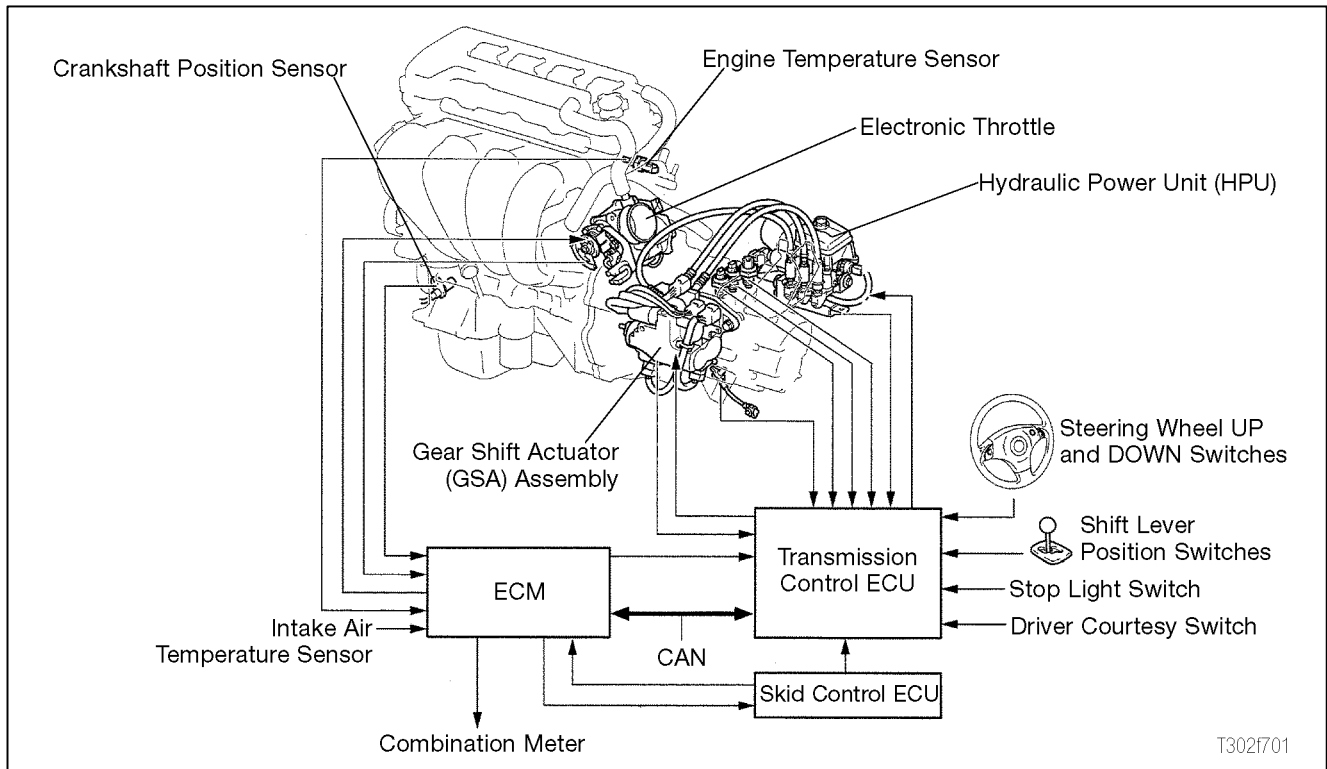


Section 7

Sequential Manual Transmission



Learning Objectives:

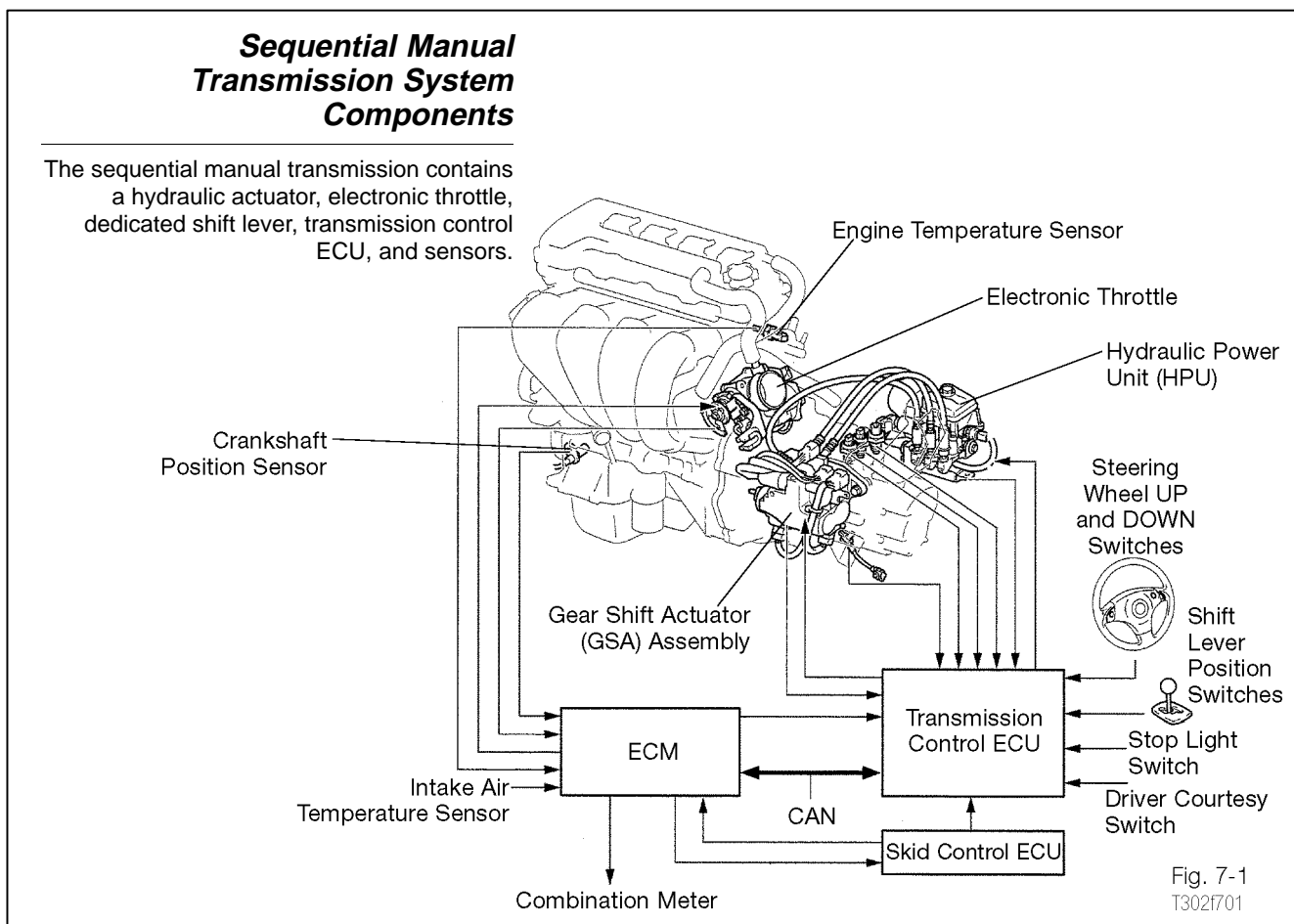
1. Identify the purpose and function of the sequential manual transmission
2. Identify and describe the operation of the following sequential manual transmission components:
 - a. Hydraulic Power Unit
 - b. Gear Shift Actuator
 - c. Shift lever
 - d. Shift Lever Switches
 - e. Transmission Control ECU
 - f. ECM
 - g. System Warning Light
 - h. Gear Position Indicator
 - i. Stop Light Switch
 - j. Shift Lock Solenoid
3. Revolution Sensor
4. Describe normal system operation
 - a. Starting the system
 - b. Start
5. Describe diagnostic equipment and tests for sequential manual transmissions, including:
 - a. Diagnostic Tester
 - b. Pinpoint Tests
 - c. ECU Relearning

Sequential Manual Transmission

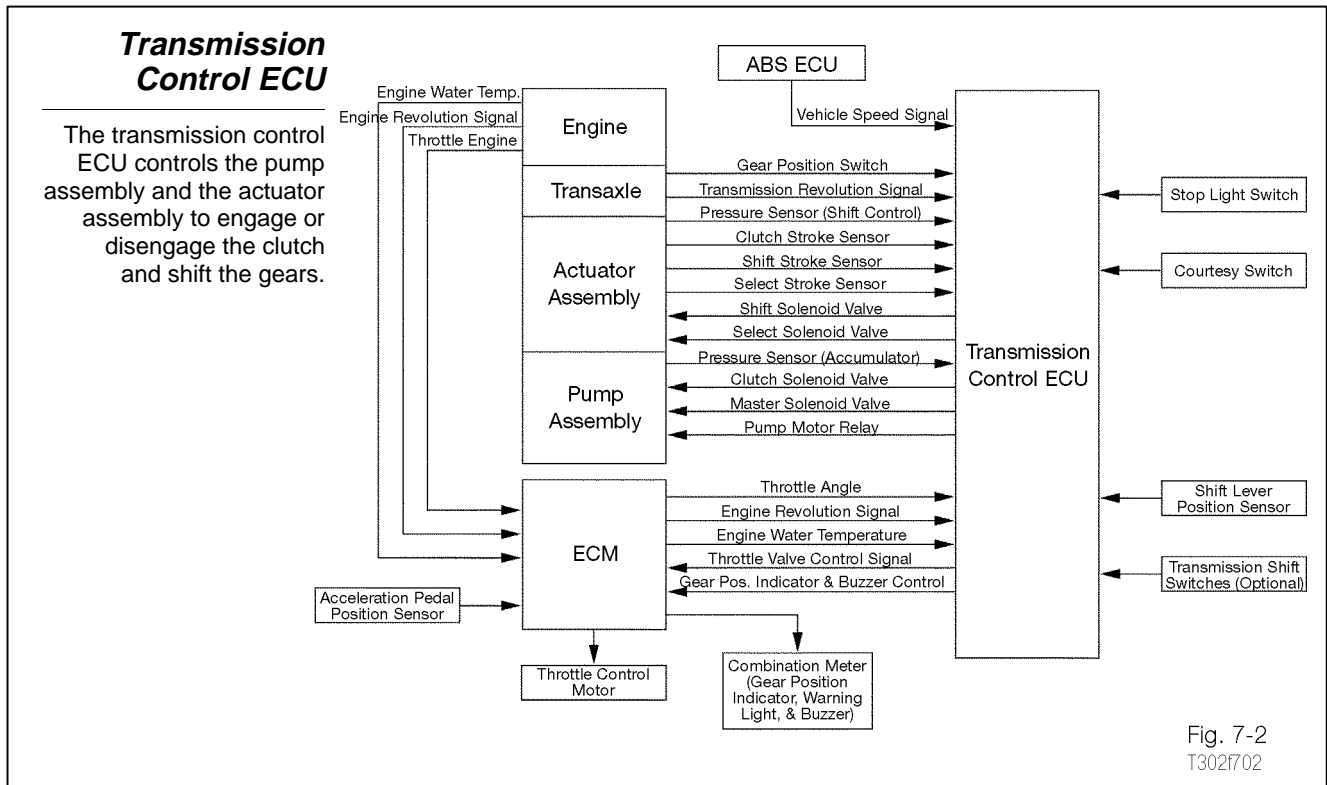
Introduction The sequential manual transmission is based on the C Series five-speed manual transaxle, and was introduced on the 2002 MR2 Spyder. The clutch pedal and master cylinder have been replaced with an actuator that is electronically controlled. When the driver presses shift switches on the steering wheel or moves the shift lever forward or rearward to shift gears, the engine speed is electronically controlled, the actuator operates the clutch and shifts gears.

When the vehicle comes to a stop, the transaxle automatically shifts to 1st gear so it can start off again without having to operate the shift lever or shift buttons. On the six speed transaxle introduced in 2003, the automatic downshift occurs to 2nd gear below 18 mph and 1st gear below 5 mph.

Components The sequential manual transmission contains a Hydraulic Power Unit (HPU) assembly, Gear Shift Actuator (GSA), electronic throttle, dedicated shift lever, transmission control ECU and sensors, in addition to the conventional transaxle.



Transmission Control Unit The Transmission Control ECU controls the hydraulic power unit and the gear shift actuator assembly to engage or disengage the clutch and shift the gears based on signals from the ECM, sensors, and switches. Additionally, the Transmission Control ECU requests the ECM to control the ETCS-i throttle control motor during gear changes.



Hydraulic Power Unit (HPU) The Hydraulic Power Unit (HPU) assembly generates hydraulic pressure for the shift operating system and the clutch release cylinder. It is located in the engine compartment and mounted to the vehicle body. The pump draws the sequential M/T fluid from the reservoir tank and provides high pressure to the accumulator. The pressure sensor monitors accumulator pressure and provides input to the transmission control ECU. The hydraulic power unit is connected to the gear shift actuator through three high-pressure hoses.

Hydraulic Power Unit (HPU)

The Hydraulic Power Unit assembly generates hydraulic pressure for the shift operating system and the clutch release cylinder.

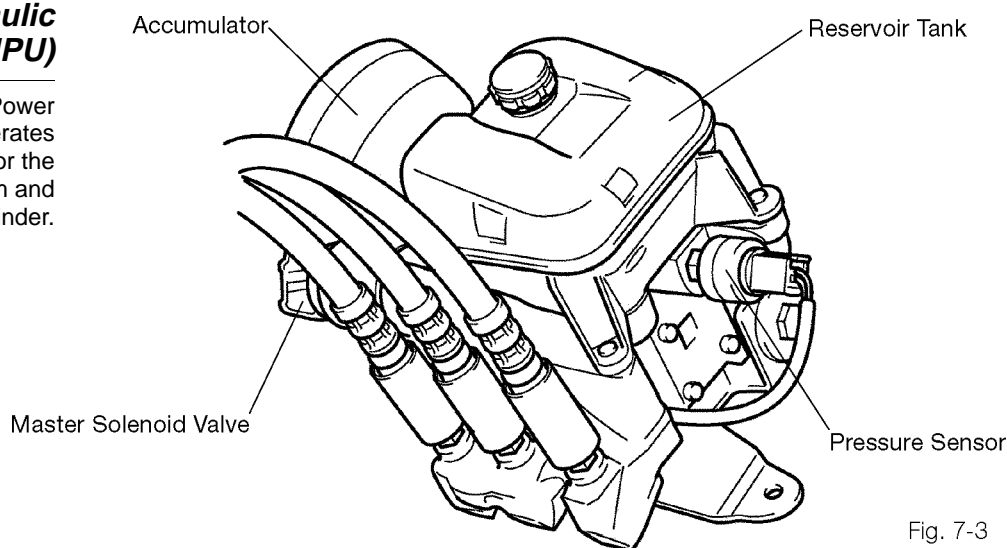


Fig. 7-3
T3021703

Gear Shift Actuator (GSA)

The Gear Shift Actuator (GSA) assembly engages or disengages the clutch and selects gears based on signals from the transmission control ECU. It is mounted to the side of the transaxle case, and attaches to the shift and select lever shaft. The actuator clutch cable attaches to the transaxles clutch release fork.

The select solenoid valve provides hydraulic pressure to move the select shaft. The select shaft positions the shift inner lever and shift fork lock over the shift fork heads of the transaxle shift and select assembly. The shift solenoid valve provides hydraulic pressure to rotate the select shaft that moves the shift inner lever to engage the desired gear. The clutch solenoid valve provides hydraulic pressure to the clutch release cylinder and moves the clutch cable to engage or disengage the clutch.

Gear Shift Actuator (GSA) Assembly

The gear shift actuator assembly engages or disengages the clutch and shifts gears based on signals from the transmission control ECU.

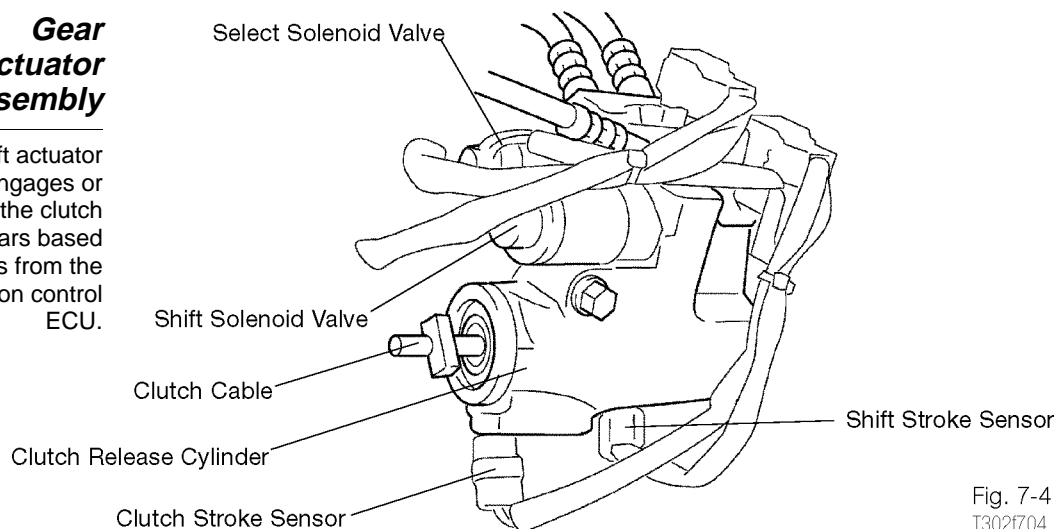


Fig. 7-4
T3021704

The gear shift actuator houses three sensors that monitor the shift stroke and select stroke of the shift and select lever shaft assembly as well as the clutch stroke. These sensors provide input to the ECU on the clutch and select shaft positions.

Stroke Sensors

The gear shift actuator houses three sensors that monitor the shift stroke and select stroke of the shift and select lever shaft assembly, and the clutch stroke.

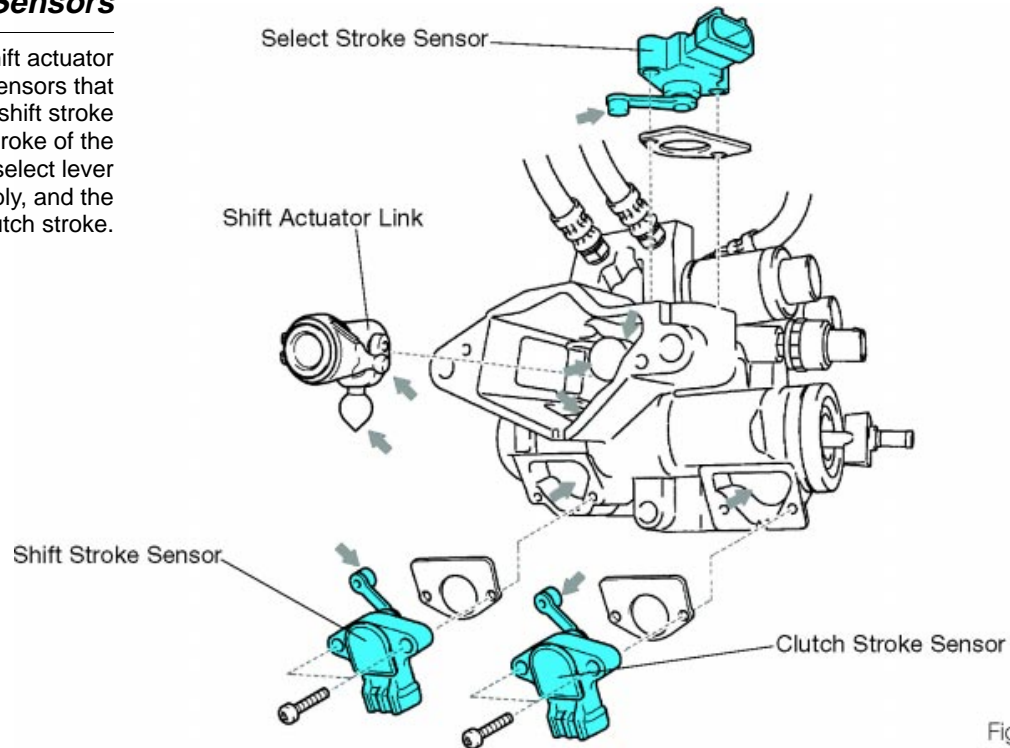


Fig. 7-5
T302f705

Gear Shift Actuator Link Fixing Plate

The gear shift actuator link fixing plate SST is required to keep the shift actuator link in a neutral position whenever the gear shift actuator is removed or a new unit is installed. Failure to use the SST may result in the inability to shift the transmission.

Gear Shift Actuator Link Fixing Plate SST

The link fixing plate must be installed prior to the removal or installation of the gear shift actuator.

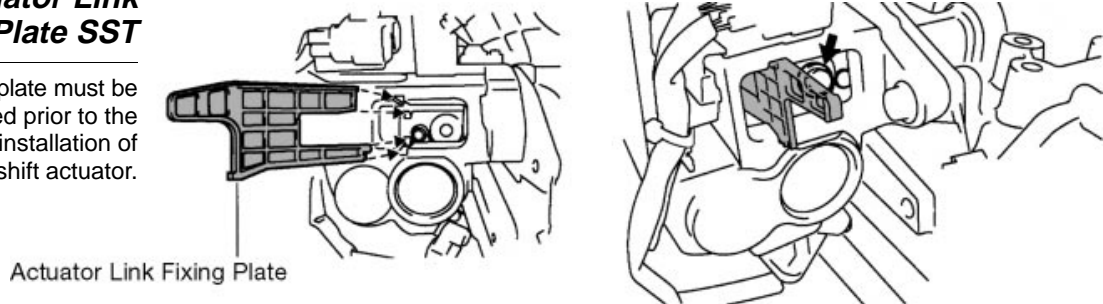


Fig. 7-6
T302f706

Shift Lever The sequential manual transmission uses a control-by-wire type shift mechanism that detects the movement of the shift lever based on the combination of four switches; this shift mechanism is integrated into the shift lever position sensor. The three ranges are R for reverse, N for neutral and S for sequential range. Shift lever position is maintained by spring-loaded detents, which provide shift feedback to the driver.

Shift Lever

The sequential manual transmission uses a control-by-wire type shift lever.

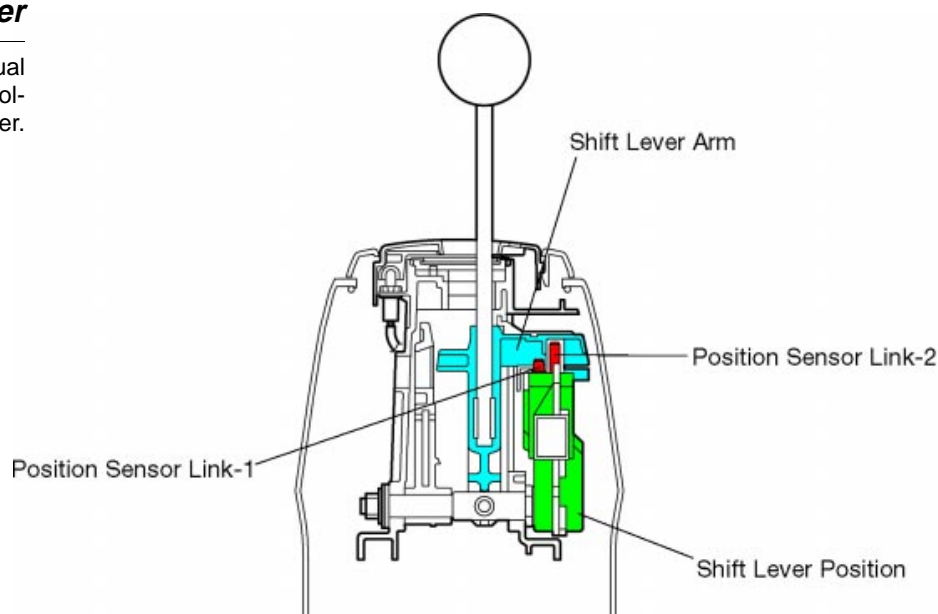


Fig. 7-7
T302f707

Shift Lever Switches The shift position and the movement of the shift lever are detected through the combination of the four switches integrated into the shift lever position sensor. Switch positions are determined by the shift lever arm and the two position sensor links. The operating conditions of the switches are detected and the signals are sent to the transmission control ECU.

Shift Lever Switches

The shift position and the movement of the shift lever are detected through the combination of the four switches that are integrated in the shift lever position sensor.

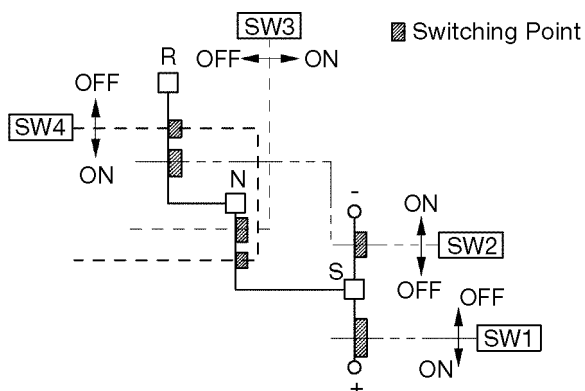


Fig. 7-8
T302f708

Steering Wheel Shift Switches Steering wheel switches (optional equipment) are available and are located on the steering wheel. Two switches are located on each steering wheel spoke; the two facing the driver provide for downshifts and the two switches facing away from the driver provide for upshifts.

Steering Wheel Shift Switches

Two switches are located on each steering wheel spoke; the two facing the driver provide for downshifts and the two switches facing away from the driver provide for upshifts.

Transmission Downshift Switches



Transmission Upshift Switches



Fig. 7-9
T3021709

Stop Light Switch The stop light switch detects when the brake pedal is applied. The ECM must see the brake pedal signal before it allows the engine to start.

Transmission Revolution Sensor The transmission revolution sensor detects input shaft speed so the ECU can disengage the clutch when shaft speed reaches a predetermined speed threshold. The ECU matches input shaft and engine speed when shifting with the pedal released.

Gear Position Indicator The gear position indicator is located in the combination meter and shows the gear position of the transmission. The indicator blinks if the shift lever position and the gear position become mismatched.

System Warning Light The System Warning Light activates to alert the driver when the transmission control ECU detects a malfunction in the sequential manual transmission.

Gear Position Indicator & System Warning Light

The gear position indicator can be found in the combination meter as well as the system warning light, which illuminates when the transmission control ECU detect an error in the sequential manual transmission.

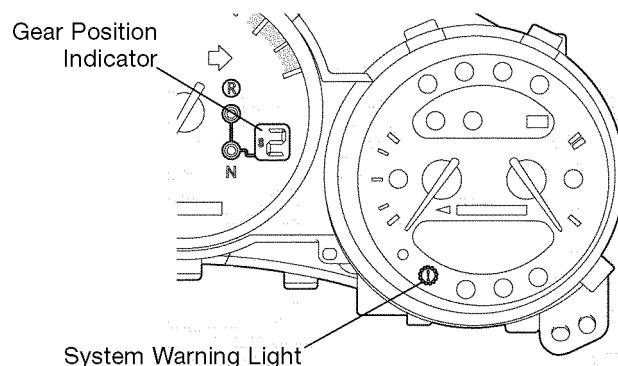


Fig. 7-10
T3021710

Courtesy Light Switch	The courtesy light switch is located on the driver's door to indicate the driver's entry to the vehicle. This input to the ECU starts the HPU to build hydraulic pressure for actuator operation.
Throttle Control (ETCS-i)	Throttle position is determined by the accelerator pedal position sensor input and the ECM. The throttle opening is controlled by the ECM's signal to the throttle motor. The ECM matches engine speed to the transmission input shaft speed for proper gear engagement.
Shift Lock Mechanism	A shift lock mechanism locks the shift lever when the ignition switch is turned to OFF or ACC. Since there is no mechanical linkage, this mechanism prevents the shift lever position and the transmission gear position from becoming mismatched.

The shift lock mechanism contains:

- Shift lock solenoid
- Stopper plate
- Lock plate (integrated with No. 2 lever)

The lock plate and No. 2 lever move in unison with the shift lever when shifting between ranges. The lock plate has holes for R, N, and S, so that it can be locked in any range. When the ignition is switched OFF, the stopper plate rotates due to the movement of the shift lock solenoid, causing the protrusion on the plate to engage with the hole in the lock plate.

A shift lock override button is accessible under the cover in the top of the center console. Pressing the button causes the linkage to disengage the stopper plate from the lock plate.

Shift Lock Mechanism

A shift lock mechanism locks the shift lever when the ignition switch is turned to OFF or ACC.

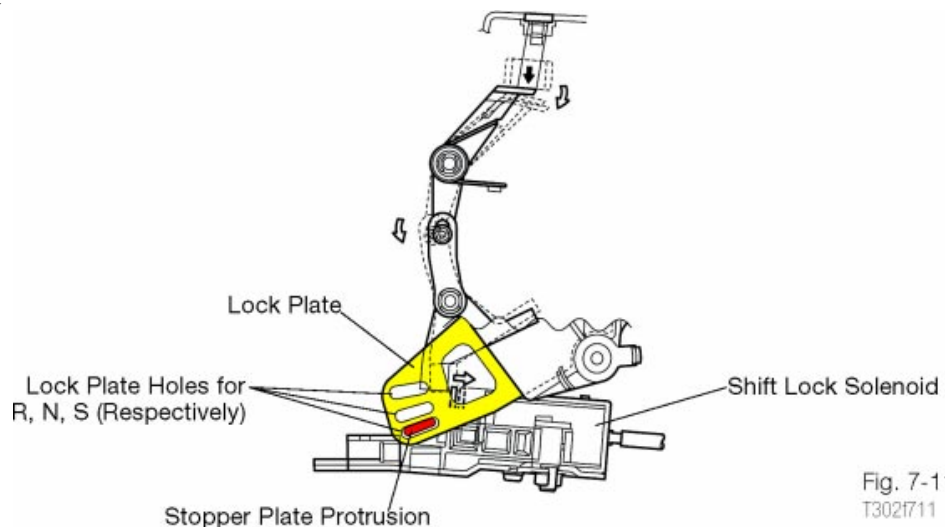


Fig. 7-11
T3021711

Shift Lock Solenoid The shift lock solenoid locks the movement of the shift lever when the ignition switch is turned to OFF or ACC and prevents the lever position and gear position from becoming mismatched.

Shift Lock Solenoid

The shift lock solenoid pulls the stopper plate to the green position shown here to disengage it from the lock plate.

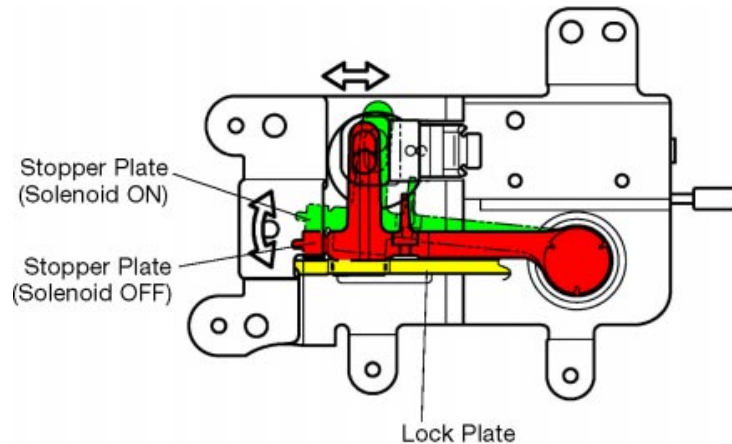


Fig. 7-12
T3021712

System Operation

When the driver's door is opened, the signal from the courtesy light switch activates the transmission control ECU, causing the hydraulic power unit to operate, creating hydraulic pressure for gear shift actuator operation.

When the ignition switch is turned on, the shift lock mechanism unlocks, enabling the driver to operate the shift lever. The ECM allows the starter to crank the engine only when the brake pedal is pressed, the shift lever is in the N range and the transmission is in neutral.

When the transmission is shifted to 1st, 2nd, or reverse gear and the accelerator pedal is pressed, the ECU engages the clutch by controlling the clutch solenoid valve and the clutch release cylinder.

When an up-shift or downshift signal, generated by the operation of the shift lever or the transmission shift switches, is input to the transmission control ECU, the control ECU disengages the clutch. The control ECU shifts gears by controlling the shift solenoid and the select solenoid in the gear shift actuator assembly. When the shift is completed, the shift stroke sensor and the select stroke sensor send signals to the ECU that engages the clutch while controlling clutch application speed.

The clutch is disengaged when the vehicle is stopped with the engine running.

To park the vehicle with the transmission in reverse or 1st gear, place the shift lever in R or S before the key is turned off. The ECU engages the clutch approximately one second after the key is turned off.

System Diagnosis

The Diagnostic Tester is a very useful tool when diagnosing electronic control transmission problems. It can be used to:

- Retrieve Diagnostic Trouble Codes (DTCs).
- View freeze-frame data.
- Display and monitor sensor and actuator data.
- Display data graphically.
- View oscilloscope waveforms.
- Perform actuator function tests.
- Record and recall data using the snapshot feature.
- Print data lists, graphs, scope displays and test results.
- Perform ECU relearning.

Diagnostic Tester

The Diagnostic Tester provides access to large quantities of information from a conveniently located diagnostic connector.

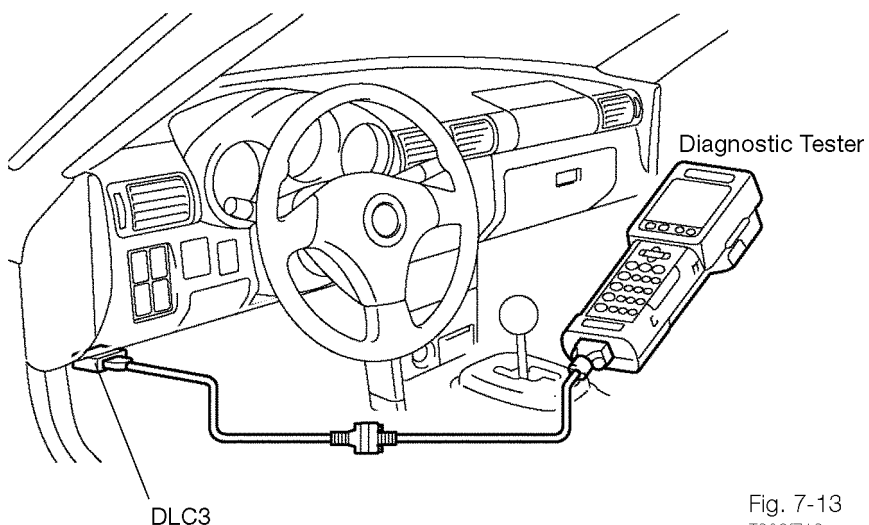


Fig. 7-13
T3021713

Diagnostic Tester Usage The Diagnostic Tester provides access to large quantities of information from a conveniently located diagnostic connector rather than performing tedious pin checks with a DVOM.

A Diagnostic Tester allows a “quick check” of sensors, actuators, and **ECM** calculated data. Scan data allows you to quickly compare selected data to repair manual specifications or known good data.

When checking intermittent fault conditions, it provides an easy way to monitor input signals while wiring or components are manipulated, heated or cooled.

Serial Data Serial data is electronically coded information, which is transmitted by one computer and received and displayed by another computer. The transmitting computer digitizes the data sensors, actuators and other calculated information and receives and displays it as an analog voltage, temperature, speed, time or other familiar unit of measurement.

NOTE

When attempting to diagnose certain types of problems using **serial data**, it is important to remember serial data is processed information, not a live signal. It represents what the ECM “thinks” it is seeing rather than the actual signal measured at the ECM terminal. Serial data can also reflect a “default” ECM signal value, rather than the actual signal.

On-Board Diagnostics System The vehicle’s onboard computer lights up the MIL on the instrument panel when the computer detects a malfunction in the transmission control ECU or in the drive system components that affect the vehicle emissions. In addition, diagnostic trouble codes are recorded in the ECU’s memory.

If the malfunction does not reoccur in three trips, the MIL goes off but the DTC remains recorded in the ECU memory. Although there may be no MIL light on, there may be stored codes to help in the diagnosis.

The diagnostic system operates in the normal mode during normal vehicle use, and also has a check mode for technicians to simulate malfunction symptoms and perform troubleshooting. Most DTCs use 2-trip detection logic to prevent erroneous detections. By switching the ECM to the check mode when troubleshooting, a technician can cause the MIL to light up for a malfunction that is only detected once or momentarily.

When the diagnostic system is switched from the normal mode to the check mode, all DTCs and freeze frame data recorded in normal mode will be erased. So before switching modes, always check the DTCs and freeze frame data, and note them down.

2-Trip Detection Logic When a logic malfunction is first detected, the malfunction is temporarily stored in the ECM memory. If the same malfunction is detected again during the second drive test, the second detection causes the MIL to light up (2nd trip). However, the ignition switch must be turned OFF between the 1st trip and 2nd trip.

Freeze Frame Data	Freeze frame data records the sequential transmission condition when a malfunction (first malfunction only), is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc., at the time of the malfunction.
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Verify Customer Complaint	Communication between the customer and the technician is essential to verifying the complaint. The technician is frequently isolated from the customer and receives his information third-hand from the Service Writer. To bridge this gap, a customer interview sheet is strongly recommended to ensure the technician has as much information as possible to begin his diagnostic effort. The more details that are available, the more likely the condition can be found quickly. A sample Customer Problem Analysis Check Sheet can be found in Appendix E.
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If the complaint cannot be verified, it may be necessary to speak with the customer and have him/her accompany you on the road test to identify their concern.

After verifying the customer's complaint, consult TIS for additional information and check Technical Service Bulletins, which may be related to the vehicle condition.

Customer Interview Sheet

The Customer Interview Sheet is a form found in the Repair Manuals and has also been included as Appendix E in this handbook. Utilizing this form insures that correct and accurate data is received.

SEQUENTIAL MANUAL TRANSMISSION SYSTEM				Inspector's Name:		
Customer's Name _____ Owner's Name _____ Year Vehicle Bought In _____ Vehicle License No. _____				Model and Model Year _____ Engine No. _____ Engine Model _____ Owner Reading _____ miles _____		
Symptoms	<input type="checkbox"/> Vehicle does not move	<input type="checkbox"/> Vehicle does not run normally. (Vehicle can run in low-vehicle mode in 1st or 2nd)				
	<input type="checkbox"/> Vehicle shifts	<input type="checkbox"/> Vehicle does not operate <input type="checkbox"/> Starter operates but engine does not start <input type="checkbox"/> Others: _____				
	<input type="checkbox"/> Fuel pump	<input type="checkbox"/> No → 2nd → 3rd → 4th <input type="checkbox"/> 4th → 5th → 1st → 2nd				
	<input type="checkbox"/> Fuel pump	<input type="checkbox"/> 1st → 2nd → 3rd → 4th → 5th <input type="checkbox"/> 5th → 4th → 3rd → 2nd → 1st				
	<input type="checkbox"/> Gear does not change in a particular shift	<input type="checkbox"/> 1st 2nd 3rd 4th 5th 6th 7th				
	<input type="checkbox"/> Shift gear cannot be disengaged	<input type="checkbox"/> 1 → 2 2 → 3 3 → 4 4 → 5 5 → 6				
	<input type="checkbox"/> Noise	<input type="checkbox"/> Motor shifting gear <input type="checkbox"/> Others: _____				
	<input type="checkbox"/> Shudder <input type="checkbox"/> Jitter					
	<input type="checkbox"/> Others					
	Drive and King (Please Print) _____					
Incident Frequency	<input type="checkbox"/> Constant	<input type="checkbox"/> Normal (times per day/week)				
	<input type="checkbox"/> Once only					
	Weather	<input type="checkbox"/> Fine <input type="checkbox"/> Windy <input type="checkbox"/> Rainy <input type="checkbox"/> Cloudy				
	Temperature	<input type="checkbox"/> Hot <input type="checkbox"/> Cold <input type="checkbox"/> Warm				
	Place	<input type="checkbox"/> In-city <input type="checkbox"/> Suburban <input type="checkbox"/> Highway <input type="checkbox"/> Rural				
	Time of Day	<input type="checkbox"/> Day <input type="checkbox"/> Night <input type="checkbox"/> Morning <input type="checkbox"/> Evening				
	Engine	<input type="checkbox"/> Cold <input type="checkbox"/> Warm <input type="checkbox"/> Hot <input type="checkbox"/> After engine starts				
	Motor speed	<input type="checkbox"/> High <input type="checkbox"/> Low				
	Starting Method	<input type="checkbox"/> On <input type="checkbox"/> Off <input type="checkbox"/> Unknown				
	Warning Lights	<input type="checkbox"/> On <input type="checkbox"/> Off <input type="checkbox"/> Unknown				
Condition When Problem Occurs	Shift Indicator	<input type="checkbox"/> On <input type="checkbox"/> Off <input type="checkbox"/> Unknown				
	Shift Position	<input type="checkbox"/> 1st <input type="checkbox"/> 2nd <input type="checkbox"/> 3rd <input type="checkbox"/> 4th <input type="checkbox"/> 5th <input type="checkbox"/> 6th				
	Shift	<input type="checkbox"/> On <input type="checkbox"/> Off <input type="checkbox"/> Unknown				
	Shift	<input type="checkbox"/> On <input type="checkbox"/> Off <input type="checkbox"/> Unknown				
	Shift	<input type="checkbox"/> On <input type="checkbox"/> Off <input type="checkbox"/> Unknown				
	Shift	<input type="checkbox"/> On <input type="checkbox"/> Off <input type="checkbox"/> Unknown				
	Shift	<input type="checkbox"/> On <input type="checkbox"/> Off <input type="checkbox"/> Unknown				
	Shift	<input type="checkbox"/> On <input type="checkbox"/> Off <input type="checkbox"/> Unknown				
	Shift	<input type="checkbox"/> On <input type="checkbox"/> Off <input type="checkbox"/> Unknown				
	Shift	<input type="checkbox"/> On <input type="checkbox"/> Off <input type="checkbox"/> Unknown				
Diagnosis	<input type="checkbox"/> Shift lever is constant driving	<input type="checkbox"/> Normal driving, gear selection problem assumed.				
	<input type="checkbox"/> From clutch	<input type="checkbox"/> Neutral <input type="checkbox"/> Reverse <input type="checkbox"/> Forward				
	<input type="checkbox"/> Acceleration	<input type="checkbox"/> High <input type="checkbox"/> Low				
	<input type="checkbox"/> High	<input type="checkbox"/> Low				
	<input type="checkbox"/> Low	<input type="checkbox"/> High				
	<input type="checkbox"/> From clutch	<input type="checkbox"/> Neutral <input type="checkbox"/> Reverse <input type="checkbox"/> Forward				
	<input type="checkbox"/> Acceleration	<input type="checkbox"/> High <input type="checkbox"/> Low				
	<input type="checkbox"/> High	<input type="checkbox"/> Low				
	<input type="checkbox"/> Low	<input type="checkbox"/> High				
	<input type="checkbox"/> From clutch	<input type="checkbox"/> Neutral <input type="checkbox"/> Reverse <input type="checkbox"/> Forward				
Conclusion	<input type="checkbox"/> Problem cannot be resolved					
	<input type="checkbox"/> Problem can be resolved. (Specify) _____					
Remarks	<input type="checkbox"/> No road noise when vehicle was brought in					
	<input type="checkbox"/> No road noise after the diagnosis					
Once written in the work function of the vehicle (VIN) with the problem function, which the customer requests,						
With the function function						

Fig. 7-14
T302f714

Warning Light Check Turn the ignition switch ON and check that the warning light goes off after 5 seconds.

If the warning light does not light up, check the sequential manual transmission warning light circuit. If the light does not go off, check for a DTC.

Check Sequential Manual Transmission Warning Light

If the warning light does not light up or does not go off, check the sequential manual transmission warning light circuit.

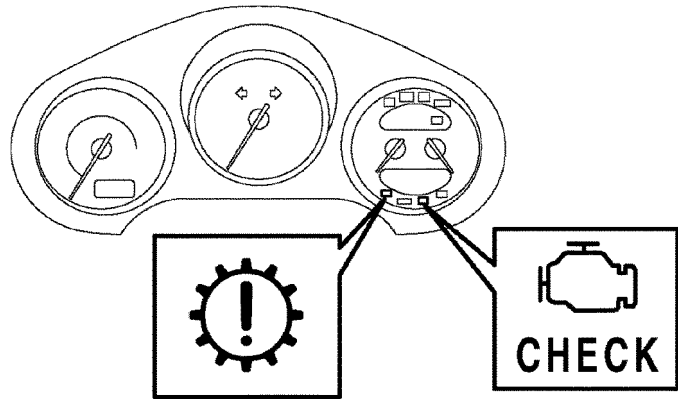


Fig. 7-15
T302f715

Prepare the Diagnostic Tester

To prepare the Diagnostic Tester:

1. Connect the Diagnostic Tester to the DLC3 at the lower left portion of the instrument panel.
2. Turn the ignition switch ON and press the ON button.
3. Check the DTCs and freeze frame data; note them down.
4. See the diagnostic section of the MR2 Repair Manual to confirm the details of the DTCs.

Using the Diagnostic Tester

To check the DTCs, connect the Diagnostic Tester to the DLC3 of the vehicle.

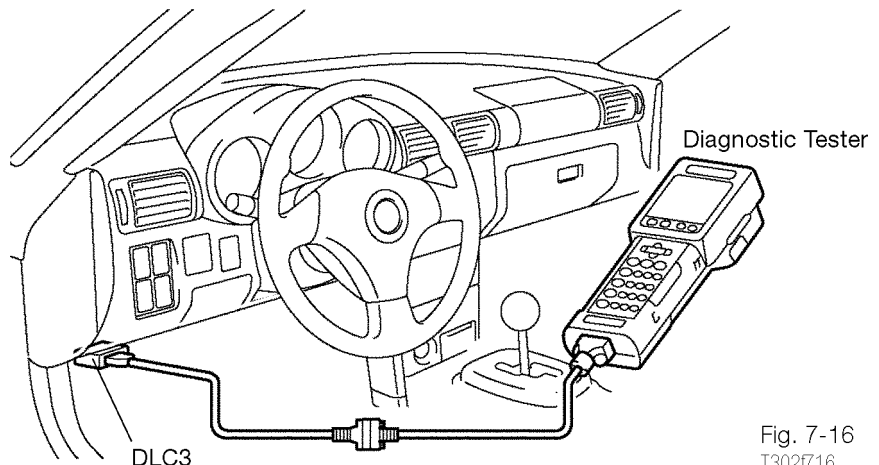


Fig. 7-16
T302f716

Diagnostic Trouble Codes (DTC) Diagnostic Trouble Codes (DTC) retrieved using the Diagnostic Tester indicate that a malfunction has occurred. The left column of the DTC chart directs you to the proper page to begin a circuit diagnosis and provides a description of the trouble code.

Using the chart in figure 7-17, DTC P0820 refers you to the circuit diagnosis on page DI-284 of the MR2 Repair Manual. The item detects a Shift Lever Switch malfunction. The components to check are the switch, circuits and ECU.

Diagnostic Trouble Codes (DTC) Chart

This is a sample page of the Diagnostic Trouble Codes Chart found in the Repair Manual.

DI-250

DIAGNOSTICS – SEQUENTIAL MANUAL TRANSMISSION

DTC No.	Detection Item	Trouble Area	SMT	Memory
P0562 (DI-256)	System Voltage Low	<ul style="list-style-type: none"> • SMT B fuse • Open or short in +B circuit • Open or short in +B1 signal circuit • Battery • Transmission control ECU 		
P0703 (DI-260)	Brake Switch "B" Circuit	<ul style="list-style-type: none"> • Stop light switch • STP fuse • Open or short in STP signal circuit • Transmission control ECU 		
P0715 (DI-263)	Input/Turbine Speed Sensor "A" Circuit	<ul style="list-style-type: none"> • Input shaft revolution sensor • Open or short in NIP signal circuit • Transmission control ECU 		
P0725 (DI-266)	Engine Speed Input Circuit	<ul style="list-style-type: none"> • Open or short in NEO or CAN circuit • ECM • Transmission control ECU 		
P0807 (DI-266)	Clutch Position Sensor Circuit Low	<ul style="list-style-type: none"> • Clutch stroke sensor • Open in clutch stroke sensor circuit • Transmission control ECU 		
P0808 (DI-268)	Clutch Position Sensor Circuit High	<ul style="list-style-type: none"> • Clutch stroke sensor • Short in clutch stroke sensor circuit • Transmission control ECU 		
P0810 (DI-274)	Clutch Position Control Error	<ul style="list-style-type: none"> • Clutch stroke sensor • Open or short in clutch stroke sensor circuit • Open or short in clutch solenoid circuit • GSA (System hoses) • HPU (Clutch solenoid) • Transmission control ECU 		
P0812 (DI-278)	Reverse Input Circuit	<ul style="list-style-type: none"> • Shift stroke sensor • Select stroke sensor • Back-up light switch • Back-up light switch No. 2 • Open or short in reverse switch circuit • Transmission control ECU • Open or short in shift stroke sensor circuit • Open or short in select stroke sensor circuit • GSA • Shift and select lever shaft 		
P0820 (DI-284)	Gear Lever X-Y Position Sensor Circuit	<ul style="list-style-type: none"> • Shift lever switch • Open or short in LSW1 – LSW4 signal circuit • Open or short in LS1C – LS4C signal circuit • Transmission control ECU 		
P0847 (DI-288)	Transmission Fluid Pressure Sensor/Switch "B" Circuit Low	<ul style="list-style-type: none"> • GSA (Master pressure sensor) • Open in master pressure sensor circuit • HPU (Master solenoid) • Transmission control ECU 		
P0848 (DI-288)	Transmission Fluid Pressure Sensor/Switch "B" Circuit High	<ul style="list-style-type: none"> • GSA (Master pressure sensor) • Short in master pressure sensor circuit • HPU (Master solenoid) • Transmission control ECU 		

2003 MR2 (FM967U)

Fig. 7-17
T302717

Circuit Diagnosis The circuit diagnosis in the Repair Manual contains a description, the electrical diagram, inspection procedures, and the appropriate steps for diagnosing the concern. Testing the circuit may now be required.

Circuit Diagnosis

This is a the Circuit Diagnosis page for the DTC P0820 from the Repair Manual. It contains a DTC description and the electrical diagram for the circuit.

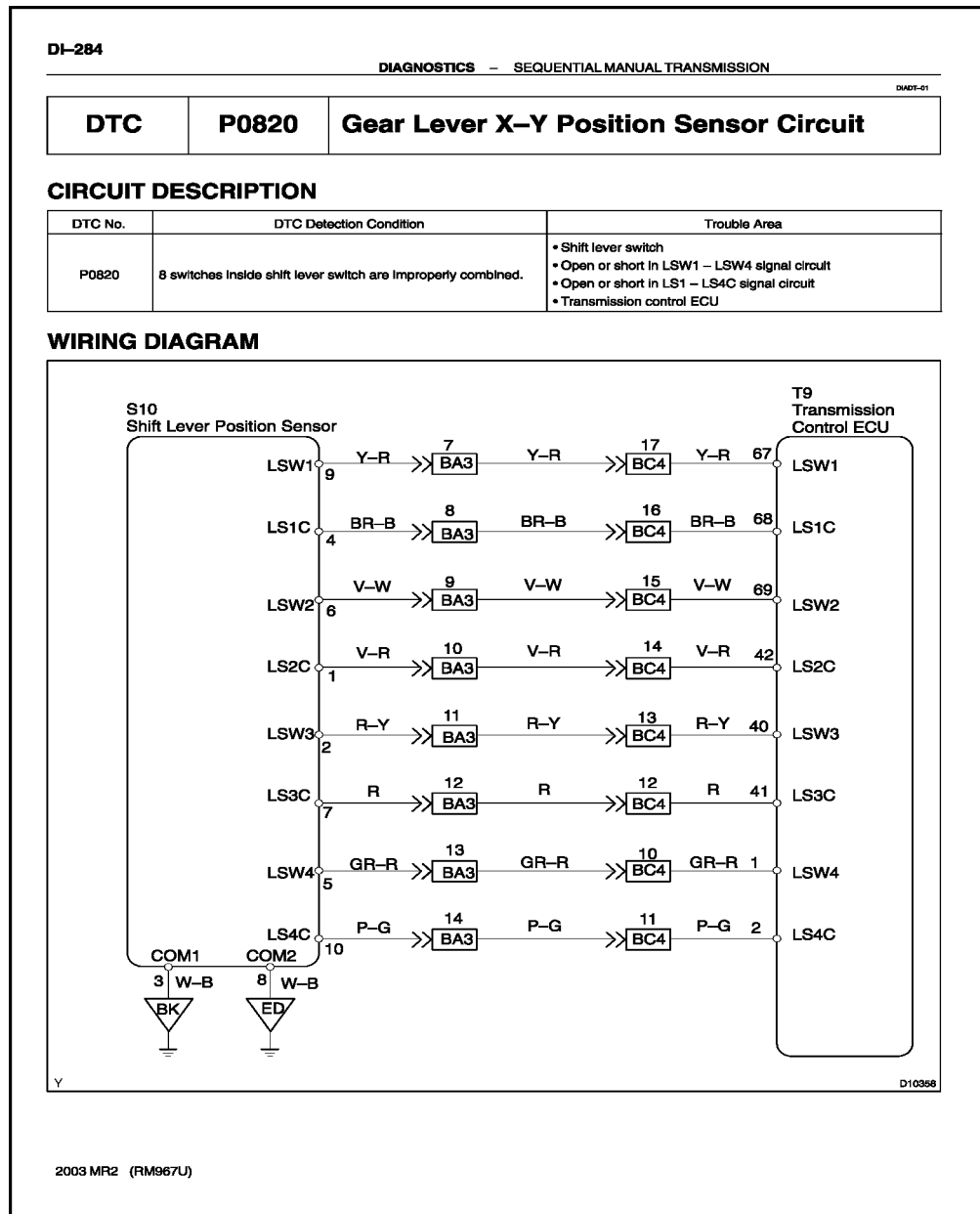


Fig. 7-18
T302718

Inspection Procedure The inspection procedure in the Circuit Diagnosis section of the Repair Manual describes the steps to take to determine the cause of the system malfunction. In this case, the Diagnostic Tester is used to check the shift lever switch and circuit. If the check fails, a pin check of the switch narrows the cause to the switch, circuit, or transmission ECU.

Inspection Procedure

In this example of the inspection procedure from the Circuit Diagnosis section of the Repair Manual, the Diagnostic Tester is used to check the shift lever switch and circuit.

DI-285

DIAGNOSTICS - SEQUENTIAL MANUAL TRANSMISSION

INSPECTION PROCEDURE

HINT:
Read freeze frame data using hand-held tester or OBD II scan tool, as freeze frame data records the engine conditions when a malfunction is detected. When troubleshooting, it is useful for determining whether the vehicle was running or stopped, the engine was warmed up or not, etc. at the time of the malfunction.

1 Connect hand-held tester, check shift lever switch signal.

PREPARATION:
(a) Start the engine and warm it up.
(b) Connect the hand-held tester to the DLC3.

CHECK:
Read the value of the shift lever switch by using the hand-held tester.

OK:

Shift lever position	Tester display							
	SHIFT SW SIG1	SHIFT SW SIG2	SHIFT SW SIG3	SHIFT SW SIG4	SHIFT CHECK SIG1	SHIFT CHECK SIG2	SHIFT CHECK SIG3	SHIFT CHECK SIG4
R	OFF	ON	OFF	OFF	ON	OFF	ON	ON
N	OFF	OFF	OFF	ON	ON	ON	ON	OFF
S	OFF	OFF	ON	OFF	ON	ON	OFF	ON
-	OFF	ON	ON	OFF	ON	OFF	OFF	ON
+	ON	OFF	ON	OFF	OFF	ON	OFF	ON

OK

Replace transmission control ECU.

NG

2003 MR2 (RM967U)

Fig. 7-19
T302719

Problem Symptoms Table The Problem Symptom Table in the Repair Manual provides access to the diagnostic test procedure if a malfunction occurs and no DTCs are present. An example is shown in figure 7-20: The symptom is found in the left column. The suspect components are listed in the second column, and the page reference is located in the column to the right of the components.

Problem Symptoms Table

If no DTC is displayed during the DTC check, use the Problem Symptoms Table to proceed to the relevant troubleshooting page.

DI-256

DIAGNOSTICS - SEQUENTIAL MANUAL TRANSMISSION

DI-256-08

PROBLEM SYMPTOMS TABLE

If a normal code is displayed during the DTC check but the problem still occurs, check the problem symptom in the order given in the table below and proceed to the relevant troubleshooting page.

NOTICE:

When replacing the transmission control ECU or sensor, turn the ignition switch OFF and close the driver's door, and after replacing the transmission control ECU, make the transmission control ECU learn characteristics (See page DI-236, step 8).

Symptom	Suspected Area	See page
No-up shift No-down shift	3. Transmission	SM-3
	4. Clutch disc	CL-1
	5. HPU (Master solenoid)	DI-352
	6. HPU (Accumulator)	DI-338
	7. HPU (Accumulator pressure sensor)	DI-338
	8. HPU (Motor pump)	DI-338
	9. HPU (Clutch solenoid)	DI-304
	10. GSA (Shift solenoid)	DI-332
	11. GSA (Select solenoid)	DI-312
	12. GSA (Master pressure sensor)	DI-321
	13. GSA (System hoses)	SM-67
	14. Shift lever	SM-81
	15. Shift lever switch	DI-284
	16. Input shaft speed sensor	DI-283
	17. Input shaft speed sensor circuit	DI-283
	18. Transmission control ECU	-
SMT warning light defective.	1. SMT warning light circuit 2. Transmission control ECU	DI-362 -
DTC check cannot be performed.	1. SMT warning light circuit 2. TC terminal circuit	DI-362 DI-230
Transmission control ECU buzzer does not sound when a miss operation occurs.	1. Door courtesy switch circuit 2. Stop light switch circuit 3. Transmission control ECU	DI-357 DI-293 -

2003 MR2 (RM967U)

Fig. 7-20
T302F720

Service Procedures

Reducing Accumulator Pressure

There are a number of procedures specific to the sequential manual transmission that may need to be performed when servicing.

Before removing any of the parts listed below, the hydraulic power unit accumulator pressure must be reduced using the Diagnostic Tester and the procedure listed in the Diagnostics section of the Repair Manual.

- Hydraulic power unit assembly
- Gear shift actuator assembly
- Shift stroke sensor
- Select stroke sensor
- Sub-wire harness
- Clutch stroke sensor
- Transmission assembly or transmission component parts
- Clutch disc or related components

Use the Diagnostic Tester to access the REDUC ACCM PRS in the active test menu. The amount of accumulator pressure will be displayed on the screen when the procedure is complete. The pressure should be zero.

Hydraulic Power Unit Fluid Level Check

After the fluid pressure has been reduced to zero, the fluid level in the hydraulic power unit must be checked with the hydraulic power unit and gear shift actuator hoses connected,

The vehicle should be parked on a level surface with the park brake set. The vehicle air cleaner box must be removed to access the fluid reservoir that is protected by a plastic cover. The level can be viewed through a check window on the reservoir tank.

The required fluid type is Toyota's Sequential M/T Fluid.

Fluid Level Check

The level can be viewed through a check window on the reservoir tank

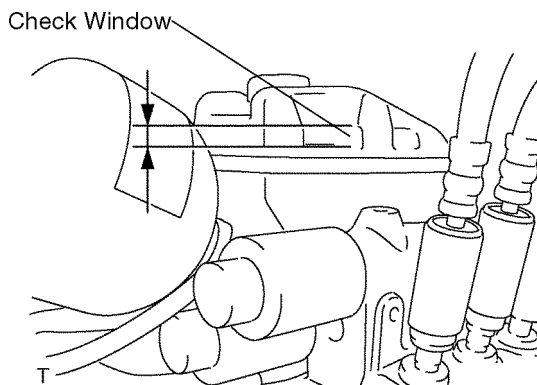


Fig. 7-21
T302f721

ECU Relearning The Diagnostic Section of the Repair Manual as well as the latest Technical Service Bulletins should be consulted when performing ECU relearning. Since the ECU monitors a number of sensors and controls the shift, clutch and throttle functions with precision, the ECU must be able to learn the values of each sensor to compensate for both manufacturing tolerances and mixing new parts with existing parts when repairs are made. ECU relearning should be performed whenever any of the following parts are replaced:

- Hydraulic power unit assembly
- Gear shift actuator assembly
- Shift stroke sensor
- Select stroke sensor
- Clutch stroke sensor
- Transmission assembly or transmission component parts
- Clutch disc or related components

NOTE

Because the ECU will be looking for events to occur in a specific order, it is important to follow the procedure in the order listed, and that both the time and speed requirements be precisely met.

Vehicle Staging Before beginning the relearning procedure ensure the following steps are taken:

- Stop the vehicle
- Close the driver's side door (door courtesy light switch provides a ground for the transmission control ECU)
- Shift lever into the N position
- Verify the ignition switch is OFF

Diagnostic Tester Use Follow the procedure in the repair manual by installing the diagnostic tester to DLC3.

- Access PARTS EXCHANGE through the OBD/MOBD Diagnostic menu because Enhanced OBD II is not supported on the SMT MR2
- Follow the screen prompts, and when prompted turn the key OFF for 15 seconds or more, then turn it ON.

The N position indicator light should light up. If the light comes ON steady, then relearning is NOT required.

Relearn Procedure If the N light does not light up or it flashes, do the following:

- Turn the ignition switch OFF and remove the key
- Disconnect the battery negative cable for at least one minute
- Make sure the transmission shift and select rod is in the neutral position (hole pointing straight up and down)
- Turn the wheels slowly so the gears rotate in the transmission allowing the synchronizers and gears to align properly while doing the following:
 - Connect the negative battery terminal
 - Insert the key and turn the ignition switch to ON
 - Wait about one minute for the gear shift actuator to actuate various gear positions and the N light to come ON

NOTE

The gear position indicator may display S5, S4, S3, S2, and S1 consecutively before the N light comes ON.

Gear Position Indicator

During the relearn procedure, the gear position indicator may display S5, S4, S3, S2, and S1 consecutively before the N light comes ON.

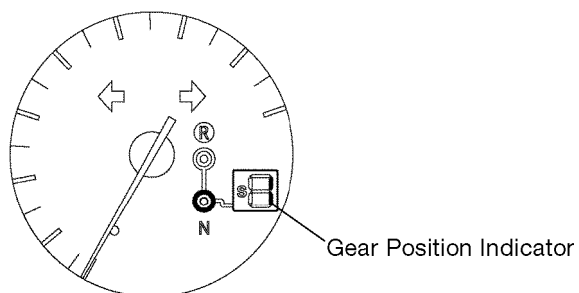


Fig. 7-22
T302f722

- Move the select lever to the S position and drive up to 20 mph in 1st gear
- When the vehicle runs above 3 mph or more the sequential indicator light lights up for one second. ECU learning is complete

ECU Replacement When replacing the SMT transmission control ECU be sure to follow the specific procedure outlined in Technical Service Bulletin TC003-02. Highlights include:

- Remove the key from the ignition when turning the ignition OFF.
- Remove the four retaining bolts from the transmission control ECU mounting flanges before removing the electrical connector.
- Attach the electrical connector before securing the transmission control ECU with the retaining bolts.
- Visually confirm that the electrical connector attaching hook is properly engaged under the transmission control ECU pin when reconnecting.
- Visually confirm that the connectors are properly aligned, and that the metal arm can easily be fully closed.
- Swing the wire harness electrical connector in a single, fluid motion into the transmission control ECU connector.

ECU Replacement

Swing the wire harness electrical connector in a single, fluid motion into the Transmission control ECU connector.

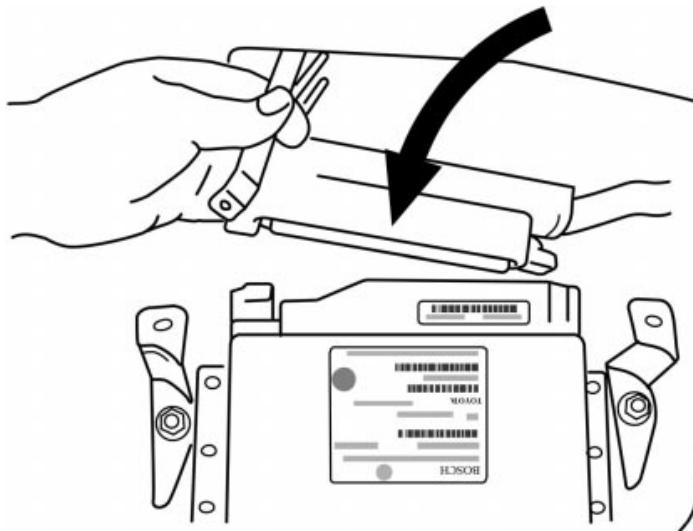


Fig. 7-23
T302f723