UNIT, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE MANUAL

FOR

SCRAPER, TRACTOR:
ELEVATING, SELF-PROPELLED,
11 CUBIC YARD,
SECTIONALIZED AND NONSECTIONALIZED MODELS

613BSS
(NSN 3805-01-144-8837)

613BSS1
(NSN 3805-01-267-4177)

613BSNS
(NSN 3805-01-144-2992)

613BSNS1
(NSN 3805-01-267-4178)

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Approved for public release: distribution is unlimited.

HEADQUARTER, DEPARTMENT OF THE ARMY

MARCH 1991
UNIT, DIRECT SUPPORT, AND GENERAL SUPPORT
MAINTENANCE MANUAL
FOR
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REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS
You can help improve this manual. If you find any mistakes or if you know of a way to improve the
procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications
and Blank Forms), or DA Form 2028-2, located in the back of this manual, direct to: Commander, U.S.
Army Tank-Automotive Command, ATTN: AMSTA-MB, Warren, MI 48397-5000. A reply will be furnished
to you.

This technical manual is an authentication of the manufacturer’s commercial literature and does not
conform with the format and content specified in AR 25-30, Military Publications. This technical manual
does, however, contain available information that is essential to the operation and maintenance of the
equipment.

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HOW TO USE THE TECHNICAL MANUAL

Introduction

The 613BS Series Tractor-Scraper is available in four configurations:

- 613BSNS and 613BSNS1  Type I - Nonsectionalized
- 613BSS and 613BSS1  Type II - Sectionalized

The Type I configurations are air transportable by three methods:

- Drive On/Drive Off
- Low Altitude Parachute Extraction (LAPES)
- Low Velocity Air Drop (LVAD)
- Requires load transfer (weight distribution).

The Type II configurations, in addition to the three methods listed above, may be sectionalized (divided into two sections) and transported by helicopter.

Volume Identification

- Operation and Lubrication information, see TM 5-3805-260-10.
- Tractor Maintenance information, see Chapters 1-3 and Appendix B of this manual.
- Scraper Maintenance information, see Chapter 4 and Appendix B of this manual.
- Tractor-Scraper Parts information, see TM 5-3825-260-24P.
- Sectionalized Unique Information, see Chapter 5 of this manual.

There is a table of Contents located at the beginning of each Chapter/Appendix that provides the specific contents and location of what is covered in the Chapter/Appendix.

Part Number Identification

The part numbers identified in this manual may not always represent the most current RPSTL part numbers. ALWAYS verify given part numbers against the current RPSTL, TM 5-3805-260-24P.

REMEMBER!

This manual is a guide for the new mechanic and a reference for the experienced mechanic.

Illustrations will guide you through the procedures for maintaining the vehicle and attachments.

Your safety and the safety of others depend upon care and judgement in the maintenance of this vehicle. A careful mechanic is good insurance against an accident. Most accidents, no matter where they occur, are caused by someone's failure to observe and follow simple, fundamental rules or precautions. For this reason, most accidents can be avoided by recognizing hazards and taking steps to avoid them before an accident occurs.

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CHAPTER 1
SPECIFICATIONS (TRACTOR)

1-1
INTRODUCTION

The specifications given in this chapter are on the basis of information available at the time the book was written. These specifications give the torques, operating pressure, measurements of new parts, adjustments and other items that will affect the service of the product.

When the words “use again” are in the description, the specification given can be used to determine if a part can be used again. If the part is equal to or within the specification given, use the part again. When the word “permissible” is in the description, is in the specification given is the “maximum or minimum” tolerance permitted before adjustment, repair and/or new parts are needed.

A comparison can be made between the measurements of a worn part, and the specifications of a new part to find the amount of wear. A part that is worn can be safe to use if an estimate of the remainder of its service life is good. If a short service life is expected, replace the part.

NOTE: The specifications given for “use again” and “permissible” are intended for guidance only and Caterpillar Tractor Co. hereby expressly denies and excludes any representation, warranty or implied warranty of the reuse of any component.

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**ENGINE DESIGN**

- **Bore**: 4.5 in. (114.3 mm)
- **Stroke**: 0 in. (127.0 mm)
- **Number of Cylinders**: 8
- **Cylinder Arrangement**: 90V
- **Firing Order (Injection Sequence)**: 1, 2, 7, 3, 4, 5, 6, 8
- **Direction of Rotation (As Seen From Flywheel End)**: Counterclockwise

**CYLINDER, VALVE AND INJECTION PUMP LOCATION**

**ENGINE SETTINGS**

<table>
<thead>
<tr>
<th>Model Description</th>
<th>Altitude (In Feet)</th>
<th>Brake W/O Fan</th>
<th>Horsepower W/Fan</th>
<th>Full Load RPM</th>
<th>High Idle Engine Only</th>
<th>Static Fuel Setting (In mm.)</th>
<th>Rated Fuel Rate (Lb/Min)</th>
<th>In Vehicle Torque Spring and Spacer Thickness in Inches</th>
<th>Torque Conv. Stall Speed</th>
</tr>
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<tr>
<td>613 Tractor Veh. S/N 38W1-Up</td>
<td>0-2, 500</td>
<td>164</td>
<td>150</td>
<td>2200</td>
<td>2385</td>
<td>2340</td>
<td>2.49 mm</td>
<td>1.027 .411</td>
<td>5S2619(.010&quot;)</td>
</tr>
<tr>
<td>5,000-7, 500</td>
<td>131</td>
<td>125</td>
<td>2200</td>
<td>2335</td>
<td>2290</td>
<td>1.90 mm</td>
<td>1880</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7, 500-10, 000</td>
<td>121</td>
<td>115</td>
<td>2200</td>
<td>2315</td>
<td>2270</td>
<td>1.68 mm</td>
<td>1940</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10, 000-12, 500</td>
<td>110</td>
<td>105</td>
<td>2200</td>
<td>2295</td>
<td>2250</td>
<td>1.44 mm</td>
<td>1985</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12, 500-15, 000</td>
<td>100</td>
<td>95</td>
<td>2200</td>
<td>2275</td>
<td>2230</td>
<td>1.22 mm</td>
<td>2035</td>
<td></td>
<td></td>
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</table>
| **General Notes:**
- Low idle in vehicle is 700 ± 10 RPM.
- Fuel injection timing (static) is 16° BTC, .127 inch of piston travel.
FUEL INJECTION PUMP

Firing order (injection sequence) ..............1, 2, 7, 3, 4, 5, 6, 8
Injection timing before TC (top center): 16 ± 1°

Torque for the nuts that hold the fuel lines
(Use 5P144 Fuel Line Socket) ...30±5 lb ft (40 ± 7 N-m)

(1) Bore in the rear bearing for the camshaft (new) ......................2 3750 ± 0005 in (60 325 ± 0 013 mm)
Diameter of rear bearing surface (journal) of the camshaft (new) ......................2 3720 ± 0005 in (60 249 ± 0 013 mm)
Maximum permissible clearance between the bearing and the camshaft bearing surface (journal) (worn) .................006 in (15 mm)

(2) Torque for screws that hold sleeve control levers .....................24 ± 2 lb in (2 8 ± 0 2 N-m)

(3) Bore in the housing for the fuel control shaft (new) ......................3543 ± 0005 in (8 999 ± 0013 mm)
Diameter of sleeve control shaft (new) ......................3530 ± 0003 in (8 966 ± 0 008 mm)
Maximum permissible clearance between the bore in the housing and the sleeve control shaft (worn) .....................003 in (0 8 mm)

(4) End play for camshaft with sleeve installed (new) .........................023 ± 018 in (0 58 ± 0 46 mm)
NOTE When installing sleeve on end of camshaft, support the camshaft to prevent damage to parts inside of injection pump and governor housing

(5) Bore in the front bearing for the camshaft (new) ......................1.0005±0005 in (25.413±0013 mm)
Diameter of front bearing surface (journal) of the camshaft (new) ........................9990±0005 in (25 375±0013 mm)
Maximum permissible clearance between the bearing and the camshaft bearing surface (journal) (worn) ......................004 in (0.10 mm)

(6) Torque for bushing 60 ± 5 lb ft (80 ± 7 N-m)

(7) Crossover levers

NOTE: For adjustment of crossover levers, see the TESTING AND ADJUSTING SECTION

(8) Torque for screws that hold crossover levers ......................24 ± 2 lb in (2 8 ± 0 2 N-m)

(9 and 10) Fuel control shafts

(11) Dowel pin (linkage between crossover levers)

(12) Distance guide pin extends into bore ......................047 ± 004 in (1.20 ± 0.10 mm)
NOTE: Install guide pin with slot towards the top of the lifter bore

(13) 9N5862 Spring for injection pump:
Length under test force ......................1 348 in (34.24mm)
Test force ......................12 5 ± 1 3 lb (55 5 ± 5 8 N)
Free length after test ......................1.566 in (39.78mm)
Outside diameter ......................728 ± 010 in (18 49 ± 0.25 mm)
# GOVERNOR

## GOVERNOR SPRING CHART

<table>
<thead>
<tr>
<th>Part No.</th>
<th>(1) 4N6119</th>
<th>(2) 4N5663</th>
<th>(3) 6N2517</th>
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</thead>
<tbody>
<tr>
<td>Color code (Stripes)</td>
<td>Three Green</td>
<td>One Pink</td>
<td>None</td>
</tr>
<tr>
<td>Put a force on spring of</td>
<td>3.0 lb (13.34 N)</td>
<td>1.0 lb (4.45 N)</td>
<td>20 lb (890 N)</td>
</tr>
<tr>
<td>Then add more force to make spring shorter by</td>
<td>700 in (17.78 mm)</td>
<td>700 in (17.78 mm)</td>
<td>200 in. (50.80 mm)</td>
</tr>
<tr>
<td>Total test force</td>
<td>11.40 ± 26 lb (50.71 ± 1.16 N)</td>
<td>4.50 ± 12 lb (20.02 ± 53 N)</td>
<td>5.60 ± 18 lb (124.91 ± 80 N)</td>
</tr>
<tr>
<td>Free length after test</td>
<td>1.659 ± 0.021 in (42.14 ± 0.53 mm)</td>
<td>1.690 ± 0.020 in (42.93 ± 0.51 mm)</td>
<td>1.136 ± 0.020 in (31.24 ± 0.51 mm)</td>
</tr>
<tr>
<td>Outside diameter</td>
<td>1.506 in (38.25 mm)</td>
<td>1.144 in. (29.06 mm)</td>
<td>.584 in. (14.83 mm)</td>
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### (4) OVERFUELING SPRINGS

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<tr>
<td>Length under test force</td>
<td>748 in. (1900 mm)</td>
</tr>
<tr>
<td>Test force (0.84 ± 0.008 N)</td>
<td>189 ± .02 lb</td>
</tr>
<tr>
<td>Free length after Test</td>
<td>1.126 in (128.60 mm)</td>
</tr>
<tr>
<td>Outside diameter</td>
<td>360 in. (9.14 mm)</td>
</tr>
<tr>
<td>Color code (Stripes)</td>
<td>One White</td>
</tr>
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Torque for bolts that hold governor weight carrier to camshaft

\[ 90 ± .10 \text{ lb in (102 ± 1.1 N-m)} \]
FUEL TRANSFER PUMP

(1) Bypass valve.
   Fuel pressure at FULL LOAD .......... 305 psi 1205 ± 35 kPa

(2) 4N605 Spring for bypass valve-
   Length under test force .................. 880 in (22.35 mm)
   Test force .................................. 3 53 lb (15 3 N)
   Free length after test .................... 1 729 in (43 92 mm)
   Outside diameter ........................... 527 in (13 39 mm)

(3) Thickness of gears
   (new) .................................. 3736 ± 0003 in (9 489 ± 0 008 mm)
   Depth of counterbore
   (new) .................................. 3750 ± 0005 in (9 525 ± 0 013 mm)

(4) Diameter of shaft for
   Idler gear .................................. 4914 ± 0003 in (12482 ± 0 008 mm)
   Bore in idler gear ......................... 4926 ± 0003 in (12 512 ± 008 mm)

(5) Put a thin layer of 5S1454 Sealing Compound on the outside diameter of the seals before installation Remove the extra sealing compound after assembly.

(6) Install inner seal from outside edge of body assembly
   a distance of ............................ 453 ± 010 in (11 51 ± 0 25 mm)

(7) Install outside seal from outside edge of body
   assembly to a distance of ............ 030 ± 010 in (0 76 ± 0 25 mm)

INJECTION NOZZLE
(9N3979)

Bench test nozzles using clean SAE J967 Calibration Oil (Kent-Moore Corp J-26400 or Viscor Calibration Fluid 1487C-SAE J-967C) at a temperature of .......... 65 to 70° F (18 to 20° C)
Nozzle setting pressures (valve lift adjustment screw turned 3/4 + 1/8 turn from closed position)
   Used nozzle ................... 1500 to 2600 psi (10300 to 17690 kPa)
   Used, adjusted nozzle .............. 2400 to 2600 psi (16545 to 17690 kPa)

Return oil leakage test
   pressure .............................. 1400 to 1600 psi (9630 to 11 045 kPa)
   Leakage in 15 seconds ............... NO minimum or maximum
   Maximum tip leakage Is 20 drops in 15 seconds with a pressure of 200 psi (1380 kPa) less than opening pressure

(1) Torque for valve lift
   locknut .................................. 35 to 45 lb in (4.0 to 5.1 N-m)

(2) Torque for pressure screw
   locknut .................................. 70 to 80 lb In (8.0 to 9.1 N-m)

(3) Torque for cap ........... 110 to 120 lb in (12.4 to 13.6 Nm)
FUEL FILTER BASE

(1) Put 9S3263 Thread Lock Compound on the threads of the tapered end of the stud to a distance of ..........30 in (76 mm)
(2) Sealing surface of stud.
NOTE Do not damage this surface
(3) Torque for stud ...................50 ± 10 lb ft (70 ± 14 N-m)
(4) Distance from sealing surface of base to end of stud ...................97 ± 05 in (246 ± 3 mm)

AUTOMATIC TIMING ADVANCE UNIT

End play between washer (2) and timing advance unit (1) ...............003 to 037 in (0.08 to 0.94 mm)
(3) Torque for screw ..............72 ± 5 lb In (8.2 ± 0.6 N m)
"Stake" (make a mark with a punch) screw (3) in two places

DRIVE GEAR FOR THE INJECTION PUMP

(1) Torque for the bolt that holds the drive gear to the camshaft of the injection pump ...................110 ± 10 lb ft (149 ± 14 N.m)
(1) Diameter of the surfaces (journals) for the camshaft bearings
(new).................................2.500 ± 0.005 in (63.500 ± 0.013 mm)
Bore In the live bearings for the camshaft (new)......2.5035 ± 0.015 in (63.589 ± 0.038 mm)
Maximum permissible clearance between bearing and bearing surface journal (new)......0.007 in (0.18 mm)

(2) Tight fit between the gear and camshaft........0.012 to 0.028 in (0.030 to 0.071 mm)
Maximum permissible temperature of the gear for installation on the camshaft (do not use a torch) 600°F (315°C)

(3) End play for the camshaft........0.007 ± 0.03 in (0.18 ± 0.08 mm)
Maximum permissible end play (worn) 0.020 in (0.51 mm)

(4) Width of thrust groove in camshaft (new)......3.60 ± 0.02 in (9.14 ± 0.05 mm)
Diameter of thrust pin (new).................3.53 ± 0.01 in (8.97 ± 0.03 mm)
Torque for thrust pin-............35 ± 5 lb ft (45 ± 7 N m)

NOTE For installation of camshaft. The timing mark or the camshaft gear tooth must be in alignment with the timing mark on the tooth space of the crankshaft gear.

(5) Height of camshaft lobes
To find lobe lift, use the following procedure
A. Measure camshaft lobe height (5)
B. Measure base circle (7)
C. Subtract base circle (STEP 8) from lobe height (STEP A) The difference is actual lobe lift (6)
D. Specified camshaft lobe lift (6) is
   a. Exhaust lobe.........3.071 in (7.800 mm)
   b. Intake lobe.........3.077 in (7.816 mm)
Maximum permissible difference between actual lobe lift (STEP C) and specified lobe lift (STEP D) is 0.01 in (0.25 mm)
VALVE COVERS

(1) Tighten bolts in sequence shown to a torque of \(10 \pm 2\) lb ft \((14 \pm 3\) N m\).

VALVE ROCKER ARMS AND CAM FOLLOWERS

(1) Torque for bolts holding rocker arms \(18 \pm 5\) lb ft \((24 \pm 7\) N m\).
(2) Torque for lock nut for valve adjustment screw \(24 \pm 5\) lb ft \((30 \pm 7\) N m\).
(3) Diameter of the shaft for the rocker arms \(8580\) to \(8588\) in \((21.793\) to \(21.814\) mm\)
Minimum permissible diameter (worn) \(8570\) in \((21.768\) mm\).
Bore in bearings for the rocker arms (new) \(8603 \pm 0.008\) in \((21.8520 \pm 0.020\) mm\).
Maximum permissible bore (worn) \(8630\) in \((21.920\) mm\).
Maximum permissible clearance between bore in bearing and shaft (worn) \(0.005\) in \((0.13\) mm\).
(4) Clearance for valves (intake valve) \(0.015\) in \((0.38\) mm\).
Clearance for valves (exhaust valve) \(0.025\) in \((0.64\) mm\).
(5) Diameter of cam follower \(1.1589 \pm 0.004\) in \((29.436 \pm 0.010\) mm\).
Minimum permissible diameter (worn) \(1.1575\) in \((29.401\) mm\).
Bore in block for cam follower \(1.1624 \pm 0.010\) in \((29.525 \pm 0.025\) mm\).
Maximum permissible bore (worn) \(1.1650\) in \((29.591\) mm\).
(6) Torque for the thrust pin for the camshaft \(35 \pm 5\) lb ft \((45 \pm 7\) N m\).