SHOP MANUAL
ALLIS-CHALMERS

MODELS
7010-7020-7030-7040-7045-7050-7060-7080

Tractor serial number is stamped on rear side of differential housing above power take-off shield. Engine serial number plate is on upper left side of engine block.

INDEX (By Starting Paragraph)

INDEX (Cont.)

DUAL DIMENSIONS

This service manual provides specifications in both the U.S. Customary and Metric (SI) systems of measurement. The first specification is given in the measuring system perceived by us to be the preferred system when servicing a particular component, while the second specification (given in parenthesis) is the converted measurement. For instance, a specification of "0.011 inch (0.28 mm)" would indicate that we feel the preferred measurement, in this instance, is the U.S. system of measurement and the metric equivalent of 0.011 inch is 0.28 mm.

CONDENSED SERVICE DATA
Models 7010-7020-7030-7040

	7010	7020	7030	7040
GENERAL				
Engine Make	Own	Own	Own	Own
Engine Model	649T	649I	3500 MARK II	3500 MARK II
Number of Cylinders	6	6	6	6
Bore	3.875 in. (98.43 mm)	3.875 in. (98.43 mm)	4.250 in. (107.95 mm)	4.250 in. (107.95 mm)
Stroke	4.250 in. (107.95 mm)	4.250 in. (107.95 mm)	5.000 in. (127.0 mm)	5.000 in. (127.0 mm)
Displacement	301 cu. in. (4909 cc)	301 cu. in. (4909 cc)	426 cu. in. (6982 cc)	426 cu. in. (6982 cc)
Main Bearings, Number of	7	7	7	7
Cylinder Sleeves	Wet	Wet	Wet	Wet
Alternator & Starter Make	DELCO-REMY*	DELCO-REMY*	DELCO-REMY*	DELCO-REMY*
*Some models are equipped with Niehoff.				
TUNE-UP				
Firing Order	1-5-3-6-2-4	1-5-3-6-2-4	1-5-3-6-2-4	1-5-3-6-2-4
Valve Tappet Gap (Hot) Intake & Exhaust	0.015 in. (0.38 mm)	0.015 in. (0.38 mm)	0.015 in. (0.38 mm)	0.015 in. (0.38 mm)
Valve Seat Angle Inlet & Exhaust	30°	30°	30°	30°
Injection Timing	18°BTDC	18°BTDC	24°BTDC	16°BTDC
Injection Pump Make	ROOSA-MASTER			
Timing Mark Location	CRANKSHAFT PULLEY			
Battery Terminal, Ground	NEG.	NEG.	NEG.	NEG.
Engine Low Idle Rpm	750-800	750-800	700-750	700-750
Engine High Idle Rpm, No Load	2480-2580	2480-2580	2500-2550	2500-2645
Engine Full Load Rpm	2300	2300	2300	2300
SIZES-CAPACITIES-CLEARANCES				
Crankshaft Main Journal Diameter	2.7465-2.7480 in. (69.761-69.799 mm)		3.2465-3.248 in. (82.461-82.499 mm)	
Crankpin Diameter	2.3720-2.3735 in. (60.248-60.286 mm)		2.7470-2.7485 in. (69.773-69.811 mm)	
Camshaft Journal Diameter, All	2.130-2.131 in. (54.10-54.13 mm)		2.130-2.131 in. (54.10-54.13 mm)	
Piston Pin Diameter	1.2515-1.2517 in. (31.78-31.79 mm)		1.5011-1.5013 in. (38.127-38.133 mm)	
Valve Stem Diameter, Inlet	0.3715-0.3720 in. (9.436-9.448 mm)		0.3715-0.3720 in. (9.436-9.448 mm)	
Exhaust	0.3705-0.3710 in. (9.410-9.423 mm)		0.3705-0.3710 in. (9.410-9.423 mm)	
Main Bearing Diametral Clearance	0.0016-0.0048 in. (0.04-0.12 mm)		0.0019-0.0051 in. (0.048-0.129 mm)	
Rod Bearing Diametral Clearance	0.0009-0.0039 in. (0.02-0.10 mm)		0.001-0.004 in. (0.02-0.10 mm)	
Piston Skirt Diametral Clearance	0.0045-0.0070 in. (0.11-0.18 mm)		0.0025-0.0050 in. (0.063-0.127 mm)	
Crankshaft End Play	0.004-0.010 in. (0.10-0.25 mm)		0.007-0.013 in. (0.18-0.33 mm)	
Camshaft Bearings Diametral Clearance	0.002-0.005 in. (0.05-0.13 mm)		0.002-0.006 in. (0.050-0.15 mm)	

CONDENSED SERVICE DATA (Cont.)

	7010	7020	7030	7040
SIZES-CAPACITIES-CLEARANCES (Cont.)				
Camshaft End Play	0.001-0.011in. (0.03-0.28 mm)		0.0027-0.0083 in. (0.068-0.210 mm)	
Cooling System Capacity*	26 qts. (24.5 L)	26 qts. (24.5 L)	32. qts. (30.2 L)	32 qts. (30.2 L)
Crankcase Oil*	16 qts. (15.1 L)	16 qts. (15.1 L)	19 qts. (17.9 L)	19 qts. (17.9 L)
Transmission*	7.4 gal. (28.0 L)	7.4 gal. (28.0 L)	7.4 gal. (28.0 L)	7.4 gal. (28.0 L)
Differential*	16.7 gal. (63.46 L)	16.7 gal. (63.46 L)	16.7 gal. (63.46 L)	16.7 gal. (63.46 L)
*Approximate capacity				
TIGHTENING TORQUES				
General Recommendations	See End of Shop Manual			
Rod Bearing Cap Screws	See Paragraph 30			
Cylinder Head Cap Screws	165.ft.-lbs. (224.0 N•m)		150 ft.-lbs. (203.2 N•m)	
Flywheel Cap Screws	135 ft.-lbs. (182.9 N•m)			
Injection Nozzle Nuts	40-60 ft.-lbs. (54.2-81.3 N•m)			
Main Bearing Screws	135 ft.-lbs. (183.0 N•m)		170-190 ft.-lbs. (230.3-257.4 N•m)	

Models 7045-7050-7060-7080

	7045	7050	7060	7080
GENERAL				
Engine Make	Own	Own	Own	Own
Engine Model	670T	3700	3700	3750 MARK II
Number of Cylinders	6	6	6	6
Bore	4.250 in. (107.95 mm)	4.250 in. (107.95 mm)	4.250 in. (107.95 mm)	4.250 in. (107.95 mm)
Stroke	5.000 in. (127.0 mm)	5.000 in. (127.0 mm)	5.000 in. (127.0 mm)	5.000 in. (127.0 mm)
Displacement	426 cu. in. (6982 cc)	426 cu. in. (6982 cc)	426 cu. in. (6982 cc)	426 cu. in (6982 cc)
Main Bearings, Number of	7	7	7	7
Cylinder Sleeves	Wet	Wet	Wet	Wet
Alternator & Starter Make	DELCO-REMY*	DELCO-REMY*	DELCO-REMY*	DELCO-REMY*
*Some models are equipped with Niehoff.				
TUNE-UP				
Firing Order	1-5-3-6-2-4	1-5-3-6-2-4	1-5-3-6-2-4	1-5-3-6-2-4
Valve Tappet Gap (Hot) Intake & Exhaust	0.015 in. (0.38 mm)	0.015 in. (0.38 mm)	0.015 in. (0.38 mm)	0.015 in. (0.38 mm)
Valve Seat Angle Inlet & Exhaust	30°	30°	30°	30°
Injection Timing	16°BTDC	26°BTDC	18°BTDC	22°BTDC
Injection Pump Make	ROOSA-MASTER			
Timing Mark Location	CRANKSHAFT PULLEY			
Battery Terminal, Ground	NEG.	NEG.	NEG.	NEG.
Engine Low Idle Rpm	700-750	700-750	700-750	725-775
Engine High Idle Rpm, No Load	2500-2550	2500-2550	2500-2645	2800-2850
Engine Full Load Rpm	2300	2300	2300	2550
SIZES-CAPACITIES-CLEARANCES				
Crankshaft Main Journal Diameter	3.2465-3.248 in. (82.461-82.499 mm)			
Crankpin Diameter	2.7470-2.7485 in. (69.773-69.811 mm)			
Camshaft Journal Diameter, All	2.130-2.131 in. (54.10-54.13 mm)			

CONDENSED SERVICE DATA (Cont.)

	7045	7050	7060	7080
SIZES-CAPACITIES-CLEARANCES (Cont.)				
Piston Pin Diameter	1.5011-1.5013 in. (38.127-38.133 mm)			
Valve Stem Diameter				
Inlet	0.3715-0.3720 in. (9.436-9.448 mm)			
Exhaust	0.3705-0.3710 in (9.410-9.423 mm)			
Main Bearing Diametral Clearance	0.0019-0.0051 in. (0.048-0.129 mm)			
Rod Bearing Diametral Clearance	0.001-0.004 in (0.02-0.10 mm)			
Piston Skirt Diametral Clearance	0.0025-0.0050 in. (0.063-0.127 mm)			
Crankshaft End Play	0.007-0.013 in. (0.18-0.33 mm)			
Camshaft Bearings Diametral Clearance	0.002-0.006 in. (0.05-0.15 mm)			
Camshaft End Play	0.001-0.008 in. (0.02-0.20 mm)		0.0027-0.0083 in. (0.068-0.210 mm)	
Cooling System Capacity*	32 qts. (30.2 L)	32 qts. (30.2 L)	32 qts. (30.2 L)	36 qts. (34.1 L)
Crankcase Oil*	19 qts. (17.9 L)	19 qts. (17.9 L)	19 qts. (17.9 L)	19 qts. (17.9 L)
Transmission*	7.4 gal. (28.0 L)	7.4 gal. (28.0 L)	7.4 gal. (28.0 L)	7.4 gal. (28.0 L)
Differential*	16.7 gal. (63.46 L)	16.7 gal. (63.46 L)	16.7 gal. (63.46 L)	17.1 gal. (64.98 L)
*Approximate capacity				
TIGHTENING TORQUES				
General Recommendations	See End of Shop Manual			
Rod Bearing Cap Screws	See Paragraph 30			
Cylinder Head Cap Screws	150 ft.-lbs. (203.2 N•m)			
Flywheel Cap Screws	135 ft.-lbs. (182.9 N•m)			
Injection Nozzle Nuts	40-60 ft.-lbs. (54.2-81.3 N•m)			
Main Bearing Screws	170-190 ft.-lbs. (230.3-257.4 N•m)			

FRONT AXLE SYSTEM

SPINDLES AND BUSHINGS

1. **R&R SPINDLES.** To remove front spindle (15–Fig. 1), support front of tractor, remove front wheel and proceed as follows: Remove snap ring (10) and pull steering arm (9) from spindle. Removal of steering arm will probably require it to be cut off using a suitable torch due to extreme press fit. Remove key (12) and withdraw spindle from bottom of axle extension (11). Remove thrust washers (16) from spindle.

Install two thrust washers (16) on spindle (15) and install it in axle extension (11) from bottom. Install key (12). Heat steering arm (9) to 600°F (315°C) and press it on spindle so maximum shaft end play is 0.030 inch (0.76 mm). Spindle should rotate freely between stops and steering arm must be clear of snap ring groove in spindle. Any adjustment of steering arm on spindle must be made prior to steering arm cooling to below 300°F (148°C). Reseating or removal of steering arm after it has cooled below 300°F (148°C) will probably require it to be cut off with a torch due to extreme press fit.

2. **R&R SPINDLE BUSHINGS.** Spindle bushings can be renewed after removing spindle as outlined in paragraph 1. Remove bushings (13 and 14–Fig. 1) using a suitable bushing driver or drift punch. New bushings are presized and should not require reaming if carefully installed. Install upper and lower bushings in axle extension (11), using a suitable press or shoulder punch,

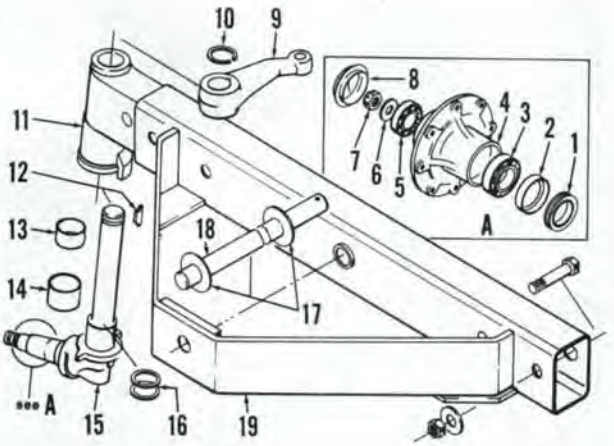

Fig. 1–Exploded view of adjustable front axle assembly.

1. Seal
2. Wear sleeve
3. Bearing assy. (inner)
4. Hub
5. Bearing assy. (outer)
6. Washer
7. Nut
8. Cap
9. Arm
10. Snap ring
11. Axle extension
12. Key
13. Bushing (upper)
14. Bushing (lower)
15. Spindle
16. Thrust washers
17. Washers
18. Pivot pin
19. Axle main member

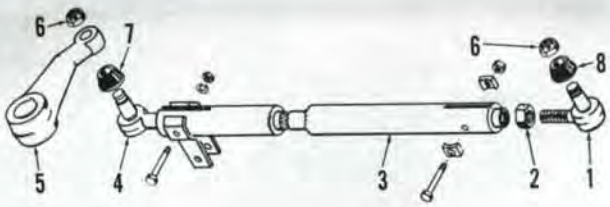

Fig. 2—Exploded view of tie rod and components. Refer to text.

1. Tie rod end
2. Locknut
3. Tube
4. Tie rod end
5. Arm
6. Nuts
7. Seal
8. Seal

until they are flush to 0.030 inch (0.76 mm) below end of bore. Reinstall spindle as outlined in paragraph 1.

TIE RODS AND TOE-IN

3. Toe-in of front wheels should be 3/32 to 7/16 inch (2.4 to 11.1 mm) measured from OD of tire at spindle height. To adjust toe-in remove nut (6—Fig. 2) and disconnect tie rod end (1) from spindle. Loosen jam nut (2) and turn tie rod end in or out as necessary to correct toe-in.

AXLE EXTENSIONS

4. To renew axle extension (11—Fig. 1), remove spindle as outlined in paragraph 1, then remove tread width adjusting bolts and withdraw axle extension from main member (19).

AXLE CENTER (MAIN)MEMBER AND PIVOT PIN

5. The axle center (main) member is a welded one-piece assembly (19—Fig. 1). The center member pivots on one long pin. The pin pivots in renewable bushings in front support casting.

To renew the pivot pin, proceed as follows: Support tractor under torque housing so that no weight is carried on front axle. Then, remove the retaining bolt and drive out pivot pin. Then, raise front of tractor until front support is clear of axle and drive bushings out of front support castings with suitable driver. New bushings are presized and should not require reaming if carefully installed. Install pivot pin (18) with one thrust washer (17) at rear. Install enough thrust washers (17) at front to establish an end play of 0.00-0.17 inch (0.0-4.3 mm).

To renew axle center (main) member, remove both axle extensions as outlined in paragraph 4, disconnect power steering cylinder at both ends and remove front axle pivot pin.

POWER STEERING SYSTEM

All models are equipped with hydrostatic power steering system that has no mechanical linkage between steering wheel and front steering cylinder. Refer to Fig. 3 for drawing showing the steering system.

There are three pumps located together under the range transmission. Pumps are driven by a shaft from the pto gear train. Pumps are bolted together in one housing but are of different type and supply oil to three separate circuits. A brief description of the pumps from front to rear follows. Refer to Fig. 4.

Front pump is an axial piston pump which delivers oil to the following:

1. 3-point hitch.
2. Remote control valve.
3. Power take-off valve.
4. Differential lock valve.
5. Brakes control valve.

Middle pump is a gear type with a flow divider. Flow divider splits output into priority and secondary flow and supplies oil for the following functions:

A. Priority flow:
   1. Power steering.
   2. Cooling oil in rear axle.
   3. Filtering oil in rear axle.
B. Secondary flow:
   1. Lubricating and cooling oil for brakes.
   2. Lubricating and cooling oil for pto clutch.

Rear pump is a gerotor type and is recessed into range transmission housing. It is the only pump that is not visible from the outside of tractor. This pump supplies oil to the following:

1. Power director clutch or power shift clutch.
2. Power director or power shift clutches, lubrication and cooling.
3. Lubrication, cooling and filtering of standard and range transmissions.

The control valve unit (8—Fig. 3) contains a rotary metering motor, a commutator feed valve sleeve and a selector valve spool. In event of engine or hydraulic power failure, the metering motor becomes a rotary hand pump to actuate the power steering cylinder when steering wheel is turned. A check valve within the gear pump housing allows recirculation of fluid within the control valve and steering cylinder during manual operation.

NOTE: The maintenance and absolute cleanliness of all parts is of utmost importance in the operation and servicing of the hydraulic power steering system. Of equal importance is the avoidance of nicks or burns on any of the working parts. Do not use cloth shop towels in cleaning internal parts; use only lint-free shop towels.

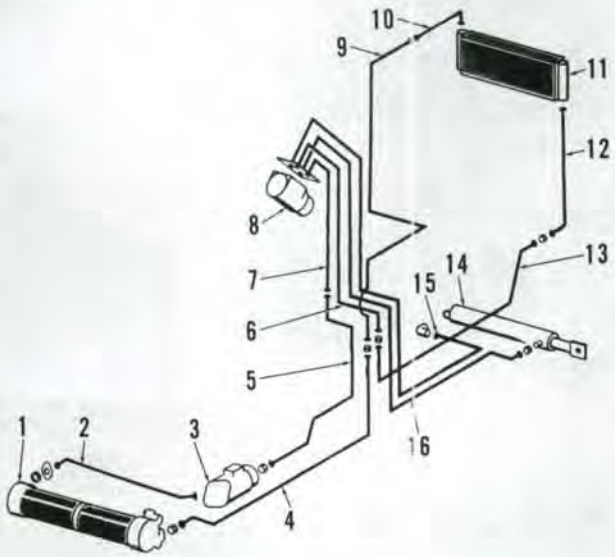

Fig. 3—A schematic showing components of hydraulic power steering system. No mechanical linkage is used between steering wheel and tractor front wheels.

1. Filters
2. Tube (intake)
3. Pump
4. Tube (return)
5. Tube (to inlet hose)
6. Hose (outlet)
7. Hose (inlet)
8. Steering control valve
9. Tube
10. Hose
11. Oil cooler
12. Hose
13. Tube
14. Steering cylinder
15. Hose (valve to cylinder)
16. Hose (valve to cylinder)