

STARTER

1994 Toyota Celica

1994 ELECTRICAL
Toyota Motor Sales, USA - Starters

Celica

DESCRIPTION

Celica uses a Nippondenso 4-brush, solenoid-actuated, gear reduction-type starter, 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.

A starter relay is used 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.

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

TROUBLE SHOOTING

WARNING: Before performing service procedures on vehicle, disconnect negative battery cable. Wait at least one minute after disconnecting negative battery cable to avoid accidental air bag deployment on models so equipped.

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. 5.

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

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

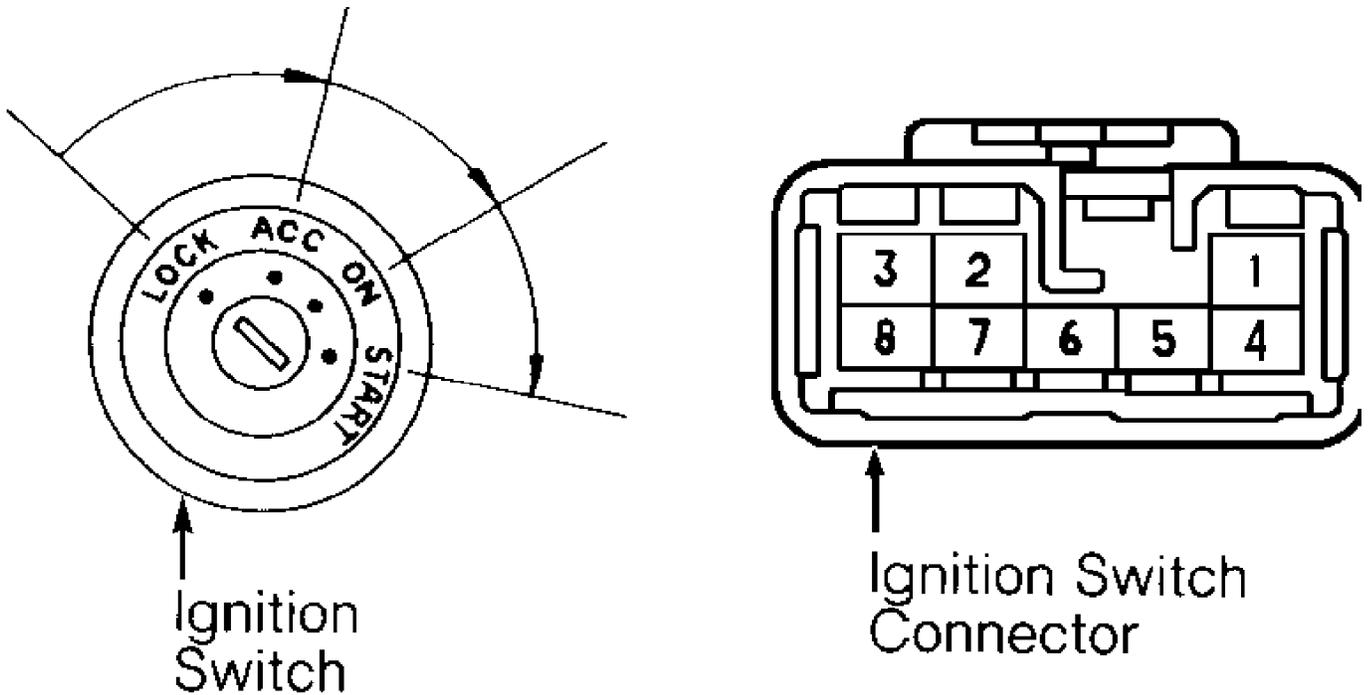
1) Switch is located above clutch pedal on bracket. Disconnect wiring harness connector from switch.

2) Connect ohmmeter probes to switch terminals. Depress clutch pedal. If continuity does not exist, adjust or replace clutch start switch. If continuity exists, check circuit to starter relay for open, and check starter relay. See STARTER RELAY TEST.

IGNITION SWITCH CONTINUITY TEST

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. 1.

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.



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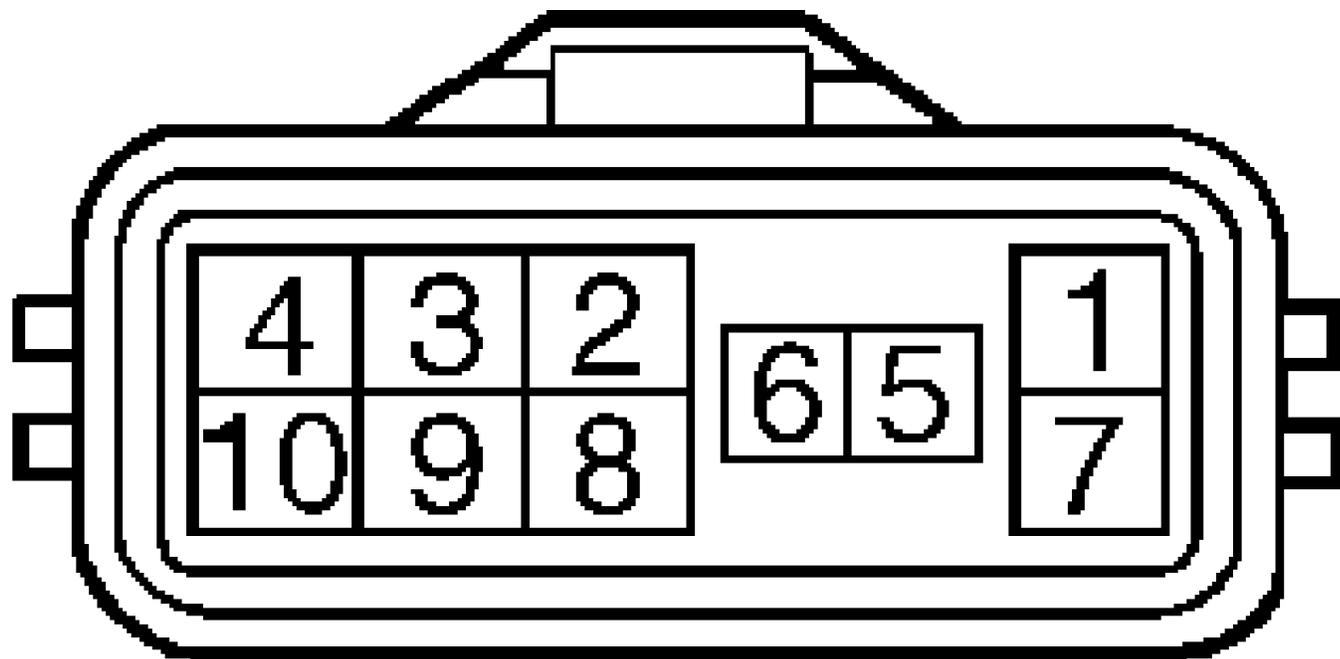
Fig. 1: Identifying Ignition Switch 8-Pin Connector
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

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.

PARK/NEUTRAL SWITCH CONTINUITY SPECIFICATIONS

Gearshift Position	Continuity Between Terminals
Park	5 & 6, 4 & 7
Reverse	4 & 8
Neutral	5 & 6, 4 & 10
Drive	4 & 9
2	2 & 4
Low	3 & 4



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Fig. 2: Identifying Park/Neutral Switch Terminals
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

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 switch bolt(s) to 48 INCH lbs. (5.4 N.m).

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. 2. See PARK/NEUTRAL SWITCH CONTINUITY SPECIFICATIONS table. Replace switch if defective.

STARTER RELAY TEST

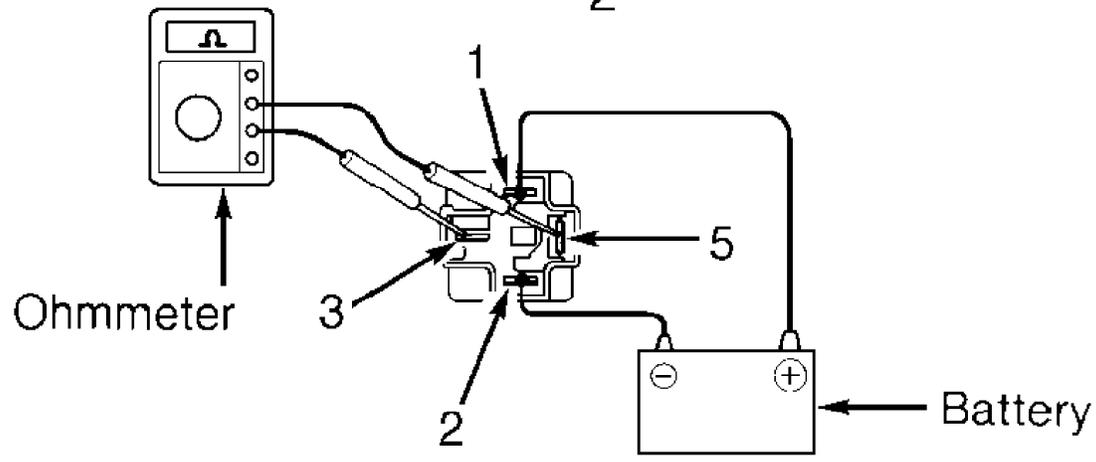
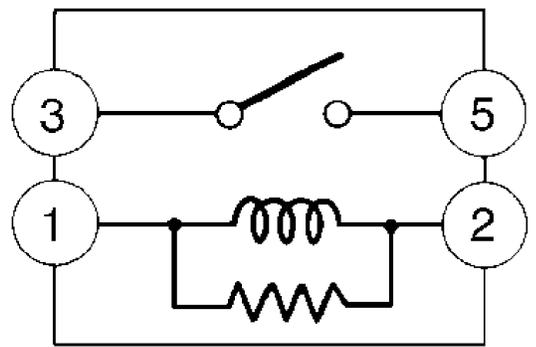
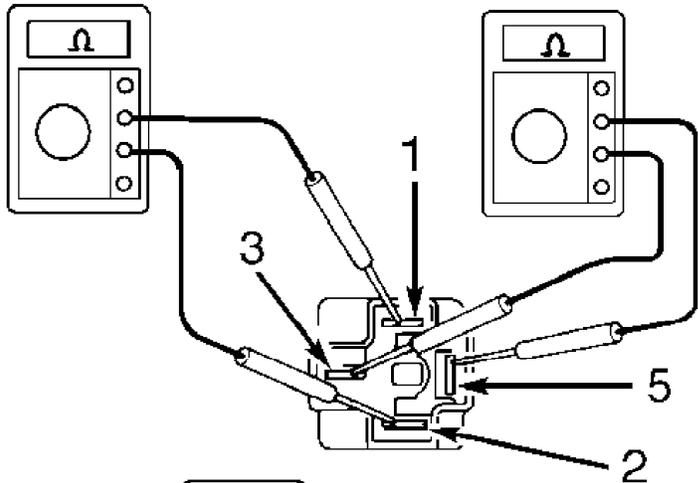
Starter Relay

1) Locate and remove starter relay. See STARTER RELAY LOCATION table. See Fig. 4. Using ohmmeter, verify continuity between relay terminals No. 1 and 2. See Fig. 3. Continuity should not exist between terminals No. 3 and 5. If continuity is not as indicated, replace relay.

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

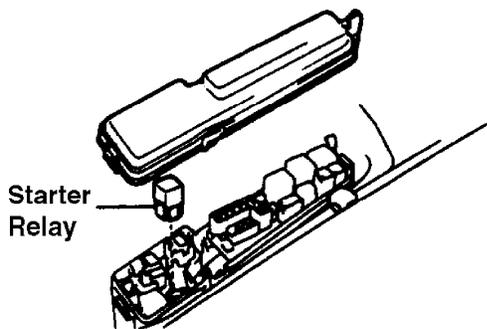
CONTINUITY

NO CONTINUITY



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Fig. 3: Testing Starter Relay
Courtesy of Toyota Motor Sales, U.S.A., Inc.



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Fig. 4: Locating Starter Relay
Courtesy of Toyota Motor Sales, U.S.A., Inc.

STARTER RELAY LOCATION

Application	Location
Celica	In Engine Compartment Relay Box

BENCH TESTING

NO-LOAD TEST

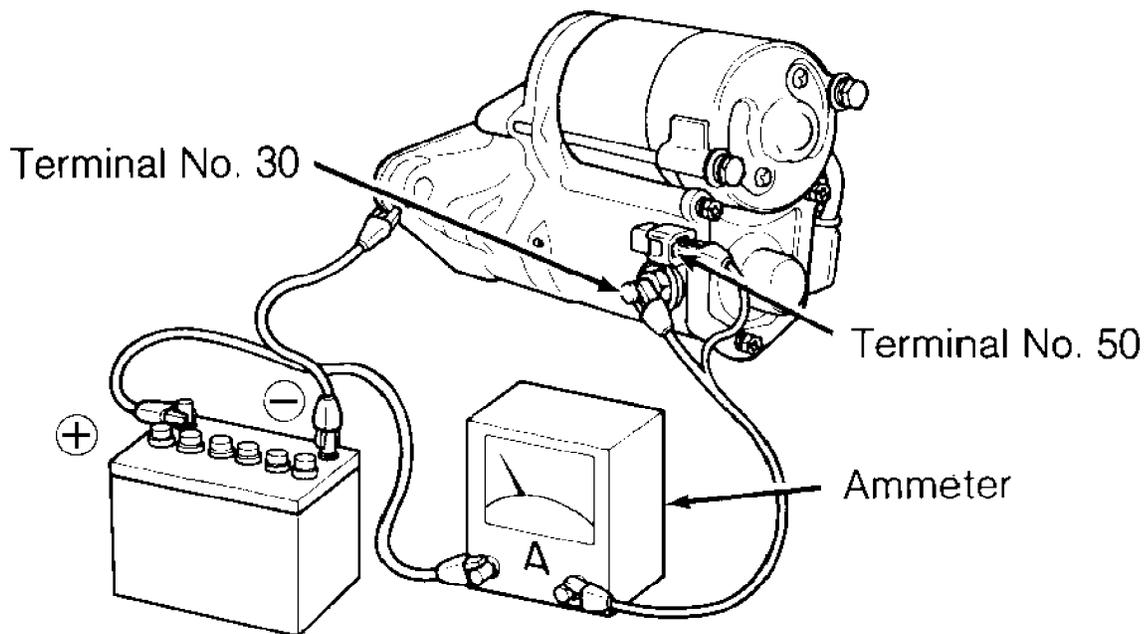
CAUTION: DO NOT engage starter solenoid for more than 5 seconds during testing, or damage to coil winding will result.

NO-LOAD TEST SPECIFICATIONS

Application	Maximum Amps @ (Volts)	RPM
1.4 kW	90 (11.5)	3000
1.6 kW	90 (11.5)	3000

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. 5. 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.



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Fig. 5: Testing Starter No-Load (Reduction Gear)
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

SOLENOID TESTS

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

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. 6. If clutch pinion gear does not move, replace solenoid. If clutch pinion gear does move, go to next test.

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. 7. 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.

Drive Pinion Return Test

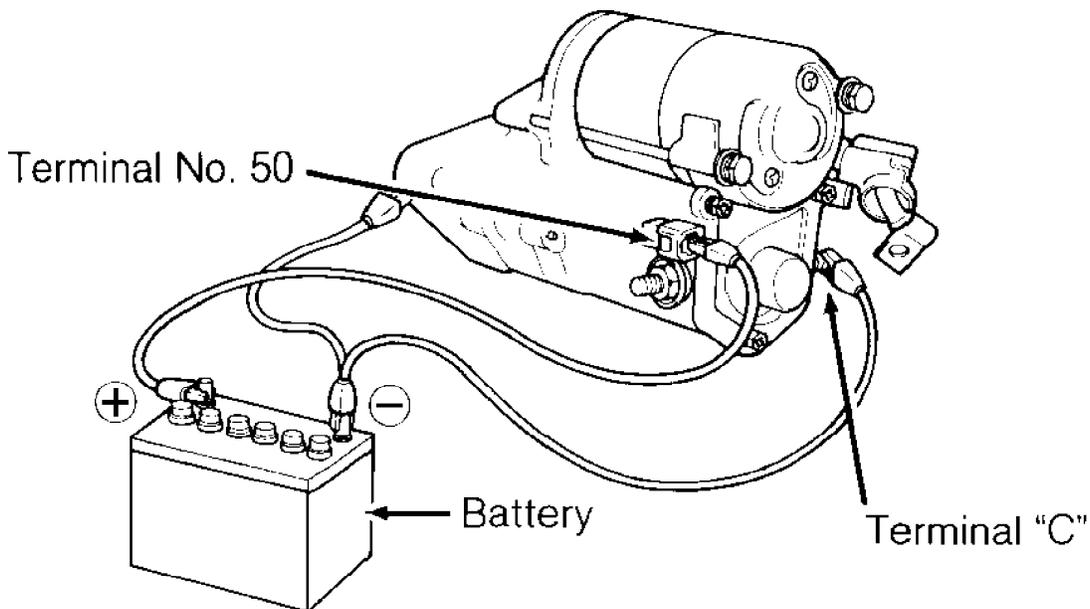
Disconnect jumper wire from negative battery terminal to starter housing. See Fig. 8. Pinion gear should now retract. If it does not retract, replace solenoid.

STARTER COMPONENT INSPECTION

Armature Coil

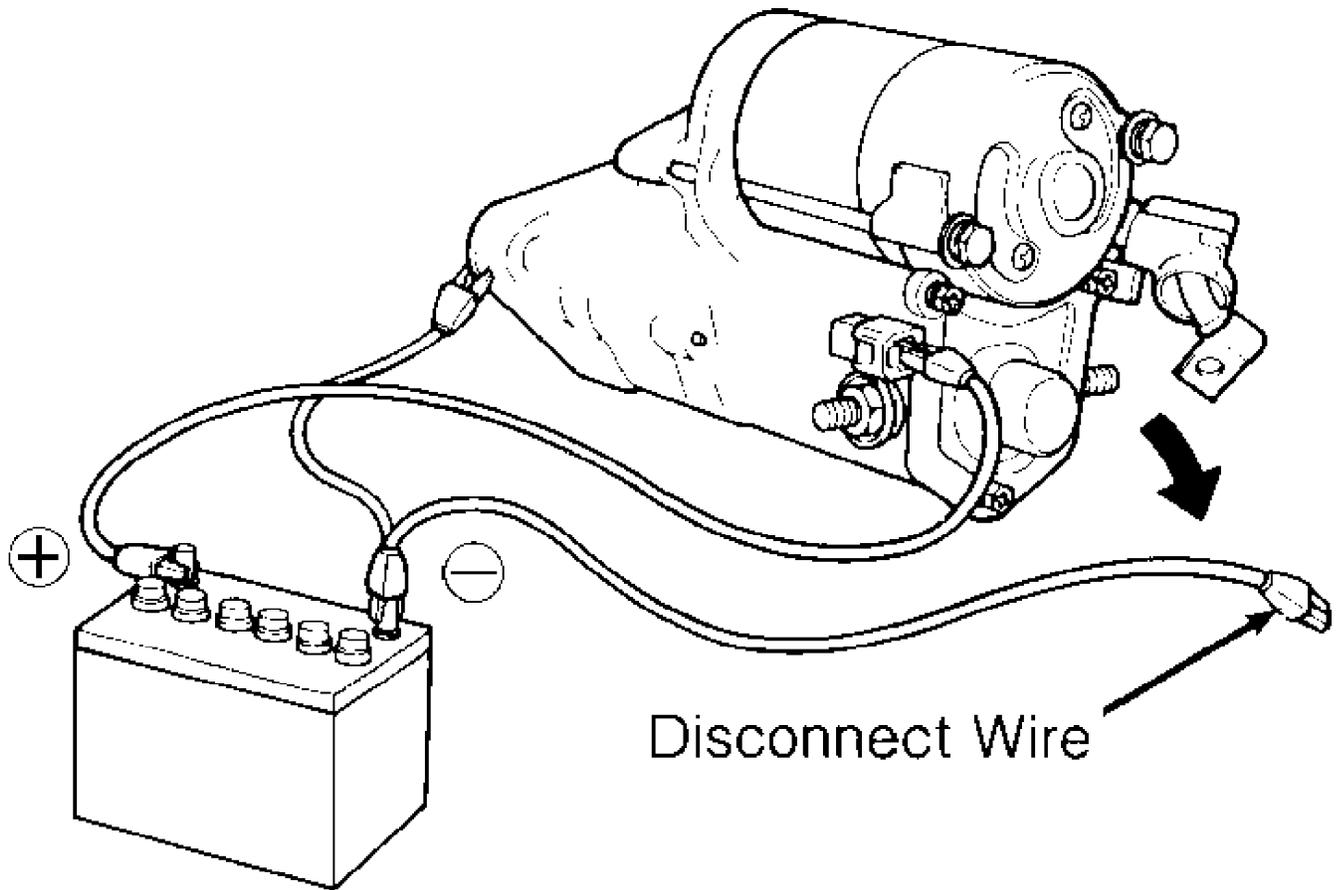
1) Using ohmmeter, check for continuity between armature coil core and insulation between commutator segments. If continuity is present, replace armature. Check armature for shorts using a growler. Replace armature as necessary.

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



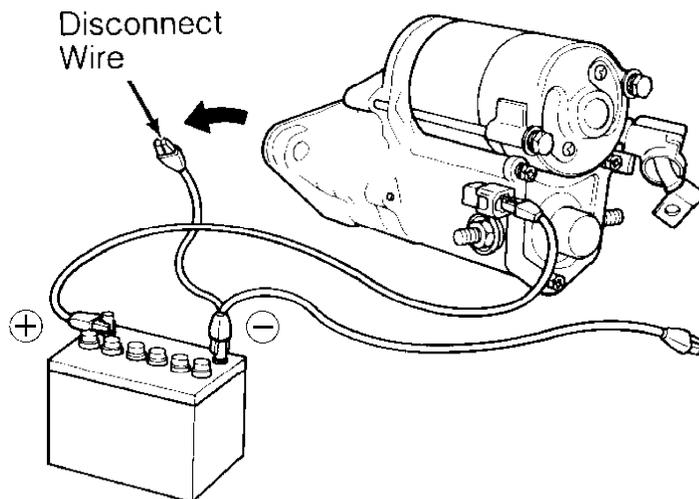
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Fig. 6: Solenoid Pull-In Coil Test
Courtesy of Toyota Motor Sales, U.S.A., Inc.



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Fig. 7: Solenoid Hold-In Coil Test
 Courtesy of Toyota Motor Sales, U.S.A., Inc.



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Fig. 8: Solenoid Drive Pinion Return Test
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

Brushes & Springs

1) Check brush length. If length is less than specification,

replace brushes. See NIPPONDENSO STARTER SPECIFICATIONS table under STARTER SPECIFICATIONS.

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. Clutch pinion gear will lock when rotated in a clockwise direction. If necessary, replace clutch assembly.

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. Wear or cutting limit of commutator diameter is 1.14" (29.0 mm) for 1.4 and 1.6 kW starter. If commutator diameter is less than minimum, replace armature.

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.

REMOVAL & INSTALLATION

STARTER MOTOR

Removal & Installation (7A-FE)

1) Disconnect negative battery cable. Disconnect intake air temperature sensor and accelerator cable from clamp on air cleaner hose. Disconnect cruise control actuator cable from clamp on air cleaner hose (if equipped). Remove vacuum hose (from port "P" of throttle body) from air cleaner hose.

2) Disconnect 4 clamps, and disconnect air cleaner cap from air cleaner case. Loosen hose clamp, and disconnect air cleaner hose from throttle body. Remove air cleaner cap and air cleaner hose assembly.

3) Remove bolt, and disconnect wire clamp from transaxle. Disconnect starter connector. Remove nut, and disconnect starter cable. Remove 2 bolts and starter. To install, reverse removal procedure. Tighten starter mounting bolts to 29 ft. lbs. (39 N.m).

Removal & Installation (5S-FE, With Cruise Control)

1) Disconnect negative battery cable. Disconnect air intake temperature sensor connector from air cleaner assembly. On California models, remove spark plug wire from air cleaner hose. On all models, 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. Disconnect cruise control actuator connector.

4) Remove 3 bolts, and disconnect actuator from body bracket. Disconnect starter connector. Remove nut, and disconnect starter cable. Remove 2 bolts, and disconnect O2 sensor connector and engine wire brackets from starter. Remove starter. To install, reverse removal procedure. Tighten starter mounting bolts to 29 ft. lbs. (39 N.m).

Removal & Installation (5S-FE, Without Cruise Control)

1) Disconnect negative battery cable. Disconnect air intake temperature sensor connector from air cleaner assembly. On California models, remove spark plug wire from air cleaner hose.

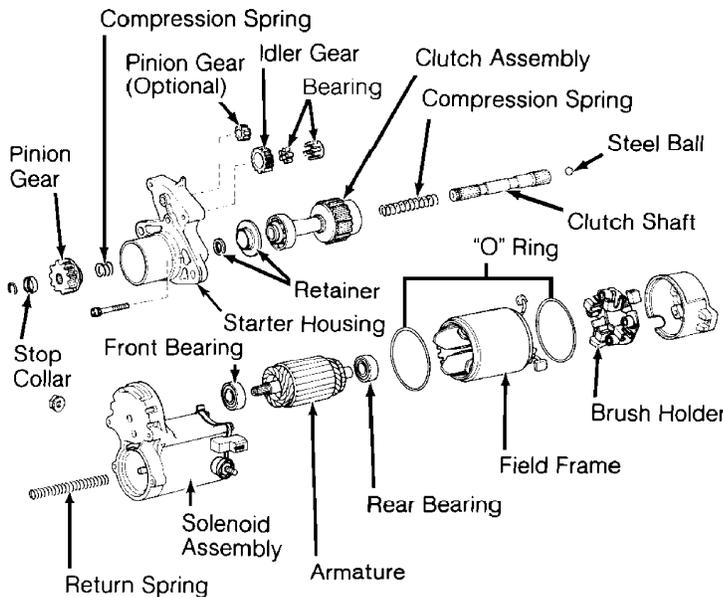
2) On California models, remove air hose for idle-up from air cleaner hose. On all models, disconnect 4 clamps, and disconnect air cleaner cap from air cleaner case. Loosen hose clamp, and disconnect air cleaner hose from throttle body.

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. Disconnect starter connector. Remove nut, and disconnect starter cable.

4) Remove 2 bolts, and disconnect O2 sensor connector and engine wire brackets from starter. Remove starter. To install, reverse removal procedure. Tighten starter mounting bolts to 29 ft. lbs. (39 N.m).

OVERHAUL

NOTE: Overhaul procedures are not available from manufacturer. For exploded views of starters, see Fig. 9.



92J01589
Fig. 9: Exploded View Of Gear Reduction Starter
Courtesy of Toyota Motor Sales, U.S.A., Inc.

STARTER SPECIFICATIONS

NIPPONDENSO STARTER SPECIFICATIONS

Application	Specification
Brush Minimum Length394" (10.0 mm)
Brush Spring Load	3.9-5.3 Lbs. (18-24 N)
Commutator	
Minimum Diameter	1.14" (29.0 mm)
Minimum Undercut Depth008" (.2 mm)
Runout002" (.05 mm)
Armature	
Core Runout002" (.05 mm)
End Play002" (.05 mm)

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS

Application	Ft. Lbs. (N.m)
Lower Crossmember Bolts (7A-FE)	112 (152)
Starter Mounting Bolts (All Models)	29 (39)

WIRING DIAGRAMS

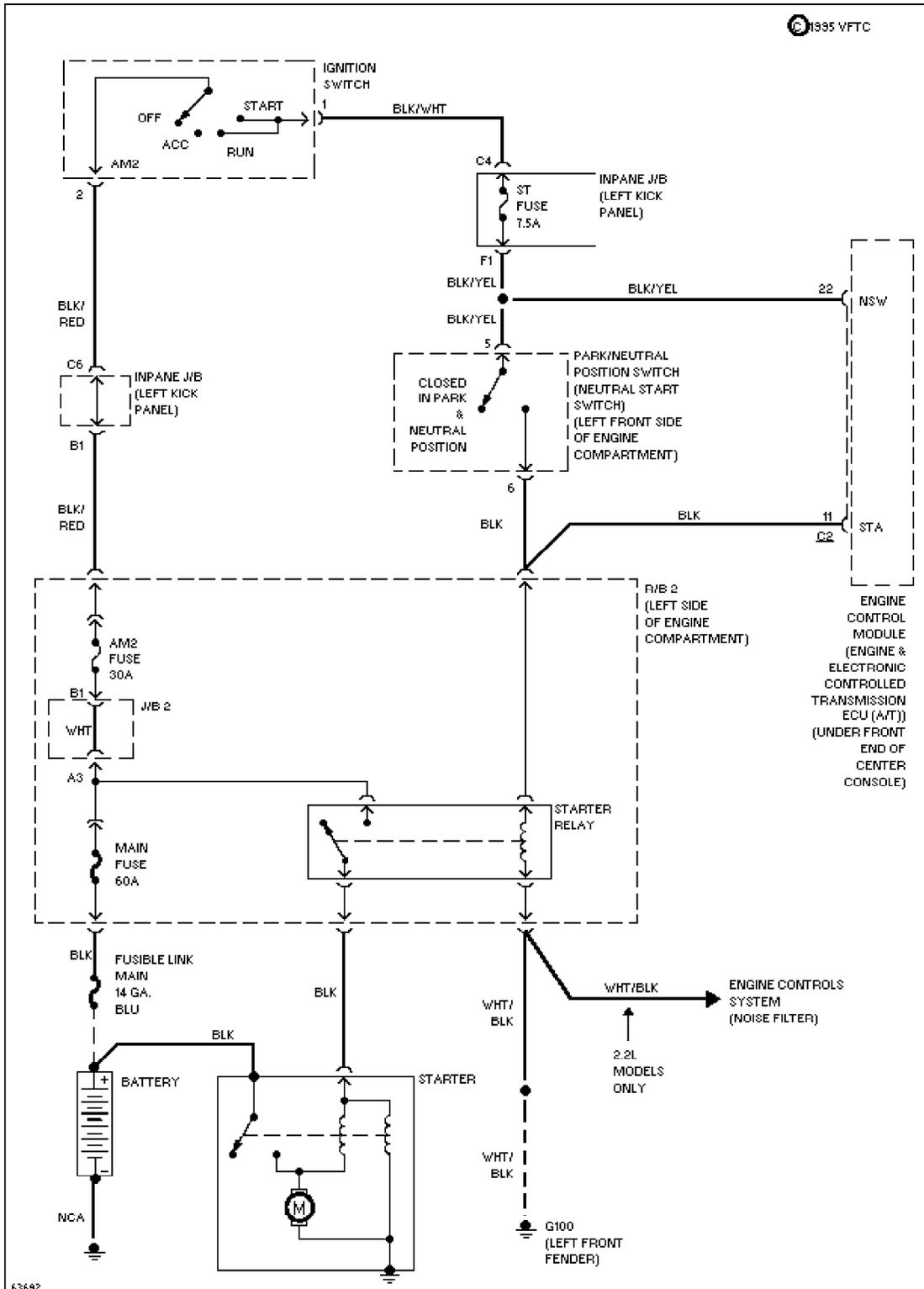


Fig. 10: Starting System Wiring Diagram (A/T)

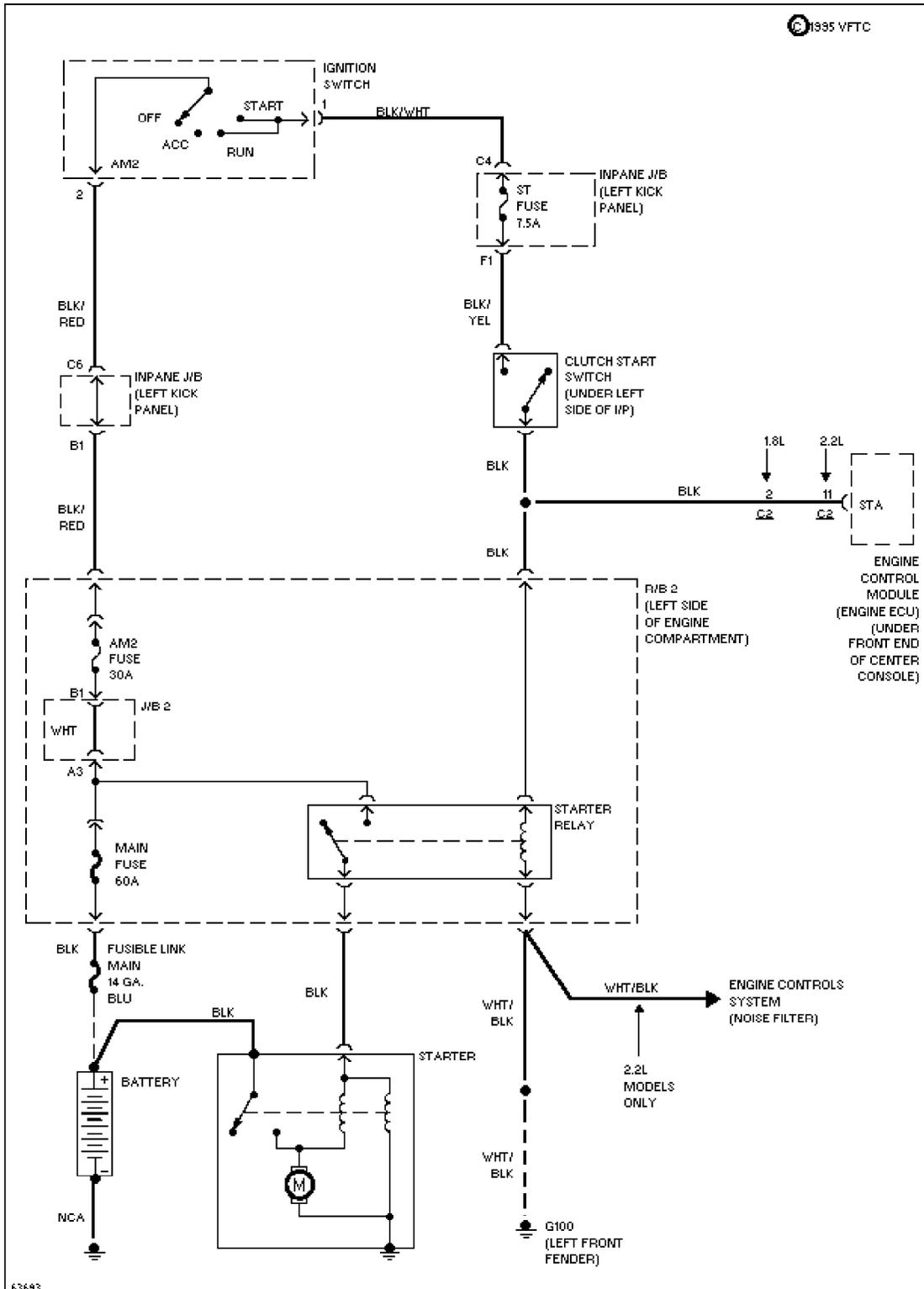


Fig. 11: Starting System Wiring Diagram (M/T)