OLIVER DEALER

Service Bulletin

LOCATION: Charles City
SUBJECT: 1650 Tractor Open Chamber Diesel Engine Specifications
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This bulletin contains 1650 Tractor open chamber diesel engine service specifications.

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Service Department

DLW:DDH:hr

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ENGINE SPECIFICATIONS

GENERAL

	DIESEL
Engine Serial Number Location	Right side of crankcase on alternator bracket mounting flange
Weight of Engine (Pounds)	900
Number of Cylinders	6
Firing Order	1-5-3-6-2-4
Bore	3-7/8
Stroke	4
Piston Displacement	283
Engine Speed (rpm)	
Low Idle	675
Rated	2200
High No Load	2420
Compression Ratio	16:1
Cranking Speed (rpm)	150
Compression Pressure at Cranking Speed (psi)	350
Allowable Compression Pressure Variation between Cylinders	10% total
Engine Operating Temperature	155-212° F.

LUBRICATION

Type	Pressure
Main Oil Gallery Pressure Control Valve	Non-adjustable, spring loaded, poppet type
Oil Filter Type	Full flow
Recommended Oil	Refer to Operator's Manual
Minimum Oil Pressure at Engine Operating Temperature	
Main Gallery	
Idle Speed	20 psi
2400 RPM	30-45 psi
Oil Pressure Relief Valve Spring -- Main Gallery	
Free Length	1-3/8"
Compressed Length	1" @ 10 lbs.
Oil Pressure Relief Valve Plunger Diameter Main Oil Gallery	0.498-0.497
Oil Change Period	100 hrs.
Filter Change Period	Every other oil change
Crankcase Capacity (without filter)	8 qts.

CAMSHAFT

Material	Cast iron (proferal) with hardened cam lobes
End Play	Controlled by spring pressure and thrust button
Thrust Button spring	
Free Length	1-3/16
Compressed Length	25/32 @ 15-1/2 - 18-1/2 lbs.
Type of Drive	Gear driven
Method of Checking Misalignment	"V" Blocks
Maximum Misalignment	0.002
Cam Lift - Intake & Exhaust	0.302
Journal Diameters	1.7495-1.7485

CAMSHAFT BUSHING AND BORE

	DIESEL
Type	Steel back, lead base, tin plate
Bushing Bore	1.8755-1.8745
Bushing Inside Diameter	
Standard	1.7520-1.7515
Maximum	1.7560
Bushing Width	1"
Running Clearance	
Standard	0.002-0.0035
Maximum	0.005

CONNECTING RODS

Material	SAE 1045 steel forging
Rod Misalignment	None
Length from Center of Small End to Center of Large End	6.750-6.749
Connecting Rod Side Clearance	
Standard	0.0075-0.0135
Diameter of Piston Pin Bushing Bore	1.312-1.313
Diameter of Rod Bearing Bore	2.5885-2.5890
Weight Variation between Lightest and Heaviest Rod in Set	1/4 oz.
Number of Connecting Rod Bolts	2
Bolt Size	3/8 - 24

CONNECTING ROD BEARINGS

Type	Replaceable shell, precision bearings
Material	Steel backed, copper-lead base, tin plate
Manner of Adjustment	None
Running Clearance	
Standard	0.0005-0.0015
Maximum	0.0025
Bearing Width	1.125-1.115
Undersize	0.003
	0.020

CRANKSHAFT

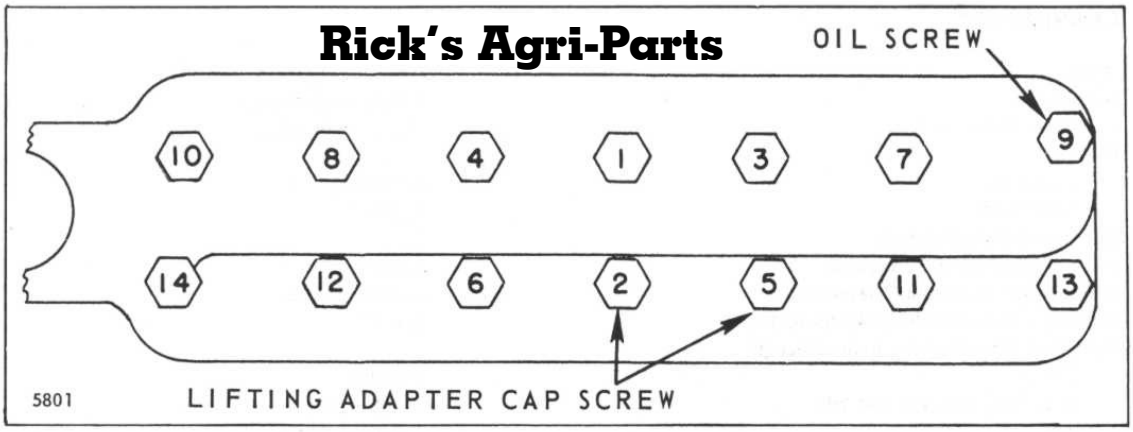
Type	Dynamically balanced
Material	C1046 steel forging
End Play Controlled by	No. 5 main bearing
End Play	
Standard	0.0045-0.0095
Maximum	0.010
Number of Main Bearings	7
Main Bearing Journal Diameter	2.625-2.624
Connecting Rod Journal Diameter	2.4375-2.4365
Maximum Journal Out-of-Round or Taper	0.0003
Maximum Main Bearing Journal Length	
Front	1-57/64
2nd, 3rd, 4th, 6th and 7th	1.745-1.755
5th	1.5025-1.5045
Maximum Connecting Rod Journal Length	1.375-1.379
Main Bearing Cap Bolt Size	5/8-11
Maximum Allowable Shaft Misalignment	0.002
Flywheel Mounting Flange Runout	0.001

CRANKSHAFT MAIN BEARINGS

	DIESEL
Type	Replaceable shell, precision
Material	Steel back, copper-lead base, lead-tin plate
Manner of Adjustment	None
Running Clearance	
Standard	0.0015-0.0045
Maximum	0.0065
Undersize	0.003
	0.020
Bearing Shell Width	1-1/4
Thrust Bearing Width	1.498-1.495
Crankcase Bore	2.8175-2.8165

CYLINDER HEAD

Type	Over head valve
Material	Cast alloy iron
Construction	One piece
Cap Screw Size	9/16-12
Number of Cap Screws	14
Maximum Cylinder Head Run-Out	0.005
Valve Port Diameters	
Intake	1-5/16
Exhaust	1-11/32
Valve Seat Angle	
Intake	30°
Exhaust	45°
Valve Seat Width	
Intake	0.079-0.089
Exhaust	0.062-0.072
Maximum Valve Seat Runout	0.002
Nozzle Bore Diameter	0.378-0.382



1650 Diesel Cylinder Head Cap Screw Tightening Sequence

FLYWHEEL WITH RING GEAR

	DIESEL
Maximum Runout	0.005
Diameter	13-5/16
Ring Gear Teeth (Number)	111

IDLER GEAR

Shaft Diameter	1.000-0.999
Shaft Running Clearance	
Standard	0.0015-0.003
Maximum	0.005
Bushing Inside Diameter	1.0015-1.002
Plunger Spring	31/32 at 7-1/2 lbs ± 1 lb.

OIL PUMP

Type	Gear
Relief Valve Setting	42 psi
Relief Valve Spring	
Free Length	2-11/16
Relief Valve Plunger Diameter	0.747-0.745
Drive Gear Clearance	
Standard	0.004
Maximum	0.008
Drive Shaft Running Clearance in Lower Bushing	
Standard	0.0015-0.004
Maximum	0.006
Drive Shaft Running Clearance in Upper Bushing	
Standard	0.0005-0.003
Maximum	0.045
Idler Gear Running Clearance	
Standard	0.0035-0.0045
Maximum	0.006

PISTONS

Material	Aluminum alloy
Surface Treatment	Tin plated
New Piston Fit in New Sleeves (Pull on Feeler Gauge)	3-6 lbs on 1/2 x 0.002
Pistons Removed from	Top
Length	4.418-4.408
Skirt Diameter	3-7/8
Maximum Allowance Out-of-Round	Cam ground
Piston Ring Groove Width	
Top	0.096-0.097
2nd	0.0955-0.0965
Oil Ring	0.1880-0.1890
Piston Pin Bore Diameter	
Coded Red	1.2499-1.2500
Coded Blue	1.2501-1.2502

PISTON PINS

	DIESEL
Type	Full floating
Installation	Fit pin at room temperature with thumb pressure
Pin Held in Position by	Retaining Rings
Outside Diameter (Standard Pin)	
Coded Red	1.2495-1.2494
Coded Blue	1.2497-1.2496
Running Clearance in Piston	
Standard	0.0002-0.0008
Running Clearance in Rod	
Standard	0.0004-0.0009
Maximum	0.0019
Rockwell "C" Hardness	60-63

PISTON PIN BUSHING

Type	Slotted and split
Material	Steel backed bronze
Inside Diameter	
Standard	1.2501-1.2503
Length	0.551-0.537

PISTON RINGS

Material	
Compression Rings	Cast iron chrome faced
Oil Rings	Cast iron chrome faced
Compression Rings for Piston	2
Compression Ring Width	0.0935-0.0930
Compression Ring Side Clearance	
Top - Standard	0.0025-0.0040
2nd - Standard	0.0020-0.0035
Maximum	0.006
End Gap	
Standard	0.010-0.020
Maximum	0.045
Oil Ring End Gap	
Standard	0.010-0.023
Maximum	0.045

PUSH RODS

Length	12
Maximum Runout	0.020

Rick's Agri-Parts

ROCKER ARMS

Rocker Arm Shaft Spring	
Free Length	2-1/2
Compressed Length	5/8 at 10 lbs.
Rocker Arm Running Clearance	
Standard	0.0035-0.0015
Maximum	0.005

ROCKER ARM SHAFT

	DIESEL
Shaft Diameter	
Standard	0.743-0.742
Minimum	0.740

SLEEVES

Type	Wet
Material	Cast iron
Brinell Hardness	212-277
Bore	
Standard	3.8750-3.8765
Maximum (Measured at Top of Ring Travel)	3.8775
Out-of-Round	
Maximum	0.002
Taper	
Maximum	0.004
Overall Length	7-7/16
Projection Above Crankcase (for Gasket Crush)	0.003-0.006
Crankcase Sleeve Lower Bore	4.281-4.282
Crankcase Sleeve Upper Bore	4.370-4.380
Crankcase Sleeve Counterbore	4.562-4.563
Sleeve Counterbore Depth in Crankcase	0.250-0.248
Sleeve Flange Thickness	0.253-0.254
Sleeve Outer Diameter	
Upper Flange	4.5600-4.5585
Packing Ring Lands	4.2790-4.2775
Sleeve Upper Flange Clearance in Crankcase	0.002-0.0045

TIMING GEARS

Type	Helical gears
Material	Steel forging
Back Lash	
Idler Gear to Crankshaft Gear	0.004-0.006
Maximum for Wear	0.007
Camshaft Gear to Crankshaft Gear	0.004-0.006
Maximum for Wear	0.007

VALVES

Rick's Agri-Parts

Material	
Intake	Silcrome #1
Exhaust	EMS-10/57
Valve Arrangement (Front to Rear)	I-E-I-E-I-E-I-E-I-E-I-E
Valve Length Overall — Intake & Exhaust	6-13/16
Valve Stem Runout - Maximum	0.002
Valve Stem Diameter	
Intake	
Standard	0.3725-0.3720
Minimum	0.3690
Exhaust	
Standard	0.3720-0.3715
Minimum	0.3680

(Valves Continued)

VALVES (Continued)

	DIESEL
Valve Running Clearance in Guides	
Intake	
Standard	0.0005-0.002
Maximum	0.004
Exhaust	
Standard	0.001-0.0025
Maximum	0.0055
Valve Face Angle	
Intake	29-1/2°
Exhaust	44-1/2°
Valve Head Diameter	
Intake	1-23/32
Exhaust	1-1/2
Valve Timing	
Intake Opens	15° BTDC
Intake Closes	35° ABDC
Exhaust Opens	35° BBDC
Exhaust Closes	15° ATDC
Valve Lift	
Intake	0.416
Exhaust	0.406
Valve Port Diameter	Refer to Cylinder Head Specifications
Maximum Valve Face Runout	0.001
Maximum Valve Seat Runout	0.002
Valve Margin - Minimum	1/64
Valve Clearance (Cold)	
Intake	0.014
Exhaust	0.024

VALVE GUIDES

Type	Straight
Material	Cast iron alloy, Brinell hardness 269-302
Valve Guide Bore	
Spiral Groove End	0.373-0.374
Plain End	0.3745-0.3757
O.D.	0.6260-0.6255
Length	3-1/2
Valve Guide Height above Counterbore of Cylinder Head	7/8

Rick's Agri-Parts

VALVE SPRINGS

Material	Spring steel
Part Number	
Intake & Exhaust	106 573-A
Free Length	2.562
Compressed Length	
Valve Closed	1.906 at 59 lbs ± 4 lbs
Valve Open	1.506 at 95 lbs ± 4 lbs

VALVE LIFTERS

	DIESEL
Type	Mushroom
Diameter	
Standard	0.6245-0.6240
Minimum	0.619
Maximum Allowable Out-of-Round	0.0003
Lifter Guide Bore	
Standard	0.625-0.626
Maximum	0.631
Running Clearance	0.0005-0.002

TORQUE WRENCH VALUES IN FOOT POUNDS (OILED)

Cylinder Head Cap Screws	
Numbers 1 thru 6 on Tightening Diagram	150
Numbers 7 thru 14 on Tightening Diagram	133
Main Bearing Cap Screws	129-133
Connecting Rod Cap Screws	46-50
Manifold Nuts	25-27
Rocker Arm Shaft Bracket Nuts	25-27
Flywheel Cap Screws	67-69
Pulley Cap Screw	75-85

FUEL SYSTEM

INJECTOR NOZZLES

Opening Pressure	
New (Or Used Nozzle with New Spring)	2800
Used Nozzle Spring	2600
Spray Orifices (Number)	Four
Orifice Diameter	0.011
Valve Lift Adjusting Screw	1/2 turn open
Return Oil Leakage	5-8 drops per 30 seconds @ 1500 psi after first drop falls
Torque Values	
Pressure Adjusting Screw Locknut	70-75 in. lbs.
Hold-down Screw	20 ft. lbs.

FUEL INJECTION PUMP (ROOSA MASTER)

Roosa Number	DBGFC 633-12DH
Governor	
Idle Speed	675
High No-Load Speed	2420
Rated Speed	2200
Timing (Static)	4° BTDC +1 -0
Distributor Rotor Diameter	0.920 nominal
Drive Shaft Tang Width	0.3105-0.3095

FUEL INJECTION PUMP (ROOSA MASTER) (Continued)

	DIESEL
Drive Shaft Bushing	0.8755-0.8765
Governor Control Arm Fork Wear	0.003 maximum wear. Fork tip to back side when new: 0.216-0.226
Plunger Diameter	0.330-0.3299
Basic Cam Dimension	1.900
Rotation	Clockwise from drive end
Torque Values	
Delivery Valve Retainer Screw	85-90 inch pounds
Head Locking Screw	15 foot pounds
Cam Advance Screw	33 foot pounds
Head Locating Screw	25 foot pounds
End Plate Screws	25-30 inch pounds

TEST SPECIFICATIONS

NOTE: All speeds are in engine rpm.

TEST STAND	
1. Injection Lines	3/32" I.D. by 20" long
2. Test Oil Temperature	110-115° F.
3. Nozzles	12SD12
4. Nozzle Opening Pressure	2500 psi
5. Calibrating Oil	Roosa Master
PUMP OPERATING SPEED	Half Engine Speed
Pump Accessories	Delivery valve, speed advance, by-pass system
PUMP SETTINGS	
1. Roller to Roller Dimension	1.962 ± .0005
2. Governor Linkage Gap (Use Roosa Gage No. 13389)	0.125" to 0.165"

3. Operate Pump at 1000 RPM (Wide Open Throttle) for 10 Minutes to Bring to Operating Temperature and Clear Air from System.
4. Check for Minimum 18" HG Transfer Pump Lift at 400 RPM with By Pass Hose Pinched.
5. Adjust Transfer Pump Pressure (Wide Open Throttle)
6. Check for Minimum Cranking Speed Delivery (See Step 14)
7. Auto Advance — Speed Responsive
   a. Advance Movement 7°

RPM	Cam Movement
b. 925-1125	Set 3°
c. 1800-2200	Finish

On Engine: No Load - Set 3° @ 700-1000 RPM — Finish @ 1800 RPM

	RPM ± 10	MM3 PER STROKE	MAX. VAR. BET. CYL.	TRANS. PUMP PRESS-PSI
8. Check Point	2200			69-73
9. Check Point	1000	56-59	3	
10. Set Torque Screw	2200	53-55	5	69-73 Hold
11. High Idle (Wide Open Throttle)	2420	12-15		
12. Recheck Point	1400	57-61		
13. Low Idle	675	9-12		
14. Minimum Cranking Speed Delivery	100	25		6 Min.