

EXHAUST BRAKE. ENGINE WARMING UP

CIRCUIT DIAGRAM (M/T-1)

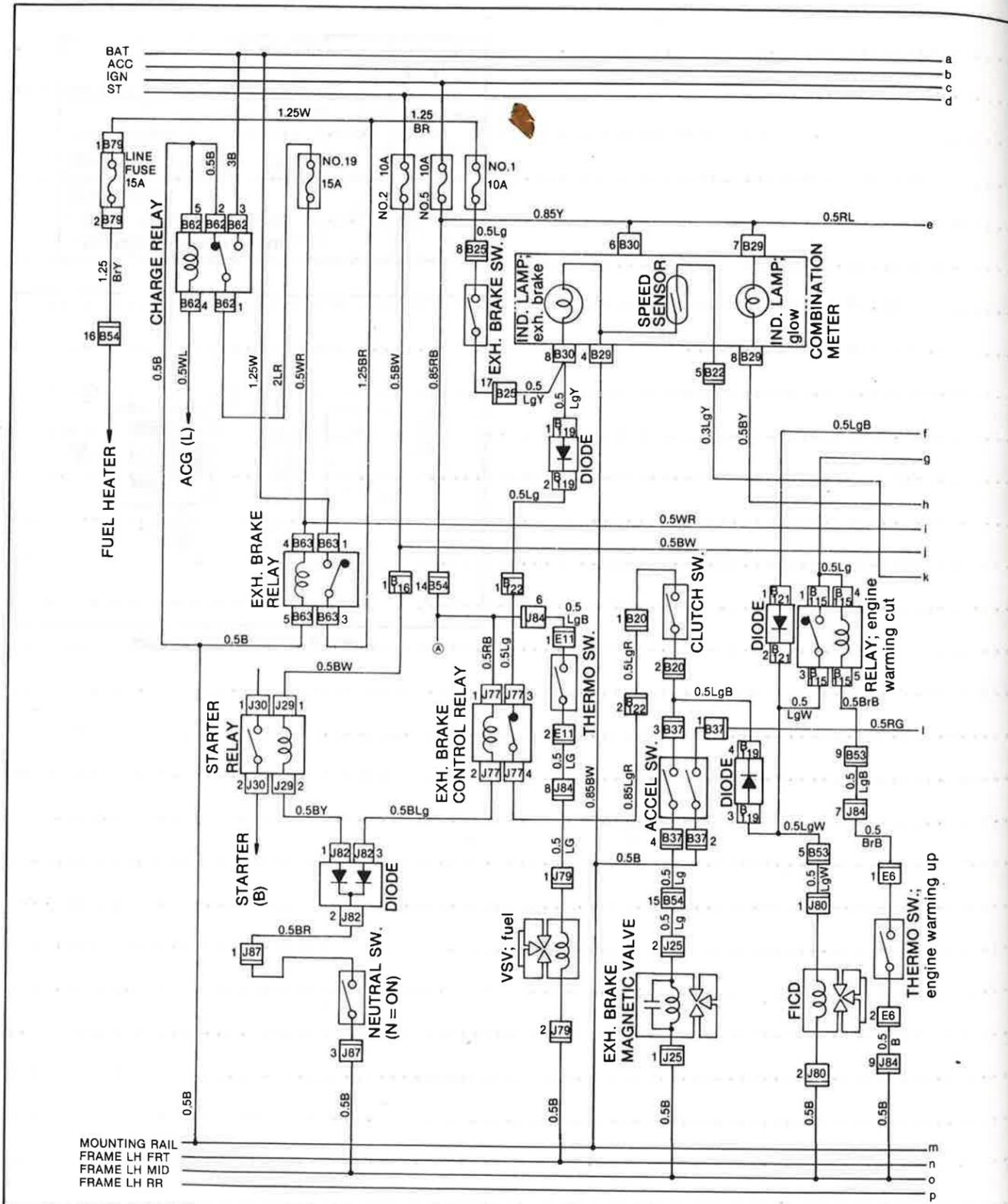


Figure 62. Circuit Diagram (M/T-1)

CIRCUIT DIAGRAM (M/T-2)

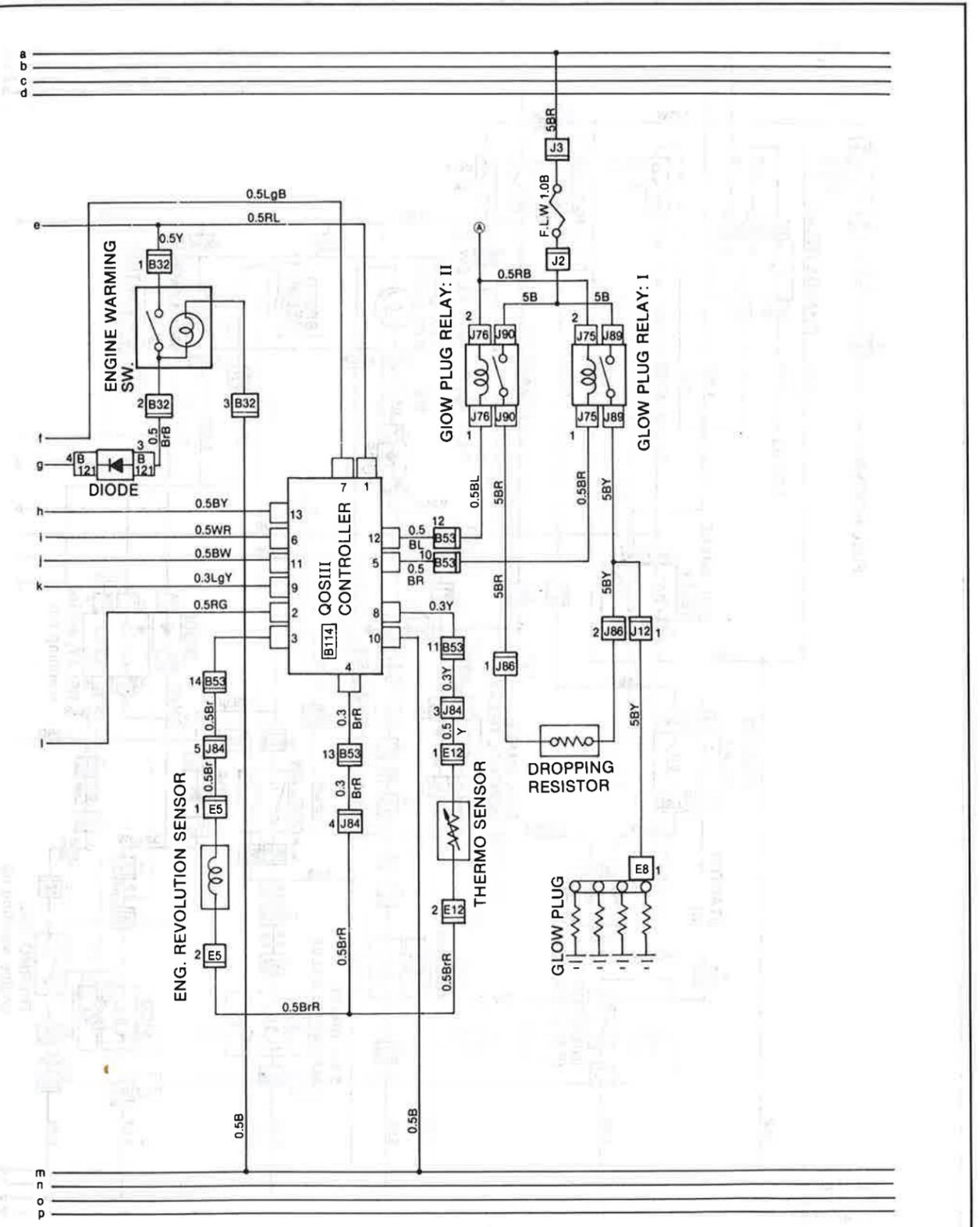


Figure 63. Circuit Diagram (M/T-2)

CIRCUIT DIAGRAM (A/T-1)

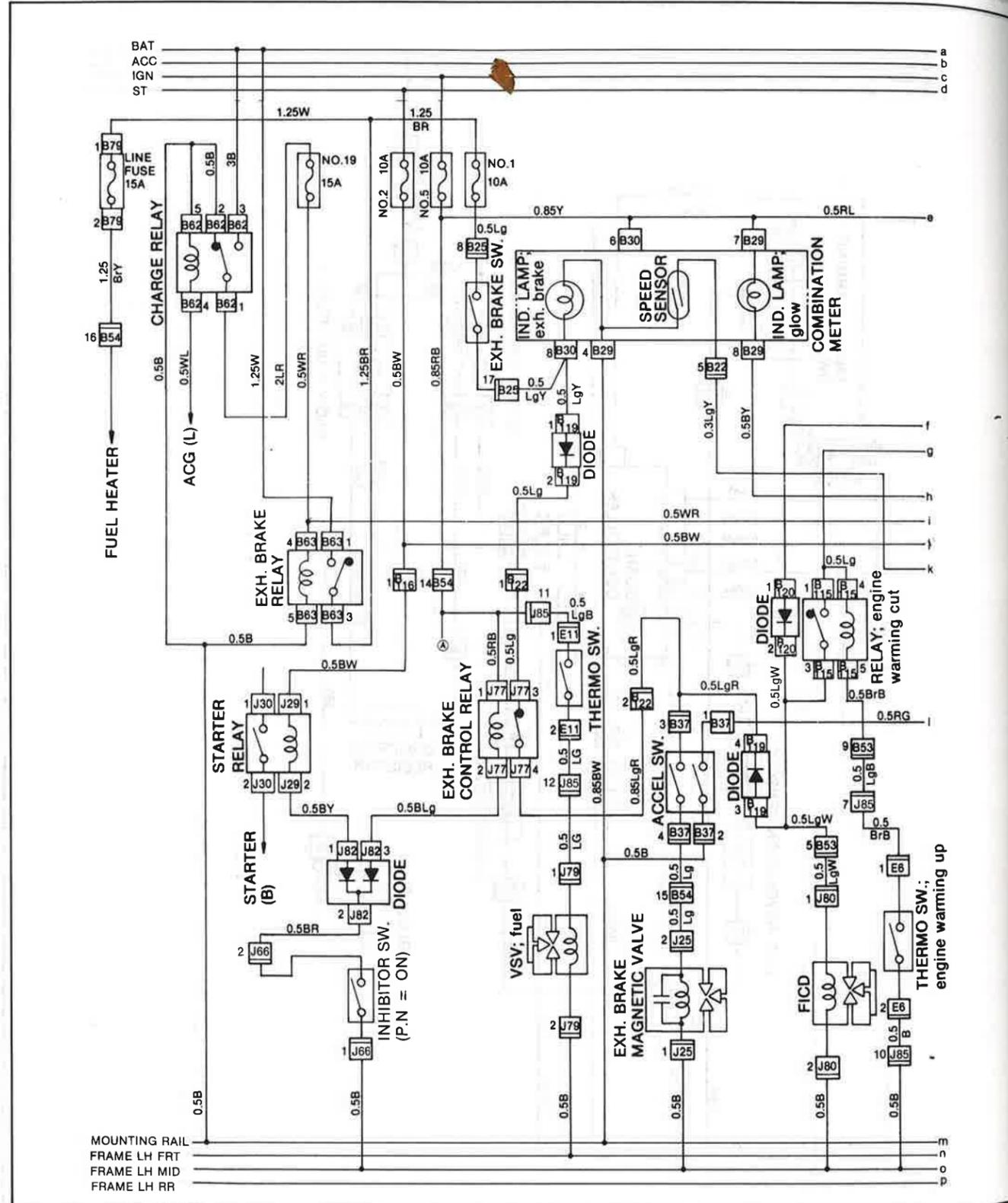


Figure 64. Circuit Diagram (A/T-1)

CIRCUIT DIAGRAM (A/T-2)

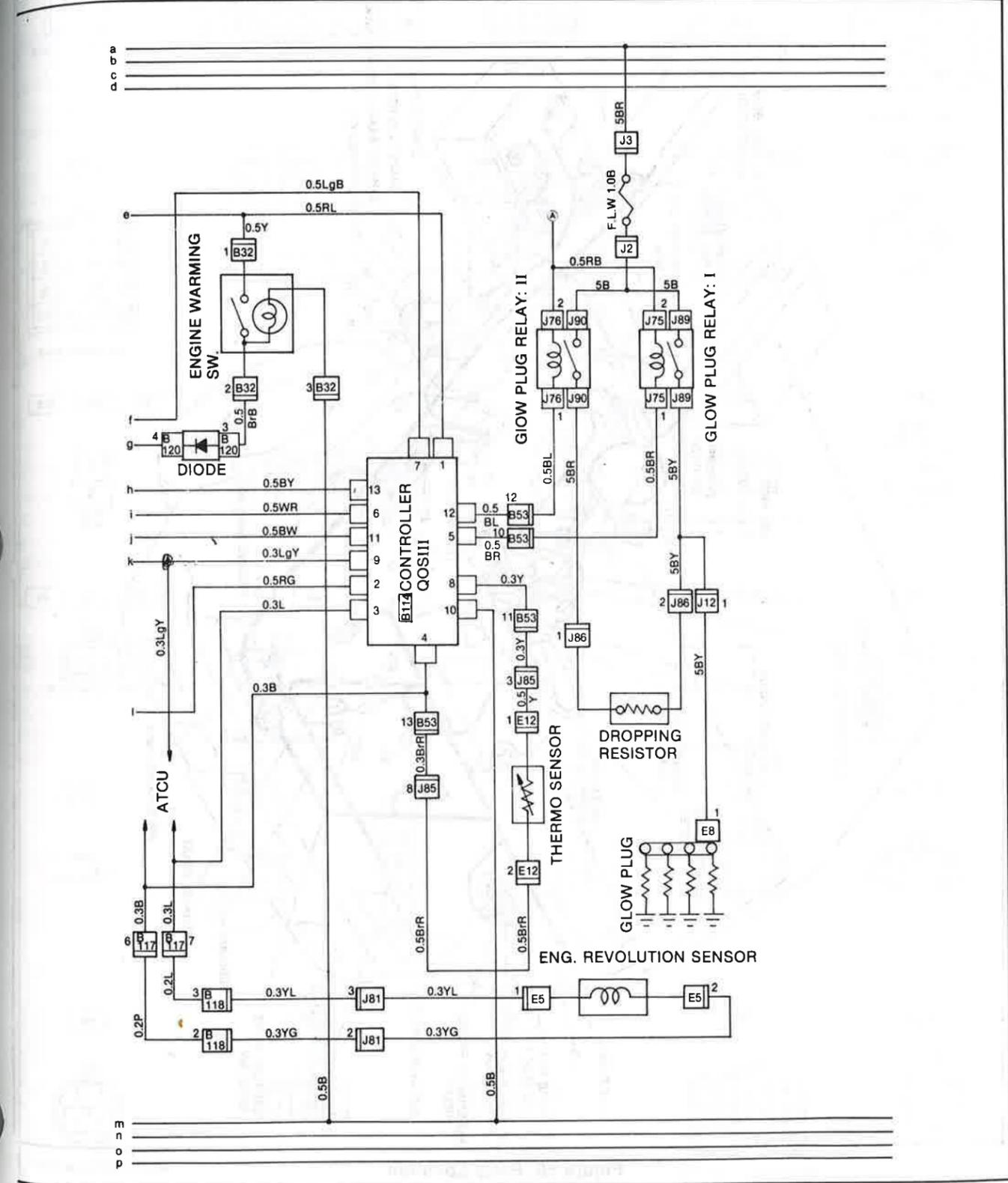


Figure 65. Circuit Diagram (A/T-2)

PARTS LOCATION

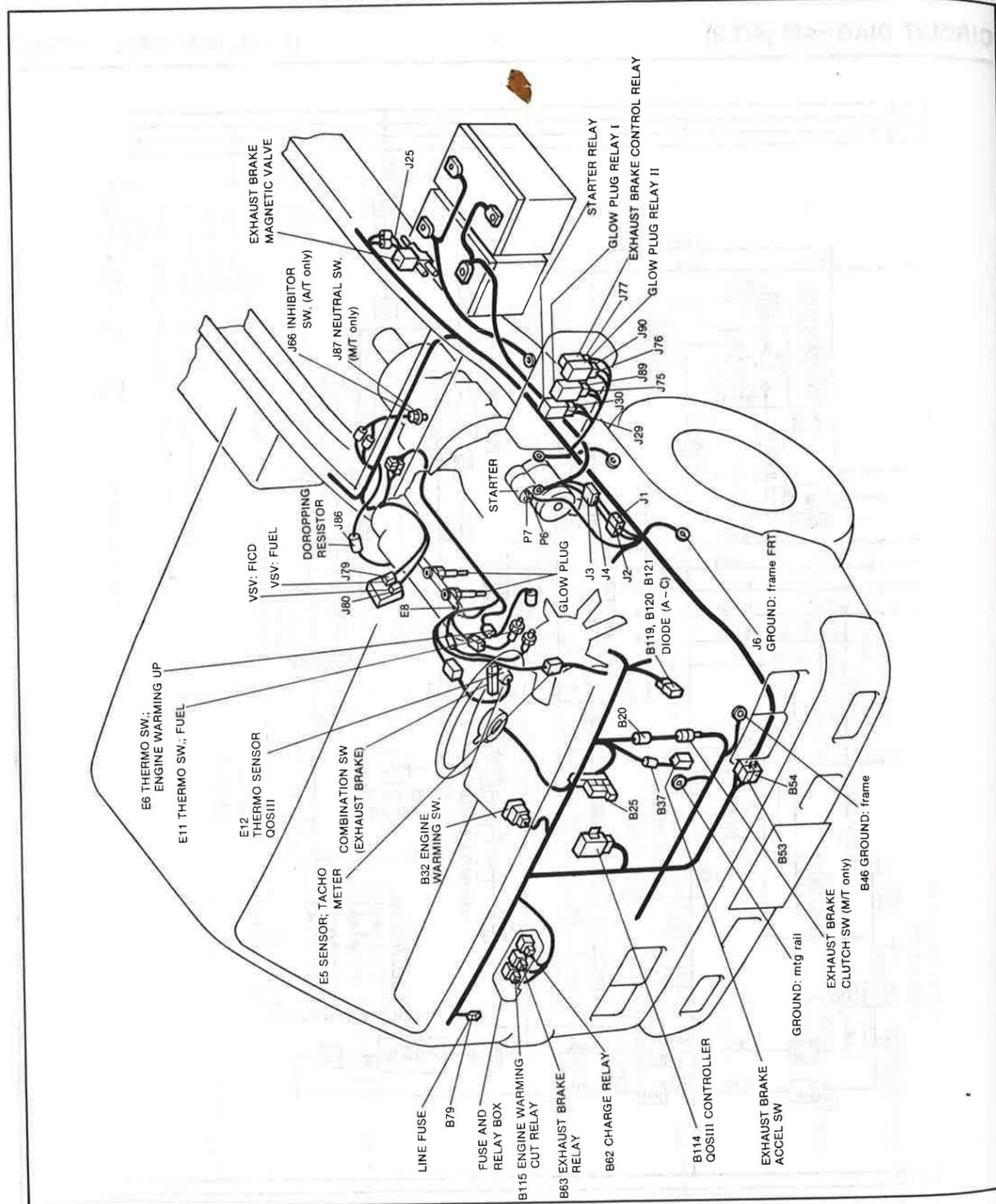


Figure 66. Parts Location

CONNECTOR CONFIGURATIONS

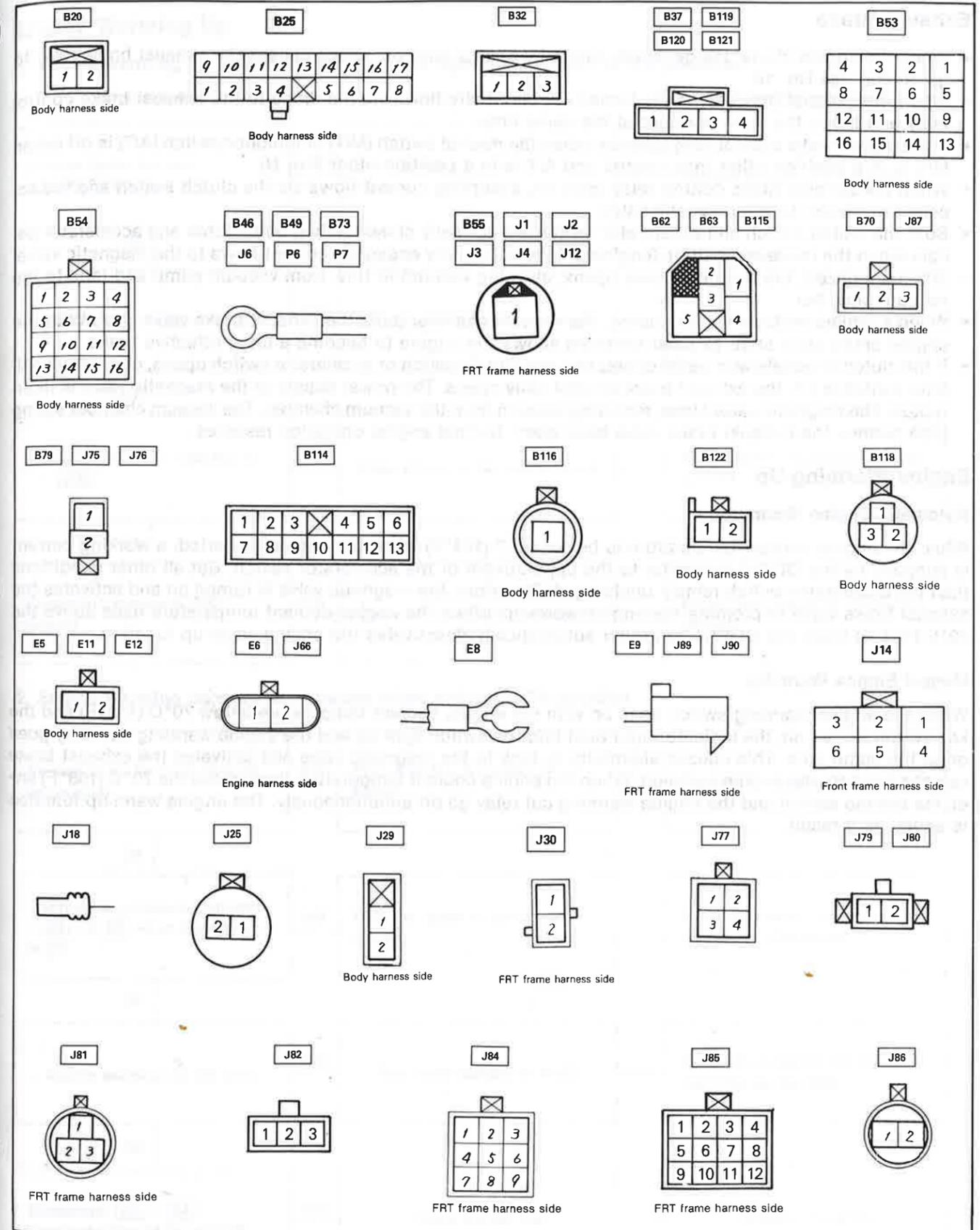


Figure 67. Connector Configurations

FUNCTION

Exhaust Brake

- When the engine starts, the generator turns the charge relay on, which causes the exhaust brake relay to go on via fuse No. 19.
- When the exhaust brake switch is turned on, electricity flows via the diode to the exhaust brake control relay and lights the indicator light at the same time.
- The exhaust brake control relay goes on when the neutral switch (M/T) or inhibitor switch (A/T) is off (when M/T is in a position other than neutral and A/T is in a position other P or N).
- When the exhaust brake control relay goes on, a working current flows via the clutch switch and the accelerator switch to the magnetic valve.
- Both the clutch switch and accelerator switch are normally closed. When both clutch and accelerator pedals are in the released position (engine at idle/clutch fully engaged), current flows to the magnetic valve.
- When energized, the magnetic valve opens, allowing vacuum to flow from vacuum pump and tank to the vacuum chamber.
- When supplied with a vacuum source, the vacuum chamber pulls the exhaust brake valve shut. With the engine brake valve shut, exhaust pressure allows the engine to become a more effective brake.
- If the clutch or accelerator pedal depressed, the clutch switch or accelerator switch opens, or neutral/inhibitor switch is on, the exhaust brake control relay opens. The power supply to the magnetic valve is interrupted. The magnetic valve closes, removing vacuum from the vacuum chamber. The vacuum chamber spring then pushes the exhaust brake valve back open. Normal engine operation resumes.

Engine Warming-Up

Automatic Engine Warm-Up

When the engine coolant temperature is below 40°C (104°F) when the engine is started, a working current is supplied by the QOSIII controller to the upstream of the accelerator switch. But all other conditions than the accelerator switch remain unchanged. Therefore, the magnetic valve is turned on and activates the exhaust brake valve to promote the engine warm-up. When the engine coolant temperature rises above the 40°C (104°F) level, the QOSIII controller automatically deactivates the engine warm-up function.

Manual Engine Warm-Up

When the engine warming switch goes on with the engine coolant temperature below 70°C (158°F) and the key switch turned on, the indicator light built into the switch lights up and the engine warming cut relay goes on at the same time. This causes electricity to flow to the magnetic valve and activates the exhaust brake valve to promote the engine warm-up. When the engine coolant temperature rises above the 70°C (158°F) level, the thermo switch and the engine warming cut relay go off simultaneously. The engine warm-up function is ended as a result.

TROUBLESHOOTING

Engine Warming Up

1. Engine warming up indicator light does not light when switch is ON position

Checkpoint	Trouble Cause	Countermeasure
Exhaust brake function (Should be operate) OK	NG Poor fuse No. 5 contact or blown	Reinstall or replace the fuse No. 5
Indicator light bulb continuity OK	NG Bulb burned out or loose contact	Replace or reinstall the bulb
Continuity between fuse No. 5 - 1 [B32] OK	NG Open circuit or bad connections	Repair open circuit or connector contact
Continuity between 3 [B32] - ground OK	NG Open circuit or bad connections	Repair open circuit or connector contact

2. Engine warming up does not operate when switch is ON position

Exhaust brake function (Should be operate) OK	NG Poor fuse No. 5 contact or blown	Reinstall or replace the fuse No. 5
Thermo sw. continuity between 1 [E6] - 2 [E6] when thermo sw. is ON OK	NG Poor sw. point or connector contact	Repair connector contact or replace the thermo sw.
Engine warming up cut relay OK	NG Poor relay contact or faulty	Reinstall or replace the engine warming up cut relay
Diode(box) [B3], [B4] continuity (Should be normal) OK	NG Diode burned out	Replace the diode

3. Automatic engine warming up does not operate when engine coolant is below 40°C (104°F)

Checkpoint	Trouble Cause	Countermeasure
Exhaust brake function (Should be operate)	NG Poor fuse No. 5 contact or blown	Reinstall or replace the fuse No. 5
OK		
Diode continuity between 1 [B120] - 2 [B120], 3 [B119] - 4 [B119] (Should be normal)	NG Diode burned out	Replace the diode
OK		
QOS III controller	NG Poor controller contact or faulty	Reinstall or replace the QOSIII controller

Exhaust Brake

1. Exhaust brake does not operate and indicator light not turns ON

Fuse No. 19	NG Poor fuse contact or blown	Reinstall or replace the fuse No. 19
OK		
Exhaust brake relay	NG Poor relay contact or faulty	Reinstall or replace the exhaust brake relay
OK		
Fuse No. 1	NG Poor fuse contact or blown	Reinstall or replace the fuse No. 1
OK		
Exhaust brake sw. continuity between 8 [B25] - 17 [B25] when sw is ON	NG Poor sw. point or connector contact	Repair connector contact or replace the exhaust brake sw

2. Exhaust brake does not operate but indicator light turns ON

Checkpoint	Trouble Cause	Countermeasure
Diode continuity between 1 [B119] - 2 [B119], 3 [J82] - 2 [J82] (Should be normal)	NG Diode burned out	Replace the diode
OK		
Fuse No. 5	NG Poor fuse contact or blown	Reinstall or replace the fuse No. 5
OK		
Neutral sw (M/T) / Inhibitor sw (A/T) continuity between 1 [J87] - 3 [J87] / 2 [J66] - 1 [J66]	NG Poor sw point or connector contact	Repair connector contact or replace the sw
OK		
Accel sw continuity between 1 [B37] - 3 [B37] when accel sw is ON	NG Poor sw point or connector contact	Repair connector contact or replace the accel sw
OK		
Clutch sw continuity between 1 [B20] - 2 [B20] when clutch sw is ON	NG Poor sw point or connector contact	Repair connector contact or replace the clutch sw
OK		
Magnetic valve continuity between 1 [J25] - 2 [J25]	NG Poor connector contact or defect the magnetic valve	Repair connector contact or replace the magnetic valve
OK		
Continuity between 2 [J25] ground	NG Open circuit or bad connections	Repair open circuit or connector contact

3. Exhaust brake does not operate but circuit is normal

Exhaust brake valve	NG Brake valve seized or defective	Repair or replace the brake valve
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ON-VEHICLE SERVICE

Exhaust Brake Switch

Remove or Disconnect
Refer to "STARTING • ENGINE STOP" of "SYSTEM REPAIR" for combination switch removal procedure.

Inspect (Figure 68)
Inspect the switch continuity by following table.

Terminal No.	17	8
SW position		
ON	○—○	○—○
OFF	○	○

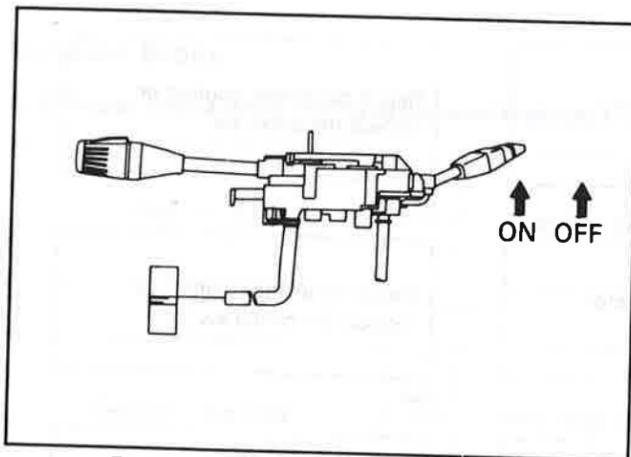


Figure 68. Exhaust Brake Switch

Install or Connect
Refer to "STARTING • ENGINE STOP" of "SYSTEM REPAIR" for combination switch installation procedure.

Exhaust Brake Relay

Inspect (Figure 69)
Check continuity between terminals.

Terminal No.	①	②	③	④	⑤
Condition					
Continuity	○—○				
Resistance approx. 80Ω					○—○
Continuity when applying battery voltage between ④ and ⑤	○—○	○—○			

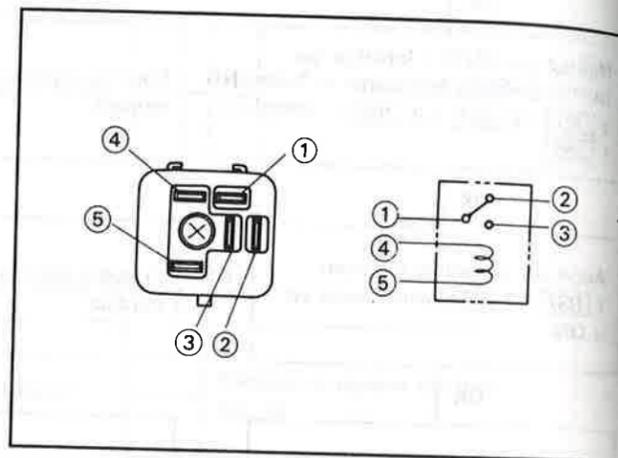


Figure 69. Exhaust Brake Relay

Exhaust Brake Control Relay

Inspect (Figure 70)
Check continuity between terminals.

Terminal No.	①	②	③	④
Condition				
Resistance approx. 80Ω	○—○			
Continuity when applying battery voltage between ① and ②				○—○

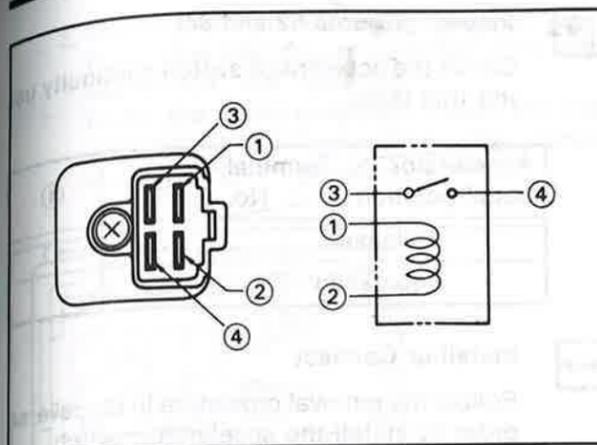


Figure 70. Exhaust Brake Control Relay

Neutral Switch

Refer to "STARTING • ENGINE STOP" in this section.

Inhibitor Switch

Refer to "7A2 INHIBITOR SWITCH" in thermo manual.

Clutch Switch

Remove or Disconnect (Figure 71)

1. Remove the return spring.
2. Disconnect the connector.
3. Remove the clutch switch (1).

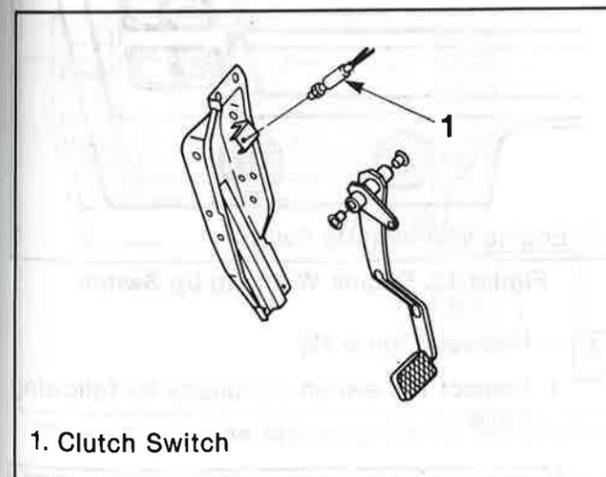


Figure 71. Clutch Switch

Inspect (Figure 72)
Check the clutch switch operate and continuity.

Max. stroke	4 mm (0.16 in.)
Operating stroke (OFF)	2.0—2.8 mm (0.07—0.11 in.)

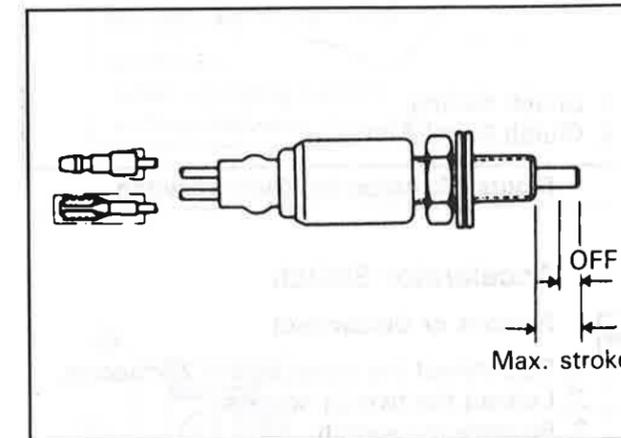


Figure 72. Clutch Switch Specification

Install or Connect

1. Clutch switch to bracket.
2. Temporary tighten the lock nut.
3. Adjust the clutch switch as follows.
4. Tighten the lock nut.

Tighten

- Lock nut to 18 N•m (14 ft.lbs.).

Adjust
The clutch switch must be adjusted so that when the clutch pedal is released, it closes the switch but does not completely depress the switch plunger. If the plunger is completely depressed by the pedal, switch damage may result.

- Fully depress the switch plunger.
- Adjust the switch in its bracket until 0.5 to 1 mm (0.02 to 0.04 inch) clearance exists between the fully depressed switch plunger and the contact area on the clutch lever (A) (figure 73).
- The switch should exhibit an open circuit (no continuity) when the clutch pedal is depressed approximately 0.75 mm (0.03 inch). The test may be made with a test light or an ohmmeter connected to the switch plug connector.

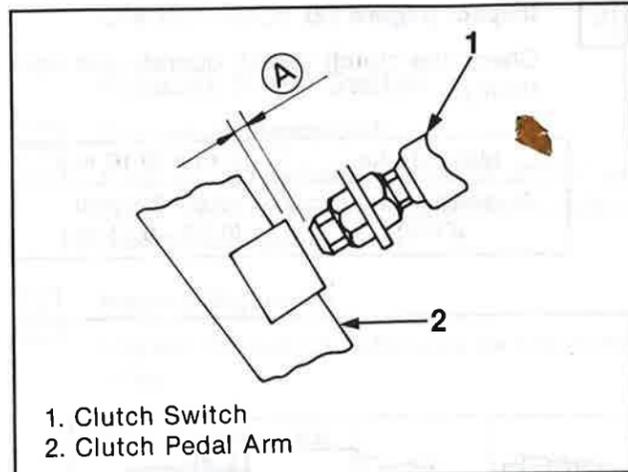


Figure 73. Adjusting Clutch Switch

Accelerator Switch



Remove or Disconnect

1. Disconnect the accel switch connector.
2. Loosen the two (2) screws.
3. Remove the switch.

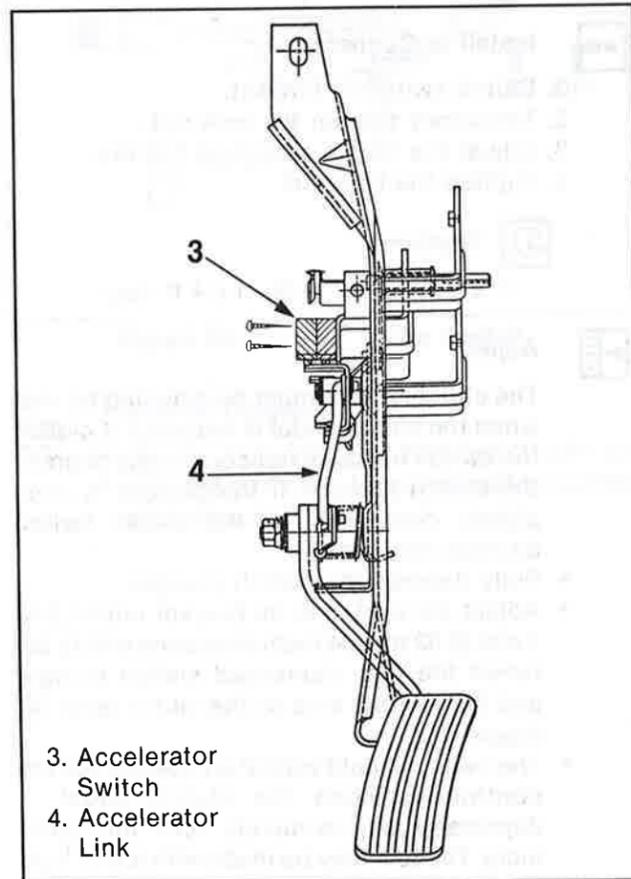


Figure 74. Accelerator Switch Removal



Inspect (Figures 62 and 64)

Check the accelerator switch continuity using this table.

Accelerator pedal position	Terminal No.	③	④
Released		○	○
Depressed		○	



Install or Connect

Follow the removal procedure in the reverse order to install the accelerator switch.

Engine Warming-Up Switch



Remove or Connect

1. Insert a screw driver between switch (5) and meter cluster to take out the switch.

NOTE: Take care not to scratch the meter cluster.

2. Disconnect the connector.

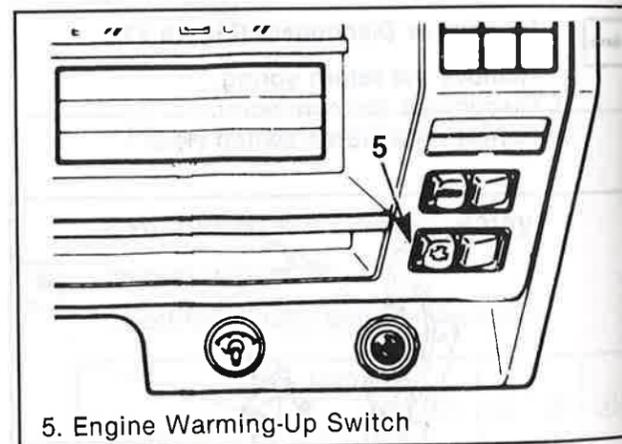


Figure 75. Engine Warming-Up Switch



Inspect (Figure 76)

1. Inspect the switch continuity by following table.

Terminal	①	②	③
SW position			
ON	○	○	○
OFF		○	○

2. Make sure the indicator light turns on, when the engine warming up switch is "ON" with key switch "ON" position. Under the above condition, check the indicator light is "ON" even if the exhaust brake switch is "OFF" position.

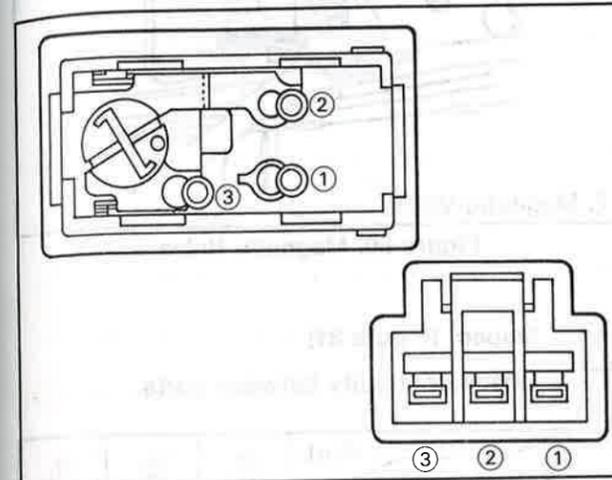


Figure 76. Connector of Switch



Install or Connect

1. Connect the connector.
2. Align the switch to the meter cluster hole.
3. Push the switch until a distinct click is heard.

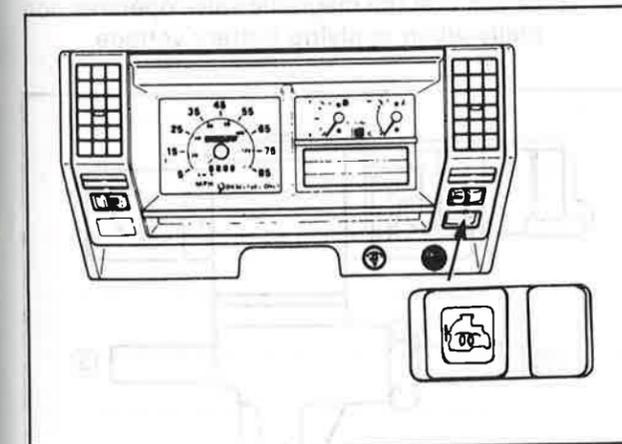


Figure 77. Engine Warming Switch Installation



Pay close attention to the important points mentioned in the following paragraphs.

Connector

Be absolutely sure that the warming up switch connector is securely connected. This will prevent poor contact and an open circuit.

Engine Warming Cut Relay



Inspect

Check the continuity between terminals.

Condition	Terminal No.	①	②	③	④	⑤
	Continuity		○	○		
Resistance approx. 80Ω					○	○
Continuity when applying battery voltage between ④ and ⑤		○	○			

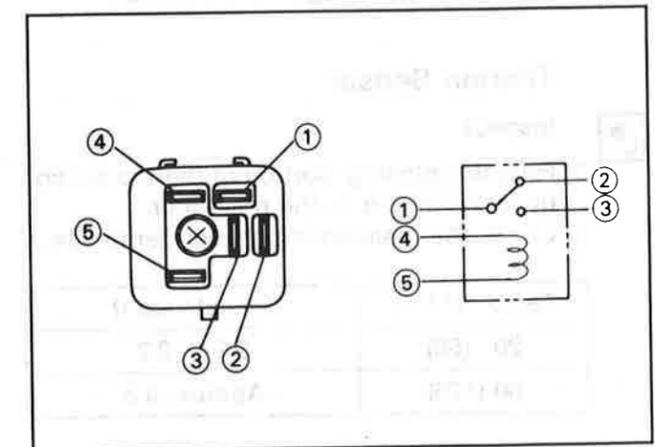


Figure 78. Engine Warming Cut Relay

Thermo Switch



Inspect (Figure 79)

1. Heat the sensing portion of thermo switch by immersing it in the hot water.
2. Make sure there is no continuity when the water temperature is approximately 158°F (70°C).
3. Make sure there is continuity when cooling it down to approximately 145°F (63°C).
4. LEAKAGE INSPECTION

Submerge the thermo switch in the hot water at the temperature around 176 - 196°F (80 - 90°C), for one and half second, and check that there is no continuous air bubble from the thermo switch.

HEADLIGHT

CIRCUIT DIAGRAM

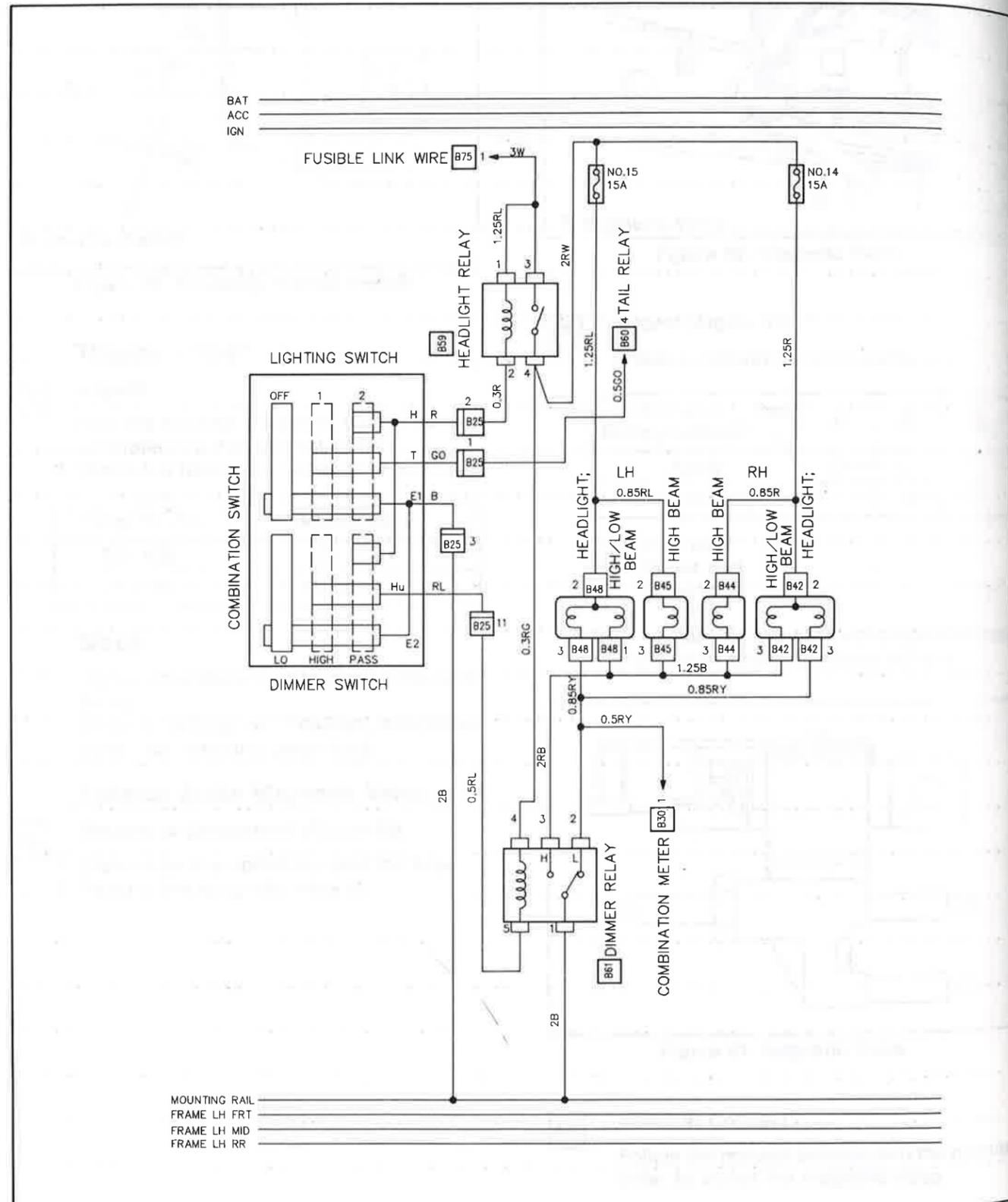


Figure 82. Circuit Diagram

PARTS LOCATION

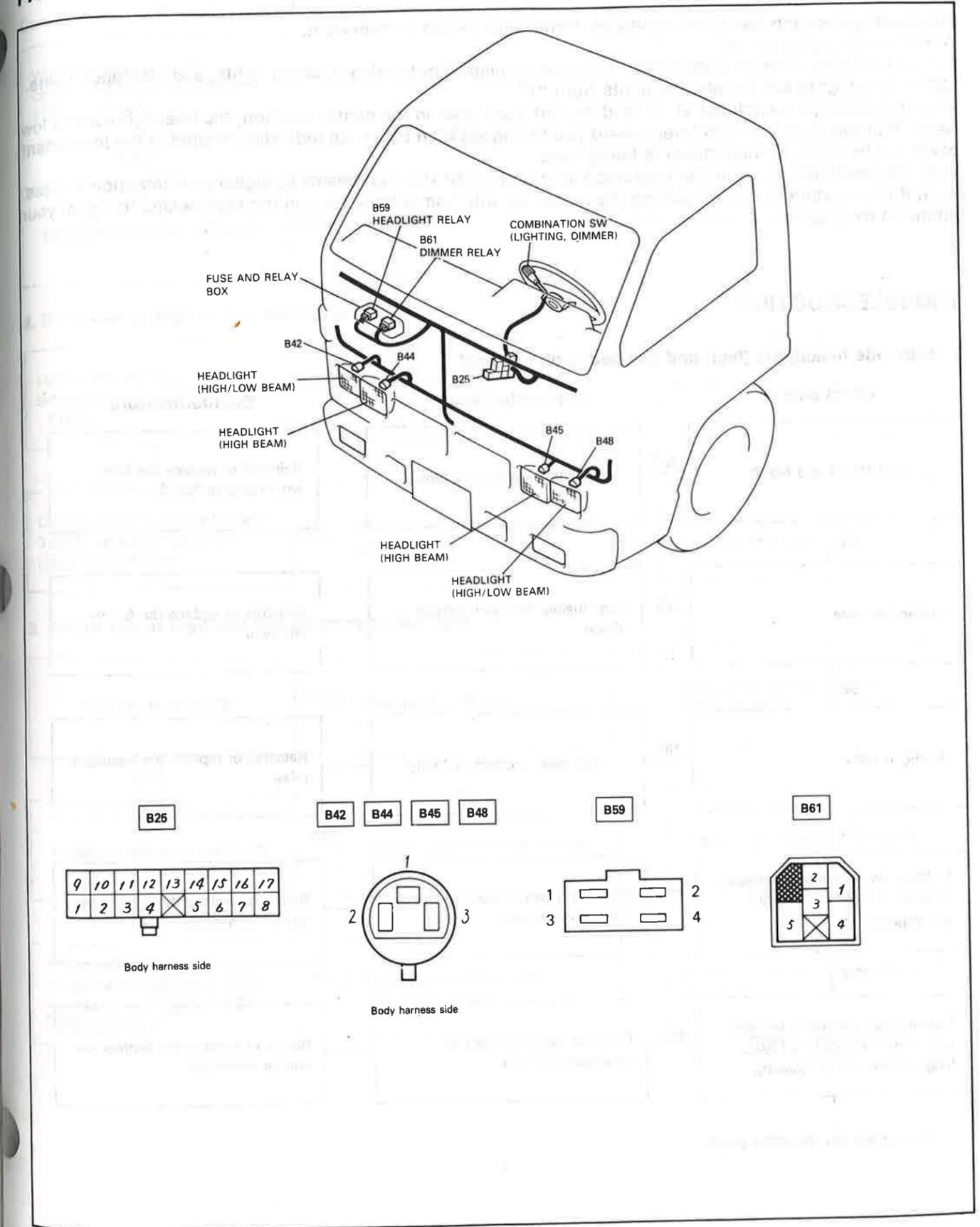


Figure 83. Parts Location