

# STARTER

## 1998 Toyota Supra

1998 STARTING & CHARGING SYSTEMS  
Toyota - Starters

Lexus; LX470  
Toyota; Avalon, Camry, Celica, Corolla, Land Cruiser, RAV4,  
Sienna, Supra, Tacoma, Tercel, T100 & 4Runner

### DESCRIPTION & OPERATION

All models, except Tercel, use Nippondenso 4-brush, solenoid-actuated, reduction gear type starters, equipped with over-running clutches. The brush holder assembly retains 4 brushes and springs in the starter housing.

Reduction gear type starters contain an integral solenoid attached to drive housing, a reduction idler gear and bearing installed into starter housing, and a clutch drive assembly. The clutch drive assembly is mounted to starter housing and is driven by the reduction idler gear from armature shaft. The brush holder assembly retains 4 brushes and 4 springs in the end cover of field frame housing.

Tercel models use a planetary type starter. Planetary gear type starters contain a clutch pinion drive assembly mounted in-line with armature shaft. The clutch pinion drive assembly is mounted onto drive end of planetary gear carrier shaft which is driven by armature shaft. The planetary gears increase torque from armature to turn clutch pinion drive assembly.

All models use a starter relay to energize starter. Manual transmission vehicles use a clutch start switch and automatic transmission vehicles use a park/neutral switch to energize starter relay. On models with theft deterrent system, theft deterrent system ECU provides ground for starter relay.

Tacoma, T100 and 4Runner models with 4WD and M/T use an optional clutch start cancel switch. When this switch is turned on, it will allow engine to be started without depressing clutch pedal when transmission is in Neutral. This allows vehicle to be driven out of difficult situations by cranking the engine with the clutch engaged.

### TROUBLE SHOOTING

NOTE: See TROUBLE SHOOTING - BASIC PROCEDURES article in the GENERAL TROUBLE SHOOTING section.

1) If a no-start condition exists and battery is known to be good, connect test light or voltmeter between starter solenoid terminal No. 50 and ground. See Fig. 9, 10 or 11.

2) Turn ignition switch to START position. If test light or voltmeter does not indicate voltage, check main fusible links and large ampere main fuses in engine compartment relay box. If fusible links and fuses are okay, see IGNITION SWITCH CONTINUITY TEST and/or STARTER RELAY TEST under ON-VEHICLE TESTING.

### ON-VEHICLE TESTING

#### \* PLEASE READ THIS FIRST \*

NOTE: Before testing, ensure battery is fully charged, battery cables and terminal ends are tight and clean, and engine grounds are secure.

## CLUTCH START SWITCH TEST

Switch is located above clutch pedal on bracket. Disconnect wiring harness connector from switch. Connect ohmmeter between clutch start switch terminals. Depress clutch pedal. If continuity does not exist, adjust or replace clutch start switch. If continuity exists, switch is functioning properly.

## CLUTCH START CANCEL SWITCH TEST

Tacoma & 4Runner

1) Remove clutch start cancel switch. Switch is located on left side of instrument panel. Connect negative lead of ohmmeter to terminal No. 1. See Fig. 1. Check for continuity between clutch start cancel switch terminals No. 1 and 2 and terminals No. 1 and 3. If continuity does not exist, go to next step. If continuity exists, replace clutch start cancel switch.

2) Check for continuity between clutch start cancel switch terminals No. 2 and 3. If continuity exists, replace clutch start cancel switch. If continuity does not exist, check operation of switch by applying battery voltage to switch. Using jumper wires, connect positive battery lead to terminal No. 3 and negative battery lead to terminal No. 1 of clutch start cancel switch.

3) Connect ohmmeter positive lead to terminal No. 2 and negative lead to terminal No. 1 of clutch start cancel switch. Continuity should not exist. Depress clutch start cancel switch. Continuity should exist and indicator light on clutch start cancel switch should be on. If switch does not test as specified, replace switch.

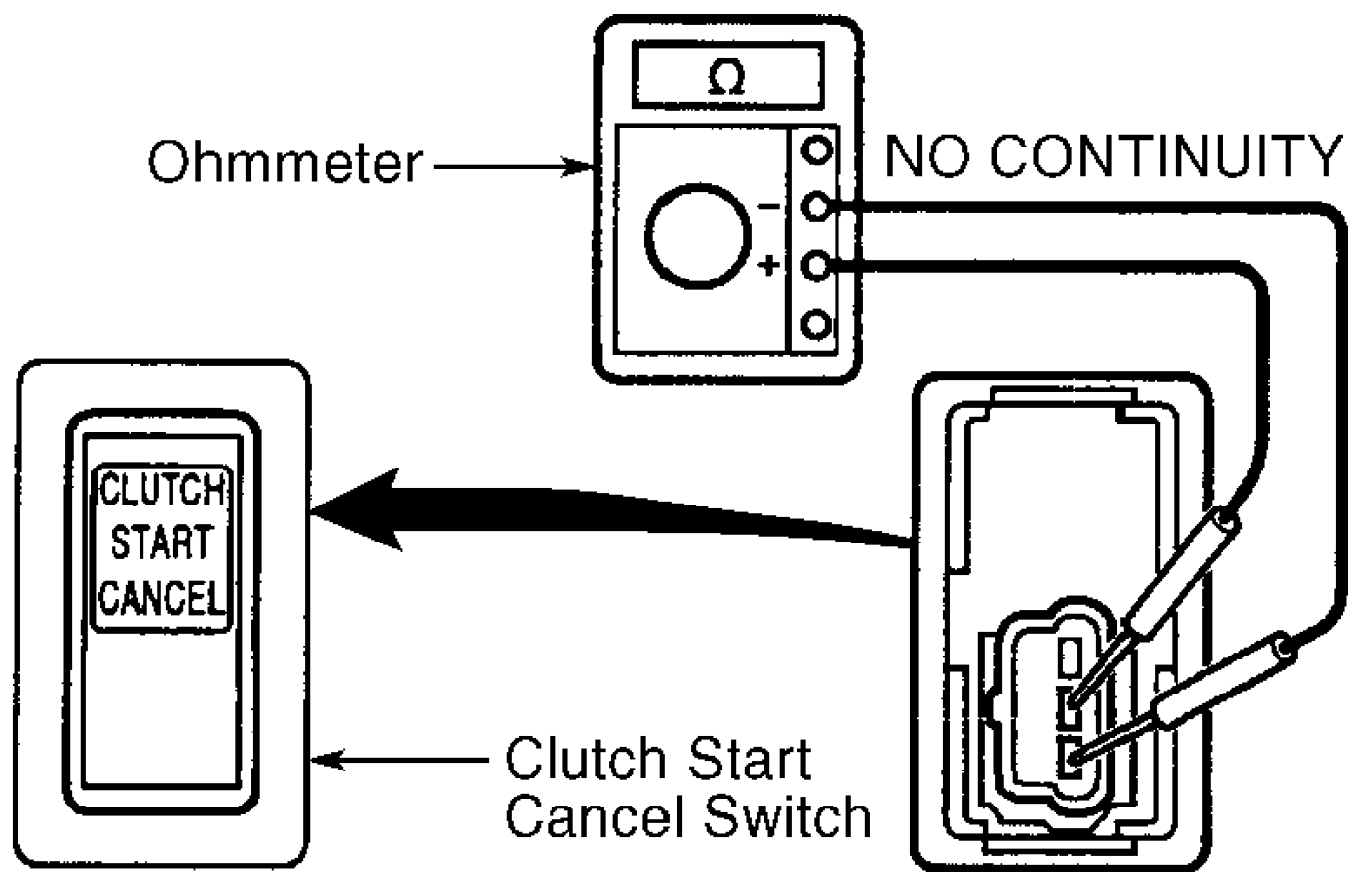
T100

1) Locate switch on left side of instrument panel. Remove left lower instrument panel to access switch connector. Disconnect wiring harness connector from switch pigtail connector. See Fig. 2.

2) Connect negative lead of ohmmeter to terminal No. 1. Check for continuity between clutch start cancel switch connector terminals No. 1 and 2 and terminals No. 1 and 3. If continuity does not exist, go to next step. If continuity exists, replace clutch start cancel switch.

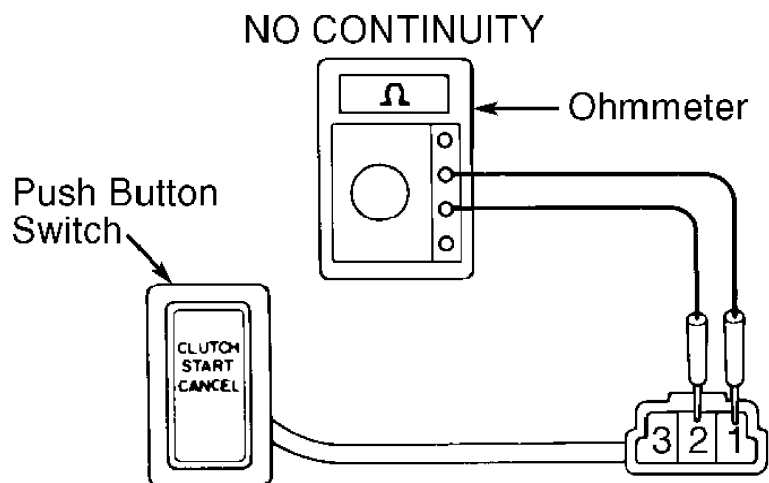
3) Check for continuity between clutch start cancel switch connector terminals No. 2 and 3. If continuity exists, replace clutch start cancel switch. If continuity does not exist, check operation of switch by applying battery voltage to switch. Using jumper wires, connect positive battery lead to terminal No. 3 and negative battery lead to terminal No. 1 of clutch start cancel switch connector.

4) Connect ohmmeter positive lead to terminal No. 2 and negative lead to terminal No. 1 of clutch start cancel switch connector. Continuity should not exist. Depress clutch start cancel switch. Continuity should exist and indicator light on clutch start cancel switch should be on. If switch does not test as specified, replace switch.



98C10217

Fig. 1: Clutch Start Cancel Switch Connector ID (Tacoma & 4Runner)  
 Courtesy of Toyota Motor Sales, U.S.A., Inc.



93F02153

Fig. 2: Clutch Start Cancel Switch Connector ID (T100)  
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

#### IGNITION SWITCH CONTINUITY TEST

**WARNING:** Deactivate air bag system before performing any service operation. See appropriate AIR BAG RESTRAINT SYSTEMS article in the ACCESSORIES & EQUIPMENT section.

#### Celica & Supra

1) Disconnect negative battery cable. Remove driver's lower instrument panel cover. Remove upper and lower steering column covers if needed. Locate ignition switch wiring harness 8-pin connector. See Fig. 3.

2) With ignition switch in LOCK position, there should be no continuity between any terminals. With ignition switch in ACC position, there should be continuity between terminals No. 5 and 7. With ignition switch in ON position, there should be continuity between terminals No. 2 and 3, and between terminals No. 4, 5 and 7. With ignition switch in START position, there should be continuity between terminals No. 1, 2 and 3, and between terminals No. 4, 7 and 8. If continuity is not as specified, replace switch.

#### T100

1) Disconnect negative battery cable. Remove driver's lower instrument panel cover. Remove upper and lower steering column covers if needed. Locate ignition switch wiring harness 8-pin connector. See Fig. 3.

2) With ignition switch in LOCK position, there should be no continuity between any terminals. With ignition switch in ACC position, there should be continuity between terminals No. 2 and 3. With ignition switch in ON position, there should be continuity between terminals No. 1, 2 and 3, and between terminals No. 7 and 8.

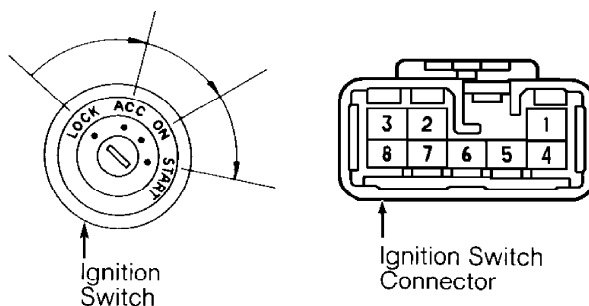
3) With ignition switch in START position, there should be continuity between terminals No. 1, 3 and 6, and between terminals No. 7 and 8. If continuity is not as specified, replace switch.

#### All Others

1) Disconnect negative battery cable. Remove driver's lower instrument panel cover. Remove upper and lower steering column covers if needed. Locate ignition switch wiring harness 8-pin connector. See Fig. 4.

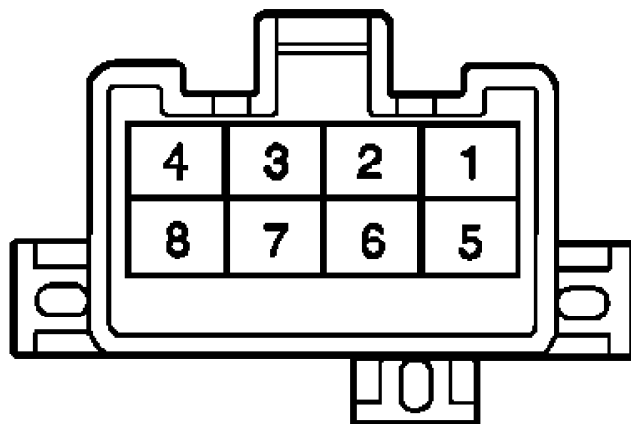
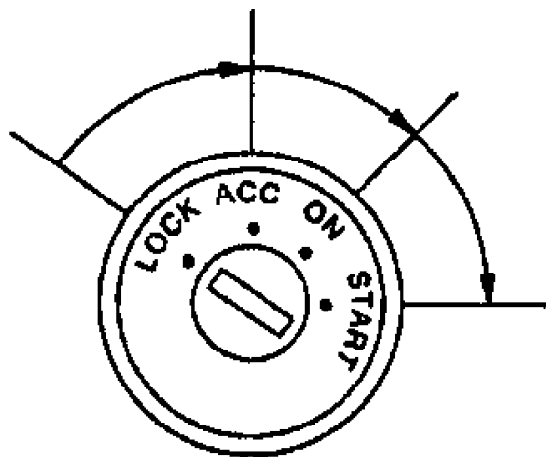
2) With ignition switch in LOCK position, there should be no continuity between any terminals. With ignition switch in ACC position, there should be continuity between terminals No. 2 and 3. With ignition switch in ON position, there should be continuity between terminals No. 2, 3 and 4, and between terminals No. 6 and 7.

3) With ignition switch in START position, there should be continuity between terminals No. 1, 2 and 4, and between terminals No. 6, 7 and 8. If continuity is not as specified, replace switch.



93G82269

Fig. 3: Ignition Switch 8-Pin Connector (Celica, Supra & T100)  
Courtesy of Toyota Motor Sales, U.S.A., Inc.



96D06126

Fig. 4: Ignition Switch 8-Pin Connector (All Others)  
Courtesy of Toyota Motor Sales, U.S.A., Inc.

## PARK/NEUTRAL SWITCH

**NOTE:** If vehicle will not start with shift lever in Park/Neutral position, verify correct park/neutral switch adjustment. If park/neutral switch is correctly adjusted, verify switch continuity.

### Adjusting Park/Neutral Switch

Locate park/neutral switch at transmission or transaxle. Loosen park/neutral position switch bolt(s) and verify shift selector is in "N" position. Align switch shaft groove with neutral basic line on switch. Hold switch in position and tighten bolt(s) to specification. See TORQUE SPECIFICATIONS.

### Park/Neutral Switch Continuity Check

Disconnect electrical connector from park/neutral switch at transmission or transaxle. Using ohmmeter, check for continuity at specified terminals with gearshift in proper positions. See Fig. 5 or 6. See appropriate PARK/NEUTRAL SWITCH SPECIFICATIONS table. If continuity is not as specified, replace switch.

## PARK/NEUTRAL SWITCH SPECIFICATIONS

PARK/NEUTRAL SWITCH SPECIFICATIONS TABLE (4-CYLINDER) TABLE

Application & Gearshift Position	Continuity Between Terminals No.
Camry, Celica, Corolla & RAV4	
Park	5 & 6, 2 & 7
Reverse	2 & 8
Neutral	5 & 6, 2 & 9
Drive	2 & 10
2	2 & 3
Low	2 & 4
Tacoma, T100 & 4Runner	
Park	5 & 6, 4 & 7
Reverse	4 & 8

Neutral	.....	5 & 6, 4 & 10
Drive	.....	4 & 9
2	.....	4 & 2
Low	.....	4 & 3
Tercel		
Park	.....	2 & 3, 1 & 6
Reverse	.....	5 & 6
Neutral	.....	2 & 3, 6 & 7
Drive	.....	6 & 8
2	.....	6 & 9
Low	.....	6 & 4

PARK/NEUTRAL SWITCH SPECIFICATIONS TABLE (6-CYLINDER) TABLE

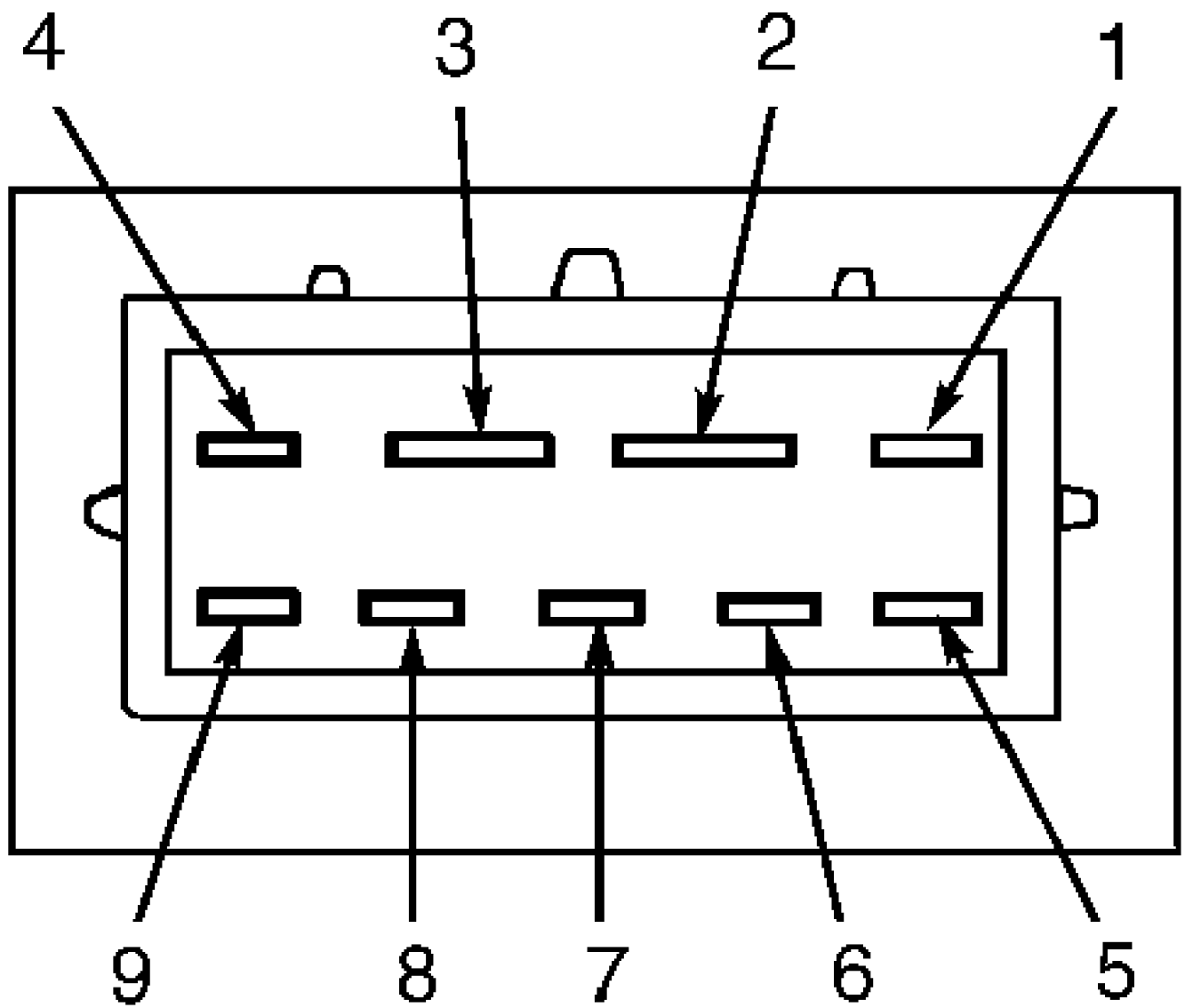
Application & Gearshift Position	Continuity Between Terminals No.
Supra	
Park	..... 5 & 6, 4 & 7
Reverse	..... 4 & 8
Neutral	..... 5 & 6, 4 & 10
Drive	..... 4 & 9
2	..... 4 & 2
Low	..... 4 & 3

PARK/NEUTRAL SWITCH SPECIFICATIONS TABLE (V6) TABLE

Application & Gearshift Position	Continuity Between Terminals No.
Avalon, Camry & Sienna	
Park	..... 5 & 6, 2 & 7
Reverse	..... 2 & 8
Neutral	..... 5 & 6, 2 & 9
Drive	..... 2 & 10
2	..... 2 & 3
Low	..... 2 & 4
Tacoma, T100 & 4Runner	
Park	..... 5 & 6, 4 & 7
Reverse	..... 4 & 8
Neutral	..... 5 & 6, 4 & 10
Drive	..... 4 & 9
2	..... 4 & 2
Low	..... 4 & 3

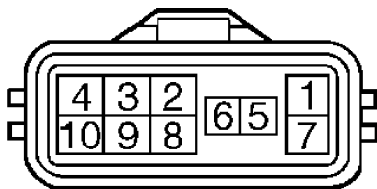
PARK/NEUTRAL SWITCH SPECIFICATIONS TABLE (V8) TABLE

Application & Gearshift Position	Continuity Between Terminals No.
Land Cruiser & Lexus LX470	
Park	..... 5 & 6, 4 & 7
Reverse	..... 4 & 8
Neutral	..... 5 & 6, 4 & 10
Drive	..... 4 & 9
2	..... 2 & 4
Low	..... 3 & 4



94J45921

Fig. 5: Identifying Park/Neutral Switch Terminals (Tercel)  
 Courtesy of Toyota Motor Sales, U.S.A., Inc.



G94E45918

Fig. 6: Identifying Park/Neutral Switch Terminals (All Others)  
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

STARTER RELAY TEST

# Land Cruiser & Lexus LX470

1) Locate and remove starter relay. Starter relay is marked "ST". See STARTER RELAY LOCATION table. Using ohmmeter, verify continuity exists between relay terminals No. 3 and 4. See STEP 1. See Fig. 7. Continuity should not exist between terminals No. 1 and 2. If continuity is not as specified, replace relay.

2) Check relay operation by applying battery voltage to terminals No. 3 and 4. See STEP 2. See Fig. 7. Continuity should now exist between terminals No. 1 and 2. If relay does not test as indicated, replace relay.

## All Others

1) Locate and remove starter relay. Starter relay is marked "ST". See STARTER RELAY LOCATION table. Using ohmmeter, verify continuity between relay terminals No. 1 and 2. See Fig. 8. Continuity should not exist between terminals No. 3 and 5. If continuity is not as specified, replace relay.

2) Check relay operation by applying battery voltage through terminals No. 1 and 2. See Fig. 8. Continuity should now exist between terminals No. 3 and 5. If relay does not test as indicated, replace relay.

## STARTER RELAY LOCATION TABLE

Application	Location
Avalon & Corolla	In Engine Compartment Junction Block
Camry & Sienna	In Engine Compartment Junction Block No. 2
Celica	In Engine Compartment Junction/Relay Block No. 2
Land Cruiser & LX470	In Engine Compartment Junction Block
RAV4, Tercel & 4Runner	In Engine Compartment Relay Block
Supra	In Engine Compartment Junction Block
Tacoma	In Engine Compartment Relay Block No. 2
T100 (1)	Driver Side Kick Panel Junction Block No. 1

(1) - On USA models without power windows, relay is on side of relay box above horn relay. On Canadian and USA models with power windows, relay is on side of relay above back-up light relay.

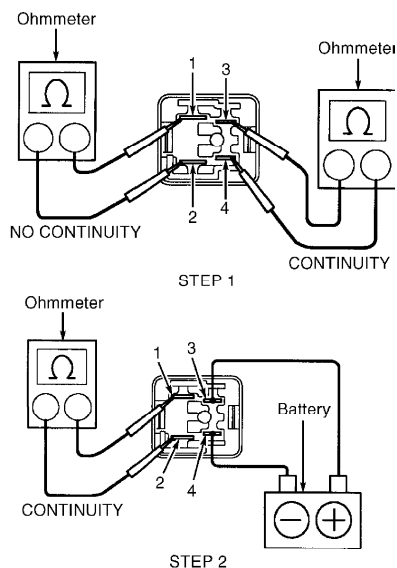
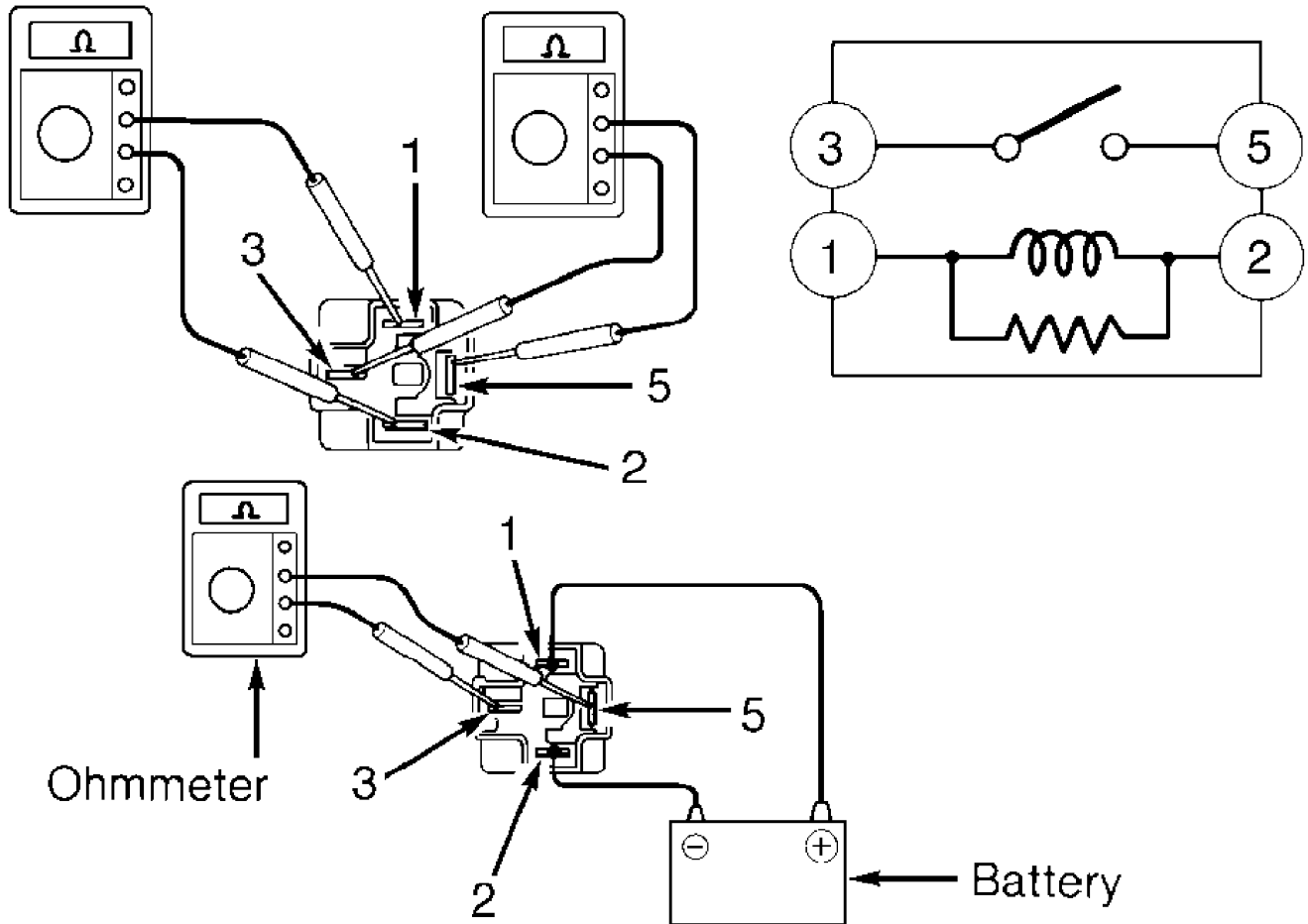


Fig. 7: Testing Starter Relay (Land Cruiser & Lexus LX470)  
 Courtesy of Toyota Motor Sales, U.S.A., Inc.



CONTINUITY

NO CONTINUITY



93A82271

Fig. 8: Testing Starter Relay (All Others)  
Courtesy of Toyota Motor Sales, U.S.A., Inc.

## BENCH TESTING

### NO-LOAD TEST

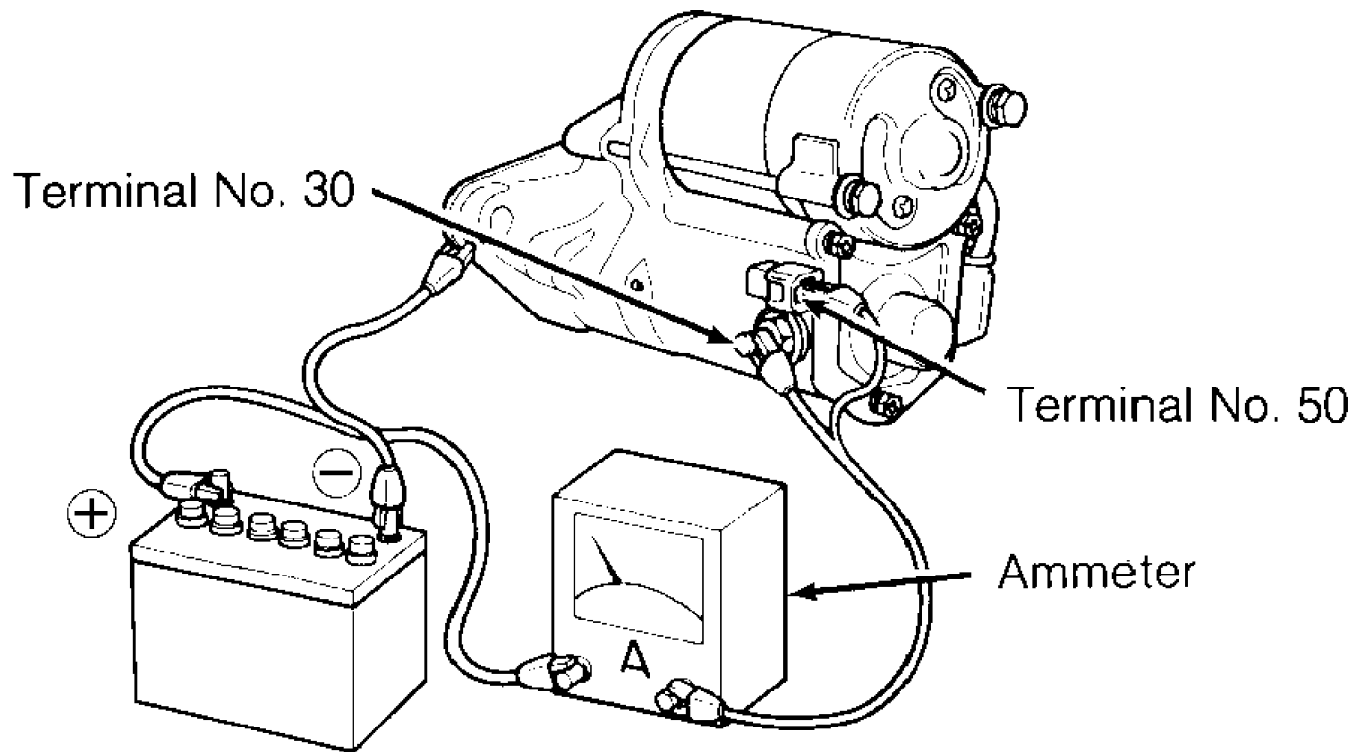
CAUTION: DO NOT engage starter solenoid for more than 5 seconds during testing, or damage to coil winding will result.

NOTE: Starter type and kilowatt (kW) rating can be found on a metal label attached to side of starter.

1) Remove starter. Connect ammeter in series between starter motor terminal No. 30 (battery terminal) and a fully charged 12-volt battery. Connect battery negative to starter case ground. See Fig. 9, 10 or 11. Connect voltmeter to battery to observe voltage draw readings.

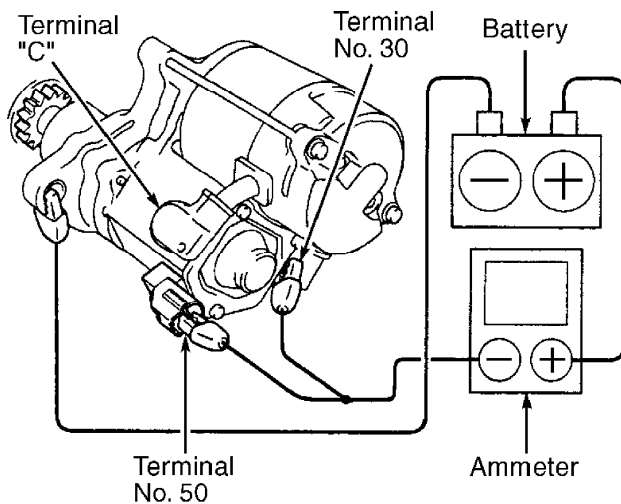
2) Connect remote starter or jumper wire to terminal No. 30 and to terminal No. 50 to engage starter. Starter drive pinion gear should extend quickly and spin smoothly. Verify starter amperage draw

and battery voltage draw to be within specifications. See NO-LOAD TEST SPECIFICATIONS table. Replace starter if not within specification.



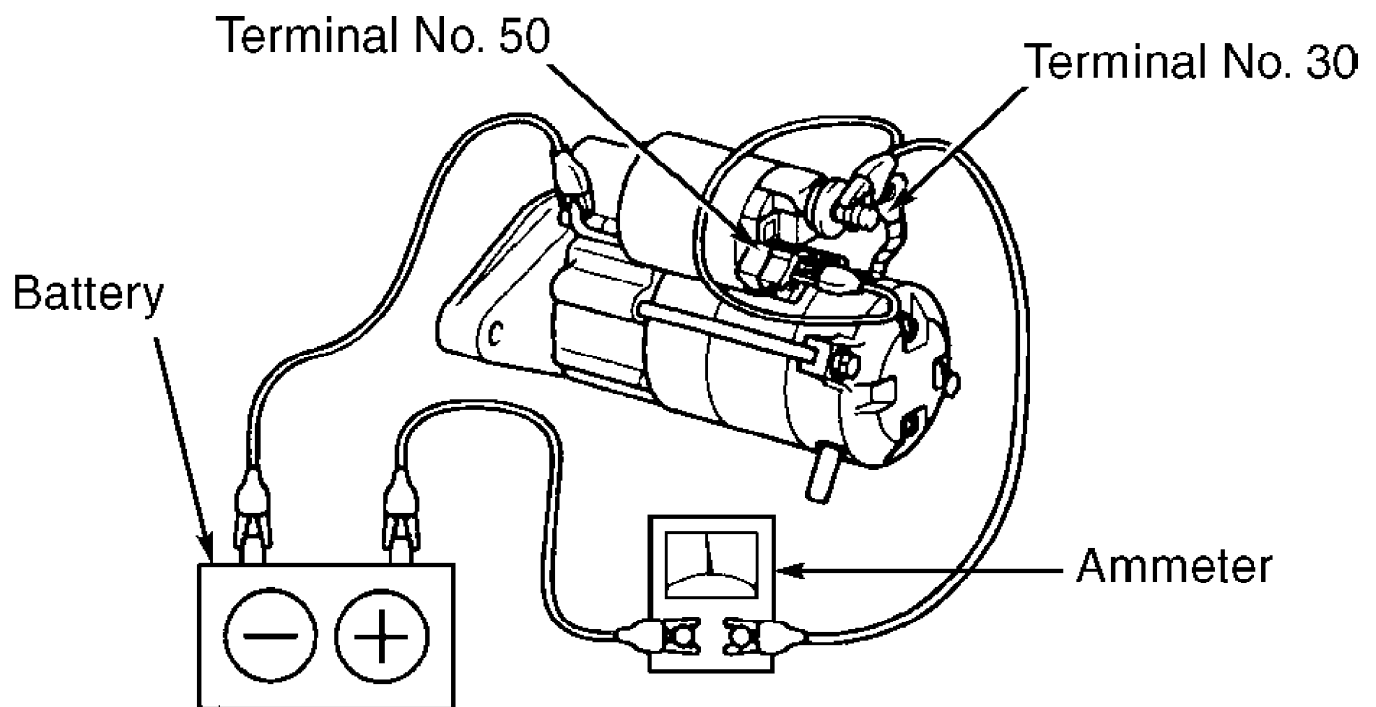
93I02164

Fig. 9: Starter No-Load Test (Celica Shown; Land Cruiser, LX470, RAV4, Supra, Tacoma 4-Cyl., T100 4-Cyl. & 4Runner 4-Cyl. Are Similar)  
Courtesy of Toyota Motor Sales, U.S.A., Inc.



98E10219

Fig. 10: Starter No-Load Test (Avalon & Sienna Shown; Camry, Corolla, Tacoma V6, T100 V6 & 4Runner V6 Are Similar)  
Courtesy of Toyota Motor Sales, U.S.A., Inc.



96F06127

Fig. 11: Performing Starter No-Load Test (Tercel)  
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

#### NO-LOAD TEST SPECIFICATIONS TABLE

Application (1)	Max. Amps @ (Volts)	(2) RPM
Avalon, Celica, Sienna & Supra 1.4 kW ...	90 (11.5) .....	3000
Camry, Corolla & RAV4 1.2 & 1.4 kW .....	90 (11.5) .....	3000
Land Cruiser & LX470 2.0 kW .....	100 (11.5) .....	2500
Tacoma & 4Runner		
1.4 kW .....	90 (11.5) .....	3000
1.8 & 2.0 kW .....	100 (11.5) .....	2500
Tercel .8 & 1.0 kW .....	90 (11.5) .....	3000
T100		
1.2 & 1.4 kW .....	90 (11.5) .....	3000
1.8 & 2.0 kW .....	100 (11.5) .....	2500

(1) - Starter type and kilowatt (kW) rating can be found on a metal label attached to side of starter.

(2) - Specification listed is minimum RPM.

#### SOLENOID TESTS

CAUTION: DO NOT engage starter solenoid for more than 5 seconds during testing, or damage to coil winding will result.

1) Pull-In Coil Test - Disconnect field coil lead from terminal "C". Connect jumper wires from negative battery terminal to terminal "C" and to starter housing. When wire is connected from positive battery terminal to terminal No. 50, clutch pinion gear should extend fully. See Fig. 12, 15 or 18. If clutch pinion gear does not move, replace solenoid. If clutch pinion gear does move, go to

next test.

2) Hold-In Coil Test - With battery connected as in previous test and clutch pinion gear still extended, disconnect jumper wire from starter terminal "C". See Fig. 13, 16 or 19. Clutch pinion gear should remain extended. If clutch pinion gear does not remain extended, replace solenoid. If clutch pinion gear does remain extended, go to next test.

3) Drive Pinion Return Test - Disconnect jumper wire from negative battery terminal to starter housing. See Fig. 14, 17 or 20. Pinion gear should now retract. If it does not retract, replace solenoid.

## STARTER COMPONENT INSPECTION

### Armature Coil

1) Using ohmmeter, check for continuity between armature coil core and insulation between commutator segments. If continuity is present, replace armature. Check armature for shorts using a growler. Replace armature as necessary.

2) Check for continuity between segments of commutator. If continuity is not present between any segment, replace armature.

### Brushes & Springs

1) Check brush length. If length is less than specification, replace brushes. See STARTER SPECIFICATIONS. If brushes are okay, go to next step.

2) Check brush holders, springs, spring clip and insulation between positive and negative holders. Verify no continuity exists between positive and negative brush holders. Repair or replace components as needed.

### Clutch Assembly & Gears

1) Inspect teeth on pinion gear, idler gear and clutch assembly for wear or damage. If damaged, replace gear or clutch assembly and inspect flywheel ring gear for wear or damage.

2) Inspect clutch pinion gear by rotating pinion gear. Depending on engine, pinion gear will rotate freely in one direction and lock when rotated in opposite direction. On Avalon, Camry, Celica, RAV4, Sienna and Supra, clutch pinion gear will lock when rotated in a clockwise direction. On all other models, pinion gear will lock in a counterclockwise direction. On all models, replace clutch assembly as necessary.

NOTE: Starter type and kilowatt (kW) rating can be found on a metal label attached to side of starter.

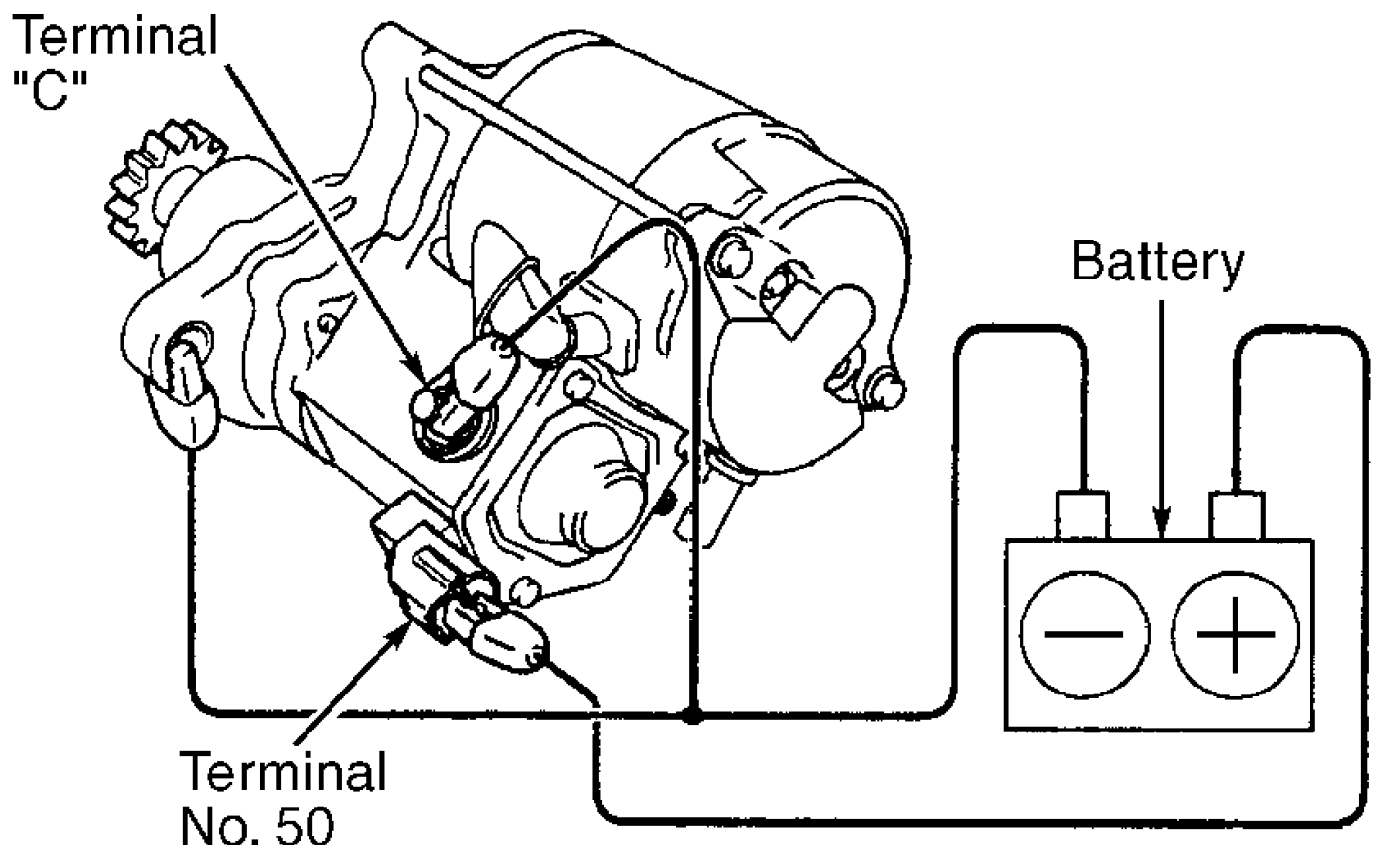
### Commutator

1) If commutator surface is dirty or burnt, it can be cleaned with No. 400 grit sandpaper or on a lathe. If commutator runout (out-of-round) is more than .002" (.05 mm), turn commutator on a lathe. If commutator diameter is less than minimum, replace armature. See STARTER SPECIFICATIONS.

2) Ensure undercut depth between commutator segments are clean, free of debris, and that edges are smooth. Minimum undercut depth is .008" (.20 mm). If undercut depth is less than minimum, use a hacksaw blade to correct to a depth of .008-.024" (.20-.60 mm).

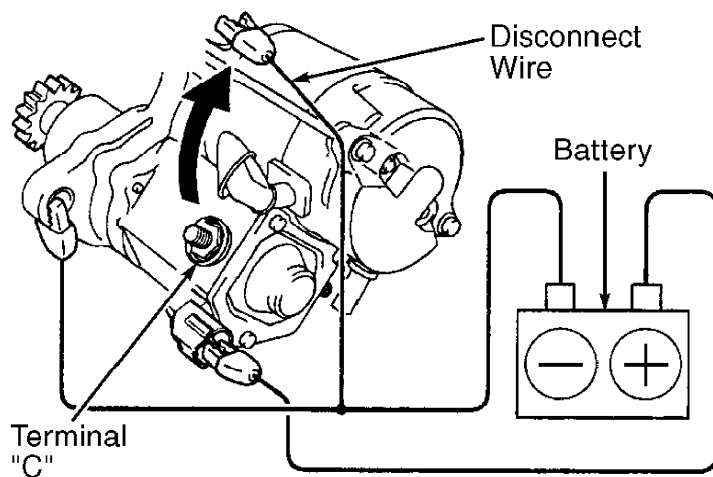
### Field Frame (Field Coil)

Verify continuity between lead wire and field coil brush lead. If continuity is not present, replace field coil. Verify there is no continuity between field coil end and field frame. If continuity exists, replace or repair field frame.



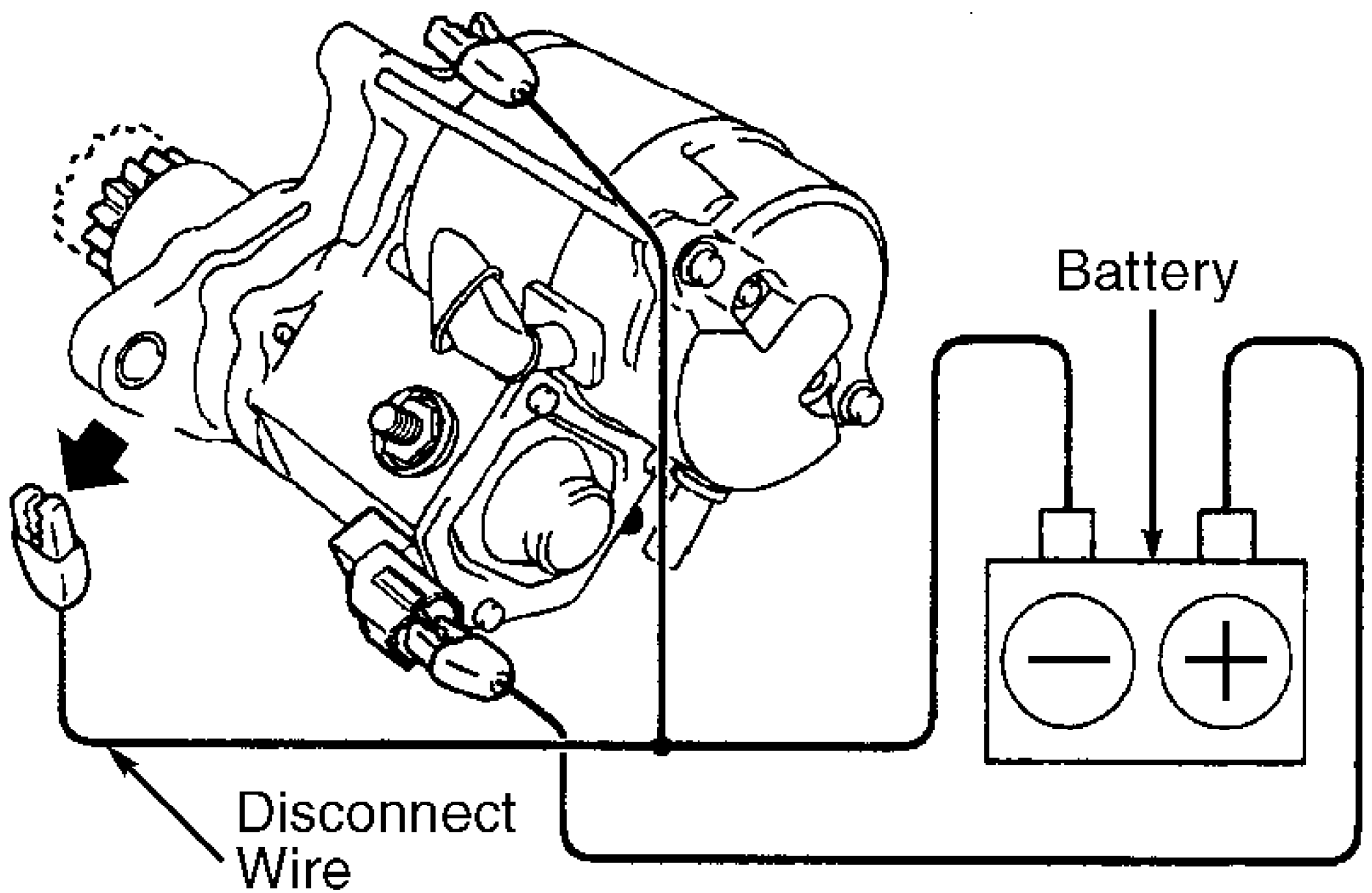
98H10220

Fig. 12: Solenoid Pull-In Coil Test (Avalon, Camry & Sienna Shown; Corolla, Tacoma V6, T100 V6 & 4Runner V6 Are Similar)  
 Courtesy of Toyota Motor Sales, U.S.A., Inc.



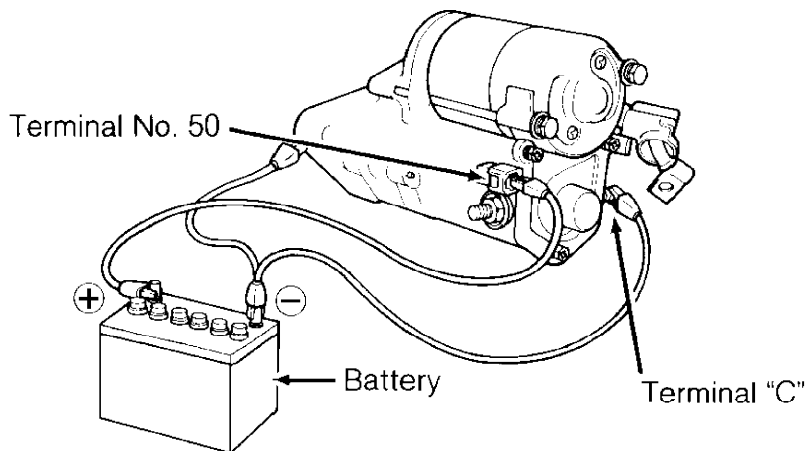
98C10225

Fig. 13: Solenoid Hold-In Coil Test (Avalon, Camry & Sienna Shown; Corolla, Tacoma V6, T100 V6 & 4Runner V6 Are Similar)  
 Courtesy of Toyota Motor Sales, U.S.A., Inc.



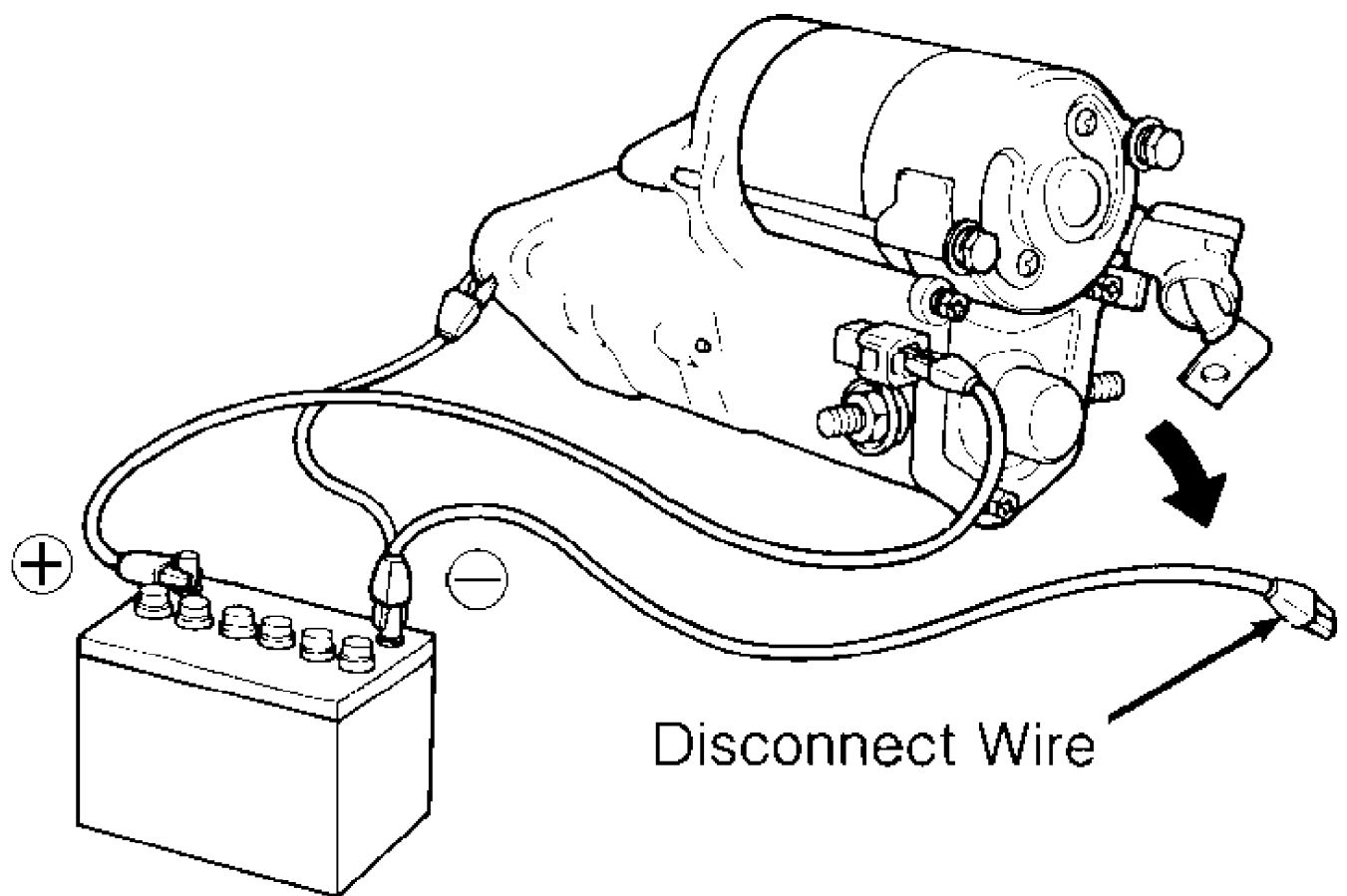
98D10226

Fig. 14: Solenoid Drive Pinion Return Test (Avalon, Camry & Sienna Shown; Corolla, Tacoma V6, T100 V6 & 4Runner V6 Are Similar)  
 Courtesy of Toyota Motor Sales, U.S.A., Inc.



93B02165

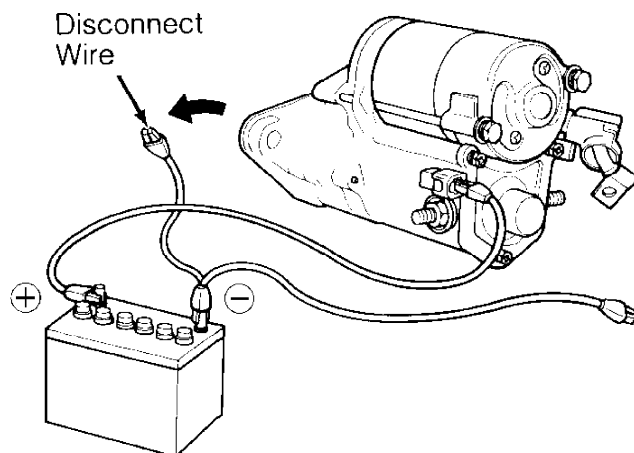
Fig. 15: Solenoid Pull-In Coil Test (Celica Shown; Land Cruiser, LX470, RAV4, Supra, Tacoma 4-Cyl., T100 4-Cyl. & 4Runner 4-Cyl. Similar)  
 Courtesy of Toyota Motor Sales, U.S.A., Inc.



93D02166

Fig. 16: Solenoid Hold-In Coil Test (Celica Shown; Land Cruiser, LX470, RAV4, Supra, Tacoma 4-Cyl., T100 4-Cyl. & 4Runner 4-Cyl. Similar)

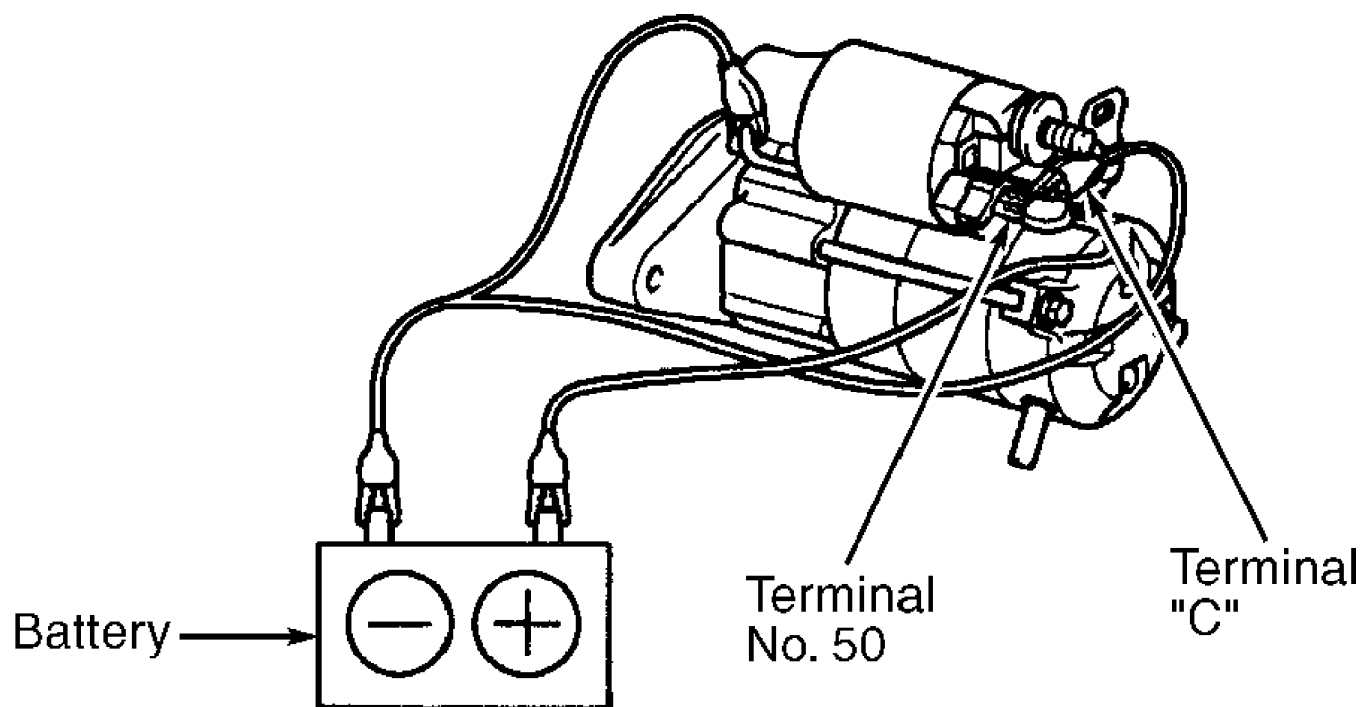
Courtesy of Toyota Motor Sales, U.S.A., Inc.



93F02167

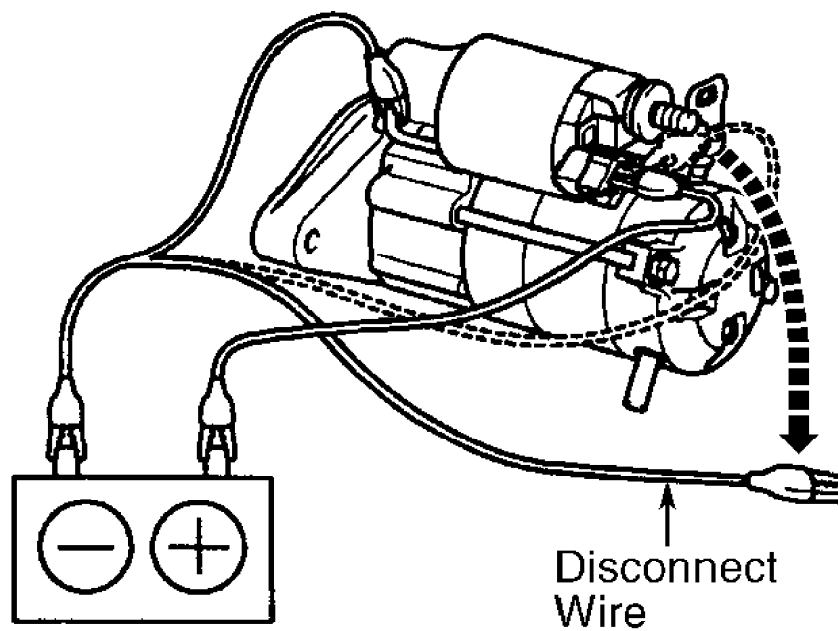
Fig. 17: Solenoid Drive Pinion Return Test (Celica Shown; Land Cruiser, LX470, RAV4, Supra, Tacoma 4-Cyl., T100 4-Cyl. & 4Runner 4-Cyl. Are Similar)

Courtesy of Toyota Motor Sales, U.S.A., Inc.



98I10221

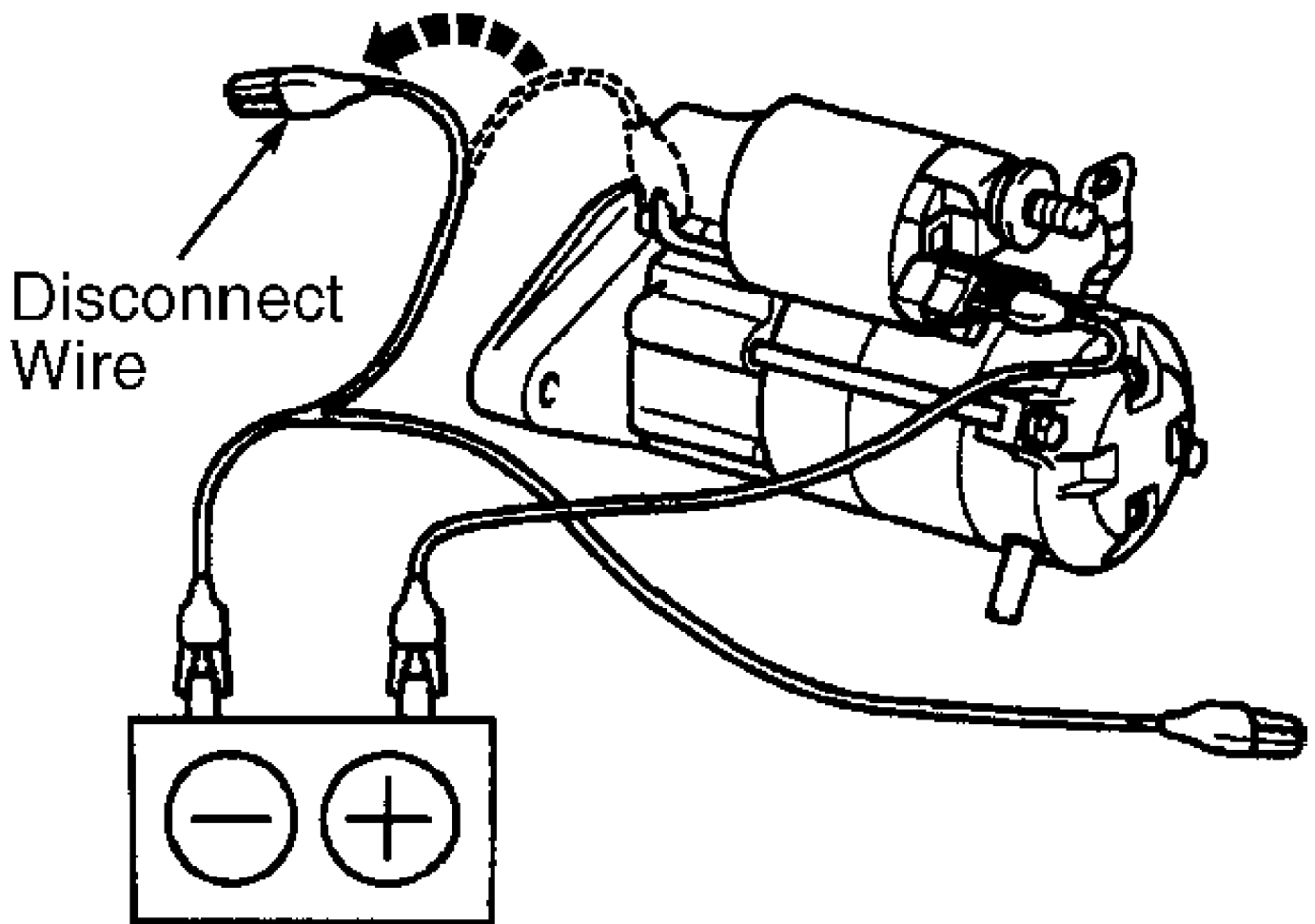
Fig. 18: Solenoid Pull-In Coil Test (Tercel)  
 Courtesy of Toyota Motor Sales, U.S.A., Inc.



98J10222

Fig. 19: Solenoid Hold-In Coil Test (Tercel)  
 Courtesy of Toyota Motor Sales, U.S.A., Inc.





**98A10223**

Fig. 20: Solenoid Drive Pinion Return Test (Tercel)  
Courtesy of Toyota Motor Sales, U.S.A., Inc.

## REMOVAL & INSTALLATION

### STARTER

Removal & Installation (Avalon, Camry & Sienna)

1) Disconnect negative battery cable and then positive cable. Remove battery and tray. If equipped with cruise control, remove cruise control actuator cover, cruise control actuator, and actuator bracket from body mount.

2) On all models, remove starter terminal/wire cover and remove starter wires. Remove starter. To install, reverse removal procedure. Tighten starter bolts to specification. See TORQUE SPECIFICATIONS.

Removal & Installation (Celica)

1) Disconnect negative battery cable. Disconnect air intake temperature sensor connector from air cleaner assembly. If equipped with cruise control, remove cruise control actuator cable from clamps.

2) On California models, remove air hose for idle-up from air cleaner hose. On all models, disconnect 4 clamps, and disconnect air cleaner cap from air cleaner case. Loosen hose clamp, and disconnect air cleaner hose from throttle body.

3) Remove air cleaner cap and air cleaner hose assembly. Remove air filter. Disconnect 2 engine wires from clamps on air cleaner case. Remove 3 bolts and air cleaner case. Remove battery. If equipped with cruise control, disconnect cruise control actuator connector.

4) Remove 3 bolts, and disconnect actuator from body bracket. On all models, disconnect starter connector. Remove nut, and disconnect starter cable. Remove 2 bolts, and disconnect oxygen sensor connector and engine wire brackets from starter. Remove starter. To install, reverse removal procedure. Tighten starter bolts to specification. See TORQUE SPECIFICATIONS.

#### Removal & Installation (Corolla)

1) Disconnect negative battery cable and then positive cable. Remove battery and tray. Remove engine coolant reservoir. Remove engine splash shield from underneath right side of compartment.

2) Remove starter terminal/wire cover and remove starter wires. Remove starter bolts and starter. Note starter mounting bolt locations (bolts are different lengths). To install, reverse removal procedure. Tighten starter bolts to specification. See TORQUE SPECIFICATIONS.

#### Removal & Installation (Land Cruiser & Lexus LX470)

1) Starter is located underneath intake manifold. Disconnect negative battery cable. Remove cover from top of engine. Remove air cleaner intake hose. Disconnect accelerator cable. Remove intake manifold. See appropriate article in the ENGINES section.

2) Remove starter wires and remove starter. To install, reverse removal procedure. Tighten starter bolts to specification. See TORQUE SPECIFICATIONS.

#### Removal & Installation (RAV4)

Disconnect negative battery cable. Remove engine coolant reservoir. Disconnect relay connectors, PCV hose, intake air temperature sensor connector, air cleaner intake hose, remaining hoses and lines for air cleaner removal. Remove air cleaner assembly. Disconnect starter connector. Remove starter wires and remove starter. To install, reverse removal procedure. Tighten starter bolts to specification. See TORQUE SPECIFICATIONS.

#### Removal & Installation (Supra, Tacoma, T100 & 4Runner)

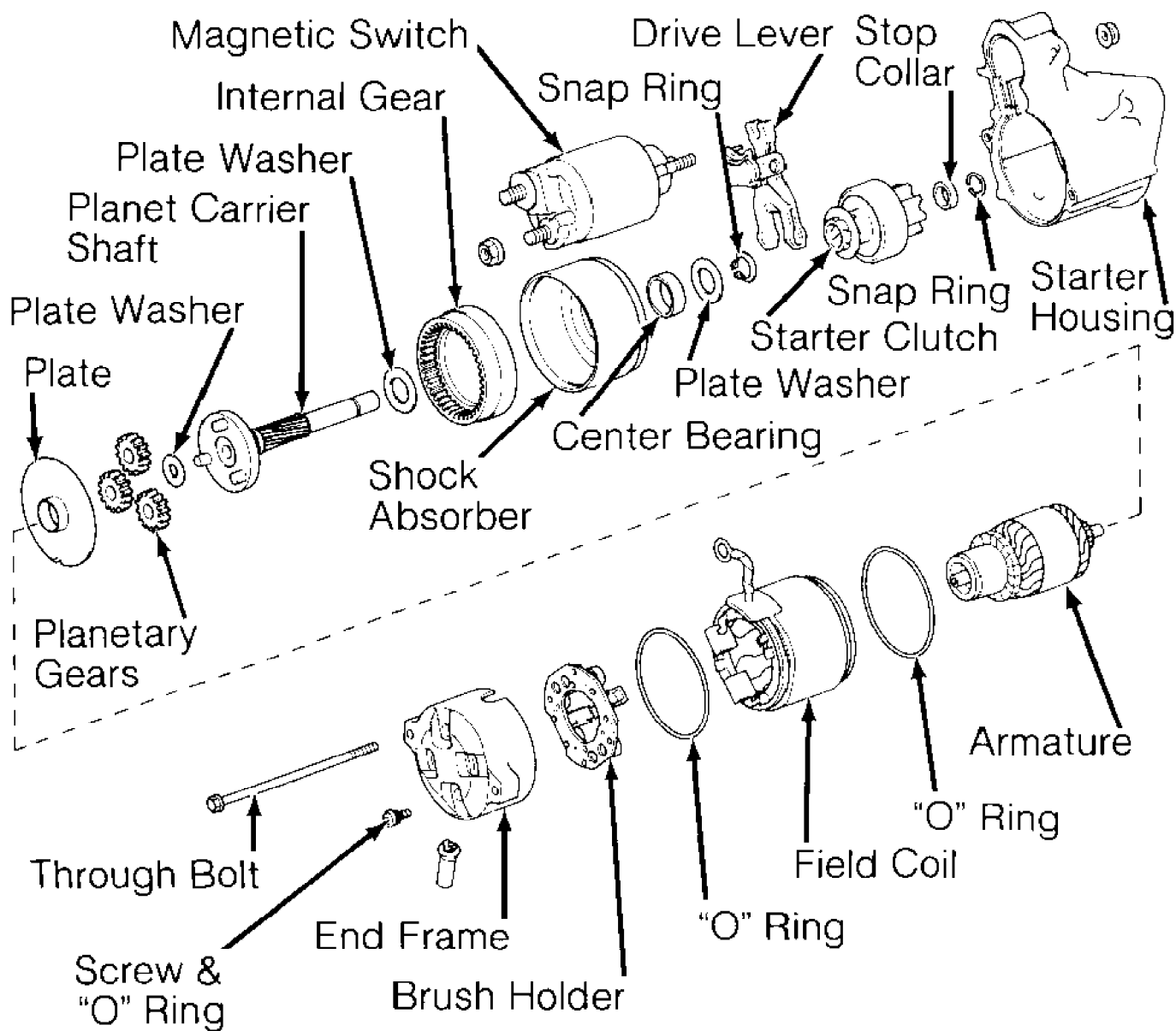
Removal and installation is basically an unbolt and bolt-on procedure. Tighten starter bolts to specification. See TORQUE SPECIFICATIONS.

#### Removal & Installation (Tercel)

Disconnect negative battery cable. Remove air cleaner intake hose. Disconnect starter connector and remove intake manifold support. Remove starter wires and remove starter. To install, reverse removal procedure. Tighten starter bolts and intake manifold support bolts to specification. See TORQUE SPECIFICATIONS.

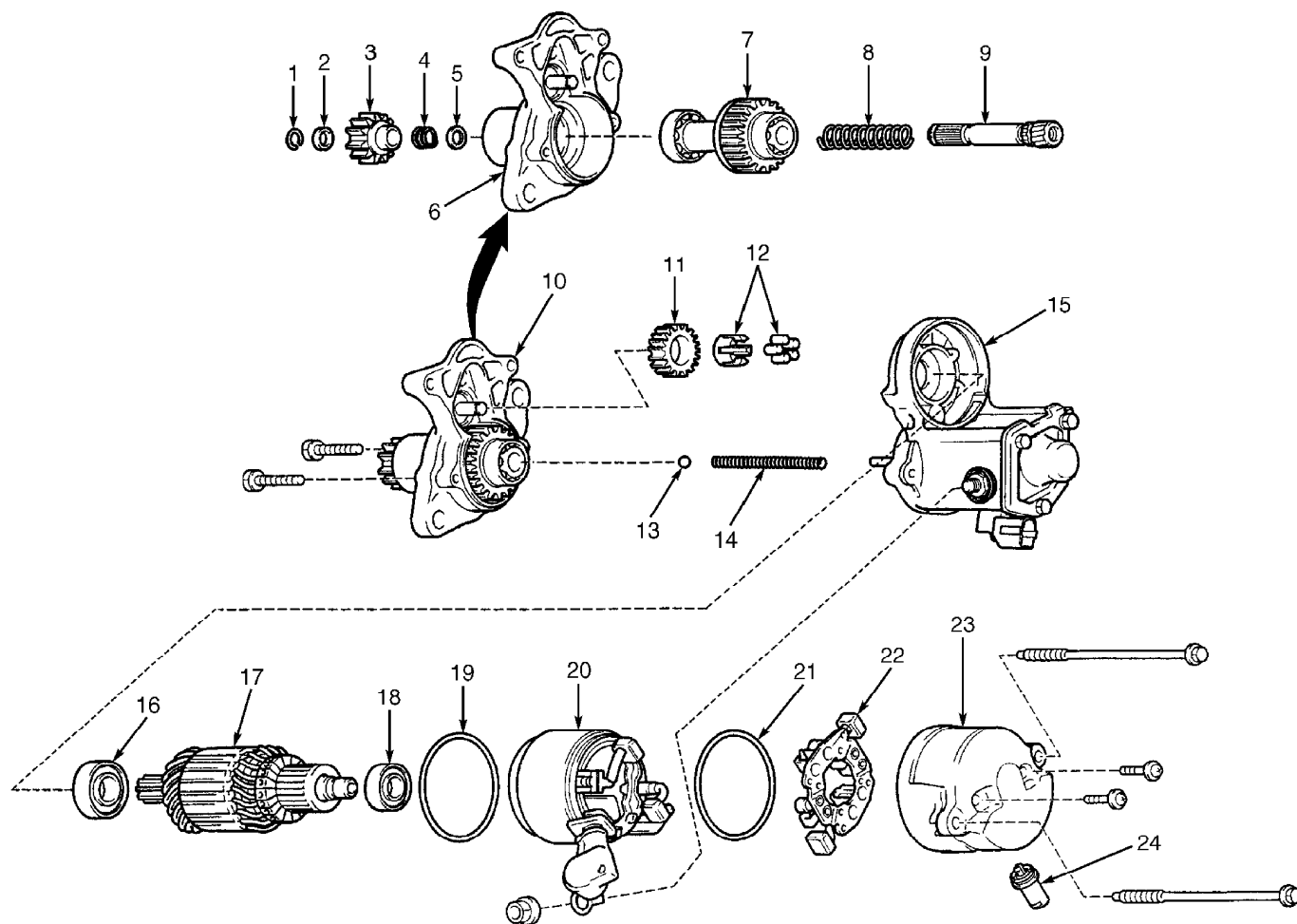
## OVERHAUL

NOTE: For overhaul procedures, refer to appropriate illustration. See Fig. 21 or 22.



93H02168

Fig. 21: Exploded View Of Planetary Gear Starter (Tercel)  
 Courtesy of Toyota Motor Sales, U.S.A., Inc.



- |                                       |                              |
|---------------------------------------|------------------------------|
| 1. Snap Ring                          | 13. Steel Ball               |
| 2. Stop Collar                        | 14. Return Spring            |
| 3. Pinion Gear                        | 15. Solenoid Assembly        |
| 4. Compression Spring                 | 16. Front Bearing            |
| 5. Spring Retainer                    | 17. Armature                 |
| 6. Starter Housing                    | 18. Rear Bearing             |
| 7. Starter Clutch                     | 19. "O" Ring                 |
| 8. Compression Spring                 | 20. Field Frame (Field Coil) |
| 9. Clutch Shaft                       | 21. "O" Ring                 |
| 10. Starter Housing & Clutch Assembly | 22. Brush Holder             |
| 11. Idler Gear                        | 23. End Cover                |
| 12. Bearing                           | 24. Dust Protector           |

98B10224

Fig. 22: Exploded View Of Reduction Gear Starter (Avalon Shown; All Others Similar)

Courtesy of Toyota Motor Sales, U.S.A., Inc.

## STARTER SPECIFICATIONS

STARTER SPECIFICATIONS TABLE (4-CYLINDER) TABLE

Application	Specification
Camry, Corolla & RAV4	
Brush Minimum Length	.394" (10.0 mm)
Brush Spring Load	

1.2 kW	.....	3.0-4.4 Lbs.	(14-20 N)
1.4 kW	.....	4.0-5.3 Lbs.	(18-24 N)
Commutator			
Minimum Diameter	.....	1.14"	(29.0 mm)
Minimum Undercut Depth	.....	.008"	(.2 mm)
Runout	.....	.002"	(.05 mm)
Armature Core Runout	.....	.002"	(.05 mm)
Celica			
Brush Minimum Length	.....	.394"	(10.0 mm)
Brush Spring Load	.....	4.0-5.3 Lbs.	(18-24 N)
Commutator			
Minimum Diameter	.....	1.14"	(29.0 mm)
Minimum Undercut Depth	.....	.008"	(.2 mm)
Runout	.....	.002"	(.05 mm)
Armature Core Runout	.....	.002"	(.05 mm)
Tacoma			
Brush Minimum Length			
1.4 kW	.....	.394"	(10.0 mm)
2.0 kW	.....	.354"	(9.0 mm)
Brush Spring Load			
1.4 kW	.....	4.0-5.3 Lbs.	(18-24 N)
2.0 kW	.....	5.0-6.2 Lbs.	(22-28 N)
Commutator			
Minimum Diameter			
1.4 kW	.....	1.14"	(29.0 mm)
2.0 kW	.....	1.34"	(34 mm)
Minimum Undercut Depth	.....	.008"	(.2 mm)
Runout	.....	.002"	(.05 mm)
Armature Core Runout	.....	.002"	(.05 mm)
Tercel			
Brush Minimum Length			
.....	.....	.354"	(9.0 mm)
Brush Spring Load			
.....	.....	3.0-4.0 Lbs.	(14-18 N)
Commutator			
Minimum Diameter			
.....	.....	1.14"	(29.0 mm)
Minimum Undercut Depth			
.....	.....	.008"	(.2 mm)
Runout			
.....	.....	.002"	(.05 mm)
Armature Core Runout			
.....	.....	.002"	(.05 mm)
T100			
Brush Minimum Length			
1.2 & 1.4 kW	.....	.394"	(10.0 mm)
1.8 & 2.0 kW	.....	.354"	(9.0 mm)
Brush Spring Load			
1.2 kW	.....	3.0-4.4 Lbs.	(14-20 N)
1.4 kW	.....	4.0-5.3 Lbs.	(18-24 N)
1.8 & 2.0 kW	.....	5.0-6.2 Lbs.	(22-28 N)
Commutator			
Minimum Diameter			
.....	.....	1.14"	(29.0 mm)
Minimum Undercut Depth			
.....	.....	.008"	(.2 mm)
Runout			
.....	.....	.002"	(.05 mm)
Armature Core Runout			
.....	.....	.002"	(.05 mm)
4Runner			
Brush Minimum Length			
1.4 kW	.....	.394"	(10.0 mm)
1.8 & 2.0 kW	.....	.354"	(9.0 mm)
Brush Spring Load			
1.4 kW	.....	4.0-5.3 Lbs.	(18-24 N)
1.8 & 2.0 kW	.....	5.0-6.2 Lbs.	(22-28 N)
Commutator			
Minimum Diameter			
1.4 kW	.....	1.14"	(29.0 mm)
1.8 & 2.0 kW	.....	1.34"	(34 mm)
Minimum Undercut Depth			
.....	.....	.008"	(.2 mm)
Runout			
.....	.....	.002"	(.05 mm)

Armature Core Runout .....	.002" (.05 mm)
----------------------------	----------------

---

STARTER SPECIFICATIONS TABLE (6-CYLINDER) TABLE

---

Application	Specification
Supra	
Brush Minimum Length .....	.394" (10.0 mm)
Brush Spring Load .....	4.0-5.3 Lbs. (18-24 N)
Commutator	
Minimum Diameter .....	1.14" (29.0 mm)
Minimum Undercut Depth .....	.008" (.2 mm)
Runout .....	.002" (.05 mm)
Armature Core Runout .....	.002" (.05 mm)

---



---

STARTER SPECIFICATIONS TABLE (V6) TABLE

---

Application	Specification
Avalon, Camry & Sienna	
Brush Minimum Length .....	.394" (10.0 mm)
Brush Spring Load .....	4.0-5.3 Lbs. (18-24 N)
Commutator	
Minimum Diameter .....	1.14" (29.0 mm)
Minimum Undercut Depth .....	.008" (.2 mm)
Runout .....	.002" (.05 mm)
Armature Core Runout .....	.002" (.05 mm)
Tacoma, T100 & 4Runner	
Brush Minimum Length	
1.4 kW .....	.394" (10.0 mm)
1.8 kW .....	.354" (9.0 mm)
Brush Spring Load	
1.4 kW .....	4.0-5.3 Lbs. (18-24 N)
1.8 kW .....	5.0-6.2 Lbs. (22-28 N)
Commutator	
Minimum Diameter	
1.4 kW .....	1.14" (29.0 mm)
1.8 kW .....	1.34" (34 mm)
Minimum Undercut Depth .....	.008" (.2 mm)
Runout .....	.002" (.05 mm)
Armature Core Runout .....	.002" (.05 mm)

---



---

STARTER SPECIFICATIONS TABLE (V8) TABLE

---

Application	Specification
Land Cruiser & Lexus LX470	
Brush Minimum Length .....	.354" (9.0 mm)
Brush Spring Load .....	4.8-6.2 Lbs. (22-28 N)
Commutator	
Minimum Diameter .....	1.34" (34 mm)
Minimum Undercut Depth .....	.008" (.2 mm)
Runout .....	.002" (.05 mm)
Armature Core Runout .....	.002" (.05 mm)

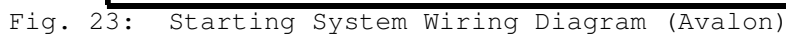
---

## TORQUE SPECIFICATIONS

### TORQUE SPECIFICATIONS TABLE

Application	Ft. Lbs. (N.m)
Intake Manifold Support	
Tercel .....	13 (18)
Starter Mounting Bolts	
Avalon, Corolla, Land Cruiser,	
Lexus LX470, RAV4, T100 & 4Runner .....	29 (39)
Camry, Sienna, Supra, Tacoma & Tercel .....	27 (37)
Celica .....	28 (38)
	INCH Lbs. (N.m)
Park Neutral Position Switch	
Land Cruiser, Lexus LX470, Tacoma, T100 & 4Runner .....	116 (13)
All Others .....	48 (5.4)

## WIRING DIAGRAMS





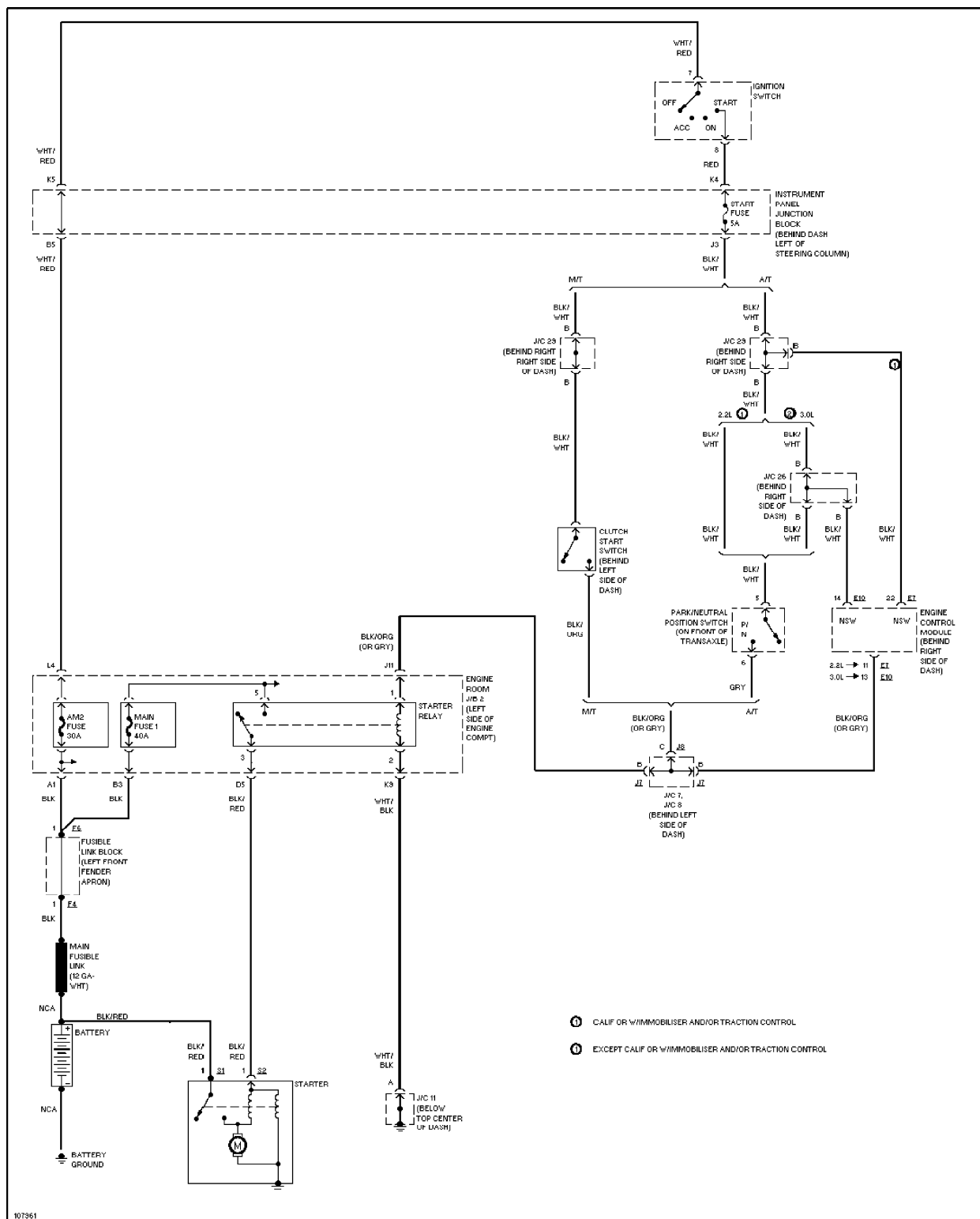


Fig. 24: Starting System Wiring Diagram (Camry)

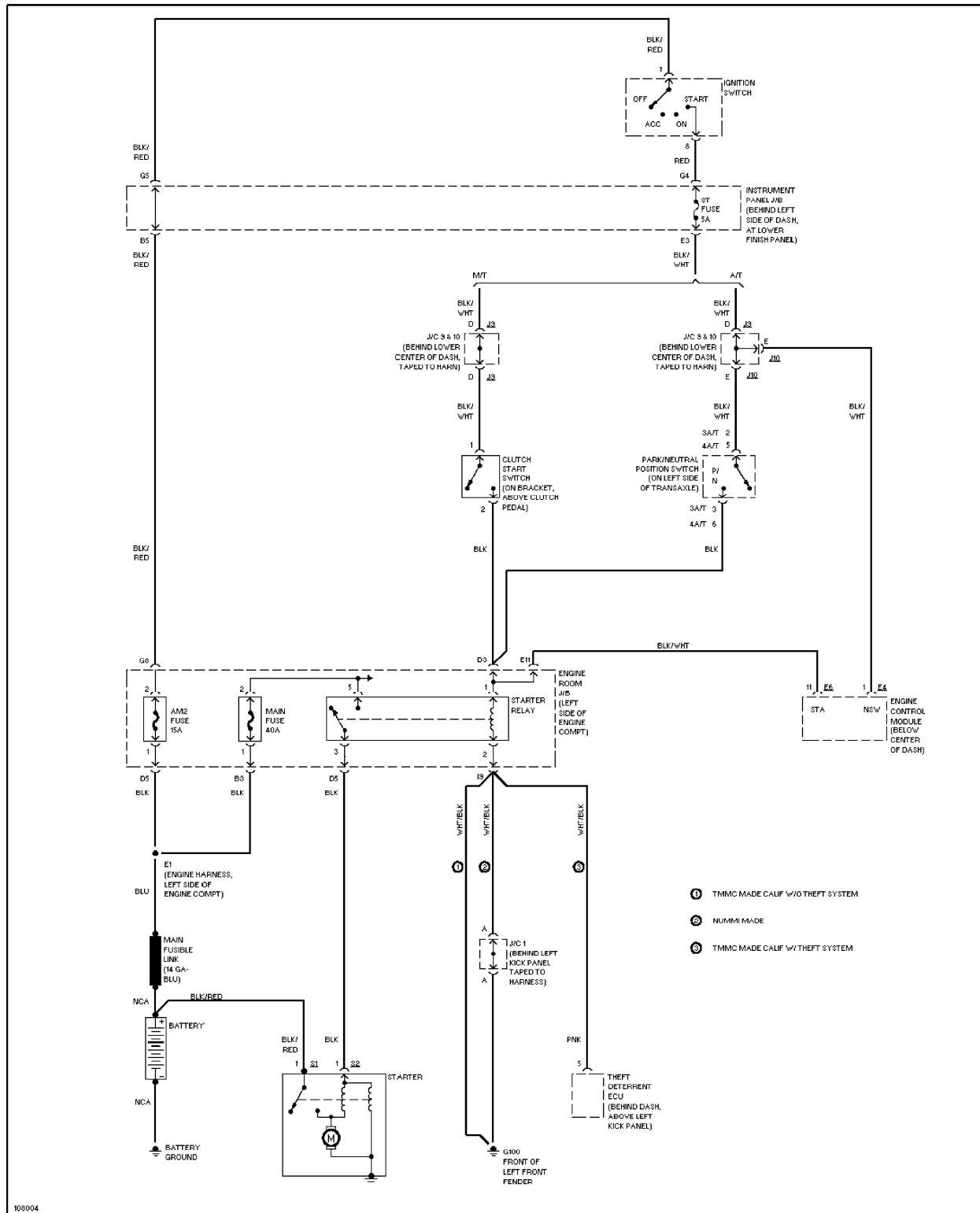


Fig. 25: Starting System Wiring Diagram (Corolla)

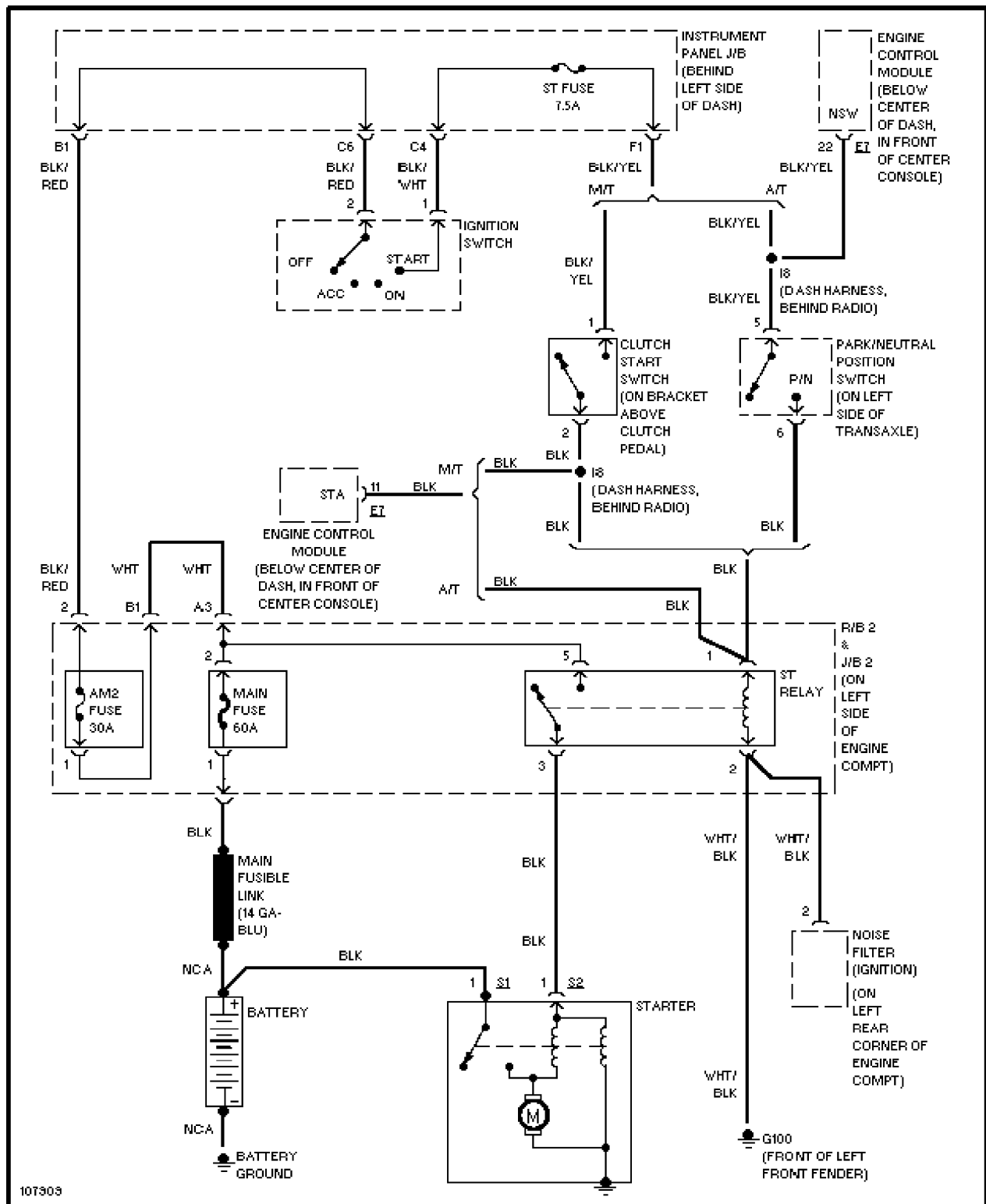


Fig. 26: Starting System Wiring Diagram (Celica)

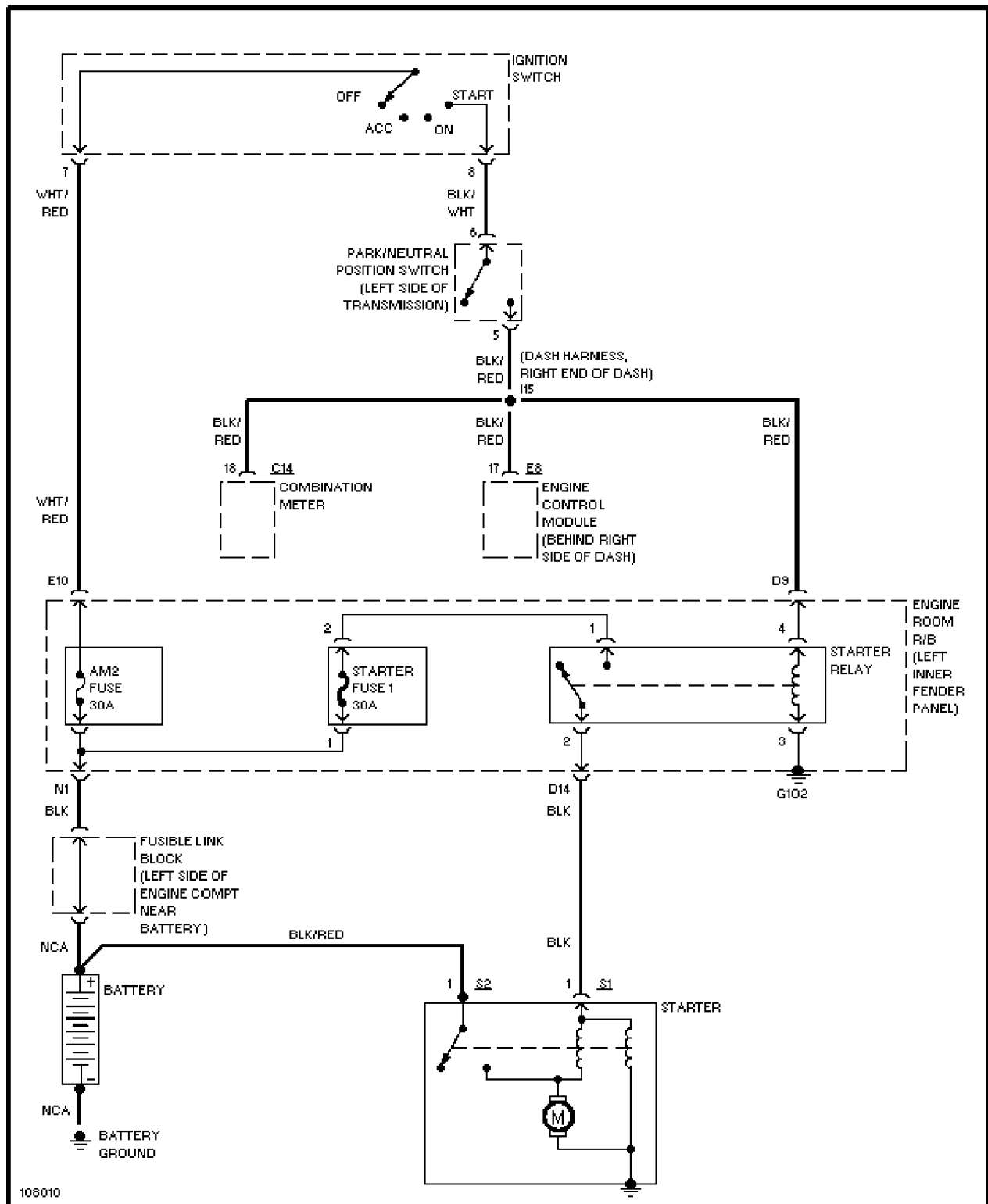


Fig. 27: Starting System Wiring Diagram (Land Cruiser)

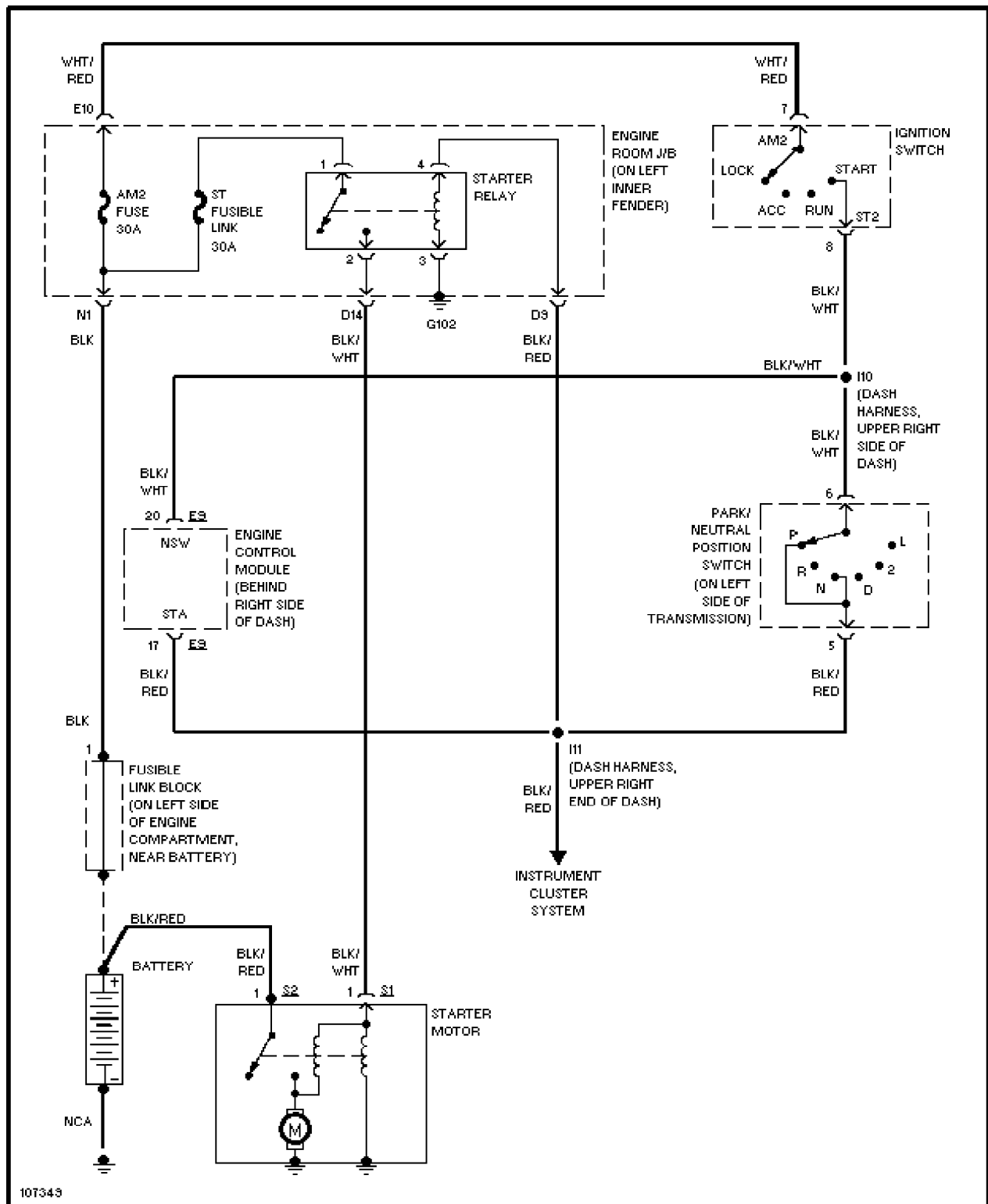


Fig. 28: Starting System Wiring Diagram (Lexus LX470)

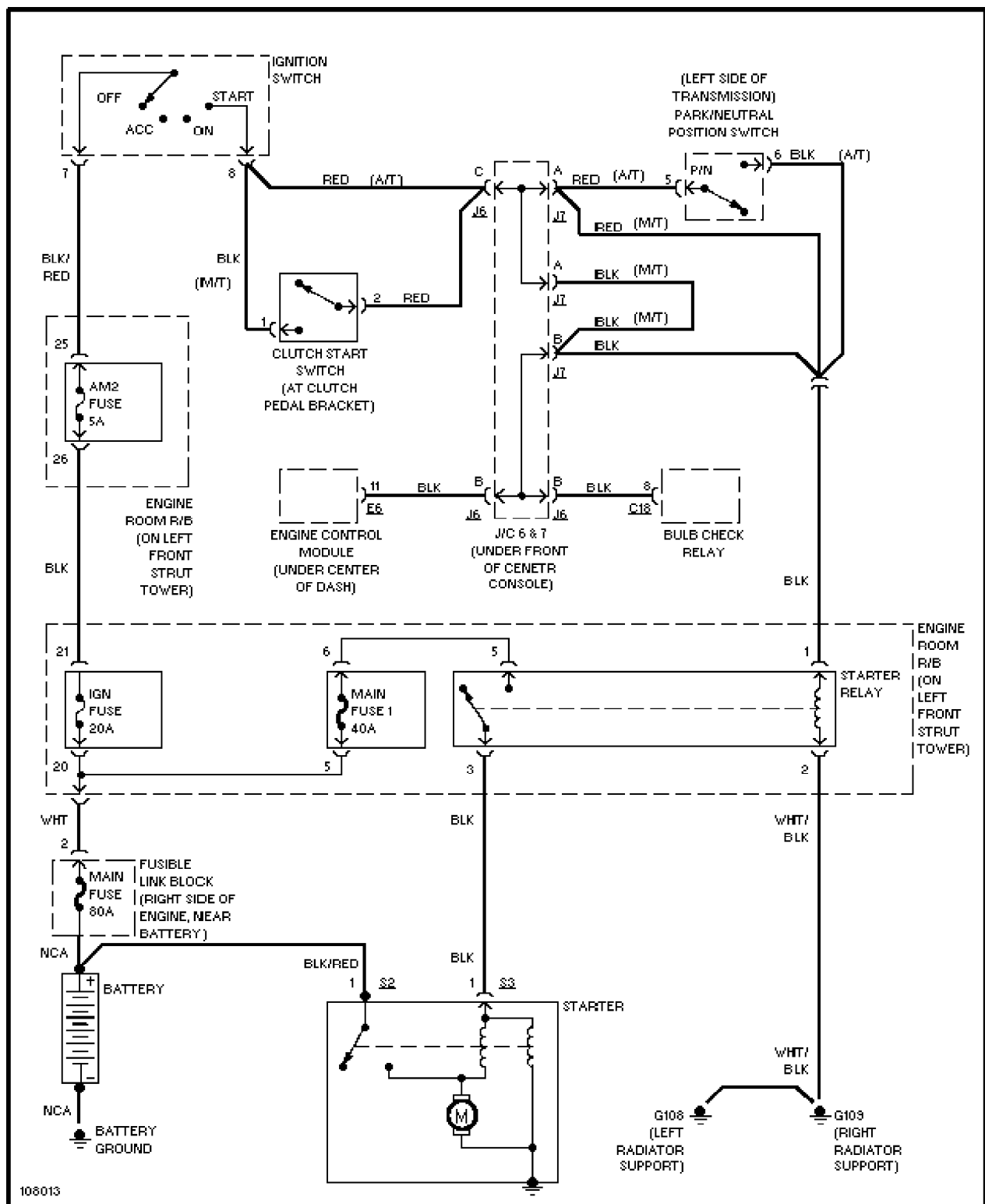


Fig. 29: Starting System Wiring Diagram (RAV4)

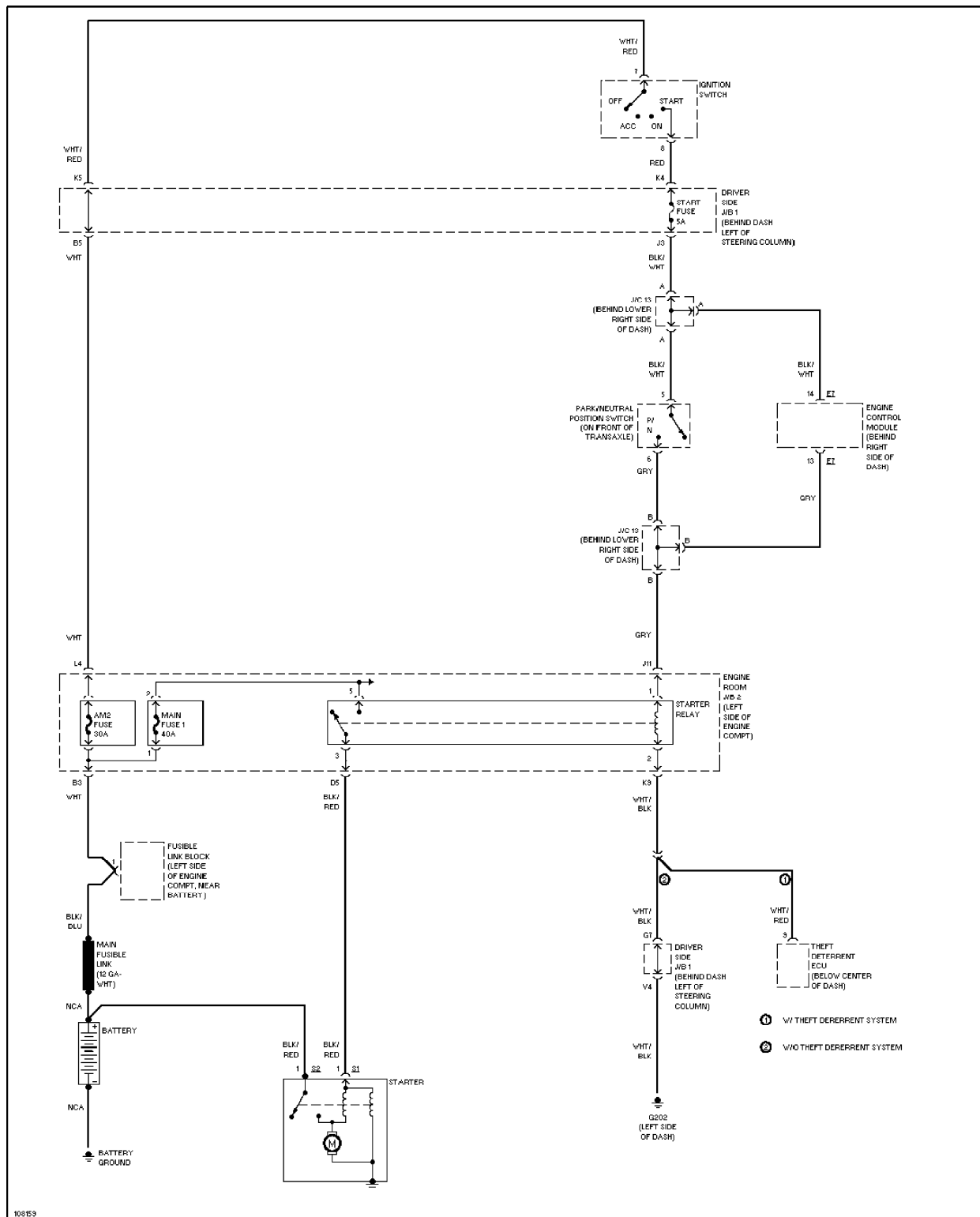


Fig. 30: Starting System Wiring Diagram (Sienna)

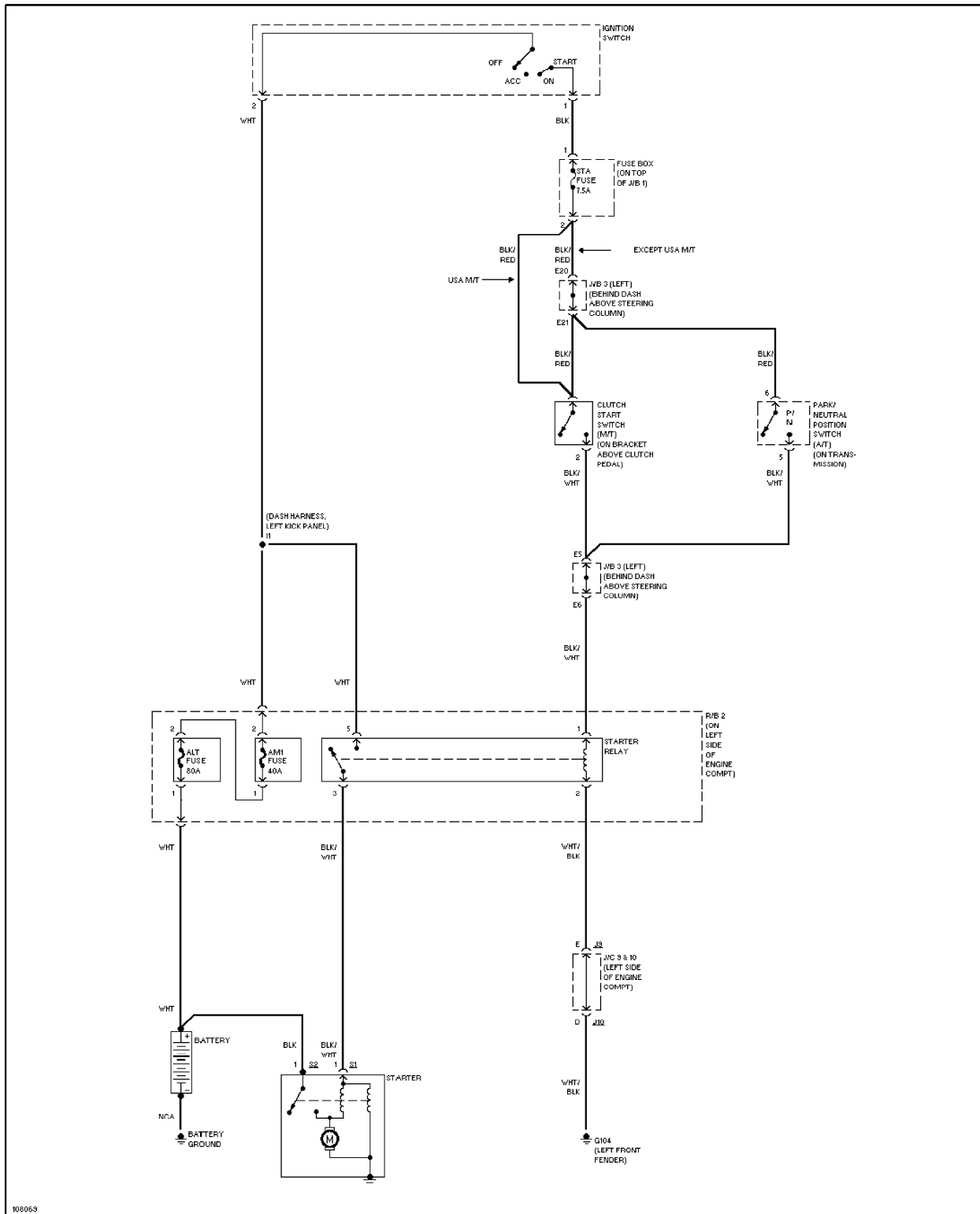


Fig. 31: Starting System Wiring Diagram (Tacoma - 2.4L)



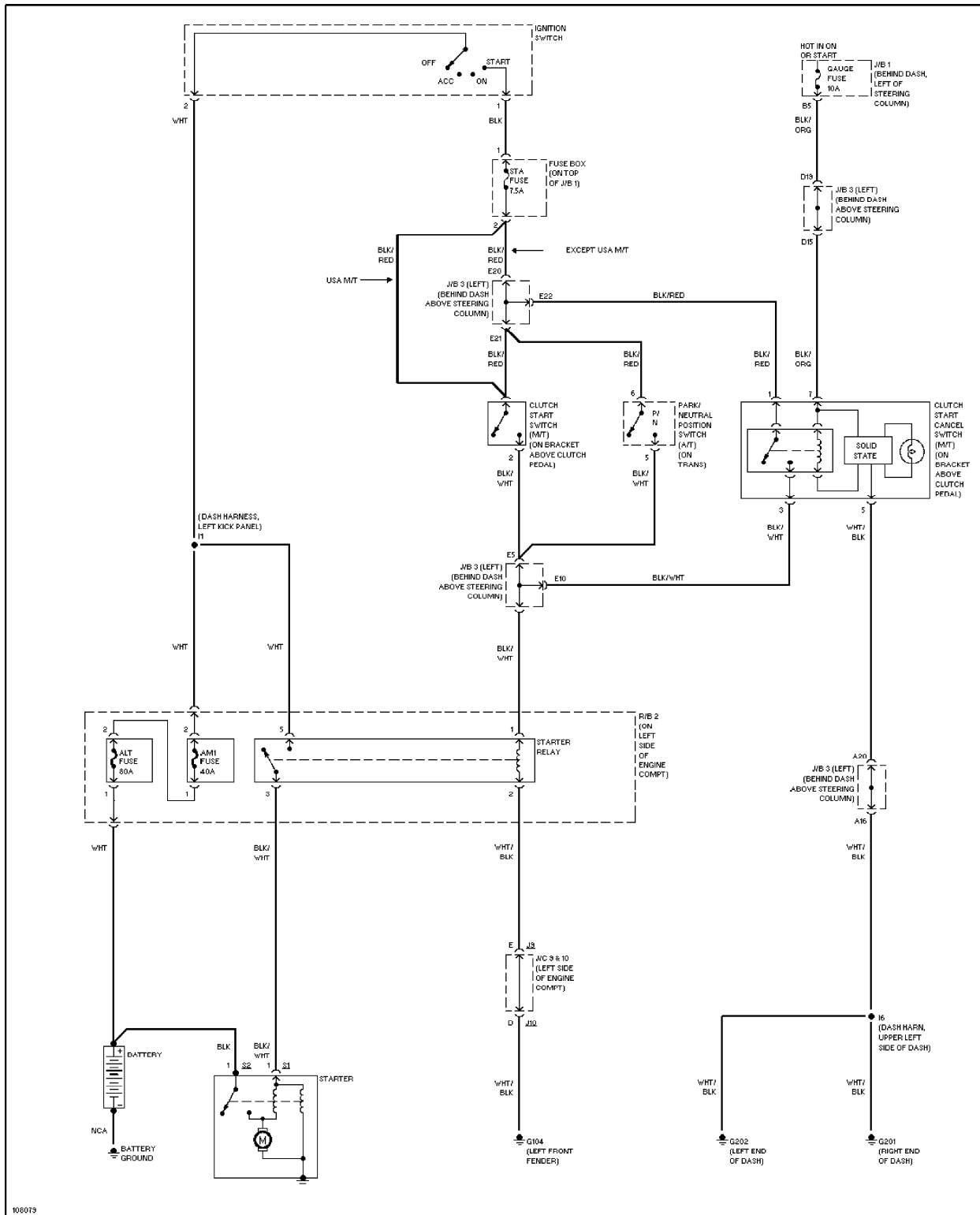


Fig. 32: Starting System Wiring Diagram (Tacoma - 2.7L)

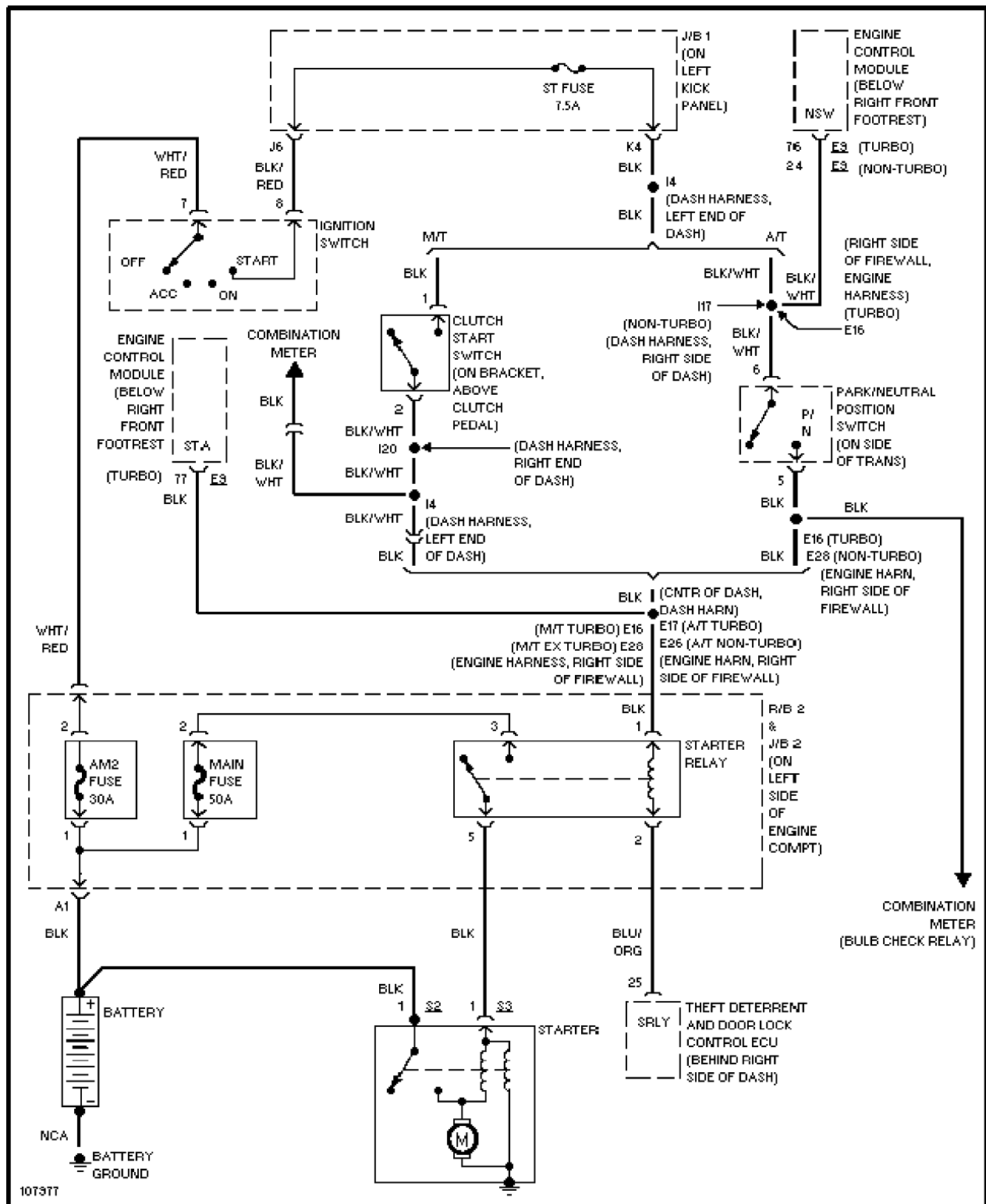
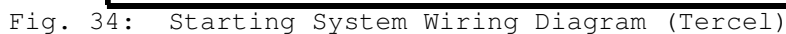


Fig. 33: Starting System Wiring Diagram (Supra)



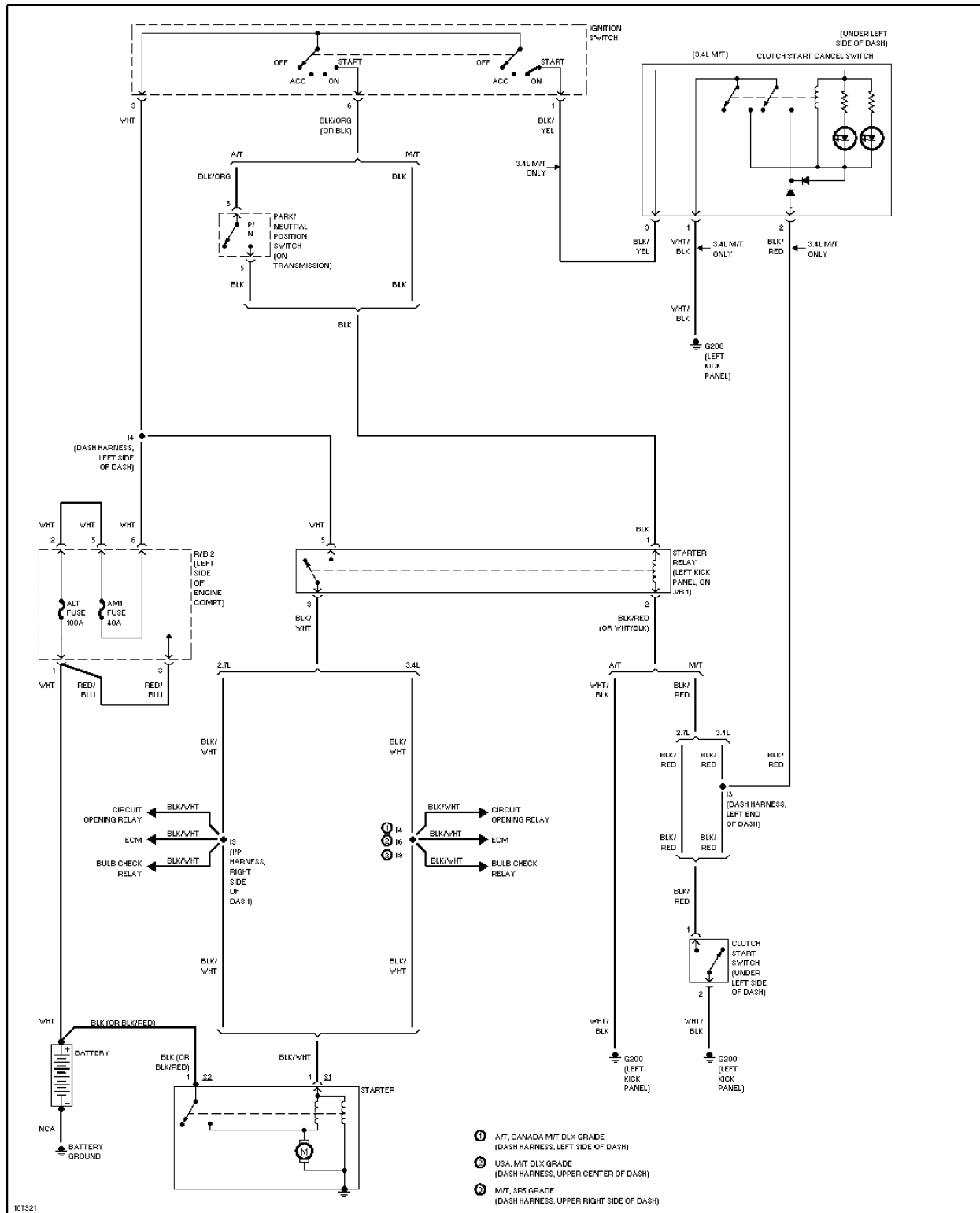


Fig. 35: Starting System Wiring Diagram (T100)

