

## 1999 Chevrolet Corvette

1999 STARTING & CHARGING SYSTEMS Starters - Cars - Except Metro, Prizm & Saturn

### 1999 STARTING & CHARGING SYSTEMS

Starters - Cars - Except Metro, Prizm & Saturn

## VEHICLE IDENTIFICATION

### MODEL & BODY CODE IDENTIFICATION

| Model   | Body Code |
|---|-----------|
| Alero, Cutlass, Grand Am, Malibu                          | "N" Body  |
| Aurora, Rivera  | "G" Body  |
| Bonneville, Eighty Eight, LeSabre, LSS                    | "H" Body  |
| Camaro, Firebird  | "F" Body  |
| Catera  | "V" Body  |
| Cavalier, Sunfire   | "J" Body  |
| Century, Grand Prix, Intrigue, Lumina, Monte Carlo, Regal | "W" Body  |
| Corvette  | "Y" Body  |
| DeVille, Eldorado   | "E" Body  |
| Park Avenue   | "C" Body  |
| Seville   | "K" Body  |

## DESCRIPTION & OPERATION

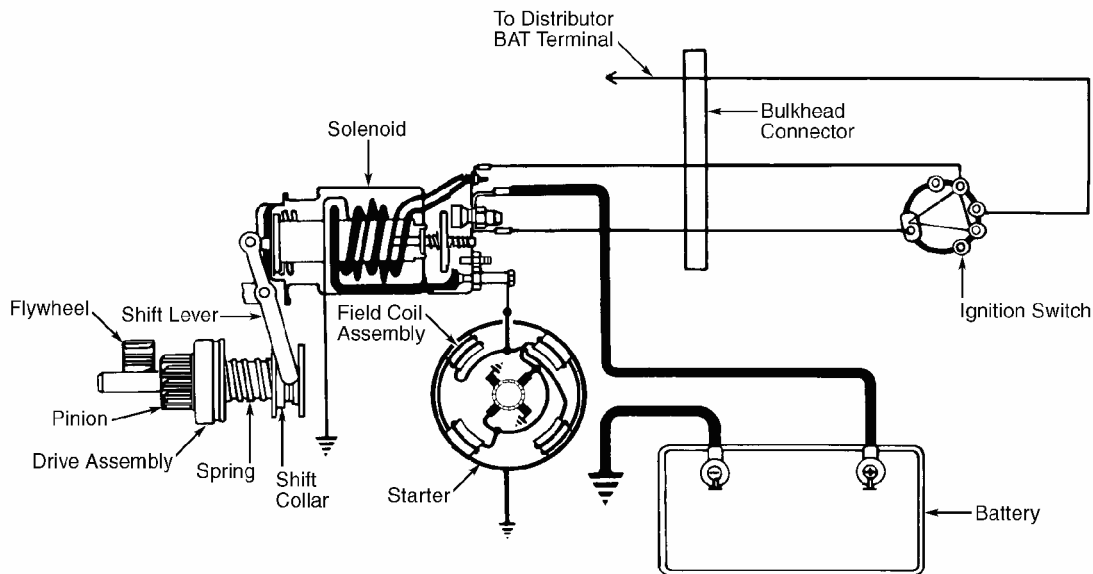
Starter motor features a small permanent magnets mounted inside the field frame and a planetary gear reduction mechanism between armature and drive. Drive housing encloses the shift lever, shift lever mechanism, and solenoid plunger to protect them from exposure to ice, dirt, and other elements.

When voltage is applied to solenoid, voltage is applied to solenoid windings which causes movement of solenoid plunger and shift lever, causing drive pinion to engage the flywheel and close solenoid switch contacts. See [Fig. 1](#) . When solenoid switch contacts close, starter motor energizes and cranks the engine. As the engine starts, the pinion overrun clutch protects the armature from excessive speed until the ignition switch is opened and the plunger return spring disengages the pinion.

Starters with the PG designation have a pinion that is driven by a gear reduction system. These starters should not be disassembled for any reason. They are serviceable only by complete replacement. Ensure replacement starters are the same size as original starters. See [Fig. 2](#) , [Fig. 3](#) and [Fig. 4](#) .

## 1999 Chevrolet Corvette

1999 STARTING & CHARGING SYSTEMS Starters - Cars - Except Metro, Prizm & Saturn



G95H13471

**Fig. 1: Illustrating Typical Cranking Circuit**  
Courtesy of GENERAL MOTORS CORP.

## STARTER IDENTIFICATION

### STARTER APPLICATIONS

| Application     | Engine/VIN <sup>(1)</sup> | Starter |
|-----------------|---------------------------|---------|
| "C" Body        | 3.8L/K & 3.8L/1           | PG260   |
| "E" Body        | 4.6L/9 & 4.6L/Y           | PG260   |
| "F" Body        | 3.8L/K & 5.7L/G           | PG260   |
| "G" Body        |                           |         |
| Aurora          | 4.0L/C                    | (2)     |
| Riviera         | 3.8L/1                    | (2)     |
| "H" Body        | 3.8L/K & 3.8L/1           | PG260   |
| "J" Body        | 2.2L/4 & 2.4L/T           | PG260   |
| "K" Body        | 4.6L/9 & 4.6L/Y           | PG260   |
| "N" Body        |                           |         |
| Alero, Grand Am | 2.4L/T                    | PG260   |
|                 | 3.4L/E                    | PG260M1 |
| Cutlass, Malibu | 2.4L/T                    | PG260MQ |
|                 | 3.1L/J                    | PG260F1 |
|                 | 3.1L/M                    | PG260F1 |
| "V" Body        | 3.0L/R                    | (2)     |
| "W" Body        | 3.1L/M                    | PG260F1 |

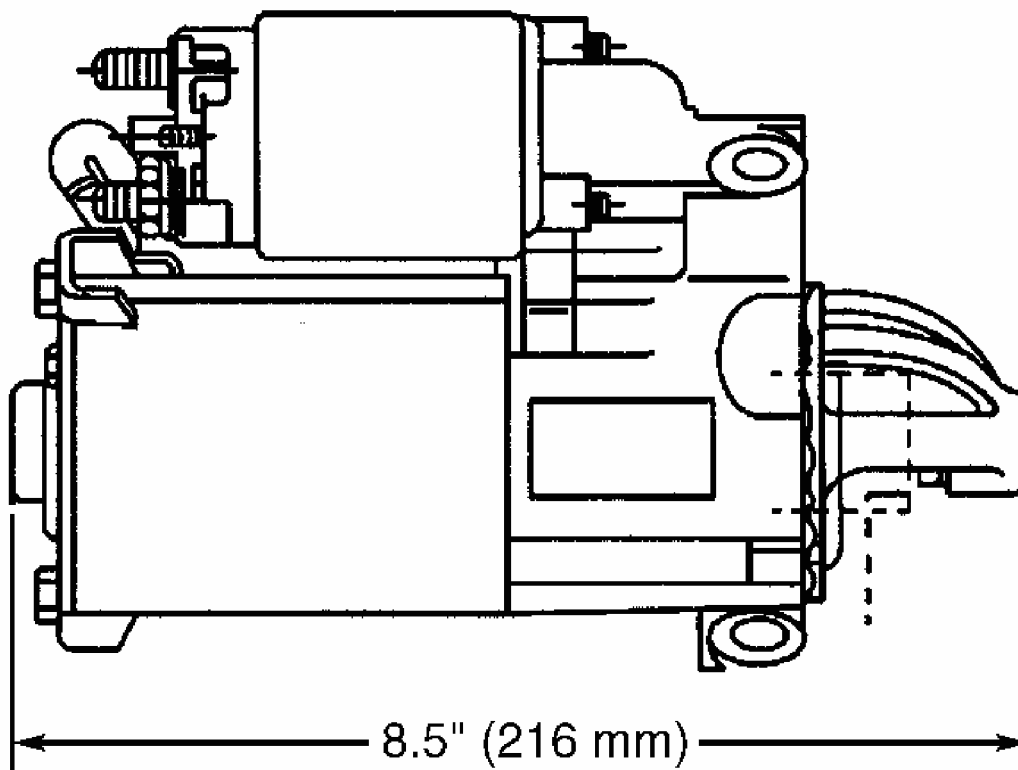
## 1999 Chevrolet Corvette

1999 STARTING & CHARGING SYSTEMS Starters - Cars - Except Metro, Prizm & Saturn

|          |        |         |
|----------|--------|---------|
|          | 3.5L/H | PG260M1 |
|          | 3.8L/K | PG260F2 |
|          | 3.8L/1 | PG260M  |
| "Y" Body | 5.7L/G | PG260   |

(1) Eighth character of Vehicle Identification Number (VIN).

(2) Information was not available from manufacturer.

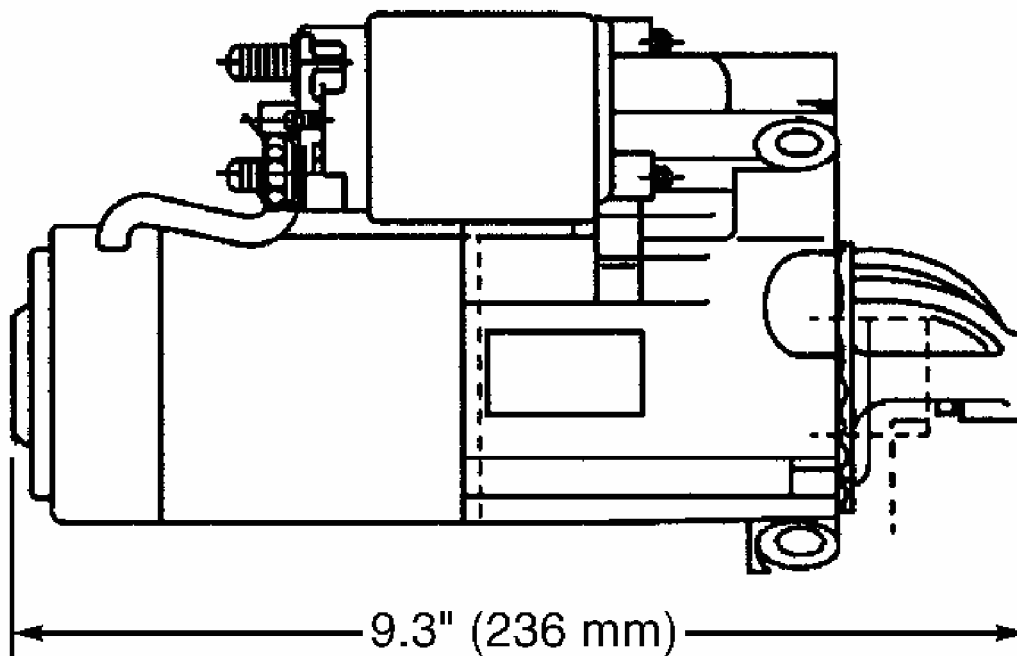


G98F00989

**Fig. 2: Measuring PG260 F1 Starter Length**  
**Courtesy of GENERAL MOTORS CORP.**

## 1999 Chevrolet Corvette

1999 STARTING & CHARGING SYSTEMS Starters - Cars - Except Metro, Prizm & Saturn



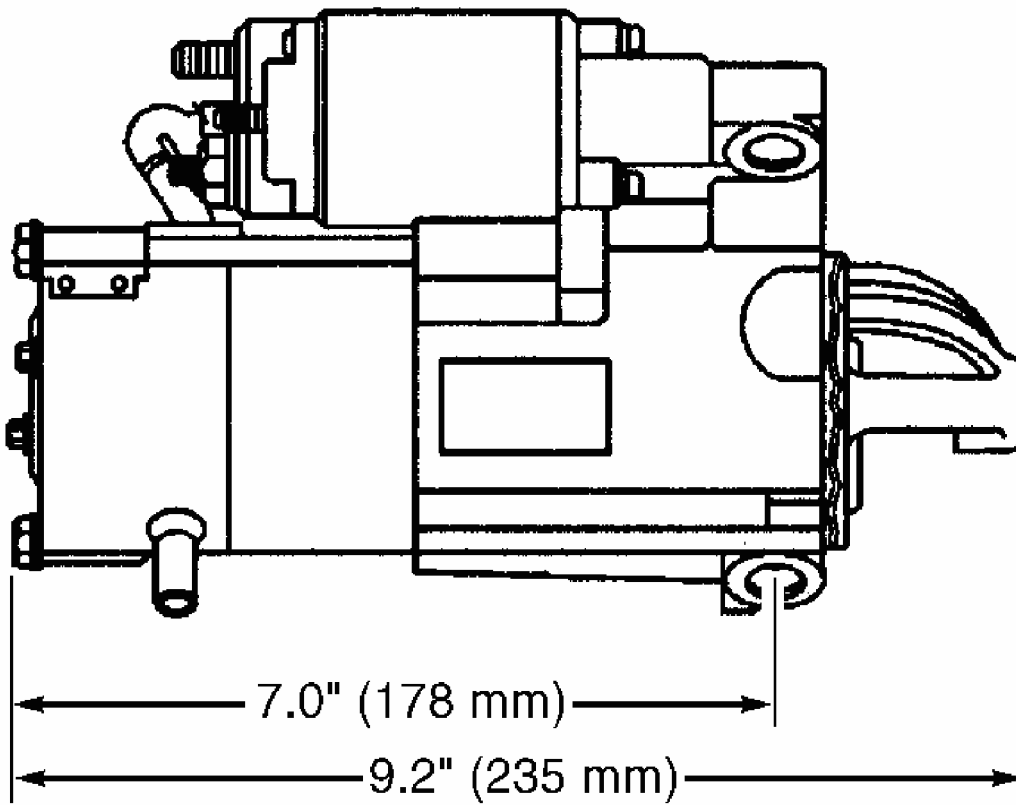
G98I00990

**Fig. 3: Measuring PG260 F2 Starter Length**  
**Courtesy of GENERAL MOTORS CORP.**



## 1999 Chevrolet Corvette

1999 STARTING & CHARGING SYSTEMS Starters - Cars - Except Metro, Prizm & Saturn



G98J00991

**Fig. 4: Measuring PG260 M Starter Length**  
Courtesy of GENERAL MOTORS CORP.

### COMPONENT LOCATIONS

#### COMPONENT LOCATIONS

| Component                          | Location   |
|------------------------------------|--|
| "C" Body                           |  |
| Instrument Panel Junction Block    | Under Right Side Of Instrument Panel                     |
| Park/Neutral Position (PNP) Switch | Left Rear Of Transaxle, Below EGR Valve                  |
| Power Control Module (PCM)         | Left Front Of Engine Compartment, In Air Cleaner Housing |
| Rear Junction Block                | Under Rear Seat, Right Side                              |
| Underhood Junction Block           | Right Front Corner Of Engine                             |

## 1999 Chevrolet Corvette

### 1999 STARTING & CHARGING SYSTEMS Starters - Cars - Except Metro, Prizm & Saturn

|                                    |  |
|------------------------------------|--|
|                                    | Compartment, Between Front Strut Tower And Battery                                     |
| <b>"E" Body</b>                    |  |
| C202 (48-pin) Connector            | Steering Column To Body Wiring Harness In-Line Connector, Near Base Of Steering Column |
| Park/Neutral Position (PNP) Switch | On Left Of Transaxle, Near Base Of Rear Engine Lift Hook                               |
| Powertrain Control Module (PCM)    | Left Front Corner Of Engine Compartment, Under Air Cleaner Housing                     |
| Right Fuse Block                   | Forward Of Left Front Strut Tower, Near Engine Compartment Fuse/Relay Center           |
| Starter Enable Relay               | Forward Of Left Front Strut Tower, Near Engine Compartment Fuse/Relay Center           |
| Starter                            | Center Of Engine, Under Intake Manifold  |
| <b>"F" Body</b>                    |  |
| Battery                            | Right Front Of Engine Compartment  |
| Body Control Module (BCM)          | Under Right Instrument Panel, Near Blower Motor  |
| Clutch Pedal Position (CPP) Switch | Mounted To Clutch Pedal Bracket  |
| IGN & STRTR Fuses                  | Underhood Electrical Center 2  |
| Park Neutral Position (PNP) Switch | Under Console, On Base Of Shift Control Lever  |
| Powertrain Control Module (PCM)    | In Engine Compartment, Near Of Right Shock Tower                                       |
| Starter Relay                      | Underhood Electrical Center 2  |
| Underhood Electrical Center 2      | Left Front Corner Of Engine Compartment  |
| <b>"G" Body</b>                    |  |
| Battery                            | Under Rear Seat  |
| Battery Thermistor                 | Under Rear Seat, Attached To   |

## 1999 Chevrolet Corvette

1999 STARTING & CHARGING SYSTEMS Starters - Cars - Except Metro, Prizm & Saturn

|                                    |  |
|------------------------------------|--|
|                                    | Positive Battery Cable   |
| Engine Compartment Fuse Block      | Right Front Corner Of Engine Compartment                           |
| Instrument Panel Fuse Block        | Left Front Of Passenger Compartment, Attached To Door Hinge Pillar |
| Park/Neutral Position (PNP) Switch | Left Center Of Engine Compartment, On Transaxle                    |
| Powertrain Control Module (PCM)    | Behind Right Side Of Instrument Panel                              |
| Right Rear Fuse Blocks No. 1 & 2   | Under Rear Seat, On Right Side                                     |
| Starter Enable Relay               | On Bracket Left Of Steering Column, Behind Instrument Panel        |
| Starter Motor (Oldsmobile)         | Top Of Engine, Under Intake Manifold                               |
| Starter Motor (Buick)              | Front Of Engine, Lower Left Side                                   |
| "H" Body                           |  |
| Battery                            | Right Front Of Engine Compartment                                  |
| Ignition Switch                    | Mounted On Steering Column, Near Base                              |
| Instrument Panel Fuse Block        | Lower Left Side Of Instrument Panel, Behind Trim Panel             |
| Park/Neutral Position (PNP) Switch | Top Of Left Side Of Transaxle                                      |
| Pass-Key(R) II Decoder Module      | Behind Right Side Of Instrument Panel                              |
| Powertrain Control Module (PCM)    | Left Front Of Engine Compartment                                   |
| Right Underhood Fuse Block         | Right Rear Of Engine Compartment                                   |
| Starter Enable Relay               | Behind Left Side Of Instrument Panel, Above Fuse Block             |
| "K" Body                           |  |
| Battery                            | Under Rear Seat  |
| Battery Thermistor                 | Under Rear Seat, Attached To Positive Battery Cable                |

## 1999 Chevrolet Corvette

1999 STARTING & CHARGING SYSTEMS Starters - Cars - Except Metro, Prizm & Saturn

|                                      |  |
|--------------------------------------|--|
| Dash Integration Module (DIM)        | Under Instrument Panel, Near Blower Motor          |
| Park/Neutral Position (PNP) Switch   | Left Side Of Transaxle, Below Throttle Body        |
| Powertrain Control Module (PCM)      | In Engine Air Cleaner Housing                      |
| Rear Fuse Block                      | Under Rear Passenger Seat, Left Side               |
| Theft Deterrent Module               | Behind Instrument Panel, Right Of Steering Column  |
| Underhood Fuse Block                 | Right Rear Of Engine Compartment                   |
| "J" Body                             |  |
| Battery                              | Left Front Corner Of Engine Compartment            |
| Clutch Pedal Position (CPP) Switch   | Left Lower Instrument Panel, Below Steering Column |
| Engine Compartment Fuse/Relay Center | Left Front Of Engine Compartment                   |
| Power Control Module (PCM)           | Right Front Corner Behind Fascia                   |
| Transaxle Range Switch               | Left Rear Of Transmission                          |
| "N" Body                             |  |
| Alero & Grand Am                     |  |
| Clutch Pedal Position (CPP) Switch   | On Bracket, Near Base Of Steering Column           |
| Fusible Link "G"                     | Lower Front Of Engine                              |
| Ignition Switch                      | Left Side Of Instrument Panel                      |
| Powertrain Control Module (PCM)      | Right Front Of Instrument Panel                    |
| Transaxle Range (TR) Switch          | Left Side Of Engine Compartment                    |
| Underhood Junction Block             | Left Side Of Engine Compartment                    |
| Cutlass & Malibu                     |  |
| Body Function Controller (BFC)       | Below Right Side Of Instrument Panel               |
| Fusible Link (2.4L)                  | Lower Font Of Engine                               |
| Fusible Link (3.1L)                  | Front Of Engine                                    |
|                                      |  |

**1999 Chevrolet Corvette****1999 STARTING & CHARGING SYSTEMS Starters - Cars - Except Metro, Prizm & Saturn**

|                                     |   |
|-------------------------------------|---|
| Powertrain Control Module (PCM)     | Below Left Side Of Instrument Panel, Near Steering Column |
| Transaxle Range Switch              | Left Side Of Engine                                       |
| Underhood Junction Block            | Left Side Of Engine Compartment                           |
| "V" Body                            |   |
| Automatic Transmission Range Switch | Left Side Of Transmission Housing                         |
| Battery                             | Left Front Corner Of Engine Compartment                   |
| Ignition Switch                     | Upper Right Side Of Steering Column                       |
| Power Distribution Fuse Block       | Attached To PCM Housing, Above Battery                    |
| "W" Body                            |   |
| Century, Intrigue, Regal            |   |
| Fuse Block                          | Right Side Of Instrument Panel, Near Door Pillar          |
| Fusible Links                       | Front Of Engine, On Starter Assembly                      |
| Powertrain Control Module (PCM)     | Left Side Of Engine Compartment, In Air Cleaner           |
| Transaxle Range Switch              | Left Of Engine, On Transaxle                              |
| Underhood Junction Block            | Right Side Of Engine Compartment, On Strut Tower          |
| Grand Prix                          |   |
| Fuse Block                          | Right Side Of Instrument Panel, In Glove Box Opening      |
| Fusible Links                       | Front Of Engine, On Starter Assembly                      |
| Powertrain Control Module (PCM)     | Left Side Of Engine Compartment, Inside Air Cleaner       |
| Transaxle Range Switch              | Left Of Engine, On Transaxle                              |
| Underhood Junction Block            | Engine Compartment,                                       |

## 1999 Chevrolet Corvette

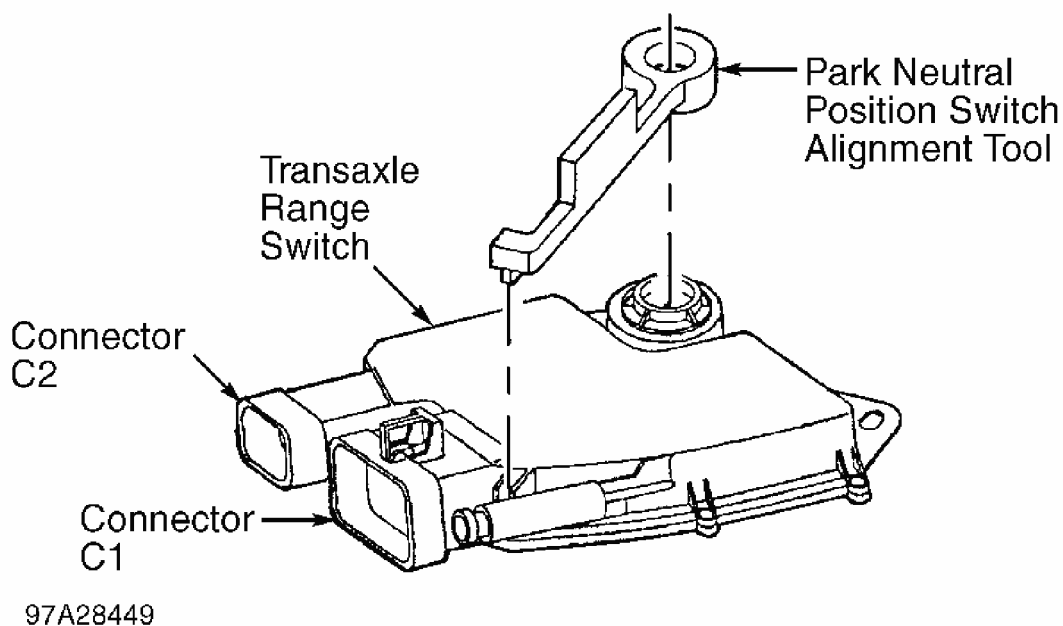
1999 STARTING & CHARGING SYSTEMS Starters - Cars - Except Metro, Prizm & Saturn

|  |   |
|--|---|
|  | Mounted To Right Strut Tower                                |
| Lumina, Monte Carlo                    |   |
| Battery                                | Left Front Corner Of Engine Compartment                     |
| Fuse Block                             | Right Side Of Instrument Panel, In Right Front Door Opening |
| Park Neutral Position (PNP) Switch     |   |
| Column Shift                           | Mounted On Steering Column                                  |
| Floor Shift                            | Mounted At Base Of Shifter                                  |
| Powertrain Control Module (PCM)        | Right Side Of Engine Compartment, Forward Of Strut Tower    |
| Theft Module & Relay                   | Behind Right Side Of Instrument Panel, Above Glove Box      |
| Transaxle Range Switch                 | Left Of Engine, On Transaxle                                |
| "Y" Body                               |   |
| Battery                                | Underhood, Behind Right Wheel Well                          |
| Body Control Module (BCM)              | Mounted To Toe Board, Above Right Footwell                  |
| Clutch Pedal Position/Cruise Switch    | On Bracket Above Clutch Pedal                               |
| Ignition & Start Switch                | Left Side Of Instrument Panel, Next To Radio                |
| Instrument Panel Junction Block        | Below Instrument Panel, At Top Of Footwell                  |
| Park/Neutral Position & Back-Up Switch | Left Side Of Transmission                                   |
| Powertrain Control Module (PCM)        | Right Side Of Engine Compartment, Below Battery             |
| Theft Deterrent Relay                  | Above BCM   |
| Underhood Junction Block               | Right Side Of Engine Compartment, Forward Of Battery        |

## ADJUSTMENTS

**TRANSAXLE RANGE SWITCH ("N" BODY)**

Remove negative battery cable. Remove shift linkage. Remove transaxle range switch electrical connector. Loosen transaxle range switch mounting bolts. Place shift shaft in Neutral position and align flats of shift shaft with switch. Place Park Neutral Position Switch Alignment (J41545) tool and rotate switch until tool drops into position. See **Fig. 5** . Tighten mounting bolts and remove alignment tool. After switch adjustment, verify that engine will only start in Park or Neutral. If engine will start in any other position re-adjust switch.



**Fig. 5: Adjusting Transaxle Range Switch ("N" Body)**  
Courtesy of GENERAL MOTORS CORP.

**TRANSMISSION RANGE SWITCH ("V" BODY)**

Place transmission shift lever in neutral position. Raise and support vehicle. Remove switch cover and wire harness connector from bracket. Remove transmission gear selector shaft nut and slide selector shaft lever from shaft. Loosen transmission range switch bolts. Connect ohmmeter to terminals "E" and "H". Rotate switch to determine range of contact (about 5 degrees). Position switch in center of contact range. Tighten transmission range switch bolts.

**TROUBLE SHOOTING**

**NOTE:** For information not covered in this article, see **TROUBLE SHOOTING** article in **GENERAL INFORMATION**.

**TROUBLE SHOOTING HINTS**

## 1999 Chevrolet Corvette

1999 STARTING & CHARGING SYSTEMS Starters - Cars - Except Metro, Prizm & Saturn

**NOTE:** Refer to appropriate wiring diagrams to verify wire color and connector terminal identification. See WIRING DIAGRAMS .

Note condition and operation of SECURITY indicator light (if equipped). If indicator stays on or flashes continuously, see appropriate ANTI-THEFT SYSTEMS article in ACCESSORIES & EQUIPMENT. Check starter solenoid terminals and battery grounds. Check for proper installation of aftermarket electronic equipment. Perform self-diagnostic system test, to be certain no trouble codes are stored in PCM memory which may lead to misdiagnosis. See appropriate SELF-DIAGNOSTICS article in ENGINE PERFORMANCE.

### "C" Body

Check THFT (30-amp) fuse, STARTER (30-amp) fuse and RUN/CRK (15-amp) fuse in underhood junction block. Also check CRANK (5-amp) fuse in rear fuse block. If any fuse is open, check for a short to ground in Yellow wire between ignition switch, underhood fuse block and rear fuse block.

### "E" Bodies

Check for open BATT1 (50-amp) fuse and BATT2 (30-amp) fuse in right underhood fuse block. If either fuse is open, check for a short to ground in Purple wire between starter enable relay and starter solenoid. Also, check for BATTERY VOLTS LOW, BATTERY NO CHARGE or SERVICE ELECTRICAL SYSTEM messages on Driver Information Center (DIC).

### "F" Body

Check STRTR (15-amp) fuse and IGN (50-amp) fuse in underhood fuse block. Check for the presence of any related DTC's for theft deterrent system or fuel enable circuits.

### "G" Body

Check IGN-3 (60-amp) fuse in right rear fuse block. Check CRANK (10-amp) fuse in instrument panel fuse block. See COMPONENT LOCATIONS . If fuse is open, check for a short to ground in Yellow wire between ignition switch and starter enable relay. Check for a short in Purple wire between starter enable relay and starter solenoid terminal "S".

### "H" Body

Check IGN SW (60-amp) fuse in right underhood fuse block. Check AIR BAG/VATS (10-amp) fuse in instrument panel fuse block. See COMPONENT LOCATIONS .

### "J" Body

Check IGN (50-amp) fuse.

### "K" Body



## 1999 Chevrolet Corvette

### 1999 STARTING & CHARGING SYSTEMS Starters - Cars - Except Metro, Prizm & Saturn

Check IGN SW (15-amp) fuse of rear fuse block, and START circuit breaker, START 1, and START 2 relays of underhood fuse block. Check for any related DTC's on Driver Information Center (DIC).

#### "N" Body

Check IGN SW-BATT1 (40-amp) fuse.

#### "V" Body

Check V2 (80-amp) fuse, located in power distribution fuse block. See **COMPONENT LOCATIONS** . If fuse is open, check for a short to ground in Red wire between power distribution fuse block and ignition switch.

#### "W" Body (Century, Grand Prix & Regal)

Check IGN MAIN 1 (40-amp) fuse and CRANK (40-amp) fuse in underhood junction block. Also, check CRANK SIGNAL, BCM, CLUSTER (10-amp) fuse and PCM-BCM, U/H RELAY (10-amp) fuse in instrument panel fuse block.

#### "W" Body (Intrigue)

Check IGN 1 (30-amp) fuse, IGN 2 (50-amp) fuse, and CRANK (40-amp) fuse in underhood junction block. Also, CRANK SIGNAL, BCM, CLUSTER (10-amp) fuse, and PCM, BCM, U/H RELAY (10-amp) fuse of instrument panel fuse block.

#### "W" Body (Lumina & Monte Carlo)

Check IGN SW 1 (50-amp) fuse in underhood junction block, and FUSE 7 (5-amp) fuse of instrument panel fuse block. Check for any related theft deterrent DTCs stored in memory.

#### "Y" Body

Check IGN 2 (60-amp) fuse, STARTER (60-amp) fuse, and CRK (10-amp) fuse in instrument panel electrical center.

### STARTER NOISE

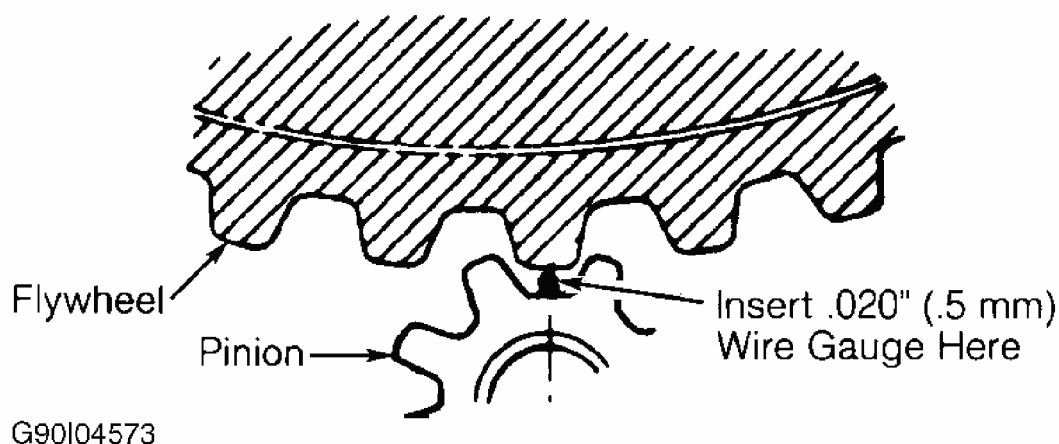
**CAUTION:** Never operate starter for periods of more than 15 seconds. Excessive cranking can cause starter to overheat. Allow starter to cool for at least 2 minutes after each time operated.

**NOTE:** Starters on most engines can not be shimmed. Noise conditions which normally require shims, can only be corrected by replacing starter.

1. A high-pitched whine, heard while cranking (before engine starts), indicates excessive distance between starter pinion and flywheel. If high-pitched whine is heard after engine starts and key is released, distance between starter pinion and flywheel is too small. Pinion-to-flywheel clearance should be .020" (0.5 mm). See **Fig. 6**.
2. If loud, siren-like "whoop" sound is heard after the engine starts, drive assembly is likely defective. If "rumble", "growl" or "knock" exists as starter is coasting to a stop after starting engine, starter armature is bent or unbalanced.

**NOTE:** Always check flywheel ring gear for signs of damage.

3. If diagnosis indicates pinion should be closer to flywheel, ensure proper starter motor was installed and ensure starter-to-engine bolts are tightened correctly. See **TORQUE SPECIFICATIONS**. During initial starter motor installation, shim(s) are not used. If shim(s) are present, install shim(s) in original location with replacement starter.
4. If diagnosis indicates pinion should be moved away from flywheel, add one shim. If using .039" (1.0 mm) double shims, do not install more than 2 shims. If using .015" (.38 mm) double shims, do not install more than 3 shims. If condition is not corrected, and pinion-to-flywheel clearance has been reached, single shims may be added to outer side of starter motor bolt using .015" (.38 mm) shims. See **STARTER** under REMOVAL & INSTALLATION.



**Fig. 6: Measuring Pinion-To-Flywheel Clearance**  
Courtesy of GENERAL MOTORS CORP.

## ON-VEHICLE TESTING

**WARNING:** Vehicles are equipped with air bag supplemental restraint

**system. Before attempting ANY repairs involving steering column, instrument panel or related components, see SERVICE PRECAUTIONS and DISABLING & ACTIVATING AIR BAG SYSTEM in appropriate AIR BAG RESTRAINT SYSTEMS article.**

**NOTE:** The following tests assume that engine and battery are operating normally and are at operating temperature, battery is charged, there are no engine problems that would cause a no-start condition, and no diagnostic trouble codes are present.

#### **SLOW OR NO CRANK ONLY AFTER EXTENDED PERIODS OF VEHICLE NON-USE**

There may be a parasitic load on electrical system. See PARASITIC LOAD EXPLANATION & TEST PROCEDURES article in GENERAL INFORMATION.

#### **ENGINE DOES NOT CRANK, STARTER SOLENOID DOES NOT CLICK**

##### **"C" Body**

1. Place gear selector in Park. Turn ignition switch to START position and observe SECURITY indicator on instrument cluster. If SECURITY indicator illuminates for about 5 seconds, then goes out. If SECURITY indicator is okay, go to next step. If SECURITY indicator remains illuminated or flashes continuously, problem exists within anti-theft system. See appropriate ANTI-THEFT SYSTEMS article.
2. Load test battery. If battery is okay, go to step 5 . If battery fails load test, replace battery and retest.
3. Check battery cables and battery cable connections. If battery cables and connections are okay, go to next step. If battery cables and connections are faulty, repair or replace as necessary.
4. Remove INJR (10-amp) fuse, located in underhood junction block. Turn ignition switch to START position. Using DVOM, measure voltage between starter solenoid terminal "S" (Purple wire) and ground. If reading is 8 volts or greater, go to next step. If reading is less than 8 volts, go to step 6 .
5. Check starter solenoid terminal "S" (Purple wire) for poor connection. Also, check for dirty or poor ground between starter and engine block. If connection and ground are okay, replace starter. See **STARTER** under REMOVAL & INSTALLATION.
6. Connect DVOM between ground and underhood junction block connector C3, terminal A14 (Purple wire). Measure voltage with ignition switch in START position. If reading is greater than 8 volts, go to next step. If reading is less than 8 volts, go to step 15 .
7. Turn ignition switch to RUN position. Connect DVOM between positive battery voltage and underhood junction block connector C2, terminal F11 (Yellow wire). If reading is greater than 8 volts, go to next step. If reading is less than 8 volts, go to step

## 1999 Chevrolet Corvette

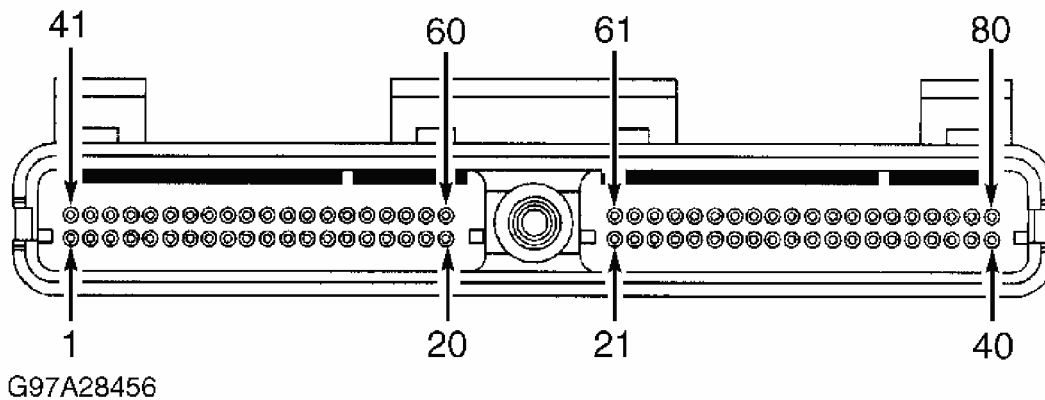
### 1999 STARTING & CHARGING SYSTEMS Starters - Cars - Except Metro, Prizm & Saturn

19 .

8. Connect DVOM between underhood junction block connector C2, terminal B9 (Purple wire) and ground. Measure voltage with ignition switch in START position. If reading is more than 8 volts, repair open in Purple wire. If reading is less than 8 volts, go to next step.
9. Check STARTER (30-amp) fuse. If STARTER (30-amp) fuse is okay, go to step 11 . If fuse is open, check for short to ground in Purple wire. Repair as necessary. If Purple wire is okay, go to next step.
10. Check if starter solenoid is shorted to ground. If solenoid is shorted to ground, replace starter. See **STARTER** under REMOVAL & INSTALLATION. If solenoid is not shorted to ground, go to step 20 .
11. Turn ignition off. Remove starter relay from underhood junction block. Note terminal identification on bottom of starter relay. Connect DVOM across underhood junction block cavities for starter relay terminals No. 85 and 86. Turn ignition switch to START position. If reading is greater than 8 volts, go to next step. If reading is less than 8 volts, go to step 20 .
12. Disconnect a Purple wire from starter solenoid. Connect DVOM to Purple wire. Using a fused jumper wire, connect underhood junction block cavities for starter relay terminals No. 30 and 87. If reading is greater than 8 volts, go to next step. If reading is less than 8 volts, go to step 20 .
13. Remove fused jumper wire, install starter relay to underhood junction block. Turn ignition switch to START position. If reading is greater than 8 volts, go to next step. If reading is less than 8 volts, replace starter relay.
14. Remove starter relay and check for poor terminal contact between starter relay and underhood junction block cavities. If terminals are okay, replace starter relay.
15. Check RUN/CRK (15-amp) in underhood fuse block. If fuse is open, repair short to ground in Yellow wire between underhood fuse block and ignition switch. See **WIRING DIAGRAMS** . If Yellow wire is okay, replace RUN/CKT (15-amp) fuse.
16. Check CRK (5-amp) in rear fuse block. If fuse is okay, go to next step. If fuse is open, repair short to ground in Purple wire between instrument fuse block and rear fuse block. See **WIRING DIAGRAMS** . If Purple wire is okay, replace RUN/CKT (15-amp) fuse.
17. Turn ignition switch to START position. Using DVOM, measure voltage at cavities for CRK (5-amp) fuse of rear fuse block. If reading is greater than 8 volts, repair short to ground in Purple wire between instrument fuse block and rear fuse block. If reading is less than 8 volts, go to next step.
18. Repair open in Purple wire between instrument fuse block and rear fuse block, or repair open in Yellow wire between underhood fuse block and ignition switch. See **WIRING DIAGRAMS** . If circuits are okay, replace ignition switch.
19. Disconnect PCM connector C2 (Clear 80-pin connector). Connect DVOM between terminal No. 76 (Yellow wire) and ground. See **Fig. 7** . Turn ignition switch to START

position. If reading is greater than 8 volts, check PCM connector C2 for poor terminal contact. If terminal contact is okay, replace and reprogram PCM. See appropriate ENGINE PERFORMANCE article. If reading is less than 8 volts, repair open in Yellow wire. See **WIRING DIAGRAMS** .

20. Check underhood junction block connectors C2 (Brown) and C3 (Gray) for poor terminal contact. Repair as necessary. If connectors are okay, replace underhood junction block.



**Fig. 7: Identifying Terminals Of PCM Connector C2 ("C" Body)**  
**Courtesy of GENERAL MOTORS CORP.**

**"E" Body**

1. Turn ignition switch to START position. If engine cranks, system is okay at this time. If engine does not crank, go to next step.
2. Place gear selector in Park. Turn ignition switch to START position, and observe Driver Information Center (DIC) display. If DIC displays STARTING DISABLED, go to appropriate ANTI-THEFT SYSTEMS article. If no message is displayed, go to next step.
3. Inspect BATT1 (50-amp) fuse in underhood fuse block. If fuse is okay, go to step 5 . If fuse is open, go to next step.
4. Repair short in Red wire between BATT1 (50-amp) fuse and theft deterrent relay. Replace BATT1 (50-amp) fuse. Go to step 30 .
5. Check BATT2 (30-amp) fuse in underhood fuse block. If fuse is okay, go to step 7 . If fuse is open, go to next step.
6. Repair short in Red wire between BATT2 (30-amp) fuse and ignition switch. Replace BATT1 (50-amp) fuse. Go to step 30 .
7. Perform battery load test. If battery is okay, go to next step. If battery is not okay, go to step15 .

## 1999 Chevrolet Corvette

### 1999 STARTING & CHARGING SYSTEMS Starters - Cars - Except Metro, Prizm & Saturn

8. Check battery cables and connections. If cables and connections are okay, go to next step. If battery cables and connections are not okay, go to step 16 .
9. Remove both INJ fuses from underhood fuse block to prevent engine from starting. Connect a DVOM between ground and starter solenoid terminal "S". Turn ignition switch to START position. If reading is greater than 8 volts, go to step 17 . If reading is less than 8 volts, go to next step.
10. Disconnect Purple wire from starter solenoid. Connect a DVOM between ground and theft deterrent relay terminal "E" (Purple wire). Turn ignition switch to START position. If reading is greater than 10 volts, go to step [18](#) . If reading is less than 10 volts, go to next step.
11. Connect Purple wire lead to starter solenoid. Connect DVOM between positive battery terminal and theft deterrent relay terminal "D" (Yellow/Black wire). Turn ignition switch to START position. If reading is 10-15 volts, go to next step. If reading is not as specified, go to step 19 .
12. Connect DVOM between theft deterrent relay terminal "B" (Red wire) and ground. If reading is 10-15 volts, go to next step. If reading is not as specified, go to step 21 .
13. Connect DVOM between ground theft deterrent relay terminal "F" (Yellow wire). Turn ignition switch to START position. If reading is 10-15 volts, go to next step. If reading is not as specified, go to step 22 .
14. Replace theft deterrent relay. Go to step 30 .
15. Replace battery. Go to step 30 .
16. Repair or replace cables and/or connectors as necessary. Go to step 30 .
17. Check for poor connections at starter, repair as necessary. If connections are okay, replace starter. See **STARTER** under REMOVAL & INSTALLATION. Go to step 30 .
18. Repair open or short to ground in Purple wire. Go to step 30 .
19. Check for an open Yellow/Black wire. Repair as necessary. If circuit is okay, go to next step. Go to step 30 .
20. Replace instrument cluster. See appropriate INSTRUMENT PANELS article. Go to step 30 .
21. Repair Red wire circuit as necessary. Go to step 30 .
22. Connect DVOM between Park Neutral Position (PNP) switch connector C1 terminal "G" (Yellow wire). Turn ignition switch to START position. If reading is 10-15 volts, go to step [27](#) . If reading is not as specified, go to next step.
23. Connect DVOM between connector C202 terminal D5 (Red wire). See **COMPONENT LOCATIONS** . If reading is 10-15 volts, go to next step. If reading is not as specified, go to 26 .
24. Check for an open in Yellow wire between ignition switch and PNP switch. Repair as necessary. See **WIRING DIAGRAMS** . Go to step 30 . If Yellow wire is okay, go to next step.

## 1999 Chevrolet Corvette

### 1999 STARTING & CHARGING SYSTEMS Starters - Cars - Except Metro, Prizm & Saturn

25. Replace ignition switch. Go to step 30 .
26. Repair open in Red wire between BATT 2 (30-amp) fuse and ignition switch. Go to step 30 .
27. Check for an open in Yellow wire between PNP switch and theft deterrent relay. If open condition exists, go to step 29 . If open does not exist, go to next step.
28. Replace Park Neutral Position (PNP) switch. Go to step 30 .
29. Repair suspect circuit as necessary. Go to next step.
30. Connect any previously disconnected components. Verify repair is complete.

#### "F" Body

1. Remove starter relay from underhood electrical center 2. Connect a test light between starter relay cavity for terminal C6 (Yellow/Black wire) and positive battery voltage. Turn ignition switch to START position. If test light illuminates, go to next step. If test light does not illuminate, problem exists within anti-theft system. See appropriate ANTI-THEFT SYSTEMS article.
2. Connect test light between starter relay cavity for terminal C4 (Red wire) and ground. If test light illuminates, go to next step. If test light does not illuminate, check for open circuit in Red wire between starter relay connector terminal C4, ignition switch connector C2, terminal "B" and IGN (50-amp) fuse. Repair or replace as necessary. Recheck system.
3. Connect test light between starter relay cavity for terminal B4 (Dark Green wire) and ground. On A/T models, place gear selector in Park or Neutral position. On M/T models, completely depress clutch pedal. On all models, turn ignition switch to START position. If test light illuminates, go to next step. If test light does not illuminate, go to step 5 .
4. Install starter relay to underhood electrical center 2. Disconnect Purple wire from starter solenoid "S" terminal. Connect a test light between Purple wire and ground. On A/T models, place gear selector in Park or Neutral position. On M/T models, completely depress clutch pedal. On all models, turn ignition switch to START position. If test light illuminates, go to step 7 . If test light does not illuminate, go to step 6 .
5. Check for an open in Dark Green wire between starter relay and Clutch Pedal Position (CPP) switch, or Park Neutral Position (PNP) switch. See **WIRING DIAGRAMS** . Check for an open in Purple/White wire between CPP switch, or PNP switch, and STARTR (15-amp) fuse. If circuits are okay, replace CPP switch or PNP switch.
6. Check starter relay for poor connection. Check Purple wire between starter relay connector terminal B6 and starter solenoid terminal "S" for a short circuit. A short in this circuit could cause the anti-theft relay to fail. If connection is okay, replace starter relay.
7. Check for an open or poor connection condition in positive battery cable between battery and starter solenoid. If okay, replace starter.

## 1999 Chevrolet Corvette

### 1999 STARTING & CHARGING SYSTEMS Starters - Cars - Except Metro, Prizm & Saturn

#### "G" Body

1. Place gear selector in Park. Turn ignition switch to START position. If vehicle starts, system is okay at this time. If vehicle does not start, go to next step.
2. Place gear selector in Park. Turn ignition switch to START position and observe SECURITY indicator on instrument cluster. SECURITY indicator should illuminate for 5 seconds, then go out. If SECURITY indicator operates as specified, go to next step. If SECURITY indicator remains illuminated or flashes continuously, problem exists within Pass-Key(R) II anti-theft system. See appropriate ANTI-THEFT SYSTEMS article.
3. Load test battery. Replace battery if it fails load test. Check battery cables and battery cable connections. If battery cables and connections are okay, go to next step. If battery cables and connections are faulty, repair or replace battery cables and connections as necessary.
4. Remove INJ (15-amp) fuse (Riviera), or INJ 1 (10-amp) and INJ 2 (10-amp) fuses (Aurora), located in instrument panel fuse block. For fuse block location, see **COMPONENT LOCATIONS** . Turn ignition switch to START position. Using DVOM, measure voltage between starter solenoid terminal "S" (Purple wire) and ground. If reading is less than 8 volts, go to next step. If reading is greater than 8 volts, check starter solenoid terminal "S" for poor connections. Also, check for poor or dirty ground between starter and engine block. If connections and ground are okay, replace starter assembly. See **STARTER** under REMOVAL & INSTALLATION.
5. Disconnect Purple wire from starter solenoid terminal "S". Connect a DVOM between ground and starter enable relay connector Purple wire terminal A2. Turn ignition switch to START position. If reading is greater than 8 volts, go to next step. If reading is less than 8 volts, go to step 7 .
6. Repair open or shorted condition in Purple wire between starter solenoid and starter enable relay. Verify repair is complete.
7. Turn ignition off. Reconnect Purple wire to starter solenoid terminal "S". Disconnect PNP switch connector C1. Connect a DVOM between PNP switch connector C1, terminal "G" (Yellow wire) and ground. Turn ignition switch to START position. If reading is 10-15 volts, go to next step. If reading is not as specified, go to step 12 .
8. Connect a DVOM between starter enable relay terminal C2 (Purple wire) and ground. Turn ignition switch to START position. If reading is 10-15 volts, go to step 10 . If reading is not as specified, go to next step.
9. Remove CRANK (10-amp) fuse from instrument panel fuse block. Connect a DVOM between Yellow wire terminal for CRANK (10-amp) fuse. Turn ignition switch to START position. If reading is 10-15 volts, go to step 13 . If reading is not as specified, go to step 14 .
10. Turn ignition switch to START position and hold. Measure voltage between starter enable relay connector terminal C1 and ground. If reading is 10-15 volts, go to next step. If reading is not as specified, repair open in Yellow wire between starter enable



## 1999 Chevrolet Corvette

### 1999 STARTING & CHARGING SYSTEMS Starters - Cars - Except Metro, Prizm & Saturn

relay and CRANK (10-amp) fuse.

11. Check for an open condition in Yellow wire between starter enable relay connector A1 and PNP switch connector C1 terminal "G". If Yellow wire circuit is okay, replace starter enable relay.
12. Connect DVOM between positive battery voltage and PNP connector Yellow/Black wire terminal. Turn ignition switch to START position. If reading is 10-15 volts, replace PNP switch. If reading is not as specified, go to next step.
13. Check for an open condition in Yellow/Black wire between PNP switch connector and Pass-Key(R) II theft deterrent module. Repair as necessary. If Yellow/Black wire is okay, replace Pass-Key(R) II theft deterrent module. Repair open or shorted condition in Purple wire between CRANK (10-amp) fuse and starter enable relay.
14. Turn ignition switch to START position and hold. Measure voltage between starter enable relay connector terminal C1 and ground. If reading is greater than 8 volts, go to next step. If reading is less than 8 volts, repair open in Yellow wire between starter enable relay and CRANK (10-amp) fuse.
15. Using DVOM, measure voltage at ignition switch connector C202, terminal D5 (Red wire). If reading 10-15 volts, go to next step. If reading is not as specified, repair open or shorted condition in Red wire between C202 terminal D5 and IGN 3 (60-amp) fuse, or an open IGN 3 (60-amp) fuse located in right rear fuse block. See **WIRING DIAGRAMS** . Repair as necessary.
16. Check for an open or shorted condition in Yellow wire between ignition switch connector C202 terminal D1 and starter enable relay connector terminal C1. If Yellow wire is okay, replace ignition switch. See STEERING COLUMN SWITCHES - AURORA & RIVIERA article.

#### "H" Body

1. Place gear selector in Park. Turn ignition switch to START position. If vehicle starts, system is okay at this time. If vehicle does not start, go to next step.
2. Place gear selector in Park. Turn ignition switch to START position and observe SECURITY indicator on instrument cluster. SECURITY indicator should illuminate for 5 seconds, then go out. If SECURITY indicator operates as specified, go to next step. If SECURITY indicator remains illuminated or flashes continuously, problem exists within anti-theft system. See appropriate ANTI-THEFT SYSTEMS article.
3. Load test battery. Replace battery if it fails load test. Check battery cables and battery cable connections. If battery cables and connections are okay, go to next step. If battery cables and connections are faulty, repair or replace battery cables and connections as necessary.
4. Remove INJECTOR (10-amp) fuse No. 7 from right instrument panel fuse block. Turn ignition switch to START position. Using DVOM, measure voltage between starter solenoid terminal "S" (Purple wire) and ground. See **WIRING DIAGRAMS** . If reading is 8 volts or greater, go to step 10 .

## 1999 Chevrolet Corvette

### 1999 STARTING & CHARGING SYSTEMS Starters - Cars - Except Metro, Prizm & Saturn

5. Using DVOM, backprobe starter enable relay connector terminal A2 (Purple wire). Turn ignition switch to START position. If reading is less than 8 volts, go to next step. If reading is 8 volts or greater, locate and repair open or shorted condition in Purple wire between starter solenoid terminal "S" and starter enable relay.
6. Connect DVOM between Park Neutral Position (PNP) switch connector C1, terminal "G" (Yellow wire) and positive battery terminal. Place gear selector in Park. If reading is 10-15 volts, go to next step. If reading is not as specified, go to step 11 .
7. Connect DVOM between stater enable relay terminal C2 (Purple wire) and ground. Turn ignition switch to START position. If readings is 10-15 volts, go to next step. If reading is not as specified, go to step 9 .
8. Remove AIRBAG/VATS (10-amp) fuse 2E located in instrument panel fuse block. Connect DVOM between AIRBAG/VATS (10-amp) fuse 2E connector terminal B1 (Yellow wire) and ground. Turn ignition switch to START position. If reading is 10-15 volts, go to step 12 . If reading is not as specified, check for an open in Yellow wire between AIRBAG/VATS (10-amp) fuse 2E, starter enable relay, and ignition switch. If Yellow wire is okay, go to 13 .
9. Connect DVOM between starter enable relay terminal C1 (Yellow wire) and ground. Turn ignition switch to START position. If reading is 10-15 volts, go to step 15 . If reading is not as specified, repair open in Yellow wire between AIRBAG/VATS (10-amp) fuse 2E, starter enable relay, and ignition switch.
10. Check for poor connection at starter solenoid terminals. Check for loose or poor ground between starter and engine. Repair as necessary. If connections and ground are okay, replace starter. See **STARTER** under REMOVAL & INSTALLATION.
11. Connect DVOM between positive battery voltage and PNP switch connector C1, terminal "E" (Yellow/Black wire). If reading is 10-15 volts, replace PNP switch. If reading is not as specified, locate and repair open in Yellow/Black wire. If Yellow/Black wire is okay, replace theft deterrent module. See appropriate ANTI-THEFT SYSTEMS article.
12. Check AIRBAG/VATS (10-amp) fuse 2E for an open. If open, locate and repair short in Purple wire between AIRBAG/VATS (10-amp) fuse 2E and starter enable relay. If fuse is okay, repair open in Purple wire between AIRBAG/VATS (10-amp) fuse 2E and starter enable relay.
13. Using DVOM, measure voltage at Red wire terminal of ignition switch. If reading is 10-15 volts, replace ignition switch. If reading is not as specified, go to next step.
14. Check IGN SW (60-amp) fuse of underhood junction block. If fuse is open, repair short to ground in Red wire between IGN SW (60-amp) fuse and ignition switch. Replace IGN SW (60-amp) fuse. If fuse is okay, repair open in Red wire between IGN SW (60-amp) fuse and ignition switch.
15. Check for an open in Yellow wire between starter enable relay connector terminal A1 and PNP switch. Repair as necessary. If open does not exist, replace starter enable relay.

## 1999 Chevrolet Corvette

1999 STARTING & CHARGING SYSTEMS Starters - Cars - Except Metro, Prizm & Saturn

### "J" Body

**NOTE:** Information not available from manufacturer.

### "K" Body

1. Turn ignition switch to START position. If engine cranks, system is okay at this time. If engine does not crank, go to next step.
2. Place gear selector in Park. Turn ignition switch to START position and observe SECURITY indicator on instrument cluster. SECURITY indicator should illuminate for 5 seconds, then go out. If SECURITY indicator is okay, go to next step. If SECURITY indicator remains illuminated or flashes continuously, go to step 15 .
3. Check START circuit breaker in underhood fuse block. If circuit breaker is open, go to next step. If circuit breaker is okay, go to step 5 .
4. Repair short to ground in Purple wire, or poor terminal connections at START1 or START2 relays in underhood fuse block. Go to step 37 .
5. Check battery and battery cables. Perform battery load test. If battery and battery cables are okay, go to step 7 . If battery and battery cables are not okay, go to next step.
6. Replace battery or battery cables. Go to step 37 .
7. Disconnect Purple wire from starter solenoid. Remove INJR1, and INJR2 fuses from underhood fuse block to prevent engine from starting. Using a DVOM, Measure voltage from starter solenoid terminal "S" and ground, while cranking engine. If reading is greater than 8 volts, go to next step. If reading is less than 8 volts, go to step 9
8. Check that starter connector for terminals "S" is clean and tight. If connection was okay, replace stater. See **STARTER** under REMOVAL & INSTALLATION. Go to step 37 .
9. Using DVOM, measure volage between underhood fuse block Black connector C3, terminal F3 (Purple wire) and ground. Turn ignition switch to START position. If reading is greater than 8 volts, go to next step. If reading is less than 8 volts, go to step 11
10. Repair open in Purple wire circuit. Go to step 37 .
11. Turn ignition off. Connect starter solenoid "S" terminal purple wire. Remove START1 and START2 relays from underhood fuse block. Connect a test light between underhood fuse block Black connector C3, terminal E3 (Yellow wire) and ground. Ensure gear selector is in Park. Turn ignition switch to START position. If test light illuminates, go to next step. If test light does not illuminate, go to step 24 .
12. Turn ignition off. Connect DVOM, set on DC volts scale, between underhood fuse block Brown connector C2, terminal A2 (Yellow/Black wire) and positive battery voltage. Turn ignition switch to START position. If reading is 10-15 volts, go to step 17 . If reading is not 10-15 volts, go to next step.

## 1999 Chevrolet Corvette

### 1999 STARTING & CHARGING SYSTEMS Starters - Cars - Except Metro, Prizm & Saturn

13. Connect scan tool to Data Link Connector (DLC). Turn ignition on. Attempt to establish communications with Vehicle Theft Deterrent (VTD) module. If communication is established, go to next step. If communications can not be established, go to step 15 .
14. Using scan tool, select Vehicle Theft Deterrent (VTD) module. Select data menu and monitor the STARTER RELAY STATUS output. Turn ignition switch to ON, to START, then back to ON positions. If STARTER RELAY STATUS switches from OFF, to ON, and back to OFF, go to step 16 . If scan tool does not display status as specified, go to next step.
15. Locate and repair fault with theft deterrent system. See appropriate ANTI-THEFT SYSTEMS article. Go to step 37 .
16. Check theft deterrent module connector for poor connection or poor terminal contact. If connector is okay, repair open or shorted condition in Yellow/Black wire. Install START1 and START2 relays back to underhood fuse block. Go to step 37 .
17. Turn ignition off. Install START1 relays back to underhood fuse block. Replace START2 relay with a known good unit. Turn ignition switch to START position. If solenoid clicks, go to next step. If solenoid does not click, go to step 19 .
18. Check START2 relay socket for poor terminal contact. If okay, then START2 relay (replacement) is faulty. Go to step 37 .
19. Turn ignition switch off. Install original START2 relay in underhood fuse block. Replace START1 relay with a known good relay.
20. Check START1 relay socket for poor terminal contact. If okay, replace original START1 relay. Go to step 37 .
21. Using DVOM, check underhood fuse block input terminal voltage. If reading is 10-15 volts, go to step 23 . If reading is not as specified, go to next step.
22. Repair open or short in battery cable between battery and underhood fuse block. Go to step 37 .
23. Ensure cable connections to underhood fuse block are clean and tight. If okay, replace underhood fuse block. Go to step 37 .
24. Turn ignition off. Install START1 and START2 relays. Check IGN SW fuse in rear fuse block. If fuse is open, go to next step. If fuse is not open, go to step .26
25. Repair short to ground in Orange wire between rear fuse block and ignition switch. Go to step 37 .
26. Turn ignition off. Connect scan tool. Turn ignition on. Attempt to establish communications with Dash Integration Module (DIM). If communication with DIM can be established, go to next step. If communications can not be established, go to step 28 .
27. Using scan tool, select DIM. Select data inputs menu. Monitor ignition crank input, as displayed on scan tool. Turn ignition switch to START position. If crank input displayed on scan tool reads ON and OFF, go to step [30](#) . If ignition crank input does not switch, go to next step.

## 1999 Chevrolet Corvette

### 1999 STARTING & CHARGING SYSTEMS Starters - Cars - Except Metro, Prizm & Saturn

28. Turn ignition off. Disconnect ignition switch connectors C1 (Natural) and C2 (Black). Connect a test light between ignition switch Natural connector C2, terminals "A" (Orange wire) and ground. If test lamp illuminates, go to step 30 . If test light does not illuminate, go to next step.
29. Repair open in Orange wire between rear fuse block and ignition switch. Go to step 37 .
30. Turn ignition off. Reconnect ignition switch electrical connectors. Disconnect Park Neutral Position (PNP) switch. Connect DVOM between PNP connector terminal "G" (Yellow wire) and ground. Turn ignition switch to START position. If reading is 10-15 volts, go to step 34 . If reading is not as specified, go to next step.
31. Turn ignition off. Connect a fused jumper wire across PNP connector Yellow wire terminals "G" and "E". Turn ignition switch to START position. If reading is 10-15 volts, go to step 33 . If reading is not as specified, go to next step.
32. Repair open or shorted condition in Yellow wire between PNP switch and underhood fuse block. Go to step 37 .
33. Ensure PNP switch connector is in good condition. If okay, replace PNP switch. Go to step 37 .
34. Turn ignition switch off. Disconnect ignition switch connectors. Connect a DVOM between PNP switch connector terminal "G" (Yellow wire) and ground. Momentarily connect a fused jumper wire across ignition switch Natural connector C2 terminals "A" (Orange wire) and "B" (Yellow wire). If reading is 10-15 volts, go to step 36 . If reading is not as specified, go to next step.
35. Repair open or snorted condition in Yellow wire between ignition switch and PNP switch. Go to step 37 .
36. Replace ignition switch. Go to step 37 .
37. Ensure all previously disconnected components are connected. Turn ignition switch to START position. If engine cranks, system is okay at this time. If engine does not crank, go to 2 .

#### "N" Body

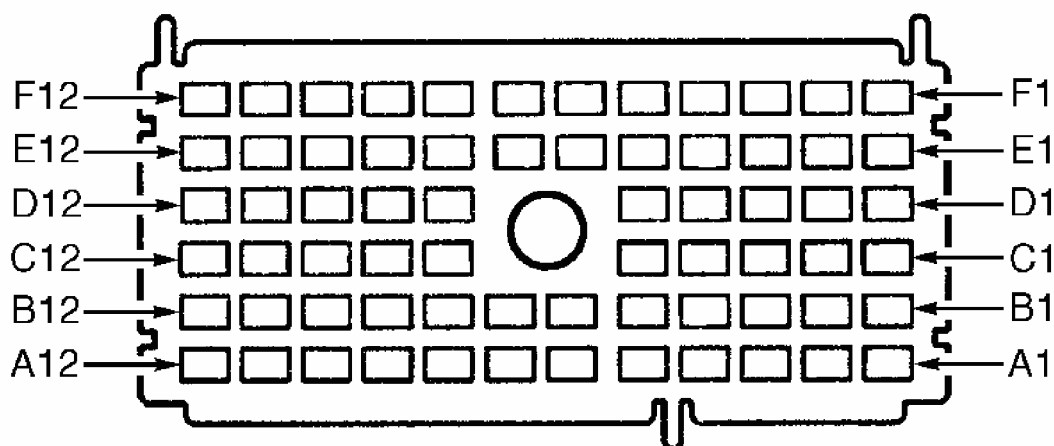
1. Place gear selector in Park (A/T). Turn ignition switch to START position. Using DVOM, measure voltage between starter solenoid terminal "S" (Purple wire) and ground. See **WIRING DIAGRAMS** . If battery voltage exists, go to next step. If battery voltage does not exist, go to step 3 .
2. Using DVOM, measure voltage between starter solenoid terminal "S" (Purple wire) and starter motor mounting bolts. Turn ignition switch to START position. If battery voltage exists, replace starter assembly and recheck symptom. If battery voltage does not exist, clean starter motor and starter motor mounting bolts, creating a good ground to engine block. Check for rust, dirt or excess paint and recheck symptom.
3. Disconnect transaxle range switch connector C1. Turn ignition switch to START position. Using DVOM, measure voltage between transaxle range switch connector C1, terminal "G" (Yellow wire) and ground. If battery voltage exists, go to next step. If

## 1999 Chevrolet Corvette

1999 STARTING & CHARGING SYSTEMS Starters - Cars - Except Metro, Prizm & Saturn

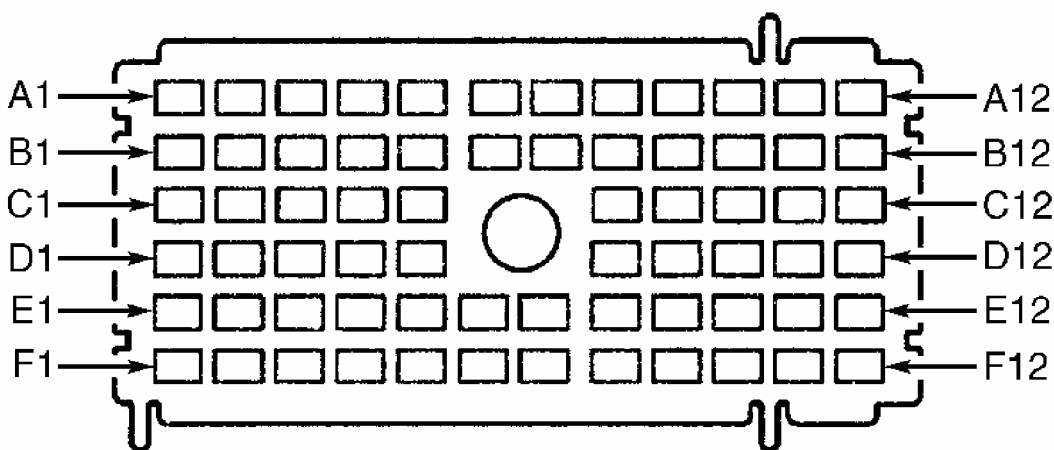
battery voltage does not exist, go to step 5 .

4. Using DVOM, measure resistance at transaxle range switch connector C1 between terminals "E" and "G". If resistance is 0-2 ohms, check for open in Purple wire between transaxle range switch connector C1, terminal "E" and starter solenoid terminal "S". Repair as necessary and recheck symptom. If resistance is not 0-2 ohms, check transaxle range switch. Adjust or replace switch as necessary and recheck symptom. See **TRANSAXLE RANGE SWITCH ("N" BODY)** under ADJUSTMENTS.
5. Using DVOM, backprobe underhood junction block. Measure voltage between underhood junction block Brown connector C3, terminal F11 (Yellow wire) and ground. See **Fig. 9** . Turn ignition switch to START position. If battery voltage exists, go to next step. If battery voltage does not exist, go to step 7 .
6. Using DVOM, backprobe underhood junction block. Measure voltage between underhood junction block Gray connector C1, terminal A11 (Yellow wire) and ground. See **Fig. 8** . Turn ignition switch to START position. If battery voltage exists, check for open in Yellow wire between underhood junction block connector C1, terminal A11 and transaxle range switch connector C1, terminal "G". If battery voltage does not exist, replace underhood junction block and recheck symptom.
7. Using DVOM, backprobe ignition switch. Measure voltage between ignition switch Black connector C2, terminal "A" (Red wire) and ground. Turn ignition switch to START position. If battery voltage exists, go to next step. If battery voltage does not exist, go to step 9 .
8. Using DVOM, backprobe ignition switch. Measure voltage between ignition switch Natural connector C1, terminal "B" (Yellow wire) and ground. Turn ignition switch to START position. If battery voltage exists, repair open circuit in Yellow wire between ignition switch connector C1, terminal "B" and underhood junction block Brown connector C3, terminal F11. If battery voltage does not exist, replace ignition switch and recheck symptom.
9. Using DVOM, backprobe underhood junction block. Measure voltage between underhood junction block Gray connector C4, terminal "A" (Red wire) and ground. If battery voltage exists, repair open circuit in Red wire between ignition switch Black connector C2, terminal "A" and underhood junction block Gray connector C4, terminal "A". If battery voltage does not exist, replace ignition switch and recheck symptom.



G97J28455

**Fig. 8: Identifying Underhood Junction Block Connector C1 ("N" Body)**  
 Courtesy of GENERAL MOTORS CORP.



G97I28454

**Fig. 9: Identifying Underhood Junction Block Connector C3 ("N" Body)**  
 Courtesy of GENERAL MOTORS CORP.

**"V" Body**

1. Place gear selector in Park. Disconnect starter solenoid terminal C2 (Black/Red wire). Turn and hold ignition switch to START position. Using a DVOM, measure voltage between starter solenoid terminal C2 (Black/Red wire) and ground. If reading is 9.5 volts or less, go to next step. If reading is more than 9.5 volts, replace starter assembly and recheck symptom.

## 1999 Chevrolet Corvette

### 1999 STARTING & CHARGING SYSTEMS Starters - Cars - Except Metro, Prizm & Saturn

2. Turn ignition switch to START position and hold. Measure voltage between ignition switch connector terminal "Z" and ground. See **WIRING DIAGRAMS** . If battery voltage does not exist, go to next step. If battery voltage exists, repair open or high resistance in Black/Red wire between starter solenoid terminal C2 and transmission range switch connector terminal "E", and in Black/Red wire between transmission range switch connector terminal "H" and ignition switch connector terminal "Z". If Black/Red wires are okay, adjust or replace transmission range switch and recheck symptom.
3. Using a DVOM, measure voltage between ignition switch connector terminal "Y" (Red wire) and ground. See **WIRING DIAGRAMS** . If battery voltage exists, replace ignition switch and recheck symptom. If battery voltage does not exist, repair open or high resistance in Red wire between ignition switch connector terminal "Y" and power distribution fuse block connector terminal "X" and recheck symptom.

"W" Body (Century & Regal)

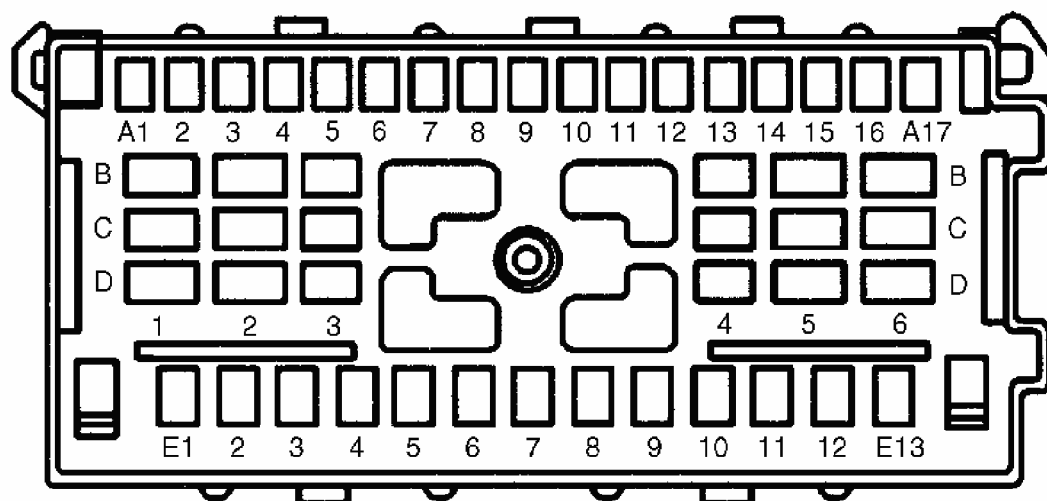
**NOTE:**      **Information not available from manufacturer.**

"W" Body (Except Century & Regal)

1. Place gear selector in Park. Turn ignition switch to START position. Using a DVOM, measure voltage between starter solenoid terminal "S" (Purple wire) and ground. If reading is less than 9.5 volts, go to next step. If reading is 9.5 volts or more, go to step 5 .
2. Disconnect transaxle range switch. See **COMPONENT LOCATIONS** . Turn ignition switch to START position. Measure voltage between transaxle range switch connector C1, terminal "G" (Yellow wire) and ground. If reading is less than 9.5 volts, go to next step. If reading is 9.5 volts or more, go to step 7 .
3. Locate Black, 48-pin C201 connector located behind instrument panel on right side of steering column. See **Fig. 10** . Measure voltage between connector C201, terminal D5 (Red wire) and ground. If reading is less than 9.5 volts, go to next step. If reading is 9.5 volts or more, go to step 8 .
4. Check for a poor connection or open in Red wire between IGN MAIN 1 (40-amp) fuse connector C5, terminal "B", located in underhood electrical center, and ignition switch. See **COMPONENT LOCATIONS** . If circuit is good, replace underhood electrical center and recheck symptom.
5. Connect a remote starter switch between starter solenoid terminal "S" (Purple wire) and positive battery terminal. Crank starter. If starter cranks, go to next step. If starter does not crank, replace starter assembly and recheck symptom.
6. Repair high resistance or poor connection in Black wire between positive battery terminal, starter solenoid terminal "B" and underhood electrical center. Recheck symptom.



7. Check for an open or high resistance in Purple wire, between starter solenoid terminal "S" and transaxle range switch connector C1, terminal "E". If wire is good, replace or adjust transaxle range switch and recheck symptom.
8. Check for high resistance, poor connections, or open in Yellow wire, between ignition switch and transaxle range switch connector C1, terminal "G". If wire is good, replace ignition switch and recheck symptom.



G97G28213

**Fig. 10: Identifying Terminals Of "W" Body Connector C201 ("E" & "G" Body Connector C202 Are Similar)**

**Courtesy of GENERAL MOTORS CORP.**

#### "Y" Body

1. Turn ignition switch to START position. If engine cranks, system is okay at this time. If engine does not crank, go to next step.
2. Install scan tool and establish communications with Body Control Module (BCM). If communications with BCM are established, go to next step. If communications with BCM can not be established, go to appropriate BODY CONTROL MODULE article.
3. Using scan tool, display DTCs. If any DTCs for BCM communications or theft deterrent are set, go to appropriate BODY CONTROL MODULE or ANTI-THEFT SYSTEMS article for DTCs set. If no DTCs are set, go to next step.
4. Remove theft deterrent relay. Connect a test light between theft deterrent relay connector terminal C2 (Yellow wire) and ground. With transmission in Park (A/T), or clutch pedal depressed (M/T), turn ignition switch to START position. If test light illuminates, go to next step. If test light does not illuminate, go to step 9 .
5. Connect test light between theft deterrent relay connector terminal C1 (Red wire) and

## 1999 Chevrolet Corvette

### 1999 STARTING & CHARGING SYSTEMS Starters - Cars - Except Metro, Prizm & Saturn

ground. If test light illuminates, go to next step. If test light does not illuminate, go to step 14 .

6. Connect a DVOM between theft deterrent relay connector terminal A1 (Yellow/Black wire) and ground. Measure resistance with transmission in Park (A/T), or clutch pedal depressed (M/T), and ignition switch in START position. If resistance is 0-2 ohms, go to next step. If resistance is not as specified, go to step 16 .
7. Connect a DVOM from theft deterrent relay connector terminal A2 and starter solenoid terminal "S" (Purple wire). If resistance is 0-2 ohms, go to next step. If resistance is not as specified, go to step 17 .
8. Install theft deterrent relay. Connect a test light between starter solenoid terminal "S" and ground. With transmission in Park (A/T), or clutch pedal depressed (M/T), and ignition in START position. If test light illuminates, go to step 18 . If test light does not illuminate, go to step 19 .
9. Inspect CRK (10-amp) fuse located in instrument panel electrical center. If fuse is open, go to step 20 . If fuse is okay, go to next step.
10. Remove CRK (10-amp) fuse. Check for power at instrument panel electrical center terminal "B" for CRK (10-amp) fuse, with ignition in START position. If test light illuminates, go to step 13 . If test light does not illuminate, go to next step.
11. Inspect IGN2 (60-amp) fuse. If fuse is open, go to step 21 . If fuse is okay, go to next step.
12. Disconnect ignition switch connector C2. Connect a test light between connector C2 terminal "A" (Red wire). If test light illuminates, go to step 22 . If test light does not illuminate, go to step 23 .
13. Disconnect Park Neutral Position (PNP) switch connector C1 (A/T), or Clutch Pedal Position (CPP) switch connector (M/T). Connect DVOM from CRK (10-amp) fuse terminal "A", and PNP switch connector terminal "E" (Purple wire), or CPP switch connector terminal "A" (Purple wire). If resistance is 0-2 ohms, go to step 24 . If resistance is not as specified, go to step 25 .
14. Inspect STARTER (60-amp) fuse for an open. If fuse is open, go to next step. If fuse is okay, go to step 26 .
15. Remove STARTER (60-amp) fuse. Connect DVOM between STARTER (60-amp) fuse connector terminal "A" (Red wire) and ground. If continuity to ground exists, go to step 28 . If continuity to ground does not exist, go to step 27 .
16. Locate and repair open or high resistance in Yellow/Black wire between theft deterrent relay and BCM. If Yellow/Black wire is okay, replace BCM. See appropriate BODY CONTROL MODULE article.
17. Locate and repair open or high resistance in Purple wire between theft deterrent relay and starter solenoid. See **WIRING DIAGRAMS** . Go to step 1 .
18. Replace starter. See **STARTER** under REMOVAL & INSTALLATION. Go to step 1 .
19. Replace theft deterrent relay. Go to step 1 .

## 1999 Chevrolet Corvette

1999 STARTING & CHARGING SYSTEMS Starters - Cars - Except Metro, Prizm & Saturn

20. Repair short to ground in Purple wire between CRK (10-amp) fuse and Park Neutral Position (PNP) switch, or Clutch Pedal Position (CPP) switch. Or, repair short to ground in Yellow wire between theft deterrent relay and PNP switch, or CPP switch. See **WIRING DIAGRAMS** . Go to step 1 .
21. Disconnect ignition switch. Check for short to ground in terminal "A" (Red wire), and terminal "B" (Yellow wire) terminals of ignition switch connector. See **WIRING DIAGRAMS** . Repair as necessary. If short does not exist, replace ignition switch. See REMOVAL & INSTALLATION under ANALOG INSTRUMENT PANELS - CORVETTE article. Go to step 1 .
22. Disconnect ignition switch connectors. Disconnect instrument panel electrical center connector C2. Check for an open or high resistance condition in Yellow wire, between ignition switch connector C1 terminal "B" and CRK (10-amp) fuse. See **WIRING DIAGRAMS** . Repair as necessary. If Yellow wire is okay, replace ignition switch. Go to step 1 .
23. Repair open or high resistance condition in Red wire between ignition switch connector C2 terminal "A" and IGN2 (60-amp) fuse. See **WIRING DIAGRAMS** . Go to step 1 .
24. Inspect or repair open or high resistance in Yellow wire between PNP switch (A/T), or CPP switch (M/T), and theft deterrent relay. If Yellow wire circuit is okay, replace PNP switch or CPP switch. See **WIRING DIAGRAMS** . Go to step 1 .
25. Repair open or high resistance in Purple wire between CRK (10-amp) fuse and PNP switch (A/T) or CPP switch (M/T). See **WIRING DIAGRAMS** . Go to step 1 .
26. Repair open in Red wire between STARTER (60-amp) fuse and theft deterrent relay. See **WIRING DIAGRAMS** . Go to step 1 .
27. Check for short to ground in Purple wire between theft deterrent relay and starter solenoid. See **WIRING DIAGRAMS** . If Purple wire circuit is okay, replace starter. See **STARTER** under REMOVAL & INSTALLATION. Go to step 1 .
28. Repair short to ground in Red wire between theft deterrent relay and STARTER (60-amp) fuse. See **WIRING DIAGRAMS** . Go to step 1 .

### ENGINE DOES NOT CRANK, SOLENOID CLICKS

#### "C", "G" & "H" Bodies

1. On "H" body, remove INJECTOR (10-amp) fuse No. 7 of right instrument panel fuse block. On "C" body, remove INJR (10-amp) fuse from underhood junction block. On "G" body, remove INJ (15-amp) fuse on Buick, INJ 1 (10-amp) fuse and INJ 2 (10-amp) fuse on Oldsmobile, located in instrument panel fuse block. On all models, turn ignition switch to START position. Using a DVOM, measure voltage between battery positive and negative terminals. Crank engine for at least 15 seconds. If reading is more than 8 volts, go to step 3 . If reading is 8 volts or less, go to next step.
2. Load test battery. If load test is not okay, replace battery. If load test is okay, check battery and starter terminals for corrosion or poor contact. If terminals are okay, replace

## 1999 Chevrolet Corvette

### 1999 STARTING & CHARGING SYSTEMS Starters - Cars - Except Metro, Prizm & Saturn

starter. See **STARTER** under REMOVAL & INSTALLATION.

3. Using DVOM, measure voltage between battery negative terminal and engine block while cranking engine for 15 seconds. If reading is less than 0.5 volt, go to next step. If reading is 0.5 volt or more, clean negative battery cable connections, or replace negative battery cable, and retest.
4. Using DVOM, measure voltage between battery positive terminal and starter solenoid terminal "B" (Black wire) while cranking engine for 15 seconds. If reading is less than 0.5 volt, replace starter. See **STARTER** under REMOVAL & INSTALLATION. If reading is 0.5 volt or more, clean positive battery cable connections, or replace positive battery cable, and retest.

#### "E" & "K" Bodies

1. Remove 2 INJ (10-amp) fuses, located in engine compartment fuse/relay block. Turn ignition switch to START position. Using a DVOM, measure voltage between battery positive and negative terminals. Crank engine for at least 15 seconds. If reading is more than 9.5 volts, go to step 3 . If reading is 9.5 volts or less, go to next step.
2. Load test battery. If battery fails load test, replace battery. If load test is okay, check battery and starter terminals for corrosion or poor contact. If okay, replace starter. See **STARTER** under REMOVAL & INSTALLATION.
3. Using DVOM, measure voltage between battery negative terminal and engine block while cranking engine for 15 seconds. If reading is less than 0.5 volt, go to next step. If reading is 0.5 volts or more, clean negative battery cable connections and retest. If reading is still 0.5 volts or more, replace battery negative cable.
4. Using DVOM, measure voltage between battery positive terminal and starter solenoid terminal "B" while cranking engine for 15 seconds. If reading is less than 0.5 volt, replace starter. See **STARTER** under REMOVAL & INSTALLATION. If reading is 0.5 volt or more, clean positive battery cable connections and retest. If reading is still 0.5 volt or more, replace battery positive cable.

#### "F" Body

1. Turn ignition switch to START position. Using a DVOM, measure voltage between battery positive and negative terminals. Crank engine for at least 15 seconds. If reading is more than 9.5 volts, go to step 3 . If reading is 9.5 volts or less, go to next step.
2. Load test battery. If battery fails load test, replace battery. If load test is okay, replace starter. See **STARTER** under REMOVAL & INSTALLATION.
3. Using DVOM, measure voltage between battery negative terminal and engine block while cranking engine for 15 seconds. If reading is less than 0.5 volt, go to next step. If reading is 0.5 volt or more, replace battery negative cable.
4. Using DVOM, measure voltage between battery positive terminal and starter solenoid terminal "B" (Black wire) while cranking engine for 15 seconds. If reading is less than 0.5 volt, replace starter. See **STARTER** under REMOVAL & INSTALLATION. If

## 1999 Chevrolet Corvette

1999 STARTING & CHARGING SYSTEMS Starters - Cars - Except Metro, Prizm & Saturn

reading is 0.5 volt or more, replace battery positive cable.

### "J" Body

1. Remove F/P INJ (10-amp) fuse, located in engine compartment fuse/relay center. Turn ignition switch to START position. Using a DVOM, measure voltage between battery positive and negative terminals. Crank engine for at least 15 seconds. If reading is 9.6 volts or more, go to step 3 . If reading is less than 9.6 volts, go to next step.
2. Load test battery. If battery fails load test, replace battery. If load test is okay, replace starter. See **STARTER** under REMOVAL & INSTALLATION.
3. Using DVOM, measure voltage between battery negative terminal and engine block while cranking engine for 15 seconds. If reading is less than 0.5 volt, go to next step. If reading is 0.5 volt or more, clean negative battery cable connections and retest. If reading is still 0.5 volt or more, replace battery negative cable.
4. Using DVOM, measure voltage between battery positive terminal and starter solenoid terminal "B" (Black wire) while cranking engine for 15 seconds. If reading is less than 0.5 volt, replace starter. See **STARTER** under REMOVAL & INSTALLATION. If reading is 0.5 volt or more, clean positive battery cable connections and retest. If reading is still 0.5 volt or more, replace battery positive cable.

### "N" Body

1. Remove F/P INJ (20-amp) fuse, located in underhood fuse block. Turn ignition switch to START position. Using a DVOM, measure voltage between battery positive and negative terminals. Crank engine for at least 15 seconds. If reading is 9.6 volts or more, go to step 3 . If reading is less than 9.6 volts, go to next step.
2. Load test battery. If battery fails load test, replace battery. If load test is okay, replace starter. See **STARTER** under REMOVAL & INSTALLATION.
3. Using DVOM, measure voltage between battery negative terminal and engine block while cranking engine for 15 seconds. If reading is less than 0.5 volt, go to next step. If reading is 0.5 volt or more, clean negative battery cable connections and retest. If reading is still 0.5 volt or more, replace battery negative cable.
4. Using DVOM, measure voltage between battery positive terminal and starter solenoid terminal "B" (Black wire) while cranking engine for 15 seconds. If reading is less than 0.5 volt, replace starter. See **STARTER** under REMOVAL & INSTALLATION. If reading is 0.5 volt or more, clean positive battery cable connections and retest. If reading is still 0.5 volt or more, replace battery positive cable.

### "V" Body

1. Place gear selector in Park position. Using DVOM, measure voltage between battery positive terminal and starter solenoid terminal "B" (Black wire). Crank engine for 15 seconds. If reading is less than 0.5 volt, go to next step. If reading is 0.5 volt or more, replace positive battery cable.

## 1999 Chevrolet Corvette

### 1999 STARTING & CHARGING SYSTEMS Starters - Cars - Except Metro, Prizm & Saturn

2. Using DVOM, measure voltage between battery negative terminal and starter housing. Crank engine for 15 seconds. If reading is less than 0.5 volt, go to next step. If reading is 0.5 volt or more, replace battery negative cable.
3. Connect remote starter switch between starter solenoid terminal C2 (Black/Red wire) and positive battery terminal. Crank starter. If starter cranks, check for poor connection or high resistance in starter circuit. See **WIRING DIAGRAMS** . If starter does not crank, replace starter. See **STARTER** under REMOVAL & INSTALLATION.

#### "W" Body

1. Place gear selector in Park position. Using DVOM, measure voltage between battery positive terminal and starter solenoid terminal "B" (Black wire). Crank engine for 15 seconds. If reading is less than 0.5 volt, go to next step. If reading is 0.5 volt or more, replace positive battery cable.
2. Using DVOM, measure voltage between battery negative terminal and ground connector located in lower left front of engine, on transaxle stud. Crank engine for 15 seconds. If reading is less than 0.5 volt, go to next step. If reading is 0.5 volt or more, replace battery negative cable.
3. Connect remote starter switch between starter solenoid terminal "S" (Purple wire) and positive battery terminal. Crank starter. If starter cranks, check for poor connection or high resistance in starter circuit. See **WIRING DIAGRAMS** . If starter does not crank, replace starter. See **STARTER** under REMOVAL & INSTALLATION.

## BENCH TESTING

### PRELIMINARY TESTS

**NOTE:** All starter assemblies are not serviceable. If any test values do not meet specifications, replace starter assembly.

Remove starter from vehicle. See **STARTER** under REMOVAL & INSTALLATION. Check starter for damage such as broken or stripped electrical terminals, broken or cracked drive end housing, etc. If no obvious damage is found, perform starter no-load test and pinion clearance check.

### SOLENOID WINDINGS TESTS

**NOTE:** To prevent overheating, DO NOT allow solenoid pull-in current to flow for more than 15 seconds.

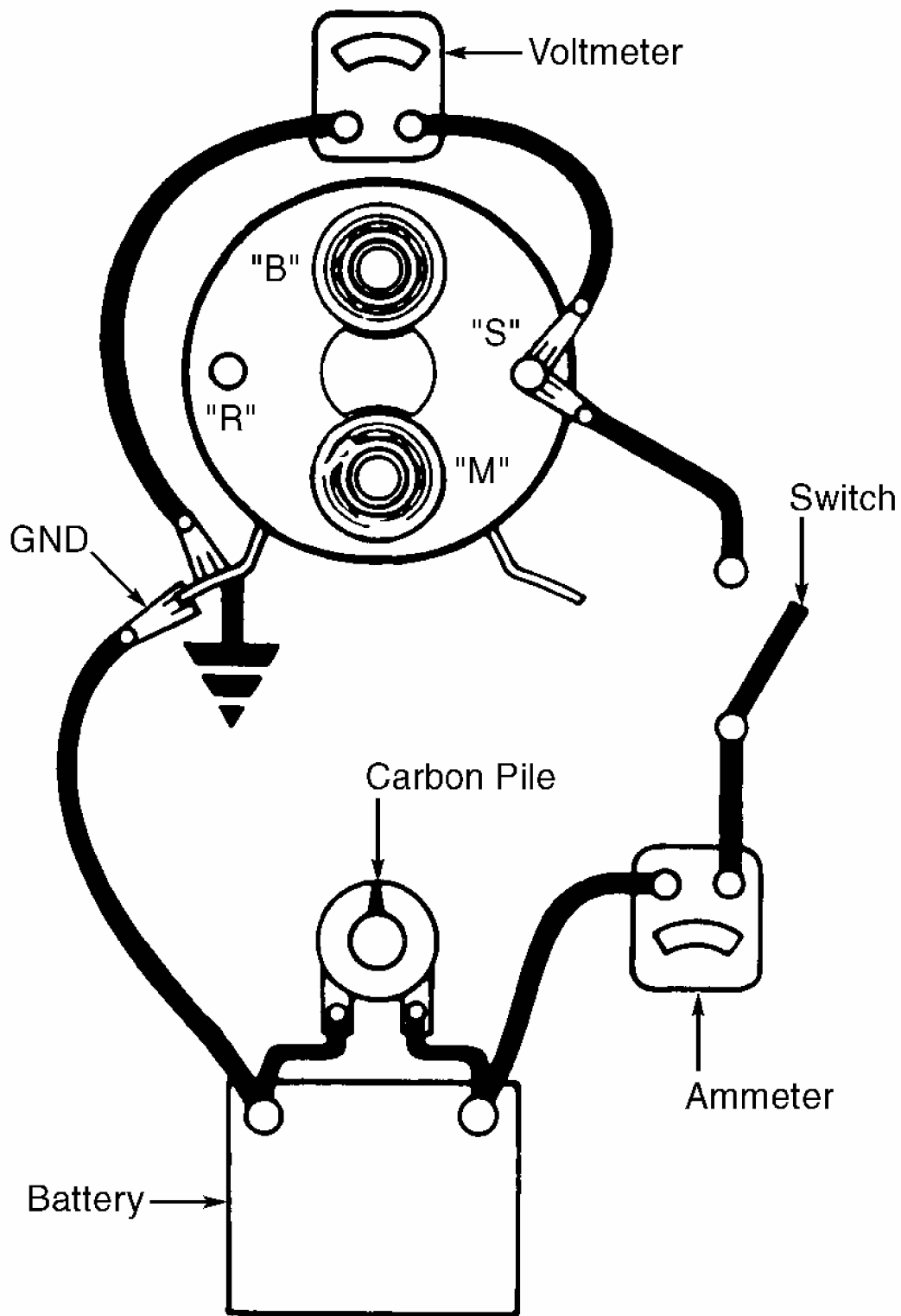
**NOTE:** Current flow will decrease as windings heat up.

#### Hold-In Windings Test

## 1999 Chevrolet Corvette

1999 STARTING & CHARGING SYSTEMS Starters - Cars - Except Metro, Prizm & Saturn

1. If solenoid is not removed from starter motor assembly, disconnect field lead from terminal "M" on solenoid and insulate field lead from solenoid motor terminal. Connect an ammeter and switch in series with 12-volt battery and starter solenoid terminal "S" as illustrated. See **Fig. 11** . Connect a voltmeter between solenoid terminal "S" and ground. Connect a carbon pile across battery.
2. Turn switch on and quickly adjust carbon pile load until voltage reads as specified. See **HOLD-IN WINDINGS SPECIFICATIONS** table. Check ammeter reading. Turn off carbon pile and open switch. See **HOLD-IN WINDINGS SPECIFICATIONS** table. If amperage reading is not as specified, replace starter.



G95G13470

**Fig. 11: Solenoid Winding Test Connections**  
**Courtesy of GENERAL MOTORS CORP.**



**1999 Chevrolet Corvette**

1999 STARTING &amp; CHARGING SYSTEMS Starters - Cars - Except Metro, Prizm &amp; Saturn

**HOLD-IN WINDINGS SPECIFICATIONS**

| <b>Application</b>                                  | <b>Starter Motor</b> | <b>Amps @ Volts</b> |
|---|----------------------|---------------------|
| 2.2L  | PG260                | (1)                 |
| 2.4L  | PG260, PG260MQ       | (1)                 |
| 3.0L  | (1)                  | (1)                 |
| 3.1L  |                      |                     |
| "N" Body  | PG260F1              | (1)                 |
| "W" Body  | PG260F1              | 6-12 @ 10           |
| 3.4L  | PG260M1              | (1)                 |
| 3.5L  | PG260M1              | 6-12 @ 10           |
| 3.8L  |                      |                     |
| "C", "F" & "H" Bodies                               | PG260                | 5-15 @ 11.5         |
| "G" Body  | (1)                  | 5-15 @ 11.5         |
| "W" Body  | PG260F2, PG260M      | 6-12 @ 10           |
| 4.0L  | (1)                  | 5-15 @ 11.5         |
| 4.6L  | PG260                | 5-15 @ 11.5         |
| 5.7L  | PG260                | 5-15 @ 11.5         |
| (1) Information is not available from manufacturer. |                      |                     |

**Pull-In Windings Test**

Connect test equipment as in hold-in windings test. See **HOLD-IN WINDINGS TEST** . See **Fig. 11** . Ground starter solenoid terminal "M". Turn switch on and quickly adjust carbon pile load until voltage reads as specified. See **PULL-IN WINDINGS SPECIFICATIONS** table. Check ammeter reading. Turn off carbon pile and open switch. See **PULL-IN WINDINGS SPECIFICATIONS** table. If ammeter reading is not as specified, replace starter assembly.

**PULL-IN WINDINGS SPECIFICATIONS**

| <b>Application</b> | <b>Starter Motor</b> | <b>Amps @ Volts</b> |
|--------------------|----------------------|---------------------|
| 2.2L               | PG260                | (1)                 |
| 2.4L               | PG260, PG260MQ       | (1)                 |
| 3.0L               | (1)                  | (1)                 |
| 3.1L               |                      |                     |
| "N" Body           | PG260F1              | (1)                 |
| "W" Body           | PG260F1              | 30-45 @ 10          |
| 3.4L               | PG260M1              |                     |

**1999 Chevrolet Corvette**

1999 STARTING &amp; CHARGING SYSTEMS Starters - Cars - Except Metro, Prizm &amp; Saturn

|   |                 | (1)          |
|---|-----------------|--------------|
| 3.5L  | PG260M1         | 30-45 @ 10   |
| 3.8L  |                 |              |
| "C", "F" & "H" Body                                 | PG260           | 30-50 @ 11.5 |
| "G" Body  | (1)             | 30-50 @ 11.5 |
| "W" Body  | PG260F2, PG260M | 30-45 @ 10   |
| 4.0L  | (1)             | 30-50 @ 11.5 |
| 4.6L  | PG260           | 30-50 @ 11.5 |
| 5.7L  | PG260           | 30-50 @ 11.5 |
| (1) Information is not available from manufacturer. |                 |              |

**STARTER NO-LOAD TEST**

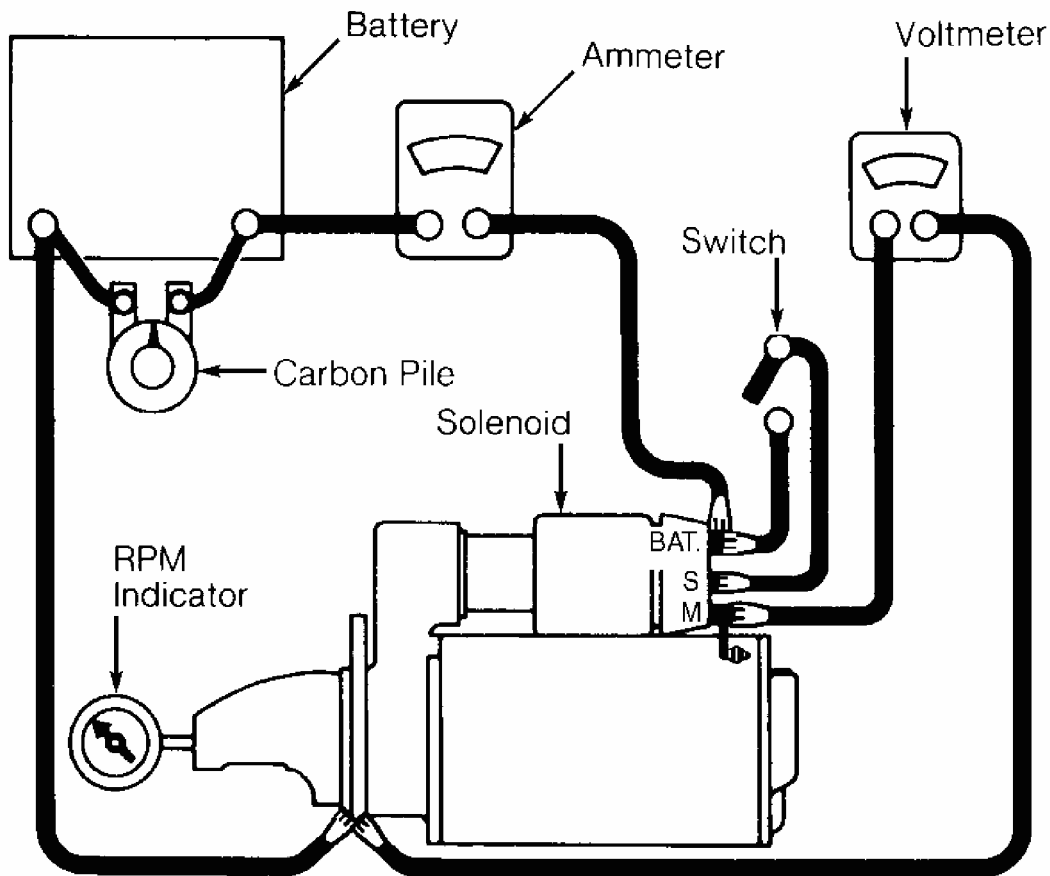
1. Secure starter in vise. Turn carbon pile off and open switch. Connect test equipment to starter as illustrated. See **Fig. 12** . Turn switch on and adjust carbon pile until voltage reads as specified. See **STARTER NO-LOAD TEST SPECIFICATIONS** table. Check ammeter reading and pinion speed on RPM indicator. Turn off carbon pile and open switch. Compare RPM and amperage readings with specification.

**CAUTION: DO NOT apply more voltage than specified. Excessive voltage may cause armature to throw windings due to excessive speed.**

2. If amperage and RPM readings are as specified, starter motor is okay. If readings are not as specified, replace starter assembly. See **STARTER** under REMOVAL & INSTALLATION.

## 1999 Chevrolet Corvette

1999 STARTING & CHARGING SYSTEMS Starters - Cars - Except Metro, Prizm & Saturn



G95113472

**Fig. 12: Starter No-Load Test Connections**  
Courtesy of GENERAL MOTORS CORP.

### STARTER NO-LOAD TEST SPECIFICATIONS

| Application   | Starter | Amps @ Volts        | RPM       |
|---------------|---------|---------------------|-----------|
| 2.2L          | PG260   | 47-70 @ 10          | (1)       |
| 2.4L          |         |                     |           |
| Except Malibu | PG260   | 60-120 @ 10         | 2900-3400 |
| Malibu        | PG260MQ | 60-120 @ 11.5       | 2900-3400 |
| 3.0L          | (1)     | 75 @ <sup>(1)</sup> | (1)       |
| 3.1L          |         |                     |           |
| "N" Body      | PG260F1 | 60-120 @ 11.5       | 2900-3400 |
| "W" Body      | PG260F1 | 40-90 @ 11.5        | 3200-4800 |
| 3.4L          | PG260M1 | 60-120 @ 10         | 2900-3400 |
| 3.5L          | PG260M1 | 60-96 @ 11.5        | 2925-3375 |

**1999 Chevrolet Corvette**

1999 STARTING &amp; CHARGING SYSTEMS Starters - Cars - Except Metro, Prizm &amp; Saturn

3.8L

|                        |         |               |           |
|------------------------|---------|---------------|-----------|
| "C", "F" & "H"<br>Body | PG260   | 60-120 @ 11.5 | 2900-3400 |
| "G" Body               | (1)     | 60-120 @ 11.5 | 2900-3400 |
| "W" Body               |         |               |           |
| VIN K <sup>(2)</sup>   | PG260F2 | 35-85 @ 11.5  | 2550-4150 |
| VIN 1 <sup>(2)</sup>   | PG260M  | 60-96 @ 11.5  | 2925-3375 |
| 4.0L                   | (1)     | 60-120 @ 11.5 | 2900-3400 |
| 4.6L                   | PG260   | 60-120 @ 11.5 | 2900-3400 |
| 5.7L                   | PG260   | 60-125 @ 11.5 | 2900-3400 |

(1) Information is not available from manufacturer.

(2) Eighth character of Vehicle Identification Number (VIN).

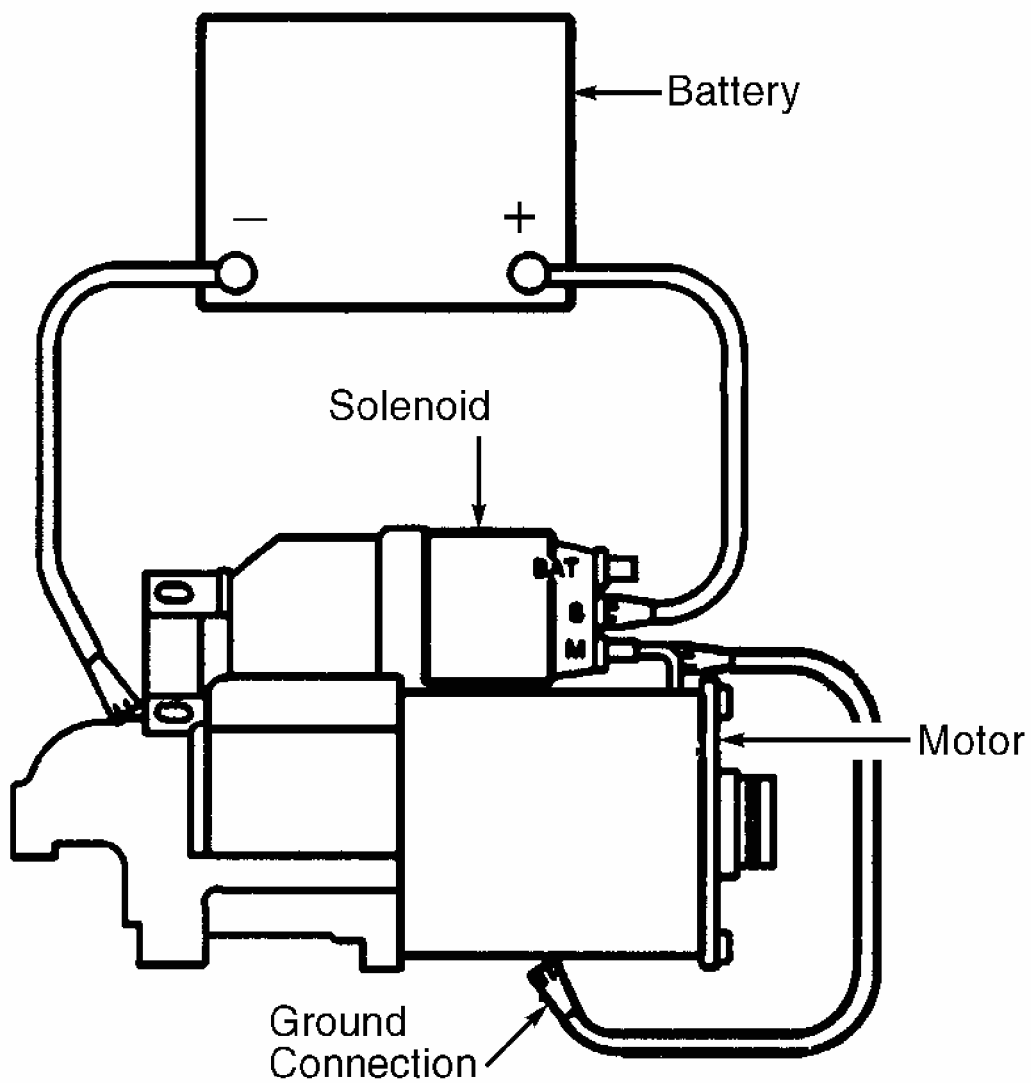
**PINION CLEARANCE CHECK**

**NOTE:** Pinion clearance is not adjustable. If clearance is not within specification, replace starter assembly.

1. Secure starter motor in vise with opening in housing accessible for measurement. Disconnect field lead at solenoid terminal "M" and insulate from solenoid field terminal "M". Connect battery negative terminal lead to starter frame. Connect 12 volts to starter solenoid terminal "S". Momentarily touch jumper lead from starter solenoid terminal "M" to starter frame, shifting pinion into cranking position. See **Fig. 13**.
2. Push pinion as far as possible away from retainer. Using a feeler gauge, ensure there is .01-.16" (.25-4.06 mm) clearance between pinion and retainer. See **Fig. 14**.

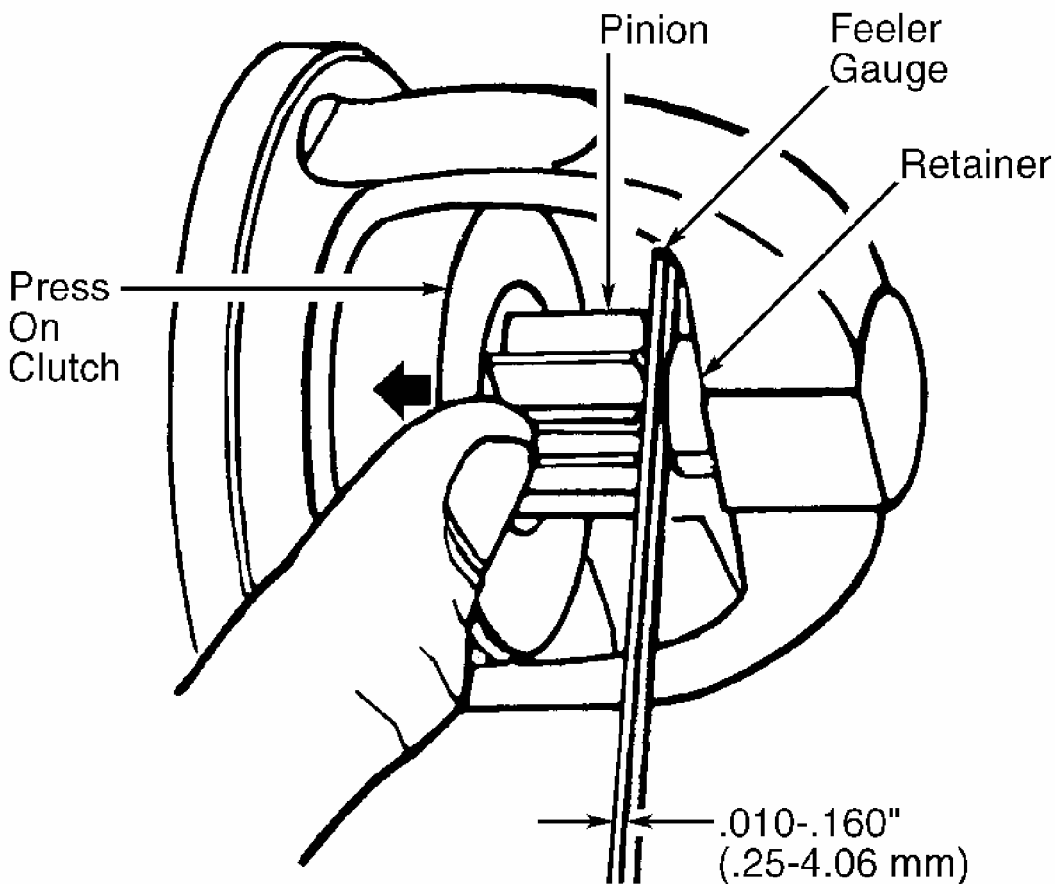
## 1999 Chevrolet Corvette

1999 STARTING & CHARGING SYSTEMS Starters - Cars - Except Metro, Prizm & Saturn



G97H28040

**Fig. 13: Pinion Clearance Connections**  
**Courtesy of GENERAL MOTORS CORP.**



G92H05218

**Fig. 14: Checking Pinion Clearance**  
Courtesy of GENERAL MOTORS CORP.

## REMOVAL & INSTALLATION

**CAUTION:** When battery is disconnected, vehicle computer and memory systems may lose memory data. Driveability problems may exist until computer systems have completed a relearn cycle. See **COMPUTER RELEARN PROCEDURES** article in **GENERAL INFORMATION** before disconnecting battery.

**NOTE:** Vehicles are designed for starter mounting without shims. A single shim or double shims may have been added to correct a noise or engagement condition. When installing starter, any previously installed shims should be replaced in original location to ensure proper pinion to flywheel clearance.

## 1999 Chevrolet Corvette

1999 STARTING & CHARGING SYSTEMS Starters - Cars - Except Metro, Prizm & Saturn

**NOTE:** On 2.2L, 2.4L, 3.0L, 4.0L and 4.6L engines, starters cannot be shimmed. Noise condition, requiring shims, can only be corrected by replacing starter.

### STARTER

#### Removal (Except 3.0L, 4.0L & 4.6L)

Disconnect negative battery cable. Raise and support vehicle. Remove brackets, splash shield and flywheel inspection cover from around starter as necessary. On 5.7L, remove exhaust pipe and catalytic converter from starter side of engine. On all models, remove starter solenoid terminal "S" nut and battery cable nut. Separate wiring from starter. Remove starter mounting bolts. Remove shims and note arrangement for reassembly (if equipped). Remove starter assembly.

#### Installation (Except 3.0L, 4.0L & 4.6L)

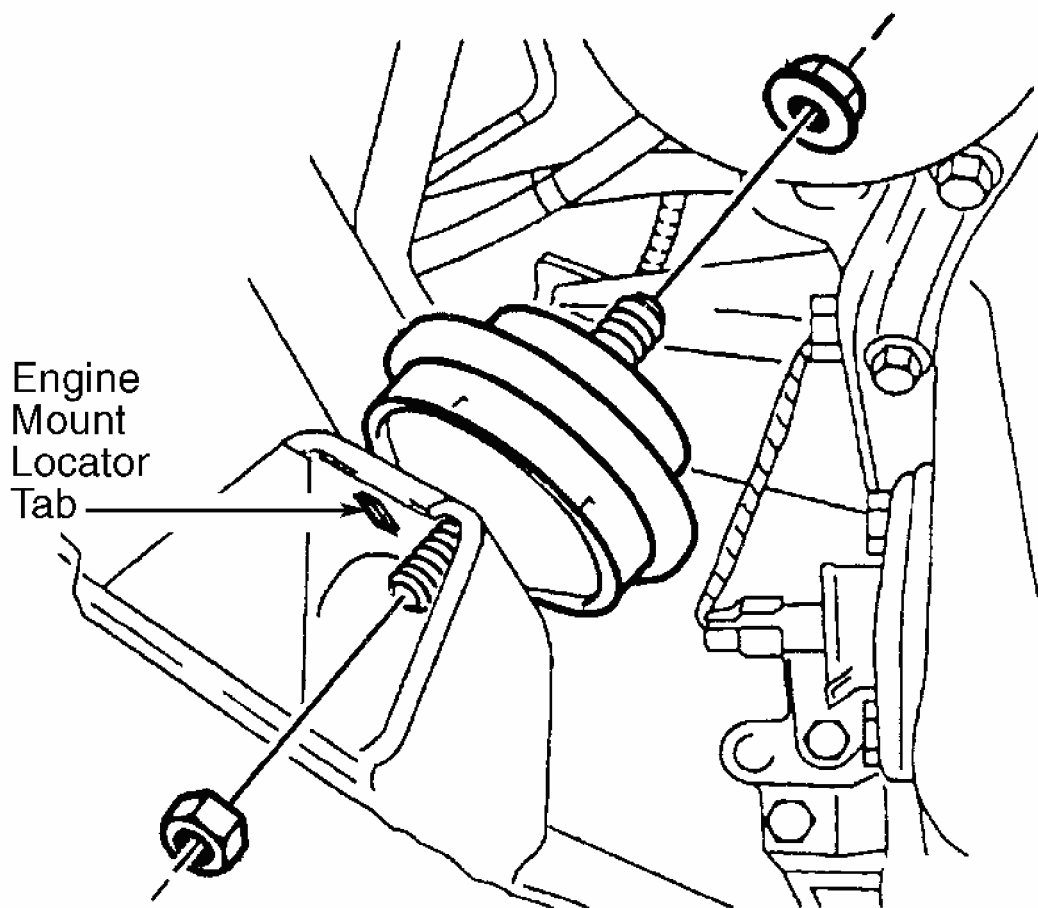
Before installing starter onto engine, tighten inner solenoid terminal nuts to ensure they are secure in cap. Starter failure may occur due to terminal or cap damage. Install starter battery cable and wiring to solenoid terminals. Ensure shims are installed in original location (if equipped). Tighten starter mounting bolts to specification. See **TORQUE SPECIFICATIONS** . Install brackets, splash shields and flywheel inspection covers previously removed as necessary. On 5.7L, install NEW gaskets, exhaust pipe and catalytic converter.

#### Removal (3.0L)

Disconnect negative battery cable. Raise and support vehicle. Remove electrical leads from starter motor. Remove passenger side catalytic converter. Remove passenger side engine mount nuts. Lower vehicle and remove air cleaner housing to throttle body ducts. Using Engine Support Fixture (J28467-A) with Adapters (J28467-450), raise and support passenger-side of engine to approximately 1.5" (38 mm). Raise vehicle. Remove engine mount from engine bracket and cradle. See **Fig. 15** . Remove engine mount bracket bolts and reposition bracket. Remove starter mounting bolts. Remove starter assembly.

#### Installation (3.0L)

Install starter assembly and mounting bolts. Install engine mount to bracket and cradle. Partially lower vehicle. Have assistant guide engine mount into place while lowering engine. Engine mount locator tab must engage slot in cradle. See **Fig. 15** . Remove Engine Support (J28467-A) and Adapters (J28467-450) and tighten engine mount nuts to specification. To complete installation, reverse removal procedure. Tighten starter mounting bolts to specification. See **TORQUE SPECIFICATIONS** .



G97H28453

**Fig. 15: Installing Passenger Side Engine Mount ("V" Body)**  
**Courtesy of GENERAL MOTORS CORP.**

**Removal (4.0L & 4.6L)**

1. Disconnect negative battery cable, then positive battery cable. Remove intake manifold cover. Disconnect left side spark plug wires. Loosen fuel filler cap to relieve tank vapor pressure. Connect Fuel Pressure Gauge (J34730-1) to fuel pressure connection. Place fuel pressure gauge bleed hose in a container and open gauge bleed valve to relieve fuel system pressure.
2. Disconnect Intake Air Temperature (IAT) sensor electrical connector. Disconnect crankcase vent pipe at camshaft covers. Disconnect EGR and crankcase ventilation pipe at throttle body. Remove air intake duct and air cleaner housing. Disconnect transaxle vent hose and transaxle shift cable from bracket.
3. Disconnect vacuum manifold at throttle body. Disconnect Throttle Position (TP) sensor and IAC actuator electrical connectors. Disconnect vacuum lines at Idle Air Control



## 1999 Chevrolet Corvette

### 1999 STARTING & CHARGING SYSTEMS Starters - Cars - Except Metro, Prizm & Saturn

(IAC) valve, and remove IAC valve. Disconnect cruise control servo vacuum hoses and electrical connector. Disconnect cruise control cable at throttle body. Remove cruise control servo and bracket.

4. Disconnect accelerator cable at throttle body and IAC actuator bracket. Disconnect throttle body coolant hoses at throttle body and surge tank pipe. Disconnect brake booster vacuum hose at intake manifold vacuum fitting. Disconnect fuel rail ground wire at rear cylinder head.
5. Holding both sides of fuel line fittings twist female connector 1/4 turn in each direction in order to loosen any dirt within fitting. Blow any dirt out of fitting using compressed air. Using a Quick-Disconnect Tool (J37088-A), disconnect quick-connect fittings at fuel rail. Wipe off male pipe end. Inspect both ends of fitting for dirt and burrs. Clean or replace components as required.
6. Remove fuel rail bracket at EGR valve mounting stud. Disconnect EGR pipe and PCV hose at intake manifold. Disconnect injector harness main connector and ground wire from cylinder head. Remove 6 bolts and 4 studs securing intake manifold, and remove intake manifold. Inspect intake manifold gaskets and replace if necessary.
7. Remove starter solenoid terminal "S" nut and battery cable nut. Separate wiring from starter. Remove starter mounting bolts. Remove starter.

#### Installation (4.0L & 4.6L)

**CAUTION:** Ensure engine and intake manifold are cool before tightening intake manifold bolts.

**NOTE:** Intake manifold gaskets are attached to intake manifold by a snap-lock feature and will remain attached to manifold. Gaskets are reusable. Gaskets should only be replaced if housing or rubber seals are damaged.

1. Before installing starter onto engine, tighten inner solenoid terminal studs to ensure they are securely fastened to solenoid. Install starter battery cable and solenoid wiring. Tighten solenoid terminal nuts to specification. Install starter and mounting bolts. Tighten starter mounting bolts to specifications. See **TORQUE SPECIFICATIONS**.
2. Install intake manifold with throttle body attached. Tighten intake manifold bolts and studs, starting at center bolts and working outward in a circular pattern. When connecting fuel line quick connect fittings apply a few drops of clean engine oil to male ends. After reconnecting fuel lines, turn ignition switch to ON position for 2 seconds, then turn ignition switch to OFF position for 10 seconds. Turn ignition switch back to ON position and check for fuel leaks. To complete installation, reverse removal procedure. See **TORQUE SPECIFICATIONS**.

## OVERHAUL

**1999 Chevrolet Corvette**

1999 STARTING &amp; CHARGING SYSTEMS Starters - Cars - Except Metro, Prizm &amp; Saturn

**NOTE:** All starter assemblies are not serviceable, and replaced as a complete unit.

**TORQUE SPECIFICATIONS****TORQUE SPECIFICATIONS**

| <b>Application</b>                              | <b>Ft. Lbs. (N.m)</b> |
|---|-----------------------|
| EGR Pipe Bolts                                  | 21 (28)               |
| Fuel Rail Retaining Nut (4.0L & 4.6L)           | 13 (18)               |
| Motor Mount Nuts (3.0L)                         |                       |
| Upper Nut                                       | 30 (40)               |
| Lower Nut                                       | 41 (56)               |
| Starter Bracket-To-Engine (2.2L)                | 32 (43)               |
| Starter Mounting Bolts                          |                       |
| 2.2L  | 37 (50)               |
| 2.4L  | 66 (89)               |
| 3.0L  | 44 (60)               |
| 3.1L  |                       |
| Alero & Grand Am                                | 32 (43)               |
| Cutlass & Malibu                                | 37 (50)               |
| 3.4L  | 32 (43)               |
| 3.5L  | 37 (50)               |
| 3.8L  |                       |
| "C", "H" & "W" Bodies                           | 32 (43)               |
| "F" Body  | 35 (47)               |
| "G" Body  | 22 (30)               |
| 4.0L & 4.6L                                     | 22 (30)               |
| 5.7L  | 37 (50)               |
| Starter Mounting Bracket-To-Engine Bolts (2.2L) | 32 (43)               |
| <b>INCH Lbs. (N.m)</b>                          |                       |
| Battery Cable-To-Solenoid Nut (4.0L)            | 89 (10)               |
| Battery Cable-To-Solenoid Nut (4.6L)            | 71 (8)                |
| Flywheel Cover Bolts ("C" Body)                 | 22 (2.4)              |
| Intake Cover Nut (4.0L & 4.6L)                  | 27 (3)                |
| Intake Manifold Bolts & Studs (4.0L & 4.6L)     | 89 (10)               |
| Solenoid Screw (3.0L)                           | 45 (5)                |
| Solenoid "S" Terminal Nut (3.4L)                | 20 (2.3)              |
| Solenoid "S" Terminal Nut (4.0L & 4.6L)         | 27 (3)                |
| Solenoid "S" Terminal Nut (5.7L)                | 36 (4)                |

## 1999 Chevrolet Corvette

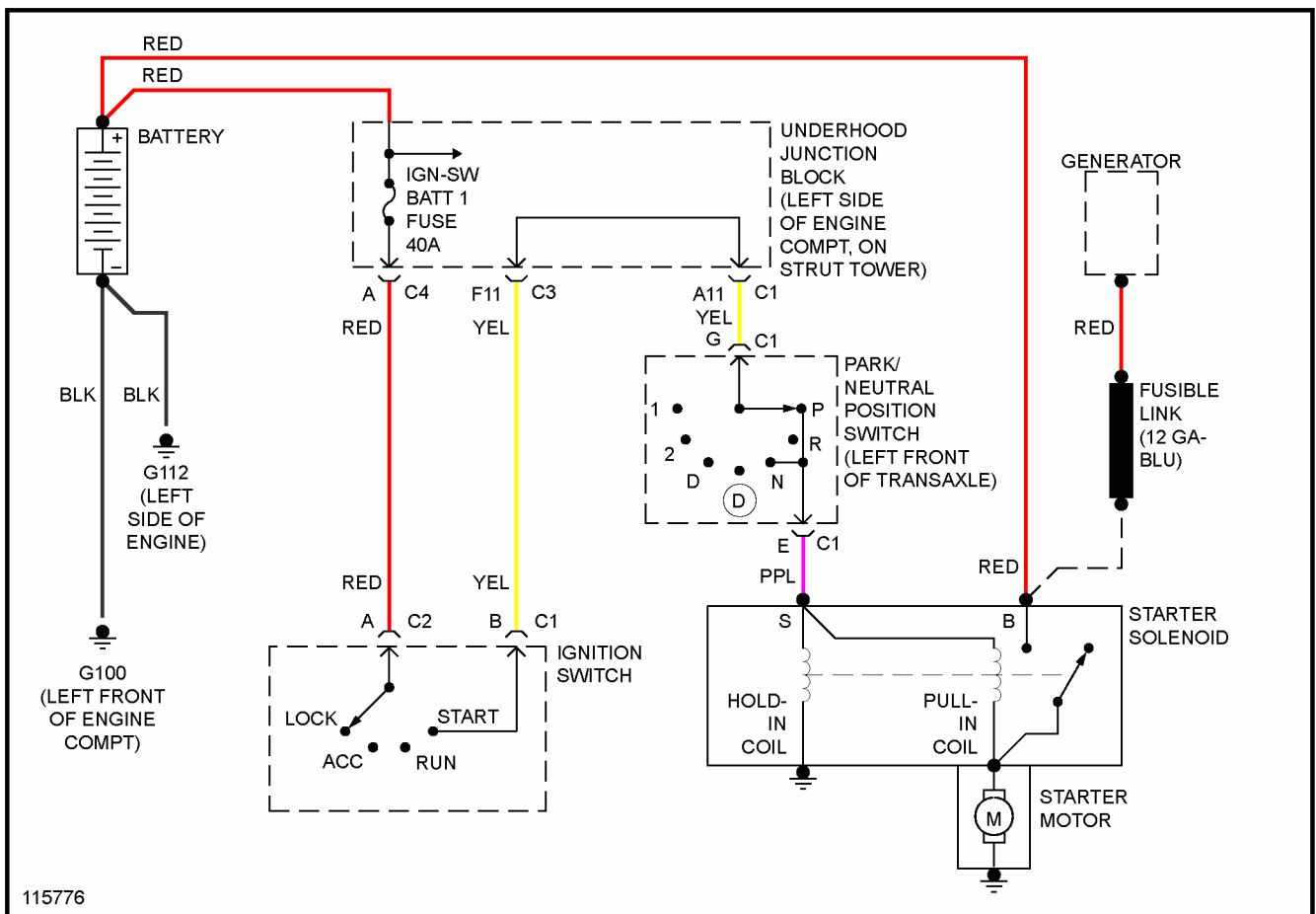
1999 STARTING & CHARGING SYSTEMS Starters - Cars - Except Metro, Prizm & Saturn

|  |          |
|--|----------|
| Starter End Bracket (2.2L)                     | 98 (11)  |
| Transmission Range (TR) Switch Bolt ("V" Body) | 106 (12) |

## WIRING DIAGRAMS

## 1999 Chevrolet Corvette

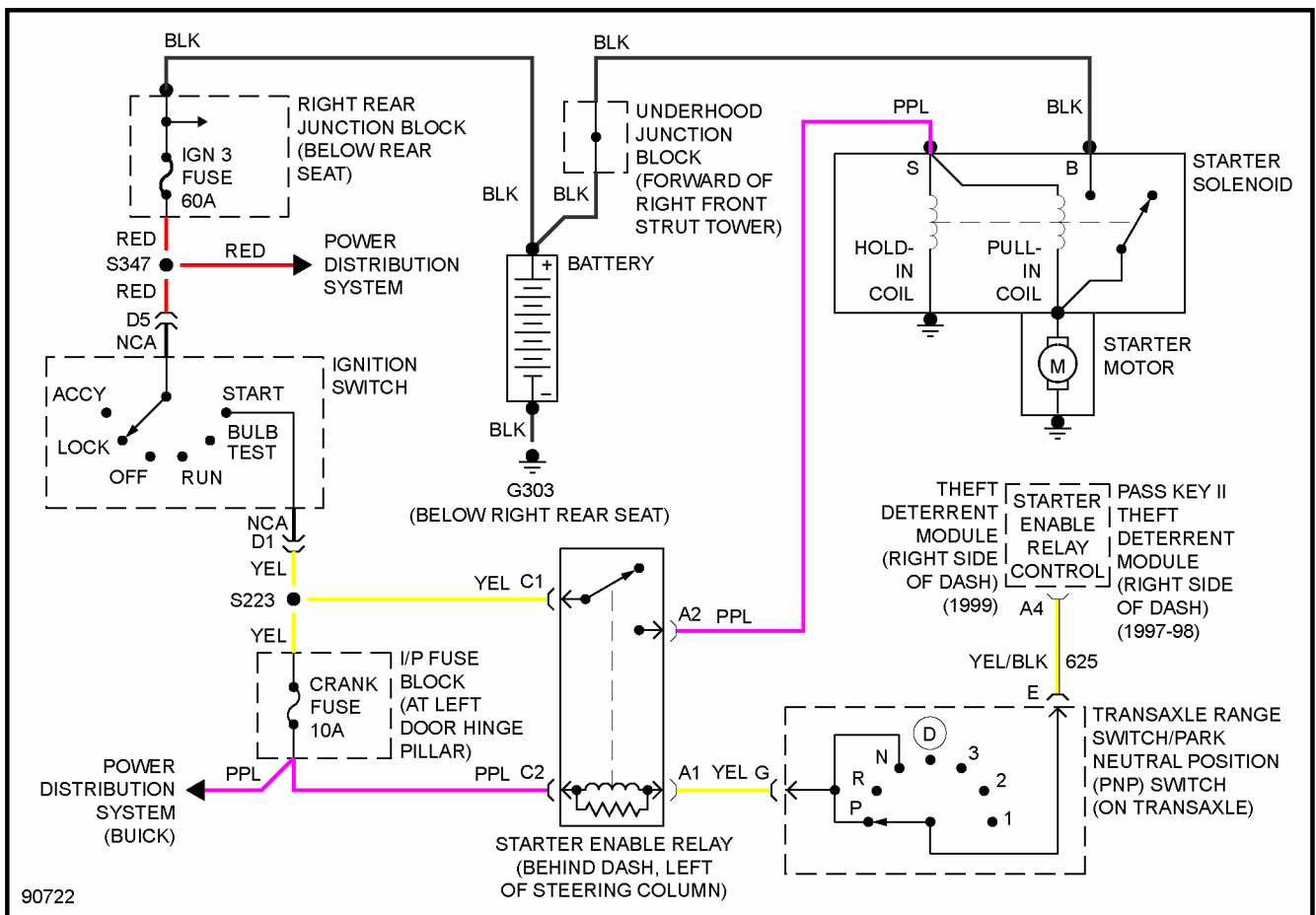
1999 STARTING & CHARGING SYSTEMS Starters - Cars - Except Metro, Prizm & Saturn



**Fig. 16: Starting System Wiring Diagram (Alero & Grand Am)**

# 1999 Chevrolet Corvette

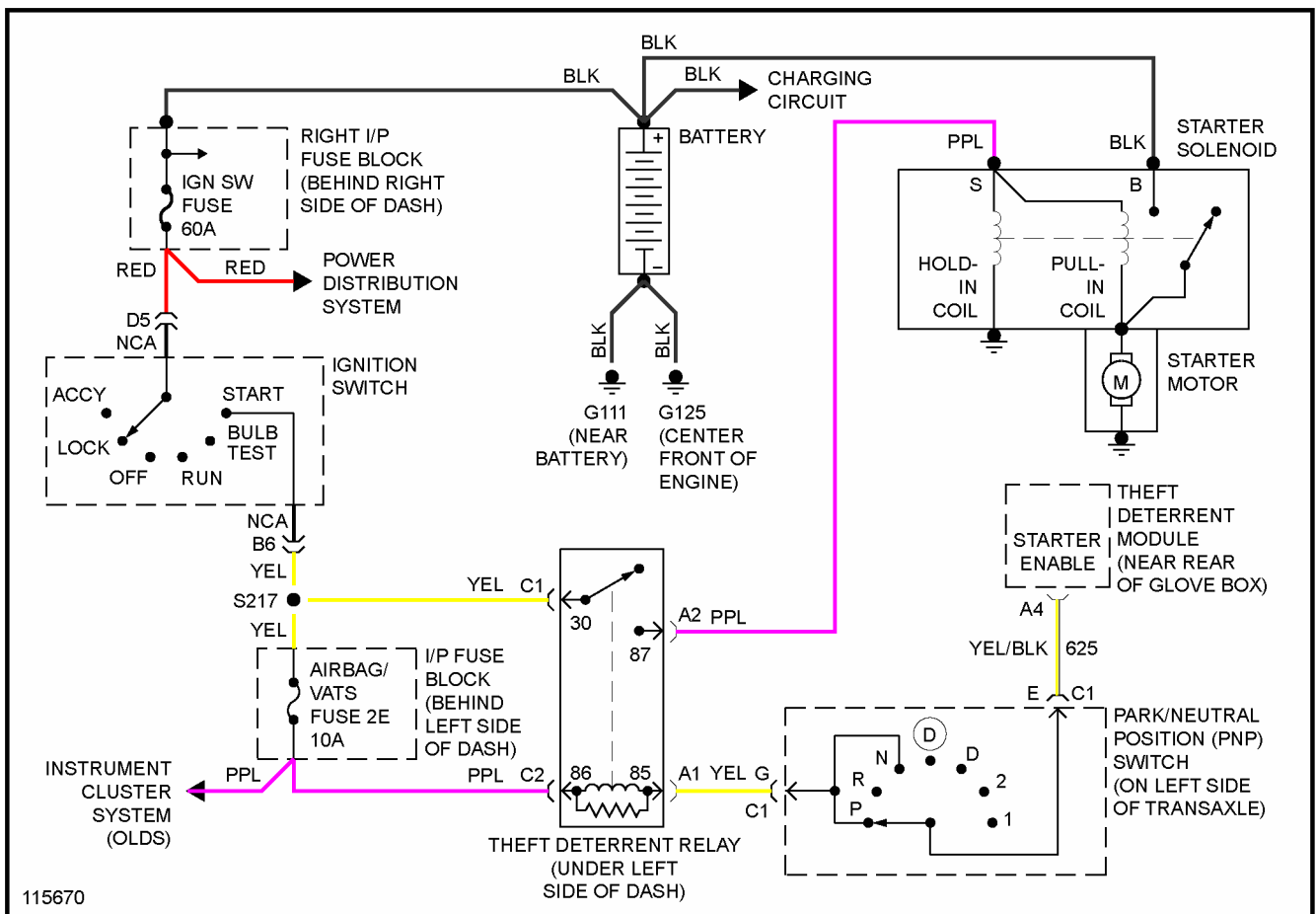
## 1999 STARTING & CHARGING SYSTEMS Starters - Cars - Except Metro, Prizm & Saturn



**Fig. 17: Starting System Wiring Diagram (Aurora & Riviera)**

# 1999 Chevrolet Corvette

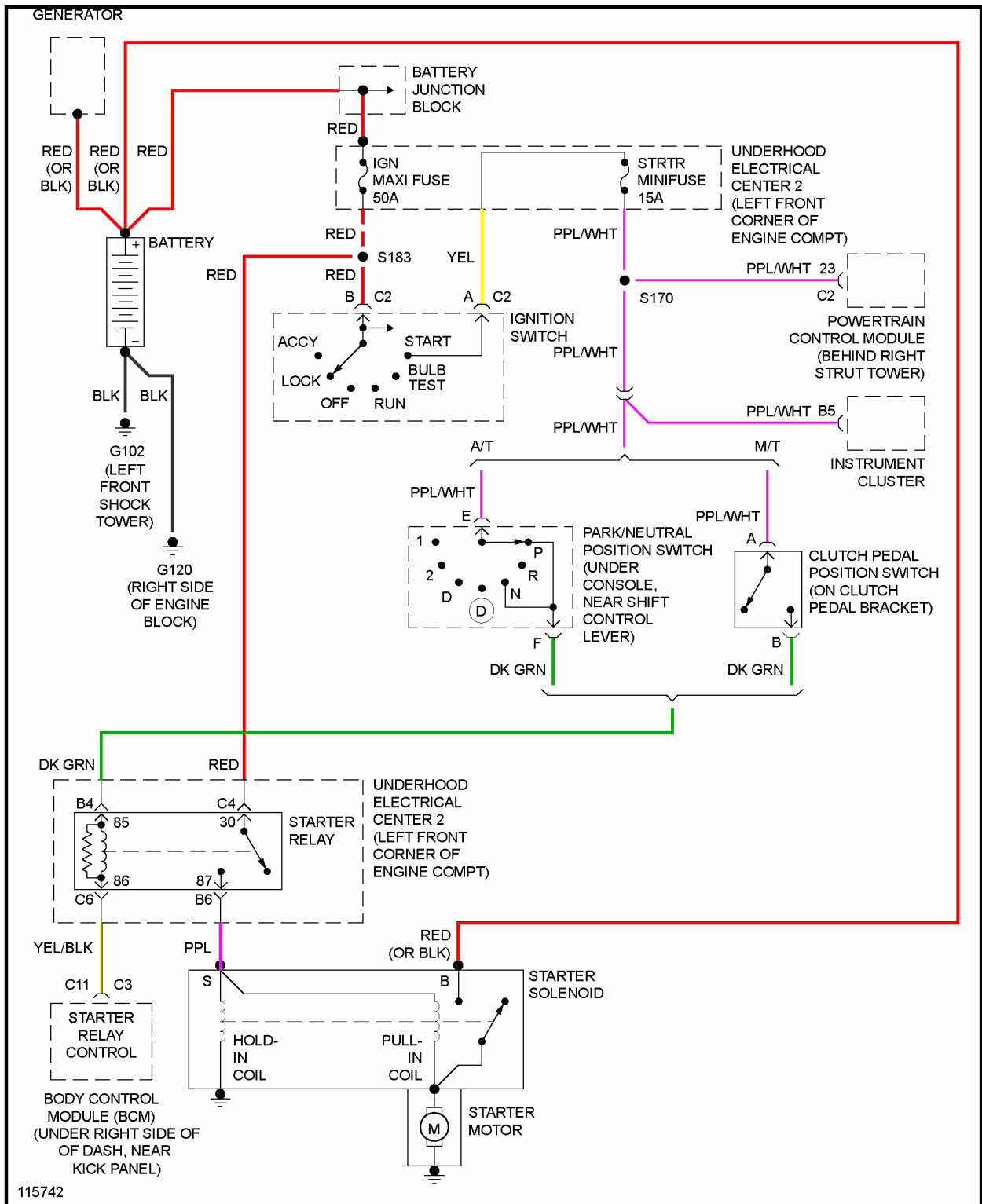
## 1999 STARTING & CHARGING SYSTEMS Starters - Cars - Except Metro, Prizm & Saturn



**Fig. 18: Starting System Wiring Diagram (Bonneville, Eighty Eight, LeSabre & LSS)**

# 1999 Chevrolet Corvette

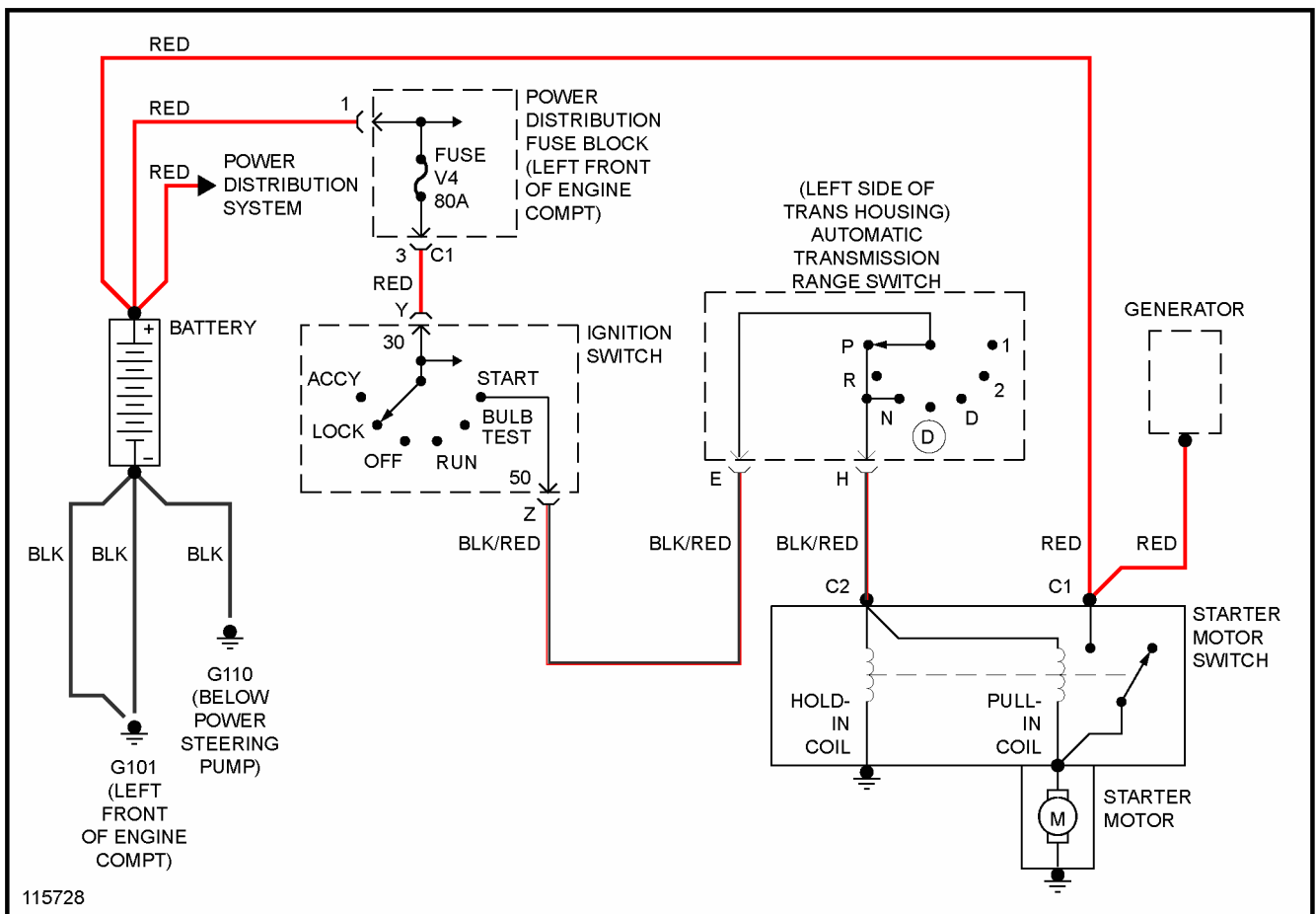
## 1999 STARTING & CHARGING SYSTEMS Starters - Cars - Except Metro, Prizm & Saturn



**Fig. 19: Starting System Wiring Diagram (Camaro & Firebird)**

## 1999 Chevrolet Corvette

### 1999 STARTING & CHARGING SYSTEMS Starters - Cars - Except Metro, Prizm & Saturn

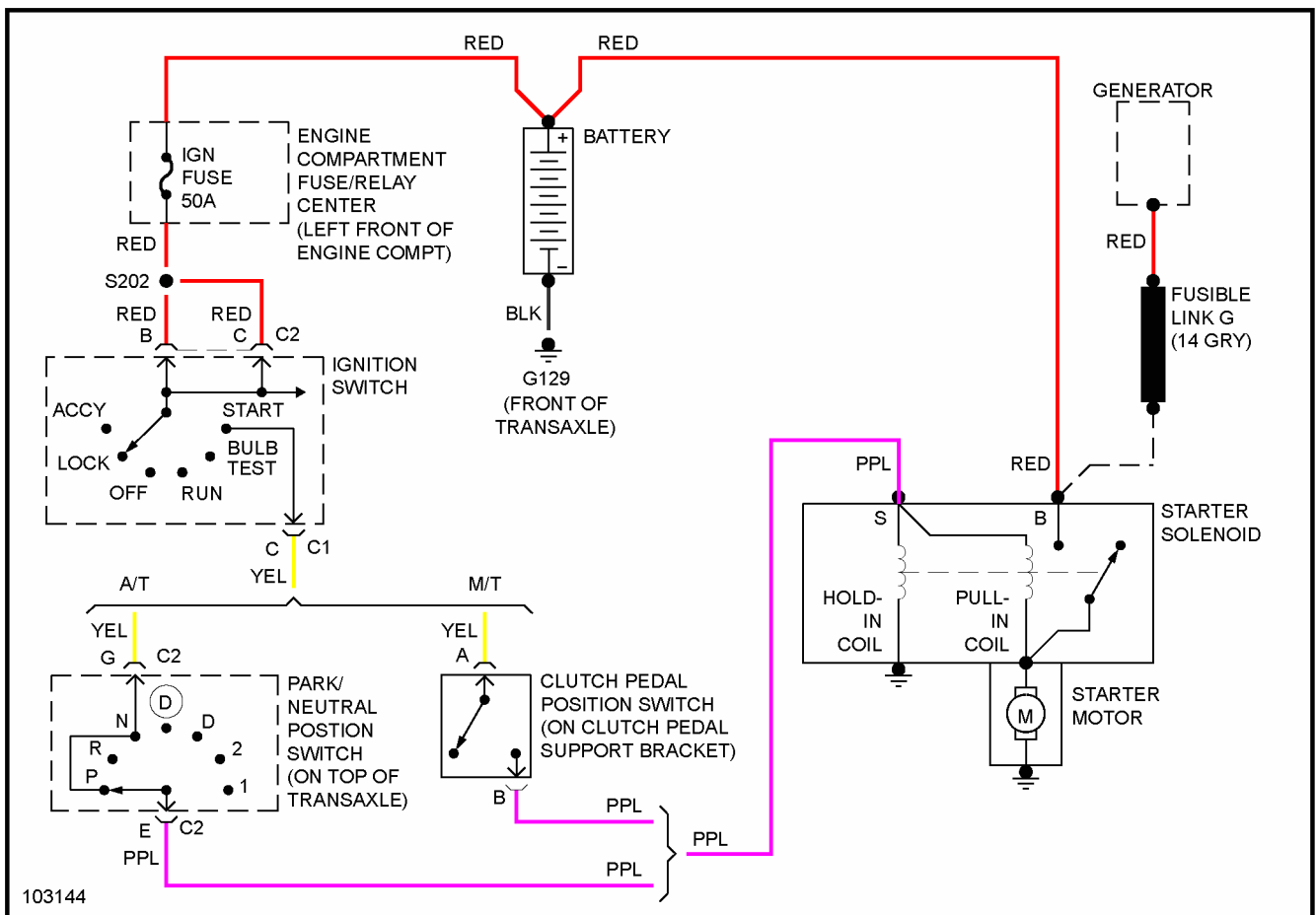


**Fig. 20: Starting System Wiring Diagram (Catera)**



## 1999 Chevrolet Corvette

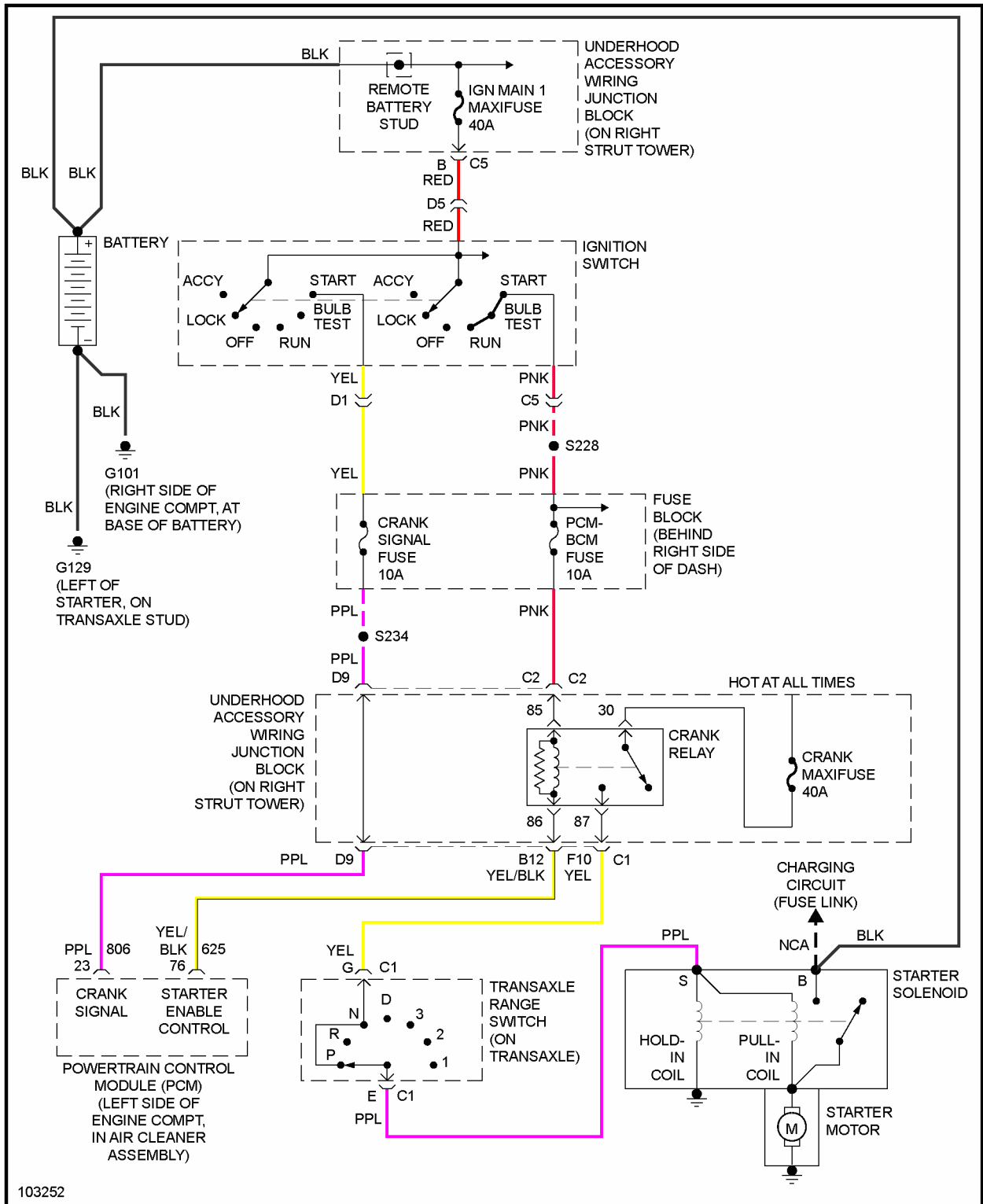
1999 STARTING & CHARGING SYSTEMS Starters - Cars - Except Metro, Prizm & Saturn



**Fig. 21: Starting System Wiring Diagram (Cavalier & Sunfire)**

# 1999 Chevrolet Corvette

## 1999 STARTING & CHARGING SYSTEMS Starters - Cars - Except Metro, Prizm & Saturn



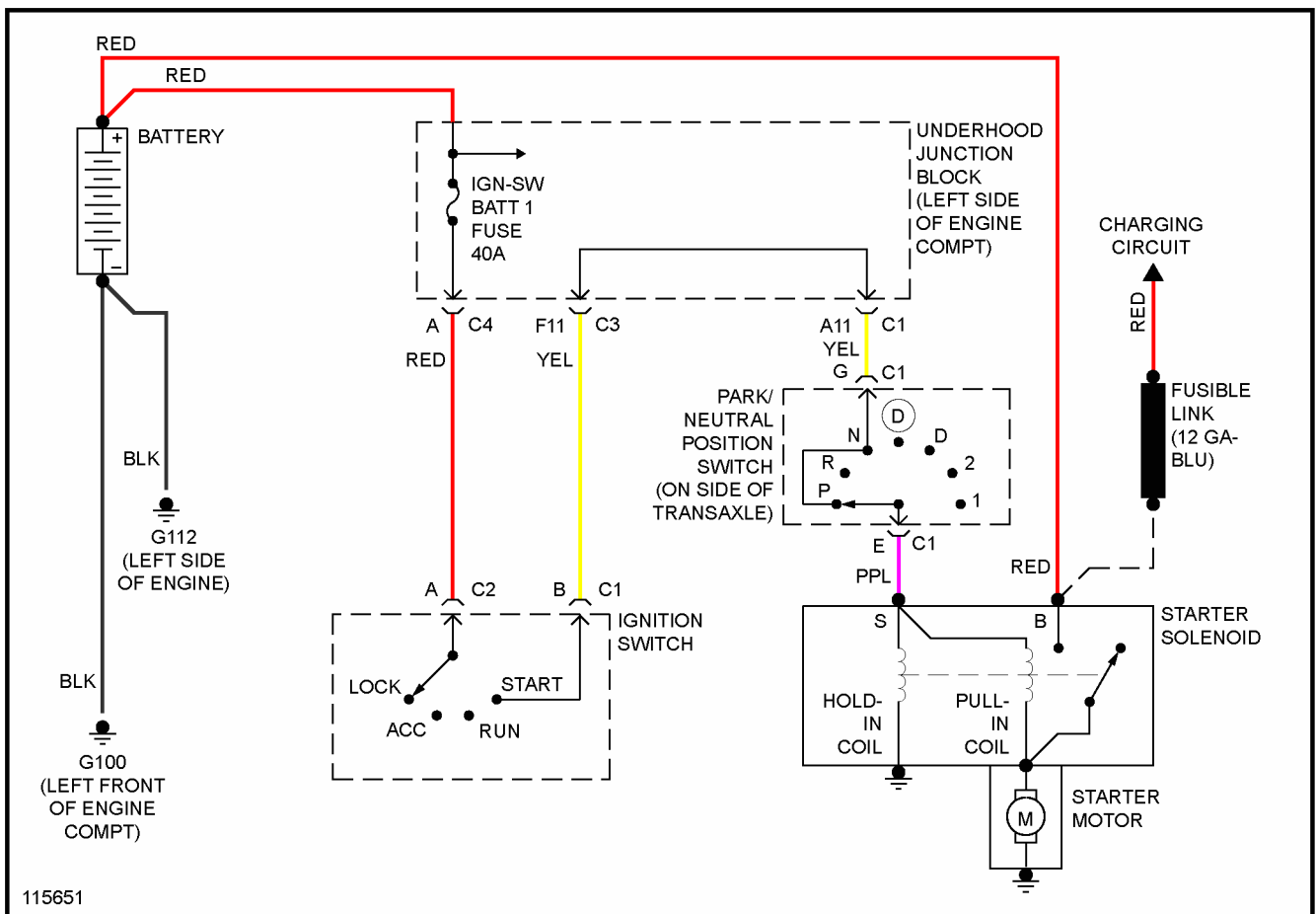
**Fig. 22: Starting System Wiring Diagram (Century & Regal)**

## 1999 STARTING & CHARGING SYSTEMS Starters - Cars - Except Metro, Prizm & Saturn



## 1999 Chevrolet Corvette

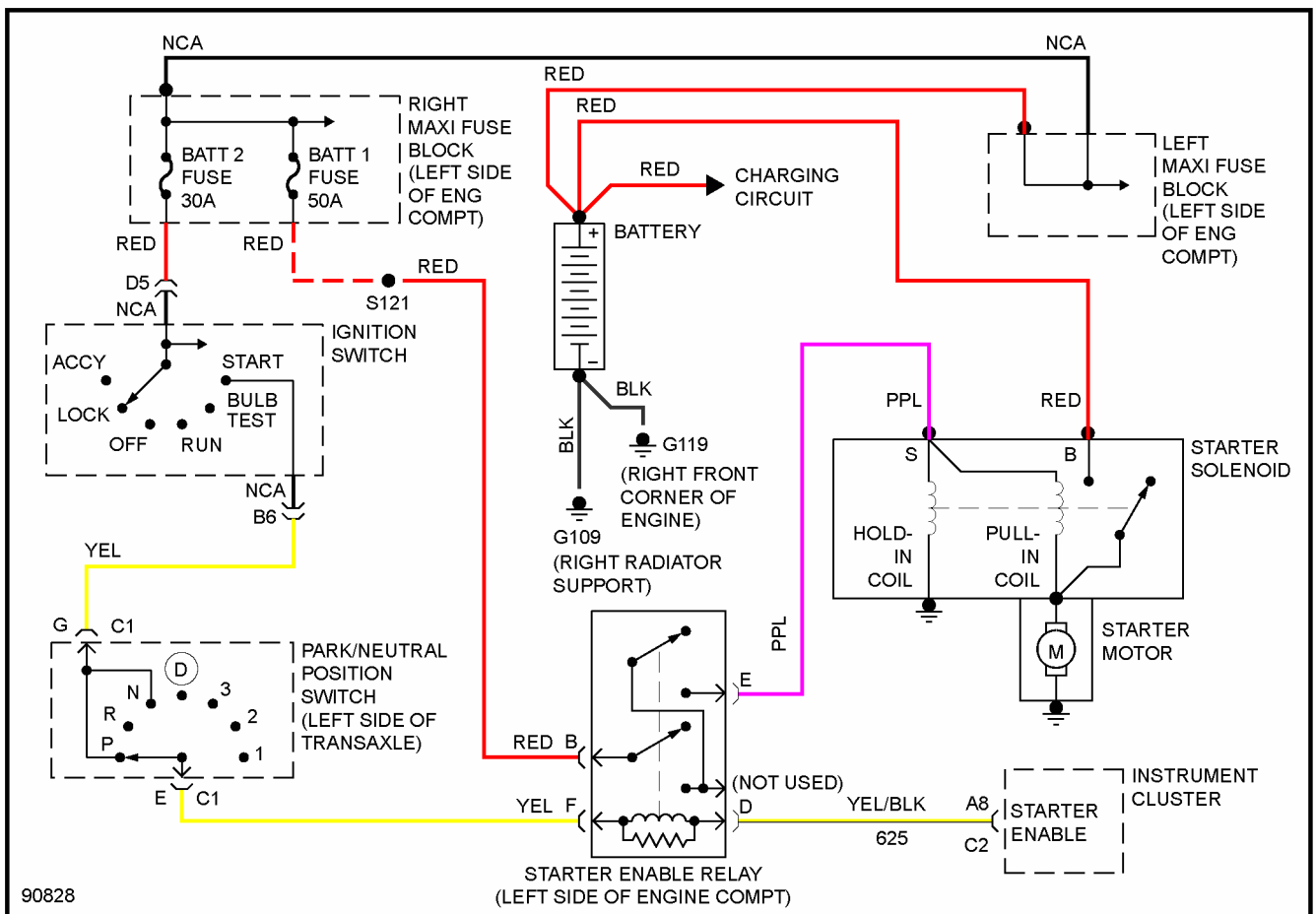
### 1999 STARTING & CHARGING SYSTEMS Starters - Cars - Except Metro, Prizm & Saturn



**Fig. 24: Starting System Wiring Diagram (Cutlass & Malibu)**

# 1999 Chevrolet Corvette

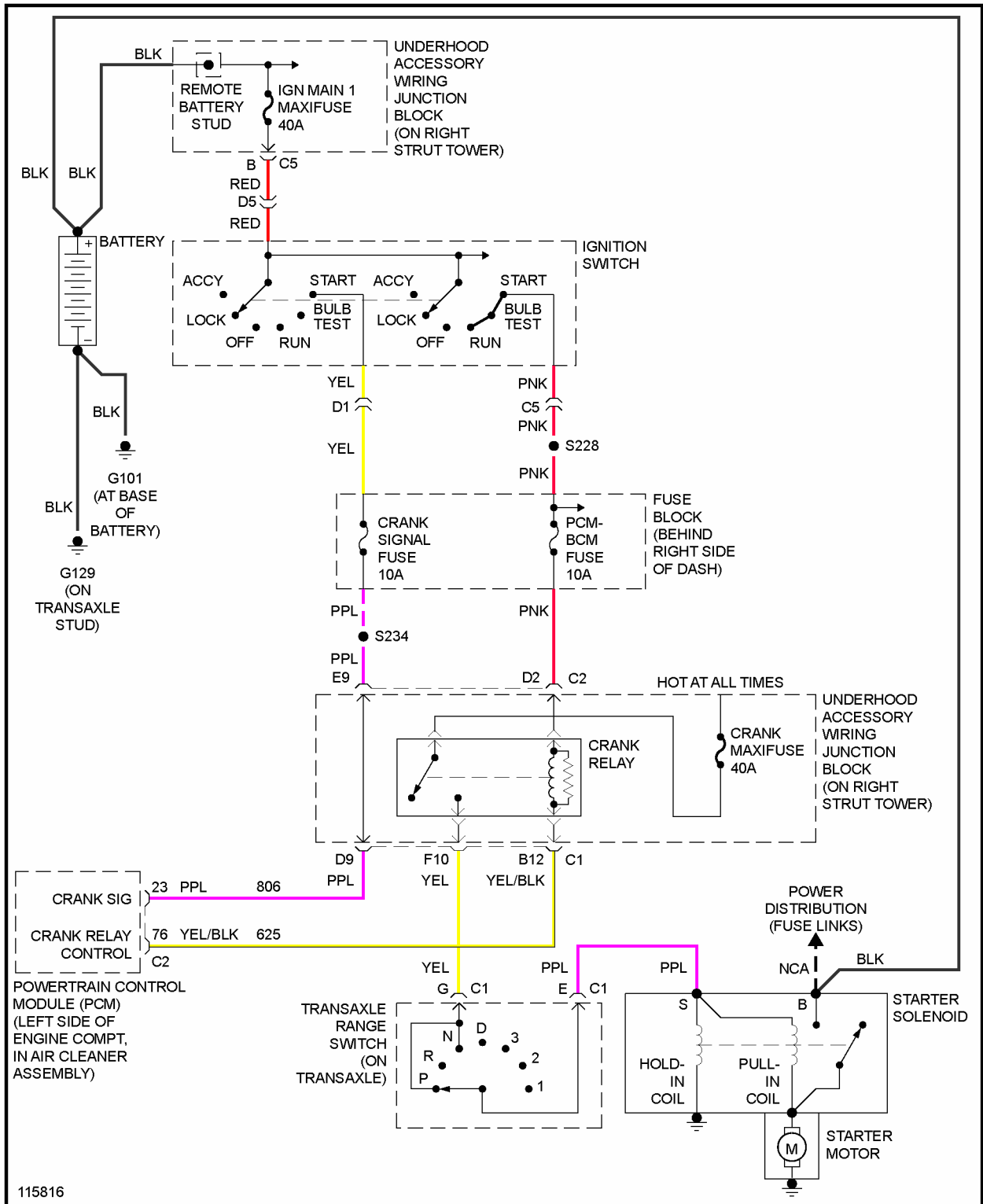
## 1999 STARTING & CHARGING SYSTEMS Starters - Cars - Except Metro, Prizm & Saturn



**Fig. 25: Starting System Wiring Diagram (DeVille & Eldorado)**

# 1999 Chevrolet Corvette

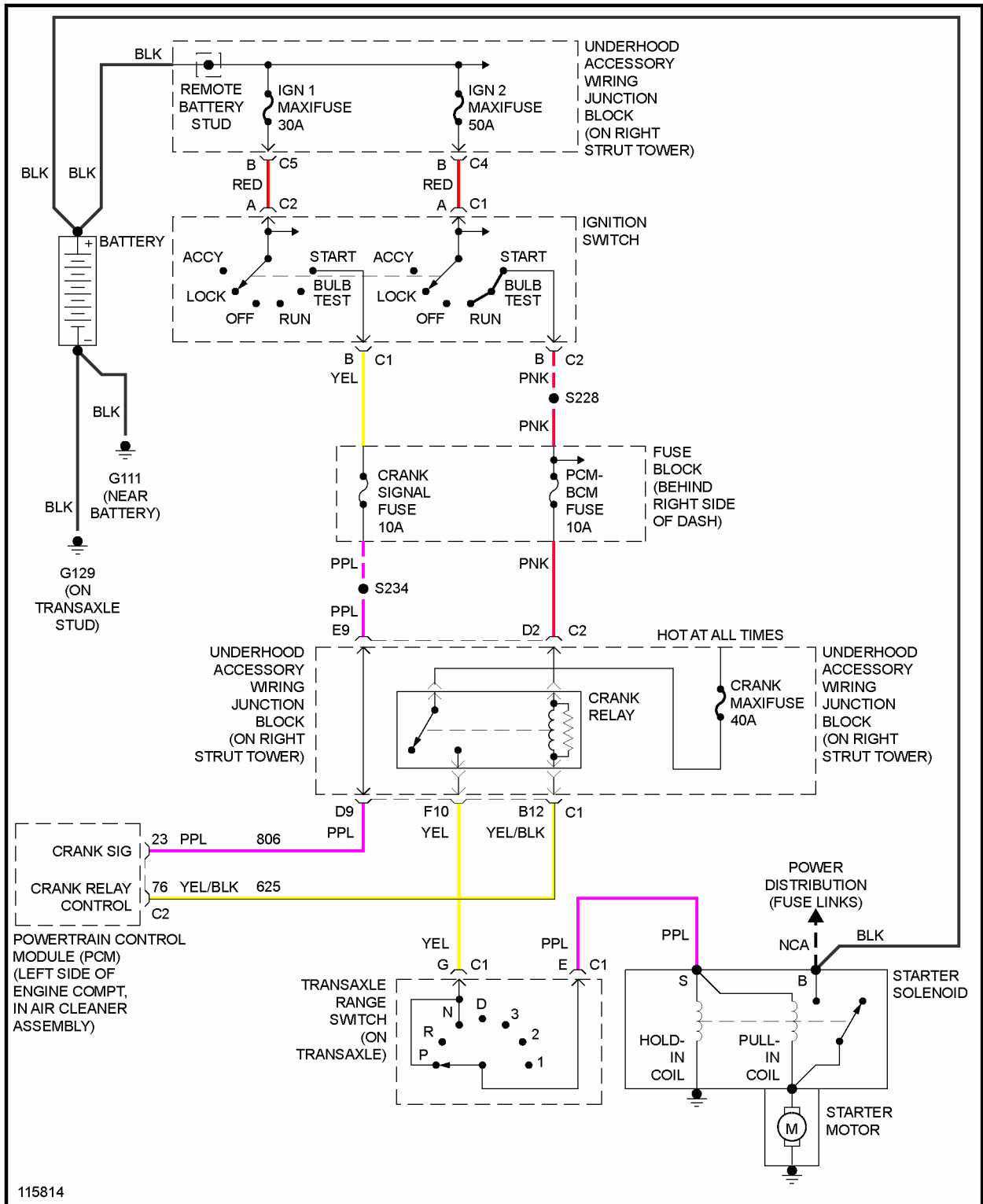
## 1999 STARTING & CHARGING SYSTEMS Starters - Cars - Except Metro, Prizm & Saturn



**Fig. 26: Starting System Wiring Diagram (Grand Prix)**

# 1999 Chevrolet Corvette

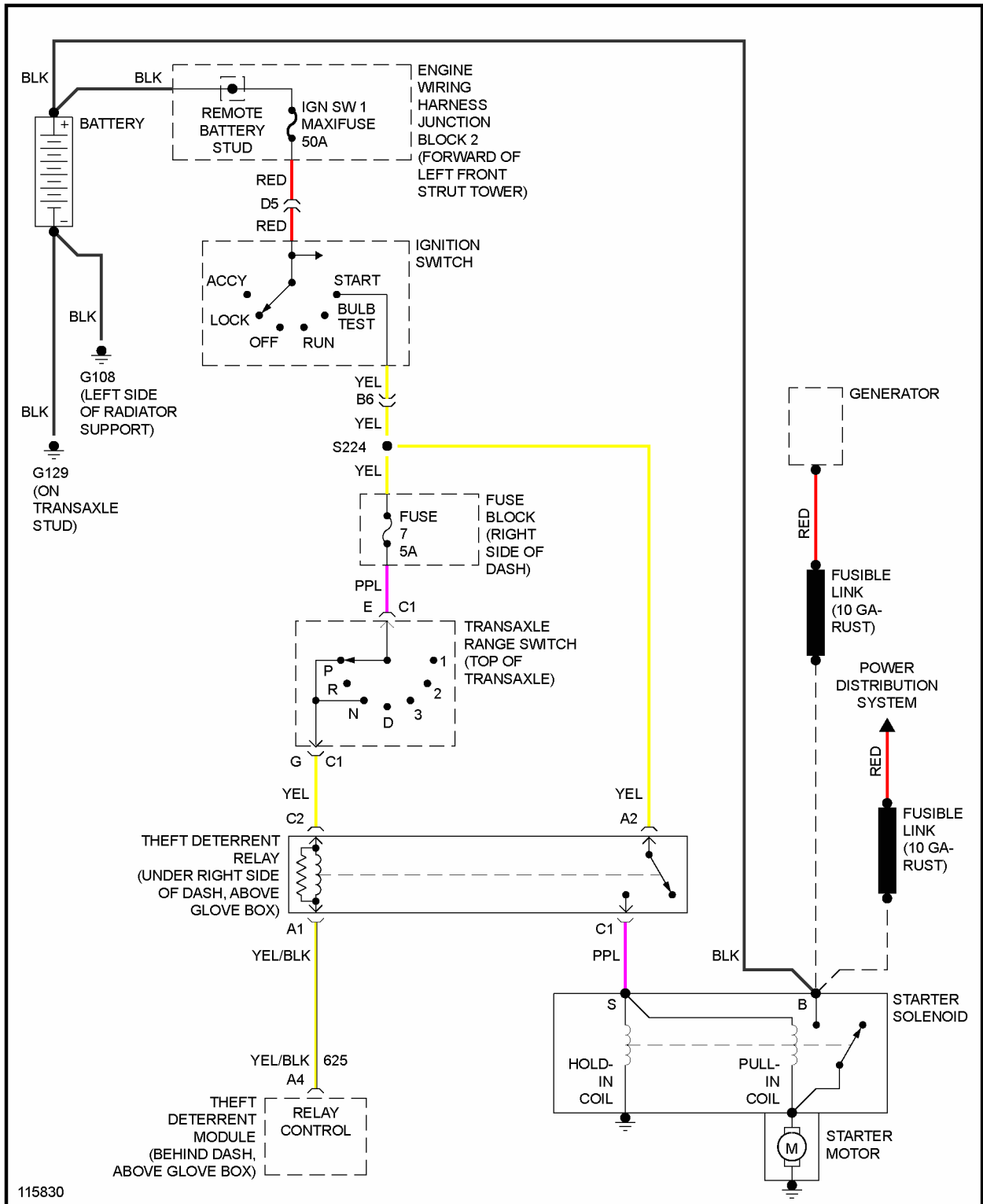
## 1999 STARTING & CHARGING SYSTEMS Starters - Cars - Except Metro, Prizm & Saturn



**Fig. 27: Starting System Wiring Diagram (Intrigue)**

# 1999 Chevrolet Corvette

## 1999 STARTING & CHARGING SYSTEMS Starters - Cars - Except Metro, Prizm & Saturn

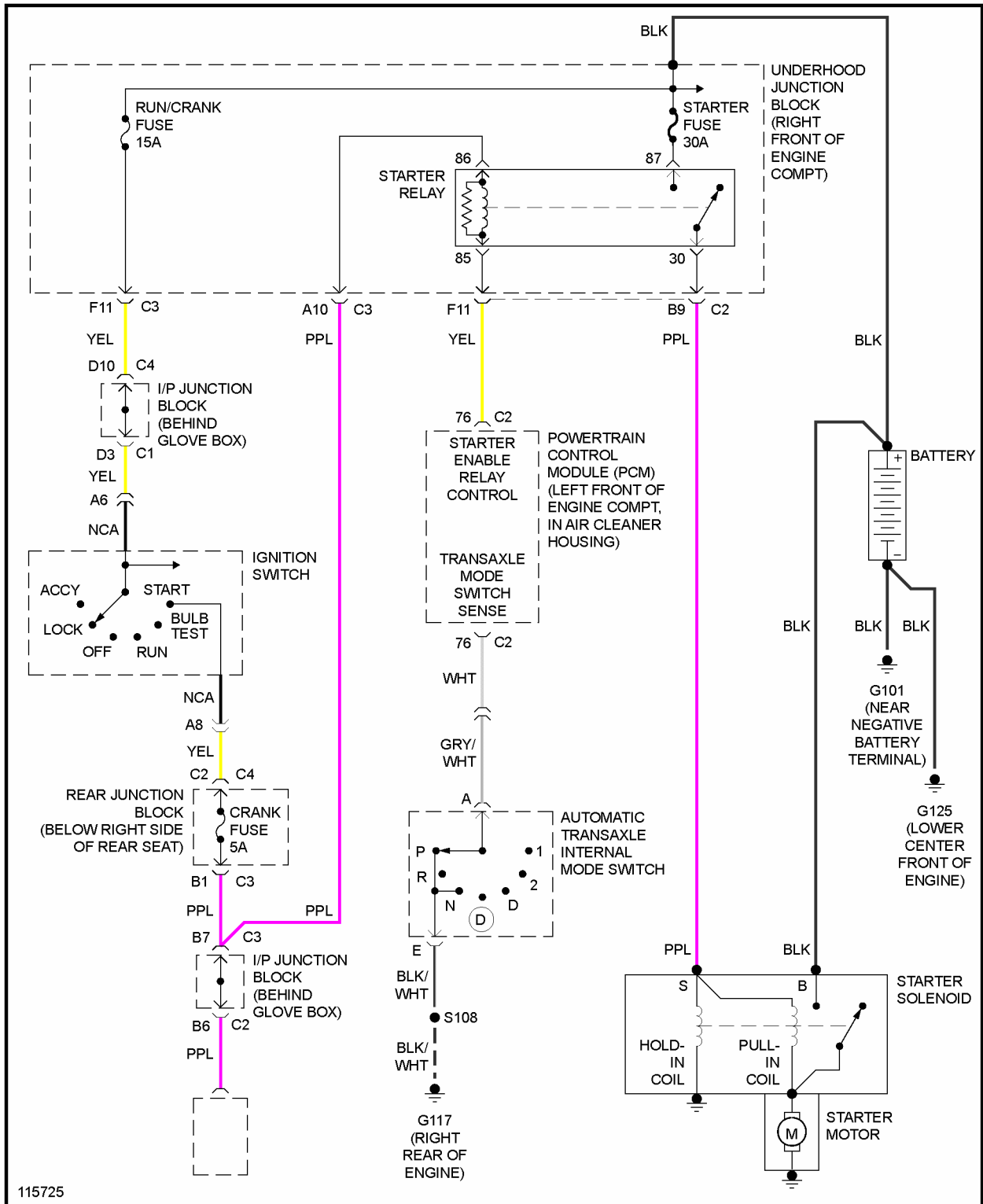


**Fig. 28: Starting System Wiring Diagram (Lumina & Monte Carlo)**



# 1999 Chevrolet Corvette

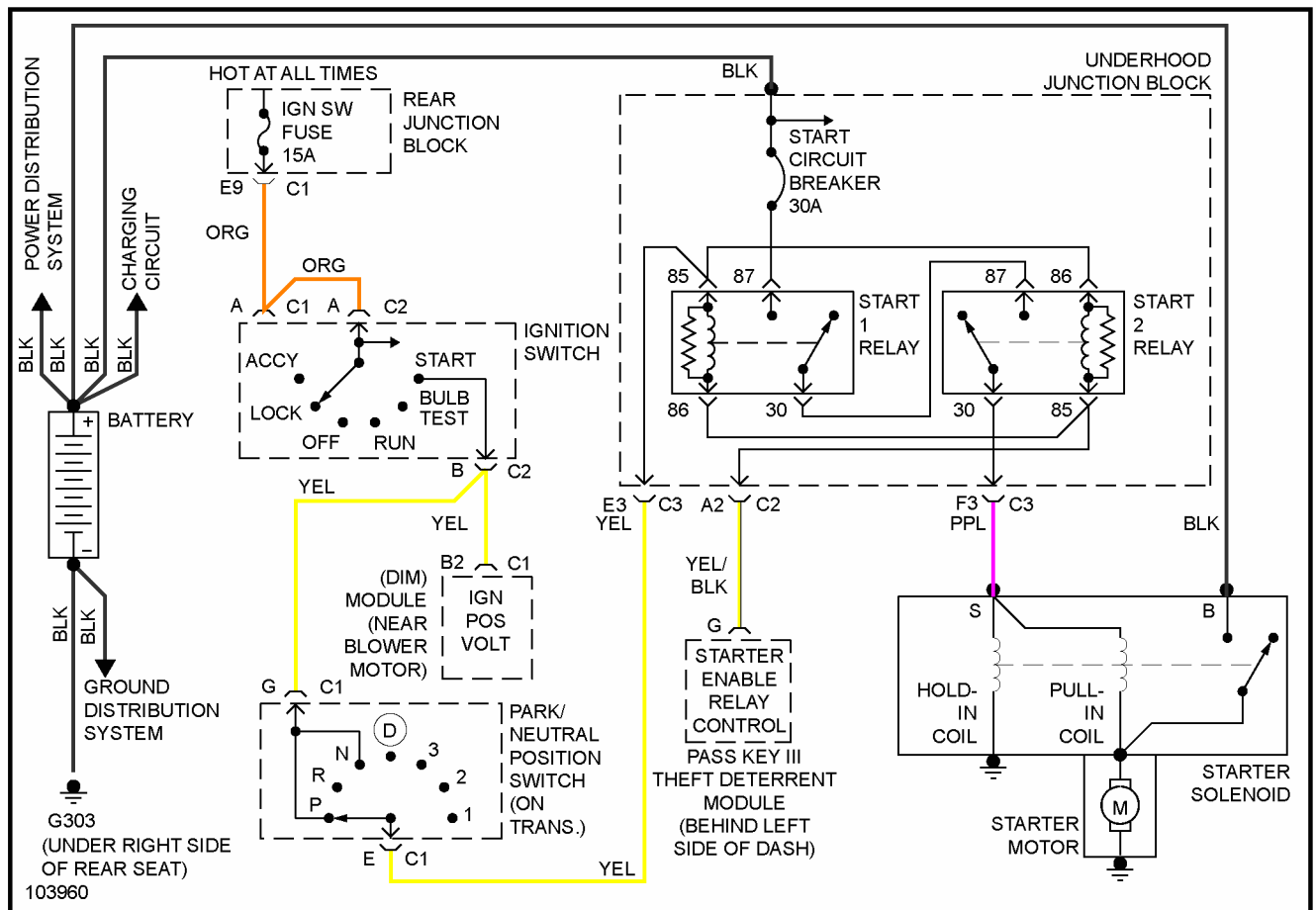
## 1999 STARTING & CHARGING SYSTEMS Starters - Cars - Except Metro, Prizm & Saturn



**Fig. 29: Starting System Wiring Diagram (Park Avenue)**

# 1999 Chevrolet Corvette

## 1999 STARTING & CHARGING SYSTEMS Starters - Cars - Except Metro, Prizm & Saturn



**Fig. 30: Starting System Wiring Diagram (Seville)**