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Caterpillar

Service Manual

631B Scraper Tractor

S/n 11G1 & 13G1 and Up

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CT-S-631BTS13G

Service Manual

ENGINE

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ENGINE SPECIFICATIONS

12A-10

Group 40.2

Page 1

See the topic SPECIFICATIONS in the GENERAL INSTRUCTIONS

Number of cylinders 6
Bore and stroke 5.4" x 6.5"
Firing order 1-5-3-6-2-4

Remaining bearings003 - .008 in.
Permissible bearing clearance010 in.
End clearance001 - .007 in.
Permissible end clearance025 in.

Air Compressor

Bore and stroke 2 1/2" x 1 11/16"
Capacity 12 CFM @ 1250 RPM
Crankshaft:
Main journal diameter 1.3779 - 1.3784 in.
Permissible main journal wear003 in.
Connecting rod journal diameter 1.1242 - 1.1250 in.
Permissible connecting rod journal wear003 in.

Connecting rod:

Connecting rod bearing clearance0003 - .0021 in.
Permissible clearance0045 in.
Center-to-center distance between connecting rod bearing and piston pin bearing 4.178 - 4.198 in.

Cylinder bore:

Diameter 2.5005 - 2.5015 in.
Permissible liner wear (increase in diameter at top of ring travel)004 in.
Cylinder bore wear limit (out-of-roundness)002 in.
Cylinder bore wear limit (taper)002 in.
Piston clearance, skirt0015 - .0025 in.
Permissible clearance, skirt004 in.

Cylinder head:

Torque on stud nuts 18 - 21 lb. ft.
Governor setting (in PSI):
Cut in setting 100 - 105
Cutout setting 120 - 125

Piston pins:

Clearance in connecting rod bearing0002 - .0005 in.
Permissible clearance0015 in.
Fit in piston loose .0002 in.
tight .0005 in.

Piston rings:

Compression ring gap005 - .015 in.
Oil ring gap005 - .015 in.
Groove clearance (all rings)002 - .004 in.

Air Compressor Drive Gear

Bearing clearance0025 - .0055 in.
End clearance004 - .008 in.

Cam Follower

Follower diameter 1.8082 - 1.8092 in.
Bore diameter 1.8130 - 1.8136 in.
Permissible clearance010 in.

Camshaft

Drive gear bearing clearance in cage003 - .005 in.
Drive gear bearing clearance in flywheel housing002 - .006 in.
Drive gear end clearance004 - .008 in.
Bearing journal diameter:
Rear journal 1.8710 - 1.8720 in.
Remaining journals 2.8750 - 2.8760 in.
Bearing clearance:
Rear bearing002 - .006 in.

Camshaft Idler Gear

Bearing clearance002 - .004 in.
End clearance004 - .008 in.
Shaft diameter 1.9970 - 1.9980 in.

Charging Alternator

	12 Volt DR1117123 & DR1117132	24 Volt DR1117121 & DR1117131
Grounded terminal	Negative	Negative
Rotation (Viewing drive end)	Clockwise	Clockwise
Circuit	B	B
Approximate alternator RPM (when testing)	2500	2500
Field current @ 12 volts (80° F.)	2.9-3.2 amps	—
Field current @ 24 volts (80° F.)	—	1.5-1.8 amps
Output: Volts Amps: Initial (alternator cold) Continuous operation (warm)	13.7 70 55	27.5 53 45
Voltage regulator: Voltage setting range Adjust current flow to and set to	13.7-14.3 10 amps 14 volts	27.5-28.5 5 amps 28 volts
Emitter base resistor	25-35 ohms	*10-20 ohms
Step voltage resistors (A-B-C-D) Potentiometer resistor #1 Potentiometer resistor #2	3-5 ohms 60-70 ohms 12-25 ohms	3-5 ohms 60-70 ohms 140-160 ohms

*Early DR1117121 Models have 25-35 ohms value.

Belt tension (slack at point midway between pulleys @ 25 lbs.) 3/4 - 1 in.

Torque values:

Pulley shaft nut 75 - 90 lb. ft.
Fan shaft nut 45 - 50 lb. ft.
Diode 13 - 16 lb. ft.

Connecting Rod

Connecting rod bearing clearance0030 - .0059 in.
Permissible bearing clearance010 in.
Connecting rod bolt nuts, torque 17 - 23 lb. ft. plus an additional 1/2 turn*
Center-to-center distance 11.124 - 11.126 in.
Bore in piston pin bearing 2.0010 - 2.0015 in.

*To obtain the correct torque reading, lubricate the threads prior to tightening.

Crankshaft

Main journal diameter 4.4995 - 4.5005 in.
Main bearing clearance0035 - .0066 in.
Permissible bearing clearance010 in.
End clearance010 - .018 in.
Permissible end clearance035 in.
Main bearing stud nuts, torque 350 lb. ft.
Connecting rod, journal diameter 3.5395 - 3.5405 in.
Permissible out-of-roundness (journal)002 in.

ENGINE SPECIFICATIONS

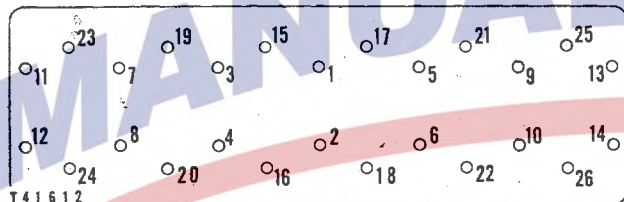
Thrower location (tight against shoulder on crankshaft)
Permissible runout on thrower ring groove face .006 in.

Cylinder Block

Main bearing original bore dimension 4.8850 - 4.8860 in.

Cylinder Head*

Tighten nuts in sequence shown in illustration.
Initial 180 lb. ft.
Final 300 lb. ft.



CYLINDER HEAD STUD NUT TIGHTENING SEQUENCE

Cylinder Liner (Use 7M4321 Adapter Plate for Removal)

Inside diameter 5.4000 - 5.4010 in.
Permissible liner wear (increase in diameter at top of ring travel) .008 in.
Counterbore dimension in block .521 - .523 in.
Liner flange thickness .5240 - .5255 in.

Engine Support Bolt Torque

Front and rear (3/4" dia. bolts) 300 - 350 lb. ft.

Flywheel

Retaining bolt torque 210 - 250 lb. ft.
Thrower:
Thrower location (against shoulder on crankshaft)
Permissible runout .006 in.

Flywheel and Timing Gear Housing

Bolt torque 60 - 70 lb. ft.

Fuel Injection Equipment

Fuel injection pump timing (Before top center) 11°
Fuel injection pump lifter setting (on engine with piston at top center) 1.8261 - 1.8341 in.
Fuel injection pump lifter setting (off engine) 1.8810 - 1.8820 in.
Fuel pump plunger length 2.7571 - 2.7577 in.
Permissible wear (decrease in length of plunger) .002 in.

Lifter Settings in Degrees (off engine)	
Lifter No. (numbered consecutively front to rear)	Timing Plate Degrees
1	3°
2	123°
3	243°
4	63°
5	303°
6	183°

Injection nozzle orifice: (Use 7F1522 Drill for cleaning 13G1 thru 13G615) .029 in.
(Use 6H8639 Drill for cleaning 13G616-up) .033 in.
Injection valve retaining nut torque 100 - 110 lb. ft.

Fuel Transfer Pump

Clearance between gears and cover, total .0008 - .0020 in.
Drive gear retaining nut torque 10 lb. ft.
Permissible bearing clearance .004 in.
Shaft diameter .4936 - .4938 in.

Generator (12V — Delco-Remy 1106943)

Brush spring tension 20 oz.
Rotation (viewing drive end) Clockwise
Circuit A
Field current (80° F.):
Volts 12
Amps 1.37 - 1.50
Output (cold):
Volts 13.0
Amps 40
Approximate RPM 1750

Generator Belt Tension

Slack at point midway between pulleys @ 25 lbs. 1/2 in.

Generator Regulator

(12V — Delco-Remy 1113027)

Circuit A
Polarity Negative ground®
Cutout relay:
Armature-yoke air gap .020 in.
Point opening .020 in.
Closing voltage range 11.8 - 13.0
Voltage regulator:
Armature-yoke air gap .067 in.
Point opening .016 in.
Voltage setting range (85° F.) 14.1 - 14.9*
Current regulator:
Armature-yoke air gap .075 in.
Current setting range 38 - 42 Amps
*14.0-14.6 volts on lower contacts.

Governor

Backlash between drive gear and driven gear .000 - .012 in.
Permissible bearing wear .008 in.
Thickness of spacer between torque spring and governor housing .093 in.

Hydraulic Pump Gear

Bearing clearance .002 - .006 in.
End clearance .004 - .008 in.

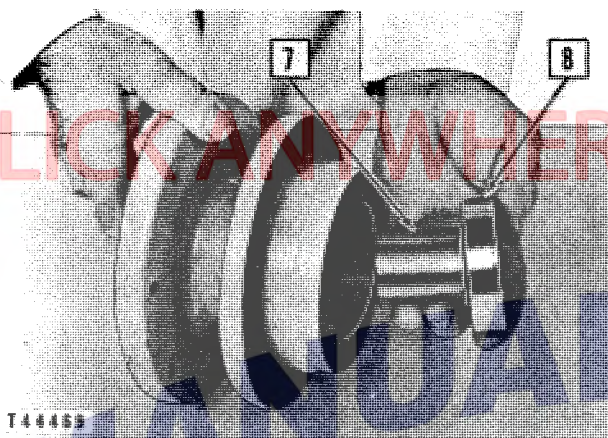
Hydraulic Pump Idler Gear

Bearing clearance .0011 - .0051 in.
End clearance .004 - .008 in.
Shaft diameter 1.7305 - 1.7315 in.

Oil Pump

Clearance between gears and end covers .002 - .004 in.
Shaft diameter 1.2275 - 1.2281 in.
Bearing bore 1.3750 - 1.3760 in.
Permissible bearing clearance .005 in.
Gear retainer nut torque 100 lb. ft.

ENGINE FAN GROUP



REMOVING BEARING AND SPACER

☐ Remove

7-Spacer. 8-Bearing.



REMOVING FAN BELTS

NOTE

Inspect the belts for wear and damage. If any one of the belts needs replacing, install a new set. Always install a matched set of belts, never only one.

FAN BELT ADJUSTMENT

The fan belts are nonadjustable and always operate under spring tension. The correct tension is obtained by turning the adjusting nut (1) clockwise to the limit of the threads. Tighten the locknut (2).



BEARING AND SEAL REMOVAL

☐ Remove

9-Seal. 10-Bearing.

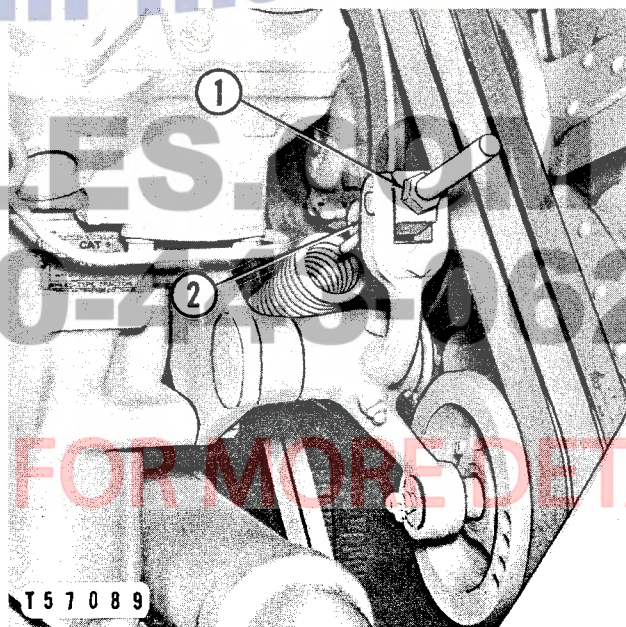
Inspect the seal (9). If worn or damaged, install a new seal with the lip facing out. Inspect the bearings (8) and (10).

Lubricate with a grease gun upon completion of the assembly.

FAN BELT REPLACEMENT

Insert a bar into the belt tightener as illustrated.

Push downward on the bar. This will swing the belt tightener inward, which allows the belts to be slipped off the pulley easily. Slip the belts off the front of the crankshaft pulley and remove them from the fan pulley.



FAN BELT ADJUSTMENT

1-Adjusting nut. 2-Locknut.