

TRANSMISSION

Automatic Transmission - 6L50 (MYB) - Description and Operation - Canyon, Colorado

DESCRIPTION AND OPERATION

DEFINITIONS AND ABBREVIATIONS

Throttle Positions

Engine Braking

A condition where the engine is used to slow the vehicle by manually downshifting during a zero throttle coastdown.

Full Throttle Detent Downshift

A quick apply of the accelerator pedal to its full travel, forcing a downshift.

Heavy Throttle

Approximately 3/4 of accelerator pedal travel, 75 percent throttle position.

Light Throttle

Approximately 1/4 of accelerator pedal travel, 25 percent throttle position.

Medium Throttle

Approximately 1/2 of accelerator pedal travel, 50 percent throttle position.

Minimum Throttle

The least amount of throttle opening required for an upshift.

Wide Open Throttle (WOT)

Full travel of the accelerator pedal, 100 percent throttle position.

Zero Throttle Coastdown

A full release of the accelerator pedal while the vehicle is in motion and in drive range.

Shift Condition Definitions

Bump

A sudden and forceful apply of a clutch or a band.

Chuggle

A bucking or jerking. This condition may be most noticeable when the converter clutch is engaged. It is similar to the feel of towing a trailer.

Delayed

tion where a shift is expected but does not occur for a period of time. This could be described as a clutch or band engagement that does not occur as quickly as expected during a part throttle or wide open throttle apply of the accelerator, or during manual downshifting to a lower range. This term is also defined as LATE or EXTENDED.

Double Bump - Double Feel

Two sudden and forceful applies of a clutch or a band.

Early

A condition where the shift occurs before the car has reached proper speed. This condition tends to labor the engine after the upshift.

End Bump

A firmer feel at the end of a shift than at the start of the shift. This is also defined as END FEEL or SLIP BUMP.

Firm

A noticeably quick apply of a clutch or band that is considered normal with a medium to heavy throttle. This apply should not be confused with HARSH or ROUGH.

Flare

A quick increase in engine RPM along with a momentary loss of torque. This most generally occurs during a shift. This condition is also defined as SLIPPING.

Harsh - Rough

A more noticeable apply of a clutch or band than FIRM. This condition is considered undesirable at any throttle position.

Hunting

A repeating quick series of upshifts and downshifts that causes a noticeable change in engine RPM, such as a 4-3-4 shift pattern. This condition is also defined as BUSYNESS.

Initial Feel

A distinctly firmer feel at the start of a shift than at the finish of the shift.

Late

A shift that occurs when the engine RPM is higher than normal for a given amount of throttle.

Shudder

A repeating jerking condition similar to CHUGGLE but more severe and rapid. This condition may be most noticeable during certain ranges of vehicle speed.

Slipping

A noticeable increase in engine RPM without a vehicle speed increase. A slip usually occurs during or after initial clutch or band apply.

A slow, almost unnoticeable clutch or band apply with very little shift feel.

Surge

A repeating engine related condition of acceleration and deceleration that is less intense than CHUGGLE.

Tie-Up

A condition where two opposing clutch and/or bands are attempting to apply at the same time causing the engine to labor with a noticeable loss of engine RPM.

Noise Conditions

Drive Link Noise

A whine or growl that increases or fades with vehicle speed, and is most noticeable under a light throttle acceleration. It may also be noticeable in PARK or NEUTRAL operating ranges with the vehicle stationary.

Final Drive Noise

A hum related to vehicle speed which is most noticeable under a light throttle acceleration.

Planetary Gear Noise

A whine related to vehicle speed, which is most noticeable in FIRST gear, SECOND gear, FOURTH gear or REVERSE. The condition may become less noticeable, or go away, after an upshift.

Pump Noise

A high pitched whine that increases in intensity with engine RPM. This condition may also be noticeable in all operating ranges with the vehicle stationary or moving.

Torque Converter Noise

A whine usually noticed when a vehicle is stopped, and the transmission is in DRIVE or REVERSE. The noise will increase with engine RPM.

Driver Shift Control

Driver shift control (DSC) allows the driver to change gears similar to a manual transmission.

Transmission Abbreviations

A/C

Air Conditioning

AC

Alternating Current

AT

Automatic Transmission

Climate Control Driver Information Center

DC

Direct Current

DIC

Driver Information Center

DLC

Data Link Connector

DMM

Digital Multimeter

DSC:

Driver Shift Control

DTC

Diagnostic Trouble Code

EBTCM

Electronic Brake/Traction Control Module

ECCC

Electronically-Controlled Capacity Clutch

ECT

Engine Coolant Temperature

EMI

Electromagnetic Interference

IAT

Intake Air Temperature

IGN

Ignition

IMS

Internal Mode Switch

ISS

Speed Sensor

MAP

Manifold Absolute Pressure

MIL

Malfunction Indicator Lamp

NC

Normally Closed

NO

Normally Open

OBD

On Board Diagnostic

OSS

Output Speed Sensor

PC

Pressure Control

PCM

Powertrain Control Module

PCS

Pressure Control Solenoid

PS

Pressure Switch

PWM

Pulse Width Modulation

RPM

Revolutions Per Minute

SS

Shift Solenoid

STL

Service Transmission Lamp

Pinout	Component Name
	Transmission Adaptive Pressure
TCC	
	Torque Converter Clutch
TFP	
	Transmission Fluid Pressure
TFT	
	Transmission Fluid Temperature
TP	
	Throttle Position
VSS	
	Vehicle Speed Sensor
WOT	
	Wide Open Throttle

TRANSMISSION IDENTIFICATION INFORMATION

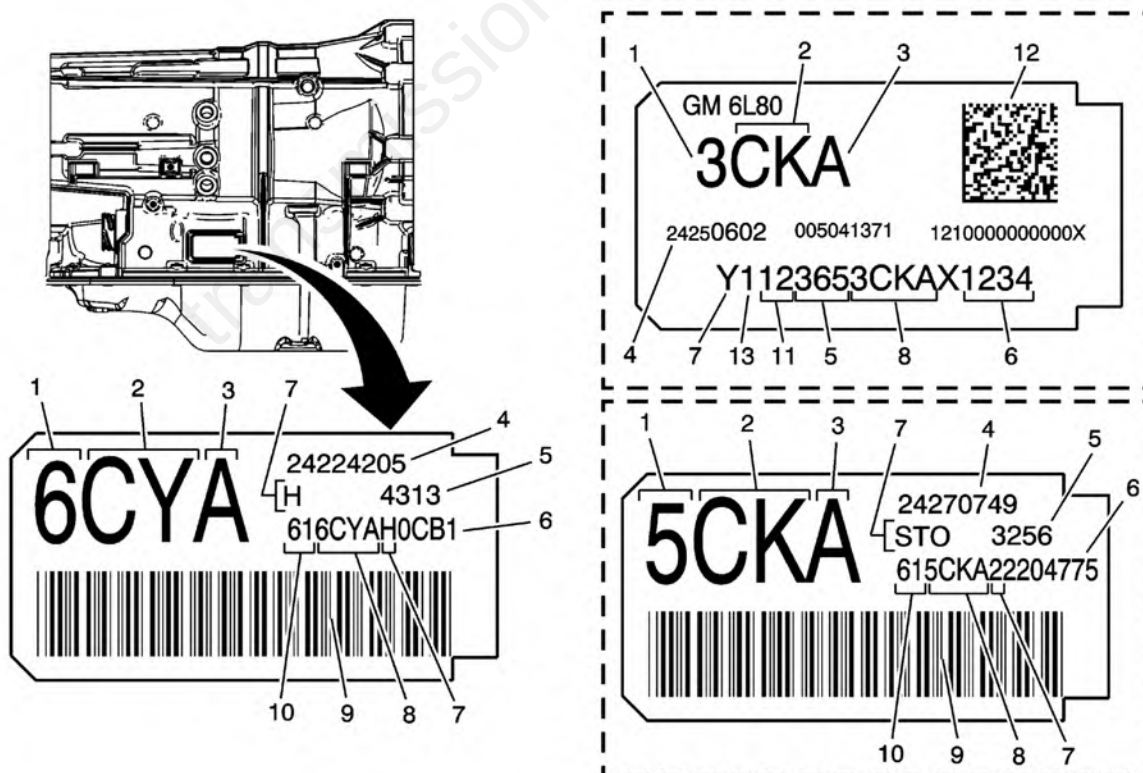


Fig. 1: Transmission Identification Label
 Courtesy of GENERAL MOTORS COMPANY

Serial Number	Component Name
1	Model Year
2	Model Code
3	Transmission Family
4	Transmission Assembly Number
5	Julian date
6	Sequential Serial Number
7	Source Code
8	Broadcast Code
9	Bar Code
10	Transmission I.D.
11	Calender Year
12	Machine Readable Matrix
13	Production Shift

TRANSMISSION GENERAL DESCRIPTION

The Hydra-matic 6-Speed RWD is a fully automatic, 6 speed, rear-wheel drive, electronic-controlled transmission. It consists primarily of a 4 element torque converter, an integral fluid pump and converter housing, a single and double planetary gear set, friction and mechanical clutch assemblies, and a hydraulic pressurization and control system. There are four variants of the transmission, all based on torque capacity. Architecture is common between the variants, and component differences are primarily related to size.

The 4 element torque converter contains a pump, a turbine, a pressure plate splined to the turbine, and a stator assembly. The torque converter acts as a fluid coupling to smoothly transmit power from the engine to the transmission. It also hydraulically provides additional torque multiplication when required. The pressure plate, when applied, provides a mechanical direct drive coupling of the engine to the transmission.

The planetary gear sets provide the 6 forward gear ratios and reverse. Changing gear ratios is fully automatic and is accomplished through the use of a transmission control module (TCM) located inside the transmission. The TCM receives and monitors various electronic sensor inputs and uses this information to shift the transmission at the optimum time.

The TCM commands shift solenoids and variable bleed pressure control solenoids to control shift timing and feel. The TCM also controls the apply and release of the torque converter clutch which allows the engine to deliver the maximum fuel efficiency without sacrificing vehicle performance. All the solenoids, including the TCM, are packaged into a self-contained control solenoid valve assembly.

The hydraulic system primarily consists of a vane-type pump, 2 control valve body assemblies, converter housing and case. The pump maintains the working pressures needed to stroke the clutch pistons that apply or release the friction components. These friction components, when applied or released, support the automatic shifting qualities of the transmission.

The friction components used in this transmission consist of 5 multiple disc clutches. The multiple disc clutches combine with one mechanical sprag clutch to deliver 7 different gear ratios, 6 forward and one reverse, through the gear sets. The gear sets then transfer torque through the output shaft.

The transmission may be operated in any of the following gear ranges:

PARK (P)

This position locks the rear wheels and prevents the vehicle from rolling either forward or backward. PARK is the best position to use when starting the vehicle. Because the transmission utilizes a shift lock control

it is necessary to fully depress the brake pedal before shifting out of PARK. For safety reasons, use the parking brake in addition to the PARK position.

REVERSE (R)

This position allows the vehicle to be operated in a rearward direction.

NEUTRAL (N)

This position allows the engine to be started and operated while driving the vehicle. If necessary, you may select this position in order to restart the engine with the vehicle moving. This position should also be used when towing the vehicle.

DRIVE (D)

Drive range should be used for all normal driving conditions for maximum efficiency and fuel economy. Drive range allows the transmission to operate in each of the 6 forward gear ratios. Downshifts to a lower gear, or higher gear ratio, are available for safe passing by depressing the accelerator or by manually selecting a lower gear in the manual mode range.

(Refer to the vehicle owner's manual for Driver Shift Control (DSC) information.)

TRANSMISSION COMPONENT AND SYSTEM DESCRIPTION

The mechanical components of the 6-Speed RWD are as follows:

- A torque converter with an electronically controlled capacity clutch (ECCC). ECCC was developed to reduce the possibility of noise, vibration, or chuggle caused by TCC apply. In a torque converter with ECCC, the pressure plate does not always fully lock to the torque converter cover. Instead, the pressure plate maintains a small amount of slippage. In RWD 6-Speed transmissions, this slippage can range from 0-50 RPM. Full lockup (0 RPM slip) is still available on some applications. TCC may apply in 2nd, 3rd, 4th, 5th, or 6th gears. The specific TCC apply points and the amount of clutch slippage are determined by a number of operating conditions, including throttle position, vehicle speed, gear, as well as specific vehicle application. Transmission fluid temperature will also affect TCC apply points.
- Vane-type fluid pump assembly
- 1-2-3-4 and 3-5 Reverse clutch assembly
- Input sun gear and carrier assembly
- 4-5-6 clutch assembly with turbine shaft
- 4-5-6 clutch hub assembly
- 1-2-3-4 clutch hub assembly
- 2-6 and 3-5 reverse clutch hub assembly
- Center support assembly, with 2-6 clutch assembly, and low and Reverse clutch assembly
- Low clutch sprag assembly
- A double planetary output carrier assembly
- Output shaft assembly
- Control valve body assembly

The electrical components of the 6-Speed RWD are as follows:

- Input and output speed sensor assembly
- Manual shift shaft position switch

solenoid valve assembly, which contains the following components:

- Transmission control module (TCM)
- 5 variable bleed line pressure control (PC) solenoids
- Transmission fluid pressure (TFP) switch assembly
- Torque converter clutch (TCC) pressure control solenoid
- 2 shift solenoids

For more information, refer to [Electronic Component Description](#).

MANUAL MODE DESCRIPTION AND OPERATION

Transmission Gear Shift Lever

Manual Mode operation can be entered into when the shift lever is placed in Manual (M) position. When manual mode is selected, the letter M of the PRNDM display will illuminate to indicate the transmission is in manual mode.

Transmission Manual Shift Switch - Up/Down

The transmission manual shift switch is mounted on the transmission gear shift lever handle. The manual shift switch is a momentary type that has three positions. The three positions are neutral or open, plus (+) for upshifts and minus (-) for downshifts. When selecting a gear, a number 1 through 6 for 6L transmission and 1 through 8 for 8L transmissions, will be displayed next to the letter M on the instrument panel, to indicate the current gear the operator has selected.

The transmission manual shift switch is an input signal to the body control module. The upshift or downshift signal commands are processed and sent out on the serial data line from the body control module to the engine control module and transmission control module.

Transmission Control Module

In manual mode, the Transmission Control Module will always have final authority of when to allow an upshift or downshift. The Transmission Control Module only allows an upshift or downshift into the appropriate gear based on engine RPM, vehicle speed and other control parameters. The transmission will not automatically downshift to the next lower gear if it would cause an engine over speed condition or an upshift if it would result in too low of engine RPM.

If the Transmission Control Module prevents an upshift or downshift for any reason, a SHIFT DENIED message will be displayed on the instrument cluster.

Manual Mode Shifting Operation

1. With the engine running, place the shift lever in Manual (M) position. The letter M of PRNDM display will illuminate to indicate Manual Mode. A number will be illuminated next to the letter M to indicate the current gear selected.
2. Momentary pressing the Transmission Manual Shift Switch - plus (+) will command the transmission to the next higher gear. The current number indicated on the PRNDM display will change to a number to indicate the gear that the vehicle operator has selected, and if conditions are appropriate, commands the Transmission Control Module to upshift to that gear.
3. Momentary pressing the Transmission Manual Shift Switch - minus (-) will command the transmission to the next lower gear. The current number indicated on the PRNDM display will change to a number to indicate the gear that the vehicle operator has selected, and if conditions are appropriate, commands the Transmission Control Module to downshift to that gear.
4. To exit Manual Mode, place the shift lever in Drive (D) position.

MODE DESCRIPTION AND OPERATION

Tow/haul mode is a function within the vehicle's software/calibration that optimizes transmission gear selection for operation during towing or with heavy loads. This optimization includes improving acceleration performance during launches, reducing shift busyness, assisting brake performance and speed control during engine braking situations, and improving vehicle speed control while requiring less throttle pedal activity.

In general, tow/haul mode maintains lower gears longer and increases shift pressures. It is designed to be most effective when the vehicle and trailer combined weight is at least 75% of the vehicle's Gross Combined Weight Rating (GCWR). Operation of tow/haul in a lightly loaded or non-loaded vehicle will not cause damage. However, there is no benefit to the selection of tow/haul when the vehicle is unloaded, and use of tow/haul mode during unloaded driving conditions will decrease fuel economy and may generate shift feel concerns.

TRANSMISSION ADAPTIVE FUNCTIONS

The Hydra-Matic® 6-Speed RWD transmission utilizes a line pressure control system during upshifts to compensate for the normal wear of transmission components. As the apply components within the transmission wear or change over time, shift time (the time required to apply a clutch) increase or decreases. In order to compensate for these changes, the transmission control module (TCM) adjusts the pressure commands to the various PC solenoids, to maintain the originally calibrated shift timing. The automatic adjusting process is referred to as "adaptive learning" and it is used to ensure consistent shift feel plus increase transmission durability. The TCM monitors the A/T input speed sensor (ISS) and the A/T output speed sensor (OSS) during commanded shifts to determine if a shift is occurring too fast (harsh) or too slow (soft) and adjusts the corresponding pressure control (PC) solenoid signal to maintain the set shift feel.

The purpose of the adapt function is to automatically compensate the shift quality for the various vehicle shift control systems. The adapt function is a continuous process that will help to maintain optimal shift quality throughout the life of the vehicle.

TRANSMISSION INDICATORS AND MESSAGES

The following transmission-related indicators and messages may be displayed on the Instrument Panel Cluster (IPC). For a complete listing and description of all vehicle indicators and messages, refer to [Indicator/Warning Message Description and Operation](#).

"TRANSMISSION HOT IDLE ENGINE"

This message is displayed when the TCM detects a transmission fluid temperature (TFT) equal to or greater than 132°C (270°F) for 5 seconds.

"SERVICE TRANSMISSION"

This message displays when there is a problem with the transmission.

ELECTRONIC COMPONENT DESCRIPTION

The control solenoid (w/body and TCM) valve assembly contains the following components:

- Transmission control module (TCM)
- Clutch pressure control solenoids (Clutch PC Sol)
- Shift solenoids (SS)
- Line pressure control solenoid (Line PC Sol)
- Torque converter clutch pressure control solenoid (TCC PC Sol)
- Transmission fluid temperature sensor (TFT Sensor)

Temperature sensor	Component Name
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- Power-up temperature sensor
- Transmission fluid pressure switches (TFP Sw)

These components are not serviced separately. The control solenoid (w/body and TCM) valve assembly utilizes a lead-frame system to connect these components electrically to the TCM. No wires are used for these components. The control solenoid (w/body and TCM) valve assembly bolts directly to the lower and upper valve body assemblies inside the transmission. The control solenoid (w/body and TCM) valve assembly connects to the engine harness 16-way connector via a pass-thru sleeve.

Control Solenoid (W/Body and TCM) Valve Assembly

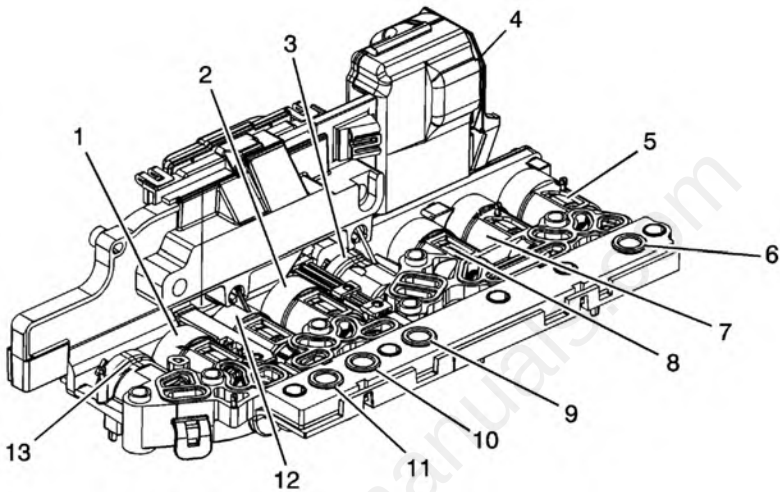


Fig. 2: Control Solenoid (W/Body and TCM) Valve Assembly
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Line Pressure Control (PC) Solenoid
2	Torque Converter Clutch (TCC) Pressure Control (PC) Solenoid
3	Shift Solenoid (SS) 2
4	16 Pin Connector
5	Pressure Control (PC) Solenoid 3
6	Transmission Fluid Pressure (TFP) Switch 5
7	Pressure Control (PC) Solenoid 4
8	Pressure Control (PC) Solenoid 2
9	Transmission Fluid Pressure (TFP) Switch 3
10	Transmission Fluid Pressure (TFP) Switch 1
11	Transmission Fluid Pressure (TFP) Switch 4
12	Pressure Control (PC) Solenoid 5
13	Shift Solenoid (SS) 1

Internal Mode Switch (IMS)

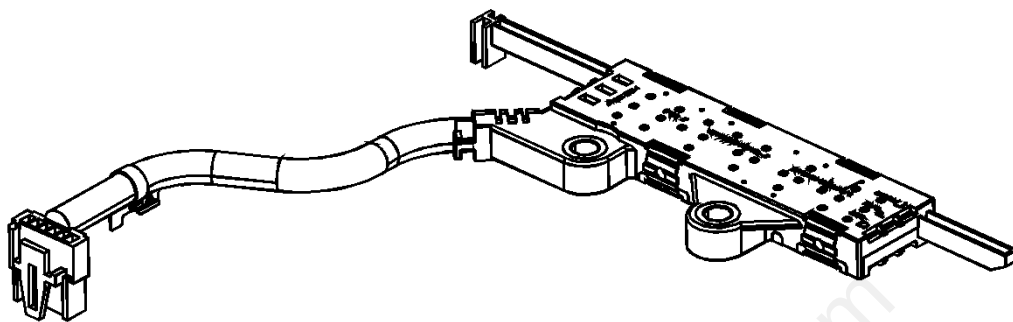


Fig. 3: Internal Mode Switch (IMS)

Courtesy of GENERAL MOTORS COMPANY

The transmission manual shift shaft switch assembly is a sliding contact switch attached to the manual shift shaft inside the transmission case. The five inputs to the TCM from the transmission manual shift shaft switch assembly indicate the transmission gear selector lever position. This information is used for engine controls as well as determining the transmission shift patterns. The state of each input is available for display on the scan tool. The five input parameters represented are Signal A, Signal B, Signal C, Signal P (Parity) and Signal N (P/N Start).

Input Speed Sensor (ISS)

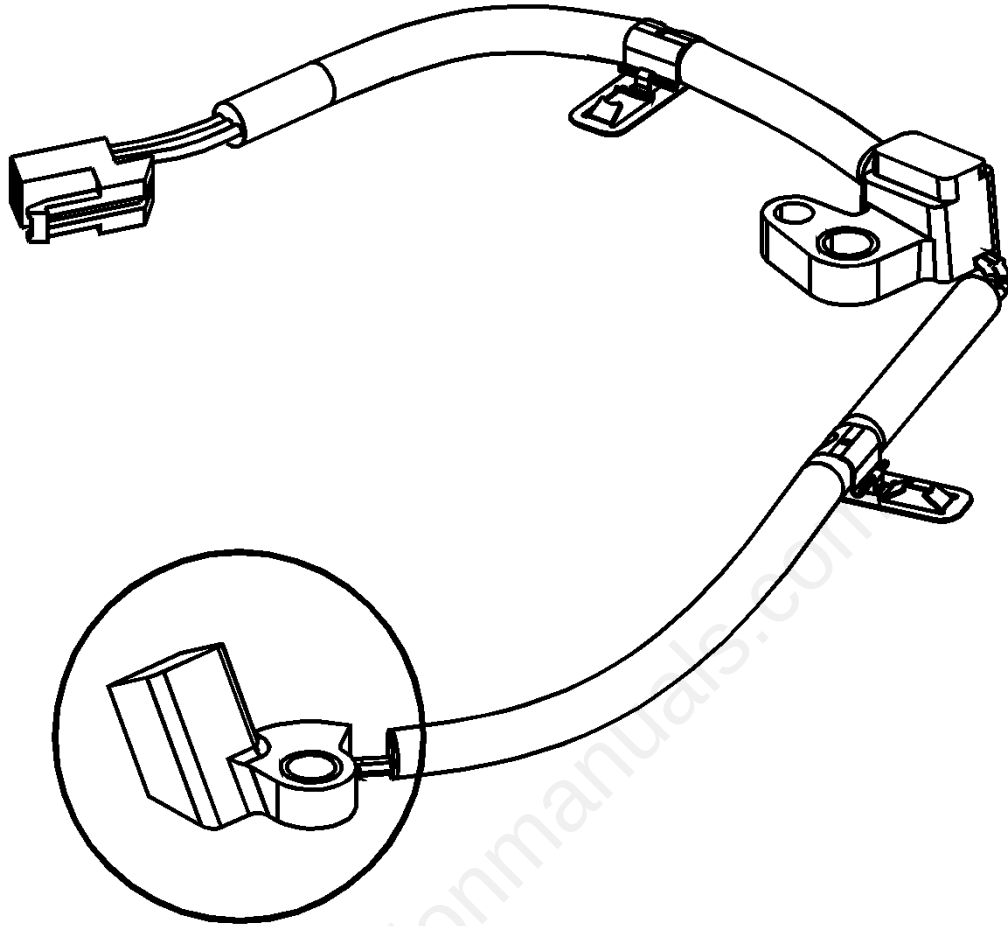


Fig. 4: Input Speed Sensor (ISS)

Courtesy of GENERAL MOTORS COMPANY

The input speed sensor (ISS) is a hall-effect type sensor. The ISS mounts to the control valve upper body assembly and connects to the control solenoid valve assembly through a wire harness and connector. The sensor faces the 1-2-3-4 and 3-5-R clutch housing machined teeth surface. The sensor receives 8.3-9.3 volts on the ISS/OSS Supply Voltage circuit from the TCM. As the 1-2-3-4 and 3-5-R clutch housing rotates, the sensor produces a signal frequency based on the machined surface of the 1-2-3-4 and 3-5-R clutch housing. This signal is transmitted through the ISS signal circuit to the control solenoid valve assembly. The control solenoid valve assembly uses the ISS signal to determine line pressure, transmission shift patterns, torque converter clutch (TCC) slip speed and gear ratio.

Output Speed Sensor (OSS)

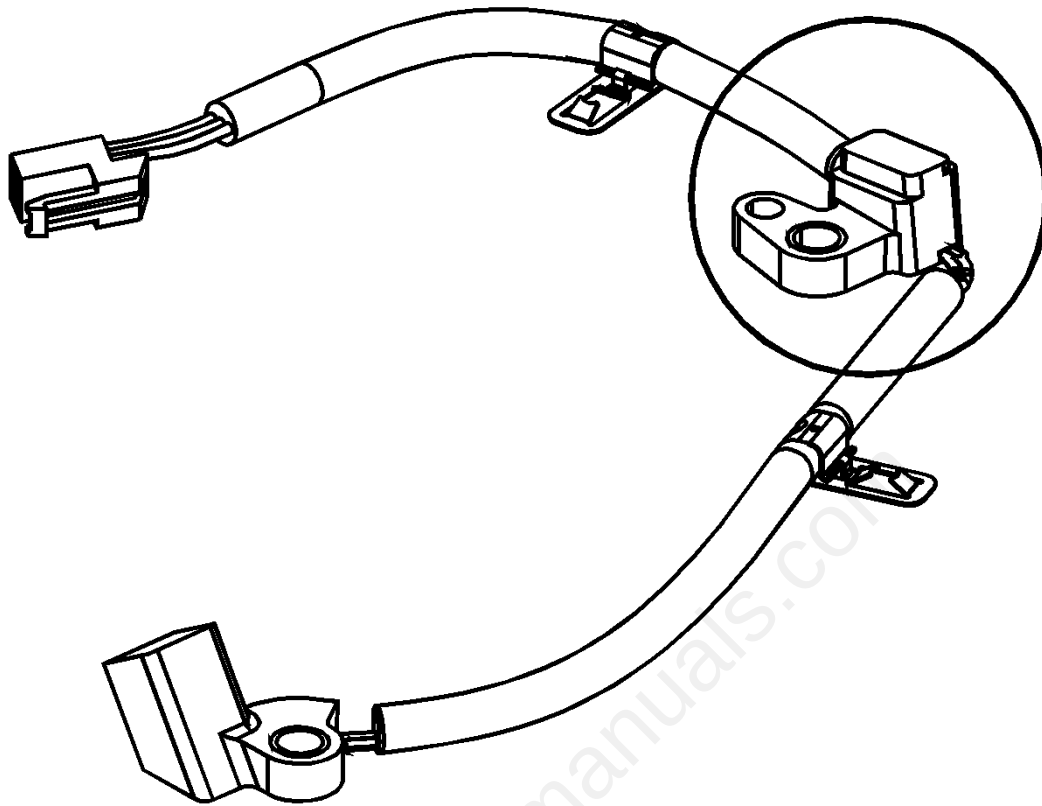


Fig. 5: Output Speed Sensor (OSS)

Courtesy of GENERAL MOTORS COMPANY

The output speed sensor (OSS) is a hall-effect type sensor. The OSS mounts to the control valve upper body assembly and connects to the control solenoid valve assembly through a wire harness and connector. The sensor faces the output shaft machined teeth surface. The sensor receives 8.3-9.3 volts on the ISS/OSS supply voltage circuit from the TCM. As the output shaft rotates, the sensor produces a signal frequency based on the machined surface of the output shaft. This signal is transmitted through the OSS signal circuit to the TCM. The TCM uses the OSS signal to determine line pressure, transmission shift patterns, torque converter clutch (TCC) slip speed and gear ratio.

AUTOMATIC TRANSMISSION INLINE 16-WAY CONNECTOR DESCRIPTION

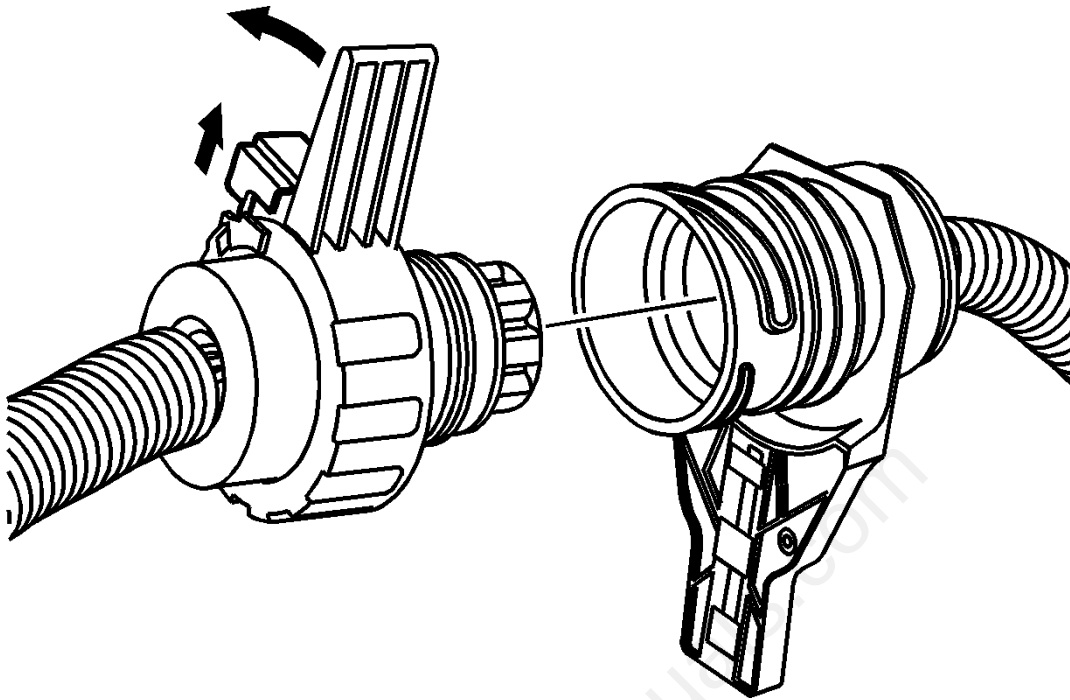


Fig. 6: Automatic Transmission Inline 16-Way Connector

Courtesy of GENERAL MOTORS COMPANY

The transmission electrical connector is an important part of the transmission operating system. Any interference with the electrical connection can cause the transmission to set diagnostic trouble codes or affect proper operation. The following items can affect the electrical connection:

- Bent pins in the connector from rough handling during connection and disconnection
- Wires backing away from the pins or coming uncrimped, in the external wiring harness
- Dirt contamination entering the connector when disconnected
- Transmission fluid leaking into the connector, wicking up into the external wiring harness and degrading the wire insulation
- Moisture intrusion in the connector
- Low pin retention in the external connector from excessive connection and disconnection of the wiring connector assembly
- Pin corrosion from contamination
- Damaged connector assembly

Remember the following points:

- Limit twisting or wiggling the connector during removal. Bent pins can occur.

pry the connector off with a screwdriver or other tool.

- Whenever the transmission external wiring connector is disconnected from the internal harness and the engine is operating, DTCs will set. Clear these DTCs after reconnecting the external connector.

Use the following procedure to disconnect the engine side of the 16-way connector from the transmission side:

1. Unlock the slide lock on the engine wiring harness connector.
2. Rotate the connector lever counterclockwise and remove the connector from the electrical connector passage sleeve.

Use the following procedure to reconnect the engine side of the 16-way connector to the transmission side:

1. Orient the alignment slot on the engine side of the connector with the alignment tab on the electrical connector passage sleeve.
2. Slide the engine side connector through the electrical connector passage sleeve and into the transmission side connector.
3. Rotate the connector lever clockwise until the connector is fully seated.
4. Lock the slide lock on the connector.

PARK - ENGINE RUNNING

When the gear selector lever is in the Park (P) position, fluid is drawn into the pump through the transmission fluid filter assembly, from the transmission fluid pan assembly. Line pressure is then directed to the following valves:

Fluid Pressure Directed in Preparation for a Shift

Manual Valve

Mechanically controlled by the gear selector lever, the manual valve is in the Park (P) position and prevents line pressure from the pressure regulator valve from entering the reverse and drive circuits.

CBR1/C456 Pressure Control (PC) Solenoid 3

The CBR1/C456 pressure control solenoid (PCS) is energized (HIGH) allowing actuator feed limit fluid to enter the PCS CBR1/C456 CL fluid circuit. PCS CBR1/C456 CL fluid is then routed through orifice #31 to the 4-5-6 clutch boost valve and through orifice #39 to the CBR1/ C456 clutch regulator valve.

CBR1/C456 Clutch Regulator Valve

PCS CBR1/C456 CL fluid at the CBR1/C4-5-6 clutch regulator valve moves the valve against CBR1/C4-5-6 clutch regulator spring force and CBR1/FDBK fluid. This allows line pressure to pass through the valve and enter the CBR1/456CL FD circuit. CBR1/456CL FD is then routed to clutch select valve 2.

Shift Solenoid 1

Shift solenoid 1 is energized (ON) allowing actuator feed limit fluid to enter the solenoid 1 circuit. Solenoid 1 fluid is routed to the #2 ball check valve and through orifice #10 to the torque converter clutch (TCC) regulator valve and shuttle valve (SHTL).

TCC Regulator Valve and Shuttle Valve

Solenoid 1 fluid is routed to the TCC regulator valve and shuttle valve and moves the valve against TCC regulator valve spring force.

#2 Ball Check Valve

id seats the #2 ball check valve against the reverse fluid passage and fluid is forced through orifice #22 into the CSV2 enable fluid circuit.

Clutch Select Valve 2

CSV2 enable fluid is routed to the clutch select valve 2 and moves the valve against clutch select valve 2 spring force. This allows CBR1/456 CL FD fluid to pass through the valve and enter the CBR1/CBR FD circuit. CBR1/CBR FD fluid is then routed: to clutch select valve 3, into the CBR1 fluid circuit and, through orifice #49 where it enters the CBR fluid circuit and an exhaust passage at the clutch select valve 3 (this fluid is intended to keep the low and reverse clutch full of fluid but not pressurized). CBR1 fluid is then routed to the low & reverse clutch assembly in preparation for a shift into low or reverse gear.

Shift Solenoid 2

Shift solenoid 2 is energized (ON) allowing actuator feed limit fluid to enter the solenoid 2 fluid circuit and is then routed to the #3 ball check valve.

3-5 Reverse Clutch Regulator Valve

Actuator feed limit fluid is routed through the valve and into the PS1 fluid passage. PS1 fluid is then sent to the normally closed #1 pressure switch and opens the switch.

#3 Ball Check Valve

Solenoid 2 fluid seats the #3 ball check valve against 456 CL fluid passage and fluid is forced through orifice #20 into the CSV3 enable fluid circuit. CSV3 enable fluid is then routed to the clutch select valve 3.

Clutch Select Valve #3

CSV3 enable fluid moves the clutch select valve 3 against clutch select valve 3 spring force. CBR fluid at the clutch select valve 3 passes through the valve and exhausts.

Park- Engine Running

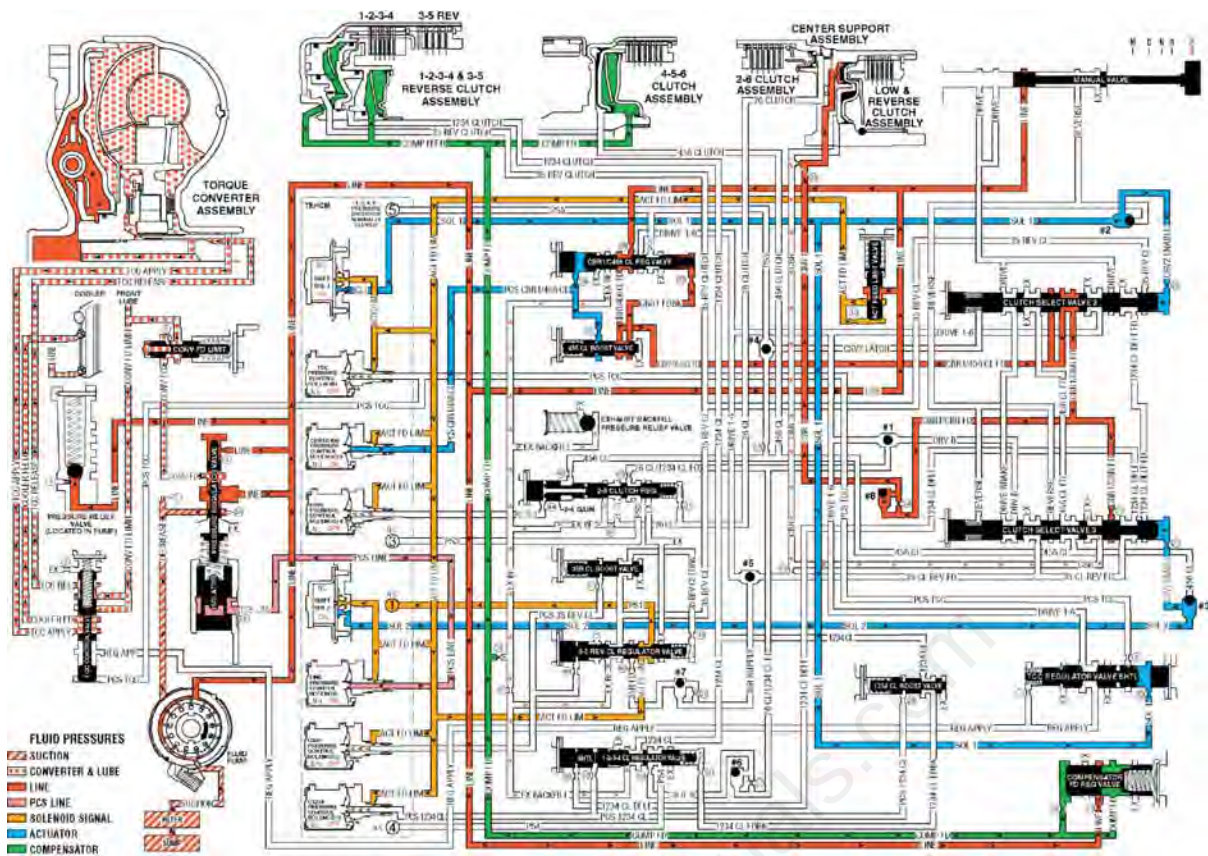


Fig. 7: Park— Engine Running Hydraulic Diagram

Courtesy of GENERAL MOTORS COMPANY

REVERSE

When the gear selector lever is moved to the Reverse (R) position (from the Park position) the normally high C35R pressure control solenoid 2 is commanded ON and the following changes occur in the transmission's hydraulic and electrical systems:

Fluid Pressure Directed in Preparation for a Shift

Manual Valve

With the manual valve in the reverse position, line pressure is directed into the reverse fluid circuit to the #2 ball check valve and clutch select valve 3.

#2 Ball Check Valve

Reverse fluid seats the #2 ball check valve against the solenoid 1 fluid passage and fluid is forced through orifice #22 into the CSV2 enable circuit.

Clutch Select Valve 2

CSV2 enable fluid, present at the valve from Park position, continues to hold the clutch select valve 2 against clutch select valve 2 spring force.

Low and Reverse Clutch Applies

Clutch Select Valve 3

from the manual valve is routed to clutch select valve 3 to combine with clutch select valve 3 spring force to keep the valve in the off position. This allows reverse fluid to pass through the valve and enter the 3-5 clutch reverse feed circuit. The 3-5 clutch reverse feed fluid from the clutch select valve 3 is also routed to #5 ball check valve. CBR1/CBR FD fluid is also directed through the clutch select valve 3 to the low and reverse clutch assembly.

Low and Reverse Clutch

CBR and CBR1 fluid pressures are routed to both the inner and outer areas of the low and reverse clutch piston to hold the piston against spring force and hold the low and reverse clutch plates. The clutch was already applied in Park, but is applied with more holding capacity in Reverse (both piston areas are pressurized).

#5 Ball Check Valve

The 3-5 clutch reverse feed fluid seats #5 ball check valve against the drive 1-6 circuit allowing 3-5 clutch reverse feed fluid to enter the 3-5 reverse supply circuit. The 3-5 reverse supply fluid is then routed to #7 ball check valve and through orifice #25 where it enters the 3-5 reverse feed circuit. The 3-5 reverse feed passes through orifice #46 and then is routed to the 3-5 reverse clutch regulator valve.

3-5 Reverse Clutch Applies

C35R Pressure Control Solenoid 2

The C35R pressure control solenoid 2 is energized (HIGH) allowing actuator feed limit fluid to enter the PCS 3-5 reverse clutch circuit. PCS 3-5 reverse clutch fluid is then routed through orifice #48 to the 3-5 reverse clutch regulator valve and through orifice #40 to the 3-5 reverse boost valve.

3-5 Reverse Clutch Regulator Valve

PCS 3-5 reverse clutch fluid moves the 3-5 reverse clutch regulator valve against 3-5 reverse clutch regulator valve spring force and 3-5 reverse clutch feedback fluid. This allows 3-5 reverse feed to pass through the valve and enter the 3-5 reverse clutch circuit. The 3-5 reverse clutch fluid is then routed to the 3-5 reverse clutch and the 3-5 reverse boost valve. PS1 fluid from pressure switch 1 exhausts through the valve allowing the switch to close.

3-5 Reverse Boost Valve

PCS 3-5 reverse clutch fluid pressure acts on a differential area moving the 3-5 reverse clutch boost valve against the 3-5 reverse clutch boost valve spring. The 3-5 reverse clutch fluid passes through the valve and enters the 3-5 reverse clutch feedback circuit. As PCS 3-5 reverse clutch fluid pressure is increased to a given value, the 3-5 reverse clutch boost valve opens the 3-5 reverse clutch feedback circuit to exhaust. This results in the 3-5 reverse clutch regulator valve moving to the full feed position sending full 3-5 clutch reverse feed pressure (full line pressure) to the clutch.

3-5 Reverse Clutch

The 3-5 reverse clutch fluid enters the 1-2-3-4 and reverse clutch housing to move the piston against spring force and compensator feed fluid to apply the 3-5 reverse clutch plates.

Reverse

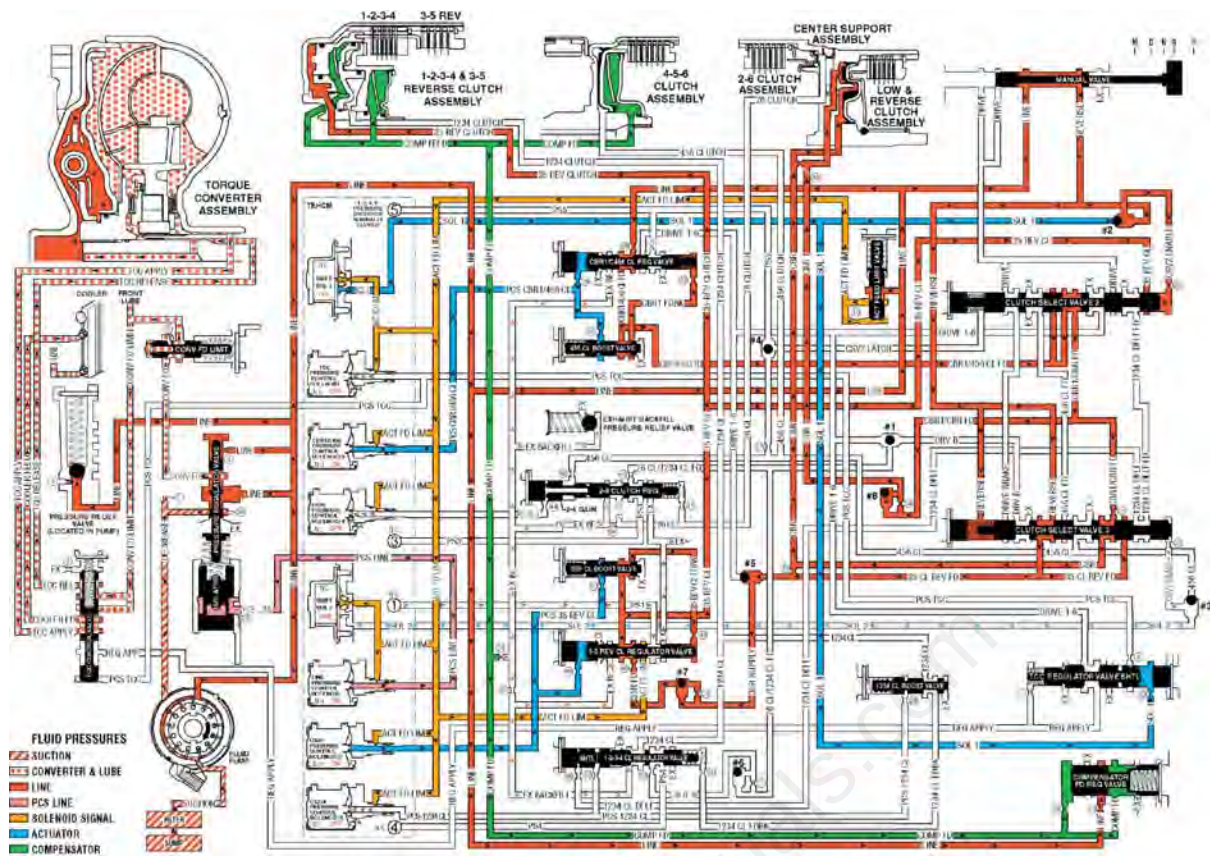


Fig. 8: Reverse Hydraulic Diagram

Courtesy of GENERAL MOTORS COMPANY

NEUTRAL - ENGINE RUNNING

When the gear selector is moved to the Neutral (N) position, the hydraulic and electrical system operation is identical to Park (P) range. However, if Neutral is selected after the vehicle was operating in Reverse (R), the normally high C35R pressure control solenoid 2 is commanded OFF and the following changes would occur in the hydraulic system:

3-5 Reverse Clutch Releases

Manual Valve

The manual valve is moved to the Neutral position and blocks line pressure from entering the reverse and drive fluid circuits. The reverse fluid from the #2 ball check valve and clutch select valve 3 is opened to an exhaust passage at the manual valve.

C35R Pressure Control Solenoid 2

The C35R pressure control solenoid 2 is commanded OFF allowing PCS 3-5 reverse clutch fluid from the 3-5 reverse clutch boost valve and 3-5 reverse clutch regulator valve to exhaust.

3-5 Reverse Clutch Boost Valve

The 3-5 reverse boost valve spring force moves the valve to allow 3-5 reverse clutch feedback fluid from the 3-5 reverse clutch regulator valve to enter the 3-5 reverse clutch circuit and exhaust.

3-5 Reverse Clutch Regulator Valve

e clutch regulator valve spring force moves the valve to allow 3-5 reverse clutch fluid from the 3-5 reverse clutch and clutch select valve 2 to pass through the valve and enter the exhaust backfill fluid circuit. The 3-5 reverse clutch fluid then enters the exhaust backfill fluid circuit and is routed through orifice #30 to the exhaust backfill pressure relief valve where excess pressure is exhausted.

3-5 Reverse Clutch

The 3-5 reverse clutch spring force combined with a force from the compensator moves the 3-5 reverse clutch piston to release the 3-5 reverse clutch plates and force 3-5 reverse clutch fluid to exhaust from the 1-2-3-4 and 3-5 reverse clutch housing. The 3-5 reverse clutch fluid is then routed to the 3-5 reverse clutch regulator valve allowing the 3-5 reverse clutch to release.

Clutch Select Valve 3

When reverse fluid exhausts through the manual valve, CSV3 enable fluid moves the valve against clutch select valve 3 spring force. The 3-5 reverse feed fluid is routed around #7 ball check valve and into the 3-5 reverse supply circuit. The 3-5 reverse supply fluid is routed around #5 ball check valve and into the 3-5 clutch reverse feed circuit and exhausts at the clutch select valve 3.

Neutral- Engine Running

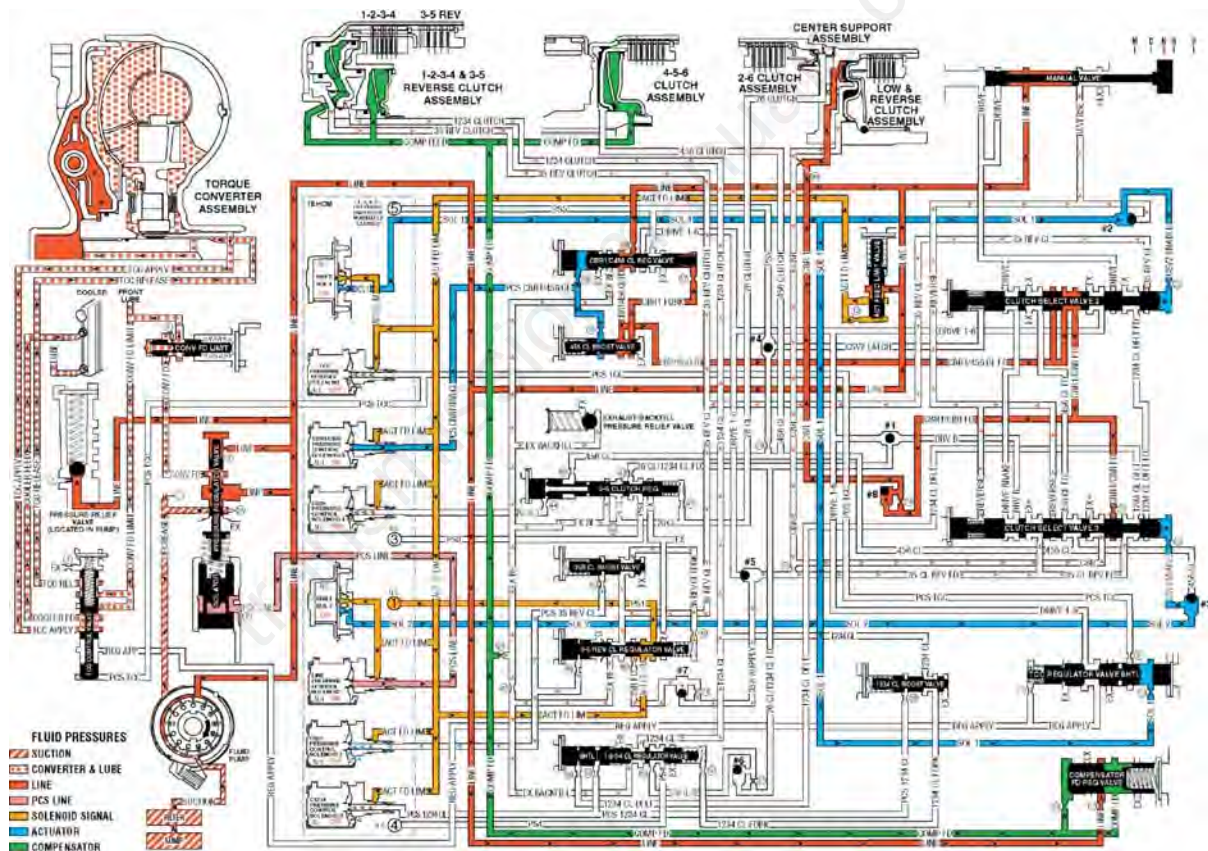


Fig. 9: Neutral– Engine Running Hydraulic Diagram

Courtesy of GENERAL MOTORS COMPANY

DRIVE RANGE, FIRST GEAR ENGINE BRAKING

When the gear selector lever is moved to the Drive (D) range from the Neutral (N) position, the transmission will provide engine braking. In this operating range, the normally-low C1234 pressure control solenoid 5 is commanded ON and in the engine braking mode the following changes occur within the hydraulic circuits:

Fluid Pressure is Directed to the 1-2-3-4 Clutch and the Low and Reverse Clutch to Provide Engine Braking

The manual valve is moved to the Drive (D) position and allows line fluid pressure to enter the drive fluid circuit. Drive fluid is then routed to the clutch select valve 2.

Clutch Select Valve 2

Drive fluid at the clutch select valve 2 passes through the valve and enters the drive brake circuit. Drive brake fluid is then routed to the clutch select valve 3.

Clutch Select Valve 3

Drive brake fluid at the clutch select valve 3 passes through the valve and enters the Drive B fluid circuit. Drive B fluid is then routed to #1 ball check valve.

#1 Ball Check Valve

Drive B fluid seats the #1 ball check valve against drive 1-6 fluid to force drive B fluid into the CB26/C1234 feed passage. CB26/C1234 feed fluid is routed to the #6 ball check valve, through orifice #43 and, to the 2-6 clutch regulator valve. CB26/C1234 feed fluid passes through the 2-6 clutch regulator valve and enters the pressure switch 3 (PS3) fluid circuit. PS3 fluid is then routed to the normally closed pressure switch 3 and opens the switch.

#6 Ball Check Valve

CB26/C1234 feed fluid seats the #6 ball check valve against the 1234 clutch feed passage forcing CB26/C1234 feed fluid through orifice #32 before entering the 1234 clutch feed circuit. The 1234 clutch feed fluid is routed through orifice #33 and then to the 1-2-3-4 clutch regulator valve.

1-2-3-4 Clutch Applies

C1234 Pressure Control Solenoid 5

The C1234 pressure control solenoid 5 is commanded ON allowing actuator feed limit fluid to enter the PCS1234 clutch fluid circuit. PCS1234 clutch fluid is then routed through orifice #35 to the 1-2-3-4 clutch regulator valve. PCS1234 clutch fluid is also routed through orifice #29 and then to the 1-2-3-4 clutch boost valve.

1-2-3-4 Clutch Regulator Valve

PCS1234 clutch fluid moves the 1-2-3-4 clutch regulator valve against 1-2-3-4 clutch regulator valve spring force to allow 1234 clutch feed fluid to pass through the valve and enter the 1234 clutch fluid circuit. The 1234 clutch fluid is then routed to the 1234 clutch boost valve and the 1-2-3-4 clutch.

1-2-3-4 Clutch Boost Valve

PCS1234 clutch fluid pressure acts on a differential area moving the 1234 clutch boost valve against the 1234 clutch boost valve spring. The 1234 clutch fluid passes through the valve and enters the 1234 clutch feedback circuit. As PCS 1234 clutch fluid pressure is increased to a given value, the 1234 clutch boost valve opens the 1234 clutch feedback circuit to exhaust. This results in the 1234 clutch regulator valve moving to the full feed position sending full 26 CL/1234 CL feed pressure (full line pressure) to the clutch.

1-2-3-4 Clutch

The 1234 clutch fluid enters the 1234 clutch housing to move the piston against spring force and compensator feed fluid to apply the 1-2-3-4 clutch plates.

Drive Range, First Gear Engine Braking

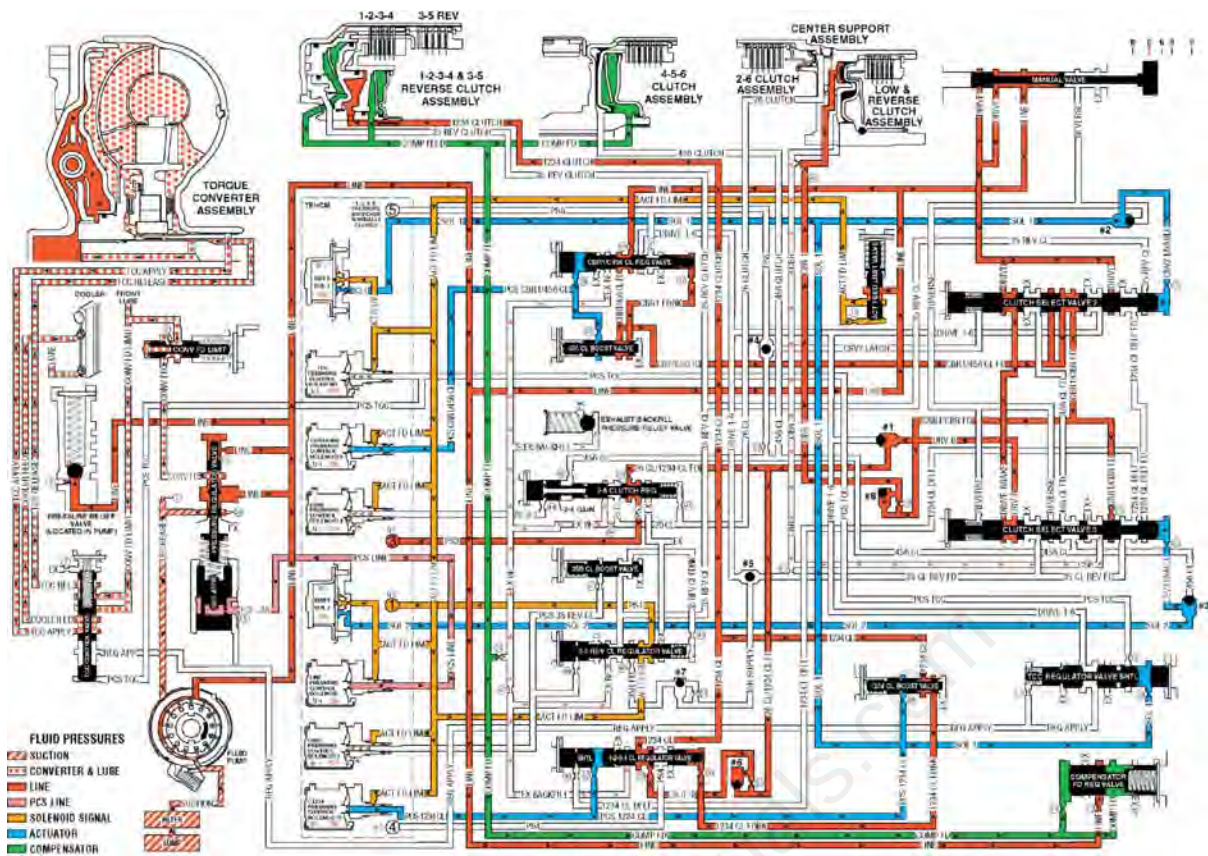


Fig. 10: Drive Range, First Gear Engine Braking Hydraulic Diagram

Courtesy of GENERAL MOTORS COMPANY

DRIVE RANGE, FIRST GEAR

As the vehicle speed increases, the transmission control module (TCM) receives input signals from the automatic transmission input and output speed sensors, throttle position sensor and other vehicle sensors to determine the precise moment to deenergize or "turn off" shift solenoid 1 and command OFF the normally-high CBR1/C456 pressure control solenoid 3.

Low & Reverse Clutch Releases

Shift Solenoid 1

When shift solenoid 1 is "turned OFF", CSV2 enable fluid from the clutch select valve 2 passes by the #2 ball check valve and enters the solenoid 1 fluid circuit. Solenoid 1 fluid from the #2 ball check valve and TCC regulator valve is then routed to the solenoid where it exhausts.

Clutch Select Valve 2

Clutch select valve 2 (CSV2) enable fluid is exhausted from the clutch select valve 2 and clutch select valve 2 spring force moves the valve to the released position. With clutch select valve 2 in the released position, drive fluid from the manual valve passes through the valve and enters the drive 1-6 fluid circuit. Drive 1-6 fluid then feeds all clutch regulator valves and the TCC regulator valve.

CBR1/C456 Pressure Control Solenoid 3

The CBR1/C456 pressure control solenoid 3 is commanded OFF allowing PCS CBR1/C456 fluid from the CBR1/C456 clutch regulator valve and 456 clutch boost valve to exhaust.

CBR1/C456 Clutch Regulator Valve

lutch regulator valve spring force moves the valve to exhaust the CBR1/456 clutch feed circuit and allow drive 1-6 fluid to enter the PS5 fluid circuit. PS5 fluid is then routed to the normally-closed pressure switch 5 and opens the switch. PS5 fluid is also routed to the #4 ball check valve and flows into the CSV2 latch fluid circuit.

#4 Ball Check Valve

PS5 fluid pressure seats the #4 ball check valve against the 456 clutch fluid circuit. PS5 fluid is then directed into the CSV2 latch fluid circuit and routed to the clutch select valve 2. CSV2 latch fluid combines with clutch select valve 2 spring force and holds the valve in this position during all 6 forward gear ranges.

#5 Ball Check Valve

Drive 1-6 fluid pressure seats the #5 ball check valve against the 35 clutch reverse feed fluid passage. Drive 1-6 fluid is then directed into the 35R supply fluid circuit which is routed to the #7 ball check valve and orifice #25.

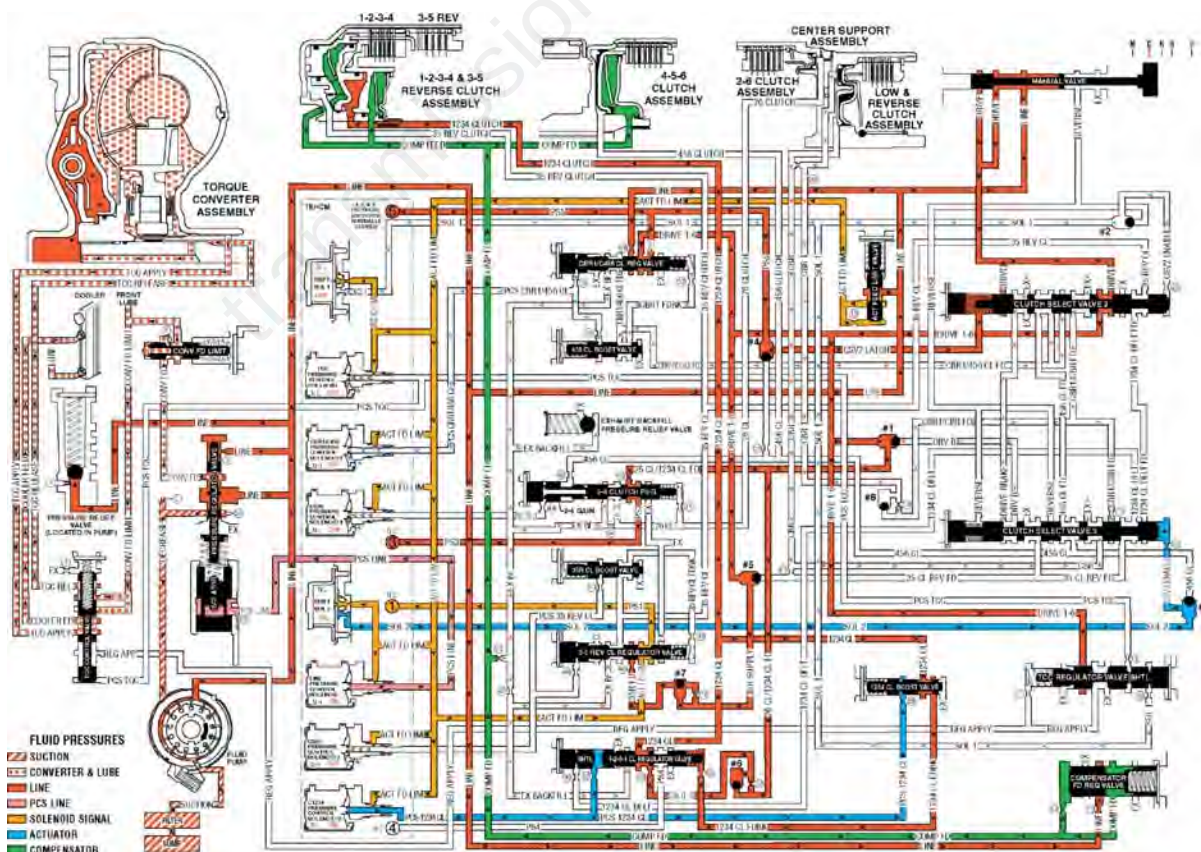
#7 Ball Check Valve

The 35R supply fluid seats the #7 ball check valve against the 35R feed fluid passage to force 35R supply fluid through orifice #25 before entering the 35R feed circuit. The 35R feed fluid is then routed to the 3-5 reverse clutch regulator valve.

Low and Reverse Clutch

Low and reverse clutch spring force moves the low and reverse clutch piston which forces clutch braking (CBR) and CBR1 fluid out of the center support. CBR fluid is routed to the clutch select valve 3 where it exhausts. CBR1 fluid is routed to the clutch select valve 2 where it exhausts. The low and reverse clutch is in the released position.

Drive Range, First Gear



Range, First Gear Hydraulic Diagram

Courtesy of GENERAL MOTORS COMPANY

DRIVE RANGE, SECOND GEAR

As the vehicle speed increases, the transmission control module (TCM) receives input signals from the automatic transmission input and output speed sensors, the throttle position sensor and other vehicle sensors to determine the precise moment to command ON the normally-low pressure control solenoid 4.

Second Clutch Applies

CB26 Pressure Control Solenoid 4

The CB26 pressure control solenoid 4 is commanded ON, allowing actuator feed limit fluid to enter the pressure control solenoid (PCS) 26 clutch fluid circuit. PCS 26 clutch fluid is then routed through orifice #44 to the 2-6 clutch regulator gain valve.

2-6 Clutch Regulator Gain Valve

The 2-6 clutch regulator gain valve allows the gain (valve input to output pressure magnification factor) of the 2-6 clutch regulator valve to be different for a 1-2 shift verses a 5-6 shift. For a 1-2 shift, PCS 26 clutch fluid pressure acts on a differential area resulting in the "high gain" pressure output.

2-6 Clutch Regulator Valve

PCS 26 clutch fluid moves the 2-6 clutch regulator / gain valve assembly against the 2-6 clutch regulator valve spring force to allow 26 clutch/1234 clutch feed fluid to pass through the valve. The 26 clutch/1234 clutch feed fluid is routed into the 26 clutch fluid circuit where it passes through orifice #41 and then to the spring end of the 2-6 clutch regulator valve, and to the 2-6 clutch within the center support.

2-6 Clutch

The 26 clutch fluid from the 2-6 clutch regulator valve is routed through the center support and to the 2-6 clutch piston assembly. The 26 clutch fluid pressure moves the piston against 2-6 clutch spring force to apply the 2-6 clutch plates.

Drive Range, Second Gear

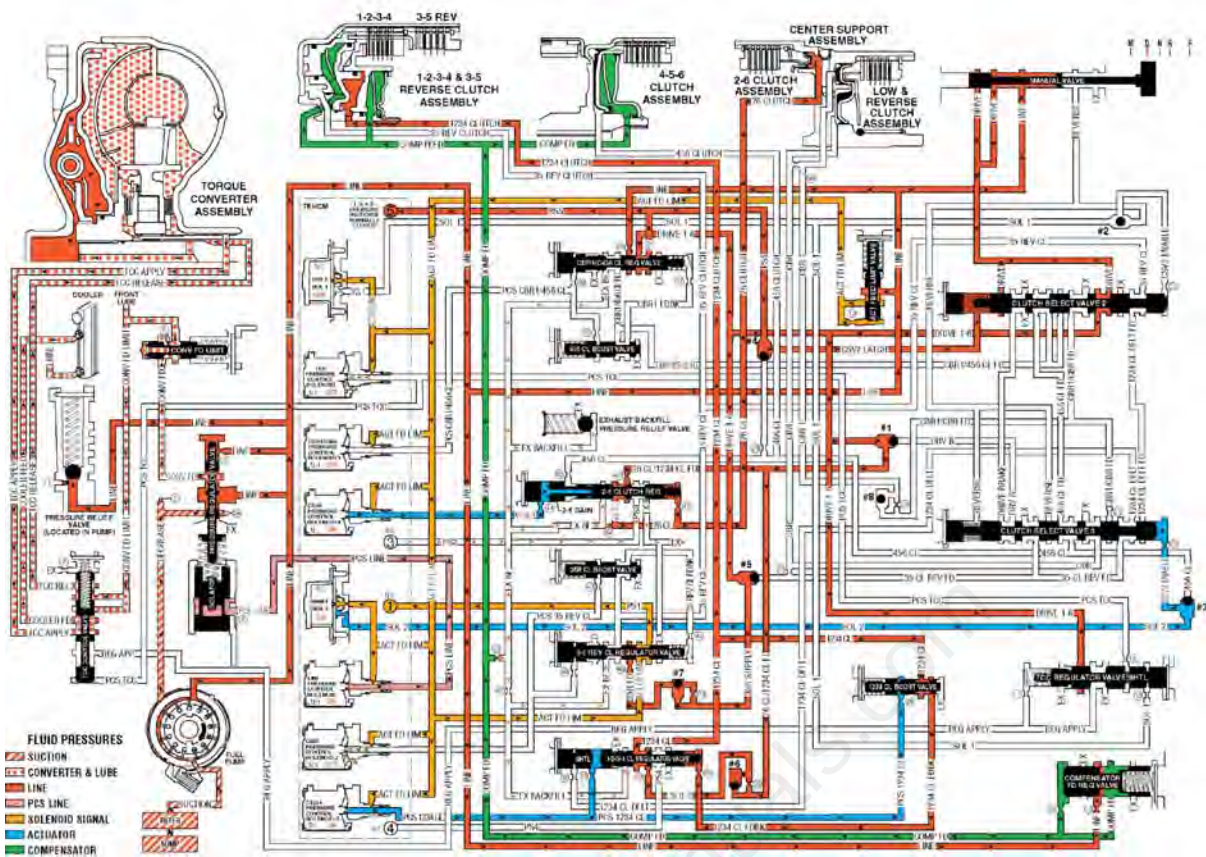


Fig. 12: Drive Range, Second Gear Hydraulic Diagram

Courtesy of GENERAL MOTORS COMPANY

DRIVE RANGE, THIRD GEAR

As the vehicle speed increases, the transmission control module (TCM) receives input signals from the automatic transmission input and output speed sensors, the throttle position sensor and other vehicle sensors to determine the precise moment to command OFF the normally-low CB26 pressure control solenoid 4. At the same time the C35R pressure control solenoid 2 is also commanded ON to regulate 3-5 clutch apply.

3-5 Reverse Clutch Applies

C35R Pressure Control Solenoid 2

The C35R pressure control solenoid 2 is commanded ON allowing actuator feed fluid to enter the pressure control solenoid (PCS) 35 reverse clutch fluid circuit. PCS 35 reverse clutch fluid is routed through orifice #48 and then to the 3-5 reverse clutch regulator valve. PCS 35 reverse clutch fluid is also routed through orifice #40 and then to the 3-5 reverse clutch boost valve.

3-5 Reverse Clutch Boost Valve

PCS 35 reverse clutch fluid pressure acts on a differential area moving the 3-5 reverse clutch boost valve against the 3-5 reverse clutch boost valve spring. The 35 reverse clutch fluid passes through the valve and enters the 35 reverse clutch feedback circuit. As PCS 35 reverse clutch fluid pressure is increased to a given value, the 3-5 reverse clutch boost valve opens the 35 reverse clutch feedback circuit to exhaust. This results in the 3-5 reverse clutch regulator valve moving to the full feed position sending full 35 reverse clutch feed pressure (full line pressure) to the clutch.

3-5 Reverse Clutch Regulator Valve

e clutch fluid moves the 3-5 reverse clutch regulator valve against 3-5 reverse clutch regulator valve spring force and 35 reverse clutch feedback fluid. This allows 35 reverse feed to pass through the valve and enter the 35 reverse clutch circuit. The 35 reverse clutch fluid is then routed to the 3-5 reverse clutch, the 3-5 reverse boost valve and the clutch select valve 2. When the 3-5 reverse clutch regulator valve is in this position, PS1 fluid from the pressure switch 1 exhausts through the valve allowing the switch to close.

3-5 Reverse Clutch

The 35 reverse clutch fluid enters the 1-2-3-4 and 3-5 reverse clutch housing to move the piston against spring force combined with force from the compensator to apply the 3-5 reverse clutch plates.

2-6 Clutch Releases

CB26 Pressure Control Solenoid 4

The CB26 pressure control solenoid 4 is commanded OFF allowing PCS 26 clutch fluid from the 2-6 clutch regulator valve to exhaust. The 26 clutch/1234 clutch feed fluid at the 2-6 clutch regulator valve passes through the valve and enters the PS3 fluid circuit. PS3 fluid is then routed to pressure switch 3 and opens the normally-closed switch.

2-6 Clutch Regulator Valve

The 2-6 clutch regulator valve spring force moves the valve to allow 26 clutch fluid from the 2-6 clutch to pass through the valve and enter the exhaust backfill fluid circuit.

2-6 Clutch

The 2-6 clutch spring force moves the 2-6 clutch piston to release the 2-6 clutch plates and forces 26 clutch fluid to exhaust from the center support. The 26 clutch fluid is routed through the 2-6 clutch regulator valve where it enters the exhaust backfill fluid circuit and is routed through orifice #30 to the exhaust backfill pressure relief valve where excess pressure is exhausted.

Drive Range, Third Gear

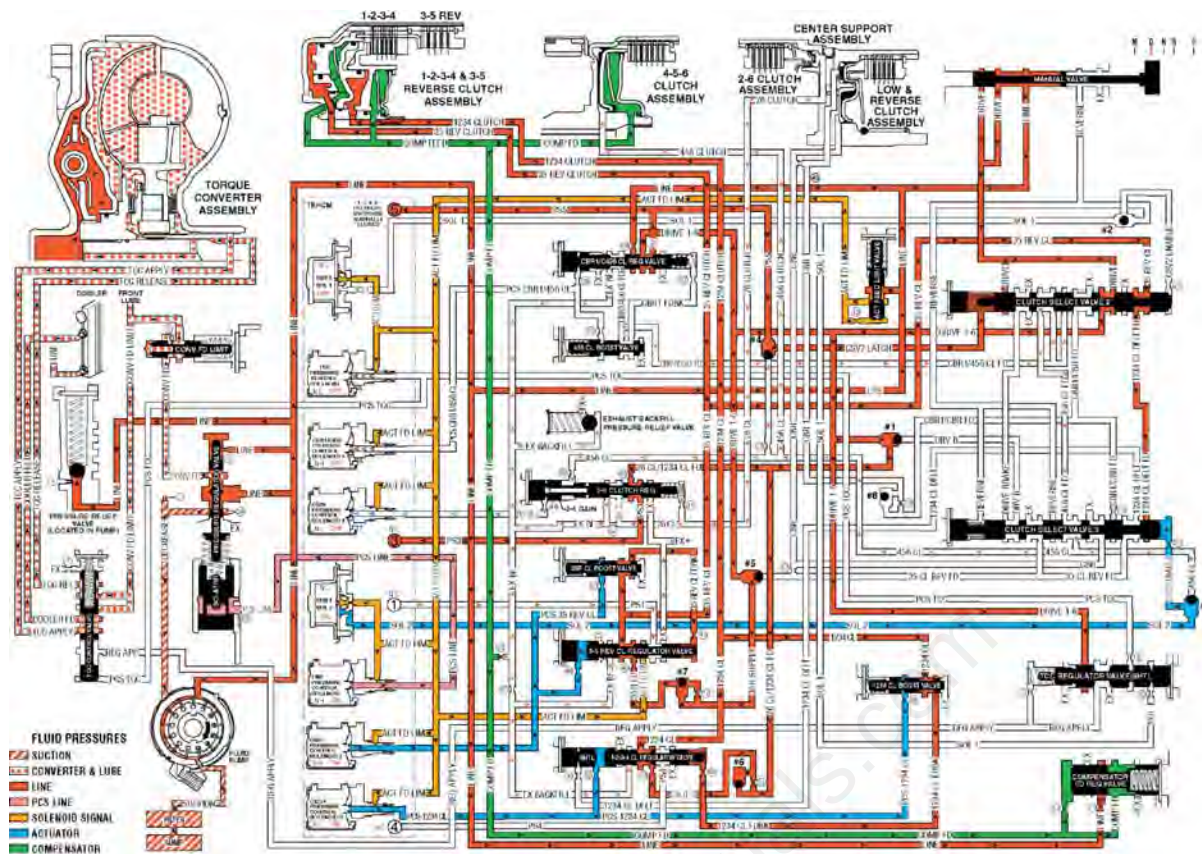


Fig. 13: Drive Range, Third Gear Hydraulic Diagram

Courtesy of GENERAL MOTORS COMPANY

DRIVE RANGE, THIRD GEAR DEFAULT

If the transmission is in 1st, 2nd or 3rd gear during a transmission electrical component failure, the transmission will default to 3rd gear. All solenoids will default to their normal state. If the torque converter clutch was applied, it will release. This default action will enable the vehicle to be safely driven to a service center.

1-2-3-4 Clutch Stays Applied

Shift Solenoid 2

Shift solenoid 2 defaults to it's normally-closed state (OFF), and SOL 2 fluid exhausts through the solenoid.

Clutch Select Valve 3

Solenoid 2 fluid pressure no longer holds the clutch select valve 3 open. When the valve moves back to the closed position, it opens the 1234 clutch default fluid circuit, and 1234 default fluid is routed to the 1-2-3-4 clutch regulator valve.

1-2-3-4 Clutch Regulator Valve

With the absence of PCS 1234 clutch fluid, due to the default state of the C1234 pressure control solenoid 5, the 1-2-3-4 regulator valve would close from spring force. However, the 1234 clutch default fluid enters behind the 1-2-3-4 regulator shuttle valve and keeps the valve in the open position.

1-2-3-4 Clutch

With the 1-2-3-4 clutch regulator valve still held in the open position, the 1-2-3-4 clutch will stay applied.

C35R Pressure Control Solenoid 2

The normal state for the C35R pressure control solenoid 2 is ON, therefore PSC 35 reverse clutch fluid will still be routed to the 3-5 reverse clutch regulator valve and the 3-5 reverse clutch boost valve.

3-5 Reverse Clutch Regulator Valve

PCS 3-5 reverse clutch fluid moves the 3-5 reverse clutch regulator valve against 3-5 reverse clutch regulator valve spring force and 3-5 reverse clutch feedback fluid. This allows 3-5 reverse feed to pass through the valve and enter the 3-5 reverse clutch circuit. 3-5 reverse clutch fluid is then routed to the 3-5 reverse clutch, the 3-5 reverse boost valve and the clutch select valve 2. When the 3-5 reverse clutch regulator valve is in this position, PS1 fluid from the pressure switch 1 exhausts through the valve, allowing the switch to close.

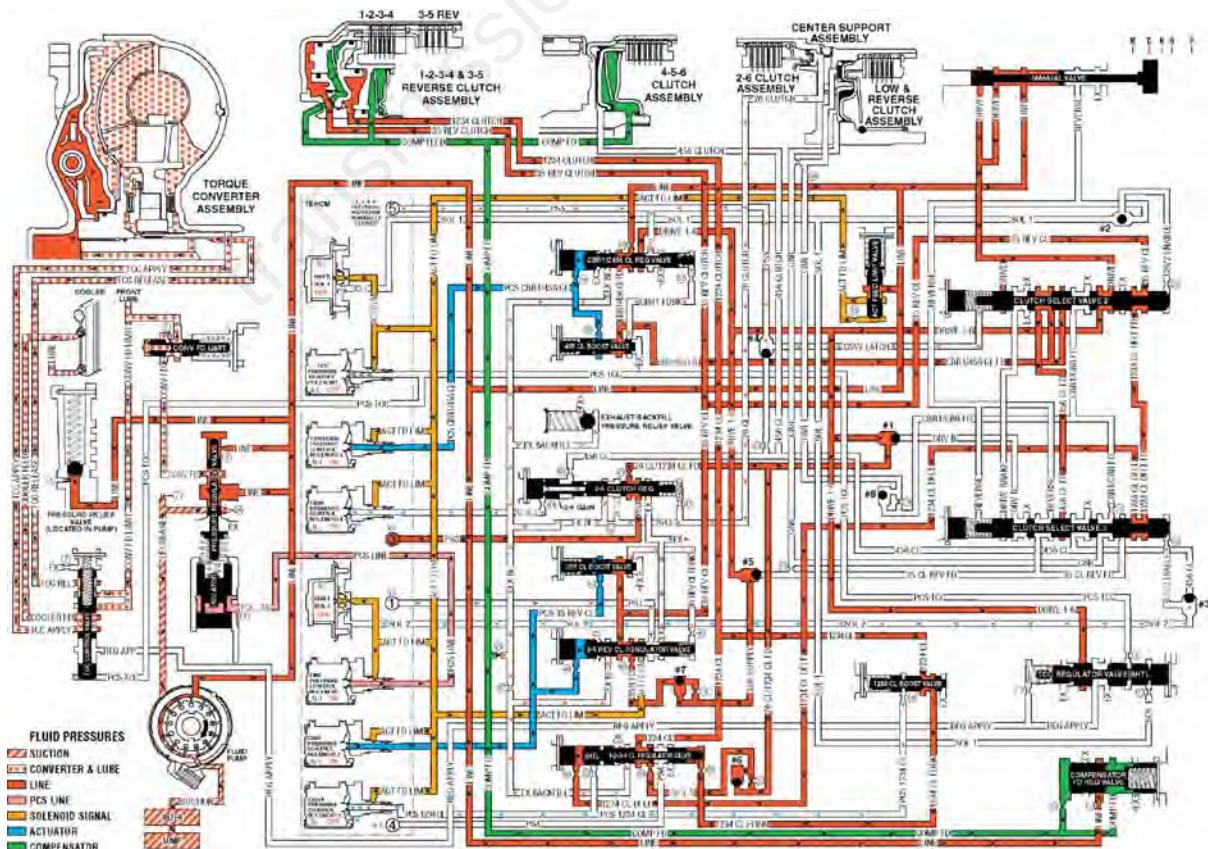
3-5 Reverse Clutch Boost Valve

PCS 3-5 reverse clutch fluid pressure acts on a differential area moving the 3-5 reverse clutch boost valve against the 3-5 reverse clutch boost valve spring. The 3-5 reverse clutch fluid passes through the valve and enters the 3-5 reverse clutch feedback circuit. As PCS 3-5 reverse clutch fluid pressure is increased to a given value, the 3-5 reverse clutch boost valve opens the 3-5 reverse clutch feedback circuit to exhaust. This results in the 3-5 reverse clutch regulator valve moving to the full feed position sending full 3-5 reverse clutch feed pressure (full line pressure) to the clutch.

3-5 Reverse Clutch

The 3-5 reverse clutch fluid enters the 1-2-3-4 and 3-5 reverse clutch housing to move the piston against spring force combined with force from the compensator to apply the 3-5 reverse clutch plates.

Drive Range, Third Gear Default



Range, Third Gear Default Hydraulic Diagram

Courtesy of GENERAL MOTORS COMPANY

DRIVE RANGE, FOURTH GEAR

As the vehicle speed increases, the transmission control module (TCM) receives input signals from the automatic transmission input and output speed sensors, the throttle position sensor and other vehicle sensors to determine the precise moment to command OFF the normally-high C35R pressure control solenoid 2. At the same time the normally-low CBR1/C456 pressure control solenoid 3 is commanded ON to regulate 4-5-6 clutch apply.

4-5-6 Clutch Applies

CBR1/C456 Pressure Control Solenoid 3

The CBR1/C456 pressure control solenoid 3 (PCS) is commanded ON allowing actuator feed fluid to enter the PCS CBR1/456 clutch fluid circuit. PCS CBR1/456 clutch fluid is routed through orifice #39 to the CBR1/C456 clutch regulator valve and, through orifice #31 to the CBR1/C456 clutch boost valve.

CBR1/C456 Clutch Regulator Valve

PCS CBR1/456 clutch fluid moves the CBR1/C456 clutch regulator valve against CBR1/C456 clutch regulator valve spring force to allow line fluid to pass through the valve and enter the CBR1/456 clutch feed circuit. CBR1/456 clutch feed is then routed to the 4-5-6 clutch boost valve and clutch select valve 2.

4-5-6 Clutch Boost Valve

PCS CBR1/456 clutch fluid pressure acts on a differential area moving the CBR1/456 clutch boost valve against the CBR1/456 clutch boost valve spring. CBR1/456 clutch fluid passes through the valve and enters the CBR1/456 clutch feedback circuit. As PCS CBR1/456 clutch fluid pressure is increased to a given value, the CBR1/456 clutch boost valve opens the CBR1/456 clutch feedback circuit to exhaust. This results in the CBR1/456 clutch regulator valve moving to the full feed position, sending full line pressure to the clutch.

Clutch Select Valve 2

CBR1/456 clutch feed fluid passes through the clutch select valve 2 and enters the 456 clutch feed circuit. The 456 clutch feed fluid is routed to the clutch select valve 3 where it passes through the valve and enters the 456 clutch fluid circuit. The 456 clutch fluid is routed to the 4-5-6 clutch, the 2-6 clutch regulator gain valve and to the #3 ball check valve. The 456 clutch fluid seats the #3 ball check valve against solenoid 2 fluid passage and directed into the CSV3 enable fluid circuit where it is routed through orifice #20 and to clutch select valve 3.

4-5-6 Clutch

The 456 clutch fluid enters the 4-5-6 clutch housing to move the piston against spring force, combined with force from the compensator to apply the 4-5-6 clutch plates.

3-5 Reverse Clutch Releases

C35R Pressure Control Solenoid 2

The C35R pressure control solenoid 2 is commanded OFF, allowing PCS 35 reverse clutch fluid from the 3-5 reverse clutch boost valve and the 3-5 reverse clutch regulator valve to exhaust through the solenoid.

3-5 Reverse Clutch Boost Valve

The 3-5 reverse boost valve spring force moves the valve to allow 35 reverse clutch feedback fluid from the 3-5 reverse clutch regulator valve to enter the 35 reverse clutch fluid circuit and exhaust.

Clutch Regulator Valve

The 3-5 reverse clutch regulator valve spring force moves the valve to allow 35 reverse clutch fluid from the 3-5 reverse clutch to pass through the valve and enter the exhaust backfill fluid circuit. The 35 reverse clutch fluid then enters the exhaust backfill fluid circuit and is routed through orifice #30 to the exhaust backfill pressure relief valve where excess pressure is exhausted.

3-5 Reverse Clutch

The 3-5 reverse clutch spring force combined with force from the compensator move the 3-5 reverse clutch piston to release the 3-5 clutch plates and forces 35 reverse clutch fluid to exhaust from 1- 2-3-4 and 3-5 reverse clutch housing. The 35 reverse clutch fluid is then routed to the 3-5 reverse clutch regulator valve and exhausted.

Drive Range, Fourth Gear

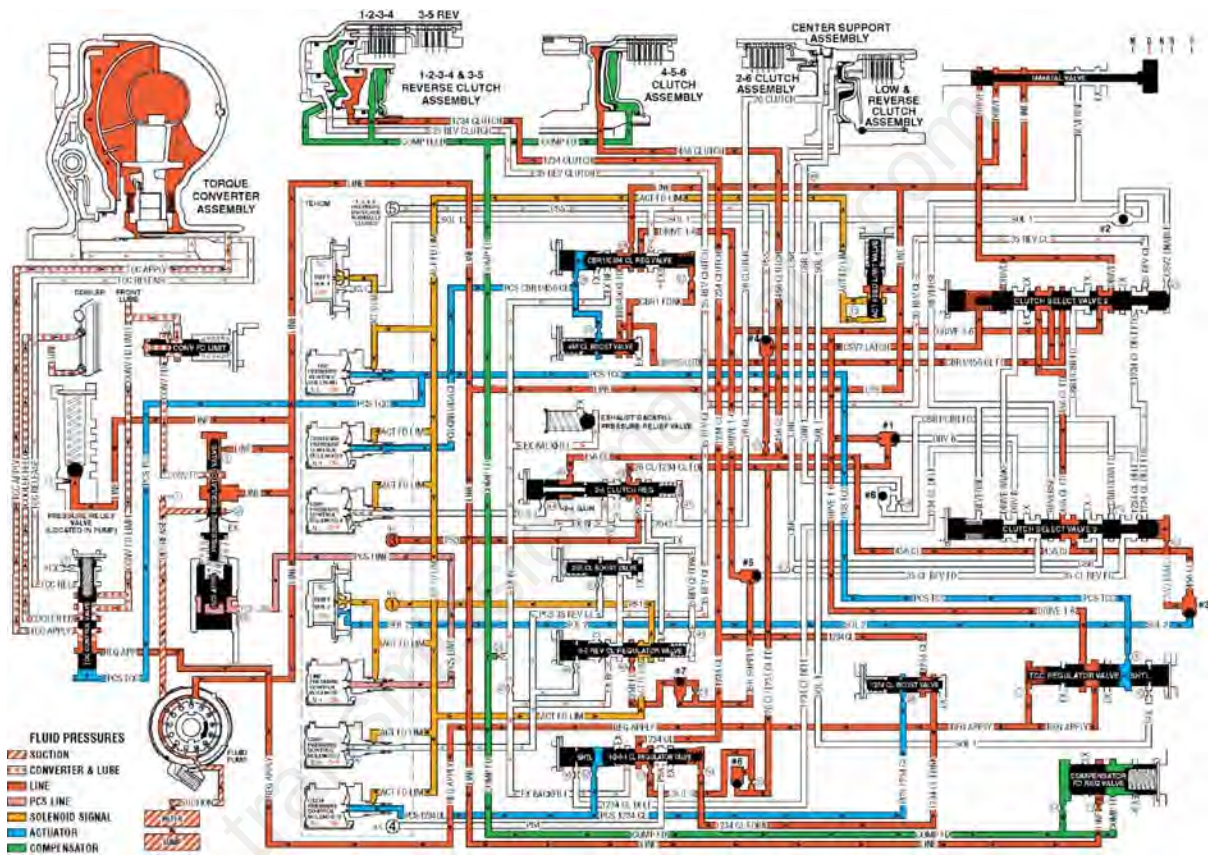


Fig. 15: Drive Range, Fourth Gear Hydraulic Diagram

Courtesy of GENERAL MOTORS COMPANY

DRIVE RANGE, FIFTH GEAR

As the vehicle speed increases, the transmission control module (TCM) receives input signals from the automatic transmission input and output speed sensors, the throttle position sensor and other vehicle sensors to determine the precise moment to command ON the normally-high C35R pressure control solenoid 2. At the same time the normally-low C1234 pressure control solenoid 5 is commanded OFF.

3-5 Reverse Clutch Applies

C35R Pressure Control Solenoid 2

The C35R pressure control solenoid 2 is commanded ON, allowing actuator feed fluid to enter the PCS 35 reverse clutch fluid circuit. PCS 35 reverse clutch fluid is routed through orifice #48 and then to the 3-5 reverse clutch

3. PCS 35 reverse clutch fluid is also routed through orifice #40 and then to the 3-5 reverse clutch boost valve.

3-5 Reverse Clutch Boost Valve

PCS 35 reverse clutch fluid pressure acts on a differential area moving the PCS 3-5 reverse clutch boost valve against the 3-5 reverse clutch boost valve spring. The 35 reverse clutch fluid passes through the valve and enters the 35 reverse clutch feedback circuit. As PCS 35 reverse clutch fluid pressure is increased to a given value, the 3-5 reverse clutch boost valve opens the 35 reverse clutch feedback circuit to exhaust. This results in the 3-5 reverse clutch regulator valve moving to the full feed position sending full 35 reverse clutch feed pressure (full line pressure) to the clutch.

3-5 Reverse Clutch Regulator Valve

PCS 35 reverse clutch fluid moves the 3-5 reverse clutch regulator valve against 3-5 reverse clutch regulator valve spring force and 35 reverse clutch feedback fluid. This allows 35 reverse feed to pass through the valve and enter the 35 reverse clutch circuit. The 35 reverse clutch fluid is then routed to the 3-5 reverse clutch, the 3-5 reverse boost valve and the clutch select valve 2. When the 3-5 reverse clutch regulator valve is in this position, PS1 fluid from the pressure switch 1 exhausts through the valve allowing the switch to close.

Clutch Select Valve 2

The 35 reverse clutch fluid passes through the clutch select valve 2 and enters the 1234 clutch default feed fluid circuit. The 1234 clutch default feed fluid is then routed to the clutch select valve 3.

3-5 Reverse Clutch

The 35 reverse clutch fluid enters the 1-2-3-4 and 3-5 reverse clutch housing to move the piston against spring force combined with force from the compensator to apply the 3-5 reverse clutch plates.

1-2-3-4 Clutch Releases

C1234 Pressure Control Solenoid 5

The C1234 pressure control solenoid 5 is commanded OFF, allowing PCS 1234 clutch fluid from the 1-2-3-4 clutch regulator valve and 1-2-3-4 clutch boost valve to exhaust.

1-2-3-4 Clutch Regulator Valve

The 1-2-3-4 clutch regulator valve spring force moves the valve to allow 1234 clutch feed fluid from the 1-2-3-4 clutch to pass through the valve and enter the exhaust backfill fluid circuit. The 1234 clutch fluid enters the exhaust backfill fluid circuit and is routed through orifice #30 to the exhaust backfill pressure relief valve where excess pressure is exhausted. Also, 1234 clutch regulator valve spring force moves the valve to allow 1234 clutch feed fluid to pass through the valve and enter the PS4 fluid circuit. PS4 fluid is then routed to pressure switch 4 and opens the normally-closed switch.

1-2-3-4 Clutch Boost Valve

The 1-2-3-4 clutch boost valve spring force moves the valve to allow 1234 clutch feedback fluid from the 1-2-3-4 clutch regulator valve to enter the 1234 clutch circuit and exhaust.

1-2-3-4 Clutch

The 1-2-3-4 clutch spring force combined with force from the compensator moves the 1-2-3-4 clutch piston to release the clutch plates and force 1234 clutch fluid from the 1-2-3-4 and 3-5 reverse clutch housing. The 1234 clutch fluid is routed through the 1-2-3-4 clutch regulator valve where it enters the exhaust backfill fluid circuit.

ifth Gear

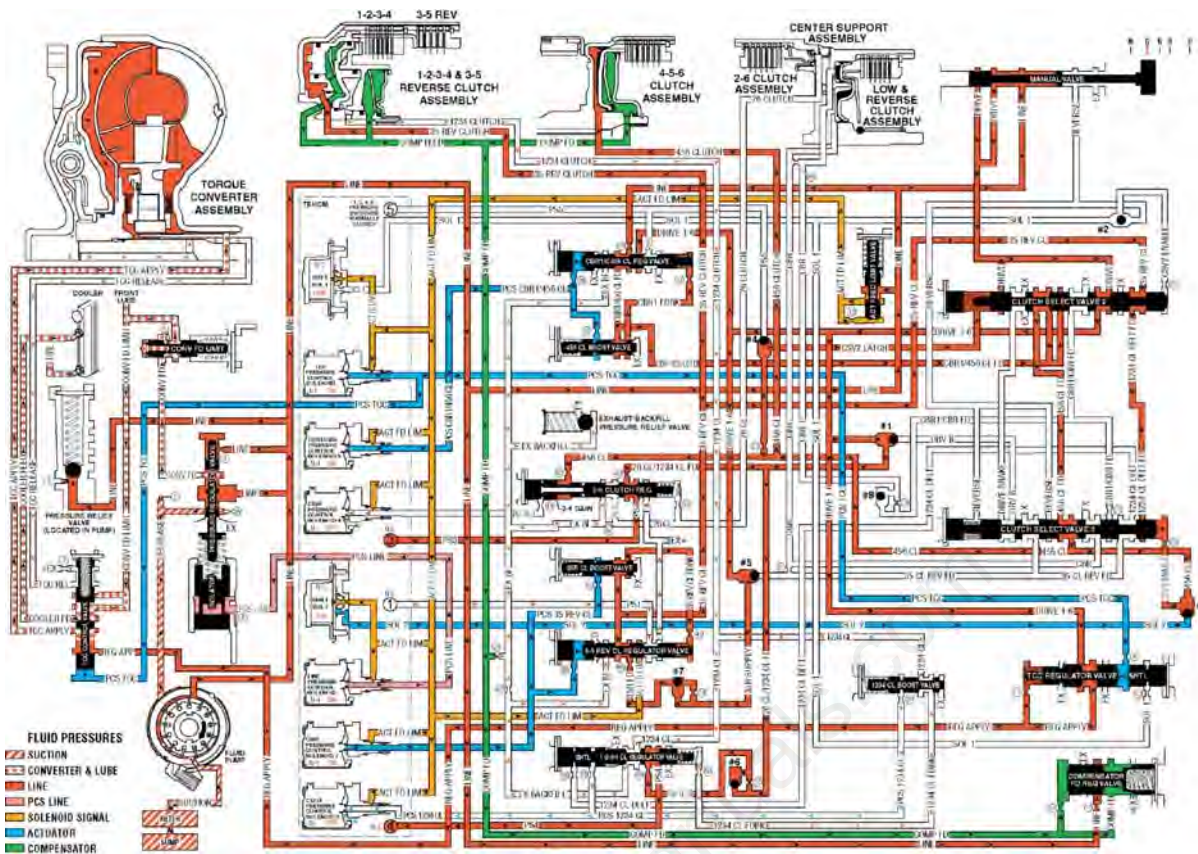


Fig. 16: Drive Range, Fifth Gear Hydraulic Diagram
Courtesy of GENERAL MOTORS COMPANY

DRIVE RANGE, FIFTH GEAR DEFAULT

If the transmission is in 4th, 5th or 6th gear during a transmission electrical component failure, the transmission will default to 5th gear. All solenoids will default to their normal state. If the torque converter clutch was applied, it will release. The transmission will stay in 5th gear default range until the ignition has been turned off or transmission shifted to reverse. When the vehicle is restarted, and shifted back into drive, the transmission will then operate in the 3rd gear default range. This default action will enable the vehicle to be safely driven to a service center.

3-5 Reverse Clutch Applies

C35R Pressure Control Solenoid 2

The C35R pressure control solenoid 2 defaults to ON, allowing actuator feed fluid to enter the pressure control solenoid (PCS) 35 reverse clutch fluid circuit. PCS 35 reverse clutch fluid is routed through orifice #48 and then to the 3-5 reverse clutch regulator valve. PCS 35 reverse clutch fluid is also routed through orifice #40 and then to the 3-5 reverse clutch boost valve.

3-5 Reverse Clutch Boost Valve

PCS 3-5 reverse clutch fluid pressure acts on a differential area moving the PCS 3-5 reverse clutch boost valve against the 3-5 reverse clutch boost valve spring. The 3-5 reverse clutch fluid passes through the valve and enters the 3-5 reverse clutch feedback circuit. As PCS 3-5 reverse clutch fluid pressure is increased to a given value, the 3-5 reverse clutch boost valve opens the 3-5 reverse clutch feedback circuit to exhaust. This results in the 3-5 reverse clutch regulator valve moving to the full feed position sending full 3-5 reverse clutch feed pressure (full line pressure) to the clutch.

Clutch Regulator Valve

PCS 3-5 reverse clutch fluid moves the 3-5 reverse clutch regulator valve against 3-5 reverse clutch regulator valve spring force and 3-5 reverse clutch feedback fluid. This allows 3-5 reverse feed to pass through the valve and enter the 3-5 reverse clutch circuit. The 3-5 reverse clutch fluid is then routed to the 3-5 reverse clutch, the 3-5 reverse boost valve and the clutch select valve 2. When the 3-5 reverse clutch regulator valve is in this position, PS1 fluid from the pressure switch 1 exhausts through the valve, allowing the switch to close.

3-5 Reverse Clutch

The 3-5 reverse clutch fluid enters the 1-2-3-4 and 3-5 reverse clutch housing to move the piston against spring force combined with force from the compensator to apply the 3-5 reverse clutch plates.

Clutch Select Valve 3

Once the clutch select valve 3 is moved to the ON position in 4th gear, it will remain in this position throughout the 5th gear default range, until the ignition has been turned OFF. When the ignition is OFF, fluid will exhaust from the valve, thus when the vehicle is restarted, the transmission will then be in the 3rd gear default range.

1-2-3-4 Clutch Releases or 2-6 Clutch Releases

C1234 Pressure Control Solenoid 5

If the transmission was in 4th gear when an electrical condition commands a protection mode, the C1234 pressure control solenoid 5 defaults to the OFF position, allowing PCS 1234 clutch fluid from the 1-2-3-4 clutch, the 1-2-3-4 clutch regulator valve and 1- 2-3-4 clutch boost valve to exhaust.

2-6 CB26 Pressure Control Solenoid 4

If the transmission was in 6th gear when an electrical condition commands a protection mode, the CB26 pressure control solenoid 4 defaults to the OFF position, allowing PCS 26 clutch fluid from the 2-6 clutch regulator valve, and the 2-6 clutch to exhaust.

Torque Converter Clutch Releases

TCC Pressure Control Solenoid

The torque converter clutch (TCC) pressure control solenoid will default to it's normal state, OFF. PCS TCC fluid will exhaust from the TCC control valve, and spring force will shuttle the valve to the off position. TCC apply fluid will then be routed to the cooler, and TCC release fluid will be routed to the torque converter for complete TCC release.

Drive Range, Fifth Gear Default

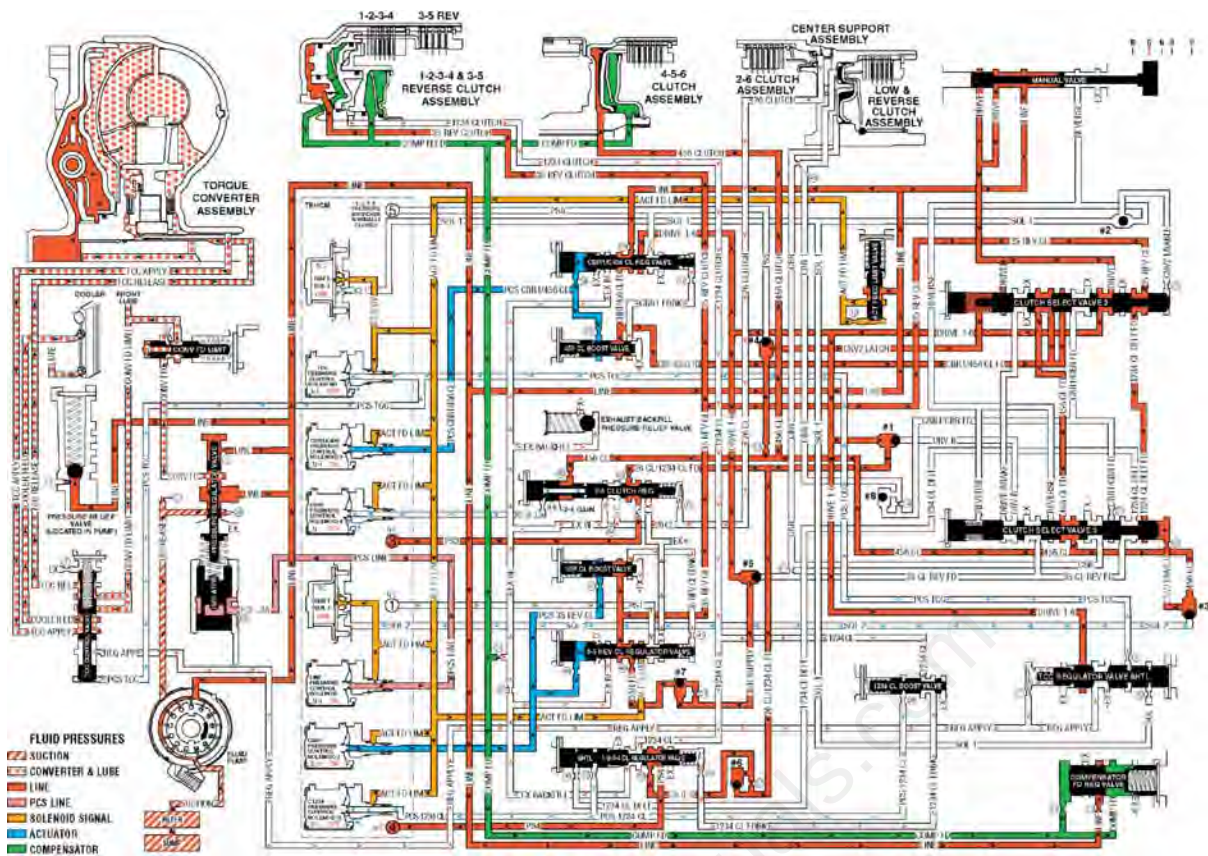


Fig. 17: Drive Range, Fifth Gear Default Hydraulic Diagram

Courtesy of GENERAL MOTORS COMPANY

DRIVE RANGE, SIXTH GEAR

As the vehicle speed increases, the transmission control module (TCM) receives input signals from the automatic transmission input and output speed sensors, the throttle position sensor and other vehicle sensors to determine the precise moment to command ON the normally-low CB26 pressure control solenoid 4 (PCS). At the same time the normally-high C35R pressure control solenoid 2 is commanded OFF.

2-6 Clutch Applies

CB26 Pressure Control Solenoid 4

The CB26 pressure control solenoid 4 is commanded ON, allowing actuator feed fluid to enter the PCS 26 clutch fluid circuit. PCS 26 fluid is routed through orifice #44 and then to the 2-6 clutch regulator gain valve.

2-6 Clutch Regulator Gain Valve

The 2-6 clutch regulator gain valve allows the gain (valve input to output pressure magnification factor) of the 2-6 clutch regulator valve to be different for a 1-2 shift verses a 5-6 shift. For a 5-6 shift PCS 26 clutch fluid pressure passes through the hollow valve and only acts on the 26 regulator valve area, resulting in the "low gain" pressure output.

2-6 Clutch Regulator Valve

PCS 26 clutch fluid moves the 2-6 clutch regulator/gain valve assembly against the 2-6 clutch regulator valve spring force to allow 26 clutch/1234 clutch feed fluid to pass through the valve. The 26 clutch/1234 clutch feed fluid is routed into the 26 clutch fluid circuit where it passes through orifice #41 and then to the spring end of the 2-6 clutch regulator valve, and to the 2-6 clutch within the center support.

The 2-6 clutch fluid from the 2-6 clutch regulator valve is routed through the center support and to the 2-6 clutch piston assembly. The 2-6 clutch fluid pressure moves the piston against 2-6 clutch spring force to apply the 2-6 clutch plates.

3-5 Clutch Releases

C35R Pressure Control Solenoid 2

The C35R pressure control solenoid 2 is commanded OFF, allowing PCS 3-5 reverse clutch fluid from the 3-5 reverse clutch boost valve and the 3-5 reverse clutch regulator valve to exhaust through the solenoid.

3-5 Reverse Clutch Boost Valve

The 3-5 reverse boost valve spring force moves the valve to allow 3-5 reverse clutch feedback fluid from the 3-5 reverse clutch regulator valve to enter the 3-5 reverse clutch circuit and exhaust.

3-5 Reverse Clutch Regulator Valve

The 3-5 reverse clutch regulator valve spring force moves the valve to allow 3-5 reverse clutch fluid from the 3-5 reverse clutch to pass through the valve and enter the exhaust backfill fluid circuit. The 3-5 reverse clutch fluid then enters the exhaust backfill fluid circuit and is routed through orifice #30 to the exhaust backfill pressure relief valve where excess pressure is exhausted.

3-5 Reverse Clutch

The 3-5 reverse clutch spring force combined with force from the compensator move the 3-5 reverse clutch piston to release the 3-5 clutch plates and forces 3-5 reverse clutch fluid to exhaust from 1-2-3-4 and 3-5 reverse clutch housing. The 3-5 reverse clutch fluid is then routed to the 3-5 reverse clutch regulator valve where it enters the exhaust backfill circuit.

Drive Range, Sixth Gear

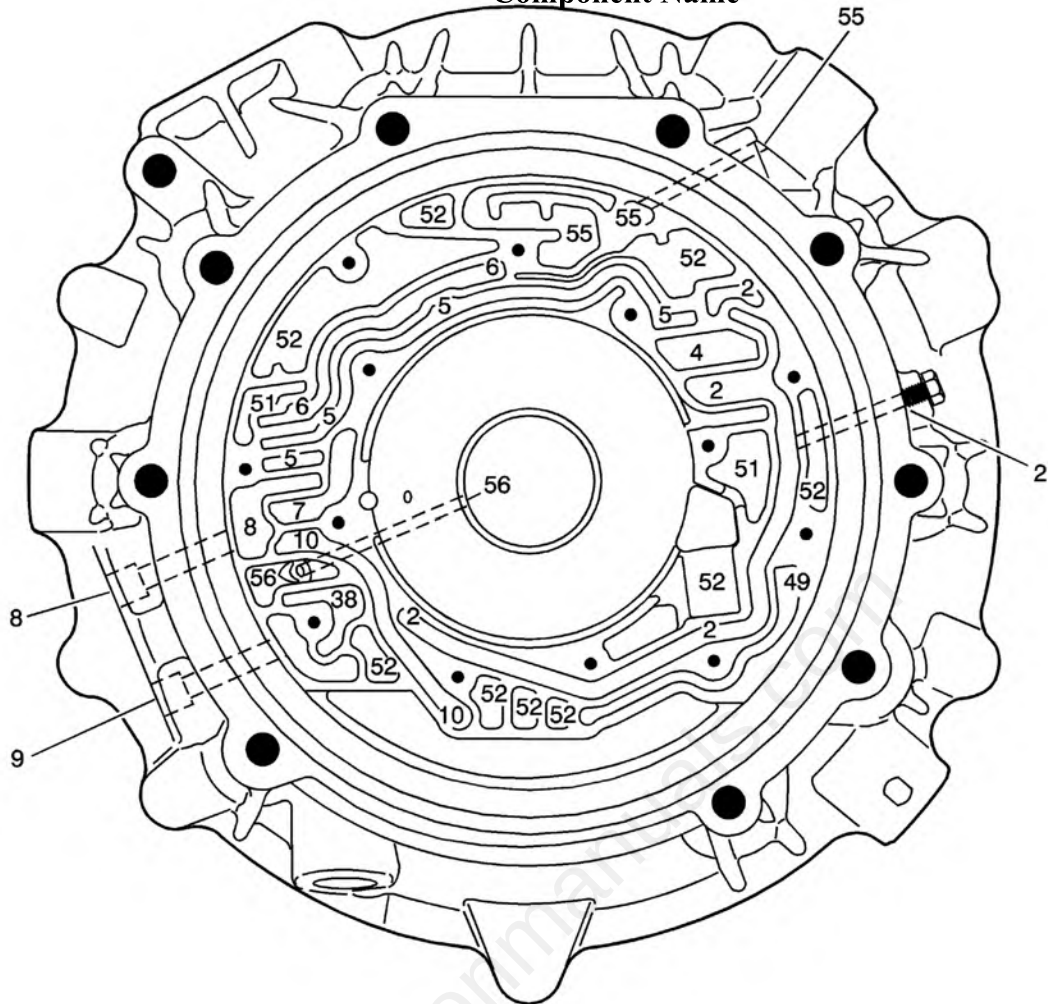


Fig. 19: Torque Converter Housing - Fluid Pump Cover Side

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
2	Line
4	Converter Feed
5	Converter Feed Limit
6	TCC Release
7	TCC Apply
8	Cooler Feed
9	Center Lube
10	Regulator Apply
38	PCS TCC
49	PCS Line
51	Exhaust
52	Void
55	Vent
56	Torque Converter Seal Drainback

Fluid Pump Cover- Torque Converter Housing Side

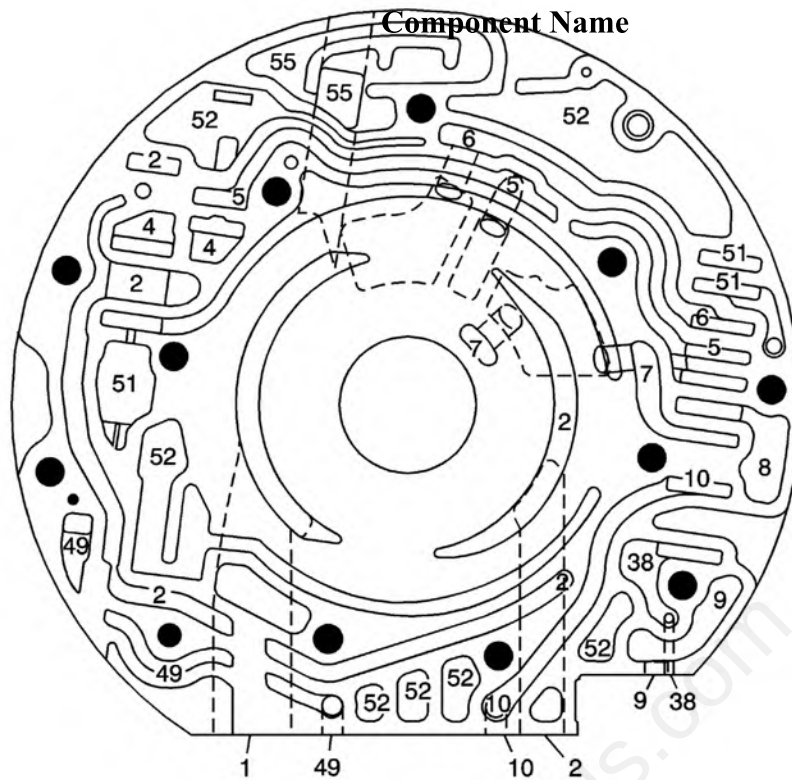


Fig. 20: Fluid Pump Cover - Torque Converter Housing Side

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Suction
2	Line
4	Converter Feed
5	Converter Feed Limit
6	TCC Release
7	TCC Apply
8	Cooler Feed
9	Center Lube
10	Regulator Apply
38	PCS TCC
49	PCS Line
51	Exhaust
52	Void
55	Vent

Fluid Pump Cover - Case Side

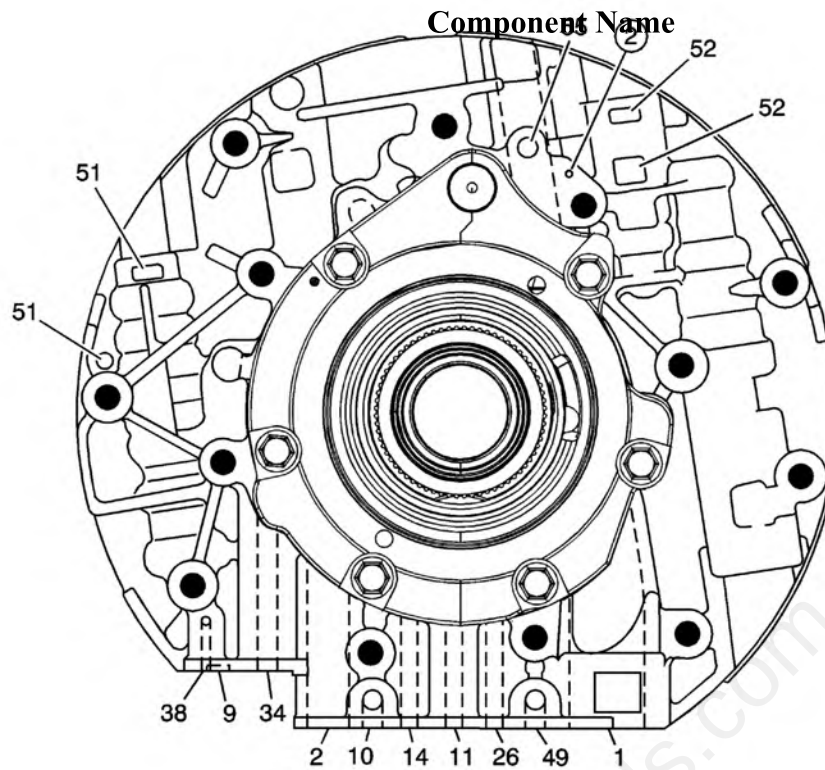


Fig. 21: Fluid Pump Cover - Case Side
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Suction
2	Line
9	Center Lube
10	Regulator Apply
11	Compensator Feed
14	3-5 Reverse Clutch
26	1-2-3-4 Clutch
34	4-5-6 Clutch
38	PCS TCC
49	PSC Line
51	Exhaust
52	Empty
55	Ventilate

Case- Top Channel Plate Side

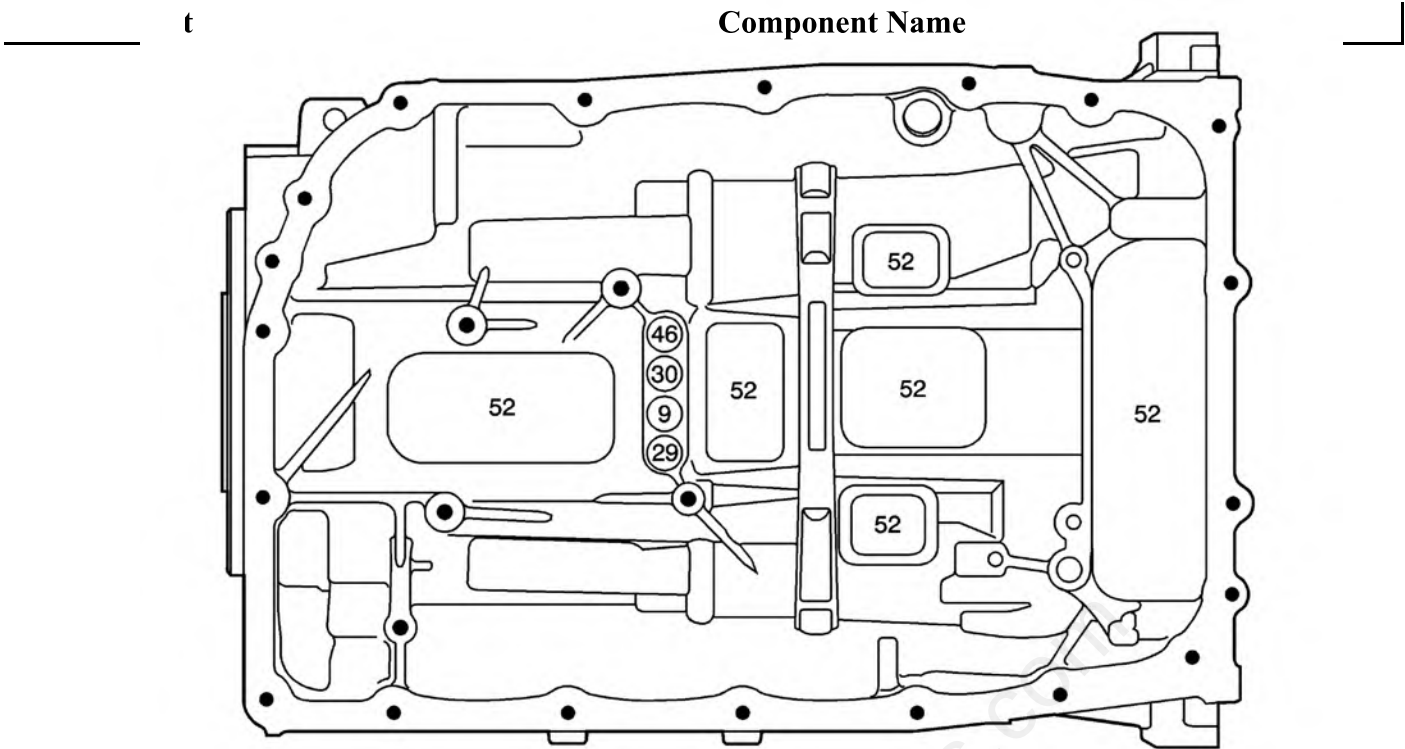


Fig. 22: Case - Top Channel Plate Side
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
9	Center Lube
29	CBR1 (Manual 1st)
30	CBR (Reverse)
46	26 Clutch
52	Void

Control Valve Upper Body Assembly - Case Side

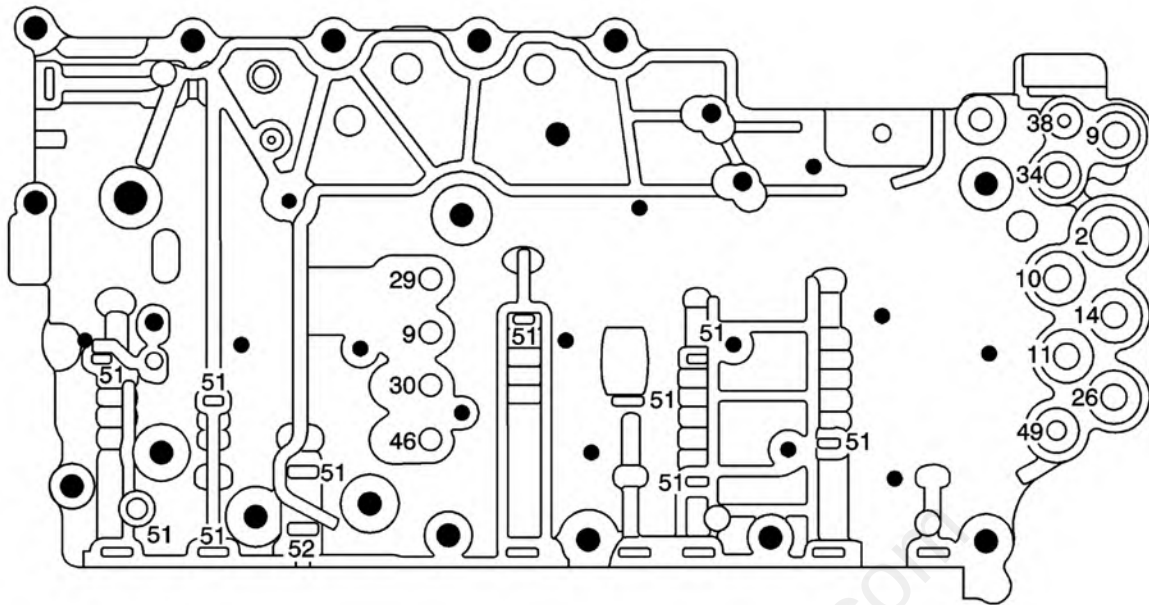


Fig. 23: Control Valve Upper Body Assembly - Case Side

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
2	Line
9	Center Lube
10	Regulator Apply
11	Compensator Feed
14	3-5 Reverse Clutch
26	1-2-3-4 Clutch
29	CBR1
30	CBR
34	4-5-6 Clutch
38	PCS TCC
46	2-6 Clutch
49	PCS Line
51	Exhaust
52	Empty

Control Valve Upper Body Assembly - Bottom Channel Plate Side

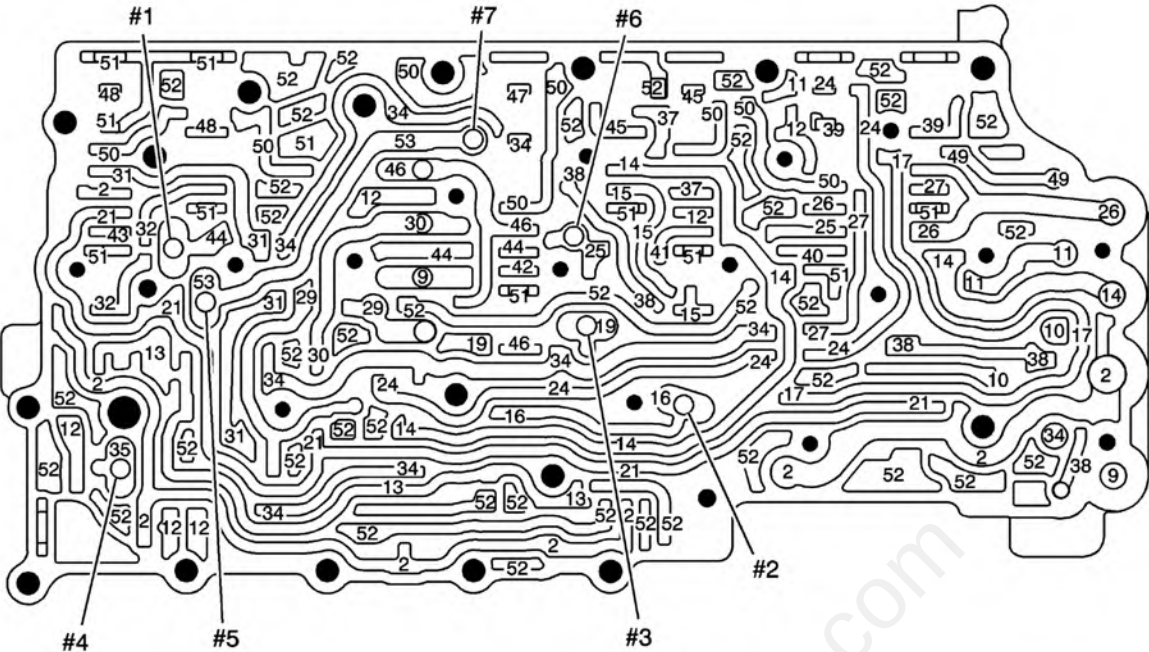


Fig. 24: Control Valve Upper Body Assembly - Bottom Channel Plate Side
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
2	Line
9	Center Lube
10	Regulator Apply
11	Compensator Feed
12	Actuator Feed Limit
13	Reverse
14	3-5 Reverse Clutch
15	3-5 Reverse Clutch Feedback
16	CSV2 Enable
17	Solenoid 1
19	CSV3 Enable
21	Drive 1-6
24	1-2-3-4 Clutch DFLT
25	1-2-3-4 Clutch Feed
26	1-2-3-4 Clutch
27	1-2-3-4 Clutch Feedback
29	CBR1
30	CBR
31	CBR1/4-5-6 Clutch Feed
32	CBR1 Feedback
34	4-5-6 Clutch
35	CSV2 Latch
37	3-5 Reverse Feed

t	Component Name
38	PCS TCC
39	PCS 1-2-3-4 Clutch
40	PS4
41	PS1
42	PS3
43	PS5
44	2-6 Clutch/1-2-3-4CL Feed
45	PCS 3-5 Rev Clutch
46	2-6 Clutch
47	PCS 2-6 Clutch
48	PCS CBR1/4-5-6 Clutch
49	PCS Line
50	Exhaust BF
51	Exhaust
52	Empty
53	3-5 Rear Feed

Control Valve Upper Body Assembly - Control Solenoid Valve Assembly Side

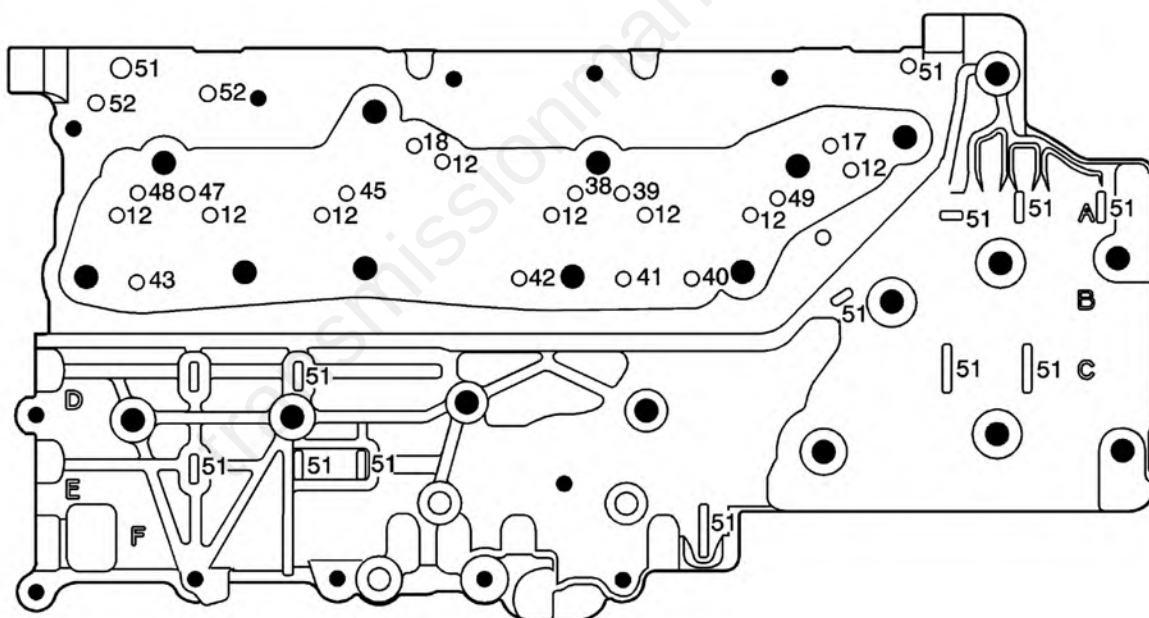


Fig. 25: Control Valve Upper Body Assembly - Control Solenoid Valve Assembly Side

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
12	Actuator Feed Limit
17	Solenoid 1
18	Solenoid 2
38	PCS TCC

t	Component Name
39	PCS 1-2-3-4 Clutch
40	PS4
41	PS1
42	PS3
43	PS5
45	PCS 3-5 Rev Clutch
47	PCS 2-6 Clutch
48	PCS CBR1/4-5-6 Clutch
49	PCS Line
51	Exhaust
52	Empty

Control Valve Lower Body Assembly - Control Valve Upper Body Assembly Side

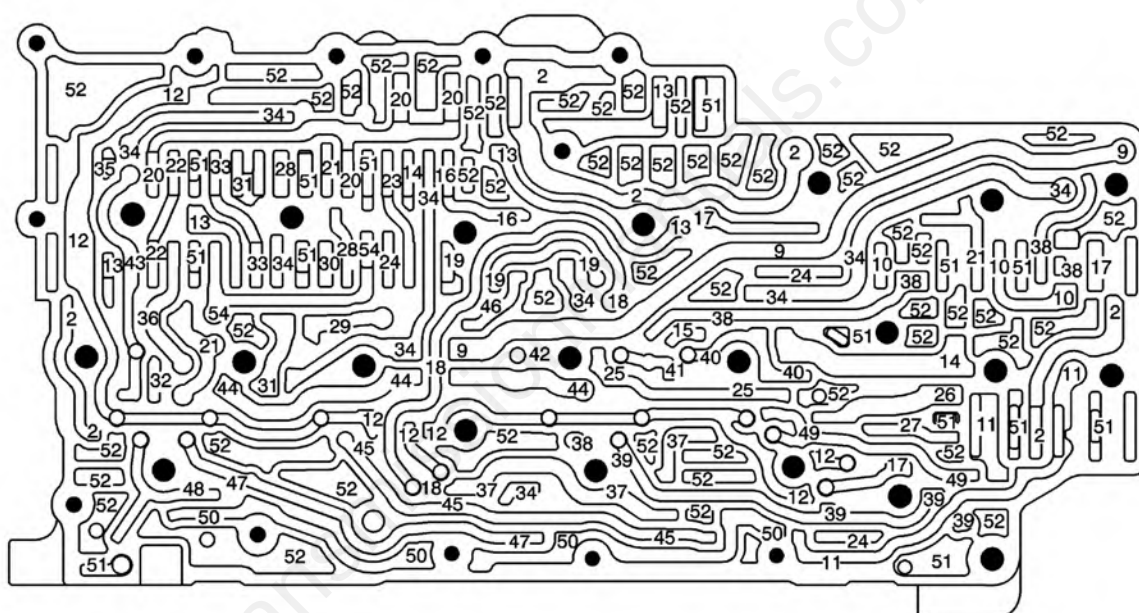


Fig. 26: Control Valve Lower Body Assembly - Control Valve Upper Body Assembly Side
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
2	Line
9	Center Lube
10	Regulator Apply
11	Compensator Feed
12	Actuator Feed Limit
13	Reverse
14	3-5 Reverse Clutch
15	3-5 Reverse Clutch Feedback
16	CSV2 Enable

t	Component Name
17	Solenoid 1
18	Solenoid 2
19	CSV3 Enable
20	Drive
21	Drive 1-6
22	Drive Brake
23	1-2-3-4 Clutch DFLT Feed
24	1-2-3-4 Clutch DFLT
25	1-2-3-4 Clutch Feed
26	1-2-3-4 Clutch
27	1-2-3-4 Clutch Feedback
28	CBR1/CBR Feed
29	CBR1
30	CBR
31	CBR1/4-5-6 Clutch Feed
32	CBR1 Feedback
33	4-5-6 Clutch Feed
34	4-5-6 Clutch
35	CSV2 Latch
36	Drive Brake
37	3-5 Reverse Feed
38	PCS TCC
39	PCS 1-2-3-4 Clutch
40	PS4
41	PS1
42	PS3
43	PS5
44	2-6 Clutch/1-2-3-4 CL Feed
45	PCS 3-5 Rev Clutch
46	2-6 Clutch
47	PCS 2-6 Clutch
48	PCS CBR1/4-5-6 Clutch
49	PSC Line
50	Exhaust BF
51	Exhaust
52	Empty
54	3-5 Clutch Reverse Feed

Control Valve Body Spacer Plate Assembly - Bottom Channel Plate Side

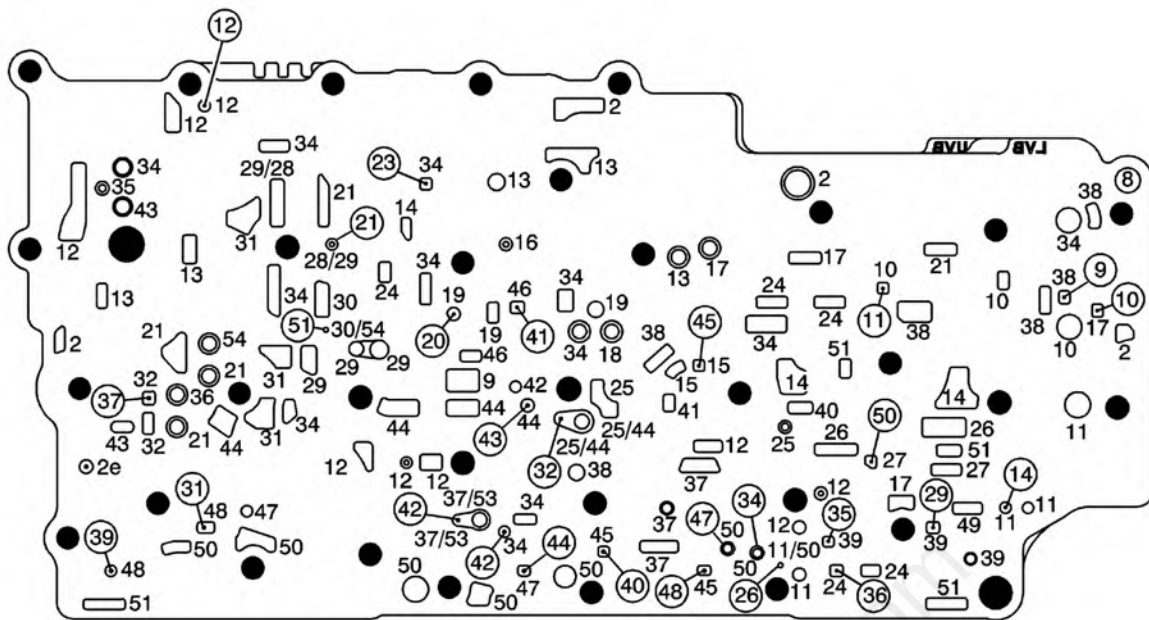


Fig. 27: Control Valve Body Spacer Plate Assembly - Bottom Channel Plate Side

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
2	Line
8	Cooler Feed
9	Center Lube
10	Regulator Apply
11	Compensator Feed
12	Actuator Feed Limit
13	Reverse
14	3-5 Reverse Clutch
15	3-5 Reverse Clutch Feedback
16	CSV2 Enable
17	Solenoid 1
18	Solenoid 2
19	CSV3 Enable
21	Drive 1-6
24	1-2-3-4 Clutch DFLT
25	1-2-3-4 Clutch Feed
26	1-2-3-4 Clutch
27	1-2-3-4 Clutch Feedback
28	CBR1/CBR Feed
29	CBR1
30	CBR
31	CBR1/4-5-6 Clutch Feed
32	CBR1 Feedback

t	Component Name
34	4-5-6 Clutch
35	CSV2 Latch
36	Drive Brake
37	3-5 Reverse Feed
38	PCS TCC
39	PCS 1-2-3-4 Clutch
40	PS4
41	PS1
42	PS3
43	PS5
44	2-6 Clutch/1-2-3-4 CL Feed
45	PCS 3-5 Rev Clutch
46	2-6 Clutch
47	PCS 2-6 Clutch
48	PCS CBR1/4-5-6 Clutch
49	PCS Line
50	Exhaust BF
51	Exhaust
53	3-5 Rear Feed
54	3-5 Clutch Reverse Feed