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2008-2009 GM MP Transfer Case

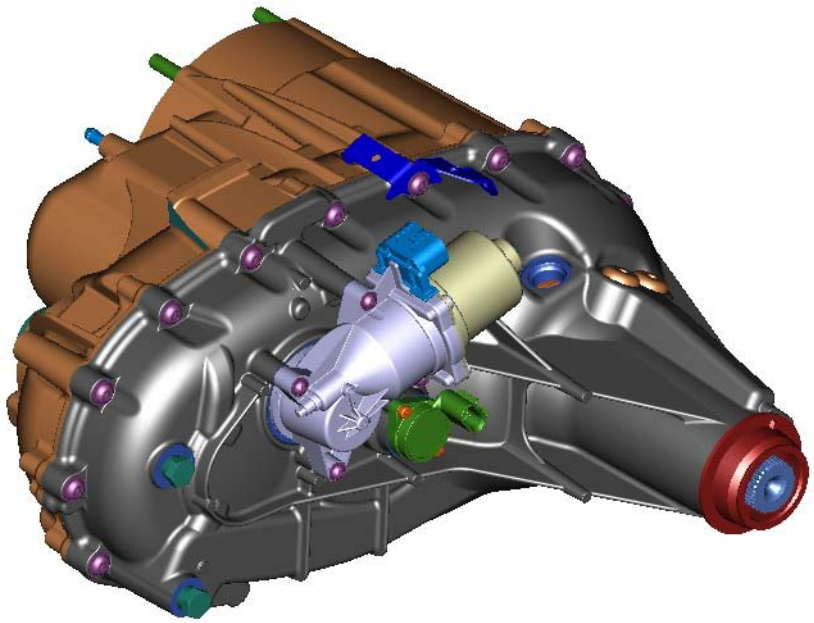
Introduction

2008-09 GM MP TRANSFER CASES RPO NQG, 1222/1225/1226 RPO NQF, 1625/1626, RPO NQH, 3023/3024
Starting with the 2008 model year General Motors introduced a series of new transfer case designs to replace the New Venture Gear designed transfer cases used for many years. Built by a company known a Magna Powertrain (MP) the new designed units are available as 3 different models:

- Manual Shift (RPO NQG) (Models 1222/1225/1226)
- Electric Shift (RPO NQF) (Models 1625/1626)
- Auto (RPO NQH) (Models 3023/3024)

Several models are available for each application, these include the 1222/1225 and 1226 manually shifted units, the 1625/1626 electric shift units and the 3023 and 3024 auto/active transfer case models.

NOTE: All models use Dexron VI fluid



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The models features are as follows:

Model	RPO	Trans	Input Shaft Splines	Output Shaft Splines	Chain Size	Planetary	Application
MP 1222 light duty	NQG	4L60E	27T	32T	7/16-1.25	3 Pinion	½ Ton
MP 1222 light duty	NQG	6L80	32T	32T	7/16-1.25	3 Pinion	½ Ton
MP 1225 Heavy Duty	NQG	6L90	29T	31T	7/16-1.5	5 Pinion	¾ Ton
MP 1226 Super Duty	NQG	6L90 LCT 1000	29T	31T	7/16-1.5	5 Pinion	¾ Ton 1 Ton
MP 1625 Heavy Duty	NQF	6L90	29T	31T	7/16-1.5	5 Pinion	¾ Ton
MP 1626 Super Duty	NQF	6L90 LCT 1000	29T	31T	7/16-1.5	5 Pinion	¾ Ton 1 Ton
MP 3023 Light Duty	NQH	4L60E	27T	32T	7/16-1.25	3 Pinion	½ Ton
MP 3023 Light Duty	NQH	2ML70	32T	32T	7/16-1.25	3 Pinion	½ Ton
MP 3024 Heavy Duty	NQH	6L90	29T	31T	7/16-1.5	5 Pinion	¾ Ton

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COMPONENT DIFFERENCES BETWEEN MODELS
MP 1222, MP 1225 and MP 1226

MP 1222 with 27T Input Spline when compared to MP 1222 with 32T input spline

- The input shaft seal is a dual lip seal used with wet cavity 4x4 adapter housing
- The high/low clutch has bias pointing engagement teeth. The leading edges of the teeth are not symmetric.

MP 1222 with 32T Input Spline when compared to MP 1222 with 27T input spline

- The input shaft seal is a single lip seal used only with dry cavity 4X4 adapter housing
- The high/low clutch has neutral pointing engagement teeth. The leading edges of the teeth are symmetric.

MP 1222, Common components to 27T and 32T Light Duty applications when compared to the MP 1225/MP 1226 Models

- The input shaft pilot bearing assembly is smaller to accommodate the smaller rear output shaft, the O.D measures 38.1 mm (1.5 in).
- The front output shaft drive sprocket is 31.75 mm (1.25 in) wide. The front output shaft driven sprocket is 31.75 mm (1.25 in) wide
- The rear output shaft rear bearing retaining rings are smaller, the outer diameter of the ring groove at the rear output shaft measures 37.5 mm (1.476 in)
- The rear output shaft rear bearing assembly is smaller, the I.D measures 40 mm (1.575 in).
- The rear output shaft seal is smaller, the inner lip diameter measures 46.2 mm (1.819 in).
- The rear output shaft bushing is smaller, the I.D measures 48 mm (1.890 in).
- The rear case half has smaller bores to accommodate the rear output shaft seal and the rear output shaft bushing

MP 1225 Model Features

- The input shaft seal is a single lip seal used only with dry cavity 4X4 adapter housings. The MP 1225 built for Canadian applications use a 2300 series round pin type chain just like all MP 1226 applications utilize. All American MP 1225 applications use a 9600 series rocker pin type chain.

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MP 1226 Model Features

The input shaft seal is a dual lip seal used specifically for the LCT 1000 (RPO MW7) which has a wet cavity 4X4 adapter housing. The dual lip seal is also used for the 6L90 (RPO MYD) in order to retain a common part number for this model.

Model differences, MP 1225/1226 as compared to the MP 1222

- The input shaft pilot bearing assembly is larger to accommodate the larger rear output shaft. The O.D measures 41.275 mm (1.625 in)
- An input shaft pilot bearing retaining ring is used.
- The high/low clutch has neutral pointing engagement teeth, the leading edges of the teeth are symmetric
- The front output shaft drive sprocket is 38.1 mm (1.5 in) wide. The front output shaft driven sprocket is 38.1 mm (1.5 in) wide
- The rear output shaft rear bearing retaining rings are larger, the O.D of the ring groove at the rear output shaft measures 38.5 mm (1.516 in).
- The rear output shaft rear bearing assembly is larger. The I.D measures 41 mm (1.614 in).
- The rear output shaft seal is larger. The inner lip diameter measures 54.2 mm (2.134 in).
- The rear output shaft bushing is larger. The I.D measures 56.08 mm (2.208 in).
- The rear case half has larger bores to accommodate the rear output shaft seal and the rear output shaft bushing
- The rear output shaft is larger

COMPONENT DIFFERENCES BETWEEN MODELS
MP 1625 and MP 1626

- MP1625: The input shaft seal is a single lip seal used only with dry cavity adapters
- MP1626: The input shaft seal is a dual lip seal used specifically for the LCT 1000 (RPO MW7) which has a wet cavity adapter. These seals are also used for the 6L90 (RPO MYD) in order to retain a common part number for this model
- The MP 1625 built for Canadian applications use a 2300 series round pin type chain just like all MP 1626 applications utilize. All US MP 1625 applications use a 9600 series rocker pin type chain.

COMPONENT DIFFERENCES BETWEEN MODELS
MP 3023 and MP 3024

MP 3023 with a 27 T Input Spline compared to MP 3023 with a 32T input spline

- The high/low clutch has bias pointing engagement teeth. The leading edges of the teeth are not symmetric
- The rear output shaft rear bearing retaining rings are larger than the MP 3023 with 32T Input Spline but smaller than the MP 3024. The I.D of the ring groove at the rear output shaft measures 37.5 mm (1.476 in).
- The rear output shaft bearing assembly I.D measures 40 mm (1.575 in) the width measures 18 mm (0.709 in).
- The rear output shaft bearing assembly surface on the rear output shaft measures 40 mm (1.575 in).
- The high/low clutch has neutral pointing engagement teeth. The leading edges of the teeth are symmetric.

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.MP 3023 with 32T Input Spline compared to the MP 3023 with a 27 Spline input

- The VSS reluctor wheel profile is thinner than the MP 3023 ATC with 27T input spline and the MP 3024, measuring 25.8 mm (1.016 in) thick.
- There is no snap ring between the VSS reluctor wheel and the rear output shaft rear bearing assembly
- There is no snap ring groove in the rear output shaft between the VSS reluctor wheel and the rear output shaft rear bearing assembly.
- The rear output shaft rear bearing retaining ring is smaller than the MP 3023 with 27T input spline and the MP 3024. The I.D of the ring groove at the rear output shaft measures 33 mm (1.299 in).
- The rear output shaft bearing assembly I.D measures 35 mm (1.378 in) the width measures 23 mm (0.906 in).
- The rear output shaft bearing assembly surface on the rear output shaft measures 35 mm (1.378 in).
- There is an additional harness bracket used on some applications

MP 3023, Common components with both a 27T and 32 T input shaft spline. Comparison of the MP 3023 to the 3024

- The input shaft pilot bearing assembly is smaller than the MP 3024 in order to accommodate the smaller rear output shaft. The outer diameter measures 38.1 mm (1.5 in).
- The rear output shaft is smaller than the MP 3024
- The front output shaft drive sprocket is 27.2 mm (1.071 in) wide
- The front output shaft driven sprocket is 29.4 mm (1.157 in) wide
- The rear output shaft seal is smaller than the MP 3024. The inner lip diameter measures 46.1 mm (1.815 in).
- The rear output shaft bushing is smaller than the MP 3024. The I.D measures 48 mm (1.890 in).
- The rear case half has smaller bores than the MP 3024 in order to accommodate the rear output shaft seal and the rear output shaft bushing
- The control lever is thinner than the MP 3024, measuring 9.5 mm (0.374 in) between the bearing surfaces
- The control actuator lever is thinner than the MP 3024, measuring 9.5 mm (0.374 in) between the bearing surfaces.
- The control actuator lever balls are larger than the MP 3024, measuring 13 mm (0.512 in) in diameter
- The control actuator lever washer is thinner than the MP 3024, measuring 1 mm (0.039 in)

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MP 3024 Common Components, Comparison of the MP 3024 to the MP 3023

- The input shaft pilot bearing assembly is larger than the MP 3023 in order to accommodate the larger rear output shaft. The outer diameter measures 41.275 mm (1.625 in).
- An input shaft pilot bearing retaining ring is used
- The high/low clutch has neutral pointing engagement teeth. The leading edges of the teeth are symmetric
- The rear output shaft is larger than the MP 3023
- The front output shaft drive sprocket is 33.5 mm (1.319 in) wide
- The front output shaft driven sprocket is 35.5 mm (1.398 in) wide
- The rear output shaft rear bearing retaining rings are larger than the MP 3023. The I.D of the ring groove at the rear output shaft measures 38.5 mm (1.516 in).
- The rear output shaft rear bearing assembly I.D measures 41 mm (1.614 in). The width measures 18 mm (0.709 in).
- The rear output shaft bearing assembly surface on the rear output shaft measures 41 mm (1.614 in).
- The rear output shaft seal is larger than the MP 3023. The inner lip diameter measures 53.8 mm (2.118 in).
- The rear output shaft bushing is larger than the MP 3023. The I.D measures 56.08 mm (2.208 in).
- The rear case half has larger bores than the MP 3023 in order to accommodate the rear output shaft seal and the rear output shaft bushing
- The control lever is thicker than the MP 3023, measuring 10.5 mm (0.413 in) between the bearing surfaces
- The control actuator lever is thicker than the MP 3023, measuring 10.5 mm (0.413 in) between the bearing surfaces.
- The control actuator lever balls are smaller than the MP 3023, measuring 10 mm (0.394 in) in diameter
- The control actuator lever washer is thicker than the MP 3023, measuring 2.5 mm (0.098 in).

System Operation (RPO NQF) MP 1625/MP 1626, (RPO NHQ) MP 3023, MP3024

Like other electric shift GM transfer cases the MP 1625 MP 1626, MP 3023 and MP 3024 utilizes the following operational modes:

- 2 High
- 4 High
- Auto (MP 3023, MP 3024)
- 4 Low---2.68-1
- Neutral

The MP series transfer cases are “shift on the fly” units. To select 2 high, auto or 4 high range simply move the switch to the desired position.

To move the transfer case to the 4 Low position:

- Ignition in the Run position
- A/T shifter in Neutral
- VSS less than 3 MPH (5 km/h)
- Move the switch to the 4 Low position

To select neutral position:

- Ignition in the Run position
- A/T shifter in Neutral
- VSS less than 3 MPH (5 km/h)
- T case in 2 High position
- Rotate the switch clockwise past the 4wd Low position and hold it in that position for 10 seconds. The red colored neutral lamp will illuminate

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AUTO TRANSFER CASE OPERATION (RPO NQH) MP 3023, MP3024

The MP 3023 and MP 3024 utilize the following components:

- Transfer case shift control switch
- Transfer case 2 wd, 4wd Incremental sensor
- Transfer case actuator drive motor
- Transfer case shaft position sensor
- Transfer case motor lock
- Transfer case control module
- VSS
- Service 4X4 indicator

Transfer case shift control switch

Located in the dash the rotary switch varies the voltage drop to the TCCM based on the switches position. The TCCM provides a 5 volt reference signal to the switch. As the switch is rotated, the resistance varies within the switch input circuit resulting in a different signal voltage value at the TCCM. The TCCM monitors the signal volt to determine which range to select.
Approximate TCCM voltage input will read:
2WD= 2 Volts
Auto= 4.4 Volts
4 High= 3.0 Volts
4 Low= 1.5 Volts

Transfer Case 2 wd, 4wd Incremental sensor

The incremental sensor is mounted on the transfer case shift motor. The sensor is a variable position hall effect sensor that is used to tell the TCCM the actual range position the motor is moving towards. The TCCM sends an 8 volt reference signal to the sensor. The sensor indicates the changing position for the transfer case motor based on degrees (.15 degree increments) of movement. The sensor signal output voltage is pulled low (.75 volts) by the sensor or it is allowed to go high (4.2 volts) as the motor rotates. Sensor operation may confuse many technicians as a certain given transfer case position does not necessarily represent a specific voltage value as an input to the TCCM. The sensor voltage and degrees of movement can be monitored with your scan tool. Typical values will be:

Command	Incremental Sensor Degrees	Incremental Sensor Direction Voltage	Incremental Sensor Voltage	Incremental Sensor Impulse ** Voltage	Incremental Sensor Direction
2WD	37 Degrees	.75V	7.5V	.75 or 4.2 V	CCW
Auto	102 Degrees	.75 V	7.5V	.75 or 4.2 V	CW *
4 High	127 Degrees	.75 V	7.5V	.75 or 4.2 V	CW *
4 Low	-77 Degrees	4.2 V	7.5 V	.75 or 4.2 V	CW

- * The motor direction will register CW during the shift up in range, 2WD to Auto to 4 Hi to 4Low. Once the shift is completed the motor position will read CCW
- ** The impulse voltage will vary based on the movement of the sensor in degrees. It is not uncommon to have the voltage read .75 V then change to 4.2 V or the opposite may occur depending on the exact position of the motor. In other words when shifting the T-Case you will see the value change without your input. This is due to the linkage varying just a fraction of a degree or so from the last commanded shift into that range.

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Transfer Case Shaft Position Sensor (Rotational Sensor)

The rotational sensor is mounted into the back of the transfer case near the motor assembly. In some applications the sensor may be described as the " Transfer case 2/4 wheel drive actuator position sensor". No matter the name, the operation is the same, the TCCM sends a 5 volt reference signal to the sensor. The TCCM also provides the ground for the sensor. As the shift shaft rotates the sensor sends a signal voltage back to the TCCM which will vary depending on the position of the shaft. This value represents the actual position of the shift shaft. Typical scan voltage values are as follows:

Commanded position	Sensor Degrees	Sensor Signal Voltage
2wd	37 Degrees	3 V
Auto	102 Degrees	3.6 V **
4 High	125 Degrees	4.0 V
4 Low	-77 Degrees	1.8 V

** Voltage Varies with clutch commanded position

Transfer Case Motor

The Transfer case motor is a permanent magnet PWM bi directional unit currently manufactured by Bosch. The TCCM controls driver circuits for motor A and motor B circuits. The motor current varies (From 0-15 amps) (Current limited to 30 amps) (Motor resistance 14-20 ohms) depending on the command and to meet the clutch slippage requirements while in Auto Mode. Unlike the previous design NVG transfer case motors, the new design actually rotates the shift shaft either clockwise (CW) or counter clock wise (CCW). This action moves the actuator cam to apply or release the clutch.

NOTE: A transfer case motor learn process must be performed with a scan tool if the motor is replaced.

Transfer Case Motor Brake

Some MP transfer case applications utilize a brake assembly to control the position of the transfer case motor armature (NQH Applications only). The brake is mounted within the transfer case motor assembly. The brake is electronically controlled by the TCCM. The TCCM controls the ground for the brake assembly. The brake is de-energized (Motor locked) during 2wd, 4 High and 4 Low ranges. When Auto range is selected the brake is energized (Motor unlocked) if the motor requires movement. Typical scan values will read:

Command	Motor Brake Voltage Feedback
2 WD	7.5 Volts
Auto	.5 V **
4 High	7.5 V
4 Low	7.5 V

** The voltage (current flow) for the brake will vary depending on the commanded position. The .5 volts listed in the chart is based on the vehicle being stationary and no wheel slip present. As the clamp load is changed by the TCCM you may see the voltage change also. The brake can cycle in as little as 20 ms from a full locked to a full unlocked position. This action is used to balance the commanded position for the motor with the actual position of the motor so the motor does not need to stay energized 100% of the time in auto range.

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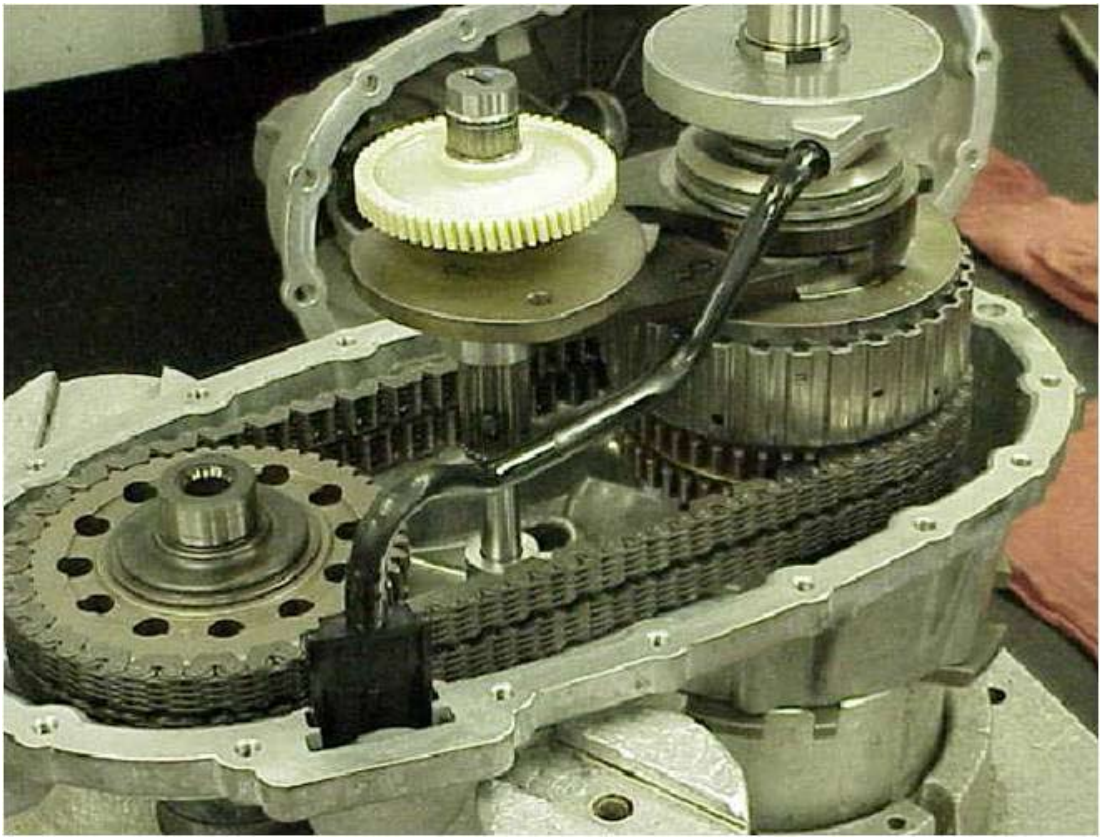

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