

AUTO TRANS DIAGNOSIS - N4A-EL/HL & NC4A-EL

1991 Mazda Miata

AUTOMATIC TRANSMISSIONS
Mazda N4A-EL, N4A-HL & NC4A-EL Electrical Diagnosis

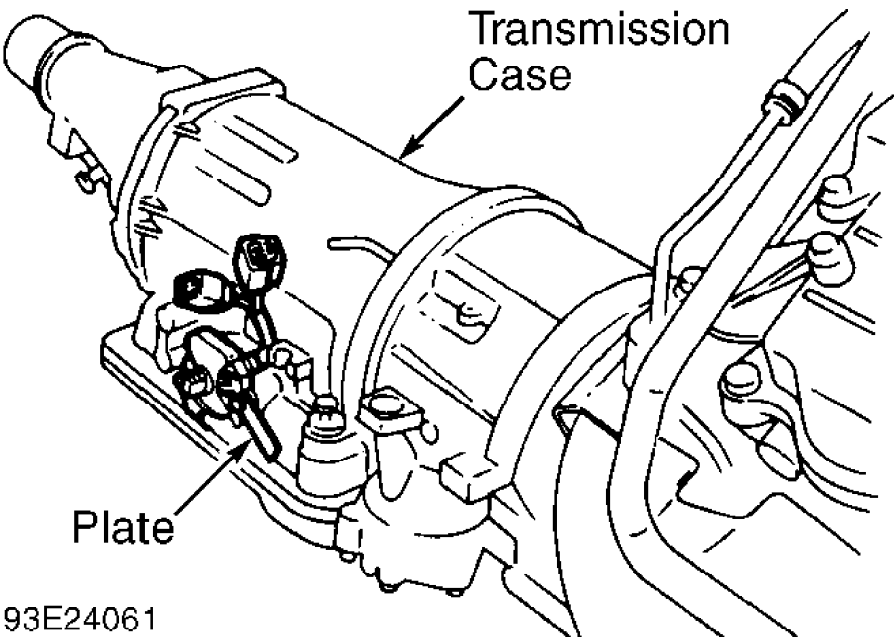
APPLICATION

TRANSMISSION APPLICATIONS

Vehicle	Transmission Model
1991-93	
B2200	N4A-HL
B2600 (2WD)	N4A-HL
1989-94	
MPV (2.6L 2WD)	N4A-HL
1990-93	
Miata	N4A-HL
1994	
Miata	NC4A-EL

IDENTIFICATION

This transmission is manufactured by Japan Automatic Transmission Company (JATCO). Transmission model is identified by a stamped metal plate attached to right side of transmission case. Plate lists model code on second line and serial number on bottom line. See Fig. 1.



93E24061

Fig. 1: Locating Model Code & Serial No. Plate
Courtesy of Mazda Motors Corp.

DESCRIPTION

This article includes both electrical and hydraulic trouble shooting and testing information. All models include a shift lock system. The 1994 Miata include a computer with on-board self-test capabilities.

LUBRICATION & ADJUSTMENT

See the appropriate TRANSMISSION SERVICING - A/T article in the AUTOMATIC TRANS SERVICING section.

SHIFT-LOCK SYSTEM

OPERATION

All models are equipped with a shift-lock system. System locks gear selector in Park unless brake pedal is pushed down. Shift-lock actuator uses an integral relay to release a solenoid (mounted on gear selector assembly).

On 1994 Miata, a key interlock solenoid and control unit prevents ignition key from being removed unless gear selector is in Park. With ignition key removed, gear selector locks in Park.

On all other models, a mechanical control cable prevents ignition key from being removed unless gear selector is in Park.

FUNCTION CHECK

1) With ignition key removed, ensure gear selector cannot be moved from Park. Insert key in ignition switch.

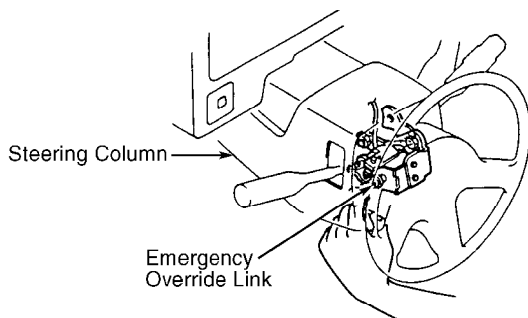
2) Turn ignition on. Ensure gear selector can only be moved with brake pedal pressed down. Move gear selector to Reverse.

3) Ensure ignition key cannot be removed. Move gear selector to Park. Ensure it is now possible to remove ignition key.

4) If shift-lock system does not operate as described, check gear selector, shift-lock solenoid and control cable or key interlock solenoid and control unit.

5) On B2200, B2600 and 1993 Miata, slide back override button. On MPV, place gear selector in Park. Depress and hold emergency override link. See Fig. 2.

6) On all models, if gear selector cannot be moved out of Park, adjust or replace shift-lock actuator. To adjust shift-lock actuator, see appropriate TRANSMISSION SERVICING article in TRANSMISSION SERVICING section.



93H23157
Fig. 2: View Of MPV Emergency Override Link
Courtesy of Mazda Motors Corp.

TESTING

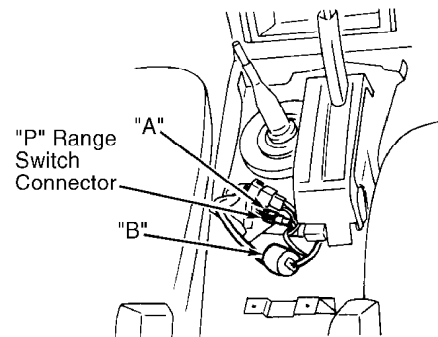
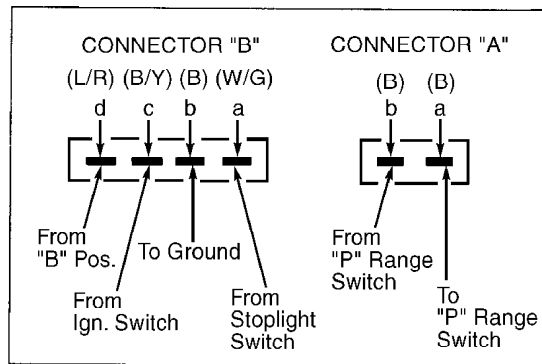
NOTE: Ensure radio code is obtained and radio anti-theft system has been deactivated before disconnecting battery.

B2200, B2600 & 1993 Miata

1) Disconnect negative battery cable. Remove gear selector console cover. Disconnect Park switch connector "A". See Fig. 3.

2) Place gear selector in Park. Continuity should be present between both Black wires. Depress gear selector release button and ensure no continuity is present. If Park switch works as described, go to next step. If Park switch does not work as described, replace Park switch.

3) Disconnect shift-lock actuator connector. Turn ignition on. Check terminal voltages and continuity. See Fig. 3. If not as specified, replace shift-lock actuator.



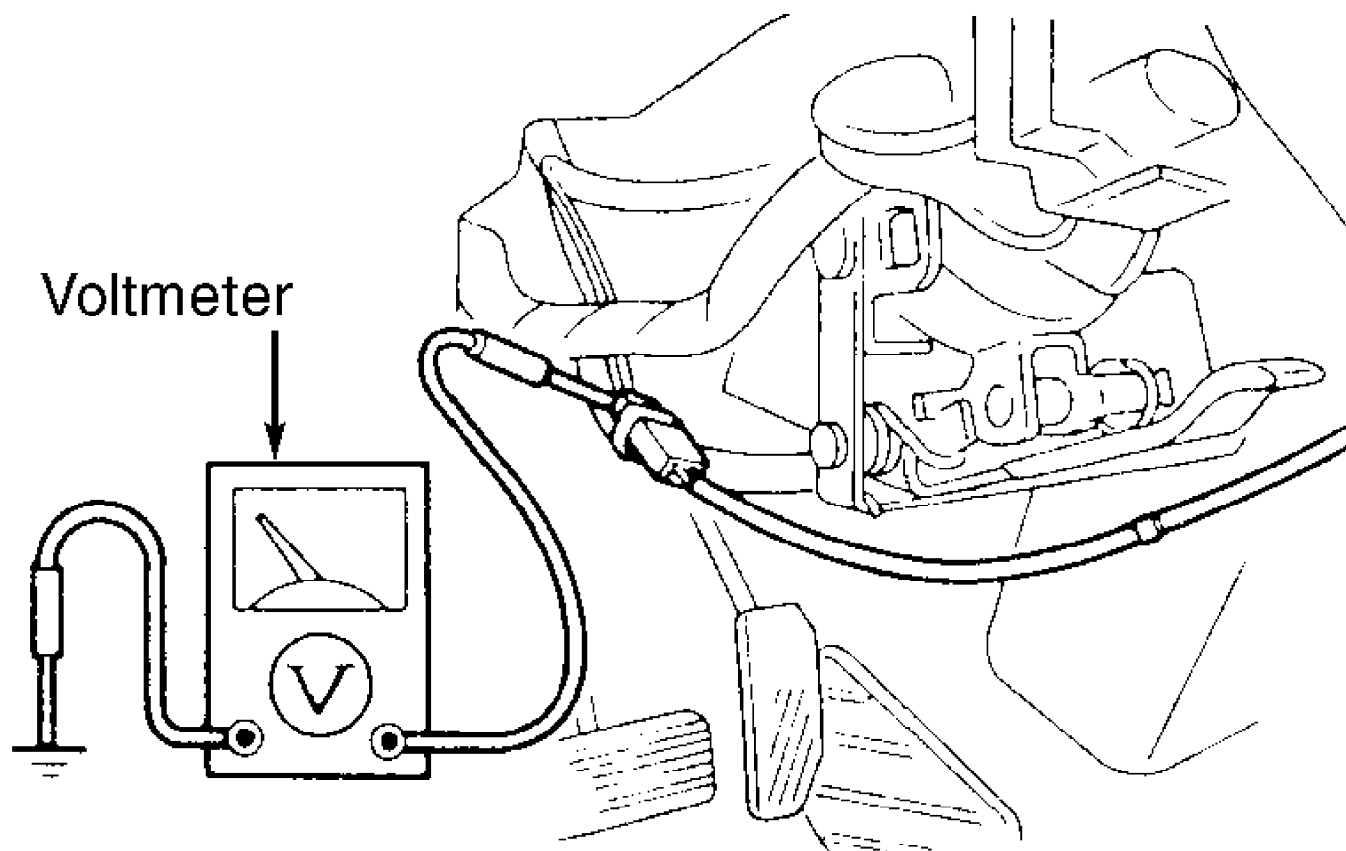
VB: Battery voltage				
Connector	Terminal	⊖ terminal connected to	Condition	Measurement valve
A	a	B—b	P range, selector lever release button not depressed	0Ω
A	b	B—b	Constant	0Ω
B	a	B—b	Brake pedal released → depressed	0V → VB
B	b (harness side)	Body	Constant	0Ω
B	c	B—b	Ignition switch ON	VB
B	d	B—b	Ignition switch OFF	VB

93/23158
Fig. 3: Testing Shift Lock Actuator, Park Switch & Connectors
Courtesy of Mazda Motors Corp.

MPV

1) Remove steering column covers. Turn ignition on. Measure voltage between Orange wire and ground. See Fig. 4. With gear selector in Park and brake pedal depressed, battery voltage should be present. If voltage is present, go to next step. If no voltage is present, check shift-lock solenoid and related circuits.

2) Release brake pedal. Voltage should be less than 1.5 volts. With gear selector in any other gear position, voltage should be less than 1.5 volts. If voltage is not as described, check inhibitor/park neutral switch, brake light circuit or PCMT.



93J23159

Fig. 4: Testing MPV Shift Lock Switch
Courtesy of Mazda Motors Corp.

1994 Miata

1) Disconnect negative battery cable. Remove gear selector console cover. Disconnect Hold switch connector.

2) Place gear selector in Park. Turn ignition on. Check terminal voltages and continuity. See Fig. 5.

3) Disconnect shift-lock actuator connector to check continuity between terminal "C" harness side and ground. If not as specified, repair wiring harness and/or replace shift-lock actuator.

TROUBLE SHOOTING

NOTE: For clutch and band operation, see ELEMENTS IN USE under TESTING.

Testing Preparation Procedure

1) The following 4 steps apply to all trouble shooting operations under this heading.

2) Check engine coolant, oil and transmission fluid levels and adjust as necessary. Warm engine and transmission to operating temperatures.

3) Ensure engine idle speed is correct. Set parking brake and block wheels front and rear for stall and line pressure test.

4) Drive vehicle for road test, line pressure cut-back point and governor pressures.

5) If transmission problems occur on initial road test, check adjustments. See appropriate TRANSMISSION SERVICING article in TRANSMISSION SERVICING section.

Using Trouble Shooting Chart

Use trouble shooting chart to diagnose a problem by symptom.

See TROUBLE SHOOTING CHART DIRECTORY.

TROUBLE SHOOTING CHART DIRECTORY

Application	Refer to:
"B" Series Trucks (1991-93)	Figs. 5-7
Miata	
1990-93	Fig. 8
1994	Fig. 14
MPV (1989-94)	Fig. 11

Inspection point		ON VEHICLE															OFF VEHICLE													
		Pre-liminary		Electronic control system				Hydraulic control system							Powertrain															
		ATF level and condition	Shift mechanism	Engine idle speed and condition	Park/Neutral switch and wiring	Kickdown switch, Kickdown solenoid, and wiring	Ignition switch and starter	OD OFF switch	OD cancel solenoid	Lockup solenoid	Vacuum diaphragm and piping	Engine stall speed	Line and governor pressure	Control valve body	Governor valve	OD band servo	Accumulator	Transmission air check	OD cancel valve	Lockup control valve	Oil pump	Torque converter	Direct clutch	Front clutch	Rear clutch	OD brake band	2nd brake band	Low and reverse brake	One-way clutch	Planetary gear
Item	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Adjustment	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Electrical System Inspection					X	X	X	X																						
Mechanical System Test												X									X	X	X	X	X	X	X	X	X	
Road Test													X								X	X	X	X	X	X	X	X	X	
Engine starting	Engine does not start in N or P range		2	3	1																	X	X		X	X	X	X	X	
	Engine starts in ranges other than N, and P ranges		1	2																										
Accelerating	Vehicle does not move in D range (moves in 1, 2, and R ranges)		1								2	3																	④	
	Vehicle does not move in forward ranges (moves in R range)		1	2							3	4					5								⑥					
	Extremely poor acceleration																													
	Vehicle does not move in R range (moves in forward range)		1	2							3	4					5							⑦	⑧		⑥			
	Extremely poor acceleration																													
	Vehicle does not move in any range		1	2							3	4					5		⑥	⑧										⑦
	Slippage felt when accelerating		1	2						6	3	4					5		⑦											
	Vehicle moves in N range		1										2												③					
	Excessive creep			1																										
	No creep at all		1	2	3								4						⑤											
Low max. speed and poor acceleration		1	2	6						3	4	5						⑫		⑨	⑩	⑪			⑦	⑧				
No shift	Does not shift from 1st to 2nd		1		3					2		4	5	6	7										⑧	⑨				
	Does not shift from 2nd to 3rd		1		3					2		4	5	6	7									⑧						
	Does not shift from 3rd to OD		1		3	8	9	2		4	5	6	7	⑫									⑩		⑪					
	Lockup does not occur in OD							3				1	2					⑤							④					
	Does not shift from OD to 3rd		1			6	7	2		3	4						5	⑪					⑧	⑨	⑩					
	Does not shift from 3rd to 2nd or from OD to 2nd		1							2		3	4	5	6								⑦		⑧	⑨				
	Does not shift from 2nd to 1st or from 3rd to 1st		1							2		3	4	5	6											⑦	⑧			
	Does not kickdown when accelerator depressed in 3rd within kickdown range		1		2					3		4	5														⑥			
	Does not kickdown when accelerator depressed in OD within kickdown range		1		2					3		4	5									⑥								
	Excessive engine speed when accelerated in 3rd due to delayed kickdown		1	2								3	4	5				6					⑦							
	Excessive engine speed when accelerated in OD due to delayed kickdown		1	2								3	4	5				6							⑦					
	Does not shift from 3rd to 2nd on D range to 2-range shift		1	2								3	4	5		6							⑥			⑦				
	Does not shift from 3rd to 1st on D range to 1-range shift		1	2								3	4	5		6							⑦			⑧				

95C20554
Fig. 5: NA4A-HL 1991-93 "B" Series Trucks Trouble Shooting (1 of 3)
Courtesy of Mazda Motors Corp.

Inspection point		ON VEHICLE														OFF VEHICLE																	
		Pre-liminary		Electronic control system				Hydraulic control system								Powertrain																	
		ATF level and condition	Shift mechanism	Engine idle speed and condition	Park/Neutral switch and wiring	Kickdown switch, kickdown solenoid, and wiring	Ignition switch and starter	OD OFF switch	OD cancel solenoid	Lockup solenoid	Vacuum diaphragm and piping	Engine stall speed	Line and governor pressure	Control valve body	Governor valve	OD band servo	2nd band servo	Accumulator	Transmission air check	OD cancel valve	Lockup control valve	Oil pump	Torque converter	Direct clutch	Front clutch	Rear clutch	OD brake band	2nd brake band	Low and reverse brake	One-way clutch	Planetary gear	Parking gear	
Item																																	
Shift shock	Excessive N range to D range shift shock		1						2	3	4														⑤								
	Excessive 1st to 2nd shift shock	1							2	3					4		5		⑦								⑥						
	Excessive 2nd to 3rd shift shock								1	2	3				4				⑥								⑤						
	Excessive 3rd to OD shift shock								1	2	3							⑤								④							
	Vehicle brakes when shifted from 1st to 2nd	1										2																③	⑤				
	Vehicle brakes when shifted from 2nd to 3rd	1										3			2														④				
	Vehicle brakes when shifted from 3rd to OD	1										3			2											④							
	Shift shock felt when accelerator released and deceleration occurs		1		3				2	4	5	6			7																		
	Excessively large 2nd to 1st shock in 1 range		1						2	3	4	5																		⑥			
Shift point	Excessively high 1st to 2nd, 2nd to 3rd, and 3rd to OD shift points	1			3				2	4	5	6																					
	Excessively high OD to 3rd, 3rd to 2nd, and 2nd to 1st shift points		1		3				2	4	5	6																					
	Kickdown operates or engine overruns when depressing pedal in 3rd beyond kick-down vehicle speed limit	1	2									3	4	5										⑥									
	Kickdown operates or engine overruns when depressing pedal in OD beyond kick-down vehicle speed limit	1	2									3	4	5													⑥						
Shift sequence	Shifts directly from 1st to 3rd	1										2	3					4									⑤						
	Shifts directly from 1st to OD	1										2	3					4						⑤									
	Shifts from 2nd to 1st, or 2nd to 3rd in 2 range		1								2	3																					
	Shifts from 1st to 2nd, or 2nd to 3rd in 1 range		1									2																					

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Fig. 6: NA4A-HL 1991-93 "B" Series Trucks Trouble Shooting (2 of 3)
Courtesy of Mazda Motors Corp.

Inspection point Item		ON VEHICLE															OFF VEHICLE																
		Pre-liminary		Electronic control system					Hydraulic control system								Powertrain																
		ATF level and condition	Shift mechanism	Engine idle speed and condition	Park/Neutral switch and wiring	Kickdown switch, Kickdown solenoid, and wiring	Ignition switch and starter	OD OFF switch	OD cancel solenoid	Lockup solenoid	Vacuum diaphragm and piping	Engine stall speed	Line and governor pressure	Control valve body	Governor valve	OD band servo	2nd band servo	Accumulator	Transmission air check	OD cancel valve	Lockup control valve	Oil pump	Torque converter	Direct clutch	Front clutch	Rear clutch	OD brake band	2nd brake band	Low and reverse brake	One-way clutch	Planetary gear	Parking gear	
Slipping	Little shift shock or excessive slippage while 1st to 2nd shifting	1	2							3		4	5		6				7									⑧					
	Little shift shock or excessive slippage while 2nd to 3rd shifting	1	2							3		4	5		6				7						⑧								
	Little shift shock or excessive slippage while 3rd to OD shifting	1	2							3		4	5		6				7								⑧						
	No shift shock or engine overruns when shifting 1st to 2nd	1	2	4						3	5		6						7			⑨						⑧					
	Engine overruns or slips when shifting OD to 3rd	1								2		3	4			5			6					⑦	⑧		⑨						
	Engine overruns or slips when shifting 3rd to 2nd	1								2		3				4			5						⑥		⑦						
Noise	Transmission noisy in P and N ranges	1										2										③											
	Transmission noisy in D, 2, 1, and R ranges	1										2										④				③				⑤	⑥		
Others	No engine braking in 1 range		1									2	3						4										⑤				
	Vehicle moves in P range or parking gear not disengaged when P range disengaged		1																													②	
	Transmission overheats	1		4								5	6		2	3			7			⑭	⑮	⑧	⑨	⑩	⑪	⑫	⑬		⑯		
	White smoke discharged from exhaust while running	1								2	3	4	5						6			⑬	⑭	⑦	⑧	⑨	⑩	⑪	⑫		⑮		
	Abnormal odor from oil level gauge pipe	1																				⑧	⑨	②	③	④	⑤	⑥	⑦		⑩		
	Transmission shifts to OD even when OD OFF switch depressed							1	2											③													
	Vehicle surges in OD									1																							

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Fig. 7: NA4A-HL 1991-93 "B" Series Trucks Trouble Shooting (3 of 3)
Courtesy of Mazda Motors Corp.

		ON VEHICLE										OFF VEHICLE																					
Inspection point	Item	Pre-liminary		Electronic control system				Hydraulic control system						Powertrain																			
		ATF level and condition	Shift mechanism	Engine idle speed and condition	Inhibitor switch and wiring	Kickdown switch, kickdown solenoid, and wiring	Ignition switch and starter	OD OFF switch	OD cancel solenoid	Lockup solenoid	Vacuum diaphragm and piping	Engine stall speed	Line and governor pressure	Control valve body	Governor valve	OD band servo	2nd band servo	Accumulator	Transmission air check	OD cancel valve	Lockup control valve	Oil pump	Torque converter	Direct clutch	Front clutch	Rear clutch	OD brake band	2nd brake band	Low and reverse brake	OD one-way clutch	One-way clutch	Planetary gear	Parking gear
	Adjustment	X	X	X	X	X				X					X	X																	
	Electrical System Inspection					X		X	X	X																							
	Mechanical System Test									X		X										X	X	X	X	X		X	X	X	X	X	
	Road Test													X									X	X		X	X		X	X	X	X	
Engine stalling	Engine does not start in N or P range		2		3		1																										
	Engine starts in ranges other than N and P ranges		1		2																												
Accelerating	Vehicle does not move in D range (moves in 1, 2, and R ranges)		1										2	3																	4		
	Vehicle does not move in forward ranges (moves in R range) Extremely poor acceleration		1	2									3	4						5						6							
	Vehicle does not move in R range (moves in forward range) Extremely poor acceleration		1	2									3	4						5						7	8		6				
	Vehicle does not move in any range		1	2									3	4						5			6		8					9		7	
	Slippage felt when accelerating		1	2						6			3	4						5			7										
	Vehicle moves in N range		1											2													3						
	Excessive creep			1																													
	No creep at all		1	2	3									4																			
	Low maximum speed and poor acceleration		1	2	6								3	4	5								13		9	11	12		7	8	10		
No shift	Does not shift from 1st to 2nd		1			3				2		4	5		6	7										8		9					
	Does not shift from 2nd to 3rd		1			3				2		4	5		6	7									8								
	Does not shift from 3rd to OD		1			3		8	9	2		4	5	6		7	12							10			12		11				
	Lockup does not occur in OD								3				1	2						5							4						
	Does not shift from OD to 3rd		1					6	7	2		3	4						5	11				8	10		11		9				
	Does not shift from 3rd to 2nd or from OD to 2nd		1							2		3	4		5	6									7		8	9					
	Does not shift from 2nd to 1st or from 3rd to 1st		1							2		3	4		5	6												7		8			
	Does not kickdown when accelerator depressed in 3rd within kickdown range		1			2				3		4	5															6					
	Does not kickdown when accelerator depressed in OD within kickdown range		1			2				3		4	5											6						7			
	Excessive engine speed when accelerated in 3rd due to delayed kickdown		1	2								3	4	5						6						7							
	Excessive engine speed when accelerated in OD due to delayed kickdown		1	2								3	4	5						6							7						
	Does not shift from 3rd to 2nd on D range to 2 range shift		1	2									3	4		5									6			7					
	Does not shift from 3rd to 1st on D range to 1 range shift		1	2									3	4	5	6									7			8					

95F20557
Fig. 8: NA4A-HL 1990-93 Miata Trouble Shooting (1 of 3)
Courtesy of Mazda Motors Corp.

Inspection point Item		ON VEHICLE														OFF VEHICLE																
		Pre-liminary		Electronic control system				Hydraulic control system								Powertrain																
		ATF level and condition	Shift mechanism	Engine idle speed and condition	Inhibitor switch and wiring	Kickdown switch, kickdown solenoid, and wiring	Ignition switch and starter	OD OFF switch	OD cancel solenoid	Lockup solenoid	Vacuum diaphragm and piping	Engine stall speed	Line and governor pressure	Control valve body	Governor valve	OD band servo	2nd band servo	Accumulator	Transmission air check	OD cancel valve	Lockup control valve	Oil pump	Torque converter	Direct clutch	Front clutch	Rear clutch	OD brake band	2nd brake band	Low and reverse brake	OD one-way clutch	Planetary gear	Parking gear
Shift sequence	Excessive N range to D range shift shock		1						2	3	4														⑤							
	Excessive 1st to 2nd shift shock	1							2	3					4			5		⑦							⑥					
	Excessive 2nd to 3rd shift shock								1	2	3			4						⑥							⑤					
	Excessive 3rd to OD shift shock								1	2	3							⑤								④						
	Vehicle brakes when shifted from 1st to 2nd	1									2																	③		⑤		
	Vehicle brakes when shifted from 2nd to 3rd	1									3			2																④		
	Vehicle brakes when shifted from 3rd to OD	1									3			2												④						
	Shift shock felt when accelerator released and deceleration occurs	1		3					2	4	5	6		7																		
	Excessively large 2nd to 1st shock in 1 range	1							2	3	4	5																		⑥		
Shift point	Excessively high 1st to 2nd, 2nd to 3rd, and 3rd to OD shift points	1		3				2	4	5	6																					
	Excessively high OD to 3rd, 3rd to 2nd, and 2nd to 1st shift points	1		3				2	4	5	6																					
	Kickdown operates or engine overruns when depressing pedal in 3rd beyond kick-down vehicle speed range	1	2								3	4	5											⑥								
	Kickdown operates or engine overruns when depressing pedal in OD beyond kick-down vehicle speed range	1	2								3	4	5													⑥						
Shift shock	Shifts directly from 1st to 3rd	1									2	3					4									⑤						
	Shifts directly from 1st to OD	1									2	3					4							⑤								
	Shifts from 2nd to 1st, or 2nd to 3rd in 2 range	1								2	3																					
	Shifts from 1st to 2nd, or 2nd to 3rd in 1 range	1									2																					

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Fig. 9: NA4A-HL 1990-93 Miata Trouble Shooting (2 of 3)
Courtesy of Mazda Motors Corp.

Inspection point Item		ON VEHICLE														OFF VEHICLE																		
		Pre-liminary		Electronic control system				Hydraulic control system										Powertrain																
				ATF level and condition	Shift mechanism	Engine idle speed and condition	Inhibitor switch and wiring	Kickdown switch, kickdown solenoid, and wiring	Ignition switch and starter	OD OFF switch	OD cancel solenoid	Lockup solenoid	Vacuum diaphragm and piping	Engine stall speed	Line and governor pressure	Control valve body	Governor valve	OD band servo	2nd band servo	Accumulator	Transmission air check	OD cancel valve	Lockup control valve	Oil pump	Torque converter	Direct clutch	Front clutch	Rear clutch	OD brake band	2nd brake band	Low and reverse brake	OD one-way clutch	One-way clutch	Planetary gear
Others	Little shift shock or excessive slippage during 1st to 2nd shift	1	2							3	4	5		6				7										⑧						
	Little shift shock or excessive slippage during 2nd to 3rd shift	1	2							3	4	5		6				7						⑧										
	Little shift shock or excessive slippage during 3rd to OD shift	1	2							3	4	5		6				7									⑧							
	No shift shock or engine overruns when shifting 1st to 2nd	1	2	4						3	5	6						7			⑨							⑧						
	Engine overruns or slips when shifting OD to 3rd	1								2	3	4		5	6			7				⑨		⑦	⑨		⑩			⑧				
	Engine overruns or slips when shifting 3rd to 2nd	1								2	3			4		5									⑦	⑥		⑦						
Noise	Transmission noisy in P and N ranges	1										2										③												
	Transmission noisy in D, 2, 1, and R ranges	1										2										④				③					⑤	⑥		
Slipping	No engine braking in 1 range		1								2	3					4												⑤					
	Vehicle moves in P range or parking gear not disengaged when P range disengaged		1																														②	
	Transmission overheats	1		4								5	6		2	3		7				⑮	⑯	⑧	⑩	⑪	⑫	⑬	⑭	⑨		⑰		
	White smoke discharged from exhaust while running	1								2	3	4	5					6				⑭	⑮	⑦	⑨	⑩	⑪	⑫	⑬	⑧		⑯		
	Abnormal odor from oil level gauge pipe	1																				⑨	⑩	②	④	⑤	⑥	⑦	⑧	③		⑪		
	Transmission shifts to OD even when OD OFF switch depressed								1	2									③															
	Vehicle surges in OD									1																								

95H20559
Fig. 10: NA4A-HL 1990-93 Miata Trouble Shooting (3 of 3)
Courtesy of Mazda Motors Corp.

Inspection point <	
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95A20560
Fig. 11: NA4A-HL 1989-94 MPV Trouble Shooting (1 of 3)
Courtesy of Mazda Motors Corp.

Inspection point		ON VEHICLE														OFF VEHICLE																	
		Pre-liminary		Electronic control system				Hydraulic control system								Powertrain																	
		ATF level and condition	Selector lever and linkage	Engine idle speed and condition	Inhibitor switch and wiring	Kickdown switch, Kickdown solenoid, and wiring	Ignition switch and starter	OD OFF switch	OD cancel solenoid	Lockup solenoid	Vacuum diaphragm and piping	Engine stall speed	Line and governor pressure	Control valve body	Governor	OD band servo	2nd band servo	Accumulator	Transmission air check	OD cancel valve	Lockup control valve	Oil pump	Hydraulic circuit	Torque converter	Direct clutch	Front clutch	Rear clutch	OD brake band	2nd brake band	Low and reverse brake	One-way clutch	Planetary gear	Parking gear
Item																																	
Shift shock	Excessive N range to D range shift shock		1						2	3	4																⑤						
	Excessive 1st to 2nd shift shock	1							2	3					4		5		⑦									⑥					
	Excessive 2nd to 3rd shift shock								1	2	3			4					⑥									⑤					
	Excessive 3rd to OD shift shock								1	2	3								⑤								④						
	Vehicle brakes when shifted from 1st to 2nd	1										2												④					③	⑤			
	Vehicle brakes when shifted from 2nd to 3rd	1										3			2														④				
	Vehicle brakes when shifted from 3rd to OD	1										3			2						⑤						④						
	Shift shock felt when accelerator released and deceleration occurs	1		3					2	4	5	6			7																		
	Excessively large 2nd to 1st shock in 1 range	1							2	3	4	5																	⑥				
Shift point	Excessively high 1st to 2nd, 2nd to 3rd, and 3rd to OD shift points	1		3					2	4	5	6									⑦												
	Excessively high OD to 3rd, 3rd to 2nd, and 2nd to 1st shift points	1		3					2	4	5	6									⑦												
	Kickdown operates or engine overruns when depressing pedal in 3rd beyond kick-down vehicle speed limit	1	2								3	4	5									⑦		⑥									
	Kickdown operates or engine overruns when depressing pedal in OD beyond kick-down vehicle speed limit	1	2									3	4	5								⑦					⑥						
Shift sequence	Shifts directly from 1st to 3rd	1										2	3					4				⑥					⑤						
	Shifts directly from 2nd to OD	1											2	3				4				⑥		⑤									
	Shifts from 2nd to 1st, or 2nd to 3rd in 2 range	1									2	3																					
	Shifts from 1st to 2nd, or 2nd to 3rd in 1 range	1										2										③											

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Fig. 12: NA4A-HL 1989-94 MPV Trouble Shooting (2 of 3)
Courtesy of Mazda Motors Corp.

		ON VEHICLE														OFF VEHICLE																	
Inspection point		Pre-liminary		Electronic control system				Hydraulic control system										Powertrain															
		ATF level and condition	Selector lever and linkage	Engine idle speed and condition	Inhibitor switch and wiring	Kickdown switch, Kickdown solenoid, and wiring	Ignition switch and starter	OD OFF switch	OD cancel solenoid	Lockup solenoid	Vacuum diaphragm and piping	Engine stall speed	Line and governor pressure	Control valve body	Governor	OD band servo	2nd band servo	Accumulator	Transmission air check	OD cancel valve	Lockup control valve	Oil pump	Hydraulic circuit	Torque converter	Direct clutch	Front clutch	Rear clutch	OD brake band	2nd brake band	Low and reverse brake	One-way clutch	Planetary gear	Parking gear
Slipping	Item																																
	Little shift shock or excessive slippage while 1st to 2nd shifting	1	2							3	4	5		6				7					⑨						⑧				
	Little shift shock or excessive slippage while 2nd to 3rd shifting	1	2							3	4	5		6				7					⑨			⑧							
	Little shift shock or excessive slippage while 3rd to OD shifting	1	2							3	4	5		6				7					⑨					⑧					
	No shift shock or engine overruns when shifting 1st to 2nd	1	2	4						3	5	6						7				⑨							⑧				
	Engine overruns or slips when shifting OD to 3rd	1								2	3	4		5	6				7				⑩		⑦	⑧		⑨					
Noise	Engine overruns or slips when shifting 3rd to 2nd	1							2	3			4	5								⑧			⑥		⑦						
	Transmission noisy in P and N ranges	1									2											③											
Others	Transmission noisy in D, 2, 1, and R ranges	1									2											④				③				⑤	⑥		
	No engine braking in 1 range		1								2	3						4				⑥							⑤				
	Vehicle moves in P range or parking gear not disengaged when P range disengaged		1																													②	
	Transmission overheats	1		4							5	6		2	3		7					⑭	⑮	⑯	⑧	⑨	⑩	⑪	⑫	⑬		⑰	
	White smoke discharged from exhaust while running	1								2	3	4	5					6				⑬	⑭	⑮	⑦	⑧	⑨	⑩	⑪	⑫		⑯	
	Abnormal odor from oil level gauge pipe	1																				⑧	⑨	⑩	②	③	④	⑤	⑥	⑦		⑪	
	Transmission shifts to OD even when OD OFF switch depressed							1	2										③														
Vehicle surges in OD									1																								

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Fig. 13: NA4A-HL 1989-94 MPV Trouble Shooting (3 of 3)
Courtesy of Mazda Motors Corp.

		Possible Cause	Electronic control system										Preliminary	Hydraulic control system		Powertrain																
			Inhibitor switch	Mode switch	Hold switch	Idle switch	Cruise control switch (Cruise C/U)		Speed sensor	Throttle sensor	Shift solenoids & 3-2 control. sol.		Turbine sensor	Lockup control sol.	ATF level and quality	Selector lever	Idle speed & ignition timing	Vacuum diaphragm and rod	Control valves	Accumulators	Oil pump	Torque converter	Direct clutch	Overdrive brake band	Overdrive one-way clutch	Front clutch	2nd brake band	Rear clutch	Low-and-reverse brake	One-way clutch	Overdrive band servo	2nd band servo
Problem	Self-diag.						○	○	○	○	○	○																				
	Adjustment	○			○								○	○	○	○														○	○	
	EC-AT TESTER	○	○	○	○	○	○	○	○	○	○																					
	Stall Test																					○										
	Time Lag Test																			○					○		○	○	○		○	
	Oil Pressure Test																○	○		○					○		○	○	○			
	Road Test													○			○	○				○	○	○	○	○	○	○	○	○	○	○
Accelerating	Vehicle does not move in D, S, L, or R range												○	○			○			○	○	○			○		○	○	○			
	Vehicle moves in N range													○			○								○		○	○	○			
	Excessive creep														○						○											
	No creep at all												○		○		○		○													
Shifting	No shift	○		○						○	○			○	○		○		○													
	Abnormal shift sequence	○		○		○		○	○	○		○	○				○					○			○	○				○	○	
	Frequent shifting	○	○			○		○		○							○															
	Excessively high or low shift point	○	○	○	○			○	○	○				○			○															
	No lockup					○		○	○	○	○		○				○				○											
	No kickdown	○		○				○					○																			
Slipping	Engine runaway or slip when starting vehicle	○										○				○	○		○		○					○	○	○	○			○
	Engine runaway or slip when up- or downshifting											○					○		○		○	○	○	○	○	○	○			○	○	
Shift shock	Excessive N to D or N to R shift shock	○					○			○					○	○	○	○														
	Excessive shift shock when upshifting or downshifting																○	○	○				○							○	○	
	Excessive shift shock when changing range	○												○			○															○
Noise	Transmission noisy in N or P range												○				○	○				○										
	Transmission noisy in D, S, L, or R range																○				○											
Others	No engine braking								○			○	○				○		○	○	○	○				○	○	○	○		○	○
	No mode change	○	○	○				○	○	○										○	○											
	Transmission overheats										○	○					○		○	○												
	White smoke discharged from exhaust											○					○	○														
	Hold indicator flashes							○	○	○	○	○																				
	Engine will not start	○											○																			

NOTE: ○ indicates possible cause.

93J24066

Fig. 14: NC4A-EL 1994 Miata Trouble Shooting
Courtesy of Mazda Motors Corp.

STALL SPEED TEST

- 1) Connect tachometer to engine. Depress brake pedal firmly.
- 2) Shift to transmission range to be tested. Accelerate engine to full throttle. When engine RPM stabilizes, take reading. DO NOT hold at full throttle more than 5 seconds. Idle engine one minute between tests. Perform test in all transmission ranges. Compare with STALL SPEED SPECIFICATIONS table.

CAUTION: Stall speed test generates very high temperatures. NEVER hold throttle wide-open for more than 5 seconds. DO NOT test more than 2 gears without idling engine to cool off fluids.

STALL SPEED SPECIFICATIONS

Application	Stall RPM
B2200	
Carbureted	1800-2200
EGI Fuel Injection	1850-2250
B2600	2100-2500
Miata	
1990-93	1900-2100
1994	2750-3150
MPV	1800-2200

STALL SPEED TEST RESULTS

High In All Ranges

Worn oil pump. Oil leakage from oil pump, control valve and/or transmission case. Stuck pressure regulator valve, direct clutch slipping or OD one-way clutch slipping.

High In "D", "2" & "1"

Direct clutch or rear clutch.

High In "D" Only

One-way clutch.

High In "1" Only; Not "R"

Rear clutch.

High In "1" & "R"

Direct clutch slipping.

High In "2" Only

Brake band slipping.

High In "R"

Front clutch or low-reverse brake slipping. Perform road test to determine which is slipping. If effective engine braking in "1" is felt, fault is in front clutch. If no engine braking is felt in "1", fault is in low-reverse clutch.

Low In "D"

Fluid leakage from rear clutch or governor hydraulic circuit and/or stuck pressure modifier valve.

Low In "D", "1" & "2"

Fluid leakage from rear clutch or governor hydraulic circuit.

Low In "R"

Fluid leakage from low and reverse brake hydraulic circuit.

Low In All Ranges
 Engine out of tune, lock-up clutch dragging or torque converter one-way clutch slipping.

SHIFT SPEED TIME LAG TEST

Idle engine at 750-850 RPM. Shift transmission from "N" to "D" and "N" to "R". Note time for transmission to fully engage. Compare with SHIFT SPEED TIME LAG SPECIFICATIONS table.

SHIFT SPEED TIME LAG SPECIFICATIONS

Application	Gear Shift	Time (Sec.)
B2200, B2600 & MPV	N-D & N-R	0.5-1.0
Miata		
1993	N-D & N-R	0.5-1.0
1994	N-D	0.5-0.6
1994	N-R	0.75-0.85

SHIFT SPEED TIME LAG TEST RESULTS

SHIFT SPEED TIME LAG EVALUATION

Condition	Possible Cause
"N" - "D" (Economy)	
More Than Specification	Insufficient Line Pressure, Rear Clutch Or One-Way Clutch Slipping
Less Than Specification	N-D Accumulator Not Operating Properly Or Excessive Line Pressure
"N" - "D" (Hold)	
More Than Specification	Insufficient Line Pressure, Rear Clutch Slipping Or 2nd Brake Band Slipping
Less Than Specification	1-2 Accumulator Not Operating Properly Or Excessive Line Pressure
"N" - "R"	
More Than Specification	Insufficient Line Pressure, Low & Reverse Brake Slipping Or Front Clutch Slipping
Less Than Specification	N-R/2-3 Accumulator Not Operating Properly Or Excessive Line Pressure

LINE PRESSURE TEST

Checking line pressure to hydraulic components ensures pressure circuits do not have excessive internal leaks or blockage.

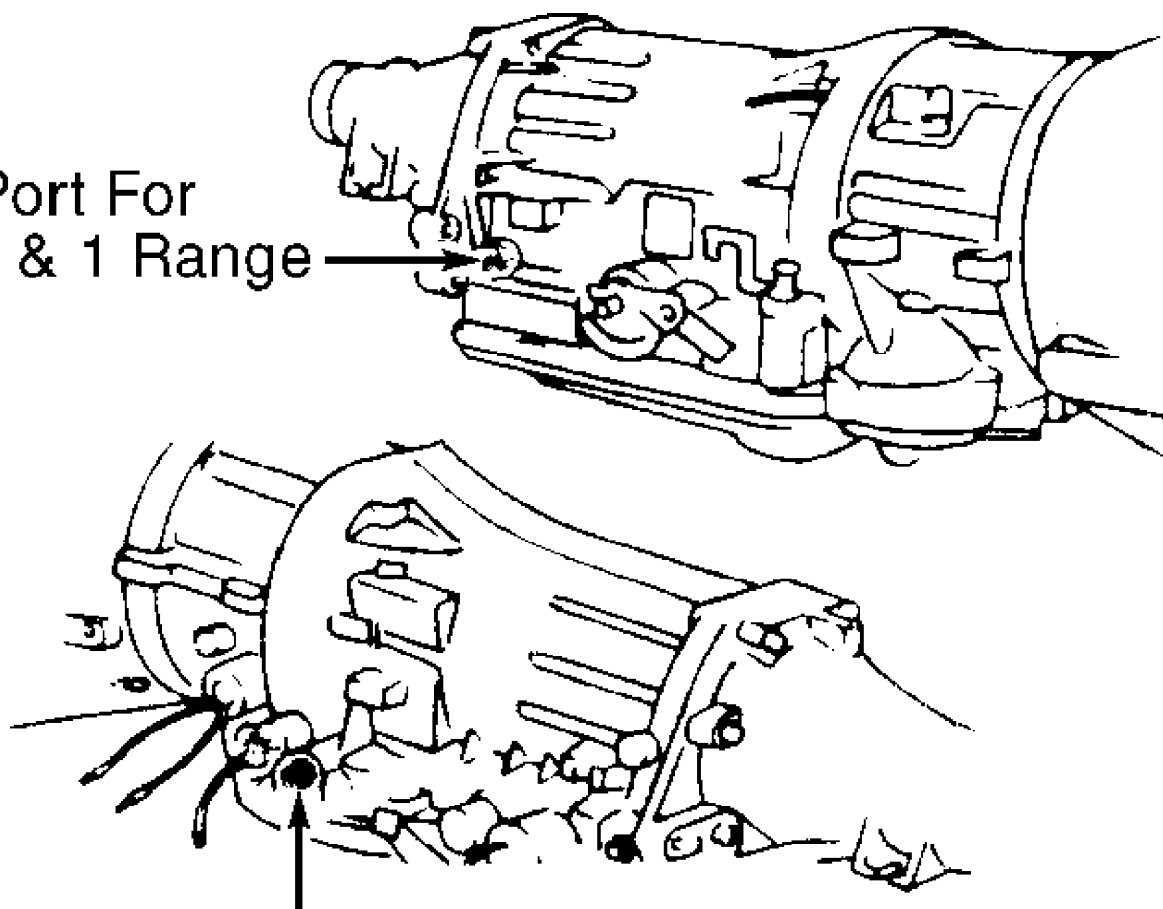
Preparation

Follow stall speed test preparation. Connect line pressure gauge to pressure ports. See Fig. 15. Place line pressure gauge where it can be read from driver seat. Ensure engine idle speed and ignition timing is correct. See appropriate article in ENGINE PERFORMANCE section.

Testing

Start engine, depress brake pedal firmly, shift selector to "D" and read line pressure at idle. Depress accelerator fully and read line pressure as soon as RPM becomes constant, then release accelerator pedal. Shift selector to "N" and idle engine for one minute. Read line pressure at idle and stall speeds for each range in the same manner. Compare with LINE PRESSURE SPECIFICATIONS table and LINE PRESSURE TEST RESULTS.

Test Port For
"D", 2 & 1 Range



Test Port For
93A24067 "R" Range

Fig. 15: Locating Line Pressure Ports
Courtesy of Mazda Motors Corp.

CAUTION: Line pressure test generates very high temperatures. NEVER hold throttle wide-open for more than 5 seconds. DO NOT test more than 2 gears without idling engine to cool off fluids.

LINE PRESSURE SPECIFICATIONS

Application & Gear Position	Idle Speed psi (kg/cm ²)	Stall Speed psi (kg/cm ²)
--------------------------------	---	--

B2200

"D" Or "1" 43-57 (3.0-4.0)	135-164 (9.5-11.5)
------------	-----------------------------	--------------------

"2"	.....	85-166	(5.9-11.7)	.....	142-172	(9.9-12.0)
"R"	.....	75-95	(5.1-6.7)	.....	252-279	(17.7-19.6)
B2600 & MPV						
"D" Or "1"	.....	43-57	(3.0-4.0)	.....	162-191	(11.3-13.4)
"2"	.....	146-228	(10.3-16.0)	...	203-232	(14.3-16.3)
"R"	.....	80-100	(5.6-7.0)	.....	317-344	(22.3-24.2)
Miata						
1993						
"D" Or "1"	.....	43-57	(3.0-4.0)	.....	135-164	(9.5-11.5)
"2"	.....	148-164	(10.4-11.6)	.....	143-171	(10.0-12.0)
"R"	.....	101-121	(7.1-8.5)	.....	326-369	(22.9-25.9)
1994						
"D"	.....	42-52	(2.9-3.7)	.....	116-132	(8.1-9.3)
"S"	.....	114-133	(8.0-9.4)	.....	116-132	(8.1-9.3)
"L"	.....	43-57	(3.0-4.0)	.....	128-156	(9.0-11.0)
"R"	.....	113-140	(7.9-9.9)	.....	286-314	(20.1-22.1)

LINE PRESSURE TEST RESULTS

Low In All Ranges

Worn or leaking oil pump, control valve or transmission case.
Sticking regulator or pressure modifier valve. Leak from direct clutch
or OD band servo release side.

Low In "D"

Fluid leakage from rear clutch or governor hydraulic circuit
and/or stuck pressure modifier valve.

Low In "D", "1", "2"

Leak from rear clutch or governor circuit.

Low In "R"

Leak from low-reverse brake circuit.

High At Idle

Leaking or disconnected vacuum line, leaking vacuum
diaphragm, or stuck pressure regulator valve.

High Line Pressure

Stuck pressure modifier and/or back-up control valve.

1994 MIATA ADDITIONAL LINE PRESSURE TEST

This additional line pressure test should only be performed
on 1994 Miata. Connect gauge to right side inspection hole. Connect a
vacuum pump to vacuum modulator and place in vehicle. Shift to "R"
with engine at idle, note pressure at specified vacuum. Compare with
the ADDITIONAL LINE PRESSURE TABLE - 1994 MIATA.

ADDITIONAL LINE PRESSURE TABLE - 1994 MIATA

Vacuum	psi (kg/cm ²)
0 in. Hg (Atmospheric Pressure)	..... 128-156 (9-11)
8 in. Hg	..... 100-114 (7-8)
16 in. Hg	..... 57-71 (4-5)

1994 MIATA ADDITIONAL LINE PRESSURE TEST RESULTS

If additional line pressure test is LOW, diagnosis is same as for line pressure test.

High In All Ranges

Leaking or disconnected vacuum hose, leaking vacuum diaphragm, over-length diaphragm rod, stuck vacuum throttle valve and/or stuck pressure regulator valve.

High In "S" (Hold)

Stuck pressure modifier valve. No variations when vacuum applied, missing diaphragm rod.

Variation Outside Specifications

Incorrect diaphragm rod length, stuck vacuum throttle valve, stuck pressure regulator valve and/or stuck pressure regulator plug.

SELF-DIAGNOSIS (1994 MIATA ONLY)

RETRIEVING FAULT CODES

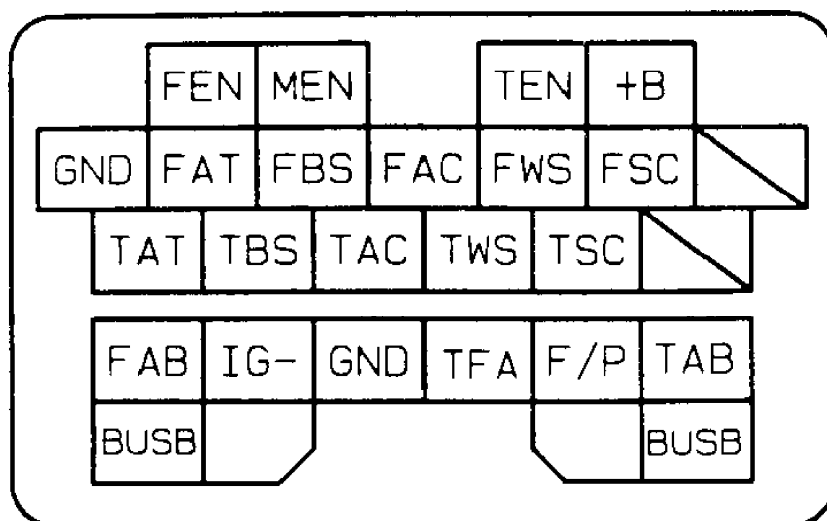
Preliminary Inspection

Ensure ATF fluid level and condition are okay. Check selector lever position. Ensure no vacuum leaks are present. Tire pressure and idle speed must be okay. Ensure inhibitor or park/neutral switch operates correctly.

HOLD Indicator Light Procedure

1) Locate Data Link Connector (DLC) underhood on left fenderwell. Short together GND and TAT terminals of DLC and turn ignition on. See Fig. 16. Warning codes are flashed on HOLD indicator light on dash. Codes are flashed in numerical order if more than one code is present.

2) Note fault code numbers. See FAULT CODE table. Perform appropriate diagnostic code chart. See appropriate CODE CHARTS. After repairs are made, clear codes.



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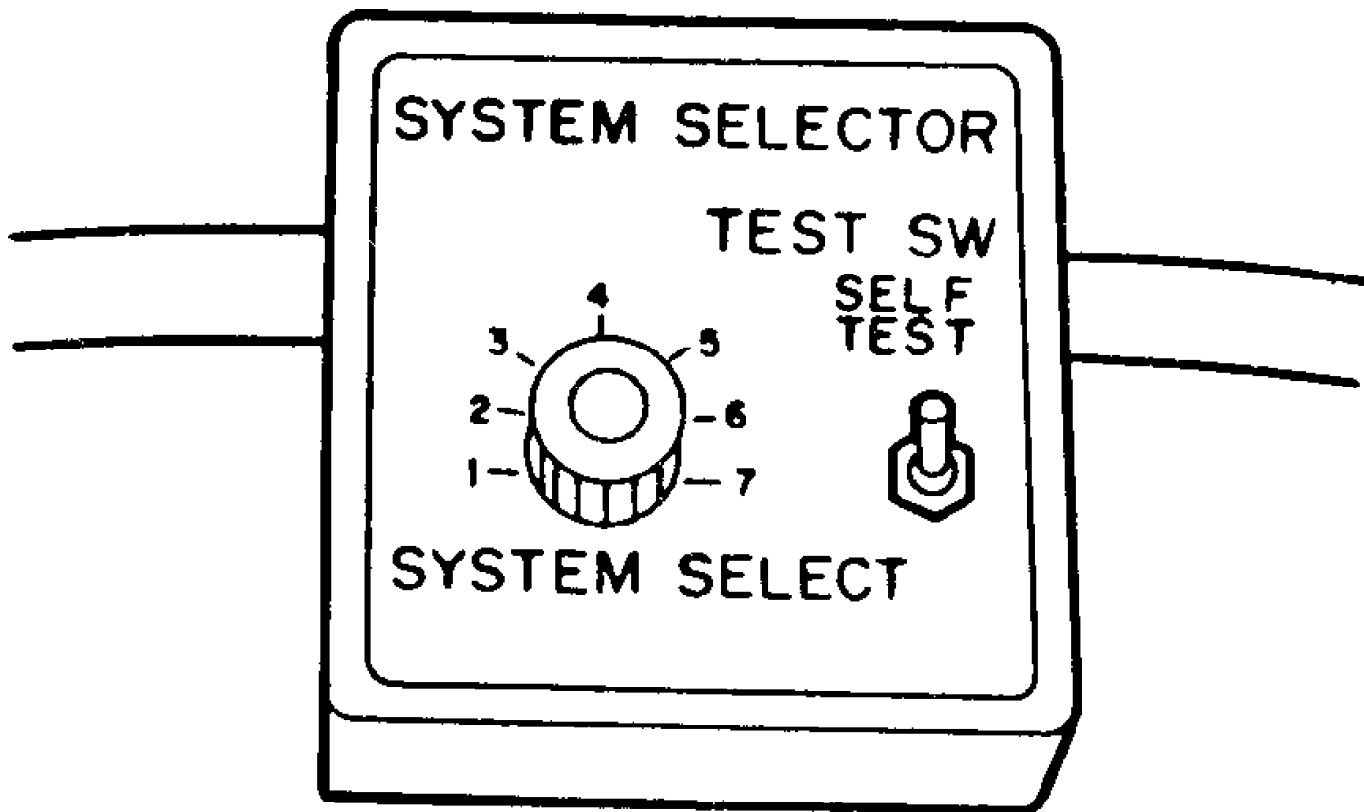
Fig. 16: Locating DLC GND & TAT Terminals
Courtesy of Mazda Motors Corp.

OEM Tester Hook-Up

1) Use manufacturer's instructions on connecting Self-

Diagnosis checker and SST, selector and tester harness to vehicle.
Connect Self-Diagnosis checker and SST to DLC.

2) Set system selector system select switch to position 2.
Set test switch to SELF TEST position. See Fig. 17



95E19764

Fig. 17: Identifying System Selector Switch Positions
Courtesy of Mazda Motors Corp.

NOTE: If using aftermarket scan tester, follow manufacturers procedures.

Retrieval Procedures

1) Turn ignition on. Code 88 should flash and buzzer should sound for 3 seconds. If 88 does not flash, check main relay and terminals 2S and 2Q of Powertrain Control Module Transmission (PCMT) for open or short.

2) If 88 flashes and buzzer sounds continuously for more than 20 seconds, check wiring to 1C terminal of PCMT for open or short. Replace PCMT if necessary and retest.

3) Note code numbers. See FAULT CODES table. See appropriate trouble code chart. Make necessary repairs. After repairs, disconnect negative battery cable for 5 seconds. Connect negative battery cable and retest system.

4) Remove OEM tester and road test vehicle at 31 MPH. Depress accelerator fully, to activate kick down, then stop vehicle gradually. Reconnect OEM tester to DLC. Turn ignition on and check for trouble codes.

5) If transmission problems are still present or no trouble codes are stored, see appropriate ELECTRICAL COMPONENT TESTS.

FAULT CODES TABLE

Code No.	Component Or Circuit Affected
06	Vehicle Speed Sensor Or Circuit
12	Throttle Position Sensor Or Circuit
55	Pulse Generator Or Circuit
60	1-2 Shift Solenoid Valve Or Circuit
61	2-3 Shift Solenoid Valve Or Circuit
62	3-4 Shift Solenoid Valve Or Circuit
63	Lock-Up Control Solenoid Valve Or Circuit
64	3-2 Control Solenoid Valve Or Circuit

CODE CHARTS

DIAGNOSTIC TROUBLE CODE No.06				VEHICLE SPEED SENSOR	
STEP	INSPECTION			ACTION	
1	Are there any poor connections at vehicle speed sensor and powertrain control module (Transmission) connectors?			Yes	Repair or replace connector
				No	Go to next step
2	Connect a circuit tester to terminal as shown. Is input voltage of vehicle speed sensor at powertrain control module (Transmission) OK?			Yes	Go to step 5
				No	Go to next step
	(+) term.	(-) term.	Voltage (V)	Condition	
	1P	Ground	Approx. 7—9 or Below 1.5	Vehicle stopped	
			Approx. 4	While driving	
3	Remove instrument cluster Is there continuity between terminal 2D of meter connector and terminal 1M of powertrain control module (Transmission)			Yes	Go to next step
				No	Repair or replace wiring and/or connector
4	Connect circuit tester to terminals 2D and 2A of meter connector Does pointer of circuit tester move slightly when front wheels are slowly turned?			Yes	Go to next step
				No	Replace vehicle speed sensor
5	Disconnect the negative battery cable for at least 20 seconds and depress the brake pedal Connect the battery cable and recheck for code. Is diagnostic trouble code displayed			Yes	Replace powertrain control module (transmission)
				No	Intermittent poor connection check for cause

95E20564

Fig. 18: Diagnostic Trouble Code No. 6
Courtesy of Mazda Motors Corp.

DIAGNOSTIC TROUBLE CODE No.12		THROTTLE POSITION SENSOR											
STEP	INSPECTION	ACTION											
1	Are there any poor connections at throttle position sensor and powertrain control module (transmission) connector or terminal?	Yes	Repair or replace connector										
		No	Go to next step										
2	Connect a circuit tester to terminal as shown Is input voltage of throttle position sensor (TVO) at powertrain control module (transmission) OK? <table><tr><th>(+) term.</th><th>(-) term.</th><th>Voltage (V)</th><th>Condition</th></tr><tr><td rowspan="2">2T</td><td rowspan="2">Ground</td><td>Approx. 0</td><td>Ignition OFF</td></tr><tr><td>Approx. 0.8—4.3</td><td>Throttle valve closed position to wide open throttle</td></tr></table>	(+) term.	(-) term.	Voltage (V)	Condition	2T	Ground	Approx. 0	Ignition OFF	Approx. 0.8—4.3	Throttle valve closed position to wide open throttle	Yes	Go to step 5
		(+) term.	(-) term.	Voltage (V)	Condition								
2T	Ground	Approx. 0	Ignition OFF										
		Approx. 0.8—4.3	Throttle valve closed position to wide open throttle										
		No	Go to next step										
3	Connect a circuit tester to terminals as shown Is input voltage of throttle position sensor (VREF) at powertrain control module (transmission) OK? <table><tr><th>(+) term.</th><th>(-) term.</th><th>Voltage (V)</th><th>Condition</th></tr><tr><td rowspan="2">2A</td><td rowspan="2">Ground</td><td>Approx. 4.5—5.5</td><td>Ignition switch ON</td></tr><tr><td>0</td><td>Ignition switch OFF</td></tr></table>	(+) term.	(-) term.	Voltage (V)	Condition	2A	Ground	Approx. 4.5—5.5	Ignition switch ON	0	Ignition switch OFF	Yes	Go to next step
		(+) term.	(-) term.	Voltage (V)	Condition								
2A	Ground	Approx. 4.5—5.5	Ignition switch ON										
		0	Ignition switch OFF										
		No	Check voltage at terminal 2I of powertrain control module (Engine) Voltage: 4.5—5.5V (Ignition switch ON) If OK, go to next step If not OK, repair wiring and/or connector										
4	Is throttle position sensor OK?	Yes	Check wiring and connectors from Powertrain control module (transmission) to throttle position sensor If OK, go to next step If not OK, repair wiring and/or connector										
		No	Adjust or replace throttle position sensor										
5	Disconnect the negative battery cable for at least 20 seconds and depress the brake pedal Connect the battery cable and recheck for diagnostic trouble code Is diagnostic trouble code displayed?	Yes	Replace powertrain control module (transmission)										
		No	Intermittent poor connection Check for cause										

95F20565

Fig. 19: Diagnostic Trouble Code No. 12
Courtesy of Mazda Motors Corp.

DIAGNOSTIC TROUBLE CODE No.55		VEHICLE SPEED PULSE GENERATOR					
STEP	INSPECTION	ACTION					
1	Are there any poor connections at vehicle speed pulse generator and powertrain control module (transmission) connector or terminal?	Yes	Repair or replace connector				
		No	Go to next step				
2	Connect a circuit tester to terminal as shown Is input voltage of vehicle speed pulse generator at powertrain control module (transmission) OK?	Yes	Go to step 5				
		No	Go to next step				
				(+) term.	(-) term.	Voltage (V)	Condition
					2J	2L	0—0.1 (AC)	Engine running (N range)
0 (AC)	Engine stopped						
3	Disconnect 20-pin powertrain control module (transmission) connector Is resistance between terminal 2J and terminal 2L OK? Resistance: 200—400Ω	Yes	Go to step 5				
		No	Go to next step				
4	Disconnect vehicle speed pulse generator connector Is resistance between terminal E and terminal F OK? Resistance: 200—400Ω	Yes	Check wiring and connectors form powertrain control module (transmission) vehicle speed pules generator If OK, go to next step If not OK, repair wiring and/or connector				
		No	Replace pulse generator				
5	Disconnect the negative battery cable for at least 20 seconds and depress the brake pedal Connect the battery cable and recheck for diagnostic trouble code Is diagnostic trouble code displayed?	Yes	Replace powertrain control module (transmission)				
		No	Intermittent poor connection Check for cause				

95G20566
 Fig. 20: Diagnostic Trouble Code No. 55
 Courtesy of Mazda Motors Corp.

DIAGNOSTIC TROUBLE CODE No.60		1-2 SHIFT SOLENOID VALVE											
STEP	INSPECTION	ACTION											
1	Are there any poor connections at solenoid valve and powertrain control module (transmission) connectors?	Yes	Repair or replace connector										
		No	Go to next step										
2	Connect a circuit tester to terminal as shown Is output voltage of 1-2 shift solenoid valve at powertrain control module (transmission) OK? B+: Battery positive voltage <table border="1"><thead><tr><th>(+) term.</th><th>(-) term.</th><th>Voltage (V)</th><th>Condition</th></tr></thead><tbody><tr><td rowspan="2">2E</td><td rowspan="2">Ground</td><td>B+</td><td>1st gear</td></tr><tr><td>0</td><td>2nd, 4GR</td></tr></tbody></table>	(+) term.	(-) term.	Voltage (V)	Condition	2E	Ground	B+	1st gear	0	2nd, 4GR	Yes	Check wiring and go to step 5
		(+) term.	(-) term.	Voltage (V)	Condition								
		2E	Ground	B+	1st gear								
0	2nd, 4GR												
No	Go to next step												
3	Disconnect 20-pin powertrain control module (transmission) connector Is resistance between terminal 2E and ground Resistance: 13—27Ω	Yes	Go to step 5										
		No	Go to next step										
4	Disconnect solenoid connector Is resistance between ground and terminal A of 1-2 shift solenoid valve OK? Resistance: 13—27Ω	Yes	Check wiring and connectors from powertrain control module (transmission) to 1-2 shift solenoid valve If OK, go to next step If not OK, repair wiring and/or connector										
		No	Replace 1-2 shift solenoid valve										
5	Disconnect the negative battery cable for at least 20 seconds and depress the brake pedal Connect the battery cable and recheck for code Is diagnostic trouble code displayed?	Yes	Replace powertrain control module (transmission)										
		No	Intermittent poor connection Check for cause										

95H20567

Fig. 21: Diagnostic Trouble Code No. 60
Courtesy of Mazda Motors Corp.

DIAGNOSTIC TROUBLE CODE No.61		2-3 SHIFT SOLENOID VALVE											
STEP	INSPECTION	ACTION											
1	Are there any poor connections at solenoid valve and powertrain control module (transmission) connectors?	Yes	Repair or replace connector										
		No	Go to next step										
2	Connect a circuit tester to terminal as shown Is output voltage of 2-3 shift solenoid valve at powertrain control module (transmission) B+: Battery positive voltage <table border="1"><thead><tr><th>(+) term.</th><th>(-) term.</th><th>Voltage (V)</th><th>Condition</th></tr></thead><tbody><tr><td rowspan="2">2G</td><td rowspan="2">Ground</td><td>B+</td><td>1st, 2nd, gear</td></tr><tr><td>0</td><td>3GR,4GR</td></tr></tbody></table>	(+) term.	(-) term.	Voltage (V)	Condition	2G	Ground	B+	1st, 2nd, gear	0	3GR,4GR	Yes	Check wiring and go to step 5
		(+) term.	(-) term.	Voltage (V)	Condition								
2G	Ground	B+	1st, 2nd, gear										
		0	3GR,4GR										
		No	Go to next step										
3	Disconnect 20-pin powertrain control module (transmission) connector Is resistance between terminal 2G and ground OK? Resistance: 13—27Ω	Yes	Go to step 5										
		No	Go to next step										
4	Disconnect solenoid connector Is resistance between ground and terminal B of 2-3 shift solenoid valve OK? Resistance: 13—27Ω	Yes	Check wiring and connectors from powertrain control module (transmission) to 2-3 shift solenoid valve If OK, go to next step If not OK, repair wiring and/or connector										
		No	Replace 2-3 shift solenoid valve										
5	Disconnect the negative battery cable for at least 20 seconds and depress the brake pedal Connect the battery cable and recheck for code Is diagnostic trouble code displayed?	Yes	Replace powertrain control module (transmission)										
		No	Intermittent poor connection Check for cause										

95I20568

Fig. 22: Diagnostic Trouble Code No. 61
Courtesy of Mazda Motors Corp.

DIAGNOSTIC TROUBLE CODE No.62		3-4 SHIFT SOLENOID VALVE											
STEP	INSPECTION	ACTION											
1	Are there any poor connections at solenoid valve and powertrain control module (transmission) connectors?	Yes	Repair or replace connector										
		No	Go to next step										
2	Connect a circuit tester to terminal as shown Is output voltage of 3-4 shift solenoid valve at powertrain control module (transmission) B+: Battery positive voltage <table><tr><th>(+) term.</th><th>(-) term.</th><th>Voltage (V)</th><th>Condition</th></tr><tr><td rowspan="2">2I</td><td rowspan="2">Ground</td><td>B+</td><td>1st, 2nd, gear</td></tr><tr><td>0</td><td>4GR</td></tr></table>	(+) term.	(-) term.	Voltage (V)	Condition	2I	Ground	B+	1st, 2nd, gear	0	4GR	Yes	Check wiring and go to step 5
		(+) term.	(-) term.	Voltage (V)	Condition								
		2I	Ground	B+	1st, 2nd, gear								
0	4GR												
No	Go to next step												
3	Disconnect 20-pin powertrain control module (transmission) connector Is resistance between terminal 2I and ground OK? Resistance: 13—27Ω	Yes	Go to step 5										
		No	Go to next step										
4	Disconnect solenoid connector Is resistance between ground and terminal B of 3-4 shift solenoid valve OK? Resistance: 13—27Ω	Yes	Check wiring and connectors from powertrain control module (transmission) to 3-4 shift solenoid valve If OK, go to next step If not OK, repair wiring and/or connector										
		No	Replace 3-4 shift solenoid valve										
5	Disconnect the negative battery cable for at least 20 seconds and depress the brake pedal Connect the battery cable and recheck for code Is diagnostic trouble code displayed?	Yes	Replace powertrain control module (transmission)										
		No	Intermittent poor connection Check for cause										

95J20569

Fig. 23: Diagnostic Trouble Code No. 62
Courtesy of Mazda Motors Corp.

DIAGNOSTIC TROUBLE CODE No.63		LOCKUP CONTROL SOLENOID VALVE											
STEP	INSPECTION	ACTION											
1	Are there any poor connections at solenoid valve and powertrain control module (transmission) connectors?	Yes	Repair or replace connector										
		No	Go to next step										
2	Connect a circuit tester to terminal as shown Is output voltage of lockup control solenoid valve at powertrain control module (transmission) B+: Battery positive voltage <table><tr><th>(+) term.</th><th>(-) term.</th><th>Voltage (V)</th><th>Condition</th></tr><tr><td rowspan="2">2K</td><td rowspan="2">Ground</td><td>B+</td><td>Solenoid ON, Lockup</td></tr><tr><td>0</td><td>Solenoid OFF, Non-lockup</td></tr></table>	(+) term.	(-) term.	Voltage (V)	Condition	2K	Ground	B+	Solenoid ON, Lockup	0	Solenoid OFF, Non-lockup	Yes	Check wiring and go to step 5
		(+) term.	(-) term.	Voltage (V)	Condition								
		2K	Ground	B+	Solenoid ON, Lockup								
0	Solenoid OFF, Non-lockup												
No	Go to next step												
3	Disconnect 20-pin powertrain control module (transmission) connector Is resistance between terminal 2K and ground OK? Resistance: 13—27Ω	Yes	Go to step 5										
		No	Go to next step										
4	Disconnect solenoid connector Is resistance between ground and terminal B of lockup control solenoid valve OK? Resistance: 13—27Ω	Yes	Check wiring and connectors from powertrain control module (transmission) to lockup control solenoid valve If OK, go to next step If not OK, repair wiring and/or connector										
		No	Replace lockup control solenoid valve										
5	Disconnect the negative battery cable for at least 20 seconds and depress the brake pedal Connect the battery cable and recheck for code Is diagnostic trouble code displayed?	Yes	Replace powertrain control module (transmission)										
		No	Intermittent poor connection Check for cause										

95C20570

Fig. 24: Diagnostic Trouble Code No. 63
Courtesy of Mazda Motors Corp.

DIAGNOSTIC TROUBLE CODE No.64				3-2 CONTROL SOLENOID VALVE										
STEP	INSPECTION			ACTION										
1	Are there any poor connections at solenoid valve and powertrain control module (transmission) connectors?			Yes	Repair or replace connector									
				No	Go to next step									
2	Connect a circuit tester to terminal as shown Is output voltage of 3-2 control solenoid valve at powertrain control module (transmission) OK? B+: Battery positive voltage			Yes	Check wiring and go to step 5									
				No		Go to next step								
	<table><tr><th>(+) term.</th><th>(-) term.</th><th>Voltage (V)</th><th>Condition</th></tr><tr><td rowspan="2">2M</td><td rowspan="2">Ground</td><td>B+</td><td>3-2 or 4-2 downshift</td></tr><tr><td>0</td><td>Other conditions</td></tr></table>			(+) term.	(-) term.		Voltage (V)	Condition	2M	Ground	B+	3-2 or 4-2 downshift	0	Other conditions
	(+) term.	(-) term.	Voltage (V)	Condition										
2M	Ground	B+	3-2 or 4-2 downshift											
		0	Other conditions											
3	Disconnect 20-pin powertrain control module (transmission) connector Is resistance between terminal 2M and ground Resistance: 13—27Ω			Yes	Go to step 5									
				No	Go to next step									
4	Disconnect solenoid connector Is resistance between ground and terminal A of 3-2 control solenoid valve OK? Resistance: 13—27Ω			Yes	Check wiring and connectors from powertrain control module (transmission) to 3-2 control solenoid valve If OK, go to next step If not OK, repair wiring and/or connector									
				No	Replace 3-2 control solenoid valve									
5	Disconnect the negative battery cable for at least 20 seconds and depress the brake pedal Connect the battery cable and recheck for code Is diagnostic trouble code displayed?			Yes	Replace powertrain control module (transmission)									
				No	Intermittent poor connection Check for cause									

95D20571
Fig. 25: Diagnostic Trouble Code No. 64
Courtesy of Mazda Motors Corp.

TESTING

ROAD TEST "D" RANGE

Testing

Perform TESTING PREPARATION PROCEDURES. Connect vacuum gauge, PCMT tester, tachometer and pressure gauges to vehicle.

NOTE: For complete PCMT tester information, see SELF-DIAGNOSIS (1994 MIATA ONLY).

1) Shift to "D" while in NORMAL mode and OD OFF switch in released position. Accelerate vehicle at half and full throttle valve opening. Throttle sensor voltage on PCMT tester (if used) represents

throttle valve opening. Vacuum on other testers represents throttle opening.

2) Ensure "1"-2", "2"-3" and "3"-OD upshifts, downshifts and lock-up are obtained. Use same procedure to check upshift for shift shock. Drive in OD, shift to "S" to check OD-"3" downshift and release throttle to check for engine braking in 3rd and 2nd.

3) Select "D" while in HOLD mode. Accelerate vehicle, check "2"-3" upshift and downshift and for no 1st and OD. Check shift points, see appropriate SHIFT SPEED CHARTS.

4) Drive in 3rd and 4th gear to ensure no unusual noise or vibration is heard. Check torque converter, axle shafts and differential for source of unusual noise. Ensure kickdown operates properly and shift points match appropriate SHIFT SPEED CHARTS.

"S" Range Test Shift Pattern Procedure (1994 Miata)

Select NORMAL mode and accelerate vehicle. Ensure 1-2, 2-3 upshifts and downshifts occur and no OD or lock-up takes place. In "S" range NORMAL, 3rd gear select Hold, check for 3rd gear holding until 3-2 downshift point is reached. Accelerate in "S" Hold range. Ensure 2nd gear is held.

"L" Range Test Shift Pattern Procedure (1994 Miata)

1) Select "L" NORMAL mode and accelerate vehicle. Check for 1-2 upshift and 2-1 downshift. Also ensure no 3rd, OD or lock-up are obtained. Check for engine braking in 1st when decelerating.

2) Drive vehicle in "D" Hold range 3rd gear. Select "L" and check that 3rd is held until 3-2 downshift point is reached and 2-1 is held until 2-1 downshift range. See appropriate SHIFT SPEED CHART.

SHIFT SPEED CHARTS

Range	Throttle condition (Manifold vacuum)	Shifting	Vehicle speed km/h {mph}		
			F2 EGI	F2 Carb.	G6
D	Fully opened	D ₁ →D ₂	51—57 {32—35}	52—58 {32—36}	53—59 {33—37}
		D ₂ →D ₃	93—99 {58—61}	88—94 {55—58}	97—103 {60—64}
		OD→D ₃	Above 84 {52}	Above 83 {51}	Above 91 {56}
		D ₃ →D ₂	84—90 {52—56}	83—89 {51—55}	91—97 {56—60}
		D ₂ →D ₁	37—43 {23—27}	38—44 {24—27}	37—43 {23—27}
	Half throttle 200 mmHg {7.87 inHg}	D ₁ →D ₂	16—22 {10—14}	20—26 {12—16}	23—29 {14—18}
		D ₂ →D ₃	29—35 {18—22}	24—30 {15—18}	40—46 {25—29}
		D ₃ →OD	43—49 {27—30}	42—48 {26—30}	64—70 {40—43}
		Lockup ON (OD)	68—74 {42—46}	70—76 {43—47}	68—74 {42—46}
		Lockup OFF (OD)	63—69 {39—43}	66—72 {41—45}	63—69 {39—43}
		OD→D ₃	26—32 {16—20}	29—35 {18—22}	36—42 {22—26}
		D ₃ →D ₂	12—18 {7—11}	12—18 {7—11}	25—31 {16—19}
		D ₂ →D ₁	12—18 {7—11}	12—18 {7—11}	13—19 {8—12}
	Fully closed	D ₁ →D ₂	12—18 {7—11}	16—22 {10—14}	13—19 {8—12}
		D ₂ →D ₃	24—30 {15—19}	21—27 {13—17}	24—30 {15—19}
		D ₃ →OD	41—47 {25—29}	40—46 {25—29}	40—46 {25—29}
		OD→D ₃	26—32 {16—20}	29—35 {18—22}	27—33 {17—20}
		D ₃ →D ₂	12—18 {7—11}	12—18 {7—11}	13—19 {8—12}
		D ₂ →D ₁	12—18 {7—11}	12—18 {7—11}	13—19 {8—12}
1	—	1 ₂ →1 ₁	38—44 {24—27}	38—44 {24—27}	41—47 {25—29}

95E20572
Fig. 26: "B" Series Truck Shift Speed Chart
Courtesy of Mazda Motors Corp.

Range	Throttle condition (Manifold vacuum)	Shifting	Vehicle speed km/h {mph}
D	Fully opened	D1→D2	49—55 {30—34}
		D2→D3	92—98 {57—61}
		OD→D3	Above 86 {53}
		D3→D2	86—92 {53—57}
		D2→D1	30—36 {19—22}
	Half throttle 200 mmHg {7.87 inHg}	D1→D2	25—31 {16—19}
		D2→D3	38—44 {24—27}
		D3→OD	60—66 {37—41}
		Lockup ON (OD)	68—74 {42—46}
		Lockup OFF (OD)	65—71 {40—44}
		OD→D3	34—40 {21—25}
		D3→D2	23—29 {14—18}
		D2→D1	12—18 { 7—11}
	Fully closed	D1→D2	12—18 { 7—11}
		D2→D3	22—28 {14—17}
		D3→OD	38—44 {24—27}
		OD→D3	25—31 {16—19}
		D3→D2	12—18 { 7—11}
		D2→D1	12—18 { 7—11}
1	—	12→11	34—40 {21—25}

95H20575

Fig. 27: MPV Shift Speed Chart
Courtesy of Mazda Motors Corp.

Range	Throttle condition (Manifold vacuum)	Shifting	Vehicle speed km/h {mph}
D	Fully opened	D1→D2	50—56 {31—34}
		D2→D3	93—99 {58—61}
		OD→D3	Above 93 {58}
		D3→D2	87—93 {54—57}
		D2→D1	37—43 {23—26}
	Half throttle 267 kPa {200 mmHg, 7.87 inHg}	D1→D2	17—23 {11—14}
		D2→D3	25—31 {16—19}
		D3→OD	44—50 {28—31}
		Lockup ON (OD)	66—72 {41—44}
		Lockup OFF (OD)	60—66 {38—40}
		OD→D3	27—33 {17—20}
		D3→D2	9—15 { 6— 9}
		D2→D1	9—15 { 6— 9}
	Fully closed	D1→D2	12—18 { 8—11}
		D2→D3	22—28 {14—17}
		D3→OD	41—47 {26—29}
		OD→D3	27—33 {17—20}
		D3→D2	9—15 { 6— 9}
		D2→D1	9—15 { 6— 9}
		12→11	38—44 {24—27}
1	—	12→11	38—44 {24—27}

95F20573

Fig. 28: 1993 Miata Shift Speed Chart
Courtesy of Mazda Motors Corp.

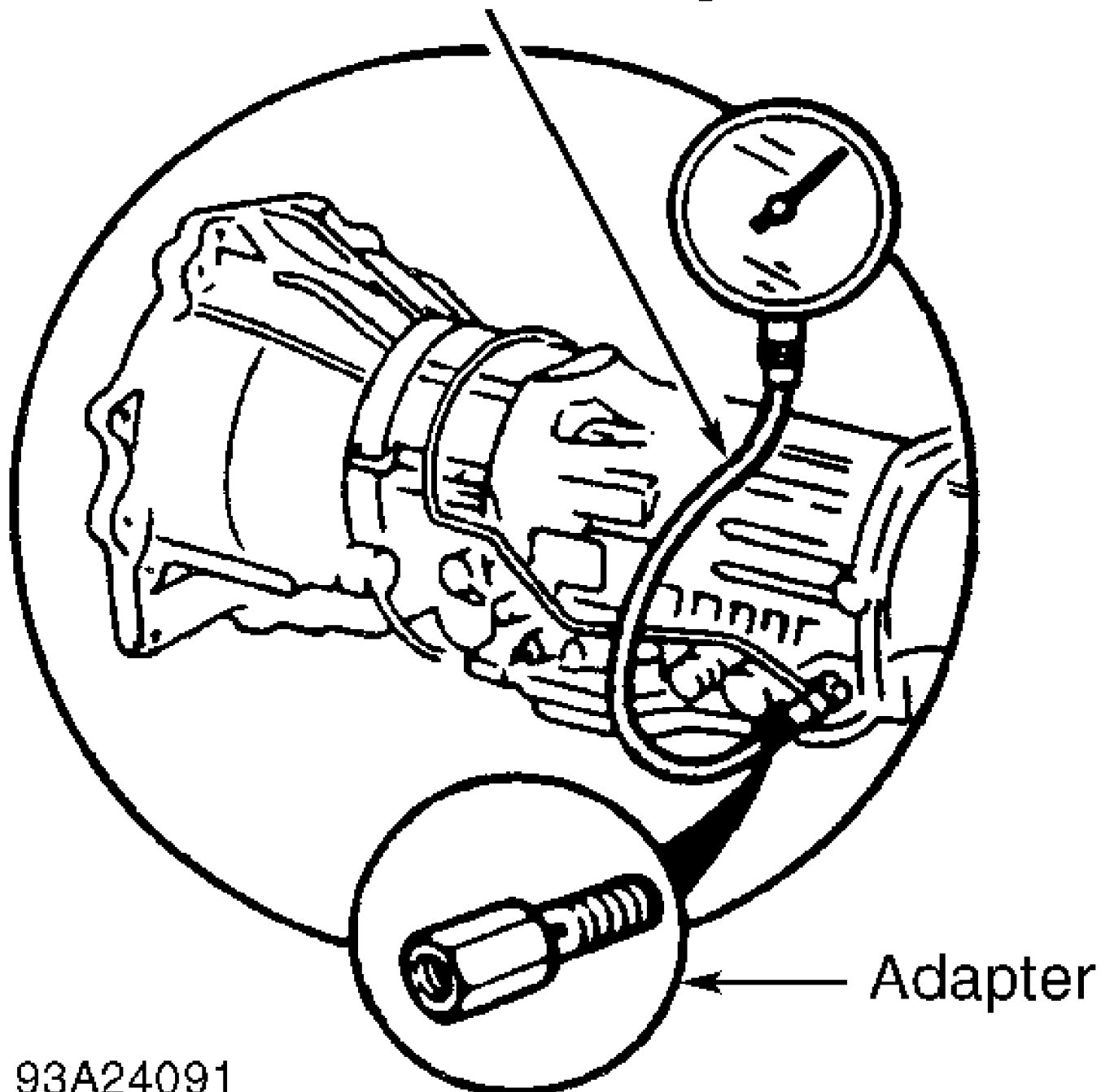
Range	Mode	Throttle condition	Shift	Vehicle speed km/h {mph}
D	NORMAL	Wide open throttle	D ₁ →D ₂	58—64 {36—39}
			D ₂ →D ₃	100—108 {62—66}
			D ₃ lockup ON	98—106 {61—65}
			D ₃ →D ₄	152—162 {95—100}
		Half throttle	D ₁ →D ₂	33—46 {21—28}
			D ₂ →D ₃	58—76 {36—47}
			D ₃ →D ₄	82—110 {51—68}
			D ₄ lockup ON	74—100 {46—62}
		Closed throttle position	D ₄ →D ₃	28—34 {17—21}
			D ₃ →D ₁	11—17 {7—10}
		Kickdown (Wide open throttle)	D ₄ →D ₃	140—150 {87—93}
			D ₃ →D ₂	92—100 {57—62}
			D ₂ →D ₁	42—48 {26—29}
	POWER	Wide open throttle	D ₁ →D ₂	58—64 {36—39}
			D ₂ →D ₃	100—108 {62—66}
			D ₃ lockup ON	98—106 {61—65}
			D ₃ →D ₄	152—162 {94—100}
		Half throttle	D ₁ →D ₂	44—55 {28—34}
			D ₂ →D ₃	99—108 {56—66}
			D ₃ lockup ON	98—106 {61—65}
			D ₃ →D ₄	140—164 {87—101}
		Closed throttle position	D ₄ →D ₃	28—34 {17—21}
			D ₃ →D ₁	11—17 {7—10}
		Kickdown (Wide open throttle)	D ₄ →D ₃	140—150 {87—93}
			D ₃ →D ₂	92—100 {57—62}
			D ₂ →D ₁	42—48 {26—29}
	HOLD	All positions	D ₁ →D ₂	27—33 {17—20}
			D ₂ →D ₃	35—45 {22—27}
			D ₄ →D ₃	152—158 {94—97}
			D ₃ →D ₁	12—18 {8—11}
			D ₃ lockup ON	95—105 {59—65}
S	POWER	Wide open throttle	S ₁ →S ₂	58—64 {36—39}
			S ₂ →S ₃	100—108 {62—66}
			S ₃ lockup ON	98—105 {61—65}
		Half throttle	S ₁ →S ₂	44—55 {28—34}
			S ₂ →S ₃	90—108 {56—67}
			S ₃ lockup ON	94—106 {58—66}
	HOLD	Closed throttle position	S ₃ →S ₁	11—17 {7—10}
			S ₃ →S ₂	92—100 {57—62}
		Kickdown (Wide open throttle)	S ₂ →S ₁	42—48 {26—29}
			S ₃ →S ₂	99—105 {61—65}
L	POWER	Wide open throttle	L ₁ →L ₂	56—62 {35—38}
		Half throttle	L ₁ →L ₂	44—55 {27—34}
		Closed throttle position	L ₃ →L ₂	96—104 {60—64}
			L ₂ →L ₁	11—17 {7—10}
		Kickdown (Wide open throttle)	L ₃ →L ₂	99—105 {61—65}
			L ₂ →L ₁	42—48 {26—29}
	HOLD	All positions	L ₂ →L ₁	35—41 {21—25}
			L ₃ lockup ON	95—105 {59—65}

95G20574
Fig. 29: 1994 Miata Shift Speed Chart
Courtesy of Mazda Motors Corp.

LINE PRESSURE CUTBACK POINT (NA4A-HL)

1) Connect oil pressure gauge to governor port. See Fig. 30.
Remove vacuum diaphragm hose and plug. Connect vacuum pump and place
gauge and pump inside vehicle.

Oil Pressure Gauge



93A24091

Fig. 30: Connecting Gauge To Governor Port (NA4A-HL)
Courtesy of Mazda Motors Corp.

2) Accelerate vehicle in "D". Read governor pressure when
line pressure drops.
3) Apply 8 in. Hg to vacuum diaphragm. Accelerate in "D".

Record highest pressure reading when line pressure drops. Compare with LINE PRESSURE CUTBACK POINT SPECIFICATIONS table.

LINE PRESSURE CUTBACK POINT SPECIFICATIONS TABLE

Application	Pressure
Applied Vacuum	psi (kg/cm ²)
B2200	
EGI Fuel Injection	
0 in. Hg	16-24 (1.1-1.6)
8 in. Hg	9-17 (.60-1.2)
Carbureted	
0 in. Hg	20-28 (1.4-1.9)
8 in. Hg	10-18 (.70-1.26)
B2600	
0 in. Hg	18-27 (1.26-1.8)
8 in. Hg	11-20 (.76-1.4)
Miata (1990-93)	
0 in. Hg	16-24 (1.1-1.6)
8 in. Hg	9-17 (.60-1.2)
MPV	
0 in. Hg	16-24 (1.1-1.6)
8 in. Hg	11-20 (.76-1.4)

LINE PRESSURE CUTBACK POINT EVALUATION

If line pressure cutback point is not within specification, check the following:

- * Missing diaphragm rod.
- * Diaphragm rod length incorrect.
- * Control valve stuck.

GOVERNOR PRESSURE TEST (NA4A-HL)

1) Governor pressure test should only be used if vehicle shift speeds are different than specification. Install adapter and pressure gauge in governor pressure port. See Fig. 30.

2) Drive vehicle in "D". Read governor pressure at specified speed. See GOVERNOR PRESSURE SPECIFICATIONS table. If not within specification, clean and repair governor. Repeat test. If still not within specification, replace governor.

GOVERNOR PRESSURE SPECIFICATIONS TABLE

Application	MPH	psi (kg/cm ²)
B2200		
EGI Fuel Injection	19	.70-1.26 (10-18)
	34	1.61-2.38 (23-34)
	53	3.22-4.20 (46-60)
Carbureted	19	.91-1.47 (13-21)
	34	1.96-2.80 (28-40)
	53	4.20-5.18 (60-74)
B2600	19	.77-1.40 (11-20)
	34	1.89-2.66 (27-38)
	53	3.99-4.97 (57-71)
Miata (1993)	19	.77-1.40 (11-20)

	34	.....	1.61-2.38	(23-34)
	53	.....	3.36-4.41	(48-63)
MPV	.....	19	.....	.91-1.48 (13-21)
	34	.....	1.83-2.60	(26-37)
	53	.....	3.80-4.78	(54-68)

GOVERNOR PRESSURE TEST RESULTS

If governor pressure is not within specification, check the following:

- * Fluid leaking from the pressure hydraulic circuit.
- * Fluid leaking from governor pressure hydraulic circuit.
- * Defective or stuck governor valve.

ELEMENTS IN USE

NOTE: Refer to CLUTCH & BAND APPLICATIONS in the associated AUTO TRANS OVERHAUL - N4A-EL, N4A-HL & NC4A-EL overhaul article.

ELECTRICAL COMPONENT TESTS

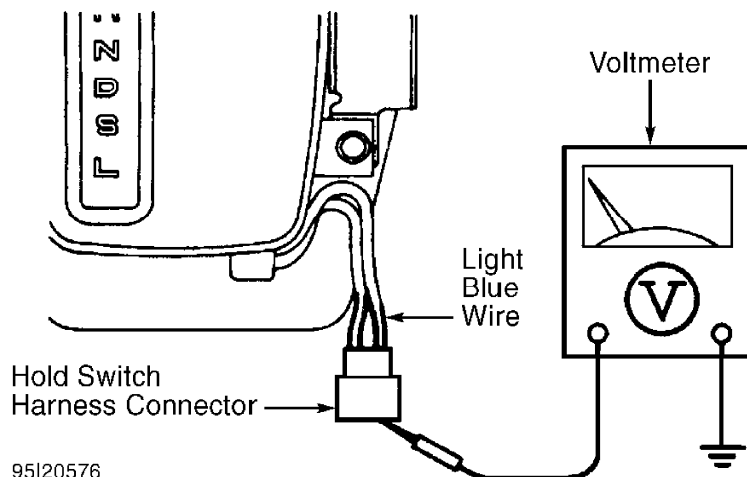
HOLD SWITCH (1994 MIATA ONLY)

Voltage Check

Remove upper console plate. Disconnect hold switch harness connector and turn ignition on. Check voltage between Light Blue wire terminal and ground. See Fig. 31. If battery voltage is not present, perform continuity check.

Continuity Check

Disconnect HOLD switch. Check continuity between terminals. With switch released, there should be no continuity. With switch depressed, continuity should exist. If continuity is not as described, replace switch. If continuity is as described, check wiring harness between hold switch and PCMT and between hold switch and ground.



95I20576
Fig. 31: Testing Hold Switch (1994 Miata Only)
Courtesy of Mazda Motors Corp.

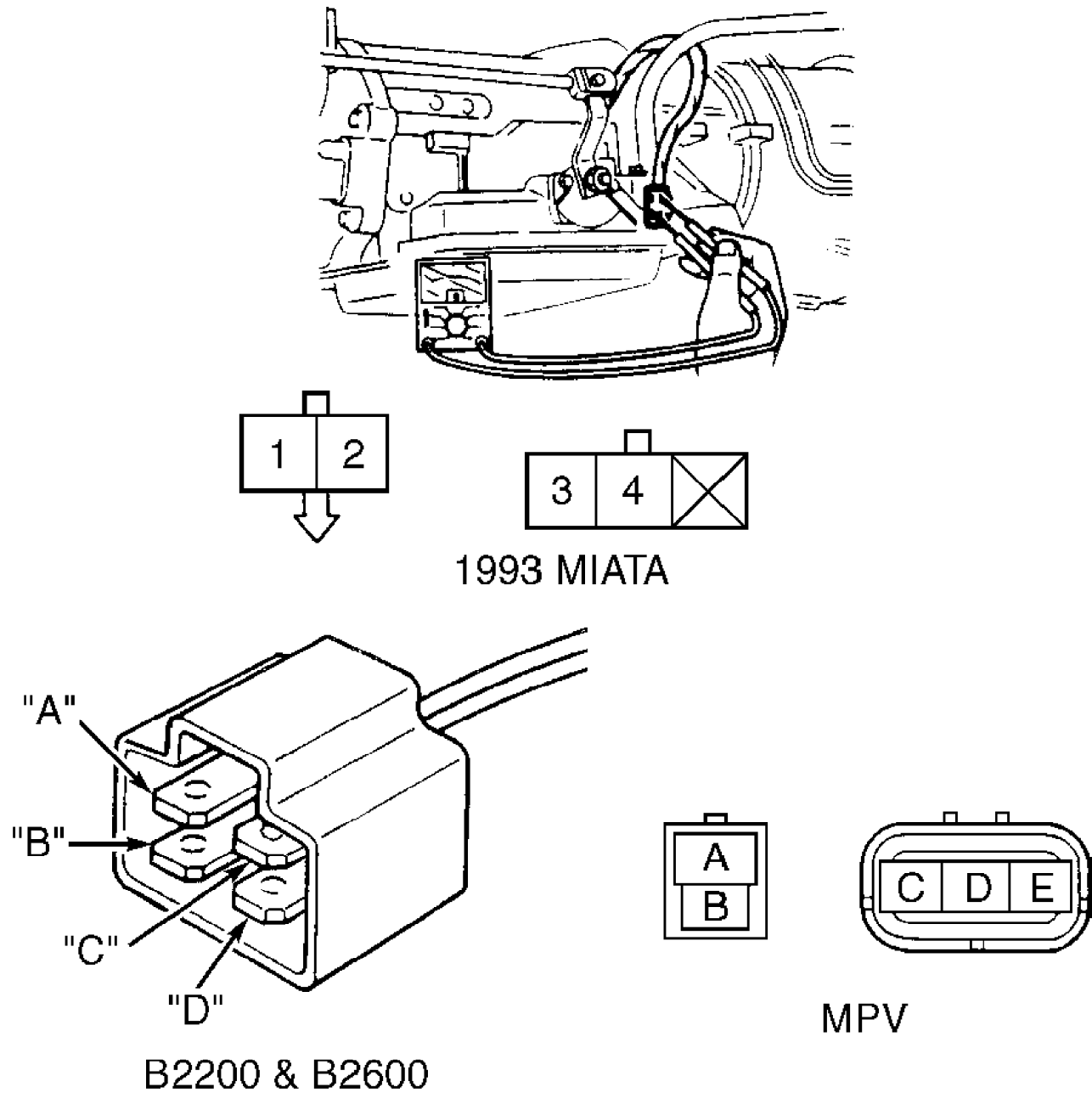
INHIBITOR/PARK NEUTRAL SWITCH

Inspection

Ensure engine will start in "P" or "N" range. Turn ignition on. Ensure back-up lights come on in "R" range.

Continuity Check

Connect gauge to terminals. See Fig. 32. Note continuity in INHIBITOR/PARK NEUTRAL SWITCH CONTINUITY table.



95J20577

Fig. 32: Identifying Inhibitor/Park Neutral Switch Terminals
Courtesy of Mazda Motors Corp.

INHIBITOR/PARK NEUTRAL SWITCH CONTINUITY TABLE

Application	Gear Position	Terminal Continuity
B2200/B2600	P & N	C to D
	R	A to B
MPV	P	A to B & C to E
	R	C to D
	N	A to B
Miata 1993	P	1 to 2
	R	3 to 4
	N	1 to 2
	P	B to H & E to L
	R	G to I
	N	B to H & D to I
	D	C to I
	S	F to I
1994	L	A to I

KICKDOWN SWITCH (NA4A-HL)

Voltage Check

Turn ignition on. Check for voltage between terminal "C" and vehicle ground. Refer to the KICKDOWN SWITCH VOLTAGE table. Also, see Fig. 33.

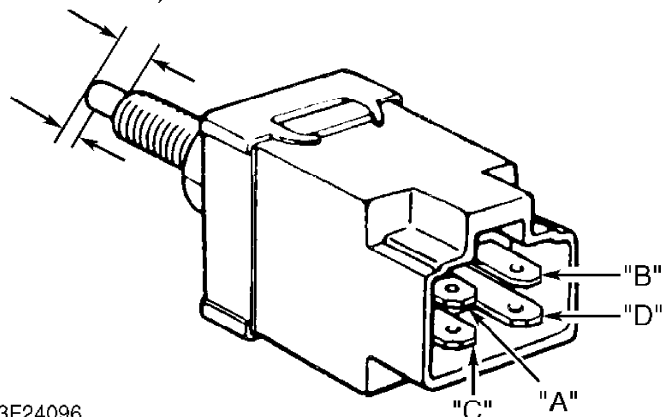
Inspection

Disconnect kickdown switch connector. Check continuity between terminals "C" and "D" when tip of switch is depressed .236-.256" (6.0-6.5 mm). See Fig. 33. If no continuity is present, replace switch. If continuity is present, kickdown switch is okay.

Switch Adjustment

Loosen lock nut. Press accelerator pedal down. Turn switch until threaded case touches stop. Turn switch counterclockwise 1/2 turn. Tighten lock nut.

.236 - .256"
(6.0 - 6.5 mm)



93F24096

Fig. 33: Inspecting Kickdown Switch
Courtesy of Mazda Motors Corp.

KICKDOWN SWITCH VOLTAGE TABLE

Throttle Depressed	Terminal Voltage
7/8-To-Full Throttle	About 12
Idle-To-7/8 Throttle	Below 1.5

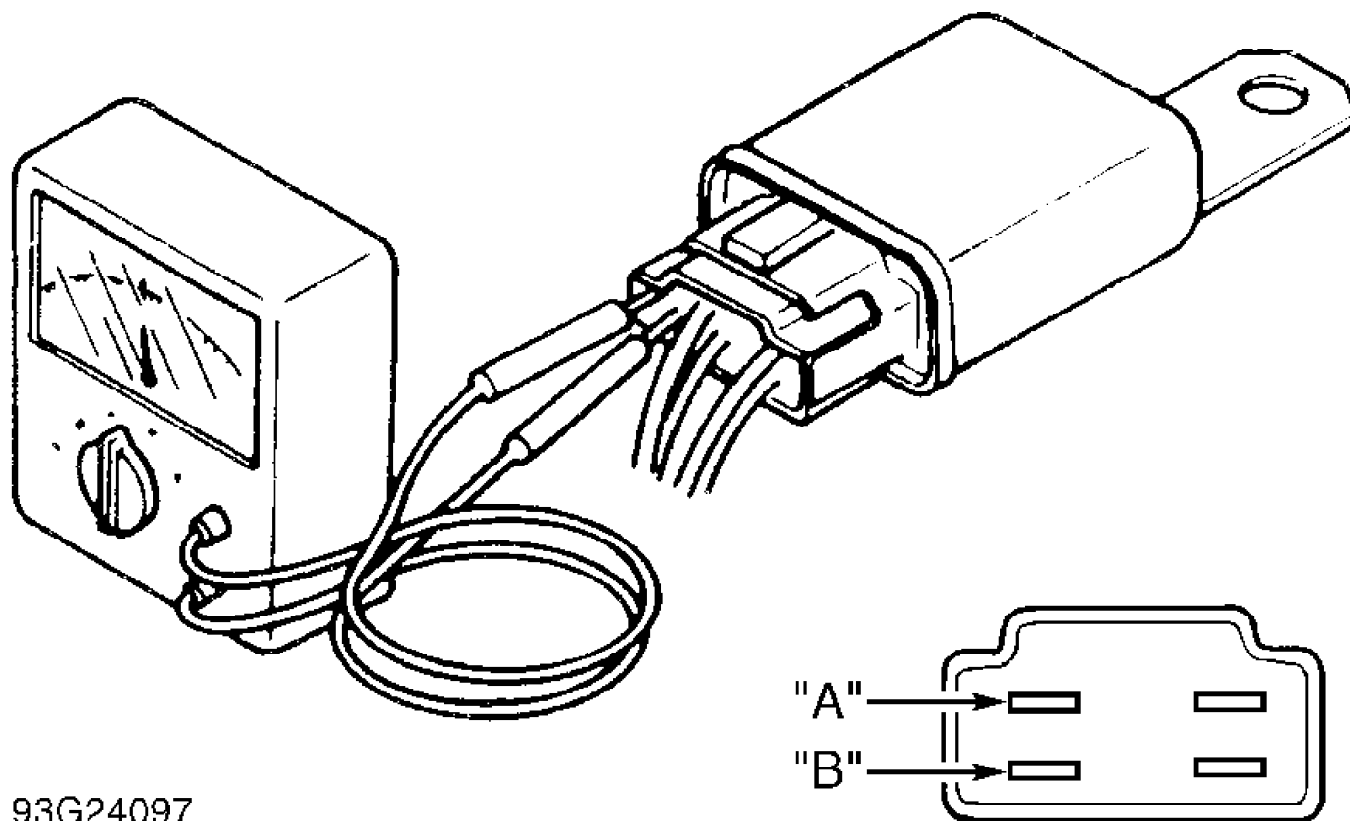
KICKDOWN RELAY TEST (NA4A-HL)

Remote-Mounted Type

Locate kickdown relay. Using a voltmeter, backprobe between positive terminal "A" and negative terminal "B". See Fig. 26. Turn ignition on. Battery voltage should be present. Fully depress accelerator pedal. If voltage is present, replace relay. If no voltage is present, relay is okay.

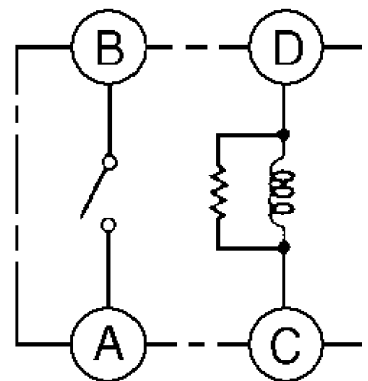
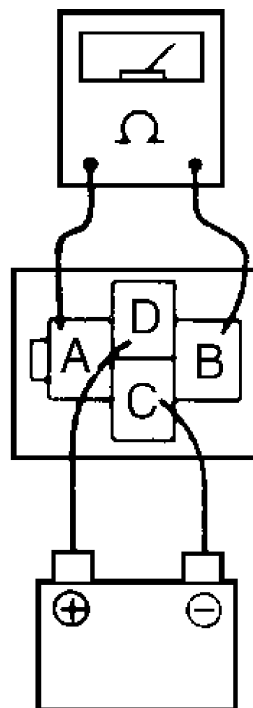
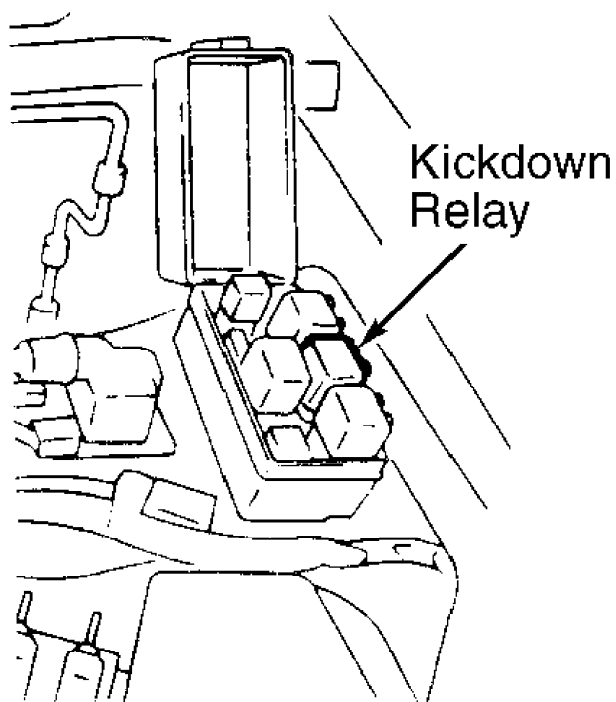
Plug-In Type

Connect battery and ohmmeter. See Fig. 35. Check for continuity. Disconnect battery. Check for no continuity. If continuity is not present with battery connected, replace relay. If continuity is present with battery connected, relay is okay.



93G24097

Fig. 34: Checking Kickdown Relay (Remote Mounted Type)
Courtesy of Mazda Motors Corp.



93H24098

Fig. 35: Checking Kickdown Relay (Plug-In Type)
Courtesy of Mazda Motors Corp.

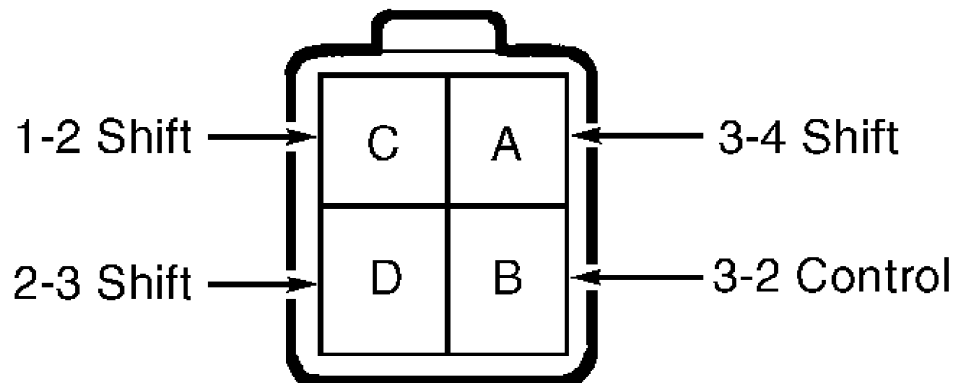
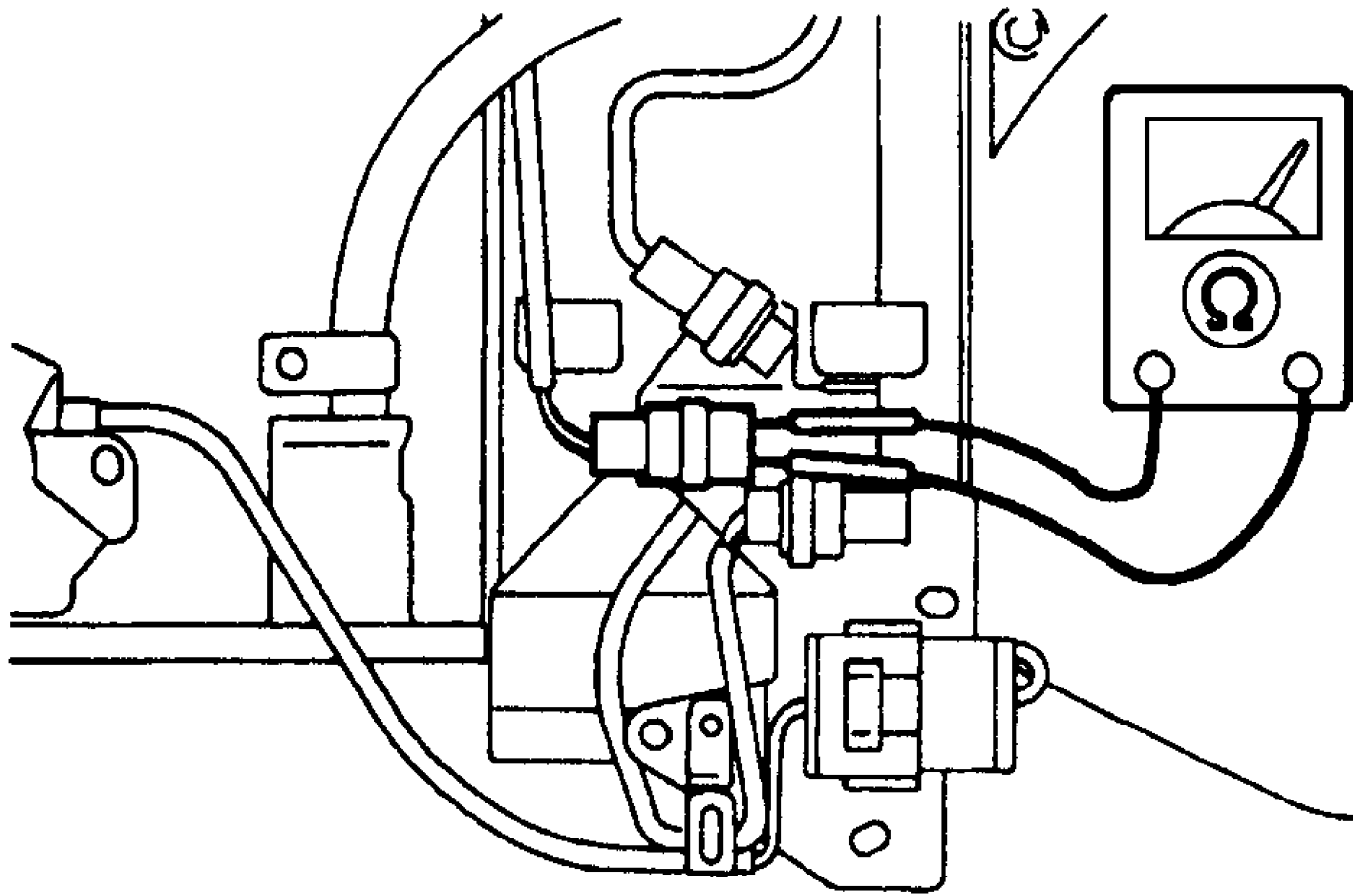
KICKDOWN SOLENOID (NA4A-HL)

Apply 12 volts to kickdown solenoid terminal. If a click noise is heard, solenoid is okay. If no click is heard, replace kickdown solenoid.

SOLENOID VALVES (NC4A-EL)

Resistance Check

Disconnect solenoid valve connector. See Fig. 36. Check resistance of each terminal to ground. Resistance should be 13-27 ohms. If resistance is not 13-27 ohms, check wiring for opens or shorts. If no opens or shorts are found, replace solenoid valve(s).



95H20609

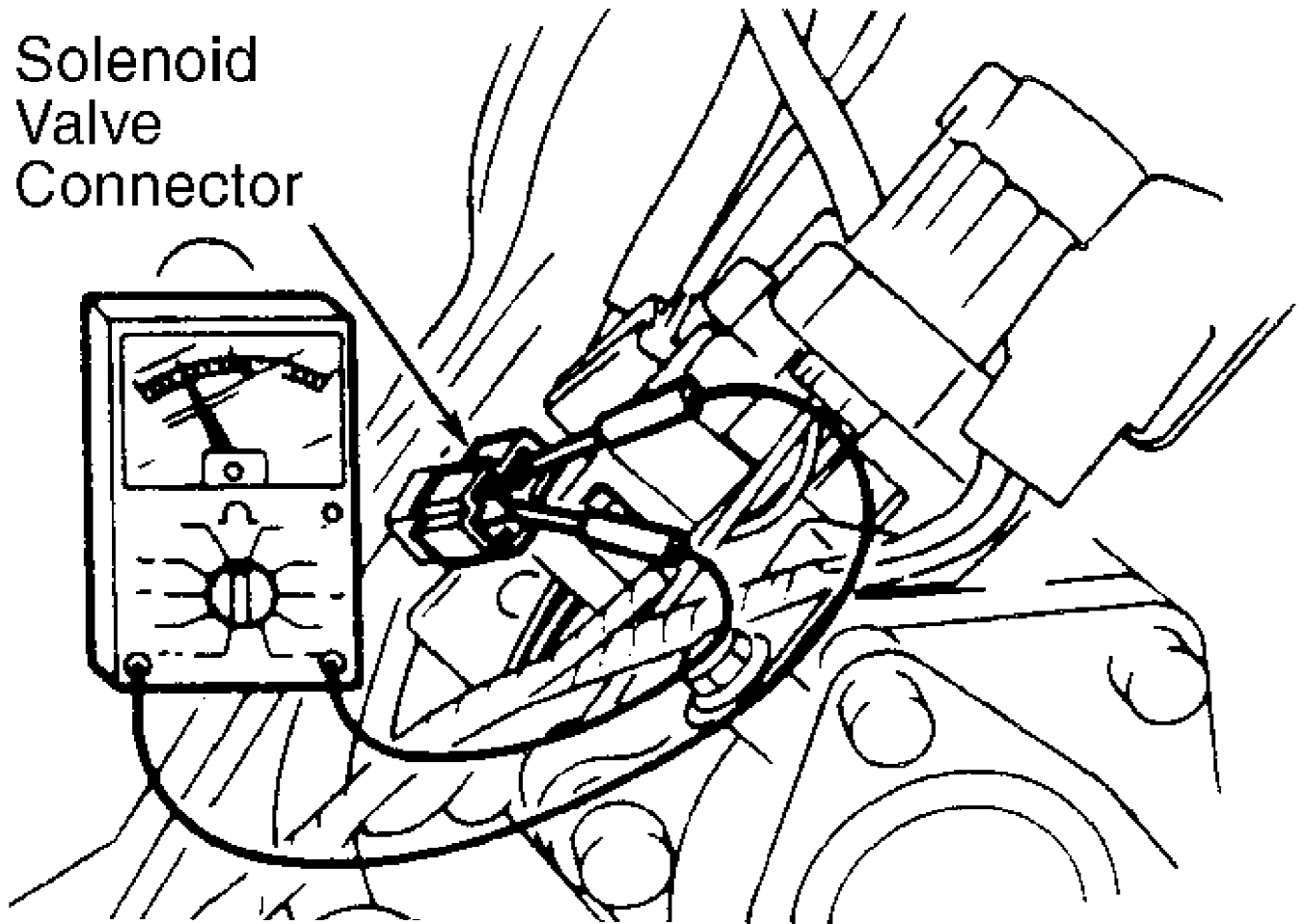
Fig. 36: Checking Solenoid Valves
Courtesy of Mazda Motors Corp.

LOCK-UP SOLENOID (NC4A-EL)

Resistance Check

Disconnect solenoid valve connector. See Fig. 36. Measure resistance between terminals. Resistance should be 13-25 ohms. If not 13-25 ohms, replace solenoid valve.

Solenoid Valve Connector

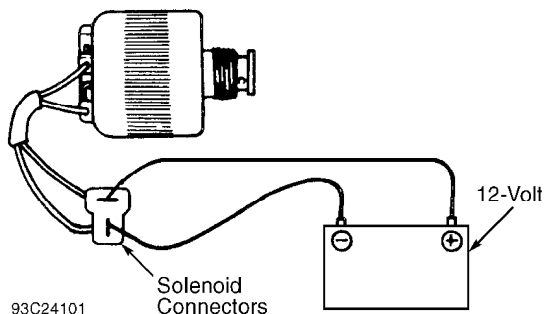


93B24100

Fig. 37: Checking Lock-Up Solenoid (NC4A-EL)
Courtesy of Mazda Motors Corp.

LOCK-UP SOLENOID (NA4A-HL)

Apply 12 volts to solenoid. Oil passage should close. Oil passage should open when voltage is removed. See Fig. 38.



93C24101
Fig. 38: Checking Lock-Up Solenoid (NA4A-HL)
Courtesy of Mazda Motors Corp.

VEHICLE SPEED PULSE GENERATOR (NC4A-EL)

Resistance Test

Disconnect vehicle speed pulse generator connector. Check resistance across sensor connector terminals. Resistance should be about 245 ohms. If not, replace turbine sensor.

VEHICLE SPEED SENSOR

Voltage Check

1) Disconnect connector from PCMT. Remove plug from connector. Connect voltmeter to input signal at PCMT. See appropriate A/T CONTROL UNIT chart.

2) Turn ignition on. Disconnect speedometer cable from transmission. Turn speedometer cable one time. About 7 volts should be indicated 4 times per revolution. If voltage is not as described, replace combination meter.

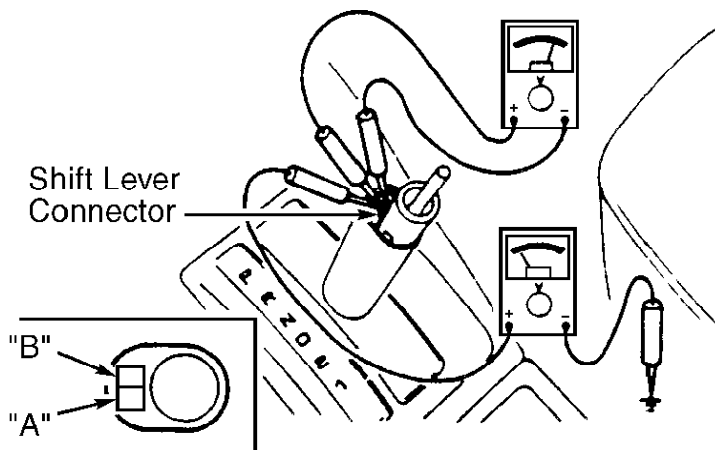
OD SWITCH

Inspection

OD switches are located in various positions. See Fig. 39. Gain access to OD switch wire connector. Turn ignition on and check for battery voltage at battery side of connector. See Fig. 39. If no battery voltage is present, inspect wires and fuses, and repair as necessary.

Continuity Test

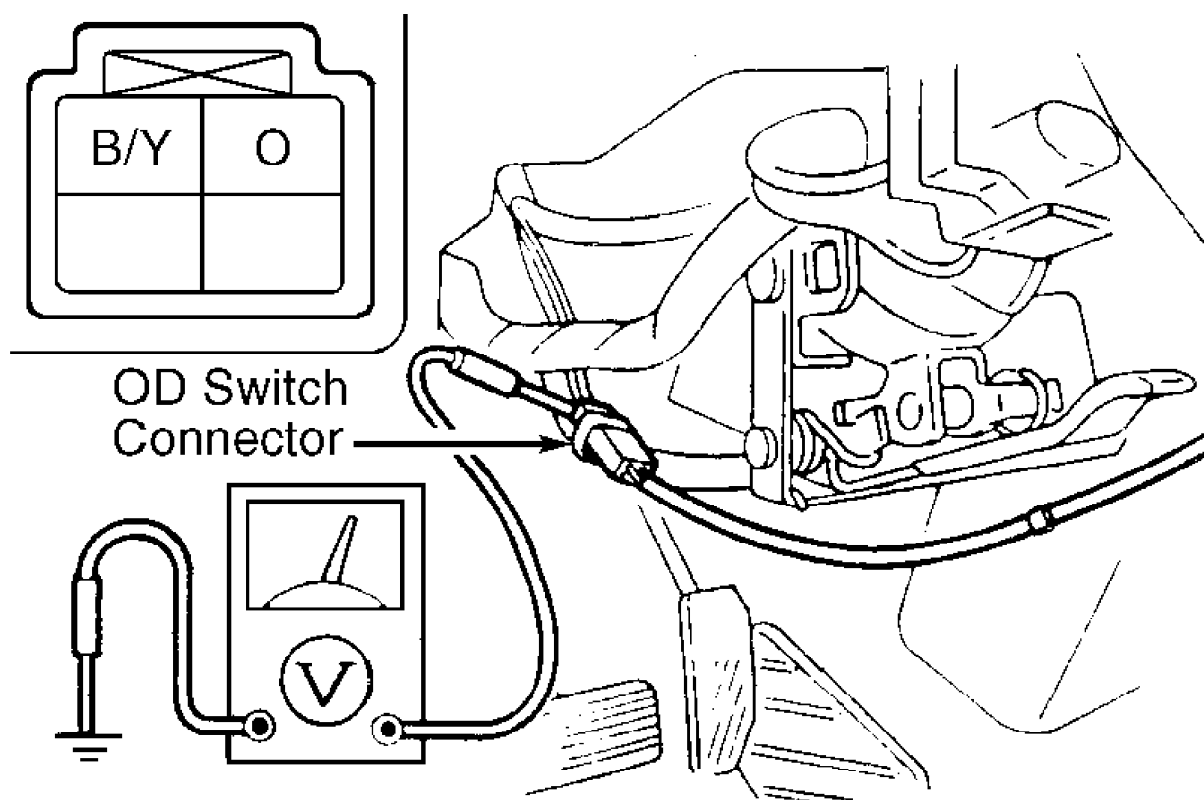
Turn ignition off. Connect ohmmeter to switch terminals. Operate switch and check for continuity. See Fig. 42. If continuity is not as described, replace switch.



Terminal Voltage	Terminal
About 12 Volt	"A" & "B"
Below 1.5 Volt	"A" & Ground

95A20610

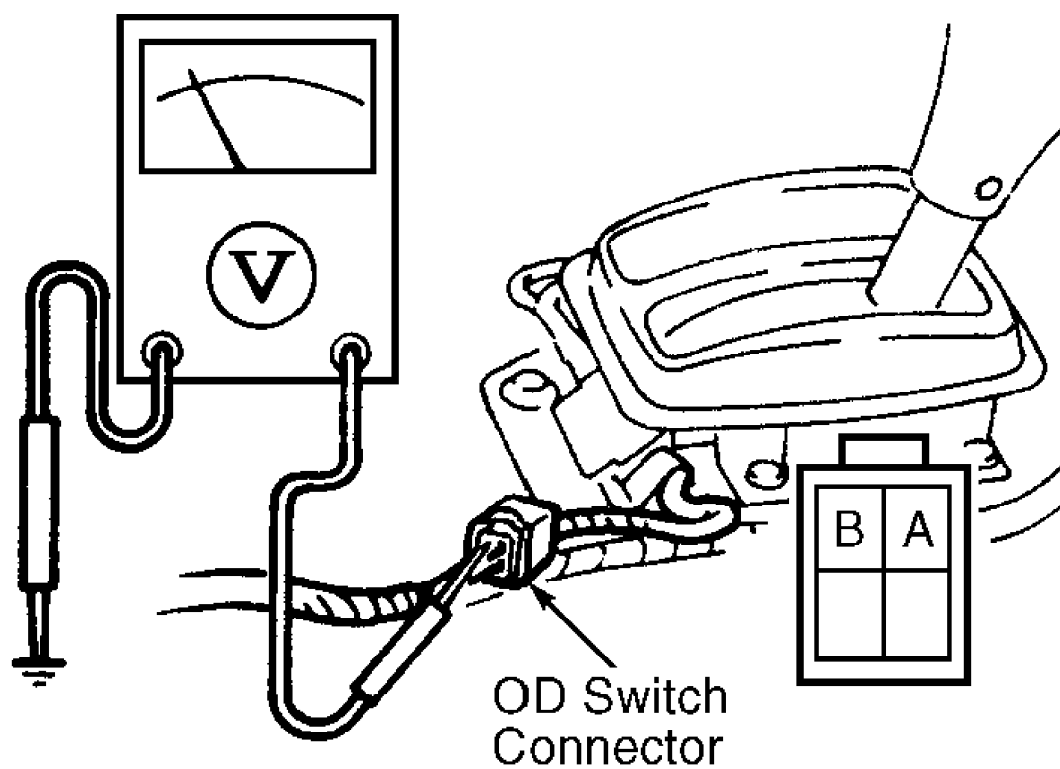
Fig. 39: Checking OD Switch Voltage
Courtesy of Mazda Motors Corp.



Terminal Voltage	Switch
About 12 Volt	Depressed
Below 1.5 Volt	Released

95B20611

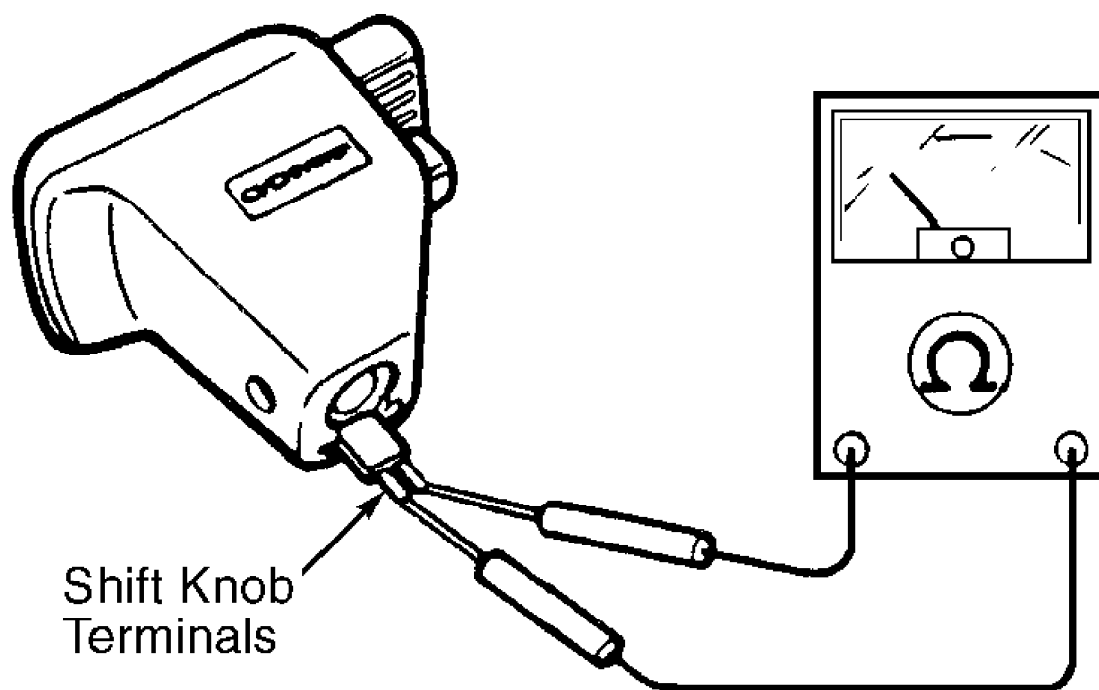
Fig. 40: Checking OD Switch Voltage
 Courtesy of Mazda Motors Corp.



Terminal Voltage	Switch
About 12 Volt	Depressed
Below 1.5 Volt	Released

95C20612

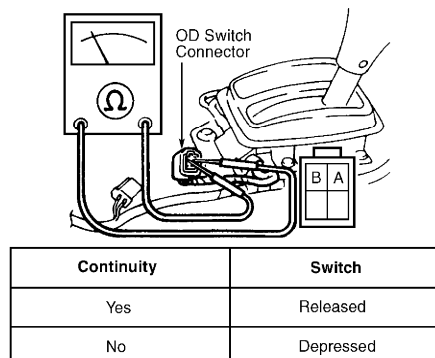
Fig. 41: Checking OD Switch Voltage
 Courtesy of Mazda Motors Corp.



Continuity	Switch
Yes	Released
No	Depressed

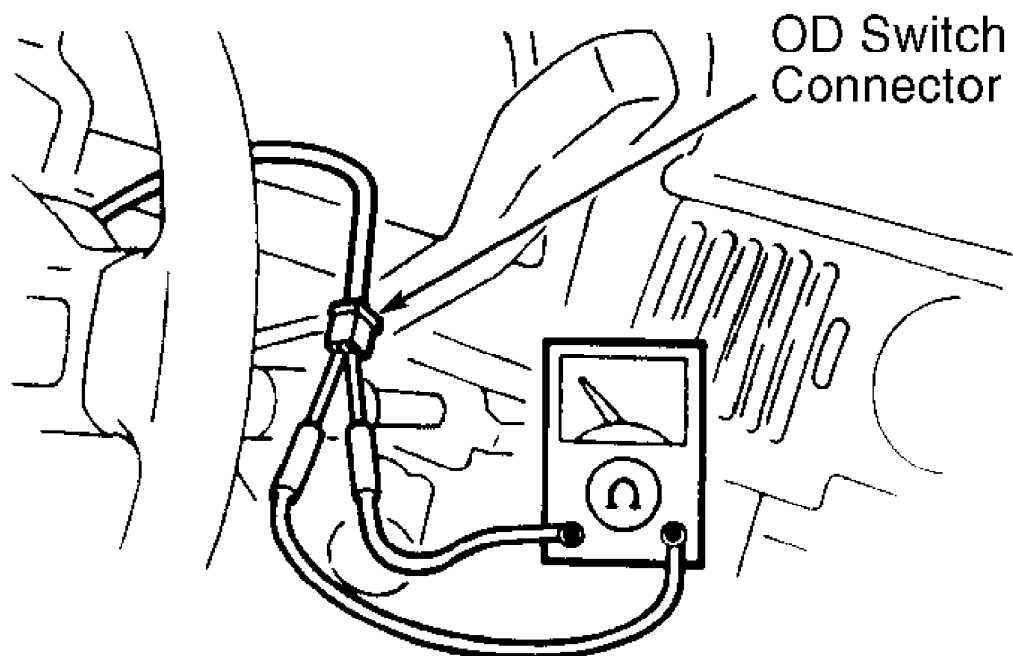
95D20613

Fig. 42: Checking OD Switch Continuity
Courtesy of Mazda Motors Corp.



95E20614

Fig. 43: Checking OD Switch Continuity
Courtesy of Mazda Motors Corp.



Continuity	Switch
Yes	Released
No	Depressed

95F20615

Fig. 44: Checking OD Switch Continuity
Courtesy of Mazda Motors Corp.

4-3 SWITCH

Inspection

Turn ignition on. With 4-3 switch connected to vehicle, check voltage between terminal "A" and ground. See Fig. 45. Compare voltage with 4-3 SWITCH VOLTAGE table while depressing accelerator pedal.

Continuity

Disconnect the connector. Check continuity between terminals "A" and "B" when tip of switch is depressed .14-.18" (3.5-4.5 mm). See Fig. 45. If continuity is not present, replace 4-3 switch. If continuity is present, 4-3 switch is okay.

4-3 SWITCH VOLTAGE TABLE

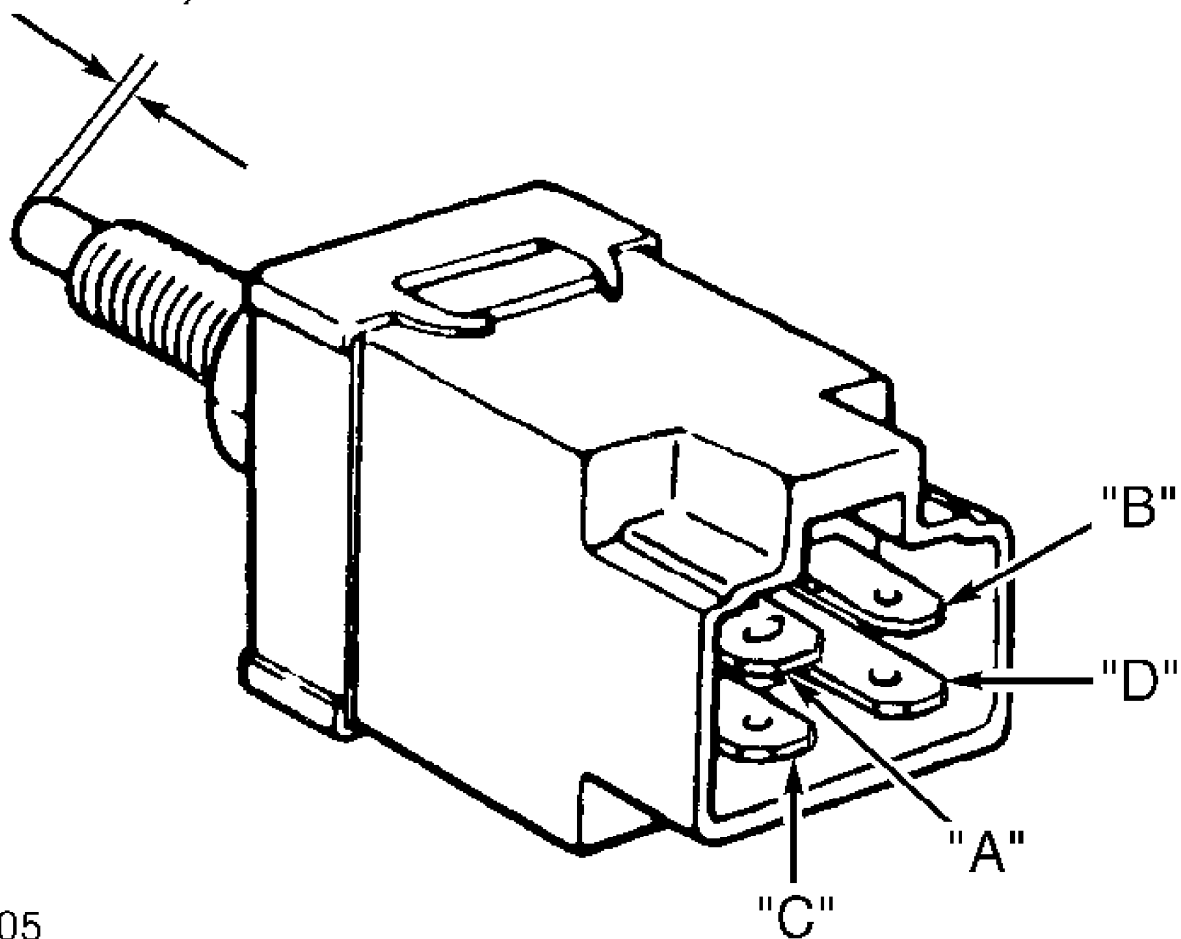
Accelerator Pedal	Voltage
About 7/8 Depressed	About 12
Idle Position-To-5/8 Depressed	Below 1.5

OD CANCEL SOLENOID

Inspection

Inspect operation of oil passage by applying 12 volts to OD cancel solenoid. Ensure oil passage closes when current is applied and is open when current is not applied. See Fig. 46.

.14 - .18"
(3.5 - 4.5 mm)



93G24105

Fig. 45: Checking Continuity Of 4-3 Switch
Courtesy of Mazda Motors Corp.

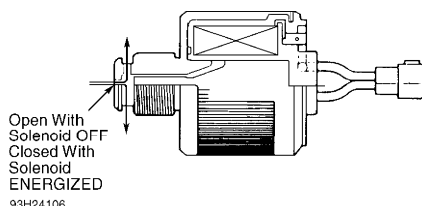
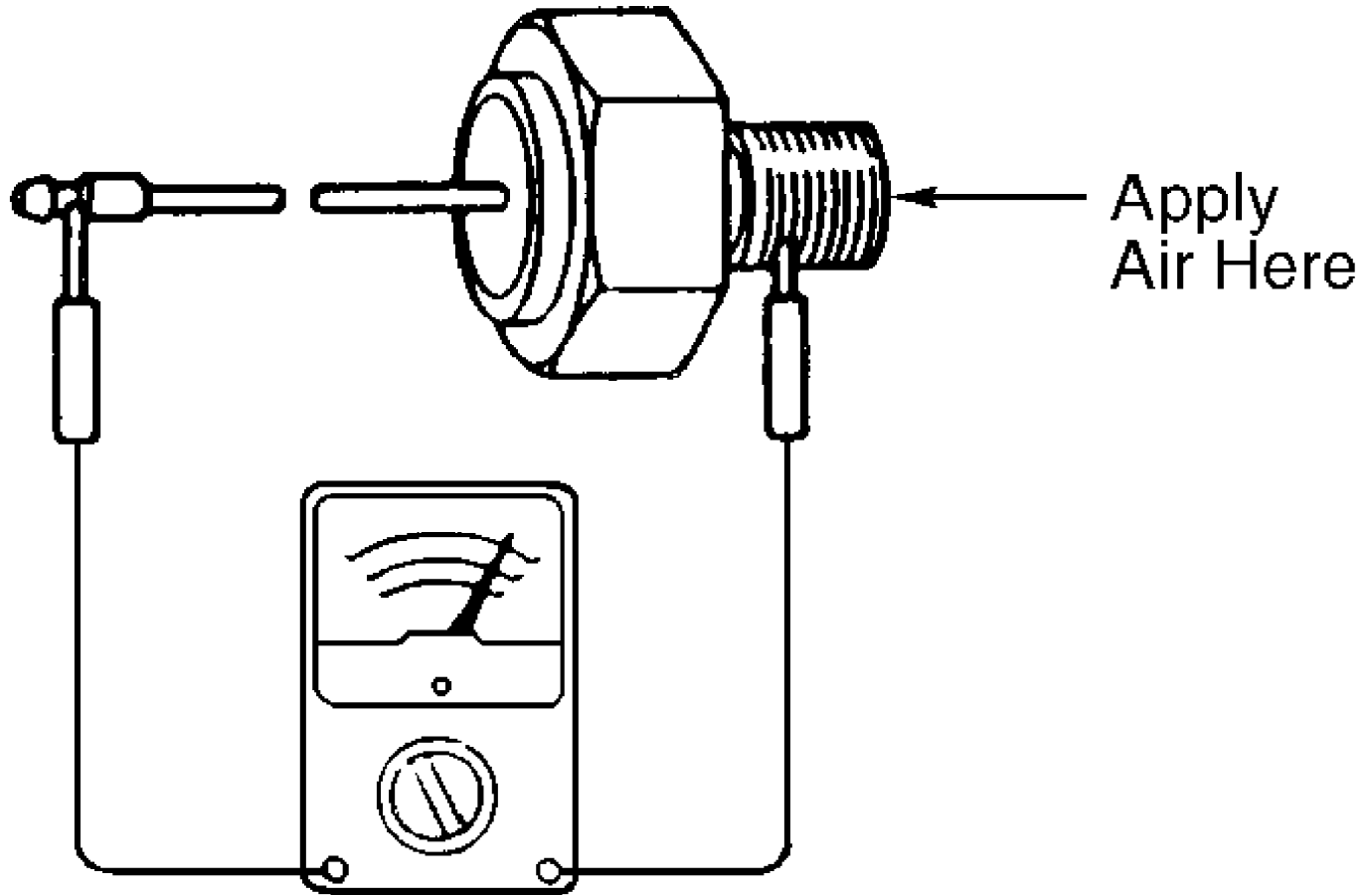


Fig. 46: Checking OD Cancel Switch
Courtesy of Mazda Motors Corp.

OIL PRESSURE SWITCH

Continuity Check

Using air pressure, check oil pressure switch. With air pressure less than 7.1 psi (.5 kg/cm²), switch should be closed. With air pressure above 42.7 psi (3.0 kg/cm²), switch will remain open until pressure drops to less than 7.1 psi (.5 kg/cm²). See Fig. 47.



93124107

Fig. 47: Checking Oil Pressure Switch
Courtesy of Mazda Motors Corp.

PCMT VOLTAGE CHECKS

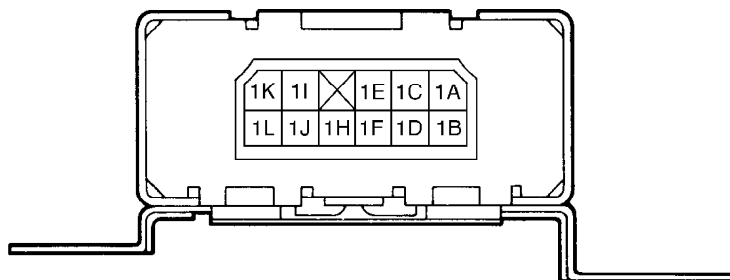
NA4A-HL

Turn ignition on. Check voltage at each control unit terminal. See appropriate PCMT chart. If voltage is not as specified at each terminal, repair or replace component(s), wiring or PCMT.

NC4A-EL

Turn ignition on. Check voltage at each control unit terminal. See PCMT (1994 MIATA) chart. If voltage is not as specified at each terminal, repair or replace component(s) or wiring. If no problem is found with any component or wiring, replace PCMT.

PCMT (B2200)



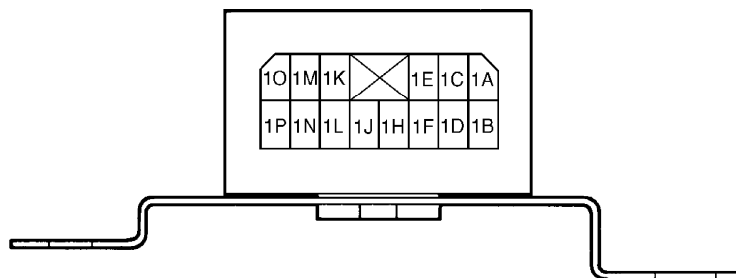
Terminal	Connected to	Voltage	Condition
1A (Output)	OD cancel solenoid	B +	Solenoid OFF: •OD gear position
		Below 1.5V	Solenoid ON: •1st, 2nd, and 3rd gear positions in forward ranges •P, R, and N ranges
1B (Ground)	—	0V	Constant
1C	—	—	—
1D	—	—	—
1E (Input)	OD OFF switch	B +	OD OFF switch depressed (ON): •OD not available
		0V	OD OFF switch released (OFF): •OD available
1F (Input)	Cruise control unit	B +	Normal conditions
		Below 1.5V	Set or Resume switch ON, or vehicle speed 8 km/h (5 mph) lower than preset speed (Driving vehicle: cruise control operation)
1H (Input)	Kickdown relay	B +	Kickdown relay OFF: •Other than conditions below
		Below 1.5V	Kickdown relay ON: •Kickdown switch On (throttle opening more than 7/8)
1I (Input)	Vehicle speed sensor	1.5—7V	During driving
		Approx. 7V or below 1.5V	Vehicle stopped
1J	—	—	—
1K (Input)	4-3 switch	B +	Switch ON: •Throttle opening 6/8—8/8
		0V	Switch OFF: •Other than conditions above
1L	—	—	—

93A24109

Fig. 48: PCMT (B2200)

Courtesy of Mazda Motors Corp.

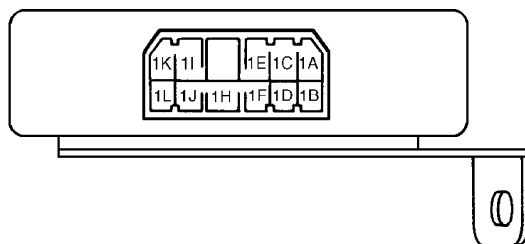
PCMT (B2600)



Terminal	Connected to	Voltage	Condition
1A (Battery power)	Battery	B +	Ignition switch ON
		0V	Ignition switch OFF
1B (Ground)	Battery ground	0V	Constant
1C (Input)	OD OFF switch	B +	OD OFF switch depressed (ON): • OD not available
		0V	OD OFF switch released (OFF): • OD available
1D	—	—	—
1E (Input)	4-3 switch	B +	Switch ON: • Throttle opening 6/8—8/8
		0V	Switch OFF: • Other than conditions above
1F (Input)	Oil pressure switch	B +	Switch OFF: • 1st, 2nd, and 3rd gear positions in forward ranges • P, R, and N ranges
		0V	Switch ON: • OD gear position
1H (Input)	Powertrain control module	B +	2Y terminal of powertrain control module voltage B + • Normal condition
		0V	2Y terminal of powertrain control module voltage 0V • Throttle fully—open position
1I	—	—	—
1J (Input)	Cruise control unit	B +	Normal conditions
		Below 1.5V	Set or Resume switch ON, or vehicle speed 8 km/h {5 mph} lower than preset speed (Driving vehicle: cruise control operation)
1K (Output)	OD cancel solenoid	B +	Solenoid OFF: • OD gear position
		Below 1.5V	Solenoid ON: • 1st, 2nd, and 3rd gear positions in forward ranges • P, R, and N ranges
1L (Input)	Vehicle speed sensor	1.5—7V	During driving
		Approx. 7V or below 1.5V	Vehicle stopped
1M (Input)	Kickdown relay	B +	Kickdown relay OFF: • Other than conditions below
		Below 1.5V	Kickdown relay ON: • Kickdown switch ON (throttle opening more than 7/8)
1N (Output)	Lockup solenoid	B +	Solenoid OFF: • Non-lockup
		Below 1.5V	Solenoid ON: • Lockup

93D24110
Fig. 49: PCMT (B2600)
Courtesy of Mazda Motors Corp.

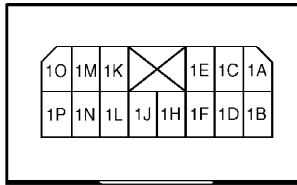
PCMT (MPV)



Terminal	Connected to	Voltage	Condition
1A (Output)	OD cancel solenoid	V _B	Solenoid OFF: • OD gear position
		0V	Solenoid ON: • 1st, 2nd, and 3rd gear positions in forward ranges • P, R, and N ranges
1B (Ground)	—	Below 1.5V	—
1C (Input)	Kickdown relay	V _B	Kickdown relay OFF: • Other than conditions below
		0V	Kickdown relay ON: • Kickdown switch ON (throttle opening more than 7/8)
1D (Output)	Lockup solenoid	V _B	Solenoid OFF: • Non lockup
		0V	Solenoid ON: • Lockup
1E (Input)	OD OFF switch	V _B	OD OFF switch depressed (ON): • OD not available
		0V	OD OFF switch released (OFF): • OD available
1F (Input)	Cruise control unit	V _B	Normal conditions
		Below 1.5V	Set or Resume switch ON, or vehicle speed 8 km/h {5 mph} lower than preset speed (Driving vehicle: cruise control operation)
1G	—	—	—
1H (Battery power)	Battery	V _B	Ignition switch ON
		0V	Ignition switch OFF
1I (Input)	Speed sensor	1.5—7V	During driving
		Approx. 7V or below 1.5V	Vehicle stopped
1J (Input)	Oil pressure switch	V _B	Switch OFF: • 1st, 2nd, and 3rd gear positions in forward ranges • P, R, and N ranges
		0V	Switch ON: • OD gear position
1K (Input)	4-3 switch	V _B	Switch ON: • Throttle opening 6/8—8/8
		0V	Switch OFF: • Other than conditions above
1L (Input)	Engine control unit	V _B	2O terminal of engine control unit voltage battery voltage • Normal condition
		Below 1.5V	2O terminal of engine control unit voltage below 1.5V • Throttle fully—open position

93F24112
Fig. 50: PCMT (MPV)
Courtesy of Mazda Motors Corp.

PCMT (1993 MIATA)



Terminal	Connected to	Voltage	Condition	
1A (Battery power)	Battery	V _B	Ignition switch ON	
		0V	Ignition switch OFF	
1B (Ground)	Battery ground	0V	Constant	
1C (Input)	OD OFF switch	V _B	OD OFF switch released •OD not available	
		0V	OD OFF switch depressed •OD available	
1D (Input)	Kickdown switch	V _B	Switch ON: •Throttle opening 7/8—8/8	
		0V	Switch OFF: •Other than conditions above	
1E (Input)	4-3 switch	V _B	Switch ON: •Throttle opening 6/8—8/8	
		0V	Switch OFF: •Other than conditions above	
1F (Input)	Oil pressure switch	V _B	Switch OFF: •1st, 2nd, and 3rd gear positions in forward ranges •P, R, and N ranges	
		0V	Switch ON: •OD gear position	
1H (Input)	Engine control unit	Below 1.5V	Ignition switch ON	
1J (Input)	Cruise control unit	V _B	Normal conditions	
		Below 1.5V	Set or Resume switch ON, or vehicle speed 8 km/h { 5 mph } lower than preset speed (Driving vehicle: cruise control operation)	
1K (Output)	OD cancel solenoid	V _B	Solenoid OFF: •OD gear position	
		Below 1.5V	Solenoid ON: •1st, 2nd, and 3rd gear positions in forward ranges •P, R, and N ranges	
1L (Input)	Speed sensor	1.5—7V	During driving	
		Approx. 7V or Below 1.5V	Vehicle stopped	
1M (Input)	Kickdown relay	V _B	Kickdown relay OFF: •Other than conditions below	
		Below 1.5V	Kickdown relay ON: •Kickdown switch ON (throttle opening more than 7/8)	
1N (Output)	Lockup solenoid	V _B	Solenoid OFF: •Lockup prohibition	Ignition switch ON
		Below 1.5V	Solenoid ON: •Lockup	Engine running
1O	—	—	—	
1P	—	—	—	

93E24111
Fig. 51: PCMT (1993 MIATA)
Courtesy of Mazda Motors Corp.

PCMT (1994 MIATA)

2S	2Q	2O	2M	2K	2I	2G	2E	2C	2A	1O	1M	1K	1I	1G	1E	1C	1A
2T	2R	2P	2N	2L	2J	2H	2F	2D	2B	1P	1N	1L	1J	1H	1F	1D	1B

Terminal	Connected to	Voltmeter		Voltage	Condition
		+ terminal	- terminal		
1A	—	—	—	—	—
1B (Output)	Hold indicator light	1B	Ground	B+	No hold mode
				Below 1.5V	Hold mode
1C (Output)	FAT terminal (data link connector)	1C		B+	Normal
				Below 1.5V or B+ (fluctuating)	If malfunction present
				Code Signal	TAT terminal grounded
1D (Output)	Powertrain control module (Engine) (terminal R)	1D		Below 2.5V	N or P range
				B+	Other ranges
1E (Input)	TAT terminal (data link connector)	1E		B+	—
1F	—	—	—	—	—
1G	ATF thermosensor	1G	Ground	3.3V	ATF temperature 25°C {77°F}
1H (Input)	Hold switch	1H		B+	Switch depressed
				0V	Switch released
1I	—	—	—	—	—
1J (Output)	—	1J	Ground	0V	—
1K	—	—	—	—	—
1L	—	—	—	—	—
1M (Input)	Cruise control unit	1M	Ground	B+	Normal conditions
				Below 1.5V	Set or Resume switch ON or vehicle speed 8 km/h {5 MPH} lower than preset speed (Driving vehicle cruise control operation)
1N (Input)	Powertrain control module (Engine) (terminal 3M)	1N		Below 1.5V	Water temperature below 50°C {122°F}
				B+	Water temperature above 60°C {140°F}
1O	Idle switch	1O		0V	Accelerator pedal depressed
				Vb	Accelerator pedal released
1P (Input)	Vehicle speed sensor	1P		Approx. 4V	While driving
				Approx. 7—9V or Below 1.5V	Vehicle stopped
2A (Input)	Throttle position sensor	2A		Approx. 4.4—5.5V	Ignition switch ON
				0V	Ignition switch OFF
2B (Input)	Park/neutral switch (N and P ranges)	2B		0V	N or P range
				B+	Other ranges
2C	—	—	—	—	—

95G20616
Fig. 52: PCMT (1994 Miata - 1 Of 2)
Courtesy of Mazda Motors Corp.

Terminal	Connected to	Voltmeter		Voltage	Condition
		+ terminal	– terminal		
2D (Input)	Park/neutral switch (D range)	2D	Ground	B+	D range
				0V	Other ranges
2E (Output)	1–2 shift solenoid valve	2E		B+	Solenoid ON in following condition: • 1st gear position
				0V	Solenoid OFF in following condition: • 2nd, 3GR, and 4GR positions
2F (Input)	Park/neutral switch (S range)	2F		B+	S range
				0V	Other ranges
2G (Output)	2–3 shift solenoid valve	2G		B+	Solenoid ON in following condition: • 1st and 2nd gear positions
				0V	Solenoid OFF in following condition: • 3GR, and 4GR positions
2H (Input)	Park/neutral switch (L range)	2H		B+	L range
				0V	Other ranges
2I (Output)	3–4 shift solenoid valve	2I	Ground	B+	Solenoid ON in following condition: • 1st, 2nd and 3GR positions
				0V	Solenoid OFF in following condition: • 4GR position
2J (Input)*	Vehicle speed pulse generator	2J		0–0.1V (AC)	Engine running
				0V (AC)	Engine stopped
2K (Output)	Lockup control solenoid valve	2K		B+	Solenoid ON, Lockup
				0V	Solenoid OFF, Non-lockup
2L (Ground)*	Vehicle speed pulse generator	2L		Below 1.5V	—
2M (Output)	3–2 control solenoid valve	2M		B+	3–2 or 4–2 downshift
				0V	Other conditions
2N	—	—	—	—	—
2O (Memory power)	Battery	2O	Ground	B+	Constant
2P (Ground)	—	2P		0V	—
2Q (Battery power)	Battery	2Q		B+	Ignition switch ON
				0V	Ignition switch OFF
2R	—	—	—	—	—
2S (Battery power)	Battery	2S	Ground	B+	Ignition switch ON
				0V	Ignition switch OFF
2T (Input)	Throttle position sensor	2T		Approx. 0.4–4.1V	Throttle valve closed throttle position to wide open throttle

*: Checked with AC range

95H20617

Fig. 53: PCMT (1994 Miata - 2 Of 2)
Courtesy of Mazda Motors Corp.

WIRING DIAGRAMS

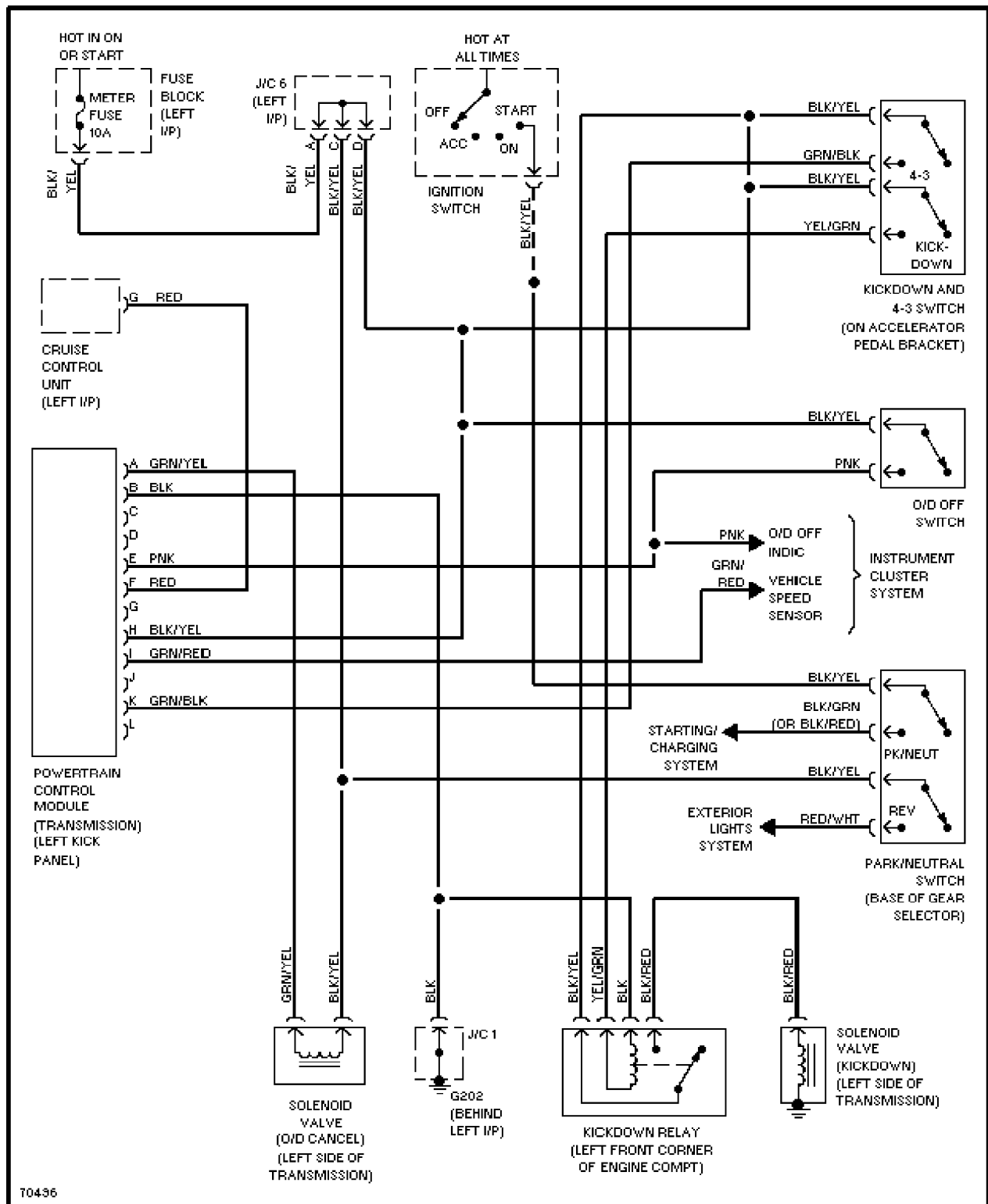


Fig. 54: Automatic Transmission Circuit Diagram (B2200)

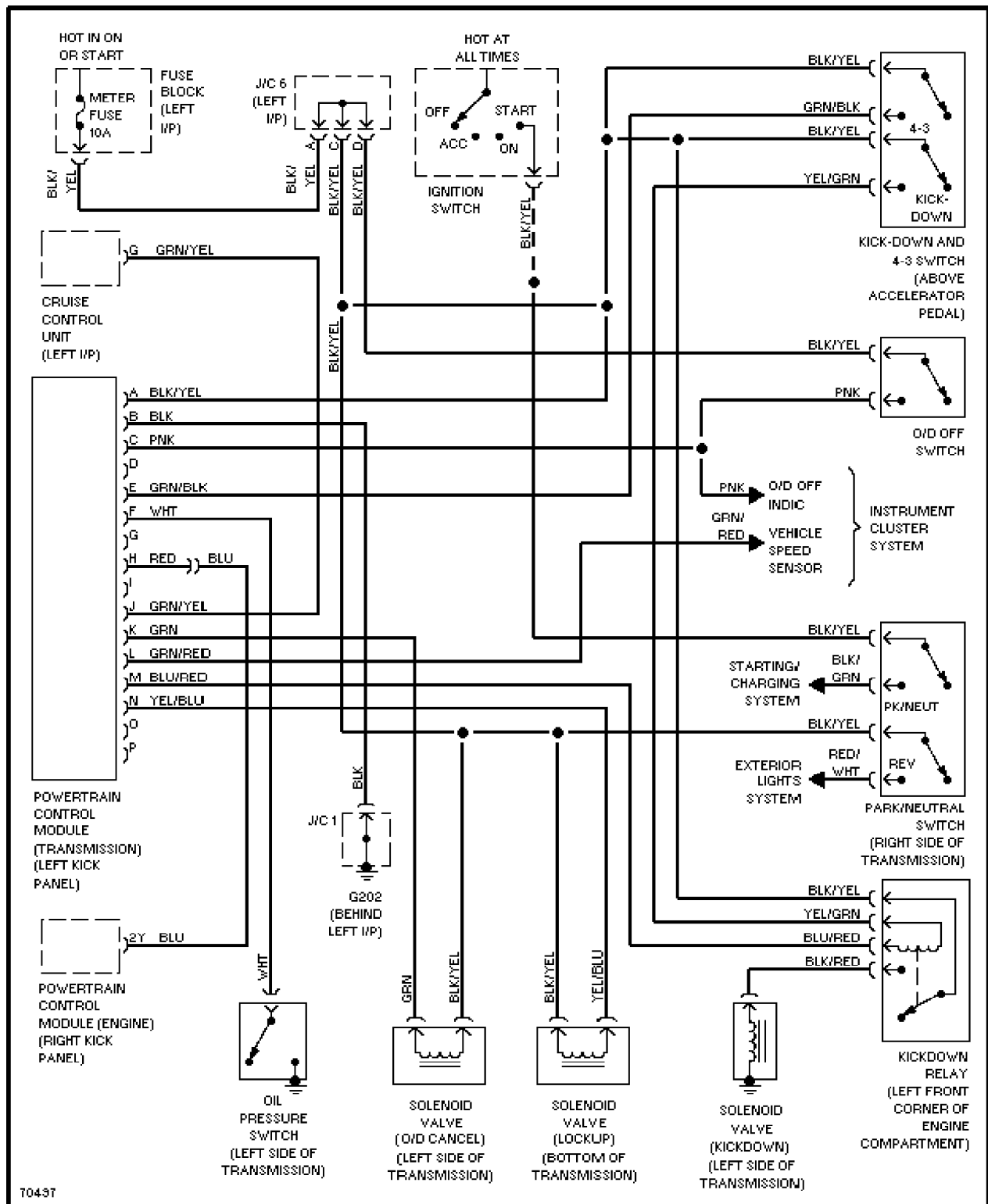


Fig. 55: Automatic Transmission Circuit Diagram (B2600 2WD)

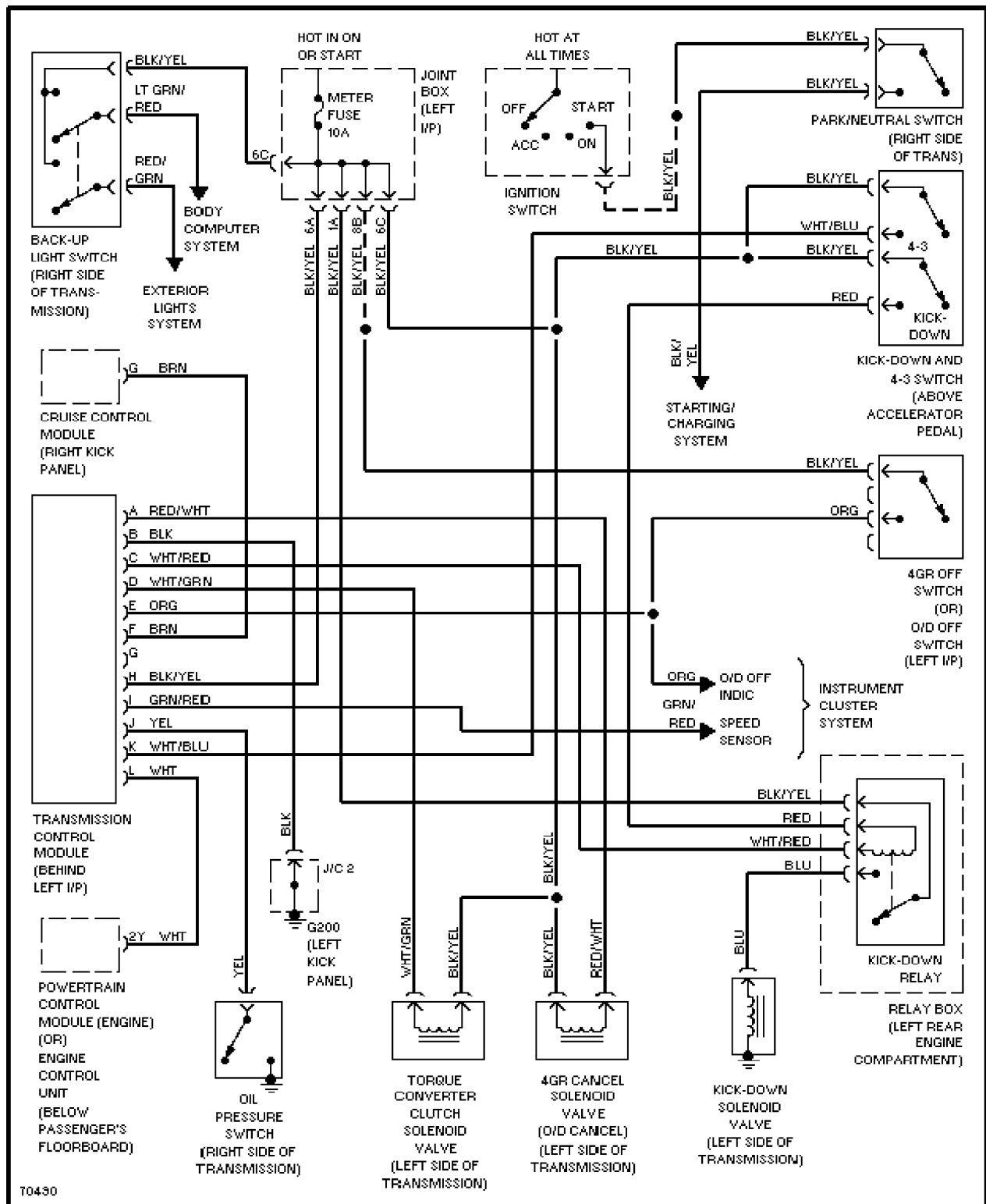


Fig. 56: Automatic Transmission Circuit Diagram (MPV)

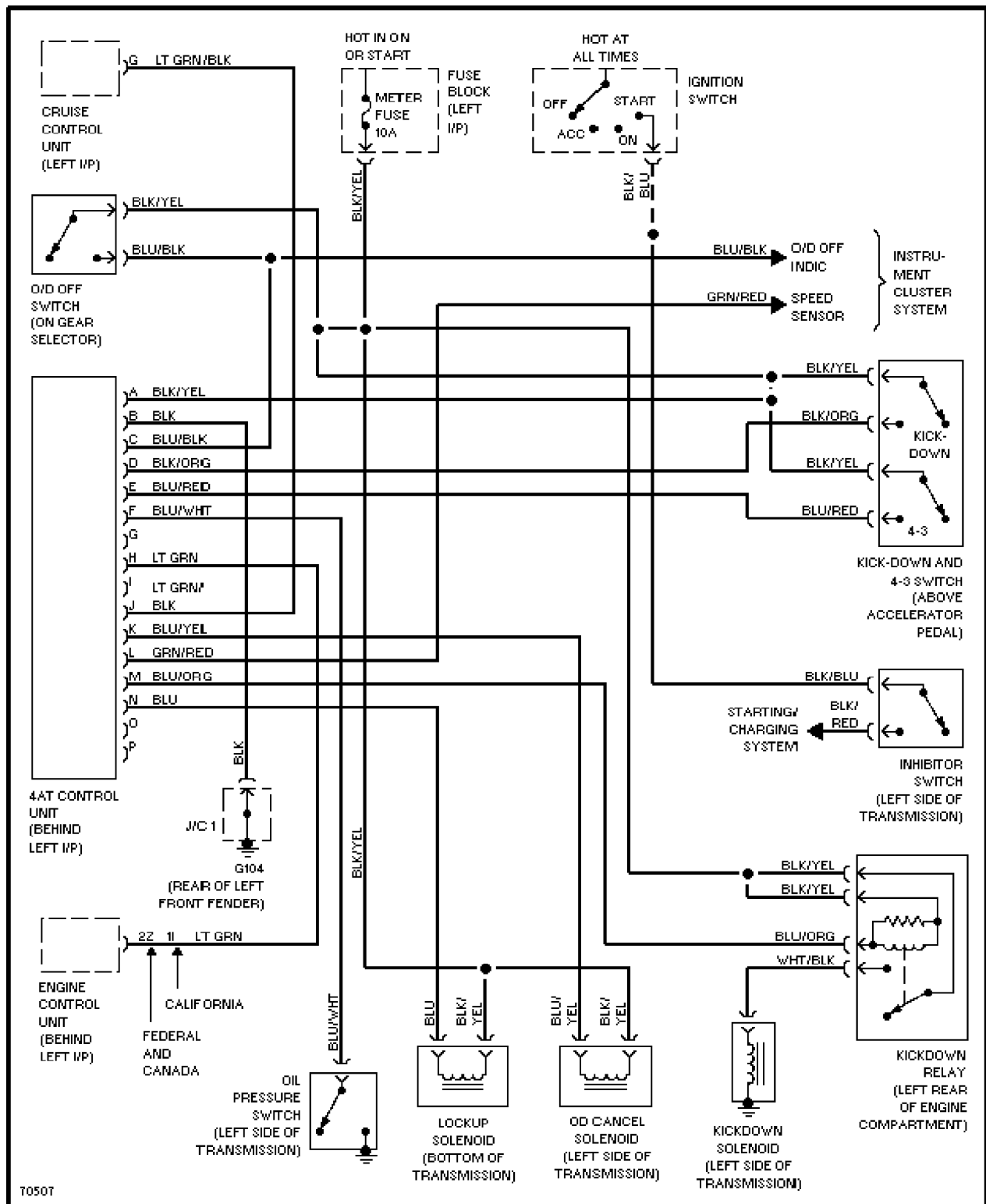


Fig. 57: Automatic Transmission Circuit Diagram (1990-93 Miata)

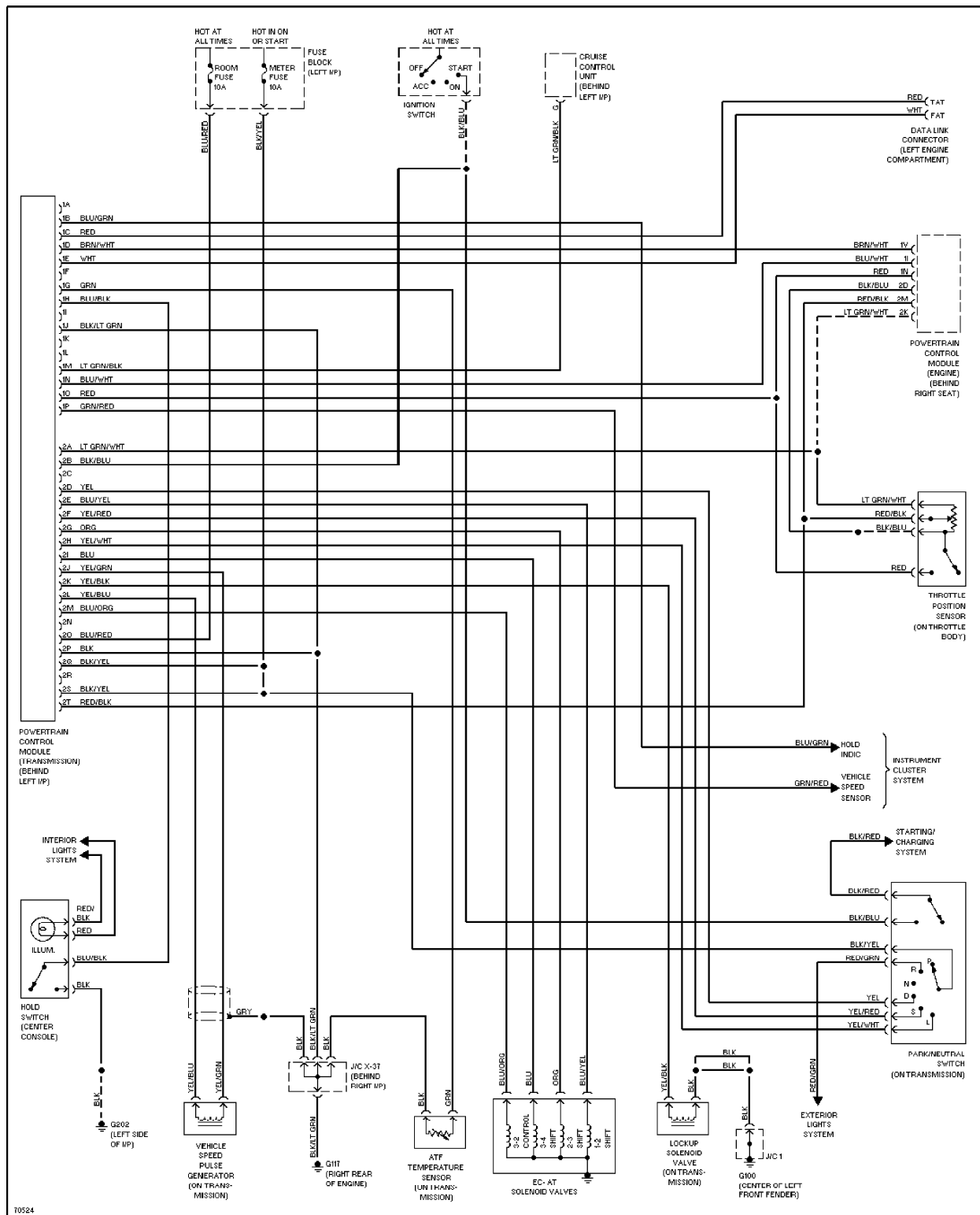


Fig. 58: Automatic Transmission Circuit Diagram (1994 Miata)