper cable assemblies.

See illustration at 2-10.1.

1) Connect the wire for the parking brake indicator light at the in-line connector. Tie the wire to the brake cable with a new cable tie strap.
2) Attach the clevis to the cable end with the washer and split pin.
3) With the clevis pins and cotter pins, attach the bar to the clevis and to the link, then attach the link to the bellcrank.

03.2 Power Train Disassembly and Assembly

Before Removing any power train system components (except when removing only wheels and tires), drain the oil from the chain case. See the Periodic Maintenance section of this manual for the correct procedure.

The following procedures are presented in the order required to disassemble the entire power train system.

2-1 Power train disassembly

2-1.1 Remove wheels and tires.

⚠ WARNING

Be sure the skid steer loader is on a level surface before removing wheels and tires.

1) Lift the frame and support it with jack stands so that the tires are off the ground.
2) Support the tire and remove the hub nuts.
3) Lift the wheel and tire by the rim and pull it free of the wheel studs.

2-1.2 Remove the chain case covers.

⚠ WARNING

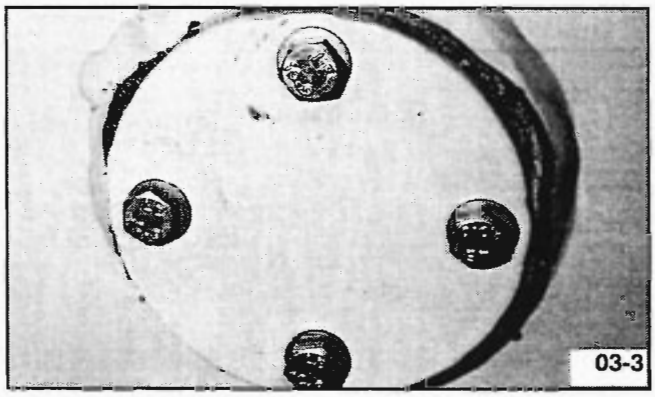
Be sure the canopy lock is securely latched whenever the canopy is in the raised position. Failure to lock the canopy securely may result in injury or death.

1) Raise and securely lock the canopy.
2) Remove the upper covers and gaskets.
3) Remove the round covers and gaskets on the outside frame, opposite the hydraulic motors.

2-1.3 Remove the parking brake components.

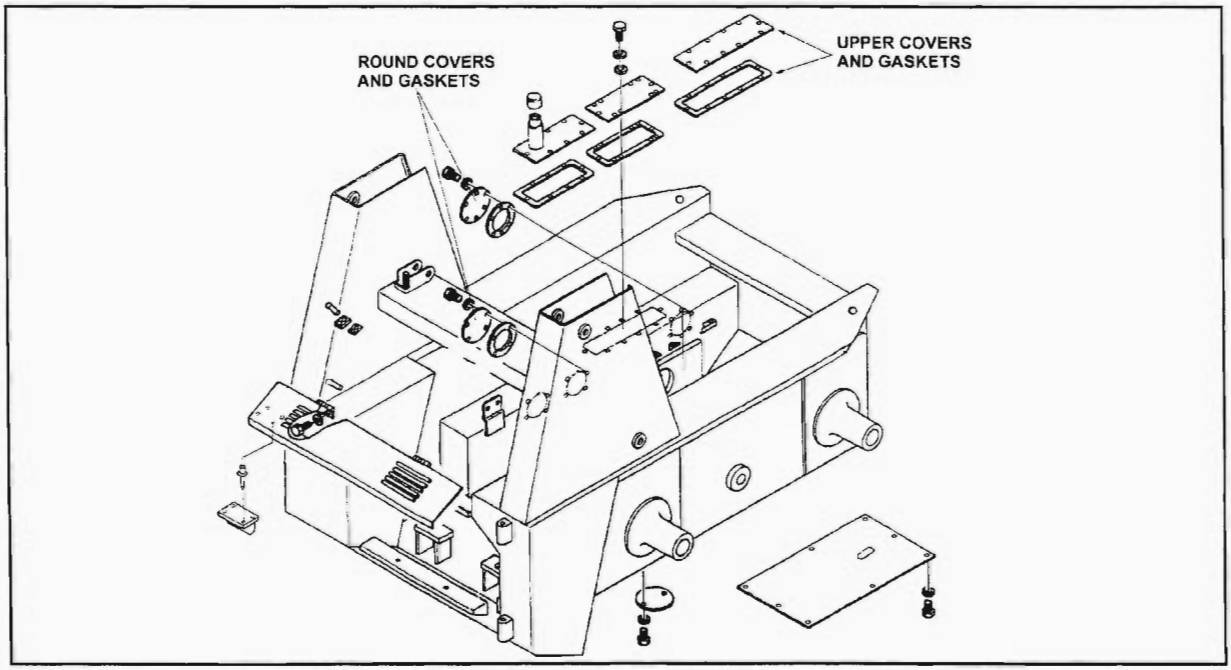
1) Follow the procedures under **Parking Brake System Removal** in section **02 Control System**.

2-1.4 Remove the disk and motor sprocket.



1) Working through the round access cover opening, remove the bolt and washer from the motor sprocket.

2) Remove the disk from the motor sprocket, then remove the motor sprocket.



04.1 General

1-1 Hydraulic system

The HYDRAULIC CHARGE PUMP is directly connected to the hydrostatic pump. It draws hydraulic oil from the HYDRAULIC TANK and "charges" the hydraulic system with hydraulic power converted from engine power.

From the hydraulic charge pump, hydraulic oil is sent under pressure to the CONTROL VALVE. Spools in the control valve, operated by the drive control levers and control pedals, distribute the oil to actuating devices – BOOM CYLINDERS, BUCKET CYLINDERS, and AUXILIARY EQUIPMENT.

Return oil from actuating devices is sent to the OIL COOLER and HYDRAULIC FILTER, then on to the HYDROSTATIC (HST) PUMP.

Various HYDRAULIC LINES carry hydraulic oil between the control valve, oil cooler, filter, and actuating devices.

1-2 Hydrostatic (HST) system

Through its manual control mechanisms, the HST PUMP sends oil to the left and right side HST MOTORS. The HST PUMP drives the HST MOTORS forward or reverse according to the position of the drive control levers.

From the HST MOTORS, oil is returned to the HYDRAULIC TANK through the DRAIN RELIEF VALVE, which controls the drain flow.

Various HYDROSTATIC LINES, both metal tubing and hose, carry hydraulic oil between the HST PUMP and the HST MOTORS.

04.3 Troubleshooting

3-1 Test Equipment

The following items should be sufficient to allow you to perform most troubleshooting operations on the DSL 601 hydraulic system.

- Pressure gauges:
  10,000 PSI (600 BAR)
  1000 PSI (60 BAR)
- Fittings:
  1-1/16-12 o-ring
  9/16-18 o-ring
  7/16-20 o-ring
- DSL 601 Hydraulic Schematic

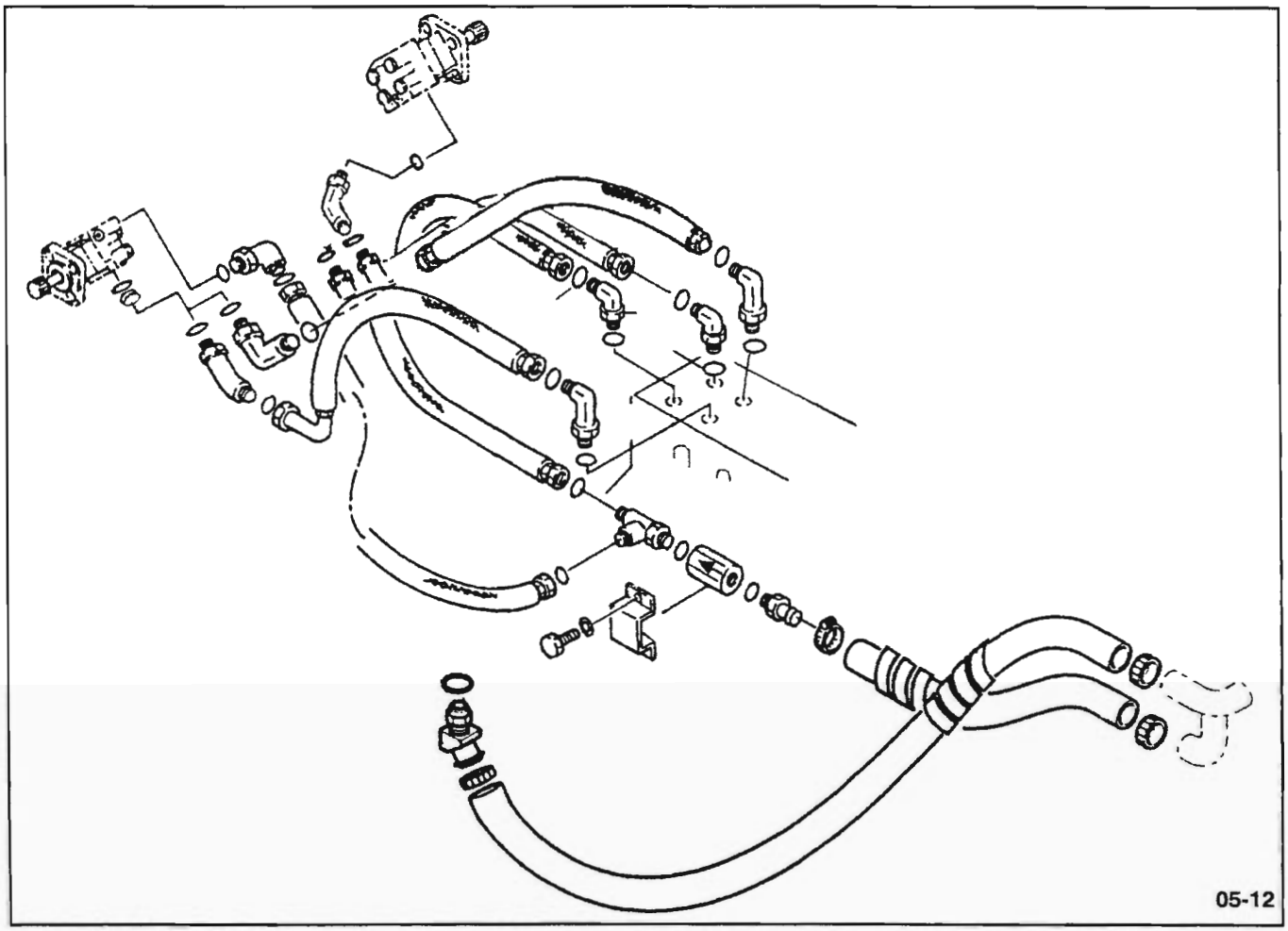
2-5 Hydrostatic (HST) lines

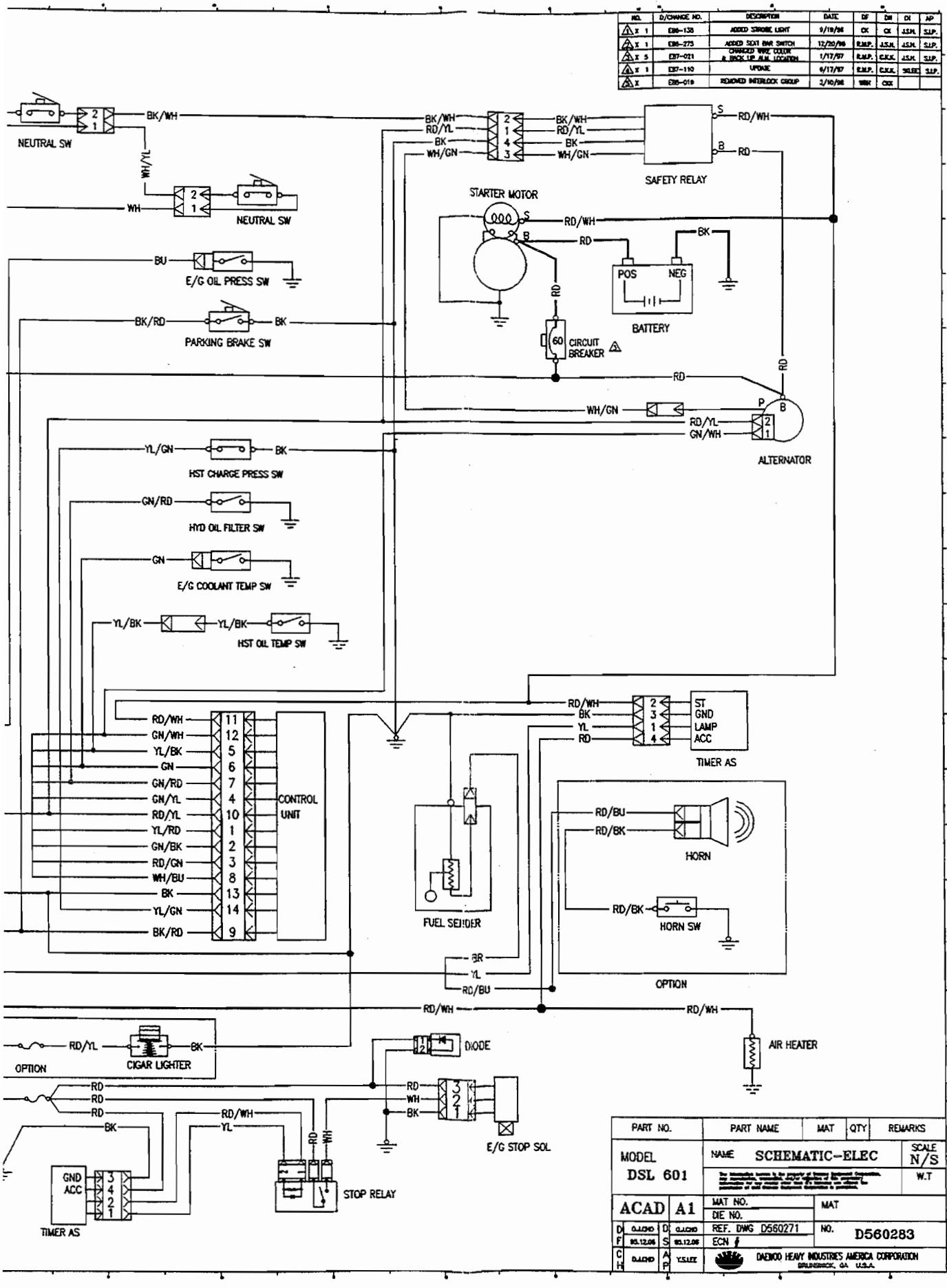
The HST tubing lines and hoses are routed among components as listed below. Hoses attach by worm-drive clamps. Hex-head fittings on tubing lines, connectors, tees, and elbows contain o-ring seals. When removing HST hoses, be sure to note placement of any coiled hose protectors. These must be located in the same place on the hoses at installation.

Hoses and tubing lines include:

- Hose from drain relief valve tee to hydraulic oil tank
- Hoses from drain relief valve to HST motors
- 2 hoses from HST pump to HST motor (L.H.)
- 2 hoses from HST pump to HST motor (R.H.)

For reference, see the Hydrostatic Lines section of the **DSL 601 Parts Manual.** Refer to the Fitting Installation information in section **10 General Information/Misc-ellaneous** for standard torque specifications.

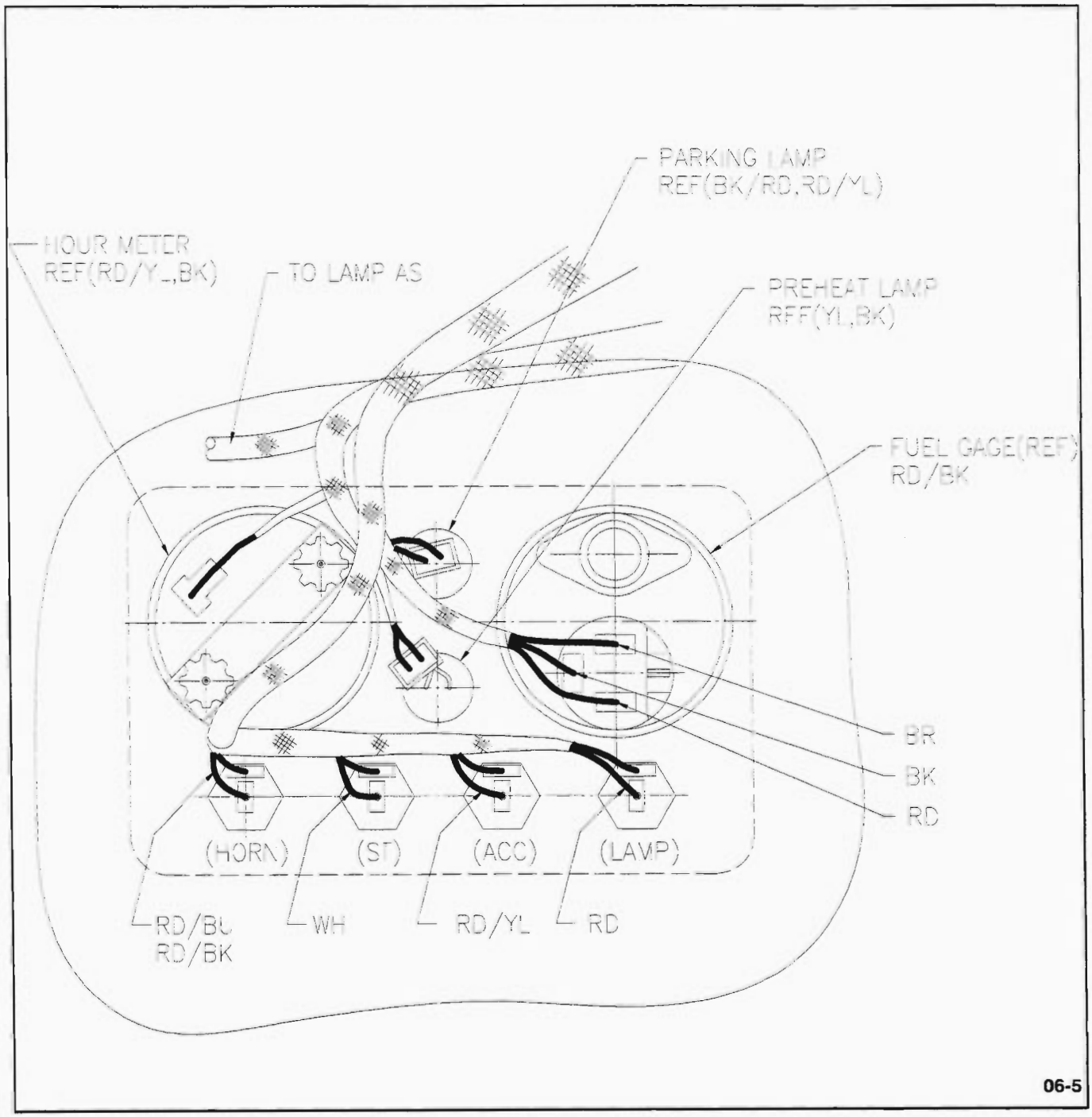




NO.	D/CHANGE NO.	DESCRIPTION	DATE	DF	DH	CH	AP
1 X 1	E98-135	ADDED STROBE LIGHT	9/19/96	CK	CK	J.S.H.	S.J.P.
2 X 1	E96-275	ADDED SEAT BAR SWITCH	12/20/96	R.M.P.	J.S.H.	J.S.H.	S.J.P.
3 X 5	E97-021	CHANGED WIRE COLOR & BACK UP ALM. LOCATION	1/17/97	R.M.P.	C.K.K.	J.S.H.	S.J.P.
4 X 1	E97-110	UPDATE	6/17/97	R.M.P.	C.K.K.	SELEC	S.J.P.
5 X	E96-019	REMOVED INTERLOCK GROUP	2/10/98	WBK	CKK		

PART NO.	PART NAME	MAT	QTY	REMARKS
MODEL DSL 601	NAME SCHEMATIC-ELEC			SCALE N/S W.T
ACAD A1	MAT NO. / DIE NO.	MAT		
D 0.J.CHO D 0.J.CHO F 95.12.06 S 95.12.06	REF. DWG D560271	NO. D560283		
C 0.J.CHO H A P Y.S.LEE	ECN #	DAEWOO HEAVY INDUSTRIES AMERICA CORPORATION SPRINGFIELD, GA U.S.A.		

Rear – right hand side



07.1 General

The frame, boom, and bucket are grouped together in part because they are the "large" components of the DSL 601 skid steer loader. However, the category includes a number of important, related sub-components.

- Quick-Tach
- Bucket and boom cylindrers and related hydraulic lines and valves
- Seat and seat bar
- Canopy
- Upper plate and floor plate
- Bottom plate and engine oil pan cover
- Fuel and hydraulic oil tanks and their respective senders, filters, and other assemblies

Above all, safety must be your chief concern when working with frame, boom, and bucket components. Their size and weight require a proper hoist and support straps - never rely upon the hydraulic cylinders to hold the boom or bucket in a position for service. Use the boom lock whenever the boom is in the raised position. Use the safety lock when raising the canopy, and a hoist and straps for removal and installation. Provide support for plates and covers when removing them.

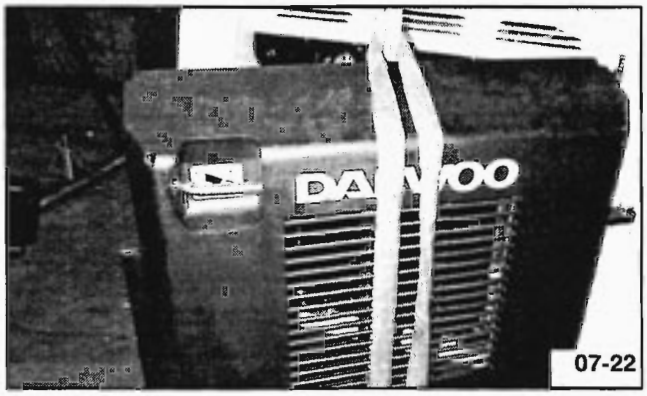
Operational problems related to the frame, boom, and bucket are usually fairly easy to diagnose. Cylinders that do not hold show evidence of leaking seals or hoses. Chatter or jerky movements often mean uneven cylinder rod length adjustment, or bent cylinder rods. (Some symptoms, however, can point to hydraulic or hydrostatic system problems - see the troubleshooting procedures of sections 04 and 05.) Where adjustments are necessary, pay close attention to specifications to avoid premature and DANGEROUS component failure.

2-6 Rear door and engine hood

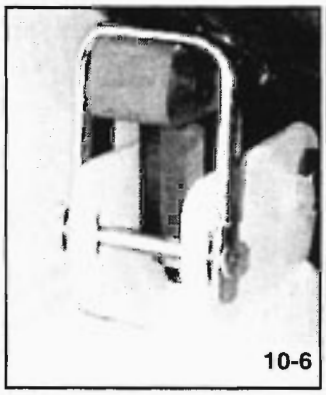
2-6.1 Remove the rear door.

⚠ WARNING

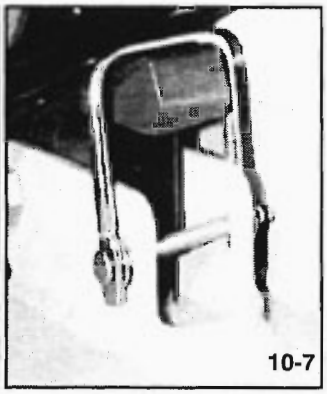
The parking brake MUST be engaged any time the loader is being serviced. If the parking brake is NOT set, the loader may roll. Failure to set the parking brake could result in death or serious injury.



1) Suspend the rear door from a hoist with a sling.
2) Remove the top and bottom hinge bolts.
3) Raise and remove the rear door with the hoist.



(Left Hand Canopy Lock)



(Right Hand Canopy Lock)
(If Equipped)

- Hook the rectangular canopy lock(s) to the hook(s) attached on rear sides of the canopy.
- To lower, reverse the above procedure.

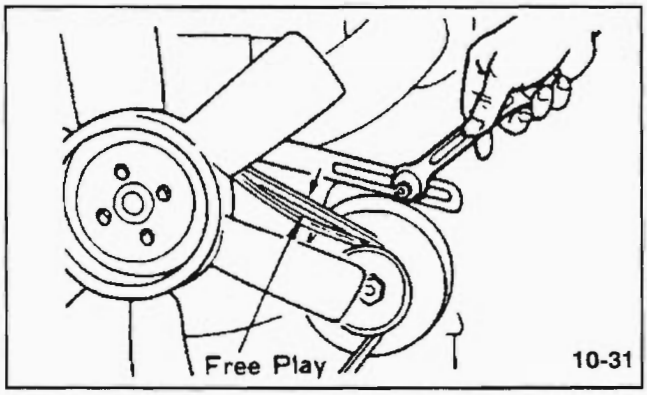
⚠ CAUTION

Never operate without canopy lowered and properly secured.

1-10 Fan Belt

1-10.1 Belt Tension

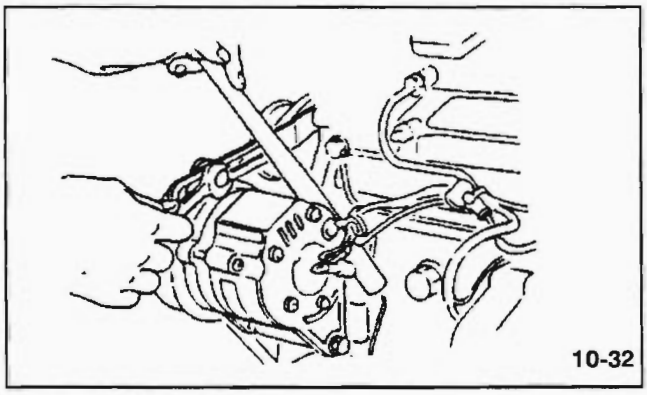
Properly adjusted, the belt should have approximately 3/8" to 9/16" (10-15 mm) of free play when checked by pressing firmly on the belt between the fan and alternator pulleys.



10-31

1-10.2 Adjustment

Belt tension can be adjusted by loosening the upper and lower pivot bolts on the alternator. Use a small pry bar to move the alternator to achieve proper tension and retighten pivot bolts.


10-32

1-21 Tire Maintenance

1-21.1 General Maintenance

Tires should be checked regularly for wear, damage, and proper inflation. When replacing tires, ensure that the size matches those already on the vehicle. Mismatched tires can change vehicle performance and cause premature wear and damage to drive train components. If tires are replaced in pairs, they should be mounted on the same side of the vehicle to minimize stress on the drive train.

⚠ DANGER

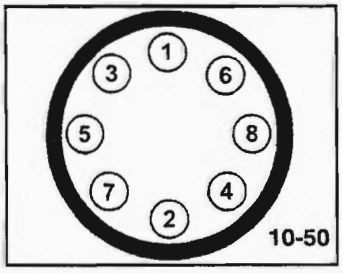
Tires should only be mounted/dismounted from rims or repaired by trained and autjorized personnel using the proper equipment and procedures. Death or serious injury could result. See OSHA 1910.177.

1-21.2 Inflation Pressures

DSL 601-45 psi (3.2 kg/cm²)

1-21.3 Installation and Removal

REMOVAL: Support the frame so that the tire(s) to be removed are off ground. Insert a wedge under the tire to prevent rotation while the lug nuts are being removed. Remove tire and rim assembly.



INSTALLATION: Install the tire and rim assembly on the axle. Tighten lug nuts to seat rim against axle assembly. Insert a wedge under the tire to prevent rotation while torquing lug nuts. Torque lug nuts to 102-112 ft/lbs (138-152 N•m) in the pattern illustrated above. Re-check torque after 10 hours of operation.

4-5 Hydraulic System, Continued

Item	Unit	Model DSL 601
• Control Valve • No. of Spools • Flow Capacity (Rate) • Relief Setting Pressure (set by valve supplier) • Circuit	- 1(gal)/min psi kg/cm²	3 80 (21) 2392 (+70) 165 (+5) • Series on Lift Float Function with Detent • Series on Tilt • Series on Auxiliary with Detent
• Boom Cylinder • Type • Number • Cylinder Bore • Cylinder Rod • Stroke • Mounting • Plating on Rod	- each in(mm) in(mm) in(mm) - -	Single Rod, Double Acting 2 1.97 (50) 1.38 (35) 31.0 (788) • Series Crest Crevice • Hard Chrome w/15-50 Micron Thickness