FINNING CAT

Service Information System

Cerrar SIS

Pantalla anterior

Producto: CHALLENGER
Modelo: 45 CHALLENGER 1DR
Configuración: Challenger 35 and Challenger 45 Agricultural Tractors 1DR00001-01699 (MACHINE) POWERED BY 3116 Engine

Operación de Sistemas
Challenger 35, Challenger 45 and Challenger 55 Agricultural Tractors Power Train
Número de medio -RENR1778-01 **Fecha de publicación -01/06/2007** **Fecha de actualización -26/06/2007**

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Transmission Systems Electrical Component Operation

SMCS - 3030

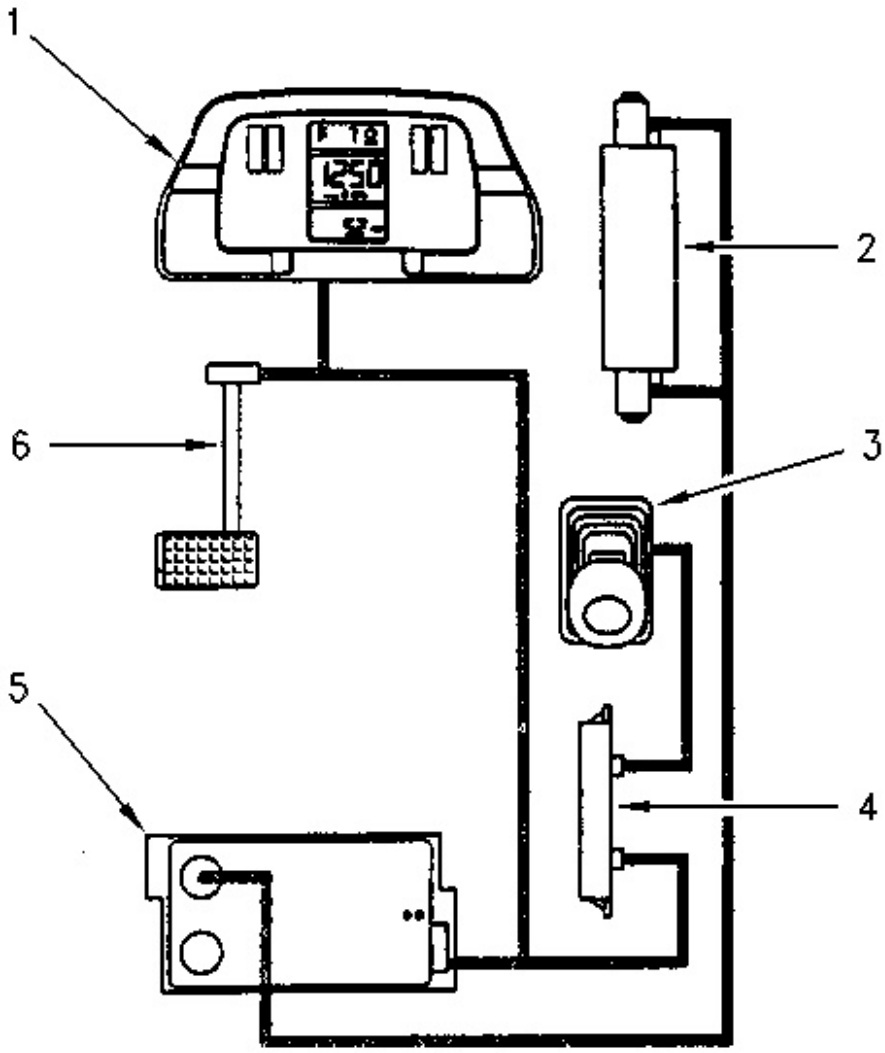

Illustration 1 g00460370

The control system for the transmission consists of the following items: Electronic Monitoring Center (1), transmission hydraulic control (2), transmission control lever (3), Right Hand Control Module (4), Chassis Control Module (5) and inching clutch control (6) .

The Electronic Transmission Control is part of the Chassis Control Module. The Electronic Transmission Control is a microprocessor which is programmed in order to manage the control of the transmission. Certain conditions will allow the transmission to shift to the NEUTRAL position in the unlikely event of a malfunction. The Electronic Transmission Control can be calibrated by the technician or by the owner in order to modify the quality of the shift and match up the electronics to the hardware of the transmission.

The Electronic Transmission Control has a self-diagnostics system which displays fault codes on the Machine Performance Monitor. The Machine Performance Monitor is located in the lower right quadrant of the Electronic Monitoring Center. The information can be viewed while the machine is operating. The information can also be stored for later use.

The fault code will allow normal operation of the transmission or the fault code will automatically return the transmission to neutral. This is dependent on the severity of the fault.

There are no mechanical components that are serviced in the Electronic Transmission Control. Do not open or disassemble the unit to service.

If the Electronic Transmission Control experiences a failure, the machine can be moved by using the limp home mode procedure. A wire assembly and a switch are required in order to activate the limp home mode. Once the limp home mode is activated, the machine can only be driven in the F5 speed and the R7 speed. However, any speed can be selected by connecting to the proper solenoids. See Systems Operation/Testing and Adjusting, "Clutch Engagement" for more information. When the switch and wire assembly are used there will be almost no modulation of the clutch engagement. The shock on the drive train can be lessened by keeping the engine at low idle. The on/off switch can be turned on and off rapidly until the machine is moving. Also, if you are steering right or steering left with a engaging clutch, you may lessen the shock on the drive train.

Clutch Circuits

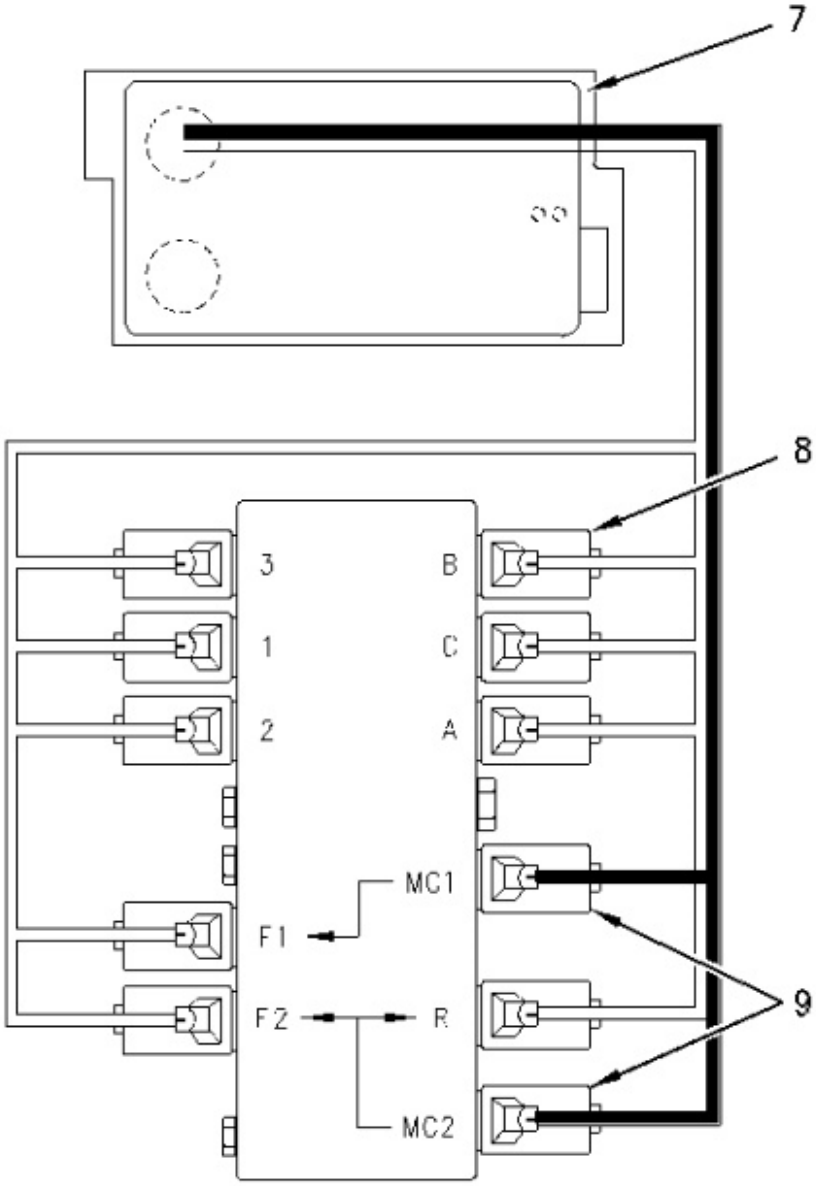

Illustration 2 g00460372

The eleven electronically controlled solenoid valves which are located on the transmission hydraulic control are activated with a positive voltage from the Electronic Transmission Control (7) .

All eleven solenoid valves (8) are a two-position solenoid valve except for the two modulating solenoids MC1 and MC2 (9) .

Modulating solenoid (MC1) is for direction clutch (F1). Modulating solenoid (MC2) is for direction clutches (F2) and (R). Both solenoids are always energized at the same time. If a direction clutch is stuck in the engaged position, then the operator would have some modulating control before the machine would lurch. If multiple clutches are engaged the machine will experience lurching.

The six two-position solenoid valves for the speed clutches are supplied with oil pressure that is regulated. When the solenoid is energized the oil is supplied to the clutch pack. The clutches fill quickly and the clutches have little slippage or no slippage that may occur.

The solenoid valves for the direction clutches have two positions. When the clutches are activated the oil supply is interrupted by the modulating solenoids (9). The heavy-duty construction of the direction clutches allows more tolerance to slippage.

Modulating Solenoids

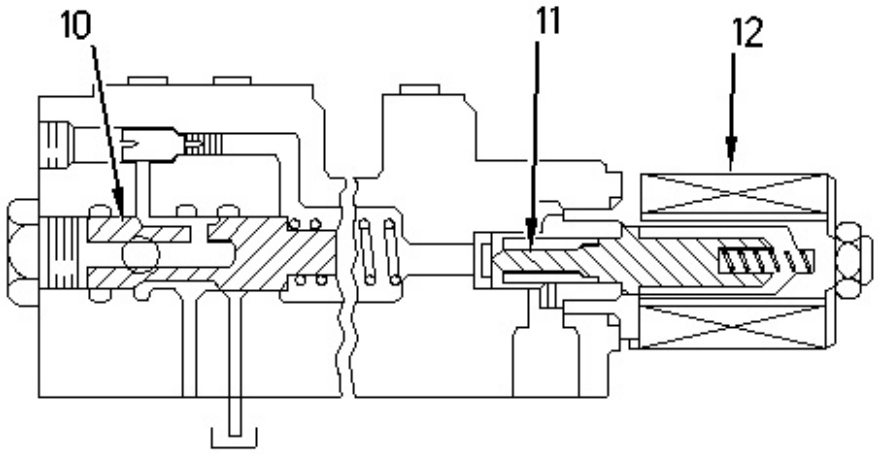

Illustration 3 g00640710

The modulating solenoids MC1 and MC2 are activated with pulse width modulation. Pulse width modulation is terminology that is used to describe the control of the electrical output that is from the Electronic Transmission Control. The modulating solenoids allow the regulation of the hydraulic valve pressure to the appropriate clutch to be inversely proportional to the average DC electrical current in the solenoid coil. If the solenoid current is low, then higher pressure is applied to the clutch.

When the solenoid coil (12) is not electrically energized, needle valve (11) is spring loaded in the closed position. This causes pilot pressure to be equal to the regulated system pressure. The pilot pressure controls the position of spool (10) in order to control the clutch pressure.

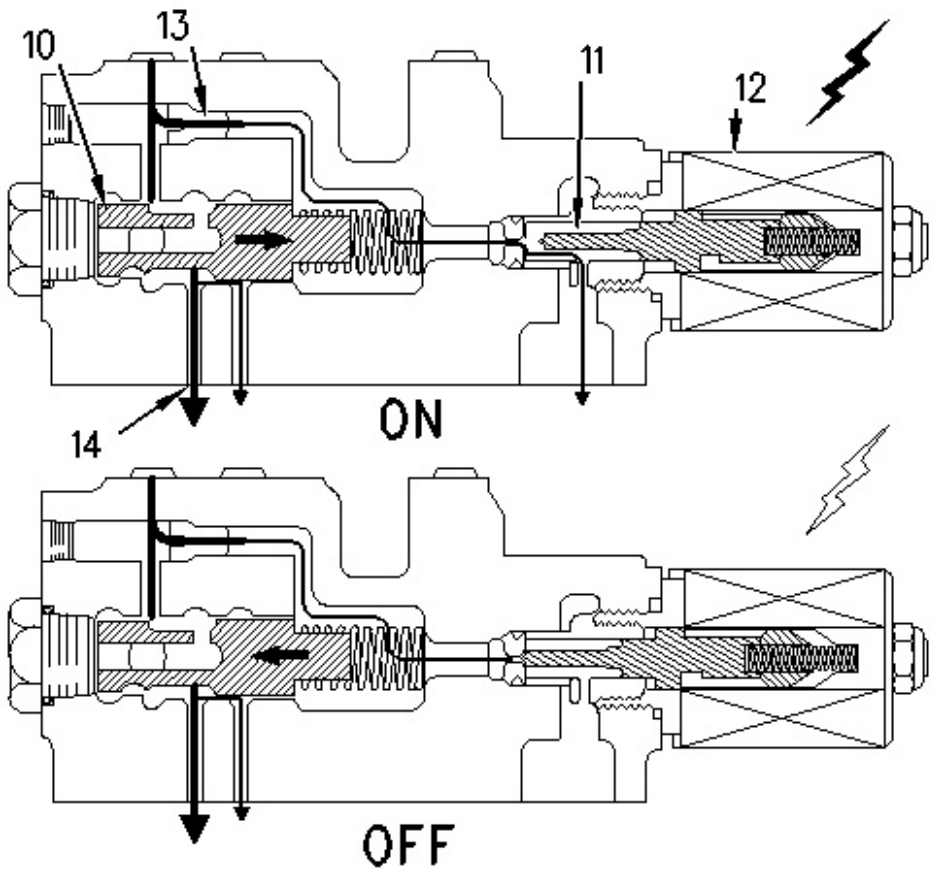

Illustration 4 g00665758

The current is applied to solenoid coil (12) in the form of a pulse width modulated signal. Needle valve (11) is moved open to the extent that is dictated by the average DC current that is applied on the solenoid. This causes an oil flow across the needle valve. The pilot pressure is dictated by the oil flow through fixed orifice (13) .

As the needle valve opens the pressure drops in the cavity for valve spool (10). This causes the valve spool to move to the right. This dumps the oil pressure to the clutch through port (14) .

When the current drops, the needle valve closes. This causes an increase in pressure in the valve spool cavity. This forces the valve spool to the left and the needle valve increases the pressure to port (14). The pressure of the application of the clutch is essentially equal to the pilot pressure. This is regardless of the amount of oil flow in the cavity for the direction clutch.

Pulse Width Modulation is best understood by the image of a switch that is attached to a 12 volt source. If a on/off switch is cycled rapidly, the voltage is reduced. The reduction of voltage is determined by the amount of time that is spent in the off position. If the switch is off 50 percent of the time, 6 volts are available. If the switch is off 75 percent of the time, 3 volts are available.

The Electronic Transmission Control has the ability to adjust the pulse width modulation in order to vary the actual rate of application of the direction clutches. Also, the actual rate of release of the direction clutches can be varied. This is dependent on load, engine speed, and ground speed.

Transmission Control Lever

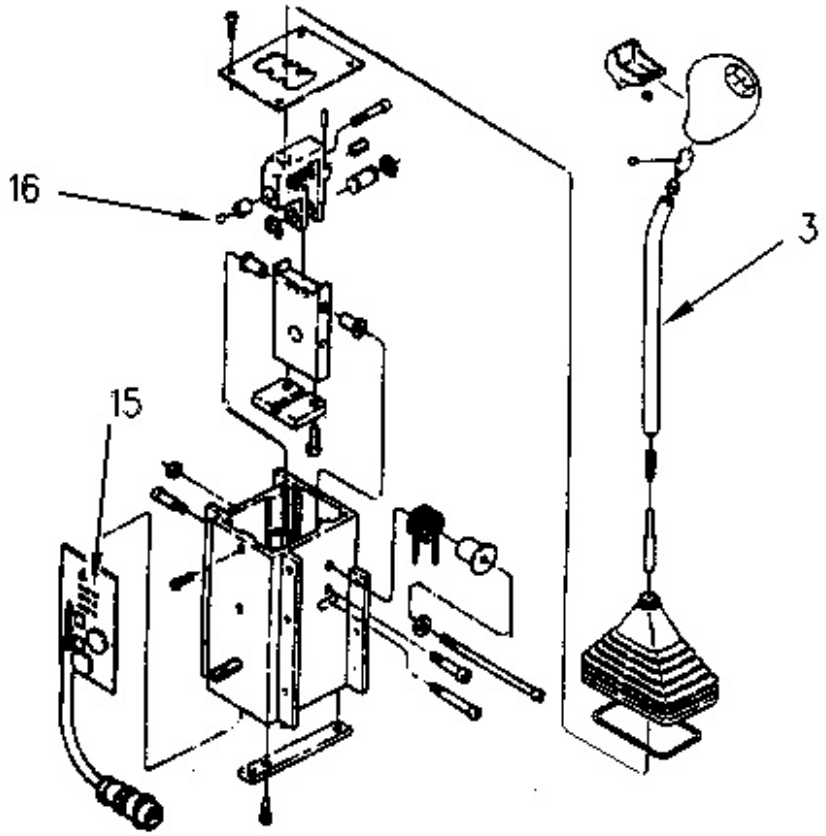

Illustration 5 g00460458

Transmission control lever (3) uses nine Hall cells (15). The Hall cells are activated by a magnet (16) that is attached to the transmission control lever (3). When the magnet passes over a Hall cell a signal is transmitted to the Electronic Transmission Control through the right hand console. This allows you to select a higher speed or lower speed or a direction change.

One Hall cell is dedicated to the neutral start circuit. The machine will not start if the transmission control lever is not in the NEUTRAL position. This Hall cell also controls an interrupt relay for the direction clutches. The relay prevents operation of the solenoid valves for the direction clutches while the transmission control lever is in the NEUTRAL position.

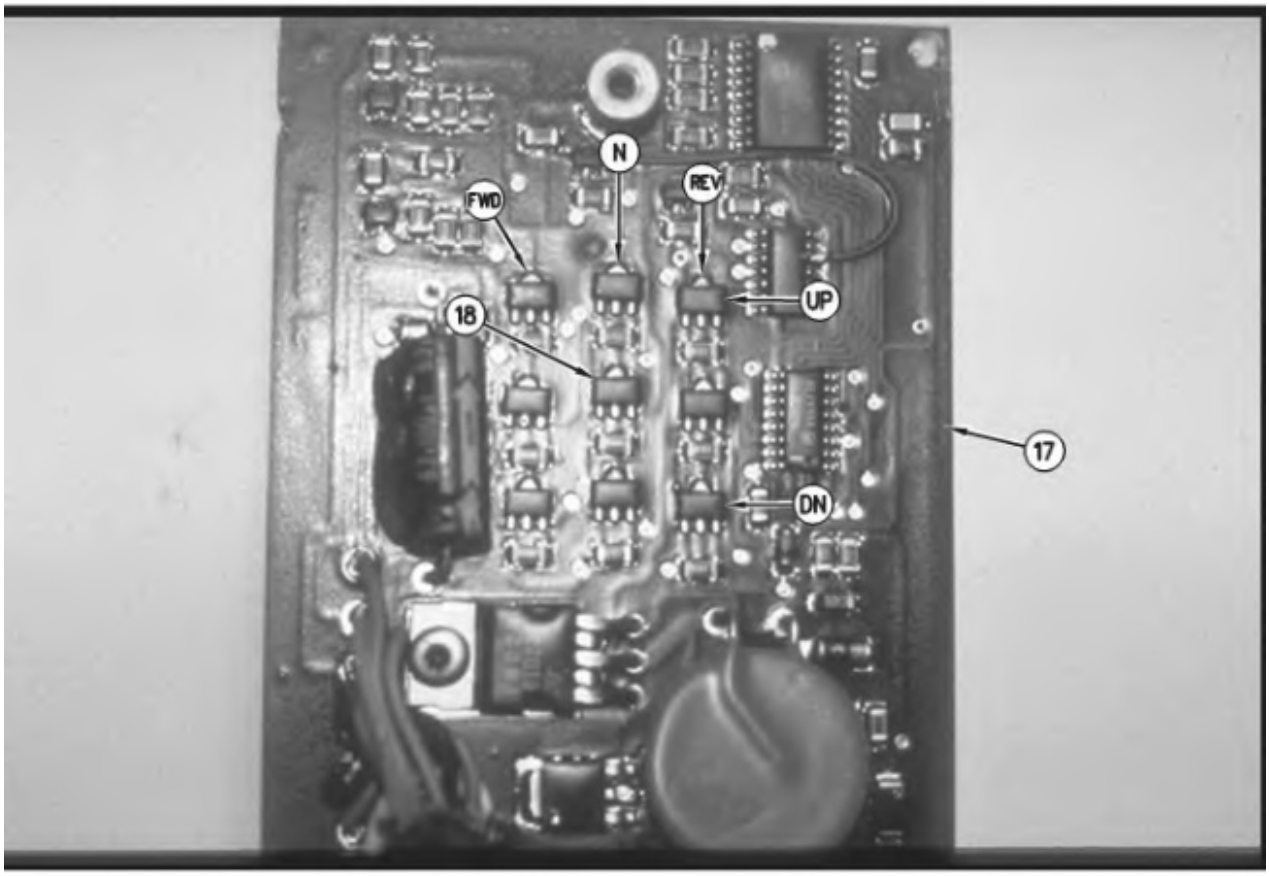

Illustration 6 g00468527

The transmission control lever transfers the input from shift card (17) to the Right Hand Control Module. The shift card is mounted next to the transmission control lever in the right hand console. Hall cells (15) provide the input for the speed and the direction of the machine. When the magnet passes over Hall cell a signal is transmitted to the Right Hand Control Module. This happens when the operator selects a change in speed or a change in direction. The information is then transferred from the Right Hand Control Module to the Electronic Transmission Control.

Hall cell (18) is dedicated to the neutral start circuit. The neutral start circuit prevents the machine from starting if the transmission control lever is not in the NEUTRAL position. This Hall cell also controls an interrupt relay for the direction clutches.

The left row of Hall cells (FWD) are used for shifts into the forward direction and the forward speeds. The center row (N) is used for shifts into the NEUTRAL position. The right row (REV) is used for shifts into the reverse direction and the reverse speeds. The top row of Hall cells (UP) provides the input for upshifting. The bottom row of the Hall cells (DN) provides the input for downshifting.

Inching Clutch Control

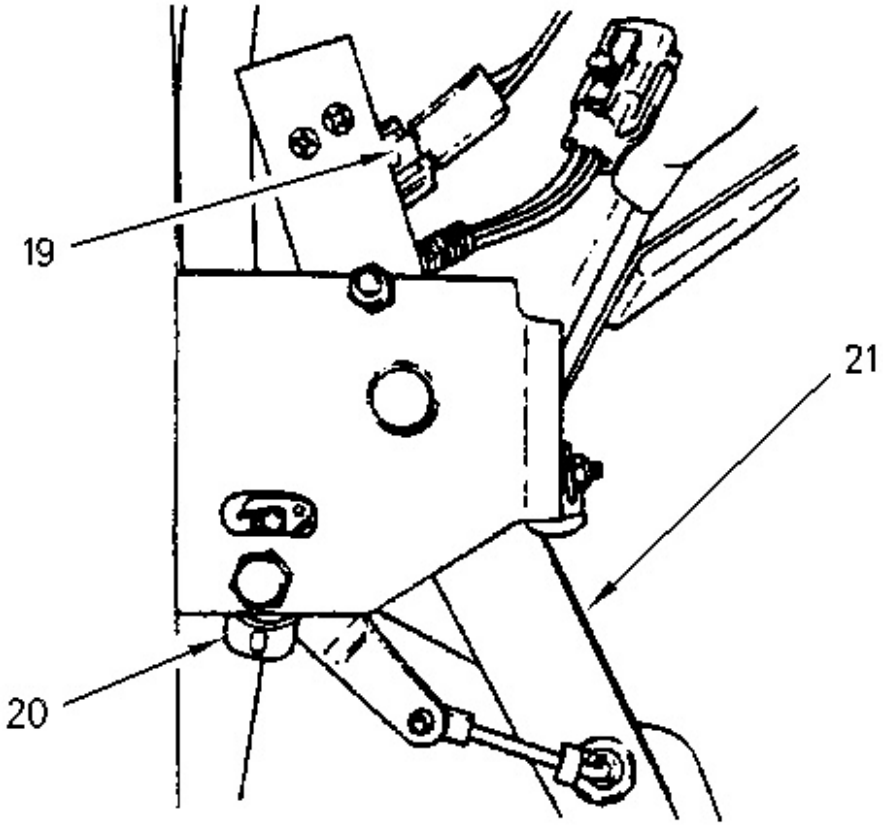

Illustration 7 g00460459

Position sensor (19) and sensor switch (20) are located on inching clutch control (21). The position sensor is a potentiometer that is powered from the Electronic Transmission Control. The position sensor indicates the position of the inching clutch control. This position sensor varies the pulse width modulated signal to the MC1 and MC2 modulating solenoids. The signal allows the transmission to engage and the signal allows the transmission to disengage. When the inching clutch control is fully depressed, sensor switch (20) is used to break the circuit to the interrupt relay for the direction clutch. Removing power from the direction clutches puts the transmission in the NEUTRAL position. Also, the sensor switch is used for the following other functions: speed matching and autoshift function.

Speed Sensors

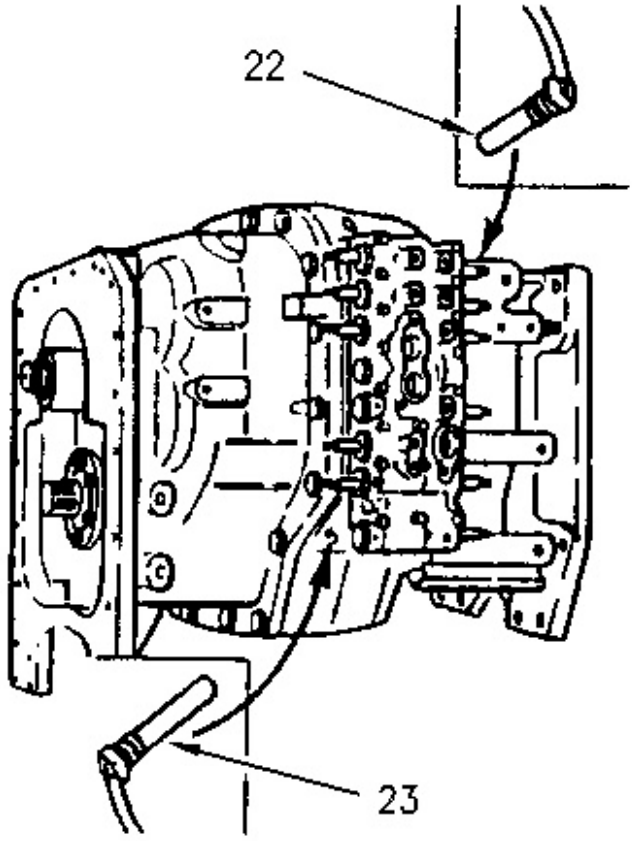

Illustration 8 g00460461

Two speed sensors are used in order to measure engine speed and the transmission output shaft speed. Engine speed sensor (22) is located in the front housing of the transmission. This sensor measures the input shaft speed. The transmission output shaft speed sensor (23) is located in the lower center housing of the transmission. Both sensors are threaded into the transmission housings. The sensors are positioned next to the gears in order to induce a pulse signal. The signal is converted and displayed as ground speed and engine speed in the Electronic Monitoring Center. The information that is produced is also used by the Electronic Transmission Control for the following functions: speed matching and autoshift function.

Display Module

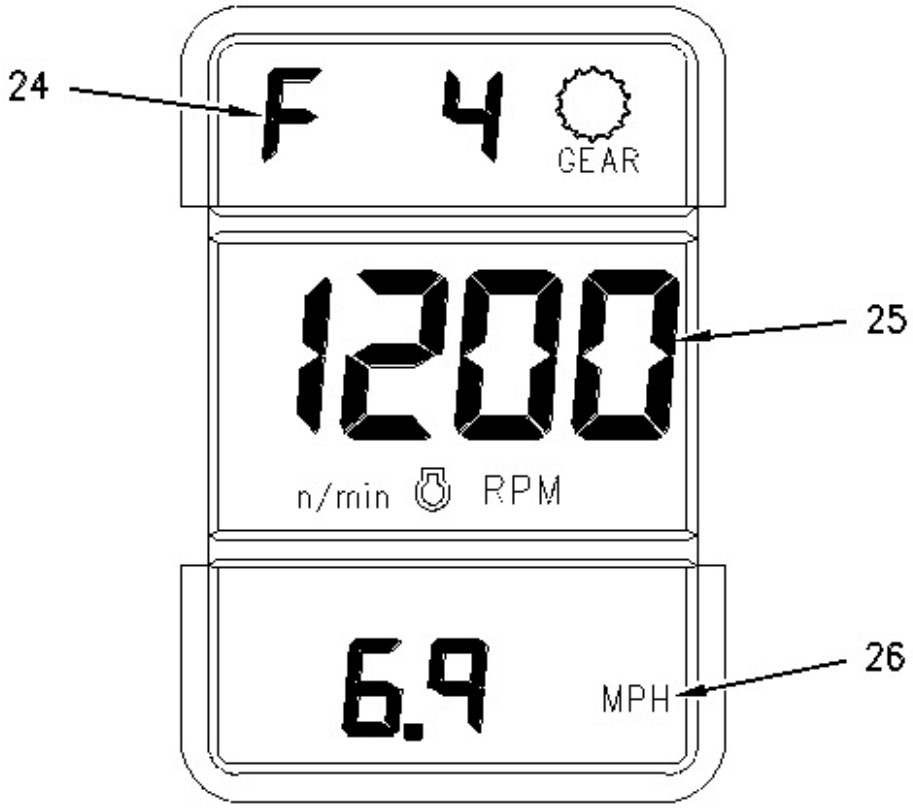

Illustration 9 g00460463

The display module for the transmission is part of the Electronic Monitoring Center. The top center display (24) is dedicated to the information from the transmission. The display shows the speed selection of the machine and the direction of the machine.

Table 1

Information for the Transmission Speeds	
Letter	**Speed Selection**
F	Forward speed
N	Neutral
R	Reverse speed
C	Creeper speeds (if equipped)
A	Automatic shift
P	Parking brake

A flashing letter indicates a prompt for the operator. This means that the transmission control lever was not in the NEUTRAL position during the engine start. A flashing P indicates that the transmission was engaged and the parking brake was applied. The transmission is disabled when the parking brake is applied. Shift the transmission back to the NEUTRAL position and disengage the parking brake. Next, shift the transmission in order to continue the operation.

The speed sensors supply output for the engine speed (25) and the ground speed (26) .

Indicator Lamps

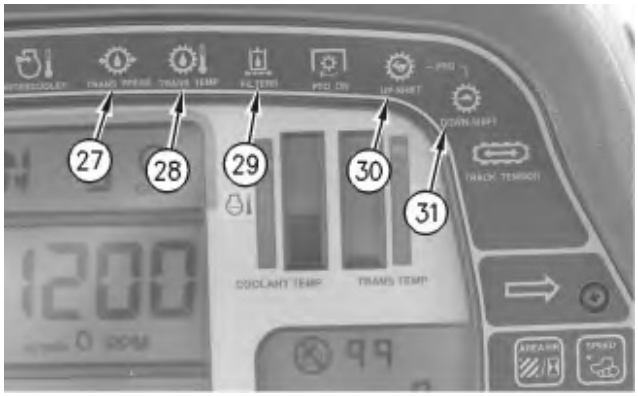

Illustration 10 g00514530

Electronic Monitoring Center

If the transmission oil pressure falls below 830 kPa (120 psi) for more than eight seconds, a critical event is recognized by the Electronic Monitoring Center. Lamp (27) will illuminate if the transmission oil pressure is low. A critical alarm will sound. The word "STOP" will flash for 30 seconds before automatic engine shutdown occurs. Stop the engine and investigate the cause. The Electronic Monitoring Center also logs an F387 fault code.

If the transmission oil temperature exceeds 107 °C (224 °F) for more than eight seconds, a critical event is recognized by the Electronic Monitoring Center. Lamp (28) will illuminate indicating excessive oil temperature. A critical alarm will sound. The word "STOP" will flash for 30 seconds before automatic engine shutdown occurs. Stop the engine and investigate the cause. The Electronic Monitoring Center also logs an F386 fault code.

If the transmission oil filter is bypassed for more than eight seconds, a noncritical event is recognized by the Electronic Monitoring Center. Lamp (29) will flash indicating a transmission filter that is becoming blocked. A noncritical alarm will sound at three minute intervals. Service the filter as soon as possible. Do not operate the machine in this condition more than one hour. The Electronic Monitoring Center also logs an F386 fault code. A lamp that is illuminated consistently indicates an implement and steering filter that is becoming blocked. A critical alarm will sound. This will occur for 90 seconds. The word "STOP" will then flash for 30 seconds before automatic engine shutdown occurs.

Lamp (30) will illuminate when the programmable up shift is selected.

Lamp (31) will illuminate if the programmable downshift is selected.