

Group 10 - Air Conditioning System Diagnosis

Group 25 - Air Conditioning Theory of Operation

Section 299 - DEALER FABRICATED TOOLS

Group 05 - Dealer Fabricated Tools

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Group 10 - General Reference Information

Specifications

POWER

POWER:

At PTO (Factory Observed at 2100 rpm)

7210 70.9 kW (95 hp)

7410 78.4 kW (105 hp)

7510 85.6 kW (115 hp)

ENGINE:

Type Diesel

Aspiration Turbocharged

Cylinders In-line 6

Slow Idle Speed 850 ± 50 rpm

Rated Engine Speed 2100 rpm

Operating Speed Range 1500—2100 rpm

Bore and Stroke 106.5 x 127.0 mm (4.19 x 5.00 in.)

Compression Ratio 17.0:1

Displacement 6.8 L (414 in. ³)

Firing Order 1-5-3-6-2-4

Valve Clearance

Intake 0.35 mm (0.014 in.)

Exhaust 0.45 mm (0.018 in.)

Lubrication System Full Pressure-full Flow Filtration

FUEL SYSTEM:

Type Direct Injection

Injection Pump Type Rotary

Injection Pump Timing TDC

Air Cleaner Dry Type Dual Element

COOLING SYSTEM:

Type

..... 69 kPa
(0.7 bar)
(10 psi)
with Centrifugal Pump Fan

North America Viscous Drive

Export Standard Direct Drive

Export Optional Viscous Drive

Thermostats Two Heavy-duty

Capacities

CAPACITIES:

Fuel Tank (Base, Hi-Crop, and High Clearance)
..... 190 L
(50 gal)

Fuel Tank (Optional for Extra Clearance)
..... 151 L
(40 gal)

Cooling System
..... 21 L
(22 qt)

Crankcase with Filter
..... 19 L
(20 qt)

Transmission, Differential and Hydraulic System

Group 10 - Brakes

Brakes Function Erratically

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Observable Symptoms

→NOTE:

Any recent repairs to the Steering / Hydraulic system may cause problems such as air in the Brake System. Determine if this is the case, and if so bleeding the brakes may only be necessary.

→NOTE:

Service Code diagnosis may resolve this observable symptom and must be performed first. Consult with customer for resolution of unrelated codes. See Additional References for Service code descriptions.

Additional References:

- [Clear Diagnostic Codes](#)
- [Brake Pistons, Plates and Disks Operation](#) .

(1) Brake Operational Check

Action:

→NOTE:

Resolve all codes before proceeding.

If any of the following symptoms are present check the line connections to the valve.

- When applying either right or left brake it doesn't function normally, however, opposite brake operates correctly.
- Applying one pedal engages both brakes.
- With engine off, brake pedals have inconsistent travel distance.
- Problems with hydraulic trailer brake operation.

Install pressure gauge into Load Sense pressure port.

Depress brake pedals one at a time and observe Load Sense pressure reading.

If Load Sense pressure is low for left or right pedal only, brake line and load sense line for opposite pedal are swapped under cab.

Remove cab floor mat and floor pan and swap opposite brake line and Load Sense line.

Result:

YES: Problem solved. Diagnosis complete.

Electrical Schematic Symbols

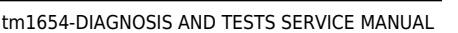
	ChassisGround		Operated Mechanically
	Single Point Ground		Operated by Pushing
	Case Ground		Operated by Pulling
	Circuit Connecting Dot		Operated by Turning
	Twisted Wires		Operated by Lever
	Male Terminal (Pin)		Operated by Pedal
	Female Terminal (Socket)		Operated by Key
	Connector Pin and Socket (Mated)		Operated by Pressure
	Multiple Pin Connector		Operated by Temperature
	Multiple Socket Connector		Thermal Effect
	Connector Assembly (Male Terminals)		Detent
	Connector Assembly (Female Terminals)		Mechanical Position

Electrical Schematic Symbols

LEGEND:

A9	ROW-TRAK™ (Optional) (SE11, W2)
F8	ROW-TRAK™ Guidance (LHP) (Optional)
H10	ROW-TRAK™ Guidance Display (LHP) ⁵ (SE12, W2)
K41	Hi-Ram Dual Relay (Optional) (Not On Load Center) (SE11, W2)
M10	Row Guidance Actuator Motor (Optional) (SE11, W2)
R11	Row Guidance Probe Position Sensor (Optional) (SE12, W2)
R12	Row Guidance Lateral Position Sensor (Optional) (SE12, W2)
X25	EOL Programming Connector
Y28	Row Guidance Auxiliary Right Solenoid (Optional) (SE11, W2)
Y29	Row Guidance Auxiliary Left Solenoid (Optional) (SE11, W2)
Y30	Row Guidance Right Solenoid (Optional) (SE11, W2)
Y31	Row Guidance Left Solenoid (Optional) (SE11, W2)

XXX



Action:**→NOTE:**

The time interval between sweeps of the wiper arm are based on the speed of the tractor and vary from 12 seconds at 0 kph (0 mph) to approximately 6 seconds at maximum tractor speed.

Disconnect connector ("L1" — "Y2") at the CCU.

With the front wiper switch at the intermittent position, multimeter should show a steady battery voltage reading at terminal "L2" of the CCU harness connector.

→NOTE:

Relay K25 is grounded intermittently, for one second at a time, through the CCU, to turn the wiper motor on during the wiper circuit intermittent cycle. The one second interval is an average that varies with tractor speed.

Ground terminal "S2" of the HARNESS side of the connector. The wiper motor should operate. If it does and the wiper motor does not operate with the connector installed, the CCU is defective.

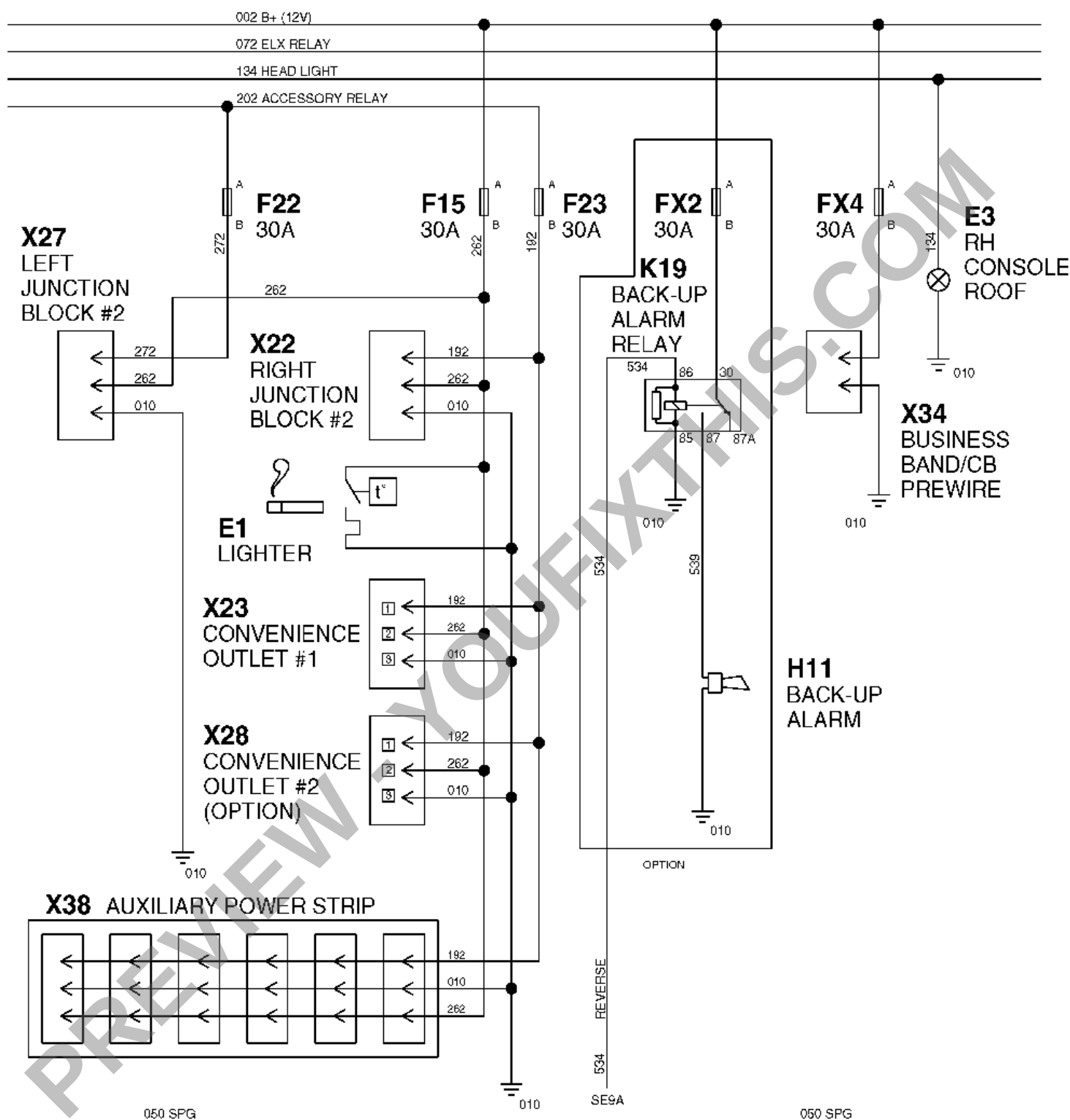
Result:

YES: Intermittent wiper circuit operation is good. Diagnostic complete.

NO: Replace CCU if harness is good. [GO TO \(1\)](#).

Group 15G - Accessory Connector and Lighter Circuit Diagnosis

Accessory Connector Circuit—SE6



RW70587

Ⓐ SCHEMATIC (SE6)

Accessory Connector Circuit Schematic SE6

CCU Diagnostic Mode (Fuel Level Sender)

Using CCU Diagnostic Mode

→NOTE:

The CCU diagnostic mode may be used to check output voltage of the fuel level sender. Refer to the following on-board diagnostic procedure.

→NOTE:

The performance Monitor (analog) can be used to perform the same calibration and diagnostic functions as the tachometer (digital), SEE "Performance Monitor—Calibration and Diagnostic Mode", in this Section, Group 20.

(1) Access On-Board CCU Diagnostic Mode

Action:

Insert a fuse in location F10 on the load center.

Turn key switch ON.

Operate right turn signal until the lower display window shows "CCU".

Pull flash-to-pass switch toward steering wheel to access CCU diagnostic mode.

→NOTE:

The CCU is now in diagnostic mode. All other controllers are in "standby" mode.

Result:

YES: [GO TO \(2\)](#) .

(2) Address 16—Fuel Level Sender

Action:



Digital Display

Access [CCU Address 16](#) in the upper display window.

A typical display would be "04.2".

The output of the fuel level sender is monitored at this address. The normal range is 0 volts (00.0) for an empty tank to 5 volts (05.0) for a full tank.

Group 15AC - Display Modules

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Result:

YES:All unit symbols displayed with no codes. [GO TO \(13\)](#) .

NO:Codes were displayed, [GO TO \(9\)](#) .

NO:Some control unit symbols did not display. [GO TO \(10\)](#) .

NO:Tach stuck on "diA" display, [GO TO \(11\)](#) .

(9) CONTROL UNIT CODES DISPLAYED DURING "RECALL CODES"**Action:**

See Section 240, Group 4 verify the description of the codes. Follow the instructions for codes that relate to control unit power-up and CCD Network Communication problems at this time only to isolate and repair the malfunction, using the "Control Modules Schematic". Also [GO TO](#) 18 [AND](#) 19 as required to check for open or shorted circuits.

IMPORTANT:

Turn the key "OFF" before disconnecting or reconnecting any control unit or tachometer.

Result:

YES:Repair as necessary. [GO TO \(2\)](#) .

(10) CAUSES FOR NO DISPLAY OF CONTROL UNIT SYMBOL DURING "RECALL CODES"**Action:****IMPORTANT:**

Turn key switch "OFF" before disconnecting or reconnecting any control unit or tachometer. Ground all control units before wiping, brushing or blowing dirt or dust from the control units.

→NOTE:

The CCU and tachometer must operate normal before other control unit problems can be isolated. Start troubleshooting at the CCU first, then follow the next control unit that did not display in the normal sequence: CCU, HCU, rcu,

[Optional Equipment]

PrF,

[Optional Equipment]

and LHP

[Optional Equipment]

a. Check battery power and ground circuits for the control unit that did not display. See "Control Modules Schematic" Section 240, Group 15 for the specific control unit connector and terminal numbers. Also [GO TO](#) 18 to check for "opens". OK: 10b

b. Check CCD Network voltage on circuits 924 and 925 at the control unit connector for the unit that did not display. Compare these voltage readings to the CCD Network voltage OF [STEP 5. GO TO](#) Steps 18 [AND](#) 19 to check for open and shorted circuits. OK: GO TO 10c

c. If CCU, HCU, rcu or LHP did not display during the "recall codes", check "Diagnostic Circuit" 312 at the control unit connector for battery voltage. The key switch must be "ON" and diagnostic fuse F10 installed. OK: GO TO 10d

d. Check the terminals of the control unit and the connector for making good contact. OK: GO TO 10e

e. If the circuits and terminals to the control unit are good, the control unit is faulty.



Tractor Eng Start Count Digital Display

→NOTE:

Nine digits are reserved for the total engine starts number display. Three separate addresses of three digits each are used. The first address ("CCU Address 40 "), is for the left three digits, the second address ("41"), is for the center three digits and the last address ("42"), is for the right three digits.

The total number of engine starts, since the tractor was built, are displayed. An engine start is counted anytime the ignition is ON and engine speed reaches 1024 rpm or more.

→NOTE:

Example shows "000,001,234" or 1,234 engine starts.

Result:

YES: [GO TO \(9\)](#) .

(9) Tractor Elapsed Engine Hours

Action:

This is normally a Read Only Address, however if the CCU is replaced, the new CCU5 controller will have a one time calibration to transfer the engine hours count. (See One Time Calibration of Addresses "[CCU Address 43](#) ", "44" and "45", this group).

Access [CCU Address 43](#) in the upper display window.

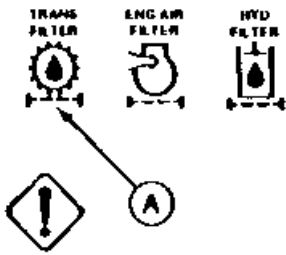
- For codes 35,72,73,78,79,80,81,85,86,93, repair before continuing with test procedure at step 3.
- For codes 17,18,26,75, repair now or after completing test procedure. These codes will not affect this continued diagnostic procedure.

Result:

YES:No Codes: [GO TO \(3\)](#) .

(3) Transmission Filter Check**Action:****LEGEND:**

A Transmission Filter Lamp

**Transmission Filter**

Operate engine at wide open throttle for 10—15 seconds.

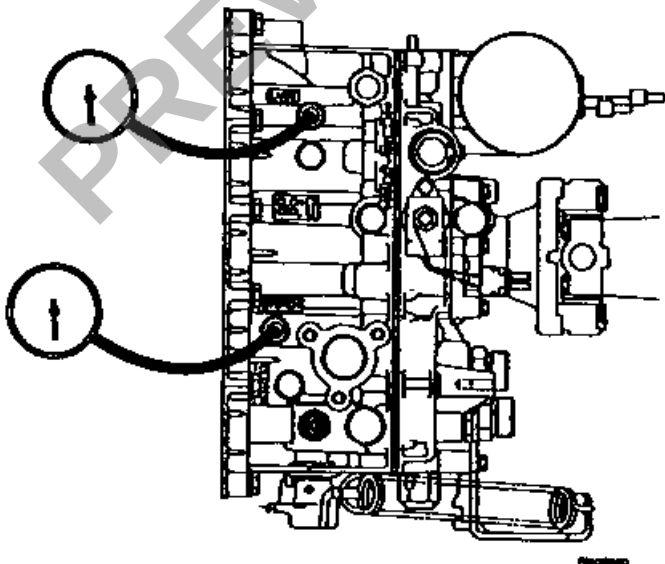
Transmission filter lamp (A) should stay OFF.

Result:

YES:Lamp off: [GO TO \(4\)](#) .

NO:Lamp on: Change filter and repeat step.

NO:Lamp on after changing filter: Check electrical, see Section 240.

(4) Install Test equipment**Action:**

Result:

YES:Exit diagnostic (beep) mode.

Neutral Start Switch Test Procedure

[1] - Start engine with Reverser controller in normal mode (not in diagnostic), range selector in neutral, and reverser lever in neutral.

[2] - Wait 6 to 7 seconds, then move reverser lever from neutral to forward or reverse.

If the reverser lever stays in the direction commanded without being held, then the neutral start switch is NOT stuck in the not neutral position (open). If this is the case, continue on with step 3.

If the reverser lever returns instantly to the neutral position, then the neutral start switch may be stuck in the not neutral position (open). Verify by checking the stored fault codes on the RCU using diagnostic mode 1.

- If the neutral start switch is stuck in the not neutral position (open) AND the Reverser lever is not commanding direction, then fault code 53 will be stored.
- If a different fault code is stored, take the action necessary for that fault code.

[3] - Leave the controller in normal mode, range selector in neutral, and the reverser lever in the direction previously commanded.

[4] - Wait 6 to 7 seconds and if the reverser lever stays in the direction commanded during this time without being held, then the neutral start switch is not stuck in the neutral position (closed).

If this is the case, return the reverser lever to the neutral position. The neutral start switch is operating properly.

If the reverser lever returned to the neutral position without being moved manually, then the neutral start switch may be stuck in the neutral position (closed). Verify by checking the stored fault codes on the RCU using diagnostic mode 1.

- If the neutral start switch is stuck in the neutral position (closed) AND the reverser lever is commanding direction AND the enable pressure switch indicates pressure, then fault code 51 will be stored.
- If a different fault code is stored, take the action necessary for that fault code.

EOV Circuit

The operation of the Engagement Override Valve is controlled by operation of the Fwd-Rev Control Valve.

- Operation if start-up occurs in neutral: System 1 oil overcomes spring pressure at 175 kPa (2 bar) (25 psi) to provide passage for clutch pressure to Fwd-Rev Valve.
- Operation if start-up occurs in gear: System 1 oil flows through the Fwd-Rev Valve to EOV to assist EOV spring. This spring and pressure oil shuts off clutch pressure at the EOV.

EOV Circuit

Stage 1	Closed	Path from Fwd-Rev Valve to spring end of EOV
Stage 2	25 psi	Path from clutch pressure to Fwd-Rev Valve Path from spring side of EOV to high sump

→NOTE:

The term high sump is used because the dumping of oil to sump is physically located in a high position. This allows the elements and lines to stay nearly full of oil so the element fill time is considerably shorter.

The C₄ element dumps to sump through the clutch oil manifold at a point whose height is between regular and high sump. Thus, the term intermediate sump. This allows some oil to stay in the line but protects from self-engagement of C₄ . All other valving is considered to be high sump.

Reverse—Tractor Started in Neutral

System 1 oil acts on the head end of the EOV forcing the valve upward against spring pressure. System 1 oil also flows (only when in Forward or Reverse) to and through the Fwd-Rev Valve to the spring end of the EOV. Since the EOV has been moved upward, oil cannot act on the spring end of the valve. A path is now open for clutch oil to flow through the EOV to the Fwd-Rev Valve and on to the reverse brake piston.

7	System Pressure
8	Pressure Regulating Valve
9	Transmission Filter Sensor
10	Transmission Filter Relief Valve
11	Filter
12	High Temperature Sensor
13	Pump
14	Front Cover
15	Inlet Screen
16	Low Temperature Sensor
17	Cooler Relief Valve
18	Lube Relief Valve
19	Tractor Oil Cooler
20	Transmission Lube
21	Clutch Cooling
22	Clutch
23	Centrifugal Force
X	Test Port

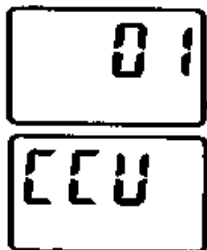
Shift Operation

Gears or ranges are shifted from the operator's cab. When shift lever is moved, the corresponding rod linkage causes radial shaft movement. The radial shaft positions the shifter shaft and shifter cam, which in turn causes axial shifter shaft movement. The shifter fork, located on shifter shaft, moves shift collar of synchronizer unit and the corresponding gear is engaged. Locking pins are located between shifter shafts so that only one gear or range can be shifted at a time.

Result:

YES: [GO TO \(1\)](#) .

NO:SEE [Section 240, Group 15](#).

(3) MFWD Dash Symbol and CCU Fault Code Check**Action:****Stored Codes Digital Display**

Key switch at "ON" position, engine "OFF".

MFWD switch at "OFF" position, and MFWD symbol is "OFF" after lamp check cycle.

CCU Address "01" should have no fault codes.

→NOTE:

If there are no stored codes, the display will continually cycle from "CCU" to "000".

→NOTE:

The performance monitor can be used to perform the same calibration and diagnostic functions as the tachometer, SEE "Performance Monitor-Calibration and Diagnostic Mode", in Section 240, Group 20.

Result:

YES: [GO TO \(6\)](#) .

NO:Code 86 and MFWD symbol flashing. [GO TO \(4\)](#) .

NO:Code 72, and PTO symbol flashing, and MFWD symbol steady. [GO TO \(5\)](#) .

(4) Code 86 and MFWD Symbol Flashing**Action:**

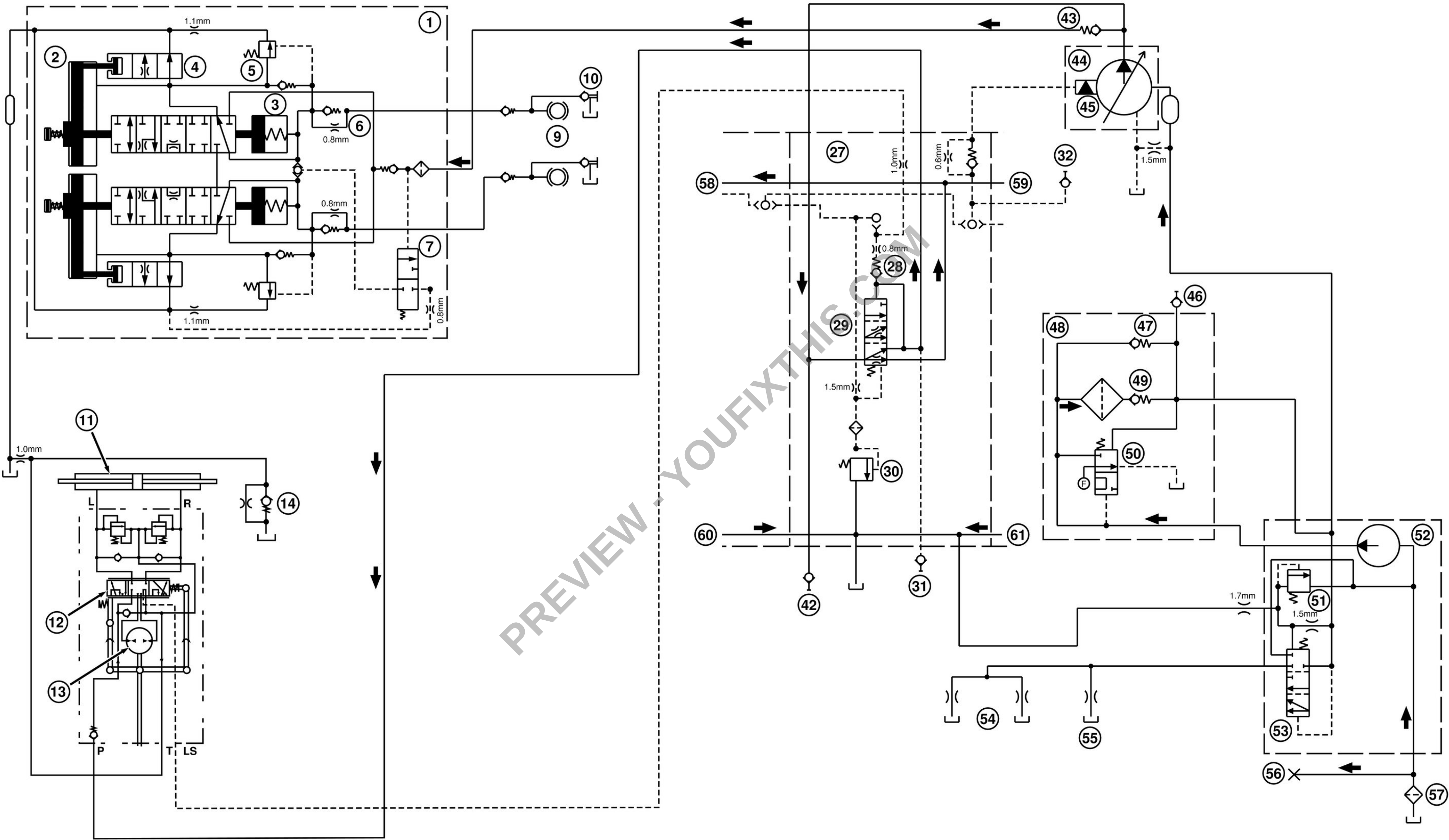
Causes for Code 86 and MFWD symbol flashing are:

Circuit 553 to MFWD solenoid is open, grounded, shorted, or has high resistance. Check circuit 553 for battery voltage at "A" terminal of MFWD solenoid harness connector.

MFWD solenoid is open, shorted, or has high resistance. Check resistance across solenoid terminals for 11 to 13 ohms.

Ground circuit 010 from solenoid is open or has high resistance. Check for less than 0.5 ohms to ground.

Steering and Brake Hydraulic Schematic



Steering and Brake Hydraulic Schematic

field operation.

Major System Tests—Hydraulics

PRELIMINARY TESTS:

[1] - Preliminary Checks

[2] - Recall Codes

[3] - Hydraulic Filter Checks

HYDRAULIC DIAGNOSTIC TESTS:

(INSTALL TEST EQUIPMENT)

Test No. 1 — PRELIMINARY MAIN PUMP INLET CHECK

Test No. 2 — MAIN HYDRAULIC PUMP STANDBY AND STALL TEST

Test No. 3 — HYDRAULIC LEAK TEST

Test No. 4 — MAIN PUMP INLET AT NO FLOW TEST

Test No. 5 — COMPENSATOR VALVE TEST AND ADJUSTMENT

Test No. 6 — MAIN PUMP INLET AT HIGH FLOW TEST

Test No. 7 — PUMP LOAD SENSE PRESSURE CHECKS

Test No. 8 — PRIMARY CIRCUIT PRESSURE TEST AND ADJUSTMENT

Test No. 9 — PRIORITY VALVE CHECK AND ADJUSTMENT

Test No. 10 — MAIN PUMP FLOW TEST

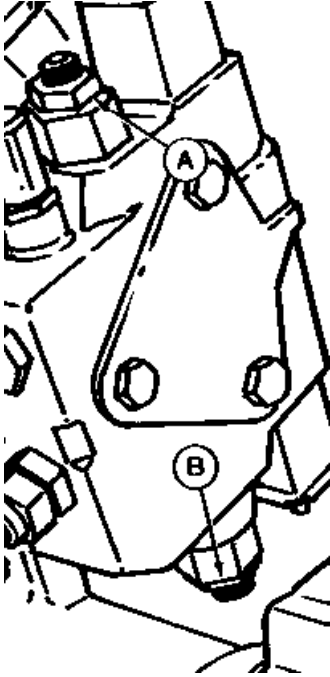
Test No. 11 — PUMP LOAD SENSE TEST AND ADJUSTMENT

Summary of Hydraulic Testing

connector below the control console. The load/depth control potentiometer and HCU are connected to the cab harness. The 8-way connector contains sensor ground (871), 5 volt power from the HCU (873), rate-of-drop output to HCU (875), 5 volt power to rocker switch (838), raise limit output to HCU (876), rocker switch lower command (839), rocker switch raise command (834) and hitch control lever output to HCU.

Complete hitch harnesses and schematics are provided in Group 10.

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**LEGEND:**

A	Lock Nuts
B	Lock Nuts

Lock Nuts

Tighten lock nuts (A) and (B) and replace caps on adjusting screws.

Calibrate the hitch.

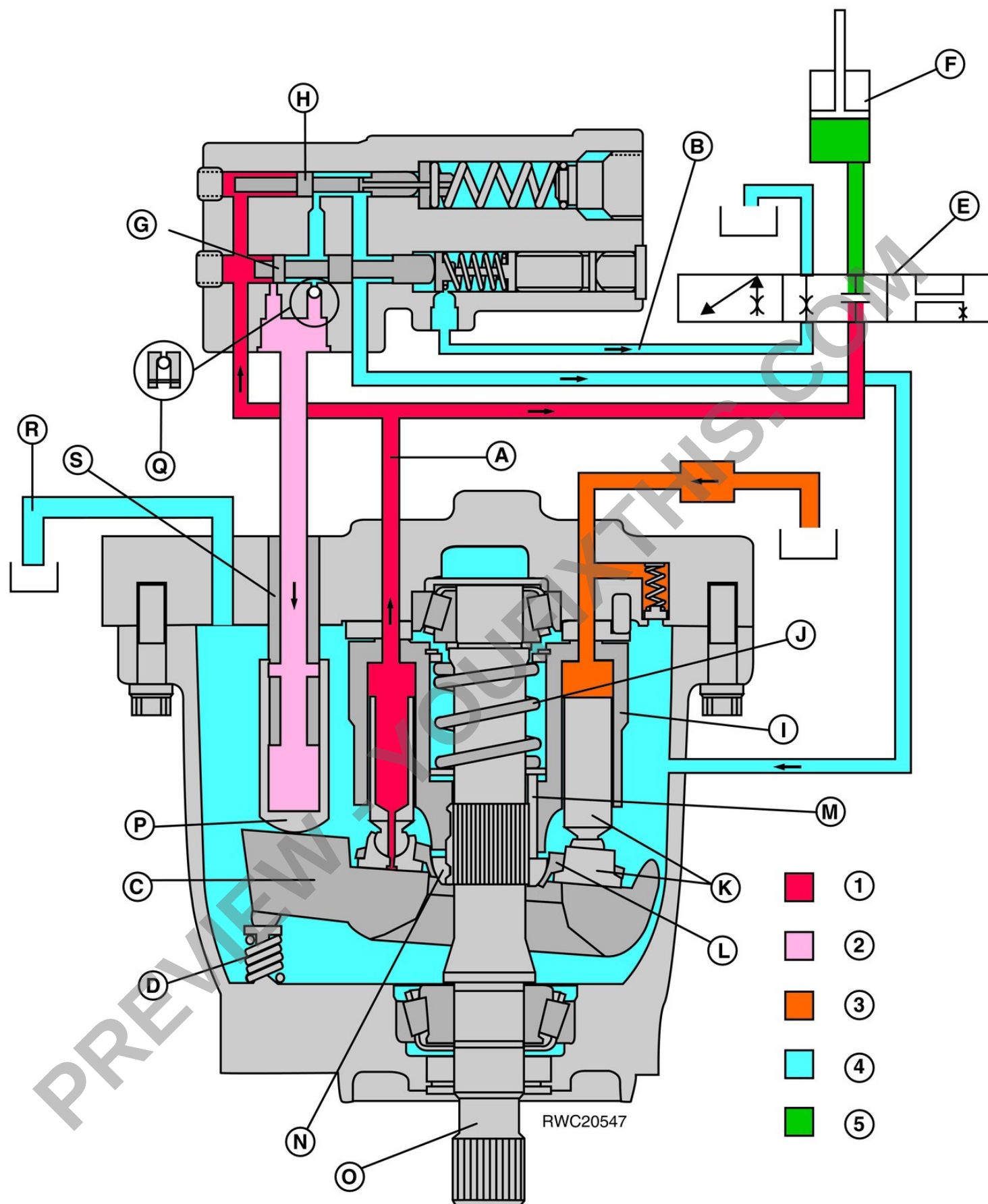
Result:

NO:SEE ["Hitch Calibration"](#) and System Checkout Procedure", this group.

Group 20 - Calibrations and Adjustments

Calibrations and Adjustment Groups

- 20A - Hitch Calibrations and Adjustments
- 20B - ROW-TRAK Calibrations and Adjustments



Stop Cylinder Extension

LEGEND:

A	Pump Outlet Pressure
B	Load-Sensing Pressure
C	Yoke
D	Yoke Control Spring
E	Control Valve

D	Sump Passages
E	Pressure Passage
F	Load-Sense Bleed Passage
G	Load-Sense Passage
H	Metering/Inlet Check Valve
I	Check Valve Orifice
J	Neutral Safety Piston
K	Extend/Retract Detent Sleeve
L	Bridge Passage
M	Extend Load Check Valve
N	Retract Load Check Valve
O	Centering Spring
P	Detent Balls
Q	Detent Cam
R	Inlet Check Valve Sensing Area
S	Pressure Sensing Extension
T	Pressure Compensator Valve
U	Secondary Pressure
V	Pressure Compensator Spring
W	Auto-Detent Relief Poppet
X	Detent Selector Valve Plate
Y	Float Pin
Z	Relief Passages
AA	Float Detent Sleeve
1	Secondary-Pressure Oil
2	Pressure-Free Oil
3	Trapped Oil

The SCV housing has two load check valves (M) and (N) with plugs. The metering valve knob rotates 5-1/2 turns, from minimum to maximum flow.

The SCV console lever operates valve (A) to control flow of secondary system pressure oil to extend or retract ports (B) or (C). When lever is at the center of the console guide, valve (A) is centered by spring (O) to isolate extend and retract ports (B) and (C) from secondary pressure passage (E) and sump passages (D).

Detent selector is illustrated in auto-detent position. SCV has three selectable detent functions:

- **Automatic Detent** —Returns lever to neutral when cylinder reaches end of travel
- **No Detent** —Returns lever to neutral when lever is released
- **Continuous Detent** —Lever must be manually returned to neutral

Drilled passage through center of valve (A) allows secondary pressure oil to push neutral safety piston (J), pin, and spring against detent cam (Q) holding detent balls against sleeve (K).

Metering check valve (H) is adjustable on-the-go from full flow to a minimum of 6 L/minute (1.6 gal/minute) flow. This valve is closed by spring force and requires 400 kPa (4 bar) (58 psi) pressure at land (R) to raise valve against adjusting screw. The back pressure is needed at neutral safety piston when priority flow required for steering momentarily reduces secondary pressure. In addition, orifice (I) slows flow of oil to prevent loss of pressure to neutral safety piston.

The metering valve (H) also prevents reverse flow during conditions when the extend or retract port is at high pressure and the secondary pressure passage is momentarily at a lower pressure. Valve tip provides a pressure sensing point down stream of the metering valve notch and is required to fully open inlet check valve (H).

Group 10 - Air Conditioning System Diagnosis

Service Equipment and Tools

→NOTE:

Order tools from the U.S. SERVICE-GARD™ Catalog or from the European Microfiche Tool Catalog (MTC). Some tools may be available from a local supplier.

Manifold Pressure Gauge Assembly

JT02051

Service air conditioning system.

A/C System Flusher

JT02075

Flush air conditioning system.

A/C System Flushing Attachment Kit

JT02078

Use with JT02075 to flush air conditioning system.

Electronic Leak Detector

JT02081

Detect refrigerant leaks.

Air Conditioning Flushing Kit

JT02098

Flush and purge air conditioning system.

Union Connector Fitting

JT02113

Connect the refrigerant loss switch.

Air Conditioning Flushing Kit Update

JT02138

Flush A/C system.

Air Conditioning Service Fitting Kit

JT05419

Connect flushing and purging test equipment.

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