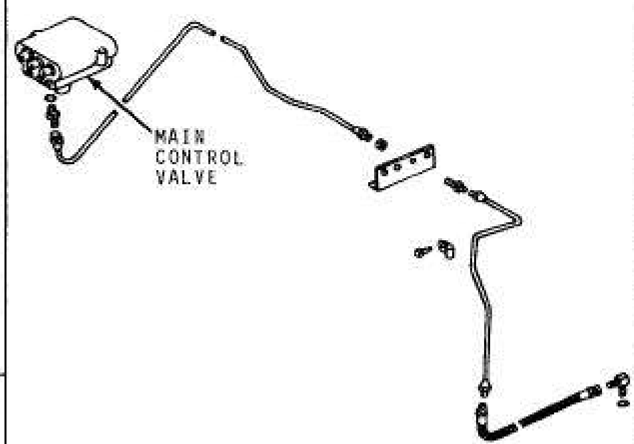
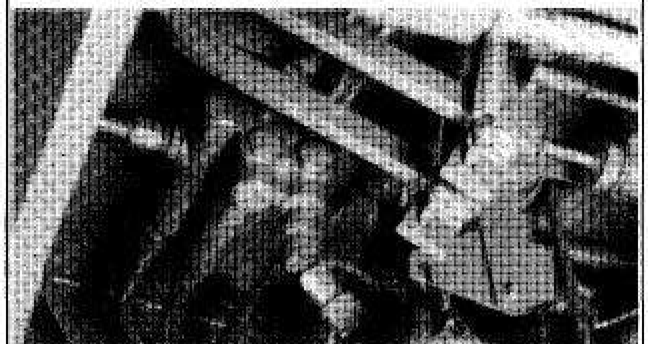
POSI-TORQ GROUND DRIVE WILL NOT MAINTAIN A CONSTANT SPEED

STEP	INSTRUCTIONS	LOCATION	RESULT	
1	Shut off engine and inspect for external oil leakage around connections and components.		No leakage noted . . .	GO TO STEP 3
			Leakage noted . . .	GO TO STEP 2
2	Repair oil leaks.		Drive will maintain a constant speed . . .	END OF TEST
			Drive will not maintain a constant speed . . .	GO TO STEP 3

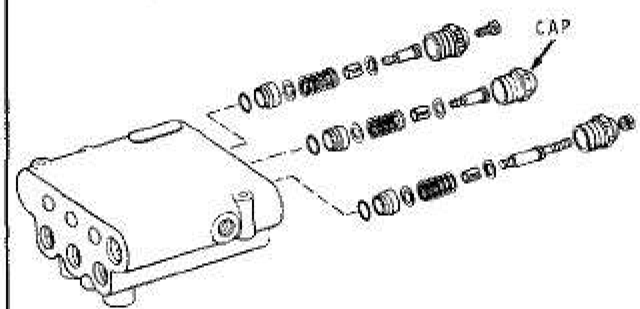
H29453

POSI-TORQ GROUND DRIVE WILL NOT MAINTAIN A CONSTANT SPEED—Continued

STEP	INSTRUCTIONS	LOCATION	RESULT	
3	Remove cotter pin and drilled pin to disconnect linkage at spool in main control valve. Push in on spool and then release. Spool should return to neutral position with end of spool approximately 1-inch (25 mm) from the valve casting. Pull out on spool and then release. Spool should again return to the same neutral position.		Spool returns to correct neutral position . . .	GO TO STEP 4
			Spool does not return to correct neutral position . . .	GO TO STEP 7
4	Connect linkage to spool and use lever in cab to move spool in both directions. Repeat procedure with tilt steering column in all four positions.		Spool returns to correct neutral position . . .	GO TO STEP 5
			Spool does not return to correct neutral position—refer to ADJUSTING MAIN CONTROL VALVE LINKAGE AND SPOOLS, page 70-15-14. If adjusting linkage does not correct spool to neutral position . . .	GO TO STEP 7

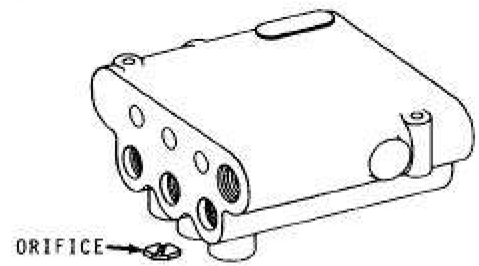
H30532

POSI-TORQUE GROUND DRIVE WILL NOT MAINTAIN A CONSTANT SPEED—Continued

STEP	INSTRUCTIONS	LOCATION	RESULT	
5	Inspect cap in main control valve to determine if it has backed out.		Cap has not backed out . . .	GO TO STEP 7
			Cap has backed out . . .	GO TO STEP 6
6	Install cap and tighten to 35 ft-lbs (45 Nm) torque.		Drive will maintain a constant speed . . .	END OF TEST
			Drive will not maintain a constant speed . . .	GO TO STEP 3
7	Remove cap and inspect centering spring. Replace centering spring if necessary. Install cap and tighten to 35 ft-lbs (45 Nm) torque.		Drive will maintain a constant speed . . .	END OF TEST
			Drive will not maintain a constant speed . . .	GO TO STEP 3

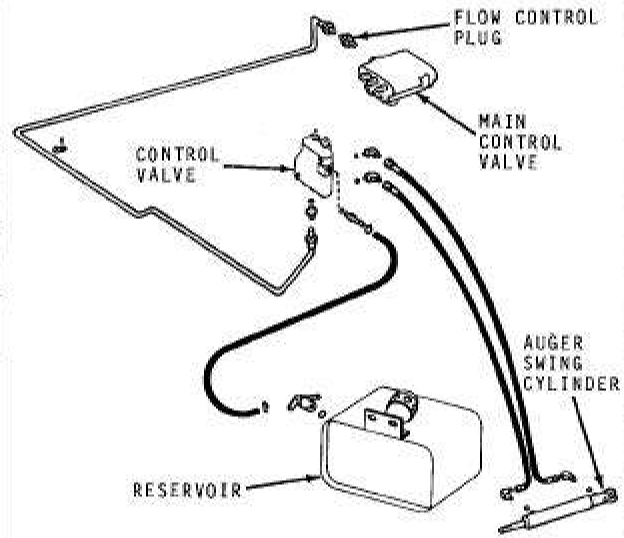
H29455

POSI-TORQ GROUND DRIVE WILL NOT MAINTAIN A CONSTANT SPEED—Continued

STEP	INSTRUCTIONS	LOCATION	RESULT	
8	Clean orifice in main control valve.		Drive will maintain a constant speed . . .	END OF TEST
			Drive will not maintain a constant speed . . .	GO TO STEP 9
9	Refer to Section 70, Group 15 and repair main control valve.		Drive will maintain a constant speed . . .	END OF TEST
			Drive will not maintain a constant speed . . .	GO TO STEP 10
10	Refer to Section 50 Group 35 and repair upper Posi-Torq unit.			END OF TEST

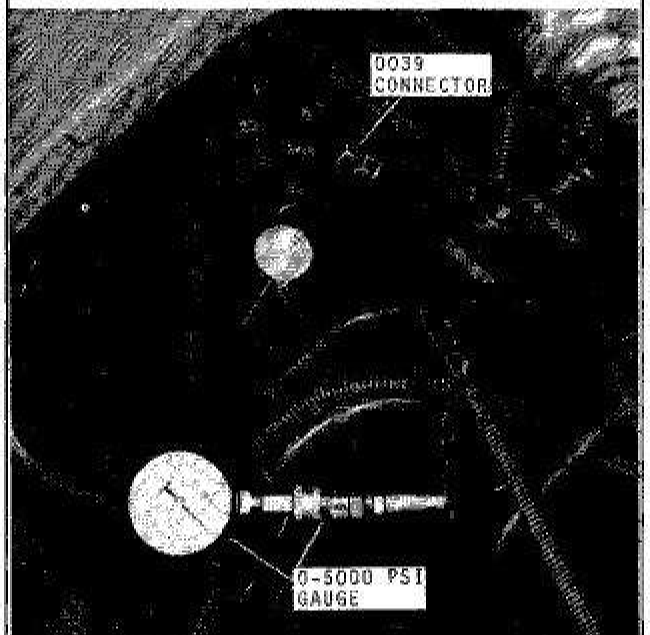
H30533

UNLOADING AUGER WILL NOT SWING IN OR OUT

STEP	INSTRUCTIONS	LOCATION	RESULT	
1	Shut off engine and inspect for external oil leakage around connections and components.		No leakage noted . . .	GO TO STEP 3
			Leakage noted . . .	GO TO STEP 2
2	Refer to Section 70, Groups 15 and 20 and repair oil leaks.		Auger swings . . .	END OF TEST
			Auger will not swing . . .	GO TO STEP 3

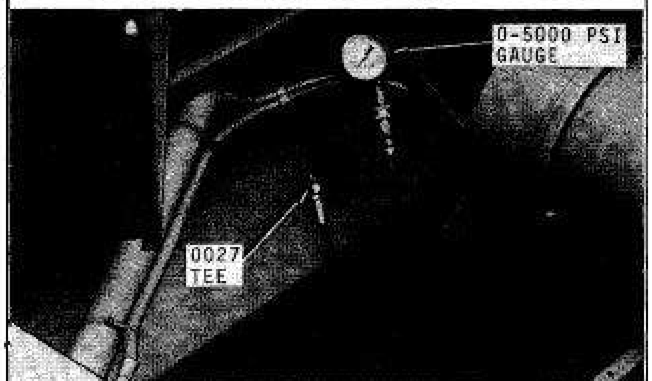
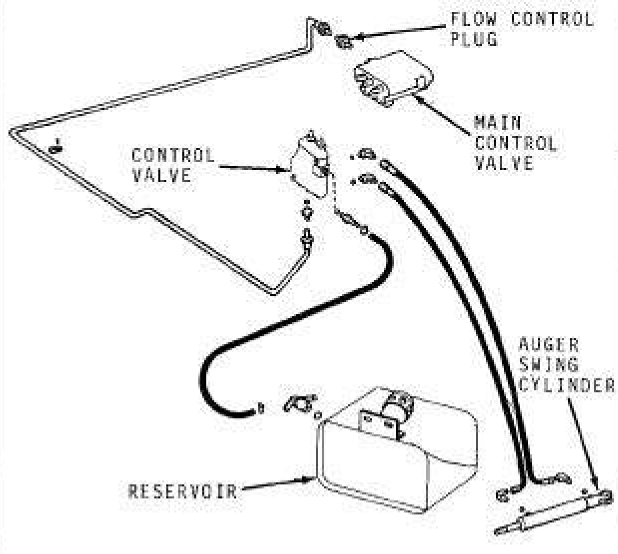
H31328

UNLOADING AUGER WILL NOT SWING IN OR OUT—Continued

STEP	INSTRUCTIONS	LOCATION	RESULT
3	Install 0-5000 psi (0-400 bar) pressure gauge on main control valve. With engine at fast idle, swing auger out. Compare reading on gauge with main system relief pressure.		Pressure is to specs . . . GO TO STEP 5 Pressure is not to specs . . . GO TO STEP 4
4	Remove and inspect flow control plug in main control valve. Clean or replace plug as necessary.		Auger swings . . . END OF TEST Auger will not swing . . . GO TO STEP 5

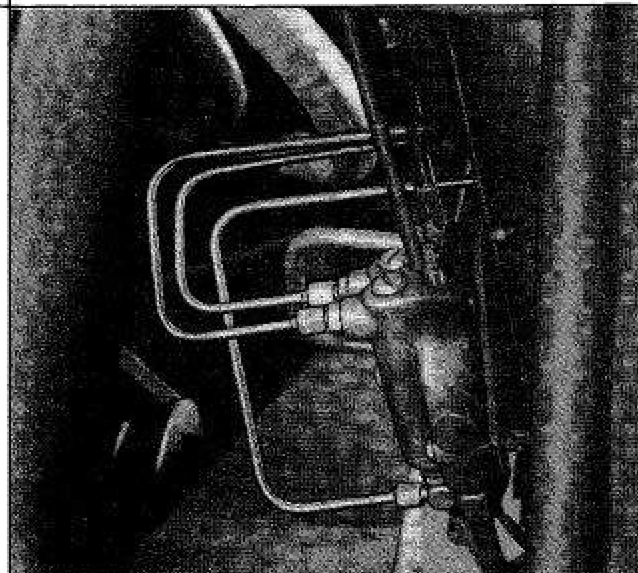
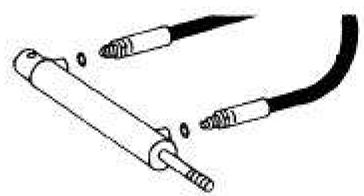
H30535

UNLOADING AUGER WILL NOT SWING IN OR OUT —Continued

STEP	INSTRUCTIONS	LOCATIONS	RESULT	
5	Install 0-5000 psi (0-400 bar) pressure gauge at rod end port in the swing cylinder. Pull up on auger swing control. IMPORTANT: Do not push down on control lever with gauge connected or an incorrect gauge reading will result. Compare reading on gauge with main system relief pressure.		Pressure is to specs . . .	GO TO STEP 8
			Pressure is not to specs . . .	GO TO STEP 6
6	Check hydraulic hoses for restrictions and clean or replace as necessary.		Pressure is to spec . . .	GO TO STEP 5
				END OF TEST
			Pressure is not to spec . . .	GO TO STEP 7

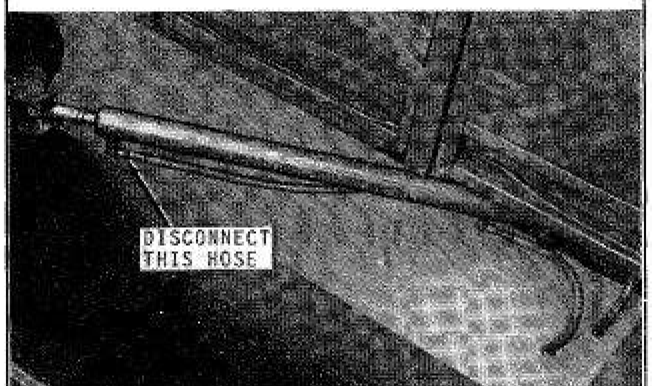
H30536

UNLOADING AUGER WILL NOT SWING IN OR OUT —Continued

STEP	INSTRUCTIONS	LOCATION	RESULT	
7	Refer to Section 70, Group 15 and repair auger swing control valve.		Auger swings . . .	END OF TEST
			Auger will not swing . . .	GO TO STEP 8
8	Inspect and clean if necessary, the orifices in the swing cylinder barrel.		Auger swings . . .	END OF TEST
			Auger will not swing . . .	GO TO STEP 9

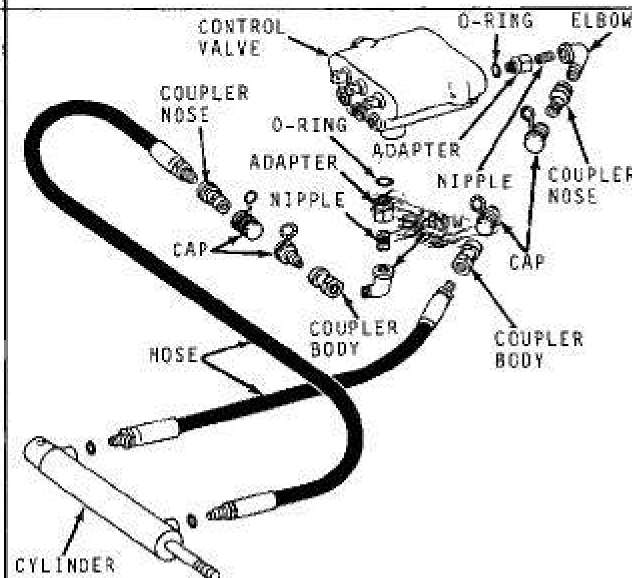
H31329

UNLOADING AUGER WILL NOT SWING IN OR OUT—Continued

STEP	INSTRUCTIONS	LOCATION	RESULT	
9	Disconnect hydraulic hose at rod end of swing cylinder. Start engine and push DOWN on control knob. IMPORTANT: Do not pull up on knob or unnecessary oil spillage will result.		Steady stream of oil flows . . .	GO TO STEP 10
			An occasional drop of oil flows from cylinder port . . .	GO TO STEP 11
10	Refer to Section 70, Group 20 and repair swing cylinder.		Auger swings . . .	END OF TEST
			Auger will not swing . . .	GO TO STEP 11
11	Refer to Section 70, Group 15 and repair main control valve.			END OF TEST

H30538

VARIABLE SPEED FEEDER HOUSE WILL NOT MAINTAIN A CONSTANT SPEED SIDEHILL 6620 ONLY

STEP	INSTRUCTIONS	LOCATION	RESULT	
1	Shut off engine and inspect for external oil leakage around line connections and components.		No leakage noted . . .	GO TO STEP 3
			Leakage noted . . .	GO TO STEP 2
2	Refer to Section 70, Group 20 and repair oil leaks.		Feeder house maintains a constant speed . . .	END OF TEST
			Feeder house will not maintain a constant speed . . .	GO TO STEP 3

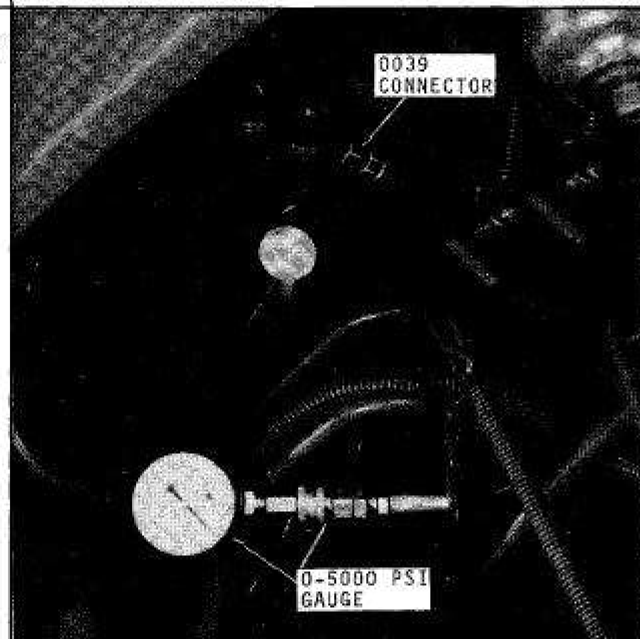
H30539

VARIABLE SPEED FEEDER HOUSE WILL NOT MAINTAIN A CONSTANT SPEED—Continued SIDEHILL 6620 ONLY

STEP	INSTRUCTIONS	LOCATION	RESULT	
3	To check cylinder seals, fully retract cylinder by decreasing feeder house speed. Shut off engine and disconnect variable speed feeder house hydraulic line with the female quick coupler. Start engine and pull control lever back slightly. IMPORTANT: Do not move lever forward or unnecessary oil spillage will result.		Oil does not flow from hose . . .	GO TO STEP 5
			Oil flows from hose . . .	GO TO STEP 4
4	Refer to Section 70, Group 20 and repair cylinder.		Feeder house maintains a constant speed . . .	END OF TEST
			Feeder house will not maintain a constant speed . . .	GO TO STEP 5

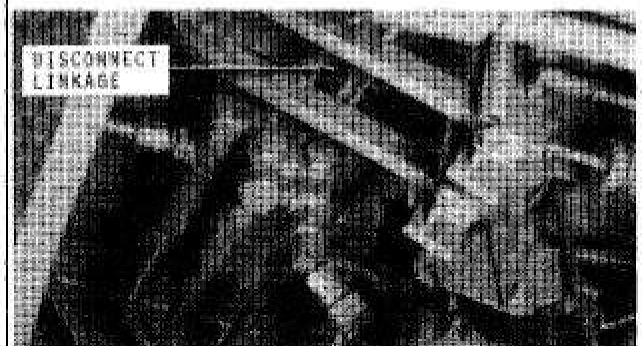
H30540

VARIABLE SPEED FEEDER HOUSE WILL NOT MAINTAIN A CONSTANT SPEED—Continued
SIDEHILL 6620 ONLY

STEP	INSTRUCTIONS	LOCATION	RESULT
5	Connect hose disconnected in Step 3 and install 0-5000 psi (0-400 bar) pressure gauge on main control valve. With engine at fast idle, move control lever in both directions. Compare reading on gauge with main system relief pressure.		Pressure is to specs . . . GO TO STEP 11 Pressure is not to specs . . . GO TO STEP 6

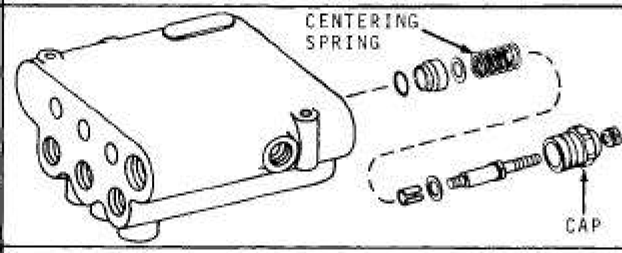
H30541

VARIABLE SPEED FEEDER HOUSE WILL NOT MAINTAIN A CONSTANT SPEED—Continued
SIDEHILL 6620 ONLY

STEP	INSTRUCTIONS	LOCATION	RESULT
6	Remove cotter pin and drilled pin to disconnect linkage at spool in main control valve. Push in on spool and then release. Spool should return to neutral position with end of spool approximately 1-inch (25 mm) from the valve casting. Pull out on spool and then release. Spool should again return to the same neutral position.		Spool returns to correct neutral position . . . GO TO STEP 7 Spool does not return to correct neutral position . . . GO TO STEP 10
7	Connect linkage to spool and use lever in cab to move spool in both directions. Repeat procedure with tilt steering column in all four positions.		Spool returns to correct neutral position . . . GO TO STEP 11 Spool does not return to correct neutral position—refer to ADJUSTING MAIN CONTROL VALVE LINKAGE AND SPOOLS, page 70-15-4. If adjusting linkage does not correct spool to neutral position . . . GO TO STEP 10

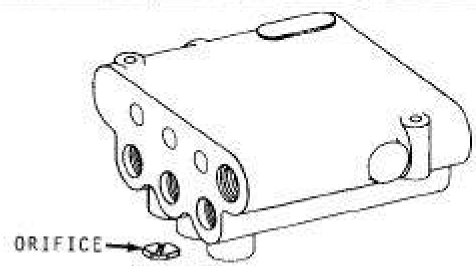
H30542

VARIABLE SPEED FEEDER HOUSE WILL NOT MAINTAIN A CONSTANT SPEED—Continued
SIDEHILL 6620 ONLY

STEP	INSTRUCTIONS	LOCATION	RESULT	
8	Inspect cap in main control valve to determine if it has backed out.		Cap has not backed out . . .	GO TO STEP 10
			Cap has backed out . . .	GO TO STEP 9
9	Install cap and tighten to 35 ft-lbs (45 Nm) torque.			GO TO STEP 7
10	Remove cap and inspect centering spring. Replace centering spring if necessary. Install cap and tighten to 35 ft-lbs (45 Nm) torque. Repeat step 6 and refer to the right for further steps.		Pressure is to spec . . .	END OF TEST
			Pressure is not to spec . . .	GO TO STEP 12

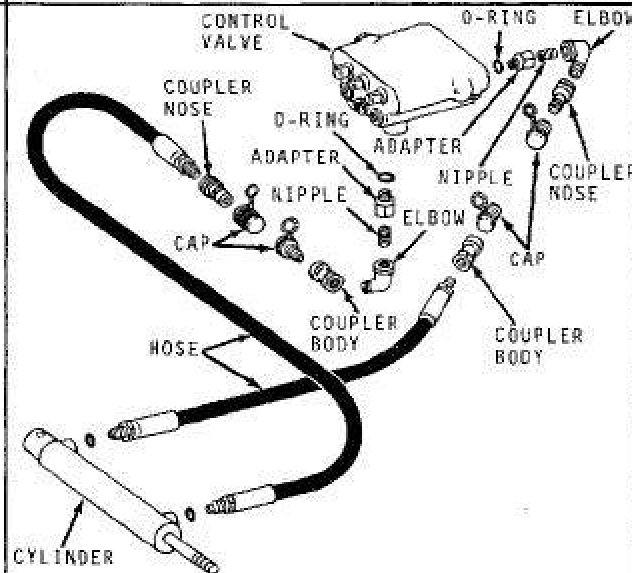
H30543

VARIABLE SPEED FEEDER HOUSE WILL NOT MAINTAIN A CONSTANT SPEED—Continued
SIDEHILL 6620 ONLY

STEP	INSTRUCTIONS	LOCATION	RESULT	
11	Clean orifice in main control valve.		Feeder house maintains a constant speed . . .	END OF TEST
			Feeder house will not maintain a constant speed . . .	GO TO STEP 12
12	Refer to Section 70, Group 15 and repair main control valve.			END OF TEST

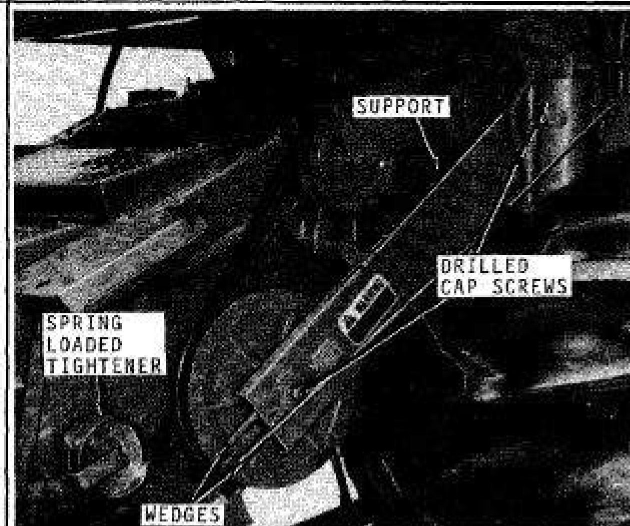
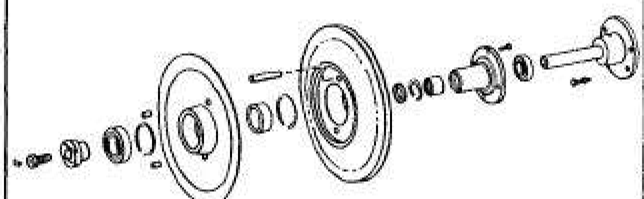
H30544

VARIABLE SPEED FEEDER HOUSE WILL NOT CHANGE SPEED
SIDEHILL 6620 ONLY

STEP	INSTRUCTIONS	LOCATION	RESULT	
1	Shut off engine and inspect for external oil leakage around line connections and components.		No leakage noted . . . Leakage noted . . .	GO TO STEP 3 GO TO STEP 2
2	Refer to Section 70, Group 20 and repair oil leaks.		Feeder house will change speed . . . Feeder house will not change speed . . .	END OF TEST GO TO STEP 3

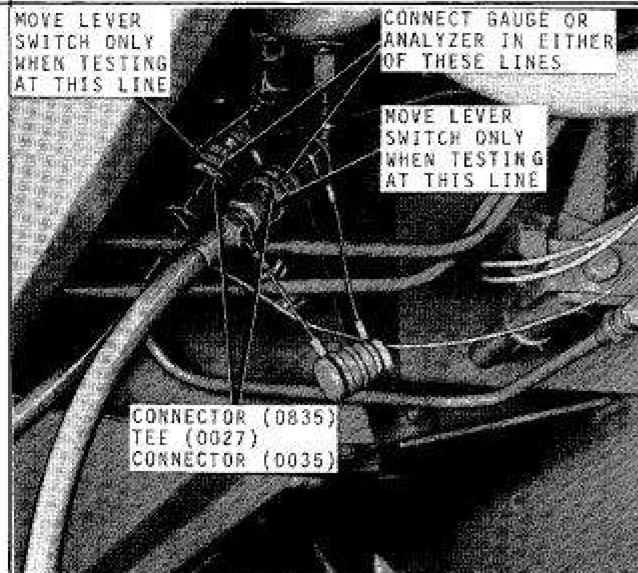
H30545

VARIABLE SPEED FEEDER HOUSE WILL NOT CHANGE SPEED—Continued
SIDEHILL 6620 ONLY

STEP	INSTRUCTIONS	LOCATION	RESULT	
3	Remove lower drive belts from spring loaded tightener. Remove two drilled cap screws and lift off support with tubes, cylinder, and hoses. Disengage feeder house with electric clutch. Start engine and activate variable speed feeder house cylinder. Cylinder should move wedges back and forth.		Wedges move back and forth . . .	GO TO STEP 4
			Wedges will not move back and forth . . .	GO TO STEP 5
4	Inspect countershaft and related parts for binding and repair. Refer to Section 110.		Feeder house will change speed . . .	END OF TEST
			Feeder house will not change speed . . .	GO TO STEP 5

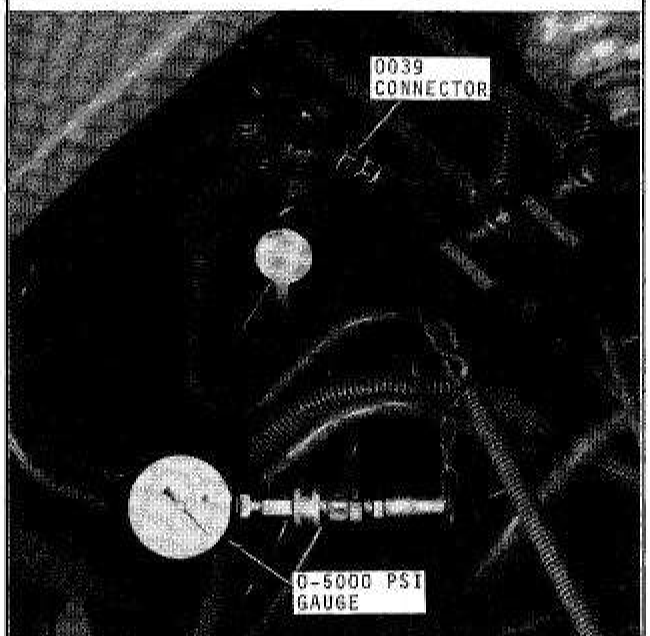
H30546

VARIABLE SPEED FEEDER HOUSE WILL NOT CHANGE SPEED—Continued
SIDEHILL 6620 ONLY

STEP	INSTRUCTIONS	LOCATION	RESULT	
5	Install 0-5000 psi (0-400 bar) pressure gauge at coupler for hydraulic hoses. With engine at fast idle, move control lever in correct direction. IMPORTANT: When checking feeder house variable speed control circuit, move lever in one direction only. If test equipment is connected to line at head end of hydraulic cylinder, move lever forward only. If test equipment is connected to line at rod end of hydraulic cylinder, move lever rearward only. Do NOT move lever in opposite direction or zero pressure will be indicated. Compare reading on gauge with main system relief pressure.		Pressure is to specs . . .	GO TO STEP 6
			Pressure is not to specs . . .	GO TO STEP 8
6	Fully retract cylinder by decreasing feeder house speed. Disconnect variable speed feeder house hydraulic line with the female quick coupler. Pull control lever back slightly. Do not push lever forward or oil spillage will result. If cylinder cannot be retracted, remove hose and allow oil to drain from cylinder.		Oil does not flow from hose . . .	GO TO STEP 8
			Oil flows from hose . . .	GO TO STEP 7

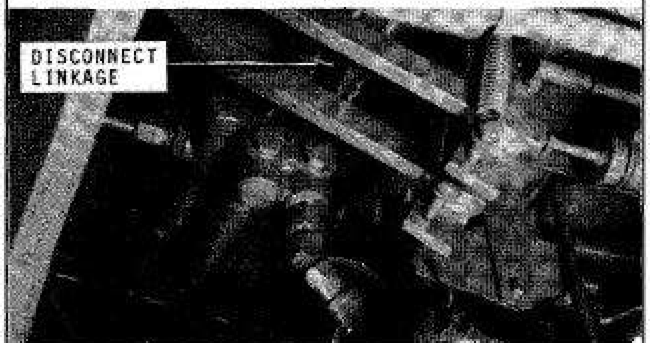
H30547

VARIABLE SPEED FEEDER HOUSE WILL NOT CHANGE SPEED—Continued
SIDEHILL 6620 ONLY

STEP	INSTRUCTIONS	LOCATION	RESULT
7	Refer to Section 70, Group 20 and repair cylinder.		END OF TEST
8	Connect hose disconnected in Step 6 and install 0-5000 psi (0-400 bar) pressure gauge on main control valve. With engine at fast idle, move control lever in both directions. Compare reading on gauge with main system relief pressure.		Pressure is to specs . . . GO TO STEP 16 Pressure is not to specs . . . GO TO STEP 9

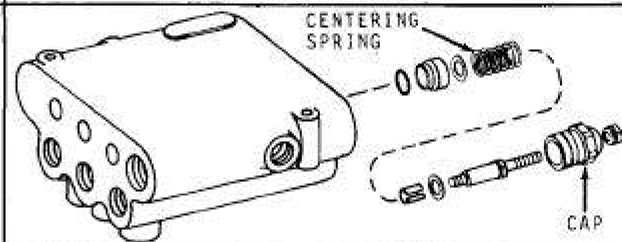
H30548

VARIABLE SPEED FEEDER HOUSE WILL NOT CHANGE SPEED—Continued
SIDEHILL 6620 ONLY

STEP	INSTRUCTIONS	LOCATION	RESULT	
9	Remove cotter pin and drilled pin to disconnect linkage at spool in main control valve. Push in on spool and then release. Spool should return to neutral position with end of spool approximately 1-inch (25 mm) from the valve casting. Pull out on spool and then release. Spool should again return to the same neutral position.		Spool returns to correct neutral position . . .	GO TO STEP 10
			Spool does not return to correct neutral position . . .	GO TO STEP 11
10	Connect linkage to spool and use lever in cab to move spool in both directions. Repeat procedure with tilt steering column in all four positions.		Spool returns to correct neutral position . . .	GO TO STEP 11
			Spool does not return to correct neutral position—refer to adjusting main control valve linkage and spools, page 70-15-4. If adjusting linkage does not correct spool to neutral position . . .	GO TO STEP 13

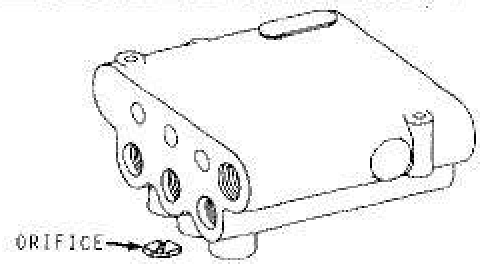
H31330

VARIABLE SPEED FEEDER HOUSE WILL NOT CHANGE SPEED—Continued SIDEHILL 6620 ONLY

STEP	INSTRUCTIONS	LOCATION	RESULT	
11	Inspect spool cap in main control valve to determine if it has backed out.		Cap has not backed out . . .	GO TO STEP 13
			Cap has backed out . . .	GO TO STEP 12
12	Install cap and tighten to 35 ft-lbs (45 Nm) torque.		Feeder house will change speed . . .	END OF TEST
			Feeder house will not change speed . . .	GO TO STEP 9
13	Remove cap and inspect centering spring. Replace centering spring if necessary. Install cap and tighten to 35 ft-lbs (45 Nm) torque. Repeat step 8 and refer to the right for further steps.			GO TO STEP 8
			Pressure is to spec. . . .	END OF TEST
			Pressure is not to spec. . . .	GO TO STEP 14

H30550

VARIABLE SPEED FEEDER HOUSE WILL NOT CHANGE SPEED—Continued SIDEHILL 6620 ONLY

STEP	INSTRUCTIONS	LOCATION	RESULT	
14	Clean orifice in main control valve.		Feeder house will change speed . . .	END OF TEST
			Feeder house will not change speed . . .	GO TO STEP 17
15	Perform PRELIMINARY TESTING PROCEDURE. See page 270-05-43.		Feeder house will change speed . . .	END OF TEST
			Feeder house will not change speed . . .	GO TO STEP 16
16	Check hydraulic lines and hoses for restrictions and clean or replace as necessary.		Feeder house will change speed . . .	END OF TEST
			Feeder house will not change speed . . .	GO TO STEP 17
17	Refer to Section 70, Group 15 and repair main control valve.			END OF TEST

H30551

Group 10
RESERVOIR

GENERAL INFORMATION

The reservoir serves as a storage tank for oil that is held in reserve until put into use in the system, and is a place to return the excess oil when any of the hydraulic cylinders are emptied.

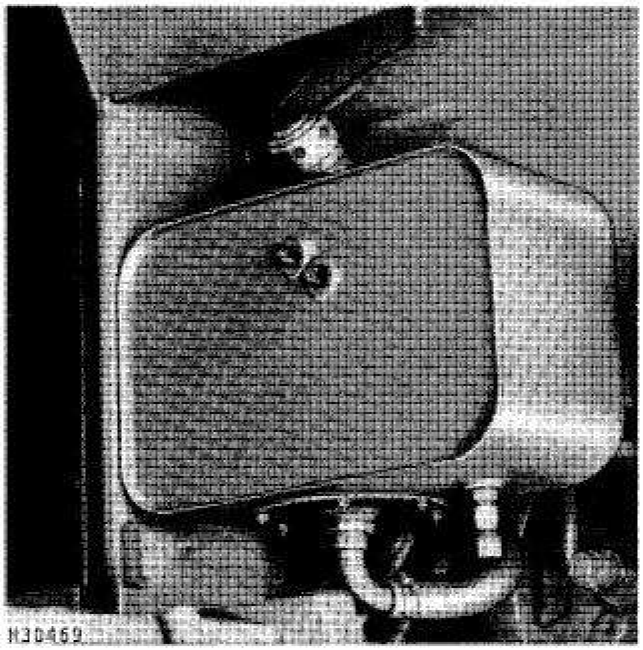


Fig. 1-Reservoir (6620, SideHill 6620 and 7720 Combines)

The reservoir (Fig. 1) for the 6620, SideHill 6620 and 7720 Combines is located on the left-hand side of the combine, just behind the cab door.

Reservoir Capacities
6620, SideHill
6620 and 7720.............. 4.8 gallons (18.1 L)
8820 .... 4.4 gallons (16.7 L)

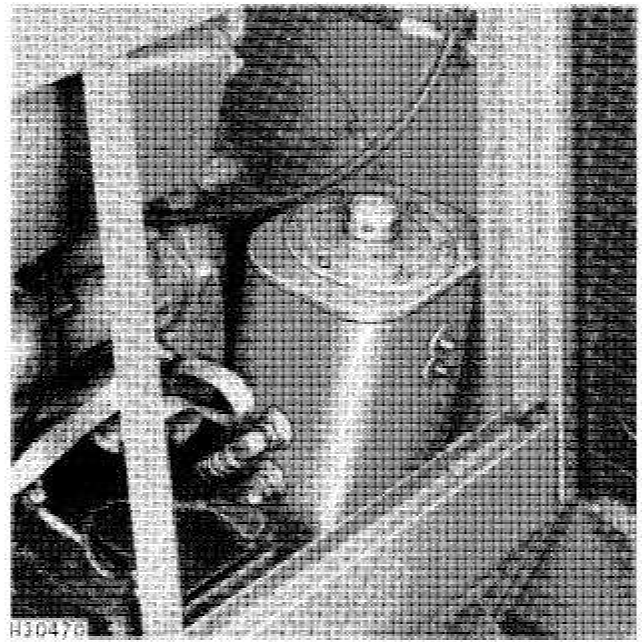


Fig. 2-Reservoir (8820 Combine)

The reservoir (Fig. 2) for the 8820 Combine is located in the engine compartment between the batteries and the firewall.

OIL SPECIFICATIONS

Use John Deere Torq-Gard Supreme engine oil or an equivalent engine oil meeting specifications API Servie SC or SD. John Deere All Weather Hydrostatic Fluid or Texaco Type "F" Automotive Automatic Transmission Fluid also may be used.

Depending on the expected prevailing temperature for the fill period, use engine oil of viscosity as shown in the following chart.

Air Temperature	John Deere Torq-Gard Supreme Oil	Other Oils Single Viscosity Oil	Multi-Viscosity Oil
Above 32°F (0°C)	SAE 10W-20	SAE 20	SAE 10W-30
Below 32°F (0°C)	SAE 10W-20	SAE 10W	SAE 10W-30

NOTE: When checking oil level or adding oil in the hydraulic system, be certain header is lowered to ground.

Group 15
HYDRAULIC PUMPS

MAIN HYDRAULIC PUMP

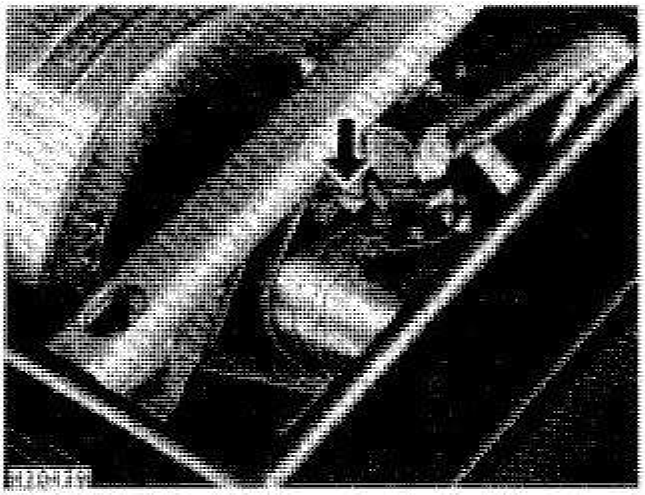
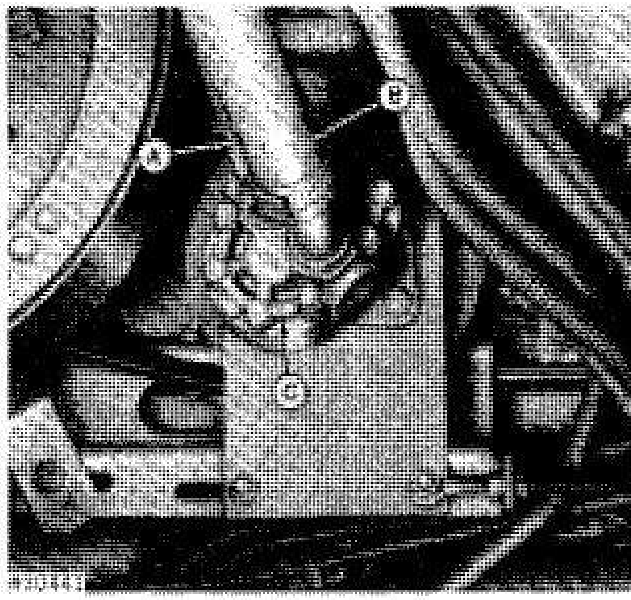


Fig. 1-Hydraulic Pump

The main hydraulic pump is a Cessna dual-gear pump. One set of gears pump the oil for the main hydraulic system and the second set of gears pump the oil for the steering system. This pump does not have a flow divider. The hydraulic oil is pumped from the oil reservoir to the pump where it is divided by the two sets of gears and directed to the main system control valve and the steering system control valve.

HYDROSTATIC DRIVE REEL OR BELT PICKUP PUMP



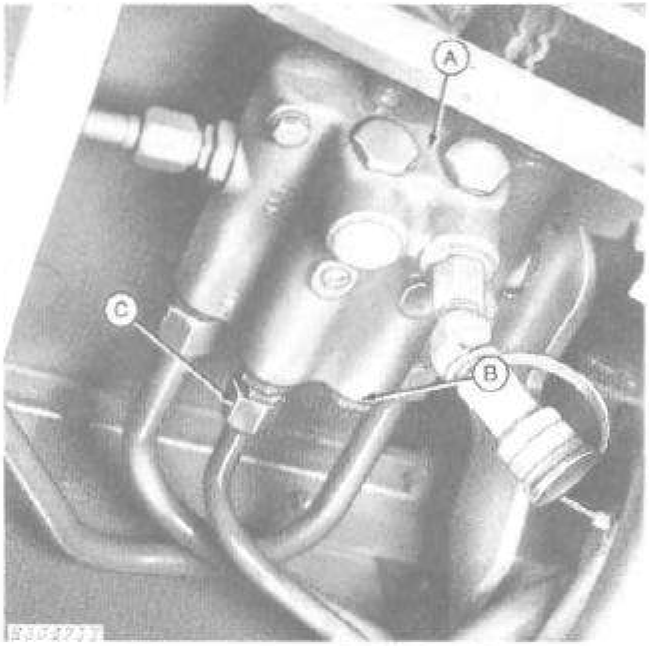
A—Pressure Hose
B—Suction Hose
C—Pump

Fig. 2-Pump for Hydrostatic Drive Reel or Belt Pickup

The Cessna Pump for the reel or belt pickup drive is a positive displacement gear-type pump. A steel-backed bronze diaphragm serves as a wear plate next to the gears. Gear shafts are carried on bushings pressed into the front and back plates.

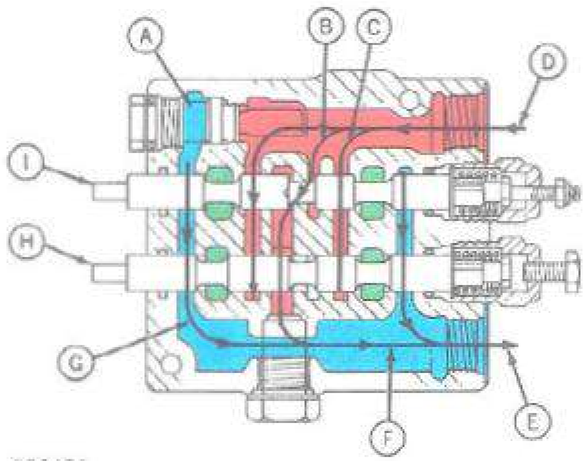
Group 20
HYDRAULIC VALVES

MAIN SYSTEM CONTROL VALVE



A—Control Valve
B—Reel Lift
C—Platform Lift

Fig. 1-Control Valve



B30473

A—Functional Flow Relief Valve
B—Free Flow
C—Functional Flow
D—Inlet
E—Outlet
F—Return Flow
G—Oil Flow When Relief Valve Pressure Is Exceeded
H—Platform Lift
I —Reel Lift
Pressure Oil
Pressure Free Oil
Trapped Oil

Fig. 2-Oil Flow Through Valve

In the hydraulic system the hydraulic pump circulates oil from the reservoir to the control valve located under the operator's platform.

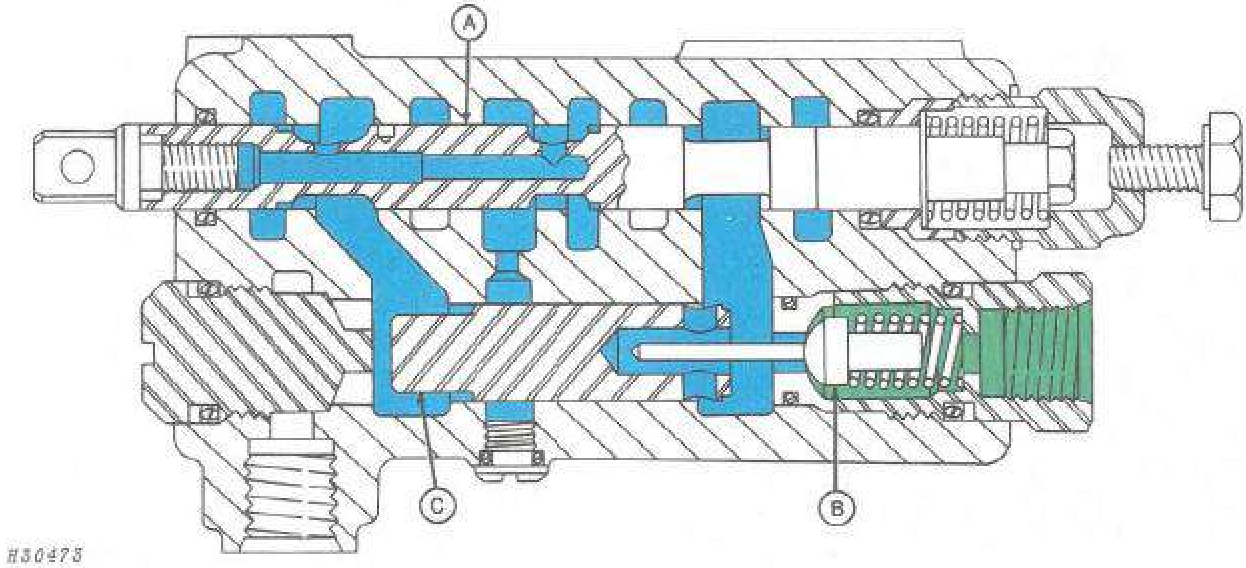
The unibody control valve contains a main system pressure relief valve which, when a working cylinder is fully extended and full system pressure is reached, relieves the oil in the system, eliminating excessive buildup of pressure.

With all control valve spools in neutral, oil flows freely under slight pressure through the control valve and back to the reservoir. Working pressure does not occur until a restriction is created by moving one of the control valve spools to an operating position which diverts oil through one of the valve ports to a hydraulic cylinder.

Oil from the hydraulic pump enters the inlet port and is split into two columns. These two columns flow through the valve to a dead end at the end of the valve. When a spool is actuated, the header lift column of oil is blocked and the other column of oil is diverted through the valve and oil lines to move the working cylinder in or out.

NOTE: The following illustrations show the neutral position of the spools, poppets, and plungers for various hydraulic functions.

Header Lift Control



A—Spool
B—Poppet
C—Plunger
Pressure Free Oil
Trapped Oil

Fig. 3-Cross-Section of Header Lift Spool

When the spool is in the neutral position, pressure-free oil flows from the pump through the valve and back to the reservoir.

Trapped oil is held in the platform lift cylinders by a lock-out poppet in the valve.

The platform lift circuit is equipped with a special unloading lock-out plunger which dumps oil directly back into the return passage instead of through the system relief valve. This prevents an excessive buildup of heat in the system.

To lift the cutting platform or corn head, the spool is pulled out. Oil then flows under pressure from the pump through the valve to the platform lifting cylinders.

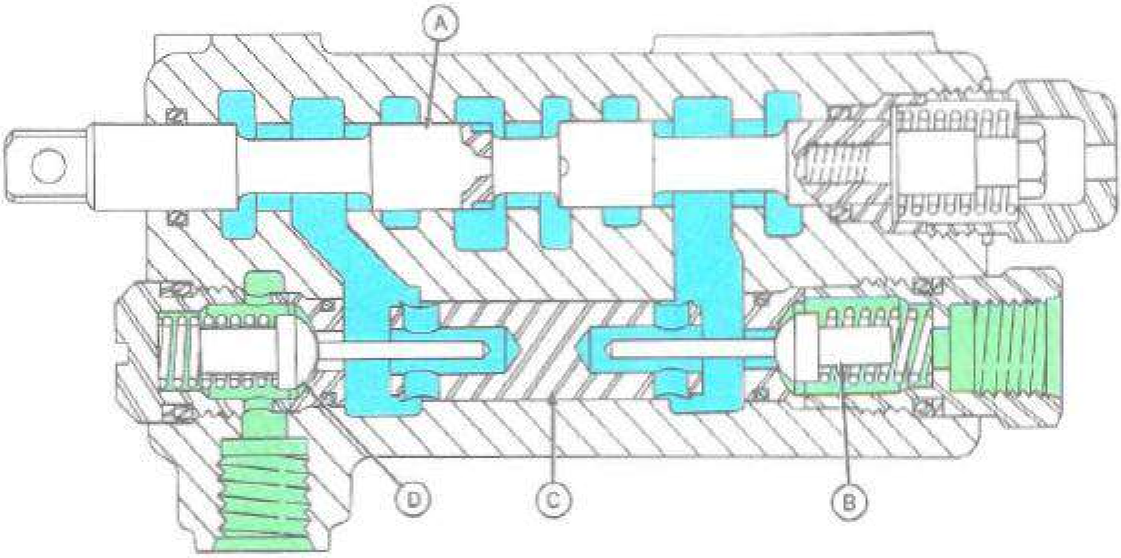
To lower the cutting platform or corn head, the spool is pushed in. Oil pressure, applied to the front of the unloading plunger, moves the lock-out poppet from its seat. After the plunger has unseated the lockout poppet, oil from the pump flows around the unloading plunger and returns to the reservoir.

The weight of the cutting platform forces oil from the platform lifting cylinders back through the valve to the reservoir.

Spool "IN" travel can be adjusted by the external adjusting screw to regulate the rate of drop of the platform.

Also, the platform lift spool is equipped with a hollow passage to allow simultaneous operation with other hydraulic units.

Posi-Torq Ground Speed (SideHill 6620)



R30474

A—Spool
B—Poppet
C—Plunger
D—Poppet
Pressure Free Oil
Trapped Oil

Fig. 4-Cross-Section of Posi-Torq Ground Speed Spool

When the spool is in the neutral position, pressure-free oil flows from the pump through the valve and back to the reservoir.

Trapped oil is held in the Posi-Torq ground speed control cylinder by lock-out poppets in the valve.

To increase the ground speed, the spool is pushed in. Oil from the pump is directed through the front port of the valve and enters the rod end of the selective ground speed control cylinder. This retracts the piston, thus increasing the ground travel speed.

Pressure of this oil forces the lock-out plunger in the valve section rearward to move the lock-out poppet from its seat, allowing the pressure-free oil in the opposite end of the selective ground speed cylinder to be released and returned to the reservoir.

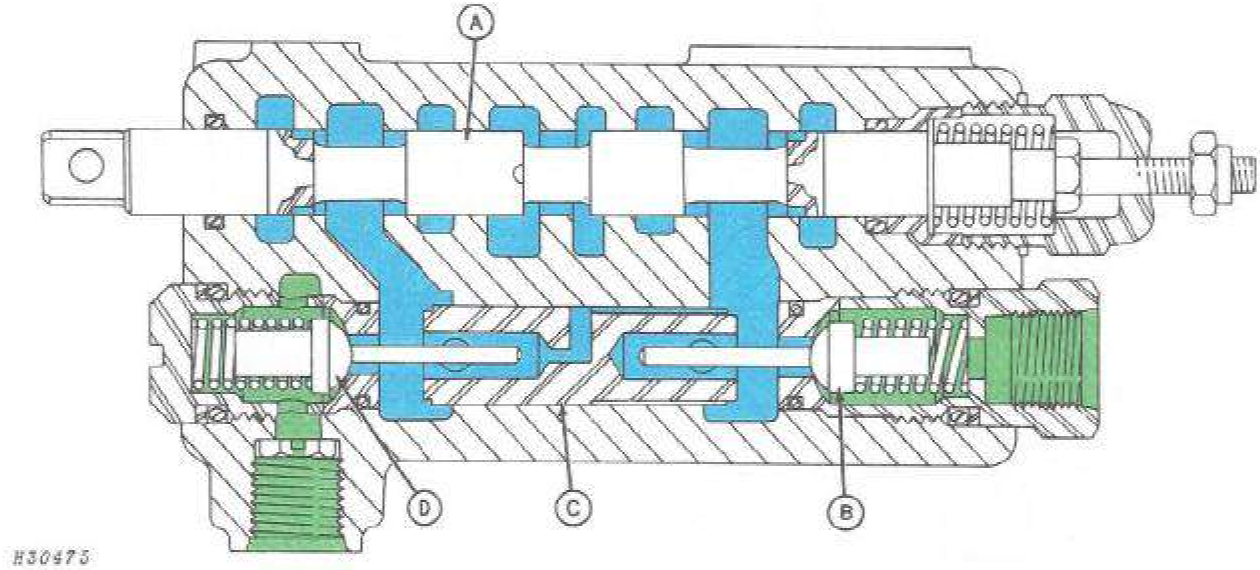
Due to the metering of the pressure oil by orifices in the selective ground speed control cylinder, the excess pressure oil is bypassed through the relief valve and returned to the reservoir.

To decrease the ground speed, the spool is pulled out. Oil from the pump is directed through the rear port of the valve and enters the head end of the selective ground speed control cylinder. This extends the piston, thus decreasing the ground travel speed.

Pressure of this oil forces the lock-out plunger in the valve section forward to move the lock-out poppet from its seat, allowing the pressure-free oil in the opposite end of the selective ground speed cylinder to be released and returned to the reservoir.

Due to the metering of the pressure oil by orifices in the selective ground speed control cylinder, the excess pressure oil is bypassed through the relief valve and returned to the reservoir.

Hydraulic Lift Reel Control



A—Spool
B—Poppet
C—Plunger
D—Poppet
Pressure Free Oil
Trapped Oil

Fig. 5-Cross-Section of Hydraulic Lift Reel or Variable Speed Feeder House Control (SideHill 6620)

When the spool is in neutral position, pressure-free oil flows from the pump through the valve and back to the reservoir.

Trapped oil is held in the reel lift cylinders by a lock-out poppet in the control valve.

The reel lift circuit contains a special lock-out plunger to relieve any pressurized oil leakage and keep the reel lift cylinder from creeping.

When the spool is moved out, pump flow is diverted to the reel lift cylinders and the reel is lifted. Excess pressure oil is bypassed through the relief valve and returned to the reservoir.

When the spool is out, the pump flow is blocked by the spool; subsequently the pump flow is pressurized to the system relief pressure and oil flow is relieved through the system relief valve.

Pump oil pressure acts on the lock-out plunger and causes it to move and unseat the nylon poppet. Oil is then allowed to escape and the reel will lower.

An orifice, located in the outlet port of this part of the valve, regulates the flow and rate of reel lift.

Spool "OUT" travel can be adjusted by the external adjusting nut to regulate the rate of drop of the reel.

HYDROSTATIC DRIVE REEL OR BELT PICKUP FLOW CONTROL VALVE

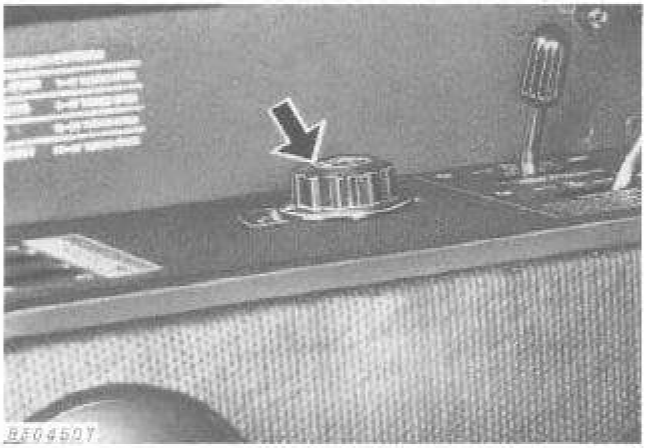
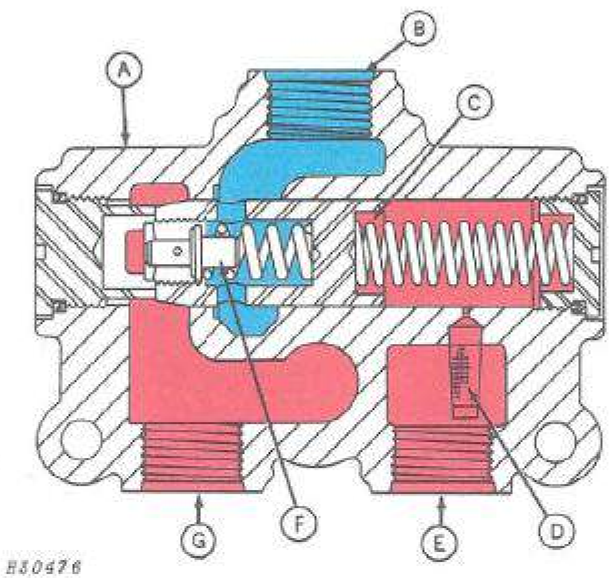


Fig. 6-Flow Control Valve Knob

The flow control valve for the hydrostatic drive reel or belt pickup is used to control the flow of oil to the motor which in turn controls the speed of the reel.

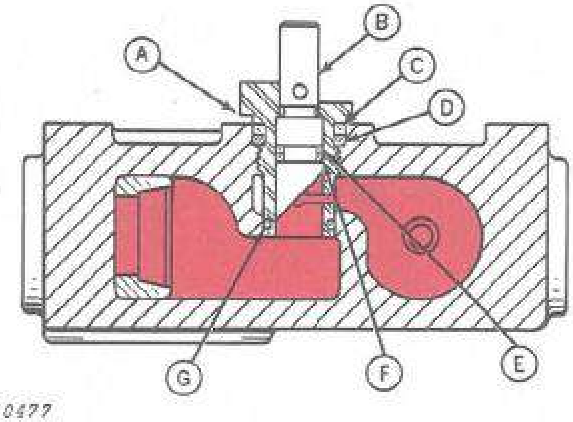
The valve is a spool-type valve and the rate of flow is controlled by a hand wheel on the operator's platform console.

Oil comes into the valve through the inlet port and delivers from 1.4 to 9.5 gpm (5.3 to 36 Lpm) to the reel drive motor. The remainder of the flow is returned to the reservoir.



A—Body
B—Return To Reservoir
C—Spool
D—Filter
E—Priority Port
F—Relief Valve
G—Inlet Port
Pressure Oil
Pressure Free Oil

Fig. 7-Cross-Section of Flow Control Valve Showing Relief Valve



A—Metering Plug
B—Metering Spool
C—Backup Washer
D—O-Ring
E—Backup Washer
F—O-Ring
G—O-Ring
Pressure Oil

Fig. 8-Cross-Section of Flow Control Valve Showing Metering Spool

UNLOADING AUGER SWING FLOW CONTROL PLUG

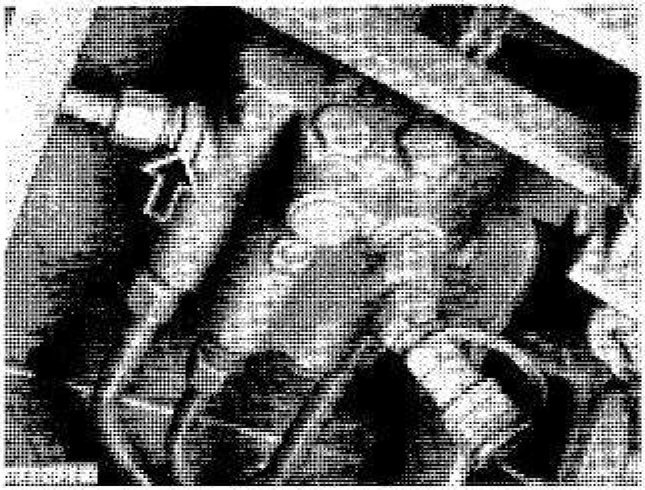
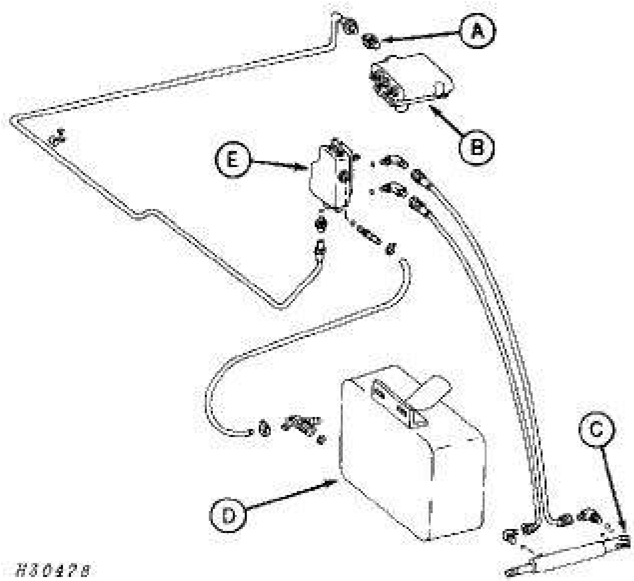


Fig. 9-Flow Control Plug

The flow control plug for the unloading auger swing, controls the flow of oil from the main control valve to the auger swing control valve.

The flow control plug is installed in the side of the main control valve and is connected to the swing control valve by a metal line.

UNLOADING AUGER SWING CONTROL VALVE



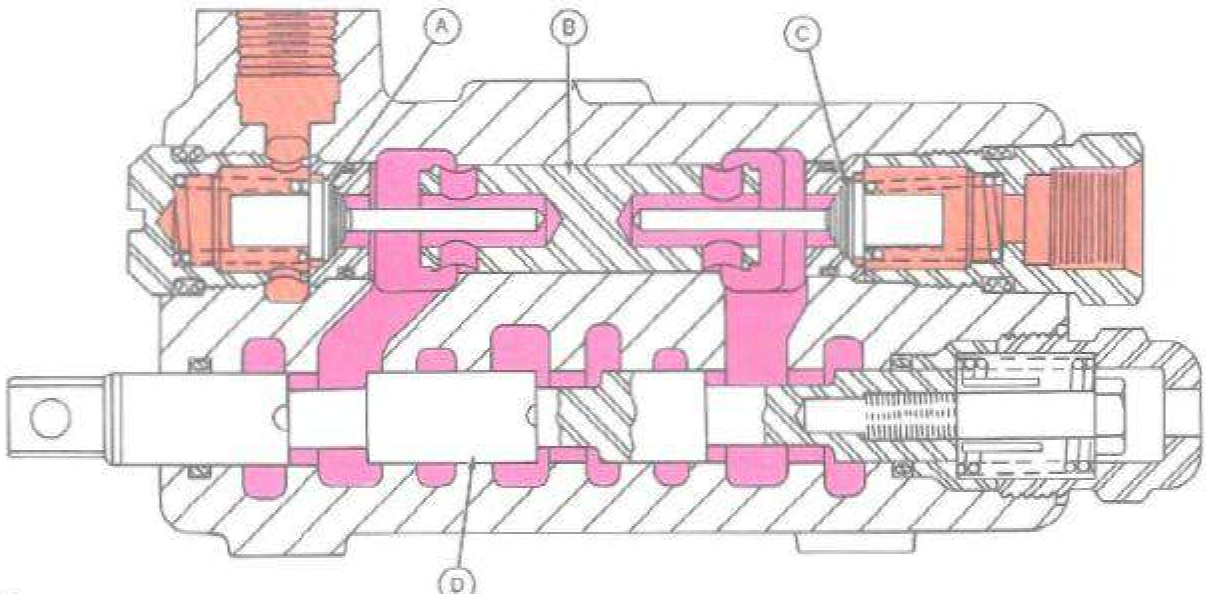
H30478

A—Flow Control Plug
B—Main Control Valve
C—Auger Swing Cylinder
D—Reservoir
E—Control Valve

Fig. 10-Hydraulic System for Unloading Auger Swing Cylinder

The control valve is a one-spool valve located under the left-hand side of the operator's seat.

Neutral Position



A—Poppet
B—Plunger
C—Poppet
D—Spool
Pressure Free Oil
Trapped Oil

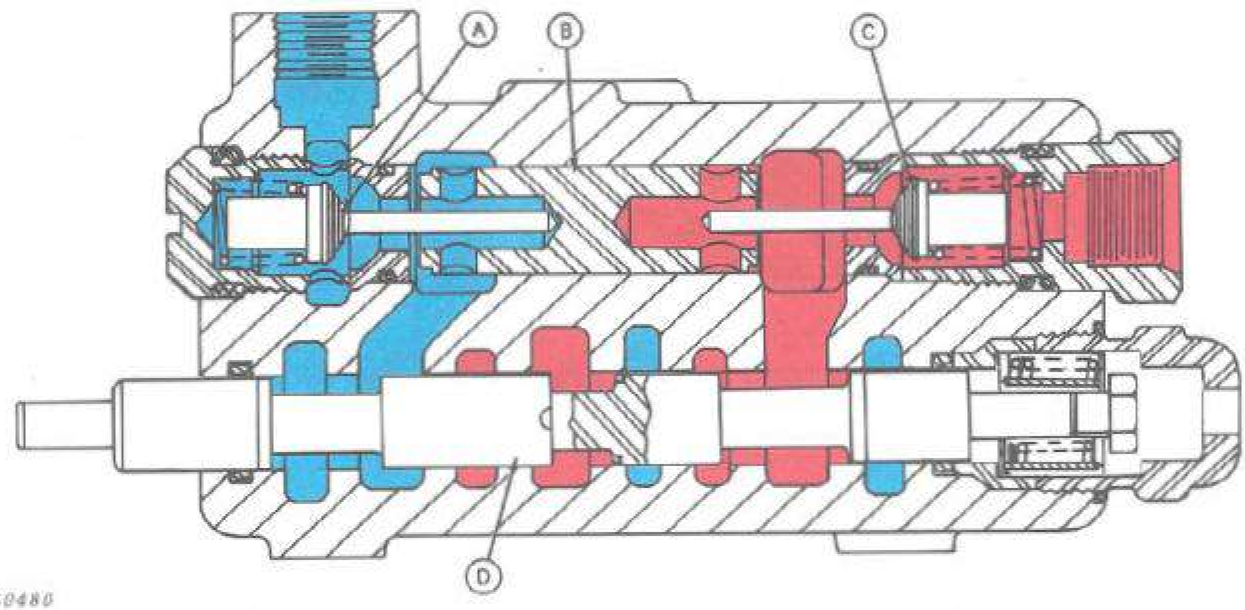
Fig. 11-Cross-Section Unloading Auger Swing Control Valve (Neutral Position)

When the spool (D) is in the neutral position, pressure free oil is inside the auger swing valve. Both inlet and outlet ports are closed, stopping the oil flow.

Trapped oil is between the main control valve and auger swing valve, and also between the auger swing cylinder and the auger swing valve.

UNLOADING AUGER SWING CONTROL VALVE—Continued

Unloading Position



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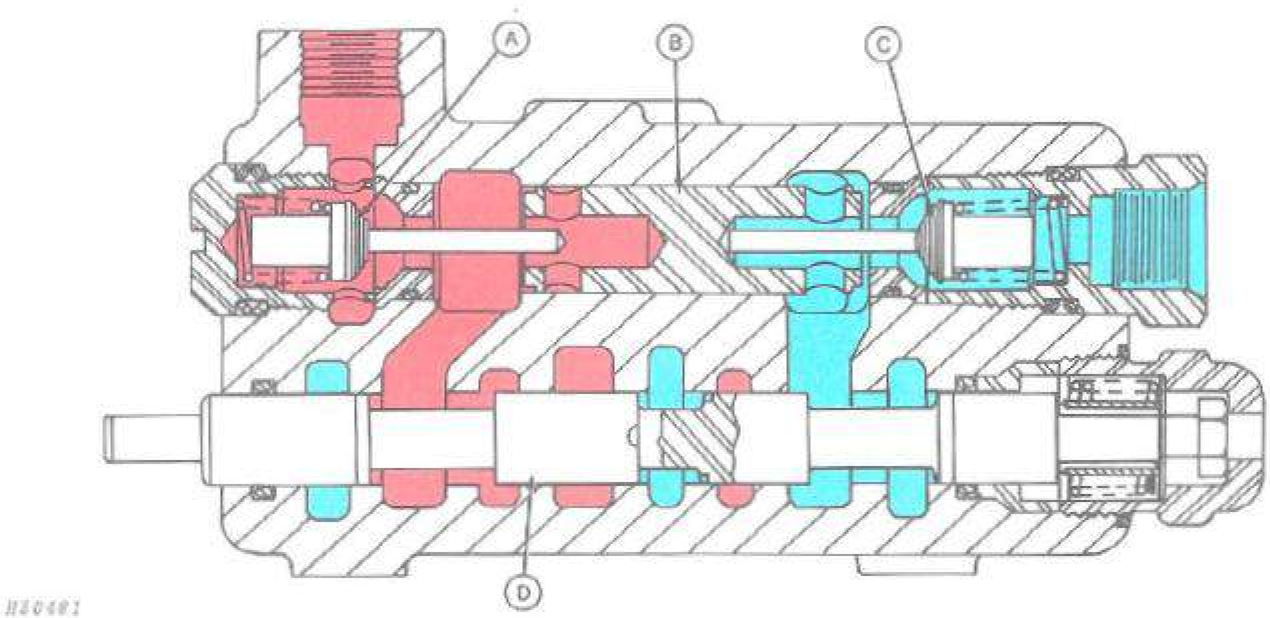
A—Poppet
B—Plunger
C—Poppet
D—Spool
Pressure Oil
Pressure Free Oil

Fig. 12-Cross Section Unloading Auger Swing Control Valve (Unloading Position)

When the control lever is raised, the spool (D) inside the auger swing valve moves allowing pressure oil to flow from the main control valve through the auger swing valve, to the auger swing cylinder to swing the unloading auger out.

Transport Position



A—Poppet
B—Plunger
C—Poppet
D—Spool
Pressure Oil
Pressure Free Oil

Fig. 13-Cross-Section Unloading Auger Swing Control Valve (Transport Position)

When the control lever is lowered, the spool (D) inside the auger swing valve moves allowing pressure oil to flow through the auger swing valve, to the auger swing cylinder and return the unloading auger to the transport position.

Group 25
HYDRAULIC CYLINDERS

HEADER LIFT CYLINDERS AND REEL LIFT SLAVE CYLINDER

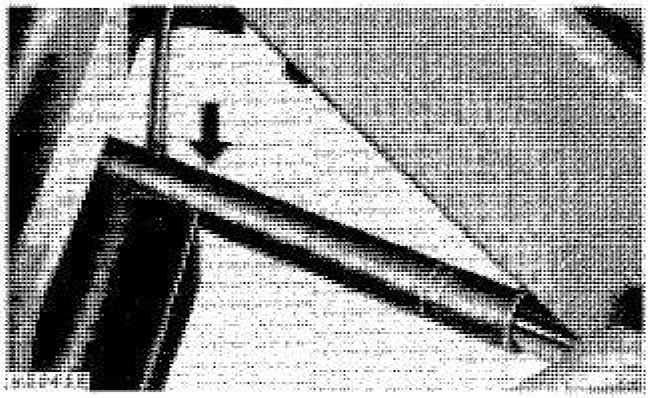


Fig. 1-Lift Cylinder for Cutting Platform

Two single-acting hydraulic cylinders are used to raise and lower the header.

These are non-removable head type cylinders in which the head is welded to the barrel, eliminating one O-ring and the need to service the head by itself.

HYDRAULIC REEL LIFT CYLINDERS

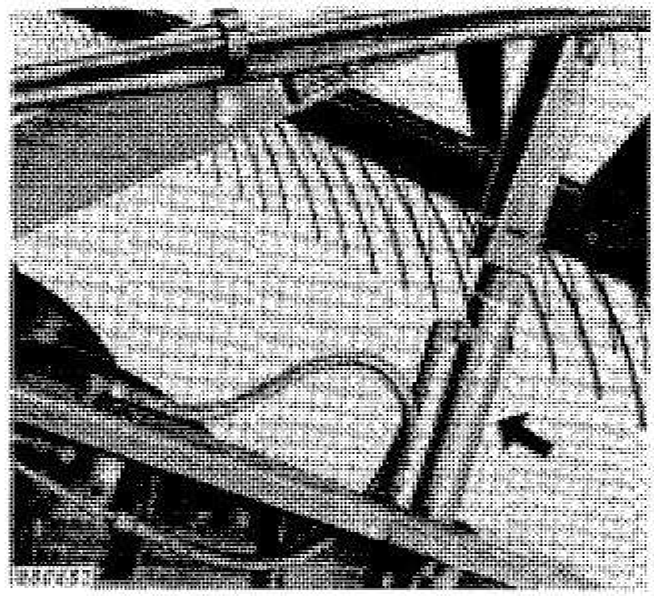


Fig. 2-Master Cylinder

The master cylinder used for the hydraulic lift reel is mounted on the right-hand side of the cutting platform and lifts the right-hand end of the reel.

The master cylinder, which is a double-acting cylinder, also supplies oil to the slave cylinder which raises the left-hand end of the reel.

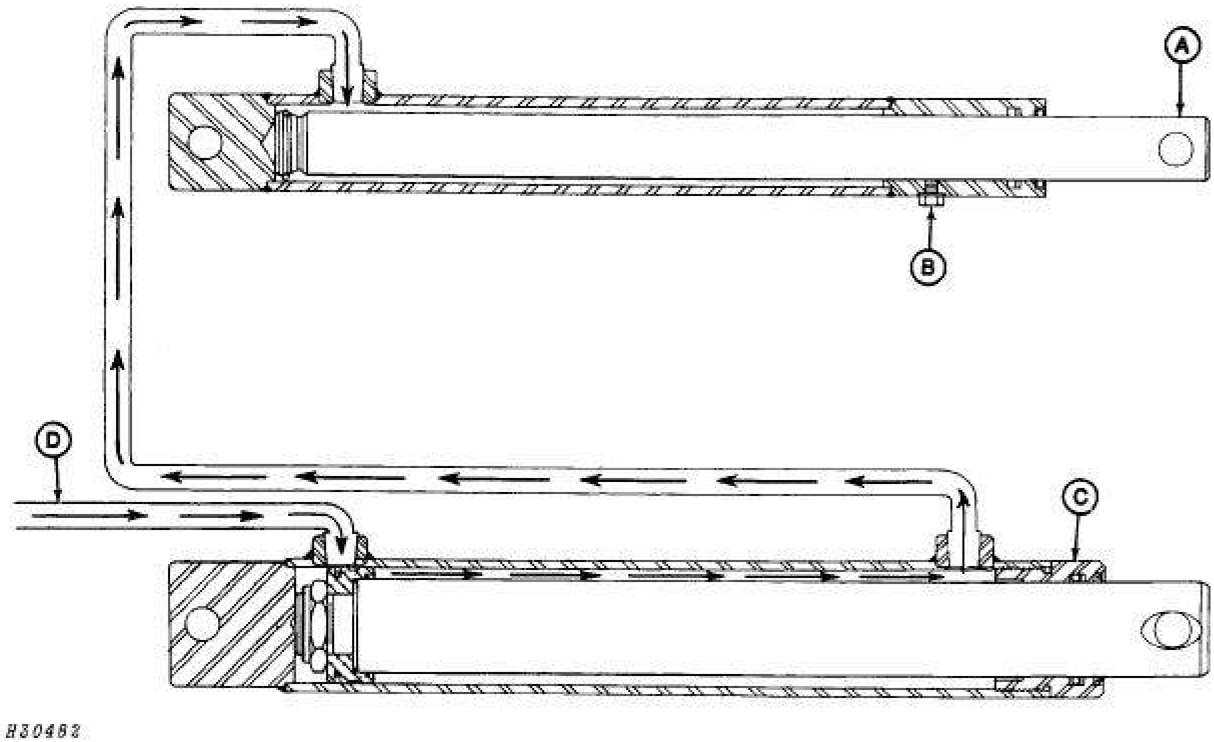
Oil flows from the control valve to the master cylinder. As the master cylinder raises, oil is forced from the rod end of the master cylinder to the slave cylinder.

If the reel is not parallel to the cutterbar, it is necessary to rephase the master and slave cylinders. This is accomplished by raising or lowering the reel as far as possible.

When this is done, the two orifices in the master cylinder allow oil to pass between the piston and the barrel of the master cylinder allowing the stroke of each cylinder to become equal. The reel will then be parallel to the cutterbar.

NOTE: For service of the hydraulic lift reel slave cylinder, see Cutting Platform Lift Cylinders, page 70-20-1.

HYDRAULIC REEL LIFT CYLINDERS—Continued



A—Slave Cylinder
B—Bleed Screw
C—Master Cylinder
D—Oil From Valve

Fig. 3-Schematic Illustration of Oil Flow for Hydraulic Lift Reel

UNLOADING AUGER SWING CYLINDER

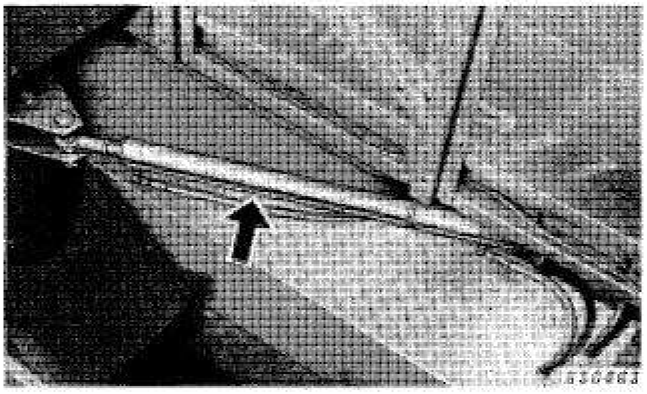


Fig. 4-Auger Swing Cylinder

A two-way action cylinder is used to hydraulically swing the unloading auger from transport to operating position or vice-versa.

VARIABLE SPEED FEEDER HOUSE CONTROL CYLINDER (SideHill 6620 Only)

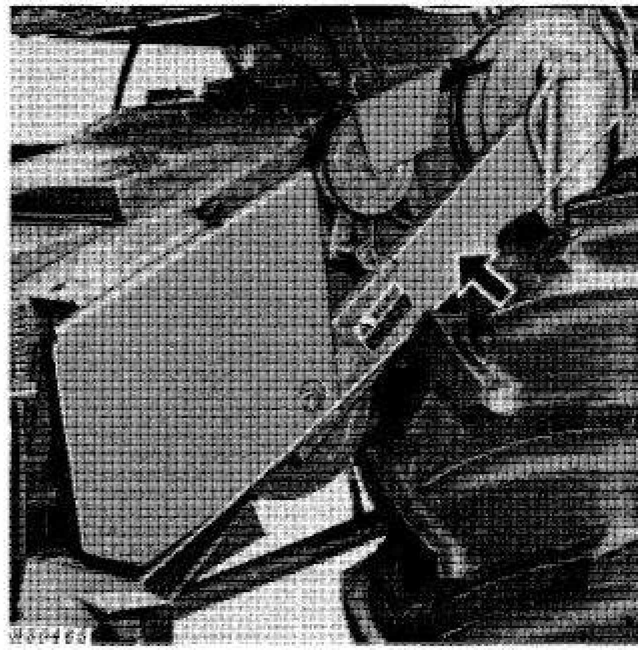


Fig. 5-Feeder House Control Cylinder

The two-way action cylinder used with the variable speed feeder house permits varying the speed for various crop conditions.

Group 30
HYDRAULIC MOTORS

HYDROSTATIC DRIVE REEL MOTOR

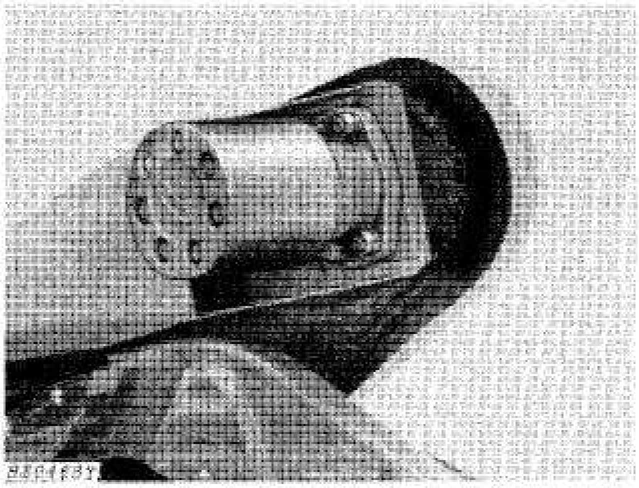


Fig. 1-Reel Drive Motor-Platforms

The hydrostatic drive motor which controls the speed of the reel, is a rotor-type internal gear motor. The amount of oil delivered to the motor from the control valve regulates the speed of the motor.

HYDROSTATIC DRIVE BELT PICKUP MOTOR

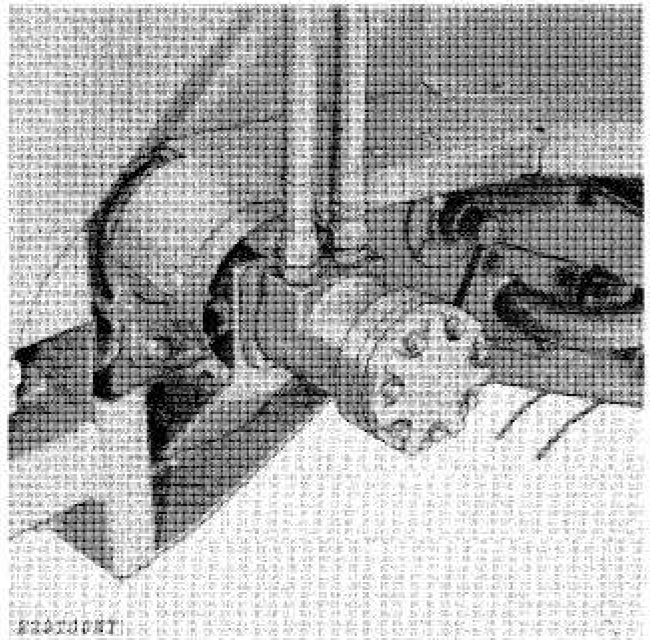


Fig. 2-Belt Pickup Drive Motor

The belt pickup drive motor is a rotor-type internal gear motor. The speed of the pickup can be varied from the cab with this motor.

Group 35
ACCUMULATOR

GENERAL INFORMATION

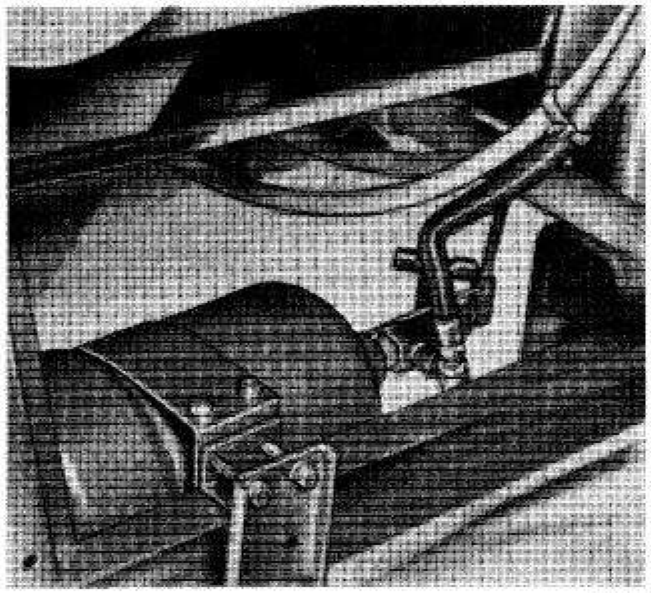


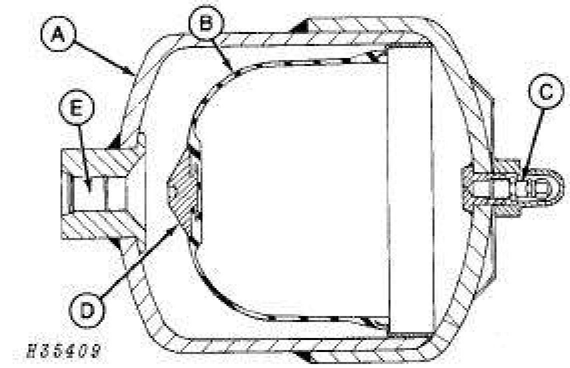
Fig. 1-(3.8 L) 1 Gallon Accumulator Illustrated

The combine may be equipped with a (1.9 L) 1/2 gallon or a (3.8 L) 1 gallon accumulator. The (1.9 L) 1/2 gallon accumulator is used with flex platforms and row-crop heads equipped with header height control. The (3.8 L) 1 gallon accumulator is used with flex platforms and row-crop heads without header height control and rigid platforms.

The accumulator system must be locked out when used with corn heads.

The accumulator system is connected in parallel to the header lift system between the lift cylinders and the main control valve. This system provides a means for suspending the header over uneven ground by compressing nitrogen gas in a bladder in the accumulator tank.

Refer to Section 270, Group 01 for hydraulic flow diagrams for the header lift - accumulator circuit.



A—Tank
B—Bladder
C—Gas Valve
D—Button
E—Oil Port

Fig. 2-Cross Section of (1.9 L) 1/2 Gallon Tank

The accumulator tank (A) (Fig. 2) contains an internal bladder (B) that separates nitrogen gas (which is compressible) from hydraulic oil, (which is not compressible). A charge of pressurized nitrogen gas is added at the factory to one side of the bladder through gas valve (C). This expands the bladder and forces hydraulic oil within the accumulator out oil port (E).

If the pressure of the oil is less than the pressure of the gas, the bladder will expand until button (D) closes off oil port (E). If the pressure of the oil is greater than that of the gas, oil will flow in, compress the bladder, and raise the pressure of the gas.

Oil flow, either in or out, will continue until the pressures of the gas and oil are equal or the bladder button closes the oil port.

PRECAUTIONS FOR ACCUMULATORS

1. Observe the following precautions when working on pneumatic accumulators. The correct procedures for service are given in detail Section 70 Group 30.

CAUTION: NEVER FILL AN ACCUMULATOR WITH OXYGEN An explosion could result if oil and oxygen mix under pressure.

2. Never fill an accumulator with air. When air is compressed, water vapor in the air condenses and can cause rust. This in turn may damage seals and ruin the accumulator. Also, once air leaks into the oil, the oil becomes oxidized and breaks down.

3. Always fill an accumulator with dry nitrogen. This gas is free of both water vapor and oxygen; this makes it harmless to parts and safe to use.

4. Never charge an accumulator to a pressure more then that recommended by the manufacturer.

5. Always use the JT05711 pressure regulator on a nitrogen cylinder.

6. Before removing an accumulator from a hydraulic system, release all hydraulic pressure.

7. When you remove an accumulator, make sure that dirt and abrasive material do not enter any of the openings.

CHECKING PRECHARGED ACCUMULATOR ON THE MACHINE

If you suspect external gas leaks, apply soapy water to the gas valve and seams on the tank at the "gas" end. If bubbles form, there is a leak.

If you suspect internal leaks, check for foaming oil in the system reservoir and/or no action of the accumulator. These signs usually mean a faulty bladder inside the accumulator.

If the accumulator appears to be in good condition but is still slow or inactive, precharge it as necessary.

Section 290
OPERATOR STATION OPERATION AND TESTS

CONTENTS OF THIS SECTION

Group 00
SPECIFICATIONS AND SPECIAL TOOLS

SPECIFICATIONS

Air Conditioning System

Evacuating System (sea level)	29-29.5 in. (1 bar) vacuum
Refrigerant capacity	70 oz. (2 kg) Refrigerant-12
Compressor	
Oil charge (new or rebuilt)	11 fluid oz. (312 mL) Frigidaire 525 oil
Pulley diameter	Approx. 5-5/8 in. (142.8 mm)
Discharge pressure	175-300 psi (12-20 bar) (12.24-20.40 kg/cm^2)
Suction pressure	10-30 psi (1-2 bar) (1.02-2.04 kg/cm^2)
Compressor Drive Belt	
Size	1/2 in. (12.7 mm)
Tension	1/4 in. (6 mm) deflection, 10 lb. (44 N) pull
Compressor Clutch Coil	
Current draw (at 12 volts)	not more than 3.2 amps. @ 80°F (27°C)
Resistance	3.7 ohms at 80°F (26.7°C)
Condenser	
Pressure drop in core	2.3 to 8 psi (138 to 552 mbar) (.140 to .563 kg/cm^2)
Evaporator	
Pressure drop in core	5 to 12 psi (345 to 827 mbar) (.352 to .843 kg/cm^2)
Expansion Valve	
Superheat setting	Approx. 6°F (14.4°C)
Thermostatic Temperature Control Switch Cold Settings	
Evaporator refrigerant temperature	
Contact points open (lower temp. limit)	30°F (—1.1°C) ± 1°F (—17.2°C)
Contact points close (upper temp. limit)	37°F (2.78°C) ± 1°F (—17.2°C)
Compressor Relief Valve	
Valve opens	440 psi (30 bar) (30.61 kg/cm^3)
Pressurizer Motor and Blowers	
Maximum current draw (at 12 volts)	17 amps
Air flow	600 cfm. (0.27 m^3/s)

Heating System

Item	Specification
Heater Valve	
Flow rate (at 5 psi [345 mbar])	Approx. 7 gpm (26.5 1/min)
Heating system flow rate	3.5 gpm (13.3 1/min)

Hose and Tubing Flare Connection Torques

Metal Tube Outside Diameter inches (mm)	Thread and Fitting Size inches (mm)	Steel Tubing** Torque ft-lbs (Nm) (kgm)	Aluminum or Copper Tubing* Torque ft-lbs (Nm) (kgm)	Nominal Torque Wrench Span (inches)
1/4 (6.35)	7/16 (11.11)	10-35 (14-47) (1.4-4.7)	5-7 (7-9) (.7-.9)	5/8
3/8 (9.53)	5/8 (15.88)	30-35 (41-47) (4.1-4.7)	11-13 (15-18) (1.5-1.8)	3/4
1/2 (12.7)	3/4 (19.05)	30-35 (41-47) (4.1-4.7)	11-13 (15-18) (1.5-1.8)	7/8
5/8 (15.88)	7/8 (22.22)	30-35 (41-47) (4.1-4.7)	18-21 (24-29) (2.4-2.9)	1-1/16
3/4 (19.05)	1-1/16 (26.99)	30-35 (41-47) (4.1-4.7)	23-28 (31-38) (3.1-3.8)	1-1/4

**If a connection is made with steel to aluminum or copper, use the lower torque specification.*
***Use steel tubing torques only when both ends of connection are steel.*

Hose and Tubing O-Ring Connection Torques

Metal Tube Outside Diameter inches (mm)	Thread and Fitting Size inches (mm)	Torque ft-lbs (Nm) (kgm)
1/4 (6.35)	7/16 (11.11)	10-15 (14-20) (1.4-2)
3/8 (9.53)	5/8 (15.88)	10-15 (14-20) (1.4-2)
1/2 (12.7)	3/4 (19.05)	24-29 (33-39) (3.3-3.9)
5/8 (15.88)	7/8 (22.22)	26-31 (35-42) (3.5-4.2)
3/4 (19.05)	1-1/16 (26.99)	30-35 (41-47) (4.1-4.7)

CAP SCREW TORQUE CHART ft-lbs (Nm) (kgm)

Diameter	Plain Head*	Three Radial Dashes*	Six Radial Dashes*
1/4	6 (8) (.8)	10 (14) (1.4)	14 (19) (1.9)
5/16	13 (18) (1.8)	20 (27) (2.7)	30 (41) (4.1)
3/8	23 (32) (3.2)	35 (47) (4.7)	50 (68) (6.8)
7/16	35 (47) (4.7)	55 (75) (7.5)	80 (108) (10.8)
1/2	55 (75) (7.5)	85 (115) (11.5)	120 (163) (16.3)
9/16	75 (102) (10.2)	130 (176) (17.6)	175 (237) (23.7)
5/8	105 (142) (14.2)	170 (230) (23)	240 (325) (32.5)
3/4	185 (244) (24.4)	300 (407) (40.7)	425 (576) (57.6)
7/8	**160 (217) (21.7)	445 (603) (60.3)	685 (925) (92.5)
1	**250 (339) (33.9)	670 (908) (90.8)	1030 (1396) (139.6)

**The types of bolts and cap screws are identified by head markings as follows:*

Plain Head: regular machine bolts and cap screws.

3-Dash Head: tempered steel high-strength bolts and cap screws.

6-Dash Head: tempered steel extra high-strength bolts and cap screws.

***Machine bolts and cap screws 7/8-inch and larger are sometimes formed hot rather than cold, which accounts for the lower torque.*

SPECIAL TOOLS

Test Equipment

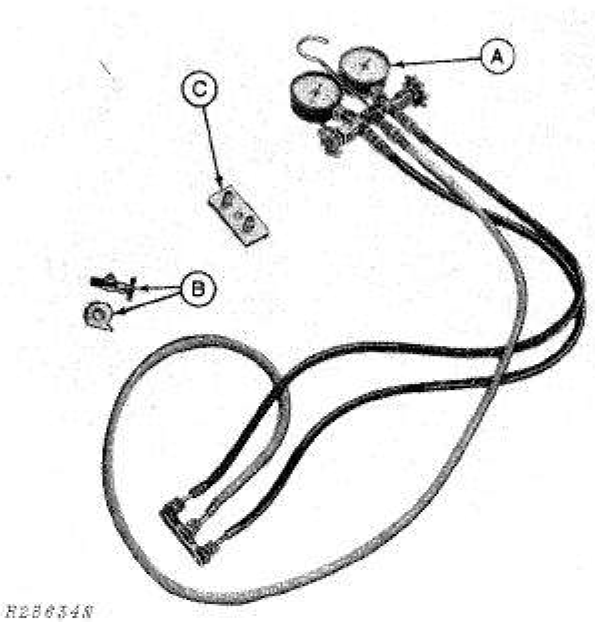


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Fig. 1-Special Test Equipment

***A—D-18019KD Manifold Pressure Gauge Assembly**
***B—D-18023KD Refrigerant Can Dispensing Valve**
***C—D-18032KD Test Plate**
... D-18018KD Air Conditioner Test Equipment Kit. This kit provides most of the tools needed to test the air conditioning system. It contains the following items, furnished in a metal storage box.

D-18019KD	**Manifold Pressure Gauge Assembly (Fig. 1).**
D-18020KD	**Safety Goggles**
D-18021KD	**Ratchet Wrench**
D-18022KD	**Pocket Thermometer**
D-18023KD	**Refrigerant Can Dispensing Valve (Fig. 1).**
D-18024KD	**Antiblowlock Valve**
D-05275ST	**Test Plate**

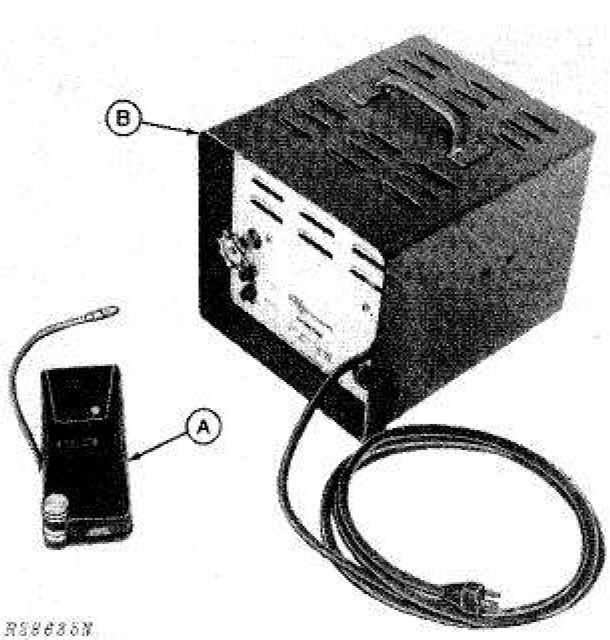

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Fig. 2-Special Test Equipment

***A—D-18009KD Electronic Leak Detector**
***B—Vacuum Pump**

Materials

Refrigerant-12 (Quantity required depends on amount of system service performed. See Charging The System.)
525 viscosity compressor oil (See "When Servicing Compressor.")

**Order from: Service Tools, Box 314, Owatonna MN, 55060*

Test Equipment

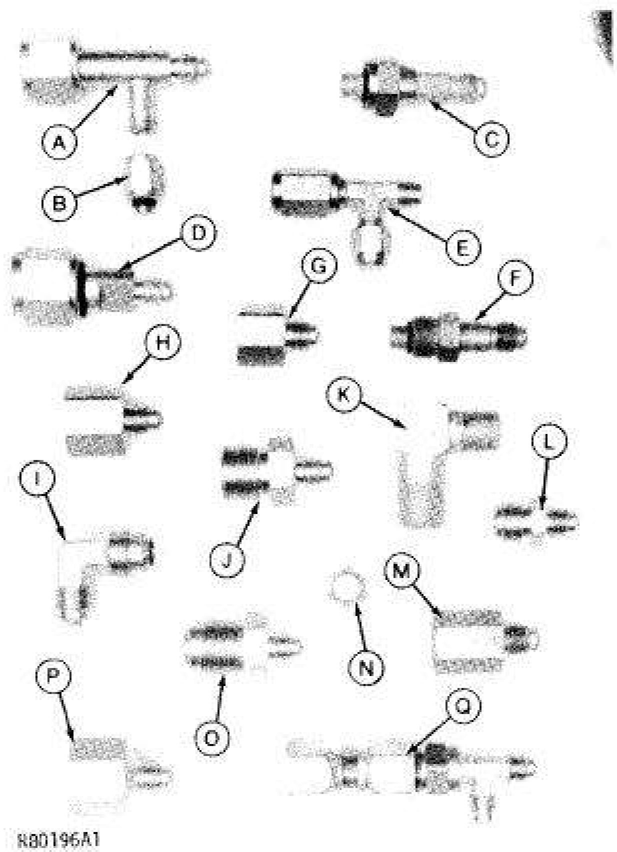


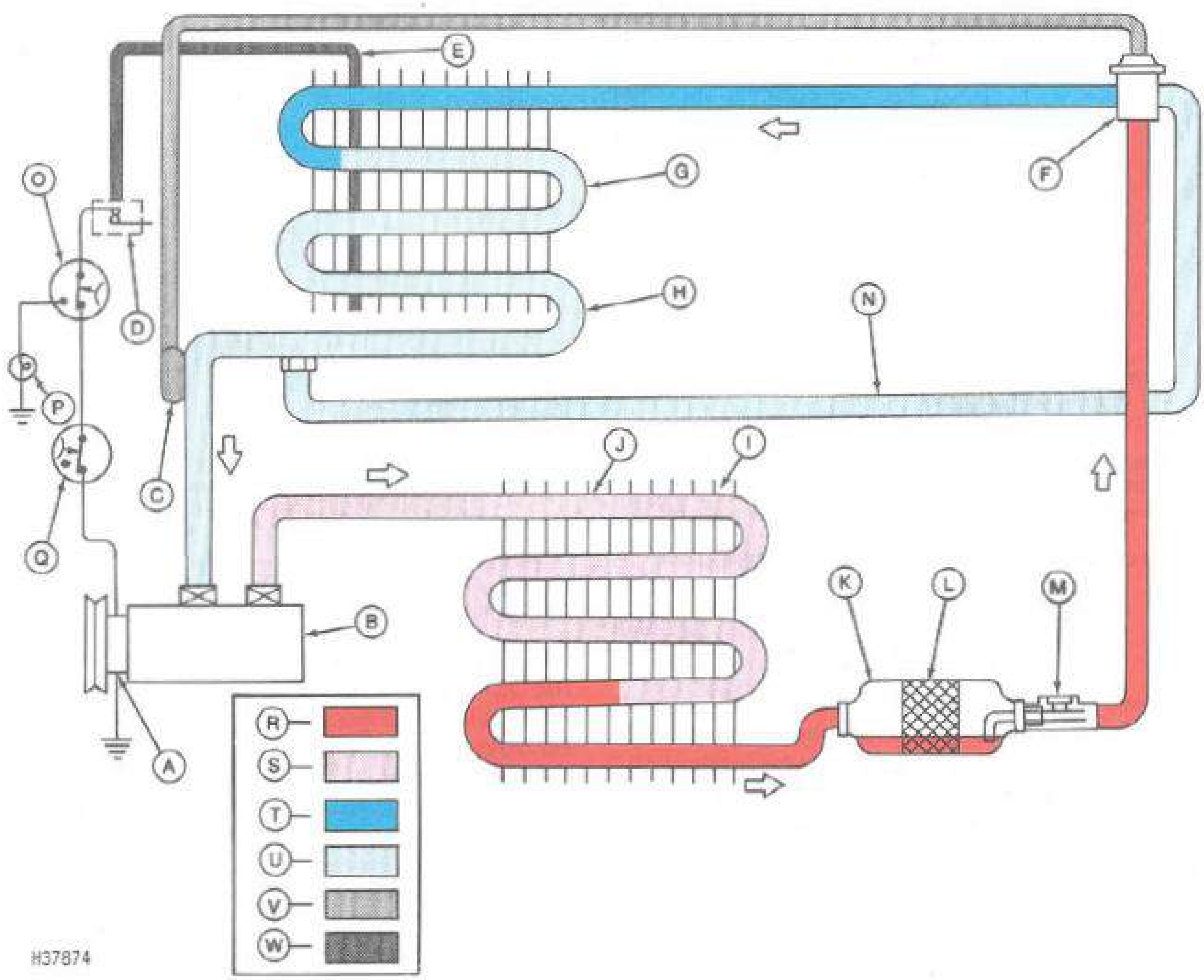
Fig. 3-D-15038 NU Fitting Kit

A—2632	3/4 Tube with 1/4 Tee
B—2633	Tube Test Plug
C—2634	3/8 to 1/4 Tube Adapter
D—2635	7/8 to 7/16 Adapter
E—2636	Union Adapter Assembly
F—2637	Tube Adapter
G—6887	5/8 to 7/16 Reducer
H—6888	3/4 to 7/16 Reducer
I—7432	3/4 to 5/8 Reducer Elbow
J—7436	1/2 to 7/16 Reducer
K—7426	1/2 to 7/16 Reducer Elbow
L—7427	7/16 to 5/8 Adapter
M—7439	7/16 to 5/8 Reducer
N—7447	Cap (2 used)
O—7509	7/8 to 7/16 Adapter
P—7510	7/8 to 7/16 Reducer
Q—7511	3/4 to 7/16 Tee Assembly

D-15038 NU fitting kit is used for flushing and purging air conditioning components, bench testing components and testing the thermal expansion valve.

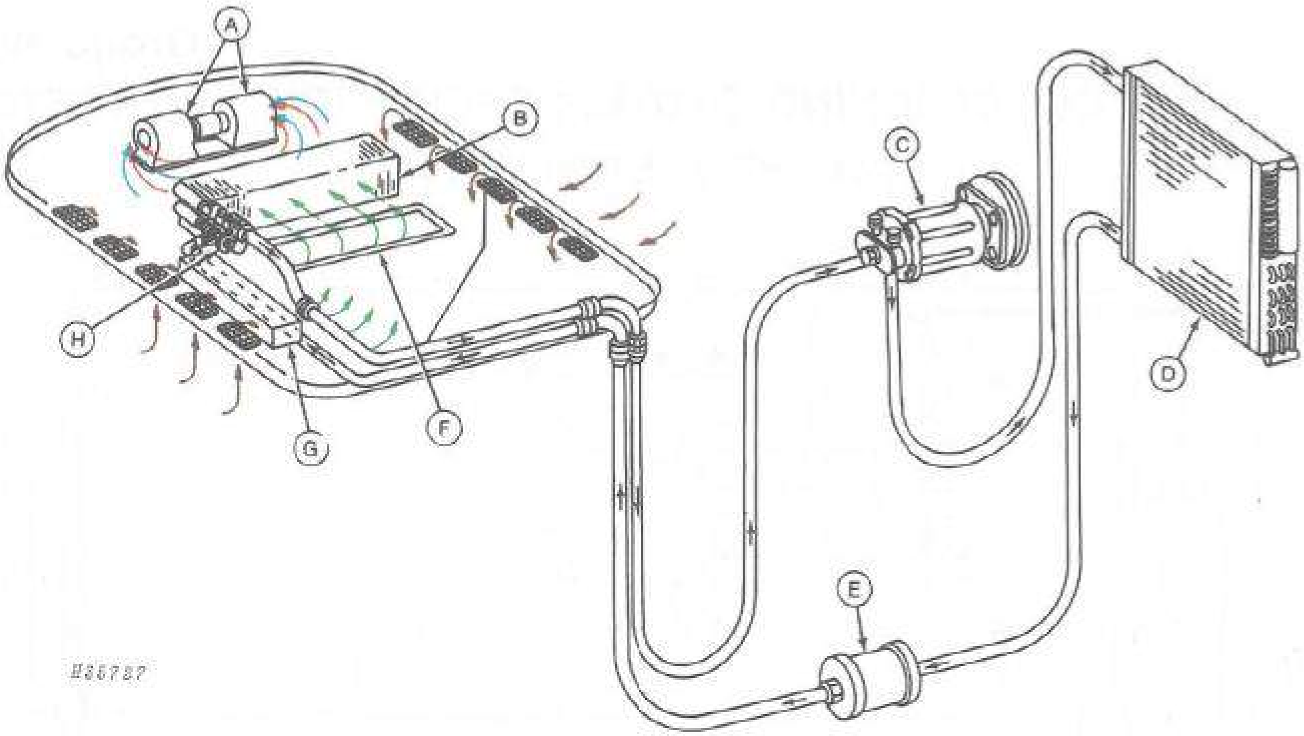
Order From: *Service Tools*
P.O. Box 314
Owatonna, MN 55060

Group 05
AIR CONDITIONING SYSTEM OPERATION AND TESTS
HOW THE SYSTEM WORKS



A—Magnetic Clutch
B—Compressor
C—Temperature Sensing Bulb
D—Temperature Control Switch
E—Sensing Tube
F—Expansion Valve
G—Evaporator
H—Heat Transfer From Cab Air To Refrigerant Gas At Evaporator
I—Heat Transfer From Refrigerant Gas To Outside Air At Condenser
J—Condenser
K—Receiver-Dryer
L—Filter
M—Sight Glass
N—Sensing Tube
O—High Pressure Switch (600001-)
P—Indicator Lamp (High Pressure)
Q—Low Pressure Switch (600001-)
R—High Pressure Liquid
S—High Pressure Gas
T—Low Pressure Liquid
U—Low Pressure Gas
V—Sensing Bulb Gas
W—Temperature Sensing Tube Gas

Fig. 1-Schematic of Air Conditioning System



A—Pressurizer Motors and Blower
B—Evaporator-Heater Core
C—Compressor
D—Condenser
E—Receiver-Dryer
F—Recirculating Filter
G—Air Filter
H—Expansion Valve

K Unfiltered Air
G Filtered Air
D Cooled Air
A Heated Air

Fig. 2-Air Conditioning System

THE SYSTEM CYCLE

Referring to Fig. 2, the compressor (C) draws low pressure refrigerant from the evaporator (B) and compresses it to a high pressure. Increasing the pressure of the refrigerant causes its boiling point to rise to a temperature higher than that of the outside air.

As the high pressure gas passes through the condenser (D), heat is removed from the gas and transferred to the cooler outside air being forced through the condenser core. This permits the refrigerant gas to cool sufficiently to condense into a liquid (still under high pressure).

The high pressure liquid then passes through the receiver-dryer (E), where contaminants such as moisture, acids, or solids are removed by a special filter. The receiver-dryer also acts as a storage reservoir for refrigerant until demanded by the evaporator.

The evaporator is where the actual cooling and drying of warm, moist cab air takes place. The flow of refrigerant entering the evaporator is regulated by a diaphragm-type valve, called an expansion valve (H). This valve uses an orifice to reduce the flow of high pressure liquid refrigerant into the evaporator, causing the refrigerant pressure and temperature to drop.

Warm cab air, pulled over the evaporator by the pressurizer blowers, gives up its heat to the cooler refrigerant, thereby cooling the air and causing the refrigerant to boil, or vaporize. Because the pressure in the evaporator is low, the boiling point of the refrigerant is also low.

Moisture (in the air) is collected on the evaporator core during the cooling process and drained away. With the cab air cooled and dehumidified, the desired effect has been produced and the cycle is now complete.

The expansion valve and a thermostatic temperature control switch (D, Fig. 1) are the two controls used in the air conditioning system to maintain the proper cooling balance.

A temperature sensing bulb (C, Fig. 1) is connected to the expansion valve by means of a capillary tube filled with a low pressure gas. The sensing bulb is clamped to the evaporator outlet pipe and is well insulated from external heat sources. Too little or too much refrigerant passing through the expansion valve into the evaporator, will limit the cooling efficiency of the system.

If too little refrigerant passes through the expansion valve, the refrigerant gas will become too hot, permitting the gas in the sensing bulb to expand enough to open the expansion valve.

If too much liquid refrigerant passes through the expansion valve, some of the liquid will still be vaporizing as it leaves the evaporator. This lowers the temperature at the outlet, which in turn lowers the temperature of the gas in the sensing bulb and allows the expansion valve to close.

The thermostatic temperature control switch is a rotary-type switch that is connected to a temperature sensing tube (E, Fig. 1) inserted in the evaporator core. The switch end of the gas-filled sensing tube has a diaphragm which controls two external contacts wired to the compressor clutch. When the cab air needs to be cooled, corresponding to the preselected control setting, the compressor will turn on. The compressor will continue to function until the selected temperature is reached.

A superheat shutoff switch on the air conditioning compressor prevents compressor failures due to loss of charge or restriction in system. The switch is sensitive to high temperature and low pressure. When the combination of both conditions occurs, the compressor is shut off to prevent damage.

DIAGNOSIS AND TESTING

Condition	Low Side — PSI	High Side — PSI	Sight Glass	Suction Line	Receiver-Drier	Liquid Line	Discharge Line	Discharge Air
LACK OF R-12	Very low	Very Low	Clear	Slightly cool	Slightly warm	Slightly warm	Slightly warm	Warm
LOSS OF R-12	Low	Low	Bubbles	Cool	Warm to hot	Warm	Warm to hot	Slightly cool
AIR IN SYSTEM	Normal (won't drop)	Normal	Occasional bubbles	Warm to hot	Warm	Warm	Warm	Slightly cool
COMPRESSOR FAILURE	High	Low	Clear	Cool	Warm	Warm	Warm	Slightly cool
CONDENSER MALFUNCTION	High	High	Clear to occasional bubbles	Slightly cool to warm	Hot	Hot	Hot	Warm
MOISTURE IN SYSTEM	Normal (may drop)	Normal (may drop)	Clear	Cool	Warm	Warm	Hot	Cool to warm
AIR IN SYSTEM	High	High	Bubbles	Warm to hot	Warm	Warm	Hot	Warm
EXPANSION VALVE (1) OPEN	High	High	Clear	Cold — sweating or frosting heavily	Warm	Warm	Hot	Slightly cool
EXPANSION VALVE (2) CLOSED	Low	Low	Clear	Cold — sweating or frosting heavily at valve inlet	Warm	Warm	Hot	Slightly cool
HIGH SIDE RESTRICTION	Low	Low	Clear	Cool	Cool or sweating or frosting	Cool or sweating or frosting	Hot to point of restriction	Slightly cool
NORMAL	Normal 7-30 psi (1-2 bar) (1.02-2.04 kg/cm²)	Normal 150-270 psi (12-30 bar) (12.24-20.40 kg/cm²)		Cool — possible light sweat	Warm	Warm	Hot	Cool (25°-30°F [-4° to -1°C]) below ambient)

PRELIMINARY CHECKS

Before attempting to service a suspected component malfunction in the air conditioning system, perform the following preliminary checks:

1. Adjust compressor drive belt to 10 lbs. (44 N) tension with 1/4 inch (6.35 mm) deflection.

2. Check compressor clutch engagement.

3. Check the condensor core to see that it is not partially or completely plugged with dirt or trash. Clean with compressed air or water when needed.

4. Check evaporator core for plugging.

5. Check air intake filters for plugging.

6. Check blowers for proper operation.

7. Check for bubbling of refrigerant (at sight glass) with engine running, temperature control on maximum cooling, and blower operating at high speed. If bubbles continue to appear after a few minutes operation, system may be low on Refrigerant-12. See "CHARGING THE SYSTEM" instructions given on page 290-05-44.

DIAGNOSING MALFUNCTIONS

If the system is still not functioning properly after making the above preliminary checks, refer to Fig. 1 and use the following list of symptoms and possible causes as a guide for diagnosing the problem:

Problem	Possible Cause	Suggested Remedy
Compressor Drive Belt Slips		
	1. Belt not tight enough	Tighten to specification (See Step 1 above)
	2. Compressor "froze-up"	Repair
	3. Excessive head pressure (overcharge of refrigerant)	Partially discharge system and recheck pressure as specified
	4. Plugged condenser	Clean as required
Outlet Air Temperature Too Warm		
	1. Lack or loss of R-12	Check for leaks and recharge system
	2. Expansion valve faulty	Replace valve
	3. Temperature control switch faulty	Replace switch
	4. Heater valve not working properly	Check valve operation
	5. Bulb on expansion valve not:	
	a. Clean	Clean
	b. Insulated	Wrap with insulating tape
	c. Contacting evaporator outlet tube	Clean
High Compressor Head Pressure		
	1. Expansion valve inlet screens plugged	Clean screen
	2. Condenser coil plugged	Clean as required
	3. Overcharge of refrigerant	Partially discharge system
	4. Air in system	Check for leaks and recharge system
	5. Restriction in compressor discharge hose	Inspect, and replace hose, if necessary
	6. Restriction in condenser outlet pipe	See Repair
	7. Restriction in receiver-dryer	Replace
	8. Air restriction to condenser core	Clean as required

Problem	Possible Cause	Suggested Remedy
Low Compressor Head Pressure		
	1. Insufficient refrigerant	Add refrigerant
	2. Compressor belt slipping	Tighten belt to specifications
	3. Magnetic clutch slipping	Repair
High Suction Pressure		
	1. Loose compressor belt	Tighten belt to specifications
	2. Magnetic clutch slipping	Repair
	3. Loose expansion valve temperature bulb clamp	Clean contact surfaces, and tighten clamp
	4. Expansion valve sticking open	Replace valve
	5. High refrigerant charge	Reduce refrigerant charge and recheck pressure
	6. Air in system	Check for leaks and recharge system
Low Suction Pressure		
	1. Shortage of refrigerant	Add refrigerant
	2. Restriction in lines or receiver-dryer	Flush lines; replace receiver dryer
	3. Air intake filters or screens plugged	Clean or replace as required
	4. Expansion valve temperature bulb charge low or lost	Replace valve
	5. Expansion valve plugged with dirt or corrosion	Flush valve; or replace
	6. Expansion valve capillary tube broken	Replace valve
	7. Moisture freezing in expansion valve	Evacuate system; replace receiver-dryer
	8. Blower fans inoperative	Perform electrical test
Icing of Evaporator		
	1. Thermostat tube in wrong area of evaporator core	Reposition tube in evaporator core
	2. Loose electrical connection	Check all electrical connections
	3. Plugged air filter	Clean or replace filter
	4. Blower motor operating too slowly	Check electrical system (Section 240)
	5. Dirty sensing tube	Clean
	6. Sensing tube not in evaporator far enough	Insert tube the full depth of core
Compressor Magnetic Clutch Inoperative		
	1. Open connection	Check circuits (Section 240)
	2. Open circuit breaker	Check circuits (Section 240)
	3. Open field coil in clutch	Replace coil
	4. Defective temperature switch or fan switch	Replace
	5. Blown thermal fuse	Determine cause of failure; replace fuse
	6. High refrigerant pressure	See high compressor head pressure above
	7. Low refrigerant pressure	See low suction pressure above
	8. Defective high and/or low refrigerant pressure switch	Replace

DIAGNOSING MALFUNCTIONS—Continued

Problem	Possible Cause	Suggested Remedy
Noisy Compressor Magnetic Clutch		
	1. Defective bearing in pulley.	Replace bearing
Compressor Magnetic Clutch Slips		
	1. Low voltage to clutch	Check electrical system (Section 240)
	2. Excessive load caused by high head pressures	Determine if problem is mechanical (Section 90) or from overcharge of refrigerant
	3. Warped drive plate	Repair
Blower Motors Inoperative		
	1. Open circuit	Check electrical system (Section 240)
	2. Defective switch	Replace switch
	3. Loose harness connection between electrical load center and motor	Check electrical system (Section 240)
Blown Thermal Fuse		
	1. Low freon	Check for leaks and add refrigerant
	2. Restriction in system	Flush system
	3. Improperly located temperature sensing tube	Reposition tube in evaporator core
	4. Moisture in system	Evacuate and recharge system
	5. Defective superheat switch	Replace
Blower Speed Too Slow Or Erratic		
	1. Motor shaft binding	Repair or replace blower
	2. Loose electrical connection	Check electrical system (Section 240)
	3. Defective switch	Replace switch
Water Dripping or Leaking From Evaporator		
	1. Drain tray outlets clogged	Clean as required
	2. Drain tray outlet packing defective	Replace packing
	3. Drain tube kinked	Straighten or replace
	4. Drain tube trap plugged or obstructed	Clean as required
	5. Drain tube trap not primed	Prime trap. Loop must be banded
	6. Expansion valve not wrapped with insulating tape	Install tape
	7. Drain hose torn	Replace

FLOW CHART FOR DIAGNOSTIC CHECKS

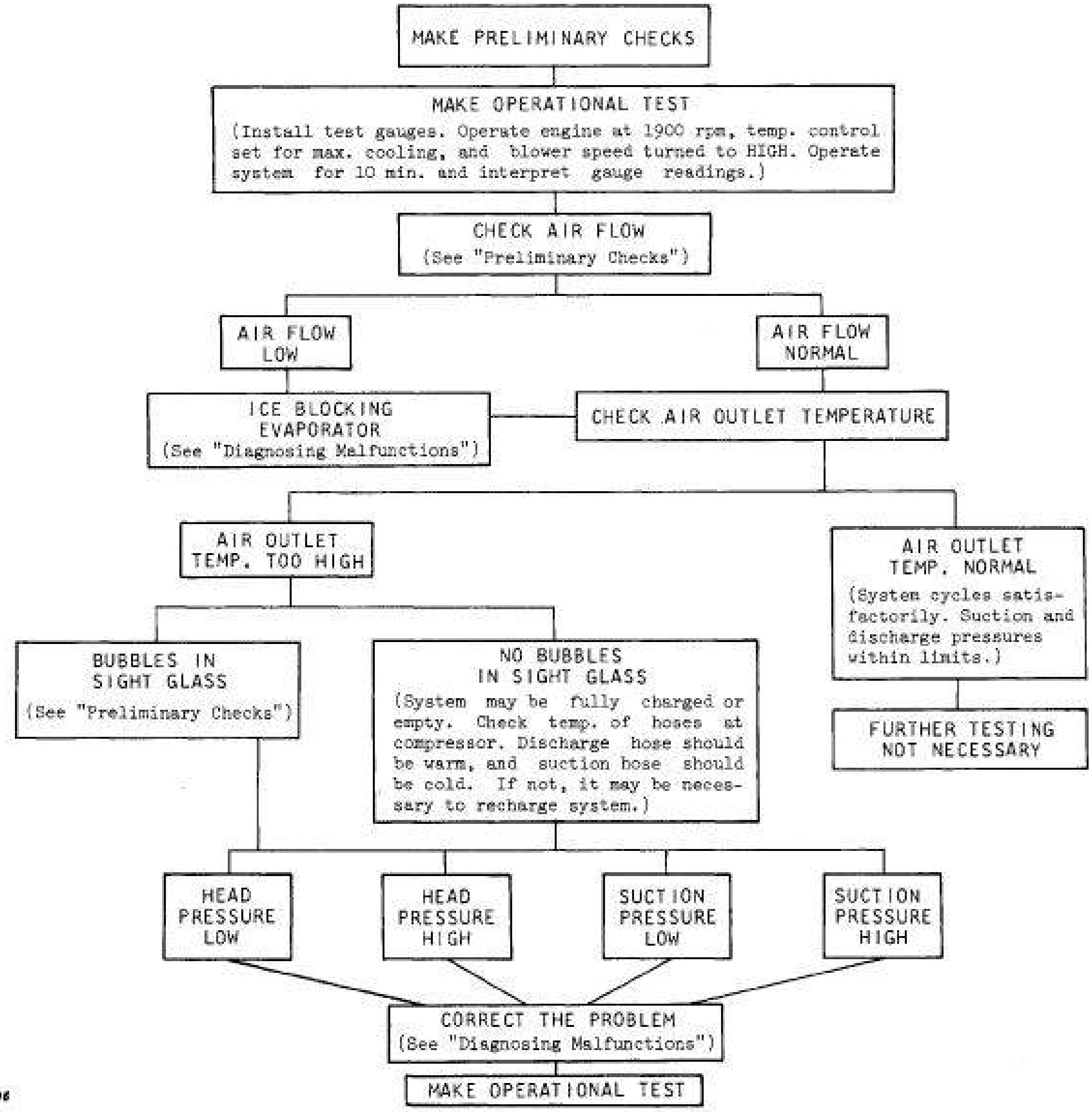


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Fig. 3-Diagnosis Flow Chart

OPERATIONAL TEST

Use the operational temperature-pressure chart as a guide in making the operational test. Compare tests results with the average values given in the chart. See page 290-00-4 for testing equipment.

1. Connect the test gauges as instructed in SYSTEM SERVICE, page 290-05-39.

2. Start engine, run at 1200 rpm with blower speed on high, and temperature control set for maximum cooling. Run system for 5-10 minutes before making tests.

3. Insert a thermometer next to one of the center air outlets and record the air temperature.

4. Observe and record pressure gauge readings.

5. Evaluate all temperature and pressure readings based upon the humidity of the outside air. Air that is humid when being cooled, will increase the load on the evaporator and cause higher head pressures than when cooling relatively dry air. Discharge pressure readings below 150 psi (10 bar) (10.20 kg/cm^2) and above 325 psi (22 bar) (22.44 kg/cm^2) should be investigated. Suction pressure readings below 5 psi (0.3 bar) (0.3 kg/cm^2) and above 45 psi (3 bar) (3 kg/cm^2) should be investigated. Normal test readings are given in the chart on the following page.

OPERATIONAL TESTS—Continued

OPERATIONAL TEMPERATURE-PRESSURE CHART

Outside Air Temp. —	80-110°F (26.7-43°C)
Compressor Discharge Pressure —	175-300 psi (12-21 bar) (12.24-20.40 kg/cm²)
Compressor Suction Pressure —	10-30 psi (1-2 bar) (1-2 kg/cm²)
Air Outlet Temp. —	55-85°F (13-30°C)

REFRIGERANT-12
PRESSURE-TEMPERATURE RELATIONSHIP

Temperature °F	Temperature °C	Pressure Psi	Pressure bar	Pressure kg/cm²
—21.7	—29.9	0	0	0
0	—17.8	9	0.6	0.6
10	—12.2	15	1.0	1.0
20	—6.7	21	1.4	1.5
30	—1.1	29	2.0	2.0
40	4.4	37	2.6	2.6
50	10.0	47	3.2	3.3
55	12.8	52	3.6	3.7
60	15.6	58	4.0	4.1
65	18.3	64	4.4	4.5
70	21.1	70	4.8	4.9
75	23.9	77	5.3	5.4
80	26.7	84	5.8	5.9
85	29.4	92	6.3	6.5
90	32.2	100	6.9	7.0
95	35.0	108	7.5	7.6
100	37.8	117	8.1	8.2
105	40.6	126	8.7	8.9
110	43.0	136	9.4	9.6
115	45.8	147	10.1	10.3
120	49.0	157	10.8	11.0
125	51.8	169	11.7	11.9
130	54.0	179	12.4	12.6
140	60.0	205	14.1	14.4

ELECTRICAL TESTING

Wiring Diagrams

Refer to Section 240 for wiring diagrams on the air conditioning system.

Component Check

When an electrically operated component in the system fails to function, make the following preliminary checks:

1. Determine if adequate voltage is being supplied to the air conditioning system.

2. Visually check for a loose connection or a broken wire.

If, after making the preliminary checks, the source of trouble has not been found, test the system for an open circuit within each component.

General Information

The low refrigerant charge protector system consists of the superheat switch, located in the rear of the compressor. This switch is sensitive to high temperature and low pressure. It will shut off the compressor when the refrigerant charge is low or is completely lost. The superheat shut-off switch is wired to the thermal fuse.

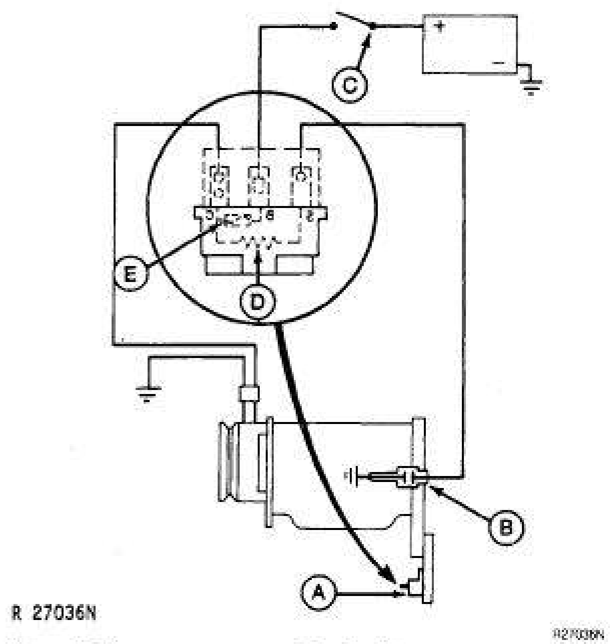
The thermal fuse, located near the rear of the compressor, is basically a temperature sensitive fuse link between the air conditioning system and the compressor clutch coil.

During normal operation of the air conditioning system, current flows through the control switch and through the thermal fuse to the clutch coil to actuate the compressor. When a partial or total loss of refrigerant in the system causes the superheat shut-off switch to sense low system pressure and a high suction gas temperature, the switch contacts will close. When the contacts close, current flows to the thermal fuse, causing it to "blow", thus opening the circuit to the compresssor clutch coil. The compressor then stops working and compressor damage, due to refrigerant loss is prevented. The cause of the refrigerant loss must be corrected and the system charged, before the thermal fuse is replaced.

Testing

When an electrical component in the system fails to function, first make these checks:

Electric Clutch



A—Thermal Fuse
B—Superheat Switch
C—Control Switch
D—Resistance-Type Heater
E—Fuse Plug

Fig. 4-Electric Clutch Wiring

Low voltage at the electric clutch (typically 3 to 4 volts) may be due to incorrectly wired thermal limiter fuse plug. Recommended minimum voltage at the clutch is 10 volts.

Refer to the schematic (Fig. 4) and check to be certain the components are correctly wired.

"A", "B", and "C" are the designations on the connector that goes on the thermal fuse. "S", "B", and "C" are the designations on the thermal fuse (opposite side of connector).

The black wire is inserted into the "A" slot, the green wire in the "C" slot, and the red wire in the "B" slot in the connector. Letter designations on the connector and thermal fuse must match as follows: "A" to "S", "B" to "B", and "C" to "C".

Superheat Shutoff Switch (-600000)

If, after checking the electric clutch wiring, the source of the trouble has not been found, test for a defective superheat shutoff switch as follows:

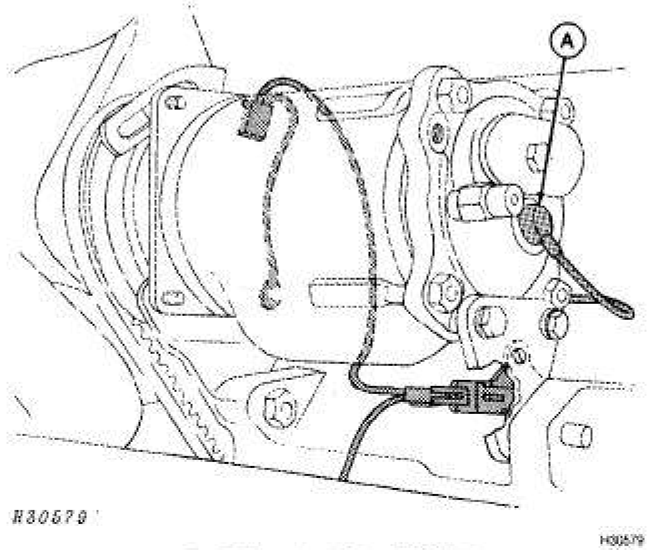


Fig. 5-Superheat Shutoff Switch

If the D-18030-KD thermal limiter tester is available, perform the tests as described in the instruction sheet furnished with the tester.

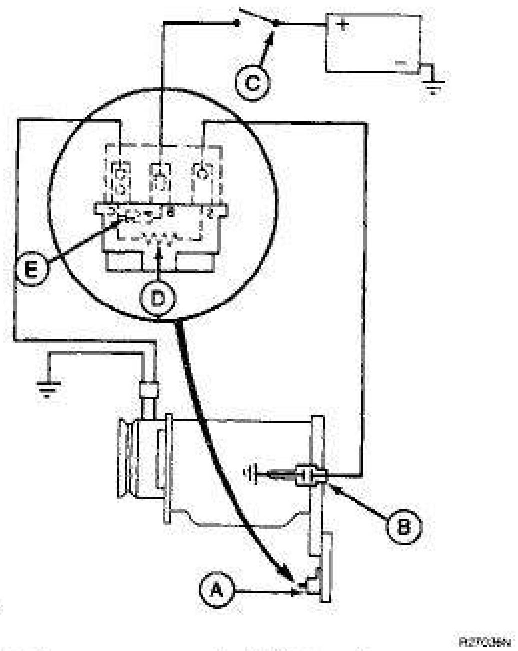
If a tester is not available, use the following procedure;

1. Disconnect the wiring lead from the superheat shutoff switch (A, Fig. 5).

2. Connect one lead of a test light on the superheat shutoff switch terminal, and the other lead to a power supply.

If the bulb lights the superheat shutoff switch is defective.

Thermal Fuse (-600000)



A—Thermal Fuse
B—Superheat Shutoff Switch
C—Air Conditioning Switch
D—Resistance-type Heater
E—Fuse Link

Fig. 6-Thermal Fuse

1. Disconnect the wiring harness from the thermal fuse (A, Fig. 6).

2. Install a continuity tester between terminals marked "B" and "C" on thermal fuse (Fig. 6).

If tester shows continuity, the thermal fuse is good. If no continuity, the fuse is blown and must be replaced.

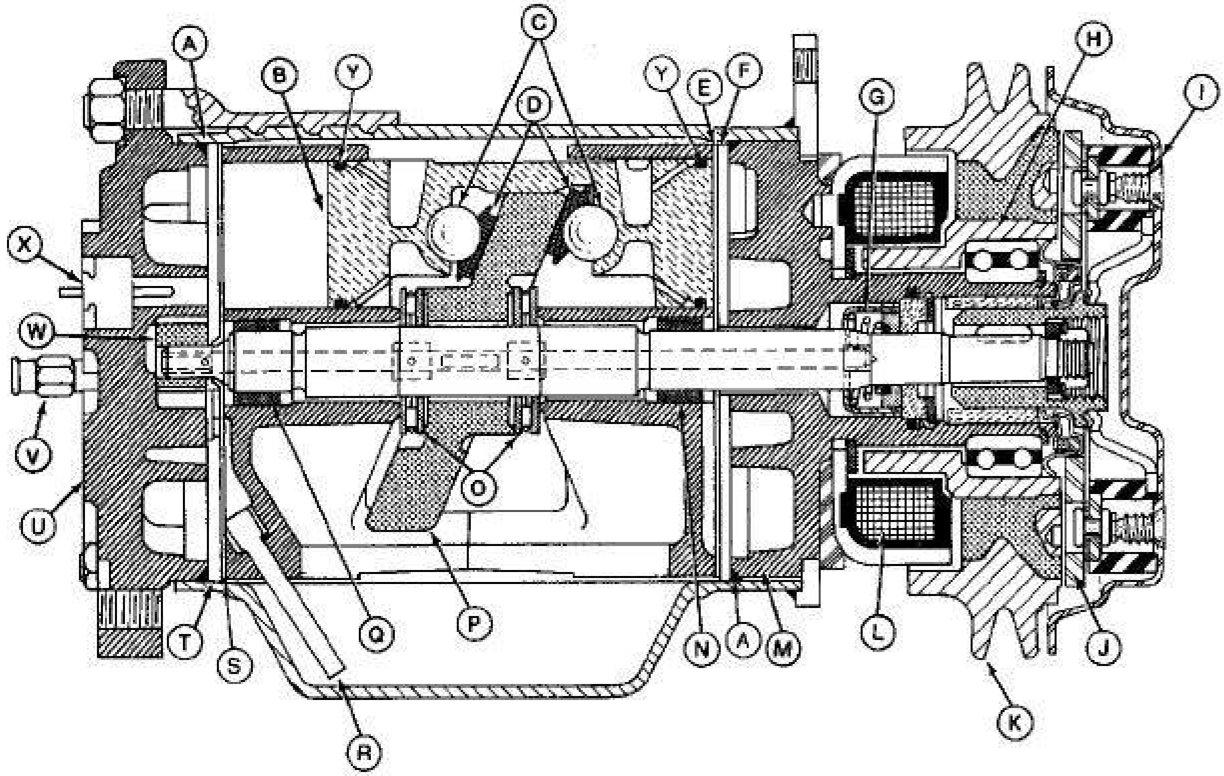
High and Low Refrigerant Pressure Switches (600001-   )

The air conditioning system is protected by high and low pressure switches. The high pressure switch protects the system when the discharge pressure is too high and the compressor when the discharge pressure is too low.

The high pressure switch (located near the outlet of the compressor) is a normally closed switch. If system pressure gets too high for safe operation (2310-2517 kPa) (335-365 psi), the switch will open, disengage the compressor clutch and activate a warning lamp in the cab.

The low pressure switch (located near the inlet of the expansion valve under the cab roof) is a normally closed switch when installed in a charged system. If system pressure is too low for safe operation (29-35 psi at the switch), the switch will open and disengage the compressor clutch. The low pressure switch does not activate the warning lamp.

COMPRESSOR



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A—O-Ring Seal
B—Piston
C—Drive Ball
D—Ball Shoe
E—Suction Reed
F—Front Discharge Valve Plate
G—Shaft Seal
H—Pulley Bearing
I—Dust Cover
J—Hub and Drive Plate Assembly
K—Pulley
L—Clutch Coil
M—Front Head
N—Mainshaft Front Bearing
O—Mainshaft Thrust Bearing
P—Swash Plate
Q—Mainshaft Rear Bearing
R—Oil Pick-Up Tube
S—Suction Reed
T—Rear Discharge Valve Plate
U—Rear Head
V—Relief Valve
W—Oil Pump
X—Superheat Switch
Y—Piston Ring

Fig. 7-Cross-Section of Delco (Frigidaire) Compressor

The compressor is a horizontal, 6-cylinder (3-pistons), double-acting type (Fig. 7), and is belt-driven from the engine crankshaft.

Pistons (B) are mounted axially around the compressor shaft and driven by a swash plate (P).

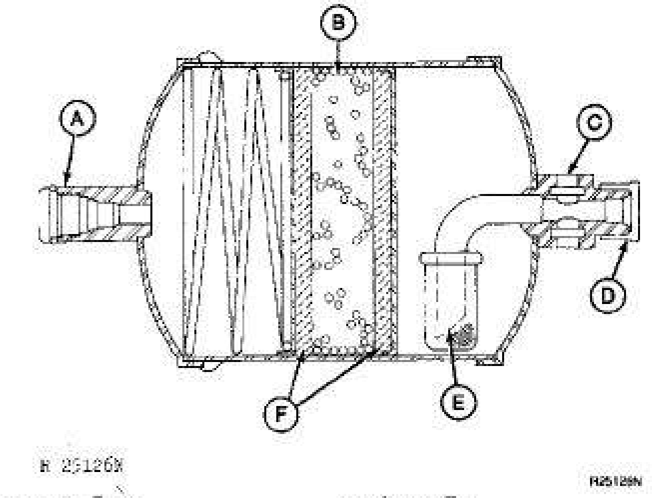
Reed-type suction and discharge valves are mounted in valve plates (S and T) between the cylinder assembly and the head at each end of the compressor. The heads are connected by gas-tight passage ways which direct refrigerant gas to a common outlet.

An oil pump (W) mounted at the rear of the compressor picks up oil from the bottom of the compressor oil sump and pumps the oil to the internal working parts of the compressor.

Operation of the compressor is controlled by the temperature control switch, which electrically controls the magnetic clutch (J) on the compressor.

The compressor is fitted with a high pressure relief valve (V) which opens whenever the compressor discharge pressure exceeds 440 psi (30 bar) (30 kg/cm²).

RECEIVER-DRYER



A—Inlet From Condenser
B—Desiccant
C—Sight-Glass
D—Outlet To Expansion Valve
E—Pick-Up Tube
F—Filter Pad

Fig. 8-Cross-Section of Receiver-Dryer

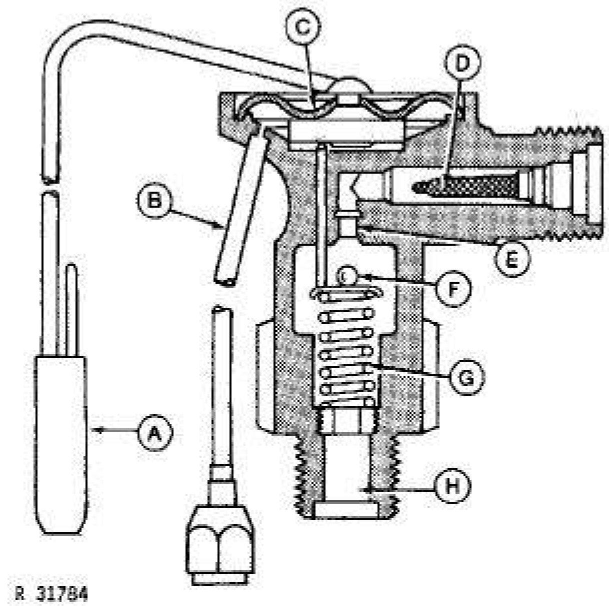
The receiver-dryer (Fig. 8), mounted in the rear of the engine compartment, has a two-fold function. First, it receives the high pressure liquid refrigerant from the condenser and stores the liquid until needed by the evaporator. Second, the unit removes harmful moisture (and acids), and filters out solid contaminants.

Solid contaminants are filtered by the strainer-filter pads (F), while moisture and acids are removed by the desiccant material (B) filling the chamber between the filter pads.

The sight glass (C) is incorporated into the receiver-dryer unit, and should be used for checking refrigerant operation.

REGULATORY CONTROLS

EXPANSION VALVE



A—Sensing Bulb
B—External Equalizer Line
C—Diaphragm
D—Screen (Early Combines)
E—Orifice
F—Valve Seat
G—Spring
H—Valve Outlet

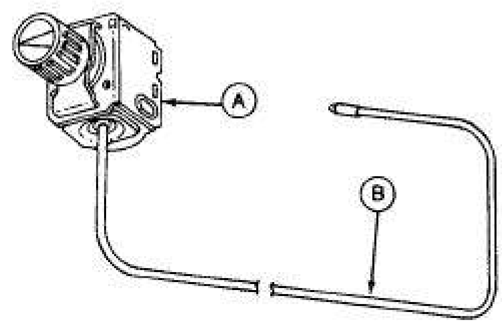
Fig. 9-Expansion Valve

Liquid refrigerant under high pressure is piped to the expansion valve (Fig. 9) from the receiver-dryer.

The function of the expansion valve is to regulate the amount of liquid refrigerant entering the evaporator (now under low pressure), depending upon the desired inside temperature. Sensing action which regulates valve action takes place in the temperature sensing bulb (A).

The expansion valve has an external equalizer line (B) which allows pressure at the valve outlet (H, or evaporator inlet) to be transmitted to the evaporator side of the diaphragm.

TEMPERATURE CONTROL SWITCH



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A—Temperature Control Switch   **B—Sensing Tube**

Fig. 10-Temperature Control Switch

The purpose of the temperature control switch (A, Fig. 10) is to regulate the temperature of the refrigerant in the evaporator corresponding to the control knob setting selected by the operator.

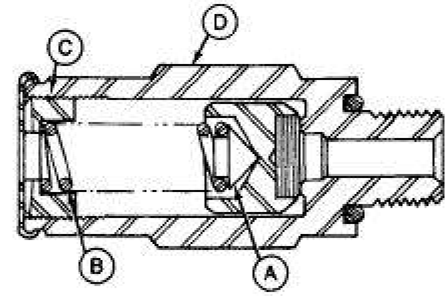
The switch consists of a set of contact points which receives its power from the pressurizer motor switch. The current flows from the temperature switch to the compressor clutch.

The contact points in the temperature switch are controlled by a gas-filled temperature sensing tube (B) having a spring bellows or diaphragm on one end making contact with the point operating mechanism. The other end of the sensing tube is inserted into the core of the evaporator.

When the control knob is turned on (clockwise), the contact points close, thereby activating the compressor. However, the compressor will not operate unless the pressurizer motors are turned on. As the temperature in the evaporator reaches its specified lower limit, the contact points are allowed to open, which in turn shuts off the compressor. The compressor will remain off until the temperature in the evaporator reaches its specified upper limit. When that limit is reached, the contact points close and the compressor starts operation. In this manner, the compressor turns off and on automatically to satisfy the demands of the evaporator.

Turning the control knob all the way to the left (counterclockwise) manually opens the contact points in the switch housing, stopping compressor operation.

COMPRESSOR RELIEF VALVE



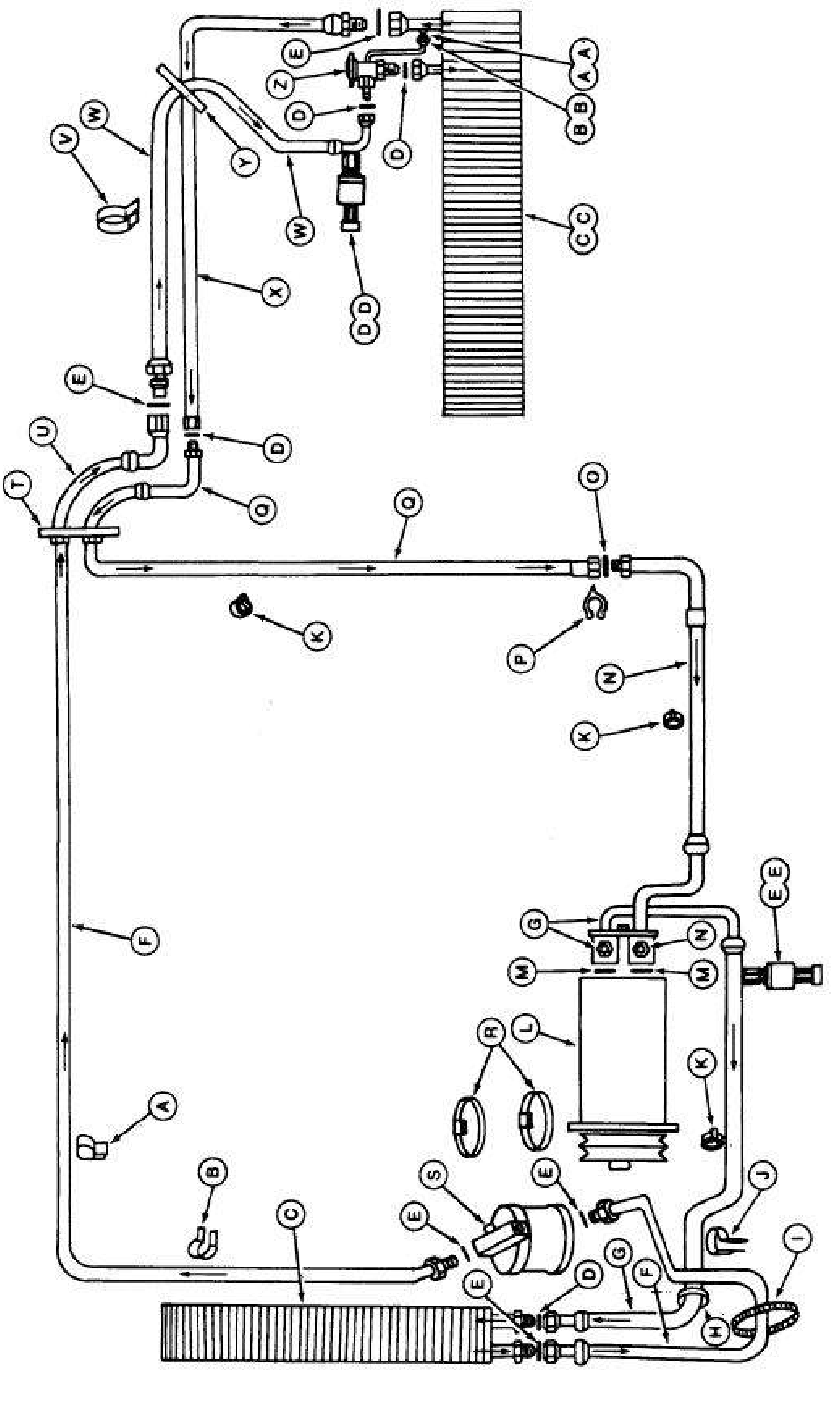
R 28639N

A—Valve Seat   **C—Spring Seat**
B—Spring   **D—Valve Housing**

Fig. 11-Compressor Relief Valve

The compressor relief valve (Fig. 11) is a pressure regulating control. If the system discharge pressure exceeds 440 psi (30 bar) (30.61 kg/cm²), the valve (A) will open automatically against spring (B) pressure and stay open until the pressure recedes. The valve will then close automatically.

If the relief valve opens, a loud popping noise will be heard. In addition, some oil may be ejected through the valve. Correct any condition that would cause this valve to open.



A—Hose Clip
B—Hose Clip
C—Condenseor
D—O-Ring
E—O-Ring
F—Bottom Condensor Hose
G—Upper Condensor Hose

H—Grommet
I—Plastic Grommet
J—Hose Clamp
K—Plastic Clip
L—Compressor
M—O-Ring
N—Compressor Suction Hose

O—O-Ring
P—Plastic Clip
Q—Intermediate Suction Hose
R—Hose Clamp
S—Receiver Drier
T—Retaining Plate and Grommets
U—Intermediate Pressure Hose

V—Hose Clamp
W—Evaporator Pressure Hose
X—Evaporator Suction Hose
Z—Expansion Valve
AA—O-Ring
BB—Equalizer Line
CC—Evaporator
DD—Low Pressure Switch
EE—High Pressure Switch

H37875

Fig. 12-Air Conditioning Diagram

STEP-BY-STEP CHARTS

When diagnosing any air conditioning problem, there are three checks that MUST be performed:

Preliminary Checks

Any of the minor problems checked here can produce an incorrect pressure temperature relationship of the refrigerant entering the evaporator, with the exception of engine coolant flowing through the heater core. Decreasing the air flow through the condenser increases the system pressure. Decreasing the air flow through the evaporator does not allow the operators compartment to get cooled to a comfortable temperature. Always make the Preliminary Checks before any operational checks or testing of the system.

Electrical Operational Checks

An operational check of the electrical system before actual testing assures the following:

1. Compressor clutch is engaging to circulate refrigerant through the system.
2. Blower motor is circulating air across the evaporator for cooling.

Make these operational checks after the Preliminary Checks, but before pressure checks and system checks.

System Pressure Checks

A system operational pressure check of the low and high sides assures that the correct refrigerant pressure is maintained when it enters the condenser and leaves the evaporator for a specific ambient temperature. Make this check after performing the two checks above, and before starting the test sequences which follow.

Additional Information

Mositure In System

During the development of the air conditioning diagnostic procedure, it was determined that moisture does not freeze out at the expansion valve. Depending upon the ambient temperature and flow through the evaporator, moisture freezes near the inlet or outlet of the evaporator. There seems to be no consistent method of indicating moisture in the system. Therefore, if all checks are "NORMAL" and the operator complained of "lack of cooling" below 80°F (27°C) there is moisture in the system. Above 80°F (27°C) moisture will not freeze in the system because the temperature of the refrigerant coming out of the expansion valve will be above 32°F (0°C), the freezing point of water.

Restriction In System

When feeling refrigerant lines or components for restriction, always check for a temperature change in the direction of normal refrigerant flow to correctly sense temperature changes.

Safety Precautions

Refrigerant-12 by itself is harmless and nonpoisonous; however, special precautions should be taken when servicing any refrigerant air conditioning system or handling refrigerant containers.

1. Do not expose eyes or skin or liquid refrigerant. Always wear safety goggles when opening refrigerant lines. Liquid Refrigerant-12 has a boiling temperature of approximately −21°F (−29.5°C) at sea level; therefore, serious injury could result if liquid refrigerant contacts the eyes or skin. If Refrigerant-12 strikes the eye, call a doctor IMMEDIATELY and:

Do not rub the eye. Splash cold water on the eye to gradually raise the temperature of the contacted area.

Obtain treatment from a physician as soon as possible.

If the liquid refrigerant comes in contact with the skin, treat the injury as though it were frozen or frostbitten.

2. Do not discharge refrigerant into an area where there is exposed flame. Heavy concentrations of refrigerant-12 contacting an open flame will produce a poisonous gas.

3. Do not weld or steam clean near or on an air conditioning system. Excessive pressure could be built-up within the system.

4. Do not subject containers of Refrigerant-12 to temperatures above 125°F (51.8°C). Also, during the charging process, water for heating the refrigerant containers should not exceed 125°F (51.8°C). Higher temperatures will cause excessive container pressures.

5. All charging and leak testing should be performed in a well-ventilated area.

6. Before loosening a refrigerant fitting, cover the connection with a cloth.

7. When charging system with engine running, be sure high pressure gauge valve is CLOSED.

8. Observe and stay clear of rotating parts.

How To Use Step-By-Step Charts

These charts are usually divided into three sections:

STEP SEQUENCE RESULT

Always start at the first step and go through the complete sequence from left to right. Each sequence ends with a result and tells you the next step. Work through the appropriate steps as directed until the malfunction has been corrected. After repair, repeat the total diagnosing sequence to be sure the problem has been corrected.

Throughout the diagnosing sequence, reference is made to the following short procedures which are located after step 56 of the diagnosing sequence. As you become more familiar with these procedures, frequent reviewing will not be necessary.

ABBREVIATIONS USED IN CHARTS

TEV —Thermal Expansion Valve
TEMP —Temperature
°F —Degrees Fahrenheit
°C —Degrees Celsius
R-12 —Refrigerant—12
RPM —Revolutions Per Minute
PSI —Pounds Per Square Inch
SPEC —Specification
RH —Right Hand
LH —Left Hand
M-BAR —Milli-bar
MM —Millimeter
MI —Milliliters
OZ —Ounce
MIN —Minimum
MAX —Maximum
SHSS —Super Heat Shut-off Switch
Hg —Mercury

Step	Result
(1) PRELIMINARY CHECKS: Check the following areas and correct any abnormal conditions before performing electrical operational checks at Step 2. a) Compressor drive belt tension. NOTE: To tighten, pry only on mounting bracket. b) Side screens clean and free of trash. c) Condenser and radiator clean and free of trash. d) Fresh air filter clean. NOTE: If filter requires frequent cleaning, clean entire inner roof area. e) Recirculating air filter clean. NOTE: This filter is just to the rear of the accessory switch control panel and requires removal of two screws. f) Be sure the heater control and wiper switches are off.	GO TO STEP 2
(2) ELECTRICAL SYSTEM - To determine whether there is an electrical or air-conditioning system problem, perform the following checks with the engine off. a) Temperature control and blower switch "OFF." b) Key switch "ON" and engine "OFF." c) Turn blower switch to low.	Blower does not work — GO TO SECTION 240 ELECTRICAL OPERATION NOTE: On combines (-6000000) complete this step without using jumper wires. If clutch engages then go to 9 if clutch does not engage then refer to section 240 - Electircal Operation
d) Key switch "OFF." Leave blower switch on low. e) Temporarily install a jumper wire in place of high pressure switch located near compressor. Jumper wire goes between two orange wires. f) Key switch "ON" and engine "OFF." g) Listen for compressor clutch engagement (click at compressor) as you turn temperature control switch on (To "MAX." cooling) and then off.	Compresor does engage — GO TO STEP 3 Hi pressure lamp comes on — GO TO STEP 4
h) Key switch "OFF." i) Remove fresh air filter or raise roof to temporarily install a jumper wire in place of the low pressure switch. j) Key switch "ON" and engine "OFF." k) Listen for compressor clutch engagement (click at compressor) as you turn temperature control switch on (To "MAX." cooling) and then off.	Compressor does not engage — GO TO STEP 4 Compressor does engage — GO TO STEP 3

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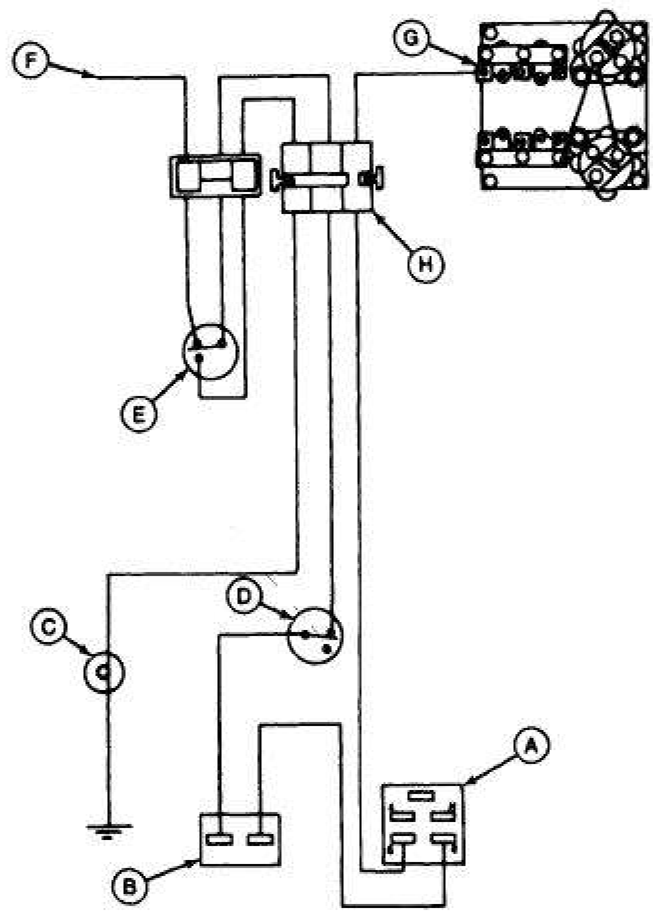
Step	*Result*
(3) CLEAN CONNECTIONS a) Key switch off. b) Remove jumper wires on high and/or low pressure switches. Clean connectors before assembling. c) Key switch "ON" and engine "OFF." d) Listen for compressor clutch engagement (click at compressor) as you turn temperature control switch to max. cooling and then off.	Compressor does engage but system does not cool — GO TO STEP 5 Compressor does not engage — GO TO STEP 4
(4) CONCLUSION - Problem is in the electrical system. Refer to the schematic below for voltage or continuity checks. Clean connectors at thermostat switch (B) and cab roof harness connector (H).	



A-Blower Switch
B-Thermostat Switch
C-Indicator Lamp (Hi Pressure)
D-Low Pressure Switch
E-High Pressure Switch
F-To Compressor
G-Circuit Breaker
H-Cab Roof Harness Connector

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Step	Result	
5 ENGINE ON OPERATION CHECKS. a) Key switch "ON" and engine at 2000 rpm. b) Blower switch at high and temperature control at "MAX." cooling. c) After 30 seconds observe hi pressure lamp and operation of compressor.	Hi pressure lamp off and compressor clutch still engaged	GO TO STEP 8
	Hi pressure lamp on	GO TO STEP 6
	Hi pressure lamp off and compressor clutch disengaged	GO TO STEP 7
6 HI-PRESSURE LAMP IS ON: a) Shut-off engine. b) Turn key switch "OFF." c) Install pressure gauge manifold (see Step 9). d) Temporarily install a jumper wire in place of the Hi-pressure switch. e) Repeat Step 5 and observe compressor discharge pressure immediately after starting engine and engaging the compressor. f) If discharge pressure is 2413 kPa (350 psi) or above, then stop engine. NOTE: Reconnect Hi-pressure switch after testing or repair.	Discharge pressure is 2412 kPa (350 psi) or above	GO TO STEP 20
	Discharge pressure is below 2413 kPa (350 psi)	GO TO STEP 55
	Hi pressure lamp on and discharge pressure is below 2413 kPa (350 psi)	GO TO STEP 4
7 COMPRESSOR CLUTCH DISENGAGED: a) Shut-off engine. b) Turn key switch "OFF." c) Remove fresh air filter to temporarily install a jumper wire in place of the Lo-pressure switch. Install fresh air filter. d) Install pressure gauge manifold (see Step 9). e) Repeat Step 5 and observe compressor discharge pressure after starting engine and engaging the compressor.	Discharge pressure is above 200 kPa (29 psi)	GO TO STEP 53
	Discharge pressure is 200 kPa (29 psi) or below	GO TO STEP 9
	Compressor clutch disengages and discharge pressure is above 241 kPa (35 psi)	GO TO STEP 4

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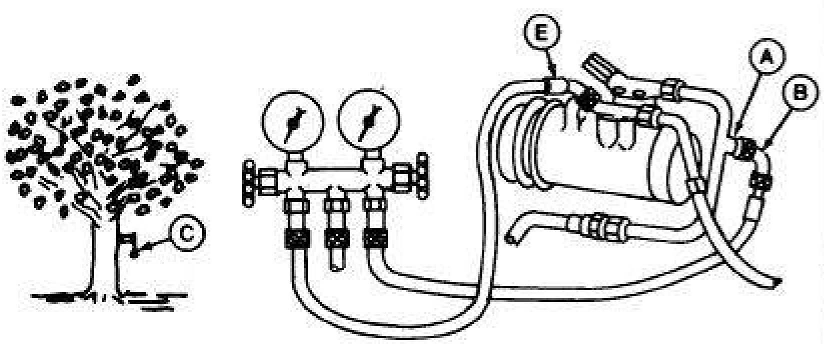
Step	*Result*
(8) ENGINE ON OPERATION CHECKS:	Checks are not normal — GO TO STEP 9
a) Key switch "ON." b) Engine at 2000 rpm. c) Blower at high. d) Temperature control switch at "MAX." e) Receiver-drier sight glass should be free of bubbles. f) Compressor suction tube should be cool or cold. g) Air from blower motor air ducts should be cold. h) Check the ambient air temperature (in shade) and temperature at center air duct lowers after 10-15 minutes of continuous operation and compare to the following chart.	Checks are normal but -Hi pressure lamp comes on — GO TO STEP 55
	Checks are normal but -Compressor clutch disengages — GO TO STEP 53
	Checks are normal but system does not cool properly — GO TO STEP 9

AMBIENT TEMPERATURE	MIN. TEMPERATURE DIFFERENCE
BELOW 75°F	20°F
BELOW 75 & 90°F	25°F
ABOVE 90°F	30°F

(9) INSTALL TEST EQUIPMENT AS ILLUSTRATED

Installgauge manifold high pressure hose (B) to discharge fitting (A). Connect low pressure hose to suction fitting (E) on compressor. Place a thermometer (C) in shade.

Result: Reconnect hi pressure switch leads and. . . GO TO STEP 10



NOTE: Purge air from hoses.

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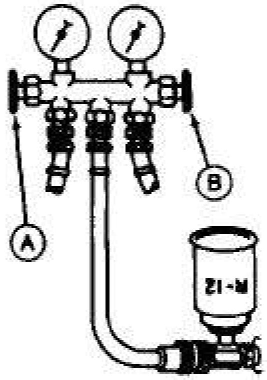
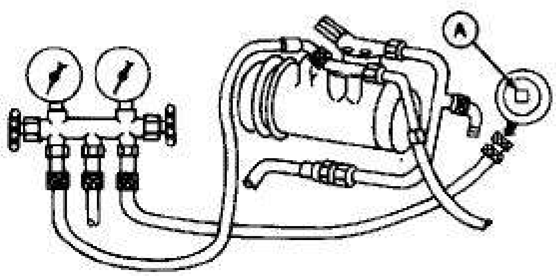
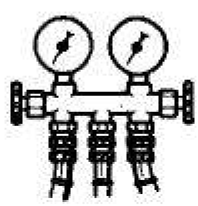
Step		*Result*	
(10) 1. Compressor off. Connect R-12 can valve to gauge manifold as shown. Can valve closed.  "OPEN" both Low (A) and High (B) side gauge valves to stabilize pressures.	2. Compare gauge readings to chart: (see table below) **CAUTION: Close both High and Low side pressure valves after pressure stabilize.**	Pressure OK	GO TO STEP 13
		No pressure	GO TO STEP 11
		Low pressure	GO TO STEP 12
(11) 1. Check test hoses for missing or damaged schrader valve depressor (A).  Repair and reconnect hoses.	2. Check gauges for pressure. 	Pressure	GO TO STEP 10
		No pressure	GO TO STEP 12

TEMPERATURE °F	TEMPERATURE °C	MINIMUM PRESSURE PSI	MINIMUM PRESSURE BAR
60	15	55	3.7
65	18	60	4.0
70	21	65	4.4
75	24	70	4.8
80	27	75	5.1
85	29	80	5.4
90	32	85	5.8
95	35	90	6.1
100	38	95	6.5
105	41	100	6.8
110	43	105	7.1
115	46	110	7.5

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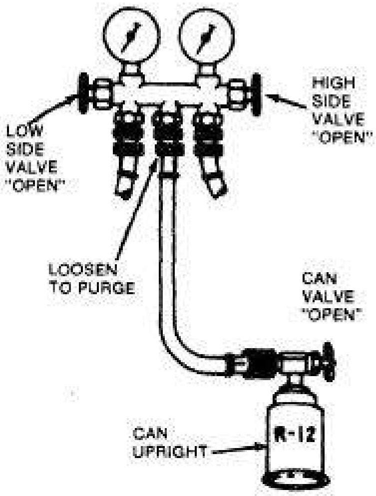
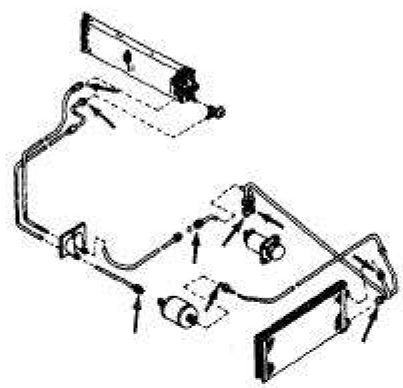
Step		*Result*
(12) Compressor off. Purge air from charging hose. Open low and high side valves.  	Open R-12 can valve. Add R-12 until pressure stabilizes. CAUTION: Close manifold valves before starting compressor. Check all components, joints and line connections for R-12 leakage with a leakage detector. 	NO LEAKS — GO TO STEP 13 LEAKS: REPAIR*, THEN... — GO TO STEP 9 *DISCHARGING, EVACUATING AND CHARGING MAY BE NECESSARY
(13) TEMPERATURE CONTROL SWITCH CHECK: a) Cab doors closed. b) Engine at 2000 rpm. c) Blower switch at high. d) Temp. control switch at "MAX." e) Operate system for 10 minutes. f) Observe compressor clutch for cycle time. g) SPEC. below 85°F (29°C). h) "Minimum" cycle time 30 seconds.		CYCLE TIME LESS THAN 30 SECONDS — GO TO STEP 14 CYCLE TIME MORE THAN 30 SECONDS — GO TO STEP 17 HI-PRESSURE LAMP COMES ON AND COMPRESSOR STOPS — GO TO STEP 20
(14) CAUSES OR FREQUENT CLUTCH CYCLING ARE: a) Blower motor inoperative. b) Air intake and recirculating filters dirty. c) Evaporator dirty.		CORRECT CONDITION THEN... — GO TO STEP 13
d) Temperature control switch capillary tube incorrectly located in evaporator. e) Temperature control switch temperature range set too cold (NOTE: First attempt D.)		IF D OR E NEEDS REPAIR OR CORRECTIONS... — GO TO STEP 15

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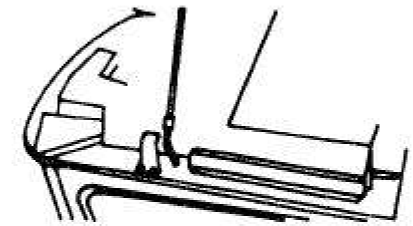
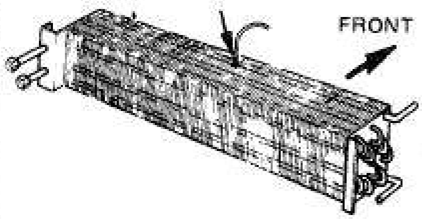
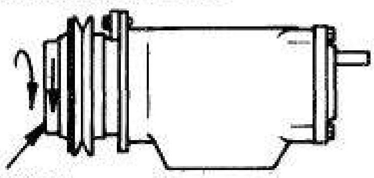
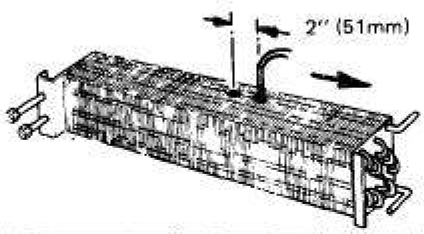
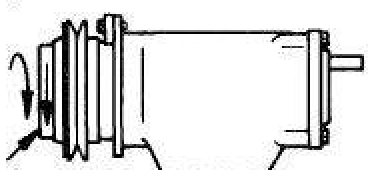
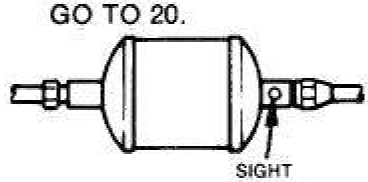
Step		*Result*	
(15) Raise cab roof. Remove pressurizer cover.  NOTE: Reinstall cab roof panel after testing or repair.	Place tube vertical between 1st and 2nd refrigerant tubes 15" from LH side of evaporator. Push tube all the way to bottom.  NOTE: If tube is vertical, GO TO 16. IMPORTANT: Pressurizer cover must be secured at each corner for all checks. Engine at 2000 rpm. Compressor operating. Observe clutch cycle time. 	Cycle time more than 30 seconds Cycle time less than 30 seconds	GO TO STEP 17 GO TO STEP 16
(16) Move capillary tube at 2" (51mm) intervals (two moves only) from center of evaporator toward RH end of evaporator. 	Observe compressor clutch cycle time.  IMPORTANT: Pressurizer cover must be secured at each corner for all checks.	Cycle time more than 30 seconds Cycle time less than 30 seconds Unable to obtain correct cycle time replace switch, then. .	GO TO STEP 17 REPEAT STEP 16 GO TO STEP 13
(17) RECEIVER-DRIER SIGHT GLASS CHECK: Engine at 2000 rpm. Compressor operating. Check receiver-drier sight glass for bubbles. NOTE: If Hi or Lo-pressure switches are activated compressor may have to be temporarily "Hot Wired" to check the system.	⚠ CAUTION: Bubbles with high discharge pressure or very slow bubbles and a vacuum. GO TO 20. 	No bubbles OK. . . Bubbles not OK. . .	GO TO STEP 20 GO TO STEP 18

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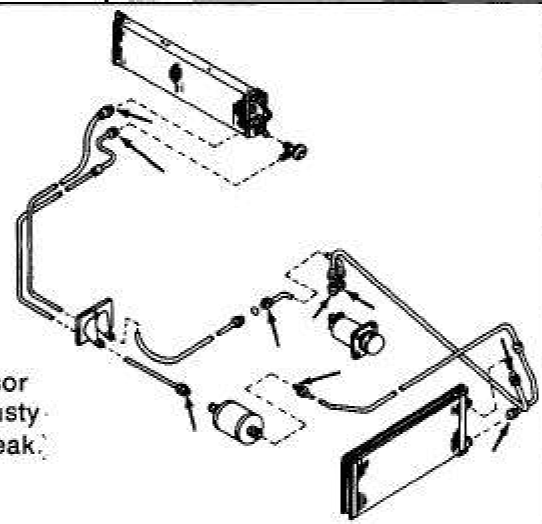
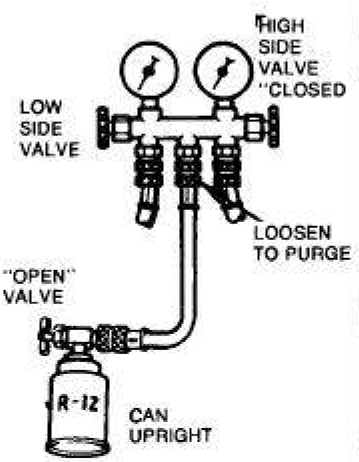
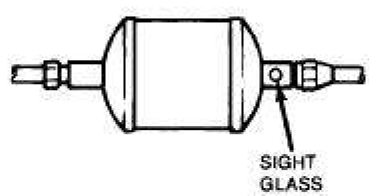
Step	*Sequence*	*Result*
(18) Check all components, joints and line connections for R-12 leakage with a leakage detector. NOTE: Check low and high sides with engine off. Repeat check on high side with compressor operating. Any damp, dusty spot indicates an R-12 leak.		No leaks: GO TO 19 Leaks: Repair.* Then . . . GO TO 9 *Discharging, evacuating and charging may be necessary.
(19) Connect R-12 container to gauge manifold as shown: Purge air from charging hose.  	Compressor operating. Engine at 2000 rpm. Open low side valve not to exceed (276 kPa) (2.76 bar) 40 psi. Add R-12 until bubbles disappear in receiver-drier sight glass, then add (460 ml) 16 oz. more.  	GO TO STEP 18. Then. . . GO TO 17

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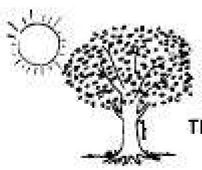
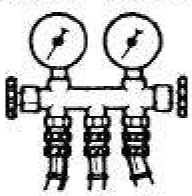
Step	*Sequence*	*Result*

(20) SYSTEM PRESSURE CHECK

Compressor operating. Engine at 2000 rpm. Blower at high. Cab doors closed. Check ambient temperature and gauge pressures.



TEMP.



Compare temperature and pressure readings to specification chart.

NOTE: The lower figures correspond to humidity near 10%. The higher figures correspond to humidity near 90%.

Specification Chart

Temp. °C	Suction kPa	Discharge kPa
11-16	7-70	690-1034
16-21	14-103	327-1171
22-27	28-138	896-1344
27-32	34-172	1000-1550
33-38	70-207	1102-1791
38-43	103-241	1205-2067

Temp. °C	Suction bar	Discharge bar
11-16	0.07-0.7	6.9-10.3
16-21	0.14-1.03	8.3-11.7
22-27	0.28-1.4	9.0-13.4
27-32	0.35-1.8	10.0-15.5
33-38	0.7-2.1	11.0-17.9
38-43	1.0-2.4	12.0-20.7

Temp °F	Suction PSI	Discharge PSI
51-60	1-10	100-150
61-70	2-15	130-170
71-80	4-20	130-195
81-90	5-25	145-235
91-100	10-30	160-260
101-110	15-35	175-300

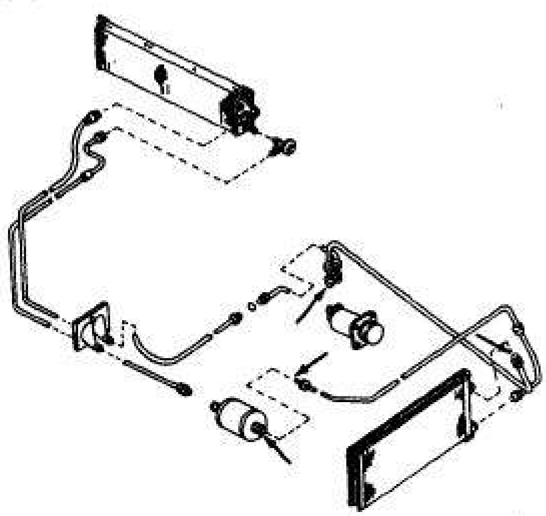
NOTE: If Hi of Lo-pressure switches are activated compressor may have to be temporarily "hot wired" to check the system.

Suction	Discharge	
Normal* or High	Normal*	GO TO 40
Low, Normal or High	High (Bubbles)	GO TO 21
High	Low	GO TO 22
Normal or High	High	GO TO 23
Low or Vacuum	Normal or Low	GO TO 31

*NOTE: Normal pressures but (1) Lo-pressure switch shuts off compressor GO TO (53)

or (2) Hi-pressure lamp comes on GO TO (55)

(21) There is a RESTRICTION at or between the following locations:



1. Compressor and condenser.
2. Condenser
3. Receiver-drier

NOTE: Feeling lines for a temperature change may or may not locate point of restriction.

⚠ CAUTION: These lines are normally hot.

Inspect and Repair.* Then . . . GO TO 9

*Can require discharging, flushing, evacuating and charging.

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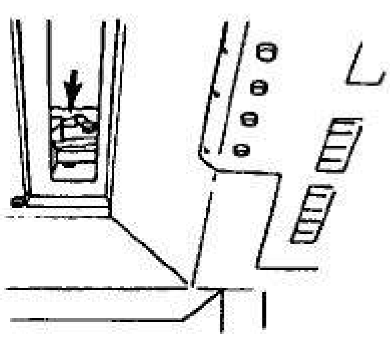
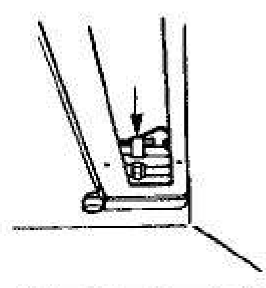
Step	*Sequence*	*Result*
(22) The following are causes of SUCTION HIGH, DICHARGE LOW: 1. Clutch not engaged 2. Belt slipping		Repair. Then . . . GO TO 20
3. Clutch slipping (Cover condenser to obtain higher pressure to check for slippage) NOTE: Repair requires discharging, evacuation and charging system.		Repair. Then . . . GO TO 9
4. COMPRESSOR FAILURE: Repair requires discharging , replacing receiver-drier, flushing, and charging system. Perform compressor voltmetric efficiency test after removal and before installation of compressor on combine.		
(23) The following are causes of SUCTION NORMAL OR HIGH, DISCHARGE HIGH: 1. Restricted air flow through condensor or radiator. NOTE: Reversed heater hoses may also cause this problem.		Clean. Then . . . GO TO 20 If heater hoses are hot GO TO 43
2. TEV thermal bulb is loose or corroded at evaporator tail pipe. 3. System is over-charged with R-12. 4. TEV is stuck open. (or) 5. Air in system.		GO TO 24
(24) Remove recirculating filter. Open insulating tape on evaporator outlet pipe. 	Inspect thermal bulb for corrosion and looseness. 	OK: GO TO 25 Not OK: Repair. Then . . . GO TO 20

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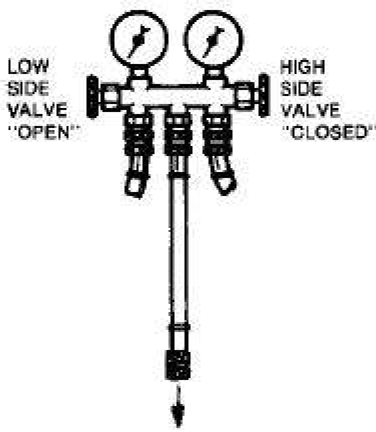
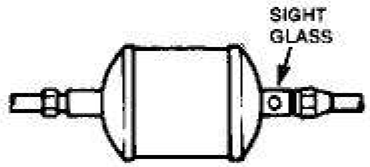
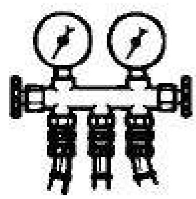
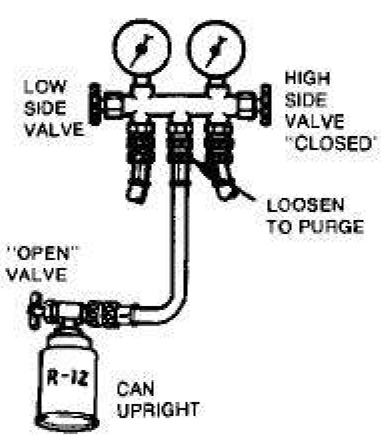
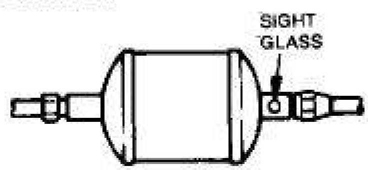
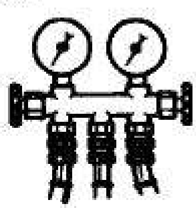
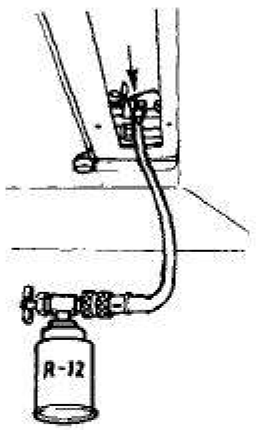
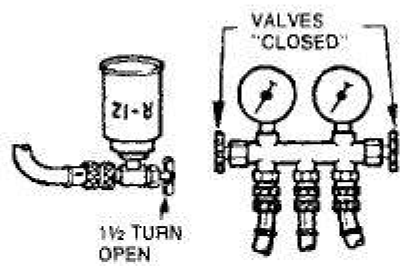
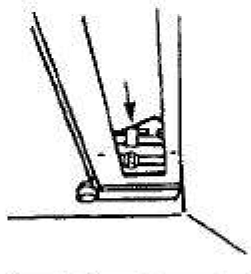
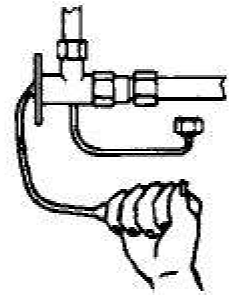
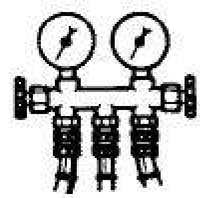
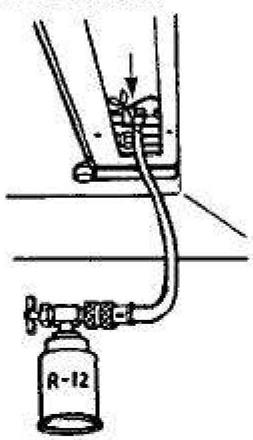
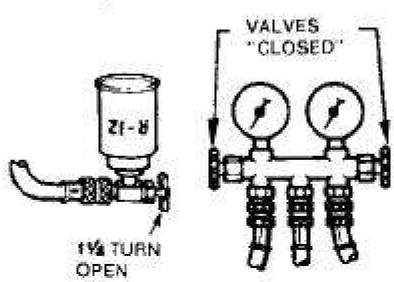
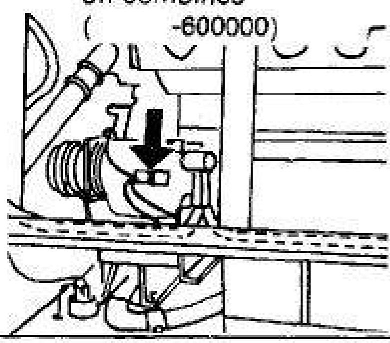
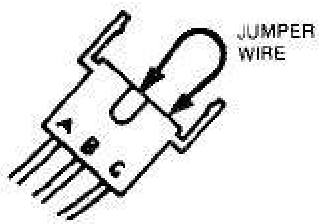
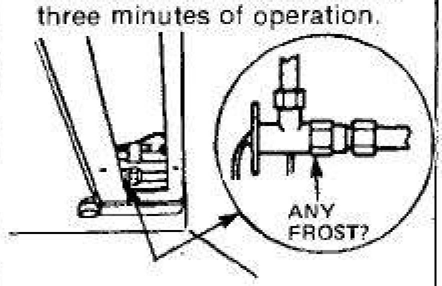
Step	*Sequence*	*Result*
(25) Compressor operating. Engine at 2000 rpm. Open low side (LH) valve to discharge R-12 at a slow rate. 	Observe receiver-drier sight glass until bubbles appear, then close low side (LH) valve.  Check gauge pressures and compare to chart at step 20. 	Discharge Pressure High: GO TO 27 Pressures Normal: GO TO 26
(26) Connect R-12 container to gauge manifold as shown: Purge air from charging hose. 	Engine at 2000 rpm. Compressor operating. Open low side valve not to exceed (276 kPa) (2.76 bar) 40 psi. Add R-12 until bubbles disappear in receiver sight glass. Then add (460 ml) 16 oz. more.  Recheck gauge pressures and compare to chart at step 20. 	Pressures Normal: GO TO 40 Pressures High: GO TO 27

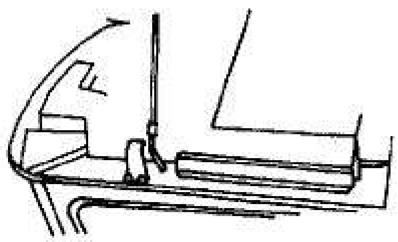
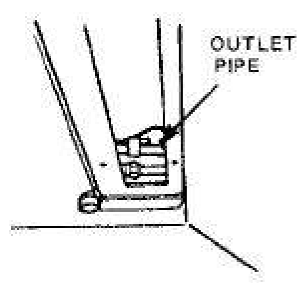
Step	*Sequence*	*Result*
(27) Connect a hose to a can of R-12. Tie open end of hose to thermal bulb of TEV as shown: 	Engine at 2000 rpm. Compressor operating. Open valve on R-12 can 1½ turn. Invert can for 10-15 seconds. Then close R-12 can valve. Observe suction pressure gauge for a pressure decrease.  ⚠ CAUTION: Stand to one side to prevent contact with liquid R-12. Wear your goggles.	Pressure Did Not Decrease: GO TO 28 Pressure Decreased: GO TO 29
(28) The TEV is sticking. Perform the following: 1. Discharge system. 2. Remove TEV inlet hose and remove screen for inspection. A. Screen is dirty 1. Flush line between receiver-drier and TEV 2. Replace receiver-drier 3. Add .75 oz (22 ml) refrigerant oil. 4. Do not install screen. Discard screen. B. Screen is clean. Do not replace receiver-drier unless more than two years old. Do not install screen. 3. If necessary, remove TEV and perform bench test. 4. Install a new TEV and connect all components. 5. Evacuate system. 6. Charge system with R-12. NOTE: Combines with these serial numbers have had the screen removed. 6620 (454642-) 7720 (461857-) 8820 (183744-)		After Charging: GO TO 20

Step	*Sequence*	*Result*
(29) The TEV is intermittently sticking open or there is air in the system. Perform the following: TEV check: Compressor operating. Engine at 2000 rpm.		
A. Remove thermal bulb of TEV from evaporator outlet pipe. 	Warm bulb with hand for one minute. Check pressure gauges for increase in pressure.   NOTE: Reattach bulb and insulate after testing or repair.	
B. Connect a hose to a can of R-12. Tie open end of hose to thermal bulb of TEV as shown:  	Open valve on R-12 can 1½ turn. Invert can for 10-15 seconds. The close R-12 can valve. Observe suction pressure gauge for a pressure decrease.  CAUTION: Stand to one side to prevent contact with liquid R-12. Wear your goggles.	Pressure Increases and Decreases: GO TO 30 Pressure Does Not Always Change: GO TO 28

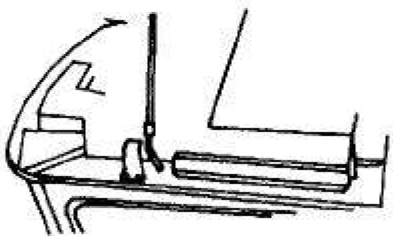
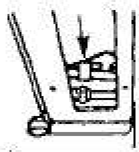
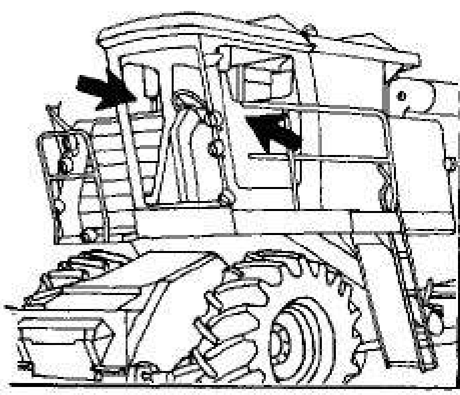
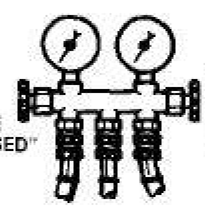
H37866

Step	*Sequence*	*Result*
(30) There is air in the system. Perform the following: 1. Discharge system. 2. Evacuate system. 3. Charge system with R-12.		After Charging: GO TO 20
(31) The following are causes of SUCTION LOW OR VACUUM, DISCHARGE NORMAL OR LOW: 1. Blower motor inoperative. 2. Dirty recirculating and fresh air filter. (Discharge may be normal or low.)		Repair or clean. Then . . . GO TO 20
3. RESTRICTION: (Discharge may be normal or low.) a. Between condenser and receiver-drier. b. At receiver-drier c. Between receiver-drier and TEV **d. At TEV (inlet screen partially clogged-do not install screen)** 4. TEV stuck closed or no gas charge in thermal bulb. (Discharge will be Low.) 5. Moisture in system. (Discharge may be normal or low.)		**NOTE: On combines (600001-)** GO TO (33) GO TO 32
(32) **Remove thermal fuse from clutch lead. Only on combines (-600000)** 	Connect a jumper wire between power and clutch terminals as shown:  NOTE: Reinstall thermal fuse after testing or repair.	GO TO 33
(33) **Compressor operating. Engine at 2000 rpm. Cab doors closed. Blower at high. Remove recirculating filter. Open insulating tape on thermal expansion valve.**	Check TEV for frost before valve outlet connection after three minutes of operation.  NOTE: Recover TEV and bulb and reinstall recirculating filter after testing or repair.	No Frost: GO TO 36 Frost: GO TO 34

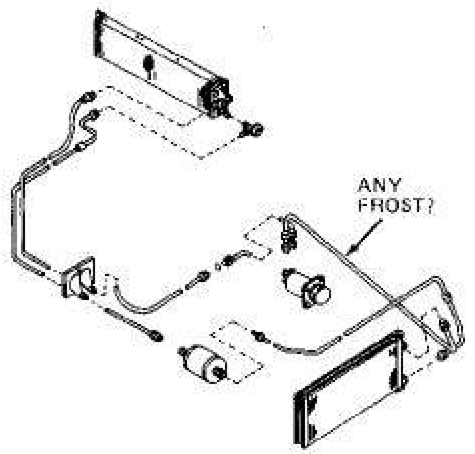
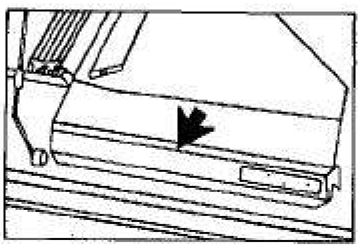
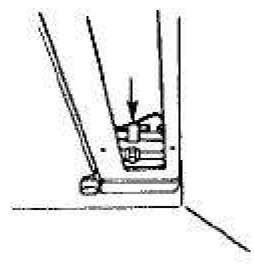
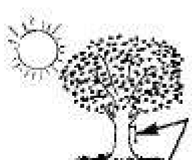
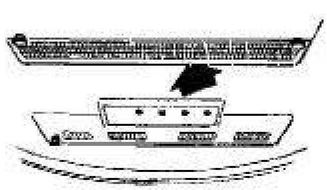
H37889

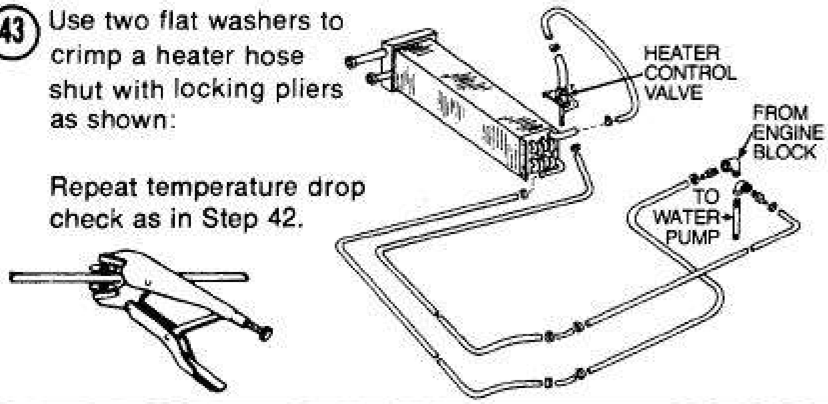
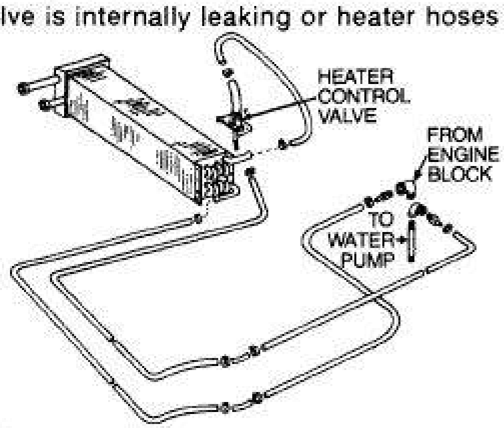
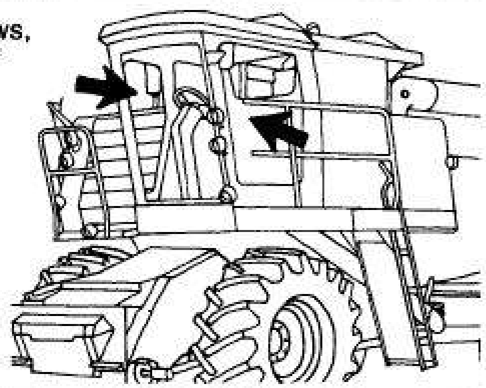
Step	*Sequence*	*Result*
(34) Raise cab roof.  NOTE: Reinstall all roof and cover screws after testing or repair.	Compressor operating. Engine at 2000 rpm. Inspect line from condenser to TEV inlet for frost or a temperature change. NOTE: A temperature change indicates a restriction.	No Frost or Temp. Change: GO TO 35 Frost or Temp. Change: Repair* Restriction. After Charging . . . GO TO 20 *May require discharging, flushing, evacuating and charging system.
(35) TEV inlet screen is partially clogged or gas charge is low in thermal bulb. Inspect TEV as follows: 1. Discharge system. 2. Remove TEV inlet hose and remove screen for inspection: A. Screen is dirty: (1) Do not install screen. Discard screen. (2) Flush line between receiver-drier and TEV. (3) Replace receiver-drier. (4) Add (22 ml) .75 oz of refrigerant oil. B. Screen is clean. (1) Replace TEV. (2) DO NOT replace receiver-drier unless more than two years old, however it must be replaced if the system has been contaminated. 3. Connect all components and purge system. 4. Evacuate system. 5. Charge system with R-12.		After Charging: GO TO 20
(36) Compressor operating. Engine at 2000 rpm. Cab doors closed. Blower at high. Recirculating filter removed.	Open insulating tape on thermal bulb of TEV. Inspect evaporator outlet pipe for frost.  	No Frost: GO TO 37 Frost: GO TO 38

H36821

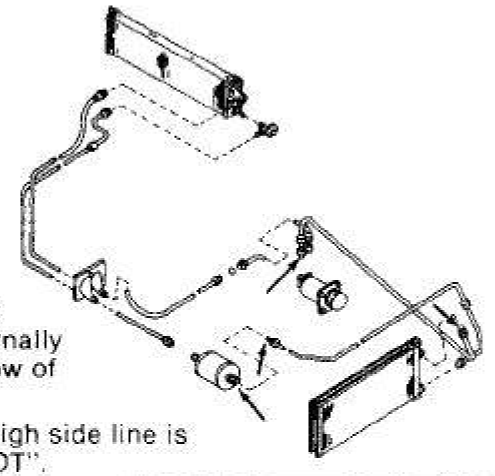
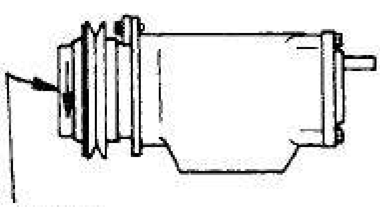
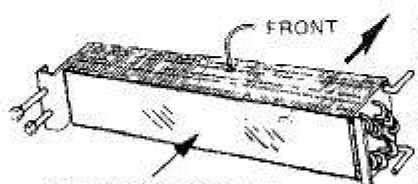
Step	*Sequence*	*Result*
(37) Raise cab roof.  Open insulation on evaporator outlet through recirculating filter opening. 	Inspect line for a point where frost starts to accumulate or a temperature change: 1. Between evaporator outlet and compressor, or 2. Between evaporator and compressor suction side. NOTE: A very slight temperature change usually indicates a restriction.	No Frost or Temp. Change: GO TO 38 Frost or Temp. Change: Repair* Restriction. Then . . . GO TO 20 *May require discharging, flushing, evacuating and charging system.
(38) Stop compressor for 3 minutes. Open cab doors. 	Compressor operating. Engine at 2000 rpm. Cab doors closed. Compare pressure readings to chart at step 20 after 2 minutes operation. 	Pressures Normal: Moisture in system. GO TO 56 Pressures Low: GO TO 39
(39) TEV thermal bulb has lost gas charge, TEV is stuck closed or screen is clogged. Inspect TEV as follows: 1. Discharge system. 2. Remove TEV inlet hose and remove screen for inspection: A. Screen is clogged: (1) Do not install screen. Discard screen. (2) Flush line between receiver-drier and TEV inlet (3) Replace receiver-drier (4) Add (22 ml) .75 oz refrigerant oil. B. Screen is clean. (1) Replace TEV. (2) DO NOT change receiver-drier unless more than two years old. 3. Evacuate system. 4. Charge system with R-12.		After Charging: GO TO 20

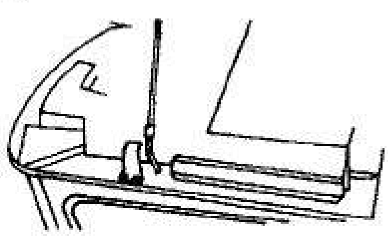
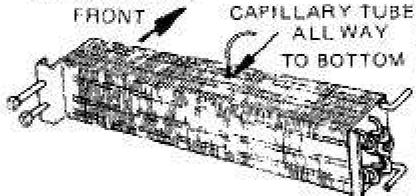
H37891

Step	Sequence		Result
(40) Compressor operating. Engine at 2000 rpm for at least 10 minutes. Inspect suction line from evaporator to compressor for frost.			No frost: GO TO 42 Frost: GO TO 41
(41) Remove recirculating filter. 	"OPEN" insulating tape on outlet of evaporator. Check TEV thermal bulb for looseness or corrosion. 		OK: GO TO 42 Not OK: Repair. Then... GO TO 42
(42) **TEMPERATURE DROP CHECK:** Record ambient temperature in shade. 	Compressor operating. Engine at 2000 rpm. Place thermometer in blower air duct. Blower switch at high. After 20 minutes minimum continuous operating time with cab doors closed, record air duct temperature. 	AMB. TEMP. below 90°F (32°C) <u>Spec. (Min.)</u> 25°F (14°C) — — — — — AMB. TEMP. 90°F (32°C) and above <u>Spec. (Min.)</u> 30°F (16°C)	In Spec.: GO TO 48 Out of Spec.: GO TO 43

Step	Result
(43) Use two flat washers to crimp a heater hose shut with locking pliers as shown: Repeat temperature drop check as in Step 42. 	In Spec.: GO TO 44 Out of Spec.: GO TO 45
(44) Heater valve is internally leaking or heater hoses are reversed. 	Repair. Then ... GO TO 42
(45) Check doors, windows, panels and seams of cab for air leakage. 	No Leaks: GO TO 46 Leaks: Repair. Then ... GO TO 42
(46) Lack of cooling can be caused by dirty components. Check the following: 1. Recirculating filter 2. Blower air duct and fan cages 3. Condenser 4. Radiator (or) 5. Evaporator NOTE: Check for damaged cooling fins of condenser, radiator and evaporator.	Not Dirty: GO TO 47 Dirty: Clean. Then ... GO TO 42

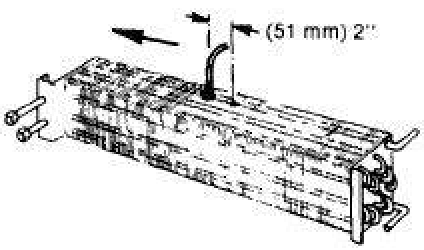
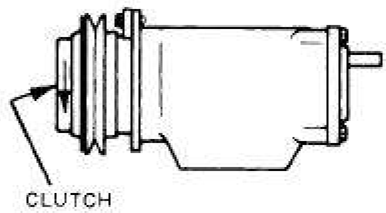
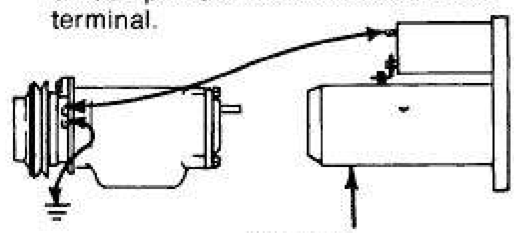
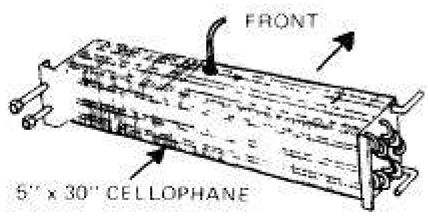
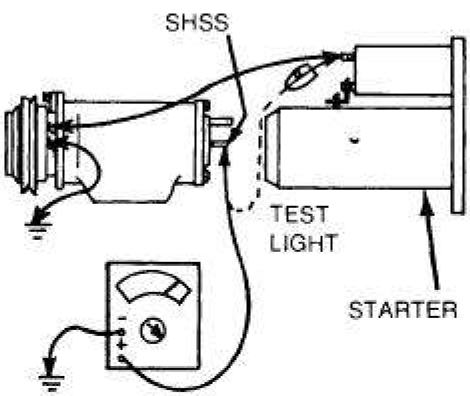
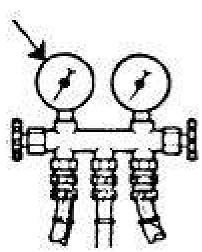
H37893

<table>
<tr><th>Step</th><th>Sequence</th><th>Result</th></tr>
<tr>
<td colspan="2">(47) Compressor operating. Engine at 2000 rpm. Feel along entire length of high side from compressor to expansion valve for a temperature change.
NOTE: Tubing may be dented, kinked or internally blocked, restricting flow of R-12.
CAUTION: High side line is normally "HOT".
</td>
<td>NOTE: If compressor runs extremely warm, check for bent by-pass tube on TEV.
No Temp. Change: No Restriction. GO TO 48
Temp. Change: Repair* Restriction. Then... GO TO 20
*Discharging, Evacuating and Charging may be necessary.</td>
</tr>
<tr>
<td>(48) CLUTCH CYCLE CHECK: Cab doors closed. Blower switch at high. Compressor operating. Engine at 2000 rpm. Observe compressor clutch for cycling within 10 minutes of operation.

</td>
<td>Remove recirculating filter. Place a piece of cellophane across rear of evaporator. Clutch should cycle in 20 seconds if AMB. TEMP. is below 75°F (24°C). 40 seconds if AMB. TEMP. is between 75 and 90°F (24 and 32°C). 60 seconds if AMB. TEMP. is above 90°F (32°C).


Remove cellophane after testing.</td>
<td>Clutch Cycles: GO TO 51
Clutch Cycle Time Out of Spec.: GO TO 49</td>
</tr>
<tr>
<td>(49) Raise cab roof.

NOTE: Reinstall all roof and cover screws after testing or repair.</td>
<td>Place capillary tube vertical 15" from LH side between 1st and 2nd refrigerant tubes of evaporator.


NOTE: If tube is vertical, GO TO 50.
IMPORTANT: Pressurizer cover must be secured at each corner for all checks.</td>
<td>Clutch Cycles: GO TO 51
Clutch Does Not Cycle: GO TO 50</td>
</tr>
</table>

H37934

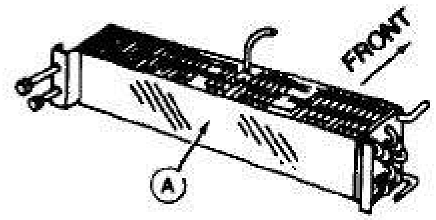
Step	*Sequence*	*Result*
(50) Move capillary tube at (51 mm) 2" intervals (2 moves only) from center of evaporator toward LH end. 	Observe compressor clutch for cycling.  IMPORTANT: Pressurizer cover must be secured at each corner for all checks.	Clutch Cycles: **GO TO 51** Clutch Does Not Cycle: **REPEAT 50** Unable to Cycle Clutch: Replace temp. switch. Then... **GO TO 48**
(51) COMBINES (600001-).......... GO TO 53 SUPER HEAT SHUT-OFF SWITCH CHECK: Connect a jumper lead from starter solenoid battery terminal to a terminal on compressor clutch. Ground other terminal. 	Remove Recirculating Filter. Cab doors closed. Blower switch at high. Temp. switch at max. Engine at 2000 rpm. Place a piece of cellophane across rear of evaporator.  Remove cellophane after testing	**GO TO 52**
(52) Connect an ohmmeter or test light to SHSS as shown. 	Observe gauge manifold suction pressure. After three minutes check test light or ohmmeter for continuity.  MANUFACTURER SPEC. CONTINUITY AT: 0 psi and 140-170°F 5" Hg at 135° to 150°F 10" Hg at 125° to 145°F	No continuity above 5" Hg: Normal. **GO TO 54** Continuity above 5" Hg: Replace SHSS. Then... **REPEAT 52**

H37896

Step	*Result*

(53) LOW PRESSURE SWITCH CHECK:

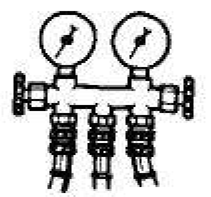
1. Remove recirculating filter and place 5" x 30" cellophane (A) across rear of evaporator.



NOTE: Reinstall filter after test.

2. Cab doors closed. Blower switch at high, temperature switch at "Max." Engine at 2000 rpm.

3. Observe gauge Discharge pressure for 10 minutes.



NOTE: Reconnect original clutch coil lead and remove cellophane from evaporator after this check.

Result:

Compressor shuts off at 200-241 kPa (29-35 psi) and turns on when pressure increases to 255-296 kPa (37-43 psi) — GO TO STEP 55

Compressor still on with pressure below 200 kPa (29 psi): Replace switch, then: — REPEAT STEP 53

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(54) *If the system checks out to be NORMAL at this step and any problem (including cleaning filters) has been corrected, the system is NORMAL.*

Result: RELEASE COMBINE FOR OPERATION

If the system checks out to be NORMAL at this step, there is the possibility of moisture in the system.

a) *If the system DOES NOT COOL PROPERLY ABOVE APPROXIMATELY* 80°F. (27°C) ambient temperature, the problem is not moisture in the system.

Result: Repeat System Diagnosis — GO TO STEP 9

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b) If the system cools satisfactory above approximately 80°F (27°C) ambient temperature, but DOES NOT COOL PROPERLY AT OR BELOW 80°F (27°C), there is moisture in the system.

IMPORTANT: If the temperature control and Lo-pressure switches are not functioning within their specified ranges, the conclusion of moisture in the system would be incorrect.

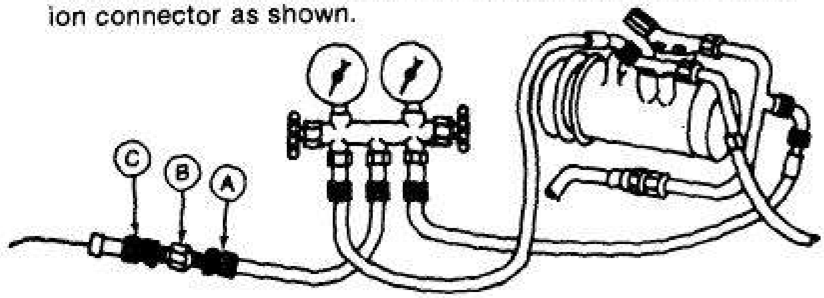
Result: GO TO STEP 56

H27896

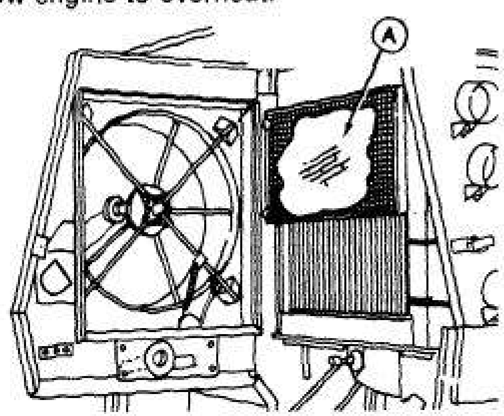
<table>
<tr><th colspan="3">Step</th><th>Result</th></tr>
<tr><td colspan="3">

(55) HIGH PRESSURE SWITCH AND LAMP CHECK:

1. Install ¼ in. union connector (B) (from JDG-247) on center hose (A) of gauge set. Connect Hi-pressure switch (C) to union connector as shown.



2. Cover condenser/oil coller with cardboard.
IMPORTANT: Frequently check engine coolant gauge DO NOT allow engine to overheat.



</td><td rowspan="2">

Compressor OFF and lamp ON at 2310-2517 kPa (335-365 psi) OK. GO TO STEP 54

Compressor ON and lamp OFF above 2517 kPa (365 psi) or compressor OFF and lamp ON below 2310 kPa (335 psi): Replace Hi-pressure Switch then: REPEAT STEP 55

</td></tr>
<tr><td>3. Blower at "High" temperature at "Max" and engine at 2000 rpm. Slowly open high side valve on gauge set. Observe gauge discharge pressure and hi-pressure lamp.
IMPORTANT: DO NOT let pressure exceed 2930 kPa (29.3 bar) (425 psi).</td><td>NOTE: Intermittent pressure lamp operation is evidence of poor wiring circuit connections.</td><td>4. remove cardboard from condenser/oil cooler after testing.</td></tr>
<tr><td colspan="3">

(56) Remove moisture from system as follows:

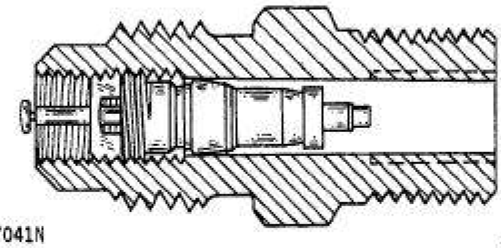
1. Discharge system.
2. Purge system with R-12 or dry nitrogen while changing receiver-drier.
3. Evacuate system.
4. Charge system with R-12.
5. Repeat test sequence.

</td><td>After Charging: GO TO 20</td></tr>
</table>

H37897

SYSTEM SERVICE

SERVICE (SCHRADER) VALVES



R 27041N

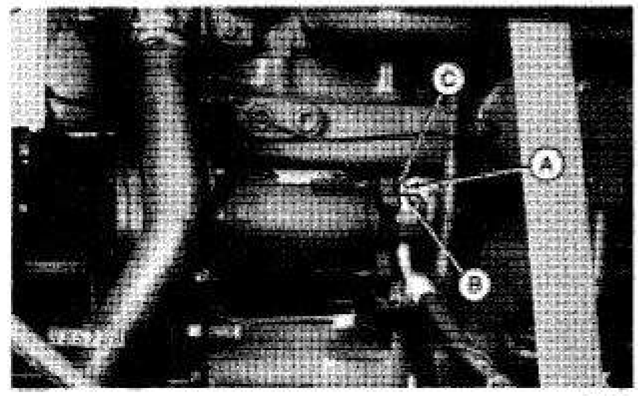
Fig. 13-Schrader Valve

When the fitting in the end of the service hose is screwed onto the Schrader valve (Fig. 13), a pin is depressed in the center of the valve allowing pressure to be read on the gauges. When the fitting is removed, the valve closes.

MANIFOLD GAUGE SET

Installation

IMPORTANT: Always disconnect the wiring lead from the superheat shutoff switch before doing any service work on the air conditioning system.



H35728

A—Acorn Caps
B—Intake Port
C—Discharge Port

Fig. 14-Compressor With Schrader Valves

1. Put on safety glasses.

2. Slowly remove acorn caps (A, Fig. 14) from the low and high side service ports, insuring that no refrigerant is leaking past a defective Schrader valve.

3. Be sure that the service hoses are equipped with a Schrader valve depressing pin.

4. Close hand shutoff valves on manifold.

5. Connect low side manifold hose (blue or green) to the intake (suction) port (B) of the compressor.

6. Connect high-pressure manifold hose (red) to the discharge port (C) of the compressor. Insure that high side valve is tight.

Purging The Hoses

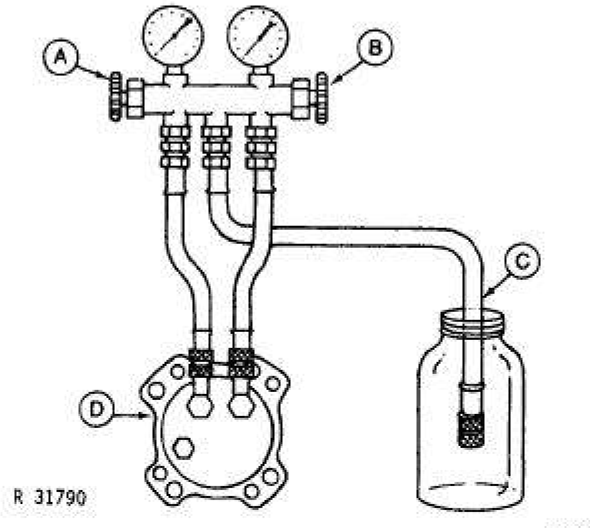
1. Crack low side service valve on the manifold. Wait a few seconds and close.

2. Crack high side service valve on the manifold. Wait a few seconds and close.

3. Air should now be purged from the service hoses.

DISCHARGING THE SYSTEM

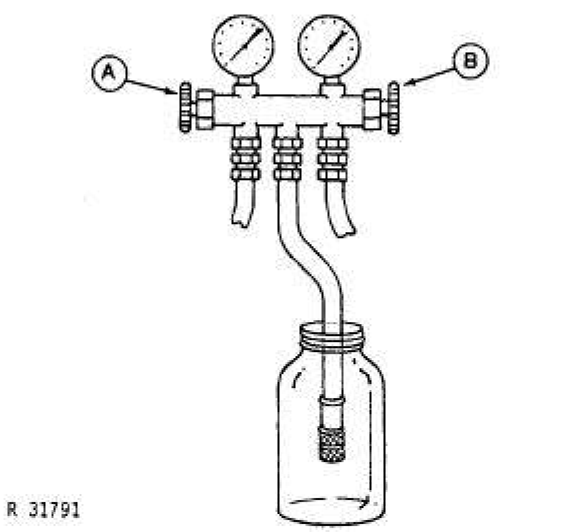
The following sequence will decrease discharging time and blow less oil out of the compressor or system by discharging from the high side.



A—Low Side Valve Closed
B—High Side Valve Open
C—Hold Hose In Quart Jar
D—Rear View of Compressor

Fig. 15-Discharging The System

1. Connect manifold gauge set to compressor test fittings as shown in Fig. 15.



A—Low Side Valve Open **B—High Side Valve Open**

Fig. 16-Discharging The System

2. When pressure is below 40 psi (276 kPa) (2.76 bar) open low side valve.

3. Measure oil blown out of system after completely discharged.

4. If system is to be flushed, add a new charge of oil. See Adding Refrigerant Oil to the System, Page 290-10-42.

5. If system is not to be flushed, add same amount of new oil blown out of system. See Adding Oil to System page 290-10-42.

6. If R-12 or oil leakage was detected, add new oil. See Adding Refrigerant Oil to the System page 290-10-42.

Flushing The System

Flushing the system with R-11 (Flushing Solvent) is recommended whenever there is an internal failure of the compressor, or a system has been left open and water or dirt could have been blown into the system.

Flushing with R-11 is more effective than flushing with R-12 for the following reasons:

a) R-11 stays in a liquid state up to 76°F (24°C).

b) Will not freeze moisture in system above 32°F (0°C). (R-12 will freeze moisture with zero pressure.)

c) Will move moisture and debris out of system more rapidly above 32°F (0°C).

d) R-11 will not freeze your skin when in direct contact. (R-12 will freeze on contact.)

Components can be flushed on combine (except compressor) with R-11 as follows:

1. Isolate the compressor, receiver-dryer and expansion valve from system.

2. Flush all components individually.

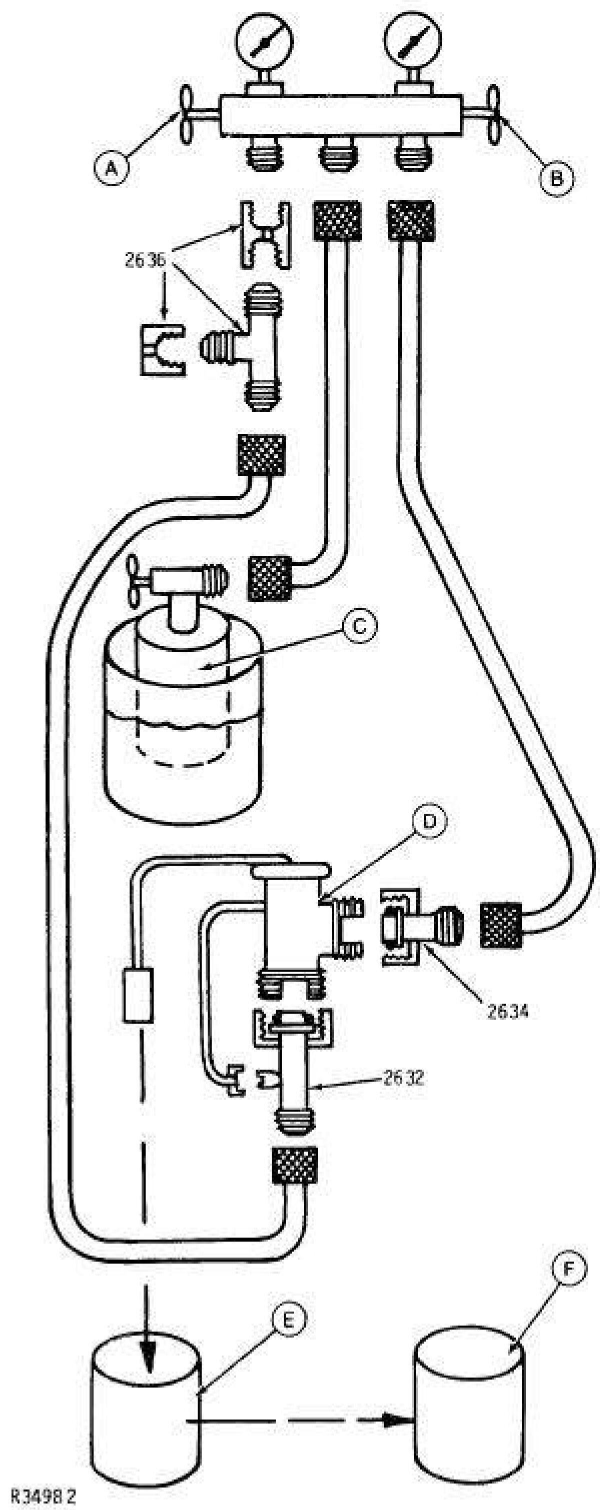
3. Remove compressor, drain oil, add R-11 through drain port, shake compressor and drain.

4. Add oil. See Adding Refrigerant Oil to the System, page 290-10-42.

5. After flushing with R-11 connect all components.

6. Purge complete system with dry nitrogen or R-12. See Purging The System, page 290-10-43.

BENCH TESTING THERMAL EXPANSION VALVE



A—Low Side Valve
B—High Side Valve
C—R-12 Container
D—Thermal Expansion Valve
E—Container with Ice Water
F—Container with Hot Water

Fig. 17-Schematic Diagram for Testing Thermal Expansion Valves

1. Close low and high gauge manifold valves (A and B, Fig. 17), and install No. 2636 special tee fitting with 0.020 in. orifice cap to low side manifold connector.

2. Install No. 2632 special fitting (Fig. 17) on outlet of expansion valve.

3. Connect test hose from special fitting on outlet of expansion valve to fitting on low side of manifold gauge.

4. Install No. 2634 fitting on inlet of expansion valve and connect test hose to it and high side of manifold gauge.

5. Install test hose to center fitting on manifold gauge and connect to R-12 container (C).

6. Place some ice in a container (E) with a small amount of water and sprinkle some rock salt over ice to obtain 26° - 32°F (−4° - 0°C) temperature.

7. Place some hot 115° - 125°F (43° - 58°C) water in a second container (F).

8. Place R-12 can in container of warm water not exceeding 125°F (52°C).

9. Open valve on R-12 can.

10. Open high side manifold gauge valve to maintain 70 - 75 psi (483 - 517 kPa) (4.8 - 5.0 bar) on high side gauge.

11. Hold sensing bulb in ice water until low side gauge stabilizes. Pressure should be 20 - 25 psi (138 - 172 kPa) (1.4 - 1.7 bar).

a) If pressure is above 25 psi (172 kPa) (1.7 bar), valve did not close enough.

b) If pressure is less than 20 psi (138 kPa) (1.4 bar), valve closed too much.

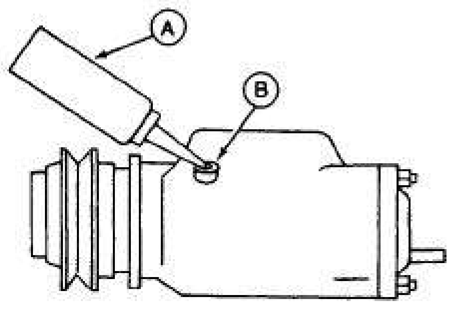
12. Hold sensing bulb in hot water until low side gauge pressure stabilizes. Pressure should be 40 - 55 psi (275 - 380 kPa) (2.7 - 3.8 bar).

a) If pressure is above 55 psi (380 kPa) (3.8 bar), valve is open too far.

b) If pressure is below 40 psi (275 kPa) (2.7 bar), valve did not open far enough.

13. If valve does not meet specifications after completing test as instructed above, replace thermal expansion valve.

ADDING REFRIGERANT OIL TO THE SYSTEM



R 31792

R31792

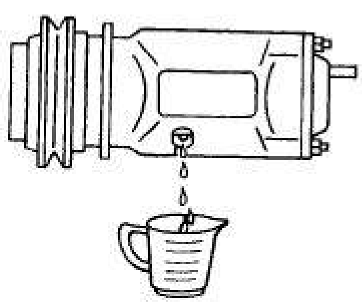
A—Squeeze Bottle **B—Drain Port**

Fig. 18-Adding Oil To Compressor

To determine oil charge needed:

1. After flushing the complete system, add 14 oz. (414 mL) of oil through drain port of compressor with a squeeze bottle (Fig. 18).

NOTE: Use 525 viscosity oil (R49856) only.



R 31793

R31793

Fig. 19-Draining Oil

2. If R-12 or oil leakage was detected and repaired, remove the compressor and measure oil drained (Fig. 19).

a) Less than 3 oz. (90 mL) of oil drained, add 8 oz. (240 mL) of new oil through drain port (Fig. 18).

b) More than 3 oz. (90 mL) of oil drained, add 6.5 oz. (195 mL) of new oil through drain port (Fig. 18).

3. When one of the following components is replaced add the corresponding volume of oil:

a) Compressor: Drain oil and add 6.5 oz. (195 mL).

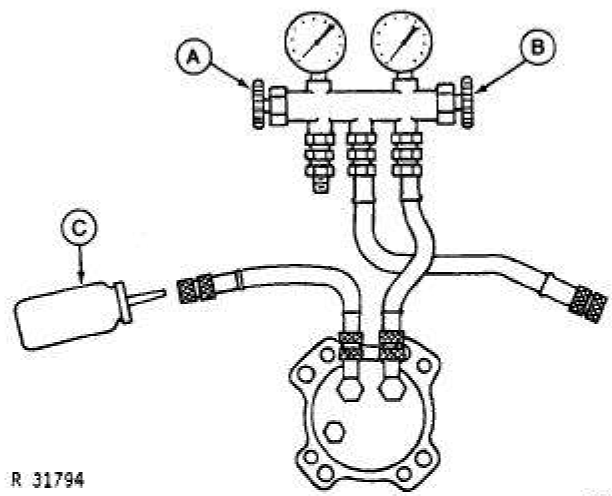
b) Condenser: 1.0 oz. (30 mL).

c) Evaporator: 1.5 oz. (45 mL).

d) Receiver-dryer: 3 oz. (32.6 mL).

e) Any refrigerant line: 0.25 oz. (7 mL) each.

NOTE: Total oil charge is 14 oz. (414 mL).



R 31794

R31794

A—Low Side Valve
B—High Side Valve Open
C—Squeeze Bottle

Fig. 20-Adding Oil To System

4. To add a small amount of oil to the system after a component has been repaired or replaced:

a) Connect gauge manifold hoses to compressor test fittings (Fig. 20).

b) Add measured amount of oil into suction test hose with a squeeze bottle (Fig. 20).

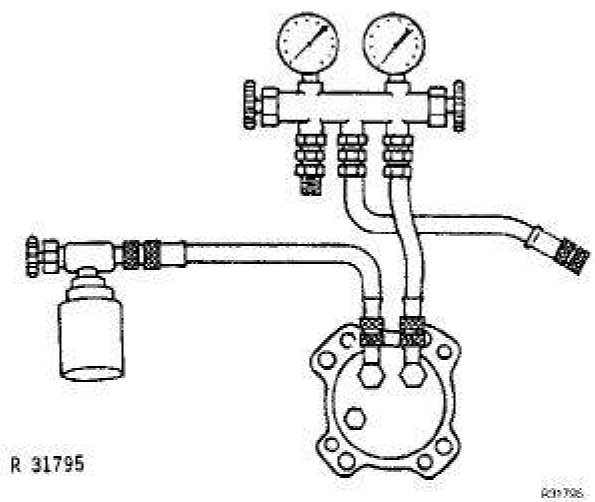


Fig. 21-Blowing Oil Into Compressor

c) Connect a can of R-12 to suction hose (Fig. 21).

d) Open R-12 can valve for 5 seconds to blow oil into compressor.

PURGING THE SYSTEM

Purging the system decreases the amount of air and moisture that could migrate into the system.

1. Purge the system with Dry Nitrogen or R-12 after flushing with R-11 or whenever a component is replaced.

2. Purge the system with 5-20 psi (340-1380 mbar) flow at point of gas entry as follows:

a) Purge replacement components individually for 15-30 seconds.

b) Connect each component after purging.

c) Purge the total system through compressor high side fitting toward condenser, receiver-dryer TEV, evaporator and discharge from compressor low side fitting.

3. Evacuate the system, below.

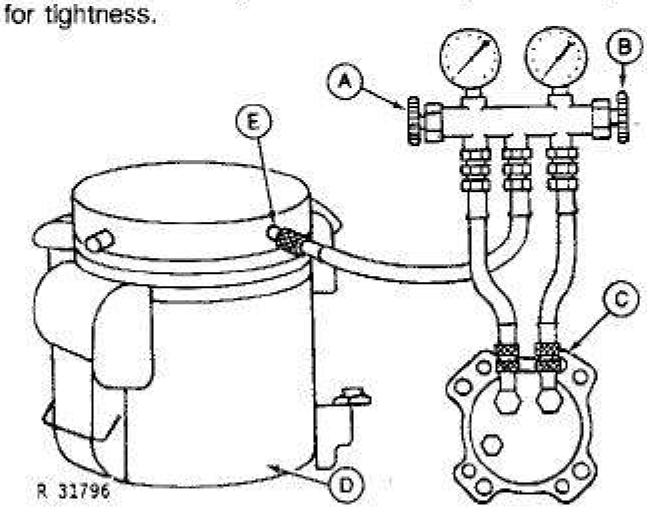
EVACUATING THE SYSTEM

1. Always evacuate the system to remove air and moisture whenever the system has been discharged for the following reasons:

a) When moisture and refrigerant oil combine, sludge is formed. Sludge does not allow moving parts to be properly lubricated.

b) When moisture and refrigerant combine, hydrofluoric and hydrochloric acid is produced. Acids are highly corrosive to metal surfaces and leakage eventually develops.

2. Check all refrigerant line and component fittings for tightness.



A—Low Side Valve Open
B—High Side Valve Open
C—Compressor
D—Vacuum Pump
E—Vacuum Port

Fig. 22-Evacuating The System

3. Attach test hoses of gauge manifold to compressor test fittings (Fig. 22).

4. Attach a vacuum pump to center hose of gauge manifold.

NOTE: Pump must be capable of pulling 28.6 in. Hg. vacuum (sea level). Deduct 1 in. Hg. from 28.6 in. for each 1000 feet (300 meters) elevation.

CAUTION: Do not operate compressor during evacuation!

5. Start vacuum pump with both gauge manifold valves and pump exhaust open.

6. If pump does not reach deepest vacuum in 6 minutes, check system for leakage by slightly pressuring the system with R-12. Then check the system for leakage with a leakage detector.

7. Evacuate the system for at least 30 minutes.

NOTE: Ambient temperature must be above 85°F (29°C) to remove moisture from the system with 28.6 in. Hg. vacuum at sea level.

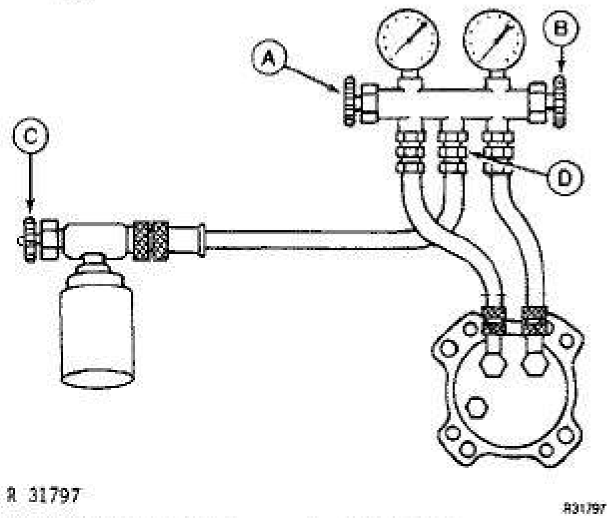
EVACUATING THE SYSTEM—Continued

8. Before stopping vacuum pump, close valves on gauge manifold. There is excessive leakage if the vacuum decreases at a rate of 1 in. Hg. in five minutes. Locate and repair leakage.

9. Charge the system. See below.

CHARGING THE SYSTEM

The best way to charge the system is to add R-12 into the high pressure port before starting engine. Use the following procedure:



A—Low Side Valve Closed
B—High Side Valve Closed
C—R-12 Valve
D—Center Hose Fitting

Fig. 23-Charging the System

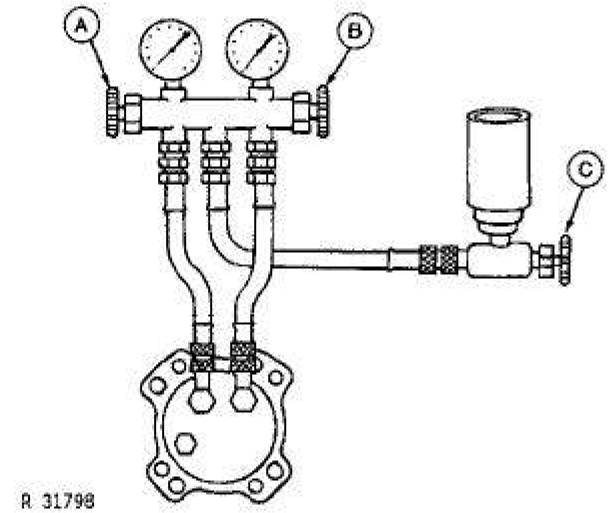
1. Engine stopped. System holding a vacuum of at least 28.6 in. Hg (less 1 in. from 29.9 for each 300 meters (1000 ft) elevation. Valves (A) and (B) closed (Fig. 23).

2. Connect R-12 container or charging station to center hose of gauge manifold (Fig. 23).

3. Loosen fitting at manifold (D). Open R-12 can valve (C) with can upright, slightly to purge water and contaminants from hose. Tighten center hose connection (Fig. 23).

4. Fully open R-12 can valve and invert container as shown. Low side valve (A) closed (Fig. 24).

5. Engine must be stopped. Open high side valve on gauge manifold and allow vacuum to draw R-12 into condenser and receiver-dryer.



A—Low Side Valve
B—High Side Valve Open
C—R-12 Valve

Fig. 24-Charging the System

NOTE: If charging with cans, close can valve to change cans.

6. After high side pressure becomes slow to increase, open low side valve on gauge manifold.

7. After low side pressure becomes slow to increase, close high side valve. Close low side valve.

CAUTION: High side valve and low side valve must be closed before starting engine.

8. Close R-12 can valve.

9. During initial start-up, start engine and run at 1200 rpm. Turn blower motor to "High" and temperature control switch to "Max".

10. Hold the refrigerant can right side up.

11. Open LOW SIDE VALVE so that low side pressure gauge does not exceed 275 kPa (40 psi).

IMPORTANT: Be sure that refrigerant enters system only as a VAPOR. Too much liquid entering the compressor can damage internal parts. Be sure to regulate the valve on the container or low side valve so that the low side reading will not exceed 275 kPa (40 psi). This will assure that refrigerant in the hose has vaporized before entering the compressor.

12. The fittings on the low side gauge will feel cold if the refrigerant is entering the system as a gas.

13. Add R-12 until system is charged with 2070 ml (70 oz) or add 16 oz after bubbles disappear in sight glass.

14. Check ambient temperature, cab temperature and system pressures as instructed in the diagnostic sequence.

LEAK TESTING

Several types of leak detectors are available to the service technician. Carefully follow manufacturers instructions when using any detector.

1. After connecting the manifold gauge set, crack the low side and high side compressor service valves.

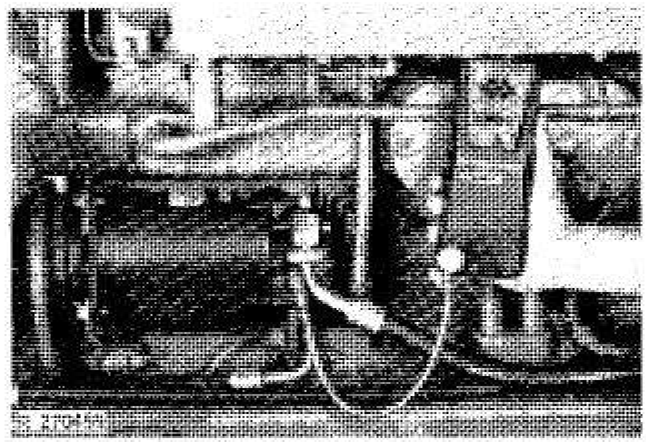
2. Close high and low side manifold hand valves.

3. Note pressure reading. 50 psi (3.4 bar) (3.46 kg/cm^2) is necessary to detect leaks. If pressure is lower than 50 psi (3.4 bar) (3.46 kg/cm^2) refrigerant must be added. To do this:

A. Purge hoses of air and attach center manifold hose to the refrigerant container.

B. Open the refrigerant container service valve and the high side manifold valve until 50 psi (3.4 bar) (3.46 kg/cm^2) is reached on the low side gauge.

C. Close high side hand valve and the refrigerant service valve. Remove hose.



R27045N

Fig. 25-Using D-18009KD Electronic Leak Detector (Typical Installation)

4. Move sampling end of detector (Fig. 25) used from point to point and examine all joints and connections and any other possible leak point. Since Refrigerant-12 is heavier than air, it is best to place the sampling end of the detector beneath the point being tested.

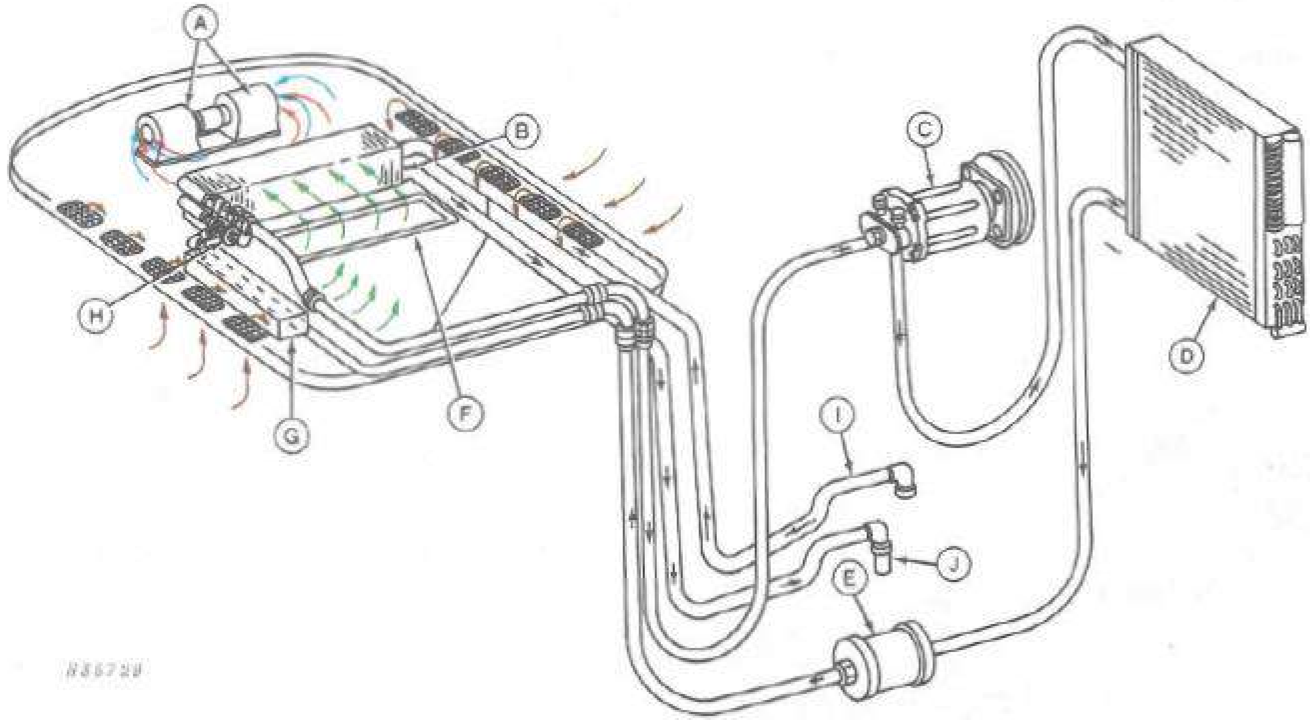
5. After locating the leak, purge the system of refrigerant. Repair leak.

6. Check compressor oil and add if necessary (page 90-05-39).

7. Add refrigerant and recheck for leaks. If no leaks are present, evacuate and charge.

Group 10
PRESSURIZER SYSTEM OPERATION AND TESTS

HOW THE SYSTEM WORKS



A—Pressurizer Motor and Blower
B—Evaporator - Heater Core
Unfiltered Air
C—Compressor
D—Condenser
E—Receiver Drier
Filtered Air
F—Recirculating Filter
G—Air Filter
Cooled Air
H—Expansion Valve
I—Heated Water
J—Returned Water
Heated Air

Fig. 1-Pressurizer System

The pressurizer system can be turned on without operating either heating or air conditioning systems. By turning it on the cab becomes pressurized, that is, air is forced into the cab and out of any small cracks and holes in cab. This air being forced out prevents dirt from coming in.

Unfiltered air is drawn in through louvers in cab roof and into the air filter element (G). The air then passes to the heater-evaporator core (B) also drawing air from inside cab through recirculation filter (F). This air is then pulled through the heater-evaporator core (B) and to the blower impellers. From here the air is forced down into the cab via the adjustable vents.

DIAGNOSING MALFUNCTIONS

Inadequate Air Flow

Clogged air filters
Clogged air inlet screen
Defective fan motor
Defective pressurizer fan switch
Loose wire connection
Fan assembled backwards

Pressurizer Fan Will Not Operate

Defective circuit breaker
Defective motor or resistor
Defective switch
Defective wiring or loose connections

Blower Motors Inoperative

Open circuit
Defective switch
Defective wiring or loose connection
Defective motor
Tripped circuit breaker

Blower Air Flow Too Slow or Erratic

Motor shaft binding
Loose electrical connection
Defective switch
Defective motor
Blower impeller slipping
Blower impeller installed backward

BLOWER IMPELLERS

1. Raise outer roof and remove front inner cover.

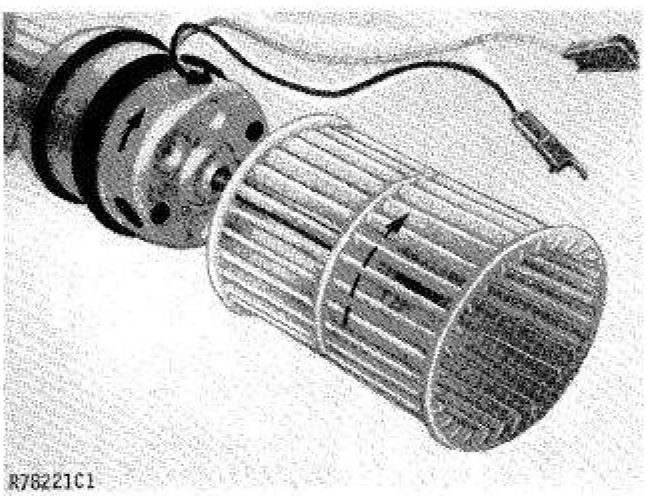


Fig. 2-Impeller Fins

IMPORTANT: Impellers are made of cast plastic and can easily be broken. If impeller is broken it will be out of balance or it could shatter when operating. Replace any cracked impellers.

2. Inspect impeller fins through openings in impeller housing. Fin curves should appear as in Figure 2. If fins are curved in opposite direction, go to next step.

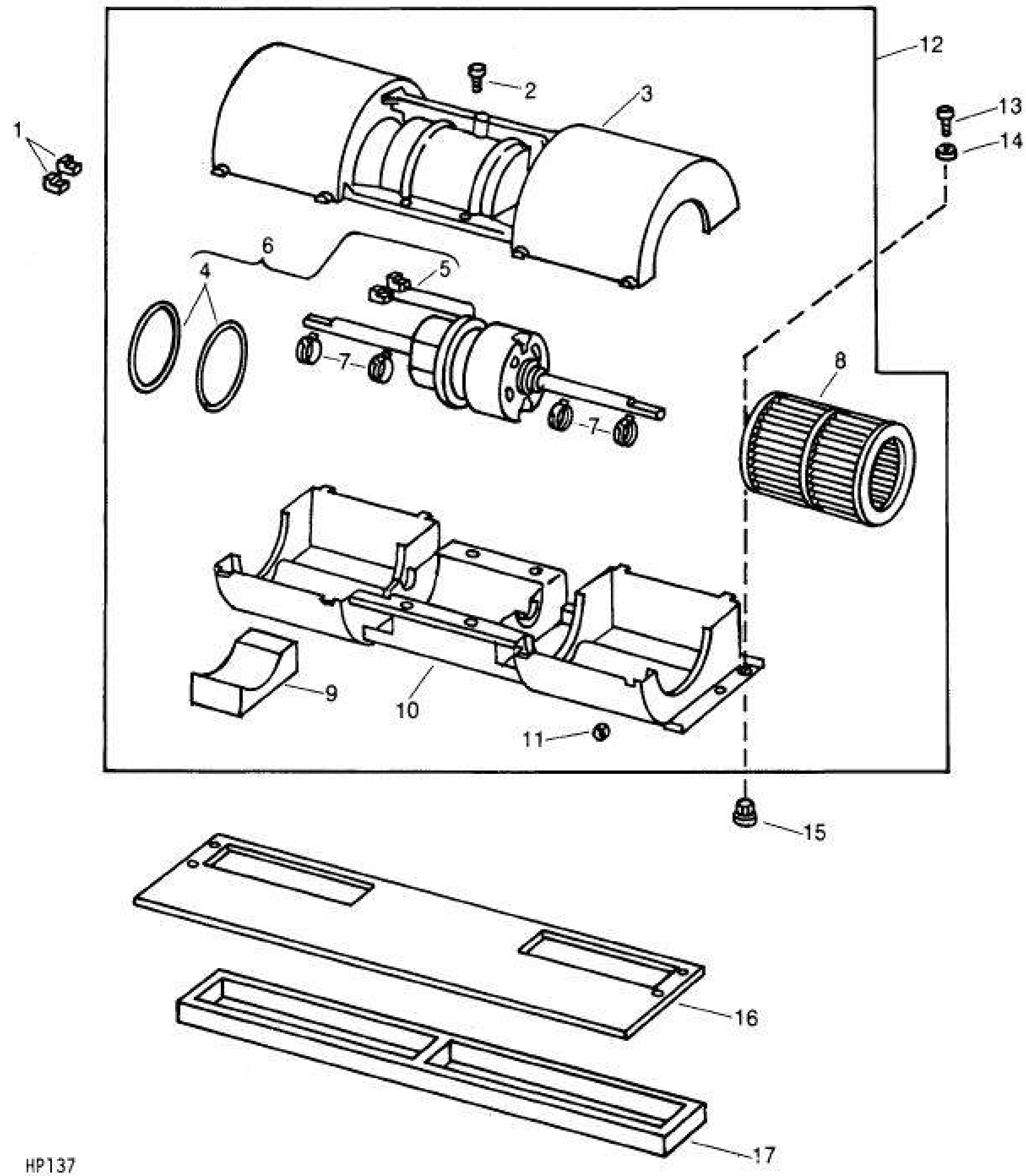
3. Disconnect motor wiring. Remove four screws (2) from blower housing. Separate housing and remove upper half (3). Remove four spring clips (7) from blower shaft (two on each impeller) and remove impellers (8) (Fig. 3).

4. Reinstall impellers (8) so that fins are in correct direction (Fig. 2).

5. If blower air delivery is normal but dirt and dust is blown into cab:

Inspect seal between edges of both covers-to-housing and the raised ridge of the roof. There must be a tight seal between these parts. If leaks or gaps are apparent, check cover fastening bolts to see they are tight. If necessary remove covers and replace H88773 seal.

PRESSURIZER BLOWER ASSEMBLY



1—Connector (2 used)
2—Screw Self Tapping (4 used)
3—Upper Housing Half
4—O-Ring (2 used)
5—Motor Assembly
6—Blower Motor
7—Clip (4 used)
8—Impeller (2 used)
9—Filter
10—Lower Housing Half
11—Ring (8 used)
12—Blower Assembly
13—Screw Self Tapping (4 used)
14—Washer
15—Insert (4 used)
16—Baffle
17—Seal

Fig. 3-Exploded View of Blower Assembly

TESTING BLOWER SWITCH

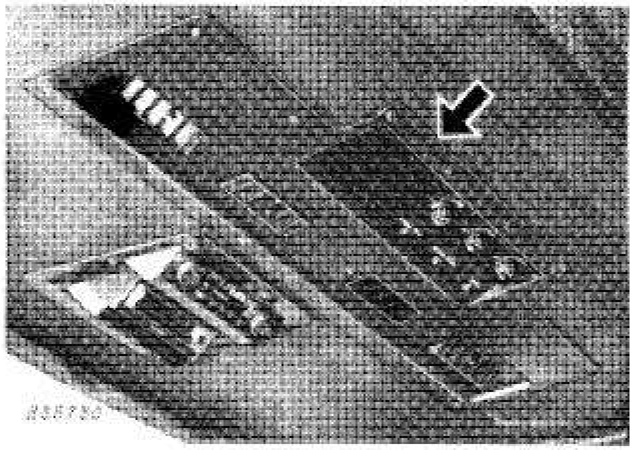


Fig. 4-Removing Bezel

1. Remove fourteen screws and remove bezel covering switches (Fig. 4).

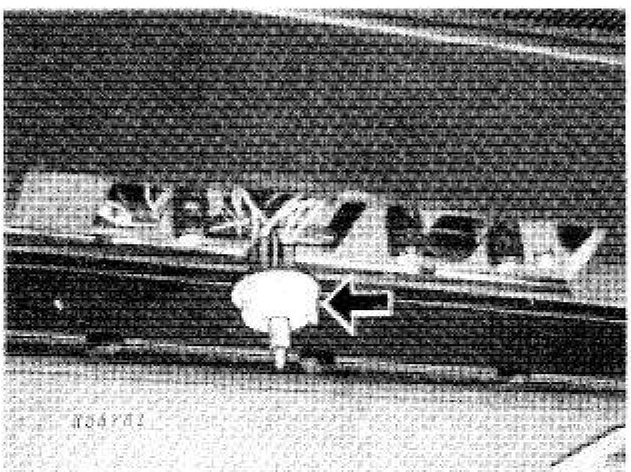


Fig. 5-Pull Switch Down

2. Remove knob and retaining nut from blower switch. Pull switch down, but do not disconnect wires (Fig. 5).

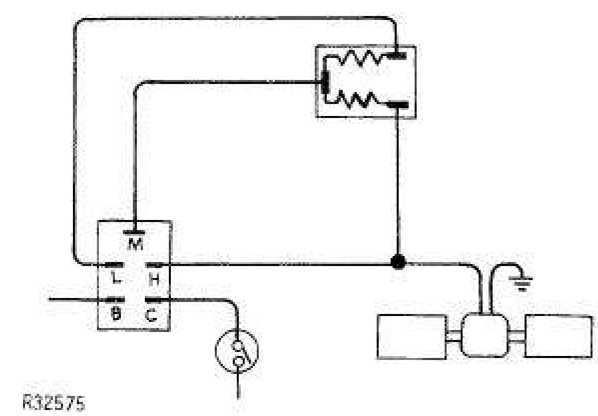
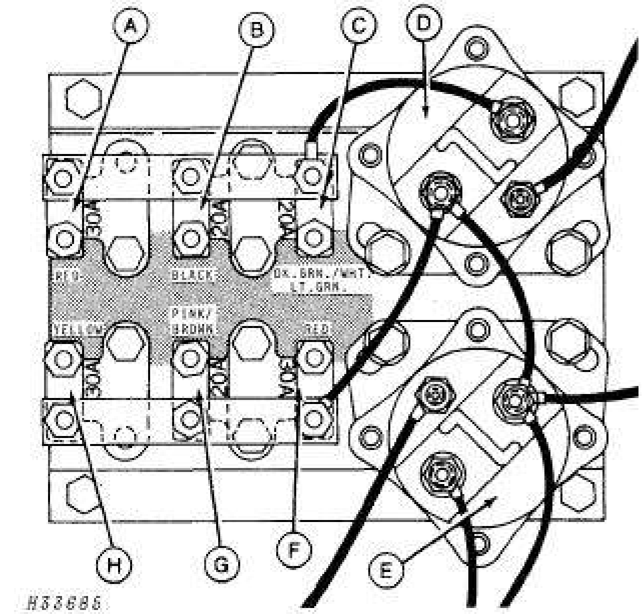


Fig. 6-Blower Circuit



A—30 amp - Cab
B—20 amp - Cab
C—20 amp - Accessories
D—Relay - Applies power to A, B, and C
E—Relay - Starter Switch
F—30 amp - To Ignition Switch Terminal "B"
G—20 amp - Lights
H—30 amp - Lights
—10 amp circuit breaker for electric clutch (located behind console)

Fig. 7-Circuit Breakers and Relays in Engine Compartment

3. The power source is the red wire to "B" terminal on the blower switch. With ignition key on, check "B" terminal for battery voltage (Fig. 6). If this wire does not have voltage, check for a problem in the top rear 30 amp circuit breaker (A), accessory relay (B) (Fig. 7), or in the wiring harnesses.

4. Use an ohmmeter to check resistance between "B" and "H" switch terminals in each switch position. Resistance should be as follows:

off - no continuity
low - about 1.0 ohm
med. - about 0.5 ohm
high - 0 ohm

5. If resistance is not correct, disconnect wires and test switch for continuity between the following terminals. Replace switch if continuity is not correct.

off - no continuity between "B" and other terminals
low - "B" to "L" and "C"
med. - "B" to "M" and "C"
high - "B" to "H" and "C"

6. If resistance is not correct in Step 4 but switch continuity is correct in Step 5, check for a defective resistor (in cab roof). Use an ohmmeter to check resistance between wires disconnected from blower switch.
between red and green wires - about 0.5 ohm
between red and yellow wires - about 1.0 ohm

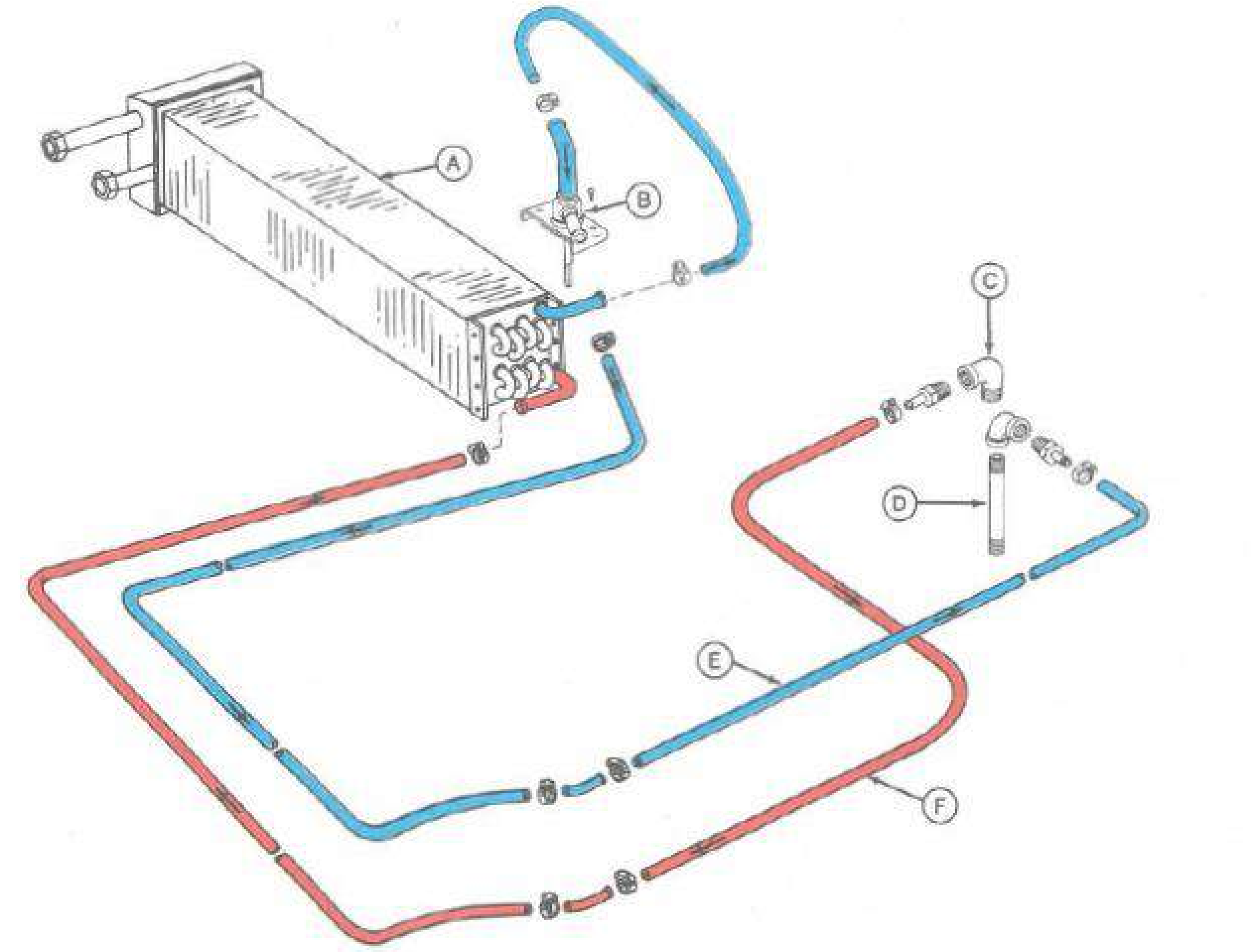
Replace resistor if it is shorted or open.

NOTE: The resistor is protected by two thermal fuses. If either fuse blows, blower motor will not run in low speed. When this happens, resistor must be replaced.

7. Connect wires to blower switch as follows:
"B" terminal - red
"L" terminal - yellow
"M" terminal - green
"H" terminal - double red
"C" terminal - orange (to cooling temperature switch)

Group 15
HEATING SYSTEM OPERATION AND TESTS

HOW THE SYSTEM WORKS



A—Combination Heater Evaporator Core
B—Heater Valve
C—Supply From Engine Block
D—Return To Water Pump
E—Return Hose (Cool Water)
F—Supply Hose (Hot Water)

Fig. 1-Heating System

Referring to Fig. 1, coolant from the engine block (A) is carried by hoses and pipes to the heater core (C), and then to the heater valve (D). The purpose of the valve is to permit or restrict flow of coolant as desired by the operator.

When the valve is open, coolant returns to the water pump by-pass through a return hose (B).

The blower draws air through the heater core and directs it inside the cab. The blower used for heating is the same one used for pressurizing and air conditioning.

DIAGNOSIS AND TESTING

Preliminary Checks

When experiencing heating system problems, first perform the following preliminary checks:

1. Determine if the engine coolant is at the proper level and sufficiently warm to give the desired heating results.

2. Check system air filters for restrictions.

3. Check for drafts around doors and panels.

4. Check heater hoses for restrictions.

Proceed with the below listed symptoms and causes when the preliminary checks have been performed and the system still fails to operate properly.

Electrical Testing

When an electrically operated component in the system fails to function properly, make the following preliminary checks:

1. Determine if adequate voltage is being supplied to the malfunctioning component.

2. Visually check for a loose connection or a broken wire.

If the source of trouble has not been found, after making the preliminary checks, test the system for an open circuit within each component. Use the wiring diagrams (Section 240) as a guide for determining each circuit location.

Diagnosing Malfunctions

Problem	Possible Cause	Suggested Remedy
Insufficient Heating		
	1. Faulty engine thermostat	Replace (Section 20)
	2. Foreign material in heater core or hoses	Clean as required
	3. Heater valve not working properly	Replace valve (page 90-10-1)
	4. Pressurizer blowers not working properly	Check circuits (Section 240); replace blowers if required (page 90-05-25)
	5. Obstruction in air inlet	Clean as required; check filter element
Inadequate Removal of Ice or Fog		
	1. Redirect air louvers	Check effect of louvers in different positions
	2. Pressurizers blowers not working properly	Check circuits (Section 240); replace blowers if required (page 90-05-25)
	3. Heater valve not working properly	Replace valve (page 90-10-1)
Heater Valve Not Shutting Off Coolant Flow		
	1. Inlet and outlet hoses reversed	Install hoses as shown in Fig. 1 on previous page
	2. Defective valve	Replace valve (page 90-10-1)

Section 350
SIDEHILL LEVELING SYSTEM OPERATIONS AND TESTS

CONTENTS OF THIS SECTION

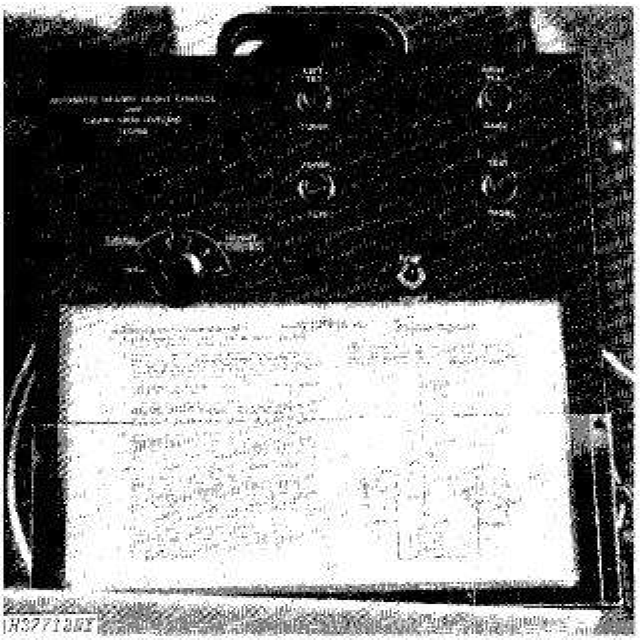
Group 00
SPECIFICATIONS AND SPECIAL TOOLS

SPECIFICATIONS

Item	Specifications
GENERAL	
Type of leveling system	Electro-Hydraulic
Leveling capability	Zero to 18 percent slope
ELECTRICAL	
Fuse	6 amp
Fuse type	AGC
Amps	3.5 amps at 12 volts
HYDRAULIC	
System capacity (includes line and components)	31 qts. (29 L)
System normal operating temperature	70°F (21°C) above ambient
Test number 1	4.1-4.7 GPM (15.5-17.8 L/m) @ 2340 RPM at 1000 psi (68 bar)
Test number 2	6.3-7.1 GPM (23.8-26.9 L/m) @ 2340 RPM at 1000 psi (68 bar)
Test number 3	10.6-11.6 GPM (40.1-43.9 L/m) @ 2340 RPM at 1000 psi (68 bar)
Test number 4	2525-2600 psi (172-177 bar) plus back pressure*
Test number 5	4 drops/min.

**Back pressure is the pressure required to circulate the oil without any system(s) activated. Back pressure will vary throughout the hydraulic system. Measure back pressure at the same location that the high pressure reading is taken.*

SPECIAL TOOLS



H27712NY

Fig. 1-D-14102DJ Tester

Tool	Use
*D-14102DJ SideHill 6620 Leveling System and Automatic Header Height Control Tester..	To test electrical systems without removing components from the combine

**Order from: Service Tools, Box 314, Owatonna MN 55060*

Group 05
GENERAL INFORMATION, DIAGNOSIS, AND TESTS

GENERAL INFORMATION

The SideHill 6620 Combine has been developed for harvesting crops on slopes up to 18 percent where level land combines are normally used. The electro-hydraulic leveling system automatically keeps the separator level as the combine moves across changing hill slopes.

The leveling system of the SideHill 6620 Combine is comprised of two integral systems: Electrical and Hydraulic.

NOTE: Information covering the electrical and hydraulic systems for automatic leveling have been separated from the main electrical system (Section 240) and hydraulic system (Section 270), and are included in this section.

Electrical System

The leveling electrical system (Fig. 1) consists of level sensing control box (L), tilt limit switches (A and K), manual tilt switch (C), leveling control cut-out switch (E), fuse (D), ignition switch (F), which is the source of electrical current, and the two solenoids on leveling control valve (M).

Hydraulic System

The hydraulic leveling system (Fig. 2, Page 350-15-2) consists of proportional flow divider (R), leveling control valve (A), and leveling cylinders (C and D).

NOTE: Complete coverage of the operation of the SideHill 6620 electrical and hydraulic leveling systems is covered in Groups 350-10 and 350-15. The following information is a brief explanation of the operation of the electrical and hydraulic leveling systems.

Automatic Leveling Operation

As the combine comes into a slope, a pendulum in the level sensing control box (L, Fig. 1) swings to one side, causing a tilt switch in the box to close. Current is sent to the appropriate solenoid on the leveling control valve (M). The activated solenoid pushes the spool in, causing pressure oil to be always directed to the rod end of the retracting cylinder. Pressure oil is obtained from the proportional flow divider (H) return oil is directed to a tee on the proportional flow divider and then returned to the reservoir.

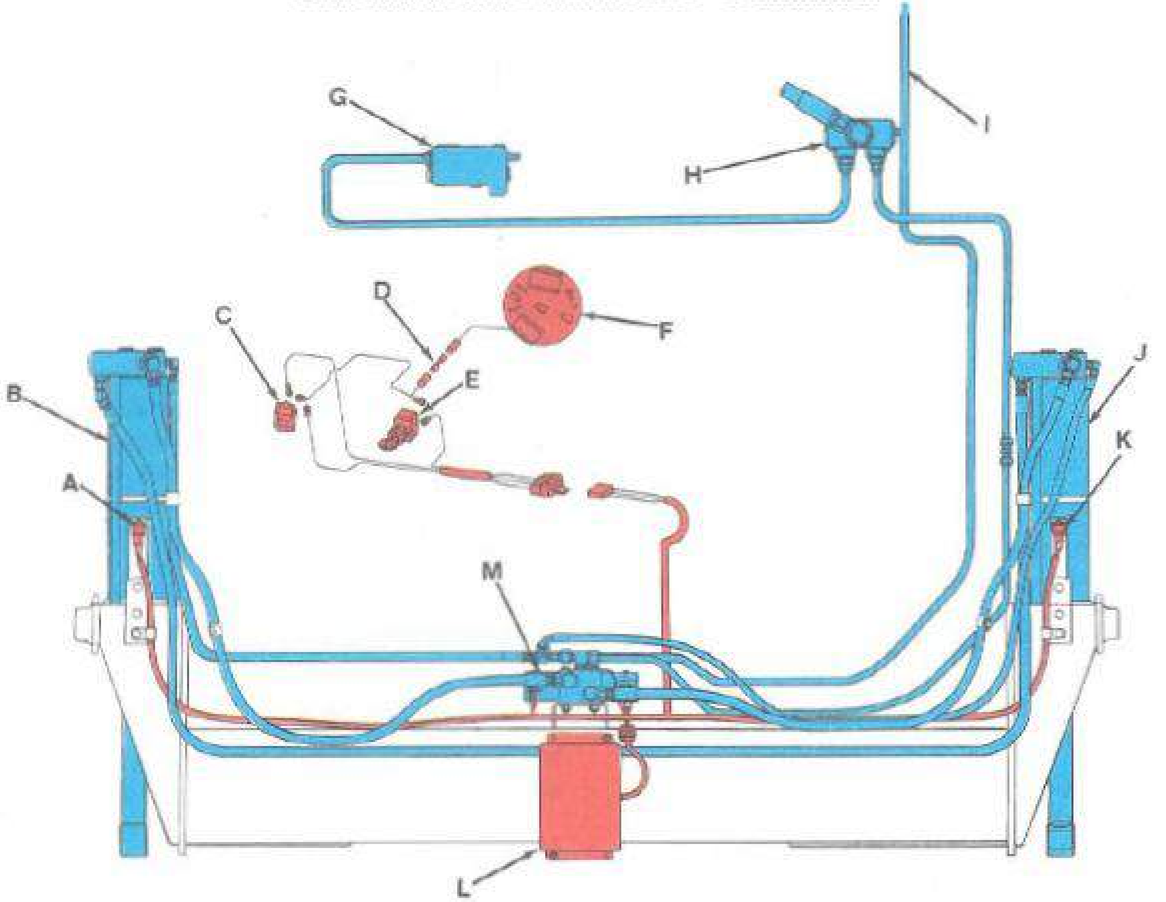
The leveling control cut-out switch (E) can be moved to the off position to turn off the automatic leveling system.

Tilt limit switches (A and K) shut off the automatic leveling system when the extending cylinder has fully extended.

Manual Leveling Operation

The combine can be manually tilted by the operator regardless of the position of the leveling control cut-out switch (E). By moving manual tilt switch (C), the operator can fully tilt the combine to the left or to the right. The manual tilt switch (C) sends current directly to the solenoids on the leveling control valve (M).

GENERAL INFORMATION—Continued



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A—Left Tilt Limit Switch
B—Right Hand Leveling Cylinder
C—Manual Tilt Switch
D—Fuse
E—Leveling Control Cut-Out Switch
F—Ignition Switch
G—Main Control Valve
H—Proportional Flow Divider
I —To Reservoir
J —Left Hand Leveling Cylinder
K—Right Tilt Limit Switch
L—Level Sensing Control Box
M—Leveling Control Valve
Electrical System
Hydraulic System

Fig. 1-SideHill 6620 Electrical and Hydraulic Systems Diagram

DIAGNOSING MALFUNCTIONS

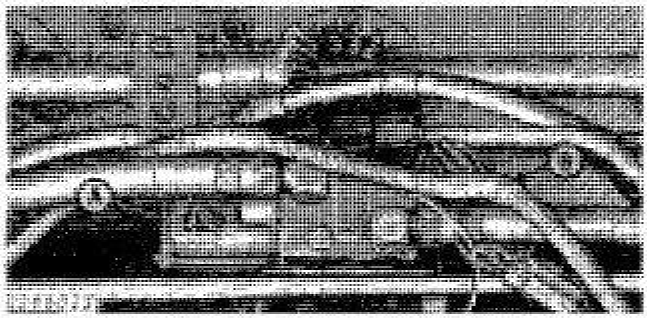

Fig. 2-Leveling Control Valve

When diagnosing leveling system problems, first determine if the problem is in the electrical system or the hydraulic system.

To determine if the problem is electrical or hydraulic, place the leveling control cut-out switch in the "OFF" position; start engine, and move throttle lever to the fast idle position. Raise header and lower lift cylinder safety stop. Block wheels to prevent combine from rolling. Crawl underneath the feeder house to manually actuate the leveling control valve.

CAUTION: Do not allow any part of the body to be caught by the final drive leveling arms while performing this test.

Depress the manual push pin (A, Fig. 2) on the leveling control valve. The combine should tilt to the left. Depress the manual push pin (B) on the leveling control valve. The combine should tilt to the right. If after depressing both push pins, the combine tilts correctly, the problem is in the electrical system. If after depressing both push pins, the combine does not tilt or slowly tilts, the problem is in the hydraulic system.

NOTE: It is important to have the engine at fast idle to develop full hydraulic flow out of the main hydraulic pump.

If the manual push pins cannot be depressed manually, the leveling control valve must be disassembled.

The following charts are divided into hydraulic and electrical malfunctions. Charts begin with easy malfunctions to check and progress with more time consuming malfunctions. Each malfunction listed gives a test or disassembly of a component to be performed to determine if it is the malfunction.

Some steps within the charts specify a test number to perform. All tests are assigned a number for easier reference.

Listed below is a table of contents for the chart headings.

Electrical Malfunctions

Hydraulic Malfunctions

ELECTRICAL MALFUNCTIONS

Combine Will Level Manually but Not Automatically to the Right

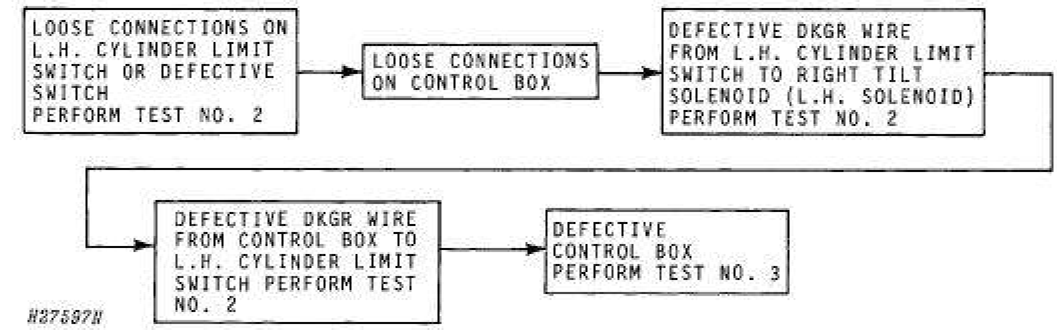

Fig. 3-Combine Will Level Manually but Not Automatically to the Right

Combine Will Level Manually but Not Automatically to the Left

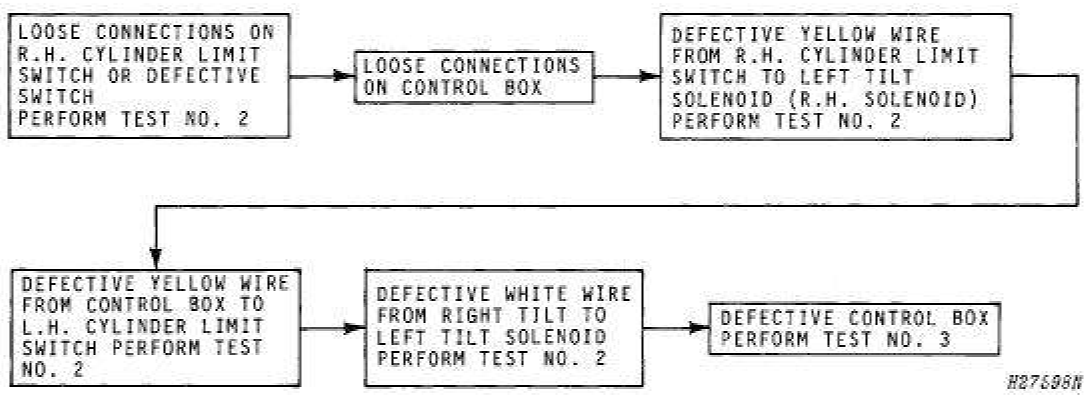

Fig. 4-Combine Will Level Manually but Not Automatically to the Left

Combine Will Level Manually but Not Automatically in Either Direction

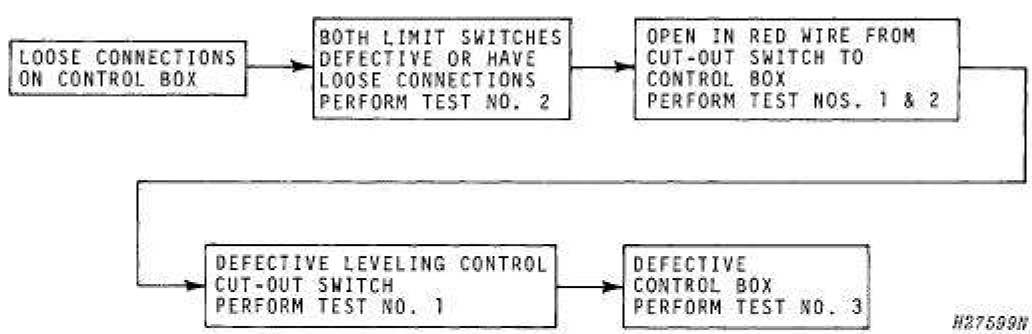

Fig. 5-Combine Will Level Manually but Not Automatically in Either Direction

Combine Will Level Automatically and Manually One Direction Only

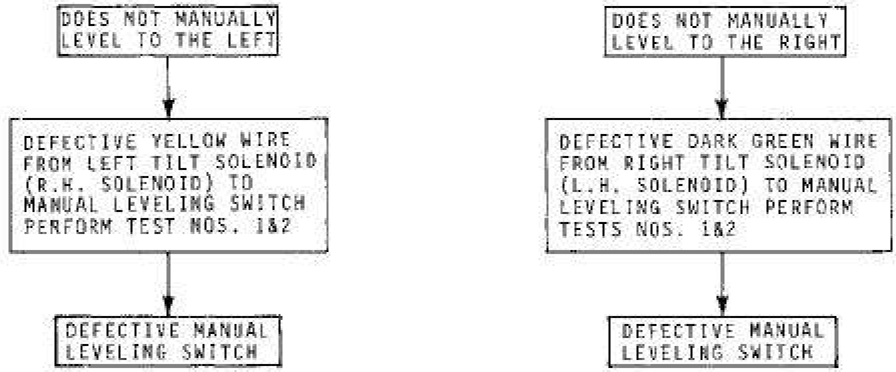

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Fig. 6-Combine Will Level Automatically and Manually One Direction Only

Combine Will Level Automatically but Not Manually in Either Direction

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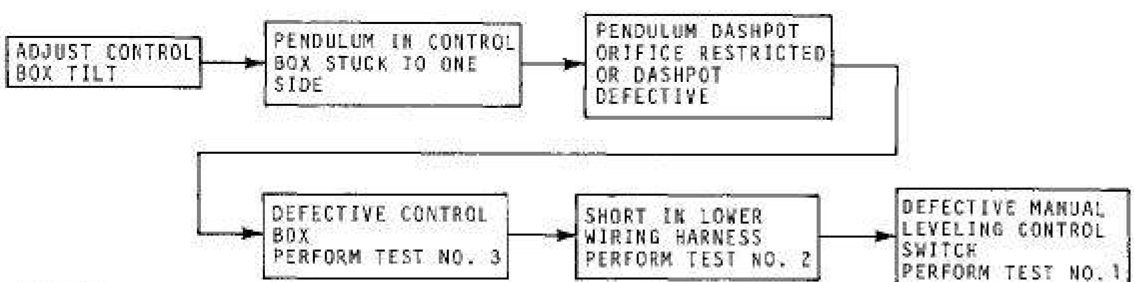
Fig. 7-Combine Will Level Automatically but Not Manually in Either Direction

Combine Levels to One Side by Itself



H27702N

Fig. 8-Combine Levels to One Side by Itself

ELECTRICAL MALFUNCTIONS—Continued

Combine Will Not Level Manually Or Automatically In Either Direction

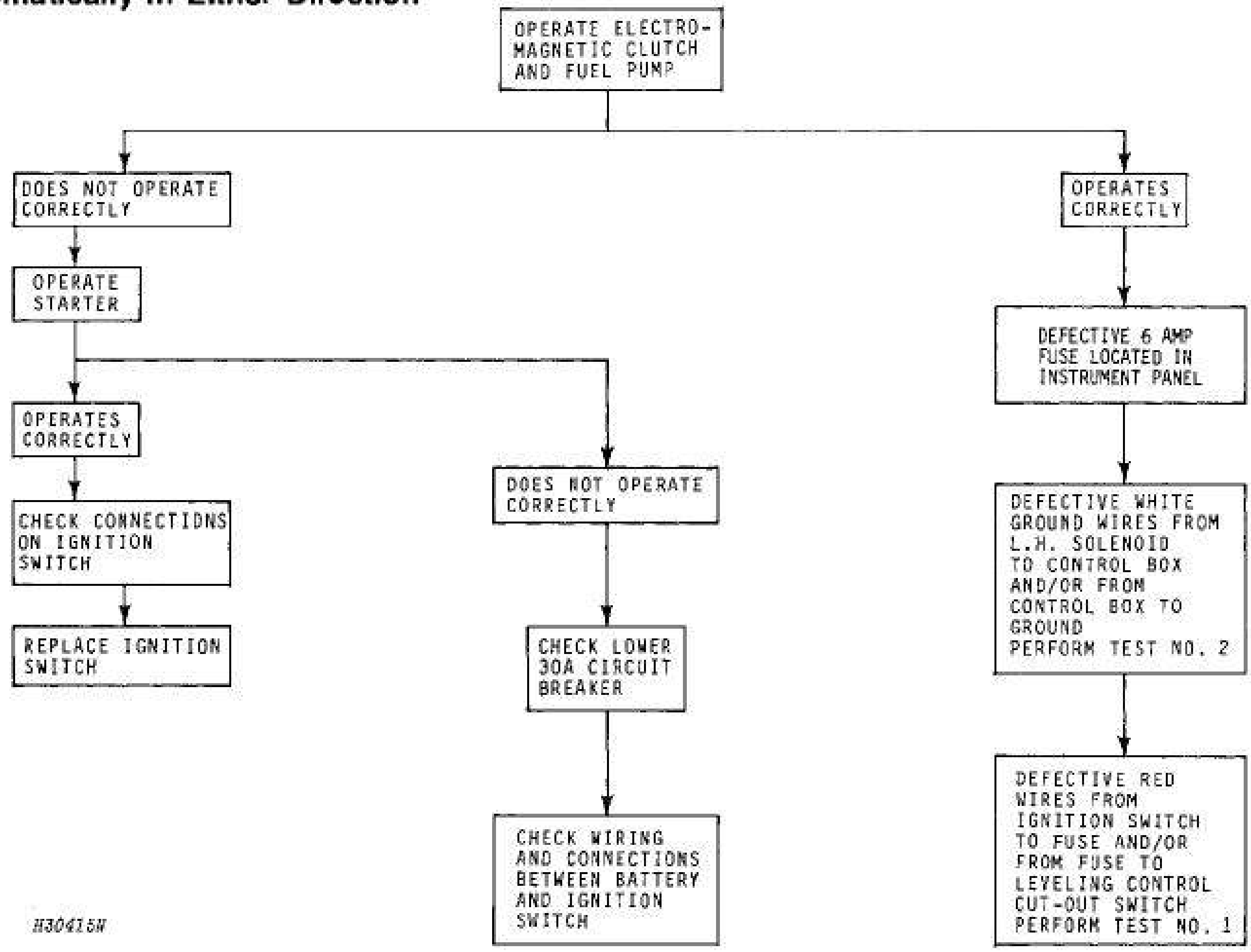


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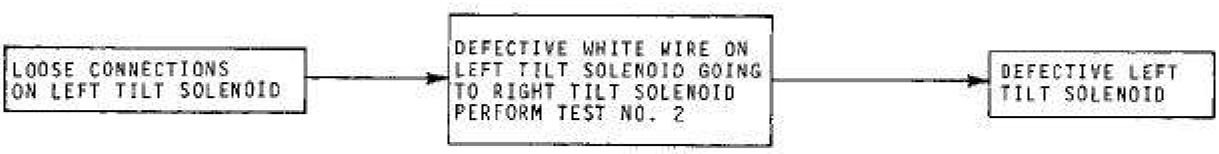
Fig. 9-Combine will not Level Manually or Automatically in Either Direction

Combine Will Not Level Manually or Automatically To The Left



H27704N

Fig. 10-Combine will not Level Manually or Automatically to the Left

Combine Will Not Level Manually Or Automatically To The Right

Fig. 11-Combine will not Level Manually or Automatically to the Right

Combine "Hunts" Or Erratically Levels

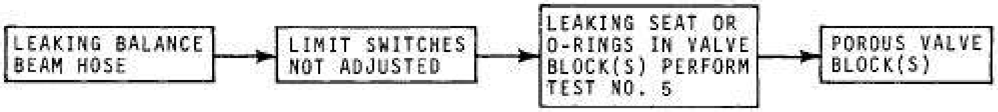
Fig. 12-Combine "Hunts" or Erratically Levels

Combine Tilts Completely To One Side, Comes Back To Level And Immediately Tilts Completely To The Same Side

This malfunction occurs in the level sensing control box either by the failure of a transistor or a defective tilt switch.

HYDRAULIC MALFUNCTIONS

Settling of Both Leveling Cylinder Only During Operation



H30416N

Fig. 13-Settling of Both Leveling Cylinders Only During Operation

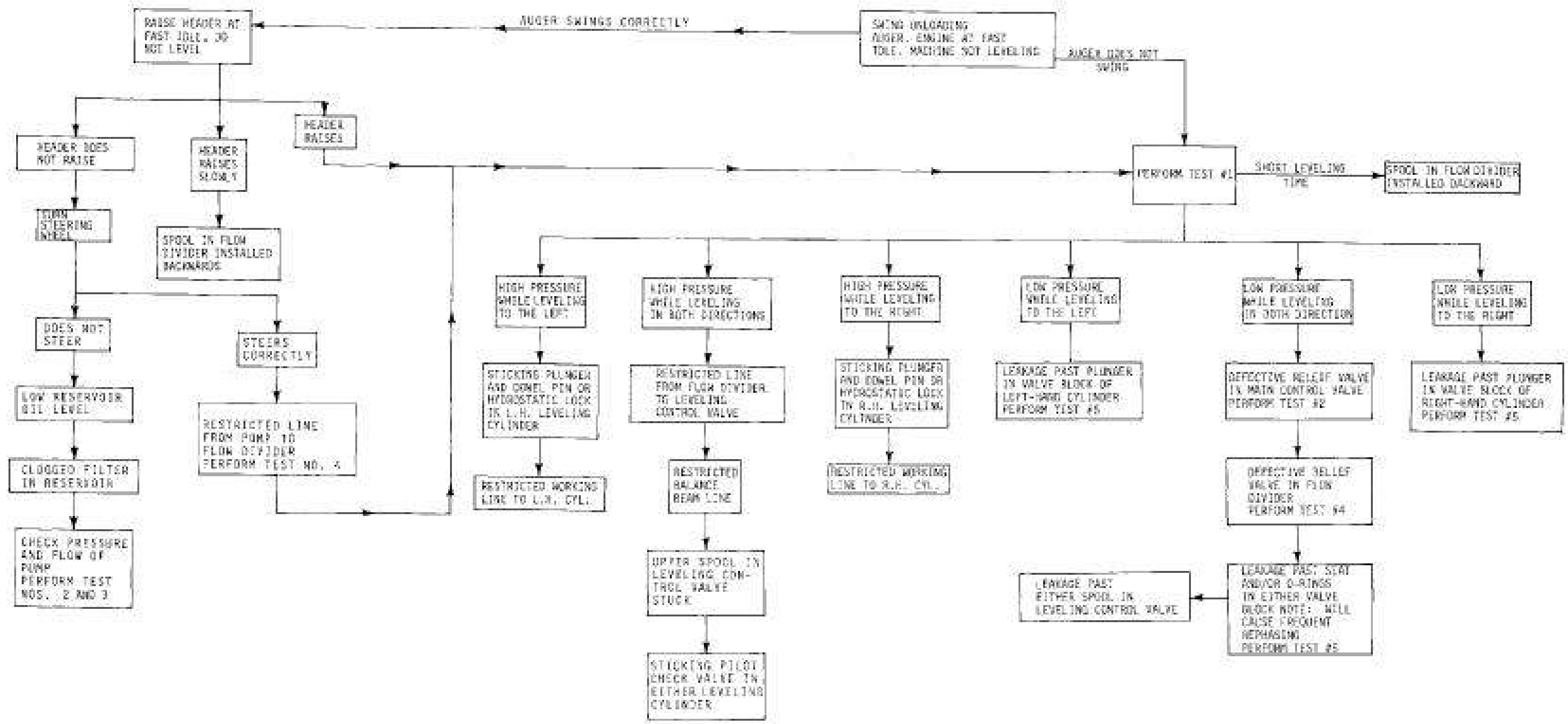
Settling of One or Both Leveling Cylinders While Parked and During Operation

H27594N

Fig. 14-Settling of One or Both Leveling Cylinders While Parked and During Operation

Leveling Cylinders Retract After Rephasing

This malfunction is caused by a leaking or missing ball check in the head end of either leveling cylinder.



R26427N

Fig. 15-Combine Levels Slowly or Not at All

ELECTRICAL TESTS

General Information

Always use accurate equipment when making electrical tests. Faulty testing equipment will prevent you from doing thorough work and may damage the electrical system.

Test Equipment

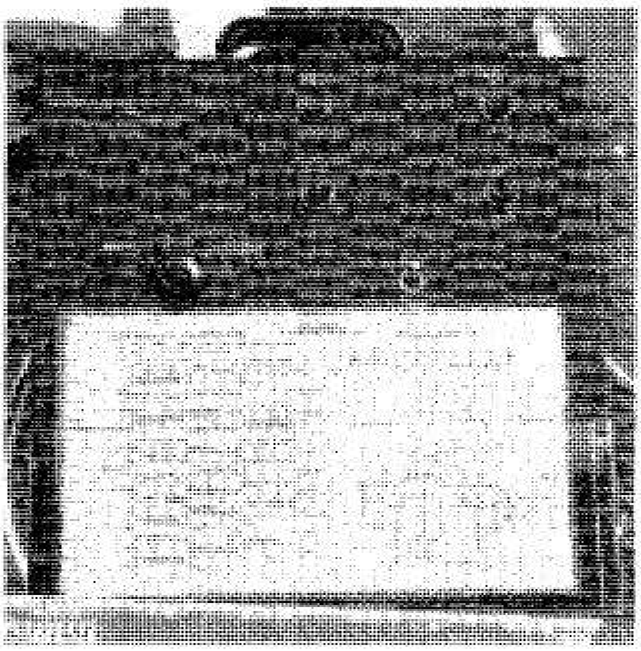


Fig. 16-Service-Gard SideHill Leveling Tester

The Service-Gard Automatic Header Height Control and SideHill 6620 Leveling Tester (Fig. 16) is available for testing the SideHill electrical leveling system. See Special Tools. A voltmeter is also required for testing the leveling sensing control box.

NOTE: When using this tester, follow the instructions included except those for testing the level sensing control box. The availability of transistors for service parts has made Steps 6 and 7 for position 2 on the Tester instructions obsolete. New Test instructions are given in Test No. 9 of this section.

Test No. 1 - Checking SideHill Upper Wiring Harness

If using the Service-Gard SideHill 6620 Leveling Tester, follow the procedure given in the next column. If a Service-Gard SideHill 6620 Leveling Tester is not available, a voltmeter can be used. Turn the ignition switch on.

1. Turn selector switch on tester to position 1. This position tests the SideHill 6620 switches in the instrument panel and the harness leading from them.

2. Disconnect the three pin connector located on the left-hand side of the combine.

3. Connect the three pin connector of the test unit to the three pin connector of the upper harness.

4. Connect ground clamp to a good ground on the combine and position tester for observation from the operator's platform.

5. Turn ignition switch on but do not start engine.

6. Move leveling control cut-out switch on instrument panel of combine to the "ON" position. Power test light should glow. If it does not glow, check for loose connections at test unit, leveling control cut-out switch, ignition switch, or for a blown fuse or broken wires. If power test light still does not glow, refer to electrical diagram on test instructions supplied with the test unit and place test probe at points A, B, C, D, E, F, and G in sequence to locate failure.

NOTE: Failure of the test probe light to glow at any point indicates that the defective component lies between that point and the point previously tested.

7. Depress the "R" position of manual leveling control switch. The right tilt light should glow. If it does not glow, check for loose connections at manual leveling control switch, test unit, defective manual leveling control switch, or for broken wires. If the right tilt light still does not glow, refer to electrical diagram on test instructions supplied with the test unit and place test probe at points E, 2, 1, and H in sequence to locate failure.

8. Press "L" position of manual leveling control switch. The left tilt light should glow. If it does not glow, check for loose connections at manual leveling control switch, test unit, defective manual leveling control switch, or for broken wires. If the left tilt light still does not glow, refer to electrical diagram on test instructions supplied with the test unit and place test probe at points E, 2, 3, and J in sequence to locate failure.

9. Turn off ignition switch, disconnect test unit. Reconnect wiring harness.

ELECTRICAL TESTS—Continued

Test No. 2 - Checking SideHill Lower Wiring Harness

If using the Service-Gard SideHill 6620 Leveling Tester, follow the procedure given below. If a Service-Gard SideHill 6620 Leveling Tester is not available, a voltmeter can be used. Turn the ignition switch on.

1. Turn selector switch on tester to Position 2.

2. Raise combine feeder house, shut off engine, and lower hydraulic cylinder safety stop.

3. Disconnect the four pin plug at the leveling control box and connect the mating plug on tester harness to the four pin plug on the SideHill harness. Connect ground clamp to a good ground on combine and locate test unit so it can be observed from the operator's platform.

4. Combine must be in level position. Turn on ignition switch but do not start engine.

5. Depress "R" position of manual leveling control switch. Right tilt test light should glow. If it does not glow, check for loose connections and defective tilt limit switch. If the right tilt light still does not glow, refer to electrical diagram on test instructions supplied with the test unit and place test probe at points F, G, H, and J in sequence to locate failure.

6. Depress "L" position of manual leveling control switch. Left tilt test light shoud glow. If it does not glow, check for loose connections and defective tilt limit switch. If the left tilt light still does not glow, refer to electrical diagram on test instructions supplied with the test unit and place test probe at points B, C, D, and E in sequence to locate failure.

Test No. 3 - Checking SideHill Level Sensing Control Box

NOTE: Disregard instructions included with the Service-Gard SideHill 6620 Leveling Tester for checking the level sensing control box (Position 2, Steps 6 and 7) and use instead, the procedure given below.

1. Disconnect the four pin plug at the leveling control box and connect the mating plug on tester harness to the four on the SideHill harness. Connect ground clamp to a good ground on combine and locate test unit so it can be observed from the operator's platform.

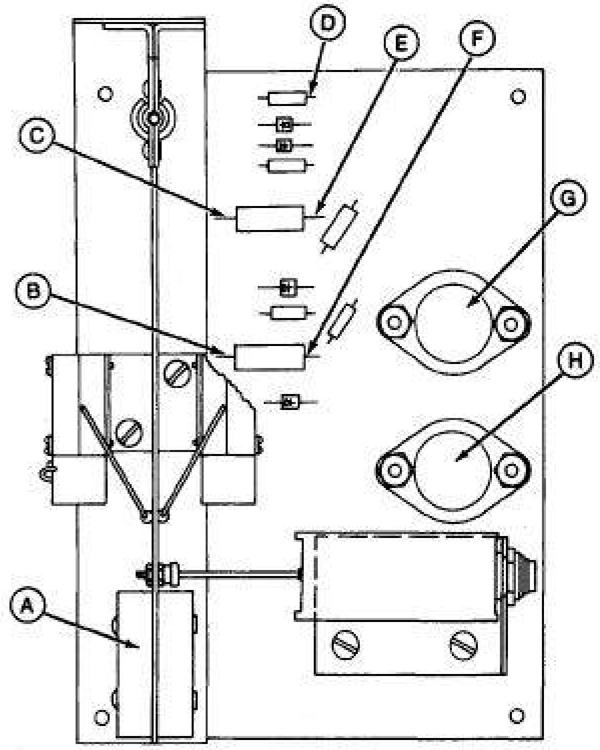
2. Connect the four pin plug on control box to the four pin plug on tester harness.

3. Turn on ignition switch and leveling control cutout switch.

4. Loosen control box mounting bolts and move bottom of box toward the combine's left side (counterclockwise). The right tilt light should glow. If the right tilt light does not glow (or if left tilt light glows), proceed to Step No. 6.

5. Rotate bottom of control box toward combine's right side (clockwise). The left tilt light should glow. If the left tilt light does not glow (or if right tilt light glows), proceed to Step No. 6.

6. Remove front cover on control box. Connect one lead of a voltmeter to a good ground on the combine.



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A—Pendulum
B—Resistor
C—Resistor
D—Resistor
E—Resistor
F—Resistor
G—Transistor
H—Transistor

Fig. 17-Checking SideHill Level Sensing Control Box

7. Probe point (D, Fig. 17). Voltmeter should indicate 10-11 volts.

NOTE: Scratch contact point with probe to remove insulating coating to get a good contact.

8. Probe points (E and F, Fig. 17) with pendulum centered. Voltmeter should indicate battery voltage (11-12 volts). If not, control box is defective.

9. Probe point (E, Fig. 17) with pendulum swung to left side of combine. Voltmeter should indicate a drop in voltage. If not, control box is defective.

10. Probe point (F, Fig. 17) with pendulum swung to right side of combine. Voltmeter should indicate a drop in voltage. If not, control box is defective.

11. Touch probe against transistor (G, Fig. 17) with pendulum swung to right side of machine. Voltmeter should indicate 9-10 volts. Center pendulum. Voltmeter should indicate zero volts. If either voltage is not correct, transistor (G, Fig. 17) is defective. The John Deere service part transistor is furnished with detailed installation instructions.

NOTE: Scratch contact point with probe to remove insulating coating to get a good contact.

12. Touch probe against transistor (H, Fig. 17) with pendulum swung to left side of combine. Voltmeter should indicate 9-10 volts. Center pendulum. Voltmeter should indicate zero volts. If either voltage is not correct, transistor (H, Fig. 17) is defective. Refer to Page 150-05-1 for repair procedures.

NOTE: If Steps 4 and 5 were negative and Steps 7 - 12 were positive, control box is defective.

HYDRAULIC TESTS

General Information

The proper use of testing equipment will quickly locate the trouble within the hydraulic leveling system, thus reducing combine "down time." For proper use of testing equipment, See Section 270.

Testing Procedure

The basic procedure when testing a hydraulic system is to apply a controlled load to the system or a component of the system to check pressure and rate of flow.

NOTE: Back pressure is the pressure required to circulate the oil without any system(s) activated. Back pressure will vary throughout the hydraulic system. Measure back pressure at the same location that the high pressure reading is taken.

Test No. 1 - Checking Leveling System Pressure

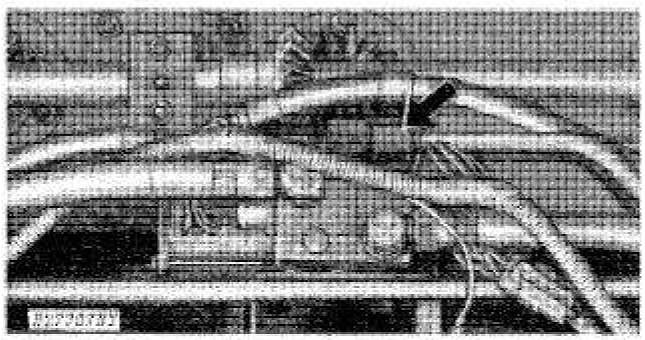

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Fig. 18-Checking Leveling System Pressure

Flow rate should be 4.1-4.7 GPM (15.5-17.8 L/m) at full engine rpm and 1000 psi (68 bar) pressure.

Check for the leveling system pressure by connecting testing equipment to the pressure port of leveling control valve (Fig. 18).

Use the following procedure:

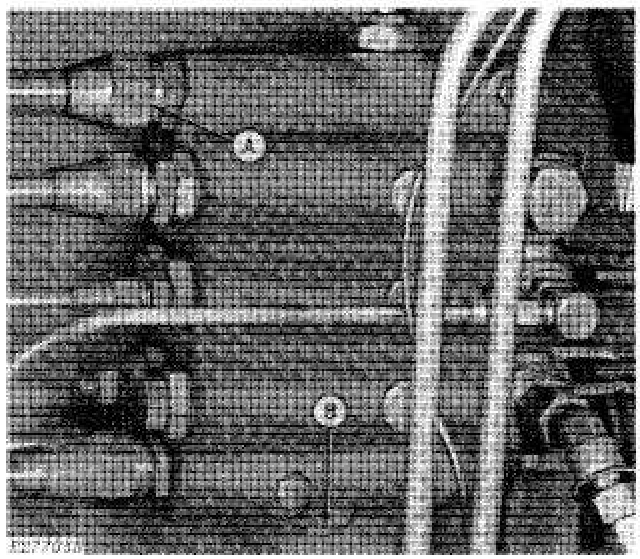
1. With test equipment connected, start engine and move throttle lever to fast idle. Turn off leveling control cut-out switch. Manually tilt machine completely to one side with the manual tilt switch.

2. Manually tilt the machine completely to the other side, with the manual tilt switch, noting the pressure and the time required to tilt the machine. This time should be 9-12 seconds.

3. Manually tilt the machine completely to the other side, noting the pressure and the time required to tilt the machine.

4. Pressures for leveling to the left and to the right should be approximately the same. The pressure required to tilt the machine depends on how full the grain tank is and other factors affecting the weight of the machine. Pressures should be in the range of 800-1200 psi (54-81 bar) with an empty grain tank.

Test No. 2 - Checking Flow to Main Control Valve



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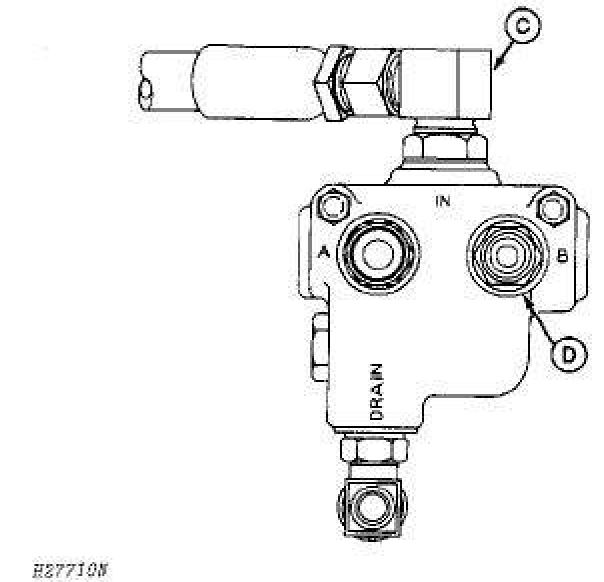
A—Pressure Port B—Gauge Port

Fig. 19-Checking Flow to Main Control Valve

Pressure should be 2200-2400 psi (150-163 bar) plug back pressure when the relief valve in the main control valve is opened. Flow rate should be 6.3-7.1 GPM (23.8-26.9 L/m) at fast idle rpm and 1000 psi (68 bar) pressure.

Check for the flow rate to the main control valve from the proportional flow divider by connecting testing equipment to pressure port (A, Fig. 19) of main control valve. If only a pressure gauge is used, connect it to the gauge port (B, Fig. 19).

Test No. 3 - Checking Pump Flow Rate



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C—Inlet Port   **D—Leveling Port**

Fig. 20-Checking Pump Flow Rate

Flow rate should be 10.6-11.6 GPM (40.1-43.9 L/m) at full engine rpm and 1000 psi (68 bar) pressure.

Check for flow rate from pump by connecting test equipment to inlet port of proportional flow divider (C, Fig. 20).

Test No. 4 - Checking Leveling System Relief Valve

Pressure should be 2525-2600 psi (172-177 bar) plus back pressure when the leveling system relief valve is open.

Check relief valve opening pressure by connecting a pressure gauge to the leveling port (D, Fig. 20) of the proportional flow divider.

NOTE: The pressure required to level the machine depends on grain tank level and anything else affecting the weight of the machine. Excessively high pressure may indicate a lack of lubrication of the feeder house front closure and/or binding in the leveling arms or front closure.

Test No. 5 - Checking Leveling Cylinder Valve Block Leakage

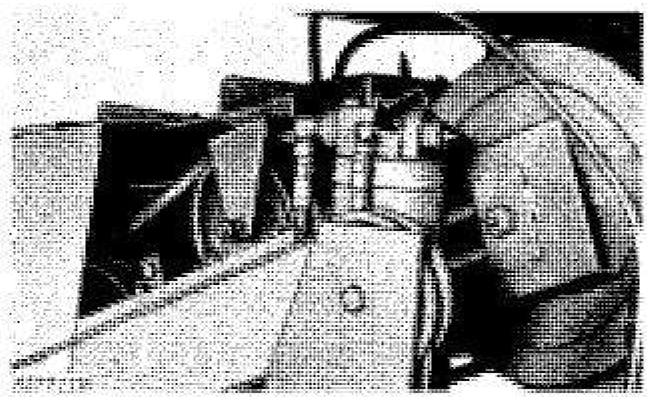

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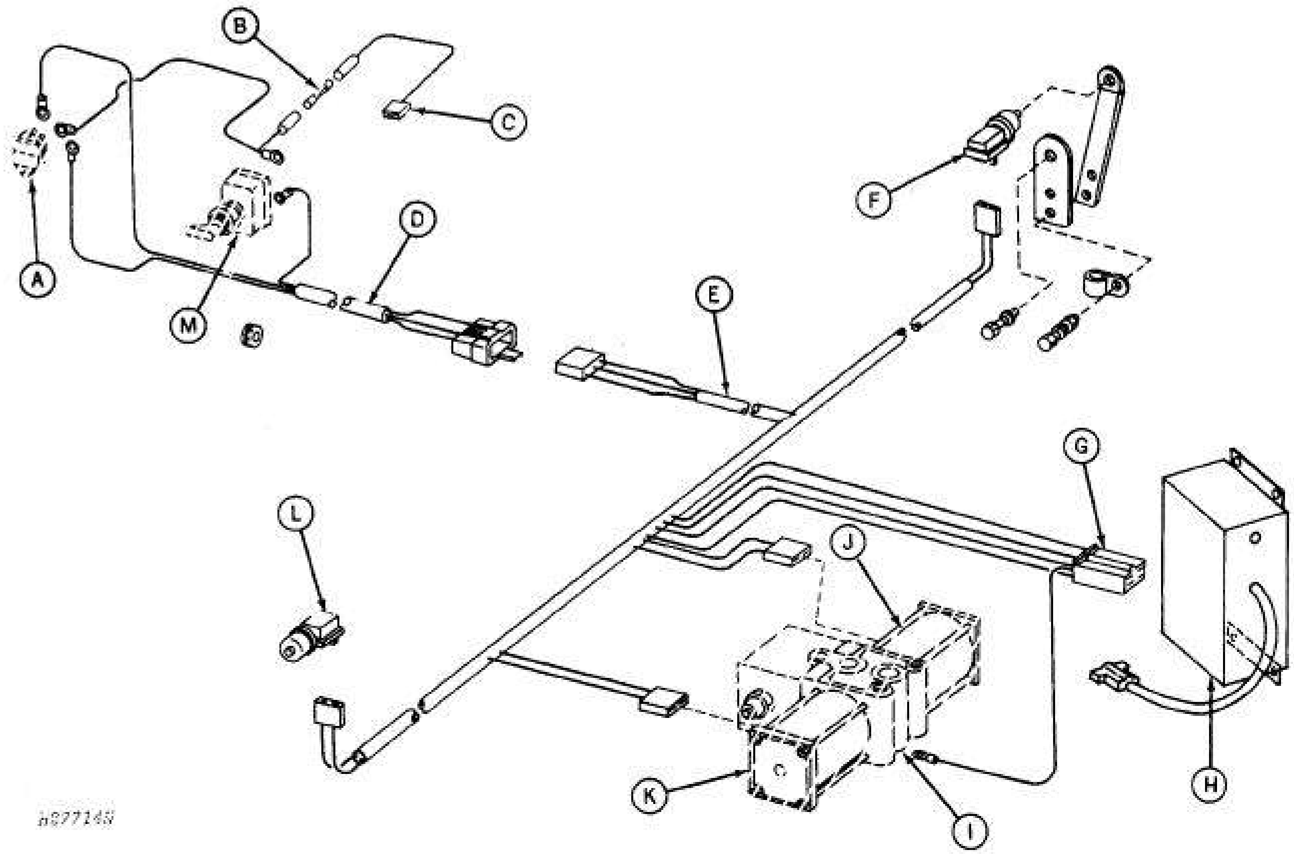
Fig. 21-Checking Leveling Cylinder Valve Block Leakage

Disconnect the drain line on leveling cylinder (Fig. 21) to check leakage of valve block. A small amount of oil should drain from the open port. After than, there should be no continuous draining of oil from the port. The leakage rate should not exceed 4 drops per minute.

Group 10
ELECTRICAL SYSTEM

GENERAL INFORMATION



A—Manual Leveling Control Switch
B—6 Amp Fuse
C—To Ignition Switch
D—Upper Wiring Harness
E—Lower Wiring Harness
F—Left Tilt Limit Switch
G—Connector
H—Level Sensing Control Box
I —Leveling Control Valve
J—Left Tilt Solenoid
K—Right Tilt Solenoid
L—Right Tilt Limit Switch
M—Leveling Control Cut-Out Switch

Fig. 1-SideHill Electrical Leveling System

The SideHill leveling system is comprised of two integral systems, Electrical and Hydraulic. The SideHill electrical system activates the hydraulic system during automatic and manual leveling.

The SideHill Electrical System consists of the following components:

Leveling control box (H, Fig. 1). Refer to Page 10-4 for operation of the control box.

Right and left tilt limit switches (F and L, Fig. 1). Refer to Page 150-05-5 for operation of these switches.

Right and left tilt solenoids (J and K, Fig. 1) on the leveling control valve (I). Refer to Page 10-2 for operation of the solenoids.

Manual leveling control switch (A, Fig. 1). Refer to Page 150-05-5 for the control switch.

Leveling control cut-out switch (M, Fig. 1), refer to Page 150-05-5 for operation of this cut-out switch.

A 6 amp fuse (B, Fig. 1).

GENERAL INFORMATION—Continued

Automatic Leveling

When the combine moves onto a slope that tilts the machine to the right or left, the pendulum in leveling control box (Fig. 2) swings to the right or left, causing the appropriate tilt switch in level sensing control box to close.

Current flows from ignition switch (Fig. 2) through fuse and leveling control cut-out switch to leveling control box.

The closed right or left tilt switch in level sensing control box (Fig. 2) directs current to the correct tilt limit switch which is normally closed. Current flows to and activates the appropriate tilt solenoid which moves the spool in leveling control valve causing the hydraulic system to level the machine to the right or left.

If the leveling cylinders reach the end of their stroke, tilt limit switch (Fig. 2) opens, causing tilt solenoid to deactivate and shutting off the hydraulic leveling system.

If the combine becomes level before the leveling cylinders come to the end of their stroke, the pendulum, in leveling control box (Fig. 2), centers between both tilt switches opening the tilt switch. This deactivates the electrical and hydraulic leveling systems.

A white wire from the common ground junction on right tilt solenoid (Fig. 2) leads to the level sensing control box. The common ground junction is grounded to the combine frame by a separate white wire. This serves as a ground for the entire electrical leveling system.

Manual Leveling

The operator activates manual leveling control switch (Fig. 2) for leveling to the right or left. Current flows from ignition switch through fuse to leveling control cut-out switch. Current flows directly to manual leveling control switch regardless of the position of leveling control cut-out switch.

Current flows from manual leveling control switch (Fig. 2) to right or left tilt solenoid, activating the right or left tilt solenoid. This moves the spool in leveling control valve, causing the hydraulic system to level the machine to the right or left.

Even with the leveling cylinders at the end of their stroke, the manual electrical and hydraulic leveling systems will still be activated. This will cause the relief valve to open in the proportional flow divider.

If the operator disengages manual leveling control switch (Fig. 2) with leveling control cut-out switch in the on position, the automatic leveling system will immediately level the machine to the right or left, since the pendulum in leveling control box is swung to the right or left. An exception is if the machine is on a slope and the combine is brought to a level position with the manual leveling system. Then the pendulum will be centered in the leveling control box and therefore, not activating the automatic leveling system.

If the operator disengages manual leveling control switch (Fig. 2) with leveling control cut-out switch in the off position, the combine will stay tilted in that position when the operator disengages the manual leveling control switch.

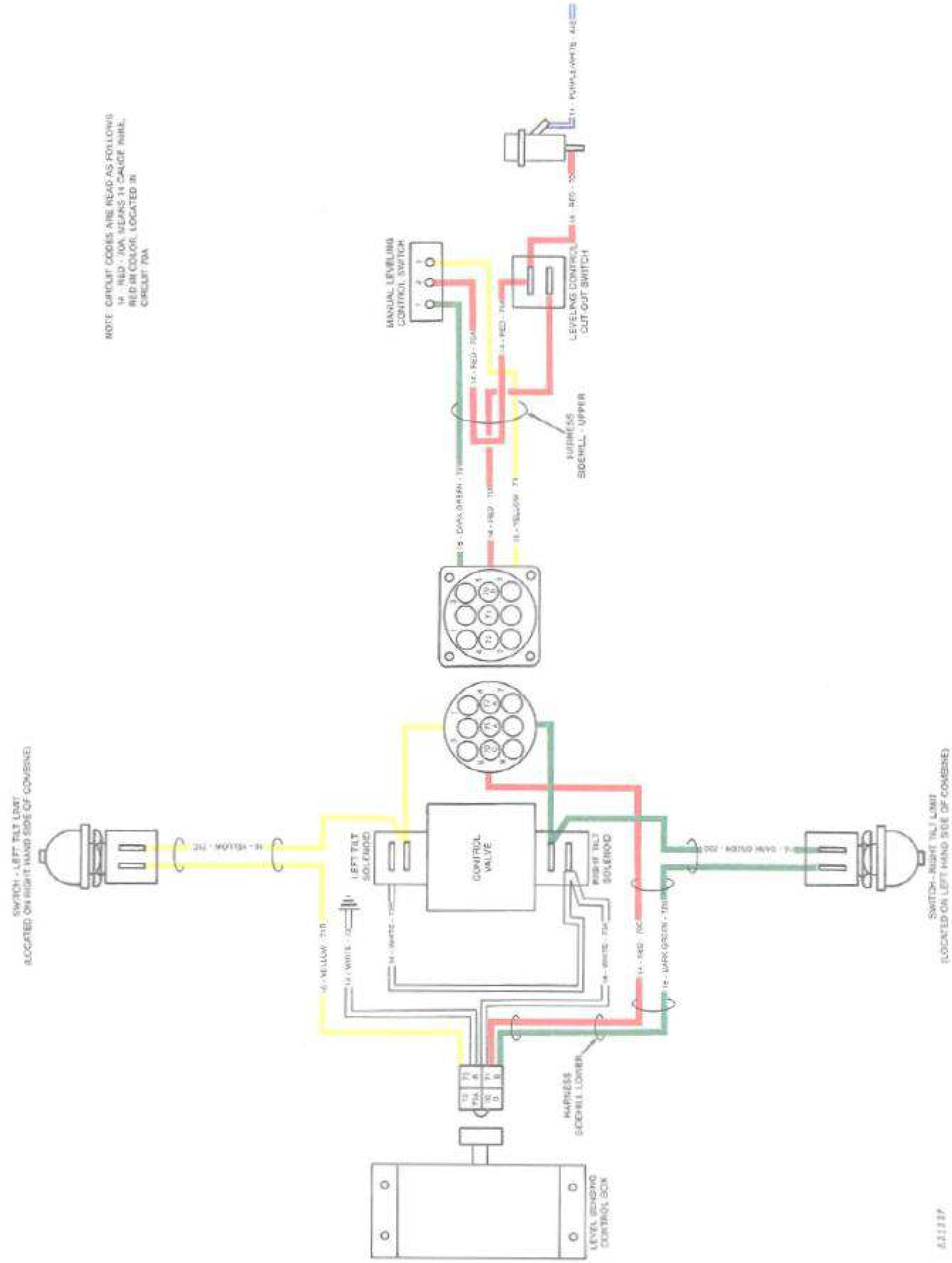


Fig. 2-SideHill 6600 Electrical Leveling System Diagram

LEVEL SENSING CONTROL BOX

General Information

The leveling control box, mounted on the front axle, contains two sensing switches, a pendulum, two transistors, a dashpot with an adjustable orifice, and miscellaneous resistors and diodes.

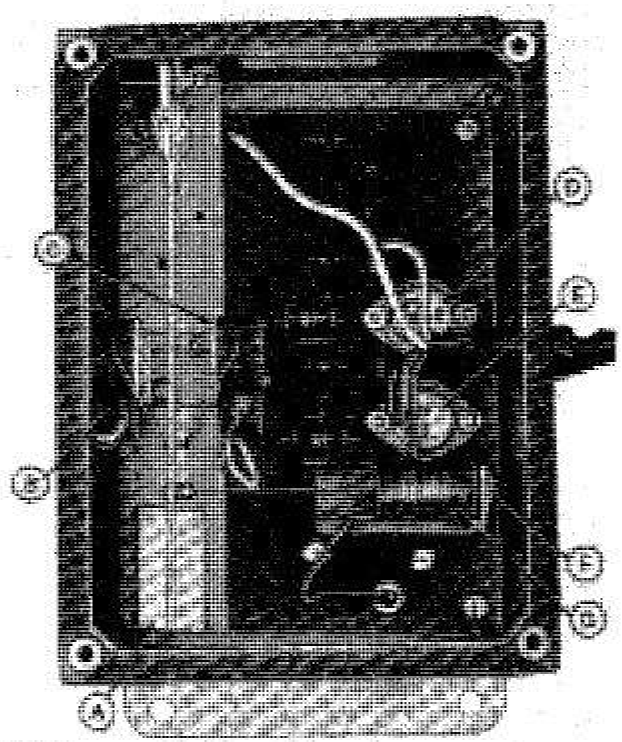
Basically, the pendulum acting against the two sensing (or tilt) switches, which activate the remaining electrical leveling system and the hydraulic leveling system, keeps the separator level while the header, wheels, and axles follow the contour of the ground.

Leveling to the Right or Left

When the combine moves onto a slope that causes it to lean to the right or left, the level sensing control box, secured to the front axle, pivots around the perpendicular pendulum (A, Fig. 3) inside the control box. If the combine leans to the right or left 1° off center, right tilt switch (C) or left tilt switch (B) is closed by pendulum (A). If the combine changes slope rapidly, dashpot (G) will keep the pendulum centered and prevent overleveling. The dashpot (G) forces air through adjustable orifice (F) when leveling and prevents unnecessary leveling action due to the combine traveling over small bumps.

Current is directed to the circuit board. The emitter base junction of transistor (E, Fig. 3) becomes forward biased and directs current through the wiring harness and closed right or left tilt limit switch to the right or left tilt solenoid on the leveling control valve, activating the hydraulic leveling system.

When the hydraulic leveling system brings the combine to a level position, pendulum (A, Fig. 3) centers, causing right or left tilt switch (C or B, Fig. 3) to open, turning off the electrical system and the hydraulic leveling action.



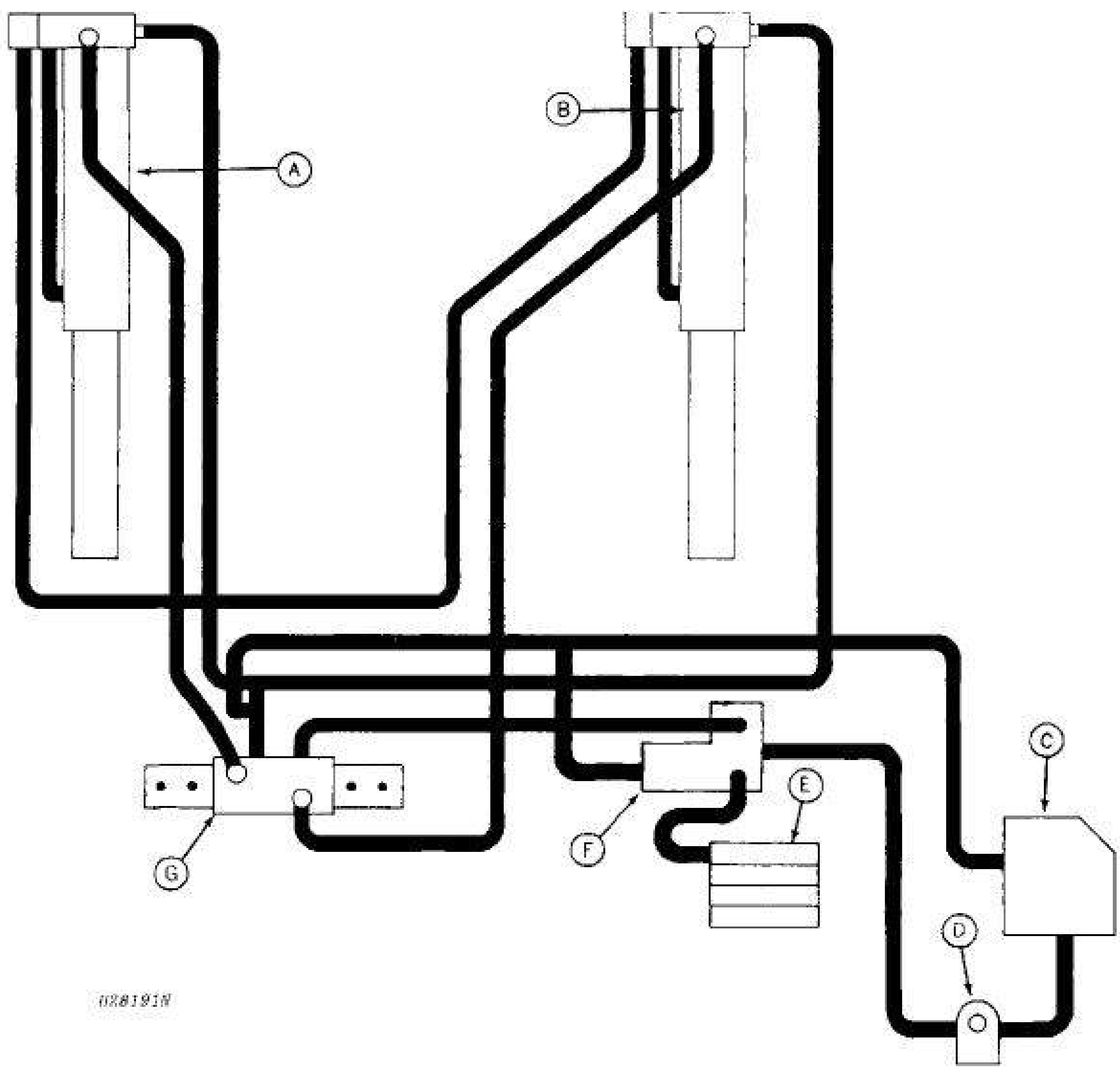
H27716NX

A—Pendulum
B—Left Tilt Switch
C—Right Tilt Switch
D—Left Tilt Transistor
E—Right Tilt Transistor
F—Adjustable Orifice
G—Dashpot

Fig. 3-Level Sensing Control Box

Group 15
HYDRAULIC SYSTEM

GENERAL INFORMATION



A—R.H. Leveling Cylinder
B—L.H. Leveling Cylinder
C—Main Hydraulic Reservoir
D—Main Hydraulic Pump
E—Main Hydraulic Control Valve
F—Proportional Flow Divider
G—Leveling Control Valve

Fig. 1-Hydraulic Components

The system consists of the following components:

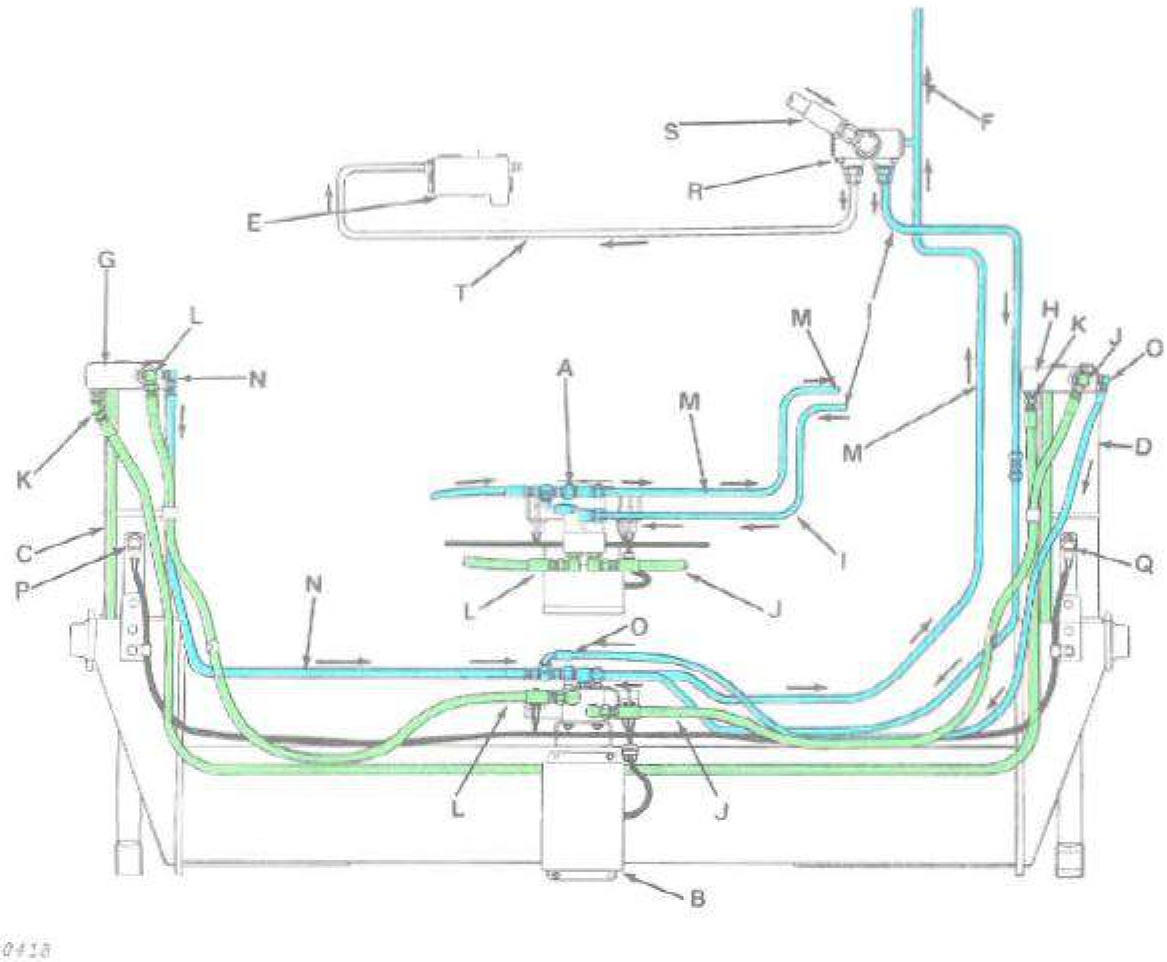
Proportional flow divider (F, Fig. 1) with relief valve. Refer to Page 15-7 for the operation of this valve.

Leveling control valve (G, Fig. 1) equipped with right and left tilt solenoids. Refer to Page 15-9 for the operation of this valve.

Two double-acting leveling cylinders (A and B, Fig. 8). Refer to Page 15-12 for the operation of the leveling cylinders.

Hydraulic lines and hoses.

GENERAL INFORMATION—Continued



A—Leveling Control Valve
B—Control Box
C—R.H. Leveling Cylinder
D—L.H. Leveling Cylinder
E—Main Control Valve
F—Return Line
G—R.H. Cylinder Valve Block
H—L.H. Cylinder Valve Block
I —Pressure Line
J—Working Line L.H. Cylinder
K—Balance Beam Line
L—Working Line R.H. Cylinder
M—Return Line
N—Drain Line
O—Drain Line
P—Left Tilt Limit Switch
Q—Right Tilt Limit Switch
R—Proportional Flow Divider
S—Pressure Line
T—Pressure Line
Pressure Free Oil
Trapped Oil

Fig. 2-Leveling System not Activated

Leveling System not Activated

When the leveling system is not activated, there is no electric current to either solenoid on the leveling control valve (A, Fig. 2).

Valve blocks (G, Fig. 2) and (H) trap oil in the head ends of both leveling cylinders (C) and (D).

Pressure free oil from proportional flow divider (R, Fig. 2) flows to the leveling control valve (A) through pressure line (I). If one or more of the following systems are used, pressure oil will flow from proportional flow divider (R) to main control valve (E) through pressure line (T).

If none of the following systems are used, pressure free oil will flow from proportional flow divider (R, Fig. 2) to main control valve (E) through pressure line (T).

Ground Speed (Except Hydrostatic Drive)
Header Lift
Reel Lift
Unloading Auger Swing
Automatic Header Height Control
Auxiliary Unloading Auger Drive

Leveling System not Activated —Continued

Pressure free oil flows through leveling control valve (A, Fig. 2) and is then returned to a tee on proportional flow divider (R), through return line (M).

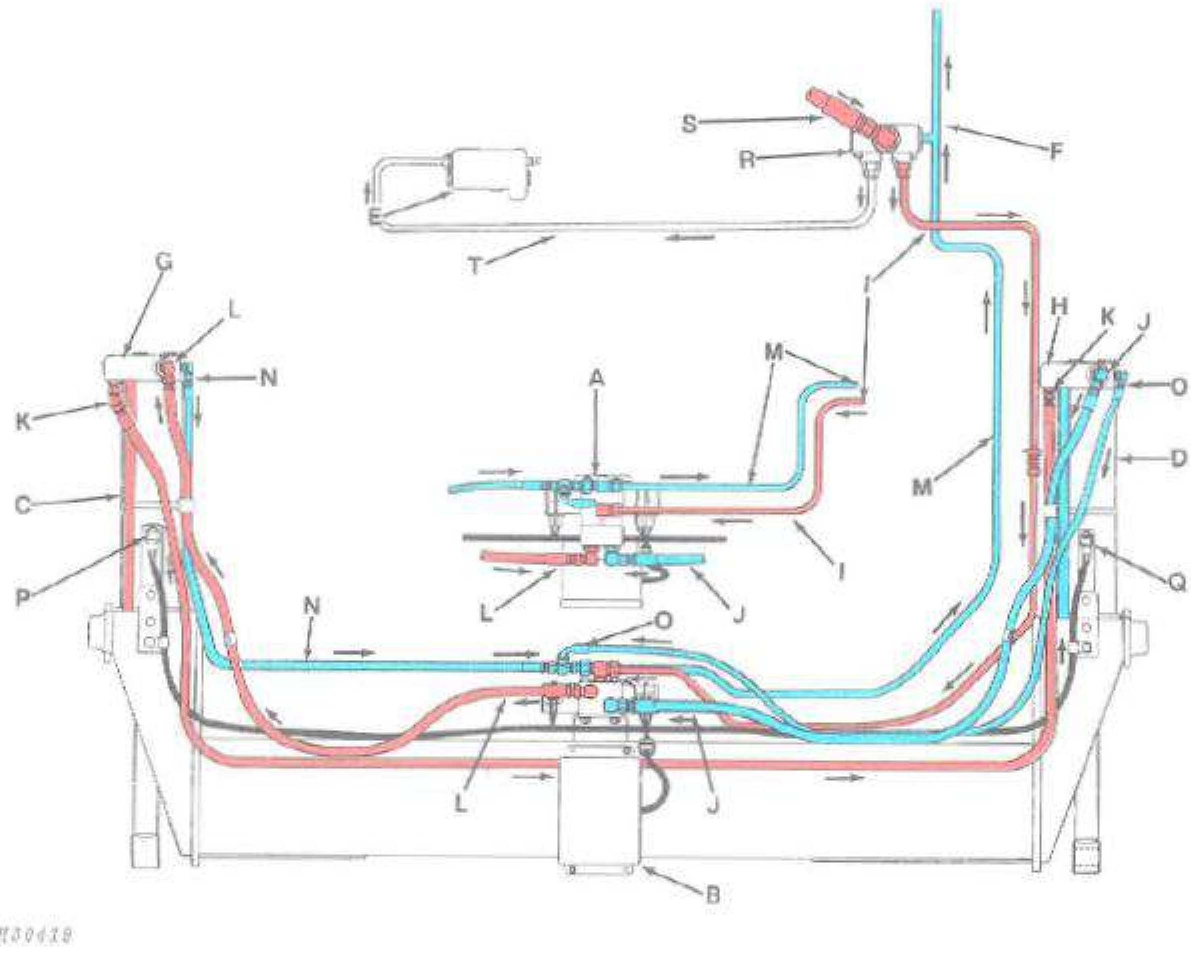
Pressure free oil flows back to the reservoir through a return line (F, Fig. 2).

Drain Lines

Drain lines (O, Fig. 2) and (N) drain internal leakage oil in valve blocks (G) and (H), preventing a hydrostatic lock between plunger and seat. Refer to Page 15-30.

The return oil is drained back to a tee on proportional flow divider (R, Fig. 2), through return line (M), and then back to reservoir through return line (F).

Leveling to the Right



A—Leveling Control Valve
B—Control Box
C—R.H. Leveling Cylinder
D—L.H. Leveling Cylinder
E—Main Control Valve
F—Return Line
G—R.H. Cylinder Valve Block
H—L.H. Cylinder Valve Block
I —Pressure Line
J—Working Line L.H. Cylinder
K—Balance Beam Line
L—Working Line R.H. Cylinder
M—Return Line
N—Drain Line
O—Drain Line
P—Left Tilt Limit Switch
Q—Right Tilt Limit Switch
R—Proportional Flow Divider
S—Pressure Line
T—Pressure Line
Pressure Oil
Pressure Free Oil

Fig. 3-Leveling to the Right

Leveling to the Right—Continued

When the combine moves onto a slope that causes it to lean to the left, the electrical system (as described on Page 10-1), activates the left-hand solenoid on leveling control valve (A, Fig. 3).

The activated solenoid pushes the spool in, causing a demand for pressure oil from the main hydraulic pump. This pressure oil flows from the main hydraulic pump to the proportional flow divider (R, Fig. 3).

The proportional flow divider (R, Fig. 3) directs 40% of the oil to leveling control valve (A) through pressure line (I). The remaining 60% is directed to main control valve (E) through pressure line (T). The proportional flow divider (R) will always direct 40% of the oil to the leveling system regardless of pressure requirements in either the leveling system or the main hydraulic system.

Leveling control valve (A, Fig. 3) directs pressure oil to valve block (H) on top of right-hand leveling cylinder (D) through working line (J).

Valve block (H, Fig. 3) then directs pressurized oil to the rod end of right-hand cylinder (D), causing it to retract.

As the right-hand cylinder (D, Fig. 3) retracts, oil forced out of the head end of the cylinder is directed by valve block (H) to valve block (G) on left-hand cylinder (C) through balance beam hose (K).

Valve block (G, Fig. 3) directs this oil to the head end of the left-hand cylinder, causing it to extend.

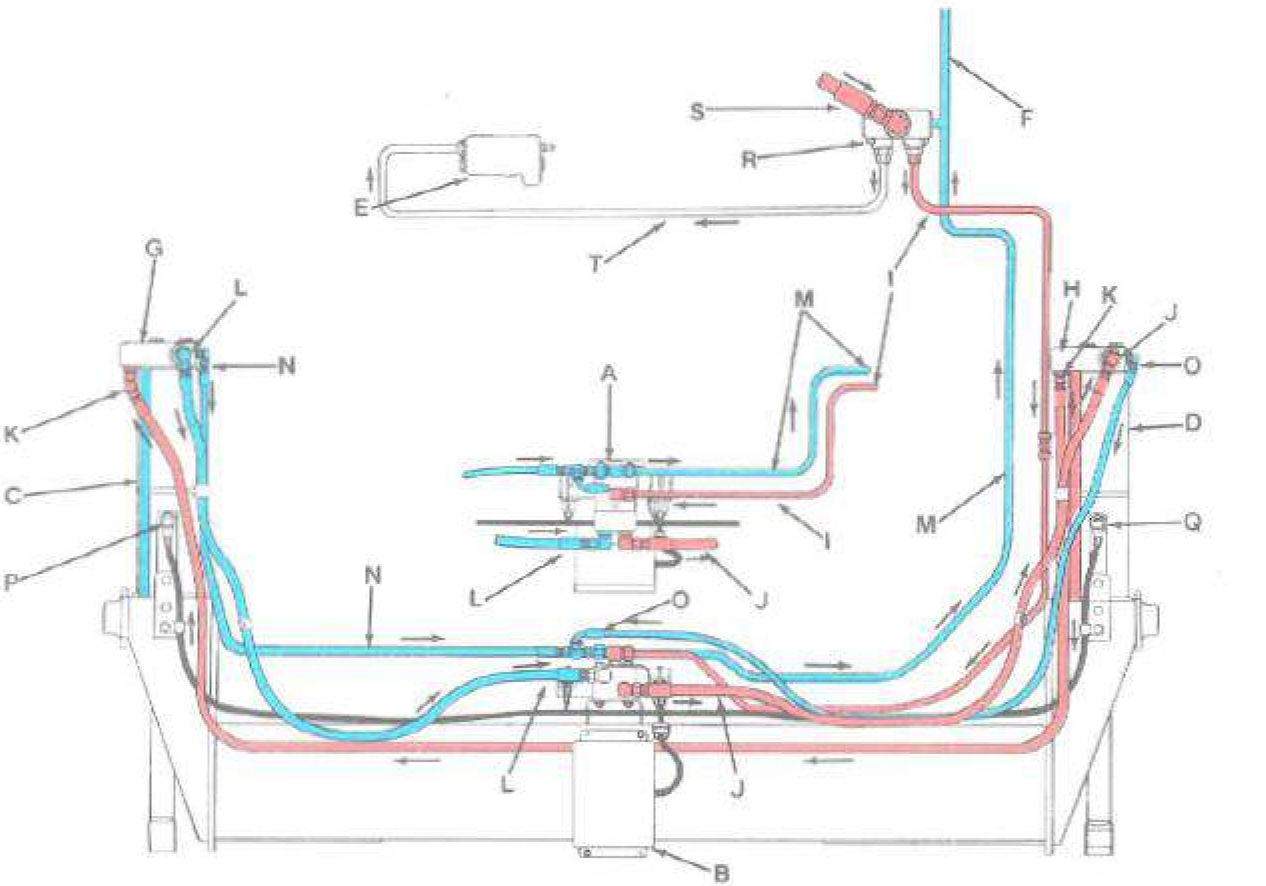
Valve block (G, Fig. 3) also directs oil forced out of the rod end of left-hand cylinder (C) to leveling control valve (A) through working line (L).

Leveling control valve (A, Fig. 3) directs this return oil from left-hand leveling cylinder (C) to a tee on proportional flow divider (R) through return line (M).

The return oil flows back to the reservoir through return line (F, Fig. 3).

When the hydraulic leveling system brings the combine separator to a level position, the electrical system shuts off the current to the left-hand solenoid on leveling control valve (A, Fig. 3). The spool, in the leveling control valve centers, causing the hydraulic leveling system to be deactivated.

If the combine is leveled to its maximum 18 percent slope, limit switch (P, Fig. 3), on the extended left-hand cylinder (C), shuts off the current to the left-hand solenoid on leveling control valve (A). This causes the spool in leveling control valve (A) to center, deactivating the hydraulic leveling system.



A—Leveling Control Valve
B—Control Box
C—R.H. Leveling Cylinder
D—L.H. Leveling Cylinder
E—Main Control Valve
F—Return Line
G—R.H. Cylinder Valve Block
H—L.H. Cylinder Valve Block
I —Pressure Line
J —Working Line L.H. Cylinder
K—Balance Beam Line
L —Working Line R.H. Cylinder
M—Return Line
N—Drain Line
O—Drain Line
P—Left Tilt Limit Switch
Q—Right Tilt Limit Switch
R—Proportional Flow Divider
S—Pressure Line
T—Pressure Line
Pressure Oil
Pressure Free Oil

Fig. 4-Leveling to the Left

Leveling to the Left

When the combine moves onto a slope that causes it to lean to the right, the electrical system (as described on Page 10-1), activates the right-hand solenoid on leveling control valve (A, Fig. 4).

The activated solenoid pushes the spool in, causing a demand for pressure oil from the main hydraulic pump. This pressure oil flows from the main hydraulic pump to the proportional flow divider (R, Fig. 4).

The proportional flow divider (R, Fig. 4) directs 40 percent of the oil to leveling control valve (A) through pressure line (I). The remaining 60 percent is directed to main control valve (E) through pressure line (T). The proportional flow divider (R) will always direct 40 percent of the oil to the leveling system regardless of pressure requirements in either the leveling system or the main hydraulic system.

Leveling control valve (A, Fig. 4) directs pressure oil to valve block (H) on top of left-hand leveling cylinder (D) through working line (J).

Leveling to the Left—Continued

Valve block (H, Fig. 4) then describes pressurized oil to the rod end of left-hand cylinder (D), causing it to retract.

As left-hand cylinder (D, Fig. 4) retracts, oil forced out of the head end of the cylinder is directed by valve block (H) to valve block (G) on right-hand cylinder (C) through balance beam hose (K).

Valve block (G, Fig. 4) directs this oil to the head end of the right-hand cylinder, causing it to extend.

Valve block (G, Fig. 4) also directs oil forced out of the rod end of right-hand cylinder (C) to leveling control valve (A) through working line (L).

Leveling control valve (A, Fig. 4) directs this return oil from right-hand leveling cylinder (C) to a tee on proportional flow divider (R) through return line (M).

The return oil flows back to the reservoir through return line (F, Fig. 4).

When the hydraulic leveling system brings the combine separator to a level position, the electrical system shuts off the current to the right-hand solenoid on leveling control valve (A, Fig. 4). The spool, in the leveling control valve centers, causing the hydraulic leveling system to be deactivated.

If the combine is leveled to its maximum 18 percent slope, limit switch (P, Fig. 4), on the extended right-hand cylinder (C), shuts off the current to the right-hand solenoid on leveling control valve (A). This causes the spool in leveling control valve (A) to center, deactivating the hydraulic leveling system.

Drain Lines

Drain lines (0, Figs. 10 or 4) and (N) drain internal leakage oil in valve blocks (G) and (H), preventing a hydrostatic lock between plunger and seat. The oil is drained back to unloading auger swing control valve (F) through return line (M). Return oil flows through the unloading auger swing control valve (F) and to the reservoir through a return line.

Leveling Cylinder Rephasing

The proper volume of oil must be trapped in the head end of each leveling cylinder to keep the separator level. When the combine is on level ground, equal amounts of oil are in the head ends of both leveling cylinders. When the combine is driven on uneven ground, or manually tilted, oil is transferred from the head end of the retracting cylinder to the head end of the extending cylinder, through the balance beam hose.

Internal leakage of oil out of this closed circuit will cause the combine to lean to one side during operation, causing unnecessary leveling corrections or may allow both cylinders to retract. Refer to Page 05-14 for diagnostic steps when this occurs. Leaning to one side, while the combine is parked, may also occur. Refer to Page 05-3 for diagnostic steps when this occurs.

Rephasing orifices are located in the leveling cylinders to add oil to the head ends of both leveling cylinders if required. A properly working combine should not require frequent rephasing. Rephasing can, however, keep a combine operating in the field until the leveling problems can be corrected. Rephasing is also necessary any time the leveling cylinder is disassembled or the balance beam hose has been disconnected.

The loosening of leveling cables may occur when rephasing is necessary. Rephase the cylinders before tightening the leveling cables. Damage to the feeder house front closure can occur if cables are too tight. Use the procedure on page 150-10-8 to rephase the leveling cylinders.

PROPORTIONAL FLOW DIVIDER

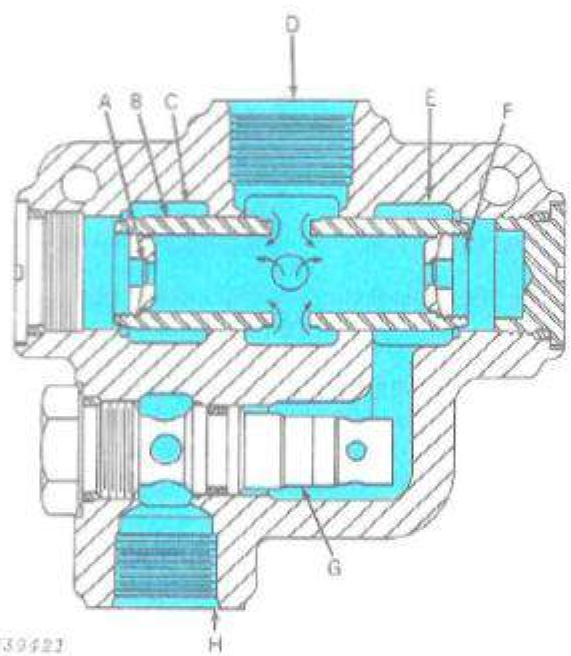
General Information

The proportional flow divider directs 40 percent of the oil to the leveling control valve and the remaining 60 percent to the main control valve. The 40/60 percent for the division of flow will be maintained regardless of pressure requirements in either the leveling system or the main hydraulic system.

The proportional flow divider contains a relief valve protecting the leveling system. When open, the relief valve returns oil from the leveling system to the reservoir. This relief valve is set at 2500 psi (175 bar).

Operation of the proportional flow divider is as follows:

Leveling System Not Activated - No Other Systems Activated



A—Main System Orifice
B—Spool
C—Main System Port
D—From Main Hydraulic Pump
E—Leveling System Port
F—Leveling System Orifice
G—Leveling System Relief Valve
H—To Reservoir
Pressure Free Oil

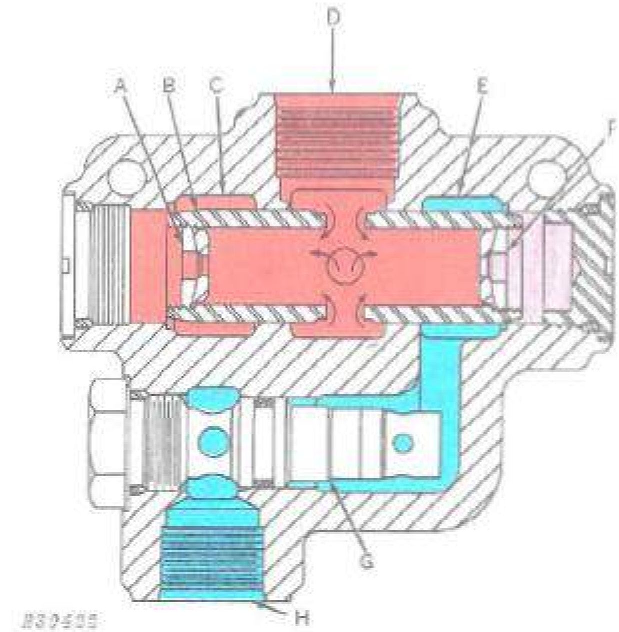
Fig. 5-Leveling System Not Activated - No Other Systems Activated

Pressure free oil flows from the main hydraulic pump to port (D, Fig. 5). Oil flows through four holes into spool (B).

Because no systems are being activated, there are equal pressure drops across orifices (A, Fig. 5) and (F) and spool (B) remains centered.

The flow divider directs 40 percent of the pressure free oil to the leveling control valve through port (E, Fig. 5) and 60 percent to the main control valve through port (C).

Leveling System Not Activated - One or More Other Systems Activated

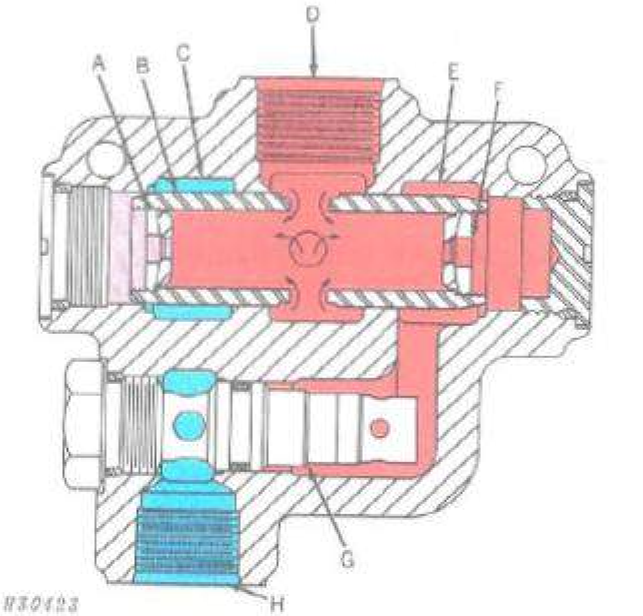


A—Main System Orifice
B—Spool
C—Main System Port
D—From Main Hydraulic Pump
E—Leveling System Port
F—Leveling System Orifice
G—Leveling System Relief Valve
H—To Reservoir
Pressure Oil
Low Pressure Oil
Pressure Free Oil

Fig. 6-Leveling System Not Activated - One or More Other Systems Activated

When one or more of the combine hydraulic systems is activated, and the leveling system is not activated, the pressure drop across orifice (F, Fig. 6) (caused by the requirement of high pressure oil through orifice [A]) moves the spool (B) to the right.

Leveling System Activated - No Other Systems Activated



A—Main System Orifice
B—Spool
C—Main System Port
D—From Main Hydraulic Pump
E—Leveling System Port
F—Leveling System Orifice
G—Leveling System Relief Valve
H—To Reservoir
Pressure Oil
Low Pressure Oil
Pressure Free Oil

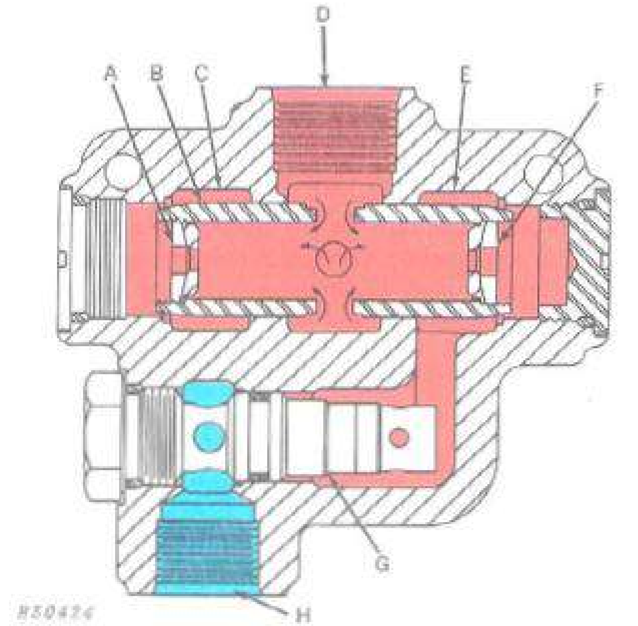
Fig. 7-Leveling System Activated - No Other Systems Activated

When the leveling system activates and no other hydraulic systems are functioning, the pressure drop (caused by the requirement of high pressure oil to the leveling system) will be across orifice (A, Fig. 7) and spool (B) will move to the left.

High pressure oil will flow to the leveling valve through port (E, Fig. 7). Low pressure oil will flow to the main control valve through port (C). Because no other systems are activated, this oil will return to the reservoir as pressure free oil.

If the high pressure oil reaches 2500 psi (175 bar) the relief valve in the proportional flow divider will open and the oil will flow to the reservoir through port (H, Fig. 7).

Leveling System Activated - One or More Other Systems Activated



A—Main System Orifice
B—Spool
C—Main System Port
D—From Main Hydraulic Pump
E—Leveling System Port
F—Leveling System Orifice
G—Leveling System Relief Valve
H—To Reservoir
Pressure Oil
Pressure Free Oil

Fig. 8-Leveling System Activated - One or More Other Systems Activated

When the leveling system and one or more of the other systems are activated at the same time, 40 percent of the high pressure oil will flow to the leveling control valve and 60 percent of the high pressure oil will flow to the main control valve.

Because high pressure oil is required for both the leveling system and the main system, the pressure drop across the orifices (A and F, Fig. 8) is equal and spool (B) remains centered.

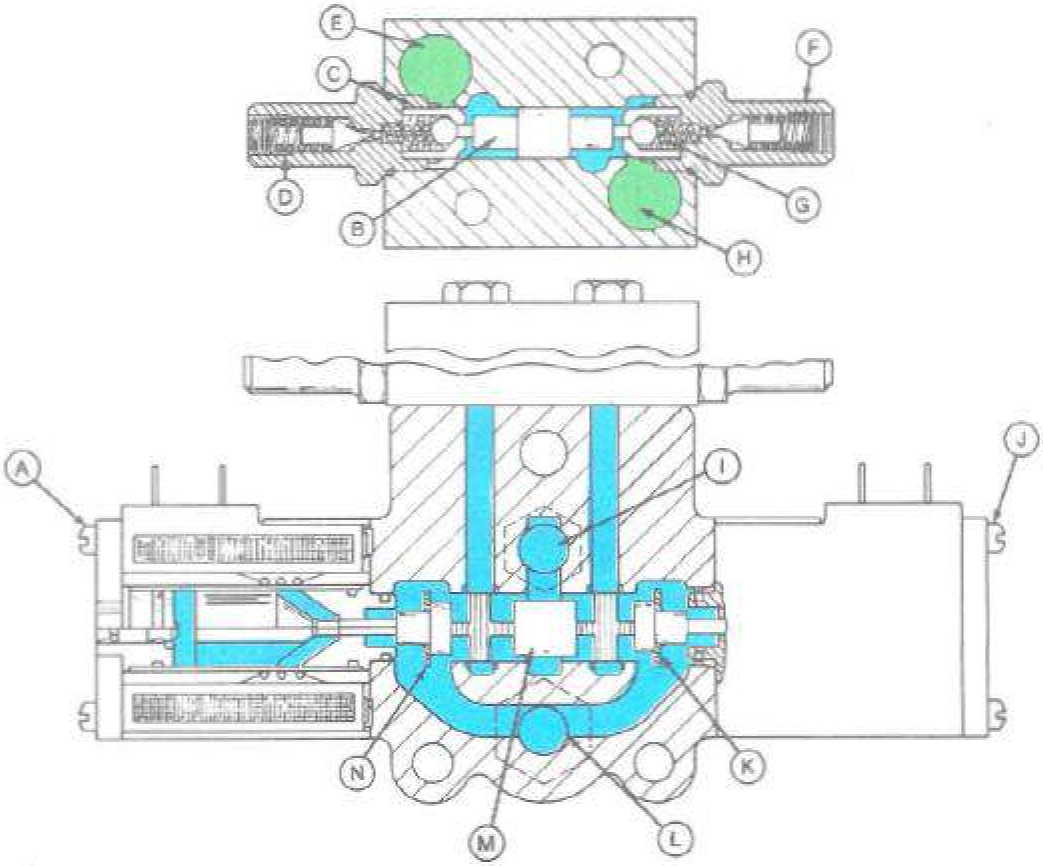
If the pressure requirement increases for the leveling or one of the other hydraulic functions, the spool in the proportional flow divider will shift accordingly to compensate for this increased requirement. This shift in the spool will maintain the 40/60 percent divided flow and will also maintain the speed at which the function should operate.

Example: If the combine is in the leveling function and the header is raised at the same time, the speed of leveling will not change. Conversely, if the header is being raised and the combine starts to level, the raising speed of the header will not change.

LEVELING CONTROL VALVE

General Information

The leveling control valve, which is mounted on the top of the front axle, consists basically of two electrically operated tilt solenoids which control the movement of the leveling valve spool. This spool controls the flow of oil to and from the leveling cylinders.



A—Left Tilt Solenoid	E—To R.H. Leveling Cylinder	I—Pressure Port	M—Spool
B—Spool	F—Thermal Relief Valve	J—Right Tilt Solenoid	N—Slotted Washer
C—Pilot Check Valve	G—Pilot Check Valve	K—Slotted Washer	Pressure Free Oil
D—Thermal Relief Valve	H—To L.H. Leveling Cylinder	L—Return Port	Trapped Oil

Fig. 9-Leveling System Not Activated

Leveling System Not Activated

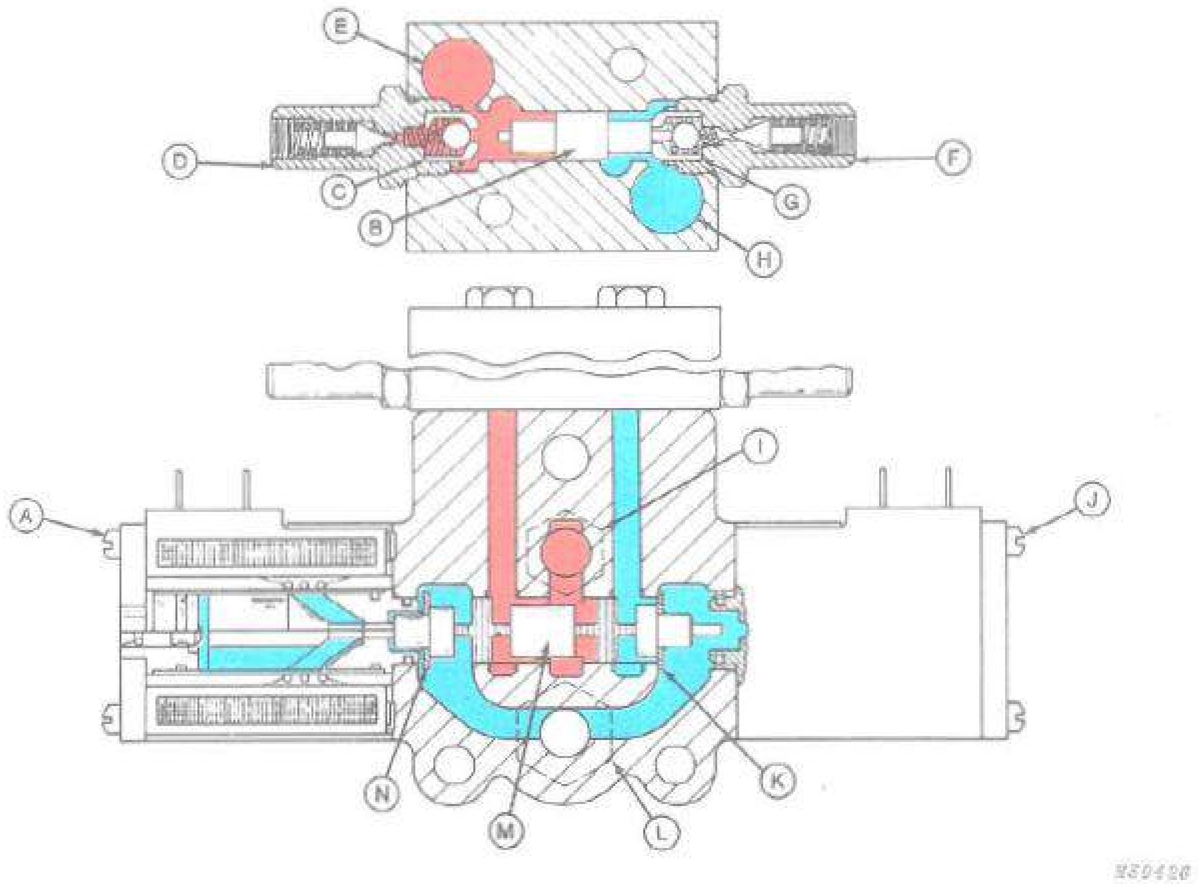
With the combine level, electric current is shut off, and neither solenoid (A or J, Fig. 9) is activated.

Springs center spool (M, Fig. 9), allowing pressure free oil to flow into port (E), around spool (M), through slotted washers (N) and (K) and through port (L). Oil returns to reservoir.

Pilot check valves (C and G, Fig. 9), are closed, trapping oil in the hydraulic lines.

The thermal relief valves (D and F) (Fig. 9) are primarily for manufacturing purposes. When the combine moves through the paint oven (at the factory), where the temperature is near 93°C (200°F), these valves will leak off. This leaking prevents the hydraulic hoses and leveling cylinders from bursting.

GENERAL INFORMATION—Continued



A—Left Tilt Solenoid
B—Spool
C—Pilot Check Valve
D—Thermal Relief Valve
E—To R.H. Leveling Cylinder
F—Thermal Relief Valve
G—Pilot Check Valve
H—To L.H. Leveling Cylinder
I—Pressure Port
J—Right Tilt Solenoid
K—Slotted Washer
L—Return Port
M—Spool
N—Slotted Washer
Pressure Oil
Pressure Free Oil

Fig. 10-Leveling to The Right

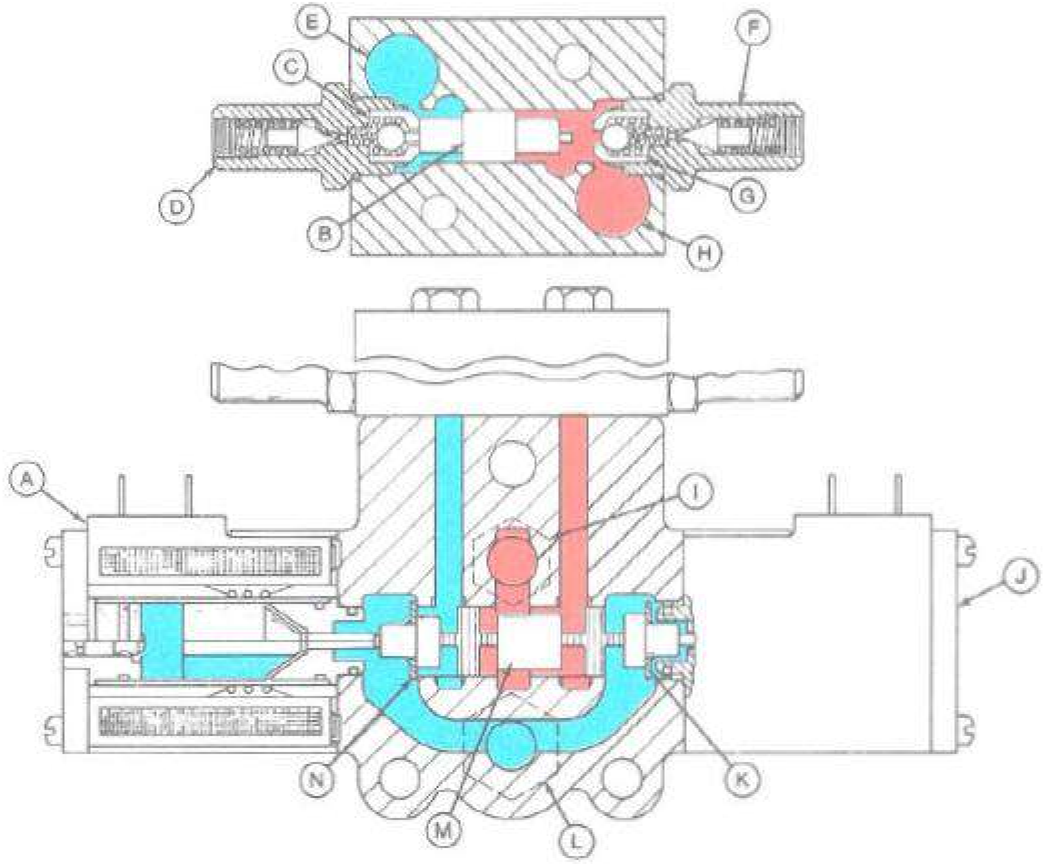
Leveling To The Right

As the combine levels to the right, right tilt solenoid (J, Fig. 10), is activated by the electrical leveling system.

The activated right tilt solenoid (J, Fig. 10), pushes spool (M) in permitting oil from port (I) to flow around spool (M) to pilot check valve (G), causing it to open. This allows pressure oil to flow to the retracting right-hand leveling cylinder.

The pressure oil also forces spool (B, Fig. 10) to the left, causing pilot check valve (C) to open, allowing oil from the extending left-hand leveling cylinder to flow around spool (M) and through slotted washer (N).

Oil flows from port (L, Fig. 10) to the reservoir.



A—Left Tilt Solenoid
B—Spool
C—Pilot Check Valve
D—Thermal Relief Valve
E—To R.H. Leveling Cylinder
F—Thermal Relief Valve
G—Pilot Check Valve
H—To L.H. Leveling Cylinder
I—Pressure Port
J—Right Tilt Solenoid
K—Slotted Washer
L—Return Port
M—Spool
N—Slotted Washer
Pressure Oil
Pressure Free Oil

Fig. 11-Leveling to the Left

Leveling To The Left

As the combine levels to the left, left tilt solenoid (A, Fig. 11), is activated by the electrical leveling system.

The activated left tilt solenoid (A, Fig. 11), pushes spool (M) in permitting oil from port (I) to flow around spool (M) to pilot check valve (C), causing it to open. This allows pressure oil to flow to the retracting left-hand leveling cylinder.

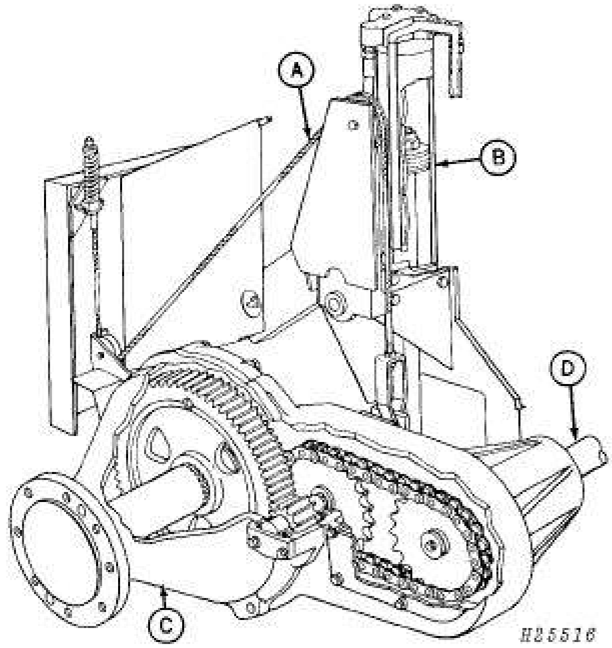
The pressure oil also forces spool (B, Fig. 11) to the right, causing pilot check valve (G) to open, allowing oil from the extending right-hand leveling cylinder to flow around spool (M) and through slotted washer (K).

Oil flows from port (L, Fig. 11) to the reservoir.

LEVELING CYLINDERS

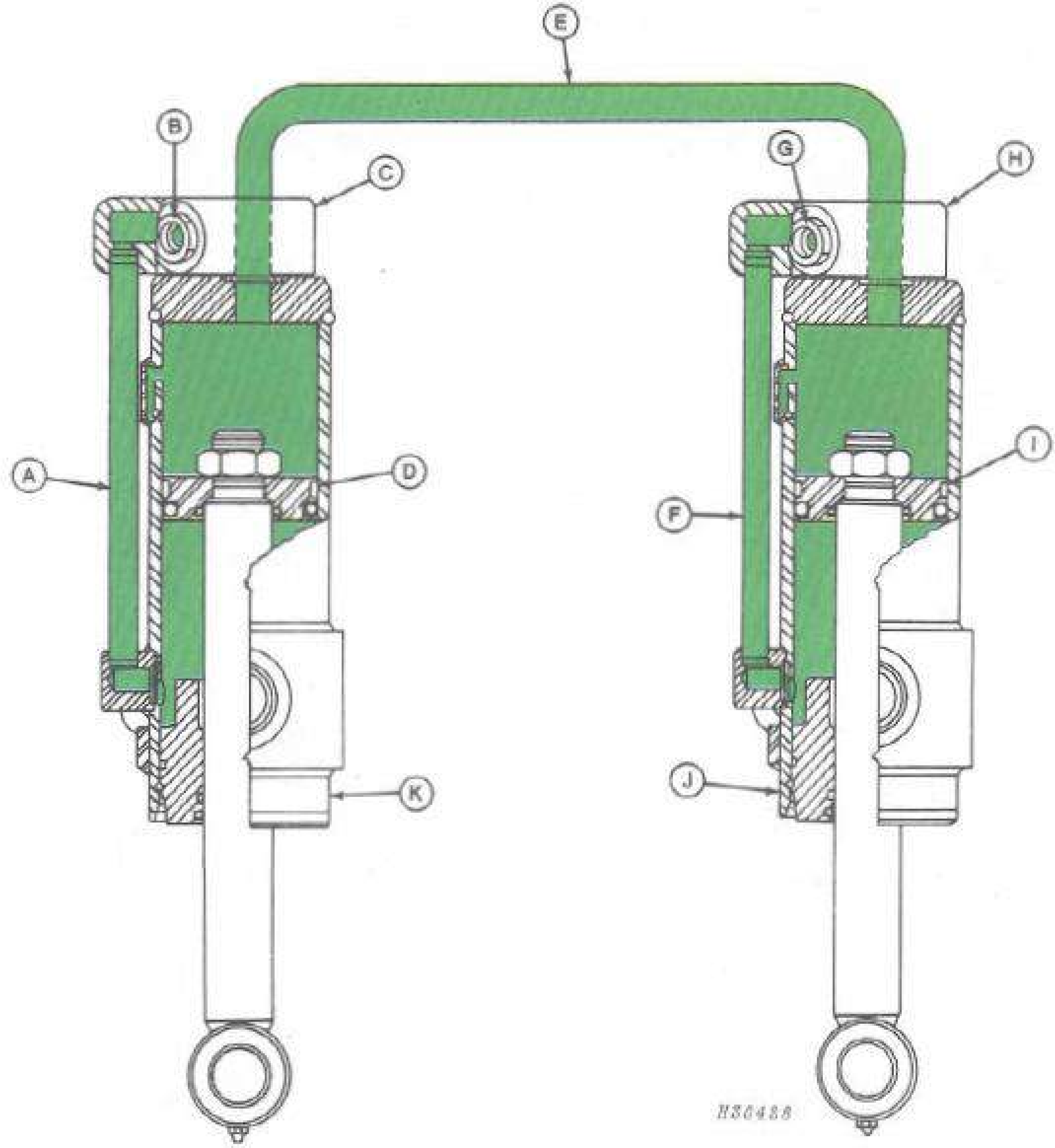
General Information

Two leveling cylinders (Fig. 12) provide the hydraulic force necessary to level the combine. Each leveling cylinder is attached to the combine frame with trunnions. The rod of each leveling cylinder is attached to the final drive housing. When a leveling cylinder extends, it rotates the final drive housing down. When a leveling cylinder retracts, it rotates the final drive housing up.



A—Platform Leveling Cable
B—L.H. Leveling Cylinder
C—Final Drive
D—Drive Shaft

Fig. 12-Leveling Cylinder



A—Transfer Tube
B—Pressure Port to Leveling Control Valve
C—Valve Block
D—Piston
E—Balance Beam Hose
F—Transfer Tube
G—Pressure Port to Leveling Control Valve
H—Valve Block
I—Piston
J—R.H. Leveling Cylinder
K—L.H. Leveling Cylinder
Trapped Oil

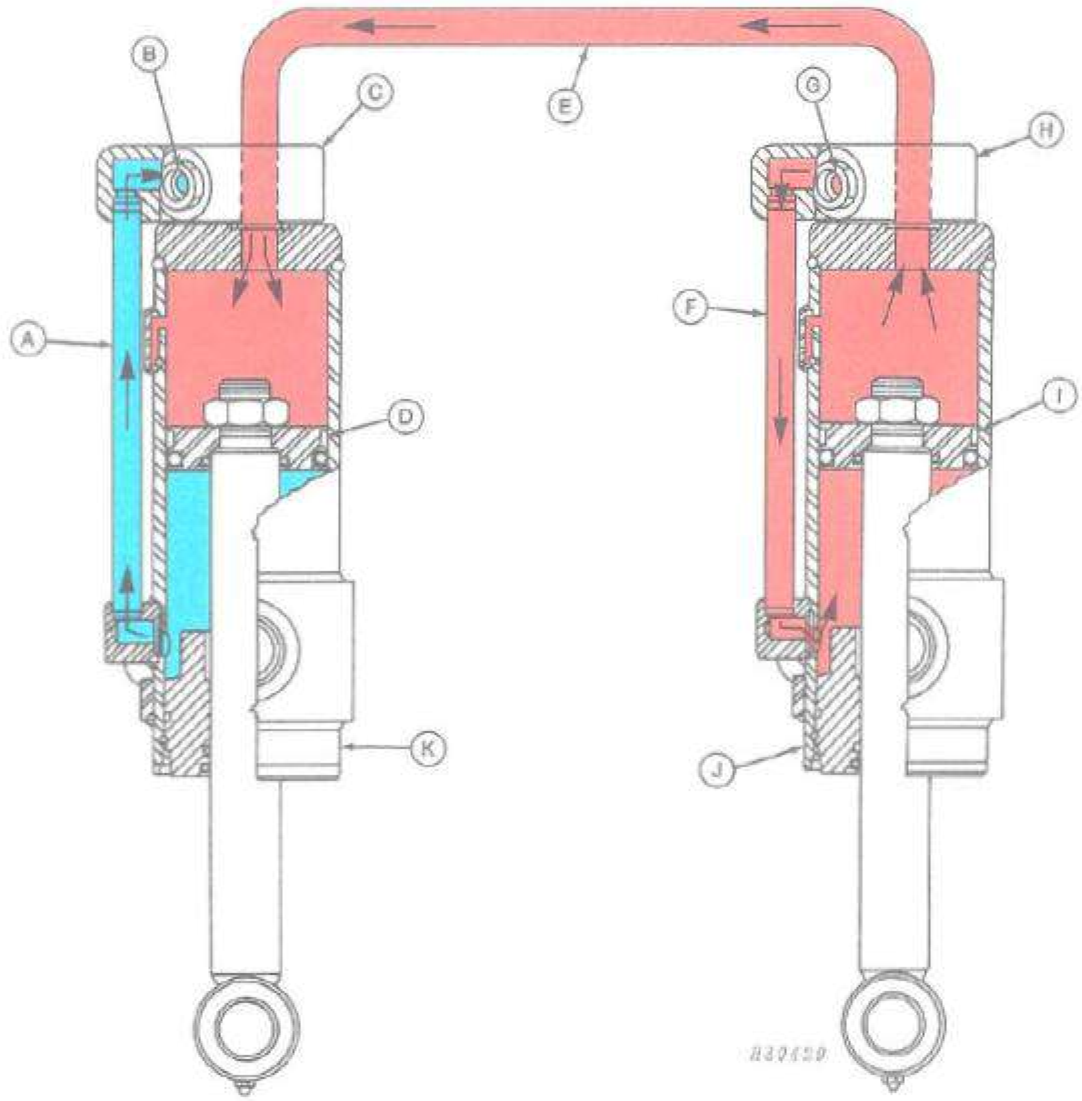
Fig. 13-Leveling System not Activated

Leveling System not Activated

When the leveling system is not activated, pilot check valve in valve block (G, Fig. 13) and (H) trap oil in the head ends of both leveling cylinders (J) and (K).

Pilot check valves, in the leveling control valve, trap oil in lines going to both ports (B and G, Fig. 13). This also traps oil in transfer tubes (A) and (F) and the rod end of both leveling cylinders (J) and (K).

LEVELING CYLINDERS—Continued



A—Transfer Tube
B—Pressure Port to Leveling Control Valve
C—Valve Block
D—Piston
E—Balance Beam Hose
F—Transfer Tube
G—Pressure Port to Leveling Control Valve
H—Valve Block
I —Piston
J—R.H. Leveling Cylinder
K—L.H. Leveling Cylinder
Pressure Oil
Pressure Free Oil

Fig. 14-Leveling to the Right

Leveling to the Right

When the electrical system activates the leveling control valve, pressure oil is always sent to the retracting cylinder. Pressure oil, from the leveling control valve, flows into port (G, Fig. 14) of the right-hand leveling cylinder (J).

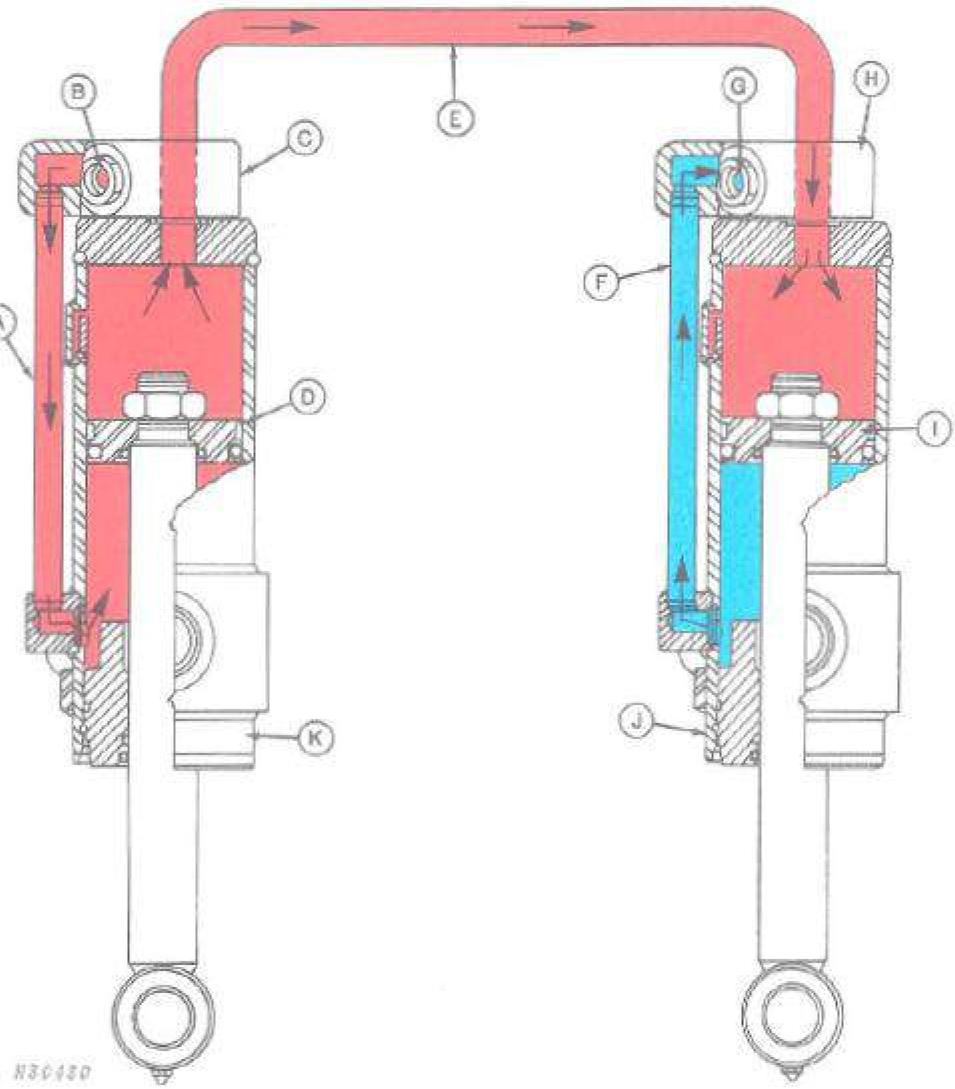
Valve block (H, Fig. 14) directs the pressure oil to transfer tube (F). The pressure oil flows down transfer tube (F) to the ram end, causing the ram to retract.

Valve block (H, Fig. 14) also directs the oil, forced out of the head end of retracting leveling cylinder (J), to left-hand leveling cylinder (K), through balance beam hose (E).

Valve bock (C, Fig. 14) directs this oil to the head end of left-hand leveling cylinder (K), causing the ram to extend.

Oil, forced out of the rod end of left-hand leveling cylinder (K, Fig. 14), flows up transfer tube (A), to valve block (C).

Valve block (C, Fig. 14) directs the return oil through port (B) and to the leveling control valve.



A—Transfer Tube
B—Pressure Port to Leveling Control Valve
C—Valve Block
D—Piston
E—Balance Beam Hose
F—Transfer Tube
G—Pressure Port to Leveling Control Valve
H—Valve Block
I—Piston
J—R.H. Leveling Cylinder
K—L.H. Leveling Cylinder
Pressure Oil
Pressure Free Oil

Fig. 15-Leveling to the Left

Leveling to the Left

When the electrical system activates the leveling control valve, pressure oil is always sent to the retracting cylinder. Pressure oil from the leveling control valve, flows into port (B, Fig. 15) of the left-hand leveling cylinder (K).

Valve block (C, Fig. 15) directs the pressure oil to transfer tube (A). The pressure oil flows down transfer tube (A) to the rod end, causing the rod to retract.

Valve block (C, Fig. 15) also directs the oil forced out of the head end of retracting leveling cylinder (K), to right-hand leveling cylinder (J), through balance beam hose (E).

Valve block (H, Fig. 15) directs this oil to the head end of right-hand leveling cylinder (J), causing the cylinder to extend.

Oil, forced out of the rod end of right-hand leveling cylinder (J, Fig. 15), flows up transfer tube (F) to valve block (H).

Valve block (H, Fig. 15) directs the return oil through port (G) and back to the leveling control valve.

LEVELING CYLINDER VALVE BLOCK

General Information

The valve block at the top of each leveling cylinder (Fig. 16) consists of a pilot check valve, plunger, dowel pin, and bleed valve.

Basically, the check valve, blocks the flow of oil out of the leveling cylinder until it is unseated hydraulically. The bleed valve is used to drain oil from the head end of the cylinder.

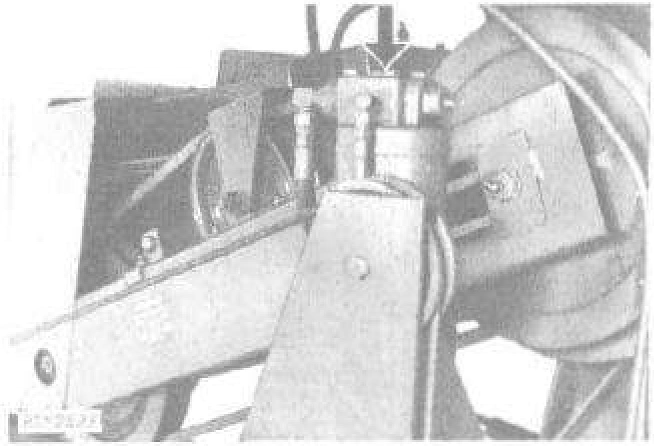
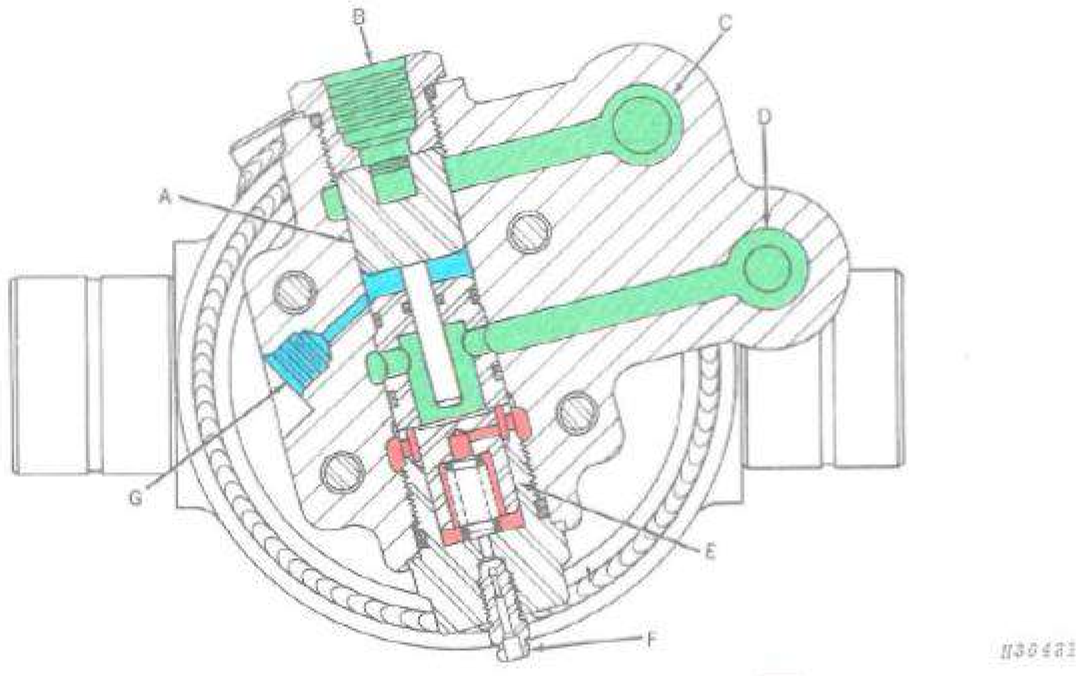


Fig. 16-Valve Block on Top of Leveling Cylinder



A—Plunger and Dowel Pin
B—Pressure Port to Leveling Control Valve
C—To Rod End
D—To Opposite Leveling Cylinder
E—Pilot Check Valve
F—Bleed Valve
G—To Reservoir

Pressure Oil
Pressure Free Oil
Trapped Oil

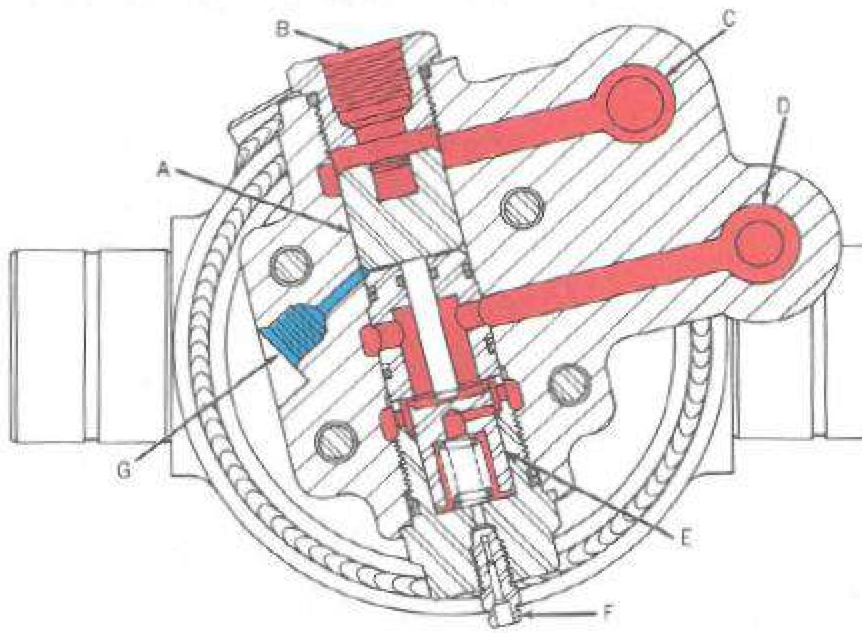
Fig. 17-Operation of Valve Block - Leveling Cylinder Not Activated

Operation of Valve Block - Leveling Cylinder Not Activated

With the leveling cylinders not activated, both pilot check valves in the leveling control valve (on the front axle) are closed, trapping oil in the hoses going to port (B, Fig. 17). This also traps the oil in the rod end of both leveling cylinders.

Pilot check valve (E, Fig. 17), in both leveling cylinders, is closed, trapping oil in the head end of the cylinder. This head of oil supports the weight of the combine. Oil is also trapped in the balance beam hose connected between the cylinders at port (D).

Bleed valve (F, Fig. 17), can be opened to drain oil from the head end of the leveling cylinders. This will lower the front of the combine for transporting or storage. With the bleed valve (F) closed, the cylinders can be rephased to fill the head ends with the proper volume of oil to raise the combine to its operating height.



A—Plunger and Dowel Pin
B—Pressure Port to Leveling Control Valve
C—To Rod End
D—To Opposite Leveling Cylinder
E—Pilot Check Valve
F—Bleed Valve
G—To Reservoir

Pressure Oil
Pressure Free Oil

Fig. 18-Operation of Valve Block - Leveling Cylinder Retracting

Operation of Valve Block - Leveling Cylinder Retracting

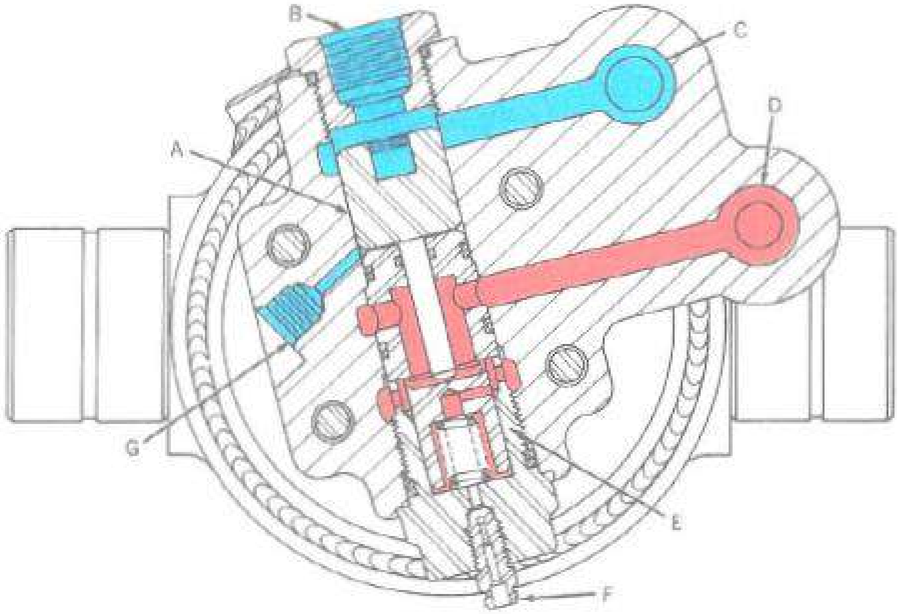
Pressure oil from the leveling control valve flows into the valve block through port (B, Fig. 18). This oil moves plunger and dowel pin (A), causing pilot check valve (E) to open.

Pressure oil also flows to the rod end of the cylinder by flowing through port (C, Fig. 18) to the transfer tube along side the cylinder.

Oil, forced out of the head end, flows through the open pilot check valve (E, Fig. 18) and to port (D). Then the oil flows to the opposite leveling cylinder through the balance beam hose.

Port (G, Fig. 18) is a drain to the reservoir. Any internal leakage is drained off, preventing a hydrostatic lock of plunger and dowel pin (A).

LEVELING CYLINDER VALVE BLOCK—Continued



A—Plunger and Dowel Pin
B—Pressure Port to Leveling Control Valve
C—To Rod End
D—To Opposite Leveling Cylinder
E—Pilot Check Valve
F—Bleed Valve
G—To Reservoir
Pressure Oil
Pressure Free Oil

Fig. 19-Operation of Valve Block - Leveling Cylinder Extending

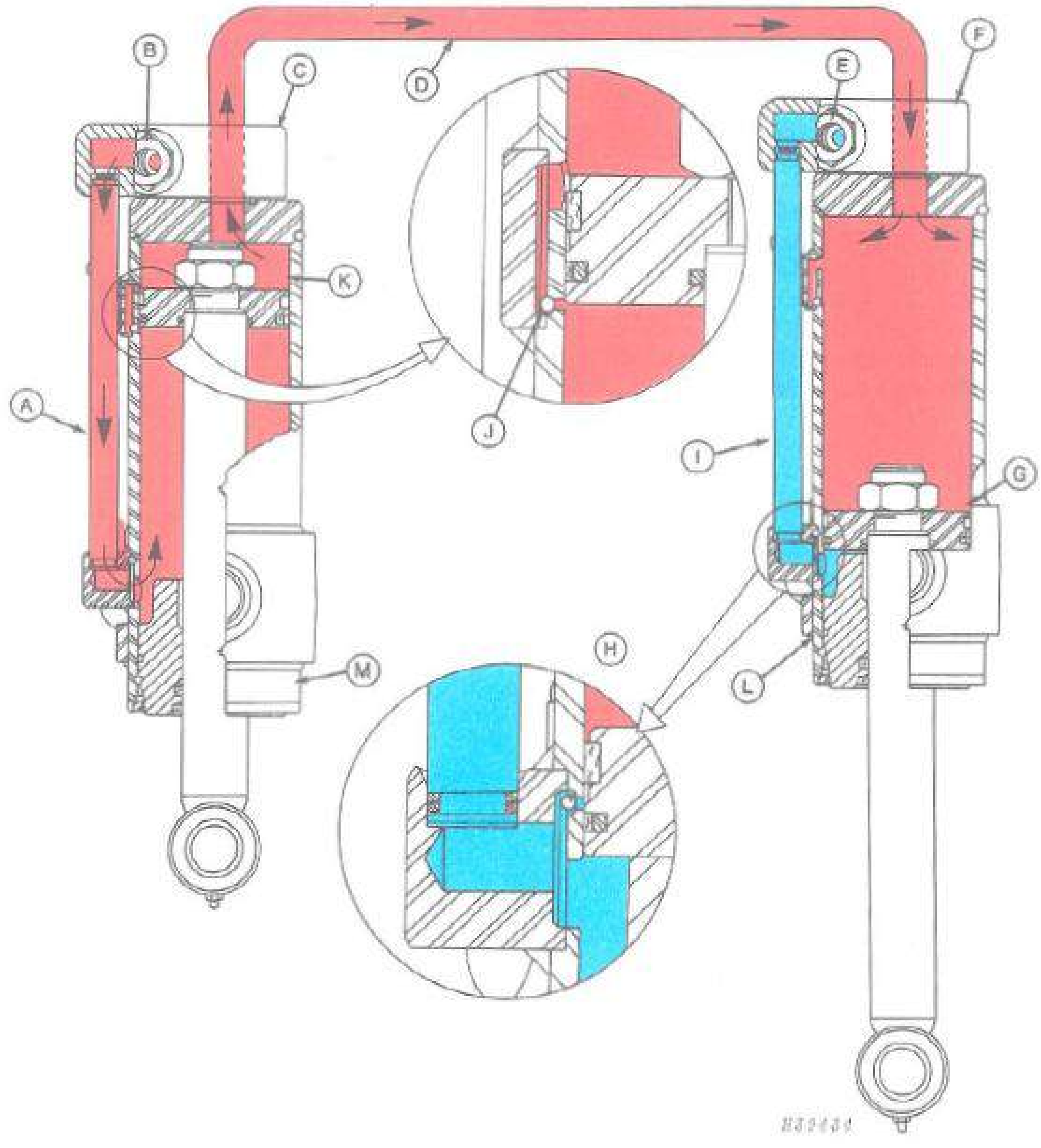
Operation of Valve Block - Leveling Cylinder Extending

Pressure oil, from the head end of the retracting cylinder, flows through the balance beam hose into port (D, Fig. 19) of the extending cylinder.

As the cylinder extends, oil is forced out of the rod end and flows up the transfer tube to port (G, Fig. 19). This oil then returns out of port (B) to the leveling control valve.

Port (G, Fig. 19) is a drain to the reservoir. Any internal leakage is drained off preventing a hydrostatic lock of the plunger and dowel pin (A).

Rephasing of Leveling Cylinders



A—Transfer Tube
B—Pressure Port to Leveling Control Valve
C—Valve Block
D—Balance Beam Hose
E—Pressure Port to Leveling Control Valve
F—Valve Block
G—Piston
H—Ball Check (Rephasing)
I—Transfer Tube
J—Ball Check (Rephasing)
K—Piston
L—R.H. Leveling Cylinder
M—L.H. Leveling Cylinder

Pressure Oil
Pressure Free Oil

Fig. 20-Rephasing Cycle of Leveling Cylinders

Rephasing Leveling Cylinders —Continued

To rephase the leveling cylinders, the combine is fully tilted to one side manually and held for 15 seconds. The manual tilt switch overrides the limit switch and allows the cylinders to fully retract and extend.

When cylinder (M, Fig. 20) is fully retracted, the rephasing orifice and ball check (J) are exposed to oil pressure. This oil pressure unseats ball check (J) and allows oil to flow from the rod end around the cylinder piston to the head end of the cylinder.

If the leveling cylinders are not in phase, cylinder (L, Fig. 20) will not be fully extended. Oil going to the head end of cylinder (M) will be directed to the head end of cylinder (L) by valve blocks (C) and (F). This oil will cause cylinder (L) to fully extend.

When cylinder (L, Fig. 20) becomes fully extended, the pressure oil will open ball check (H) and allow oil to flow up transfer tube (I) to valve block (F). Oil is then returned to the leveling control valve through port (E) in valve block (F).

Both ball checks (H and J, Fig. 20) allow only a small amount of oil to flow past them. Therefore, during rephasing, oil pressure will build up until the relief valve opens. The relief valve in the proportional flow divider will open.

Section 360
AUTOMATIC HEADER HEIGHT CONTROL OPERATION AND TESTS

CONTENTS OF THIS SECTION

Group 00
SPECIFICATIONS AND SPECIAL TOOLS

SPECIFICATIONS

ITEM	SPECIFICATION
ELECTRICAL	
Fuse (Not used with Dial-A-Matic system)	6 amp
Fuse type	AGC
Amps	3.5 amps @ 12 volts
HYDRAULIC	
System normal operating temperature	70°F (21°C) above ambient
Test number 4	4.25-5.35 gpm (26.8-33.8 m³/s) @ 2340 rpm
Swinging unloading auger out	2200-2400 psi (150-163 bar) + Back Pressure*
Test number 5	
Raising header with automatic header height control system	4.25-5.35 gpm (26.8-33.8 m³/s) @ 2340 rpm 2200-2400 psi (150-163 bar) + Back Pressure*
Lowering header with automatic header height control system	4.25-5.35 gpm (26.8-33.8 m³/s) @ 2340 rpm 450-750 psi (31-51 bar)
Test number 6	
Raising header with automatic header height control	4.25-5.35 gpm (26.8-33.8 m³/s) @ 2340 rpm 2200-2400 psi (150-163 bar) + Back Pressure*
Test number 7	2200-2400 psi (150-163 bar) + Back Pressure*

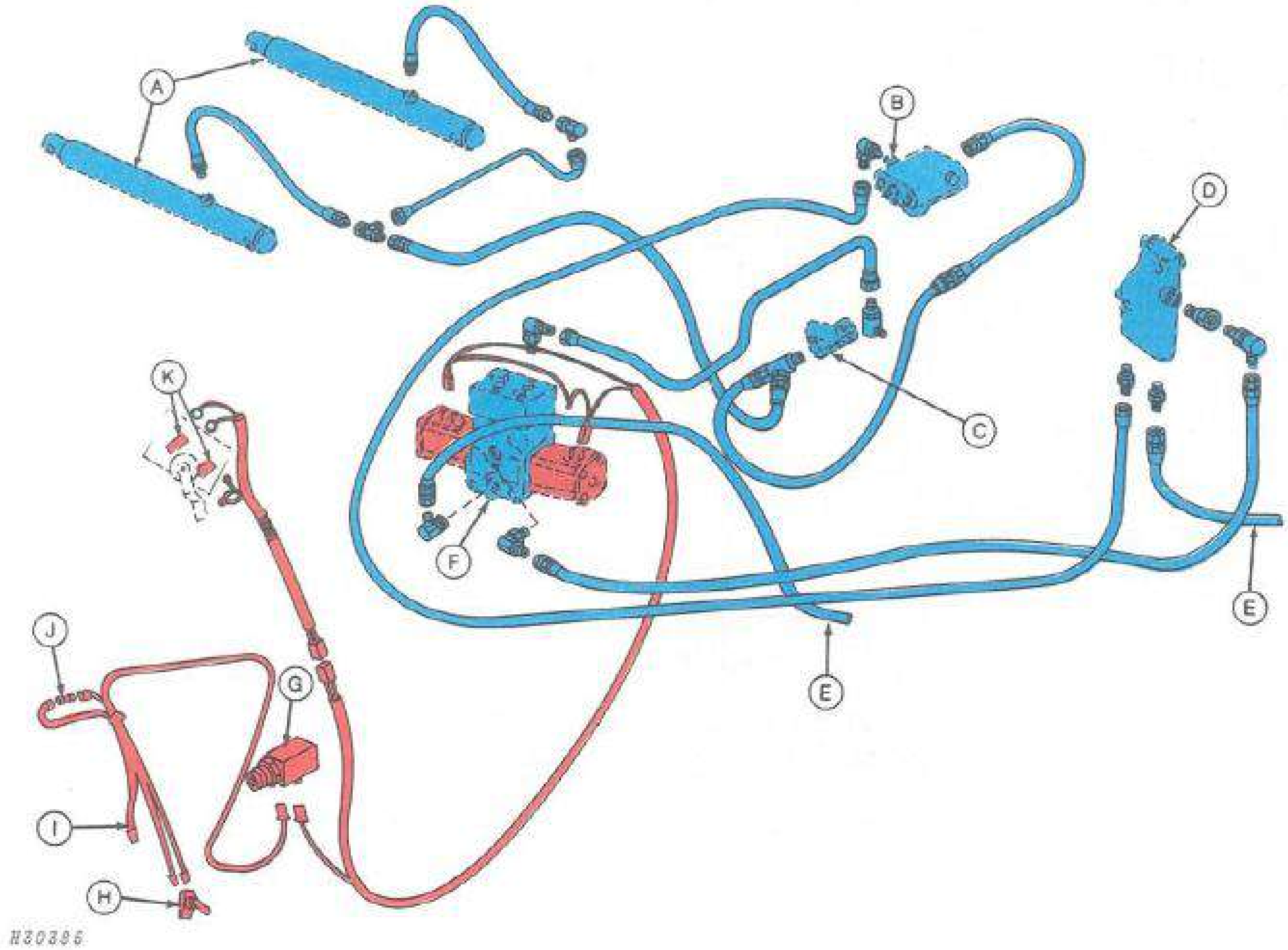
**Back pressure is the pressure required to circulate the oil without any system(s) activated. Back pressure will vary throughout the hydraulic system. Measure back pressure at the same location that the high pressure reading is taken.*

SPECIAL TOOLS

Tool No.	Name	Use
D-14102DJ*	Automatic Header Height Control and SideHill 6620 Leveling Control Tester	To test electrical systems without removing components from the combine.
JT05463*	Adapter Harness	Used with D-14102DJ Tester to test the Dial-A-Matic header height control system amplifier.
JT05464*	System Harness	Used with D-14102DJ Tester to test the Dial-A-Matic system.
JT05465*	Kit	Consists of JT05463 and JT05464.

***Order from: Service Tools, Box 314, Owatonna MN, 55060*

Group 05
GENERAL INFORMATION, DIAGNOSIS, AND TESTS



A—Header Lift Cylinders
B—Flow Control Plug, Main Control Valve
C—Drop Rate Valve
D—Secondary Control Valve
E—To Reservoir
F—Auto Header Valve
G—Actuating Switch
H—Control Switch
I—To Ignition Switch
J—6 Amp Fuse
K—Raise and Lower Switches
Electrical System
Hydraulic System

Fig. 1-Automatic Header Height Control Diagram

GENERAL INFORMATION

The automatic header height control option is used on John Deere self-propelled combines equipped with the Row-Crop Head or the 200 Series Flex Platform.

The system actuates the header lift cylinders to raise or lower the header to maintain the floating row units (Row-Crop Head) or flexible cutterbar (200 Series Platform) within a specific float range.

Automatic header height control is comprised of three integral systems: mechanical, electrical, and hydraulic.

Mechanical System

The mechanical system consists of a height sensing shaft, bell cranks, linkage rods, and actuator cam for both the row-crop head and flexible cutterbar. The actuator cam opens and closes two raise and lower switches.

Electrical System

The electrical system consists of the ignition switch (I, Fig. 1), 6 amp fuse (J), control switch (H), actuating switch (G), raise and lower switches (K), and two solenoids on the auto header valve (F). When activated, either solenoid activates the hydraulic system.

GENERAL INFORMATION—Continued

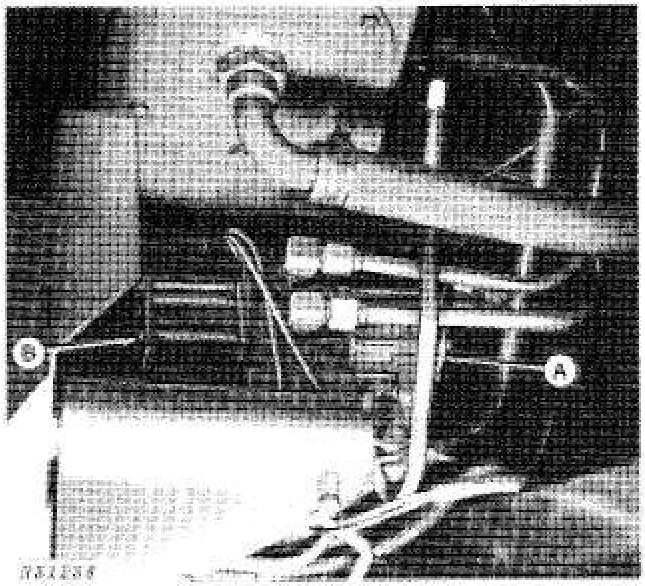
Hydraulic System

The hydraulic system consists of the flow control plug in the main control valve (B, Fig. 1), secondary control valve (D), auto header valve (F), drop rate valve (C), header lift cylinder (A), and oil cooler (7720 and 8820). When the auto header valve is activated, the hydraulic system raises or lowers the header.

NOTE: Information covering the electrical and hydraulic systems for automatic header height control has been separated from the main electrical system (Section 240) and hydraulic systems (Section 270), and is included in this section.

Refer to Groups 25, 30, 35 and 40 for information on the Dial-A-Matic header height control system.

DIAGNOSING MALFUNCTIONS



A—Push Pin for Lowering Header **B—Push Pin for Raising Header**

Fig. 2-Auto Header Valve

When diagnosing automatic header height control problems, determine if the problem is in the electrical system or the hydraulic system.

To determine if the problem is electrical or hydraulic in nature, place the automatic header height control switch in the "OFF" position; start engine, move throttle lever to the fast idle position, and place transmission in neutral.

CAUTION: Set parking brake, being certain that machine will not roll. This test is performed near the drive tires and could result in personal injury if the combine started to move.

Depress manual push pin (A) (Fig. 2) in "LOWER" solenoid on the auto header valve. The header should lower to the ground. Next, depress manual push pin (B) in "RAISE" solenoid on the auto header valve. The header should raise. If after depressing both push pins the header raises and lowers correctly, the problem is in the electrical system. If the header does not raise or lower, the problem is in the hydraulic system.

NOTE: It is important to have the engine at fast idle to develop full hydraulic flow out of the main hydraulic pump.

If the manual push pins cannot be depressed manually, the auto header valve must be disassembled.

The following charts are divided into hydraulic and electrical malfunctions. Charts begin with easy malfunctions to check and progress with more time consuming malfunctions.

Some steps within the charts specify a test number to perform. All tests are assigned a number for easy reference.

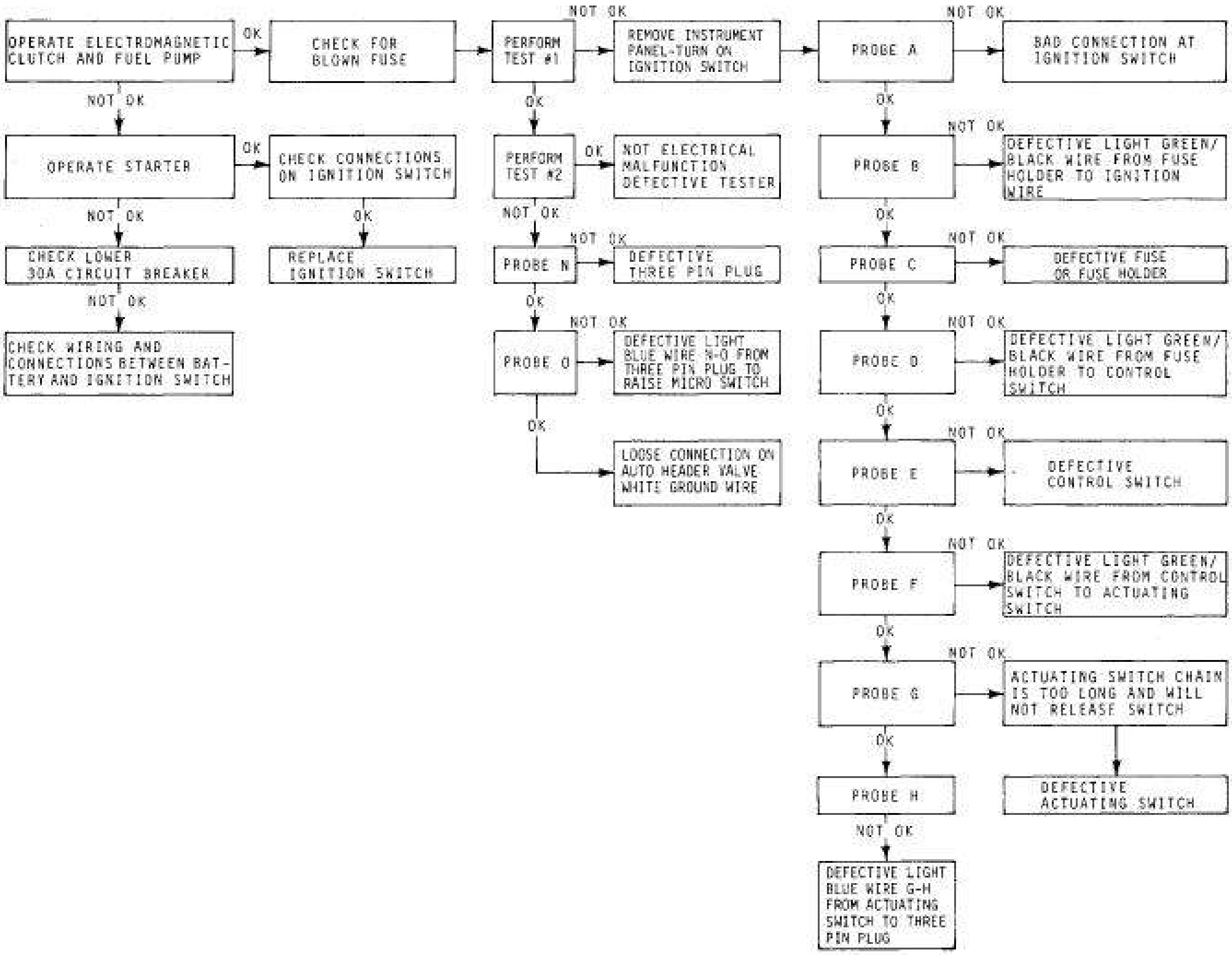
Listed below is a table of contents for the chart headings:

Electrical Malfunctions

Hydraulic Malfunctions

ELECTRICAL MALFUNCTIONS

Automatic Header Height Control Will Not Operate



H30386

Fig. 3-Automatic Header Height Control Will Not Operate

ELECTRICAL MALFUNCTIONS—Continued

Header Raises Automatically But Will Not Lower

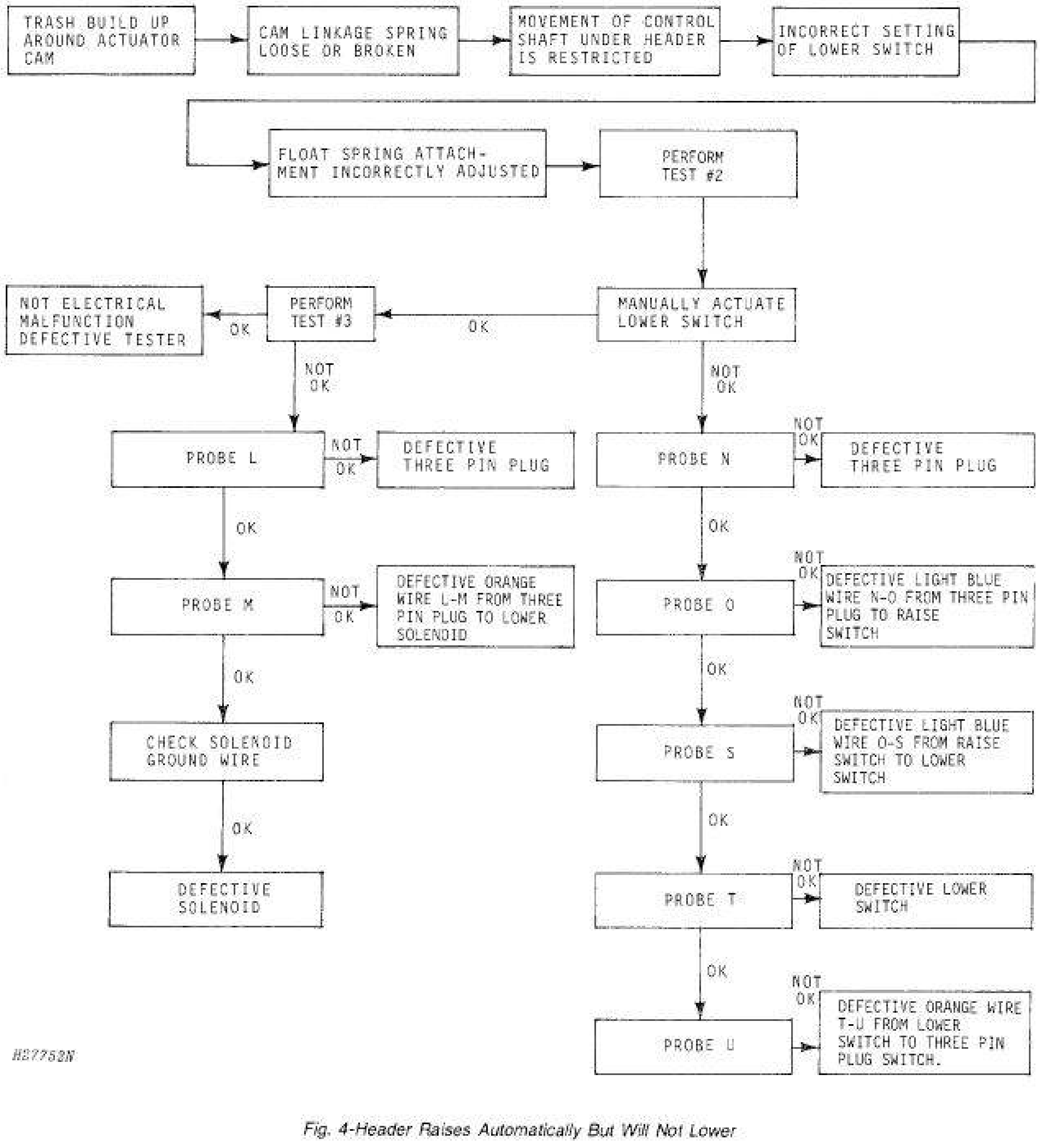


Fig. 4-Header Raises Automatically But Will Not Lower

Header Lowers Automatically But Will Not Raise

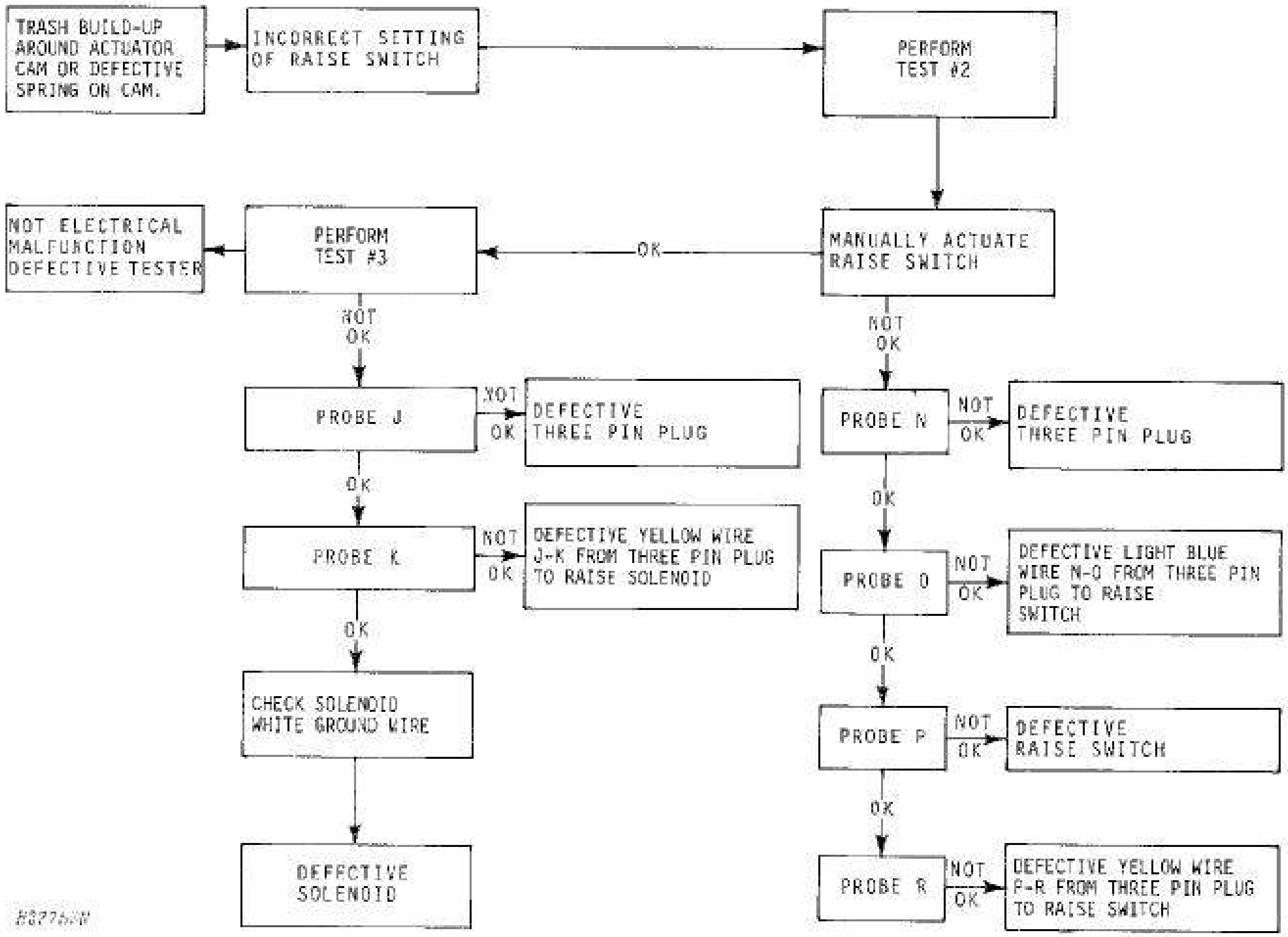


Fig. 5-Header Lowers Automatically But Will Not Raise

Header Raises Manually But Lowers When Lever is Released

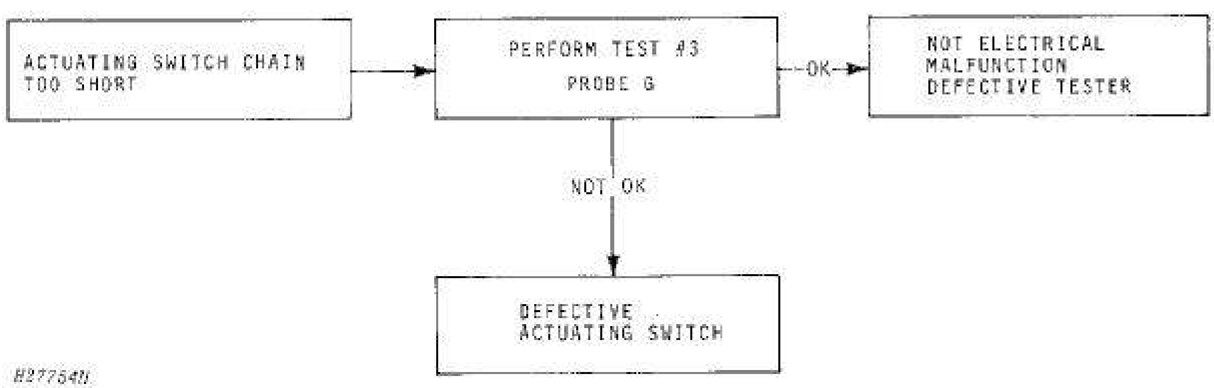


Fig. 6-Header Raises Manually but Lowers when Lever is Released

HYDRAULIC MALFUNCTIONS

Header Raises Or Lowers Slowly Or Not At All

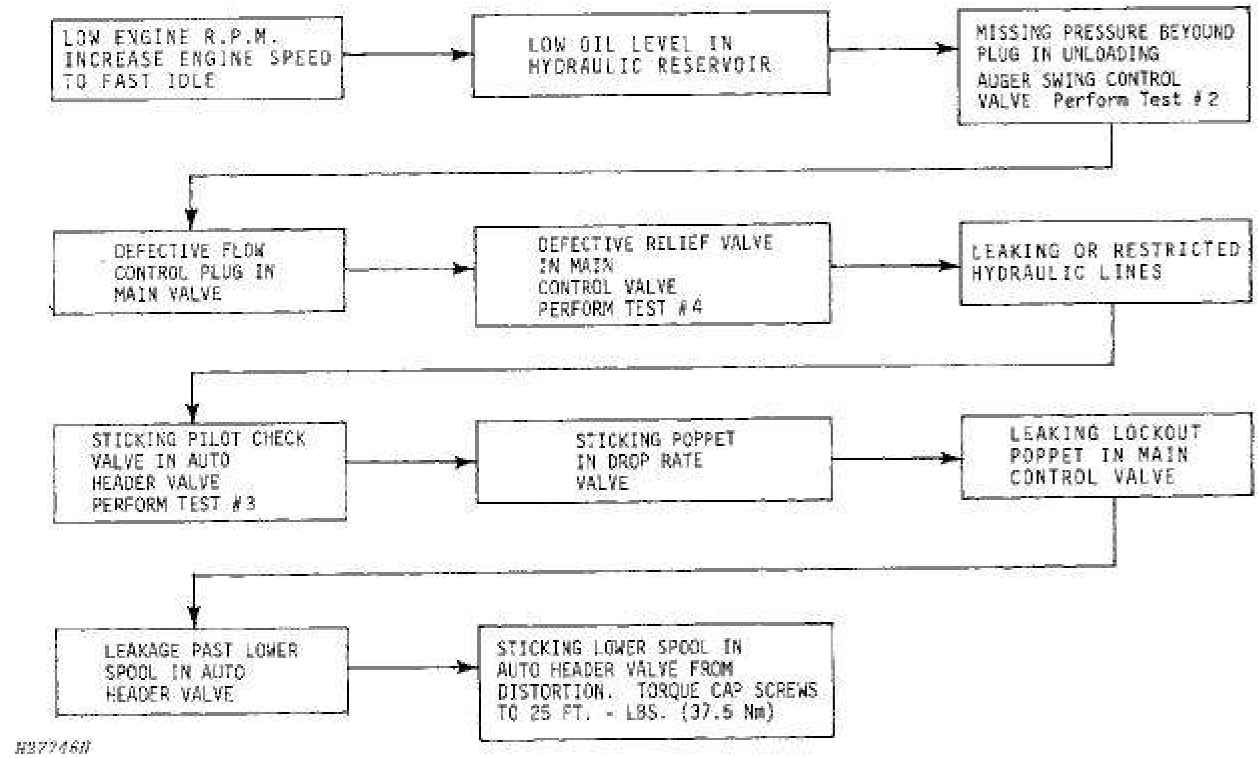


Fig. 7-Header Raises or Lowers Slowly or not at all

Header Raises Automatically But Will Not Lower

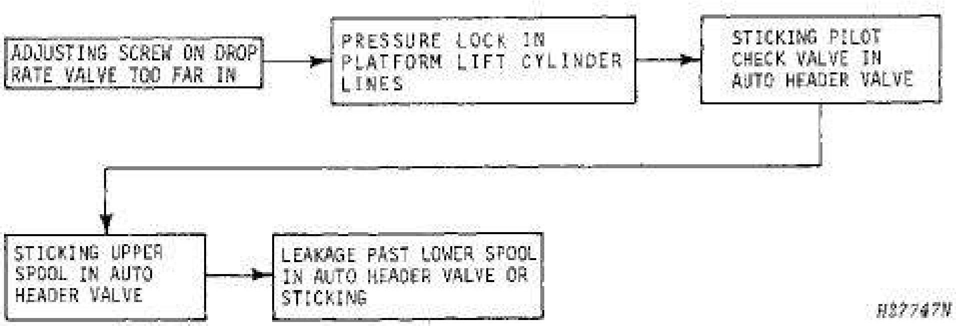


Fig. 8-Header Raises Automatically but Will Not Lower

Hydraulic System Overheats

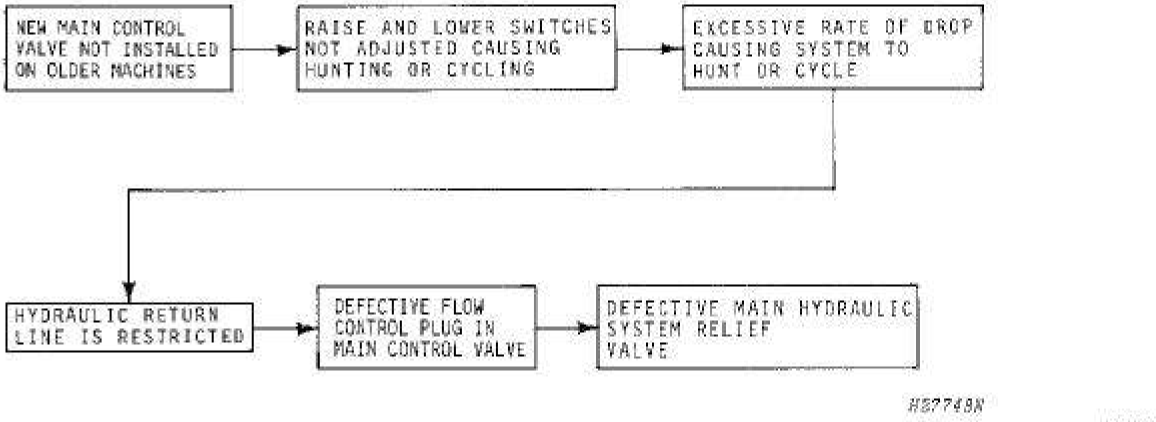


Fig. 9-Hydraulic System Overheats

Header Hunts Or Cycles Up And Down

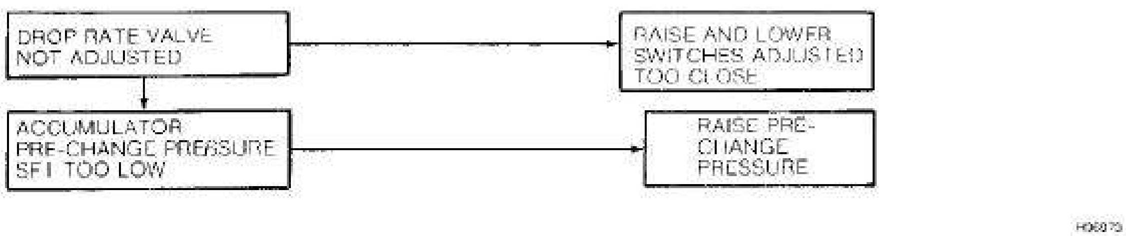


Fig. 10-Header Hunts or Cycles Up and Down

Header Lowers After Being Raised

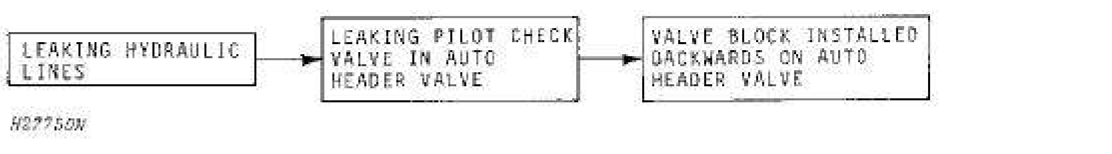
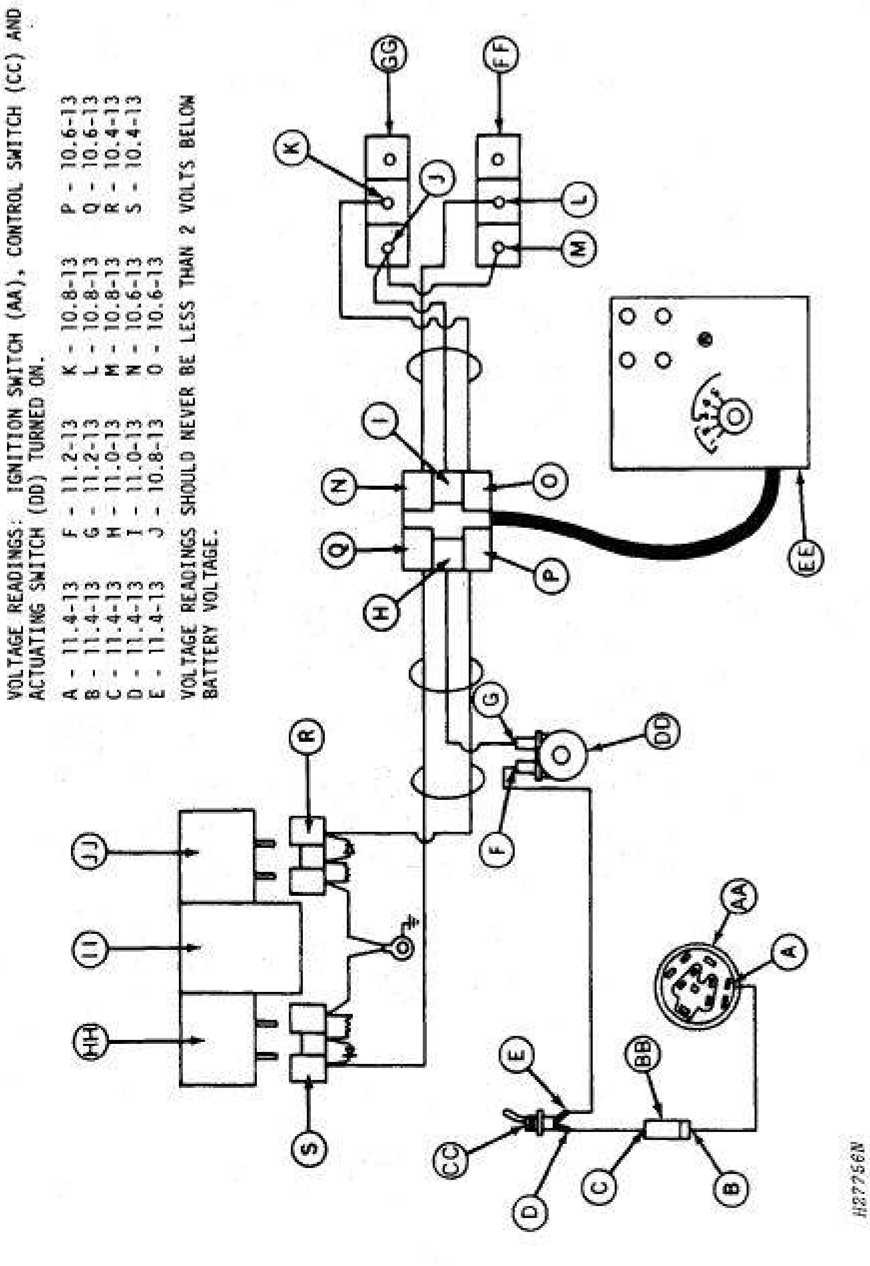


Fig. 11-Header Lowers after Being Raised

ELECTRICAL SYSTEM TESTS



AA—Ignition Switch
BB—6 Amp Fuse
CC—Control Switch
DD—Actuating Switch
EE—Service-Gard Tester
FF—Lower Switch
GG—Raise Switch
HH—Lower Header Solenoid
II—Auto Header Valve
JJ—Raise Header Solenoid

Fig. 12-Automatic Header Height Control Electrical Circuit Diagram

The Service-Gard Automatic Header Height Control and SideHill 6620 Leveling Tester (Fig. 13) is available for testing the header height control electrical system.

Test No. 1 - Checking Upper Wiring Harness

If using the Service-Gard Automatic Header Height Control Tester (Fig. 12, Key EE), follow procedures in the instructions for position 3, Steps 1 and 2. If a Service-Gard Tester is not available, a voltmeter can be used.

Test No. 2 - Checking Lower Wiring Harness

If using the Service-Gard Automatic Header Height Control Tester (Fig. 12, Key EE), follow procedures in the instructions for position 5, Steps 1 through 4. If a Service-Gard Tester is not available, a voltmeter can be used.

Test No. 3 - Checking Solenoids on Auto Header Valve

If using the Service-Gard Automatic Header Height Control Tester (Fig. 12, Key EE), follow procedures in the instructions for position 4, Steps 1 through 3.

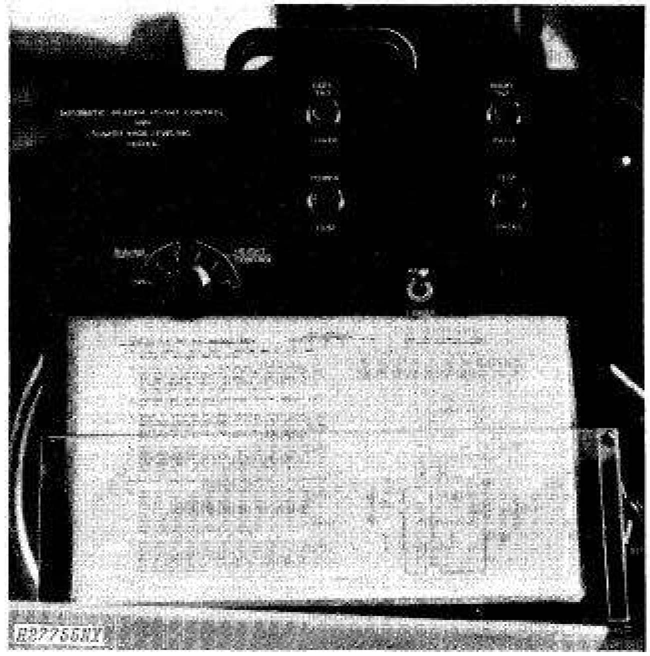


Fig. 13-Automatic Header Height Control Tester

HYDRAULIC SYSTEM TESTS

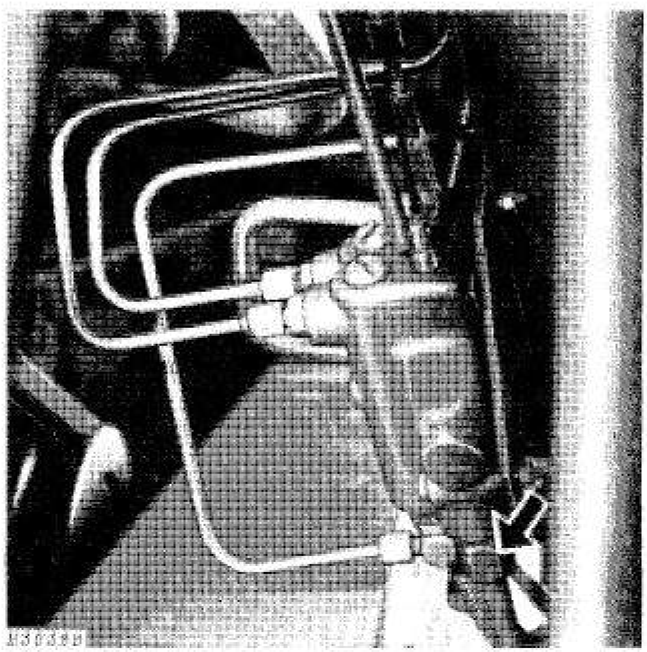
The proper use of testing equipment will quickly locate the trouble within the header control hydraulic system, thus reducing combine "down time." For proper use of testing equipment, see Section 270.

Testing Procedure

The basic procedure, when testing a hydraulic system, is to apply a controlled load to the system or a component of the system to check pressure and rate of flow.

Back pressure is the pressure required to circulate the oil without any system(s) activated. Back pressure will vary throughout the hydraulic system. Measure back pressure at the same location that the high pressure reading is taken.

Test No. 1 - Checking Flow to Secondary Control Valve



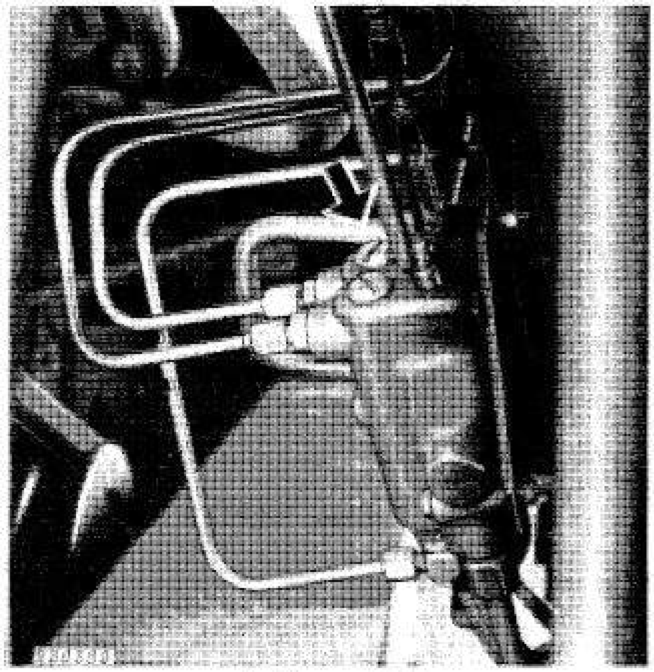
A—Inlet

Fig. 14-Test No. 1 - Test Port for Secondary Control Valve

Flow rate should be 4.25-5.35 gpm (26.8-33.8 m^3/s) at full engine rpm. When swinging the unloading auger outward, pressure should be 2200-2400 psi (150-163 bar) plus back pressure.

Check the flow rate to the secondary control valve from the main control valve by connecting test equipment to inlet line (A, Fig. 14) of the valve.

Test No. 2 - Checking Flow to Solenoid Control Valve



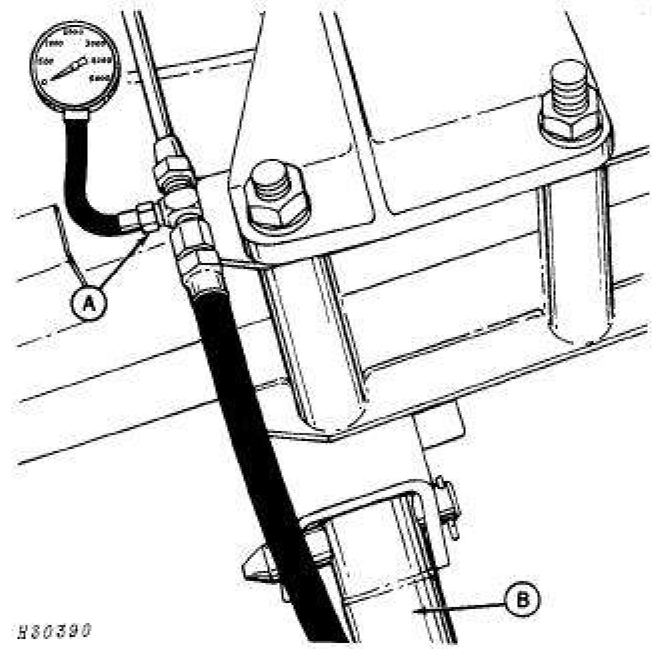
A—Pressure Port

Fig. 15-Test No. 2 - Test Port for Solenoid Control Valve

Flow rate should be 4.25-5.35 gpm (26.8-33.8 m^3/s) at full engine rpm when raising or lowering the header. When raising the header with the automatic header height control system by manually activating the auto header valve, pressure should be 2200-2400 psi (150-163 bar) plus back pressure at relief pressure. When lowering the header with the automatic header height control system by manually activating the auto header valve, pressure should be 450-750 psi (31-51 bar).

Check the flow rate to the auto header valve by connecting test equipment to pressure BYD port (A, Fig. 15) of the secondary control valve.

Test No. 3 - Checking Flow to Platform Lift Cylinders



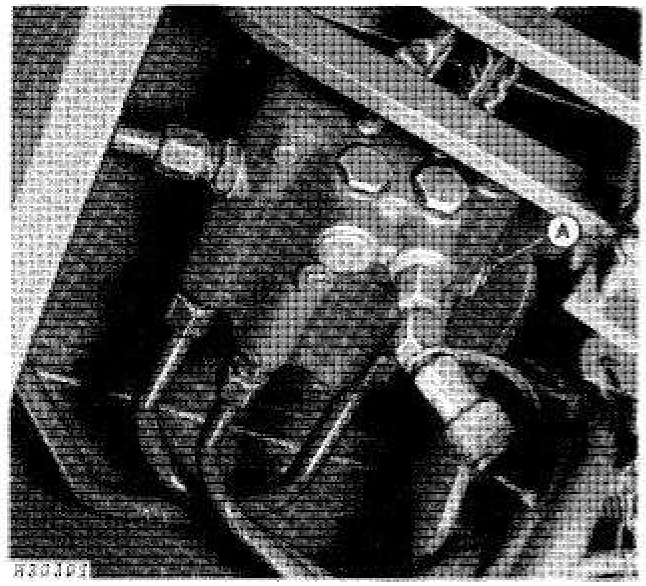
A—0039 Connector
B—Header Lift Cylinder

Fig. 16-Test No. 3 - Test Port for Header Lift Cylinders

When raising the header with the automatic header height control system by manually activating the auto header valve, flow rate should be 4.25-5.35 gpm (26.8-33.8 m^3/s) at full engine rpm. Pressure should be 2200-2400 psi (150-163 bar) plus back pressure at relief pressure.

Check the flow rate to the header lift cylinders from the auto header valve by connecting test equipment to pressure line (A, Fig. 16).

Test No. 4 - Checking Main System Relief Valve



A—Gauge Port

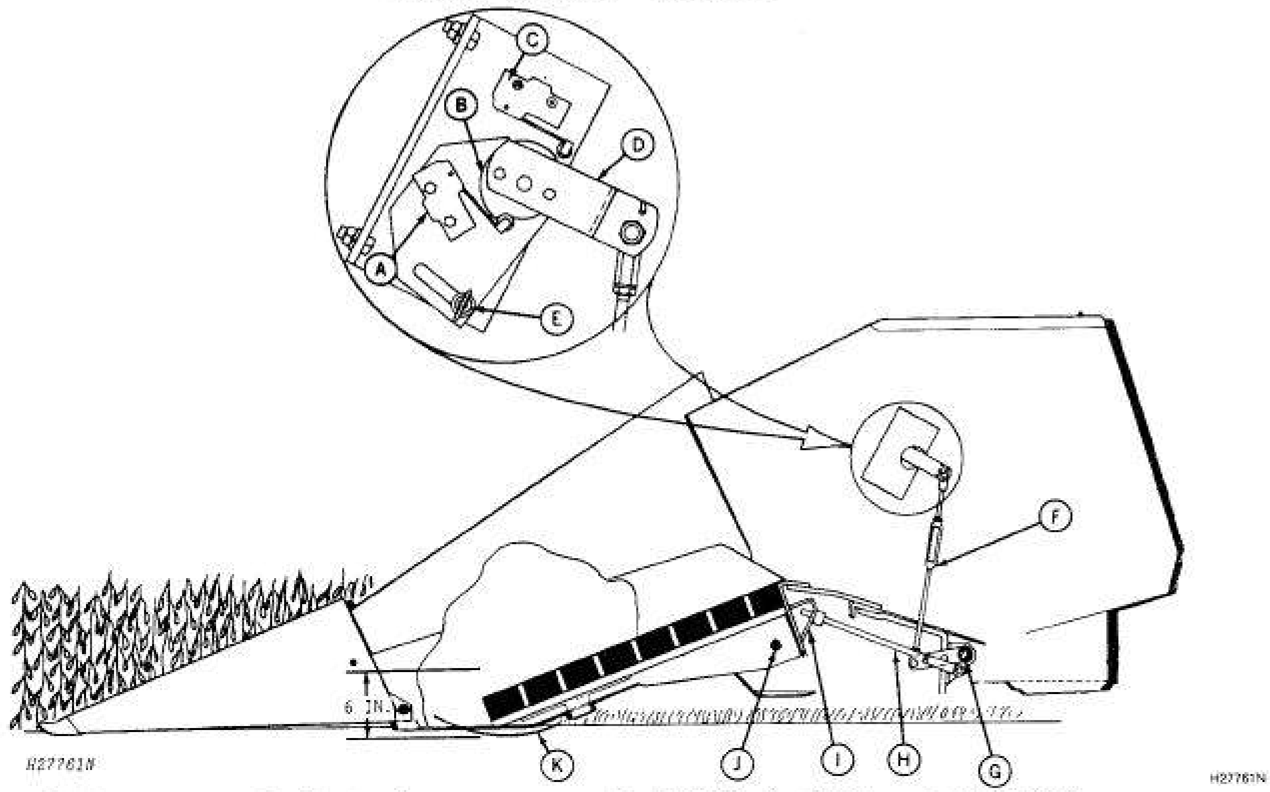
Fig. 17-Test No. 4 - Gauge Port for Main Control Valve

Pressure should be 2200-2400 psi (150-163 bar) plus back pressure at relief pressure.

Check the pressure of the main system relief valve by connecting pressure gauge to gauge port on main control valve (A, Fig. 17).

Group 10
MECHANICAL SYSTEM

ROW-CROP HEAD



A—Lower Switch
B—Actuator Cam
C—Raise Switch
D—Actuator Arm
E—Wing Nut
F—Push Rod
G—Height Sensing Shaft
H—Push Rod
I —Bracket
J—Pivot Point
K—Skid Shoe

Fig. 1-Row-Crop Head Mechanical System

GENERAL INFORMATION

Each row unit on the Row-Crop Head floats independently of one another. Each row unit floats within a 6-inch (152 mm) range when measured at the skid shoe.

When any one row unit floats up higher than the other row units, push rod (H, Fig. 1) turns height sensing shaft (G). Push rod (H) is not attached to bracket (I), but slides through a hole in bracket (I). Therefore, when any one row unit floats down lower than the other row units, the height sensing shaft (G) will not turn. This enables the highest row unit to always control the automatic header height control system. There is one push rod (H) for every row unit.

When the height sensing shaft (G, Fig. 1) turns, an actuator arm moves push rod (F). Movement of push rod (F) moves actuator arm (D) which causes actuator cam (B) to rotate.

Actuator cam (B, Fig. 1) opens and closes switches (A) and (C). The switches are actuated by the rollers riding on actuator cam (B). A closed switch activates the electrical and hydraulic systems for raising and lowering the header.

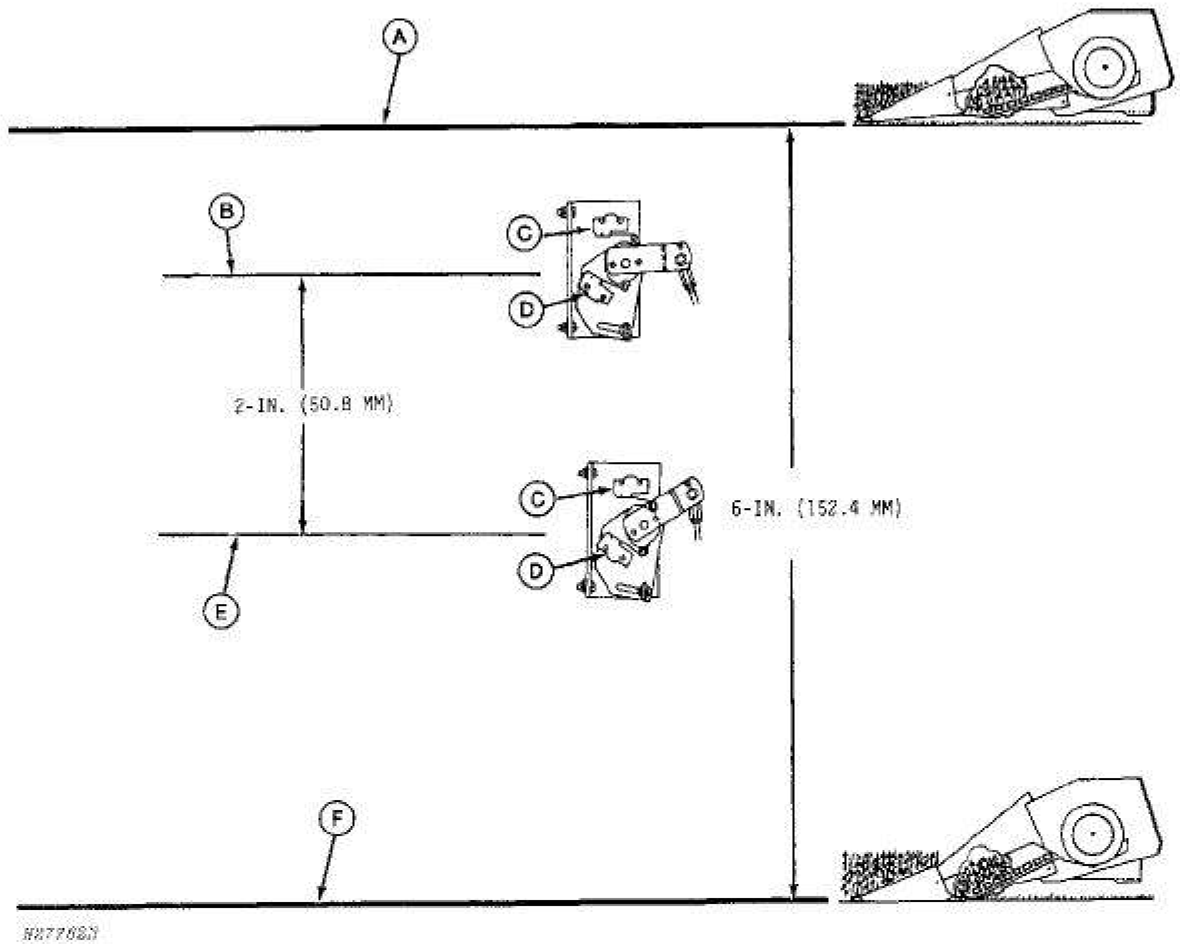
When lower switch (A, Fig. 1) closes, the system will lower the head. When raise switch (C) closes, the system will raise the head.

Every push rod (H, Fig. 1) is adjustable in length so every push rod (H) can be adjusted to rotate height sensing shaft (G) the same amount of rotation. Push rod (F) is adjustable in length with a turnbuckle. Adjusting the turnbuckle on push rod (F) will affect when raise switch (C) opens and closes within the 6-inch (152 mm) float range of the skid shoes.

Adjusting the turnbuckle on push rod (F) will also affect when lower switch (A) opens and closes within the 6-inch (152 mm) float range of the skid shoes. However, lower switch (A) can also be adjusted to open and close within the 6-inch (152 mm) float range by loosening wing nut (E) and rotating the bracket that lower switch (A) is attached to. This, therefore, affects the distance the skid shoe travels between both switch closing.

GENERAL INFORMATION—Continued

Raise and Lower Switch Adjustments—Dry Ground Conditions (Row-Crop Head)



A—Upper Mechanical Stop
B—Raise Switch Closing
C—Raise Switch
D—Lower Switch
E—Lower Switch Closing
F—Lower Mechanical Stop

Fig. 2-Row-Crop Head Switch Adjustments (Dry Ground Conditions)

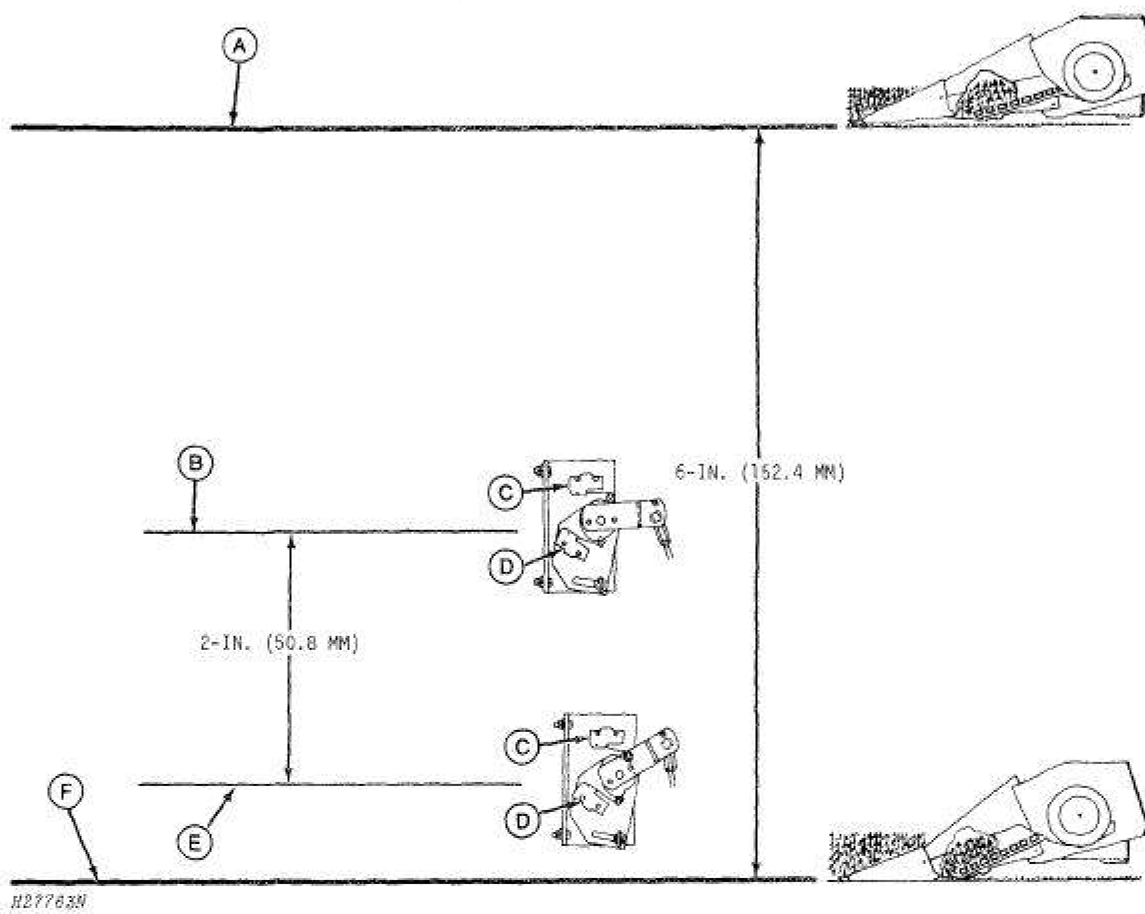
Raise and lower switches can be adjusted to close anywhere within the 6-inch (152 mm) float range of the skid shoe. Placement of these switch closings within the float range is dependent upon ground conditions. This is because the force exerted by the skid shoe on the ground (ground force) varies as the row unit moves through its float range.

Float springs support each row unit and as the row unit is raised, spring tension is relieved, causing the skid shoe ground force to increase. The actual value of pounds of ground force is dependent on the float spring tension adjustment. However, the ground force will increase by approximately 90 lbs. (40.8 kg) when the row unit is raised from the lower mechanical stop to the upper mechanical stop.

Dry ground conditions will permit a heavier ground force. Raise switch (C, Fig. 2) is adjusted by the turnbuckle on push rod (F) (Fig. 1, Page 360-10-1) to close at point (B) within the 6-inch (152 mm) float range.

Lower switch (D, Fig. 2) is adjusted to close at point (E) within the 6-inch (152 mm) float range by loosening wing nut (E) (Fig. 1, Page 360-10-1) and rotating the bracket that the lower switch is attached to. The distance the skid shoe travels between switch closings should be approximately 2 inches (51 mm). A larger distance will generate fewer signals to raise and lower the head and may be necessary in very uneven ground with high ground speeds.

Raise And Lower Switch Adjustments—Wet Ground Conditions (Row-Crop Head)



H27763N

A—Upper Mechanical Stop
B—Raise Switch Closing
C—Raise Switch
D—Lower Switch
E—Lower Switch Closing
F—Lower Mechanical Stop

Fig. 3-Row-Crop Head Switch Adjustments (Wet Ground Conditions)

Wet ground conditions will require a reduced ground force to prevent skid shoes plowing into the ground and causing dirt to be picked up by the gatherer belts.

This is done by adjusting switch closings lower in the 6-inch (152 mm) float range where ground force is reduced because the row unit float springs are carrying more of the row unit weight. The 2-inch (51 mm) distance between switch closings is recommended.

200 SERIES PLATFORM FLEXIBLE CUTTERBAR

GENERAL INFORMATION

The flexible cutterbar floats within a 4-inch (102 mm) range. When any one section of the cutterbar floats higher than the rest, support arm (F, Fig. 4) moves actuator arm (E) and causes height sensing shaft (H) to turn. Actuator arm (E) is not attached to support arm (F), but rests on top of support arm (F). Therefore, when any one section floats down lower than the other sections, height sensing shaft (H) will not turn. This enables the highest section of the cutterbar to always control the automatic header height control system. There is one actuator arm (E) for every section of the cutterbar.

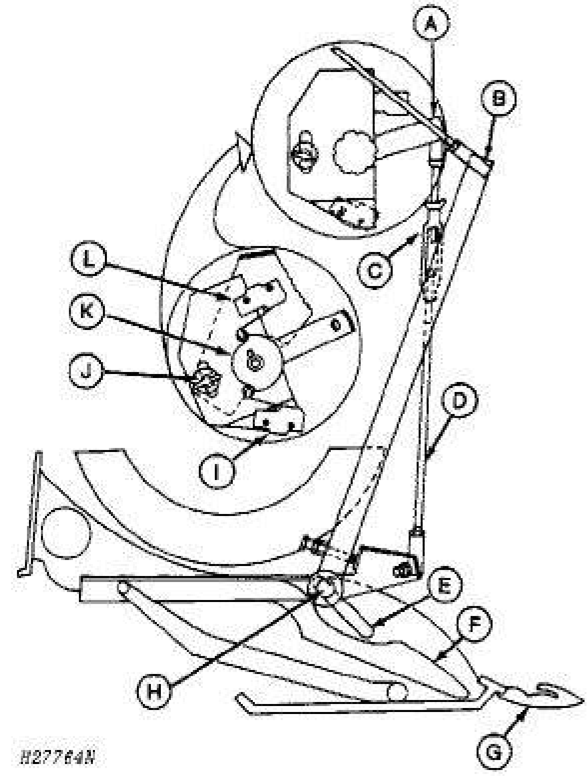
When height sensing shaft (H, Fig. 4) turns, an actuator arm moves push rod (D). Movement of push rod (D) moves actuator arm (A) which causes actuator cam (K) to rotate.

Actuator cam (K, Fig. 4) opens and closes switches (I) and (L). The micro switches are actuated by the rollers riding on actuator cam (K). A closed switch activates the electrical and hydraulic systems for raising and lowering the platform.

When lower switch (I, Fig. 4) closes, the system will lower the head. When raise switch (L) closes, the system will raise the head.

Push rod (D, Fig. 4) is adjustable in length with turnbuckle (C). Adjusting turnbuckle (C) on push rod (D) will affect when raise switch (L) opens and closes within the 4-inch (102 mm) float range of the cutterbar.

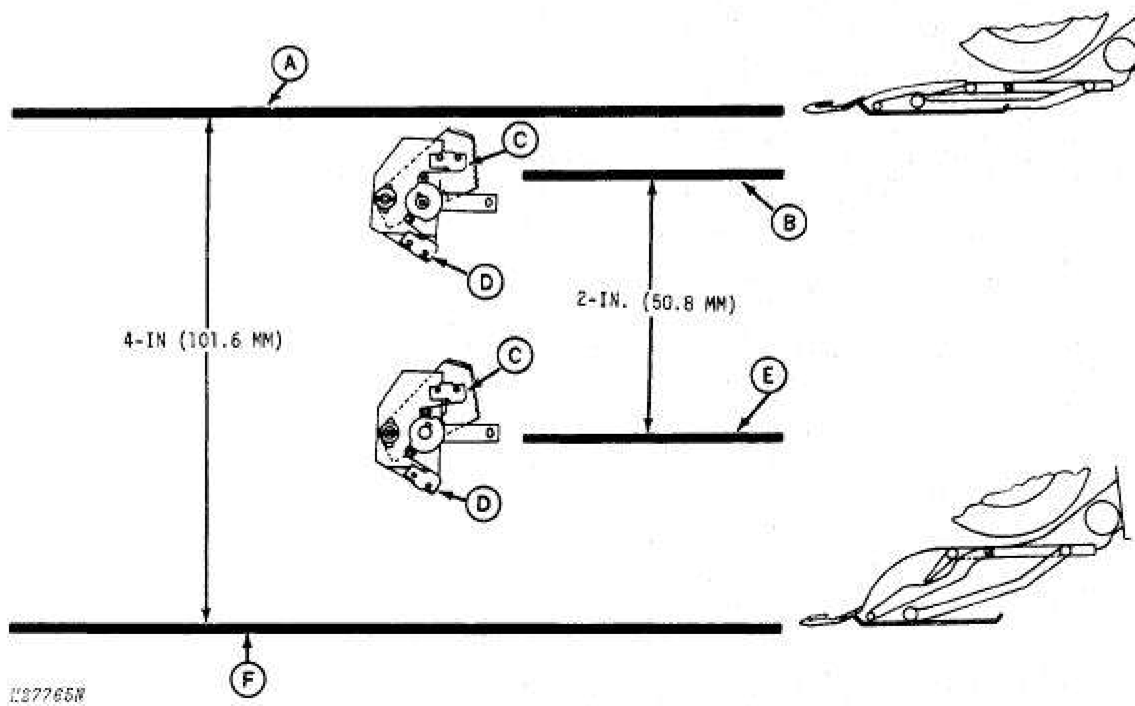
Adjusting turnbuckle (C, Fig. 4) on push rod (D) will also affect when lower switch (I) opens and closes within the 4-inch (102 mm) float range of the cutterbar. However, lower switch (I) can also be adjusted to open and close within the 4-inch (102 mm) float range by loosening wing nut (J) and rotating the bracket that lower switch (I) is attached to. This, therefore, affects the distance the cutterbar travels between both switch closings.



A—Actuator Arm
B—Push Rod
C—Turnbuckle
D—Push Rod
E—Actuator Arm
F—Support Arm
G—Cutterbar
H—Height Sensing Shaft
I —Lower Switch
J—Wing Nut
K—Actuator Cam
L—Raise Switch

Fig. 4-200 Series Flexible Cutterbar Mechanical System

Raise And Lower Switch Adjustment—Dry Ground Conditions (200 Series Platform Flexible Cutterbar)



A—Upper Mechanical Stop
B—Raise Switch Closing
C—Raise Switch
D—Lower Switch
E—Lower Switch Closing
F—Lower Mechanical Stop

Fig. 5-200 Series Platform Flexible Cutterbar Switch Adjustments (Dry Ground Conditions)

Raise and lower switches can be adjusted to close anywhere within the 4-inch (102 mm) float range of the cutterbar. Placement of these switch closings, within the float range, is dependent upon ground conditions. This is because the force exerted by the cutterbar on the ground (ground force) varies as the cutterbar moves through its float range.

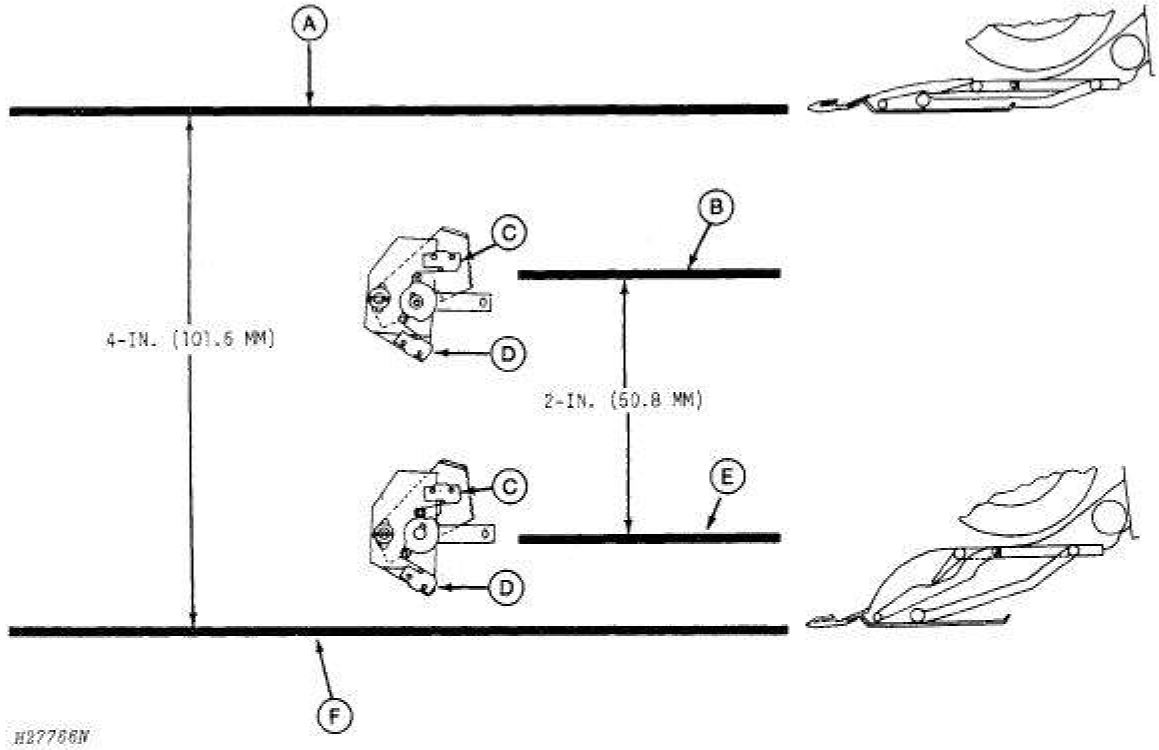
The curved transition plate between the cutterbar and platform bottom operates as a leaf spring supporting the weight of the cutterbar. As the cutterbar is raised within its float range, tension is relieved from the curved transition plate, causing the cutterbar to become heavier and causing a higher ground force.

Dry ground conditions will permit a heavier ground force to gain a close cut. Raise switch (C, Fig. 5) is adjusted by the turnbuckle on push rod (D) (Fig. 4, Page 360-10-4) to close at point (B) within the 4-inch (102 mm) float range. Lower switch (D) is adjusted to close at point (E) within the 4-inch (101.6 mm) float range by loosening wing nut (J) (Fig. 4, Page 360-10-4) and rotating the bracket that the lower switch is attached to.

The distance the cutterbar travels between switch closings should be approximately 2 inches (51 mm). With slower ground speeds and even ground, a smaller distance will permit the cutterbar to operate higher in the float range for better performance.

GENERAL INFORMATION—Continued

Raise And Lower Switch Adjustment—Wet Ground Conditions (200 Series Platform Flexible Cutterbar)



A—Upper Mechanical Stop
B—Raise Switch Closing
C—Raise Switch
D—Lower Switch
E—Lower Switch Closing
F—Lower Mechanical Stop

Fig. 6-200 Series Platform Flexible Cutterbar Switch Adjustments (Wet Ground Conditions)

Wet ground conditions will require a reduced ground force to prevent the cutterbar plowing into the ground and causing dirt to be picked up by the cutterbar. This is done by adjusting switch closings lower in the 4-inch (102 mm) float range where ground force is reduced because the curved transition plate is carrying more of the cutterbar weight. The 2-inch (51 mm) distance between switch closings is recommended and may be decreased to 1-inch (25 mm) for even ground at slow ground speeds.

Service Of The Mechanical System Components (50 Row-Crop Head or 200 Series Cutting Platform)

Components of the mechanical systems should be replaced if they are worn, damaged, or broken.

Group 15
ELECTRICAL SYSTEM

GENERAL INFORMATION

When control switch is closed by the operator, a current path exists between ignition switch and actuating switch. If the header is within 18 inches (457 mm) of the ground, actuating switch is closed, causing a current path to exist between ignition switch and both raise and lower switches. If raise switch is closed by the mechanical system, current flows to raise solenoid on auto header valve, activating the hydraulic system for raising the header. If lower switch is closed by the mechanical system, current is then sent to lower solenoid on auto header valve, activating the hydraulic system for lowering the header.

When control switch is opened by the operator, the entire automatic header height control system is turned off.

When the header is over 18 inches (457 mm) above the ground, actuating switch is opened, turning off the automatic header height control system. Actuating switch prevents the header from being lowered by the automatic header height control system when the head is fully raised. When the operator drives the combine into a cut of grain, he lowers the platform within 18 inches (457 mm) of the ground, causing actuating switch to close and turning on the automatic header height control system.

Control Switch

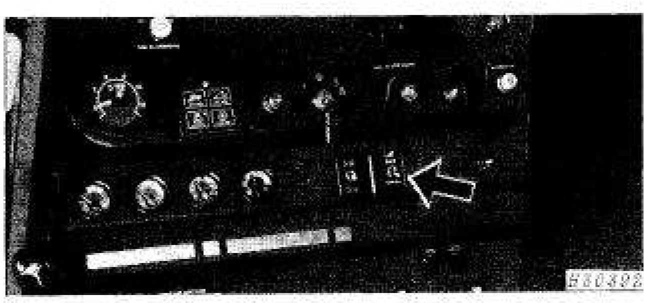


Fig. 1-Control Switch

The control switch for automatic header height control is mounted on the instrument panel (Fig. 1). The operator can choose to turn on the automatic header height control system or turn it off and use the range indicator.

Raise and Lower Switches

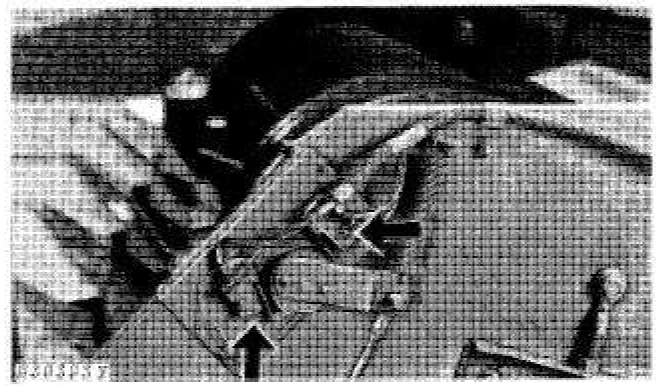


Fig. 2-Raise and Lower Switches for Row-Crop Head

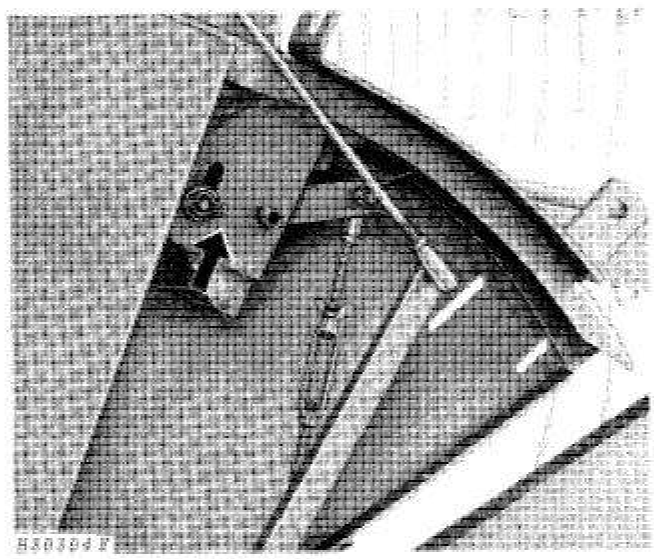


Fig. 3-Raise and Lower Switches for 200 Series Platform

Raise and lower switches are mounted on the left-hand side of the Row-Crop Head (Fig. 2) and on the right-hand side of the 200 Series Platform (Fig. 3). When closed, these switches send current to the appropriate solenoid on the auto header valve.

GENERAL INFORMATION—Continued

Actuating Switch

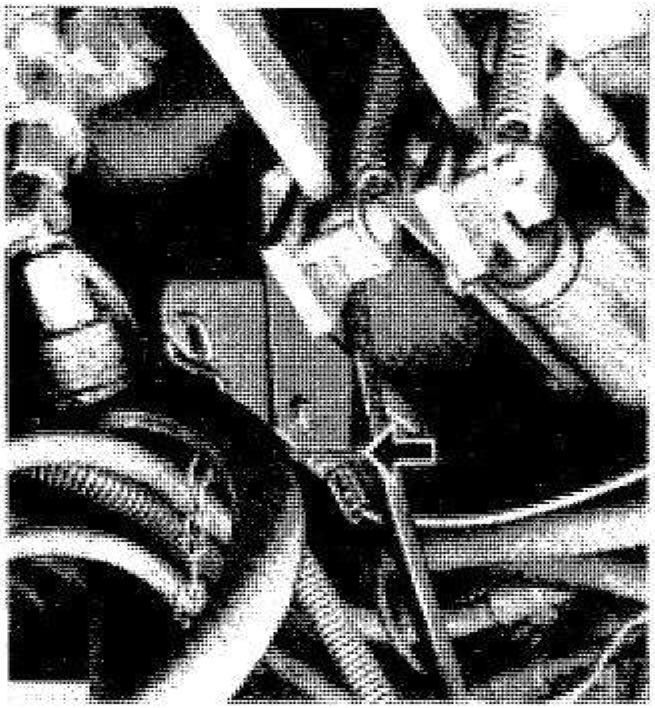


Fig. 4-Actuating Switch

The actuating switch (Fig. 4), turns on the automatic header height control when the header is within 18 inches (457 mm) of the ground. One end of chain is attached to the feeder house; the other end is attached to an actuator arm. When the feeder house and platform are lowered, chain pulls the actuator arm away from actuator switch, causing it to close. Chain is adjustable in length (A) so that the switch closes when the header is within 18 inches (457 mm) of the ground.

Range Indicator

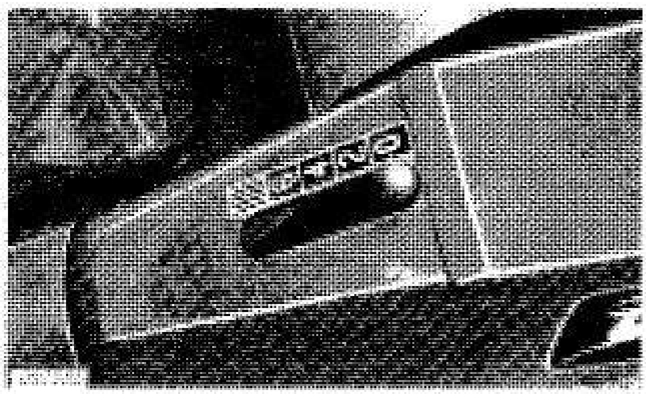


Fig. 5-Range Indicator for Row-Crop Head

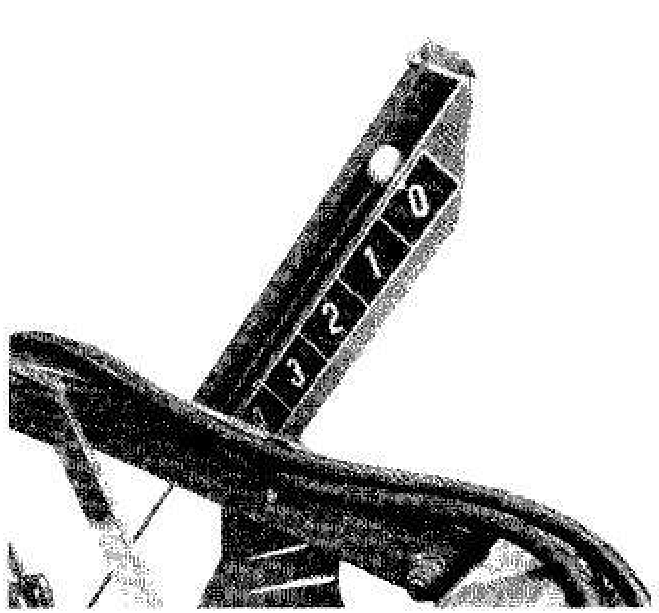


Fig. 6-Range Indicator for 200 Series Platform

The range indicator (Fig. 5 or 6) tells the operator where the row unit or flexible cutterbar is within its range. The operator can then manually raise and lower the platform to keep the row unit or flexible cutterbar within its float range.

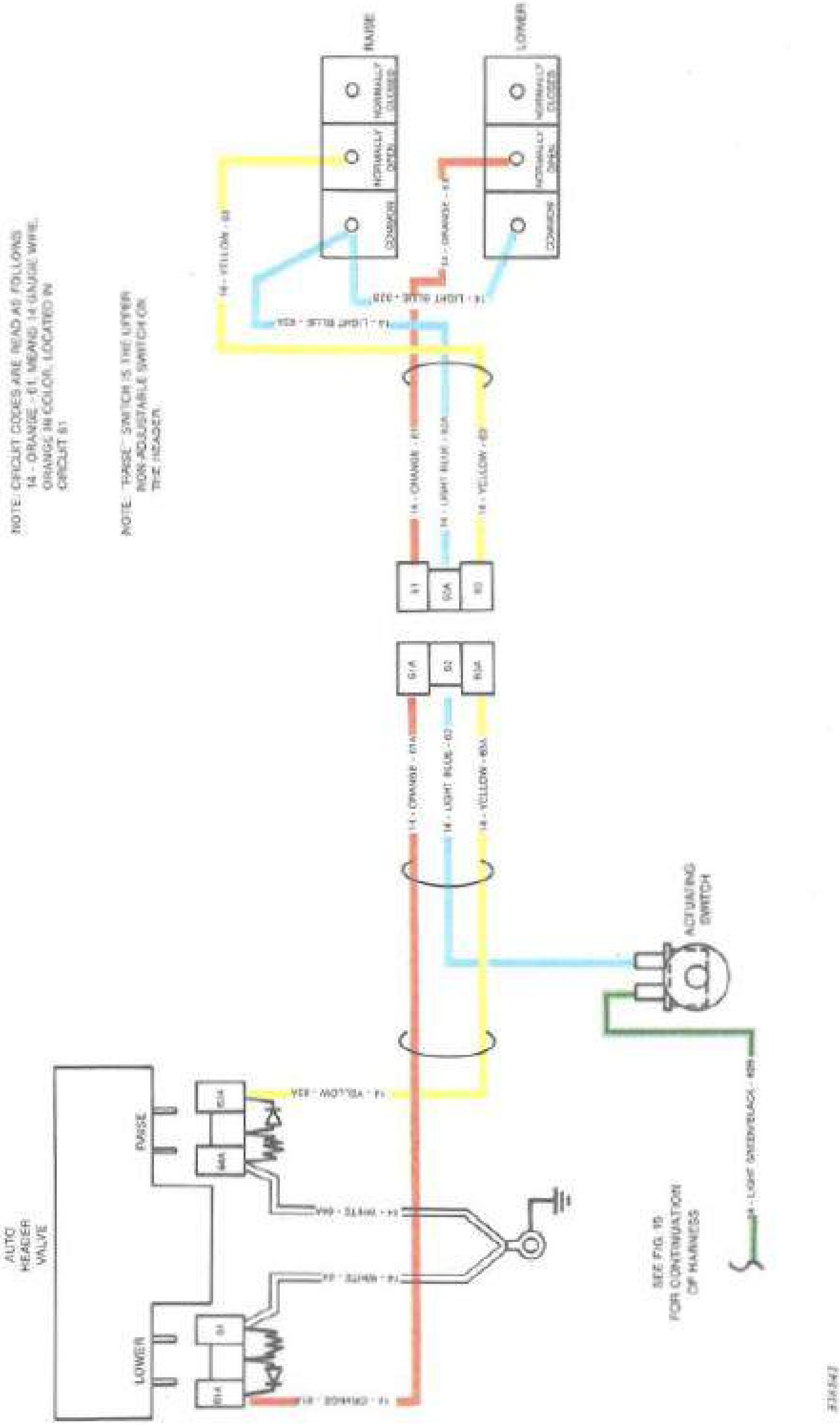
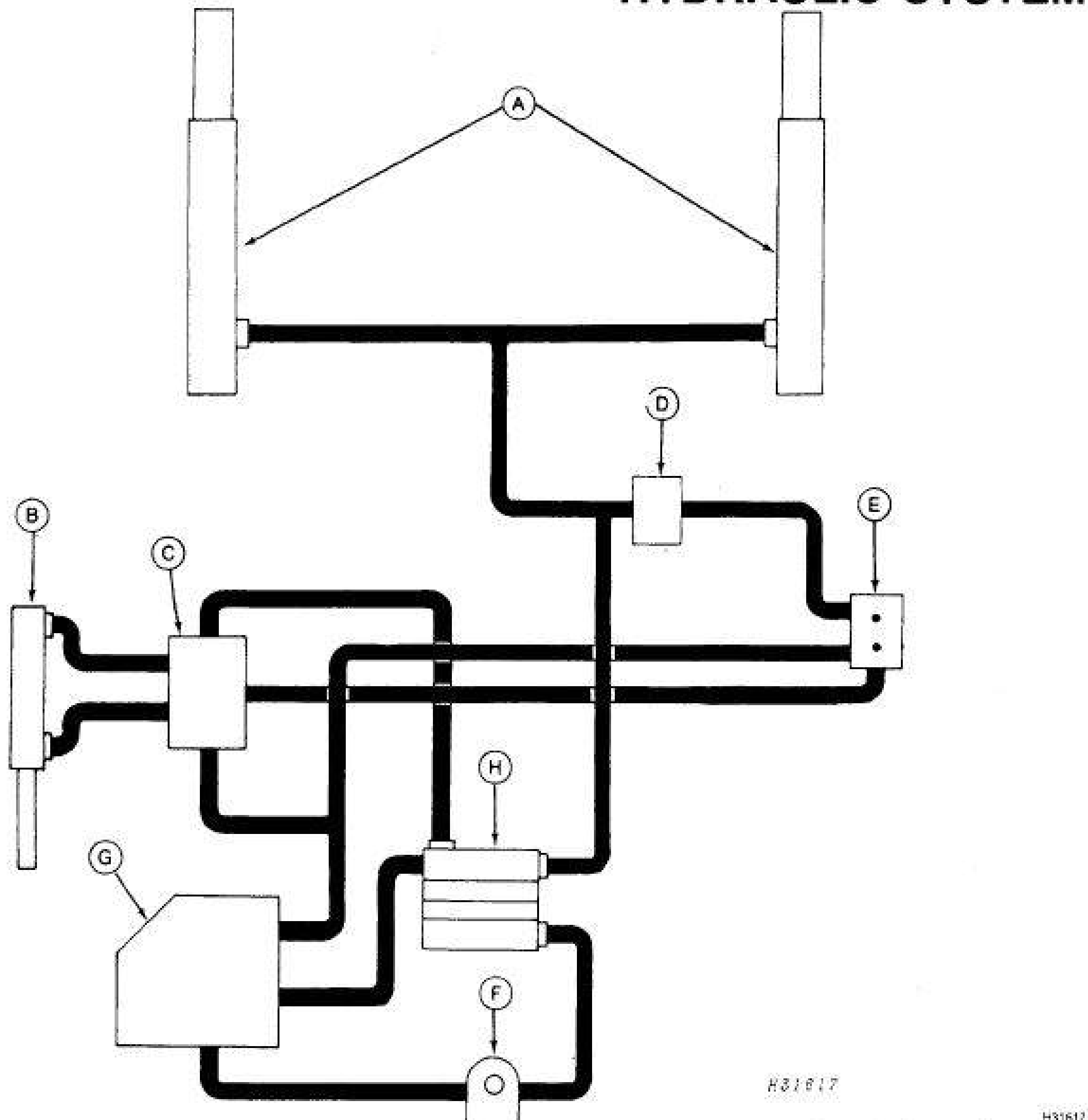


Fig. 7-Automatic Header Height Control Wiring Diagram

Group 20
HYDRAULIC SYSTEM



A—Header Lift Cylinders
B—Unloading Auger Cylinder
C—Secondary Control Valve
D—Drop Rate Valve
E—Auto Header Valve
F—Main Hydraulic Pump
G—Main Hydraulic Reservoir
H—Main Hydraulic System Control Valve

Fig. 1-Hydraulic Components—6620 and SideHill 6620 Combines

GENERAL INFORMATION

The automatic header height control system for the 6620 and SideHill 6620 Combines consists of the following components:

Two header lift cylinders (A) (Fig. 1) which raise and lower the header. Refer to Section 270 for information on these cylinders.

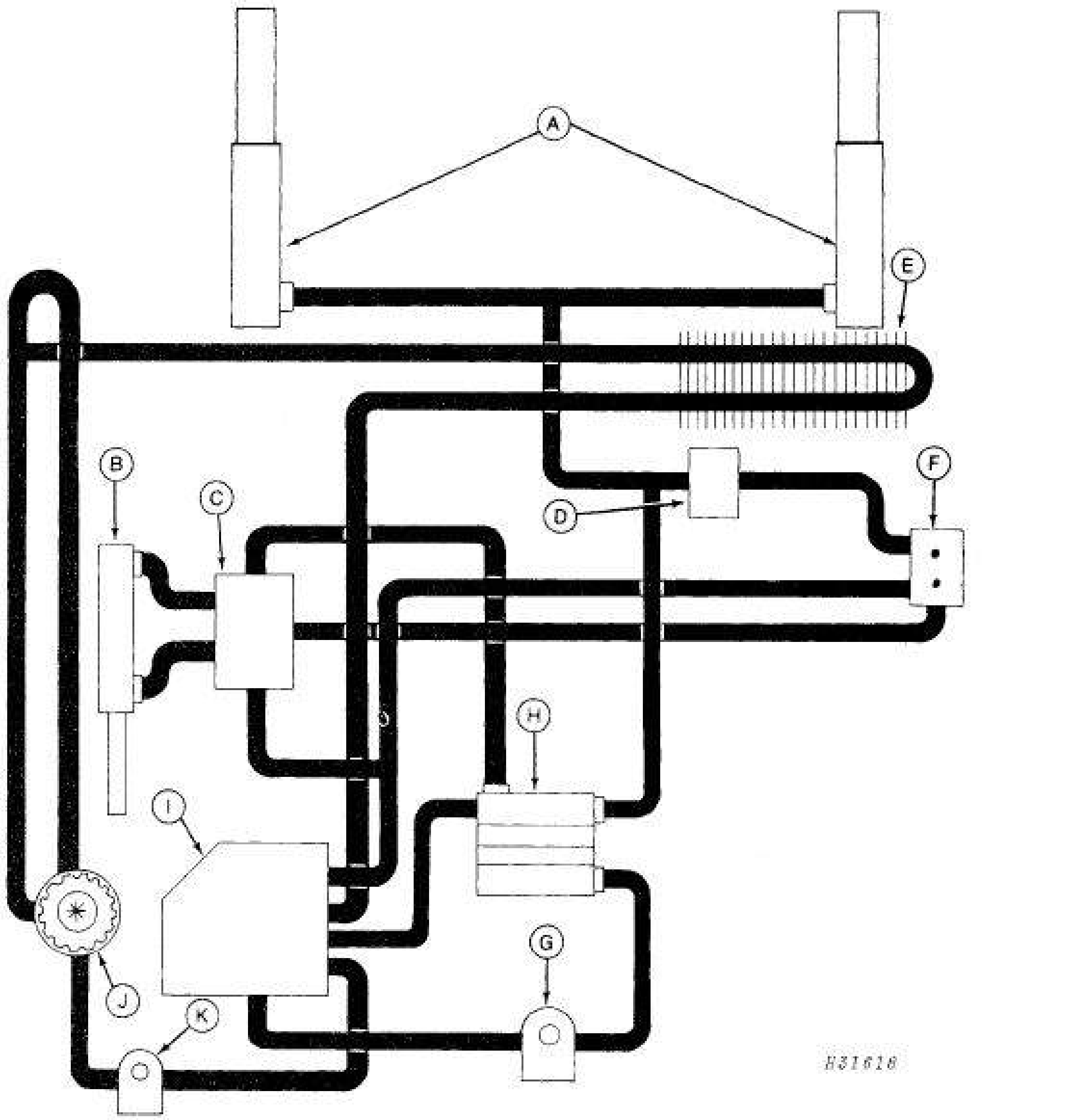
Secondary control valve (C) (Fig. 1) and unloading auger cylinder (B). Oil for the header height control circulates through these two components.

Drop rate valve (D) (Fig. 1) controls the speed of header drop. See this section for information on this valve.

An auto header valve (E) (Fig. 1) equipped with two solenoids transfers electrical energy to hydraulic energy to operate the system. See this section for operation of this valve.

Main system reservoir (G) (Fig. 1), main system control valve (H), and main system hydraulic pump (F) provide the basic hydraulic flow for the system. See Section 270 for information about these components.

GENERAL INFORMATION—Continued



A—Header Lift Cylinders
B—Unloading Auger Cylinder
C—Secondary Control Valve
D—Drop Rate Valve
E—Oil Cooler
F—Auto Header Valve
G—Main Hydraulic Pump
H—Main Hydraulic Control Valve
I—Main Hydraulic Reservoir
J—Reel Speed Control Valve
K—Reel Drive Pump

Fig. 2-Hydraulic Components—7720 Combine

The automatic header height control system for the 7720 Combine consists of the following components:

Two header lift cylinders (A) (Fig. 2) which raise and lower the header. Refer to Section 270 for information on the cylinders.

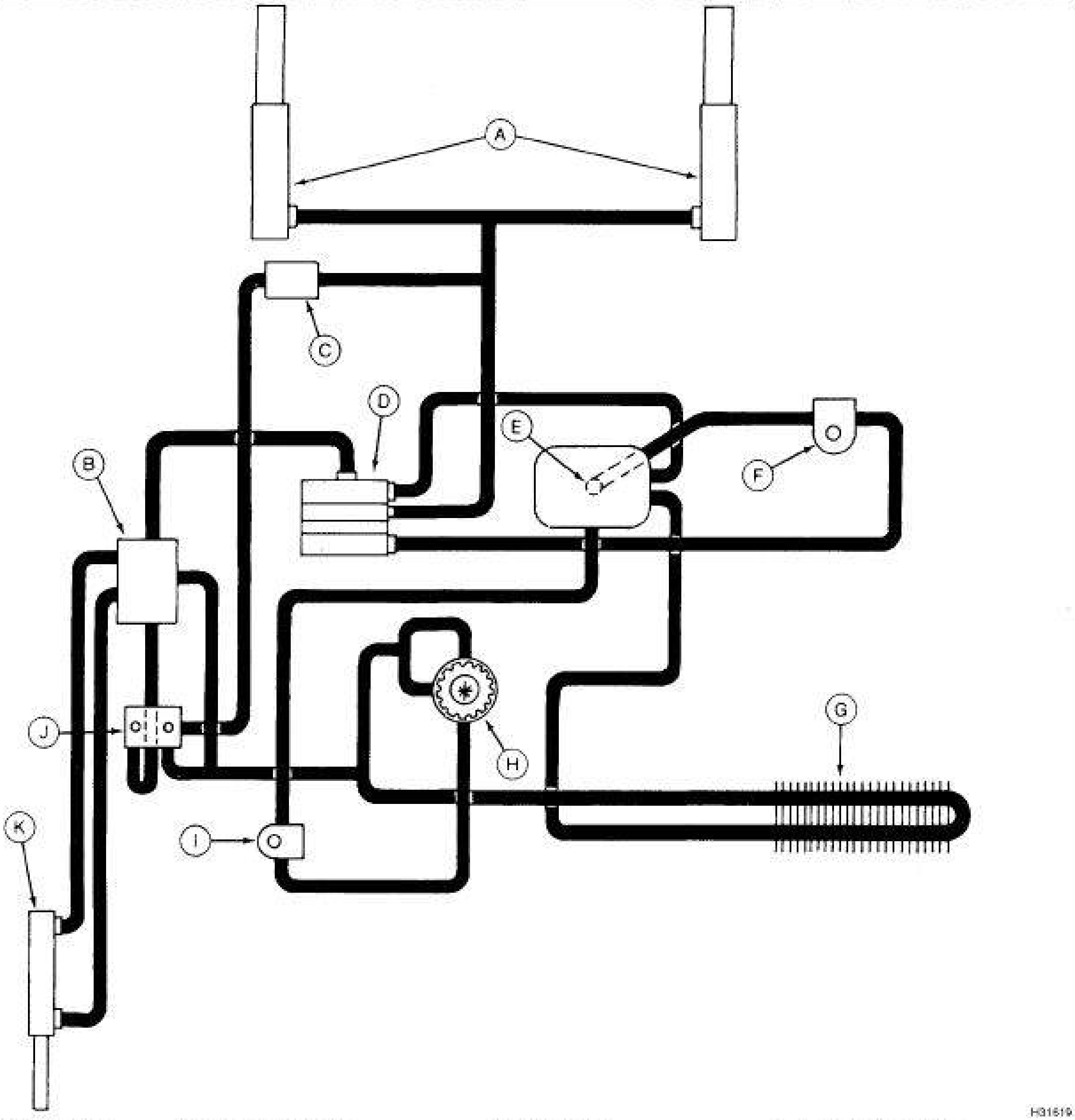
Secondary control valve (C) (Fig. 2) and unloading auger cylinder (B). Oil for the header height control circulates through these two components.

Drop rate valve (D) (Fig. 2) controls the speed of header drop. See this section for information on this valve.

An auto header valve (F) (Fig. 2) equipped with two solenoids transfers electrical energy to hydraulic energy to operate the system. See this section for operation and service of the valve.

An oil cooler (E) (Fig. 2) is used to cool the oil for the automatic header height control circuit. This oil also passes through the reel speed valve (J) and reel drive pump (K).

Main system reservoir (I) (Fig. 2), main system control valve (H), and main system hydraulic pump (F) provide the basic hydraulic flow for the system. See Section 270 for information about these components.



A—Header Lift Cylinders
B—Secondary Control Valve
C—Drop Rate Valve
D—Main Hydraulic Control Valve
E—Main Hydraulic Reservoir
F—Main Hydraulic Pump
G—Oil Cooler
H—Reel Speed Control Valve
I—Reel Drive Pump
J—Auto Header Valve
K—Unloading Auger Cylinder

Fig. 2A-Hydraulic Components—8820 Combine

The header height control system for the 8820 Combine consists of the following components:

Two header lift cylinders (A) (Fig. 2A) which raise and lower the header. Refer to Section 270 for information on these cylinders.

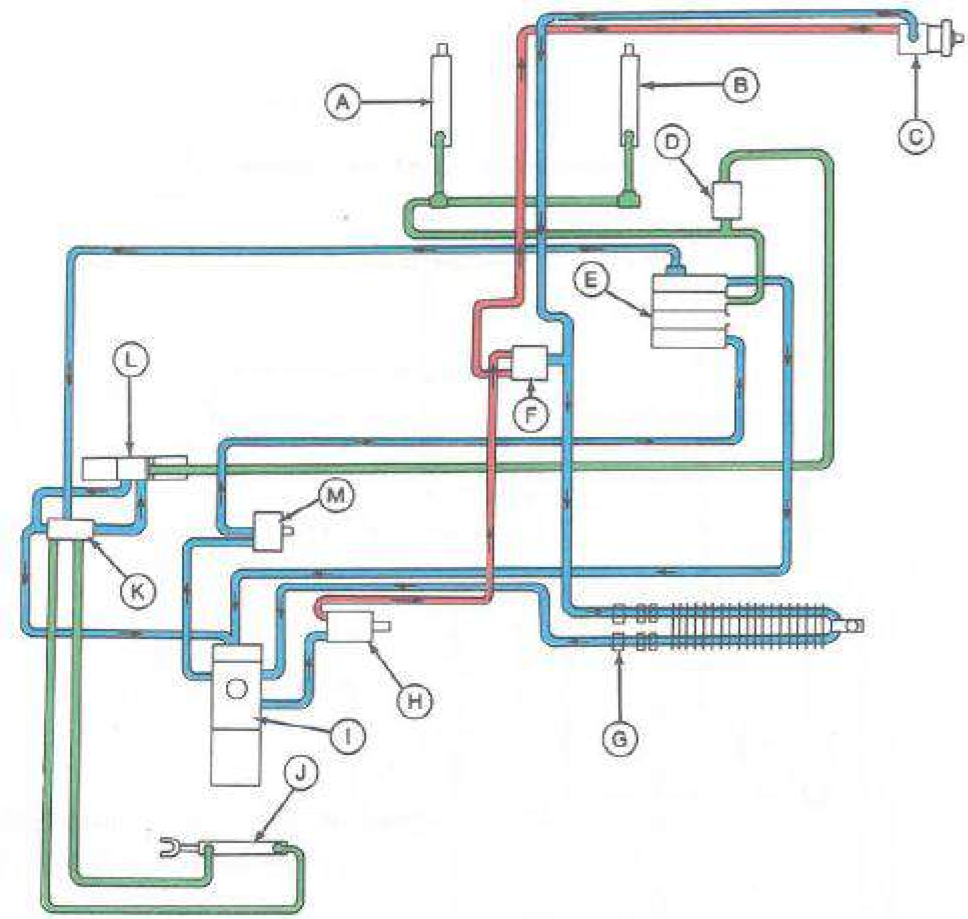
Secondary control valve (B) (Fig. 2A) and unloading auger cylinder (K). Oil for the header height control circulates through these two components.

Drop rate valve (C) (Fig. 2A) controls the speed of header drop. See this section for information on this valve.

An auto header valve (J) (Fig. 2A) equipped with two solenoids transfers electrical energy to hydraulic energy to operate the system. See this section for operation and service of the valve.

An oil cooler (G) (Fig. 2A) is used to cool the oil for the header height control circuit. This oil also passes through the reel speed valve (H) and reel drive pump (I).

Main system reservoir (E) (Fig. 2A), main system control valve (D), and main system hydraulic pump (F) provide the basic hydraulic flow for the system. See Section 270 for information about these components.



A—L.H. Header Lift Cylinder	F—Reel Flow Control Valve (7720 and 8820 Only)	I —Reservoir	L —Auto Header Valve
B—R.H. Header Lift Cylinder	G—Oil Cooler (7720 and 8820 Only)	J—Unloading Auger Swing Cylinder	M—Main Hydraulic Pump
C—Reel Drive Motor	H—Reel Drive Pump (7720 and 8820 Only)	K—Secondary Control Valve	Pressure Oil
D—Drop Rate Valve			Pressure Free Oil
E—Main Control Valve			Trapped Oil

H30401

Fig. 3-Hydraulic System - Header Not Activated

Header Not Activated

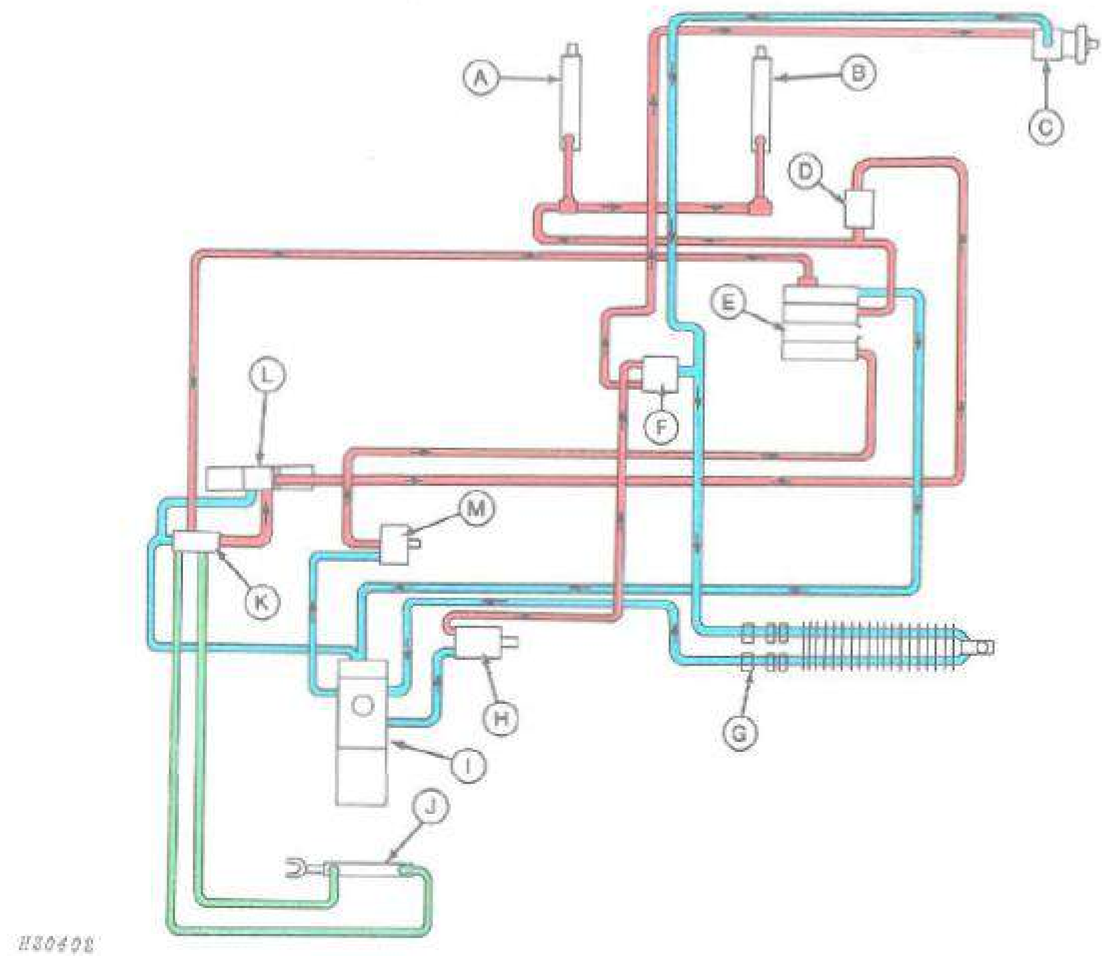
The electrical system has not activated either solenoid on the auto header valve (L, Fig. 3). The pilot check valve in the auto header valve and the lockout poppet in the main control valve (E) close, trapping oil in the header lift system.

Pressure free oil now flows from the reservoir (I, Fig. 3) to the main hydraulic pump (M) and then to the main control valve (E).

From the main control valve, approximately 4-3/4 gallons (18 L) of oil flows through a flow control plug in the valve and over to the secondary control valve (K, Fig. 3). The balance of the oil from the main control valve is then returned to the reservoir (I).

The secondary control valve (K, Fig. 3) then directs the 4-3/4 gallons (18 L) of oil to the auto header valve (L), where it flows through the valve and back to the reservoir (I).

GENERAL INFORMATION—Continued



A—L.H. Header Lift Cylinder
B—R.H. Header Lift Cylinder
C—Reel Drive Motor
D—Drop Rate Valve
E—Main Control Valve
F—Reel Flow Control Valve (7720 and 8820 Only)
G—Oil Cooler (7720 and 8820 Only)
H—Reel Drive Pump (7720 and 8820 Only)
I—Reservoir
J—Unloading Auger Swing Cylinder
K—Secondary Control Valve
L—Auto Header Valve
M—Main Hydraulic Pump
Pressure Oil
Pressure Free Oil
Trapped Oil

Fig. 4-Hydraulic System - Header Raising

Header Raising

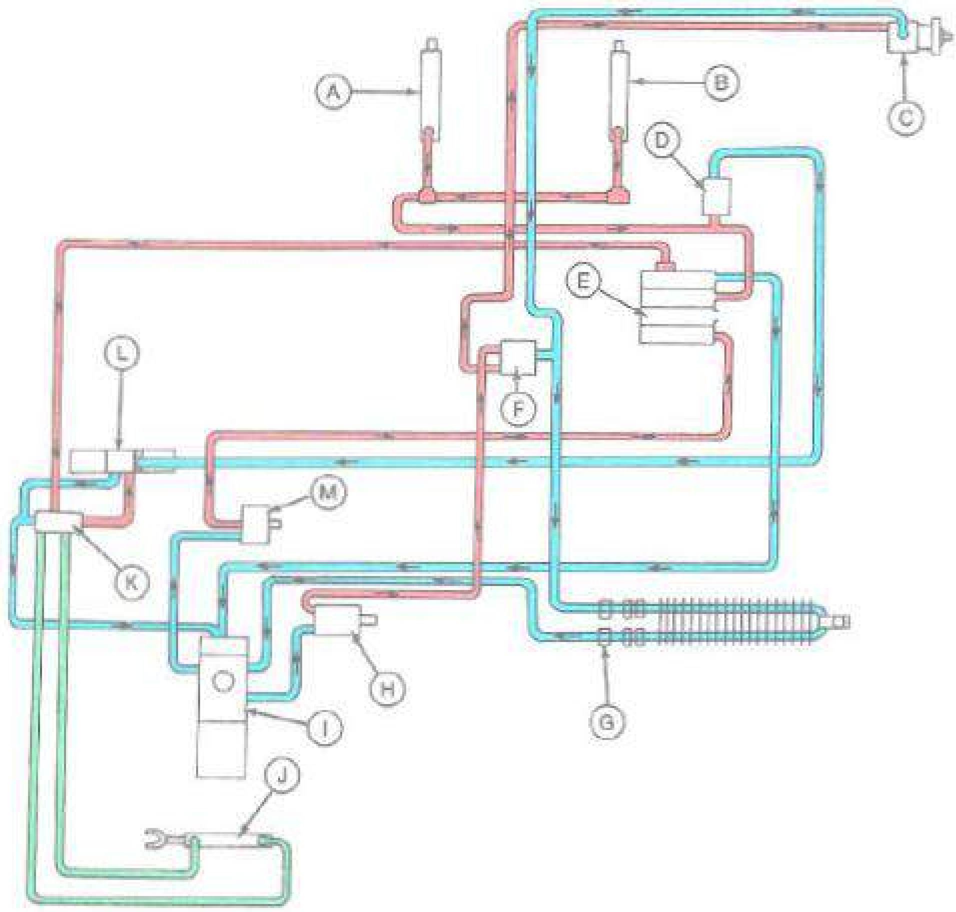
When field conditions require raising of the header, the automatic header height control hydraulic system is activated by the automatic header height control electrical system. Refer to Group 15 of this section for information on the electrical system.

The electrical system activates the raise solenoid on the header valve (L, Fig. 4). Pressure free oil flows from the reservoir (I) to the main hydraulic pump (M). The oil then flows, under pressure, from the pump to the main control valve (E).

Oil flows out of the flow control plug in the main control valve (E, Fig. 4) and to the secondary control valve (K). The secondary control valve directs oil to the auto header valve (L).

The auto header valve then directs this oil to the drop rate valve (D, Fig. 4). Oil flows, unrestricted, through the drop rate valve and into the header lift cylinders (A and B). The lockout poppet in the main control valve prevents oil from flowing back to the reservoir.

7720 and 8820 Combines are equipped with an oil cooler (G, Fig. 4), located in front of the radiator. It's function is to cool the hydraulic oil as it flows from the reel drive motor, before it is returned to the reservoir.



A—L.H. Header Lift Cylinder
B—R.H. Header Lift Cylinder
C—Reel Drive Motor
D—Drop Rate Valve
E—Main Control Valve
F—Reel Flow Control Valve (7720 and 8820 Only)
G—Oil Cooler (7720 and 8820 Only)
H—Reel Drive Pump (7720 and 8820 Only)
I—Reservoir
J—Unloading Auger Swing Cylinder
K—Secondary Control Valve
L—Auto Header Valve
M—Main Hydraulic Pump
Pressure Oil
Pressure Free Oil
Trapped Oil

Fig. 5-Hydraulic System - Header Lowering

Header Lowering

When field conditions require lowering the header, the automatic header height control hydraulic system is activated by the automatic header height control electrical system. Refer to Group 15 of this section for information on the electrical system.

The electrical system activates the lower solenoid on the header valve (L, Fig. 5). Pressure fill oil flows from the reservoir (I) to the main hydraulic pump (M). The oil then flows, under pressure, from the pump to the main control valve (E).

Oil flows out of the flow control plug in the main control valve (E, Fig. 4) and to the secondary control valve (K). The secondary control valve directs the oil to the auto header valve (L).

The auto header valve allows oil in the header lift system to flow back to the reservoir. Oil flows from the header lift cylinders (A and B, Fig. 5) to the drop rate valve (D). The lockout poppet in the main control valve prevents any oil from flowing back to the reservoir.

The drop rate valve meters the flow rate to control the rate of drop of the header. Oil flows from the drop rate valve to the auto header valve which directs this oil back to the reservoir.

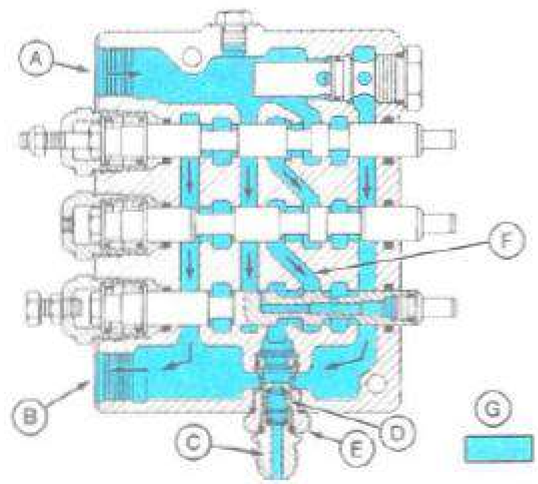
The oil cooler on 7720 and 8820 Combines allow the oil to be cooled before it is returned to the reservoir.

MAIN CONTROL VALVE

GENERAL INFORMATION

The automatic header height control hydraulic system obtains oil from the flow control plug in the main control valve. This same oil is also used to swing the unloading auger.

Height Control Not Activated

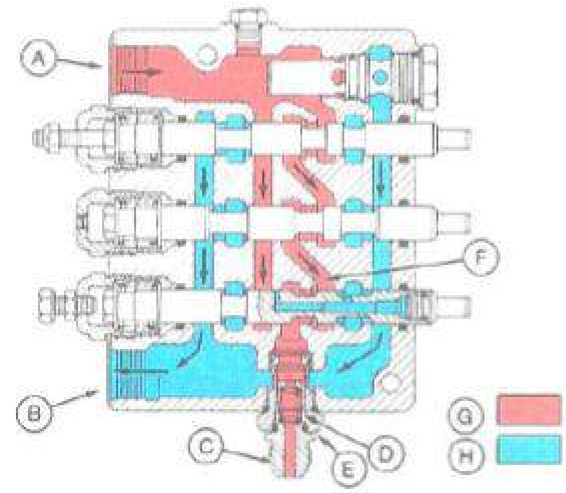


A—Inlet Port
B—To Reservoir
C—To Automatic Header Height Control System
D—Piston
E—Flow Control Plug
F—Free Flow Path
G—Pressure Free Oil

Fig. 6-Main Control Valve - Height Control Not Activated

Pressure free oil flows into port (A, Fig. 6) from the main hydraulic pump. Oil flows through the valve, along the free flow path (F). Piston (D), in flow control plug (E), meters the flow and moves outward to allow excess oil to flow to reservoir through port (B). Oil metered by the orifice in piston (D) flows through port (C) to the automatic header height control system.

Height Control Activated



A—Inlet Port
B—To Reservoir
C—To Automatic Header Height Control System
D—Piston
E—Flow Control Plug
F—Free Flow Path
G—Pressure Oil
H—Pressure Free Oil

Fig. 7-Main Control Valve - Height Control Activated

The electrical system activates either solenoid on the auto header valve activating the hydraulic system and causing a demand for pressurized oil. Oil flows through the valve along the free flow path (F, Fig. 7). Piston (D), in flow control plug (E), moves slightly inward to maintain pressure. The metered pressurized oil flows through the orifice in piston (D) and through port (C) to the automatic header height control system. Excess oil flows to reservoir through port (B).

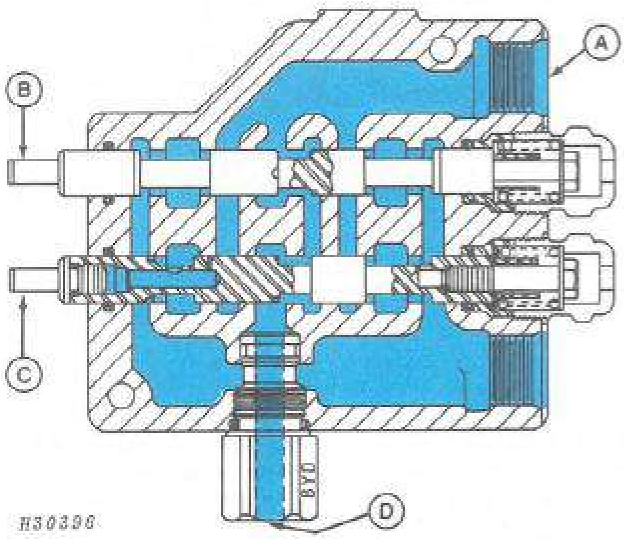
NOTE: Removal, repair, and installation of the main control valve is covered in Section 70 Hydraulic Systems Repair of this technical manual.

SECONDARY CONTROL VALVE

GENERAL INFORMATION

The automatic header height control hydraulic system and unloading auger swing hydraulic system use the oil coming from the flow control plug in the main control valve.

Automatic Header Height Control Not Activated

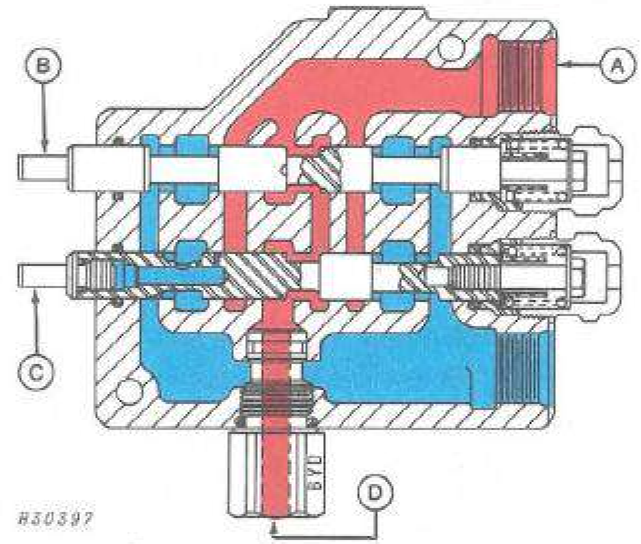


A—In Port
B—Spool
C—Spool
D—BYD Port
Pressure Free Oil

Fig. 8-Secondary Control Valve - Automatic Header Height Control Not Activated

Pressure free oil, from the flow control plug in the main control valve, flows into port (A) (Fig. 8). Spools (B and C) are centered. Pressure free oil flows around spools (B and C) and to the auto header valve through port (D).

Automatic Header Height Control Activated



A—In Port
B—Spool
C—Spool
D—BYD Port
Pressure Oil
Pressure Free Oil

Fig. 9-Secondary Control Valve - Automatic Header Height Control Activated

Pressurized oil, from the flow control plug in the main control valve, flows into port (A) (Fig. 9). Spools (B and C) are centered. Pressurized oil flows around spools (B and C) and to the auto header valve through port (D). High pressure oil is sent to the auto header valve for raising and lowering the header.

AUTO HEADER VALVE

GENERAL INFORMATION

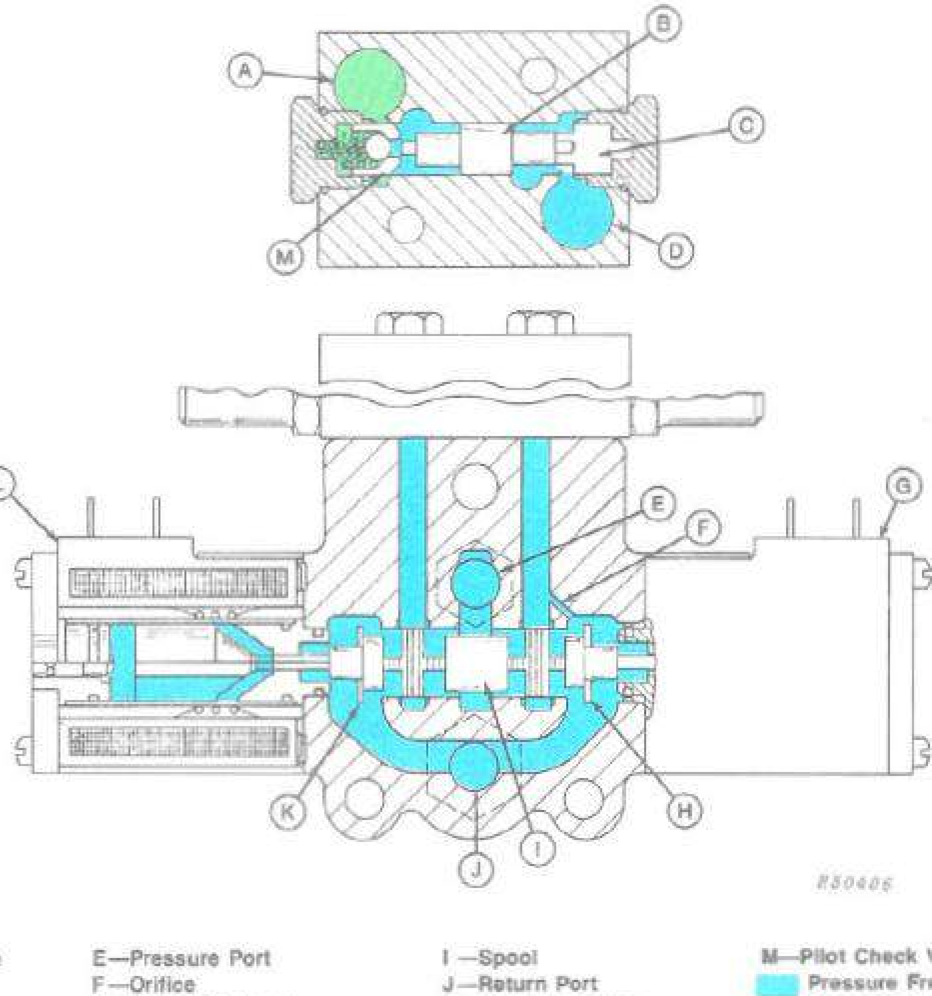
The auto header valve is located next to the operator's platform ladder. The auto header valve directs pressure oil to the header lift cylinders and directs return oil to the reservoir.

The leveling control valve for the SideHill leveling system and the auto header valve for the automatic header height control are similar in appearance, but they have these differences;

1. Only the SideHill leveling control valve has thermal relief valves.

2. The check block on the SideHill leveling control valve may be installed in either direction on the valve. The check block on the auto header valve must be installed in only one position. Mark check block to auto header valve before removal.

3. The auto header valve contains an internal orifice or leak off passage, the SideHill valve does not. Remove the raise solenoid to see this orifice.



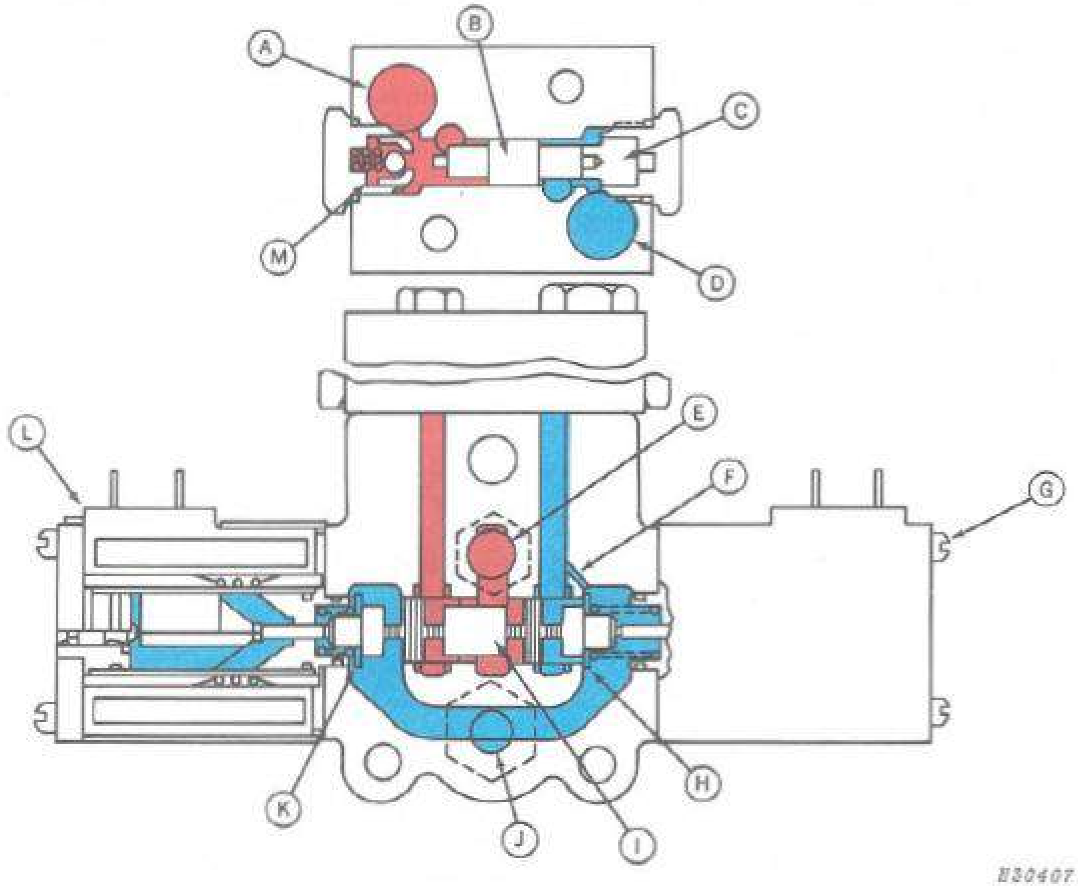
A—To Drop Rate Valve
B—Spool
C—Plug
D—Plugged Port
E—Pressure Port
F—Orifice
G—Raised Solenoid
H—Slotted Washer
I —Spool
J—Return Port
K—Slotted Washer
L—Lower Solenoid
M—Pilot Check Valve
Pressure Free Oil
Trapped Oil

Fig. 10-Auto Header Valve - Header Not Activated

Header Not Activated

Neither solenoid on the auto header valve is activated. Springs center spool (I, Fig. 10) allowing pressure free oil to flow into port (E), around spool (I), through slotted washers (H and K) and to reservoir through port (J). Pilot check valve (M) closes, trapping oil in the header lift system.

GENERAL INFORMATION—Continued

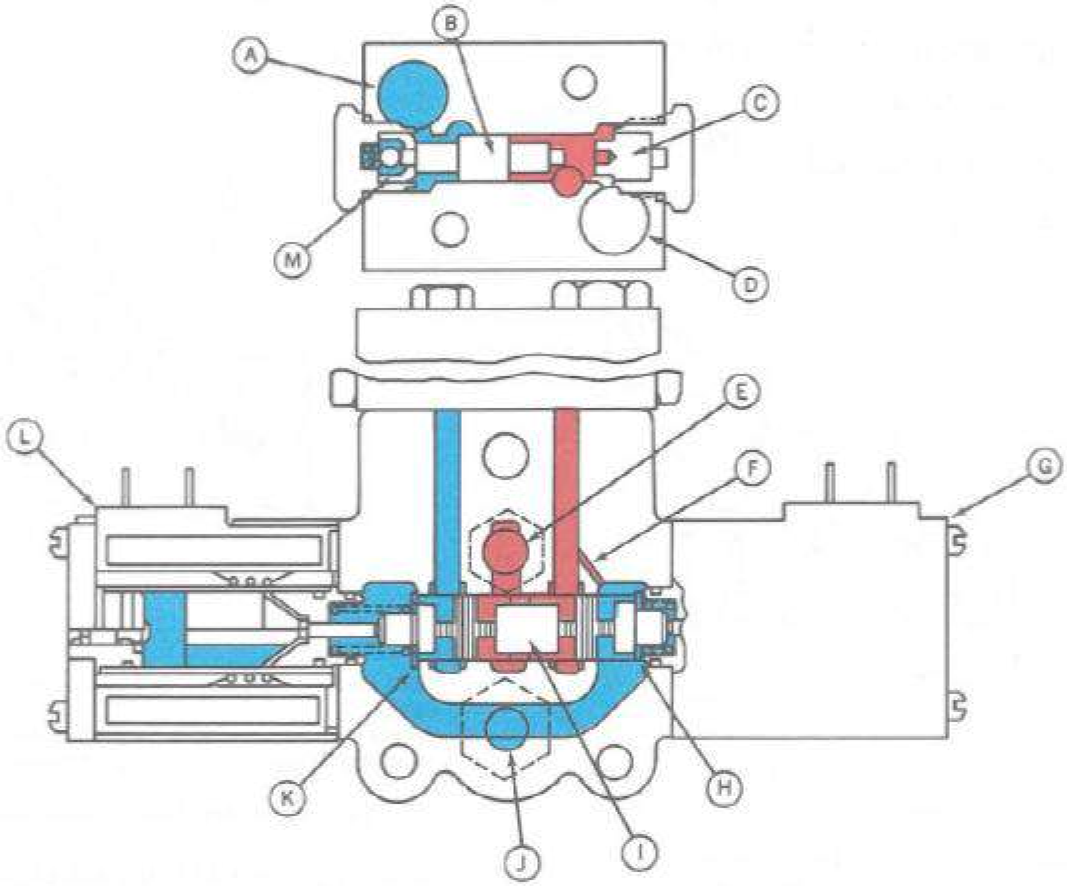


A—To Drop Rate Valve	E—Pressure Port	I—Spool	M—Pilot Check Valve
B—Spool	F—Orifice	J—Return Port	Pressure Oil
C—Plug	G—Raise Solenoid	K—Slotted Washer	Pressure Free Oil
D—Plugged Port	H—Slotted Washer	L—Lower Solenoid	

Fig. 11-Auto Header Valve - Header Raising

Header Raising

To raise the header, raise solenoid (G, Fig. 11) is activated by the automatic header height control electrical system. The activated raise solenoid (G) pushes in or moves to the left spool (I). This causes pressure oil from port (E) to flow around spool (I) up to pilot check valve (M), causing it to open. Open pilot check valve (M) allows pressure oil to flow to the drop rate valve and then to the header lift cylinders. The pressure oil also forces spool (B) to the right. Plug (C) limits the travel of spool (B). Slotted washer (H) limits the travel of spool (I).



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A—To Drop Rate Valve
B—Spool
C—Plug
D—Plugged Port
E—Pressure Port
F—Orifice
G—Raised Solenoid
H—Slotted Washer
I —Spool
J—Return Port
K—Slotted Washer
L—Lower Solenoid
M—Pilot Check Valve
Pressure Oil
Pressure Free Oil

Fig. 12-Auto Header Valve - Header Lowering

Header Lowering

To lower the header, lower solenoid (L, Fig. 12) is activated by the automatic header height control electrical system. The activated lower solenoid (L) pushes in or moves to the right spool (I). This causes pressure oil from port (E) to flow around spool (I) up to spool (B), causing it to move to the left, causing pilot check valve (M) to open.

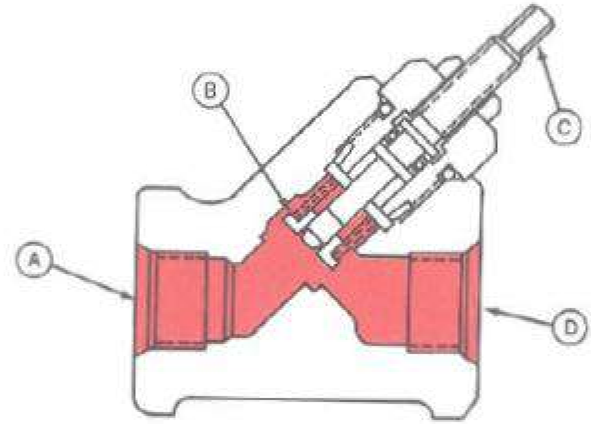
Open pilot check valve (M) allows return oil from the header lift cylinders to flow through port (A), around spool (I), through slotted washer (K), and to reservoir through port (J). Orifice (F) allows the pressure oil to flow to reservoir without losing the pressure required to move spool (B).

DROP RATE VALVE

GENERAL INFORMATION

The drop rate valve controls the rate of drop of the header. The drop rate valve affects the rate of drop, only for automatic header height control.

Header Raising

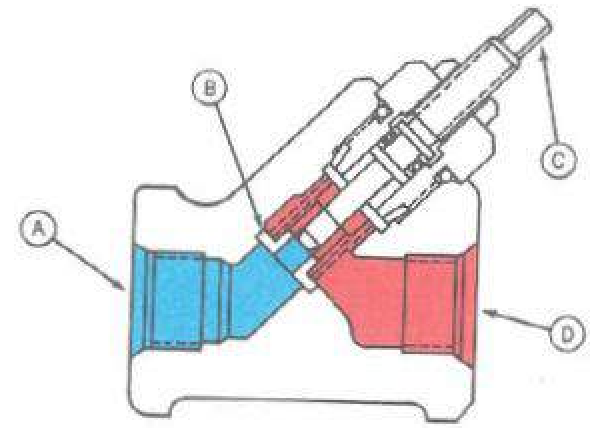


A—From Auto Header Valve
B—Poppet
C—Adjusting Screw
D—To Platform Lift Cylinders
Pressure Oil

Fig. 13-Drop Rate Valve - Header Raising

Pressure oil flows from the auto header valve to port (A, Fig. 13). The pressure oil moves back poppet (B) and flows unrestricted to the header lift cylinders through port (D).

Header Lowering

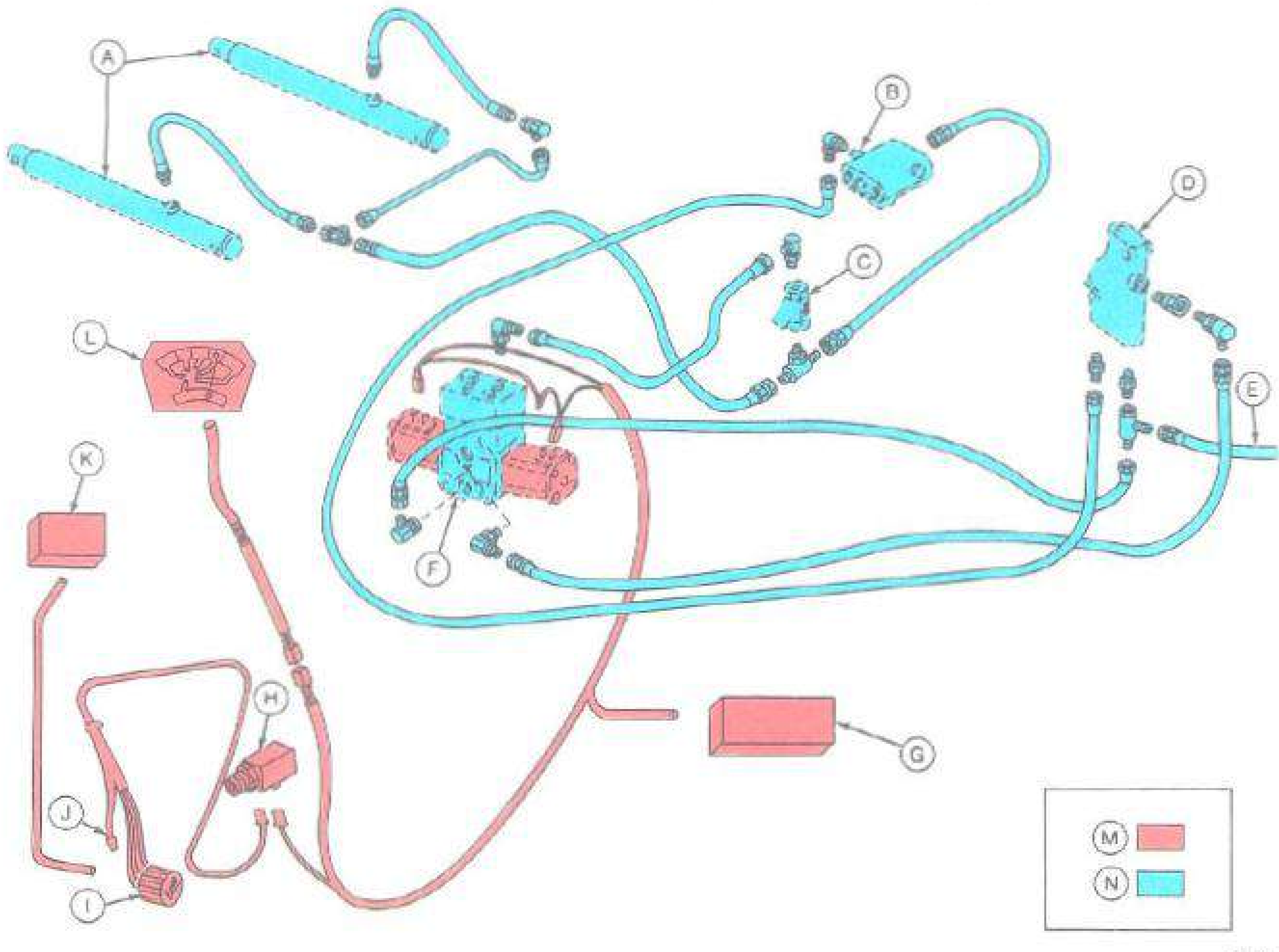


A—From Auto Header Valve
B—Poppet
C—Adjusting Screw
D—To Platform Lift Cylinders
Pressure Oil
Pressure Free Oil

Fig. 14-Drop Rate Valve - Header Lowering

Pressure oil flows from the header lift cylinders to port (D, Fig. 14). Oil is metered through two slots in poppet (B) and flows through port (A) to the auto header valve. The amount of the slot exposed in poppet (B) is dependent upon how far adjusting screw (C) is turned in. Turning adjusting screw (C) inwards, slows down the rate of drop; turning it out, speeds up rate of drop.

Group 25
DIAL-A-MATIC HEADER HEIGHT CONTROL GENERAL INFORMATION, DIAGNOSIS, AND TESTS



A—Header Lift Cylinders
B—Flow Control Plug, Main Control Valve
C—Drop Rate Valve
D—Secondary Control Valve
E—To Reservoir
F—Auto Header Valve
G—Amplifier
H—Actuating Switch
I—Control Switch
J—To Ignition Switch
K—Circuit Box
L—Sensing Box
M—Electrical
N—Hydraulic

Fig. 1-Dial-A-Matic Header Height Control Diagram

GENERAL INFORMATION

The Dial-A-Matic header height control option is used on John Deere self-propelled combines equipped with a row-crop head or a 200 Series Flex Platform.

The system actuates the header lift cylinders to raise or lower the header to maintain the floating row units (row-crop head) or flexible cutterbar (200 Series Platform) within a specific float range.

This header height control is comprised of three integral systems: mechanical, electrical and hydraulic.

Mechanical System

The mechanical system consists of a height sensing shaft, bell cranks and linkage rods for both the row-crop head and flexible cutterbar.

Electrical System

The electrical system consists of the ignition switch (J) (Fig. 1), control switch (I), actuating switch (H), sensing box (L), two solenoids on the auto header valve (F), an amplifier (G) and a circuit box (K). When activated, either solenoid activates the hydraulic system.

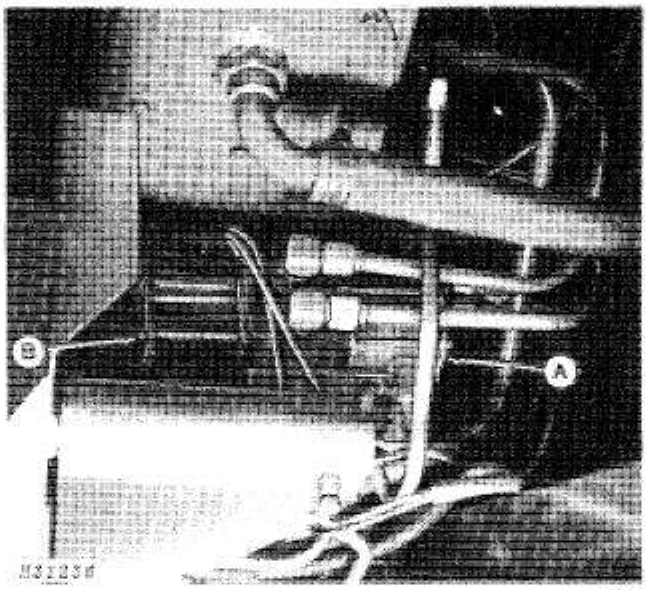
GENERAL INFORMATION—Continued

Hydraulic System

The hydraulic system consists of the flow control plug in the main control valve (B) (Fig. 1), secondary control valve (D), auto header valve (F), drop rate valve (C), header lift cylinders (A), and oil cooler (7720 and 8820). When the auto header valve is activated, the hydraulic system raises or lowers the header.

NOTE: Information covering the electrical and hydraulic systems for Dial-A-Matic header height control has been separated from the main electrical system (Section 240) and hydraulic systems (Section 270), and is included in this section.

DIAGNOSING MALFUNCTIONS



A—Push Pin for Lowering Header **B—Push Pin for Raising Header**

Fig. 2-Auto Header Valve

When diagnosing automatic header height control problems, determine if the problem is in the electrical system or the hydraulic system.

To determine if the problem is electrical or hydraulic in nature, place the automatic header height control switch in the "OFF" position; start engine, move throttle lever to the fast idle position, and place transmission in neutral.

CAUTION: Set parking brake, being certain that machine will not roll. This test is performed near the drive tires and could result in personal injury if the combine started to move.

Depress manual push pin (A) (Fig. 2) in "LOWER" solenoid on the auto header valve. The header should lower to the ground. Next, depress manual push pin (B) in "RAISE" solenoid on the auto header valve. The header should raise. If after depressing both push pins the header raises and lowers correctly, the problem is in the electrical system. If the header does not raise or lower, the problem is in the hydraulic system.

NOTE: It is important to have the engine at fast idle to develop full hydraulic flow out of the main hydraulic pump.

If the manual push pins cannot be depressed manually, the auto header valve must be disassembled.

The following charts are divided into hydraulic and electrical malfunctions. Charts begin with easy malfunctions to check and progress with more time consuming malfunctions.

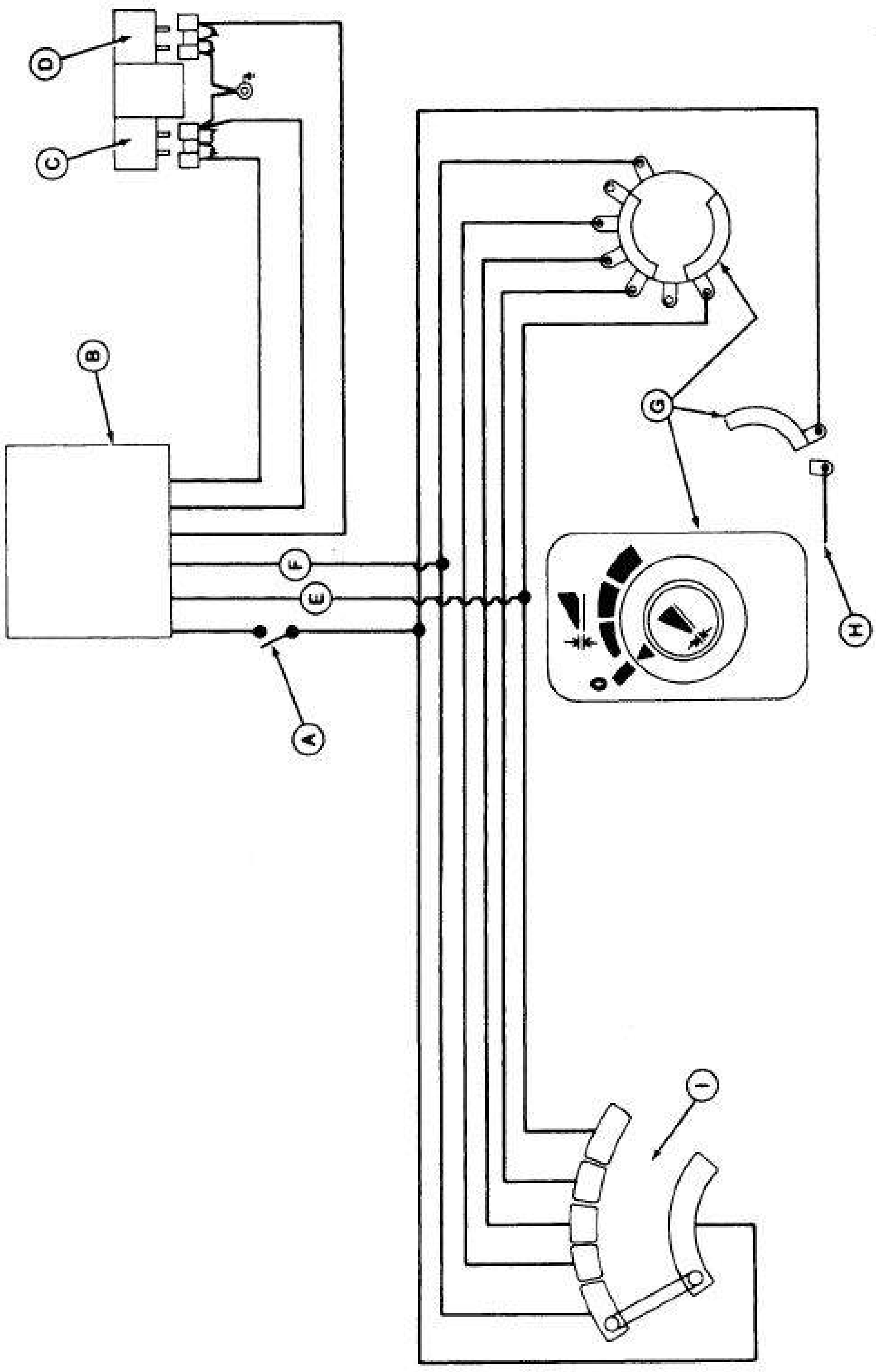
Some steps within the charts specify a test number to perform. All tests are assigned a number for easy reference.

Electrical System

Problem	Cause	Remedy
Dial-A-Matic Header Height Control Will Not Operate	Defective control switch.	Replace control switch.
	Rubber boot is not correctly positioned on actuating switch.	Position rubber boot in groove in actuating switch plunger.
	Defective actuating switch.	Replace actuating switch.
	Loose connection on ignition switch.	Tighten connection.
	Loose connections on actuating switch.	Tighten connections.
	Actuating switch chain is adjusted too long and will not release switch.	Adjust actuating switch chain.
	Loose connection on auto header valve ground wire.	Tighten connection.
	Main wiring harness on feeder house loose or disconnected.	Connect harness.
Dial-A-Matic Header Height Control Lowers But Will Not Raise	Loose connections on auto header valve.	Tighten connections.
Dial-A-Matic Header Height Control Raises but Will Not Lower	Loose connections on auto header valve.	Tighten connections.
	Movement of control shaft under header is restricted.	Check shaft for restrictions.
System Cycles Excessively or "Hunts"	Incorrect adjustment of drop rate valve.	Adjust drop rate valve.
Header Was Raised Manually But Continues To Lower When Lever Is Released.	Actuating switch chain is adjusted too short and will not actuate switch.	Adjust actuating switch chain.
	Defective actuating switch.	Replace actuating switch.
System Will Not Shut Off Unless Control Switch Is Turned "Off."	Actuating switch chain is adjusted too short and will not actuate switch.	Adjust actuating switch chain.
	Defective actuating switch.	Replace actuating switch.

Electrical System—Continued

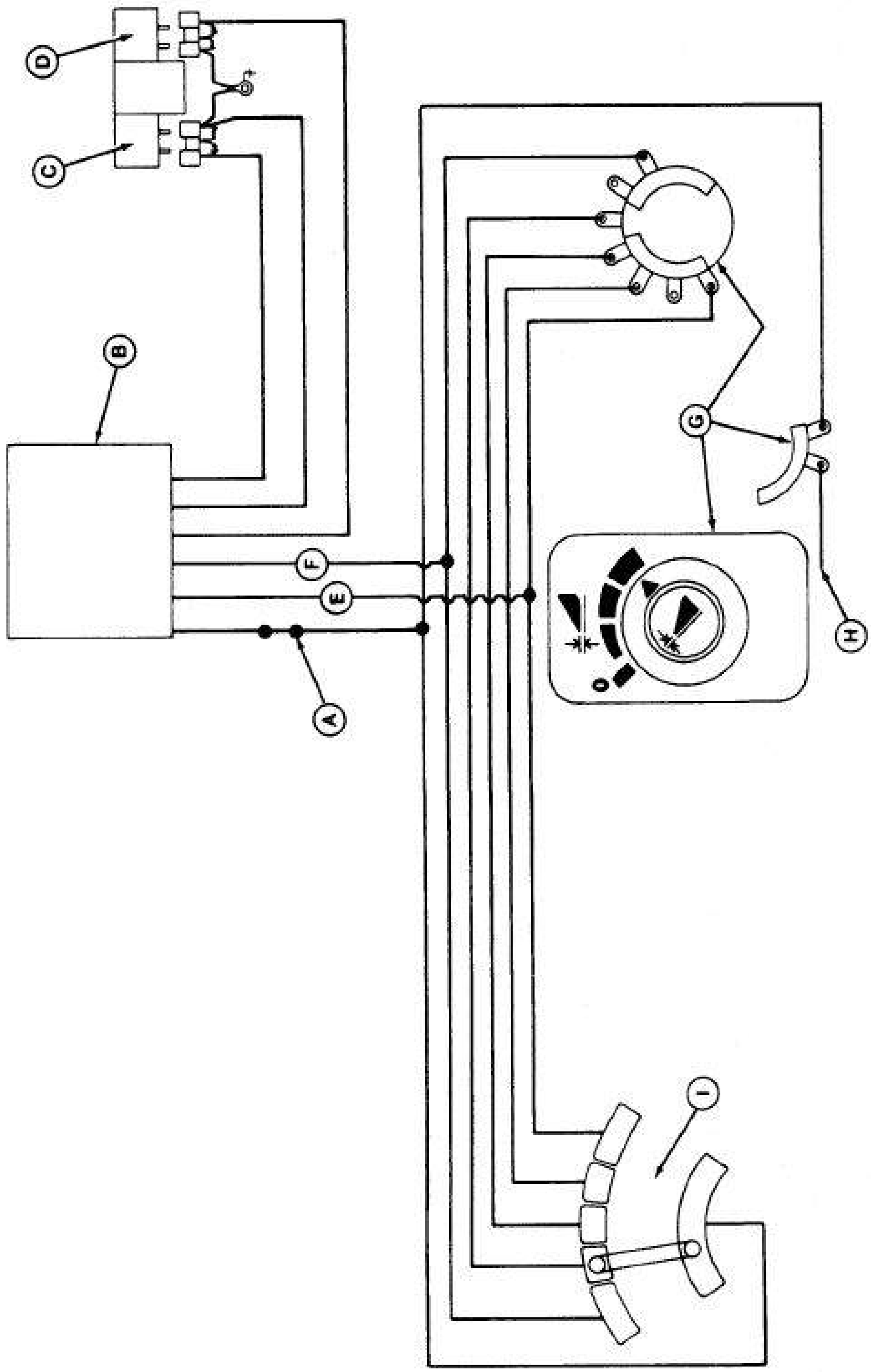
The following illustrations show electrical current flow within the system when the control switch is set to a particular position for different ground pressure requirements.



A—Actuating Switch
B—Amplifier
C—Auto Header Valve Raise Solenoid
D—Auto Header Valve Lower Solenoid
E—Raise Signal
F—Lower Signal
G—Control Switch
H—12-Volt Source
I—Sensing Box

Fig. 3-Off Position

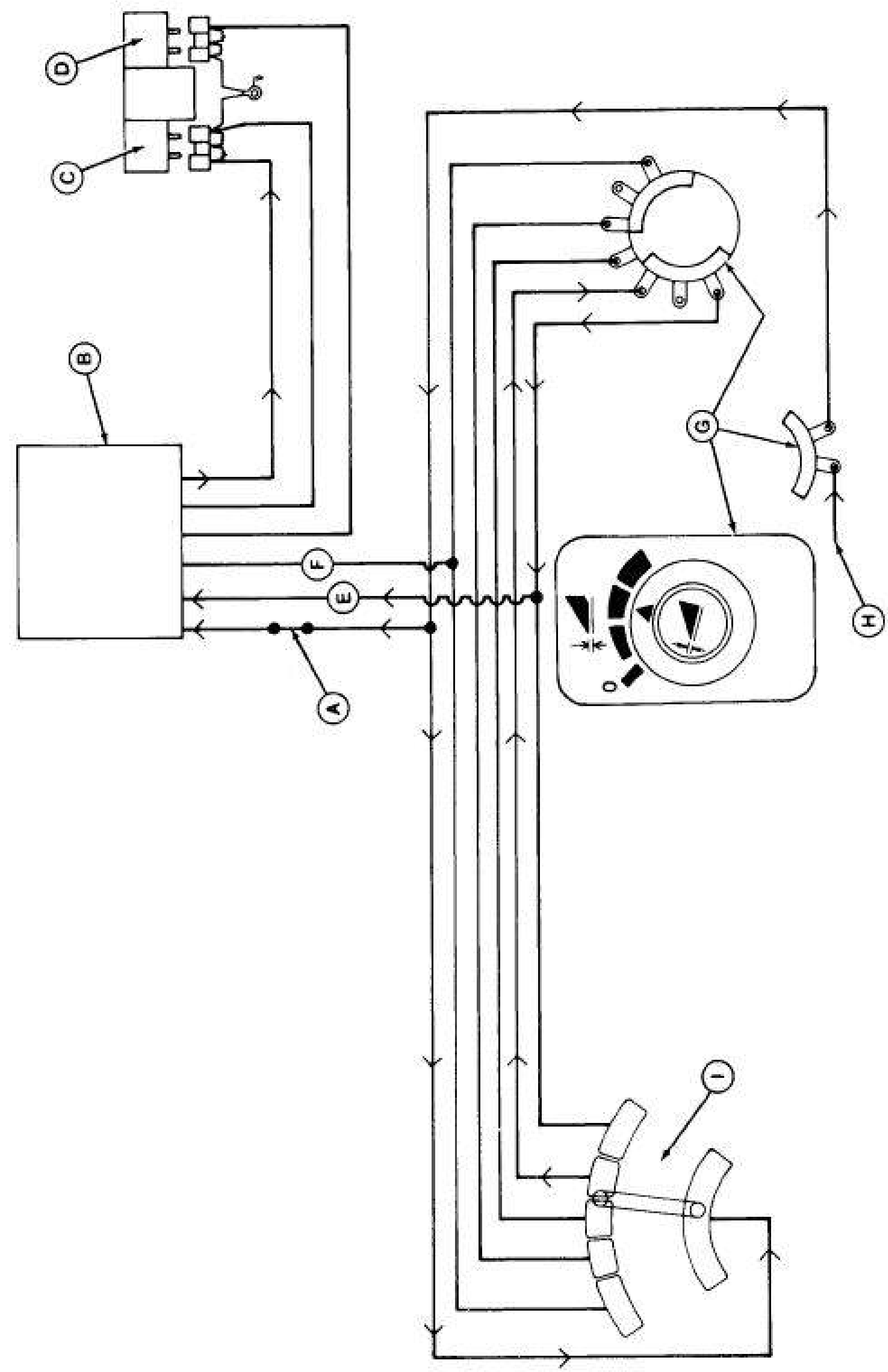
Electrical System—Continued



A—Actuating Switch
B—Amplifier
C—Auto Header Valve Raise Solenoid
D—Auto Header Valve Lower Solenoid
E—Raise Signal
F—Lower Signal
G—Control Switch
H—12-Volt Source
I —Sensing Box

Fig. 4-Light Ground Pressure—No Signal

Electrical System—Continued



A—Actuating Switch
B—Amplifier
C—Auto Header Valve Raise Solenoid
D—Auto Header Valve Lower Solenoid
E—Raise Signal
F—Lower Signal
G—Control Switch
H—12-Volt Source
I—Sensing Box

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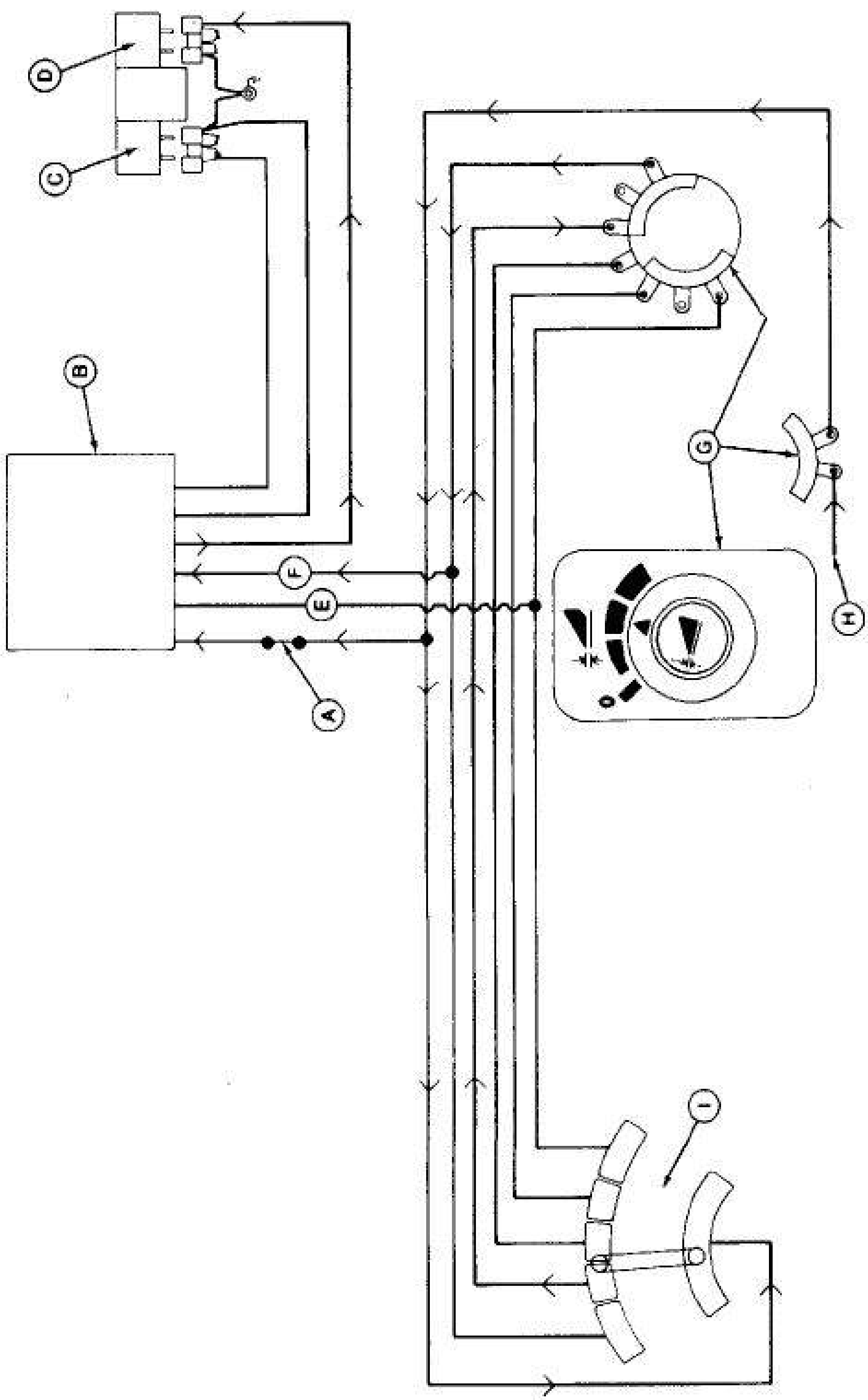
Fig. 5-Raise Signal—Medium Ground Pressure

Electrical System—Continued

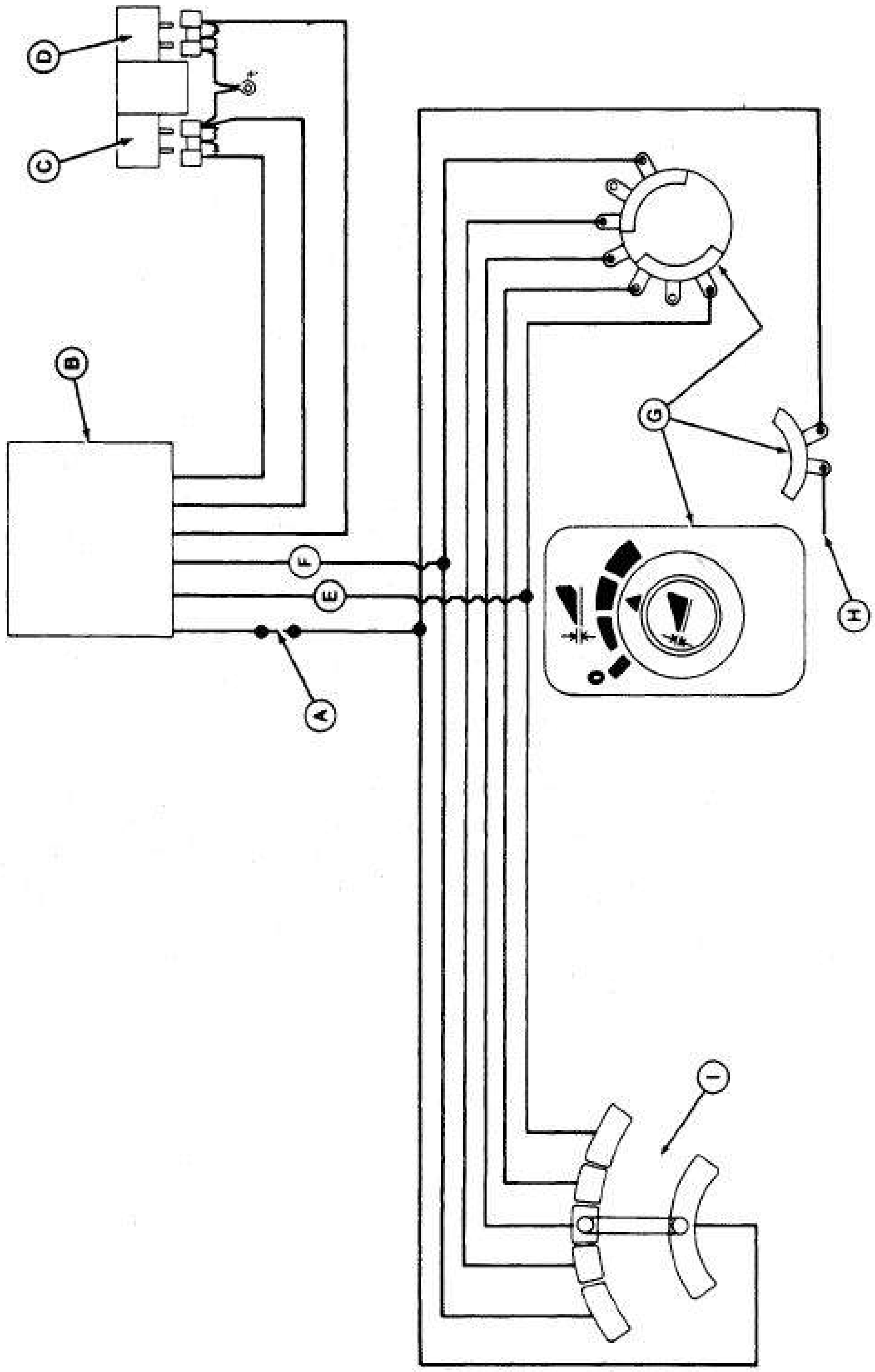


H36978

A—Actuating Switch
B—Amplifier
C—Auto Header Valve Raise Solenoid
D—Auto Header Valve Lower Solenoid
E—Raise Signal
F—Lower Signal
G—Control Switch
H—12-Volt Source
I—Sensing Box

Fig. 6-Lower Signal—Medium Ground Pressure

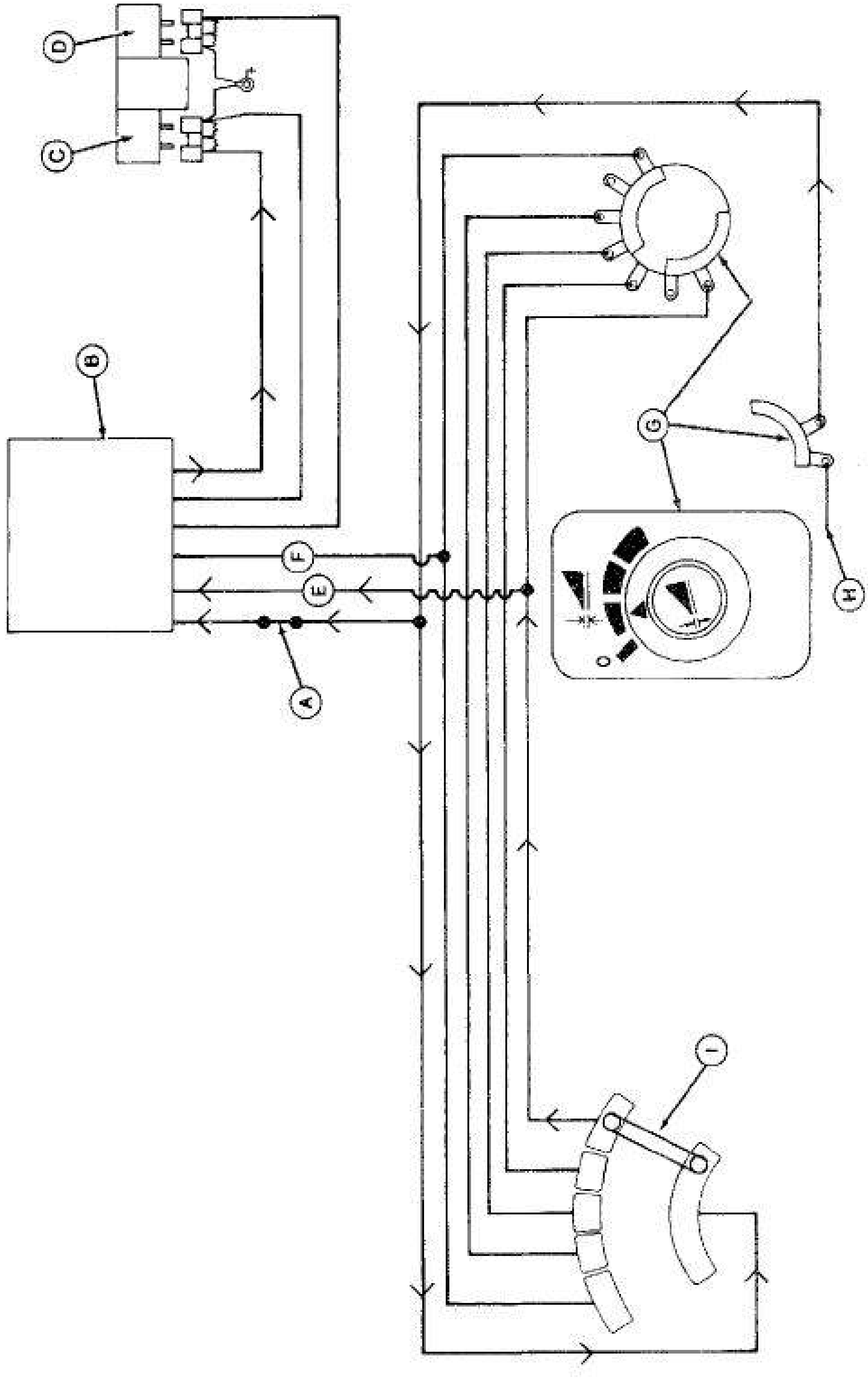
Electrical System—Continued



A—Actuating Switch
B—Amplifier
C—Auto Header Valve Raise Solenoid
D—Auto Header Valve Lower Solenoid
E—Raise Signal
F—Lower Signal
G—Control Switch
H—12-Volt Source
I—Sensing Box

Fig. 7-No Signal—Medium Ground Pressure

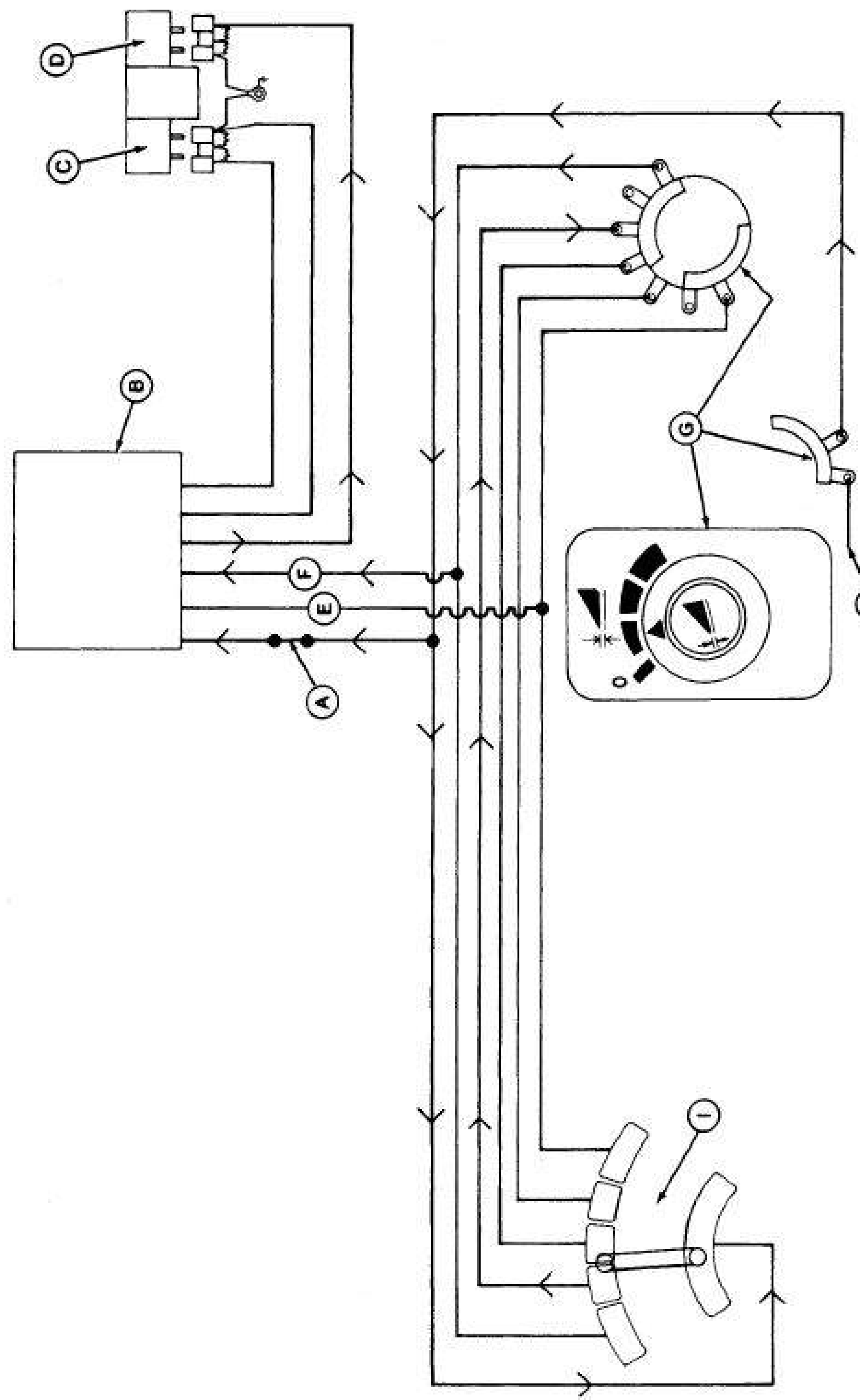
Electrical System—Continued



A—Actuating Switch
B—Amplifier
C—Auto Header Valve Raise Solenoid
D—Auto Header Valve Lower Solenoid
E—Raise Signal
F—Lower Signal
G—Control Switch
H—12-Volt Source
I—Sensing Box

Fig. 8-Raise Signal—Heavy Ground Pressure

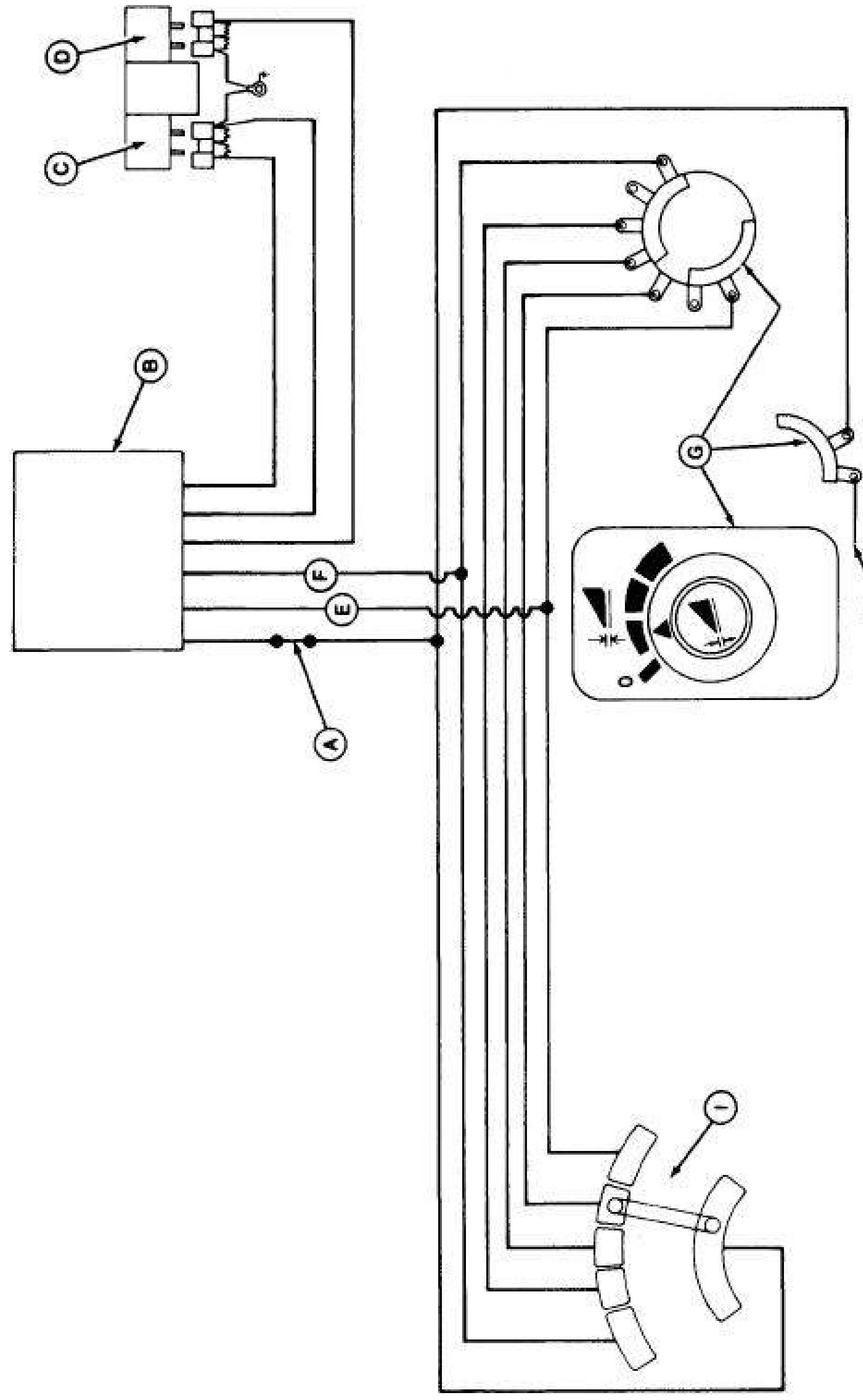
Electrical System—Continued



A—Actuating Switch
B—Amplifier
C—Auto Header Valve Raise Solenoid
D—Auto Header Valve Lower Solenoid
E—Raise Signal
F—Lower Signal
G—Control Switch
H—12-Volt Source
I—Sensing Box

Fig. 9-Lower Signal—Heavy Ground Pressure

Electrical System—Continued



A—Actuating Switch
B—Amplifier
C—Auto Header Valve Raise Solenoid
D—Auto Header Valve Lower Solenoid
E—Raise Signal
F—Lower Signal
G—Control Switch
H—12-Volt Source
I —Sensing Box

Fig. 10-No Signal—Heavy Ground Pressure

Hydraulic System—Continued

Problem	Cause	Remedy
Dial-A-Matic Header Height Control Will Not Operate	Defective auto header valve.	Repair valve.
	Electrical problem.	See ELECTRICAL SYSTEM trouble shooting.
Dial-A-Matic Header Height Control Lowers But Will Not Raise	Defective "RAISE" (front) solenoid on auto header valve.	Repair valve.
	Electrical problem.	See ELECTRICAL SYSTEM trouble shooting.
Dial-A-Matic Header Height Control Raises But Will Not Lower	Insufficient supply of hydraulic oil to auto header valve.	Increase engine speed to fast idle. (See combine operator's manual.)
	Defective "LOWER" (rear) solenoid on auto header valve.	Repair valve.
	Electrical problem.	See ELECTRICAL SYSTEM trouble shooting.
Header Raises Slowly or Not	Insufficient supply of hydraulic oil to solenoid control valve.	Increase engine speed to fast idle. (See combine operator's manual.)
	Insufficient hydraulic oil pressure from main hydraulic system.	See Section 270.
	Defective relief valve in main hydraulic system control valve.	Repair main control valve.
	Defective flow control plug in main valve.	Repair main control valve.
Header Lowers Too Fast or Too Slow	Incorrect adjustment of drop rate valve.	Adjust drop rate valve.

Hydraulic System—Continued

Problem	Cause	Remedy
Header Is Too Slow To Return To Operating Level After Encountering Irregular Ground	Readjustment of drop rate valve slowed drop rate more than desired.	Readjust drop rate valve.
Header Lowers With Control Switch In "Off" Position	Defective auto header valve.	Repair valve.
Solenoid Control Valve Does Not Function When Manually Operated	Defective auto header valve.	Repair valve.
Solenoids On Control Valve Do Not Make An Audible "Click" When Energized	Loose connections on solenoids.	Tighten connections.
	Defective auto header valve solenoids.	Repair valve.
	Defective auto header valve.	Repair valve.
Dial-A-Matic Header Height Control System Leaks Hydraulic Oil	Loose hydraulic connections.	Tighten hydraulic connections.
	Defective auto header valve.	Repair valve.
System Overheats	Defective flow control plug in main valve.	Repair main control valve.
	System cycles excessively or "HUNTS".	See ELECTRICAL SYSTEM trouble shooting.
	Defective main hydraulic system relief valve.	Repair main control valve.
	Hydraulic return line is restricted.	Clean or replace line.

HYDRAULIC MALFUNCTIONS

Header Raises Or Lowers Slowly Or Not At All

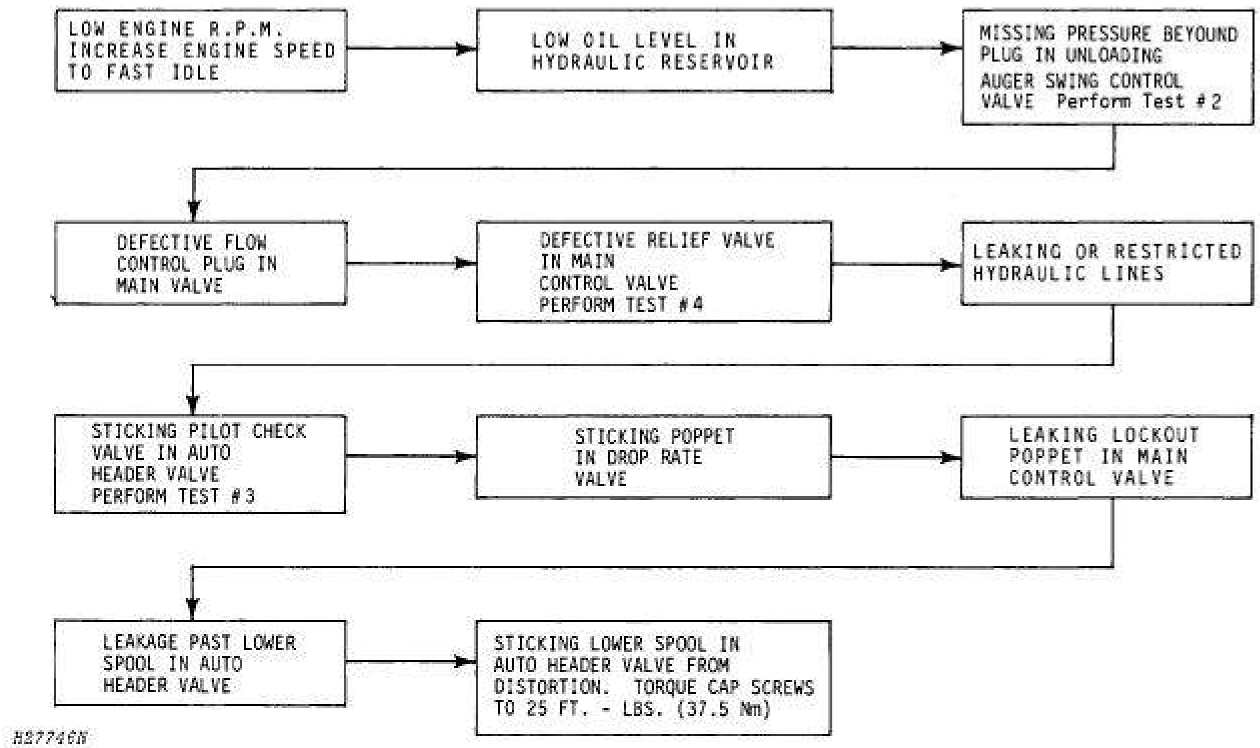


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Fig. 11-Header Raises or Lowers Slowly or not at all

Header Raises Automatically But Will Not Lower

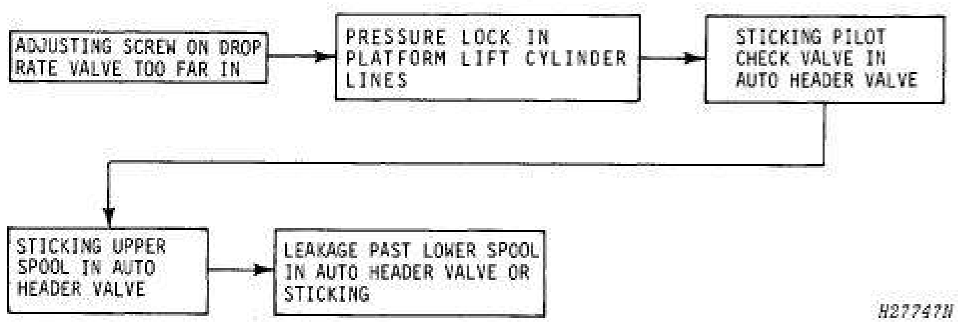

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Fig. 12-Header Raises Automatically but Will Not Lower

Hydraulic System Overheats

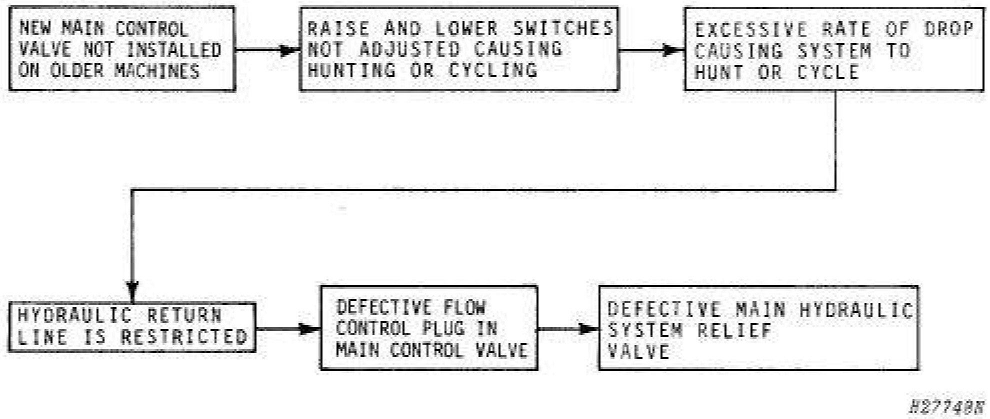

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Fig. 13-Hydraulic System Overheats

Header Hunts Or Cycles Up And Down

H36973

Fig. 14-Header Hunts or Cycles Up and Down

Header Lowers After Being Raised

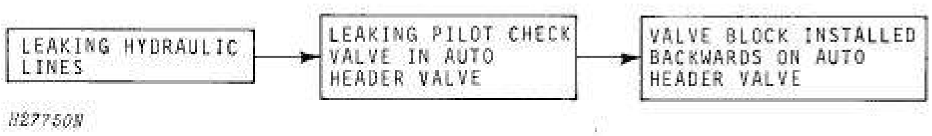

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Fig. 15-Header Lowers after Being Raised

HYDRAULIC SYSTEM TESTS

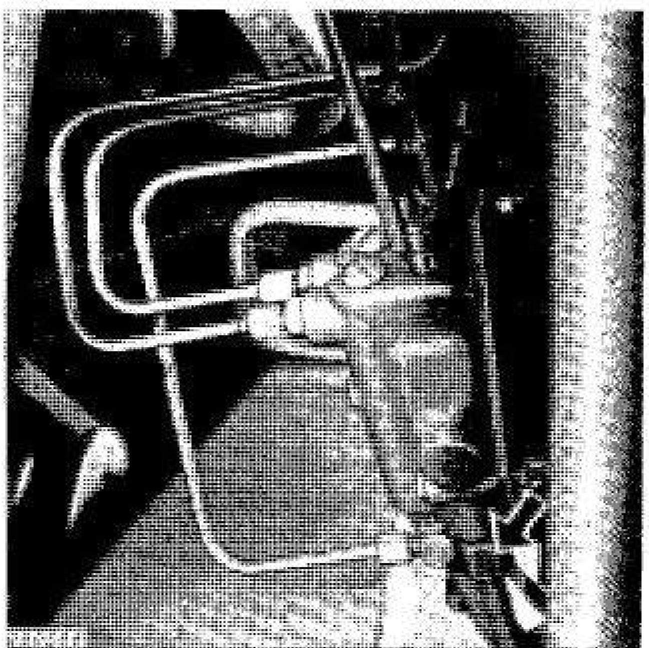
The proper use of testing equipment will quickly locate the trouble within the header control hydraulic system, thus reducing combine "down time." For proper use of testing equipment, see Section 270.

Testing Procedure

The basic procedure, when testing a hydraulic system, is to apply a controlled load to the system or a component of the system to check pressure and rate of flow.

Back pressure is the pressure required to circulate the oil without any system(s) activated. Back pressure will vary throughout the hydraulic system. Measure back pressure at the same location that the high pressure reading is taken.

Test No. 1 - Checking Flow to Secondary Control Valve



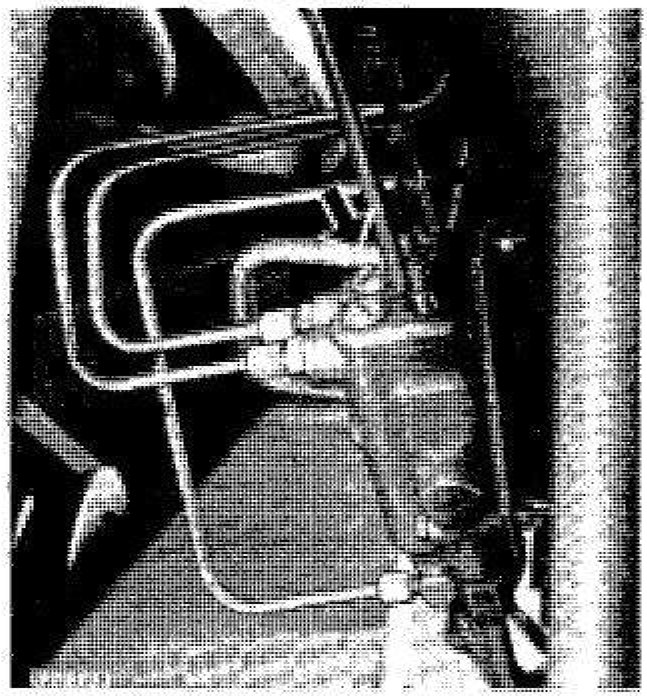
A—Inlet

Fig. 16-Test No. 1 - Test Port for Secondary Control Valve

Flow rate should be 4.25-5.35 gpm (26.8-33.8 m³/s) at full engine rpm. When swinging the unloading auger outward, pressure should be 2200-2400 psi (150-163 bar) plus back pressure.

Check the flow rate to the secondary control valve from the main control valve by connecting test equipment to inlet line (A, Fig. 16) of the valve.

Test No. 2 - Checking Flow to Solenoid Control Valve



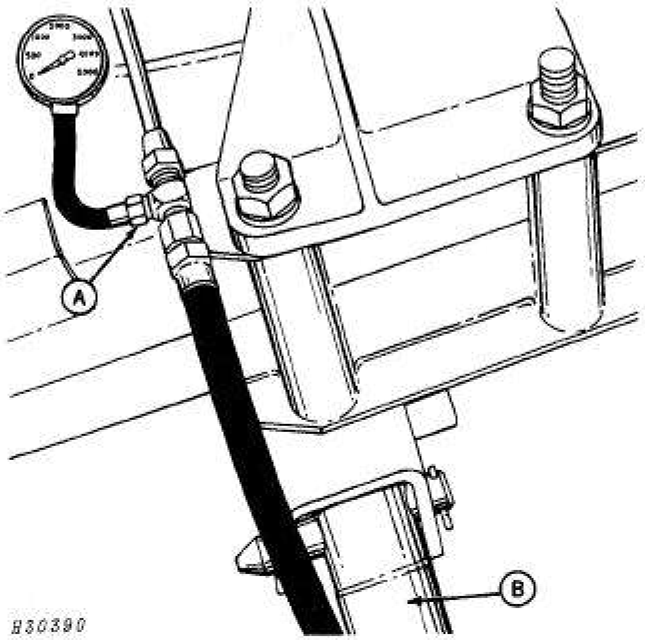
A—Pressure Port

Fig. 17-Test No. 2 - Test Port for Solenoid Control Valve

Flow rate should be 4.25-5.35 gpm (26.8-33.8 m³/s) at full engine rpm when raising or lowering the header. When raising the header with the automatic header height control system by manually activating the auto header valve, pressure should be 2200-2400 psi (150-163 bar) plus back pressure at relief pressure. When lowering the header with the automatic header height control system by manually activating the auto header valve, pressure should be 450-750 psi (31-51 bar).

Check the flow rate to the auto header valve by connecting test equipment to pressure BYD port (A, Fig. 17) of the secondary control valve.

Test No. 3 - Checking Flow to Platform Lift Cylinders



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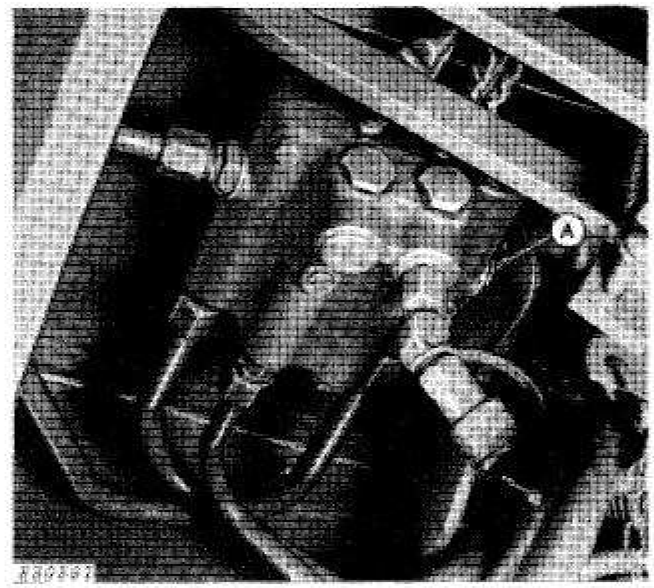
A—0039 Connector
B—Header Lift Cylinder

Fig. 18-Test No. 3 - Test Port for Header Lift Cylinders

When raising the header with the Dial-A-Matic header height control system by manually activating the auto header valve, flow rate should be 4.25-5.35 gpm (26.8-33.8 m^3/s) at full engine rpm. Pressure should be 2200-2400 psi (150-163 bar) plus back pressure at relief pressure.

Check the flow rate to the header lift cylinders from the auto header valve by connecting test equipment to pressure line (A, Fig. 18).

Test No. 4 - Checking Main System Relief Valve



H30391

A—Gauge Port

Fig. 19-Test No. 4 - Gauge Port for Main Control Valve

Pressure should be 2200-2400 psi (150-163 bar) plus back pressure at relief pressure.

Check the pressure of the main system relief valve by connecting pressure gauge to gauge port on main control valve (A, Fig. 19).

HOW TO USE STEP-BY-STEP DIAGNOSIS CHARTS

The following charts provide a step-by-step sequence to test and isolate an electrical malfunction in the DIAL-A-MATIC Header Height Control system.

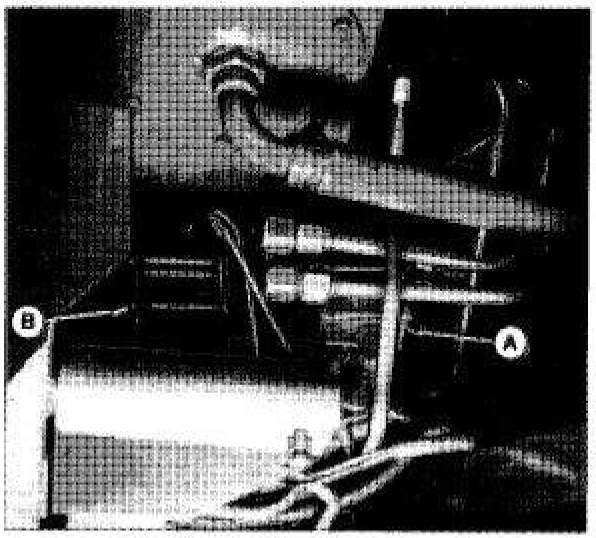
The charts are divided into two sections: INSTRUCTIONS and RESULT. Always start at the first step and go through the sequence from left to right.

Each sequence ends with a result. The result will tell you what action to then take by directing you to the next step.

Although there are over 65 steps in the following diagnostic procedure, not all of these steps will need to be followed for a particular malfunction. Most malfunctions can be isolated by following approximately 12 steps.

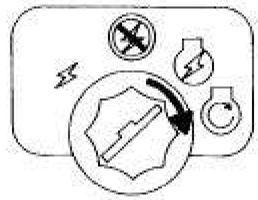
DIAL-A-MATIC HEADER HEIGHT CONTROL

STEP	INSTRUCTIONS	RESULT	
1	The first six steps of this diagnostic chart determine which additional steps are required. In most cases only a few steps will be needed to find the problem.	After reading instructions . . .	GO TO STEP 2
2	Determine if there is a hydraulic or electrical malfunction by manually moving spool in auto header valve on left hand side.	Header raises and lowers correctly . . .	GO TO STEP 3
		Header does not raise and lower correctly . . .	GO TO STEP 5

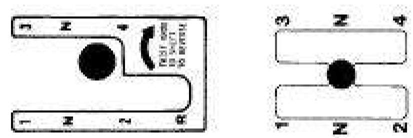


B-Push pin for lowering header (left hand solenoid)

A-Push pin for raising header (right hand solenoid)



START ENGINE
FAST IDLE



Posi-Torq *Hydrostatic*

PLACE IN NEUTRAL

P
PARK

PARK BRAKE ON

H37238

DIAL-A-MATIC HEADER HEIGHT CONTROL

STEP | INSTRUCTIONS | RESULT

STEP 3

ROW-CROP HEAD

The following field preparation adjustments are only those that will effect the Dial-A-Matic header height control. Refer to the operators manual for these adjustments.

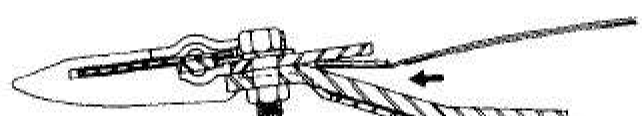
1. Adjust row units for floating operation.
2. Adjust gatherer sheet clearance.
3. Adjust row unit skid shoes.
4. Adjust row unit float spring tension.
5. Adjust range indicator. Range indicator linkage must not bind or catch.
6. Adjust actuating rods. Height sensing shaft must turn freely.
7. Adjust height sensing linkage.
8. Adjust actuating switch and drop rate valve.

RESULT: If after making header adjustments Dial-A-Matic does not work . . . GO TO STEP 4

FLEX PLATFORM

The following field preparation adjustments are only those that will affect Dial-A-Matic header height control. Refer to the operators manual for these adjustments.

1. Adjust cutterbar tilt. Do this adjustment with the cutterbar locked out.
2. Adjust range indicator. It must not bind.
3. Adjust reel lower stop.
4. Remove lock-out washers.
5. Adjust support spring and stabilizer spring.
6. Height sensing shaft must turn freely.
7. Place sensing box in middle of slot.
8. Adjust actuating switch and drop rate valve.
9. Check skid shoes for dirt and clean. Do not back up header with cutterbar on the ground. Clean out area below.

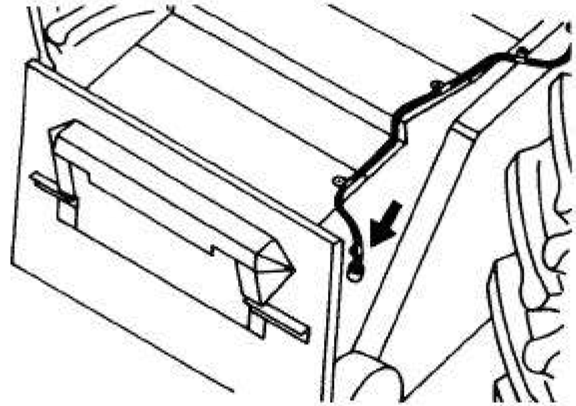


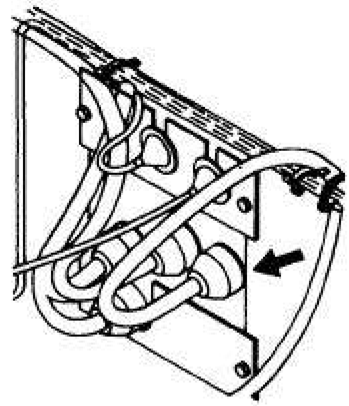
RESULT: If after making header adjustments Dial-A-Matic works . . . END OF TEST

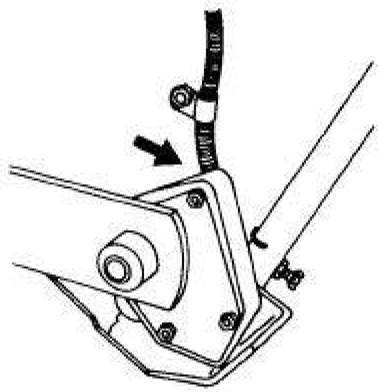
H3728

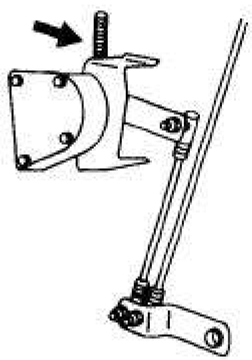
DIAL-A-MATIC HEADER HEIGHT CONTROL

STEP	INSTRUCTIONS	RESULT	
4	Inspect, clean and tighten the following connectors.	Dial-A-Matic does not work . . .	GO TO STEP 6
		Dial-A-Matic works . . .	END OF TEST

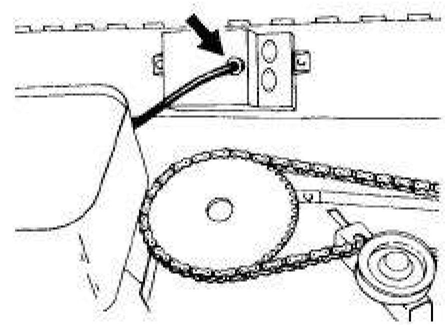

FEEDER HOUSE

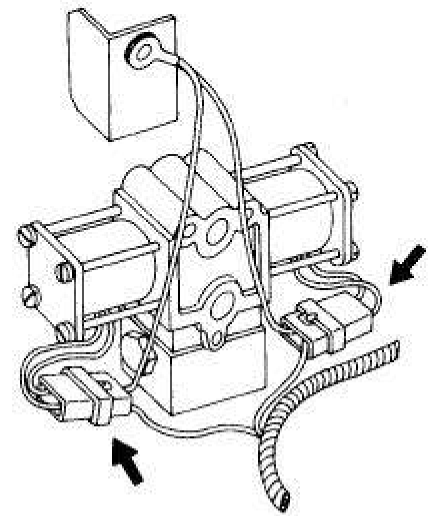

FIREWALL


FLEX PLATFORM


ROW-CROP HEAD

SENSING BOX


AMPLIFIER


SOLENOIDS

STEP	INSTRUCTIONS	RESULT	
5	Problem is in the hydraulic system. Refer to group 25 in this section.	Hydraulic problem . . .	GO TO GROUP 25

H37240

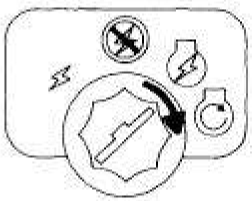
DIAL-A-MATIC HEADER HEIGHT CONTROL

STEP 6

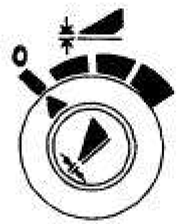
INSTRUCTIONS

Perform the following functional test.

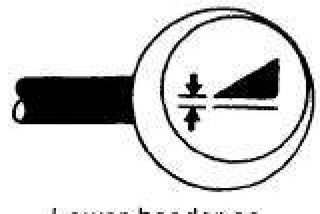
Note: Manual header lift is assumed to be ok.



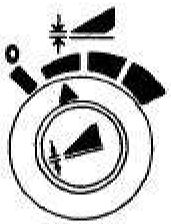
Start engine, run at fast idle.



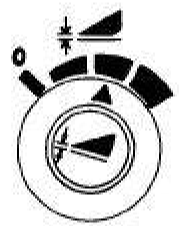
Off



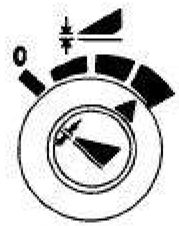
Lower header so that weight of header is completly on the ground.



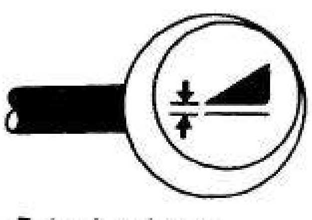
Header should raise slightly.



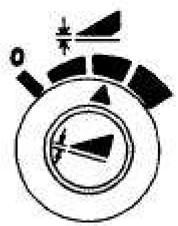
Header should raise slightly.



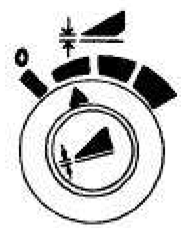
Header should raise slightly.



Raise header no more than (152 mm) 6 inches. Header should lower.



Header should lower slightly.



Header should lower slightly.

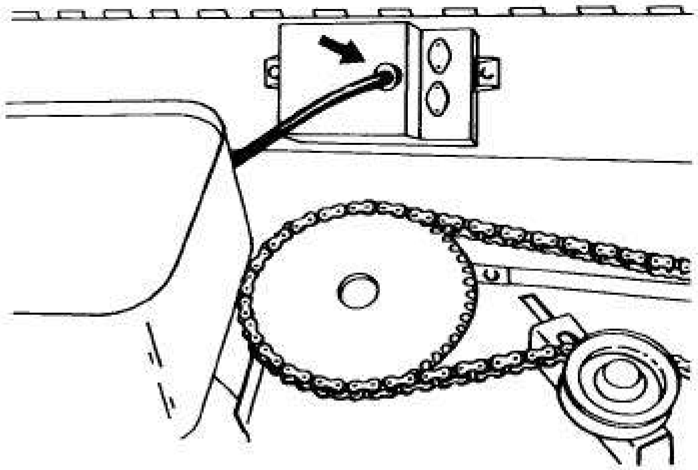
RESULT

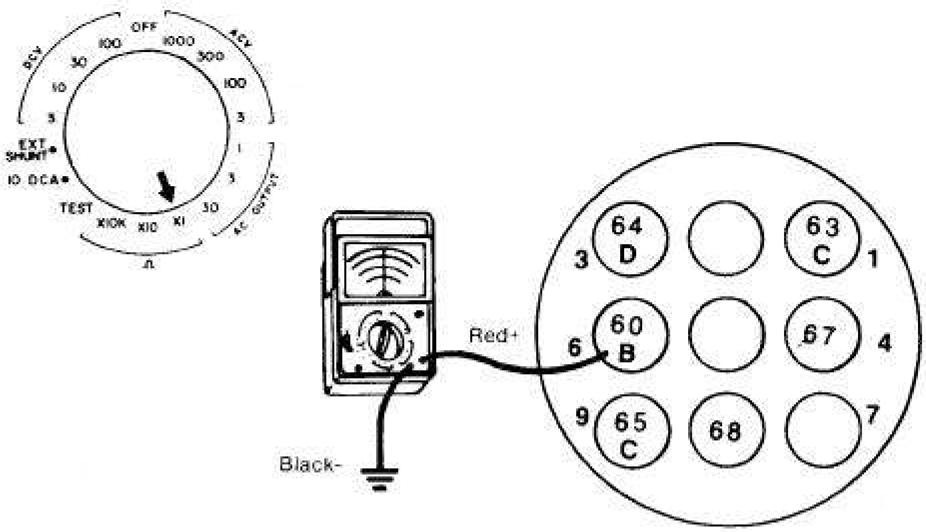
Result	Action
Operates correctly . . .	END OF TEST
Header did not raise and lower for any step . . .	GO TO STEP 7
Header did not raise and lower for any step and sidehill leveling does not work . . .	GO TO STEP 10
System stops working after first switch setting . . .	GO TO STEP 36
Header raises but will not lower or lowers but will not raise . . .	GO TO STEP 46
Some steps did not raise and/or lower . . .	GO TO STEP 52
Does not raise until header is raised manually, then continues to raise . . .	GO TO STEP 67

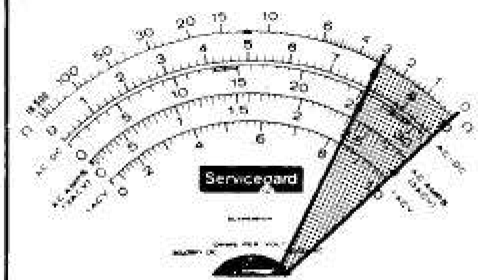
H37241

DIAL-A-MATIC HEADER HEIGHT CONTROL

STEP	INSTRUCTIONS	RESULT
7	Test continuity of ground wire. Turn ignition switch off.	

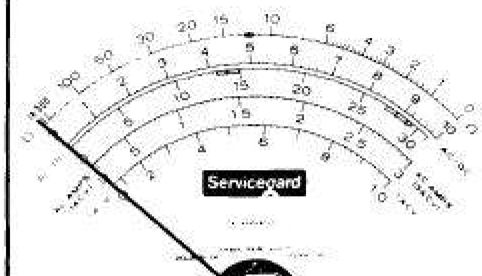






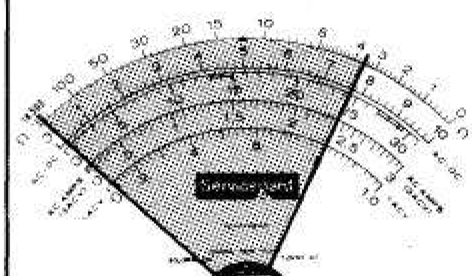
0-3 OHMS

GO TO STEP 8



∞ (INFINITY) OHMS

GO TO STEP 11

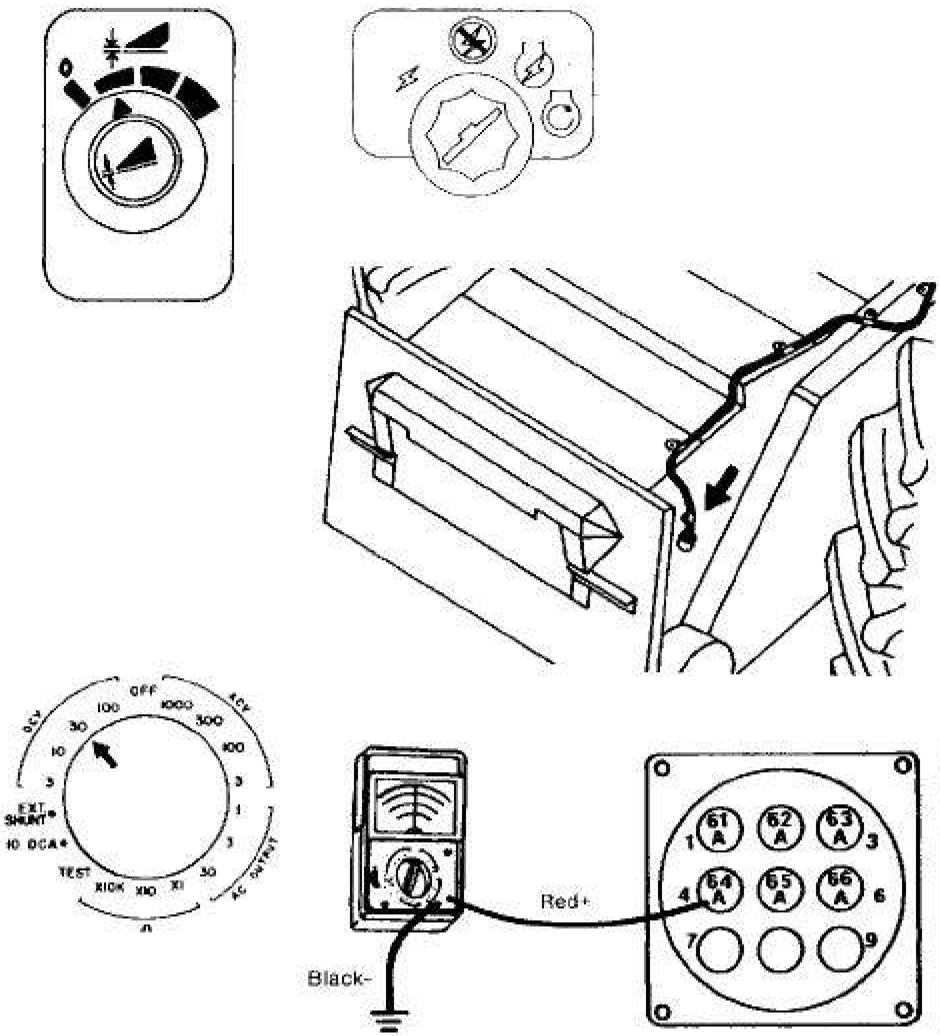
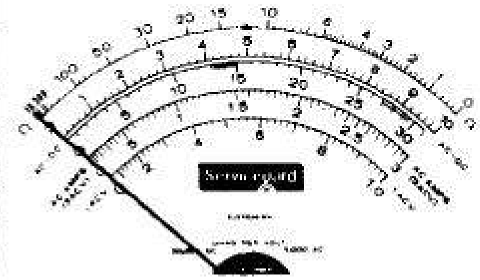
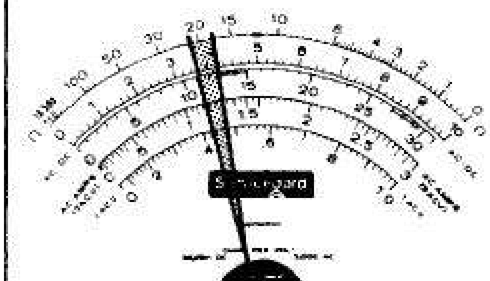


3.5-500 OHMS

Clean ground terminal above auto header valve. Repeat this step.

H37242

DIAL-A-MATIC HEADER HEIGHT CONTROL

STEP	INSTRUCTIONS	RESULT	
8	Test for voltage with ignition switch and height control switch on. 	 0 VOLTS	GO TO STEP 9
		 11.0-12.8 VOLTS (Normal battery voltage with engine shut off is 11.7-12.8 volts)	GO TO STEP 20

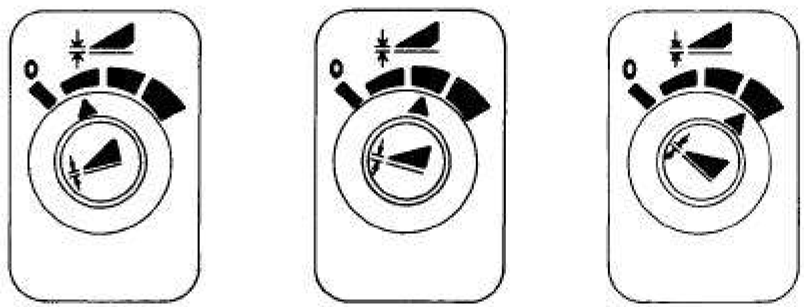
H37243

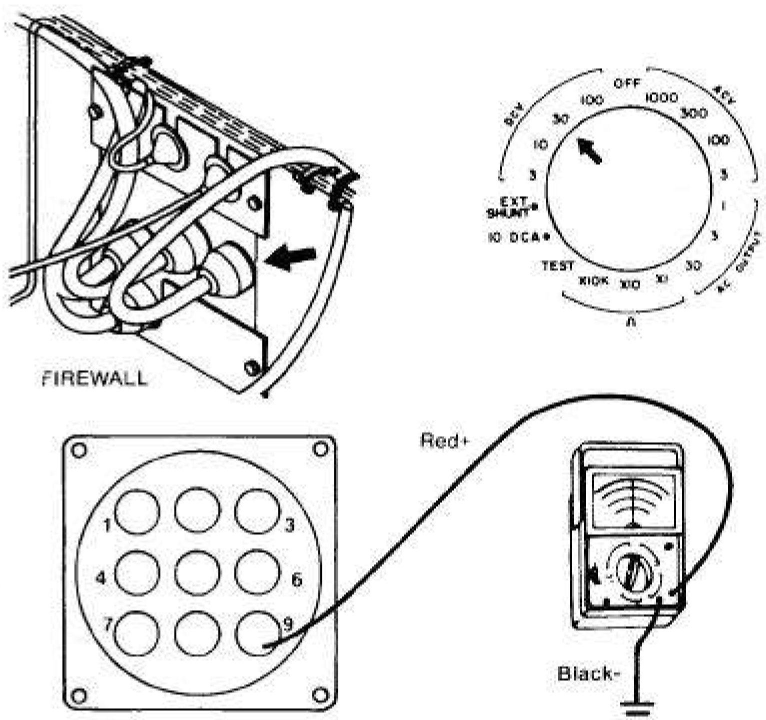
DIAL-A-MATIC HEADER HEIGHT CONTROL

STEP | **INSTRUCTIONS** | **RESULT**

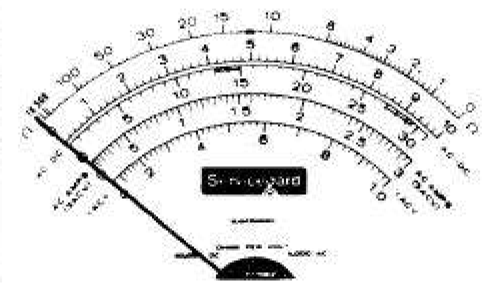
9

Test for voltage for three switch settings, with ignition switch on.



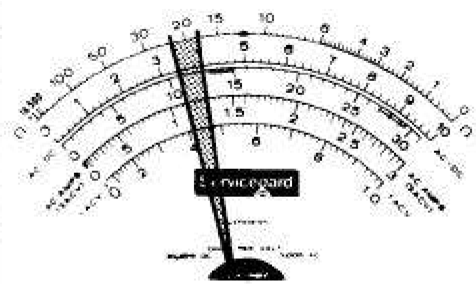


RESULT



0 VOLTS
(For all three switch positions)

GO TO STEP 10

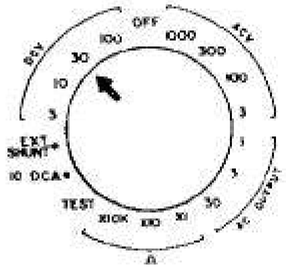
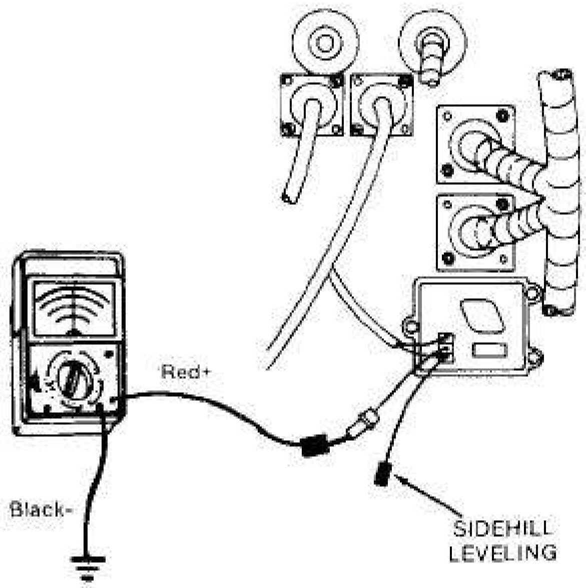
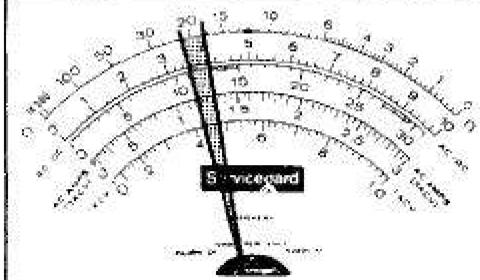


11.0-12.8 VOLTS
(For all three switch positions)

GO TO STEP 12

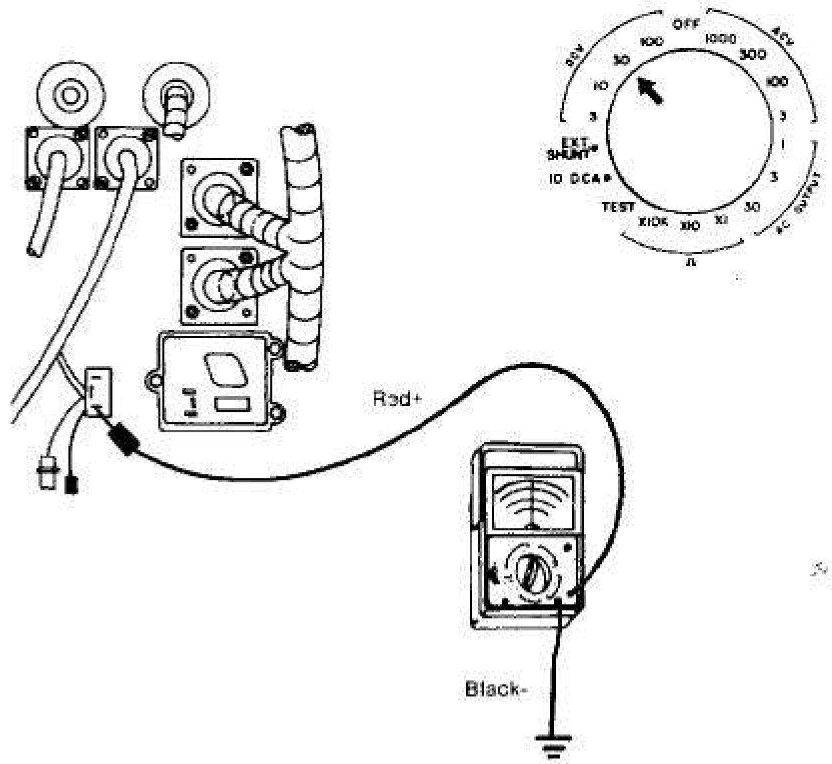
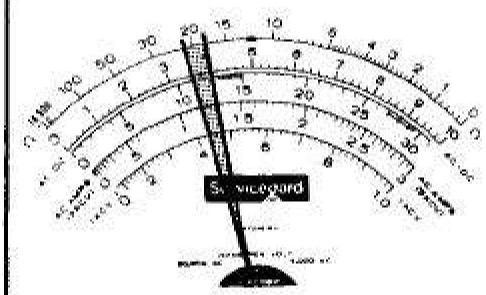
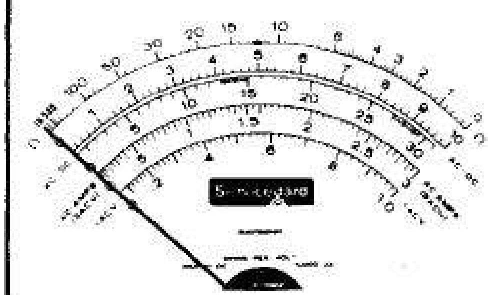
H37244

DIAL-A-MATIC HEADER HEIGHT CONTROL

STEP	INSTRUCTIONS	RESULT	
10	Remove screws securing instrument panel. In lower right hand corner on firewall is single pin connector on circuit box. Test for voltage with ignition switch on.  	 11.2-12.8 VOLTS	GO TO STEP 13
		 0 VOLTS	GO TO STEP 14
11	Inspect white ground wire (circuit No. 60) from amplifier CPC connector to white wire on auto header valve. Repair as needed.	Repair wire . . .	GO TO STEP 6
12	Contact in firewall CPC connector could be corroded.Clean contacts. If Dial-A-Matic still does not work then light blue wire (circuit No. 64A) from feeder house CPC connector to firewall CPC conector is defective.	Repair wire . . .	GO TO STEP 6

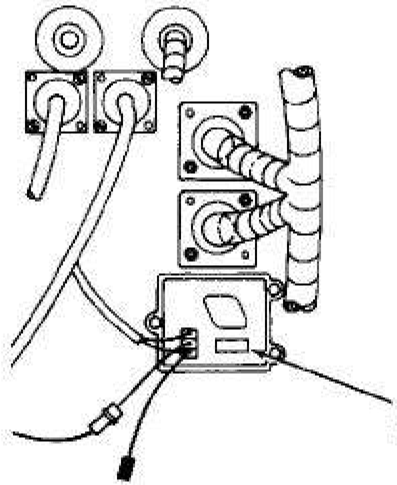
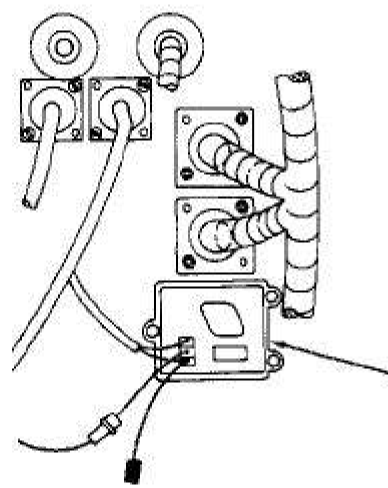
H37240

DIAL-A-MATIC HEADER HEIGHT CONTROL

STEP	INSTRUCTIONS	RESULT	
13	If combine has been in storage, rotate switch several times to clean contacts. Clean single pin connector, otherwise replace switch.	Replace switch . . .	GO TO STEP 6
14	Remove connector from circuit box and test for voltage on connector with ignition switch on. 	 11.2-12.8 VOLTS	GO TO STEP 15
		 0 VOLTS	GO TO STEP 17

H37246

DIAL-A-MATIC HEADER HEIGHT CONTROL

STEP	INSTRUCTIONS	RESULT	
15	 Clean 3 pin connector. Circuit breaker is secured by nuts inside circuit box.	Dial-A-Matic works . . .	END OF TEST
		Dial-A-Matic does not work . . .	GO TO STEP 16
16		Replace circuit box . . .	GO TO STEP 6

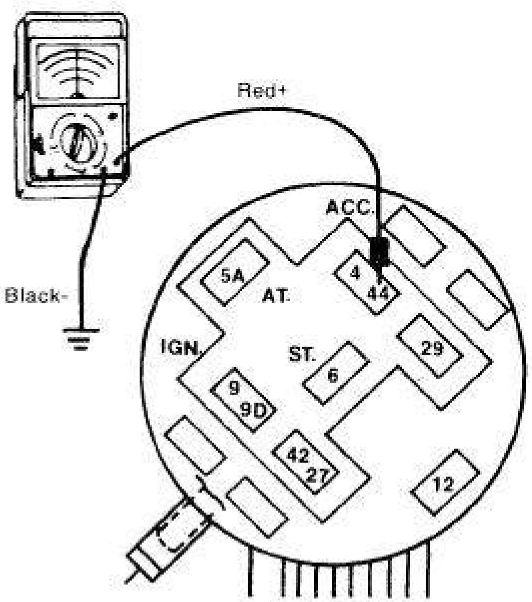
H37247

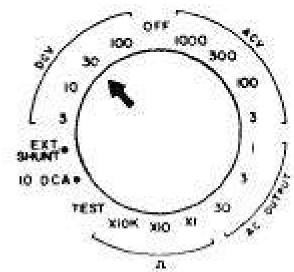
DIAL-A-MATIC HEADER HEIGHT CONTROL

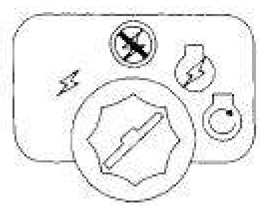
STEP | INSTRUCTIONS | RESULT

Step 17

Test for voltage at ignition switch.

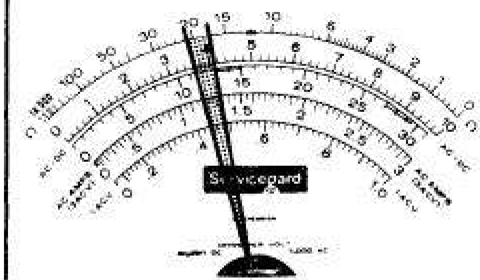




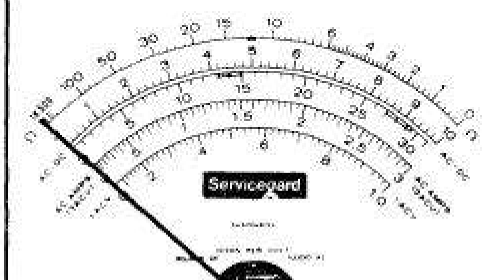


IGNITION SWITCH ON

Result:



11.4-12.8 VOLTS — GO TO STEP 18



0 VOLTS — GO TO STEP 19

Step 18

Wire from ignition switch to connector for circuit box (circuit No. 44) is defective. Repair wire.

Result: Repair wire . . . GO TO STEP 6

Step 19

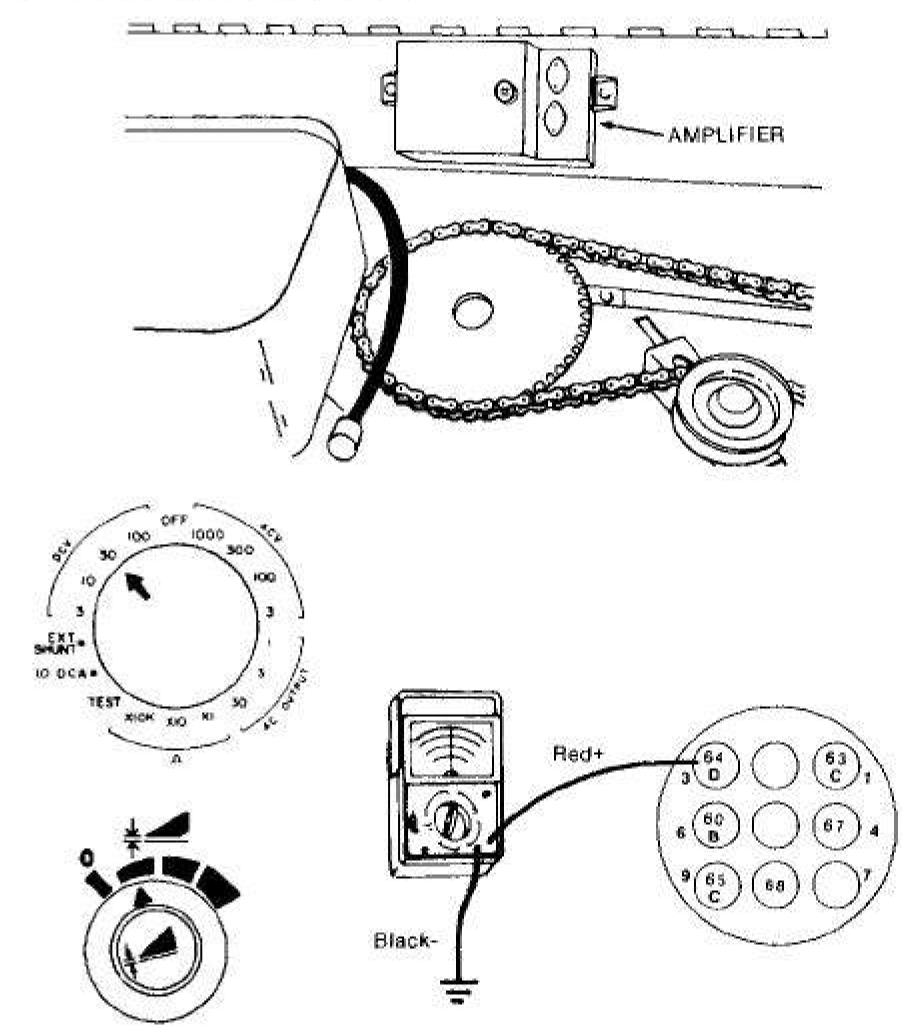
Defective ignition switch. Replace switch.

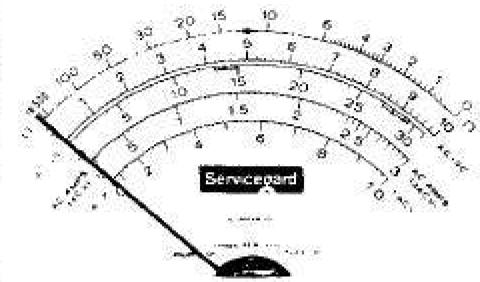
Result: Replace switch . . . GO TO STEP 6

H37248

DIAL-A-MATIC HEADER HEIGHT CONTROL

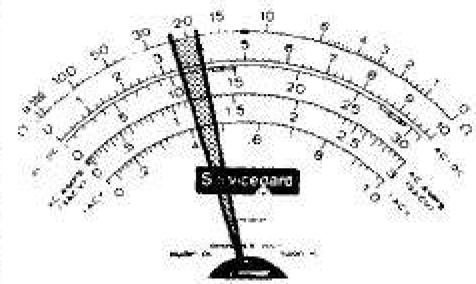
STEP	INSTRUCTIONS	RESULT
20	Test for voltage at amplifier CPC connector. Feeder house must be lowered and ignition switch on.	





0 VOLTS

GO TO STEP 21

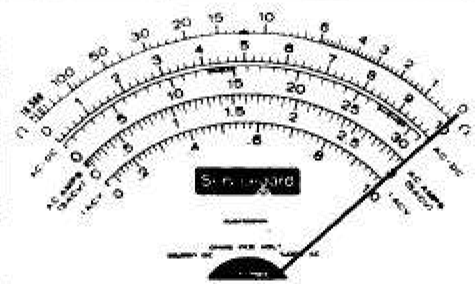
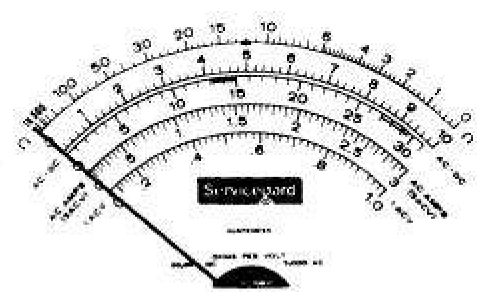


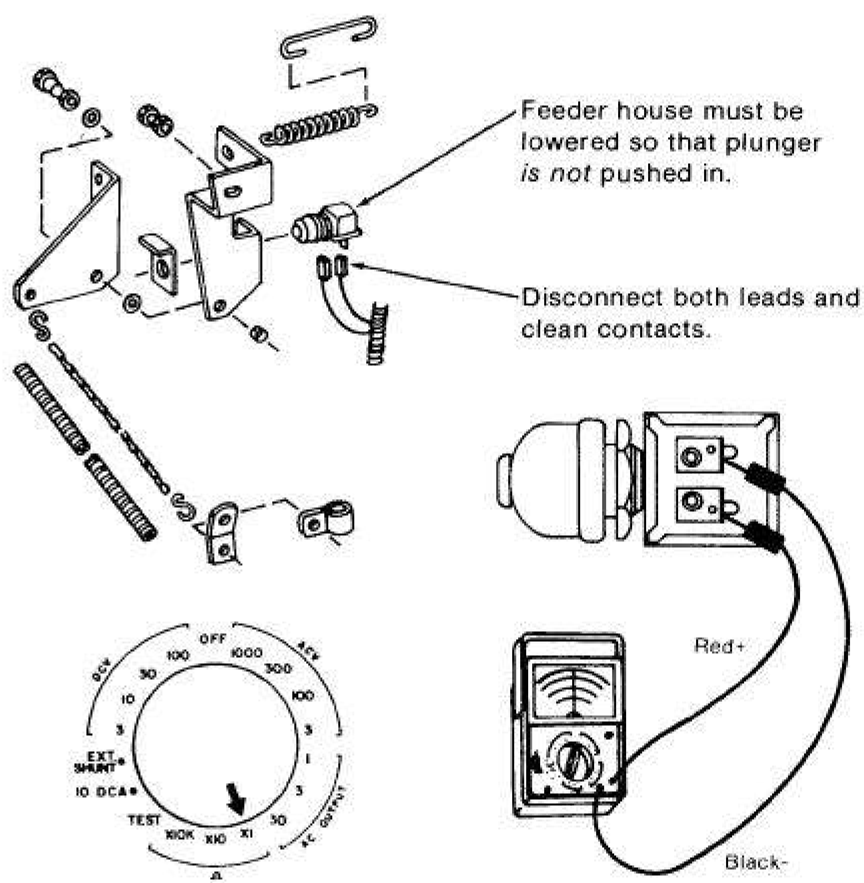
11.0-12.8 VOLTS

GO TO STEP 27

H37249

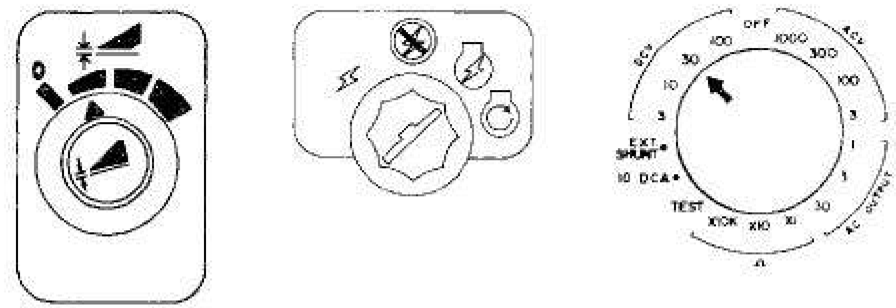
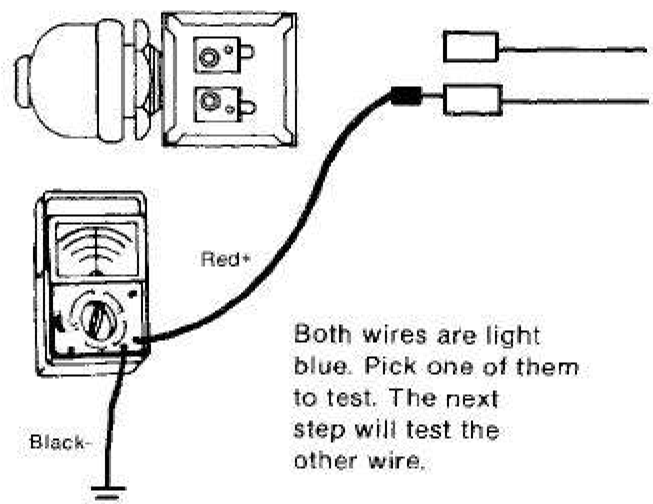
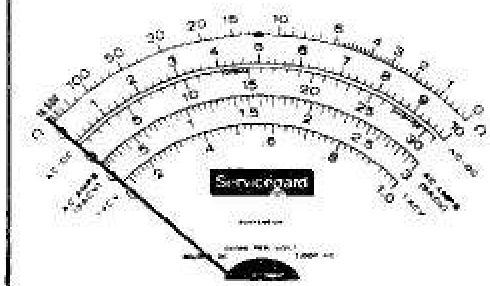
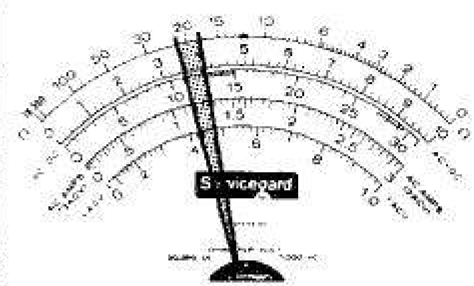
DIAL-A-MATIC HEADER HEIGHT CONTROL

STEP	INSTRUCTIONS	RESULT	
21	Inspect chain on actuating switch for correct length. See operator's manual. Inspect rubber seal on switch. End of plunger must go through hole in rubber seal. Test continuity of switch with feeder house lowered.	 0 OHMS	GO TO STEP 22
		 ∞ (INFINITY) OHMS	GO TO STEP 23

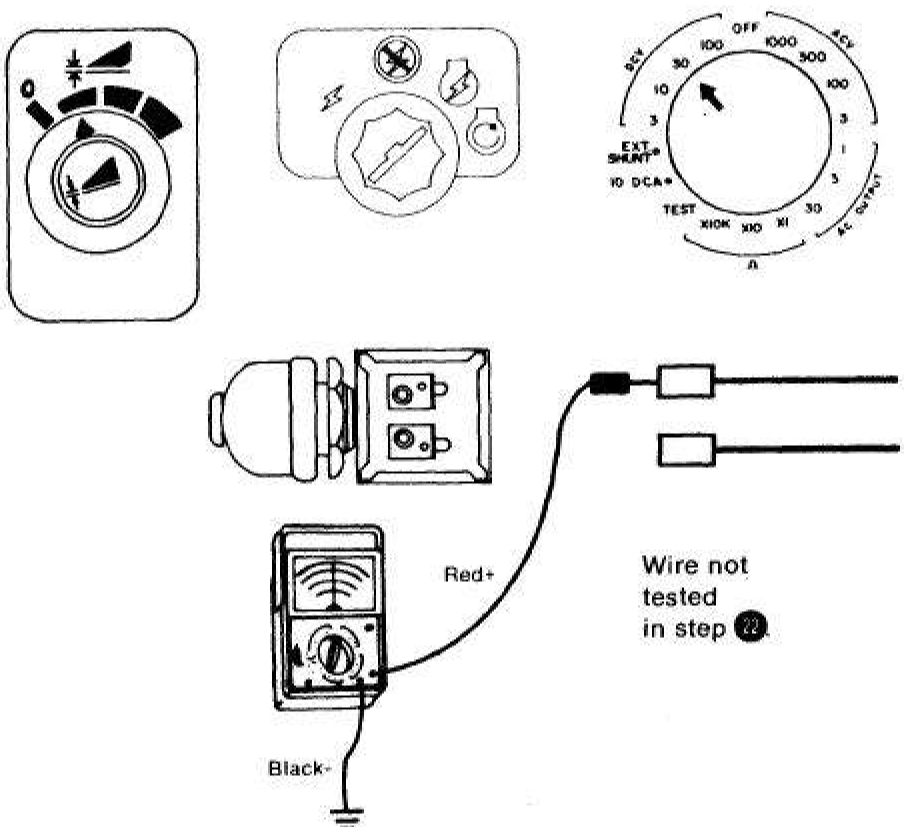
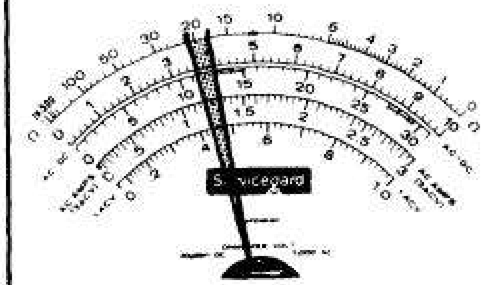
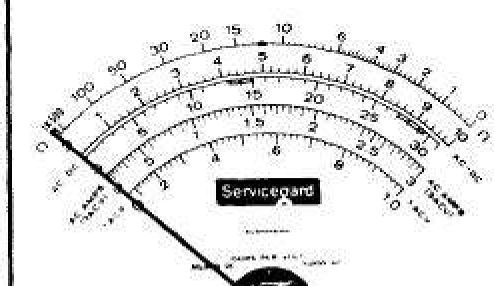


H37250

DIAL-A-MATIC HEADER HEIGHT CONTROL

STEP	INSTRUCTIONS	RESULT
22	Test for voltage at actuating switch with ignition switch and height control switch on.   Both wires are light blue. Pick one of them to test. The next step will test the other wire.	 0 VOLTS — GO TO STEP 24  11.2-12.8 VOLTS — GO TO STEP 25
23	Defective actuating switch. Replace switch.	Replace switch . . . GO TO STEP 6

DIAL-A-MATIC HEADER HEIGHT CONTROL

STEP	INSTRUCTIONS	RESULT	
24	Test for voltage at actuating switch with ignition switch and height control switch on. 	 11.2-12.8 VOLTS	GO TO STEP 25
		 0 VOLTS	GO TO STEP 26
25	Wire from actuating switch to amplifier (circuit No. 64D) is defective. Repair wire. A good switch in step 21 with no voltage in step 20 and voltage in step 22 indicates this wire is defective.	Repair wire . . .	GO TO STEP 6

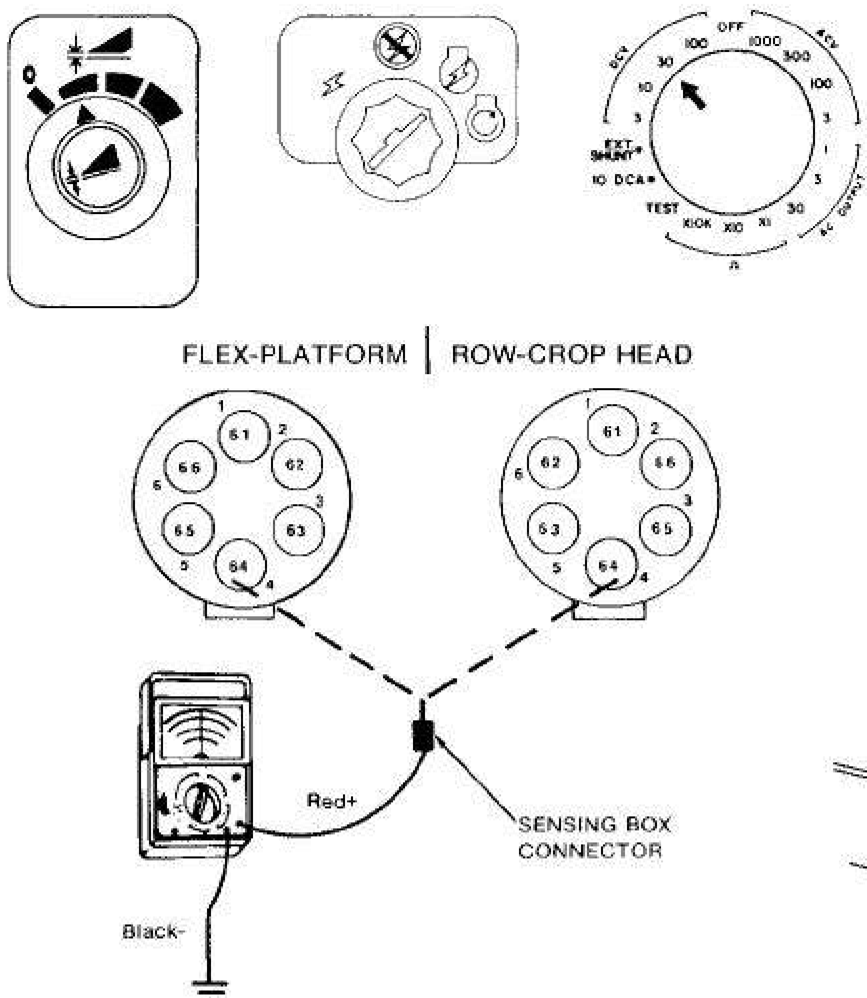
DIAL-A-MATIC HEADER HEIGHT CONTROL

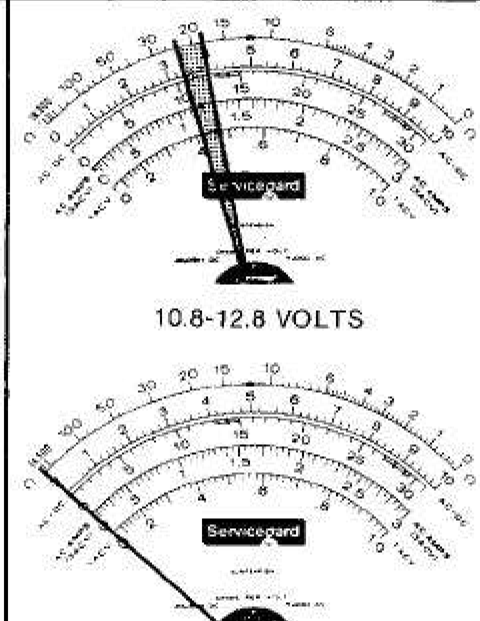
STEP	INSTRUCTIONS	RESULT	
26	Wire from actuating switch to splice (circuit No. 64C) is defective. A good switch in step 21 with no voltage in steps 20, 22, and 24 indicates this wire is defective.	Repair wire...	GO TO STEP 6
27	Use D-14102 DJ tester to test the amplifier on the combine as follows: 1. Start engine and lower header. Shut off engine. 2. Turn ignition switch and control switch on. 3. Disconnect amplifier connector. Using JTO5463 adaptor harness, install tester between harness and amplifier. 4. Place selector switch on the tester to the number "5" position. Power test light should be on. If not, check connections and bulb. 5. Flip switch to raise. Raise light should glow. Be certain bulb tester is OK. 6. Flip switch to lower. Lower light should glow. Be certain bulb tester is OK. Use this procedure to bench test the amplifier. 1. Use CPC contacts on the end of wire for plugging into the amplifier. CPC contacts are in RE11154 electrical repair kit. 2. Connect pin 3 of amplifier to +12 volts and pin 6 to ground. 3. No voltage should be on pins 4 and 8. 4. Connect pin 1 to +12 volts, in addition to pin 3 with +12 volts. 5. Voltage should be on pin 4. 10 volts is normal. 6. Remove contact from pin 1 and place on pin 9. 7. Voltage should be on pin 8. 10 volts is normal.	Amplifier not OK, Replace...	GO TO STEP 6
		Amplifier OK...	GO TO STEP 28

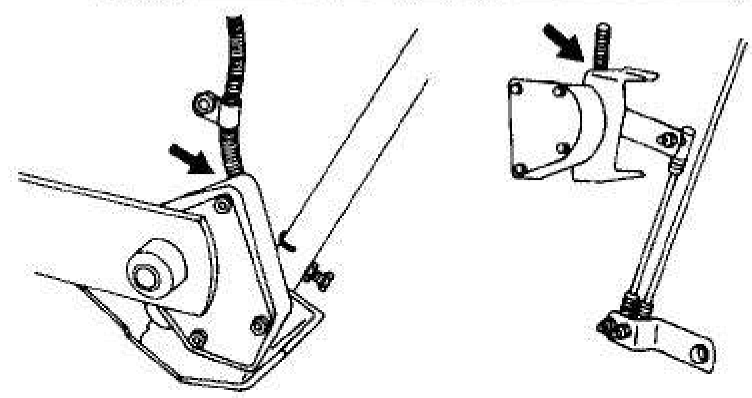
H38814

DIAL-A-MATIC HEADER HEIGHT CONTROL

STEP	INSTRUCTIONS	RESULT
28	Secure feeder house connector test for voltage at sensing box connector with ignition switch and height control switch on.	10.8-12.8 VOLTS — GO TO STEP 29 0 VOLTS — GO TO STEP 30



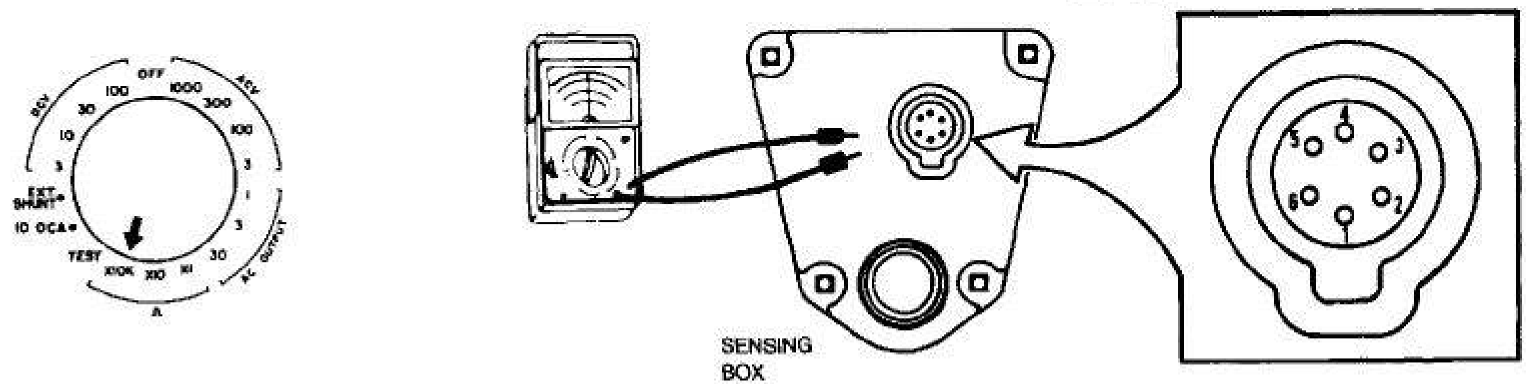




H37254

DIAL-A-MATIC HEADER HEIGHT CONTROL

STEP	INSTRUCTIONS	RESULT	
29	1. Remove sensing box from header. Position as shown in lower right hand corner of this page. 2. Turn shaft counter-clockwise. 3. Measure resistance between pins 3 and 4. Resistance should be 0 OHMS on the 10k scale. 4. Measure resistance between pin 4 and pins 1, 2, 5, and 6. Resistance should be infinity (∞). 5. Slowly turn shaft clockwise until resistance between pins 3 and 4 goes to infinity (∞). 6. Measure resistance between pins 2 and 4. Resistance should be 0 OHMS on the 10k scale. 7. Measure resistance between pins 3 and 4. Measure resistance between pin 2 and pins 1, 5, and 6. Resistance should be infinity (∞). 8. Slowly turn shaft clockwise until resistance between pins 2 and 4 goes to infinity (∞). 9. Measure resistance between pins 1 and 4. Resistance should be 0 OHMS on the 10k scale. 10. Measure resistance between pin 1 and pins 5 and 6. Resistance should be infinity (∞). 11. Slowly turn shaft clockwise until resistance between pins 1 and 4 goes to infinity (∞). 12. Measure resistance between pins 4 and 6. Resistance should be 0 OHMS on the 10k scale. 13. Measure resistance between pins 5 and 6. Resistance should be infinity (∞). 14. Turn shaft completely clockwise. 15. Measure resistance between pins 4 and 5. Resistance should be 0 OHMS.	Sensing box not ok. . . Sensing box ok. . .	GO TO STEP 31 GO TO STEP 32



H38815

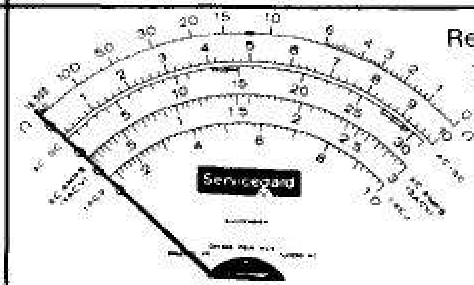
DIAL-A-MATIC HEADER HEIGHT CONTROL

STEP	INSTRUCTIONS	RESULT	
30	Light blue wire (circuit No. 64) in header harness is defective. Repair wire.	Repair wire . . .	GO TO STEP 6
31	Disassemble sensing box. Replace brushes if required. Remove circuit board for further testing.		GO TO STEP 33
32	Test as follows: 1. Circuit No. 64 in the sensing box connector is not making contact when the connector is assembled to the box. 2. All wires in the header harness are broken. Test for continuity before replacing harness. Use procedure in step 60. 3. Control switch failure. Use procedure in step 52. 4. Pin number 3 in amplifier CPC connector is not making contact when the connector is assembled to the amplifier.	Dial-A-Matic works . . .	END OF TEST
		Dial-A-Matic does not work . . .	GO TO STEP 38

H37256

DIAL-A-MATIC HEADER HEIGHT CONTROL

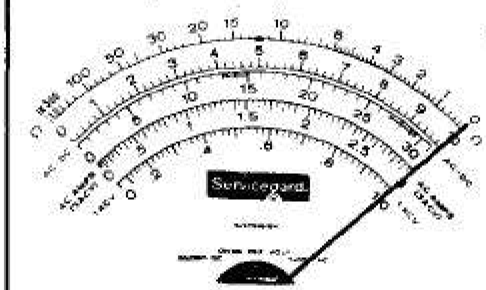
STEP	INSTRUCTIONS	RESULT
33	Test continuity of circuit board in these six places.	∞ (INFINITY) OHMS — Reading for any of the six places: GO TO STEP 34 0 OHMS — Reading for all six places: GO TO STEP 35



∞ (INFINITY) OHMS

Reading for any of the six places

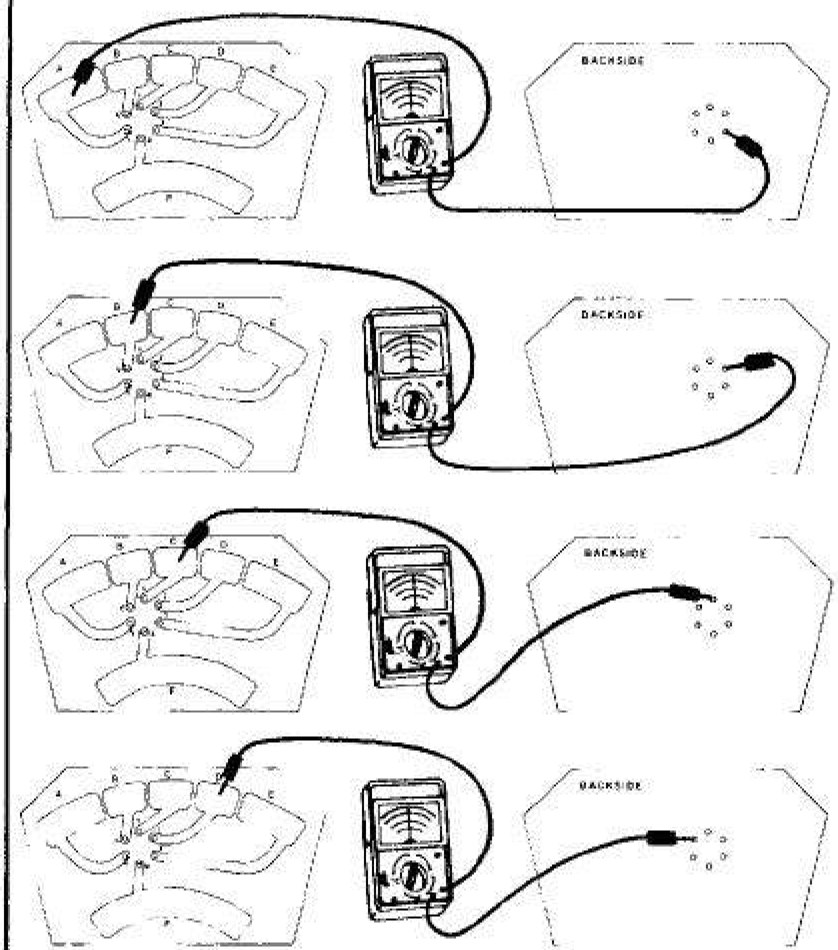
GO TO STEP 34

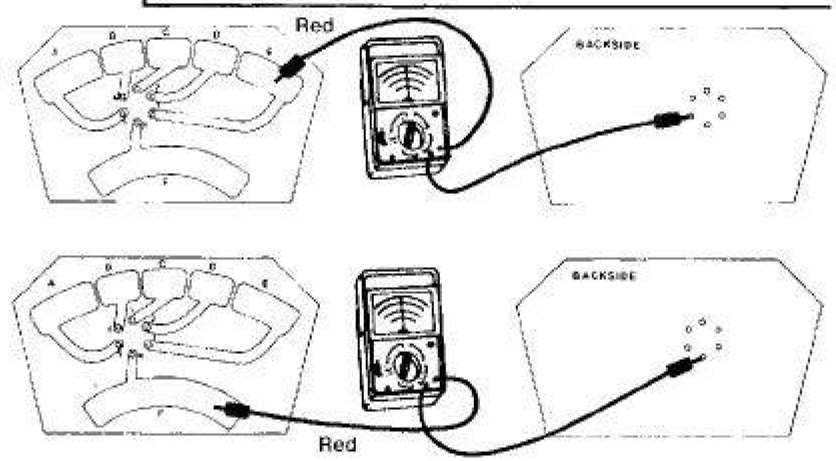


0 OHMS

Reading for all six places

GO TO STEP 35





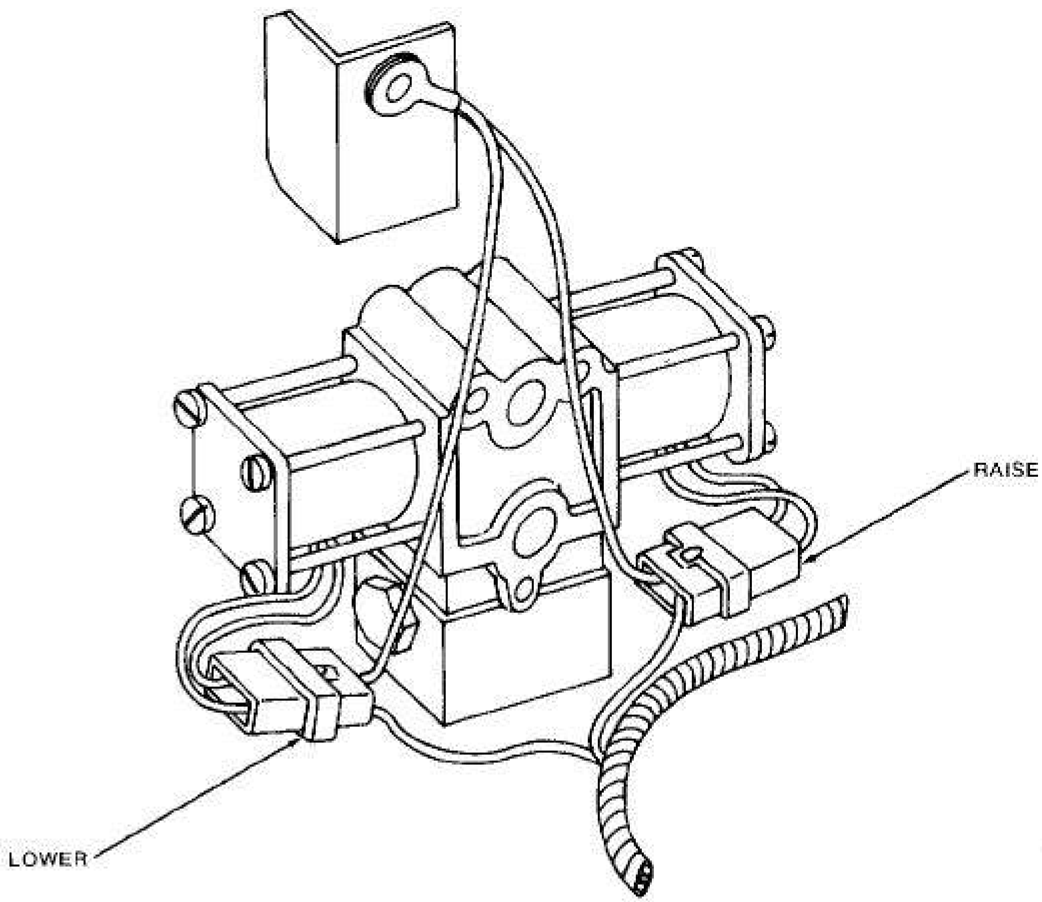
DIAL-A-MATIC HEADER HEIGHT CONTROL

STEP	INSTRUCTIONS	RESULT	
34	Circuit Board is defective. Replace circuit board.	Replace circuit board . . .	GO TO STEP 6
35	Contact between brushes and circuit board is poor. Replace brushes and clean circuit board. Assemble sensing box except for cover.	Clean, replace, assemble sensing box . . .	GO TO STEP 29
36	A ground causing the circuit breaker to open is suspected. If the combine and/or header is new then misplaced wires in the amplifier CPC connector are suspected. Dissassemble connectors and compare wire color with wiring diagram.	Wires are ok . . .	GO TO STEP 54
		Wires are not ok . . .	GO TO STEP 37
37	Use JDG-140 extractor tool from JDG-155 electrical repair tool kit to place contacts properly in the connector. If you do not have JDG-140 tool then replace harness.	Repair or replace harness . . .	GO TO STEP 6

H37268

DIAL-A-MATIC HEADER HEIGHT CONTROL

STEP	INSTRUCTIONS	RESULT	
38	Clean connectors on auto header valve.	Dial-A-Matic still does not work . . .	GO TO STEP 39
		Dial-A-Matic works . . .	END OF TEST



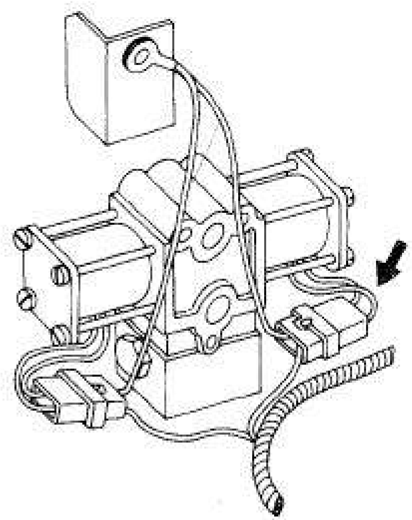
H37239

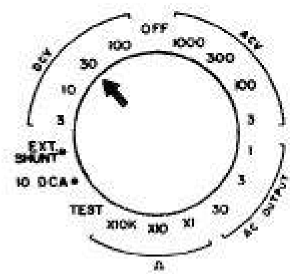
DIAL-A-MATIC HEADER HEIGHT CONTROL

STEP 39

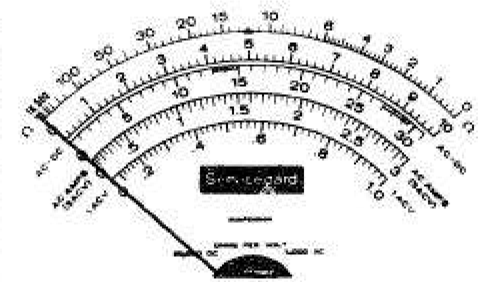
INSTRUCTIONS

1. Turn control switch to off.
2. Start engine and lower header until it is completely on the ground.
3. Shut off engine.
4. Turn on ignition switch and header height switch.
5. Disconnect connector on right hand solenoid on auto header valve. Test for voltage on yellow wire. This wire is for rasing the header.



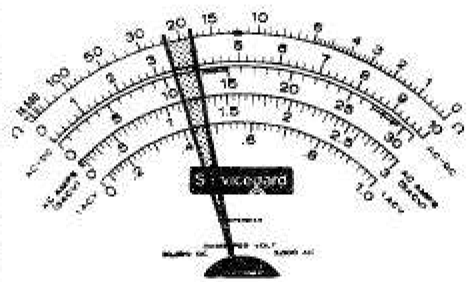


RESULT



0 VOLTS

GO TO STEP 40

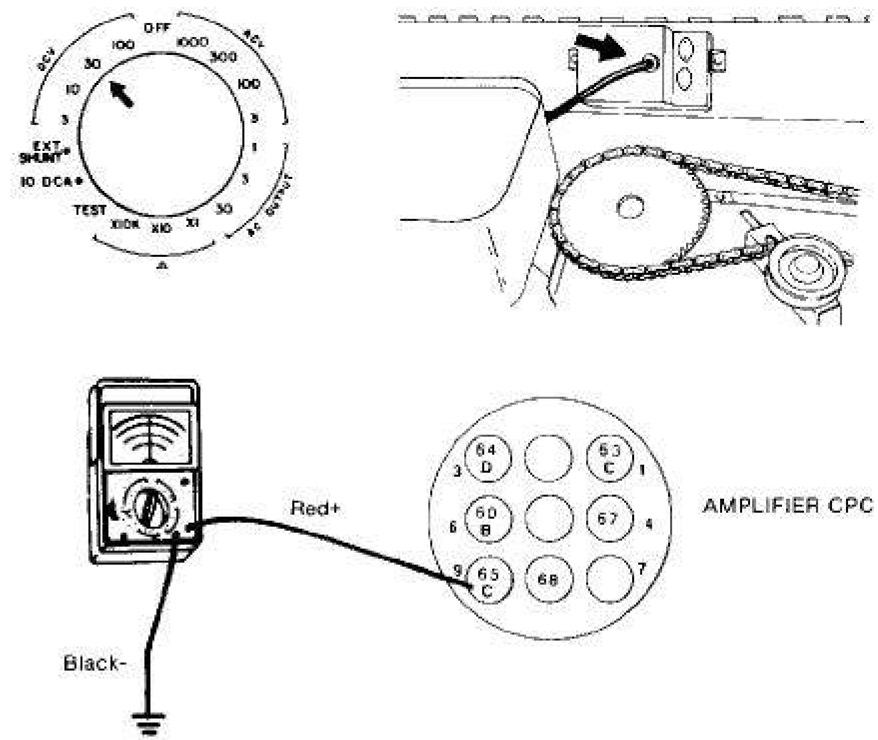
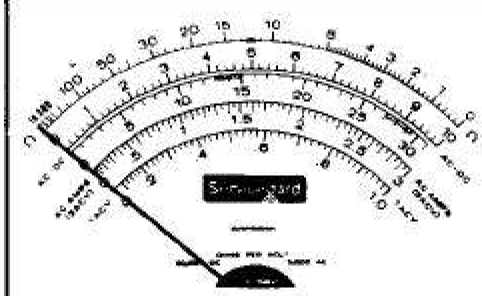
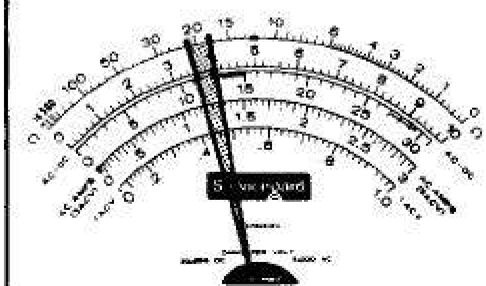


11.0-12.8 VOLTS
(Normal voltage with
engine shut off is 11.7-12.8 volts)

GO TO STEP 42

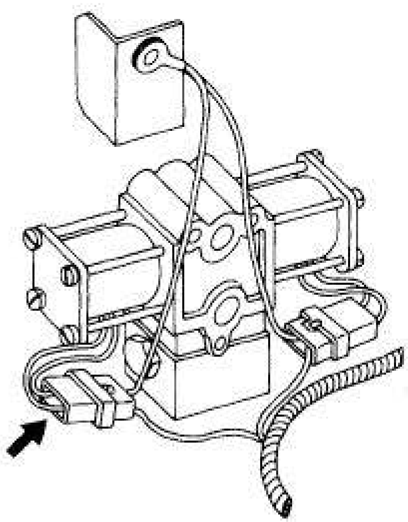
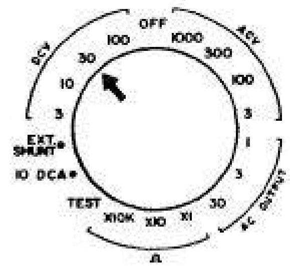
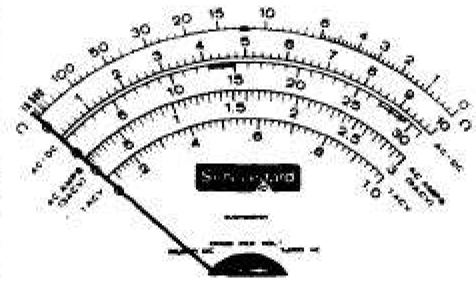
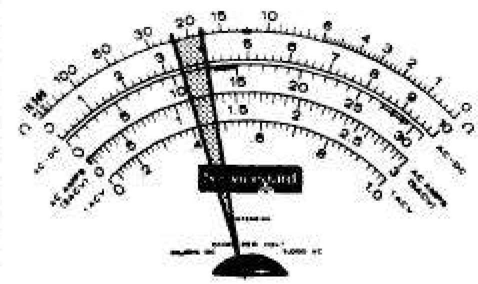
H37260

DIAL-A-MATIC HEADER HEIGHT CONTROL

STEP	INSTRUCTIONS	RESULT
40	1. With header completely lowered as in step 39 disconnect amplifier CPC connector. 2. Turn on ignition switch and header height switch. 3. Test for voltage on pin 9 in amplifier CPC connector. 	 0 VOLTS GO TO STEP 39  11.2-12.8 VOLTS GO TO STEP 41
41	Yellow wire from amplifier to solenoid is defective. Repair wire.	Repair wire . . . GO TO STEP 42

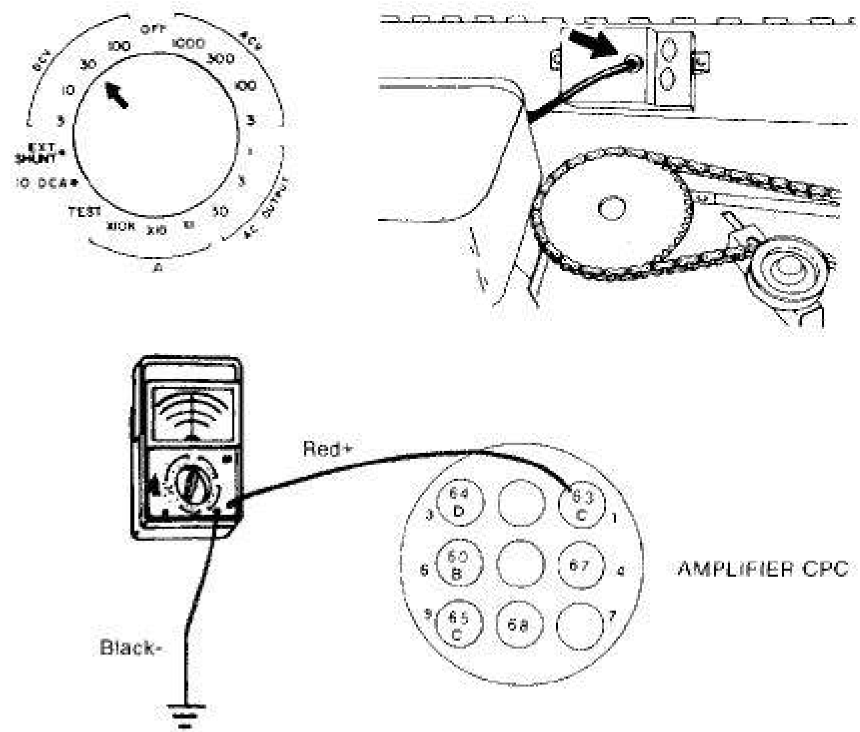
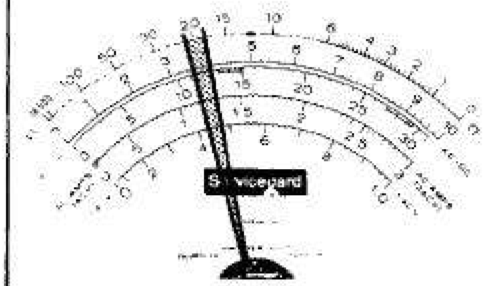
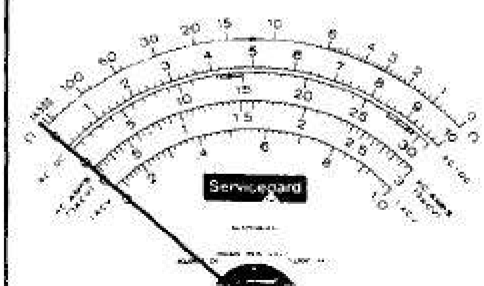
H37261

DIAL-A-MATIC HEADER HEIGHT CONTROL

STEP	INSTRUCTIONS	RESULT
42	1. Turn header height switch off. 2. Start engine and raise header until it clears ground by (152 mm) 6 inches. 3. Shut off engine. 4. Turn on ignition switch and header height switch. 5. Disconnect connector on left hand solenoid on auto header valve. Test for voltage on orange wire. This wire is for lowering the header. 	 0 VOLTS GO TO STEP 43  11.0-12.8 VOLTS GO TO STEP 45

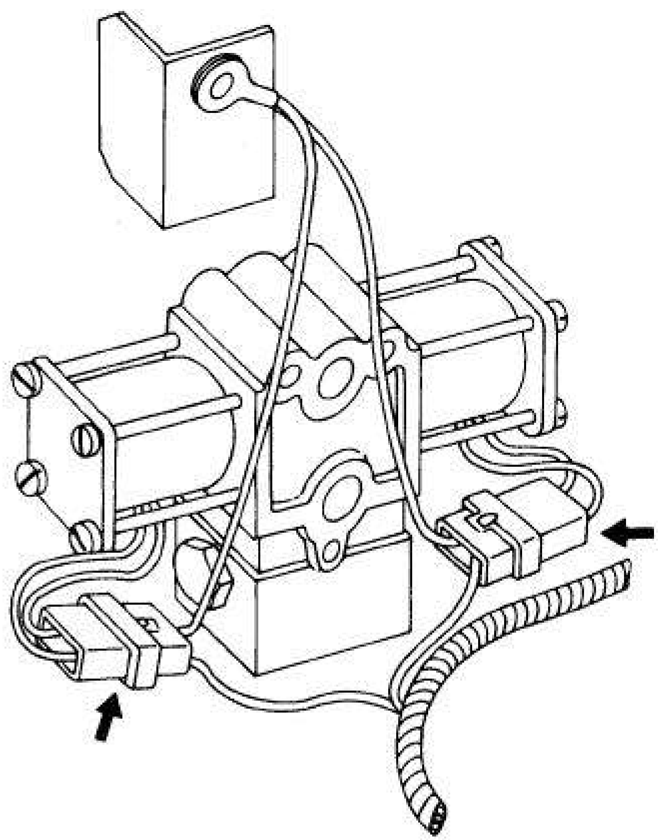
H37262

DIAL-A-MATIC HEADER HEIGHT CONTROL

STEP	INSTRUCTIONS	RESULT	
43	1. With header raised as in step 42 disconnect amplifier CPC connector. 2. Turn on ignition switch and header height switch. 3. Test for voltage on pin 1 in amplifier CPC connector.  	 11.2-12.8 VOLTS	GO TO STEP 44
		 0 VOLTS	GO TO STEP 59
44	Orange wire from amplifier to solenoid is defective. Repair wire.	Repair wire . . .	GO TO STEP 6

H3726J

DIAL-A-MATIC HEADER HEIGHT CONTROL

STEP	INSTRUCTIONS	RESULT	
45	Defective solenoids. Replace solenoids.	Replace solenoids and . .	GO TO STEP 6
46	Clean connectors on auto header valve. 	Dial-A-Matic does not work . . .	GO TO STEP 47
		Dial-A-Matic works . . .	END OF TEST

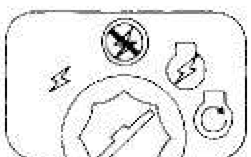
H37264

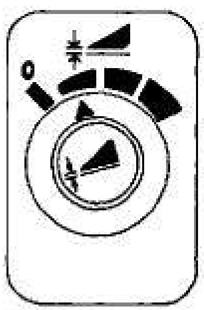
DIAL-A-MATIC HEADER HEIGHT CONTROL

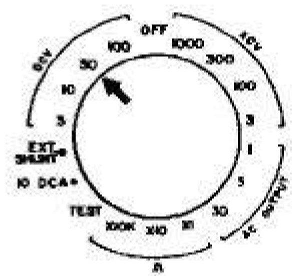
STEP | **INSTRUCTIONS** | **RESULT**

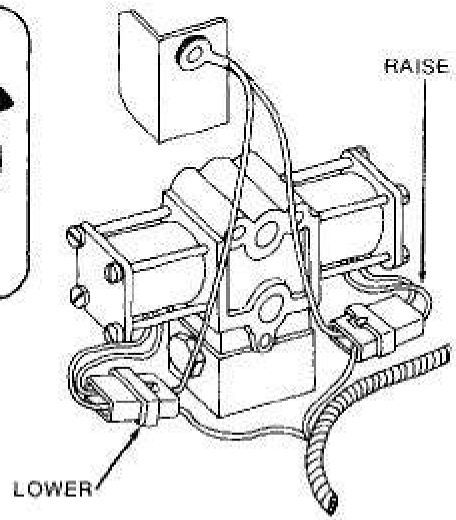
47

1. Turn header height switch off.
2. Start engine and raise header until it clears ground by (152 mm) 6 inches.
3. Shut off engine.
4. Turn ignition switch and header height switch on.
5. Disconnect connector on left hand solenoid on auto header valve. Test for voltage on orange wire. This circuit is for lowering the header.
6. Turn header height switch off.
7. Start engine and lower header until it is completely on the ground.
8. Shut off engine.
9. Turn on ignition switch and header height switch.
10. Disconnect connector on right hand solenoid on auto header valve. Test for voltage on yellow wire. This is the circuit for raising the header.



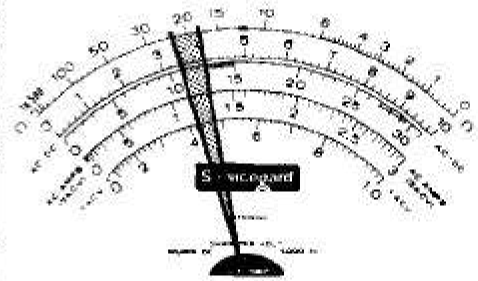






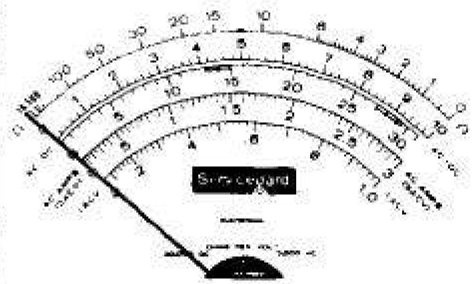
RESULT

Normal battery voltage with engine shut off is 11.7-12.8 volts



11.0-12.8 VOLTS

GO TO STEP 45



0 VOLTS

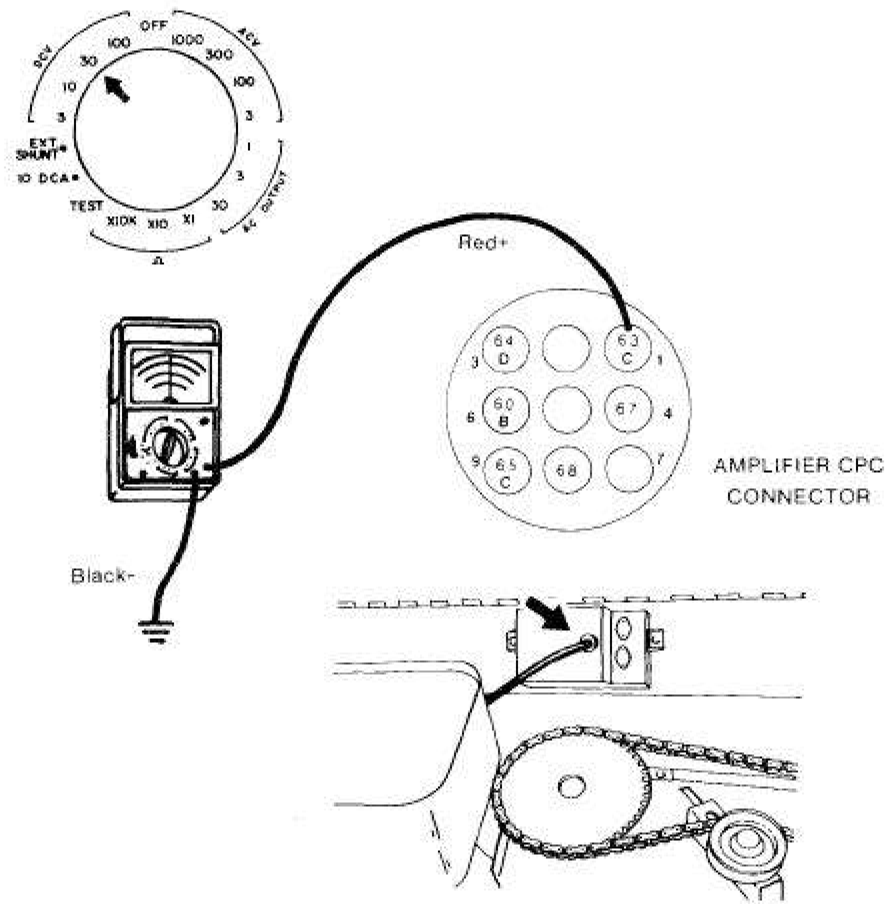
Left hand solenoid . . . GO TO STEP 48

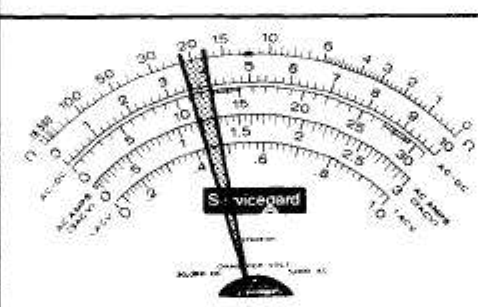
Right hand solenoid . . . GO TO STEP 49

H07265

DIAL-A-MATIC HEADER HEIGHT CONTROL

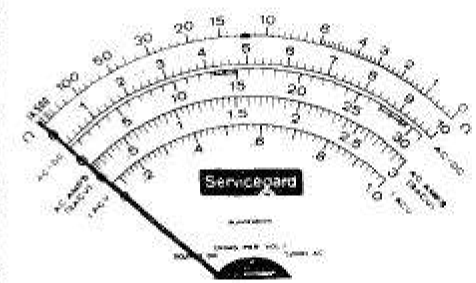
STEP	INSTRUCTIONS	RESULT
48	1. Disconnect amplifier CPC connector. 2. Start engine and raise header until it clears ground by (152 mm) 6 inches. 3. Shut off engine. Turn on header height switch. 4. Test for voltage on pin 1 in amplifier CPC connector.	11.2-12.8 VOLTS — GO TO STEP 50 0 VOLTS — GO TO STEP 59





11.2-12.8 VOLTS

GO TO STEP 50

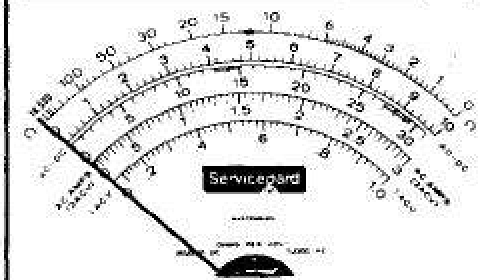
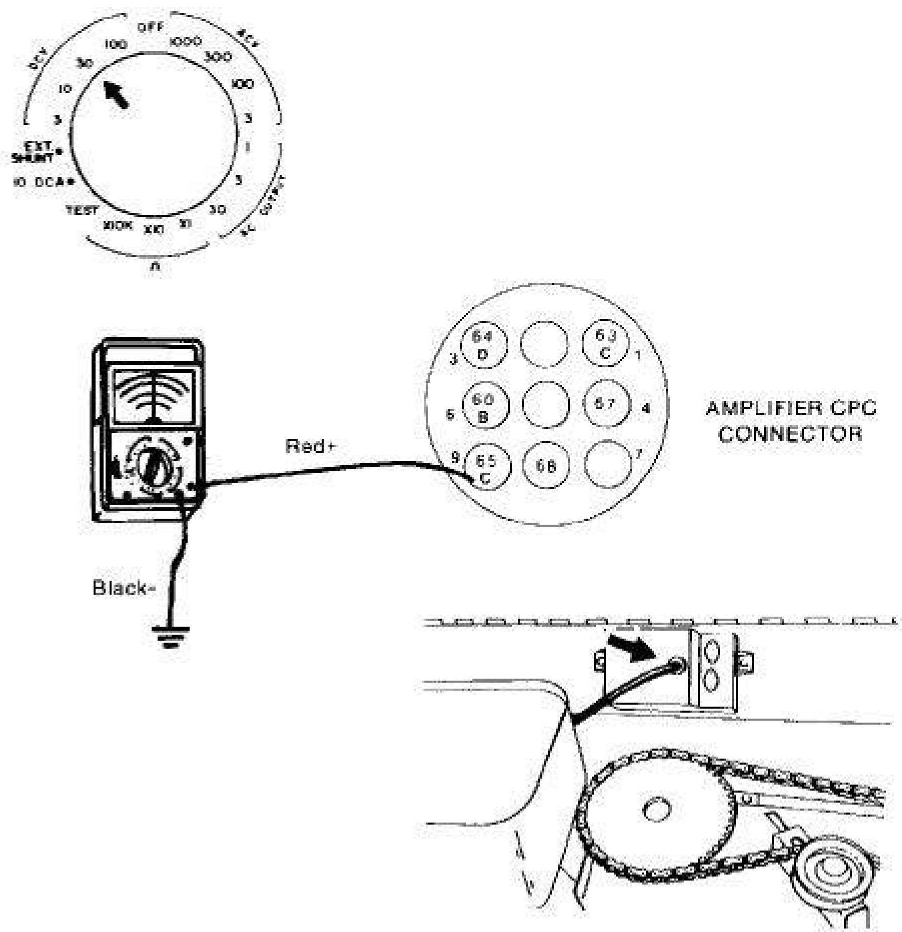
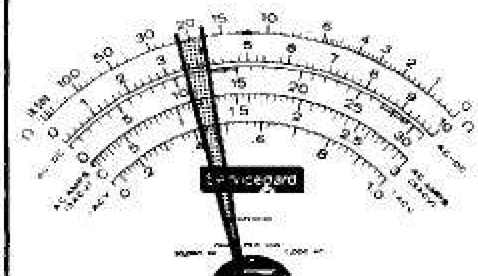


0 VOLTS

GO TO STEP 59

H37266

DIAL-A-MATIC HEADER HEIGHT CONTROL

STEP	INSTRUCTIONS	RESULT	
49	1. Disconnect amplifier CPC connector. 2. Start engine and lower header until it is completely on the ground. 3. Shut off engine. Turn on header height switch. 4. Test for voltage on pin 9 in amplifier CPC connector.	 0 VOLTS	GO TO STEP 59
		 11.2-12.8 VOLTS	GO TO STEP 50

H37267

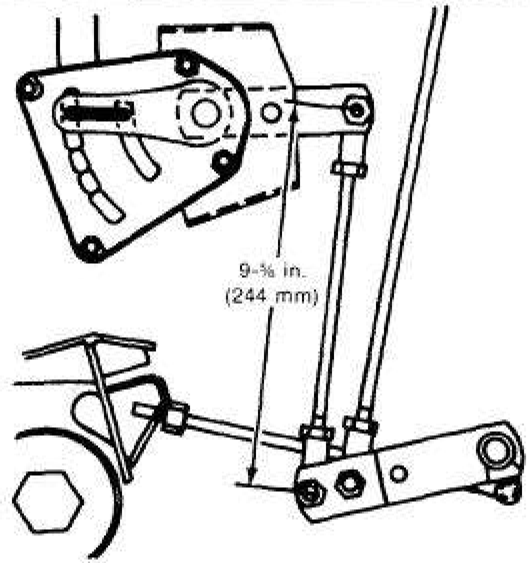
DIAL-A-MATIC HEADER HEIGHT CONTROL

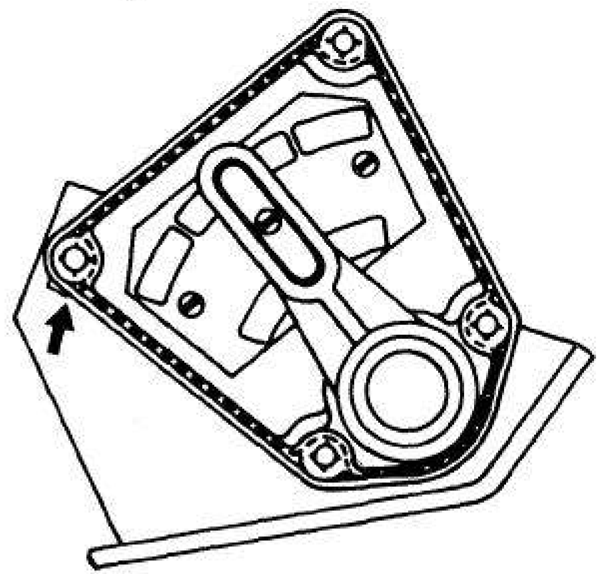
STEP	INSTRUCTIONS	RESULT	
50	Use D-14102 DJ tester to test the amplifier on the combine as follows: 1. Start engine and lower header. Shut off engine. 2. Turn ignition switch and header height switch on. 3. Disconnect amplifier CPC connector. Using JT05463 adaptor harness, install tester between harness and amplifier. 4. Place selector switch on tester to number "5" position. Power test light should be on. If not, check connections. Be certain bulb in tester is OK. 5. Flip switch to raise. Raise light should glow. Be certain bulb in tester is OK. 6. Flip switch to lower. Lower light should glow. Be certain bulb in tester is OK. Use this procedure to bench test the amplifier: 1. Use CPC contacts on the end of wires for plugging into the amplifier. CPC contacts are in RE11154 electrical repair kit. 2. Connect pin 3 of amplifier to +12 volts and pin 6 to ground. 3. No voltage should be on pins 4 and 8. 4. Connect pin 1 to +12 volts. 5. Voltage should be on pin 4. 6. Remove contact from pin 1 and place on pin 9. 7. Voltage should be on pin 8.	Amplifier not OK Replace . . . Amplifier is OK . . .	GO TO STEP 6 GO TO STEP 51
51	Wire from amplifier to solenoid is defective. Repair wire.	Repair wire . . .	GO TO STEP 6

H50670

DIAL-A-MATIC HEADER HEIGHT CONTROL

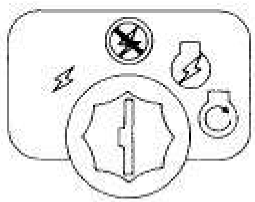
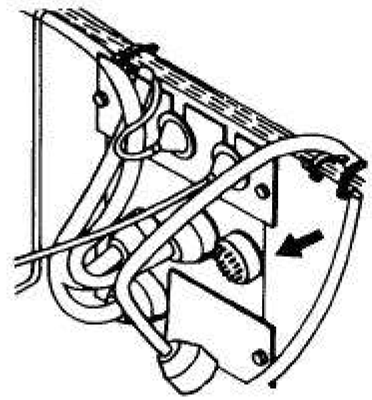
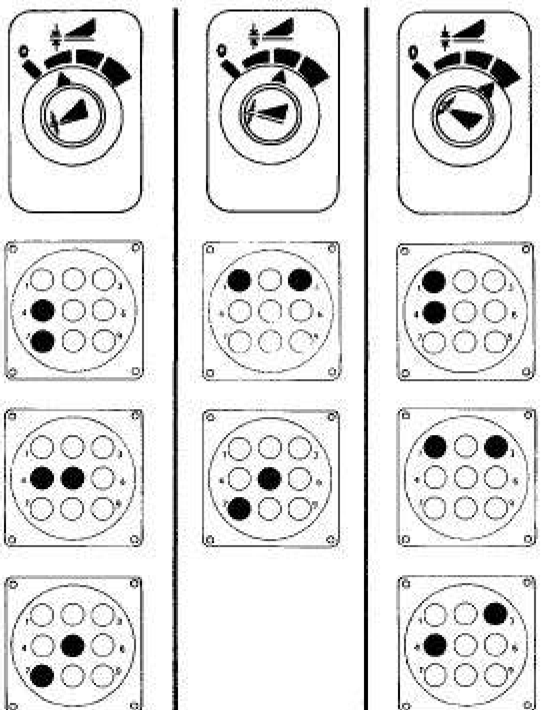
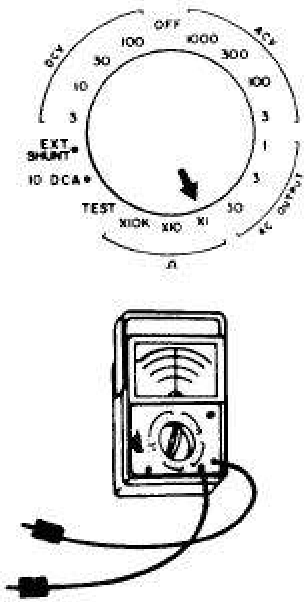
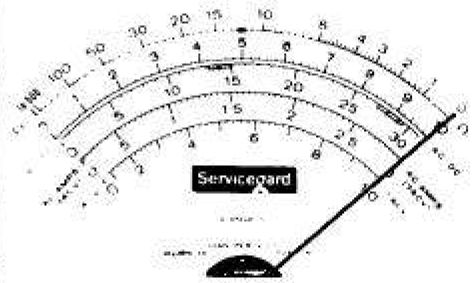
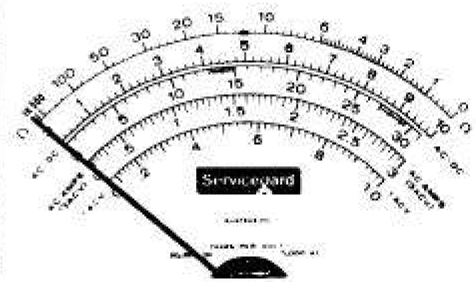
STEP	INSTRUCTIONS	RESULT	
52	ROW-CROP HEAD Measure length of rod or align holes in arms by adjusting length of rod.	Adjustments ok . . .	GO TO STEP 53
	FLEX PLATFORM Sensing box should be in the middle of the slot. On some headers it may be necessary to go to end of slot. Cutterbar must float at least (76 mm) 3-inches.	Adjustments not ok-adjust . . .	GO TO STEP 6





H37269

DIAL-A-MATIC HEADER HEIGHT CONTROL

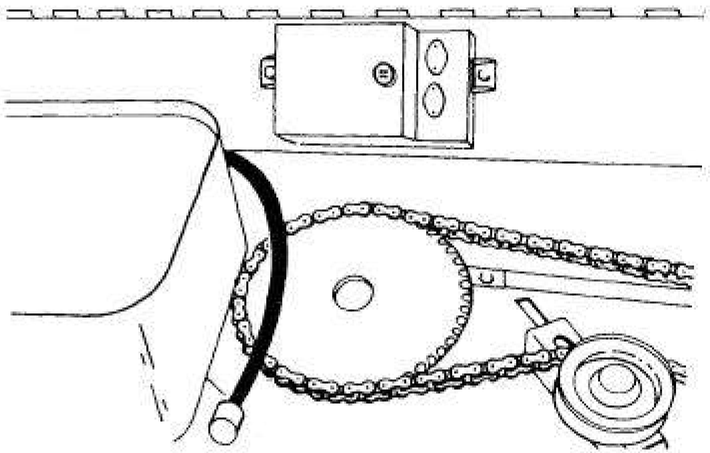
STEP	INSTRUCTIONS	RESULT
53	Test continutity of the control switch. Ignition switch must be off.   FIREWALL CPC CONNECTOR  	 0 OHMS — GO TO STEP 54 For any of the 8 tests:  ∞ (INFINITY) OHMS — GO TO STEP 13

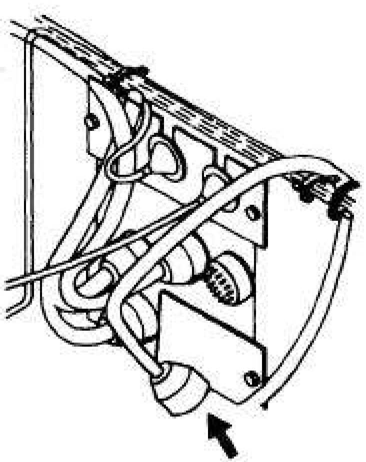
NOTE: Other pins will also have continuity. Those shaded are the ones required for normal operation.

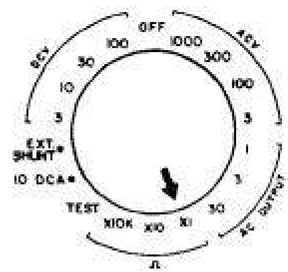
H37270

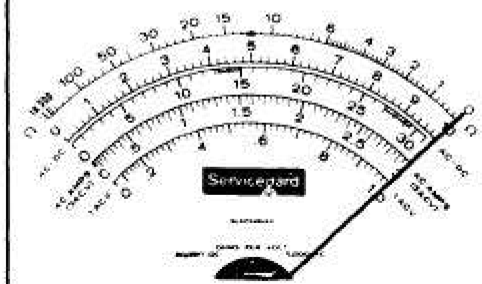
DIAL-A-MATIC HEADER HEIGHT CONTROL

STEP	INSTRUCTIONS	RESULT
54	Disconnect CPC connectors at amplifier and firewall. Be certain feeder house connector is connected. Check for grounds at connector for sensing box.	


AMPLIFIER CPC CONNECTOR


FIREWALL CPC CONNECTOR

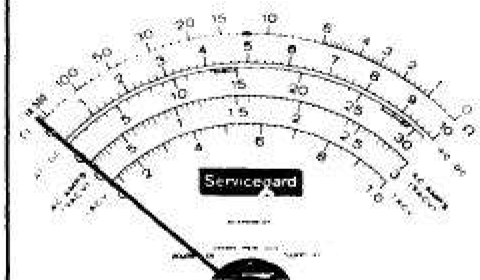




0 OHMS

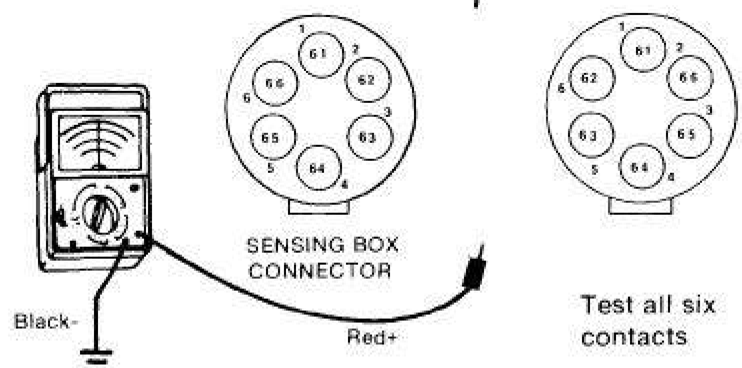
GO TO STEP 55

For all six contacts



∞ (INFINITY) OHMS

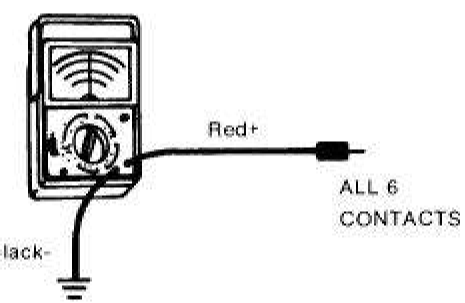
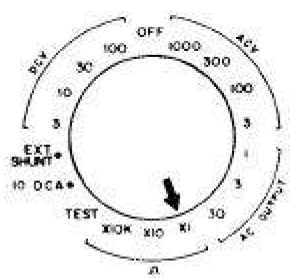
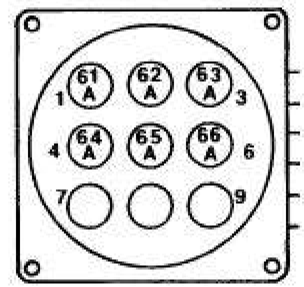
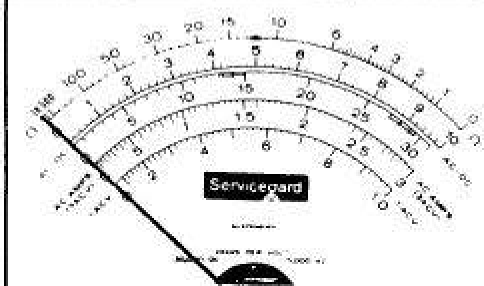
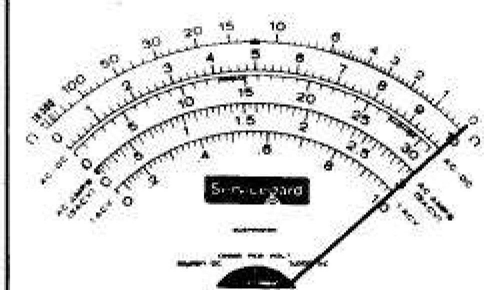
GO TO STEP 58



Test all six contacts

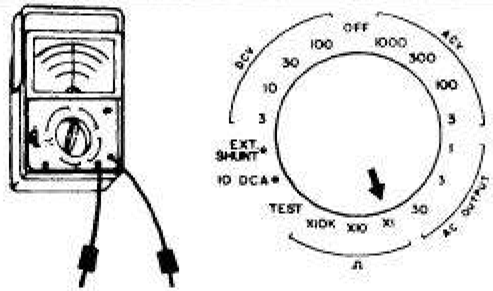
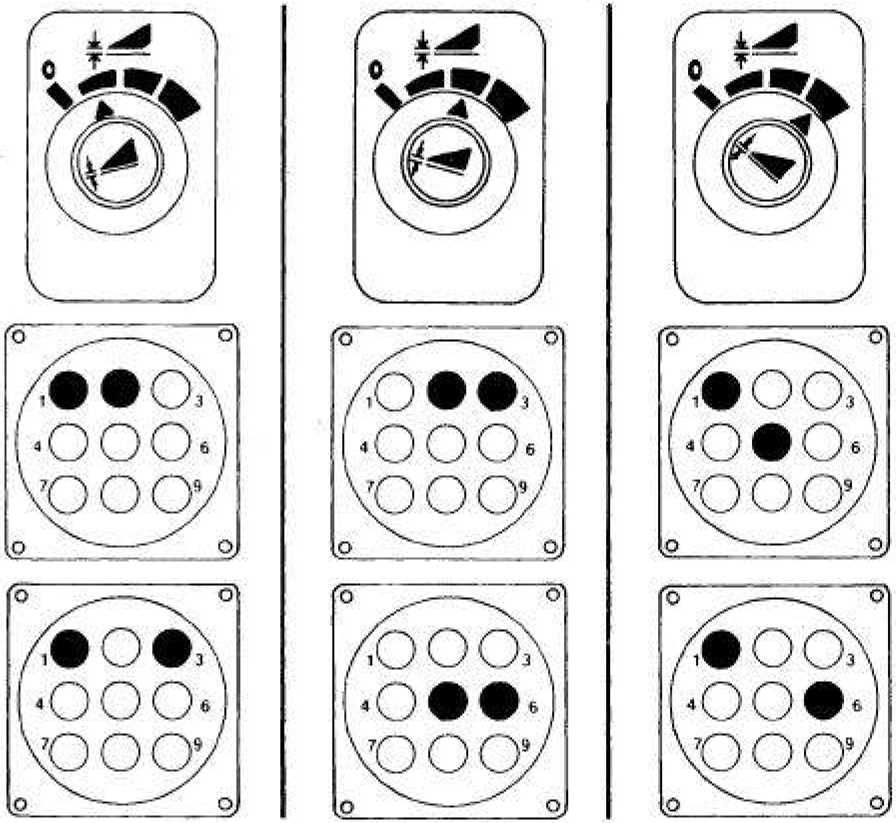
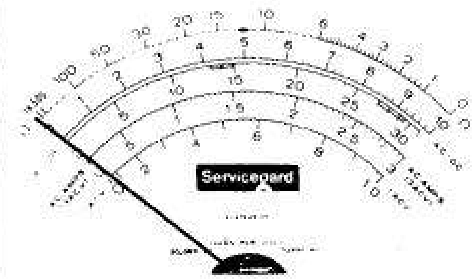
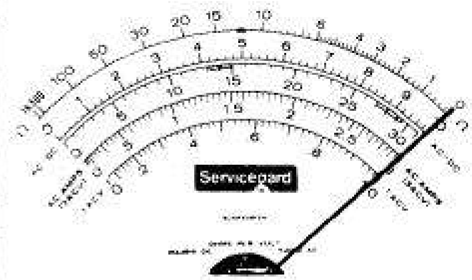
H37271

DIAL-A-MATIC HEADER HEIGHT CONTROL

STEP	INSTRUCTIONS	RESULT	
55	Leave amplifier and firewall connectors disconnected as done in step 54. Diconnect feeder house connector. Check for grounds.    FEEDER HOUSE CPC CONNECTOR	 ∞ (INFINITY) OHMS	GO TO STEP 56
		 0 OHMS	GO TO STEP 57
56	There is a grounded wire in the header harness. Repair or replace harness.		GO TO STEP 6
57	There is a grounded wire in the separator harness.Repair or replace harness.		GO TO STEP 6

H37272

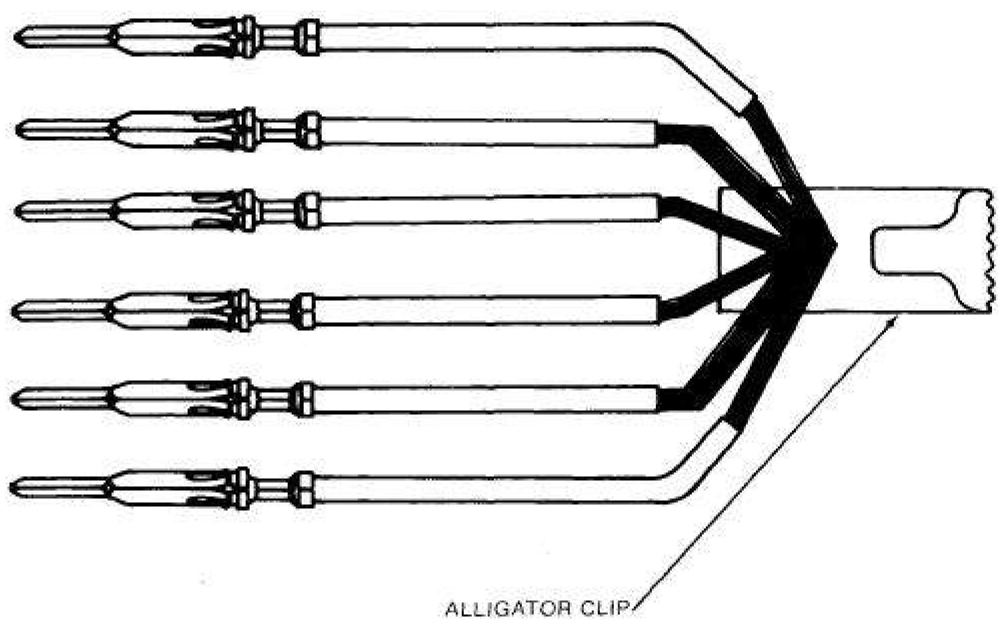
DIAL-A-MATIC HEADER HEIGHT CONTROL

STEP	INSTRUCTIONS	RESULT
58	Test continuity between shaded pins in feederhouse CPC connector. Amplifier CPC connector must be disconnected.  	 ∞ (INFINITY) OHMS — GO TO STEP 59 For all six tests  0 OHMS — GO TO STEP 62

H37273

DIAL-A-MATIC HEADER HEIGHT CONTROL

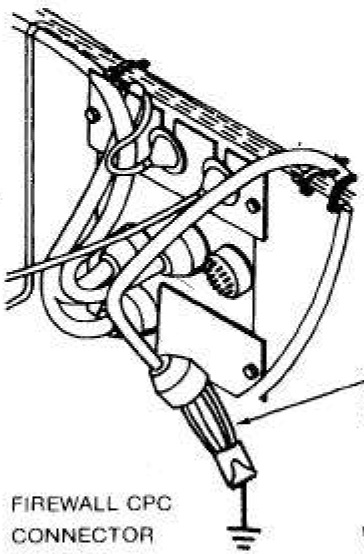
STEP	INSTRUCTIONS	RESULT	
59	Construct a special tester from repair kit. This will allow continuity testing of a harness without using a long length of wire and making six trips to the other end of the harness.	After making special tester . . .	GO TO STEP 60

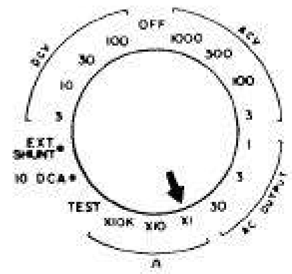


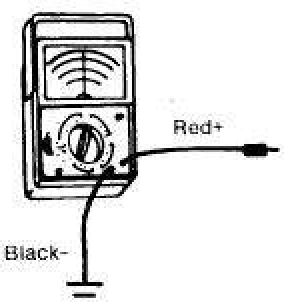
H37274

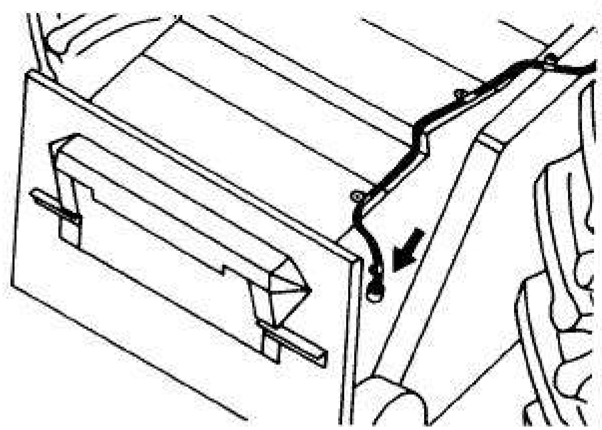
DIAL-A-MATIC HEADER HEIGHT CONTROL

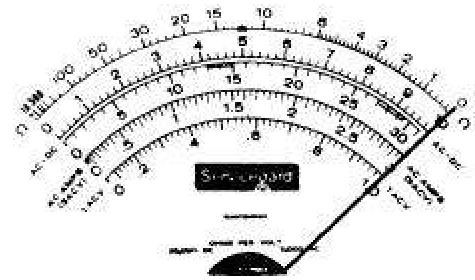
STEP	INSTRUCTIONS	RESULT
60	1. Insert contacts of special tester into contacts of firewall connector. Clamp alligator clip to combine frame. 2. Test continuity of wires at feeder house connector.	For all six contacts: 0 OHMS — GO TO STEP 61 ∞ (INFINITY) OHMS — GO TO STEP 64



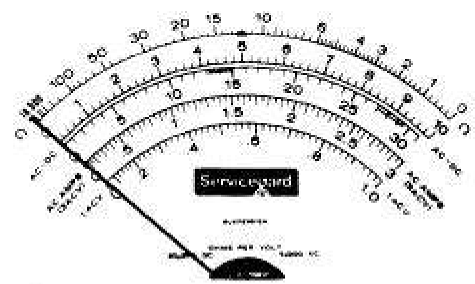








0 OHMS

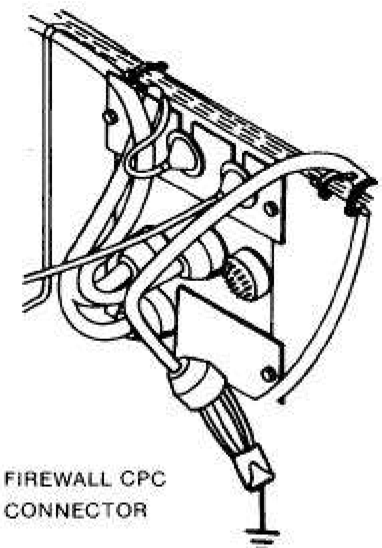


∞ (INFINITY) OHMS

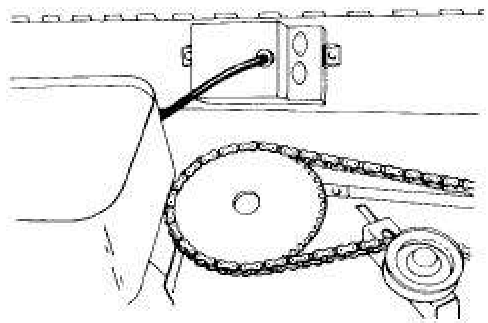
H37275

DIAL-A-MATIC HEADER HEIGHT CONTROL

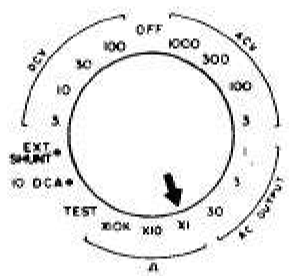
STEP	INSTRUCTIONS	RESULT
61	1. Insert contacts of special tester into contacts of firewall CPC connector. Clamp alligator clip to combine frame. 2. Be certain feeder house is lowered. 3. Test continuity of pins 1, 3, and 9 in amplifier CPC connector.	

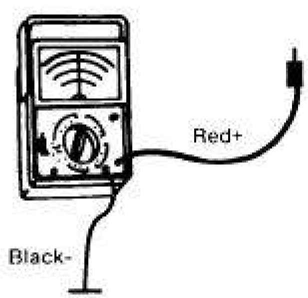


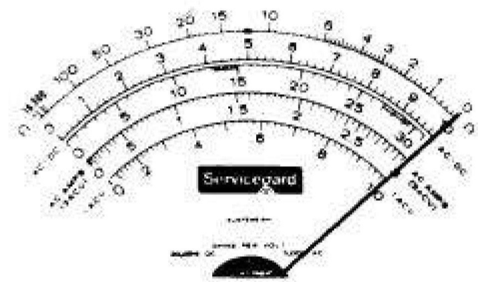
FIREWALL CPC CONNECTOR



AMPLIFIER CPC CONNECTOR



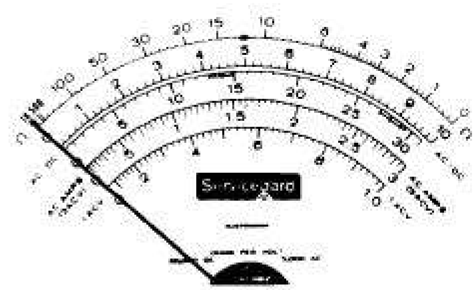




0 OHMS

For both pins

GO TO STEP 62



∞ (INFINITY) OHMS

GO TO STEP 66

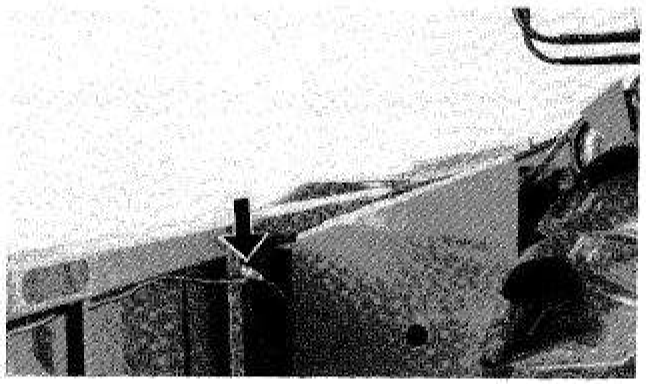
H37276

DIAL-A-MATIC HEADER HEIGHT CONTROL

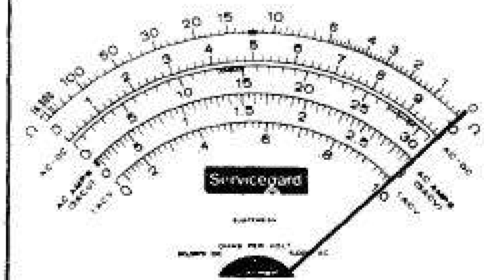
STEP 62

INSTRUCTIONS

1. Construct special tester as shown in step 59.
2. Disconnect feeder house connector.
3. Insert contacts of special tester into contacts of header harness.
4. Disconnect connector at sensing box. Test continuity of wires.

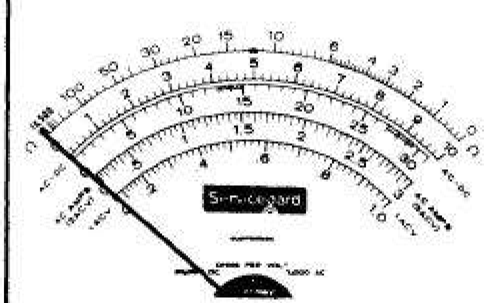


RESULT



0 OHMS

For all six contacts — GO TO STEP 29



∞ (INFINITY) OHMS

GO TO STEP 65

H37277

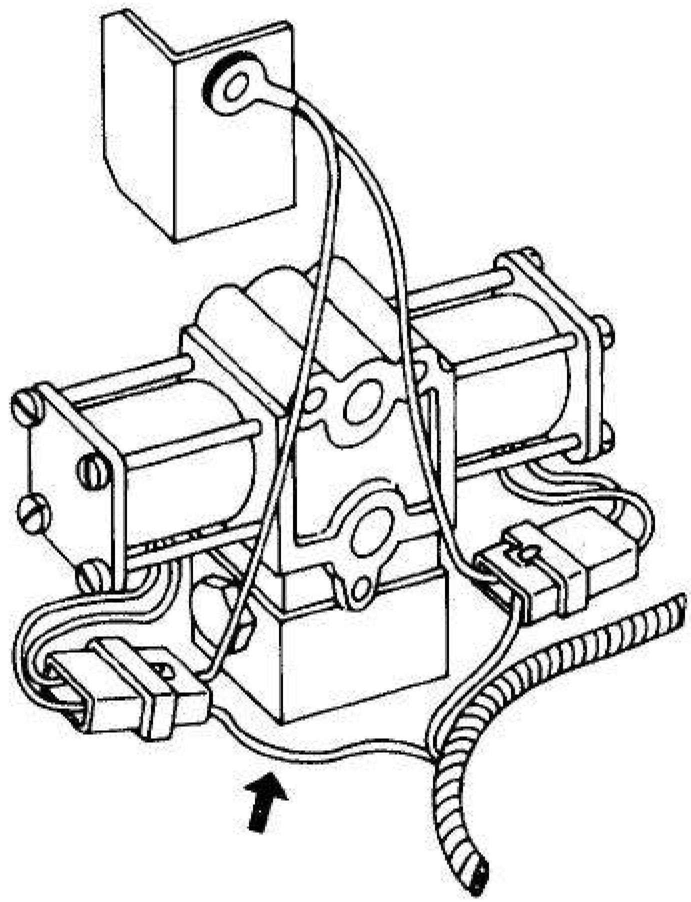
DIAL-A-MATIC HEADER HEIGHT CONTROL

STEP	INSTRUCTIONS	RESULT
63	One or more contacts in firewall CPC connector is not making contact. Clean or repair contact(s).	GO TO STEP 6
64	Broken wire(s) between firewall CPC connector and feeder house connector. Repair by adding new wire(s) to harness.	GO TO STEP 6
65	Broken wire(s) in header harness. Repair by adding new wire(s) to harness.	GO TO STEP 6
66	Broken wire(s) between firewall CPC connector and amplifier CPC connector. Repair by adding wire(s) to harness.	GO TO STEP 6

H37278

DIAL-A-MATIC HEADER HEIGHT CONTROL

STEP	INSTRUCTIONS	RESULT	
67	Connectors on auto header valve may be switched. Orange wire must go to outside or left hand solenoid.	Connectors are switched. Exchange connectors and . . .	GO TO STEP 6
		Connectors are ok . . .	GO TO STEP 68



H3729

DIAL-A-MATIC HEADER HEIGHT CONTROL

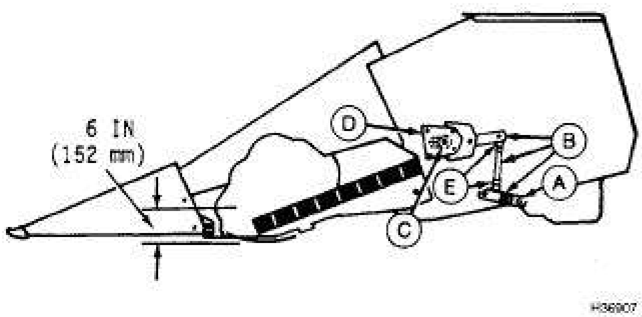
STEP	INSTRUCTIONS	RESULT
68	Contacts are placed wrong in the connectors or a flex platform harness was installed on a row-crop head or a row-crop head harness on a flex platform. If this problem only occurs in the medium ground pressure position then check firewall CPC connector. The header harness must have four wires misplaced for this symptom. The combine harness must have circuits 63 and 65 crossed or circuits 67 and 68 crossed.	Reposition contacts with JDG-140 extractor tool and . . . . GO TO STEP 6

H37280

Group 30
DIAL-A-MATIC HEADER HEIGHT CONTROL MECHANICAL SYSTEM

ROW-CROP HEAD

GENERAL INFORMATION



A—Height Sensing Shaft
B—Linkage Assembly
C—Wiper Arm
D—Sensing Box
E—Adjustable Ball Joints

Fig. 1-Row-Crop Head Mechanical System

The Dial-A-Matic header height control maintains the correct position of the header frame by sensing the position of each individual row unit. Individual row units are designed to pivot independently about the common drive shaft and have a (152 mm) 6 inch float range measured at skid shoe.

IMPORTANT: For the Dial-A-Matic header height control to perform correctly, row units must be in floating position and correct row unit float spring tension and gatherer sheet clearance must be maintained. Row unit skid shoes must be adjusted for correct cutting height.

The Dial-A-Matic header height control works as follows:

1. When one or more row units deflect up to follow ground contour, height sensing shaft (A) (Fig. 1) turns linkage assembly (B) which in turn moves wiper arm (C) in sensing box (D).

2. Movement of wiper arm (C) contacts one of five printed circuit pads in the sensing box.

3. The pad that is contacted activates the system for raising or lowering the row-crop head.

4. When the wiper arm contacts the "raise" pad, the row-crop head raises.

5. When the wiper arm contacts the "lower" pad, the row-crop head lowers.

6. If additional movement is required loosen the lock nut and remove ball joint from arm. Shorten the rod for raising and lengthen the rod for lowering. Replace ball joint in arm and tighten lock nut.

7. The sensing box sends low current signals to the amplifier. The amplifier amplifies this current into high powered signals to the solenoids on the auto header valve.

8. The auto header valve, directs hydraulic oil under pressure to the two header lift cylinders to raise and allows return oil to flow back to hydraulic reservoir for lowering header.

9. The actuating switch, located under operator's station shuts off the Dial-A-Matic header height control when header is raised approximately 18 inches (457 mm) above ground.

Switch Positioning for Ground Conditions

Dry ground conditions allow a heavier ground force for a close cut. The header must be operated with the rotary switch in 1st position. Soft ground conditions require the rotary switch to be in 2nd position. Wet ground conditions require the rotary switch to be in 3rd position. Additional adjustment is made by loosening lock nut on a ball joint and removing ball joint from arm. Shorten rod to raise or lengthen rod to lower. Replace ball joint in arm and tighten lock nut.

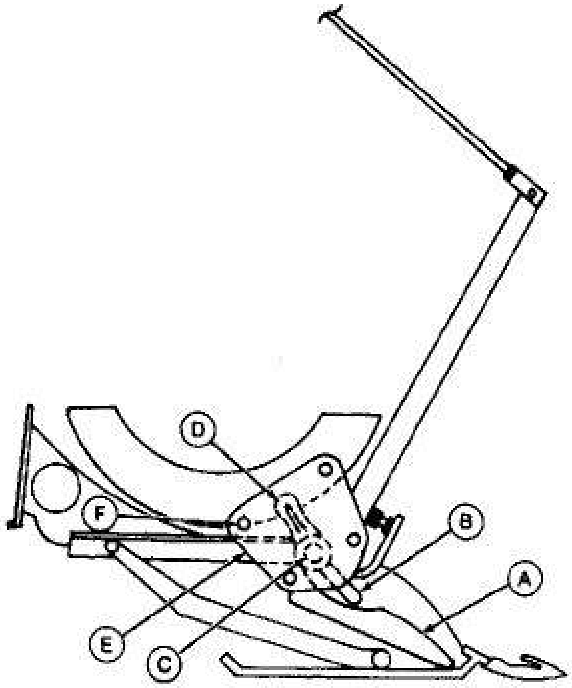
A float spring supports each row unit. As the row unit is raised, spring tension is relieved causing skid shoe ground force to increase. The actual value of pounds of ground force is dependent on the float spring tension adjustment. However, the ground force will increase by approximately (50.8 kg) 90 lbs when the row unit is raised from the lower mechanical stop to the upper mechanical stop. Be certain to:

1. Check adjustment of inner gatherer sheet clearance.

2. Turn drop rate valve adjusting screw out until header "hunts" or cycles up and down. Turn adjusting screw in until header stops "hunting" then turn adjusting screw in an additional 1/2 turn.

200 SERIES PLATFORM

GENERAL INFORMATION



A—Stop Arm
B—Actuator Arm
C—Height Sensing Rod
D—Wiper Arm
E—Housing
F—Adjusting Bolt

Fig. 2-200 Series Flexible Cutterbar Mechanical System

The flexible cutterbar floats within a (102 mm) 4-inch range. When any one section of the cutterbar floats higher than the rest, stop arm (A) (Fig. 2) moves actuator arm (B) and causes height sensing rod (C) to turn. Actuator arm rests on top of the stop arm preventing turning of the height sensing rod, if one section of the cutterbar floats down lower than other sections. This makes the highest section of cutterbar control the Dial-A-Matic header height control system.

The curved transition sheet between the cutterbar and the platform bottom operates as a leaf spring supporting weight of the cutterbar. As the cutterbar is raised within its float range, tension is relieved from the transition plate, causing the cutterbar to become heavier and causing a higher ground force.

Dial-A-Matic header height control works as follows:

1. Height sensing rod (C) turns wiper arm (D) in housing (E).

2. Movement of wiper arm (D) contacts one of five printed circuit pads.

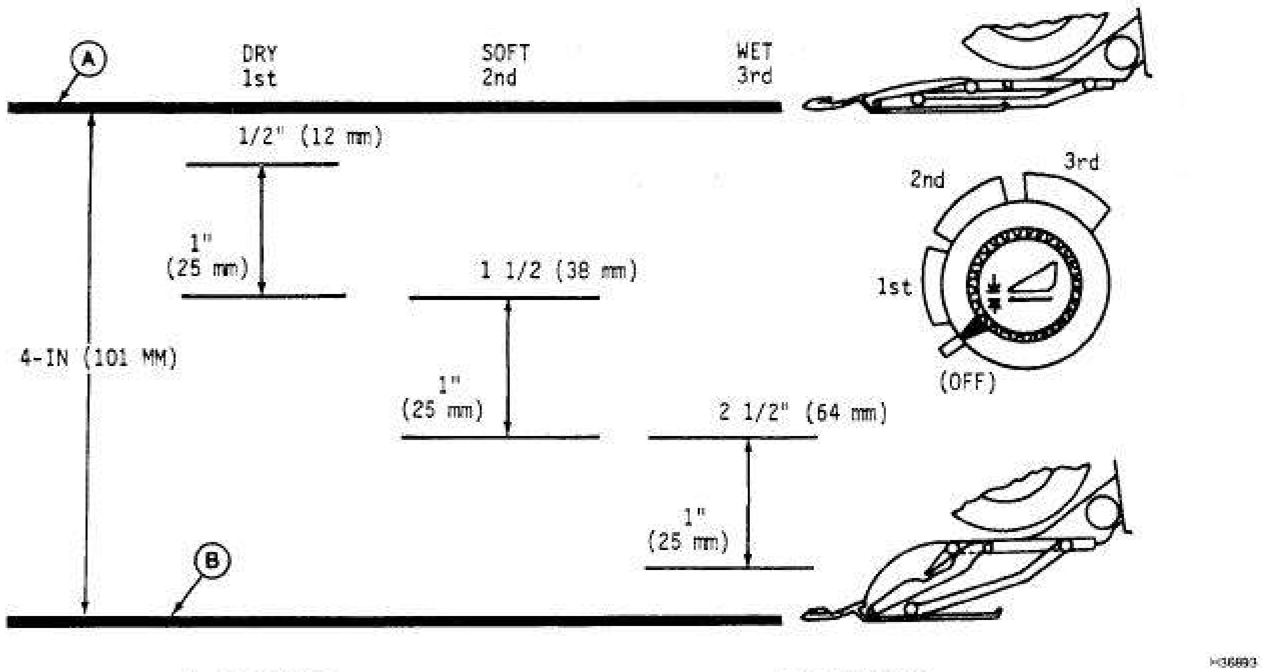
3. A pad that is contacted activates system for raising or lowering platform.

4. When wiper arm contacts "raise" pad, platform raises.

5. When wiper arm contacts "lower" pad, platform lowers.

6. If a fine tuning is required loosen adjusting bolt (F) and rotate housing clockwise to raise, or counterclockwise to lower. Tighten adjusting bolt (F).

Switch Positioning for Ground Conditions



A—Upper Stop **B—Lower Stop**

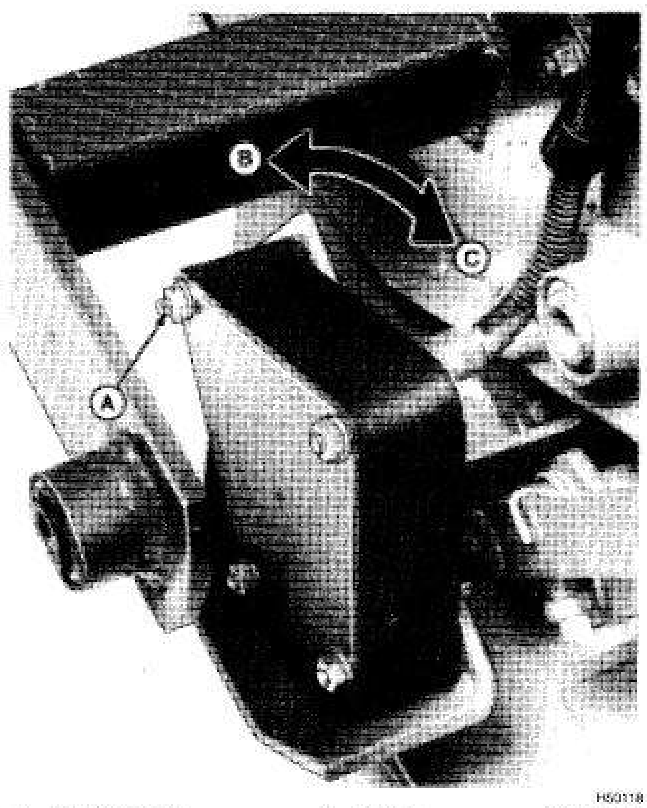
Fig. 3-Switch Positions for Ground Positions

Dry ground conditions require a heavier ground force while soft or wet ground conditions require less ground force. The first switch position (Fig. 3) provides highest ground force and second and third positions provide progressively less force. There is a fixed area of (25 mm) 1-inch between the raise and lower signals in all three positions.

Use the first position whenever possible since this position gives the closest cut and best feeding (transition sheet is flattest and cutterbar is closer to reel in this position). If the platform pushes dirt or material at the center or right-hand end move switch to second or third position. If pushing occurs at left-hand end adjust cutterbar drive case spring.

Adjusting Sensing Box on Platform

In extremely dry conditions the platform may climb up and over soybean stubble. If this occurs, loosen adjusting nut (A) (Fig. 4) and rotate housing toward (B). This will move the three ranges closer to upper stop and increase ground pressure. After making this adjustment always field test or lower left-hand end of cutterbar on a 4 x 4 to see that a raise signal can be obtained with switch in 1st position. If raise signal cannot be obtained in 1st position, loosen nut (A) and rotate housing toward (C).

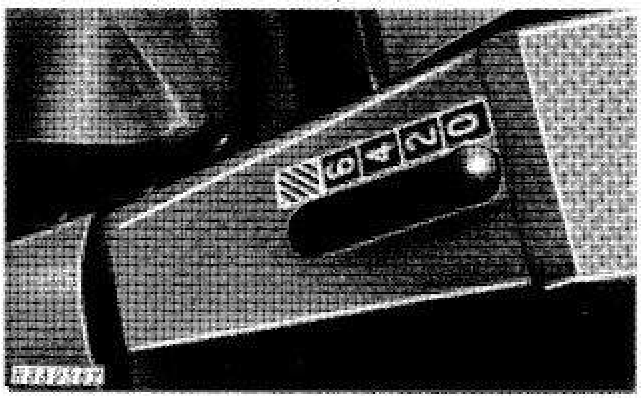


A—Adjusting Nut **B—Lower** **C—Raise**

Fig. 4-Adjusting Sensing Box

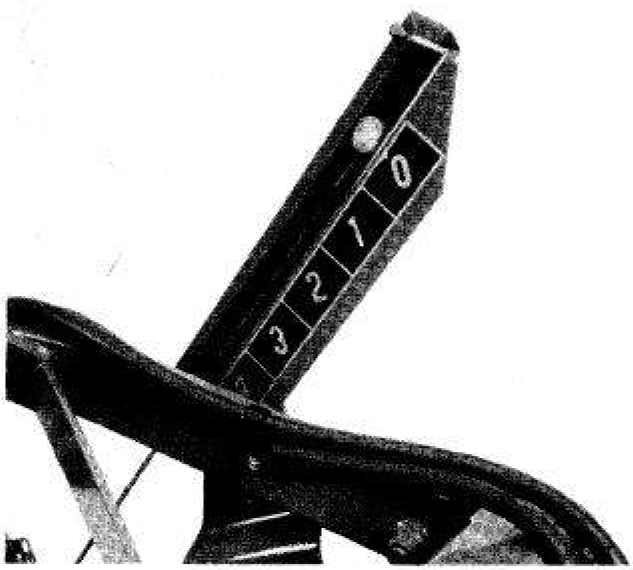
GENERAL INFORMATION—Continued

Range Indicator



H33928Y

Fig. 5-Range Indicator for Row-Crop Head



H50114

Fig. 6-Range Indicator for 200 Series Platform

The range indicator (Fig. 5 or 6) tells the operator where the row unit or flexible cutterbar is within its range. The operator can then manually raise and lower the platform to keep the row unit or flexible cutterbar within its float range.

Group 35
DIAL-A-MATIC HEADER HEIGHT CONTROL ELECTRICAL SYSTEM

GENERAL INFORMATION

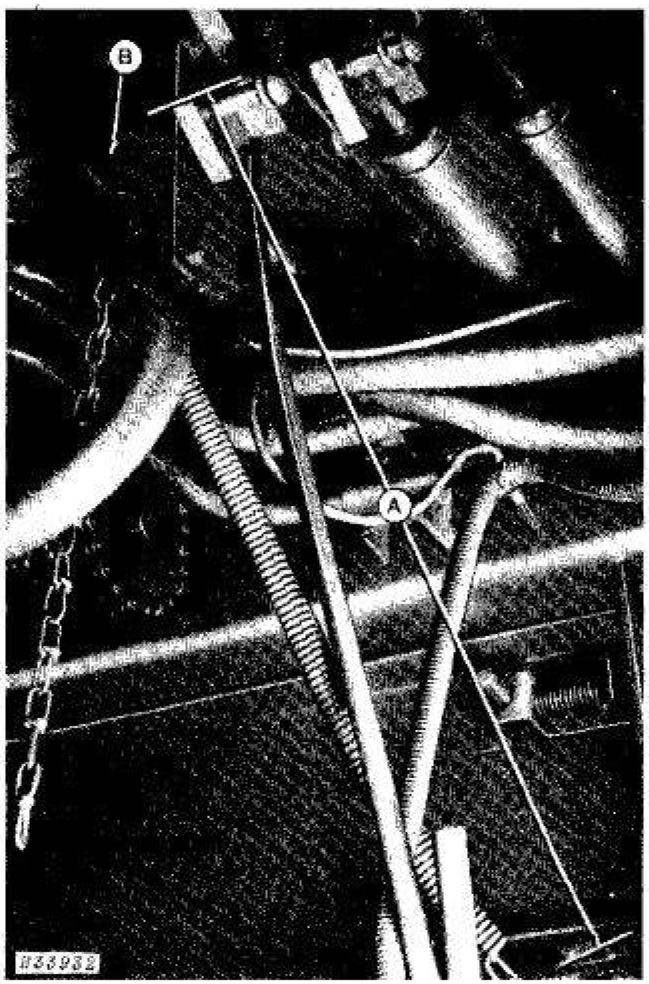
The electrical portion of the Dial-A-Matic header height control consists of these components. Refer to the wiring diagram at the end of this group to see how they are linked electrically.

COMPONENT	LOCATION	FUNCTION
Control Switch	Instrument Panel	To turn off system or to set it at any one of three positions for various ground conditions.
Actuating Switch	Under Operator's Platform	Shuts off system when the header is raised approximately (457 mm) 18 inches above ground.
Sensing Box	Lower right-hand side on platforms - upper left-hand side on row-crop heads.	Sensing box contains a brush, wiper arm and five printed circuit pads. Transmits on electrical signal to the amplifier.
Amplifier	Behind left-hand swing-up access panel on combine.	Receives low current signals from the sensing box on the header and amplifies this current into high powered signals to the solenoids on the auto header valve.
Raise and lower solenoids on the auto header valve	Next to operator's platform ladder	Activates the hydraulic system to raise or lower the header.
Circuit Box	Behind instrument panel	Protects the amplifier from transient electrical signals and reverse polarity. The circuit box contains a 20 amp circuit breaker to protect the entire system against shorts.

When the control switch is set at one of three positions by the operator, current exists between the ignition switch and the actuating switch. If the header is within (457 mm) 18 inches off the ground, the actuating switch is closed, causing a current to exist between the ignition switch and one of five printed circuit pads.

GENERAL INFORMATION—Continued

Actuating Switch



A—Chain Length **B—Chain**

Fig. 1-Actuating Switch

When the header is over 18 inches (457 mm) above the ground, the actuating switch is opened, turning off the header height control system (Fig. 1).

Shutting off the system in this manner allows the operator to turn around into new rows or to unload, without turning off the control switch on the instrument panel.

When the operator drives the combine into new rows, he lowers the header within 18 inches (457 mm) of the ground. This causes the actuating switch to close and the header height control system is turned on.

One end of chain (B) (Fig. 1) is attached to the feeder house; the other end is attached to an actuator arm. When the feeder house and header are lowered, chain (B) pulls the actuator arm away from actuator switch, causing it to close. Chain (B) is adjustable in length so that the switch closes when the header is within 18 inches (457 mm) of the ground.

If the chain is adjusted too long, it will not release the actuating switch and the header height control will not operate.

If the chain is adjusted too short, the header can be raised manually, but will continue to lower when the lever is released. Also, if the chain is adjusted too short, the system will not shut off unless the control switch is turned to the "OFF" position.

The length (A) of the actuating switch chain should be adjusted approximately 16 inches ± 1/2-inch (406 mm ± 13 mm). This chain length opens the actuating switch approximately 18 inches (457 mm) above the ground. Remember, this chain length is only a starting point and may require adjustment.

To adjust actuating switch chain length:

1. Note existing position of chain.
2. Remove hook and insert it in the desired link.

Control Switch

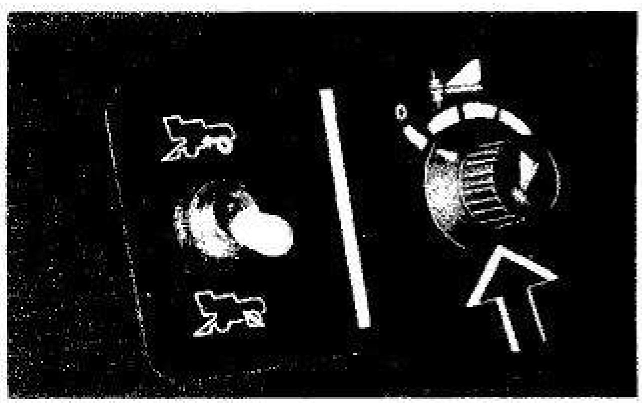


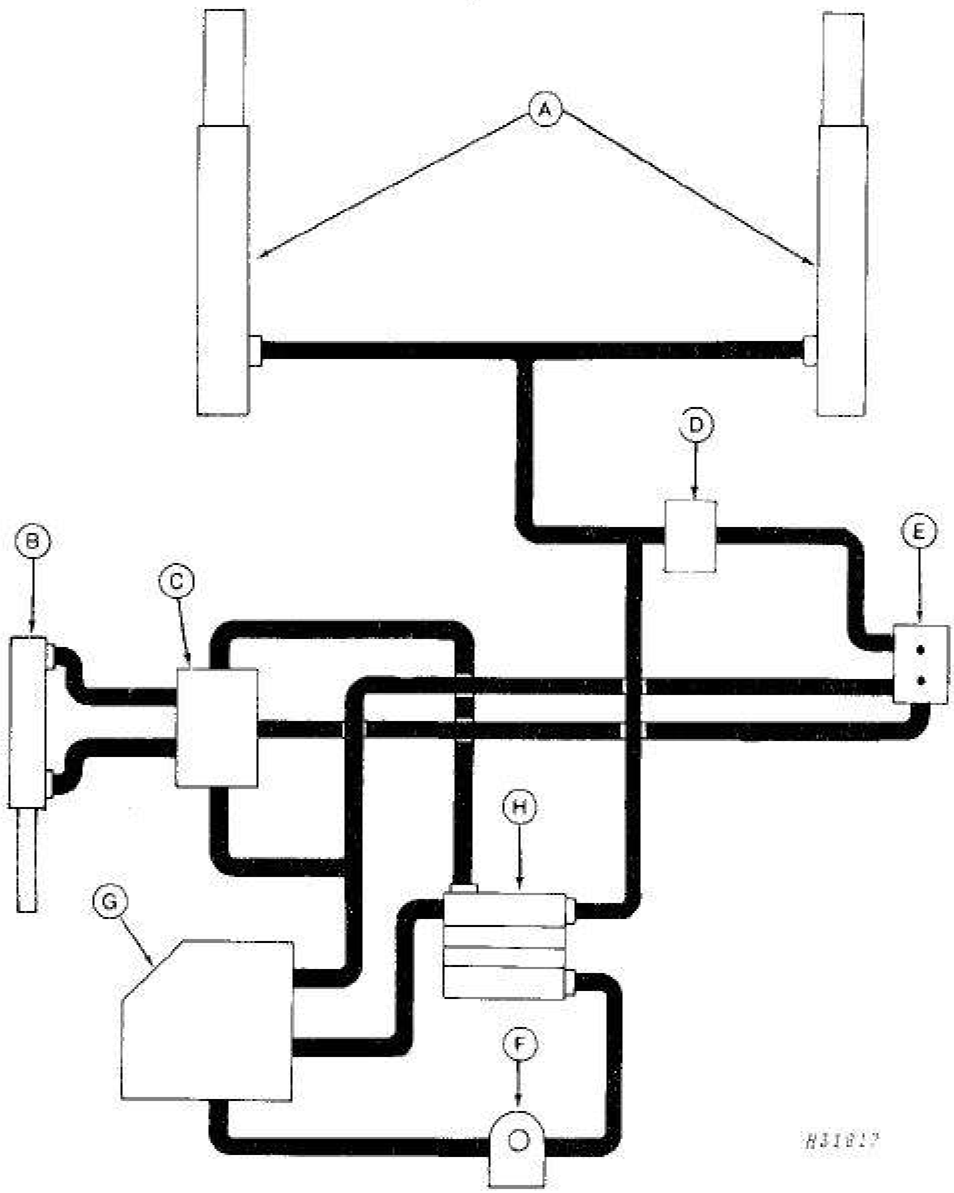
Fig. 2-Control Switch

The control switch for the header height control is mounted on the instrument panel (Fig. 2). This switch can turn off the system or set it to one of three positions.

IMPORTANT: Turn off the system when transporting the combine.

When the control switch is opened by the operator, the entire header height control system is turned off.

Group 40
DIAL-A-MATIC HEADER HEIGHT CONTROL HYDRAULIC SYSTEM



H31617

A—Header Lift Cylinders
B—Unloading Auger Cylinder
C—Secondary Control Valve
D—Drop Rate Valve
E—Auto Header Valve
F—Main Hydraulic Pump
G—Main Hydraulic Reservoir
H—Main Hydraulic System Control Valve

Fig. 1-Hydraulic Components—6620 and SideHill 6620 Combines

GENERAL INFORMATION

The Dial-A-Matic header height control system for the 6620 and SideHill 6620 Combines consists of the following components:

Two header lift cylinders (A) (Fig. 1) which raise and lower the header. Refer to Section 270 for information on these cylinders.

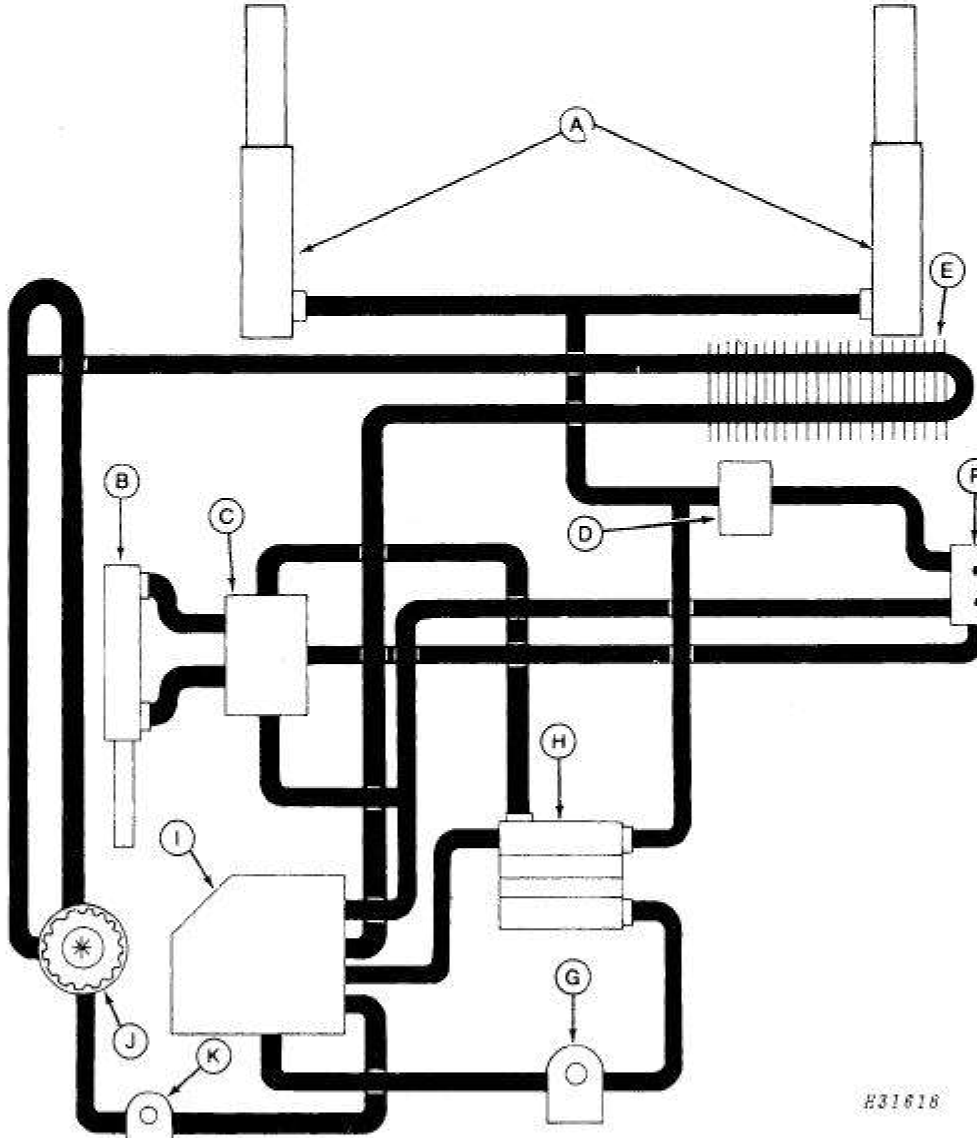
Secondary control valve (C) (Fig. 1) and unloading auger cylinder (B). Oil for the header height control circulates through these two components.

Drop rate valve (D) (Fig. 1) controls the speed of header drop. See this section for information on this valve.

An auto header valve (D) (Fig. 1) equipped with two solenoids transfers electrical energy to hydraulic energy to operate the system. See this section for operation of this valve.

Main system reservoir (G) (Fig. 1), main system control valve (H), and main system hydraulic pump (F) provide the basic hydraulic flow for the system. See Section 270 for information about these components.

GENERAL INFORMATION—Continued



H31618

A—Header Lift Cylinders
B—Unloading Auger Cylinder
C—Secondary Control Valve
D—Drop Rate Valve
E—Oil Cooler
F—Auto Header Valve
G—Main Hydraulic Pump
H—Main Hydraulic Control Valve
I—Main Hydraulic Reservoir
J—Reel Speed Control Valve
K—Reel Drive Pump

Fig. 2-Hydraulic Components—7720 Combine

The Dial-A-Matic header height control system for the 7720 Combine consists of the following components:

Two header lift cylinders (A) (Fig. 2) which raise and lower the header. Refer to Section 270 for information on the cylinders.

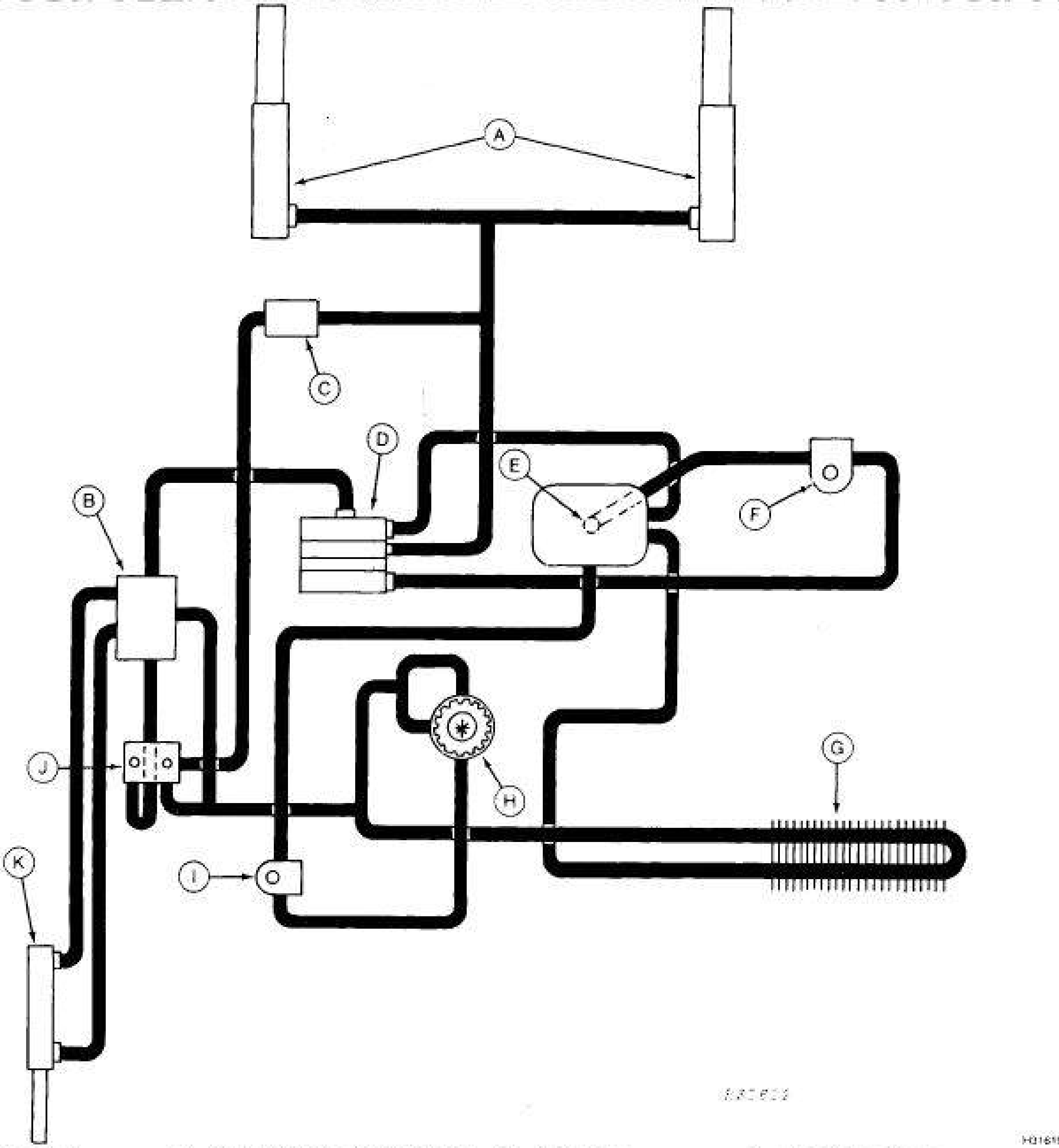
Secondary control valve (C) (Fig. 2) and unloading auger cylinder (B). Oil for the header height control circulates through these two components.

Drop rate valve (D) (Fig. 2) controls the speed of header drop. See this section for information on this valve.

An auto header valve (F) (Fig. 2) equipped with two solenoids transfers electrical energy to hydraulic energy to operate the system. See this section for operation and service of the valve.

An oil cooler (E) (Fig. 2) is used to cool the oil for the Dial-A-Matic header height control circuit. This oil also passes through the reel speed valve (J) and reel drive pump (K).

Main system reservoir (I) (Fig. 2), main system control valve (H), and main system hydraulic pump (F) provide the basic hydraulic flow for the system. See Section 270 for information about these components.



A—Header Lift Cylinders
B—Secondary Control Valve
C—Drop Rate Valve
D—Main Hydraulic Control Valve
E—Main Hydraulic Reservoir
F—Main Hydraulic Pump
G—Oil Cooler
H—Reel Speed Control Valve
I—Reel Drive Pump
J—Auto Header Valve
K—Unloading Auger Cylinder

Fig. 2A-Hydraulic Components—8820 Combine

The Dial-A-Matic header height control system for the 8820 Combine consists of the following components:

Two header lift cylinders (A) (Fig. 2A) which raise and lower the header. Refer to Section 270 for information on these cylinders.

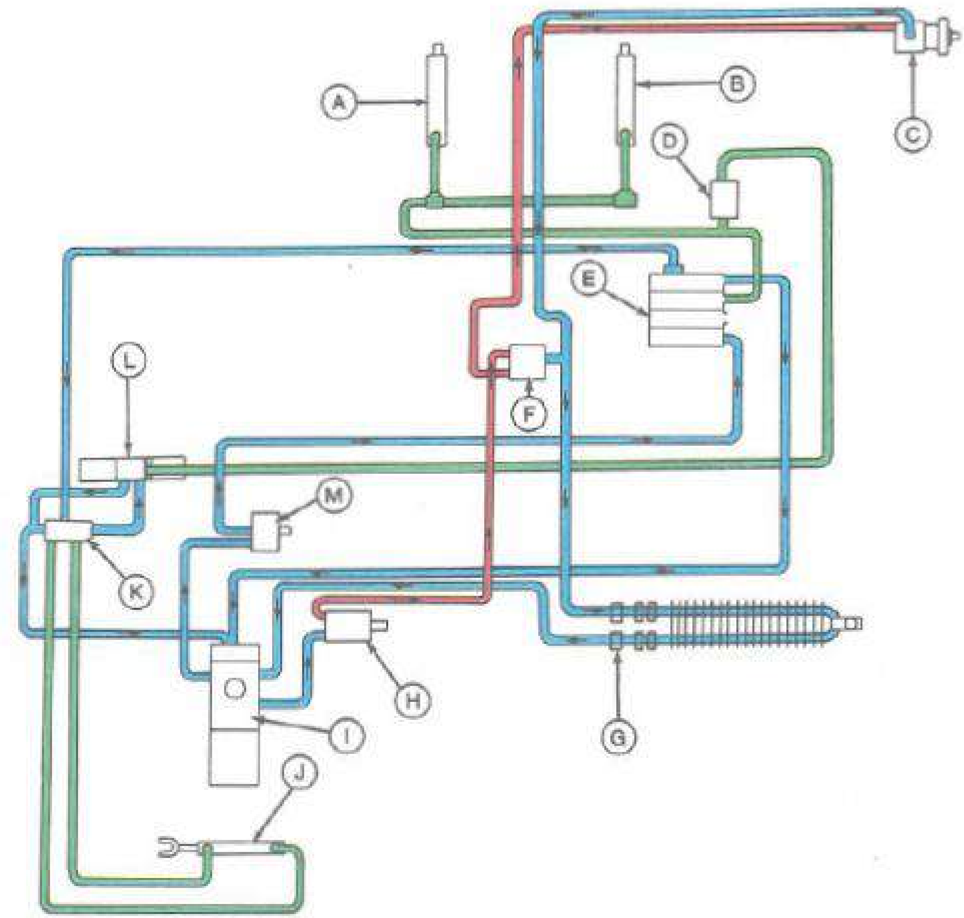
Secondary control valve (B) (Fig. 2A) and unloading auger cylinder (K). Oil for the header height control circulates through these two components.

Drop rate valve (C) (Fig. 2A) controls the speed of header drop. See this section for information on this valve.

An auto header valve (J) (Fig. 2A) equipped with two solenoids transfers electrical energy to hydraulic energy to operate the system. See this section for operation and service of the valve.

An oil cooler (G) (Fig. 2A) is used to cool the oil for the Dial-A-Matic header height control circuit. This oil also passes through the reel speed valve (H) and reel drive pump (I).

Main system reservoir (E) (Fig. 2A), main system control valve (D), and main system hydraulic pump (F) provide the basic hydraulic flow for the system. See Section 270 for information about these components.



H30401

A—L.H. Header Lift Cylinder
B—R.H. Header Lift Cylinder
C—Reel Drive Motor
D—Drop Rate Valve
E—Main Control Valve
F—Reel Flow Control Valve (7720 and 8820 Only)
G—Oil Cooler (7720 and 8820 Only)
H—Reel Drive Pump (7720 and 8820 Only)
I—Reservoir
J—Unloading Auger Swing Cylinder
K—Secondary Control Valve
L—Auto Header Valve
M—Main Hydraulic Pump
Pressure Oil
Pressure Free Oil
Trapped Oil

Fig. 3-Hydraulic System - Header Not Activated

Header Not Activated

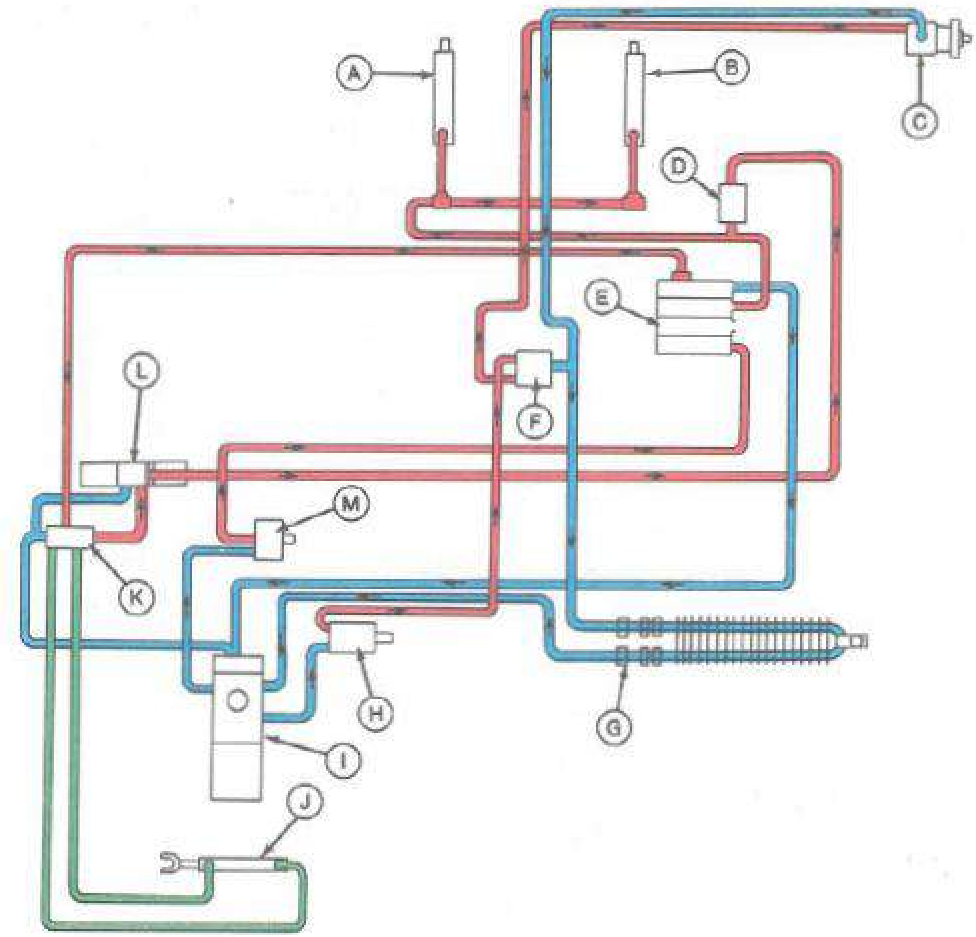
The electrical system has not activated either solenoid on the auto header valve (L, Fig. 3). The pilot check valve in the auto header valve and the lockout poppet in the main control valve (E) close, trapping oil in the header lift system.

Pressure free oil now flows from the reservoir (I, Fig. 3) to the main hydraulic pump (M) and then to the main control valve (E).

From the main control valve, approximately 4-3/4 gallons (18 L) of oil flows through a flow control plug in the valve and over to the secondary control valve (K, Fig. 3). The balance of the oil from the main control valve is then returned to the reservoir (I).

The secondary control valve (K, Fig. 3) then directs the 4-3/4 gallons (18 L) of oil to the auto header valve (L), where it flows through the valve and back to the reservoir (I).

GENERAL INFORMATION—Continued



H30408

H30402

A—L.H. Header Lift Cylinder
B—R.H. Header Lift Cylinder
C—Reel Drive Motor
D—Drop Rate Valve
E—Main Control Valve
F—Reel Flow Control Valve (7720 and 8820 Only)
G—Oil Cooler (7720 and 8820 Only)
H—Reel Drive Pump (7720 and 8820 Only)
I—Reservoir
J—Unloading Auger Swing Cylinder
K—Secondary Control Valve
L—Auto Header Valve
M—Main Hydraulic Pump
Pressure Oil
Pressure Free Oil
Trapped Oil

Fig. 4-Hydraulic System - Header Raising

Header Raising

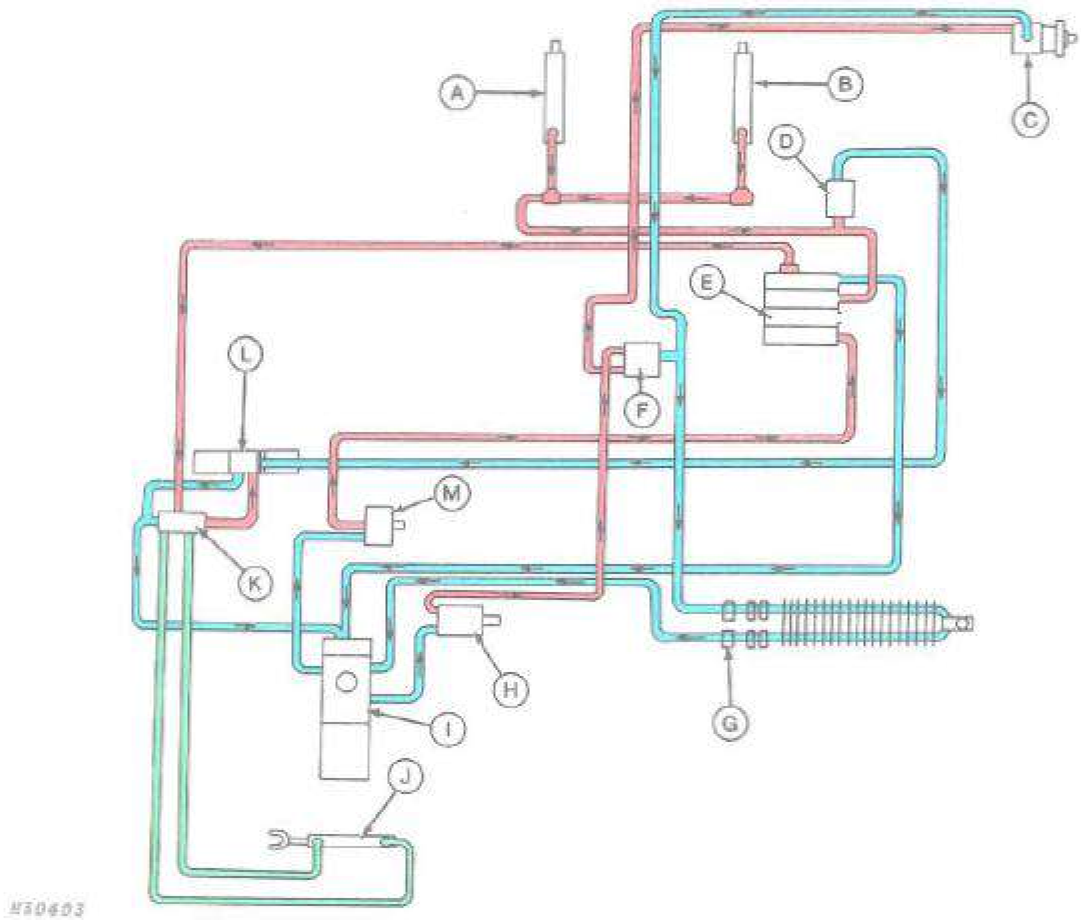
When field conditions require raising of the header, the header Dial-A-Matic height control hydraulic system is activated by the Dial-A-Matic header height control electrical system. Refer to Group 15 of this section for information on the electrical system.

The electrical system activates the raise solenoid on the header valve (L, Fig. 4). Pressure free oil flows from the reservoir (I) to the main hydraulic pump (M). The oil then flows, under pressure, from the pump to the main control valve (E).

Oil flows out of the flow control plug in the main control valve (E, Fig. 4) and to the secondary control valve (K). The secondary control valve directs oil to the auto header valve (L).

The auto header valve then directs this oil to the drop rate valve (D, Fig. 4). Oil flows, unrestricted, through the drop rate valve and into the header lift cylinders (A and B). The lockout poppet in the main control valve prevents oil from flowing back to the reservoir.

7720 and 8820 Combines are equipped with an oil cooler (G, Fig. 4), located in front of the radiator. It's function is to cool the hydraulic oil as it flows from the reel drive motor, before it is returned to the reservoir.



A—L.H. Header Lift Cylinder
B—R.H. Header Lift Cylinder
C—Reel Drive Motor
D—Drop Rate Valve
E—Main Control Valve
F—Reel Flow Control Valve (7720 and 8820 Only)
G—Oil Cooler (7720 and 8820 Only)
H—Reel Drive Pump (7720 and 8820 Only)
I—Reservoir
J—Unloading Auger Swing Cylinder
K—Secondary Control Valve
L—Auto Header Valve
M—Main Hydraulic Pump
Pressure Oil
Pressure Free Oil
Trapped Oil

Fig. 5-Hydraulic System - Header Lowering

Header Lowering

When field conditions require lowering the header, the Dial-A-Matic header height control hydraulic system is activated by the automatic header height control electrical system. Refer to Group 35 of this section for information on the electrical system.

The electrical system activates the lower solenoid on the header valve (L, Fig. 5). Pressure fill oil flows from the reservoir (I) to the main hydraulic pump (M). The oil then flows, under pressure, from the pump to the main control valve (E).

Oil flows out of the flow control plug in the main control valve (E, Fig. 4) and to the secondary control valve (K). The secondary control valve directs the oil to the auto header valve (L).

The auto header valve allows oil in the header lift system to flow back to the reservoir. Oil flows from the header lift cylinders (A and B, Fig. 5) to the drop rate valve (D). The lockout poppet in the main control valve prevents any oil from flowing back to the reservoir.

The drop rate valve meters the flow rate to control the rate of drop of the header. Oil flows from the drop rate valve to the auto header valve which directs this oil back to the reservoir.

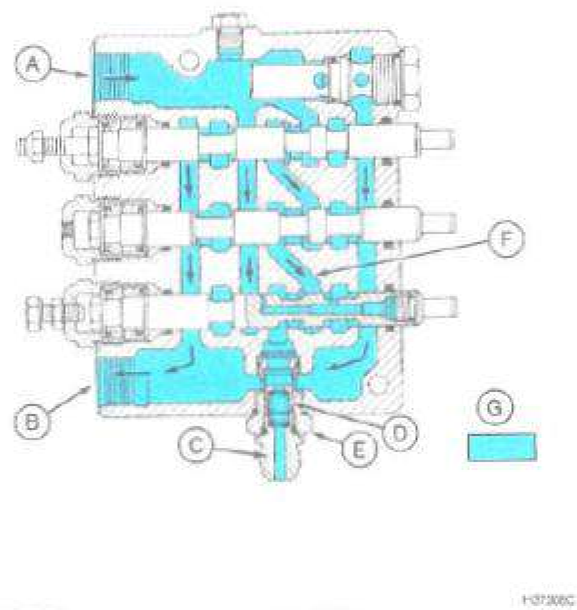
The oil cooler on 7720 and 8820 Combines allow the oil to be cooled before it is returned to the reservoir.

MAIN CONTROL VALVE

GENERAL INFORMATION

The Dial-A-Matic header height control hydraulic system obtains oil from the flow control plug in the main control valve. This same oil is also used to swing the unloading auger.

Height Control Not Activated

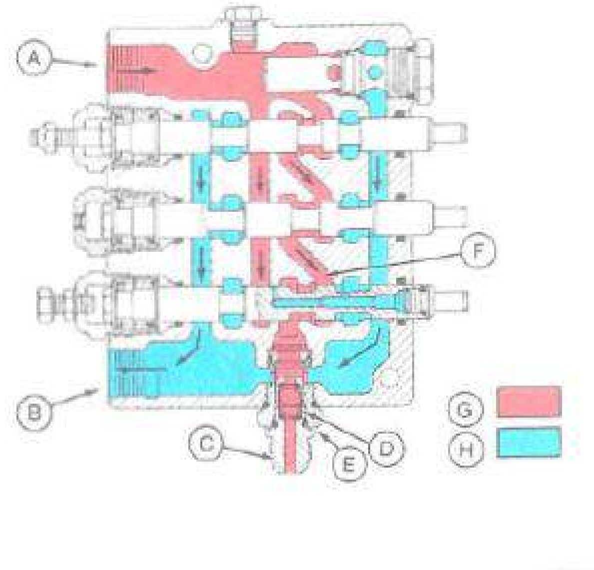


A—Inlet Port
B—To Reservoir
C—To Automatic Header Height Control System
D—Piston
E—Flow Control Plug
F—Free Flow Path
G—Pressure Free Oil

Fig. 6-Main Control Valve - Height Control Not Activated

Pressure free oil flows into port (A, Fig. 6) from the main hydraulic pump. Oil flows through the valve, along the free flow path (F). Piston (D), in flow control plug (E), meters the flow and moves outward to allow excess oil to flow to reservoir through port (B). Oil metered by the orifice in piston (D) flows through port (C) to the Dial-A-Matic header height control system.

Height Control Activated



A—Inlet Port
B—To Reservoir
C—To Automatic Header Height Control System
D—Piston
E—Flow Control Plug
F—Free Flow Path
G—Pressure Oil
H—Pressure Free Oil

Fig. 7-Main Control Valve - Height Control Activated

The electrical system activates either solenoid on the auto header valve activating the hydraulic system and causing a demand for pressurized oil. Oil flows through the valve along the free flow path (F, Fig. 7). Piston (D), in flow control plug (E), moves slightly inward to maintain pressure. The metered pressurized oil flows through the orifice in piston (D) and through port (C) to the Dial-A-Matic header height control system. Excess oil flows to reservoir through port (B).

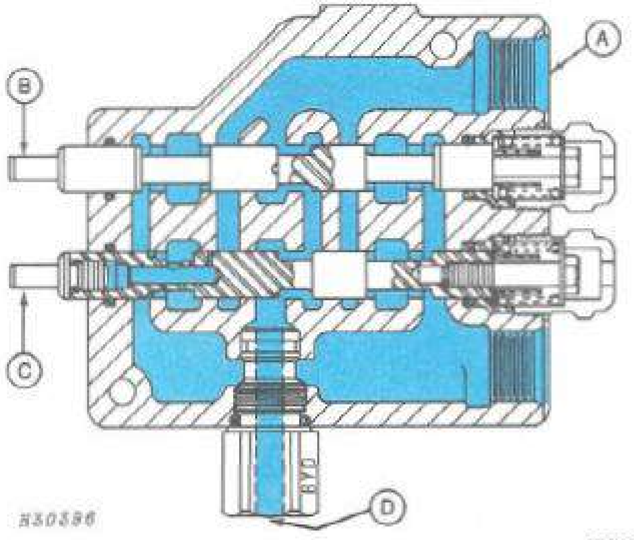
NOTE: Removal, repair, and installation of the main control valve is covered in Section 70 Hydraulic Systems Repair of this technical manual.

SECONDARY CONTROL VALVE

GENERAL INFORMATION

The Dial-A-Matic header height control hydraulic system and unloading auger swing hydraulic system use the oil coming from the flow control plug in the main control valve.

Height Control Not Activated

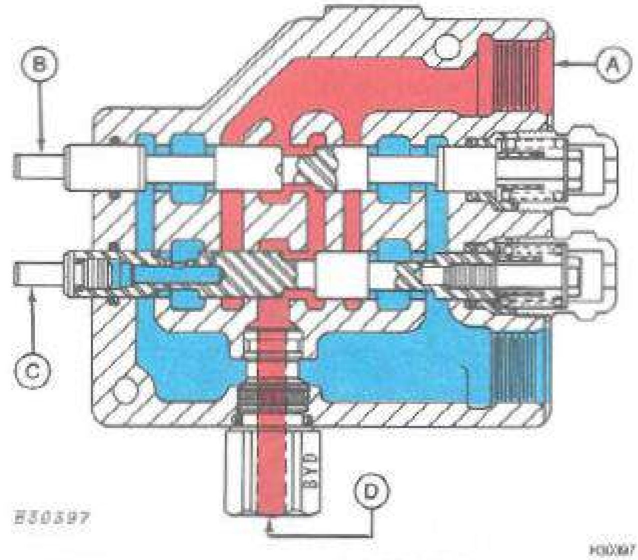


A—In Port
B—Spool
C—Spool
D—BYD Port
Pressure Free Oil

Fig. 8-Secondary Control Valve - Height Control Not Activated

Pressure free oil, from the flow control plug in the main control valve, flows into port (A) (Fig. 8). Spools (B and C) are centered. Pressure free oil flows around spools (B and C) and to the auto header valve through port (D).

Height Control Activated



A—In Port
B—Spool
C—Spool
D—BYD Port
Pressure Oil
Pressure Free Oil

Fig. 9-Secondary Control Valve - Height Control Activated

Pressurized oil, from the flow control plug in the main control valve, flows into port (A) (Fig. 9). Spools (B and C) are centered. Pressurized oil flows around spools (B and C) and to the auto header valve through port (D). High pressure oil is sent to the auto header valve for raising and lowering the header.

AUTO HEADER VALVE

GENERAL INFORMATION

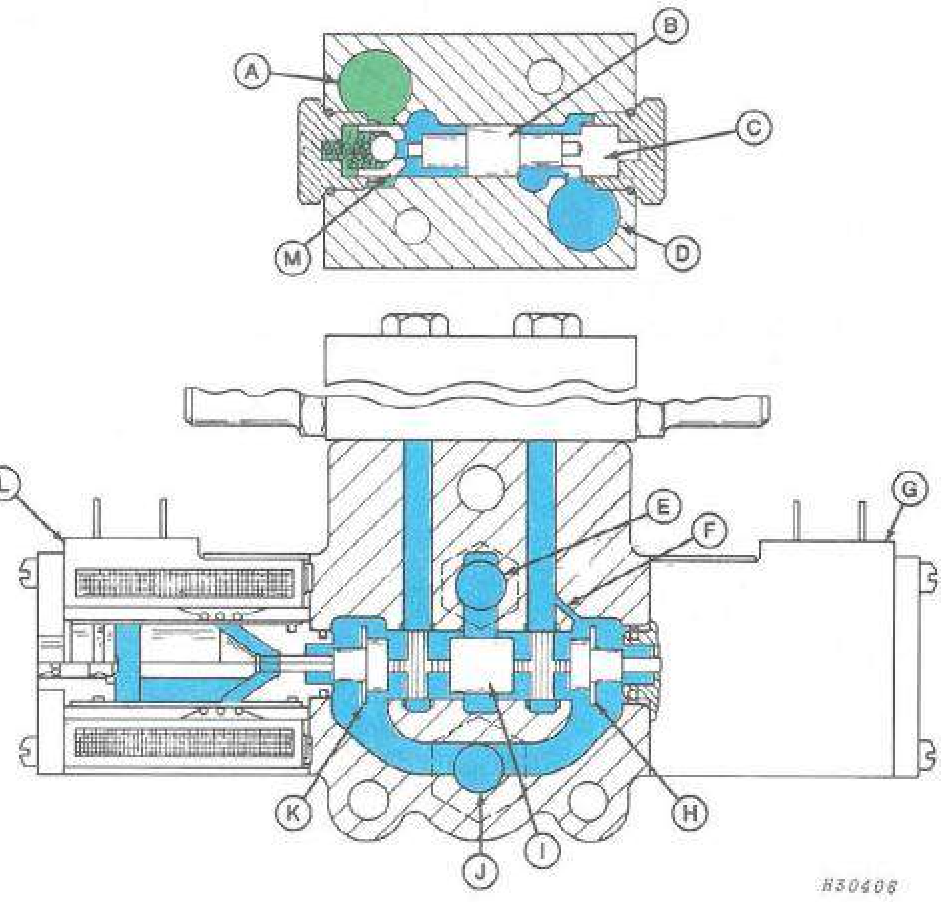
The auto header valve is located next to the operator's platform ladder. The auto header valve directs pressure oil to the header lift cylinders and directs return oil to the reservoir.

The leveling control valve for the SideHill leveling system and the auto header valve for the Dial-A-Matic header height control are similar in appearance, but they have these differences;

1. Only the SideHill leveling control valve has thermal relief valves.

2. The check block on the SideHill leveling control valve may be installed in either direction on the valve. The check block on the auto header valve must be installed in only one position. Mark check block to auto header valve before removal.

3. The auto header valve contains an internal orifice or leak off passage, the SideHill valve does not. Remove the raise solenoid to see this orifice.



H30406

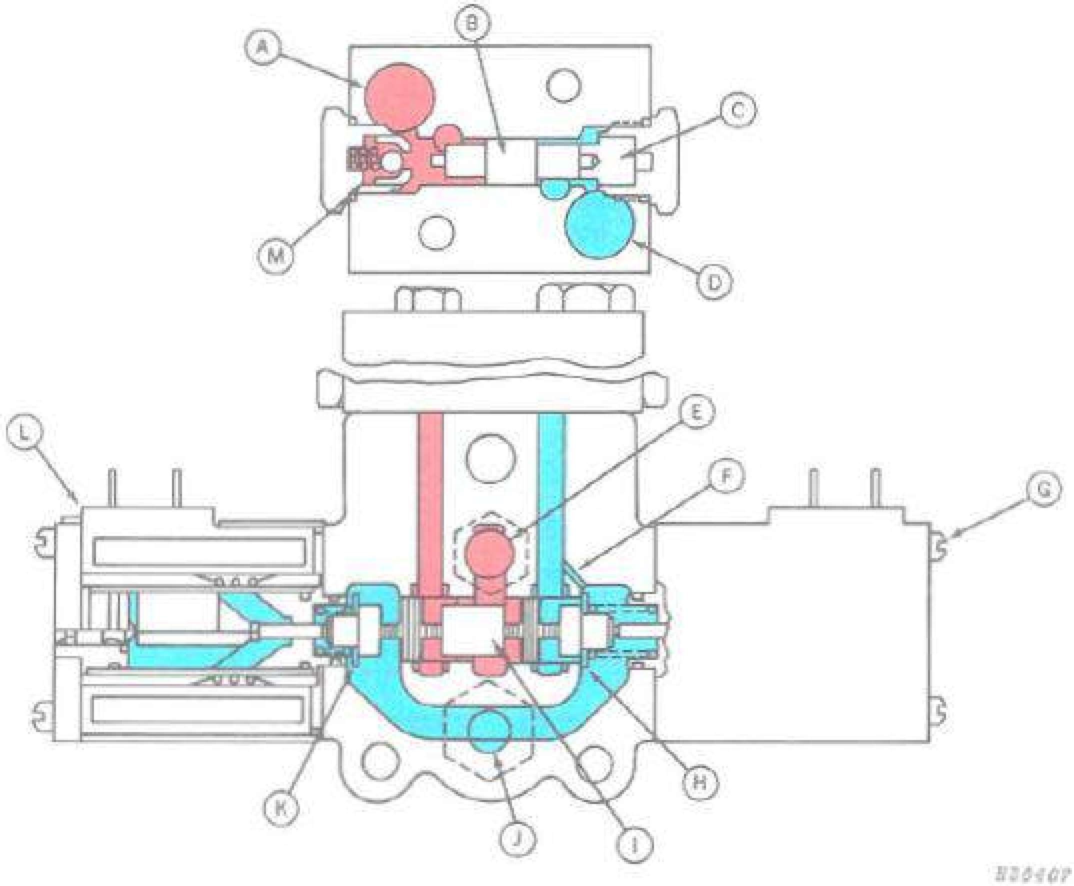
A—To Drop Rate Valve
B—Spool
C—Plug
D—Plugged Port
E—Pressure Port
F—Orifice
G—Raised Solenoid
H—Slotted Washer
I—Spool
J—Return Port
K—Slotted Washer
L—Lower Solenoid
M—Pilot Check Valve
Pressure Free Oil
Trapped Oil

Fig. 10-Auto Header Valve - Header Not Activated

Header Not Activated

Neither solenoid on the auto header valve is activated. Springs center spool (I, Fig. 10) allowing pressure free oil to flow into port (E), around spool (I), through slotted washers (H and K) and to reservoir through port (J). Pilot check valve (M) closes, trapping oil in the header lift system.

GENERAL INFORMATION—Continued

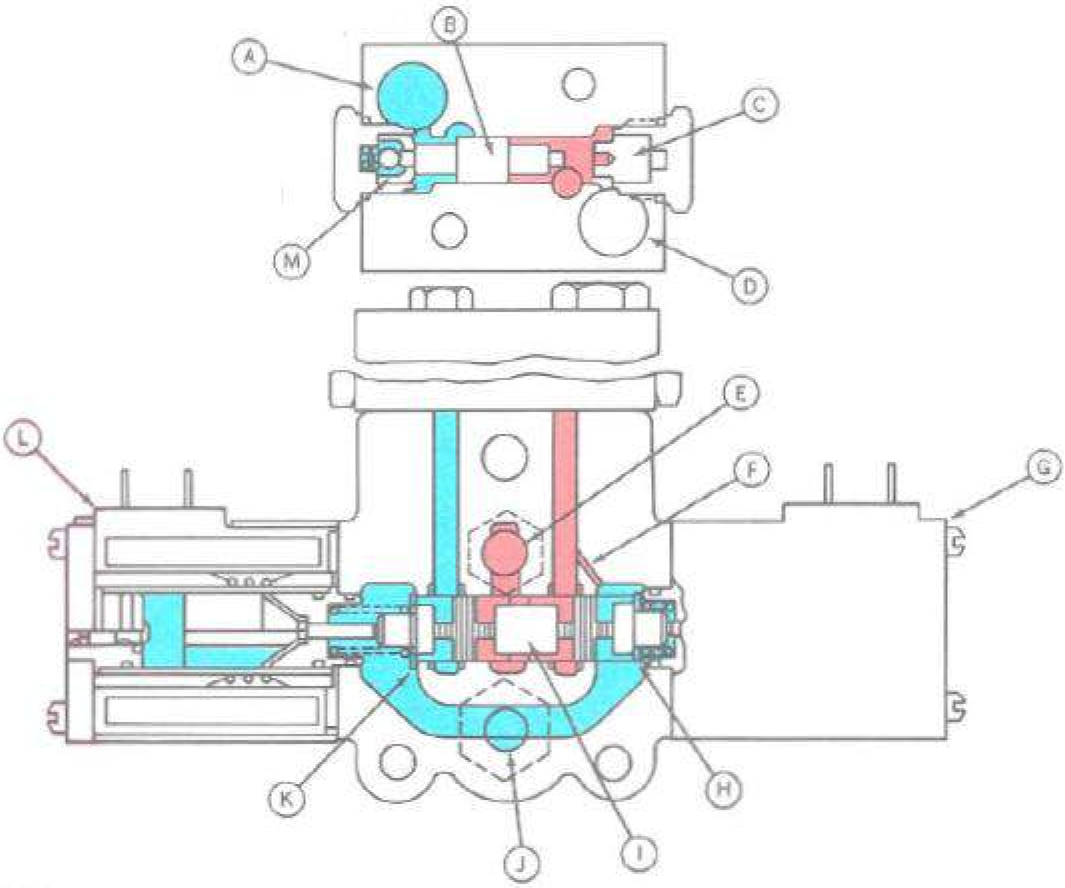


A—To Drop Rate Valve	E—Pressure Port	I—Spool	M—Pilot Check Valve
B—Spool	F—Orifice	J—Return Port	Pressure Oil
C—Plug	G—Raise Solenoid	K—Slotted Washer	Pressure Free Oil
D—Plugged Port	H—Slotted Washer	L—Lower Solenoid	

Fig. 11-Auto Header Valve - Header Raising

Header Raising

To raise the header, raise solenoid (G, Fig. 11) is activated by the Dial-A-Matic header height control electrical system. The activated raise solenoid (G) pushes in or moves to the left spool (I). This causes pressure oil from port (E) to flow around spool (I) up to pilot check valve (M), causing it to open. Open pilot check valve (M) allows pressure oil to flow to the drop rate valve and then to the header lift cylinders. The pressure oil also forces spool (B) to the right. Plug (C) limits the travel of spool (B). Slotted washer (H) limits the travel of spool (I).



A—To Drop Rate Valve
B—Spool
C—Plug
D—Plugged Port
E—Pressure Port
F—Orifice
G—Raise Solenoid
H—Slotted Washer
I —Spool
J—Return Port
K—Slotted Washer
L—Lower Solenoid
M—Pilot Check Valve
Pressure Oil
Pressure Free Oil

Fig. 12-Auto Header Valve - Header Lowering

Header Lowering

To lower the header, raise solenoid (L, Fig. 12) is activated by the Dial-A-Matic header height control electrical system. The activated raise solenoid (L) pushes in or moves to the left spool (I). This causes pressure oil from port (E) to flow around spool (I) up to spool (B), causing it to move to the left, causing pilot check valve (M) to open.

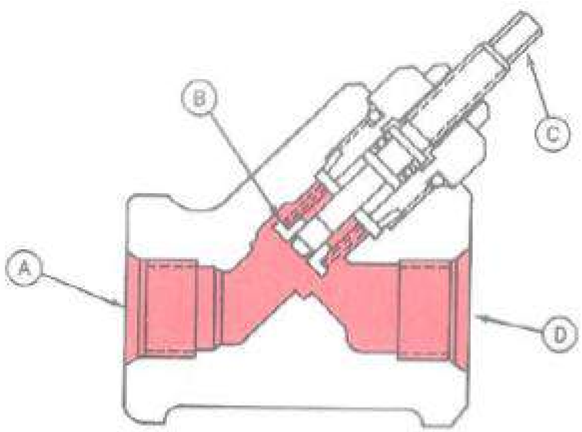
Open pilot check valve (M), allows return oil from the header lift cylinders to flow through port (A), around spool (I), through slotted washer (K), and to reservoir through port (J). Orifice (F) allows the pressure oil to flow to reservoir without losing the pressure required to move spool (B).

DROP RATE VALVE—CONTINUED

GENERAL INFORMATION

The drop rate valve controls the rate of drop of the header. The drop rate valve affects the rate of drop, only for Dial-A-Matic header height control.

Header Raising



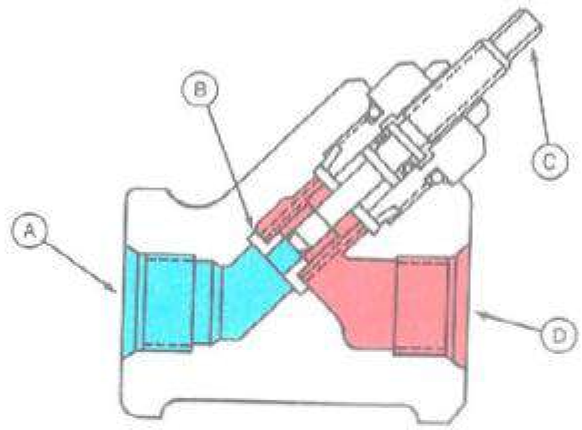
H30409

A—From Auto Header Valve
B—Poppet
C—Adjusting Screw
D—To Platform Lift Cylinders
Pressure Oil

Fig. 13-Drop Rate Valve - Header Raising

Pressure oil flows from the auto header valve to port (A, Fig. 13). The pressure oil moves back poppet (B) and flows unrestricted to the header lift cylinders through port (D).

Header Lowering



H30410

A—From Auto Header Valve
B—Poppet
C—Adjusting Screw
D—To Platform Lift Cylinders
Pressure Oil
Pressure Free Oil

Fig. 14-Drop Rate Valve - Header Lowering

Pressure oil flows from the header lift cylinders to port (D, Fig. 14). Oil is metered through two slots in poppet (B) and flows through port (A) to the auto header valve. The amount of the slot exposed in poppet (B) is dependent upon how far adjusting screw (C) is turned in. Turning adjusting screw (C) inwards, slows down the rate of drop; turning it out, speeds up rate of drop.