

SHOP MANUAL

ALLIS-CHALMERS

MODELS D-21, D-21 SERIES II, TWO-TEN AND TWO-TWENTY

Tractor serial number is located on the front flange of the torque (clutch) housing at left hand side of tractor. Engine serial number is located on nameplate which is attached to the upper rear corner of cylinder block on the left hand side of tractor.

Model D-21 tractors were available with a naturally aspirated diesel engine. D-21 Series II, Two-Ten and Two-Twenty tractors are equipped with a turbo-charged diesel engine. All models are available with an adjustable, wide front axle. Two-Twenty models are also available with a driving front axle (Front Wheel Assist).

INDEX (By Starting Paragraph)

BRAKES			
Adjustment (D-21 & D-21 Series II).....	105		
Two-Twenty	106		
R & R and Overhaul (D-21 & D-21 Series II)	105A		
Two-Twenty	106A		
CLUTCH			
Engine Clutch	72		
Engine Clutch Shaft	76		
COOLING SYSTEM			
Radiator	67		
Water Pump	68		
DIESEL FUEL SYSTEM			
Filters and Bleeding	51		
Injection Pump	56		
Injection Pump Gears	34		
Nozzles	53		
DIFFERENTIAL			
Adjustment	95		
R&R and Overhaul	96		
F.W.A.	172		
ELECTRICAL	70		
ENGINE			
Assembly—R&R	20		
Cam Followers	26		
Camshaft	36		
Connecting Rods & Bearings	41		
Crankshaft & Bearings	42		
Cylinder Head	21		
Cylinder Sleeves	39		
ENGINE (Cont.)			
Flywheel	45		
Front Oil Seal	43		
Injection Timing	56		
Main Bearings	42		
Oil Cooler	49		
Oil Pan	46		
Oil Pump	47		
Piston Pins	40		
Piston & Rod Removal	38		
Pistons & Rings	39		
Rear Oil Seal	44		
Rocker Arms	27		
Speed Adjustments	58		
Timing Gear Cover	30		
Timing Gears	31		
Turbocharger	60		
Valve Guides	24		
Valves & Valves Seats	22		
Valve Springs	25		
FINAL DRIVE & DIFFERENTIAL			
Bevel Gears, Adjust	97		
Bull Gears, Renew	100		
Bull Pinion Bearings, Adjust	99		
Bull Pinion, Renew	99		
Differential Overhaul	96		
Wheel Axle Shafts	103		
FRONT SYSTEM (Without Front Wheel Assist)			
Adjustable Front Axle	1		
Power Steering	8		
FRONT WHEEL ASSIST			
Drive Adapter	165		
Front Axle Assembly	168		
Idler Gear, Shaft and Bearings	167		
Lubrication	164		
Power Steering	8		
POWER LIFT SYSTEM			
Checks and Adjustments	121, 123		
Filters	155		
Pump	137		
Valves	150, 154		
Work Cylinders	129		
POWER STEERING	8		
POWER TAKE-OFF			
Clutch and Brake	114, 115		
Controls	110, 112		
Output Shaft and Bearings	116, 117		
Reduction Gears and Shafts	113		
Test and Adjust	107, 109		
TRANSMISSION (FRONT)			
Assembly, R&R	80A		
Countershaft	87		
Mainshaft	86		
Reverse Idler	85		
Shifter Assembly	80		
TRANSMISSION (DUAL RANGE)			
Bevel Pinion Shaft	92		
Countershaft	94		
Shifter Assembly	90		

CONDENSED SERVICE DATA

GENERAL

	D-21	D-21 Series II	210 220
Liquid Capacities			
Cooling System	21 Qts.	31 Qts.	21 Qts.
Crankcase (with filter)	12 Qts.	12 Qts.	†21 Qts.
Fuel Tank	52 Gals.	52 Gals.	51 Gals.
Transmission (approx.)	21 Gals.	21 Gals.	27 Gals.
†Capacity is 15 qts. for 220 model.			

Front Wheels	
Toe-In	$\frac{1}{8}$ - $\frac{1}{8}$ Inch
Speeds	
Number Forward	8
Number Reverse	2
Electrical System	
Voltage	12
Ground Polarity	Negative
No. of Batteries	2 or 4
Battery Voltage, each	12

CONDENSED SERVICE DATA (Cont.)

DIESEL ENGINE

General	D-21	D-21 Series II	210
	Own		
Make			
Model	3400	3500	3500
No. of Cylinder	6	6	6
Bore—Inches	4 1/4	4 1/4	4 1/4
Stroke—Inches	5	5	5
Displacement—Cubic Inches	426	426	426
Compression Ratio	16:1	16:1	16:1
Firing Order	1-5-3-6-2-4		
Compression Pressure @			
150 RPM*	400 psi	400 psi	400 psi
600 RPM*	500 psi	500 psi	500 psi
*Compression pressures given are approximate and at sea level.			
Tappets & Valves			
Tappet Gap, Hot	0.015	0.015	0.015
Cold	0.018	0.018	0.018

	D-21	D-21 Series II	210
Valve Face & Seat Angle—			
Intake	30°	30°	30°
Exhaust	45°	45°	45°
Diesel System			
Pump Make	Roosa-Master		
Injection Timing, Static	34°BTDC	34°BTDC	34°BTDC
Timing Mark on	Crankshaft Pulley		
Nozzles Make	Own		
Opening Pressure	2750 psi	2900 psi	3125 psi
Governed Speed			
Low Idle RPM	675	675	675
High Idle RPM	2400	2400	2400
Rate Load RPM	2200	2200	2200
Tightening Torques (Ft.-Lbs.)			
General Recommendations			
Cylinder Head	See End of Shop Manual		
Crankshaft Pulley	See Paragraph 21		
Flywheel	200-220	200-220	200-220
Main Bearing Cap Screws	95-105	95-105	95-105
Rad Cap Screws	170-190	170-190	170-190
	See Paragraph 38		

FRONT AXLE SYSTEM (Models without Front Wheel Assist)

SPINDLES

1. **R&R SPINDLES.** To remove front spindle (10—Fig. AC1), support front of tractor, remove front wheel and proceed as follows: Remove snap ring (6) and pull steering arm (8) from spindle. Remove key (K) from spindle and withdraw spindle from bottom of axle extension (5). Remove thrust washers from spindle.

2. **SPINDLE BUSHINGS.** Spindle bushings can be renewed after removing spindle as outlined in paragraph 1. Remove bushings (7) using suitable drift punch. New bushings are pre-sized and should not require reaming if carefully installed. Renew thrust washers if necessary before reinstalling spindle.

TIE-RODS AND TOE-IN

3. Refer to Figs. AC1 and AC2. Toe-in of front wheels should be 1/16 to 1/8-inch, and can be adjusted by lengthening or shortening tie-rods (12) equally as follows: Remove bolt (B) from outer ends of tie-rods and loosen clamp bolts (C) at inner ends. Turn the tie-rod tubes (12) in or out on inner tie-rod ends (13) to obtain correct adjustment. Reinstall and tighten bolt (B), then tighten clamp bolt (C) and recheck toe-in. Readjust if necessary.

Tie-rod end sockets are non-adjustable automotive type and except for dust cover, must be renewed as a complete unit.

AXLE EXTENSIONS

4. To renew either axle extension (5—Fig. AC1 or Fig. AC2), remove spindle as outlined in paragraph 1; then, remove tread width adjusting bolts and withdraw axle extension from main member.

STEERING ARM

5. To renew the steering arm (15—Fig. AC1) or steering arm bushings (16), proceed as follows: Disconnect steering cylinder piston rod and tie-rods from the steering arm, then remove steering arm from pivot pin (P) on the crossbar in front axle main member.

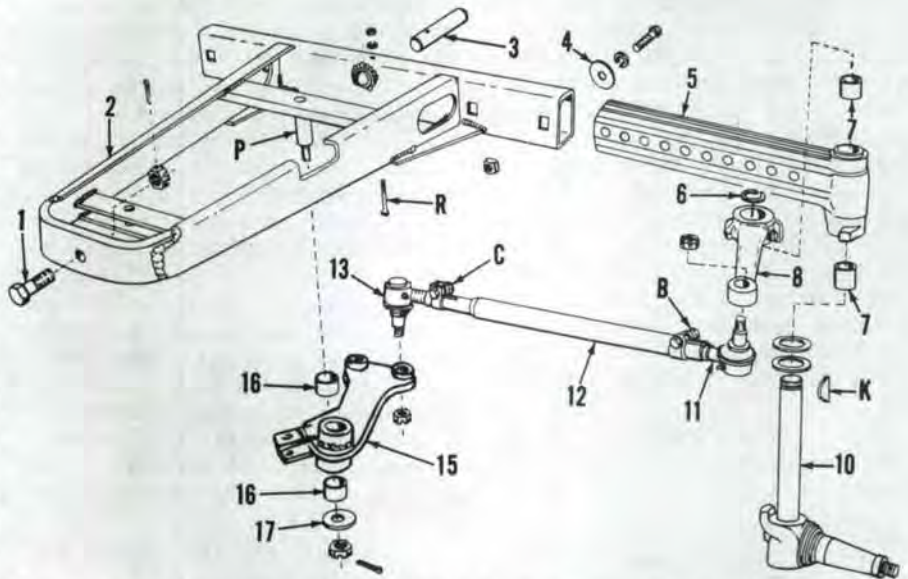


Fig. AC1 — Exploded view of Model D-21 front axle assembly. Bolt (R) retains front pivot pin (3). To adjust front wheel toe-in, remove bolt (B), loosen clamp (C) and turn tie rod tube (12) in or out as required.

- | | | | |
|-------------------|---------------------|-----------------------|-----------------------|
| B. Bolt | 1. Rear pivot bolt | 8. Snap ring | 12. Tie rod tube |
| C. Clamp | 2. Axle main member | 7. Spindle bushings | 13. Inner tie rod end |
| K. Key | 3. Front pivot pin | 8. Steering arm | 15. Steering arm |
| P. Pivot for (15) | 4. Flat washer | 10. Spindle | 16. Bushings |
| R. Retainer bolt | 5. Axle extension | 11. Outer tie rod end | 17. Retainer washer |



Fig. AC2 — View showing front axle extension. Toe-in should be correct for each tread width position when bolt (B) is located in proper notch (N) in tie rod. Refer to Fig. AC1 for legend.

Drive the bushings (16) out of steering arm using a suitable bushing driver. New bushings are pre-sized and should not require reaming if carefully installed.

The steering arm pivot pin (P) is an integral part of the axle center (main) member and radius rod assembly.

AXLE CENTER (MAIN) MEMBER AND PIVOT PINS

6. The axle center (main) member and the radius rods are welded one-piece assembly (2—Fig. AC1 or Fig. AC2). The center member pivots on a bolt (1) at rear end of assembly and a pin (3) at front end. The bolt and pin pivot in renewable bushings in the clutch (torque) housing and in the front support casting.

To renew the pivot bolt or pivot pin, proceed as follows: Support tractor under the torque housing so that no weight is carried on the front axle. Then, remove the retaining bolt (R—Fig. AC1) and drive the front pivot pin out towards front of tractor. The plug (3—Fig. AC3) with lubricating fitting will be driven out with pin. Then, raise front of tractor until front support is clear of axle and drive bushing (2) out to rear with suitable driver. New bushing is pre-sized and should not require reaming if carefully installed. Install pivot pin and retaining bolt, then drive the plug (3) into front support with a hollow driver so that plug is flush with casting.

To remove rear pivot bolt, support rear (radius rod) end of axle main member and remove cotter pin and

slotted nut from pivot bolt. Then, remove pivot bolt from axle and torque housing. Drive bushing out of torque housing. New bushing is pre-sized and should not require reaming if carefully installed. Install pivot bolt through torque housing, install slotted nut and tighten nut to a torque of 150 Ft.-Lbs. If slot in nut does not align with hole in bolt, continue to tighten nut until cotter pin can be inserted.

To renew the axle center (main) member, remove both axle extensions as outlined in paragraph 4, disconnect rear end of power steering cylinder, remove steering arm from pivot pin and remove the front axle pivot pin and rear pivot bolt.

FRONT SUPPORT

7. The front support (1—Fig. AC3) is a heavy one-piece casting. The front axle pivot bushing (2) and plug (3) can be renewed as outlined in paragraph 6 without removing the front support. To remove front support for other jobs, proceed as follows: Drain the cooling system. Remove hood and air cleaner to intake manifold tube. On Two-Twenty models, disconnect hydraulic lines to the oil cooler. On all models, disconnect both radiator hoses, then unbolt hood front support panels from side rails, and remove the panels, radiator and air cleaner as a unit. Disconnect front of steering cylinder from steering arm (15—Fig. AC1). Support the tractor under torque housing so there is no weight on front axle pivot pin. Attach a hoist to front support at lifting point provided, remove cap screws retaining side rails to front support and remove the front support from side rails and front axle pivot pin. NOTE: If front support casting binds between the side rails, loosen the bolts retaining side rails to engine front support plate. Any front end weights attached to front support casting should be removed before unbolting and removing the front support.

POWER STEERING SYSTEM

All models are equipped with hydrostatic power steering system that has no mechanical linkage between the steering wheel and tractor front wheels. Refer to Fig. AC4 for drawing showing the steering system.

Power for steering is supplied by a gear type pump that is driven from the engine timing (camshaft) gear. On models with a hydraulic lift system, the hydraulic and power steering pumps are an integral unit. Transmission oil is utilized as fluid for the system.

The control valve unit (1—Fig. AC4) contains a rotary metering motor, a commutator feed valve sleeve and a selector valve spool. In the event of engine or hydraulic power failure, the metering motor becomes a rotary hand pump to actuate the power steering cylinder when the steering wheel is turned. A check valve within the control

valve housing allows recirculation of fluid within the control valve and steering cylinder during manual operation. NOTE: The maintenance of absolute cleanliness of all parts is of the utmost importance in the operation and servicing of the hydraulic power steering system. Of equal importance

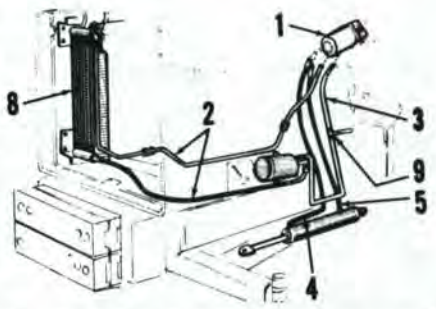


Fig. AC4—Drawing showing components of hydraulic power steering system. No mechanical linkage is used between the steering wheel and tractor front wheels. Note that the components are not located in position in which they are installed on tractor. Cooler (8) is not used on D-21 models.

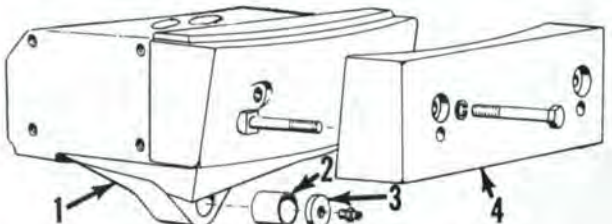


Fig. AC3—View of front support casting and related parts. Additional flat front weights can be bolted onto the weight shown.

- | | |
|------------------|-----------------------------|
| 1. Front support | 5. "Left turn" tube |
| 2. Pivot bushing | 8. Oil cooler |
| 3. Plug | 9. "T" fitting to PTO valve |
| 4. Front weight | |

BUY NOW

**Then Instant Download
the Complete Manual
Thank you very much!**