

GENERATOR & REGULATOR

1998 Toyota Supra

1998 STARTING & CHARGING SYSTEMS
Toyota - Generators & Regulators

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

DESCRIPTION & OPERATION

The generator is a small, high RPM, high performance type with an internal Integrated Circuit (IC) voltage regulator which controls charging system voltage. A transistor inside IC regulator controls generator voltage output to maintain a constant voltage. Charging system voltage is maintained within an operating range of 13.2-15.1 volts. See GENERATOR REGULATED OUTPUT SPECIFICATIONS table under NO-LOAD TEST under ON-VEHICLE TESTING for specific model operating ranges. For generator rated ampere output, see GENERATOR RATED AMPERE OUTPUT SPECIFICATIONS table.

When ignition is turned on, battery voltage flows from generator terminal "L" through IC regulator to ground, causing discharge warning light to come on. When engine starts, generator RPM increases, which increases generator output voltage. When generator output voltage is greater than battery voltage, voltage to recharge battery flows from terminal "B". At the same time, voltage at terminal "L" increases and the potential difference between battery and terminal "L" ceases, causing discharge warning light to go off.

GENERATOR RATED AMPERE OUTPUT SPECIFICATIONS TABLE

Application	Amperes
Avalon, Camry & Corolla	80
Celica	
A/T	80
M/T	70
Land Cruiser & Lexus LX470	80 Or 100
RAV4	90
Sienna	100
Supra	
Non-Turbo	80
Turbo	
A/T	100
M/T	90
Tacoma	
4-Cylinder	70
V6	90 Or 100
Tercel	(1) 60 Or 70
T100	70
4Runner	
4-Cylinder	70
V6	60

(1) - Manufacturer does not specify which generator applies to which model.

TROUBLE SHOOTING

NOTE: See TROUBLE SHOOTING - BASIC PROCEDURES article in the

GENERAL INFORMATION section.

Check all fuses, fusible links, ignition switch, and appropriate relays (if equipped). Check generator output. See NO-LOAD TEST under ON-VEHICLE TESTING.

ADJUSTMENTS

NOTE: New belt refers to a belt which has been used 5 minutes or less on a running engine. Used belt refers to a belt which has been used more than 5 minutes on a running engine. After installing new belt(s), run engine for at least 5 minutes and recheck tension.

BELT TENSION

BELT TENSION SPECIFICATIONS TABLE (4-CYLINDER) TABLE (1)

Application	New Belt Lbs. (kg)	Used Belt Lbs. (kg)
Camry & RAV4		
Generator		
With A/C	140-190 (64-86)	100-120 (45-54)
Without A/C	100-150 (45-68)	75-115 (34-52)
Power Steering	95-145 (43-66)	60-100 (27-45)
Celica		
Generator		
With A/C	170-180 (77-82)	95-135 (43-61)
Without A/C	100-150 (45-68)	75-115 (34-52)
Power Steering	99-121 (45-55)	44-77 (20-35)
Corolla	(2)	(2) *
Tacoma, T100 & 4Runner		
A/C	135-185 (61-84)	80-100 (36-45)
Generator	116-169 (53-77)	66-88 (30-40)
Power Steering	135-180 (61-82)	85-120 (39-54)
Tercel		
A/C	135-185 (61-84)	80-120 (36-54)
Generator	140-180 (64-82)	80-120 (36-54)
Power Steering	140-180 (64-82)	80-120 (36-54)

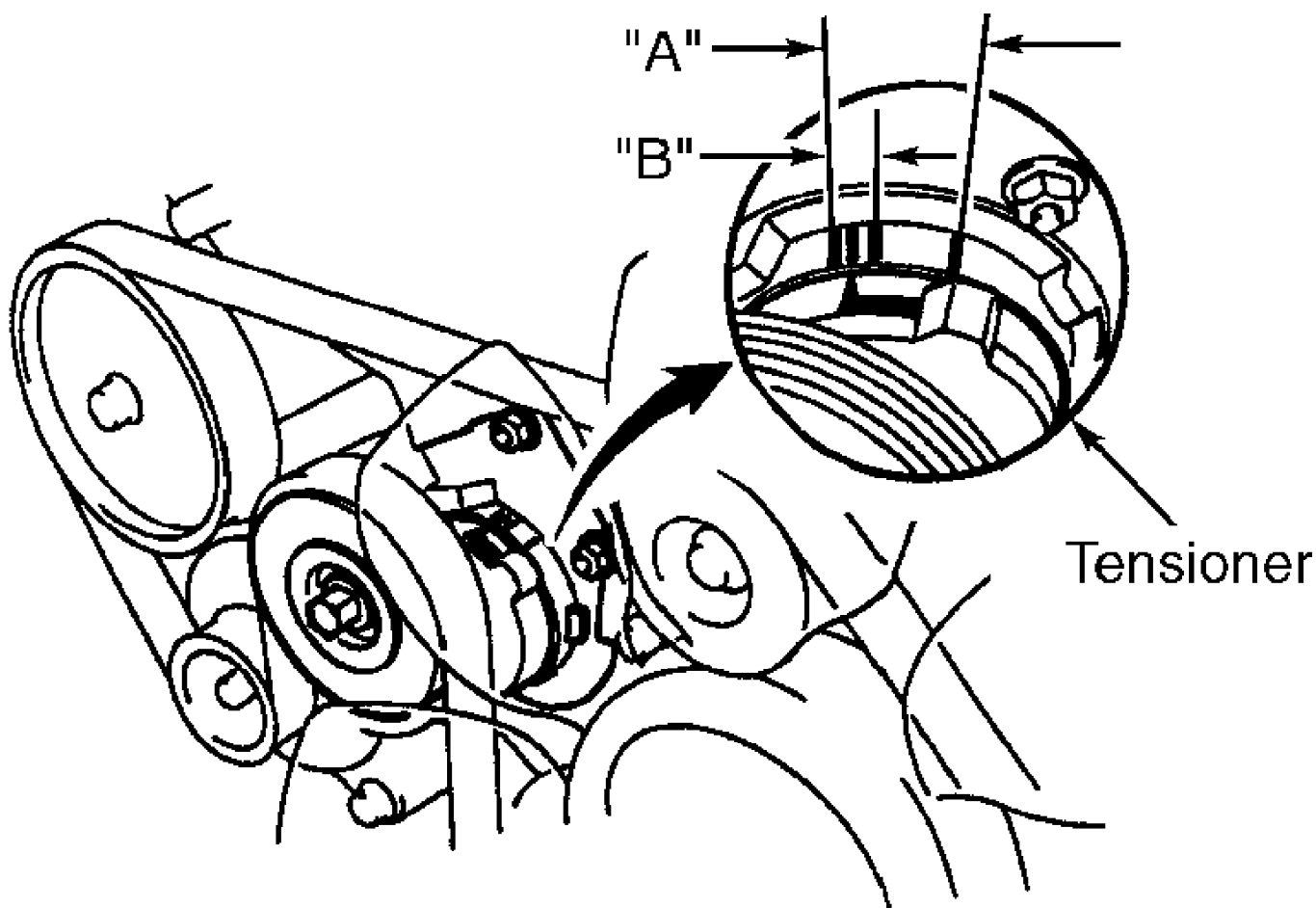
(1) - Measure belt tension with Burroughs (BT-33-73F) tension gauge.

(2) - Automatic belt tensioner is used. Adjustment is not required.

BELT TENSION SPECIFICATIONS TABLE (6-CYLINDER) TABLE

Application	New Belt Lbs. (kg)	Used Belt Lbs. (kg)
Supra	(1)	(1) *

(1) - Automatic belt tensioner is used. Adjustment is not required. If belt tension is not within "A" range of automatic belt tensioner, replace belt. See Fig. 1.



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Fig. 1: Drive Belt Tensioner (Land Cruiser/Lexus LX470 Shown; Supra Similar)
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

BELT TENSION SPECIFICATIONS TABLE (V6) (1) TABLE

Application	New Belt Lbs. (kg)	Used Belt Lbs. (kg)
Avalon, Camry & Sienna		
Generator	170-180 (77-82)	95-135 (43-61)
Power Steering	150-185 (68-84)	95-135 (43-61)
Tacoma, T100 & 4Runner		
A/C	135-185 (61-84)	80-120 (36-54)
Generator	140-180 (64-82)	80-120 (36-54)
Power Steering	135-180 (61-82)	85-120 (39-54)

(1) - Measure belt tension with Burroughs (BT-33-73F) tension gauge.

BELT TENSION SPECIFICATIONS TABLE (V8) TABLE

Application	New Belt Lbs. (kg)	Used Belt Lbs. (kg)
Land Cruiser & Lexus LX470 (1)		(1) *

(1) - Automatic belt tensioner is used. Adjustment is not required. If

belt tension is not within "A" range of automatic belt tensioner, replace belt. See Fig. 1.

ON-VEHICLE TESTING

NO-LOAD TEST

1) Disconnect battery-to-generator terminal "B" wire. See Fig. 2. Using an ammeter and voltmeter, connect negative ammeter lead to disconnected generator terminal "B" wire end, and connect positive ammeter lead to generator terminal "B".

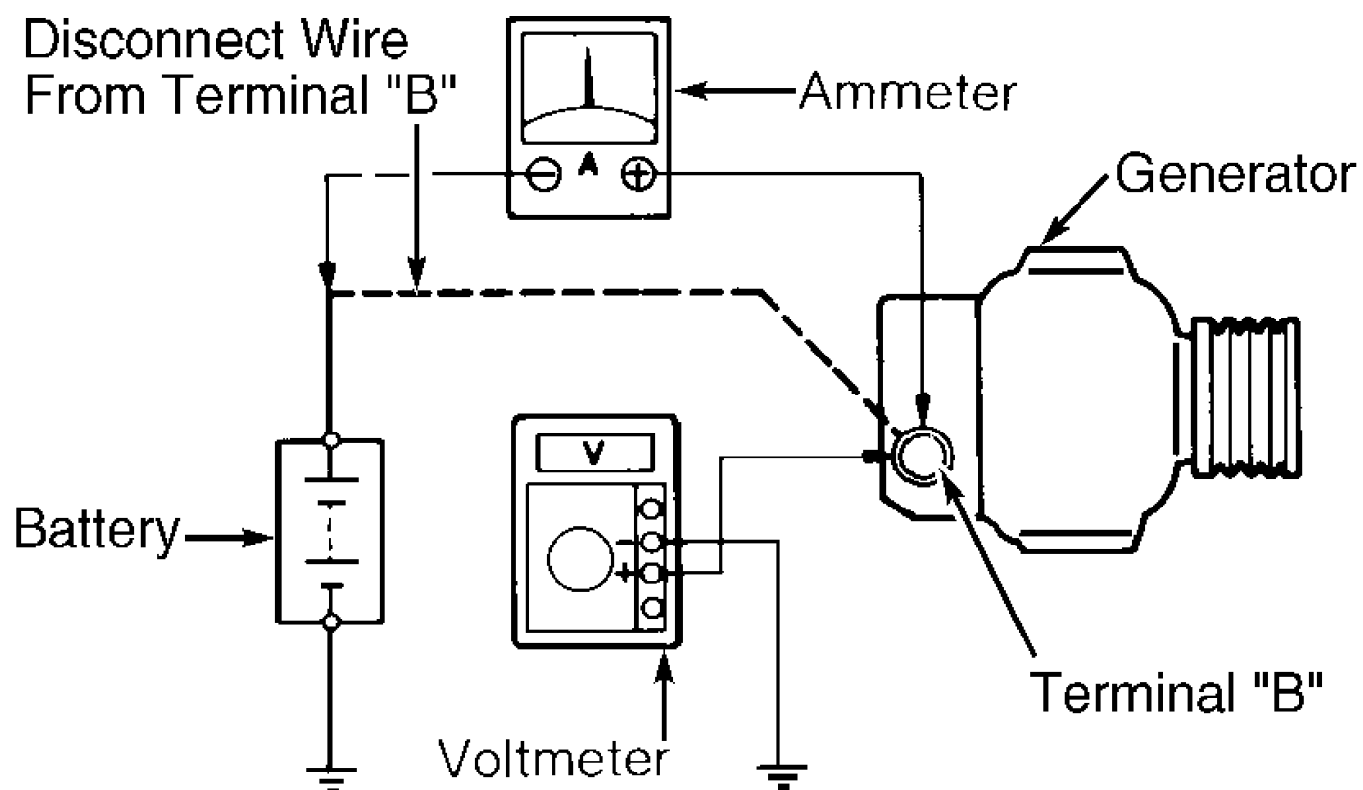
2) Connect voltmeter positive lead to generator terminal "B" and negative lead to ground. See Fig. 2. Start engine and increase engine speed to 2000 RPM. Both meters should read within specification. See GENERATOR REGULATED OUTPUT SPECIFICATIONS table. If voltage is more than specified, replace IC regulator. If voltage is less than specified, go to next step.

3) Locate small hole in back of generator. See Fig. 3. It may be necessary to remove generator end cover to access hole. Using a probe, ground generator terminal "F" (full field) to generator case. See Fig. 3. If voltage is more than specified range, replace IC regulator. If voltage is less than specified range, repair or replace generator.

GENERATOR REGULATED OUTPUT SPECIFICATIONS TABLE (1)

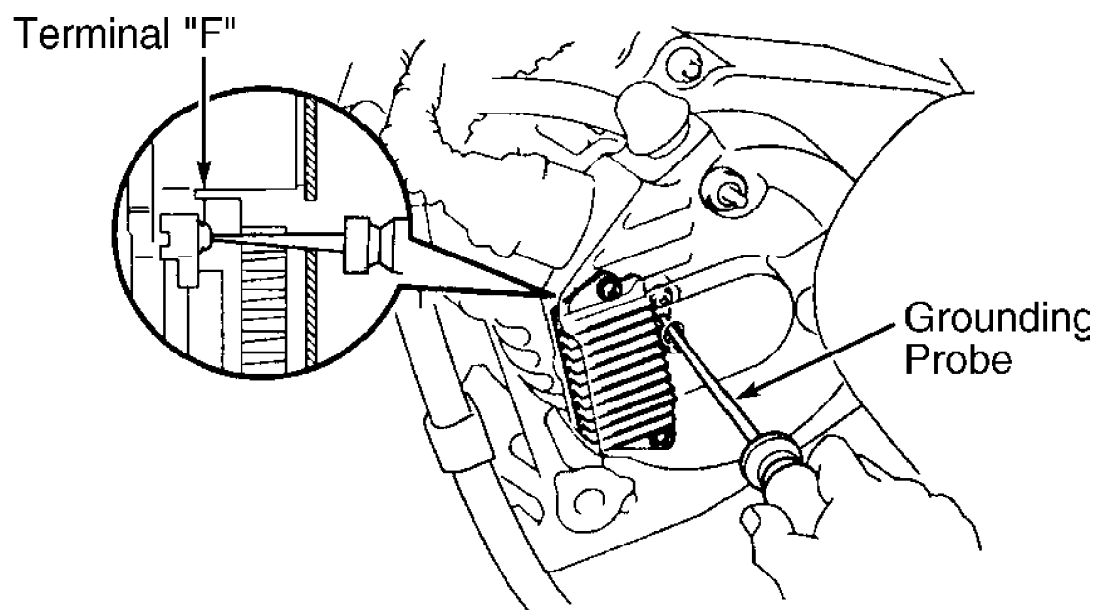
Application	Amps	Volts
Avalon	10 Or Less	13.2-15.0
Camry, Corolla & Tercel ...	10 Or Less	13.5-15.1
Celica & RAV4		
77°F (25°C)	10 Or Less	14.0-15.1
239°F (115°C)	10 Or Less	13.5-14.3
Land Cruiser, Lexus LX470, Sienna & Supra	10 Or Less	13.2-14.8
Tacoma		
77°F (25°C)	10 Or Less	13.7-14.7
239°F (115°C)	10 Or Less	13.2-14.0
T100		
4-Cylinder	10 Or Less	13.2-14.8
V6		
77°F (25°C)	10 Or Less	13.7-14.7
239°F (115°C)	10 Or Less	13.2-14.0
4Runner		
77°F (25°C)	10 Or Less	13.7-14.7
239°F (115°C)	10 Or Less	13.2-14.0

(1) - Specification given is with engine speed at 2000 RPM.



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Fig. 2: Testing Charging Circuit
Courtesy of Toyota Motor Sales, U.S.A., Inc.



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Fig. 3: Testing Generator Full Field Output (Typical)
Courtesy of Toyota Motor Sales, U.S.A., Inc.

LOAD TEST

NOTE: If battery is fully charged, disable ignition system. Crank engine for about 15 seconds to partially discharge battery.

1) Connect an ammeter as described in NO-LOAD TEST, step 1). See Fig. 2. Start engine. Turn on high beam headlights and place heater blower control on HI. Increase engine speed to 2000 RPM.

2) Check ammeter reading. Ammeter should read 30 amps or more. If amperage is less than specified, repair or replace generator.

NOTE: If battery is fully charged, generator load test results may be less than 30 amps.

BENCH TESTING

Brushes

1) Brushes should slide smoothly in holders. Replace brushes if damaged or worn. On 4Runner, new brush exposed length should be .374-.453" (9.5-11.5 mm). On all other models, new brush exposed length should be .413" (10.5 mm).

2) On all models, minimum exposed length should be more than .059" (1.5 mm). There are 2 different brush holders used. One brush holder is replaced as an assembly, and the other has replaceable brushes. If exposed brush length is less than minimum, replace brushes or brush holder assembly. Install new brush springs when replacing brushes.

Rotor

1) Check rotor for open field windings by using an ohmmeter across slip rings. Rotor resistance should be within specification. See ROTOR RESISTANCE SPECIFICATIONS table.

2) Check rotor for shorts to ground by connecting ohmmeter between slip ring and rotor shaft. Ohmmeter should indicate no continuity. Check slip rings for wear or pitting. Standard slip ring diameter is .559-.567" (14.2-14.4 mm). Turn slip rings on lathe if necessary. Minimum slip ring diameter is .504" (12.8 mm).

Stator

Connect ohmmeter between 2 stator leads. Continuity should exist between all stator leads. Connect ohmmeter between each stator lead and metal core. Continuity should not exist. If stator does not test as indicated, replace stator.

Diodes

1) With diode/rectifier assembly removed and on bench, contact positive diode plate terminal with one ohmmeter probe. Using other ohmmeter probe, contact each diode lead in same plate. Note ohmmeter reading. Reverse ohmmeter probes, and repeat tests for all diodes.

2) All diodes should show continuity in one direction and no continuity in opposite direction. If any diode is defective, replace diode/rectifier assembly.

ROTOR RESISTANCE SPECIFICATIONS TABLE

Application	(1) Ohms
Avalon, Sienna, Tacoma, T100 & 4Runner	2.1-2.5
Camry	
4-Cyl.	2.7-3.1
V6	2.1-2.5
Land Cruiser & Lexus LX470	2.1-2.5
Tercel	

Type A (2)	2.1-2.5
Type B Or C (2)	2.7-3.1
All Other Models	2.7-3.1

- (1) - Specification given is with temperature at 68°F (20°C).
 (2) - Manufacturer does not specify difference between type "A", "B" or "C" generators.
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REMOVAL & INSTALLATION

GENERATOR

Removal & Installation (Land Cruiser & Lexus LX470)

1) Disconnect negative battery cable. Drain engine coolant. Rotate belt tensioner counterclockwise to release tension on belt and remove drive belt. Remove splash shield from underneath engine. Remove radiator reservoir tank and radiator.

2) Using Spanner Wrench (09960-10010) to keep power steering pump pulley from rotating, remove power steering pump pulley retaining nut. Remove power steering pump pulley. Remove generator mounting bolts and generator. To install, reverse removal procedure. Tighten bolts to specifications. See TORQUE SPECIFICATIONS.

Removal & Installation (Supra)

1) Disconnect negative battery cable. Remove splash shield from underneath engine. On turbo models, remove air tube from air charge air cooler. Remove lower radiator fan shroud. On turbo models with manual transmission, remove drive belt tensioner damper.

2) On all models, remove drive belt. Remove generator mounting bolts and generator. To install, reverse removal procedure. Tighten bolts to specifications. See TORQUE SPECIFICATIONS.

Removal & Installation (All Others)

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

OVERHAUL

GENERATOR

Disassembly

1) Remove rear end cover (if equipped). See Fig. 4. Remove brush holder and IC regulator. Remove diode assembly. Remove rubber insulators or seal plate (if equipped). Use generator Pulley Set Nut Wrench Set (SST 09820-63010) to remove generator pulley.

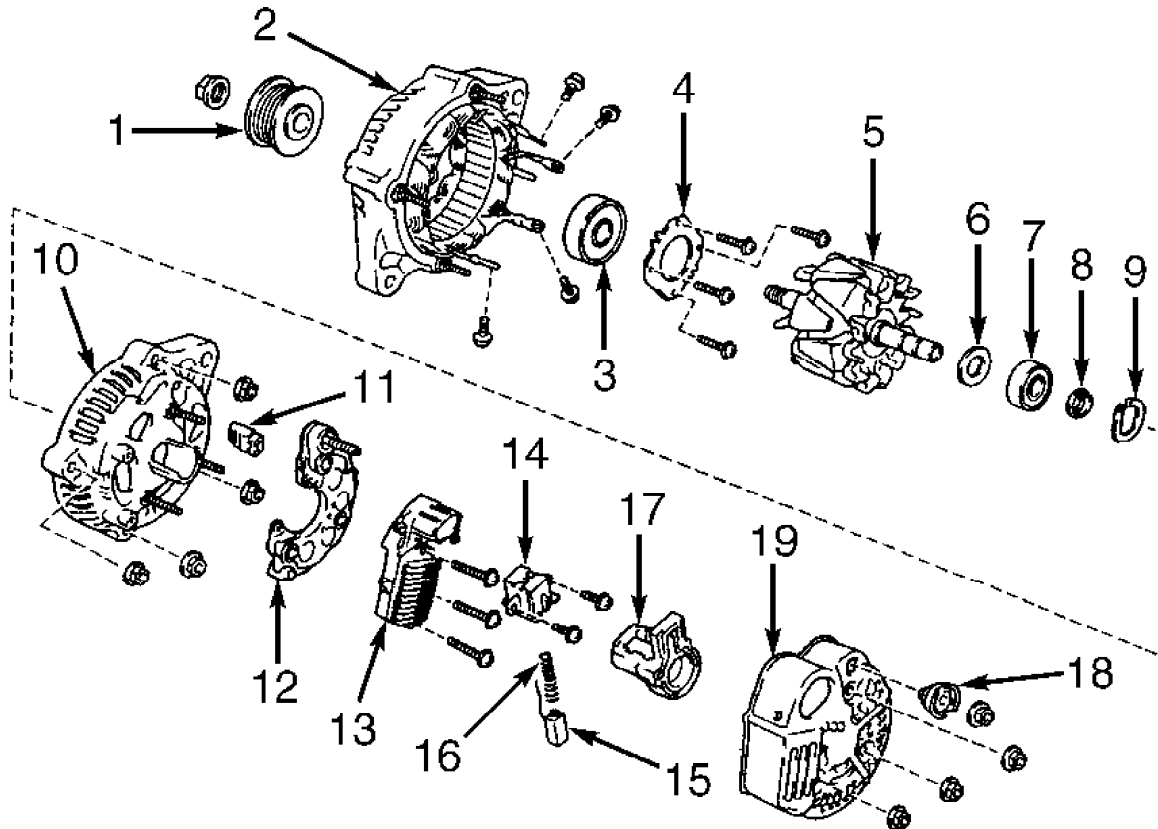
2) To remove pulley, install SST "A" and "B" to rotor shaft and tighten SST "B" clockwise to 29 ft. lbs. (39 N.m). See Fig. 5. Place SST "C" securely into a vise. Verify that SST "A" is secured to rotor shaft and install SST "A" and "B" and generator into SST "C". Turn SST "A" in correct direction to loosen pulley nut. See Fig. 5. To prevent damage to rotor shaft, DO NOT loosen pulley nut more than 1/2 turn. Remove SST "A" and "B" and generator from SST "C". Remove SST "A" and "B" from rotor shaft, and remove pulley nut and pulley.

3) Remove rectifier and frame using appropriate puller. Remove generator washer (if equipped). Remove rotor from drive end frame (stator).

Assembly

To assemble, reverse disassembly procedure. Use generator

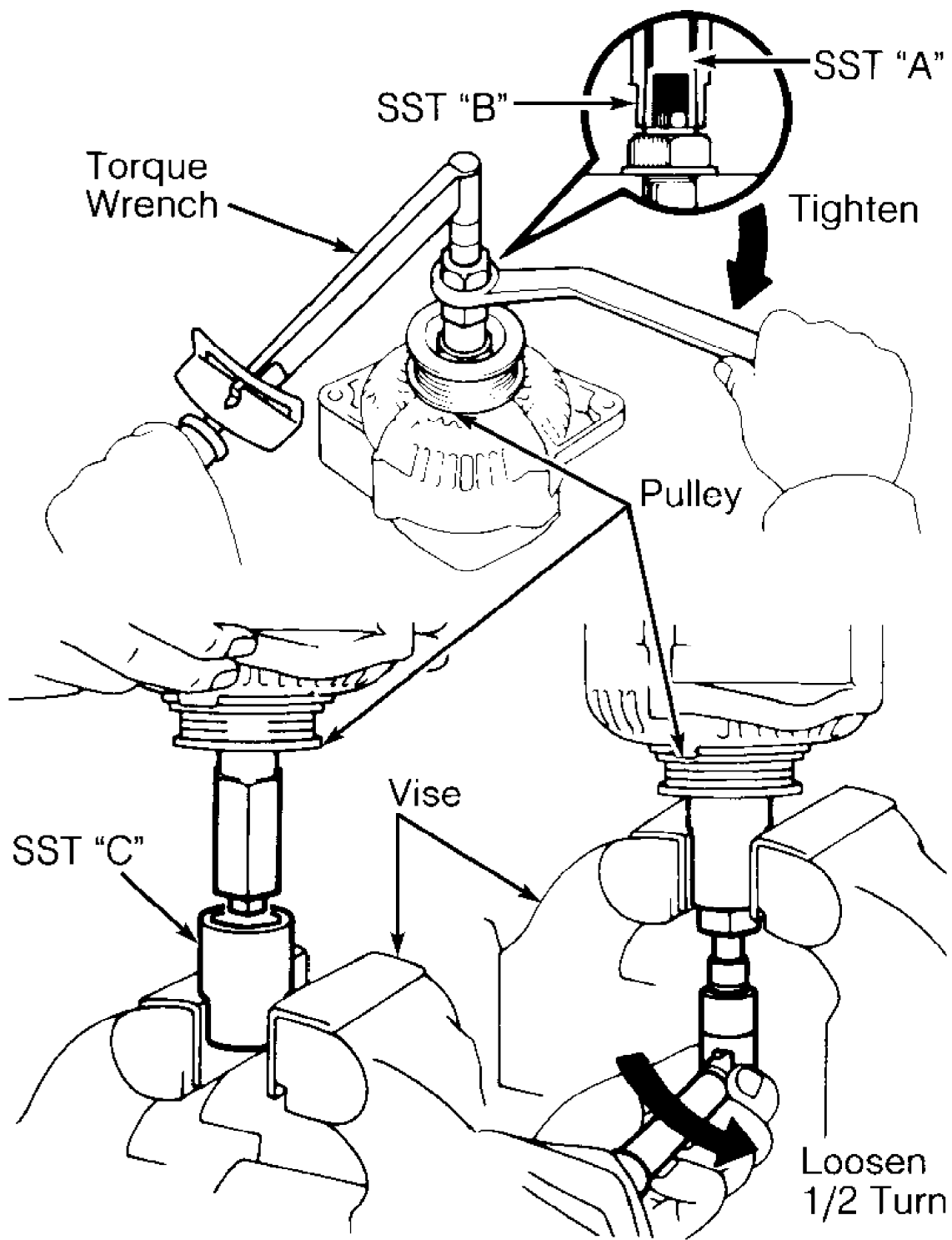
Pulley Set Nut Wrench Set (SST 09820-63010) to install generator pulley. Place SST "C" securely into a vise. Install SST "A" and "B" and generator into SST "C". See Fig. 5. Tighten pulley nut to 81 ft. lbs. (110 N.m) in the opposite direction of disassembly. See Fig. 5. After completing assembly, verify rotor turns smoothly.



- | | |
|-----------------------------|------------------------|
| 1. Pulley | 11. Rubber Insulator |
| 2. Drive End Frame (Stator) | 12. Diode Assembly |
| 3. Front Bearing | 13. IC Regulator |
| 4. Retainer | 14. Brush Holder |
| 5. Rotor | 15. Brush |
| 6. Bearing Cover | 16. Spring |
| 7. Rear Bearing | 17. Brush Holder Cover |
| 8. Bearing Cover | 18. Terminal Insulator |
| 9. Thrust Washer | 19. Rear End Cover |
| 10. Diode End Frame | |

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Fig. 4: Exploded View Of Generator (Celica M/T Shown; All Others Similar)
 Courtesy of Toyota Motor Sales, U.S.A., Inc.



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Fig. 5: Removing Generator Pulley
 Courtesy of Toyota Motor Sales, U.S.A., Inc.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS TABLE

Application	Ft. Lbs. (N.m)
Avalon & Sienna	
Generator Adjusting Bolt	13 (18)
Generator Pivot Bolt	41 (56)
Generator Pulley Nut	81 (110)
Camry	
4-Cylinder	
Generator Adjusting Bolt	13 (18)
Generator Pivot Bolt	38 (51)
Generator Pulley Nut	81 (110)
V6	
Generator Adjusting Bolt	13 (18)
Generator Pivot Bolt	41 (56)
Generator Pulley Nut	81 (110)
Celica	
Generator Adjusting Bolt	14 (19)
Generator Pivot Bolt	40 (54)
Generator Pulley Nut	81 (110)
Corolla	
Generator Adjusting Bolt	18 (24)
Generator Pivot Bolt	40 (54)
Generator Pulley Nut	81 (110)
Land Cruiser & Lexus LX470	
Generator Mounting Bolts	29 (39)
Generator Pulley Nut	81 (110)
Power Steering Pulley Nut	32 (43)
RAV4	
Generator Adjusting Bolt	13 (18)
Generator Pivot Bolt	38 (51)
Generator Pulley Nut	81 (110)
Supra	
Generator Mounting Bolts	30 (41)
Generator Pulley Nut	81 (110)
Tacoma, T100 & 4Runner	
4-Cylinder	
Generator Adjusting Lock Bolt	21 (28)
Generator Pivot Bolt	43 (58)
Generator Pulley Nut	81 (110)
V6	
Generator Adjusting Lock Bolt	25 (34)
Generator Pivot Bolt	38 (51)
Generator Pulley Nut	81 (110)
Terrel	
Generator Adjusting Bolt	(1) *
Generator Pivot Bolt	30 (41)
Generator Pulley Nut	81 (110)

(1) - Tighten to 105 INCH lbs. (12 N.m) .

WIRING DIAGRAMS

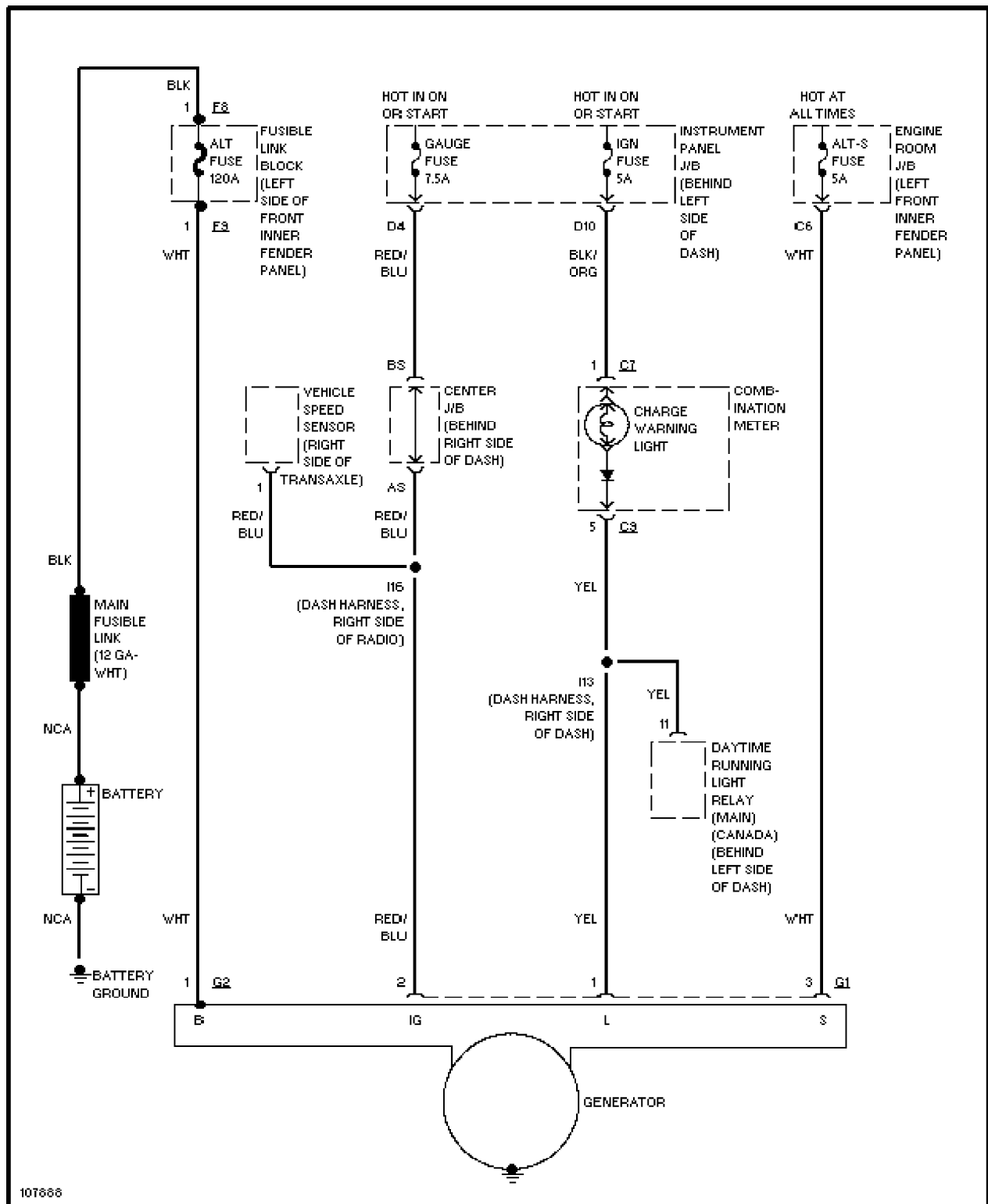


Fig. 6: Charging System Wiring Diagram (Avalon)

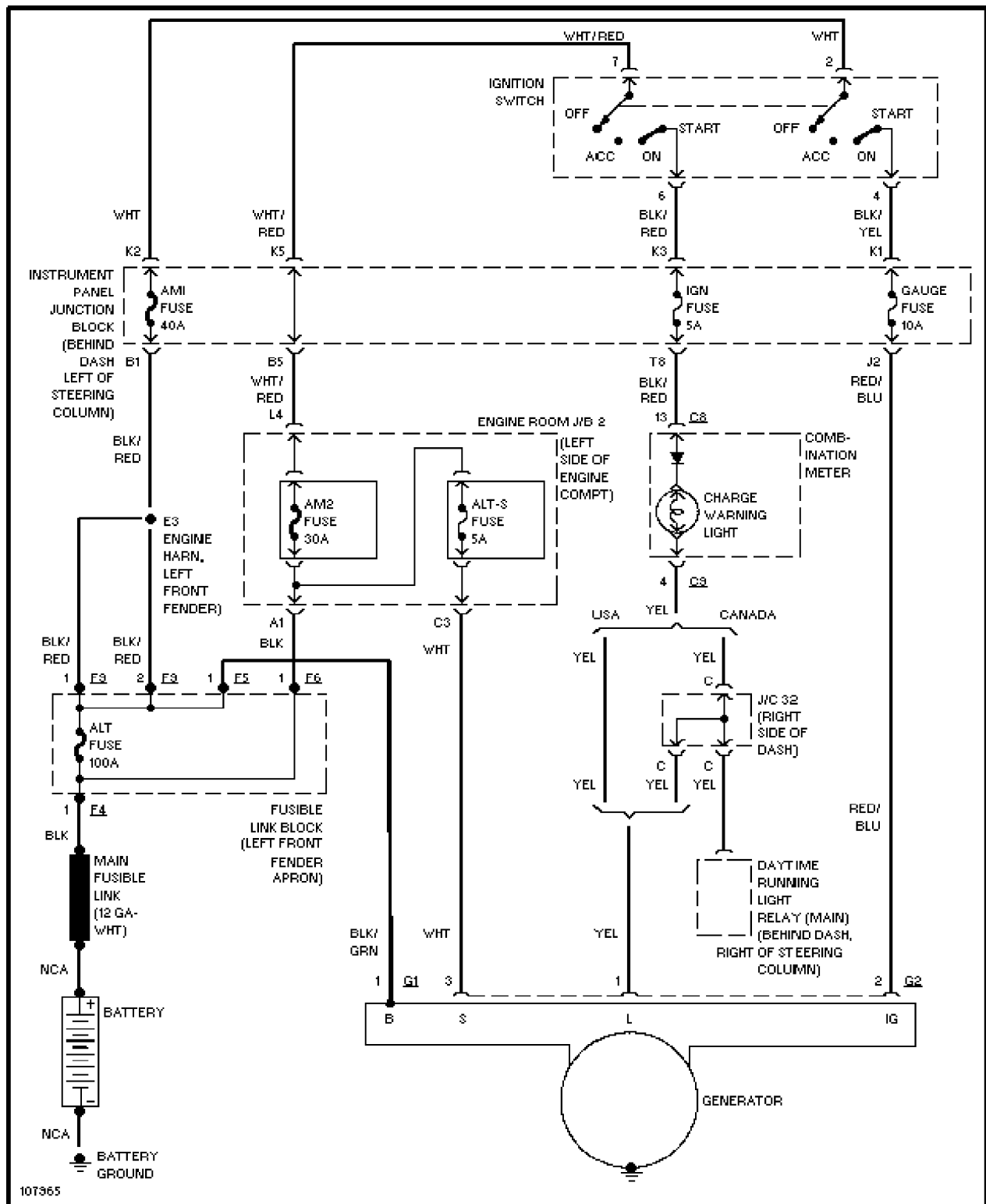


Fig. 7: Charging System Wiring Diagram (Camry)

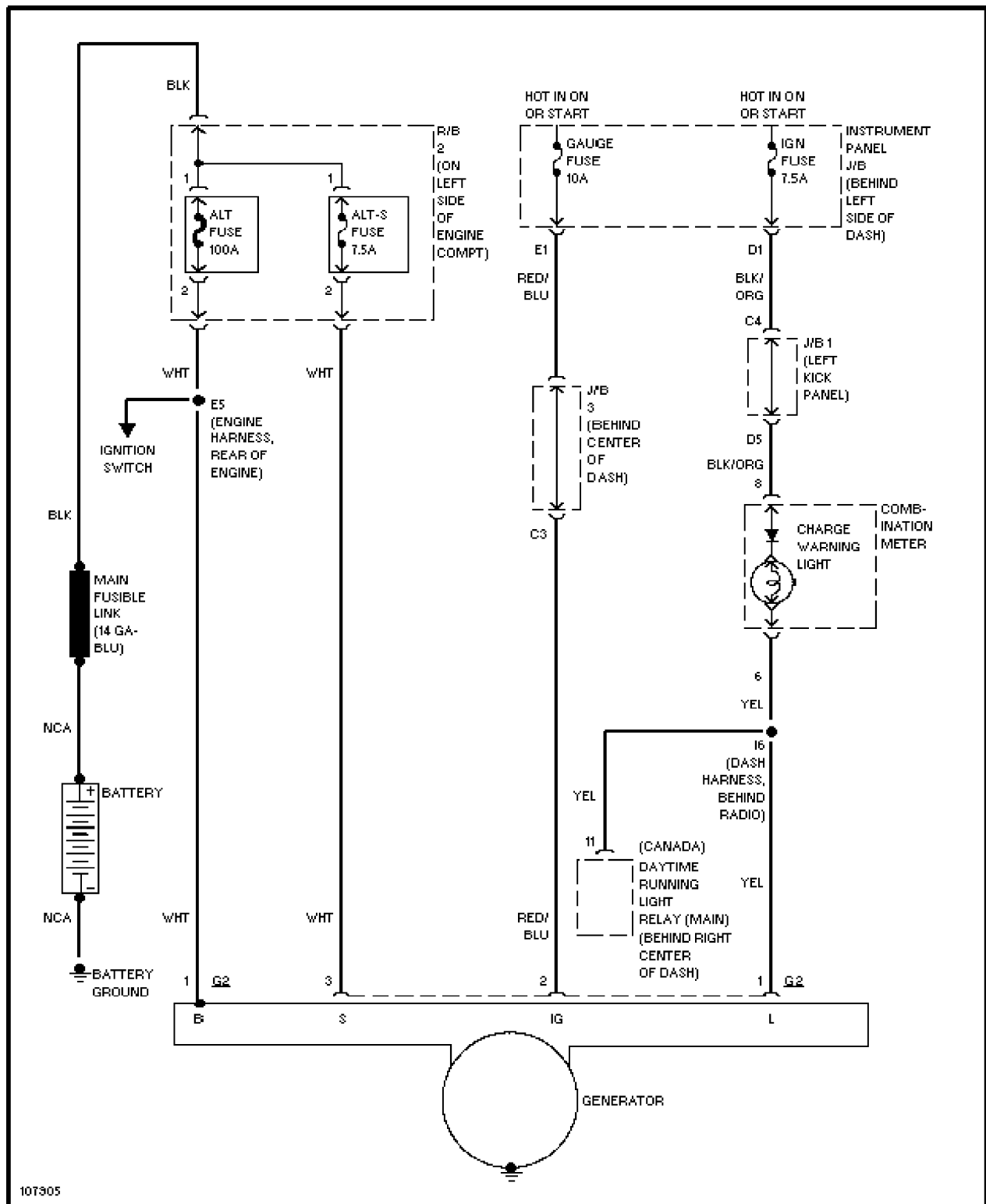


Fig. 8: Charging System Wiring Diagram (Celica)

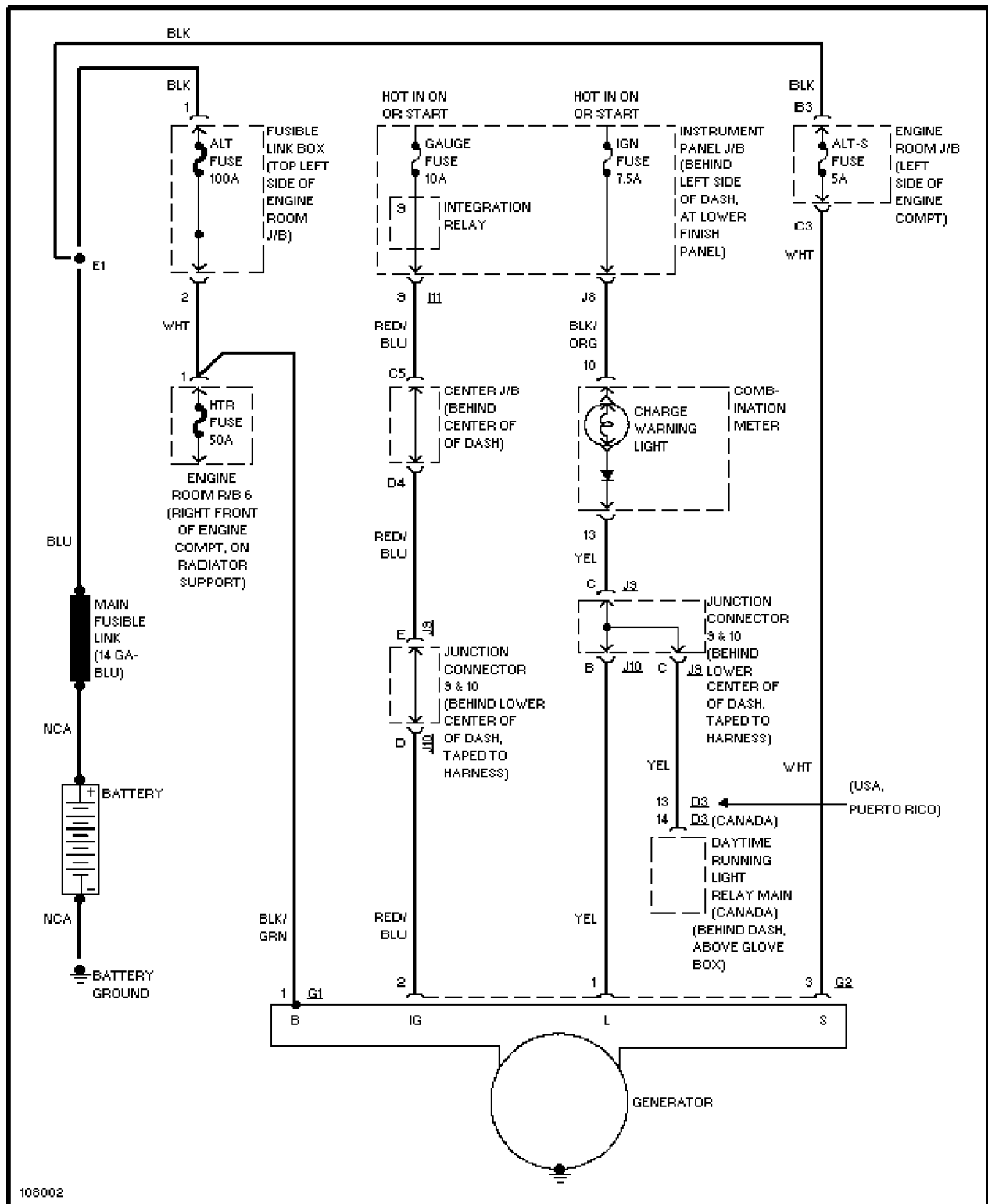
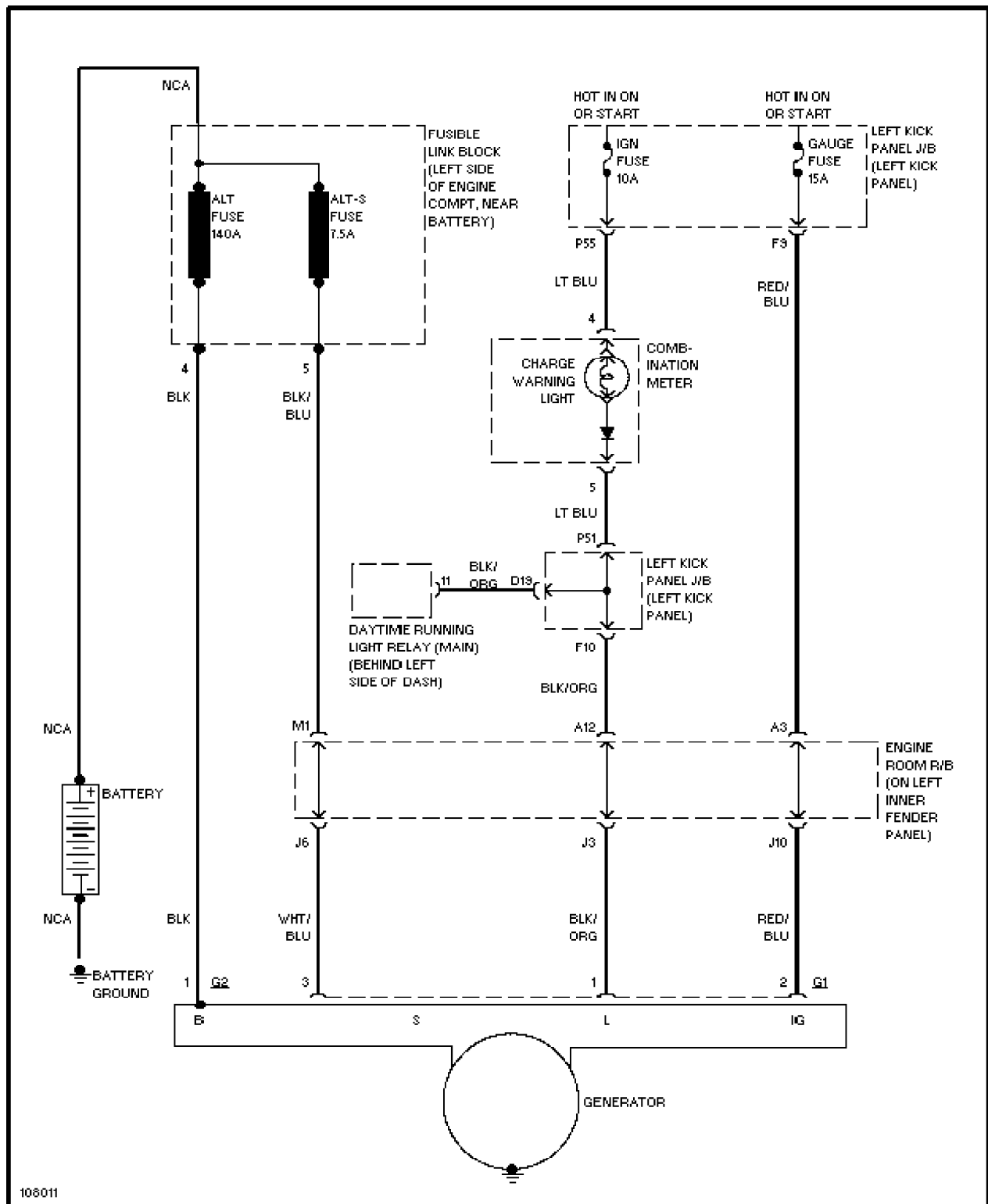


Fig. 9: Charging System Wiring Diagram (Corolla)



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Fig. 10: Charging System Wiring Diagram (Land Cruiser)

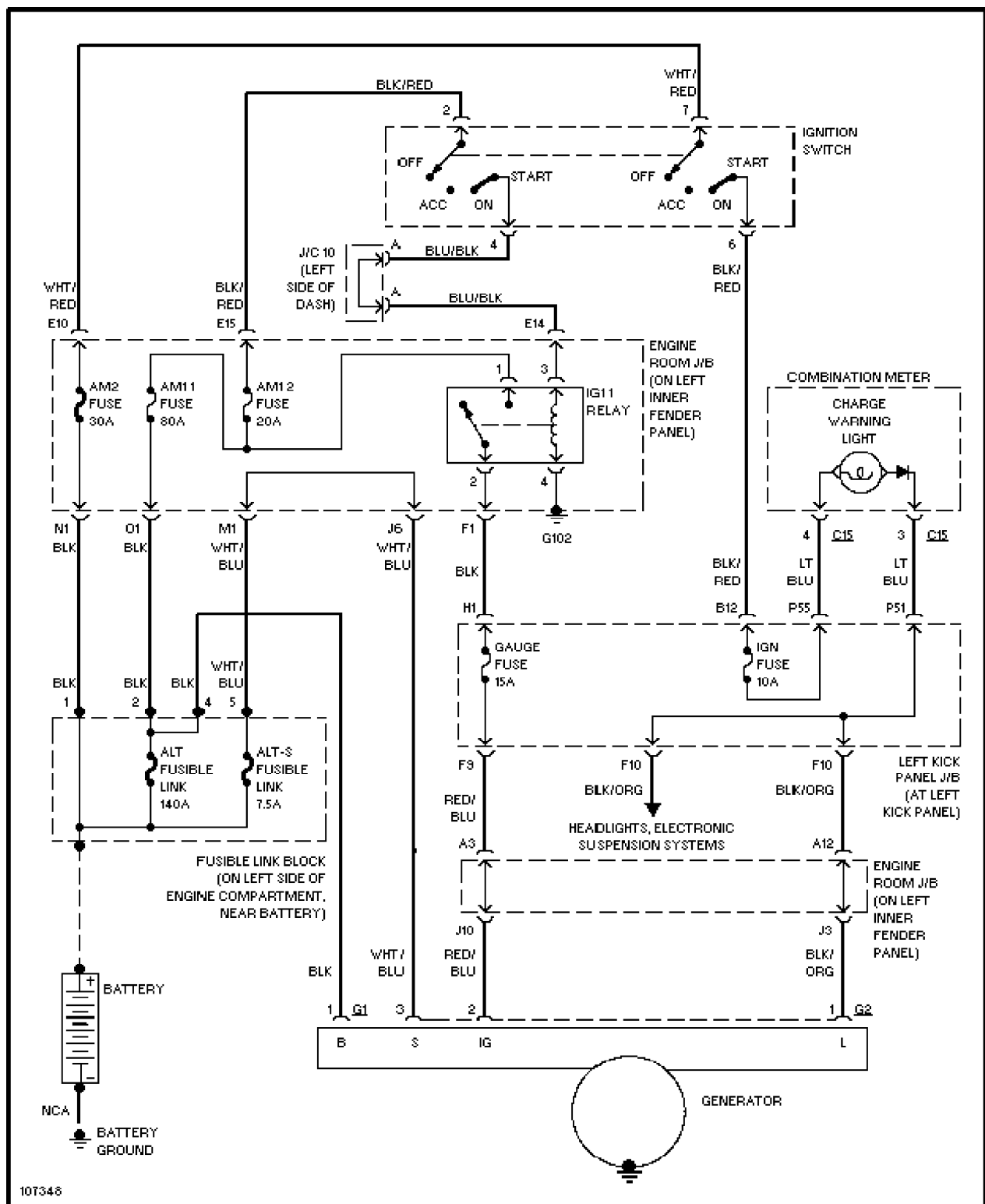


Fig. 11: Charging System Wiring Diagram (Lexus LX470)

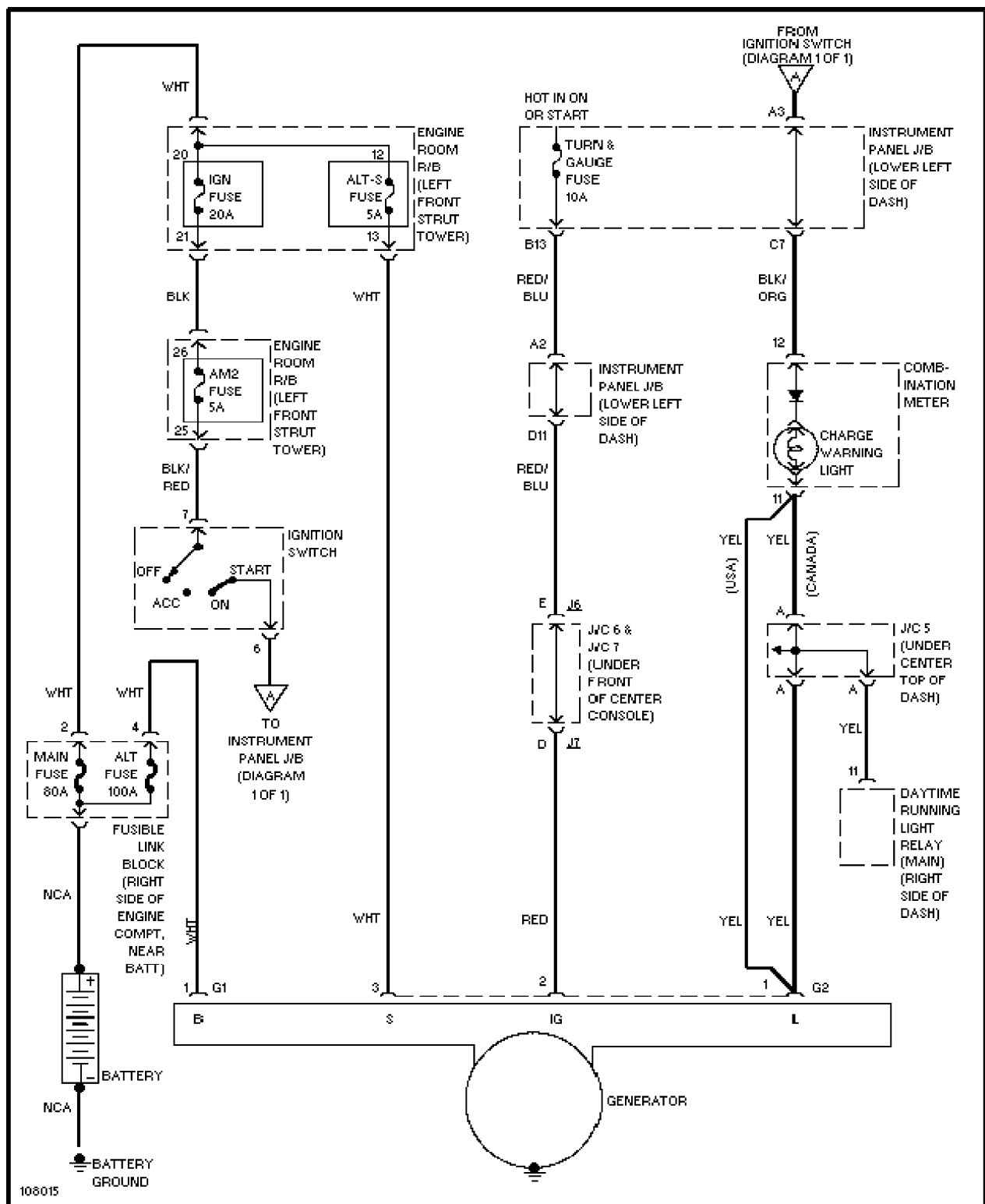


Fig. 12: Charging System Wiring Diagram (RAV4)

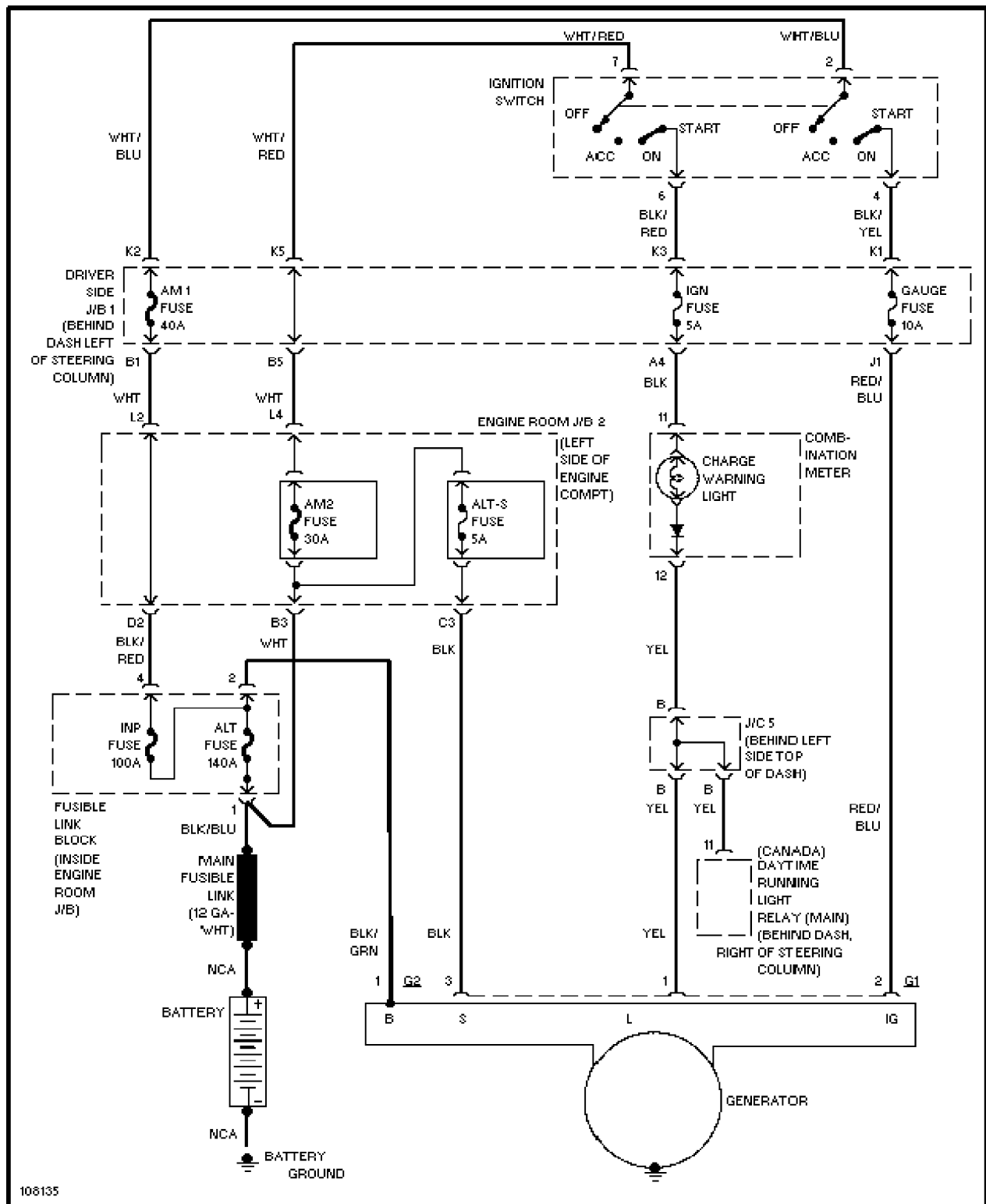


Fig. 13: Charging System Wiring Diagram (Sienna)

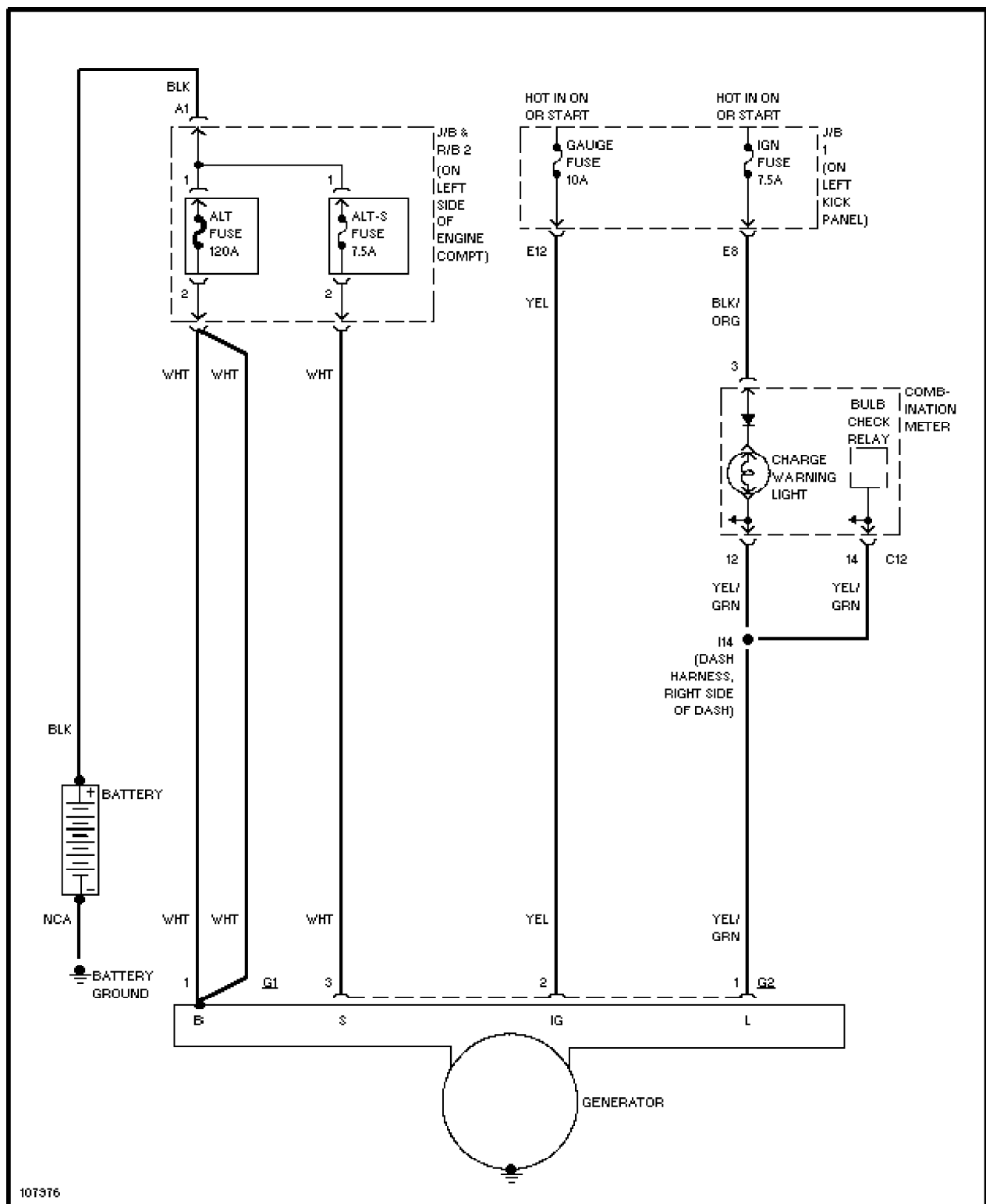


Fig. 14: Charging System Wiring Diagram (Supra)

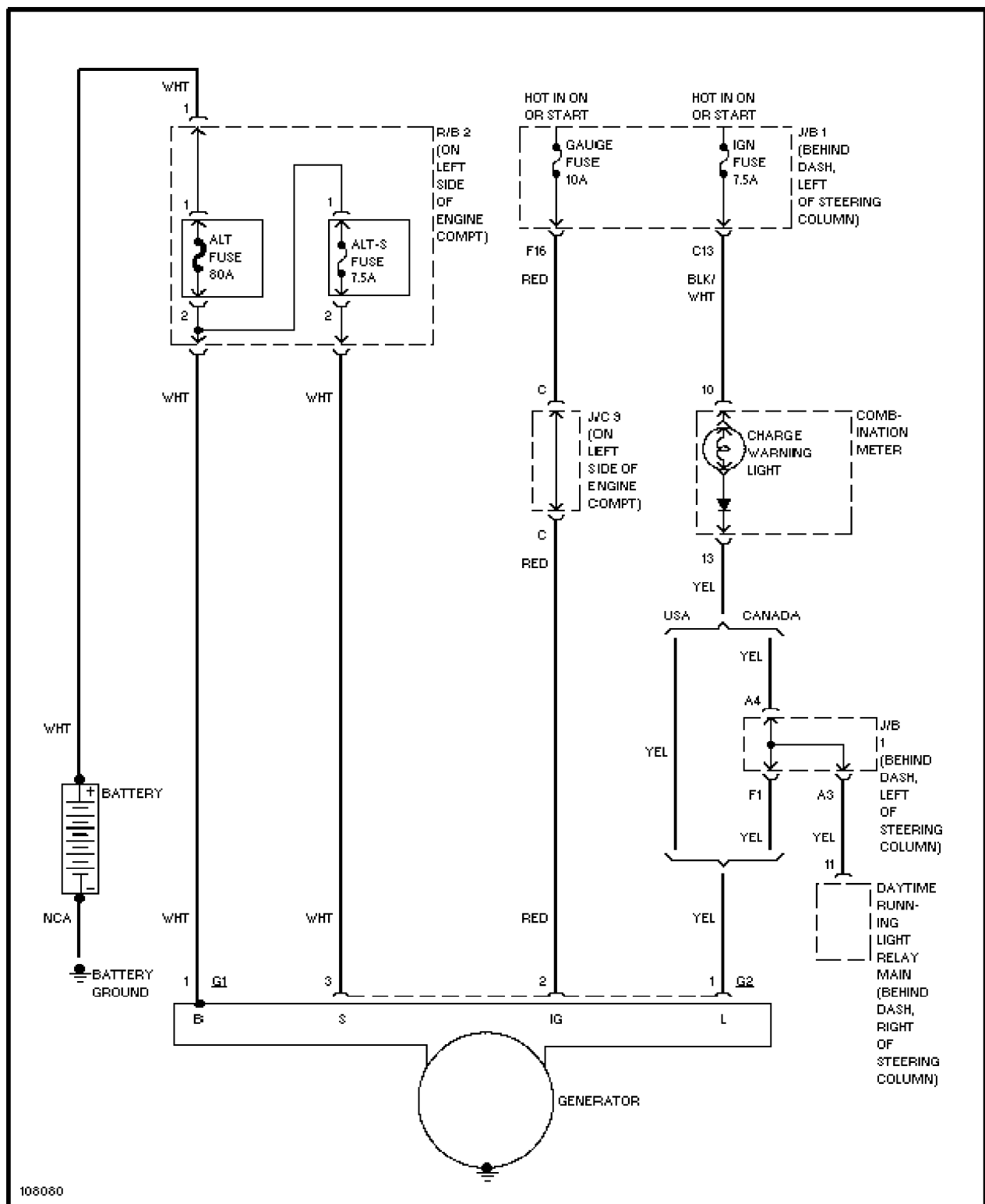


Fig. 15: Charging System Wiring Diagram (Tacoma)

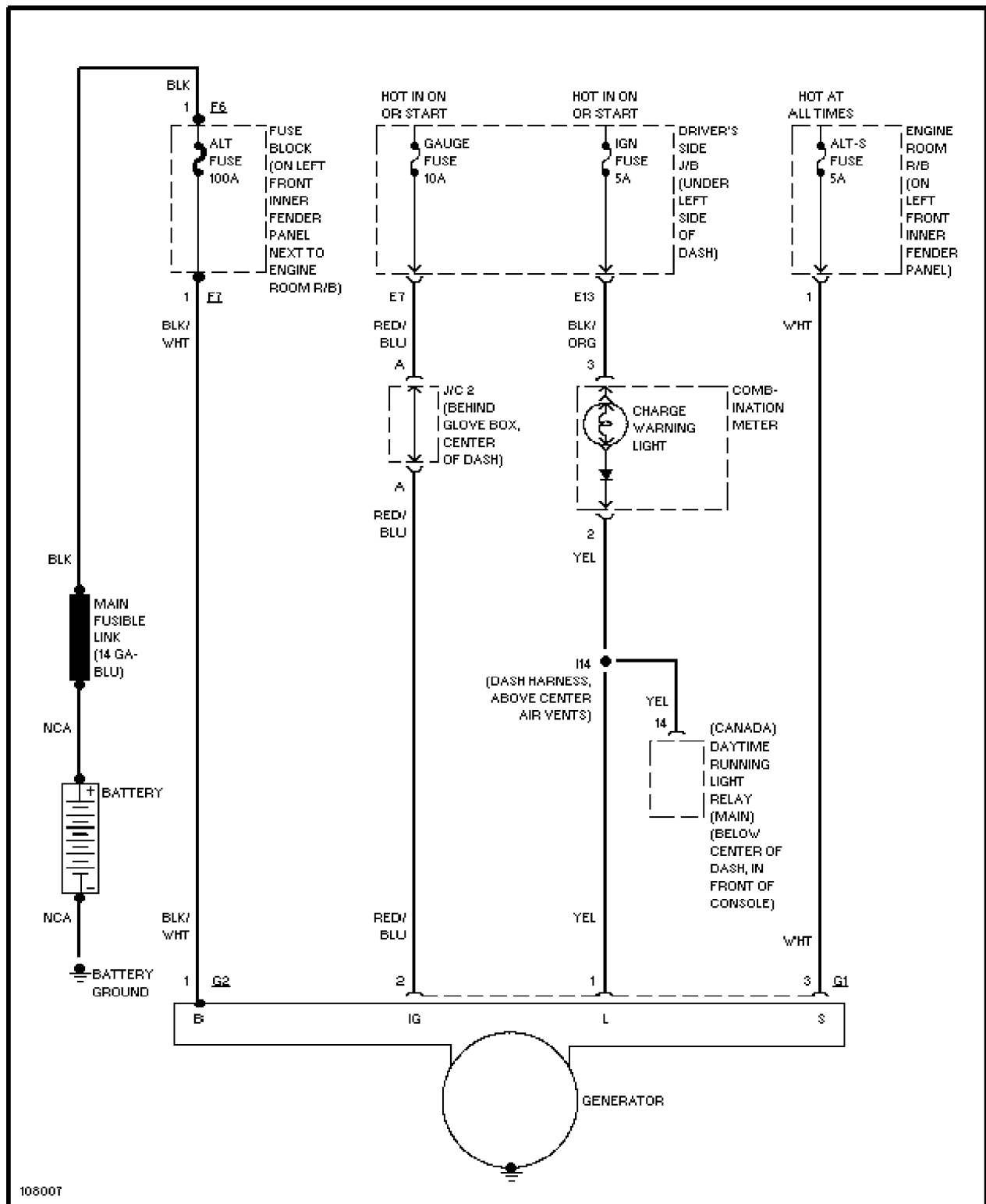


Fig. 16: Charging System Wiring Diagram (Tercel)

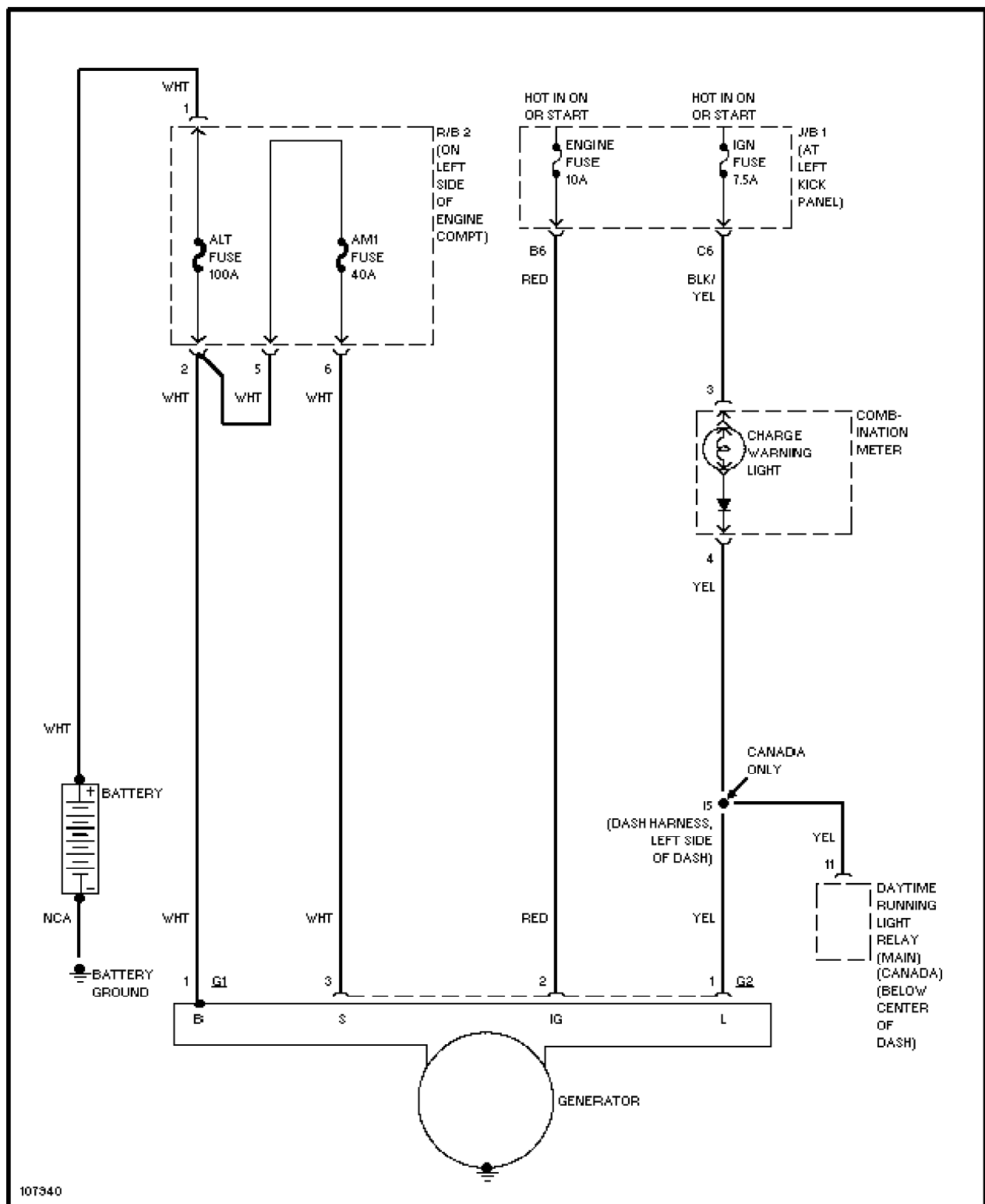


Fig. 17: Charging System Wiring Diagram (T100)

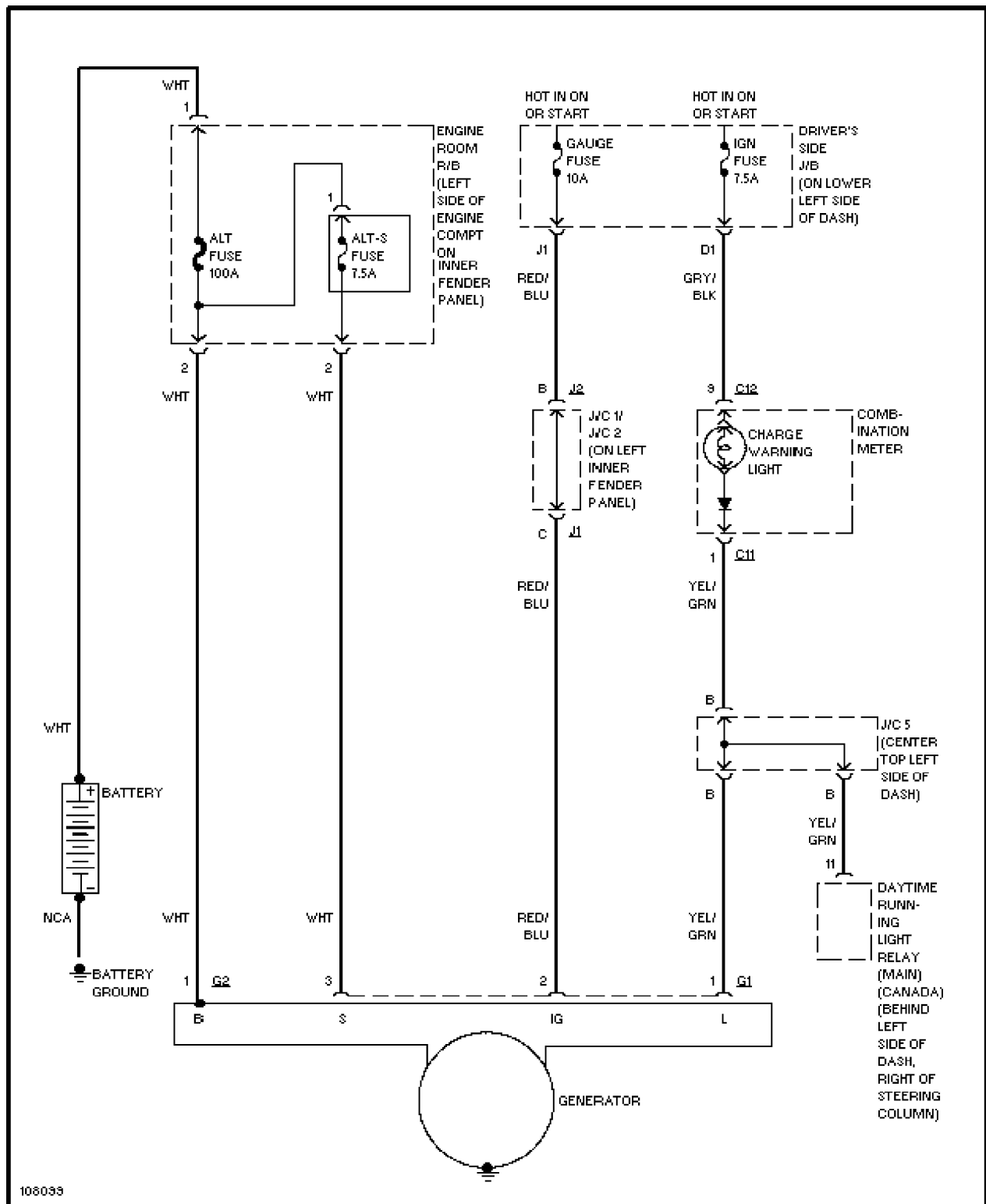


Fig. 18: Charging System Wiring Diagram (4Runner)