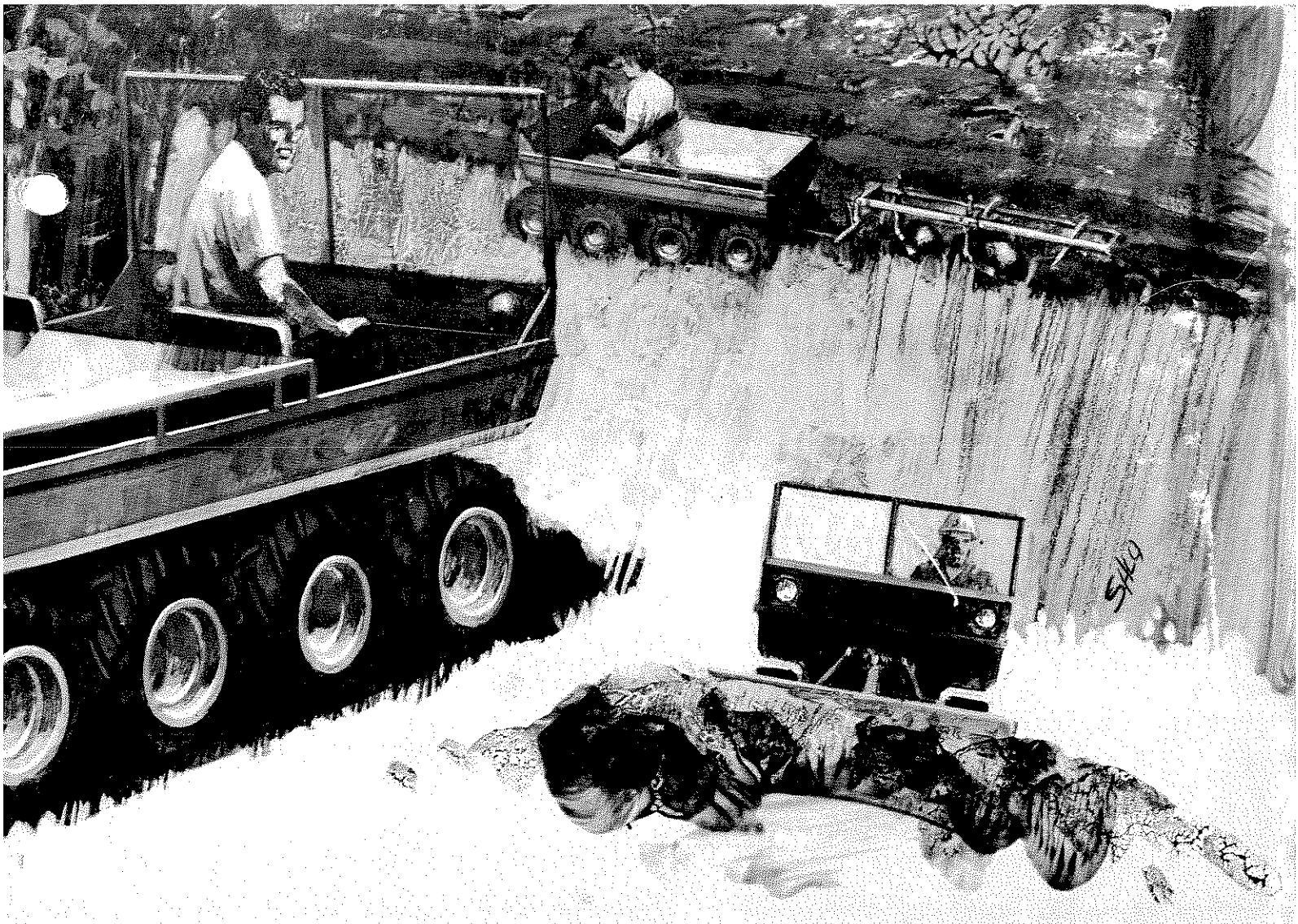


KID T.M.

SERVICE MANUAL

MODEL "A"

HOW TO ORDER PARTS

When ordering parts, state Part Number, KID Serial Number, Part Name, and Quantity Required --- DO NOT ORDER BY REFERENCE NUMBER.

To assure continued successful and trouble-free operation of your KID, order all parts from your authorized KID dealer or distributor.

DO NOT ACCEPT "WILL-FIT" PARTS. THEY MAY SHORTEN THE LIFE OF THE KID.

The information and specifications included in this Illustrated Parts List were in effect at the time of approval for printing. Kinetics International reserves the right, however, to discontinue or change any specifications or design at any time without notice and without incurring any obligation whatsoever.

INTRODUCTION

This Service Manual outlines maintenance, lubrication, adjustments, replacements and repair services necessary for satisfactory operation during normal operations. Unusual operating conditions will require scheduled services to be performed more often than that shown in the schedules.

The information is first grouped by chapter and major system. Each system is then broken down into subsystems. The lubrication and maintenance guide in Section II lists periodic maintenance according to hours operation.

The information and specifications included in this manual were in effect at the time of approval for printing. Kinetics International reserves the right, however, to discontinue or change any specification or design at any time without notice and without incurring any obligation whatsoever.

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

CONVERSION TABLES

INCHES (FRACTIONS & DECIMALS) TO MILLIMETERS

INCHES	MM	INCHES	MM
1/64 = .0156	.3969	33/64 = .5156	13.0969
1/32 = .0312	.7937	17/32 = .5312	13.4937
3/64 = .0469	1.1906	35/64 = .5469	13.8906
1/16 = .0625	1.5875	9/16 = .5625	14.2875
5/64 = .0781	1.9844	37/64 = .5781	14.6844
3/32 = .0937	2.3812	19/32 = .5937	15.0812
7/64 = .1094	2.7781	39/64 = .6094	15.4781
1/8 = .125	3.1750	5/8 = .625	15.8750
9/64 = .1406	3.5719	41/64 = .6406	16.2719
5/32 = .1562	3,9687	21/32 = .6562	16,6687
11/64 = .1719	4.3656	43/64 = .6719	17.0656
3/16 = .1875	4.7625	11/16 = .6375	17.4625
13/64 = .2031	5.1594	45/64 = .7031	17.8594
7/32 = .2187	5.5562	23/32 = .7187	18.2562
15/64 = .2344	5.9531	47/64 = .7344	18.6531
1/4 = .25	6.350	3/4 = .75	19.050
17/64 = .2656	6.7469	49/64 = .7656	19.4469
9/32 = .2812	7.1437	25/32 = .7812	19.8437
19/64 = .2969	7.5406	51/64 = .7969	20.2406
5/16 = .3125	7.9375	13/16 = .8125	20.6375
21/64 = .3281	8.3344	53/64 = .8281	21.0344
11/32 = .3437	8.7312	27/32 = .8437	21.4312
23/64 = .3594	9.1281	55/64 = .8594	21.8281
3/8 = .375	9.5250	7/8 = .875	22.2250
25/64 = .3906	9.9219	57/64 = .8906	22.6219
13/32 = .4062	10.3187	29/32 = .9062	23.0187
27/64 = .4219	10.7156	59/64 = .9219	23.4156
7/16 = .4375	11.1125	15/16 = .9375	23.8125
29/64 = .4531	11.5094	61/64 = .9531	24.2094
15/32 = .4687	11.9062	31/32 = .9687	24.6062
31/64 = .4844	12.3031	63/64 = .9844	25.0031
1/2 = .5	12.700	1 = 1.0000	25.40

POUNDS TO KILOGRAMS

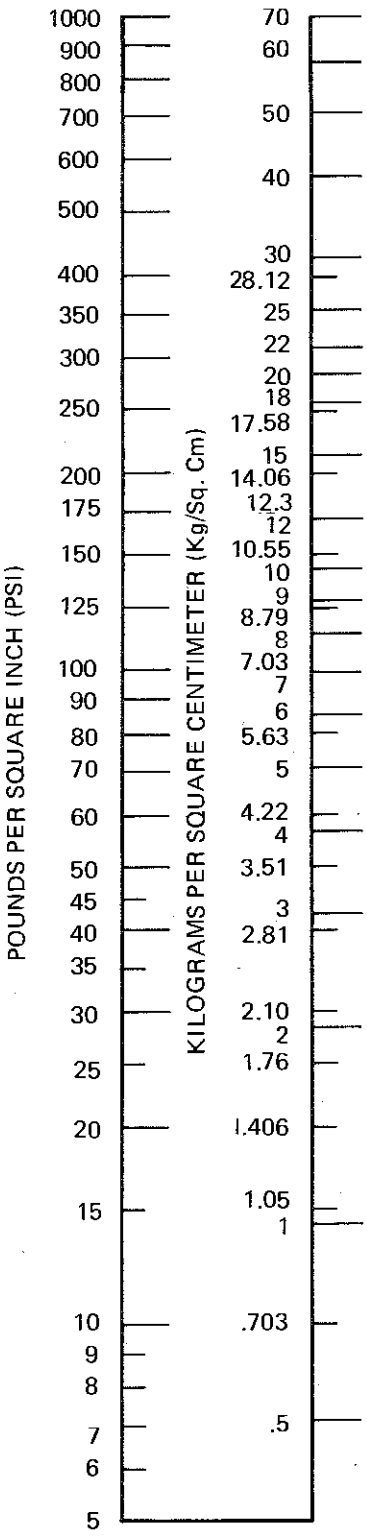
LBS.	KG.	LBS.	KG.	LBS.	KG.	LBS.	KG.
1	.454	31	14.06	61	27.97	91	41.28
2	.907	32	14.51	62	28.12	92	41.73
3	1.361	33	14.97	63	28.58	93	41.18
4	1.814	34	15.42	64	29.03	94	42.64
5	2.268	35	15.88	65	29.48	95	43.09
6	2.722	36	16.33	66	29.94	96	43.54
7	3.175	37	16.78	67	30.39	97	44.00
8	3.629	38	17.24	68	30.84	98	44.45
9	4.082	39	17.69	69	31.30	99	44.91
10	4.536	40	18.14	70	31.75	100	45.36
11	4.990	41	18.60	71	32.21	200	90.72
12	5.443	42	19.05	72	32.66	300	136.08
13	5.897	43	19.50	73	33.11	400	181.44
14	6.350	44	19.96	74	33.57	500	226.80
15	6.804	45	20.41	75	34.02	600	272.16
16	7.257	46	10.87	76	34.47	700	317.51
17	7.711	47	21.32	77	34.93	800	362.87
18	8.165	48	21.77	78	35.38	900	408.23
19	8.618	49	22.23	79	35.83	1000	453.59
20	9.072	50	22.68	80	36.29	2000	907.18
21	9.525	51	23.13	81	36.74	3000	1360.78
22	9.979	52	23.59	82	37.19	4000	1814.37
23	10.43	53	24.04	83	37.65	5000	2267.96
24	10.89	54	24.49	84	38.10	6000	2721.55
25	11.34	55	24.95	85	38.56	7000	3175.15
26	11.79	56	25.40	86	39.01	8000	3628.74
27	12.25	57	25.85	87	39.46	9000	4082.33
28	12.70	58	26.31	88	39.92	10000	4535.92
29	13.15	59	26.76	89	40.37	15000	6803.89
30	13.61	60	27.22	90	40.82	20000	9071.85

TORQUE - FT LBS TO Kg m

Torque (Ft-Lbs)	Torque (Kg m)	Torque (Ft-Lbs)	Torque (Kg m)
5	(0.6915)	95	(13.1385)
6	(0.8298)	105	(14.5215)
8	(1.1064)	110	(15.2130)
10	(1.3830)	115	(15.9045)
11	(1.5213)	120	(16.5960)
12	(1.6596)	150	(20.7450)
13	(1.7979)	160	(22.1280)
14	(1.9362)	167	(23.0961)
18	(2.4894)	170	(23.5110)
19	(2.6277)	175	(24.2025)
20	(2.7660)	210	(29.0430)
24	(3.3192)	235	(32.5005)
27	(3.7341)	240	(33.1920)
28	(3.8132)	250	(34.5750)
30	(4.1490)	270	(37.3410)
31	(4.2873)	280	(38.7240)
34	(4.7022)	295	(40.7985)
35	(4.8405)	375	(51.8625)
39	(5.3937)	395	(54.6285)
41	(5.6703)	420	(58.0860)
44	(6.0852)	435	(60.1605)
49	(6.7767)	440	(60.8520)
51	(7.0533)	590	(81.5970)
55	(7.6065)	605	(83.6715)
75	(10.3725)	660	(91.2780)
78	(10.7874)	675	(93.3525)
83	(11.4789)	910	(125.8530)
85	(11.7555)	990	(136.9170)

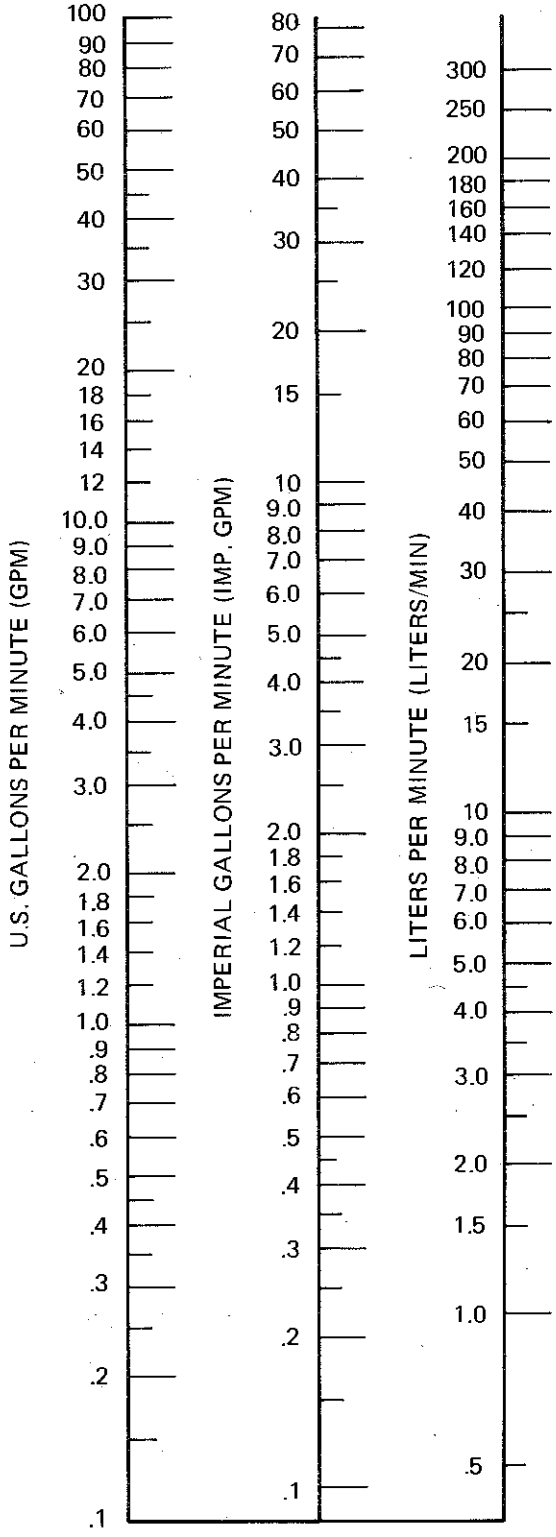
PSI to Kg/sq cm

PRESSURE

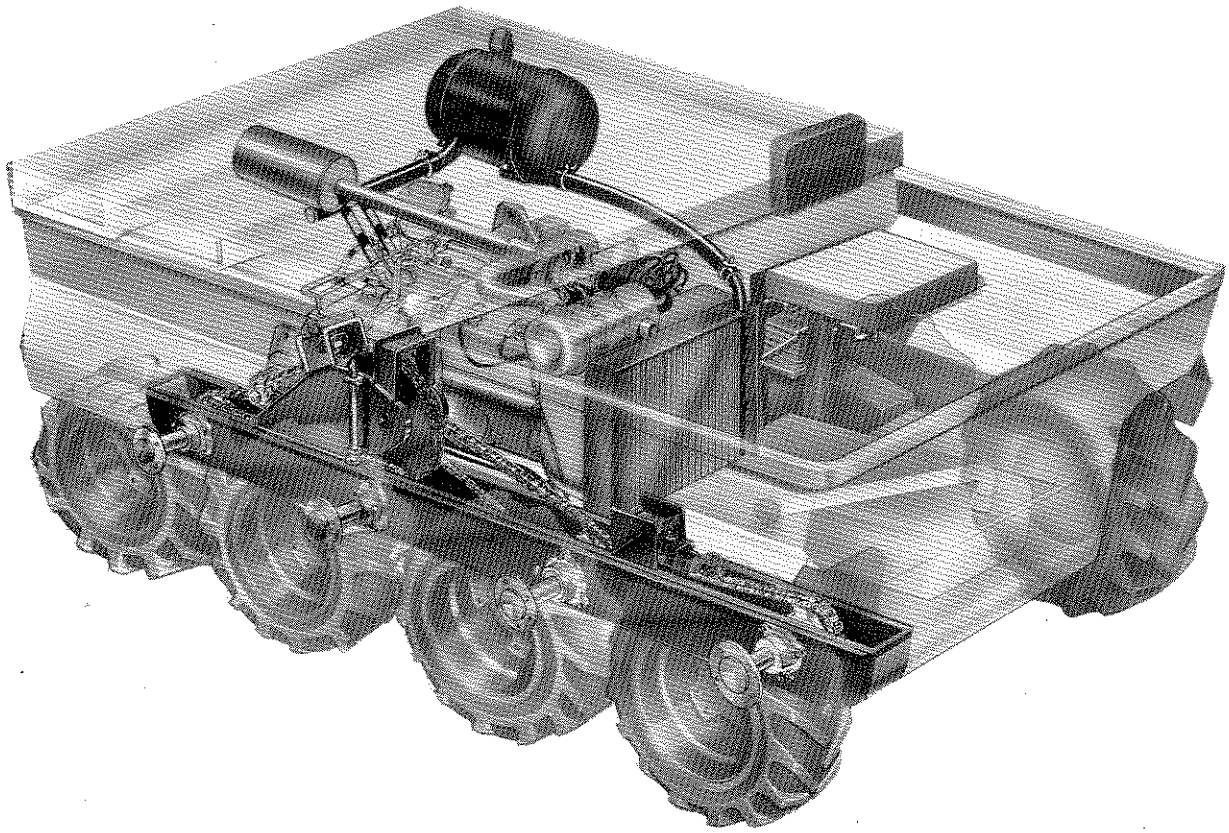


GPM to Liters/Min.

FLOW



KID TRACTOR



SECTION I KID DATA

GENERAL DATA AND SPECIFICATIONS

Weight		
Basic Tractor (with front and rear support structure)	2,200 lbs	(998 Kg)
Payload (including 2 man crew)	1,000 lbs	(454 Kg)
Gross Vehicle Weight	3,200 lbs	(1,452 Kg)
Dimensions (Without Optional Equipment)		
Length	96.0 in.	(243.8 cm)
Width	60.0 in.	(152.4 cm)
Height	45.0 in.	(114.3 cm)
Wheel Base	73.4 in.	(186.4 cm)
Ground Clearance	6.5 in.	(16.5 cm)
Cargo Area	22.0 sq. ft.	(2.0 sq. m)
Body Construction		
Upper and Lower Hull	Steel - Unitized, Watertight	
Drive Train		
8-Wheel Drive	Chain-Sprocket System	
Mechanical Drive Ratio (Standard)	10.95: 1	
Farm Drive Ratio (Optional)	13.95: 1	
Electrical System		
Battery	12 volt, 32 amp. hour	
Alternator	Flywheel type, Solid State, 12 volts, 10 amp.	
Engine		
Make	Wisconsin VH4D (gasoline)	
Type	Air-Cooled, 4-Cylinder, 4 Cycle	
Weight	340 lbs (154.4 Kg)	
Displacement	107.7 cu. in. (1,765 CC)	
Horsepower	30 hp (30.4 metric) @ 2800 RPM	
Transmission		
Make	Vickers	
Type	Right-angle Hydrostatic	
Displacement (pump and motor)	2.01 cu. in. (32.9 cc) per revolution @ 2400 RPM	
Output Speed	0-4000 RPM, infinitely variable and reversible	
Maximum Operating Pressure	4,500 PSI (316.4 Kg/sq. cm.)	

KID DATA (Cont'd)

Tires

- Size . . . . . 23 - 8.50 x 12 all-terrain type
- Tubes . . . . . Optional
- Pressure - Standard 2-Ply . . . . . 10-20 PSI (0.6 - 1.2 at)
- Optional 4-Ply . . . . . 10-24 PSI (0.6 - 1.5 at)
- Tread . . . . . 46.0 in. (116.8 cm.)
- Ply . . . . . 2 (4 optional)

Performance

- Maximum Speed (Land, with standard drive ratio) . . . . . 25 MPH (40.2 Kms/hr)
- Maximum Speed (Water) . . . . . 1.5 MPH (2.4 Kms/hr)
- Gradeability . . . . . 70% (60% continuous)
- Side Slope . . . . . 50% (40% continuous)
- Turning Radius . . . . . 0 ft. (pivot)
- Turning diameter (Minimum) . . . . . 10 ft. 8 inches (2 in. clearance each corner)

FLUID CAPACITIES

Component	U. S. Measure	Imperial Measure	Metric Measure
Fuel Tank	9.3 gallons	7.7 gallons	35.2 liters
Engine (with filter change)	4.0 quarts	3.3 quarts	3.8 liters
Transmission System	20.0 quarts	16.7 quarts	18.9 liters
Gearbox	.50 quart	.43 quart	.48 liter

FUEL SPECIFICATIONS

The use of quality gasolines will provide maximum performance from your engine. A good regular grade of gasoline, with an octane rating of 78 or above, should be used. Gasoline with an octane rating of less than 78, or gasoline of an inferior quality will cause severe damage to the engine.

OIL SPECIFICATIONS

The use of proper oil is required and recommended for continued economical and trouble-free performance. Lubricating oils are graded by viscosity and classified in accordance with severity of operation.

The oil recommended for use in the KID engine, gearbox, and transmissions is classified as MS (Most Severe). This oil meets specifications required for tractors operating under unfavorable or severe operating conditions.

The viscosity grades of oil recommended for the KID are listed in the following chart.

For Engine, Gearbox and Transmissions	
Expected Temperature	**Viscosity**
0° F (-18° C) and above	SAE 10W-30
Below 0° F (-18° C)	SAE 5W-20

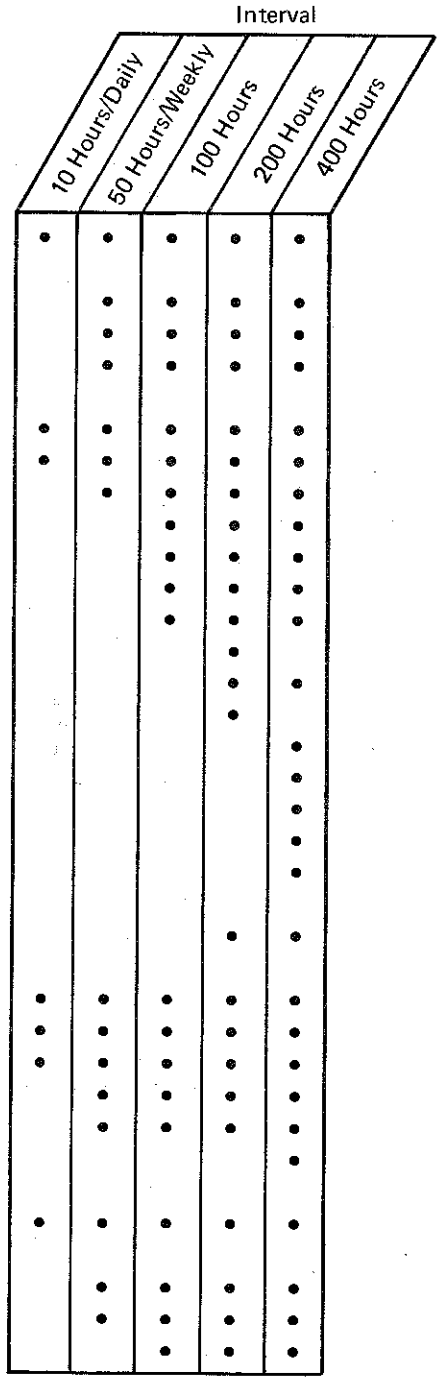
Compression Specifications

A compression check will indicate the condition of the pistons, piston rings, cylinder heads, and valves. Perform a compression check as follows:

1. Remove all four spark plugs.
2. Using a hand pressure oil can, squirt oil (10W-30) on the cylinder walls, making sure the oil runs down the walls into the piston rings.
3. Turn the engine at least one revolution to force excess oil out the spark plug holes.
4. Insert the compression tester into each spark plug hole and turn the engine. Normal compression is 95 to 104 psi. Minimum allowable operating compression is 60 psi. Any compression below 60 psi requires engine overhaul.

SECTION II LUBRICATION AND MAINTENANCE

OPERATION



TRACTOR BODY
- Drain liquids from hull (if necessary)
- Check battery fluid level and clean terminals and hold down brackets
- Lubricate cargo deck hinges
- Clean engine compartment

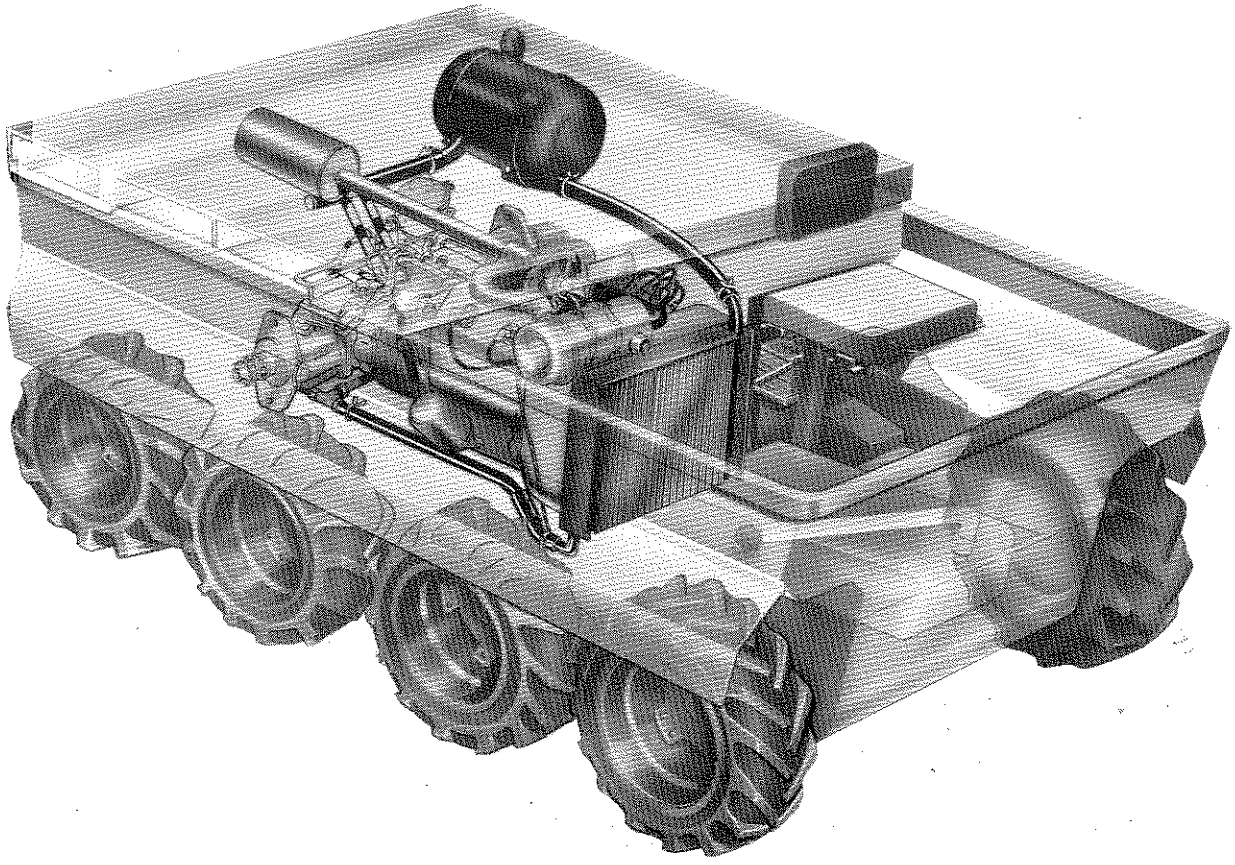
ENGINE
- Check engine oil level
- Clean air cleaner filter collector cup
- Clean air cleaner filter element
- Clean fuel pump filter
- Change engine oil and filter
- Clean oil filler and breather cap
- Lubricate Distributor
- Clean and re-gap distributor points
- Time engine
- Clean spark plugs
- Check valve clearance
- Decarbonize engine
- Change distributor points and condenser
- Clean and adjust carburetor
- Change spark plugs

GEAR BOX
- Check Gearbox oil level

TRANSMISSION
- Check transmission oil reservoir level
- Check for oil leakage
- Clean transmission oil cooler fins (intake side)
- Check and lubricate transmission linkages
- Lubricate control lever and ball joints
- Replace oil filter element

DRIVE SYSTEM
- Check tire pressure
- Lubricate drive chains, sprockets, and main drive chain tensioner, adjust if required
- Lubricate outer axle bearings
- Lubricate inner axle bearings

POWER TRAIN



SECTION III
ENGINE MAINTENANCE

A. ELECTRICAL SYSTEM

1. Distributor

The illustration (Figure III-3) identifies the component parts of the distributor and shows their relationship to the complete assembly. Use the illustration to identify and locate parts when adjusting or assembling the distributor.

a. Lubrication

Lubricate the distributor after every 100 hours operations as follows:

CAUTION

Do not lubricate the distributor more than recommended. Fast moving parts will throw the oil off and short out the ignition system.

(1) Apply two to three drops of SAE-10W oil to the oiler on the side of the distributor base.

(2) Remove distributor cap and rotor and apply three to five drops of SAE-10W oil to the felt on top of cam sleeve; one to two drops to the breaker arm pivot; and three drops to the cam wick.
Do not lubricate excessively. Oil on contact points will cause them to burn.

(3) Replace the distributor cap.

b. Inspection and Maintenance

In addition to the usual 100-hour lubrication, the distributor should be inspected and maintained as follows:

(1) Remove the distributor cap and check for cracks and evidence of arcing. Check carbon rotor contact for damage or excessive wear. If these conditions exist, the cap should be replaced.

(2) Check the rotor for cracks or evidence of excessive burning at the end of the metal strip. If these conditions exist, the rotor should be replaced.

(3) Check the condenser lead for a broken wire or frayed insulation. Clean and tighten connections on terminal posts. Make sure the condenser is mounted firmly to provide a good ground connection.

(4) Check distributor points for excessive wear, proper mating, transferred metal, or pitting. If any of these conditions exist, new points should be installed.

(5) Adjust the distributor points as follows:

(a) Turn the engine over until the distributor breaker arm rubbing block is on the highest point of a cam.

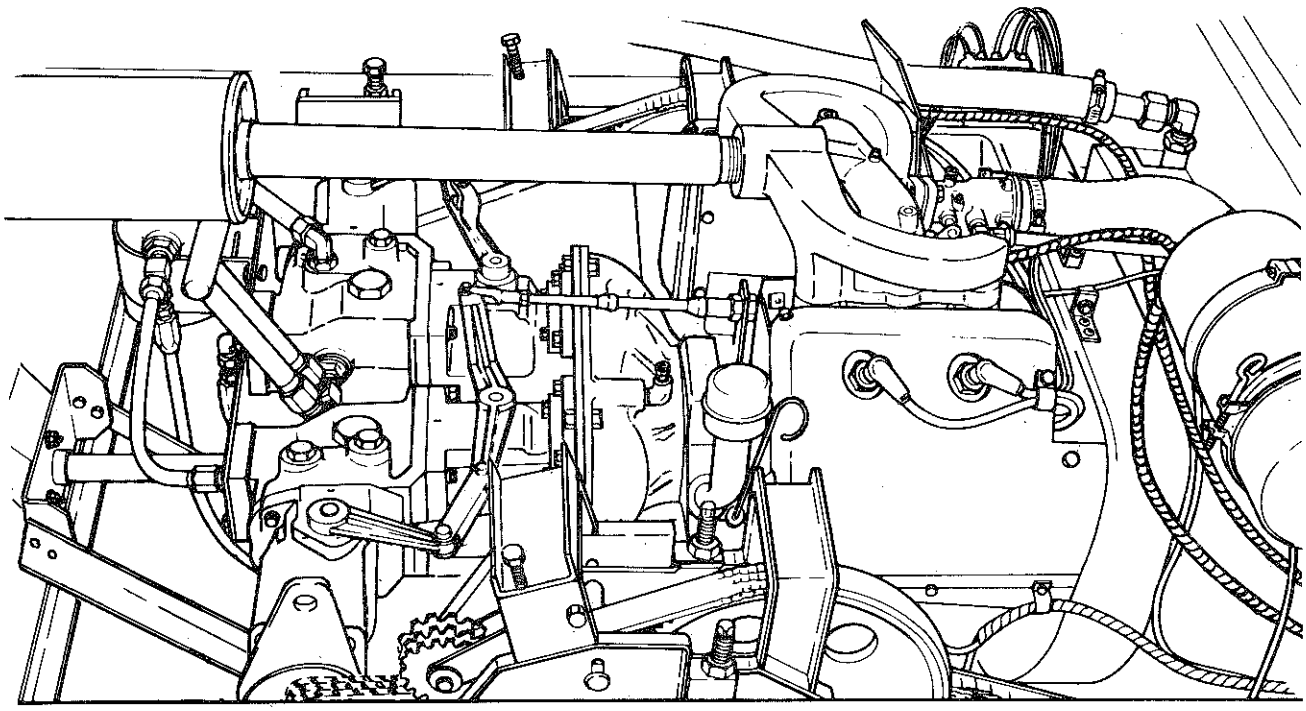


Figure III-1 Engine Compartment

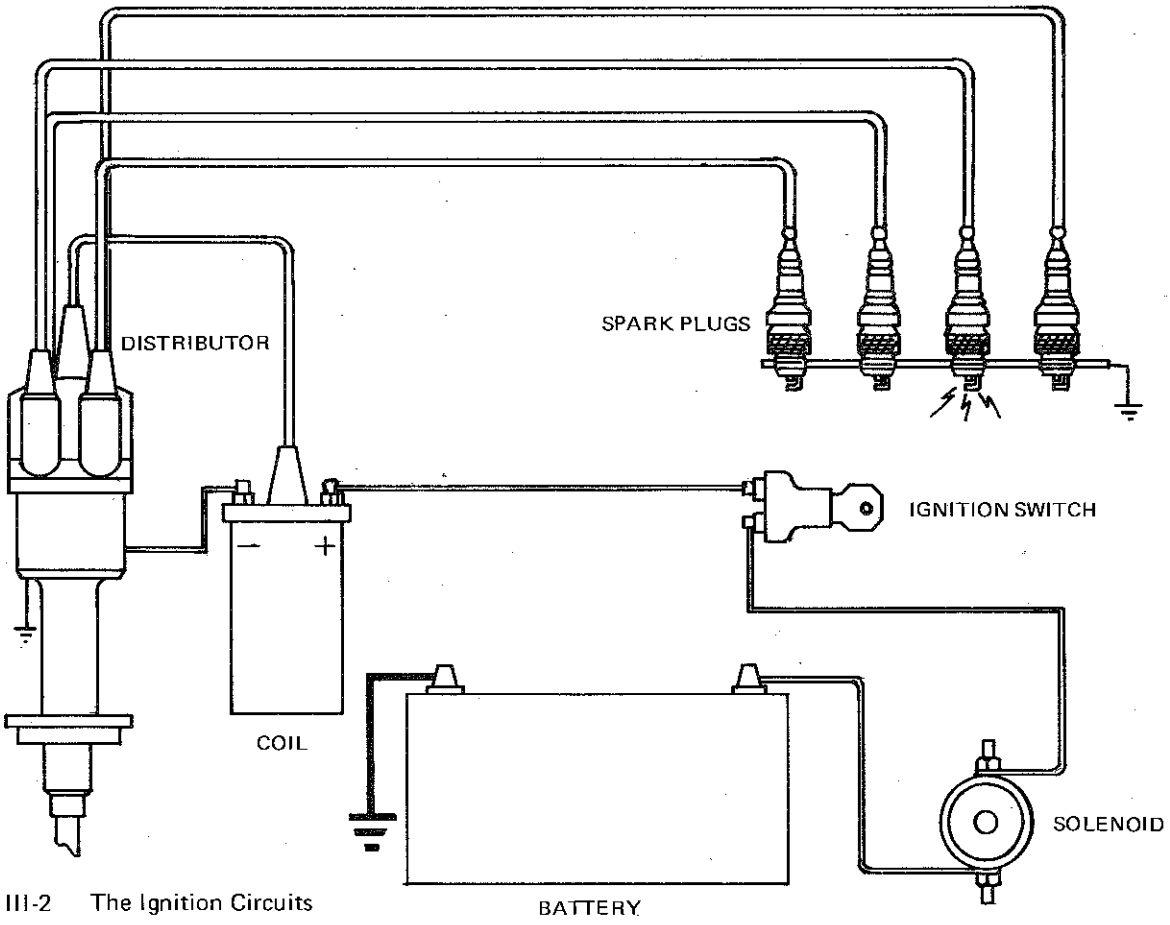


Figure III-2 The Ignition Circuits

NOTE

The distributor point gap must be set between 0.018 and 0.022 inch (0.46 to 0.56 mm) at full separation.

(b) Loosen the stationary contact lockscrew very slightly and insert feeler gauge between points.

(c) Using a screwdriver, turn adjusting screw to open or close points as required until a slight drag is felt when sliding the feeler gauge between the points.

(d) Tighten the lockscrew and recheck the gap.

c. Breaker Points and Condenser Replacement

When replacement of points and condenser is required install as follows:

(1) Remove the distributor cap, the rotor and the dust cover.

(2) Loosen the distributor terminal screw (it is not necessary to remove this screw).

(3) Lift the breaker point spring free of the terminal and release the spring tension.

(4) Remove the breaker point hold-down screw, and lift the breaker point assembly free of the pivot post.

(5) Install the new breaker points and hold-down screw, and set the spring in place on the terminal.

(6) Remove the condenser lead from the terminal, remove the condenser hold-down screw, and remove the condenser.

(7) Install the new condenser and tighten the terminal screw.

NOTE

Make sure the condenser lead is clear of the rotor and breaker points and is not touching the base.

(8) Adjust the distributor points as follows:

(a) Turn the engine over until the distributor breaker arm rubbing block is on the highest point of a cam.

(b) Loosen the stationary contact lockscrew very slightly, and insert feeler gauge between points.

(c) Using a screwdriver, turn adjusting screw to open or close points as required until a slight drag is felt when sliding the feeler gauge between the points.

(d) Tighten the lockscrew and recheck the gap.

(9) Lubricate in accordance with scheduled 200-hour lubrication and maintenance (See Section II).

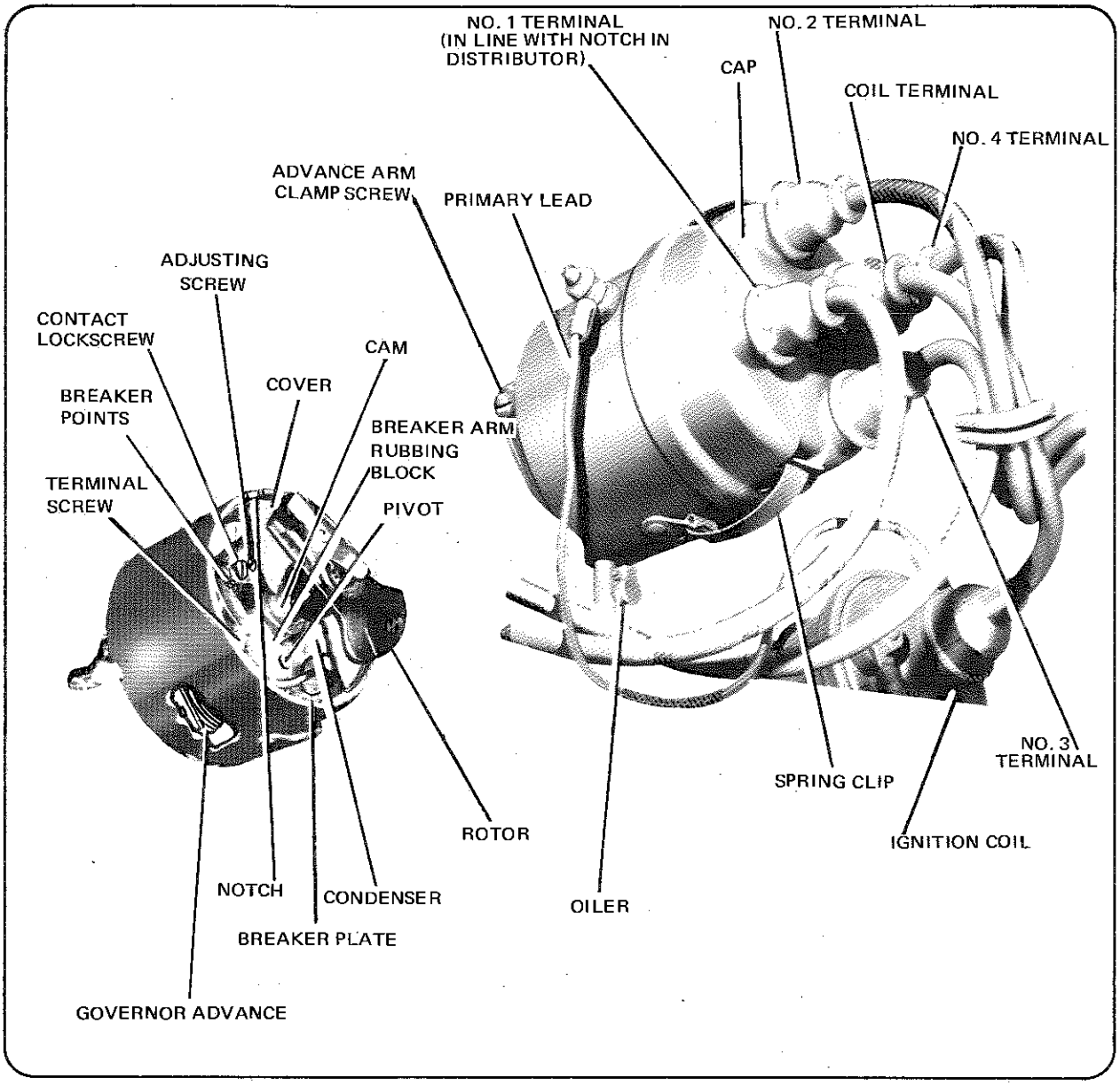


Figure III-3 The Ignition Distributor

d. Ignition Timing

(1) Ignition Timing (Not Operating)

(a) Remove the spark plug from No. 1 cylinder and place a finger over the hole.

(b) Turn the engine until air is forced out, showing that the piston is in the compression stroke.

(c) Install the timing disc on the PTO stub shaft as illustrated (Figure III-4).

(d) Turn the engine slowly until the "zero" mark on the timing disc aligns with the scribe line on RH Transmission adapter sub-plate. No. 1 piston is now at top-dead-center, and the center line of the distributor rotor should be in line with center of the notch in the distributor housing.

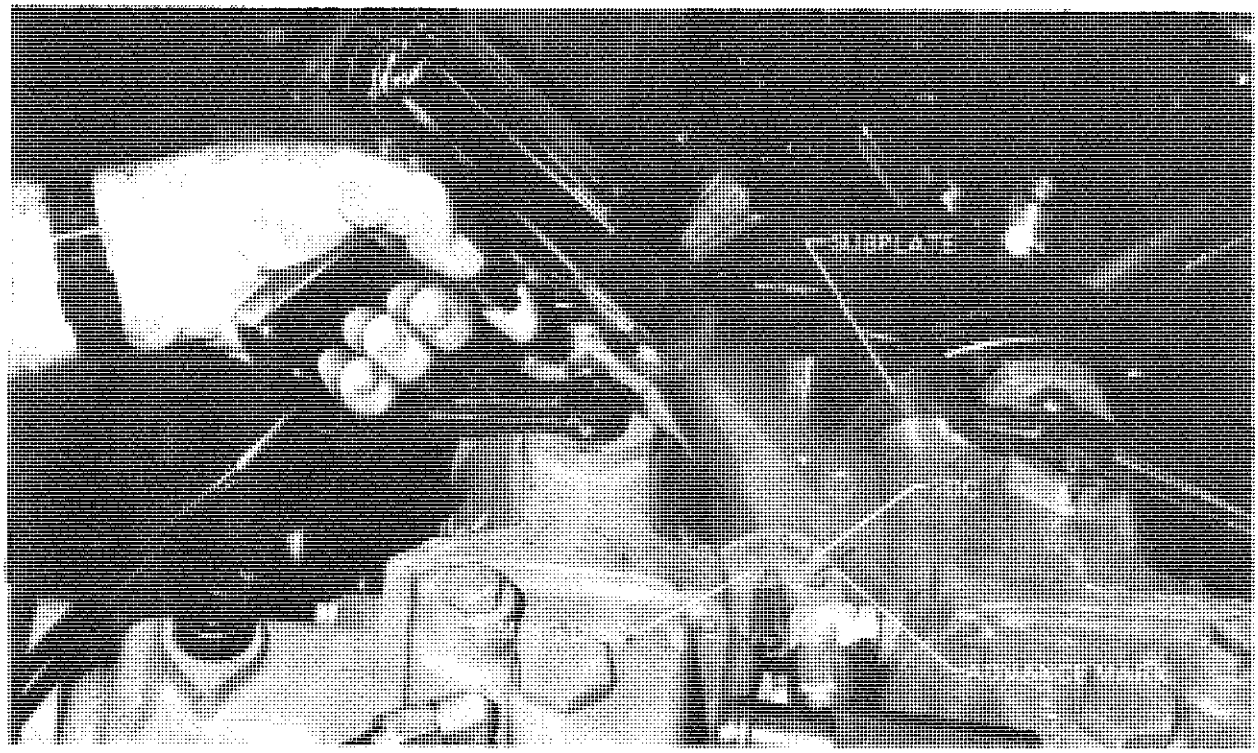


Figure III-4 Timing Tool

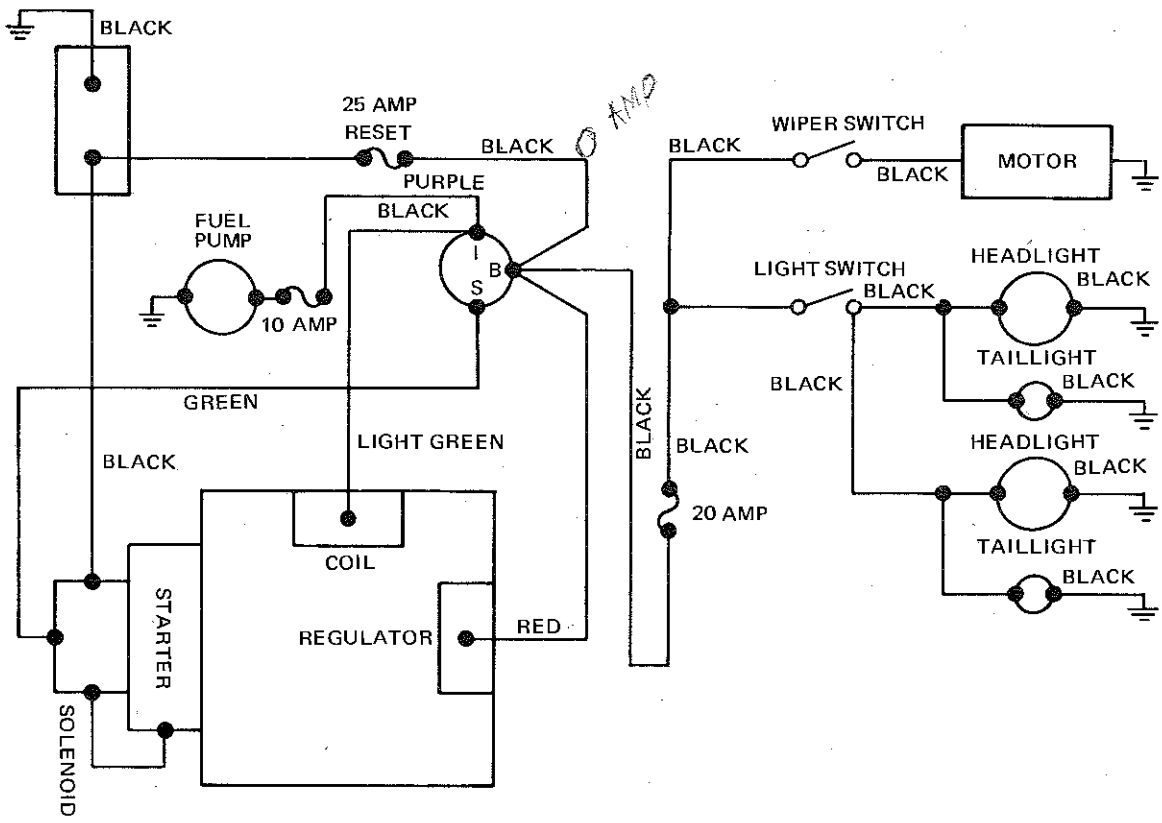


Figure III-5 Electrical Schematic

NOTE

If the center line of rotor does not align with mark on distributor entire distributor must be pulled out and the gears engaged so the rotor lines up.

(e) Loosen the advance arm clamp screw and turn the distributor body counterclockwise until the breaker points are fully closed. Turn distributor body clockwise until breaker points are just starting to open.

(f) Tighten advance arm clamp screw. The engine timing is set in retarded (non-operating) condition.

2. Ignition Timing (Operating - Running Advance)

(a) With the ignition timing set per (1) set running advance as follows:

(b) Make sure timing disc is installed as illustrated (Figure III-4).

(c) Insert a small screwdriver in the No. 1 tower in the distributor cap. Clamp the timing light red lead to the screwdriver, and the other lead to ground (shrouding or engine).

(d) Start engine and illuminate timing disc with the timing light, with engine running at 2000 RPM.

(e) Loosen advance arm clamp and turn distributor until the 23° mark on the timing disc aligns with scribe line on RH Transmission adapter sub-plate. Tighten advance arm clamp.

NOTE

Do not attempt to set running advance at less than 2000 RPM because the automatic advance is not fully advanced below this speed.

2. Spark Plugs

(a) Installation

Install new spark plugs as follows:

(1) Remove cables from spark plugs and remove plugs from engine.

(2) Use a feeler gauge to check new spark plug gap . Set gaps to 0.030 inch (0.762 mm).

(3) Make sure the new spark plugs each have a new gasket, and no old gaskets were left in the cylinder head spark plug hole.

(4) Install the new plugs. Tighten until they seat on the gasket, then tighten 1/2 to 3/4 turn more. Clean the spark plug leads and inspect for cracks, fraying or other damage. Connect the leads to the plugs.

3. Battery

(a) Battery Testing

(1) Hydrometer Tests

Specific gravity of batteries is checked by means of a hydrometer. Hydrometer floats are calibrated to indicate correctly only at one fixed temperature (80° F). The temperature correction amounts to approximately .004 specific gravity referred to as 4 points of gravity for each 10° F. above 80° F. For each 10° F below 80° F subtract 4 points. Always correct the specific readings for temperature variations. Measure the specific gravity of the electrolyte in each battery cell. If the specific gravity of all cells is above 1.235 but the variation between cells is more than 50 points (.050) it is an indication of an unserviceable battery. If the specific gravity of a cell or cells is less than 1.235, recharge the battery (show charge). If the specific gravity of the cells is higher than 1.235 and variation between cells is less than 50 points, the battery may be checked under load.

(2) Battery Load Tests

(a) Light load Test

A light load test is an "in the tractor" test which quickly determines the serviceabiltiy of a lead acid battery. A light load tester or a 0-4 voltmeter with cadmium probes can be used for this purpose.

IMPORTANT

Always follow the manufacturer's operating instructions supplied with the test equipment. Add distilled water to required levels. With load or headlights on check each cell for voltage reading. If reading is lower than 1.95 volts, battery is too low to test. Differences between the highest and lowest cells should not exceed 0.50 volts. If such a difference exists, the battery should be replaced.

(b) Heavy Load Test.

Turn control knob of battery charger to "off" position. Turn voltmeter selector switch to "16 volt" position. Connect test leads. Turn control knob until ammeter reading is equal to 3 times the ampere hour rating of the battery (96 Amp). Maintain this load for 15 seconds, note voltmeter reading, then turn control knob to "off" position. If voltmeter reading is 9.6 volts, or higher with battery temperature at a minimum of 70° F, battery has correct output capacity. If less than 9.6 volts, replace battery.

b. Battery Charging

Slow Charging

NOTE

Disconnect battery ground cable before charging.

(1) This is the best method of recharging a battery. Ensure that the electrolyte is at the proper level before charging the battery, and that battery caps are removed. Normal charging rate is 5 Amperes for a 12 V battery. A minimum period of 24 hrs is required when using this method. A battery is fully charged when all cells are gassing freely and three corrected specific gravity readings taken at hourly intervals show no increase in specific gravity.

(2) Fast Charging

When fast charging a battery always disconnect the terminal cables. The rate of charging is unrestricted as long as no excessive gassing or loss of electrolyte occurs and as long as the temperature of any one cell does not exceed 125° F.

c. Battery Maintenance

(1) General

It is important that the battery is in a fully charged condition when the owner/operator receives his vehicle, or when a replacement battery is installed. Liquid level in the battery should be checked at regular intervals; every day if temperature is above 100° F. If the liquid level is below the bottom of filler holes, distilled water should be added. The top of the battery should be kept clean, and the battery hold down bolts should be kept properly tightened.

(2) Cleaning

NOTE

Never clean the battery while installed. Remove it completely from the KID to avoid dropping corrosive residue into hull.

Check external condition of battery. When cleaning battery, tighten vent caps first, then wash with a diluted solution of ammonia or soda. Flush with clear water. If battery posts and cable terminals are corroded, disconnect and clean with a soda solution and wire brush.

(3) Connecting

When connecting battery cables to battery posts, observe polarity. Reverse battery connections will damage alternator. The negative battery connection is always grounded to the engine block. Coat battery posts and cable terminals with a thin film of petroleum jelly before connecting cables to battery. Add distilled water to battery cells if necessary to bring fluid level to lower edge of opening.

WHEN ATTACHING JUMPER CABLES:

First, attach one end of one jumper cable to the positive terminal of the booster battery (identified by a "+" or "P" on the battery case, post, or clamp) and the other end of the same cable to the positive terminal of the discharged battery. Second, attach one end of the remaining cable to the negative terminal ("–" or "N") of the booster battery, and finally to the negative terminal of the discharged battery -- taking care that none of the jumper clips contact each other. Reverse this sequence exactly when removing the jumper cables.

CAUTION

Any procedure other than the preceding could result in personal injury caused by electrolyte squirting out of the battery vents, damage or injury due to battery explosion, and/or damage to the charging system of the booster vehicle's or immobilized vehicle's charging system.

4. Starter Solenoid

a. Maintenance

There is no maintenance during the operational life of the starter solenoid other than to check the electrical leads and solenoid mounting bolts for tightness.

b. Removal (See figure III-6)

(1) Disconnect the battery ground cable.
(2) Disconnect the two high current electrical cables.
(3) Disconnect the low current lead.
(4) Remove two solenoid mounting bolts.
(5) Remove the solenoid.

c. Repair

There is no repair recommended for the solenoid.

d. Installation

(1) Hold the solenoid in place and install the two mounting bolts.
(2) Connect the two high current electrical cables.
(3) Connect the low current lead.
(4) Connect the battery/ground cable.

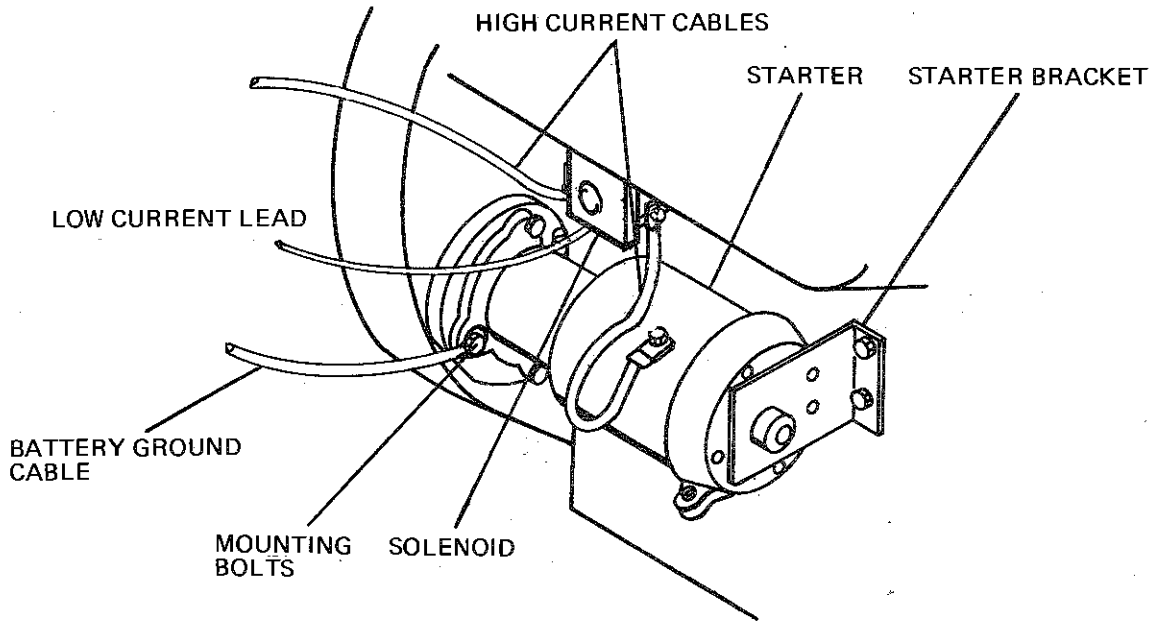


Figure III-6 Starter and Solenoid

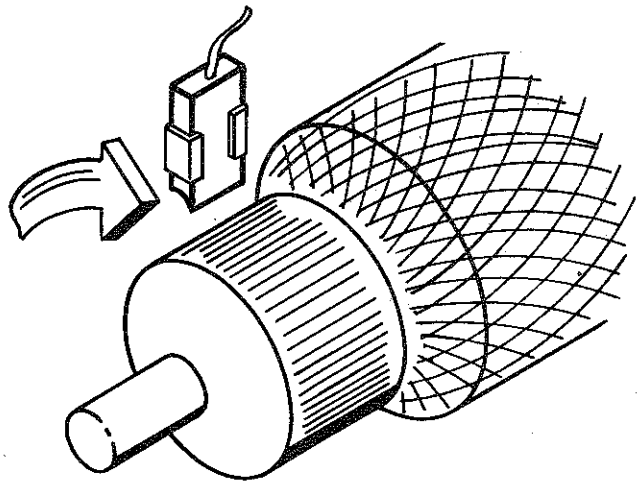


Figure III-7 Starter Brush Positioning

5. Starter

a. Maintenance

There is no maintenance during the operational life of the starter while installed, other than to check the electrical lead and starter mounting bolts for tightness. The starter brushes can be replaced only when the starter is removed from the engine.

b. Removal (See figure III-6).

(1) Disconnect the battery ground cable.

(2) Release tension on main drive chain, lower jackshaft, disconnect the master link of No. 4 chain and remove No. 4 chain from drive sprocket (See Section V). Carefully lay the two ends of the chain down out of the way.

(3) Disconnect the starter electrical cable.

(4) Remove two starter bracket bolts and remove the bracket.

(5) Remove three starter mounting bolts and remove starter.

c. Replacing Brushes

(1) Remove the dust strap.

(2) Raise the brush pressure springs and pull the four brushes out of their guides.

(4) Scribe a line on outside of case and end plate for locating during reassembly.

(5) Remove the end plate-and-brush assembly.

(6) Remove dust and dirt using a bristle brush or cloth, wipe the armature and all adjacent parts clean with a cloth dipped in solvent, and wipe or blow dry.

(7) Using the scribe mark, locate the new end plate in the desired position one inch from case and set the new brushes near their respective guides.

(8) Move the end plate into position against the case, being careful not to damage the brushes or leads.

(9) Lift the brush pressure springs and slide the brushes into their guides so that the high edge of the contact surface is facing in the direction of armature rotation, as illustrated (figure III-7).

(10) Make sure no wires or insulation are caught between the end plate and case.

(11) Press the end plate into position lining up the scribe mark, and install the four end plate screws.

(12) Turn the armature by hand and make sure no wires are rubbing.

(13) Install the dust strap.

d. Installation

(1) Hold the starter in place and install three mounting bolts.

(2) Set the starter bracket in position on the end of the starter and hold in place on engine block. Install two bracket bolts.

(4) Using master link, connect No. 4 chain, making sure chain is properly engaged on sprockets.

(5) Connect the battery.

(6) Readjust tension on main drive chain (See Section V).

6. Ignition Coil

The ignition coil is a hermetically sealed unit and requires no maintenance or repair. It should be inspected periodically for cracks and damage or loose electrical leads. The mounting bolts must be tight at all times because the mounting surface acts as ground for the primary coil. The electrical lead from the distributor (primary lead) should be attached to the negative (–) terminal of the coil. The high tension cable should be fully bottomed in the coil to prevent arcing.

7. Alternator, Rectifier, and Voltage Regulator

a. The alternator is an integral part of the flywheel assembly. No maintenance or repair is recommended without first removing the engine from the vehicle.

b. The Rectifier and the Voltage Regulator are attached to the aft surface of the flywheel shroud on the right hand side. No maintenance or repair of these units is recommended.

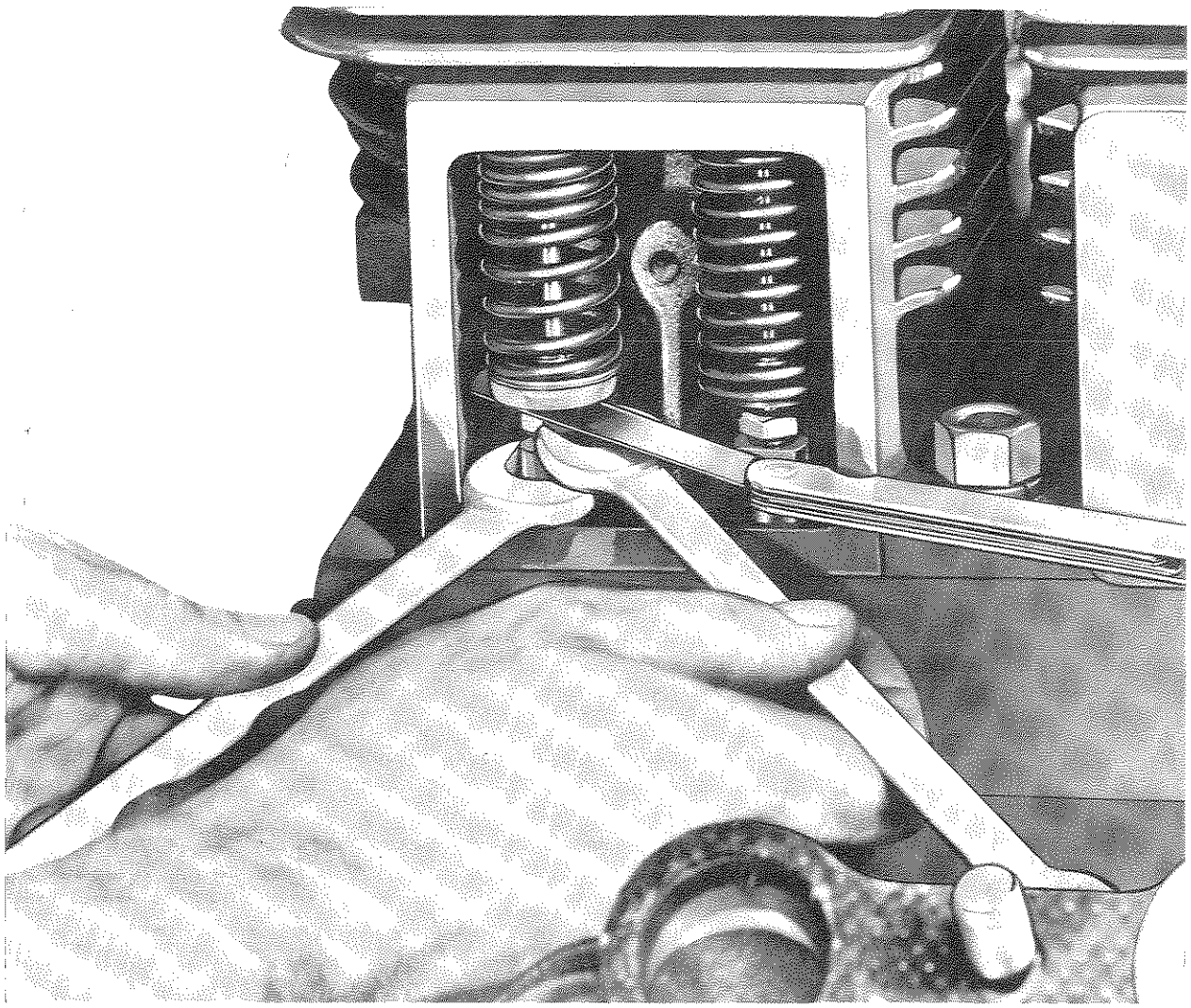


Figure III-8 Setting Valve Clearance

B. VALVE CLEARANCE ADJUSTMENT

1. Preparation

Prepare to adjust the valves as follows:

a. Loosen the hose clamp and remove the air intake hose from the carburetor inlet adapter.
b. Disconnect carburetor linkage.
c. Disconnect the carburetor fuel line, cover the open end of the line, and secure to one side.
d. Remove the control linkage support bracket and set aside.
e. Disconnect the muffler from the exhaust manifold.
f. Remove the 4 manifold hold-down nuts and remove the intake and exhaust manifolds (with the carburetor attached).
g. Remove the distributor cap and secure out of the way. Remove the distributor hold-down bolt, and remove the distributor.
h. Disconnect the governor oil line at both ends and cover the open ports.
i. Remove the governor return spring from the governor lever and make a mark on the lever indicating which hole the spring was connected to.
j. Remove the 3 governor mounting bolts and remove the governor.
k. Remove the inner cooling air shrouds from the cylinders.
l. Remove the 4 valve tappet cover plates.

2. Adjustment

Adjust the valve clearance as follows (see figure III-8).

a. Turn the crankshaft until the piston is well into the compression stroke, with both valves fully closed and both tappets completely free (cam lobe on opposite side of camshaft from tappet).

b. Hold the valve lifter with a wrench, and using another wrench, turn the self-locking adjusting screw until the proper feeler gauge has a slight drag when placed in the gap. The intake valve clearance should be 0.008 inch (0.20 mm), and the exhaust valve clearance should be 0.016 inch (0.41 mm).

c. Repeat steps a and b for all 4 cylinders.

d. If valve clearance adjustment is all that is necessary at this time, replace all the units removed in steps 1.a. through l., using new gaskets in the intake and exhaust manifolds, the governor, and valve tappet covers. Otherwise, proceed to decarbonize (Step C).

C. DECARBONIZING

1. Procedure

Remove the carbon from the combustion chambers as follows:

a. Disconnect the spark plug wires from the spark plugs and secure the wires to one side, clear of the heads.

b. Remove the spark plugs.

c. Remove the outer cooling air shroud.

d. Remove the 34 cylinder head hold-down bolts.

e. Remove both cylinder heads and gaskets.

CAUTION

Do not damage or scratch the sealing surfaces (where the head gasket seats) of either the head or the block.

f. Turn the crankshaft until No. 1 piston is at the top of the compression stroke with both valves fully closed.

WARNING

Do not use any kind of cleaning agent, paper, cloth or paste that contains emery.

g. Using a wire brush and scraper, remove all carbon and lead deposits from the cylinder heads, pistons, valves, and block.

h. Turn the crankshaft to position each piston as outlined in step f., and remove carbon.

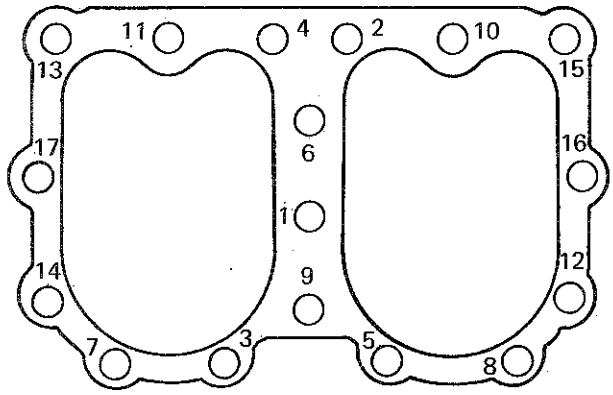


Figure III-9 Head Bolt Tightening Sequence

NOTE

Dust off all residue immediately after cleaning one cylinder and before turning the crankshaft to clean the next cylinder, to prevent dirt from getting under opened valves.

i. Wipe all dust from surfaces with a kerosene soaked cloth and wipe dry. Blow off surfaces with compressed air if available.

j. Install new head gaskets and replace the heads. First tighten the cylinder hold-down bolts hand tight, then tighten the bolts to 22 to 24 ft. lbs (3.04 to 3.31 Kgm) torque, tightening from the center out, as illustrated (figure III-9).

k. Replace the cooling air shrouds and install new spark plugs.

D. CARBURETOR

1. Removal

a. Turn ignition switch OFF, and disconnect battery ground cable.

b. Remove carburetor intake flexible hose.

c. Disconnect fuel inlet line and cap the open end of line.

d. Disconnect choke control wire and throttle control (from governor - do not change setting).

e. Remove two carburetor mounting bolts and remove carburetor.

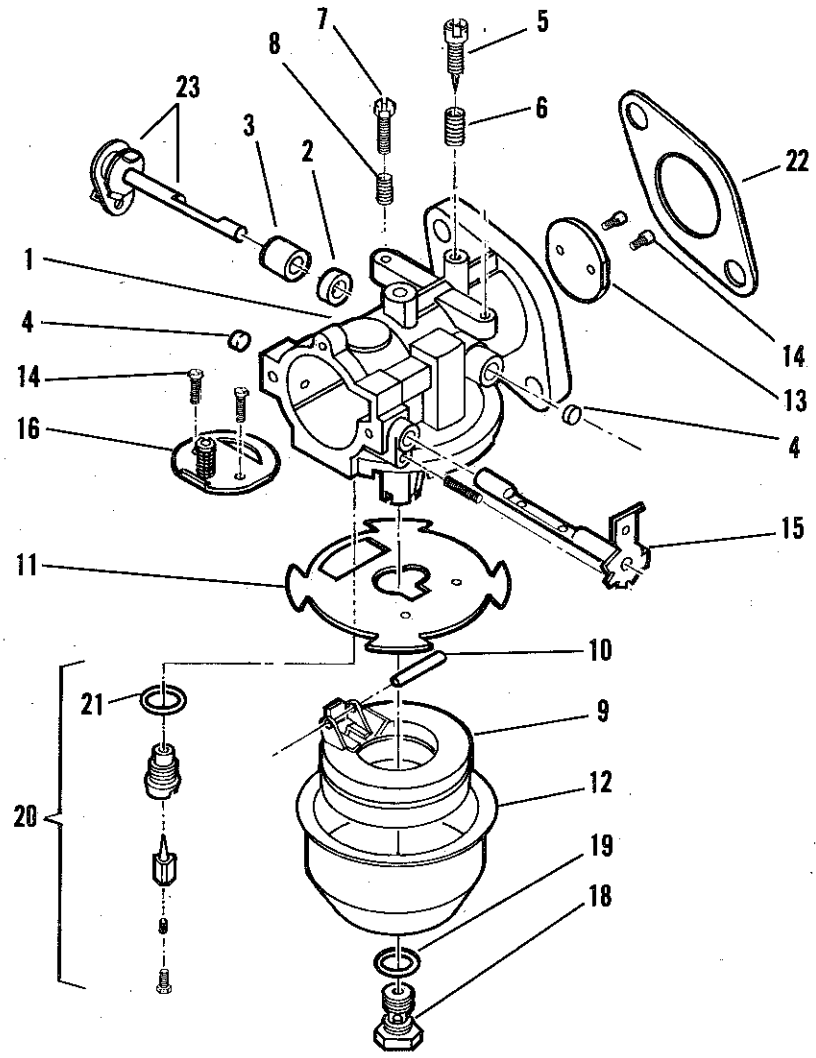


Figure III-10 Carburetor Assembly

2. Cleaning and Adjusting

The exploded view (figure III-10) identifies the component parts of the carburetor and shows their relationship to the complete assembly. Use the key numbers on the exploded view to identify and locate parts when assembling or disassembling the carburetor.

a. Disassembly.
   (1) With carburetor inverted, remove main jet (18). Remove main jet assembly washer (19) and the fuel bowl (12).
   (2) Stand throttle body (1) on end and press float axle (10) out of float hinges. Remove axle and float (9).
   (3) Hold hand under fuel inlet, and turn throttle body to horizontal position. Catch needle valve, pin and spring (parts of 20) as they fall from seat.
   (4) Remove idle adjusting needle (5) and spring (6) by turning counterclockwise. Remove throttle stop screw (7) and spring (8) in the same way.
   (5) Lay throttle body down with fuel bowl side up. Use large screwdriver to remove needle valve seat (part of 20) and washer (21) from fuel inlet port.
   (6) Remove bowl-to-body gasket (11).

b. Cleaning.
   Thoroughly clean all metal parts in a carburetor cleaning solvent. Blow out all passages in throttle body and fuel bowl with reduced air pressure. Be sure all carbon deposits have been removed from throttle bore and idle discharge holes. Reverse the flow of compressed air through all passages to insure the removal of all dirt. Never use a drill or wire to clean out jets or idle holes.

c. Inspection of Parts.
   (1) Float Assembly - Replace if filled with gasoline, damaged, or if float axle bearing is worn excessively. Inspect float lever for wear at point of contact with fuel valve needle. Replace if wear is excessive.
   (2) Float Axle - Replace if any wear has occured on the bearing surface.
   (3) Fuel Valve (Needle and Seat) Assembly - Replace as a complete unit. Wear of any of these parts can seriously affect the operation of the float.
   (4) Idle Adjusting Needle - Inspect tapered end of the needle to make sure it is smooth and free of grooves. Replace if pitted or grooved.
   (5) Gaskets - Replace all gaskets each time the carburetor is overhauled.

d. Reassembly
   (1) Lay throttle body down with fuel bowl side up and install bowl-to-body gasket (11).
   (2) Install Washer (21) and fuel valve seat (part of 20). Use large screwdriver to tighten seat to 100 in-lbs. Insert valve, spring and pin (parts of 20) into seat.
   (3) Install float (9) and float axle (10) on support brackets of throttle body. Check operation of the float to be sure the hinge and axle do not bind and that the float moves in a perpendicular direction.
   (4) Install throttle stop screw (7) and spring (8). Adjust screw to open throttle slightly.
   (5) Install idle adjusting needle (5) and spring (6). Screw needle clockwise until it seats lightly against the idle discharge hole, then back it out 1½ turns as a preliminary idle adjustment.

e. Float Setting.
   (1) With fuel bowl removed, set depth gauge to dimension recommended in illustration (figure III-11).
   (2) Hold throttle body assembly in an inverted position and at the same time support float so that the tab of the float lever just contacts the needle valve without any pressure or weight.
   (3) Place depth gauge in position as illustrated.
   (4) If float position is not to the dimension shown by depth gauge, remove float and bend tab that contacts the needle valve (use two long-nose pliers - close to the float body), until correct dimension is obtained. Reassemble float to throttle body and re-check float level position.

f. Assembly of Fuel Bowl to Throttle Body.
   Assemble washer (19) on main jet (18) and install fuel bowl (12) on inverted throttle body, using care to avoid damage to the float. Screw main jet into throttle body boss, using 1/2 inch wrench. Tighten to 100 in. lbs. Install adjusting screw (part of 18). Screw clockwise until needle end seats lightly against main jet orifice, then back screw out 2 ¼ turns as a preliminary high speed adjustment.

PLACE GAUGE ON GASKET
HOLD FLOAT SO THAT LEVER
CONTACTS HEAD OF PIN
WITHOUT PRESSURE

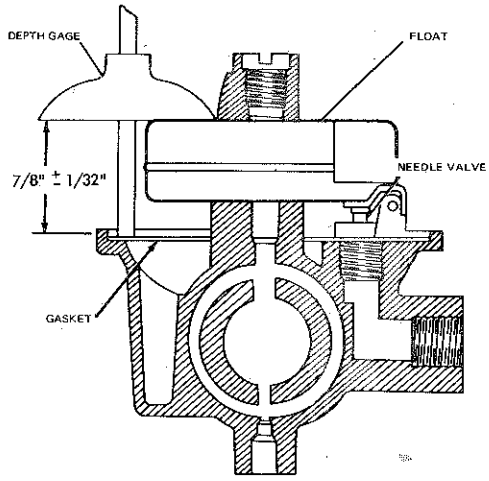


Figure III-11 Float Level Setting

3. Installation

a. Hold carburetor in position, with new gasket in place, and install two mounting bolts.
b. Connect choke control and throttle control.
c. Connect the fuel inlet line.
d. Install flexible hose on carburetor intake.
e. Connect battery ground cable, turn on fuel pressure, and check for leaks.

4. Idle Speed and Mixture Setting

After the carburetor is installed on the engine and the engine is in running condition, adjust the idle mixture and speed as follows:

(1) Start the engine and turn the idle speed screw (throttle stop) to the point where the engine will run without holding the throttle open. Turn the mixture adjustment to the point where the engine runs smoothest. Let engine run 10 minutes to warm up.
(2) Turn the idle adjustment counterclockwise until the engine runs rough and the speed decreases, then turn clockwise through smooth running until the engine speed decreases again. Slowly turn counterclockwise again to the point where the speed is highest and smoothest.
(3) Set the idle speed screw to the desired idle speed and turn idle adjustment very slightly for smoothest idle.

E. MANUALLY OPERATED ENGINE CONTROLS

1. Choke

a. Removal (see figure III-12).
(1) Disconnect the choke wire from the carburetor.
(2) Loosen 2 clips holding choke in position.
(3) Remove locknut inside control pedestal.
(4) Pull choke wire out through hole in pedestal, retaining nut when it drops off wire.

b. Inspection

Check the choke wire for sharp bends, frayed conduit, or excessive binding. If any of these conditions exist, replace the unit.

c. Installation
(1) Hold the locknut in position under the hole in top of pedestal, and feed choke wire through and back to carburetor.
(2) Tighten the locknut inside pedestal.
(3) Tighten 2 holding clips, making sure the choke wire does not have any sharp bends and is not rubbing.
(4) Push choke handle all the way in, and set the choke butterfly full open in the carburetor.
(5) Connect choke wire to carburetor, bend the wire so that the butterfly starts to close as soon as choke handle is pulled.
(6) Check choke operation to make sure it has full travel and is not being held partly closed with handle in.

2. Throttle

CAUTION

When removing or replacing throttle, do not change the governor setting or in any way change the relationship of the governor arm to the throttle.

a. Removal (see figure III-12).
   (1) Disconnect the throttle wire from the lower arm of the throttle lever.
   (2) Loosen clip on top of flywheel shroud, and clip in base of pedestal.
   (3) Remove locknut on throttle wire inside pedestal.
   (4) Hold the locknut and pull throttle wire out through hole in pedestal.

b. Inspection
   Check the throttle wire for sharp bends, frayed conduit, or excessive binding. If any of these conditions exist, replace the unit.

c. Installation
   (1) Hold the locknut in position under the hole in top of pedestal and feed throttle wire through and back to carburetor.
   (2) Tighten locknut inside pedestal.
   (3) Tighten 2 holding clips making sure the throttle wire does not have any sharp bends and is not rubbing.
   (4) Push throttle handle all the way in, and slip the throttle wire into the screw clamp on throttle lever.
   (5) Make sure the throttle handle is all the way down, hold the throttle lever against the carburetor idle stop screw, and tighten the screw clamp on the wire.

   Check throttle operation for full travel and make sure it is not binding.

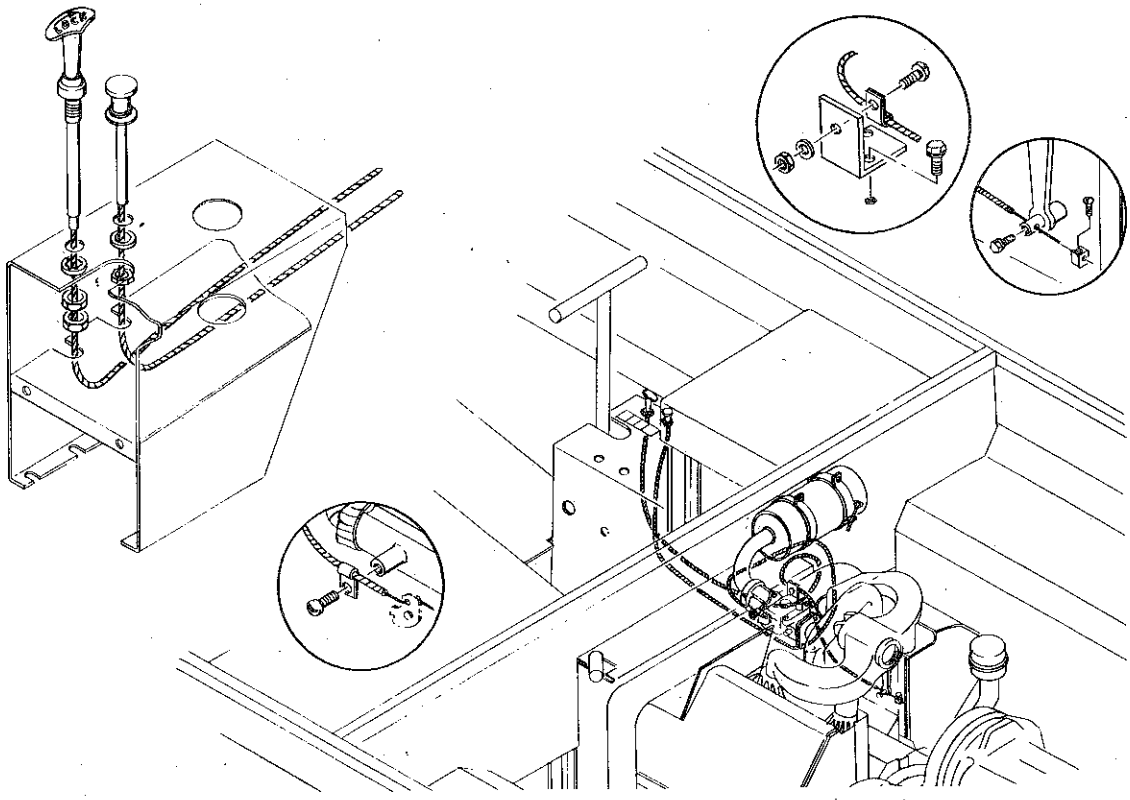
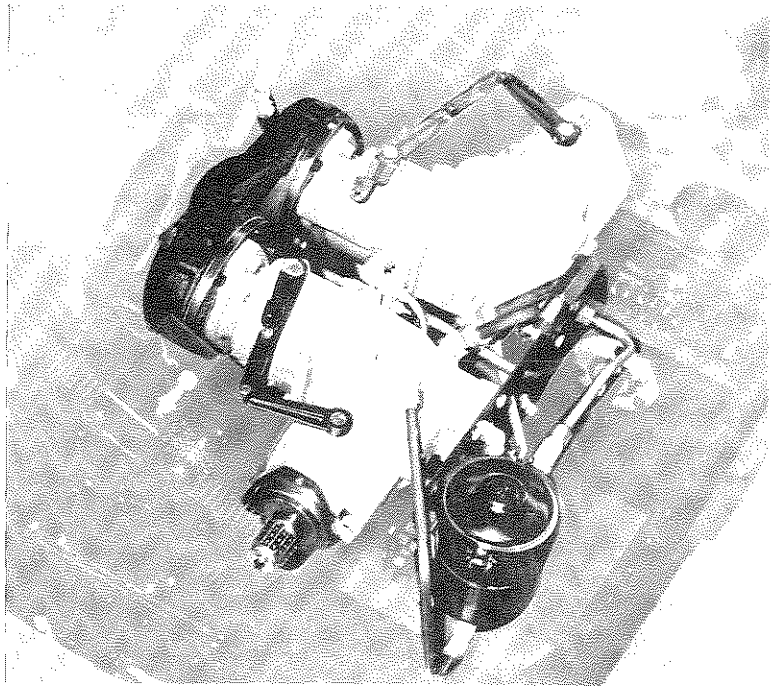


Figure III-12 Choke and Throttle Controls



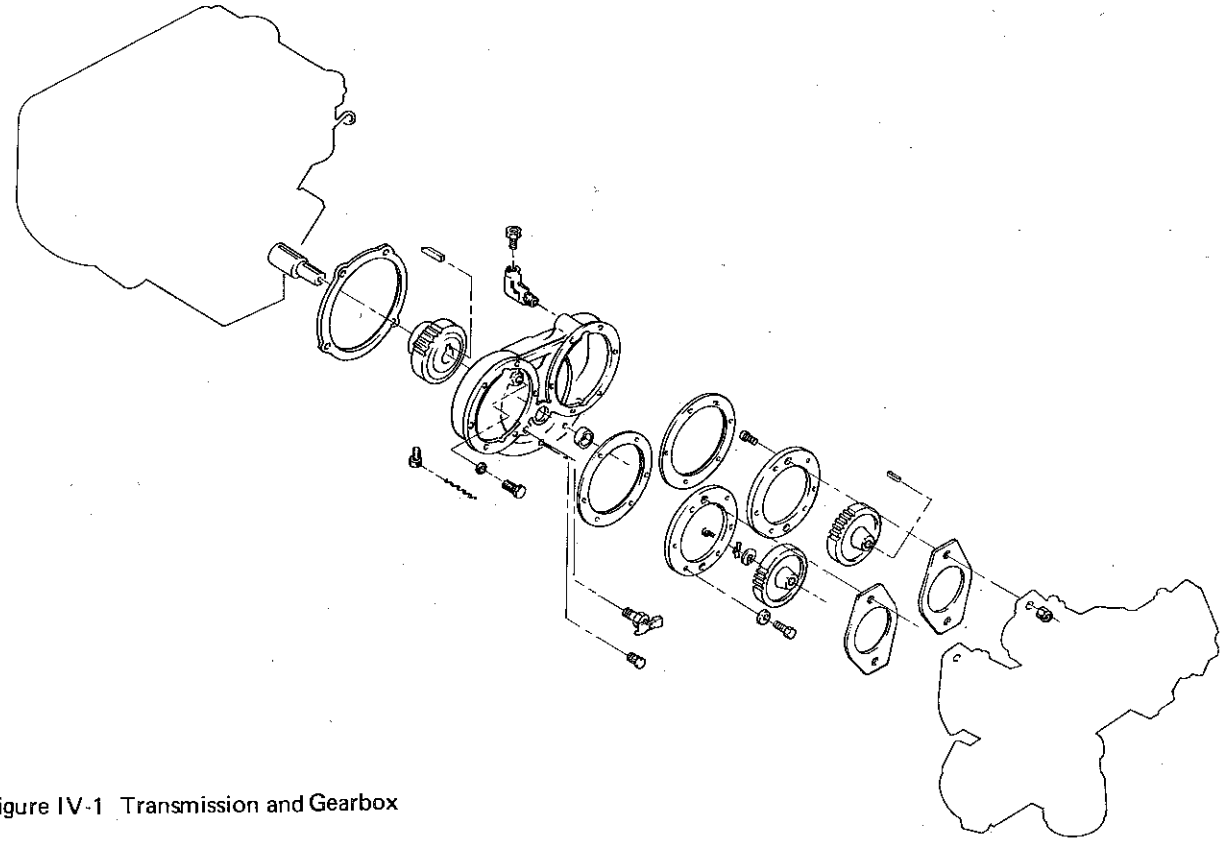


Figure IV-1 Transmission and Gearbox

SECTION IV
TRANSMISSION AND GEARBOX MAINTENANCE

From the service standpoint, the gearbox and transmissions require only routine maintenance. Repair or replacement requiring removal of the units from the vehicle are covered in the KID Shop Manual.

A. GEARBOX

Check the gearbox oil level every 200 hours as follows (see figure IV-1). Turn the petcock counterclockwise several turns (open). Remove the vented filler cap and slowly pour 10W-30 oil into the gearbox until oil starts to run out the petcock. Close the petcock and install the filler cap.

B. TRANSMISSIONS

1. Transmission Controls

The transmission controls (see figure IV-2) consist of a control lever in the driver's compartment; two sets of push-pull type control cables; and control arms on each transmission in fixed relationship.

a. Control Arms (1, 2, and 3)

There is no adjustment of the transmission control arms required during the operational life of the transmissions. The control arms are installed on the transmissions with roll pins and pivot bolts in a fixed relationship and cannot be changed.

(1) Transmission Neutral

When the roll pin through the transmission pump control shaft (4) is aligned fore-and-aft with the vehicle (parallel to the PTO shaft), the transmission is in the neutral position. If the transmission is not in neutral when the control shaft is in this position, the trouble is internal and the transmission should be replaced (see shop manual).

(2) Maintenance

The transmission control arms should be checked periodically for excessive wear at friction points. Check security of all nuts, bolts, and roll pins, and replace when worn. Lubricate all friction points with 10W-30 oil.

b. Control Linkage (5, 6, 7, and 8)

(1) Removal

(a) Turn ignition switch OFF.

(b) Push operator's control lever full forward and release the forward end of control linkage (8) by turning self-aligning ball nut counterclockwise until free of control lever.

(c) Loosen large locknuts (7) holding control linkage to control pedestal.

(d) Loosen large locknuts (6) holding control linkage to bracket.

(e) Remove clevis bolt and release the aft end of control linkage (5) from the transmission control arm (3).

(f) Pull the control linkage out of the control pedestal.

(g) Pull the control linkage out of the bracket and remove from vehicle.

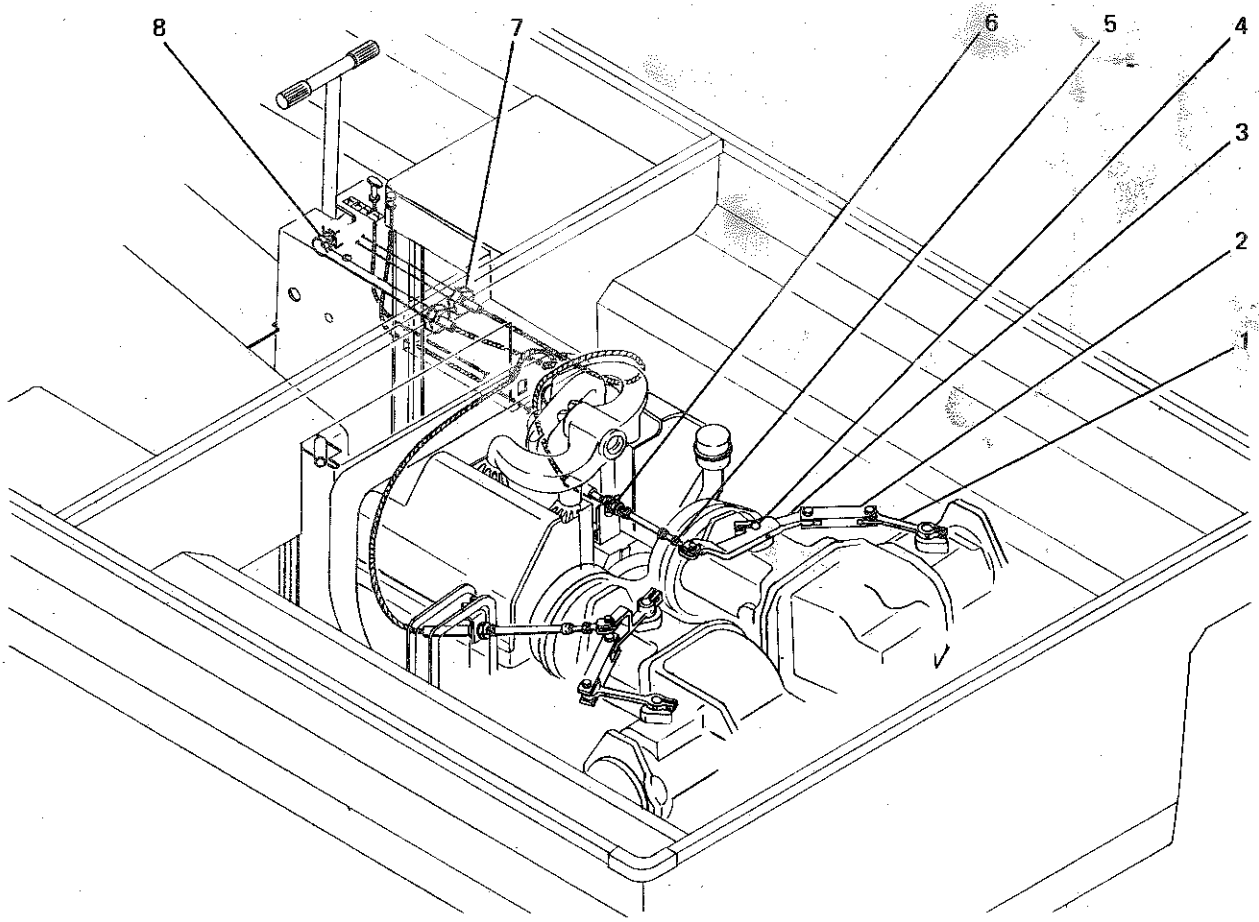


Figure IV-2 Transmission Controls

NOTE

For the left-hand control, remove the bracket from the jackshaft.

WARNING

Do not start engine with control linkage off. Serious personal injury may result.

(2) Inspection and Repair

(a) Inspect the linkage for sharp bends, worn or binding ball joint end fittings, excessive binding.

(3) Installation

(a) Slide the forward end of control linkage (8) through locknuts (7).

(b) Hold the control lever in neutral (straight up and down with handle parallel to axles), and screw the rod and bolt (8) in finger tight.

(c) With the control lever still in neutral, tighten locknuts (7).

(d) Hold the transmission in neutral (see a(1)) and connect the aft end of control linkage (5) with nut finger tight.

(e) With transmission still in neutral, tighten locknuts (6).

(f) Using rod end adjustments (5 and 8), adjust for neutral at transmission and control lever (See b(4)).

(g) Tighten forward rod end bolt to control lever, and tighten aft rod end adjustment jam nut.

(4) Neutral Adjustment

When the control lever is straight up and down with the handle parallel to the axles, the transmissions should be in neutral (See a(1)).

Adjust as follows:

(a) Disconnect the aft end of the control linkage (5) by removing clevis.

(b) Set the control lever and transmission both in neutral and HOLD in that position.

(c) Loosen jam nut at (5) and turn the clevis on or off the rod as necessary to allow the clevis bolt to slide in place with ease.

NOTE

Leave at least 4 threads engaged at all times in linkage adjustment.

(d) If all the allowable adjustment at (5) is not enough, connect (5) and adjust at (8).

(e) To adjust at (8), push control lever forward, remove bolt from lever, loosen jam nut, and turn ball joint end on or off the rod as necessary.

(f) If the combined adjustments of (5) and (8) are not enough, a coarse adjustment may be obtained by loosening either locknuts (6) or (7), feeding through more linkage, and repeating steps (a) through (d).

(g) Tighten all jam nuts, locknuts and connecting bolts.

2. Hydraulic System

The hydraulic system consists of a reservoir, an oil cooler, a filter, and the necessary plumbing to supply clean, temperature-controlled oil to the transmissions and the implement actuators (See simplified flow diagram figure IV-3).The hydraulic pumps are an integral part of the transmissions. Oil flows out of the reservoir to replenishing pumps in the transmissions, filling the main pumps and motors. The oil then flows out of the replenishing pumps through the filter and into the main pumps. From the main pumps the oil flows through the cooler and back into the reservoir.

Repair or adjustment of transmissions can only be accomplished in the shop (See shop manual). Service is, therefore, limited to the filter, the cooler, the tank, and fittings.

CAUTION

Hydraulic System cleanliness is of the utmost importance. Serious damage and equipment failure can result from foreign matter in the system.

a. Hydraulic System Oil Level (figure IV-4).

Remove the hydraulic system oil reservoir cap and check that the oil level is up to the bottom of the filler neck screen. If necessary, fill to the correct level with 10W-30 oil. DO NOT overfill. If the screen is dirty, remove and wash in kerosene. Dry thoroughly and replace. Wash the cap, dry thoroughly, and replace on tank.

b. Seals

Check around all hydraulic system seals for evidence of leaks. If leaking excessively, replace the seals (see shop manual).

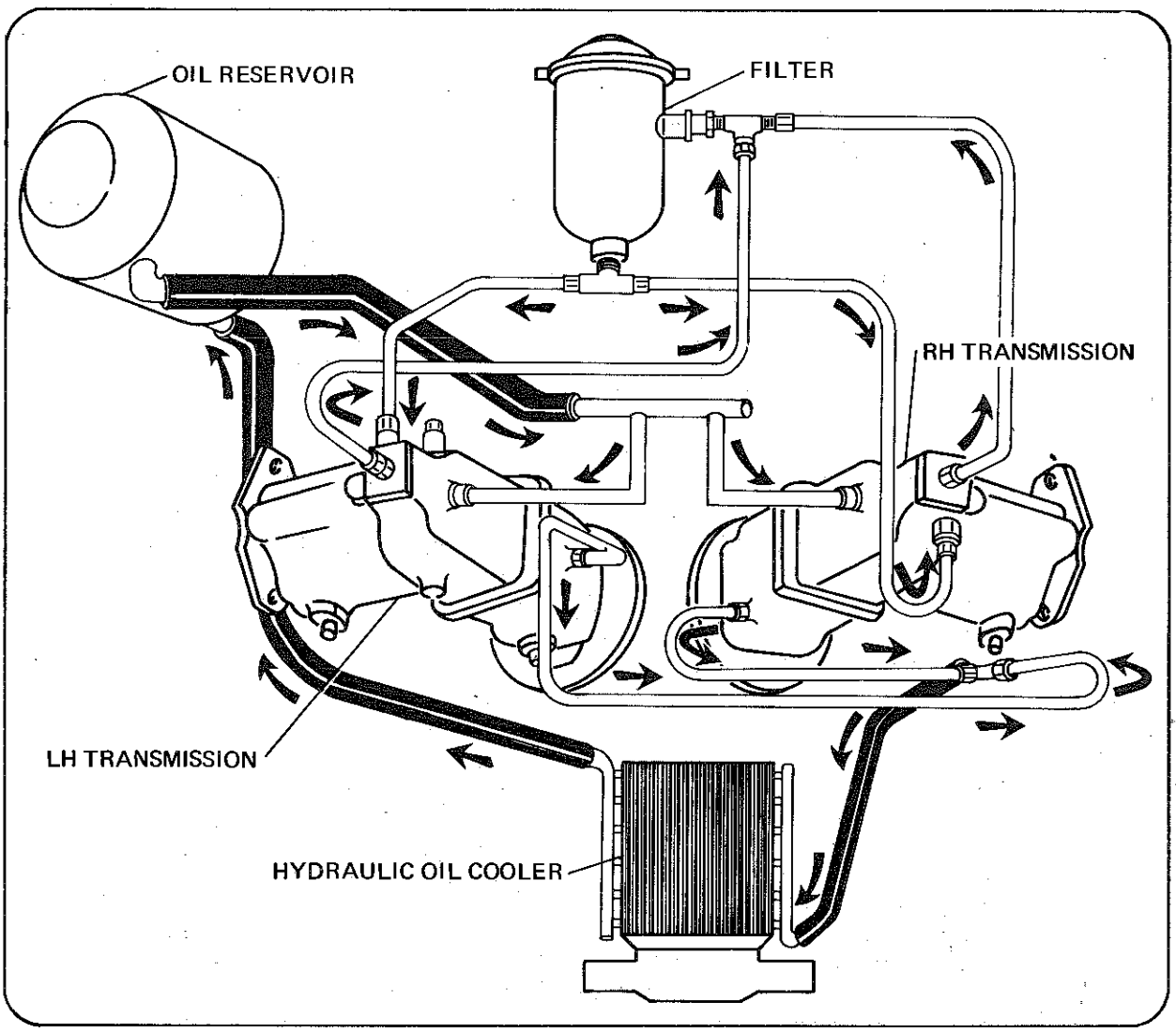


Figure IV-3 Simplified Flow Diagram KID Hydraulic System

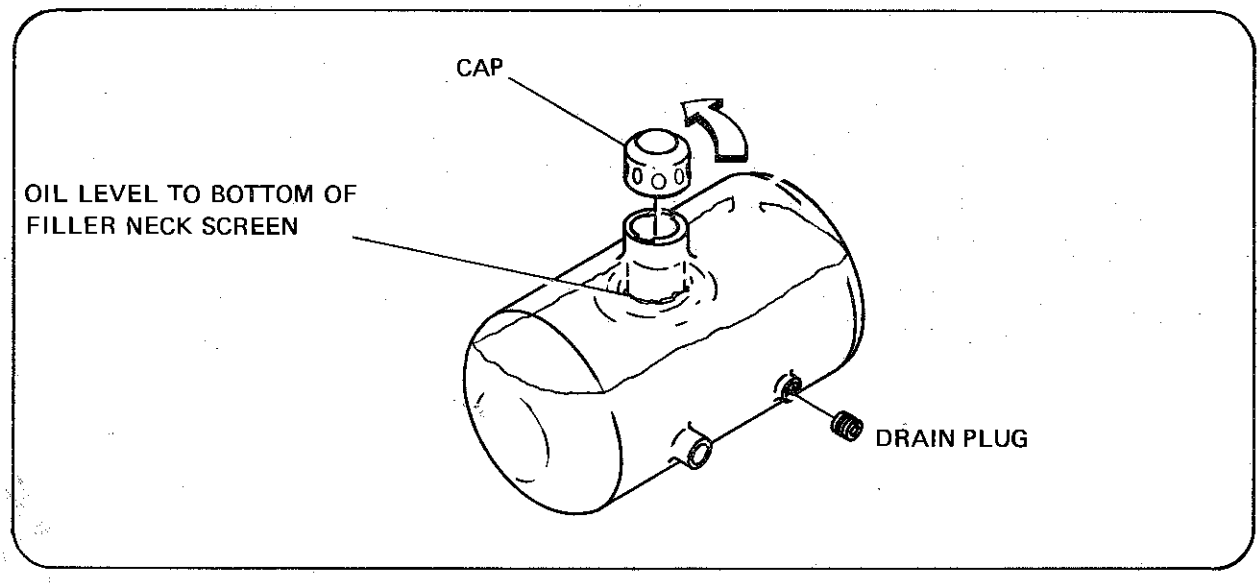


Figure IV-4 Hydraulic System Reservoir

(c) Transmission Oil Cooler

WARNING

It is extremely important that the transmission oil cooler have maximum cooling air flow at all times. DO NOT BLOCK THE INTAKE (FRONT) OF COOLER. Clean out all dirt and debris accumulated on fins at least once daily (see figure IV-5).

When cleaning dirt and debris from the transmission oil cooler, use only a medium-stiff bristle brush or whisk broom to clean between the fins. Do not clean with wire brush or metal probes. Care must be exercised to avoid bending or otherwise damaging the cooling fins. If vacuum is available, vacuum on the front will aid in cleaning.

If fins have been dented or warped, use a standard fin comb to straighten. It is important to the hydraulic oil cooling system that the fins be clean and straight.

d. Replace Transmission Oil Filter (figure IV-6).
   (1) Release 2 filter cover clamp screws.
   (2) Remove filter cover.
   (3) Remove filter element and replace with new element.
   (4) Check cover gasket for breaks, cracks or creases, and replace if necessary.
   (5) Replace cover and tighten clamp screws.

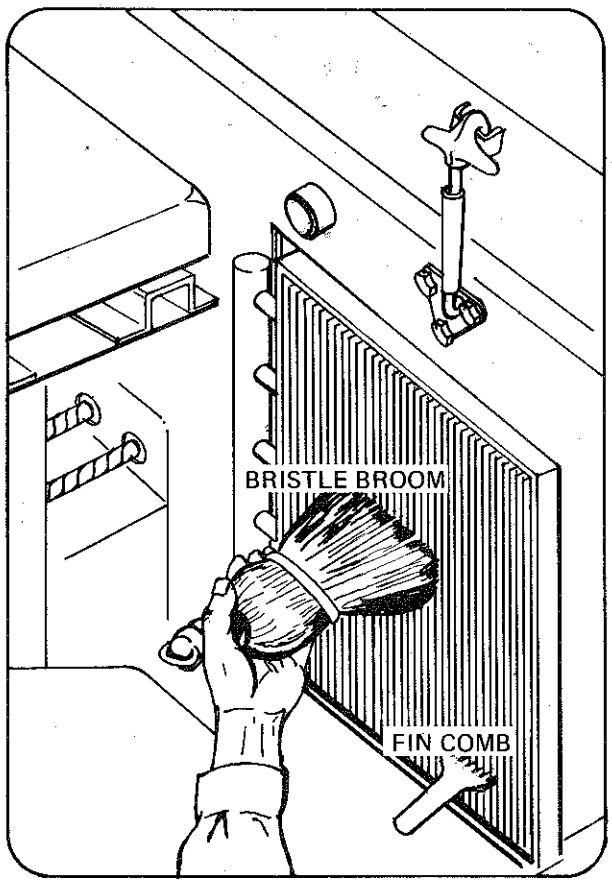


Figure IV-5 Cleaning Transmission Oil Cooler

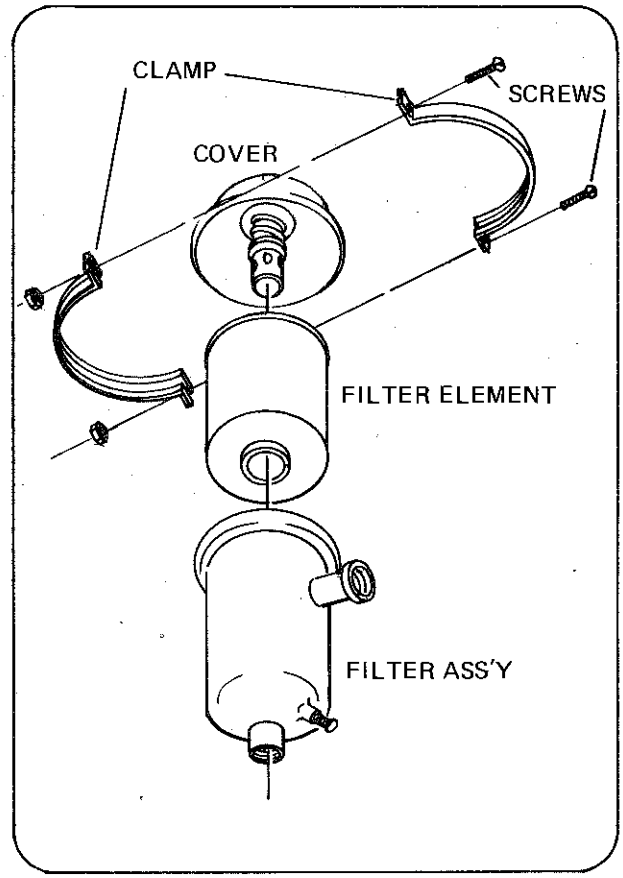
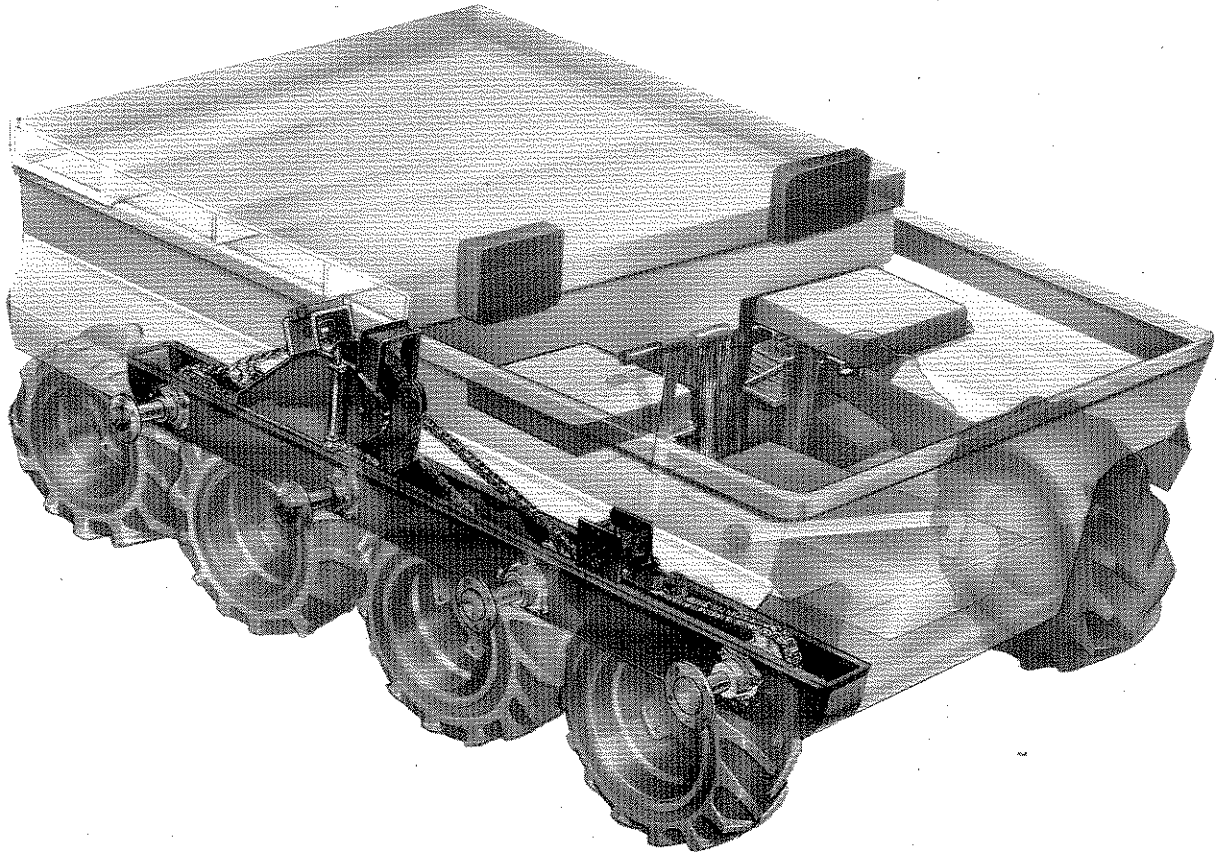


Figure IV-6 Transmission Oil Filter

SECTION V
KID DRIVE SYSTEM MAINTENANCE



The KID Drive system transmits torque from the transmissions to the wheels. The drive system consists of two symmetrical chain systems, with one chain system transmitting power from the left transmission to the four left wheels, and the other chain system transmitting power from the right transmission to the four right wheels. The chains are numbered as illustrated (figure V -1).

NOTE

On all chain master links requiring cotter pins, discard the old cotter pins upon removal and reinstall with new ones. When installing cotter pins be sure that they are spread apart as far as possible after insertion and the ends bent down hard against link pins.

A. DRIVE CHAINS

1. Main Drive Chains (No. 1)

NOTE

The most efficient way to remove and replace most of the drive chains is to first remove the Main Drive Chain (triple-strand chain). This will provide free rotation of all other drive chains when the vehicle has been elevated to provide clearance between the ground and the wheels.

a. Removal

(1) Loosen tension adjustment on idler sprocket and triple strand chain by backing off locknut and adjusting screw.

(2) Remove Master Link closest to the idler sprocket and lift out chain. (3 provided in each main drive chain).

b. Inspection

(1) Suspend chain vertically and apply a load of 50 lbs. to bottom end.

(2) Measure the distance between 32 pitches of the chain.

(3) If distance is more than 12.25 inches replace chain. (New 12").

c. Repair

If a chain breaks or fails due to broken pins, side bars and/or rollers, temporary repairs may be required in order to avoid long shutdowns. Replacement of the chain, however, is recommended for the following reasons:

(1) If one section of the chain has failed because of fatigue, other sections are sure to follow.

(2) If the chain has been broken by a single high overload, parts other than the failed ones are usually bent or severely weakened.

d. Installation

NOTE

When installing any master link point the pins away from any adjacent sprocket, to avoid the possibility of fouling cotter pins.

(1) Before installing a new chain, carefully check sprocket teeth. If teeth are worn to a hooked shape as illustrated (figure V -2), sprockets should be replaced.

(2) Before installing chain loosen tension on jackshaft assembly by backing off locknuts and adjusting screws.

IMPORTANT

In loosening jackshaft adjusting screws, back off only 5 turns at a time on each side.

(3) Place triple-strand chain around transmission drive sprocket, under idler sprocket, and around triple-strand chain sprocket on jackshaft.

(4) Replace master link assembly and secure with retaining clip (pins pointing outward).

(5) Readjust jackshaft adjusting screws until triple chain is almost taut.

(6) Adjust chain tension by adjusting idler sprocket.

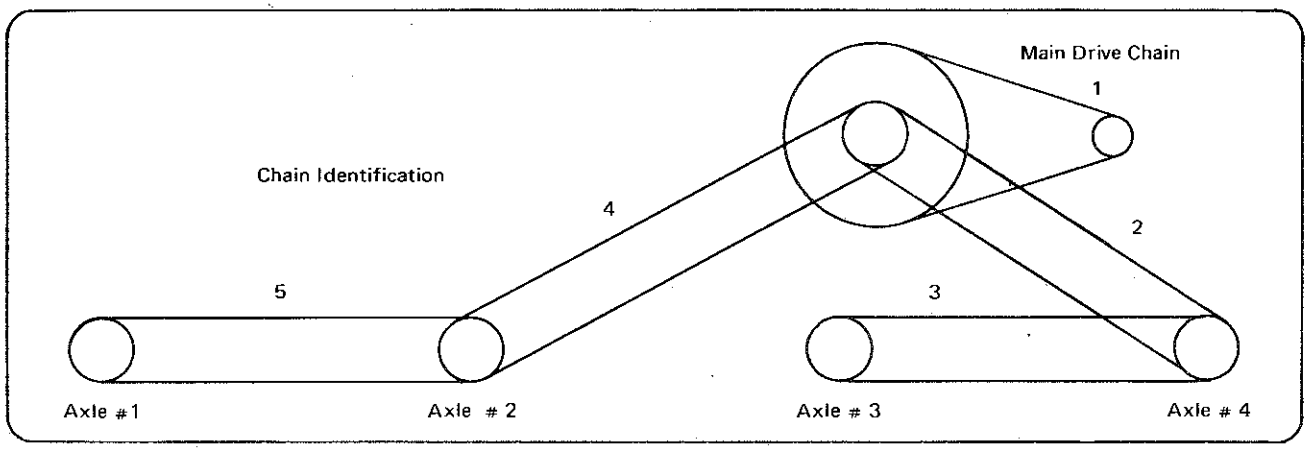


Figure V-1 Drive Chains

2. No. 2 Drive Chain, L.H. and R.H. Side

a. Removal

(1) Make sure that master link is close to the axle sprocket in the unloaded span of the chain. If not, and main drive chain is installed, first remove main drive chain. When main drive chain is removed, elevate the vehicle so that the wheels can be turned by hand. Manually rotate wheels to provide access to master link.

(2) Loosen chain tension on jackshaft assembly by backing off locknuts and adjusting screws (not more than 5 turns at a time on each side).

(3) Remove master link and lift out chain.

(4) Reinstall master link in one end of the chain.

b. Inspection

(1) Vertically suspend the chain and apply a load of 70 lbs. to bottom end.

(2) Measure the distance between 16 pitches of the chain. If distance is more than 12-3/8 inches, replace chain.

c. Repair

(See 1c)

d. Installation

(1) Place chain around sprocket on the axle, and around corresponding sprocket on the jackshaft.

(2) Reinstall master link and secure with retaining clip (pins pointing inboard).

(3) Adjust jackshaft assembly until chain is almost taut.

3. No. 3 Drive Chain, L.H. and R.H. Side

a. Removal

(1) Make sure that master link is close to the No. 4 axle sprocket in the unloaded span of the chain. If master link is not accessible, remove main drive chain, elevate vehicle and manually rotate wheel to obtain access to the master link.

(2) Loosen tension adjustment on idler sprocket located underneath jackshaft assembly. Tie idler sprocket up clear of chain.

(3) Remove master link and manually rotate the No. 3 axle to remove chain from the No. 3 axle sprocket. After this, remove chain from No. 4 axle sprocket and pull chain.

(4) Reinstall master link at one end of the chain.

b. Inspection

(1) Use same procedure as for No. 2 chain.

c. Repair

(Sec 1c)

d. Installation

The following procedure describes how to install the No. 3 chain when the No. 2 chain is installed:

(1) Connect a length of flexible steel wire to one end of the chain.

(2) Feed steel wire underneath the No. 4 axle and the No. 3 axle, starting from the No. 4 axle.

(3) Feed in chain from No. 4 axle, making sure that sprocket does not interfere, and at the same time pulling chain with flex wire toward No. 3 axle sprocket.

(4) When chain has reached No. 3 axle sprocket, insert free end of flex wire underneath the idler sprocket, toward the No. 4 axle.

(5) Place chain around No. 3 sprocket and manually rotate No. 3 wheel (making sure that chain will locate properly on the idler sprocket by means of the flex wire) until chain end almost reaches the No. 4 axle sprocket.

(6) Place other end of chain on the No. 4 axle sprocket with approximately 2" overlap over the sprocket.

(7) Replace master link assembly and secure with retaining clip (pins pointing outboard).

4. No. 4 Drive Chain R.H. and L.H. Side

a. Removal

(1) Remove passenger (or driver) seat, battery, foot plate (LH and RH) and chain cover sheet metal (LH and RH)

(2) With main drive chain removed and vehicle elevated from the ground, manually rotate No. 2 wheel until easy access is obtained to the master link in the unloaded span of the chain.

(3) Loosen chain tension on jackshaft assembly by backing off locknuts and adjusting screws (not more than 5 turns at a time on each side).

(4) Remove master link, separate chain, and remove chain from jackshaft sprocket and No. 2 axle sprocket.

(5) Reinstall master link at one end of the chain.

b. Inspection

Use same procedures as for No. 2 and 3 chains.

c. Repair (See 1 c).

d. Installation

(1) Place one side of chain around No. 2 axle sprocket, making sure that the remainder of the chain is on the bottom of the vehicle.

(2) Carefully rotate No. 2 wheel so as to feed one end of the chain around the sprocket, toward and underneath the idler sprocket.

(3) Place other end of chain around jackshaft sprocket, making sure that bottom of the chain is as taut as possible.

(4) Bring the two loose ends of the chain together by manually rotating the No. 2 wheel.

(5) Replace master link assembly and secure with retaining clip (pins pointing outboard).

(6) Adjust chain tension by readjusting jackshaft adjusting screws until chain is almost taut. Secure adjusting screws with the locknuts.

5. No. 5 Drive Chain, L.H. and R.H. Side

a. Removal

(1) Remove screws securing foot plate to support brackets and fuel tank flange, and remove foot plate.

(2) Remove screws securing plates covering chain and remove plates.

(3) With main drive chain removed and vehicle elevated from the ground, manually rotate No. 1 axle until master link is accessible in the unloaded span of the chain.

(4) Remove chain tension by backing off adjusting screw on idler sprocket situated near No. 2 axle.

(5) Remove master link, separate chain, and remove chain by manually rotating No. 2 wheel counterclockwise.

(6) Reinstall master link at one end of the chain.

b. Inspection
Use same procedure as for No. 2 and 3 chains.

c. Repair
Use similar same procedure as described for No. 2 and 3 chains.

d. Installation
(1) Place chain around sprocket on No. 2 shaft, working from the bottom up.
(2) Manually rotate No. 2 wheel counterclockwise, feeding chain underneath the idler sprocket.
(3) Place other end of chain around sprocket on No. 1 axle, starting at the bottom side of the sprocket, and manually rotate the No. 1 wheel clockwise so as to feed the chain toward the No. 2 axle.
(4) Remove slack out of bottom of chain and join chain ends.
(5) Replace master link and secure (pins pointing inboard).
(6) Adjust chain tension by readjusting the idler sprocket adjusting screw situated near the No. 2 axle.
(7) Replace cover plates and foot plates and secure with screws.

6. Chain Adjustments

Adjust all chains to correct tension. Correct tension is determined by measuring the deflection of the chain mid-point between the two sprockets (See figure V-3). The deflection should be no greater than 1/4 inch (62 mm).

NOTE

When adjusting chain tension, the wheels on that side must be free to turn. Deflect chain with hand pressure.

a. Adjusting No. 1 Drive Chain (Typical RH and LH)

NOTE

No. 1 drive chain must always be adjusted after adjusting No. 2 or 4.

(1) Loosen jamnut on the chain drive idler arm assembly.
(2) Rotate adjusting bolt until the chain is properly tensioned.
(3) Tighten jamnut.

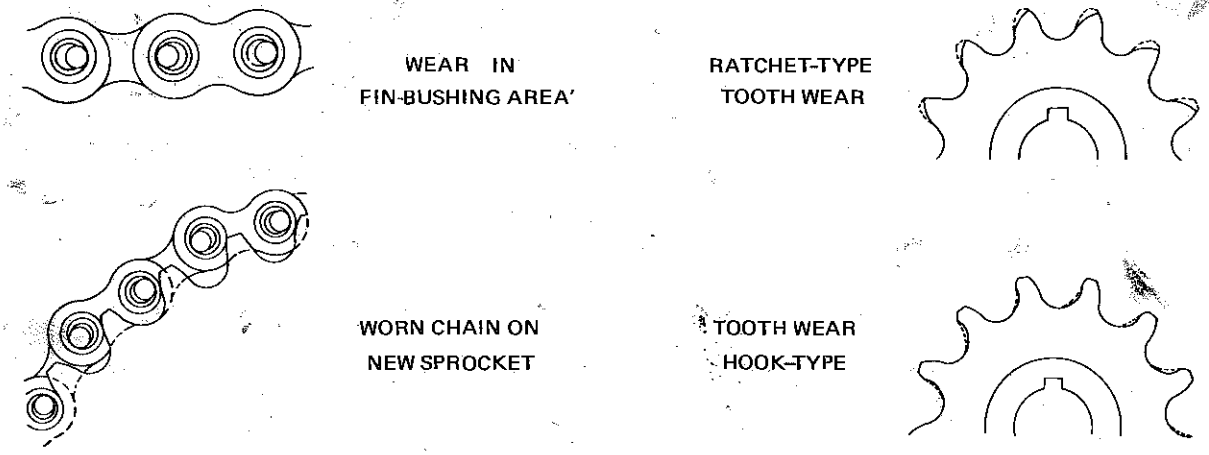


Figure V-2 Chain and Sprocket Wear

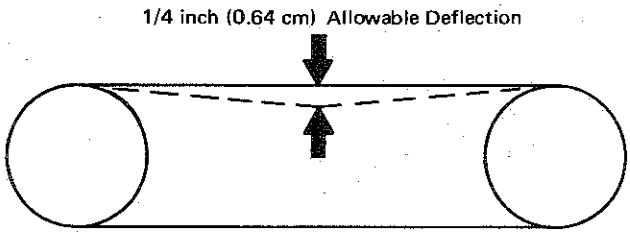


Figure V -3 Chain Adjustment

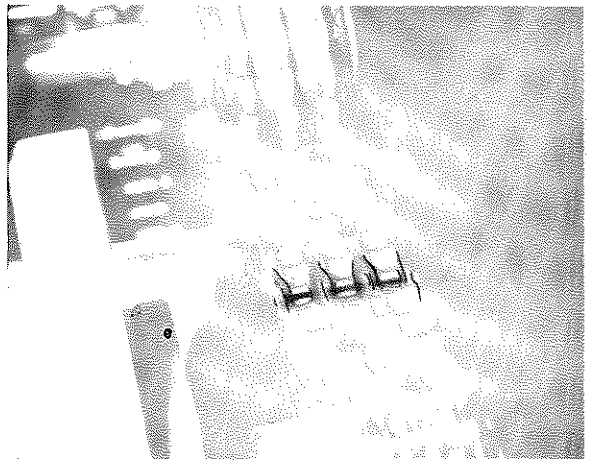


Figure V -4 Offset Link

b. Adjusting No. 2 and No. 4 Drive Chains (LH Described, Typical for RH)

> **NOTE**
> Drive Chain Number 1 must be adjusted every time Drive Chains 2 and 4 are adjusted.

(1) Loosen 3 mounting bolts in jackshaft assembly.
(2) Loosen 2 jackshaft adjusting screw jamnuts.
(3) Rotate both adjusting screws equally (no more than 5 turns apart), until Number 2 and Number 4 drive chains are properly tensioned.
(4) Tighten jamnuts and mounting bolts.

c. Adjusting Number 3 Drive Chain or Number 5 Drive Chain (Typical 2 places LH and 2 places RH).
(1) Loosen jamnut on idler arm assembly.
(2) Rotate adjusting nut until drive chain is properly tensioned.
(3) Tighten jamnut.

d. Shortening a Chain
To shorten a chain, remove the master link, and replace it with a "half link" or "offset link" (see figure V -4). This shortens the chain by half a link.

7. Lubricating Drive Chains

Lubricate all drive chain sprockets and the main drive chain tensioner, using 10W-30 oil every 50 hours.

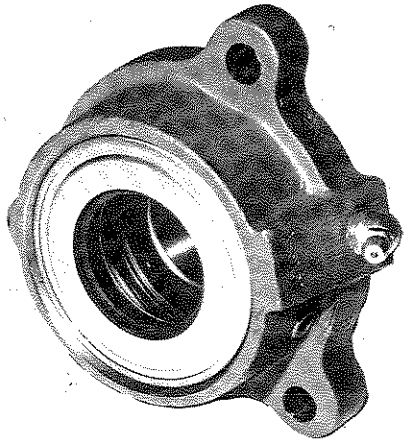


Figure V -5 Outer Axle Bearings

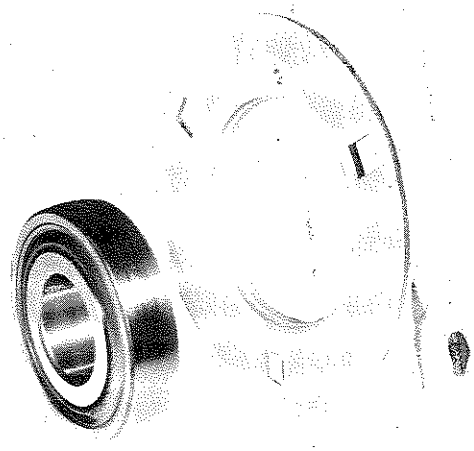


Figure V -6 Inner Axle Bearings

B. SPROCKETS

Sprockets should be checked for wear as illustrated every time chains are adjusted or replaced (See Figure V-2).Sprockets should be lubricated every 50 hours with 10W-30 oil. Sprocket removal and replacement requires special tools (see shop manual).

C. JACKSHAFTS

Replacement of jackshafts requires special tools (see shop manual).

D. AXLES

Replacement of axles requires special tools (see shop manual).

E. AXLE BEARINGS

1. Replacement of Axle Bearing Requires Special Tools, (See Shop Manual)

2. Outer Axle Bearing Lubrication (figure V -5).

Grease the outer axle bearings at least every 50 hours or weekly, and more frequently during extensive water operations. Always use lithium based grease.The recommended procedure for ease of access to outer bearing grease fittings is to remove No. 2 wheel assembly (Second from the front) which allows access to No. 1, No. 2 and No. 3 outer bearings. No. 4 may be greased from the rear of the tractor.

3. Inner Axle Bearing Lubrication (figure V -6).

Grease the inner axle bearings every 100 hours operation. Always use a lithium based grease.

F. TIRES

1. Maintenance

Inspect tires for cuts or damage, evidence of slipping on rim, and proper inflation. Pressure should be 10 to 20 PSI for 2-ply tires, and 10 to 24 PSI for 4-ply tires.

2. Repair

a. Tube Repair

(1) Remove valve core and allow all air to escape from tube.
(2) Lay tube on flat surface and roughen the surface around the hole.
(3) Spread rubber cement around hole over an area slightly larger than patch.
(4) Allow cement to dry until tacky (approximately 3 minutes).
(5) Peel protective film off patch and immediately press over hole.
(6) Rub patch thoroughly in all directions to cement in place.
(7) Replace valve core and inflate, and check for leaks.

b. Tubeless Tire Repair

(1) Remove the tire from the rim and remove all damaging material such as nails, glass, etc.
(2) Thoroughly dry the damaged area and roughen the surface around the hole on the inside of the tire, using a scraper. Take care not to damage the liner or expose any cords.
(3) Lubricate the hole by inserting the snout of the vulcanizing fluid can into the hole from both inside and outside. Pour vulcanizing fluid on insertion tool and insert with twisting motion to lubricate.
(4) Place plug in insertion tool and lubricate both plug and tool with vulcanizing fluid.
(5) Insert plug into hole from inside of tire, and cut off 1/16 inch from surface. Do not pull on plug when cutting.
(6) If a headless type plug is used, cover the inside end with a patch. When using a cold patch, spread vulcanizing fluid around plug and allow to dry. Remove patch backing, center patch over plug end, and stitch down firming using stitching tool, working from center out. When using hot patch, apply cement specified to area and allow to dry. Remove backing, center patch over plug, clamp finger tight and apply heat.

NOTE

Temporary tire repair may be accomplished without removing tire by using tire repair kit "Simplug" or equal. Pull damaging object out of hole, dip plug and insertion tool in vulcanizing fluid, and insert plug from outside. Trim outside end of plug 1/8 inch from surface. Do not pull plug when cutting. Inflate tire.

SECTION VI
TROUBLESHOOTING GUIDE

ENGINE

Four basic conditions must exist in order to start and run the engine:

1. A proper fuel-air mixture in the cylinder.
2. Good compression in the cylinder.
3. A good spark, at the correct time, to ignite the mixture.
4. A means of turning the crankshaft until the engine starts.

If any one of these conditions does not exist, the engine will not start.

The proper fuel-air mixture is dependent on a good fuel supply, a fuel pump, fuel lines, a carburetor, an air cleaner, and an air intake system.

The proper compression is dependent on valves, a piston, piston rings, cylinder head, and spark plug gasket.

The proper spark is dependent on a battery, a coil, breaker points, distributor, spark plugs, and wiring.

Turning the crankshaft is dependent on a battery, a switch, a solenoid, and an electric starting motor.

In isolating a trouble, it is best to work through the particular system step by step, starting with the most probable cause.

These are only suggestions to be used when the problem is not apparent at all. They are not necessarily true in all cases.

The troubleshooting chart lists the most common troubles encountered when the engine is in two conditions: starting and running.

Some of the most common malfunctions may be located or isolated as follows:

1. Dead Cylinder

Run the engine at a steady speed and disconnect and reconnect the spark plug leads, one at a time, and listen closely to the engine speed. The engine speed should drop off noticeably each time a working cylinder plug is disconnected. If this does not occur, that cylinder is weak or dead. (Check the spark plug first.)

2. Starting System

It is not an indication that the starting system is faulty if the engine will not start when the starter motor turns over at a normal rate of speed. Failure of the starting motor to spin the engine, or turning it too slow, is an indication that one or more of the starting system components is defective. To determine where the trouble is, perform the following tests.

(a) Battery Test

Switch on the ignition and energize the starting motor. If the starting motor spins the engine at a fairly good rate of speed and then rapidly slows down, the battery is discharged. A 12-volt battery may operate the starting motor with a defective cell, but it will not spin the starting motor fast enough.

(b) Battery Cable Test

Insert the tip of a screwdriver between the battery post and the cable connector and turn the ignition switch. If the starting motor now turns, the connection is bad. Remove the cable connector and clean it and the battery post by scraping or wire brushing. Replace and secure cable connector to battery post. Repeat this procedure on the other battery terminal connection.

(c) Solenoid Starting Switch Test

Bridge the solenoid starting switch terminals with a jumper cable. If, when the system is energized, the starting motor turns, the solenoid starting switch must be replaced. If the starting motor does not function with the starter switch shorted, using a fully charged battery and having good electrical connections, the starting motor must be defective.

(d) Starting Motor Test

The size of the spark from the jumper cable clamp to the solenoid starting switch terminal in the previous test is an indication of what kind of trouble to expect. If a strong spark occurs and the starting motor does not turn, it is possible that the starting motor has a short circuit or the starting motor drive is stuck to the flywheel.

A condition in which there is little or no spark when the jumper cable contacts the starting switch terminal can be caused by a dead battery, poor battery terminal connection or poor connections at the starting motor brushes due to a burned or oily commutator. If the starting motor spins but does not turn the engine, the starting motor drive is defective. Defective starting motor should be removed from the engine and tested to determine the cause of the malfunction.

CAUTION

Never operate the starting motor more than 30 seconds at a time without pausing to allow it to cool for at least 2 minutes. Overheating caused by excessive cranking will seriously damage the motor.

NOTE

If the 25-amp reset switch in the line between the battery and the ignition switch heats enough to break the circuit, turn the ignition switch OFF and wait 30 seconds before turning it ON.

TROUBLESHOOTING GUIDE

ENGINE
STARTING TROUBLE

CAUSE	REMEDY
Fuel System	
No fuel in tank.	Fill tank with a good grade of gasoline, 78 octane rating or above.
Carburetor not choked sufficently.	Pull up manual choke control.
Flooded engine	Push manual choke down, and pull throttle up to its full travel length. Start the engine and push throttle down gradually as engine clears and speed increases.
Vapor Lock (vaporized fuel in system blocks flow of fuel).	Allow fuel system components (usually fuel line) to cool. This allows vapor to condense to a liquid.
Ice in fuel line.	Allow ice to thaw.
Non-volatile gasoline (poor quality, old, or low octane gasoline).	Drain fuel tank and replace with a good grade of gasoline.
Dirt, water, or foreign matter in gasoline.	Clean or replace fuel filter in fuel pump. Drain fuel tank and replace with clean fuel.
Broken or binding choke linkage.	Replace or repair linkage.
Broken or binding throttle linkage.	Replace or repair linkage.
Fuel pump inoperative.	Check for poor electrical connection and fuse in fuel pump line.
Fuel pump operating but not pumping fuel.	Check for clogged fuel filter or fuel line, and clean.
Incorrect carburetor idle adjustment.	Adjust carburetor idle adjustment needle.
Vented tank cap plugged. Engine will start with fuel tank cap off.	Replace tank cap with new vented cap.
Compression	
Oil drained from cylinder walls (engine not used for a considerable length of time).	Restore oil in cylinder walls and pistons. Pour in spark plug holes.
Fuel Pump	
Fuel pump motor does not run when ignition switch is in ON position.	Check for poor electrical connections at switch, battery, and fuel pump. Check fuse. Check 25-amp reset switch.
Unsatisfactory pump operation after pump is installed.	Replace pump. Check for the following: a. Proper pump voltage and polarity. b. Loose pump electrical connections. c. Bad pump ground connections. d. Collapsed or clogged filter screen.

TROUBLESHOOTING GUIDE

ENGINE

STARTING TROUBLE

CAUSE	REMEDY
Starter System	
Starter will not crank engine; solenoid starting switch does not click.	Charge or replace battery.
	Check for loose connections or defective wiring between ignition switch and starter switch. Tighten connections or replace wiring. Check 25-amp reset switch.
Starter will not crank engine; solenoid starting switch clicks.	Inspect battery cables and check battery ground connection. Clean and tighten cables and connections.
Engine turns over too slowly to start.	Charge or replace battery.
	Engine low on oil, or wrong oil viscosity grade for ambient temperature. Change engine oil and engine oil filter.
Slow starter speed:	
Discharged battery or shorted battery cell.	Recharge or repair.
Engine ground loose.	Clean terminal and tighten (both ends).
Loose or dirty terminals	Clean and tighten.
Dirty commutator.	Clean with No. 00 sandpaper.
Worn out brushes.	Install new brushes.
Weak brush spring tension.	Replace.
Worn bearings.	Replace.
Burned starter switch contacts.	Replace switch.
Starter will not turn engine:	
Open circuit at starter.	Correct.
Starter switch defective.	Replace switch.
Starter drive broken or stuck.	Repair or replace.
Battery discharged.	Recharge battery.
Ignition System	
Ignition cable disconnected from distributor or spark plugs.	Ensure that all cables are tightly in place on distributor cap or plugs.
Broken or frayed ignition cables.	Replace cables.

TROUBLESHOOTING GUIDE

ENGINE
STARTING TROUBLE

CAUSE	REMEDY
Ignition cables wet.	Allow cables to dry thoroughly.
Spark plugs wet or dirty.	Remove and clean plugs.
Spark plug gap incorrect.	Check, clean, and re-gap plugs.
Spark plug insulators broken.	Replace plug or plugs.
Distributor breaker points pitted or badly burned.	Remove distributor cap, rotor and dust cover. Re-gap or replace distributor points.
Distributor breaker arm sticking.	Apply one or two drops of SAE 10W oil to breaker arm pivot.
Distributor cap cracked or terminals badly corroded.	Replace cap. Ensure that spark plug cables are replaced in proper towers.
Distributor rotor cracked or contact strip excessively burned.	Replace rotor. Do not attempt to repair strip.
Breaker points burned or pitted.	Replace and adjust.
Breaker arm stuck on pivot pin.	Clean and lubricate.
Breaker arm spring weak.	Replace.
Points improperly adjusted.	Adjust .018 to .022 in. (.46 to .56 mm)
Spark plug points improperly set.	Adjust .030" (,762mm)
Spark plug wire terminals in distributor cap corroded.	Clean.
Battery Discharged:	
Shorted cell in battery	Replace battery.
Short in wiring.	Check wiring circuit and repair.
Alternator not charging.	Inspect alternator regulator and rectifier ground.
Loose or dirty terminals.	Clean and tighten.
Insufficient driving.	Recharge battery.
Low electrolyte level in cells.	Add distilled water.

TROUBLESHOOTING GUIDE

ENGINE
RUNNING TROUBLE

CAUSE	REMEDY
Alternator	
Fails to charge:	
Open or high resistance in charging circuit, ground return circuit, or battery connections.	Test and correct.
Open rotor (field coil).	Test and replace if necessary.
Low or unsteady charging rate:	
Intermittent or high resistance charging or ground return circuit or battery connections.	Test and correct.
Shorted or open rectifier diode.	Test and replace if necessary.
Grounded or shorted turns in rotor (field coil)	Test and replace if necessary.
Open, grounded, or shorted turns in stator.	Test and replace if necessary.
Excessive charge rate:	
Faulty regulator	Check and repair as necessary.
Engine Misses:	
Spark plug gap incorrect.	Check and re-gap spark plugs.
Broken or frayed ignition cable.	Test by checking spark at distirbutor and at spark plug end of cable. Replace cable if necessary.
Weak spark or intermittent spark.	Check ignition cables for loose connections.
Dirt in carburetor or contaminated fuel.	Clean carburetor air cleaner and air filter. Drain fuel tank and replace with good grade of gasoline. Clean fuel pump.
Engine Overheats:	
Oil low in engine crankcase.	Add proper oil to crankcase.
Incorrect grade or dirty oil in crankcase.	Drain engine oil, replace engine oil filter, and add proper grade of oil.
Poor quality gasoline.	Drain fuel tank and replace with a good grade of gasoline.
Engine overloaded.	Observe the recommended load limits when pulling or towing a load.
Restricted air circulation over transmission oil cooler radiator vanes.	Do not obstruct transmission oil cooler radiator vanes. Radiator vanes must be kept clean of all foreign matter.
Part of air shroud missing from engine.	Engine must be properly shrouded to direct air over cylinders.
Dirt or foreign matter on engine cooling fins.	Remove engine shrouding, and clean fins. Straighten fins if bent or damaged.

TROUBLESHOOTING GUIDE

ENGINE
RUNNING TROUBLE

CAUSE	REMEDY
Restricted engine exhaust.	Inspect exhaust outlet pipe for any obstruction.
Engine Knocks:	
Poor quality or low octane gasoline.	Use a good grade of gasoline.
Engine operating under heavy load at low speed.	Observe vehicle load restrictions.
Spark advanced too much.	Reset distributor timing.
Engine Backfires Through Carburetor:	
Water or dirt in gasoline or poor grade of gasoline.	Clean or replace fuel filter if contaminated. Drain fuel tank and replace with a good grade of gasoline.
Engine cold.	Allow engine to reach normal operating temperature.
Incorrect valve clearance.	Set valves.
Engine Suddenly Stops:	
Vented tank cap plugged. Engine will run with fuel tank cap off.	Replace tank cap with new vented cap.
Fuel Tank empty.	Fill.
Coil Secondary Lead Disconnected (to center tower of distributor)	Replace.

TROUBLESHOOTING GUIDE

TRANSMISSIONS

1. General

The cause of improper functioning in a hydraulic system is best diagnosed with adequate testing equipment and a thorough understanding of the complete hydraulic system.

A hydraulic transmission unit exhibiting an excessive increase in heat or noise is a potential failure. When either of these conditions are noticed, immediately shut down the KID vehicle engine, locate the trouble, and take corrective action. Use the hydraulic flow diagram for reference when troubleshooting the transmission.

Major reasons for hydraulic system failure are heat, dirt, air and cavitation. The information below is a guide for recognizing and correcting some of these failures and preventing breakdowns.

2. Transmission Creating Excessive Noise

a. Air in the System.

Air in the system sometimes presents a "milky" appearance in the reservoir oil. A leak at the intake (suction) side of the pump will cause aeration in the fluid. When this condition exists, there is a mixture of air with the oil. Since air is compressible, it is pressurized and released within the high pressure pump and an explosion of the tiny air bubbles occurs. This phenomena can be translated into an audible sound above the normal hydraulic system sound level. Air in the fluid system presents a rattling sound within the pump, resulting in reduced lubrication and an erratic action in the hydraulic system. In the event of aeration in the transmission, check the operation of the auxiliary pump.

b. Cavitation.

Cavitation is caused by a low pressure condition at the inlet port of the pump. Vapor pockets are formed which separate the oil molecules, resulting in noisy and erratic operation of the hydraulic transmission. Serious erosion of the pumping unit parts will occur in a short operational period.

A worn or failed replenishing pump is the primary cause of cavitation in a closed-loop hydrostatic transmission circuit.

Cavitation can also be caused by using too heavy an oil in the hydraulic system. After overhaul or when refilling, use the oil specified. During cold weather the oil will thicken while standing overnight or for any considerable length of time. Cavitation may be experienced at initial start. This condition will disappear as the oil begins to warm and thin out.

3. Hydraulic Transmission Overheating

Overheating of the hydraulic system can cause system failure. When hydraulic oil becomes excessively hot, it will oxidize. When oxidation occurs, the oil will have less lubricity and the transmission will wear out faster. As an example, the rate of oxidation will double for every 10 degrees of temperature rise over 160° F. At high temperatures, O-rings, seals, and gaskets will deteriorate. One of the reasons for excessive heat is internal leakage. If the pumping unit becomes worn, slippage occurs, causing rapid heat build-up. This condition can be recognized by a slowing down of the vehicle or loss of power.

Another reason for excessive heat may be a plugged or failed oil cooler. This can be readily determined and remedied.

In summary, if the vehicle loses speed, specifically after it has been operating for a while, check the hydraulic fluid temperature. This can be done with a thermometer submersed in the reservoir. Compare the resultant temperature reading with maximum operating temperature recommendations.

4. System Not Developing Pressure

The reasons for loss of pressure in the transmission hydraulic system are:

a. One of the two replenishing relief valves has failed to open.
b. Internal leakage (slippage).
c. External loss.

If the replenishing relief valve fails, normally there will be movement of the vehicle in one direction but not in the other. It is not likely that both replenishing relief valves will fail simultaneously, therefore, the failed valve can be located by exchanging valves from one side to the other.

If the vehicle slows down or stops in both directions, the fluid supply is passing directly back to the reservoir through internal slippage, or there is external loss of fluid.

5. External Leakage

Ruptured lines, loose connections or worn gaskets and seals can cause leakage. Line or connection leakage is usually easy to correct; however, seal or gasket leakage requires disassembly of a part or all of the transmission. If an O-ring within the unit is cut worn, or hardened, internal leakage will be evident by slowing down of the vehicle when it is in motion.

6. Miscellaneous

When troubleshooting the hydraulic system do not overlook the possibility of mechanical failure of parts related to the hydrostatic transmission. Look for the following indications:

a. Sheared shaft keys.
b. Disconnected or improperly adjusted control linkage.
c. Disconnected or broken drive mechanisms.

7. Trouble, Cause and Remedy

The following table lists the most prevalent trouble and causes for transmission malfunction. Use this table as a guide if trouble with the transmission is indicated.

TROUBLESHOOTING GUIDE

TRANSMISSION

CAUSE	REMEDY
Transmission Pump Not Delivering Fluid to Motor End	
Reservoir fluid level low.	Add fluid to reservoir.
Inlet strainer plugged.	Clean strainer after new fluid is added.
Air leak in inlet line prevents priming and causes irregular control circuit action.	Pour fluid on intake joints while listening for change in sound of operation. Tighten as required.
Coupling or shaft sheared or disengaged.	Disassemble unit and check shaft and rotating group for damage. Replace necessary parts.
Speed Fluctuations with Constant Input Flow	
Irregular wear between housing and cylinder block.	Lap housing and cylinder block. Minor defects can be removed by lightly stoning the surface. Lapping should not exceed 0.002 inches. The surface is hardened and excessive lapping will remove this hardened surface. If the wear or damage is extensive, replace the housing.
Excessive Noise in Transmission	
Air in the system.	Correct cause of air leak.
	Open reservoir cap and operate hydraulic system until purged.
	Bleed hydraulic lines at highest point downstream of auxiliary pump while system is under pressure.
Vacuum Condition.	Check inlet (suction) lines and fittings for air leaks or obstruction.
	Check auxiliary pump function.
Oil too thick.	Be certain correct type of oil is used for refilling or adding to the system.
Cold weather.	Run hydraulic system until unit is warm to the touch and noise disappears.
Coupling Misalignment.	Check for damaged shaft bearing or other parts. If necessary, replace and realign the coupled shaft.
Partly clogged inlet line, inlet strainer or restricted inlet pipe.	Service the inlet strainers. Check the fluid condition and, if necessary, drain and flush the system. Refill with clean fluid.
Air bubbles in fluid.	Check to be certain return lines are below fluid level and well separated from intake line.

TROUBLESHOOTING GUIDE

TRANSMISSION

CAUSE	REMEDY
Reservoir air vent plugged.	Must be open through breather opening or air filter.
Unit running too fast.	Conform with recommended maximum speeds.
System Not Developing Pressure or Slow Operation	
Replenishing relief valve stuck open.	Replace one or both. Do not attempt to repair Cartridges. They are factory assembled and preset.
Unit not delivering fluid.	Check circulation by watching fluid in reservoir.
Relief valve setting not high enough.	Test with pressure gauge.
Relief valve sticking open.	Remove contamination in relief valve.
Leak in hydraulic control system (cylinders or valves).	Test independently by progressively blocking off the circuit.
Charge pump ring in backwards.	Remove charge pump cover and check for proper rotation. Reverse pump ring if improperly installed.
Worn pump.	Repair or replace pump.
Worn motor.	Replace worn parts or motor.
Inadequate size oil lines.	Increase oil line size.
Pump cavitation.	Increase oil line size to pump.
Plugged filter.	Replace filter element or clean filter.
Relief setting too low.	Set relief valve.
Motor Will Not Turn	
Shaft seized in housing due to excessive side load or misalignment. (note 500 lb maximum radial loading on shaft.)	Replace housing assembly set if damaged.
Large contaminating particles in fluid such as machining chips or sand. Very dirty fluid.	Flush system - use better filtration.
Broken shaft from extreme side loads or misalignment.	Replace
Motor Runs Without Turning Shaft.	
Broken shaft.	Replace shaft assembly. Check housing for wear and replace if necessary.

TROUBLESHOOTING GUIDE

TRANSMISSIONS

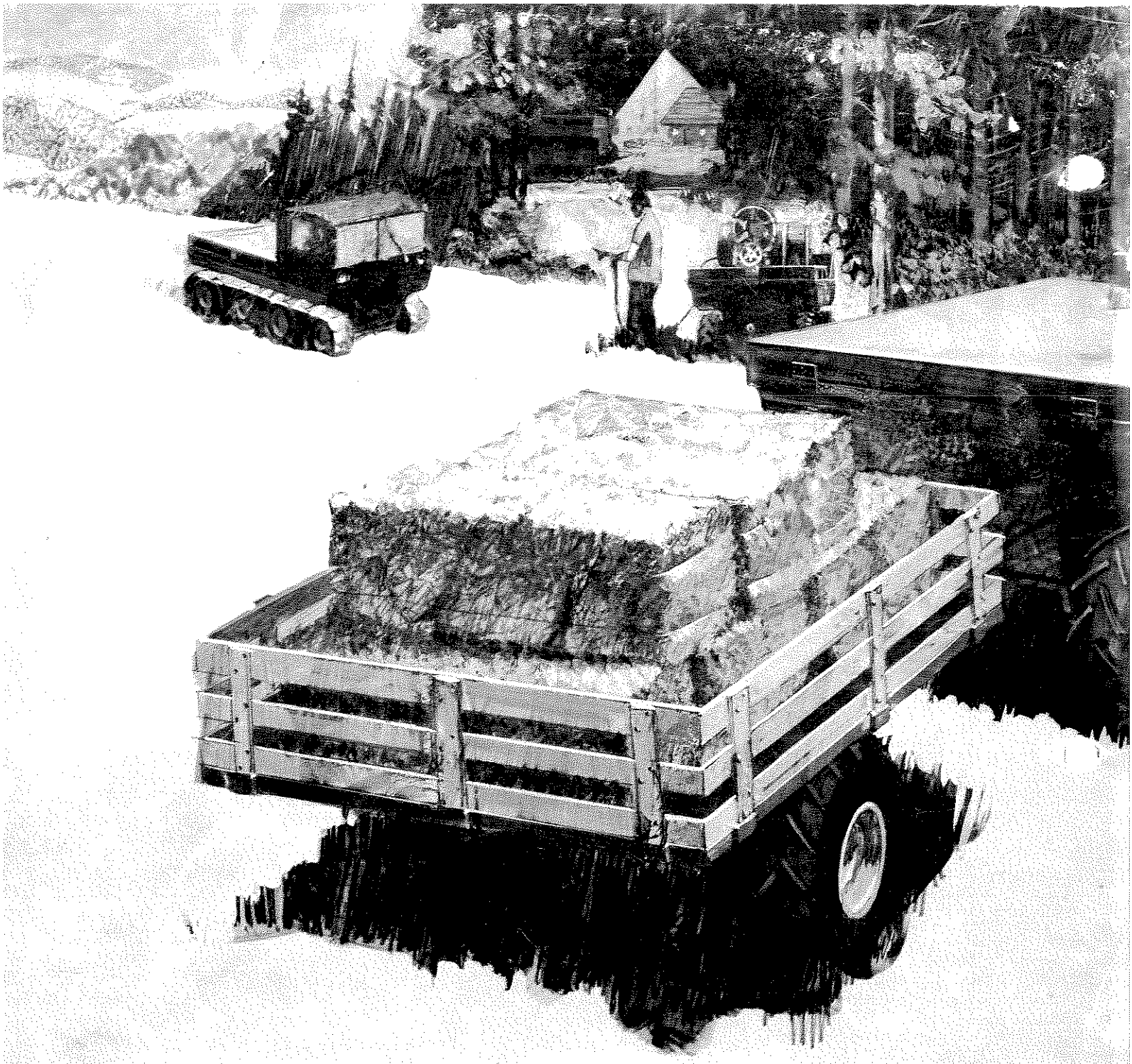
CAUSE	REMEDY
Motor Turns in Wrong Direction	
Hose connections wrong.	Reverse connections.
Leak at Shaft	
Worn or cut quad-ring.	Replace quad-ring, polish shaft at seal area.
Leak Between Flange and Housing	
Loose flange.	Tighten.
Damaged seal between housing and flange.	Replace seal. Check housing surface at seal for sharp nicks or deep scratches.
Leak in body plug seal.	Replace faulty O-rings.
Leak at Oil Ports	
Poor fittings.	Replace fittings carefully.
Damaged threads.	Replace housing or use special seal nut.
Cracked Front Flange	
Use of installation bolts which are too long and bottom against housing.	Replace flange, and use proper size bolts.
Leak Between Gerotor and End Cap	
Dirt between surfaces.	Reassemble - clean and dry parts.
Scratches or nicks on surface.	Polish very carefully on a flat, hard surface, avoid rounding the edges.
Leak Between Housing and Wear Plates or Between Wear Plates and Gerotor	
End cap bolts loose.	Tighten the 7 cap screws at gerotor end of motor.
NOTE: All motors are tested and rated at a maximum back pressure of 1000 psi.)	If the threads are accidentally stripped in the housing, the hole may be drilled and tapped deeper and the motor reassembled with longer bolts.
Hydraulic Transmission Overheating	
Internal leakage.	If established that excessive internal leakage is evident, return vehicle to shop for repair.
Oil cooler not functioning.	Locate trouble and repair and replace.
Fluid level low.	Add oil to operating level.
Loss of Fluid	
Ruptured hydraulic lines or loose fittings.	Check all external connections, tubing, and hoses. Tighten connections, replace ruptured tube or hose.
Leaking gaskets or seals in hydrostatic transmission	Observe mating sections of hydrostatic transmission for leaks. Replace seals or gaskets if possible.
Miscellaneous	
Sheared shaft.	Replace
Misadjusted or broken control linkage.	Locate and repair.
Disconnected or broken drive mechanism.	Repair

HOW TO ORDER PARTS

When ordering parts, state Part Number, KID Serial Number, Part Name, and Quantity Required --- DO NOT ORDER BY REFERENCE NUMBER.

To assure continued successful and trouble-free operation of your KID, order all parts from your authorized KID dealer distributor.

DO NOT ACCEPT "WILL-FIT" PARTS. THEY MAY SHORTEN THE LIFE OF THE KID



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