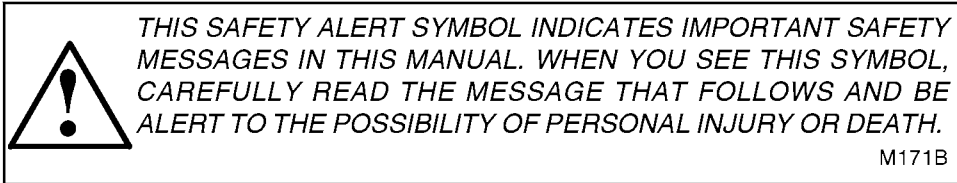


40 YR - 40 ER
Service Manual

S-406062 M3

Reprinted




CASE



If Safety Decals on this machine use the words **Danger, Warning or Caution**, which are defined as follows:

- **DANGER:** Indicates an immediate hazardous situation which if not avoided, will result in death or serious injury. The color associated with Danger is RED.
- **WARNING:** Indicates a potentially hazardous situation which if not avoided, will result in serious injury. The color associated with Warning is ORANGE.
- **CAUTION:** Indicates a potentially hazardous situation which if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices. The color associated with Caution is YELLOW.

If Safety Decals on this machine are ISO two panel Pictorial, decals are defined as follows:

- The first panel indicates the nature of the hazard.
- The second panel indicates the appropriate avoidance of the hazard.
- Background color is YELLOW.
- Prohibition symbols such as   and  if used, are RED.



WARNING

IMPROPER OPERATION OF THIS MACHINE CAN CAUSE INJURY OR DEATH. BEFORE USING THIS MACHINE, MAKE CERTAIN THAT EVERY OPERATOR:

- Is instructed in safe and proper use of the machine.
- Reads and understands the Manual(s) pertaining to the machine.
- Reads and understands ALL Safety Decals on the machine.
- Clears the area of other persons.
- Learns and practices safe use of machine controls in a safe, clear area before operating this machine on a job site.

It is your responsibility to observe pertinent laws and regulations and follow Case Corporation instructions on machine operation and maintenance.

40YR-40ER TABLE OF CONTENTS

GENERAL

Introduction	6	
Nomenclature	4, 5	
Table of Contents	1, 2	
Warranty	3	

MECHANICAL COMPONENTS AND CONTROLS **A-E**

ELECTRICAL SYSTEM

Description	1 thru 4	
Trouble Shooting	4	A

ENGINE AND THROTTLE LINKAGE

Description	1, 2	
Adjustments	2 thru 4	B
Master Cylinder	3	
Slave Cylinder	4	
Trouble Shooting Master/Slave Cylinder Hydraulic Systems (see section "C")		

BRAKES AND BRAKE LINKAGE

General Description	1	
Bleeding	2	C
Master Cylinder	3, 4	
Swivel	5	
Power System with trouble shooting information	5 thru 7	
Mico Brake Lock with trouble shooting information	8, 9	
Wheel Brakes	10	
Parking Brakes	11	
Trouble Shooting Master/Slave Cylinder Hydraulic Systems		
	12 thru 14	

DRIVE CONTROLS AND DRIVE LINE

Controls, with trouble shooting information	1 thru 3	
Revers-o-matic, with test procedures	3, 4	D
Shift and Outrigger Control Linkage	5, 6	
Drop Box	6, 7	
Axle Drive Unit (differential)	8 thru 18	
Trouble Shooting Differential	18	
Wheel Drive Unit (planetary)	19 thru 28	
Trouble Shooting Planetary	29	
Torque Specifications for Differential and Planetary Drive Units	30, 31	
Steering Linkage to Drive Wheels	32	
Trouble Shooting Drive Controls	33	

SWING MECHANISM

Description	1	
Swing Brake Overhaul	1	E
Swing Reduction Gearbox	2 thru 8	
Replacing Turntable Bearing and Positioning Swing Pinion	8 thru 12	



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40YR-40ER TABLE OF CONTENTS(CONT'D)

HYDRAULIC SYSTEM **F-O**

GUIDE TO THE 40 R HYDRAULIC SYSTEM

What is a Hydraulic System?	1, 2	F
Schematic Diagrams	3, 4	
Description of 40 R Hydraulic System	5 thru 15	
Pumps	5 thru 7	
Control Valves	7 thru 11	
Relief Valves	11 thru 14	
Low Pressure Components	14, 15	
Steering Controls	15	
Optional Equipment	15, 16	

RELIEF PRESSURE CHECK

Why Check Relief Pressure?	1	G
Relief Pressure Check Procedures	1	
Relief Pressure Charts	2, 3, 4	

TROUBLE SHOOTING THE 40 R HYDRAULIC SYSTEM

Why Trouble Shooting?	1	H
Trouble Shooting Procedures	1 thru 4	
Pumps	1	
Swivel	1, 2	
Control Valves	2	
Steering Orbitrol	2, 3	
Relief Valves	3	
Swing Motor	3, 4	
Cylinders	4	
Trouble Shooting Charts	5 thru 12	
Pump	5	J
General Hydraulic System Malfunctions	5 thru 8	
Valve Banks	8	
Swing Circuit	8, 9	
Outrigger, Hoist, Crowd, Tool Circuits	10, 11	
Steering Circuit	11, 12	

MAIN PUMP OVERHAUL PROCEDURE

STEERING PUMP OVERHAUL PROCEDURE

SWIVEL OVERHAUL PROCEDURE

CONTROL VALVE OVERHAUL PROCEDURE

ORBITROL OVERHAUL

See NOTE on page H3
of TROUBLE SHOOTING section

SWING MOTOR OVERHAUL PROCEDURE

CYLINDER OVERHAUL PROCEDURE

GENERAL TORQUE SPECIFICATIONS

Capscrews and Studs	1	P
Hydraulic Fittings	2	



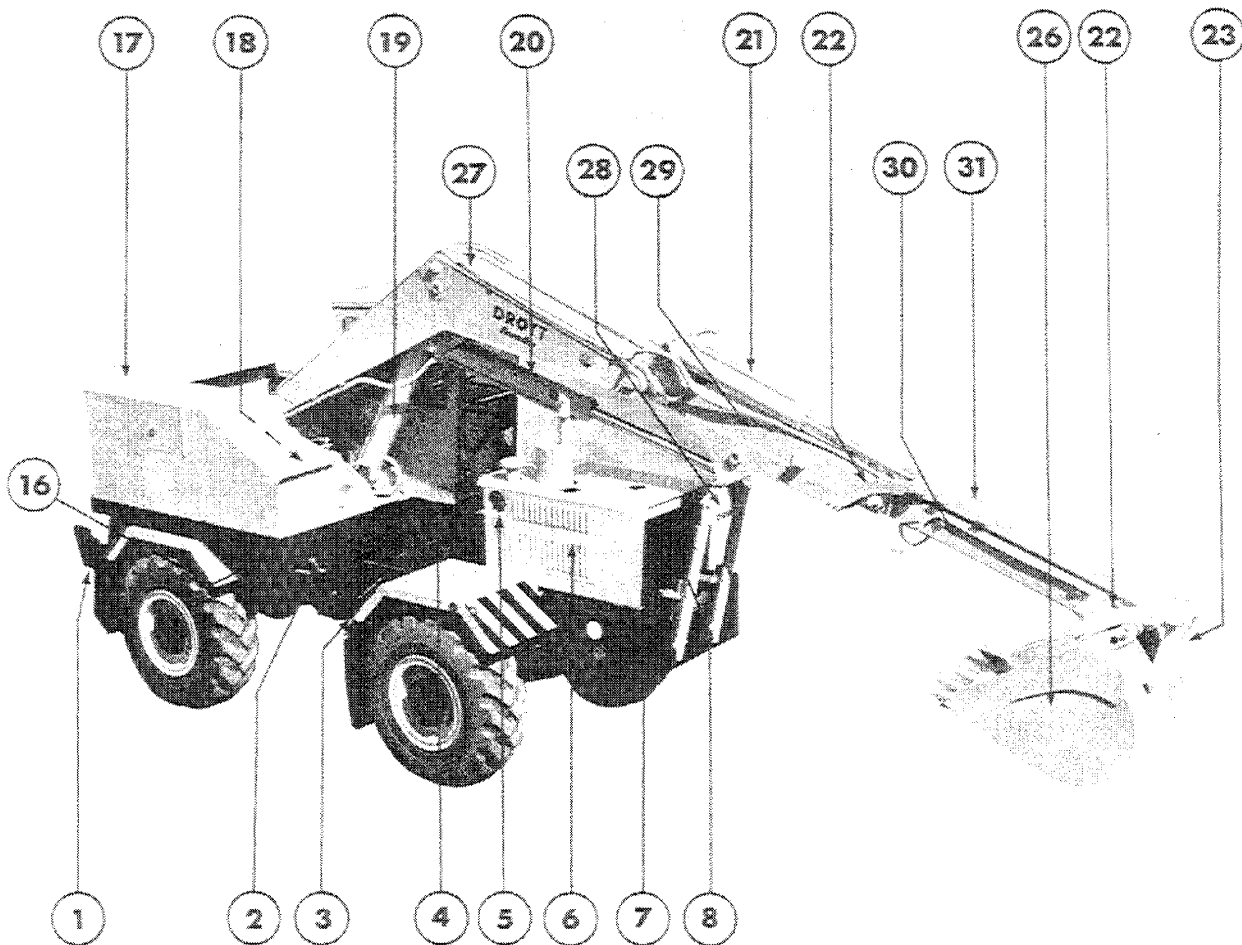
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40YR - 40ER

DROTT
MANUFACTURING COMPANY
A Division of J. I. Case Company

WARRANTY

1. Drott warrants that it will repair or furnish without charge F. O.B. its Factory, in accordance with its published **Claim and Adjustment Policy** in effect at the date of sale by the Distributor, a similar part to replace any material in its equipment which within **six months or 1200 hours** (whichever occurs first) after the date of sale by Distributor, is proven to the satisfaction of Drott to have been defective at the time it was sold, provided that, if so requested, all parts claimed defective shall be returned properly identified to the Company's factory, charges prepaid.
2. **Drott makes no warranty of merchantability or otherwise except as herein provided.** No warranty other than title and description has been made or exists either expressly or by implication, all other statutory and implied warranties, including warranties as to merchantability, being hereby expressly waived and excluded from this transaction, and the Company's liability in connection with this transaction is expressly limited to the repair or replacement of defective parts in accordance with its published **Claim and Adjustment Policy** in effect at the date of sale by the Distributor, all other damages direct or consequential, arising under statute, through negligence or otherwise, being hereby expressly waived.
3. This warranty applies only to new and unused equipment which, after shipment from the factory of the Company, has not been altered, changed, repaired, or treated in any manner whatsoever. No Warranty of any kind, statutory, implied, or otherwise, relating to merchantability, fitness or other qualities shall apply to trade accessories, attachments, tools, or implements not manufactured by Drott, or to second-hand equipment, or to new and unused equipment, which, after shipment from the Factory, has been altered, changed, repaired, or treated in any manner whatsoever, and no attempt to repair or promise to repair or improve the equipment covered by this contract by any representative of Drott shall waive any consideration of the contract or change or extend this warranty in any manner whatsoever.
4. Engines, tires, batteries, electrical and similar equipment are covered only by the standard warranty of the manufacturer of such equipment.

40 YR-40ER NOMENCLATURE



CRUZ-AIR (lower structure) (items 1 thru 15)

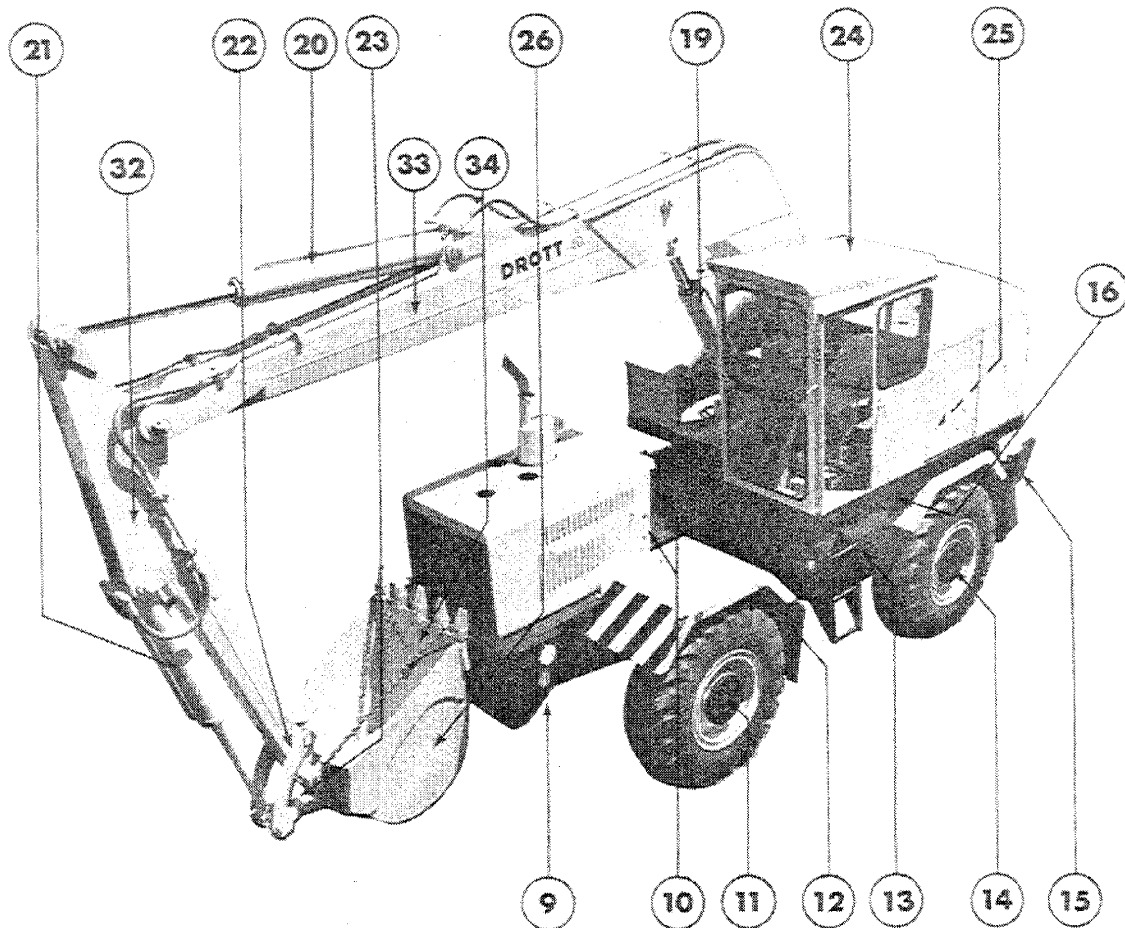
1. Right rear outrigger
2. Hydraulic oil reservoir - (right side)
3. Optional front outrigger location - (both sides)
4. Battery location - (under cover)
5. Engine air cleaner
6. Engine compartment
7. Light mounting bracket - Right Side - (folds back to frame)
8. Hydraulic oil cooler
9. Light mounting bracket - Left Side - (folds back to frame)
10. Engine instrument panel - (stop controls added for GMC engines)
11. Front driving and steering axle
12. Optional front outrigger location - (both sides)
13. Fuel tank - gasoline or diesel - (with ladder attached)
14. Rear driving axle
15. Left rear outrigger

TURNTABLE BEARING LOCATION (item 16)

TURNTABLE (items 17 thru 26)

17. Shroud, and counterweight area

40 YR-40 ER NOMENCLATURE (CONT'D)



- 18. Swing speed reduction, and swing motor location
- 19. Boom hoist cylinder
- 20. Boom crowd cylinder
- 21. Tool cylinder
- 22. Tool levers
- 23. Tool link
- 24. Operator's compartment with controls
- 25. Main hydraulic valve location
- 26. Tool - (back hoe bucket shown)

"Y" (YUMBO) BOOM (items 27 thru 31)

- 27. "Y" Main boom
- 28. "Y" Boom support
- 29. "Y" Tool boom
- 30. "Y" Tool boom extension
- 31. "Y" Boom adjustable link

"E" (EXCAVATOR) BOOM (items 32 thru 34)

- 32. "E" Boom dipper stick
- 33. "E" Main boom
- 34. "E" Boom carry chain

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40 R CRUZ-AIR

INTRODUCTION TO SERVICE MANUAL

This book has been prepared as a guide to the mechanic in servicing the DROTT CRUZ-AIR. It is intended to tell the mechanic how the machine works and to help him understand why a malfunction has occurred as well as to tell him how to repair the machine. This is especially true of sections dealing with Hydraulic System Repair.

Sections A through E of this manual deal with the mechanical components of the machine and their controls. Trouble-shooting information for a given component will be found in the section in which it is described.

Sections F through H deal with the Hydraulic System of the machine. These sections contain no overhaul or repair information, but are intended to help the mechanic in another way, by describing how a hydraulic system works, what the components of the Cruz-air hydraulic system are, how to keep those components in good repair, and how to pinpoint hydraulic problems. This manual is designed to help you prevent trouble, rather than repair damage that has already been done.

Overhaul Instructions begin with section J; if you care for your machine properly, you may never need them.

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40YR - 40ER

ELECTRICAL SYSTEM

The Electrical System supplies current at regulated voltage for all lights, instruments, and electrical controls of the machine.

The Charging Circuit

The electrical system is powered by a self-rectifying belt driven alternator, which is mounted on the engine.

WARNING: Because the alternator and voltage regulator are designed for use on only one polarity system, take the following precautions when working on the charging circuit:



1. When installing a battery, always make sure the ground polarity of the battery and the ground polarity of the alternator are the same. If battery leads are connected to the wrong battery posts, the battery will short through the alternator, and may "burn out" the alternator diodes and portions of the wiring harness.
2. When connecting a booster battery or battery charger, be sure to connect negative terminals together and positive terminals together. The reason for this is the same as stated in precaution #1.
3. Never operate the alternator on an open circuit. With no battery or other electrical load on the circuit, a voltage build-up will occur within the alternator which could be extremely dangerous to anyone touching the alternator "BAT" terminal.
4. Do not short across or ground any of the terminals on the alternator or regulator.
5. Do not attempt to polarize the alternator as you would a DC generator. Polarizing the alternator is not necessary, because voltage generated in the alternator is of both polarities, and direction of current flow is automatically controlled by the diode rectifier.

NOTE! BEFORE WORKING ON ELECTRICAL SYSTEM:

To protect alternator from damage by accidental open-circuit operation shorting, or reversal of polarity in charging circuit, the best practice is to pull the field coil to rectifier connector (shown in figures A1 and A2) to break the circuit within the alternator.

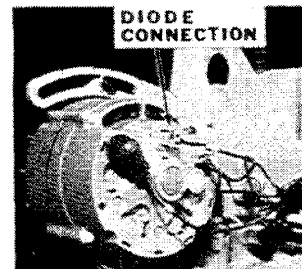


Figure A1. Gasoline Eng. Figure A2. Diesel Eng.
Disconnect Diode Rectifier Circuit

Always do this before removing battery lead wires, or connecting booster or charger to battery. Re-insert field coil - to - rectifier connector after battery lead wire has been re-connected, or booster or charger leads have been removed.

To protect alternator when installing new battery, leave field coil - to - rectifier connector disconnected until after the battery has been installed and its polarity has been checked against polarity of battery lead wires. See precaution #1, above.

Charging the Batteries:

Never attempt to charge a battery until after electrolyte level has been checked. Fluid should be over tops of separators. If battery temperature reaches 125° F, the battery should be taken off charge or the charging rate reduced, to avoid damage to battery.



CAUTION: Electrical storage batteries generate highly inflammable hydrogen gas while being charged. This gas will escape through vents in cell caps, forming an explosive atmosphere around the battery if area is poorly ventilated. The gas will remain in the battery cells for some time after battery has been charged, and its ignition by sparks or flame will cause an internal explosion which may shatter the battery.

1. Do not smoke in the battery-charging area or near recently charged batteries.
2. Do not break live circuits at terminals of newly charged or charging batteries because the resulting spark may ignite the hydrogen gas.

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40YR - 40ER

ELECTRICAL SYSTEM

Wiring Harness Inspection

Check the wiring periodically for abrasion, loose or corroded terminals, loose grommets and mountings. Purchase mounting straps and grommets as needed from local automotive supplier or your local dealer.

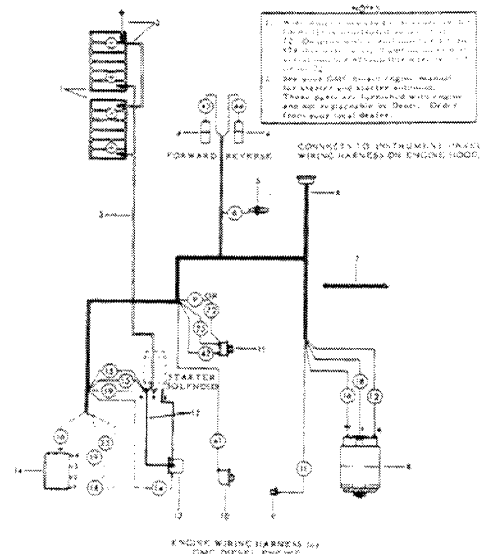
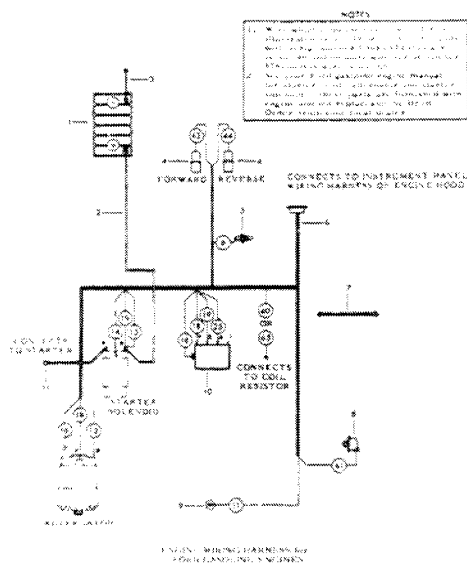
Checking-out Malfunctions

If an electrical component of the machine does not work, first check the circuit protector, then check its wiring. The Engine, Main Frame, and

Turntable wiring harnesses are schematically illustrated in the following pages to help in troubleshooting the various circuits of the electrical system.

Circuit Protection

The electrical system is protected from overload by a circuit breaker and by fuses. The circuit breaker and fuses are labeled, along with the circuits each one protects, in the schematic diagrams of Instrument Panels in Section J of Parts Book.



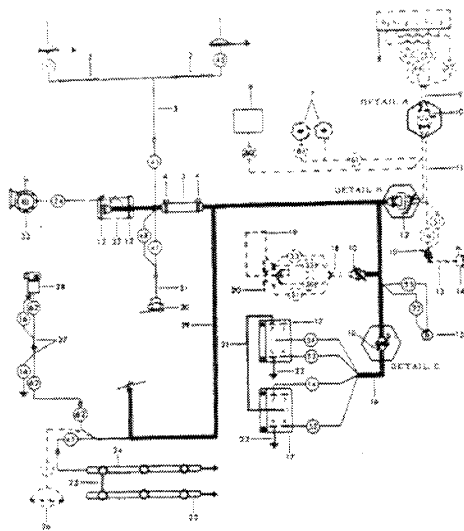
PARTS LISTING FOR FORD GASOLINE ENGINE WIRING HARNESS.

1. BATTERY
2. CABLE - battery to starter solenoid
3. CABLE - battery to ground
4. SHIFTING SOLENOID
5. THERMO SWITCH
6. ENGINE WIRING HARNESS
7. CABLE - engine to ground
8. OIL PRESSURE SENDING UNIT
9. ENGINE TEMPERATURE SENDING UNIT
10. VOLTAGE REGULATOR
11. CABLE - starter solenoid to starter

PARTS LISTING FOR GMC DIESEL ENGINE WIRING HARNESS

1. BATTERY
2. CABLE - battery to starter solenoid
3. CABLE - battery to ground
4. SHIFTING SOLENOID
5. THERMO SWITCH
6. ENGINE WIRING HARNESS
7. CABLE - engine to ground
8. ALTERNATOR
9. ENGINE TEMPERATURE SENDING UNIT
10. OIL PRESSURE SENDING UNIT
11. PRESSURE SWITCH
12. JUMPER WIRE
13. STARTER SOLENOID RELAY
14. VOLTAGE REGULATOR

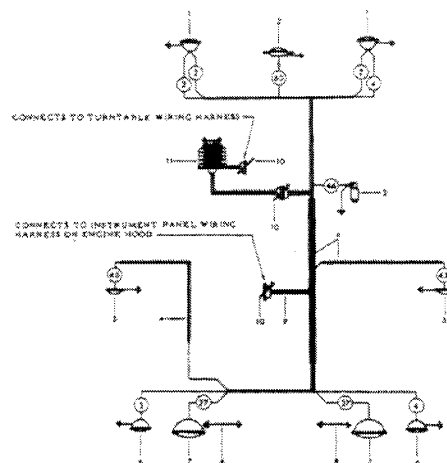
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TURNTABLE WIRING HARNESS IN
FORD GASOLINE ENGINES AND GMC DIESEL ENGINE

**PARTS LISTING FOR TURNTABLE
WIRING HARNESS**

1. CLEARANCE LIGHT
2. JUMPER WIRE
3. CLEARANCE LIGHT WIRING HARNESS
4. HOSE CLAMP
5. PROTECTIVE GUARD AND HOSE
6. L. P. GAS HEATER
7. VALVE ACTUATOR SOLENOID
8. REVERSING SWITCH
9. MICRO SWITCH WIRING HARNESS
10. CABLE TIE
11. MICRO SWITCH AND DUAL FLOW WIRING HARNESS
12. CABLE TIE
13. DUAL FLOW SOLENOID SWITCH WIRING HARNESS
14. DUAL FLOW SOLENOID SWITCH
15. STOP LIGHT SWITCH
16. STARTING RELAY WIRING HARNESS
17. STARTING RELAY
18. MAGNETIC SWITCH WIRING HARNESS
19. JUMPER WIRE
20. MAGNETIC SWITCH
21. JUMPER WIRE
22. GROUND WIRE
23. LIGHT BAR
24. LIGHT BAR
25. JUMPER WIRE
26. WORKING LIGHT
27. WINDSHIELD WIPER WIRING HARNESS
28. WINDSHIELD WIPER MOTOR
29. TURNTABLE WIRING HARNESS
30. TRANSMISSION SWITCH
31. TRANSMISSION SWITCH WIRING HARNESS
32. PLASTIC COVER
33. HORN



MAIN - LOWER WIRING HARNESS IN
FORD GASOLINE ENGINES AND GMC DIESEL ENGINE

**PARTS LISTING FOR MAIN - LOWER
HARNESS**

1. REAR TAIL, STOP AND SIGNAL LIGHT
2. LICENSE WITH LIGHT BRACKET
3. MICRO LOCK
4. AUTO NON-METALLIC LOOM
5. CLEARANCE LIGHT
6. SIGNAL LIGHT
7. HEAD LIGHT
8. GROUND WIRE
9. MAIN - LOWER WIRING HARNESS
10. CABLE TIE
11. COLLECTOR RING

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ELECTRICAL SYSTEM

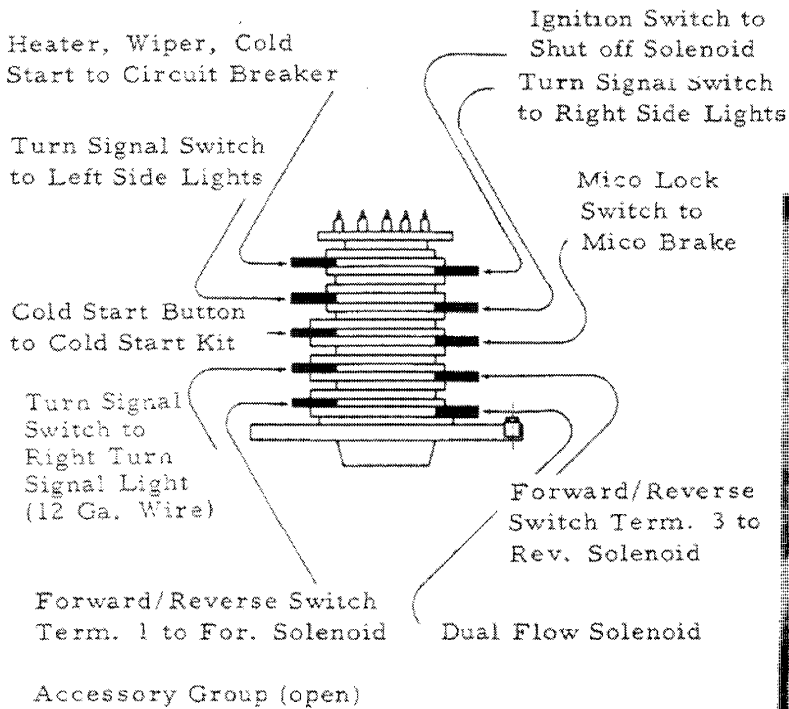


Figure A3. Diagram of Collector Ring, Showing Paths of Current Flow.

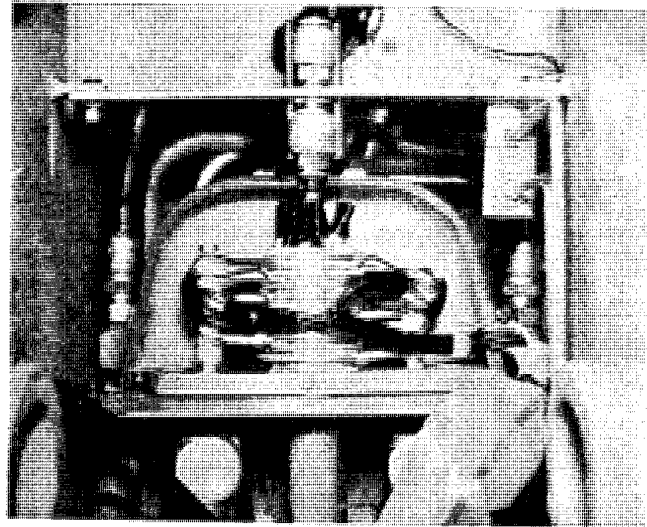


Figure A4. Collector Ring in Place on Machine.

Collector Ring
General Description

The Collector Ring is mounted at the center of rotation of the Cruz-air, just above the hydraulic swivel. Its function is to pass current from the main frame (chassis) of the Cruz-air to the turntable. The Collector Ring consists of a series of brass rings, one for each circuit. Two brushes ride on each brass ring to assure positive electrical contact between the chassis and the turntable at all times.

Trouble Shooting

An illustration of the Collector Ring, with all circuits labeled, is on page A4. If erratic behavior is noted in any of these circuits, the collector ring may be the source of trouble. Some atmospheric conditions cause brass to tarnish; under some working conditions, fine-grained silt can filter through the dust-cover and accumulate on the rings. Either condition will impair brush contact. This can often be remedied by swinging the turntable through several revolutions in both directions.

NOTE: Also, a brush may have jumped out of its channel (strong impact against machine can cause this). Make sure all brushes are properly seated in their channels.

If swinging does not renew contact between brushes and rings, it may be necessary to clean the rings and brushes. Use the following procedure:

1. Solid deposits and corrosion (tarnish) can be removed from the rings and brushes with fine sandpaper. After using the sandpaper, blow away the dust with compressed air.
2. Deposits of oil and grease may be removed from the rings and brushes with non-flammable cleaning fluid. Do not use an inflammable cleaning fluid.

NOTE: Do not overgrease the collector ring bearing (refer to "Scheduled Maintenance" in Operator's Handbook). Overgreasing may cause grease to break through the bearing seal and enter the brush-and-ring compartment, where it will foul the rings and brushes, stopping current flow.

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40YR - 40ER

ENGINE AND THROTTLE LINKAGE

Engine Maintenance and Service

The engine is serviced by its manufacturers through their own dealer networks. Complete information on service and maintenance of the engine is available from its manufacturer.

Engine and governor adjustments are covered in the engine operator's manual, which is included in the literature that accompanies each machine.

RPM Specifications

A periodic check of engine speeds is an important part of any machine maintenance program. Often, improper machine performance can be traced to an engine in need of a few simple adjustments.

NOTE: The engine should be warmed to operating temperature before any performance checks are made.

Governed RPM

Maximum governed rpm is determined by running the engine under minimum load conditions (all controls in "neutral"), with the speed control set at "full fuel". Check engine speed with a tachometer, making sure it corresponds with specifications in the chart below.

NOTE: If engine throttle linkage is suspected of malfunction, disconnect it and work engine governor lever by hand. Check speeds obtained in this way against speeds obtained with throttle linkage connected.

Gasoline Engine: Wire electric tachometer to IGNITION terminal of distributor and to a reliable ground. Read engine speed on dial.

Diesel Engine: Use a strob-tachometer, with timing light beamed on a chalk-mark on the engine crankshaft pulley. Connect tachometer's RED wire to POSITIVE (+), or "hot" terminal of battery, and BLACK wire to NEGATIVE (-), or "ground" terminal of battery. Adjust strob-tachometer until timing light "stops" chalk mark. Read tachometer

ENGINE RPM SPECIFICATIONS

	Hi Idle	Lo Idle	Gov. RPM
GMC 4-53:	2585	550-600	2400
Cummins 6V-352:	2640	550-600	2400

Throttle Linkage General Description

The accelerator in the operator's compartment of the Cruz-air is linked mechanically to a hydraulic master cylinder. The hydraulic line from the accelerator master cylinder leads through a valve on the operator's control panel (accelerator lock) and down through a swivel at the center of rotation of the turntable. From the swivel, the line leads to a slave cylinder near the engine governor. The slave cylinder is mechanically linked to the governor.

Figure B1 is a schematic illustration of the engine throttle linkage. Brake fluid serves as the hydraulic medium in this linkage.

Mechanical Linkage Adjustment General Information

The engine cannot perform its best unless the throttle linkage is properly adjusted and maintained. Procedures are as follows:

Mechanical Linkage Adjustment Accelerator Travel

The bolt under the free end of the accelerator pedal (see figure B2) limits accelerator travel.

Adjustment should be made when an increase in linkage travel is necessary to obtain specified top governed speed. It also can be used to bring top speed down.

Loosen jam nut and turn bolt in a tightening direction to increase stroke of master cylinder. Turn bolt counterclockwise to decrease master cylinder stroke. Secure the adjustment by tightening jam nut.

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40YR - 40ER

ENGINE AND THROTTLE LINKAGE

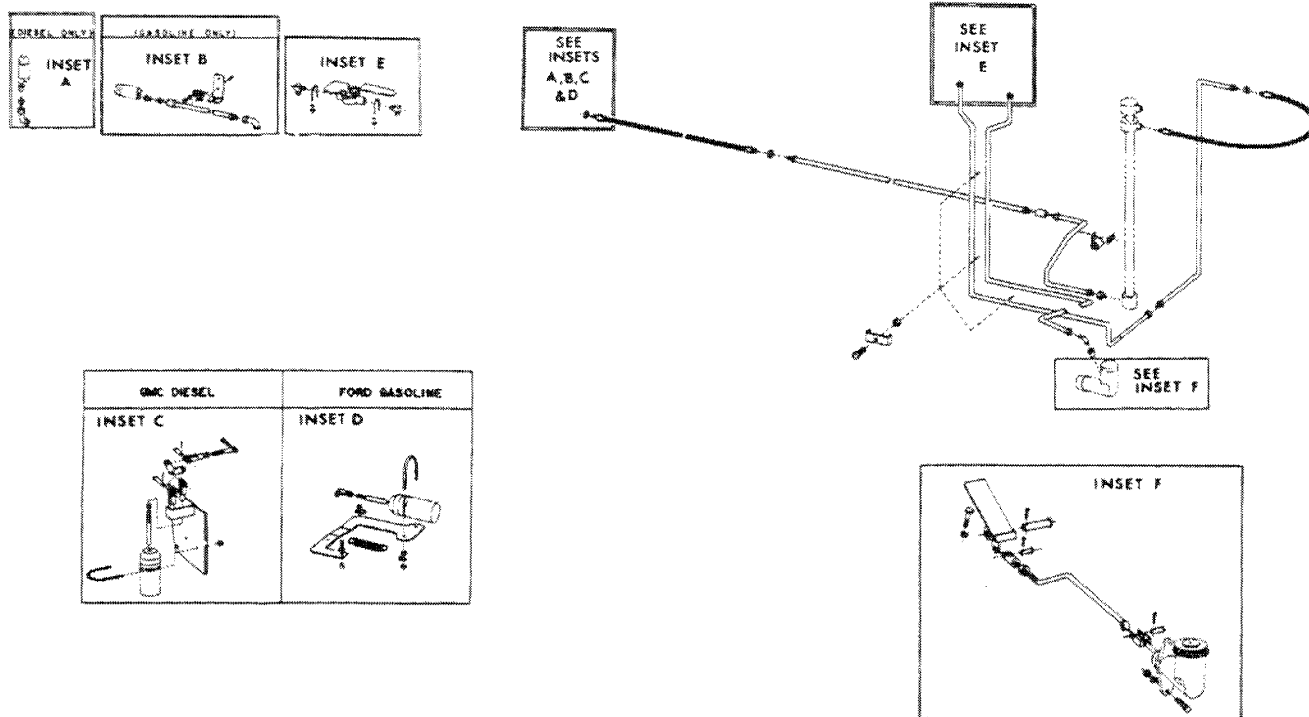


Figure B1. Schematic Diagram of Mechanical and Hydraulic Linkage from Accelerator to Governor.

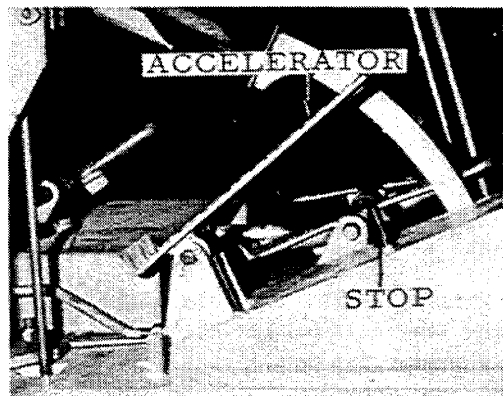


Figure B2. Accelerator Limit Stop.

NOTE: Accelerator stroke must not exceed stroke of piston in master cylinder. If accelerator stops before it reaches adjustment bolt, the master cylinder piston is striking the master cylinder body. Accelerator limit bolt should be adjusted to prevent this.

Mechanical Linkage Adjustment Master Cylinder Piston Travel

The position of the piston in the master cylinder can be adjusted by moving the yoke on the master cylinder plunger.

This adjustment should be made when the operator desires a change in accelerator pedal angle.

Loosen jam nut on master cylinder plunger and remove linkage connecting pin. Turn yoke clockwise to lower accelerator pedal; turn yoke counterclockwise to set accelerator at a steeper angle. An adjustment of accelerator travel limit-bolt (see above) may be necessary after this adjustment has been made.

NOTE: After adjustment, make sure accelerator is stopped at top speed by limit-bolt, not by piston striking body of master cylinder.

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40YR - 40ER

ENGINE AND THROTTLE LINKAGE

Mechanical Linkage Slave Cylinder Pushrod

The position of the governor control arm will be changed in relation to accelerator position when this adjustment is made. This adjustment should be made when a change in the governor arm travel is necessary to obtain correct MIN and MAX governed speeds.

NOTE: Check engine speeds against chart with linkage disconnected before making this adjustment.

To bring both MIN and MAX governed speeds (when controlled by accelerator) up to specifications, pushrod should be lengthened.

Remove linkage connecting pin at yoke, loosen jam nut, and turn yoke counter clockwise.

To bring both MIN and MAX governed speeds (when controlled by accelerator) down to specifications, pushrod should be shortened. Remove connecting pin, loosen jam nut, and turn yoke clockwise. Tighten jam nut to secure adjustment, connect linkage, and test the adjustment.

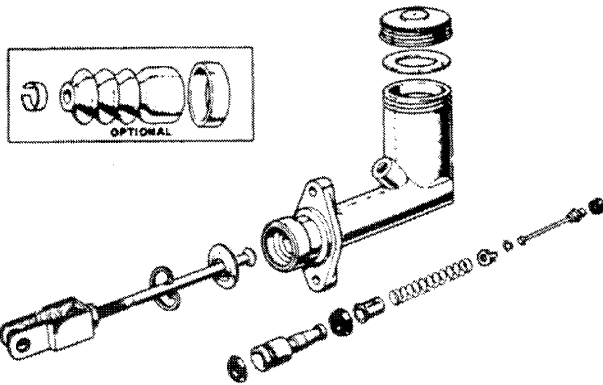


Figure B3. Diagram of Master Cylinder.

Hydraulic Linkage Periodic Inspection

The engine cannot perform its best unless the hydraulic linkage operates freely and has no loose connections. Check periodically at joints in the line for evidence of leakage. Check fluid level frequently. Keep fluid clean.

Hydraulic Linkage Bleeding

If accelerator feels spongy, and engine response

seems sluggish, the hydraulic line may require bleeding. This can be done either with a pressure bleeder, or with accelerator pedal. Accelerator slave cylinder is equipped with bleed fitting.

NOTE: If frequent bleeding is required, check system for leaks -- look for dark accumulations of dirt around line connections. Check for leakage at slave cylinder - it may need overhaul.

Procedure:

Refer to Brake Bleeding Procedure in Section C of this manual.

Hydraulic Linkage Repair Procedures

Hydraulic components of the throttle linkage include the master cylinder, mounted on right side of operator's seat pedestal; the accelerator lock valve, mounted on the control panel; the swivel, mounted above the main hydraulic swivel and electrical collector ring, at the center of the turntable; the slave cylinder, mounted on the right side of the engine. Malfunction of any of these parts will show up in engine performance. Refer to Trouble Shooting for diagnosis of hydraulic problems.

Master Cylinder

To identify malfunctions which may require repair to master cylinder, refer to Trouble Shooting in Section C. Although the accelerator master cylinder does not look like the brake master cylinder, the same general description and overhaul procedure will apply to both. Refer to Brake Master Cylinder in Section C of this manual.

Five service kits for this cylinder are available from your DROTT distributor.

1. Piston parts, with residual check valve abutment and spring.
2. Residual check valve parts.
3. Fill cap gasket and rubber seals.
4. Piston actuator and linkage parts.
5. Fill cap and gasket.

Accelerator Lock Valve

If the engine begins to slow shortly after operating speed has been set with accelerator lock, so that it requires frequent resetting, and you have inspected the throttle hydraulic lines and found no leakage, the accelerator lock valve is probably allowing fluid to by-pass. Install a new lock valve.

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40YR - 40ER
 ENGINE AND THROTTLE LINKAGE

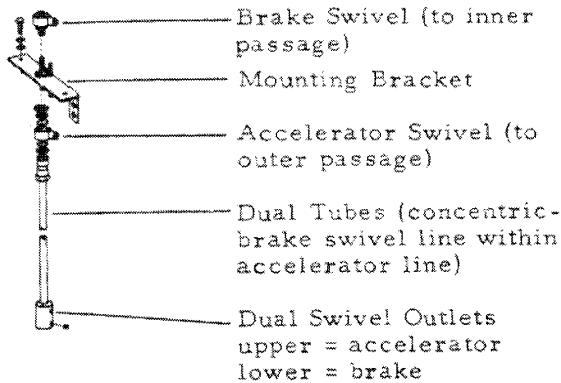


Figure B4. Accelerator Swivel Parts.

Hydraulic Linkage Swivel

Fluid from the accelerator master cylinder passes between turntable and the chassis through the (outer) sleeve of a two-port swivel. Fluid from the brake master cylinder flows through the center of this swivel. Leakage may occur around the swivel fittings at the top of the swivel assembly.

If loss of fluid occurs at this point in the accelerator circuit, it is probable that the sleeve-swivel must be replaced. Refer to Brake Swivel Overhaul in Section C of this manual for disassembly procedure.

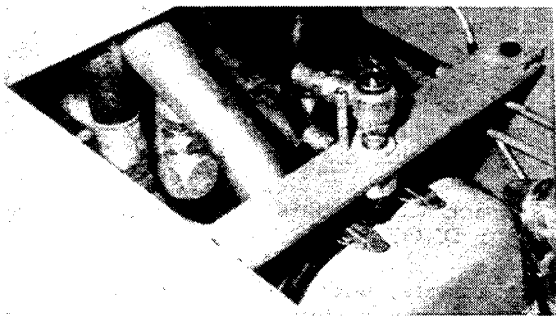


Figure B5. Location of Swivel

Accelerator Slave Cylinder

The engine governor control arm is moved by linkage attached to the slave cylinder piston. If leakage is apparent around the boot of the slave cylinder, or if piston hangs up in its bore in the cylinder body, the cylinder must be overhauled. Always discard old rubber seals and dust covers when overhauling cylinder. Install new ones.

U-bolt holding slave cylinder in place should be loose - not binding cylinder, only holding it in place.

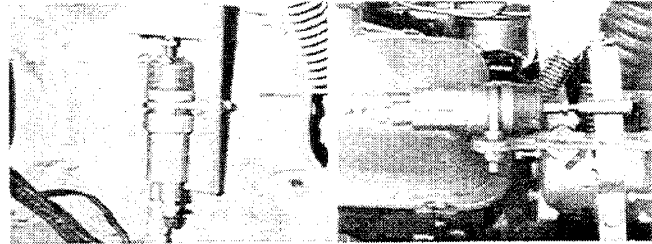


Figure B6. Diesel Governor Slave Cylinder with Linkage. Figure B7. Gasoline Governor Slave Cylinder with Linkage.

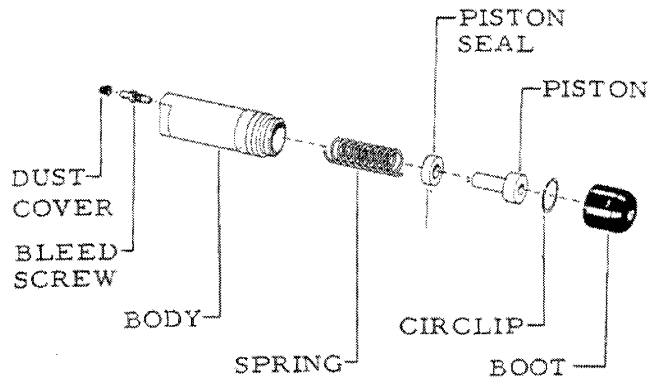


Figure B8. Diagram of Slave Cylinder Parts.

Disassembly of Slave Cylinder

It may be necessary, after removing the boot, to blow the piston out of the body with compressed air. Clean cylinder body and internal parts in denatured alcohol or brake fluid only. Dry them thoroughly with compressed air.

While shining a strong light into the inlet port, sight through the cylinder bore. If pitting, scratches, or visible wear pattern is evident, replace the body of the cylinder.

Dirt, gummy substances and/or surface corrosion can be removed with jeweler's rouge or crocus cloth. Do not attempt to hone single-piston cylinder.

New piston and rubber seals are available in kit form from your DROTT distributor. If cylinder bore is damaged (see above) entire cylinder must be replaced.

Engine Adjustments

Engine tune-up information, and adjustment procedures for engine governor, carburetor or injector, are in the engine manufacturers' operation and service manuals.

DROTT 40YR - 40ER

BRAKES AND BRAKE LINKAGE

Brake Linkage General Description

The brake pedal in the operator's compartment is mechanically linked to a hydraulic master cylinder. The hydraulic line from the master cylinder leads to a swivel at the center of rotation of the turntable. A pipe leading from the bottom of the swivel carries fluid to the master cylinder connection port of the Hydrovac power brake unit. From there, lines lead to hydraulic cylinders in the wheels of the machine. An electrically actuated (MICO) brake locking device on the Hydraovac output line maintains pressure in wheel cylinder to hold machine while operating.

Figure C1 is a schematic illustration of the hydraulic linkage between the brake master cylinder and the Hydrovac power unit. Standard brake fluid serves as a medium in this linkage.

Mechanical Linkage Adjustment Pedal to Master Cylinder Linkage

With brakes released, just enough clearance should be provided in the master cylinder link-

age to permit the piston to return to the full "off" position. The pedal should have from 1/8" to 3/8" of free play when released.

NOTE: Pedal free-play adjustment should be made with engine off and vacuum in reserve tank depleted. Deplete vacuum by pressing brake pedal about 20 times with the engine off.

To lengthen or shorten the link between the brake pedal and the master cylinder, loosen the jam nut on the master cylinder push rod and turn the adjustment nut. Turn counterclockwise to lengthen the link, clockwise to shorten link.

Hydraulic Linkage Periodic Inspection

The brakes cannot perform at their best unless the hydraulic linkage operates freely and has no loose connections. Make a periodic check of joints in the hydraulic lines for evidence of leakage. Check fluid level frequently.

DIRT CAN CAUSE BRAKE FAILURE: Keep Fluid Clean.

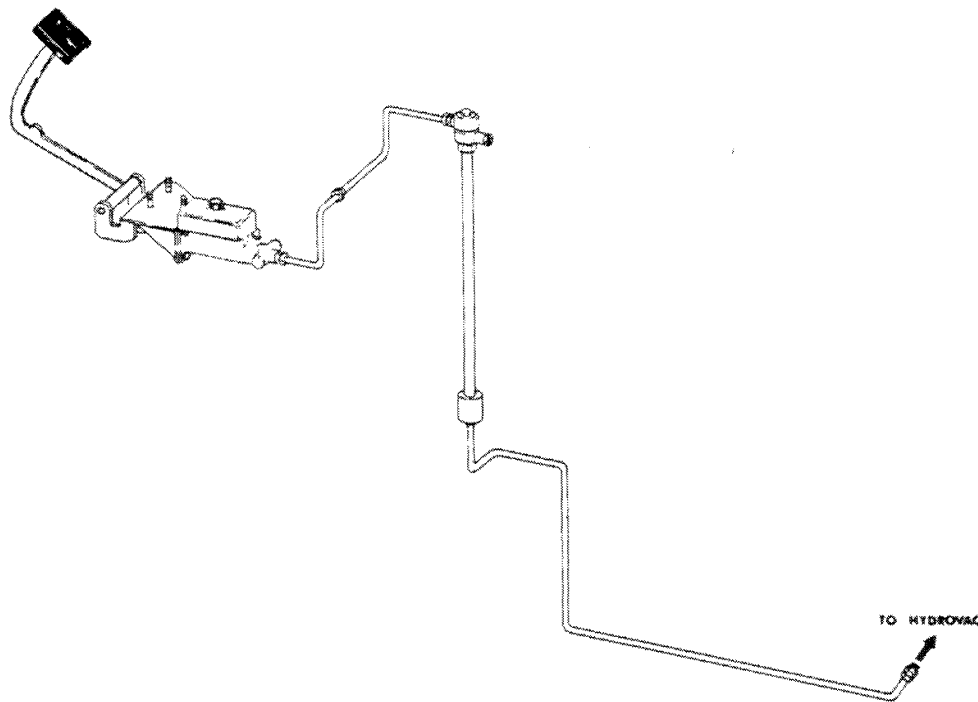


Figure C1. Diagram of Mechanical and Hydraulic Linkage between Brake Pedal and Hydraulic Unit.

DROTT

40YR - 40ER

BRAKES AND BRAKE LINKAGE

Hydraulic Linkage Bleeding

If brake pedal feels spongy, and excessive pedal travel, or pumping, is required to apply the brakes and set the MICO Lock, the lines may require bleeding. Air can seep into the lines through any loose connection, or through worn cups in cylinders.

NOTE: If bleeding is required frequently, the brake system should be thoroughly inspected. Look for dark accumulations of dirt around line connections. Check for leakage at wheel cylinders -- They may require overhaul.

WARNING:



Do not begin bleeding operation until engine is off and vacuum in reserve tank has been depleted.

Bleeding Order:

Bleed the system using brake pedal or air-pressure type bleed tank. The brake system is to be bled in the following order:

1. Bleed fitting on output connection of master cylinder.
2. Bleed fitting on control valve (rear end) of Hydrovac.
3. Bleed fitting on Hydrovac output line (front end).
4. Bleed fitting on left front wheel brake.
5. Bleed fitting on right front wheel brake.
6. Bleed fitting on left rear wheel brake.
7. Bleed fitting on right rear wheel brake.

Bleeding Procedure:

1. Clean each bleed fitting thoroughly to remove accumulated dirt and grime. Clean dirt from around master cylinder filler cap.
2. Be sure the master cylinder reservoir is full of clean fluid that is free of air bubbles.
3. If a pressure bleeder is used be sure it contains sufficient fluid. Insert the proper adapter in the master cylinder filler opening and connect the hydraulic hose from the pressure bleeder to the adapter. Charge the bleeder with air (no more than 20 psi).

NOTE: Do not open supply valve on bleeder until first bleed fitting is opened.

4. Slip a hose over the end of the fitting to be opened. Submerge the other end of the hose in a glass jar partly filled with brake fluid, so that air bubbles in fluid draining from the system may be easily observed.

5. Open bleed fitting, then open pressure-bleeder supply valve and permit fluid to flow from the brake system until bubbles are no longer seen coming from the end of the hose in the jar. Close the bleed-fitting, remove the hose and go on to the next fitting (see Bleeding Order, above). Recharge pressure bleeder as necessary. If bleeding manually, instruct operator to depress brake pedal slowly to its stroke limit, after you have opened the bleed fitting. Close bleed fitting before calling for release of pedal. As many as 20 strokes may be needed to pump aerated fluid from longest lines. Follow Bleeding Order. Keep master cylinder reservoir at least half full, to prevent air from entering system through master cylinder.

6. After bleeding all cylinders, close pressure bleeder supply valve and remove hose and adapter from master cylinder fill port (if pressure-bleeder was used). Fill master cylinder reservoir to within 3/8" of top, and replace cap.

Bleeding Salvaging Brake Fluid

Fluid drained from the hydraulic system (brake or accelerator) during bleeding operation is "aerated", and no longer suitable for use as hydraulic fluid. If clean, the drained fluid may be kept for use in cleaning brake parts, or as a lubricant on rubber grommets, shock absorber bushings, and other parts that cannot be lubricated with petroleum-base lubricants.

Brake Master Cylinder Overhaul Kit, containing boot, retainer, piston, and cups is available from your DROTT distributor.

Removal and Replacement of Master Cylinder

Disconnect hydraulic line, remove mounting bolts, and disconnect pedal linkage. Brake master cylinder pushrod may remain attached to pedal linkage. There is no retainer holding rod to cylinder or piston. Accelerator master cylinder pushrod must be removed from linkage, because it is retained in the cylinder by the stop plate. Remove clevis pin to disconnect linkage.

Replacement is reverse of removal. Use new gaskets at line fittings. Adjust pedal free play after installation -- see page C1.

DROTT

40YR - 40ER

BRAKES AND BRAKE LINKAGE

Brake Hydraulic Components Repair Procedures

Hydraulic components of the brake linkage include: The master cylinder, mounted under the floor of the operator's compartment; the swivel, mounted above the main hydraulic swivel and electrical collector ring, at the center of rotation of the turntable; the Hydrovac power unit mounted over the rear axle of the machine; the Mico brake lock, mounted on the Hydrovac output line; the brake slave cylinders, mounted at each of the machine's four wheels. Malfunction of any of these parts will show up in brake performance. Refer to "Trouble Shooting, Master-and-Slave Cylinder Hydraulic Systems" for diagnosis of hydraulic problems.

Repair Procedure Master Cylinder

If the brake pedal descends slowly to the end of its stroke when it is pushed hard, but no loss of fluid is noted, oil is probably by-passing a worn cup in the master cylinder. To identify other malfunctions which may require overhaul of master cylinder, refer to Trouble Shooting, page C12 of this manual.

Parts breakdown of master cylinder is shown in figure C5. The residual check valve for the brake hydraulic system is built into the Hydrovac master cylinder, and therefore is not needed in pedal-actuated master cylinder.

NOTE: Accelerator requires no free-play adjustment. Adjust high-speed limit and pedal angle as described in Linkage Adjustment, page B2.

Disassembly of Master Cylinder

Put cylinder in vise, being careful not to clamp it too tight. Use screw driver or snapping pliers to remove retaining ring. Internal parts of cylinder should then slide out. A residual check valve will be found in the accelerator master cylinder. No residual check valve will be found in the brake master cylinder.

Cleaning and Inspection of Master Cylinder Cleaning:

Degrease all metal parts, rinse them in denatured alcohol or brake fluid, and blow them dry with compressed air. Do not use cotton waste to clean or dry cylinder bore or parts, as particles of lint or thread fibers may block the master cylinder compensating port when the unit is put back in service.

Clean rubber parts by washing them in clean denatured alcohol or hydraulic brake fluid. Dry them with compressed air.

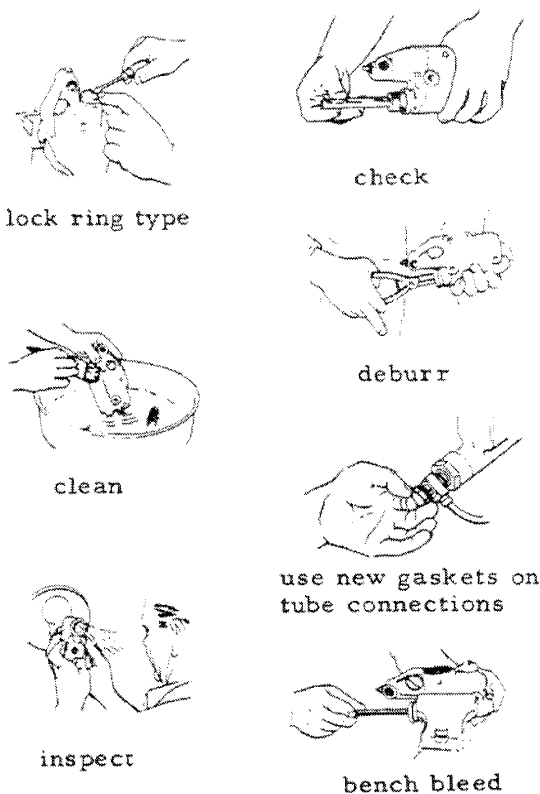


Figure C2. Illustrations of Overhaul Procedures

WARNING:



Do not use mineral-base cleaning solvents such as gasoline, kerosene, acetone, paint thinner, etc. on any rubber parts. These solvents cause rubber to deteriorate, and deterioration will continue after solvent has been wiped off.

Inspection:

After cleaning, hold the cylinder casting against a strong light and sight through the cylinder bore (see figure C2). If pitting, scratches, or visible wear-patterns are evident, the housing must be replaced.

Honing the Cylinder

It is possible to hone the cylinder, if the honing will not greatly increase diameter of the cylinder bore. A cylinder should never be honed more than once.

Cylinder diameter can be checked with a "NO-GO" gauge or a micrometer; it must not exceed the standard (nominal) diameter by more than seven thousandths of an inch (0.007"). For example, a 1-1/8" (1.125") diameter cylinder bore must not exceed 1.132" after honing. (1.125+0.007=1.132).