Group 8
ELECTRICAL AND INSTRUMENTS

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STARTING MOTORS

Car Model Usage	All Models
Starter Model	MDT-6002-1770712
Starter Model	MDT-6002-177-712
Voltage	12
No. of Fields	4
No. of Poles	4
Brushes	4
Spring Tension	32 to 48 ounces
Drive	Solenoid Shift Overrunning Clutch
End Play	.005″ Minimum
Free-Running Test	
Voltage	11
Amperage Draw	80 Amps. Maximum
Minimum Speed rpm	3800 Minimum
Stall Torque Test	
Torque Foot-Pounds	8.5
Voltage	4
Amperage Draw	350
Pinion to Housing Clearance	.070″ to .120″ Between Pinion Stop (with Armature End Play Removed)
Solenoid Switch	
Pull-in Coil	28.6 to 32.9 Amps. at 6 Volts
Hold-in Coil	10.2 to 11.8 Amps. at 6 Volts

GENERATORS

ALL MODELS

Generator Model	(Auto-Lite No.)	(Chrysler No.)
Standard	GJM-8201A	(2095074)
Low Cut-in	GHM-8001B	(1842784)
Single Air Conditioning	GJM-8202A	(2095075)
Dual Air Conditioning	GHM-8002A	(1842780)
Air Conditioning — Heavy Duty	GGA-6003F	(1842606)
W/O Air Conditioning Heavy Duty	GGA-6003	(1842603)

Generator Model	Auto-Lite No.	Chrysler No.	Auto-Lite No.	Chrysler No.	Auto-Lite No.	Chrysler No.
	GHM-8001B	1842784	GJM-8201A	2095074	GGA-6003F	1842606
	GHM-8002A	1842780	GJM-8202A	2095075	GGA-6003	1842603
Voltage	12		12		12	
Rated Out-Put	30 Amperes		35 Amperes		40 Amperes	
Ground Polarity	Negative		Negative		Negative	
Poles	2		2		2	
Brushes	2		2		2	

GENERATORS Continued

Brush Spring Tension	34 to 41 ounces	34 to 41 ounces	34 to 41 ounces
End Play	.003 to .010 inches	.003 to .010 inches	.003 to .010 inches
Field Coil Draw (Arm to Field Terminal)	1.2 to 1.3 Amps at 10 volts	1.6 to 1.7 Amps at 10 volts	1.2 to 1.3 Amps at 10 volts
Metering Draw	3.3 to 3.8 Amps at 10 Volts	3.8 to 4.3 Amps at 10 Volts	2.9 to 3.4 Amps at 10 Volts
Output Test (Generator RPM) (at 70° F.)			
Partial	10 Amps, 13.5 Volts at 1040 Max. RPM	10 Amps, 13.4 Volts at 1480 Max. RPM	10 Amps, 13.4 Volts at 1020 Max. RPM
Maximum	30 Amps, 15 Volts at 1800 Max. RPM	35 Amps, 15 Volts at 2400 Max. RPM	40 Amps, 15 Volts at 1800 Max. RPM

REGULATOR
ALL MODELS

Regulator Model	Auto-Lite VBO-4202BC Chrysler No. 1889944 (For 35 Amp. Gen.)	Auto-Lite VBO-4202CC Chrysler No. 2095341 (For 30 Amp. Gen.)	Auto-Lite VBO-4202AC Chrysler No. 2095200 (For 40 Amp. Gen.)
Volts	12	12	12
Ground Polarity	Negative	Negative	Negative

Resistors

Marked 60		55.0 to 70.0 ohms
Marked 38	34.5 to 45 ohms	34.5 to 42.0 ohms
Marked 30		28.0 to 34.5 ohms

Voltage Regulator

Voltage Winding Resistance	44.0 to 49.0 ohms
Armature Air Gap	.048 to .052 inch

Contacts closed with high limit gauge installed.
Contacts open with low limit gauge installed.
Gauge on contact side and next to brass stop pin.

Voltage Setting (Operating Voltage)
After 15 minutes run at 7 Amperes

Temperature in Degrees F.	50°	60°	70°	80°	90°	100°	110°	120°
Maximum Setting	15.04	14.97	14.90	14.83	14.76	14.69	14.01	14.54
Minimum Setting	14.42	14.36	14.30	14.23	14.16	14.09	14.62	13.94

Current Limiting Regulator

Armature Air Gap	.048 to .052 inch

Contacts closed with high limit gauge installed.
Contacts open with low limit gauge installed.
Gauge on contact side and next to brass stop pin.

REGULATORS Continued

Current Setting (After Voltage Regulator Setting)

Operating Amperage after 15 minutes at 7 amperes. Then followed with a 15 minute run at rated current regulator setting (below 13.5 volts).

	Temperature (F.)	50°	60°	70°	80°	90°	100°
Model VBO-4202CC (2095341) 30 Amp.	Maximum Setting	35	33	32	31	30	29
	Minimum Setting	31	29	28	27	26	25
Model VBO-4202BC (1889944) 35 Amp.	Maximum Setting	39	38	37	36	35	34
	Minimum Setting	35	34	33	32	31	30
Model VBO-4202AC (2095200) 40 Amp.	Maximum Setting	46	45	44	43	42	41
	Minimum Setting	42	41	40	39	38	37

Cut-Out Relay:

Voltage Winding Resistance	107 to 121 ohms
Air Gap (contacts open) (Measure gap as near to hinge as possible.)	.031 to .034 inch
Point Gap (Minimum)	.015 inch
Closing Voltage	12.6 to 13.6 Volts
Discharge Amperes	Must be below 6 amperes

DISTRIBUTOR

Auto-Lite Model	1BP-4005C	1BP-4005D	1BP-4006C
Chrysler No.	1889562	2095054	1889564
Centrifugal Advance	0° @ 250 to 450	0° @ 275 to 425	0° @ 310 to 490
(Degrees and rpm)	0 to 2° @ 450 3.5 to 5.5° @ 800 7 to 9° @ 2200	0 to 4.3° @ 425 3.3 to 5.3° @ 540 10 to 12° @ 2150	0 to 2° @ 490 3.5 to 5.5° @ 800 8.5 to 10.5° @ 2300
Vacuum Advance	0° @ 7.4 to 9″	0° @ 7.4 to 9″	0° @ 7.4 to 9″
(Degrees of Inches of Vacuum)	4.5 to 7.8° @ 12″ 8.3 to 11° @ 15″	4.5 to 7.8° @ 12″ 8.3 to 11° @ 15″	4.5 to 7.8° @ 12″ 8.3 to 11° @ 15″
Contact Gap	.014 to .019″	.014 to .019″	.014 to .019″
Dwell Angle	27 to 32°	27 to 32°	27 to 32°
Condenser Capacity	.25 to .285 mfd.	.25 to .285 mfd.	.25 to .285 mfd.
Arm Tension (Spring)	17 to 21.5 oz.	17 to 21.5 oz.	17 to 21.5 oz.
Rotation	Counter-clockwise	Counter-clockwise	Counter-clockwise
Timing	10° BTC	10° BTC	10° BTC

DISTRIBUTOR Continued

Auto-Lite Model	1BS-4006E	1BS-4011
Chrysler No.	2095065	1889568
Centrifugal Advance	0° @ 325 to 475	0° @ 325 to 475
(Degrees and rpm)	0 to 4.3° @ 475 4.5 to 6.5° @ 640 9 to 11° @ 2400	0 to 4.3° @ 475 4.5 to 6.5° @ 640 9 to 11° @ 2400
Vacuum Advance	0° @ 7.2 to 8.9″	0° @ 7.2 to 8.9″
(Degrees of Inches of Vacuum)	4.5 to 7.5° @ 12″ 7.5 to 10.5° @ 14.5″	4.5 to 7.5° @ 12″ 7.5 to 10.5° @ 14.5″
Contact Gap	.014 to .019″	.014 to .019″
Dwell Angle	One set points — 27 to 32° Both sets points — 34 to 40°	One set points — 27 to 32° Both sets points — 34 to 40°
Condenser Capacity	.25 to .285 mfd.	.25 to .285 mfd.
Arm Tension (Spring)	17 to 21.5 oz.	17 to 21.5 oz.
Rotation	Counter-clockwise	Counter-clockwise
Timing	7.5° BTC	5° BTC

CIRCUIT BREAKERS

Circuit	Type	Rated Capacity	Location
Lighting System	Circuit Breaker	22½ AMP	Integral with Headlight Switch
Windshield Wiper			
Constant Speed	Circuit Breaker	6 AMP	Back of Wiper Switch
Variable Speed	Circuit Breaker	5 AMP	Back of Wiper Switch
Window Lifts	Circuit Breaker	20 AMP — (30 AMP Spl. 4 Dr.)	Behind Left Front Kick Panel
Six Way Seat	Circuit Breaker	40 AMP	Behind Left Front Kick Panel

FUSES

Auto Pilot	10 amp.
Radio Fuse	7½ amp.
Clock Fuse	1 amp.
Glove Comp., Trunk Comp., Map and Dome Light Fuse	6 amp.
Cigar Lighter Fuse	14 amp.
Back Up Lights Fuse	6 amp.
Rear Window Defroster Fuse	6 amp.
Air Cond. or Heater Fuse	20 amp.
Mirror-Matic	2 amp.

NOTE: The Fuses listed are in fuse block located behind instrument panel to left of radio.

LIGHT BULB CHART

DE SOTO MODELS

Location	Candle Power	Lamp No.
Dual Headlights (Sealed-Beam)		
Single Filament Lights	37½ (Watts)	4001
Dual Filament Lights	50-37½ (Watts)	4002
Stop and Turn Signal Lights	32-4	1034
Tail Lights	4	67
Parking and Turn Signal Lights	32-4	
Map Light	15	1004
Back-Up Lights	32	1073
Dome Light	15	1004
Luggage Compartment Light (When So Equipped)	15	1003
Rear License Plate Light	4	67
Headlight High Beam Indicator Light	2	57
Clock (When So Equipped)	2.85	1816
Radio (When So Equipped)	2	44
Trans. Selector Control Lights	2.85	1816
Parking Brake Warning Light (When So Equipped)	6	90
Instrument Lights	2	57
Turn Signal Indicator Lights	2	57
Ash Tray Light (front) (When So Equipped)	2	57
Speedometer Light	2	57
Auto-Pilot (When So Equipped)	2.85	1816
Heater	2.85	1816

LIGHT BULB CHART

CHRYSLER AND IMPERIAL

Location	Candle Power	Lamp No.
Dual Headlights (Sealed-Beam) Single Filament Lights	37½ (Watts)	4001
Dual Filament Lights	50-37½ (Watts)	4002
Stop and Turn Signal Lights	32-4	1034
Tail Lights	4	67
Parking and Turn Signal Lights	32-4	1034
Map Light	15	1004
Back-Up Lights	32	1073
Dome Light	15	1004
Luggage Compartment Light	15	1003
Rear License Plate Light	4	67
Headlight High Beam Indicator Light	2	57
Trans. Selector Control Lights	2.85	1816
Parking Brake Warning Light	6	90
Turn Signal Indicator Lights	2	57
Speedometer Light	2	57
Auto-Pilot Light	2.85	1816

BATTERY SERVICE DIAGNOSIS

1. BATTERY IS RUN DOWN

- **a.** Low voltage regulator setting.
- **b.** Circuit breaker points stuck.
- **c.** Short in the charging circuit.
- **d.** Battery terminals corroded.
- **e.** Faulty stop light switch.

2. BATTERY WILL NOT RETAIN WATER

- **a.** Voltage regulator setting too high.
- **b.** Battery case cracked.
- **c.** Sealing compound defective.

3. BATTERY WILL NOT TAKE A CHARGE

- **a.** Low electrolyte level.
- **b.** Internal short.
- **c.** Battery worn out.
- **d.** Battery plates sulphated.

Group 8

ELECTRICAL AND INSTRUMENTS

SERVICE PROCEDURES

4. BATTERY VISUAL INSPECTION

a. Inspect the battery carrier for damage caused by the loss of acid from the battery. If corrosion exists, it will be necessary to remove the battery hold-down clamp and battery and clean the corroded areas with clean warm water and baking soda. Scrub areas with a stiff bristle brush to loosen the corrosion. Flush off the loose particles of corrosion with clean water. Dry and paint corroded steel parts.

b. The battery posts and terminals should be cleaned with a terminal cleaning tool, as shown in Figures 1 and 2 and the complete battery should be washed with warm water and baking soda and wiped clean with a damp cloth.

CAUTION

Care should be taken to keep the cleaning solution out of the battery cells to eliminate weakening the electrolyte.

c. After cleaning, install battery, connect cable clamps to the battery posts and tighten securely. Coat the battery posts and connections with a light grease or petroleum to retard corrosion. Tighten the battery hold down screw nuts to 3 foot pounds torque.

d. Examine the battery for cracks in the case or raised cells.

5. SPECIFIC GRAVITY TEST

A hydrometer is used to measure the specific gravity of the electrolyte in a battery cell.

The liquid level of the battery cell should be at normal height (bottom of vent plug hole) and the electrolyte should be thoroughly mixed with any battery water which may have just been added by charging the battery before taking any hydrometer readings.

Hydrometer floats are calibrated to indicate correctly only at one fixed temperature.

Draw electrolyte in and out of the hydrometer barrel several times to bring the temperature of the hydrometer float to that of the acid in the cell and then measure the electrolyte temperature in the cell.

The temperature correction amounts to .004 specific gravity points for each 10 degrees Fahrenheit change in temperature.

A fully charged battery has a specific reading of 1.255 to 1.275.

A battery that has a specific gravity reading of 1.210 or less and all cells reading evenly within 15 specific gravity points (.015) of each other, requires recharging.

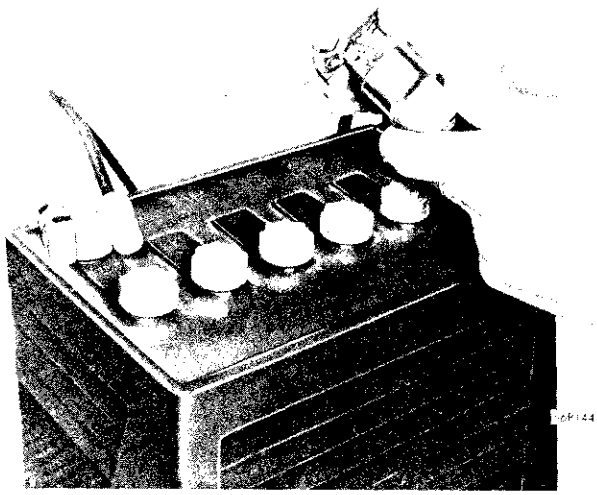

Fig. 1—Cleaning the Inside of the Cable Clamp

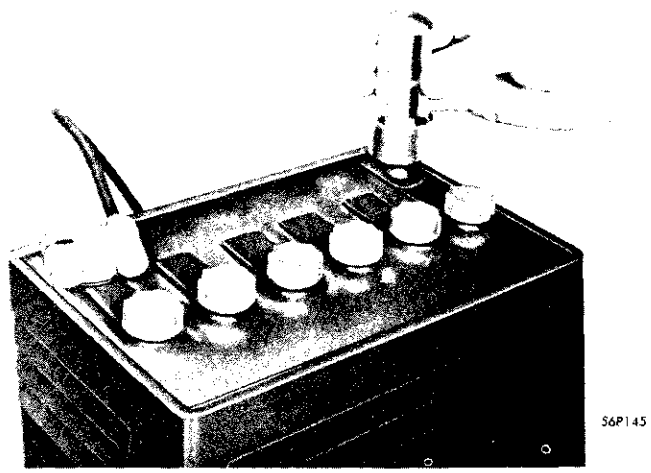

Fig. 2—Cleaning the Outside of the Battery Post

A battery that has a specific gravity reading which varies more than 15 points between any two cells should be recharged and a high rate discharge tester or other suitable method used to check the battery before discarding battery as unsuitable for use.

6. VOLTAGE TESTS

NOTE: Freshly charged batteries have a "surface charge" which causes high and inaccurate readings unless properly dissipated. If battery is in the vehicle, turn the headlights on for one to three minutes to remove the surface charge. Turn lights off and wait several minutes before taking another reading.

To make a battery test, make contact of the meter prods (Tool MT-379) to the proper cell terminals (red to positive, black to negative), using caution not to connect across more than one cell. The point of prod will have to be pushed through sealing compound to make contact with the buried link for each cell reading.

The individual cell readings should not vary more than 0.15 volt between any two cells. A battery varying more than 0.15 volt between any two cells should be recharged and a high rate discharge tester used to test the battery before discarding the battery as unsuitable for use.

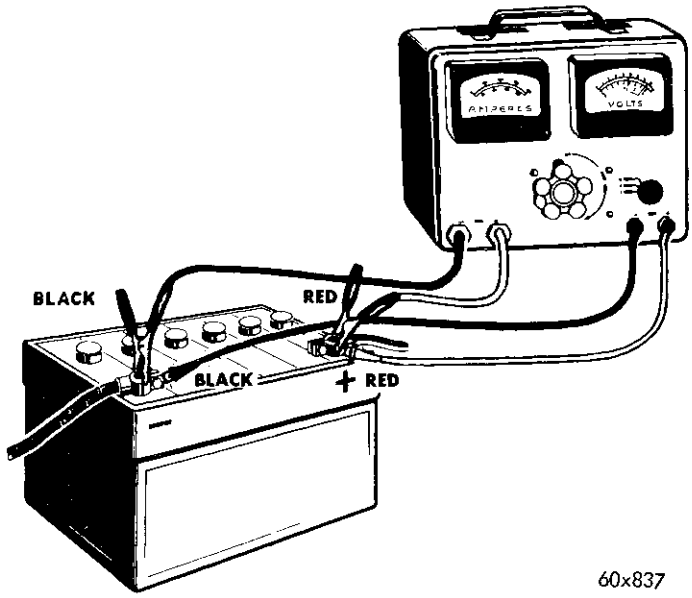

Fig. 3—High Rate Discharge Test

7. HIGH RATE DISCHARGE TEST OF BATTERY CAPACITY

Satisfactory capacity tests can be made only when the battery equals or exceeds 1.210 specific gravity at 80 degrees Fahrenheit. If the reading is below 1.210, the battery should be slow charged until fully charged in order to secure the proper test results.

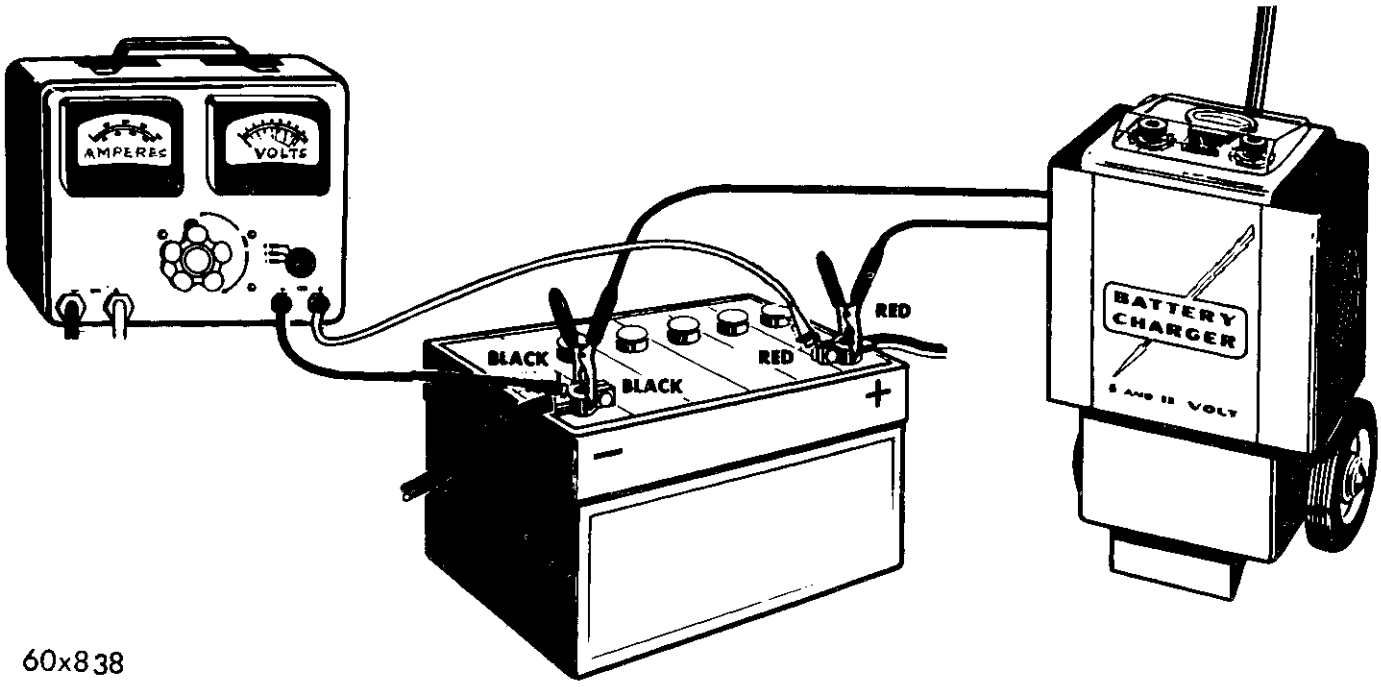

Fig. 4—Three Minute Charge Test

Test Procedure

(1) Turn the control knob of the battery starter tester to the "OFF" position.

(2) Turn the voltmeter selector switch to the 16 volt position.

(3) Connect the test ammeter and voltmeter positive leads to the battery negative terminal and the ammeter and voltmeter negative leads to the battery positive terminal (Fig. 3).

NOTE: The voltmeter clips must contact the battery posts or the cable clamps and not the ammeter clips.

(4) Turn the control knob clockwise until the ammeter reading is equal to three times the ampere hour rating of the battery (180 amperes for a 60 ampere hour battery).

(5) Maintain load for 15 seconds, the voltmeter should read 9.5 volts or more, which will indicate that the battery has good output capacity.

(6) Turn the control knob to the "OFF" position.

8. CHARGING THE BATTERY

If voltage in "High Rate Discharge Tests" in Paragraph 7 was under 9.5 volt, the battery should be test charged to determine whether the battery can be satisfactorily charged.

a. Three Minute Test Charge (Fig. 4)

(1) Connect the (positive +) charger lead to the battery positive terminal and the (negative —) charger lead to battery negative terminal.

(2) Trip the power switch to the "ON" position. Turn the charger timer switch past "three minutes" and then back to "three minutes".

(3) Adjust the charge switch to the highest possible rate, not exceeding 40 amperes.

(4) When the fast charge cuts off at end of 3 minutes, turn back to fast charge.

(5) Use the 4 volt scale of battery starter tester voltmeter and quickly measure the voltage across each cell while battery is being fast charged. A defective cell or cells will be detected by a cell voltage variation of more than .1 volt.

(6) If cell voltages are even within .1 volt, use 16 volt scale of battery starter tester and measure the total voltage of the battery posts while the battery is being fast charged. If the total voltage under charge exceeds 15.5 volts, the battery is sulphated and should be cycled and slow charged until the specific gravity reaches 1.260. (See "Slow Charging", Paragraph 8(c)).

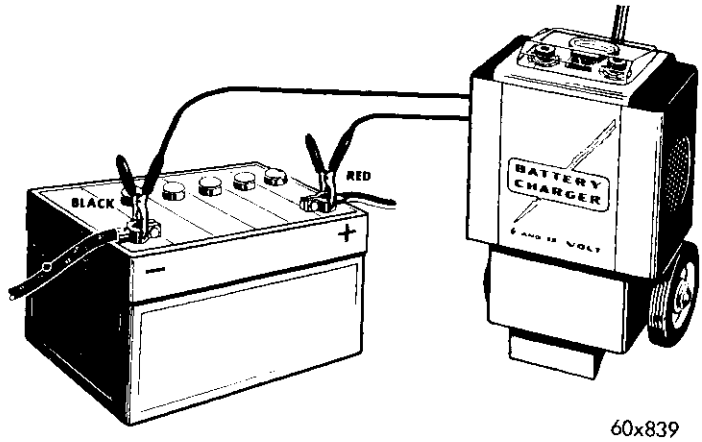

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Fig. 5—Fast Charging the Battery

If the specific gravity remains constant after testing the battery at one hour intervals for three hours, the battery is at its highest state of charge.

(7) Make another capacity test. If the capacity test does not meet the specifications, replace the battery.

A slow charge is preferable to bring the battery up to a full charge.

Safe slow charging rates are determined by allowing one ampere per positive plate per cell, the proper slow charging rate would be 5 amperes for a 60 ampere hour battery.

b. Fast Charging the Battery (Fig. 5)

If adequate time for a slow charge is not available, a high rate (FAST) charge is permissible and will give a sufficient charge in one hour enabling the battery to continue to give service proportionate to its condition and state of charge.

Connect the (positive +) charger lead to the battery positive terminal and the (negative —) charger lead to the battery negative terminal.

CAUTION

The battery can be damaged beyond repair unless the following precautions are taken:

(1) The battery electrolyte temperature must **NEVER** exceed 125 degrees Fahrenheit.

If this temperature is reached, the battery should be cooled by reducing the charging rate or remove the battery from the circuit.

NOTE: The manufacturers of high rate charging equipment generally outline the precautions and some models have thermostatic temperature limiting and time limiting controls.

(2) As the batteries approach full charge the electrolyte in each cell will begin to gas or bubble. Excessive gassing must not be allowed.

(3) Do not fast charge longer than one hour.

The battery is fully-charged when three successive hourly hydrometer readings show no rise in specific gravity. Remember to use the temperature correction when checking specific gravity.

If the battery does not show a significant change in specific gravity after one hour of "FAST" charge, the slow charge method should be tried.

WARNING

When batteries are being charged an explosive gas mixture forms beneath the cover of each cell. Do not smoke near batteries on charge or which have recently been charged. Do not break live circuits at the terminals of the batteries on charge. A spark will occur where the live circuit is broken. Keep all open flames away from the battery.

c. Slow Charging Batteries to Remove Sulphation

To condition a battery that is sulphated, charge the battery for a minimum of 24 hours at a maximum charging rate of (4) amperes. As the battery approaches full charge, check specific gravity at hourly intervals. With no rise in specific gravity for three successive readings, the battery is charged to its peak capacity.

STARTING MOTOR

SERVICE DIAGNOSIS

9. STARTER FAILS TO OPERATE

a. Weak battery or dead cell in battery.

b. Ignition switch defective.

c. Loose or corroded battery cable terminals.

d. Open circuit, wire between ignition — starter switch and ignition terminal on starter relay.

e. Faulty drive unit.

f. Faulty solenoid or solenoid switch relay.

g. Faulty starting motor.

h. Armature shaft sheared.

10. STARTER FAILS AND LIGHTS DIM

a. Weak battery or dead cell in battery.

b. Loose or corroded battery cable terminals.

c. Internal ground in windings.

d. Grounded starter fields.

e. Armature rubbing on pole shoes.

11. STARTER TURNS, BUT PINION DOES NOT ENGAGE

a. Starter clutch slipping.

b. Adjust pinion clearance.

c. Broken teeth on flywheel drive gear.

d. Armature shaft rusted, dirty or dry, due to lack of lubrication.

12. STARTER RELAY DOES NOT CLOSE

a. Battery is discharged.

b. Check open circuit wire between the starter relay ground terminal post and the neutral starter switch (automatic transmissions only).

c. Check open circuit wire between the ignition-starter switch and ignition terminal and the starter relay.

d. Neutral starter switch on (automatic) transmission faulty.

e. Check the starter relay.

f. Check the ignition-starter switch.

13. RELAY OPERATES BUT SOLENOID DOES NOT

a. Open circuit wire between the starter-relay solenoid terminal and the solenoid terminal and the solenoid actuating terminal post.

b. Solenoid switch contacts corroded.

c. Loose terminal connections on terminal buss bar between the solenoid and the starter field.

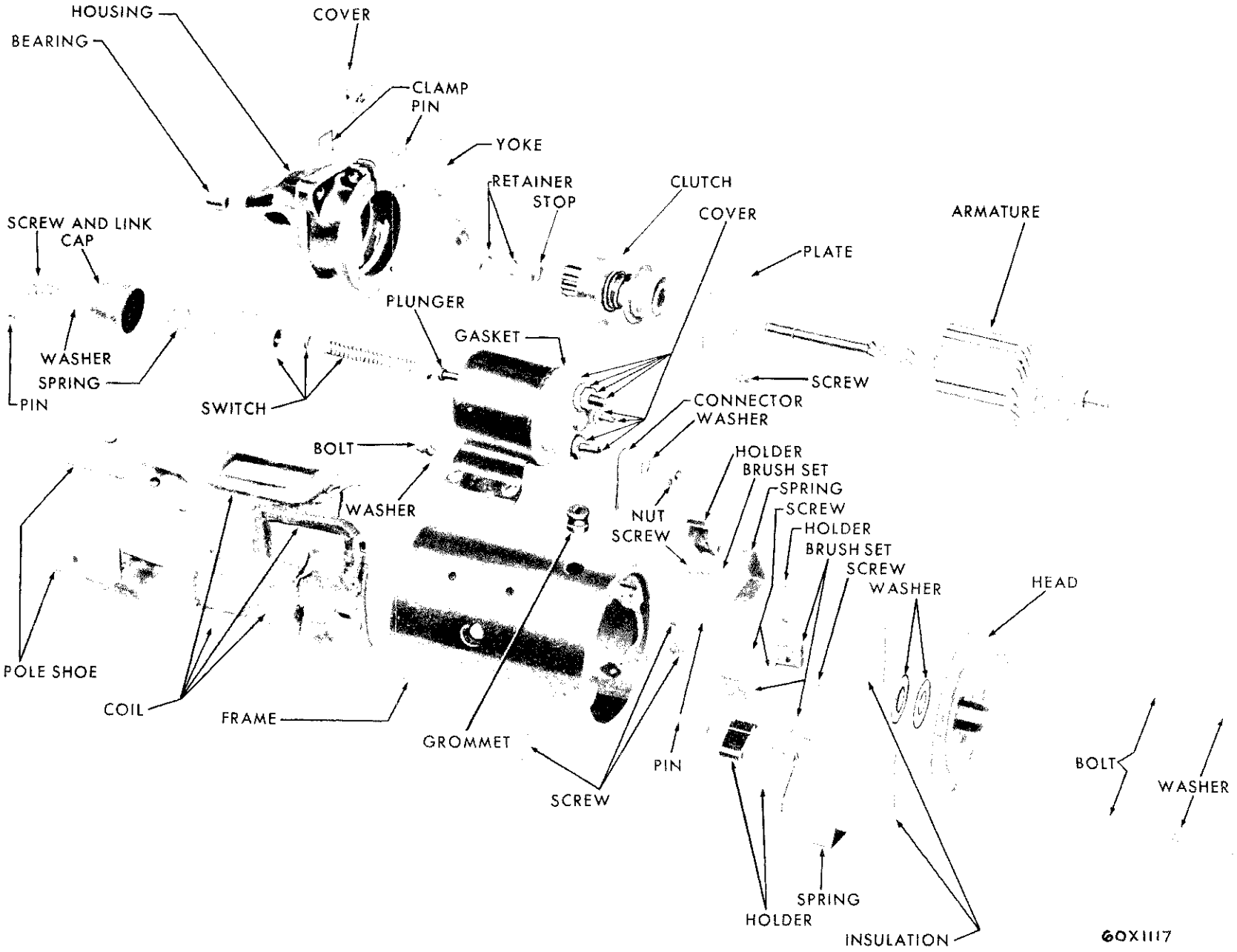


Fig. 6—Starter Motor (Exploded View)

d. Broken lead or loose soldered connection inside the solenoid switch cover. (Replace the solenoid.)

14. SOLENOID PLUNGER VIBRATES BACK AND FORTH WHEN SWITCH IS ENGAGED

a. Battery is low.

b. Check for loose connections at the relay, ignition-starter switch and solenoid.

c. Lead or connections broken inside the solenoid switch cover or open hold-in winding. (Replace the solenoid.)

d. Solenoid is defective.

e. Check condition of moisture on the solenoid contacts (Cold Weather Conditions).

15. STARTER OPERATES BUT WILL NOT DISENGAGE WHEN IGNITION-STARTER IS RELEASED

a. Broken solenoid plunger spring or spring out of position.

b. Faulty ignition-starter switch.

c. Faulty solenoid.

d. Pinion clearance improperly adjusted.

e. Solenoid plunger stuck in the solenoid.

f. Insufficient clearance between the winding leads and the main contractor in solenoid.

g. Defective relay.

STARTERS

The starter motor (Fig. 6) is a 12 volt four pole assembly. The starter drive is an overrunning clutch type with a solenoid shift type switch mounted on the starter motor.

The brush holders are riveted to the starter motor frame and are not serviced separately. Brush replacement can be made by removing the bearing end head.

16. TESTING STARTER CURRENT RESISTANCE AND CURRENT DRAW

Test the battery. If it tests 1.210 specific gravity or less, engine at normal operating temperature, charge the battery. Test the circuit resistance and the starter current draw as follows:

(1) Disconnect the battery lead from the battery terminal post.

(2) Connect a 0 to 300 scale ammeter between the disconnected lead and the battery terminal post.

(3) Connect a test voltmeter with .10 volt scale divisions between the battery positive post and the starter switch terminal at the starter.

(4) Crank the engine and observe the readings on the voltmeter and the ammeter. The voltage should not exceed .12 volt per 100 amperes of current. The current should not exceed 150 to 250 amperes. A reading of voltage that exceeds .12 volt per 100 amperes indicates there is a high resistance caused from loose circuit connections, defective cable, burned switch contacts or, in some instances, a short in the starter which causes a voltage leak. A current that is high and is combined with slow cranking speed, indicates that the starter should be removed and repaired.

17. REMOVAL OF STARTING MOTOR

(1) Disconnect the cable at the battery.

(2) Remove the starter cable at the starter.

(3) Disconnect the solenoid lead wire from the solenoid.

(4) Remove the bolts attaching the starter to the flywheel housing and remove the starting motor from beneath the engine.

18. TESTING THE STARTER MOTOR (BENCH TEST)

a. Free Running Test

Place the starter in a vise and connect a fully-charged, 12 volt battery to the starter as follows:

Connect a test ammeter (100 amperes scale) and a carbon pile rheostat in series with the battery positive post and the starter terminal. Connect a voltmeter (15 volt scale) across the starter. Rotate the carbon pile to the full-resistance position. Connect the battery cable from the battery negative post to the starter frame. Adjust the rheostat until the battery voltage shown on the voltmeter reads 11 volts. The current draw should be 80 amperes maximum at 3800 minimum rpm.

b. Stall Test

Install the starter motor in the test bench. Follow instructions of test equipment manufacturer and check stall torque of the starter against the following specifications. With applied battery voltage adjusted to 4 volts, stall torque should be 8.5 foot pounds minimum, with a current draw of 350 amperes.

19. DISASSEMBLING THE STARTER

(1) Refer to Figure 6, remove the solenoid link cotter pin, clevis pin, attaching screws and remove the solenoid.

(2) Remove the through bolts and tap the commutator end head from the field frame.

(3) Lift the brush holder arms to raise the brushes from the commutator. Hold the brushes up by placing "U" shaped clips to the outside of the frame.

(4) Tap the drive end housing free from the dowel pin and remove the drive end housing and armature as an assembly from the field frame.

(5) Remove the shield plate attaching screws and remove the pinion housing from the armature and drive assembly.

(6) To remove the drive from armature, slide the pinion gear toward the commutator end of the armature, drive the stop collar toward the pinion and remove the lock ring and slide the starter drive from the armature.

(7) Slide the shifting fork from the starter drive.

(8) Disconnect the brush leads and remove the brush arms, brushes and springs.

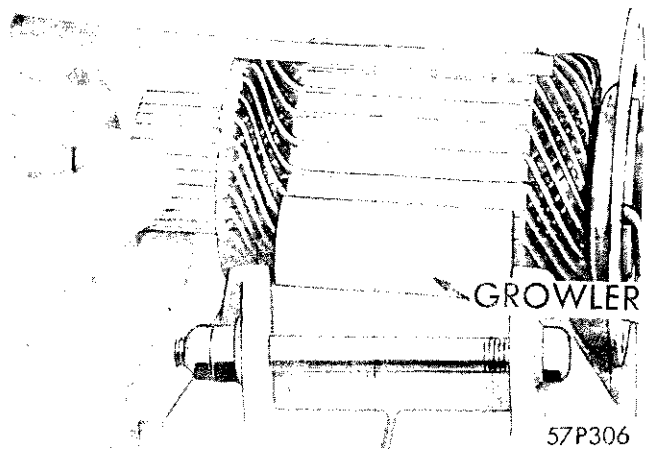


Fig. 7—Testing Armature for Short

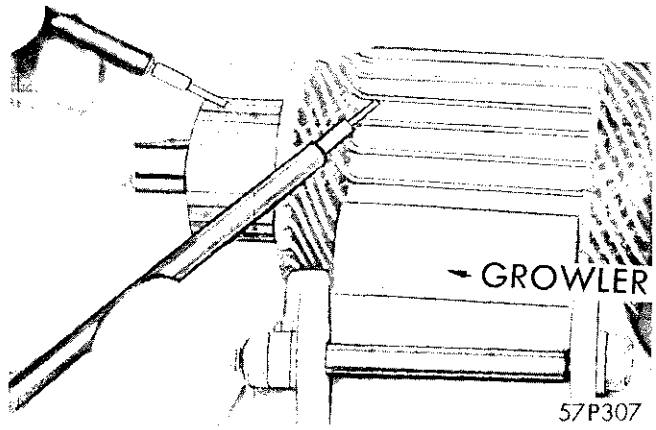


Fig. 8—Testing Armature for Ground

(9) If necessary to replace the field coils, disconnect the field coil to the brush leads. Remove the terminal post nut and washers. Remove the pole shoe screws with a special pole shoe impact screwdriver, Tool C-3475.

20. CLEANING THE STARTER PARTS

Do not immerse parts in cleaning solvent. Immersing the field frame and coil assembly and/or armature will damage insulation. Wipe these parts with clean cloth only.

Do not immerse the drive unit in cleaning solvent. The drive clutch is pre-lubricated at factory and the solvent will wash the lubrication from the clutch. The drive unit may be cleaned with a brush moistened with cleaning solvent and wiped dry with a cloth.

21. REPLACING BRUSHES AND SPRINGS

Brushes that are worn more than ½ the length of a new brush, or are oil-soaked, should be replaced. The starter must be disassembled to install brushes and springs.

22. TESTING THE ARMATURE

a. Testing the Armature for Short Circuit

Place the armature in a growler (Fig. 7) and hold a thin steel blade parallel to the core and just above it, while slowly rotating the armature in the growler. A shorted armature will cause the blade to vibrate and be attracted to the core. Replace a shorted armature.

b. Testing Armature for Ground

Touch the armature shaft and the end of a commutator bar with a pair of test lamp prods (Fig. 8). If the lamp lights, it indicates a grounded armature. Replace a grounded armature.

c. Testing Commutator Runout, Refacing and Undercutting

Place the armature in a pair of "V" blocks and check the runout with a dial indicator. Check both the shaft and commutator. A bent shaft requires replacement of armature. When the commutator runout exceeds .003 inch, the commutator can be refaced with Tool C-770. Remove only sufficient metal to provide a smooth, even surface. After the commutator is refaced, undercut insulation between bars to a depth of 1/32 inch with Tool C-770. Undercut the insulation square and full width of groove, and polish the commutator with 00 sandpaper to remove the burrs.

23. TESTING THE FIELD COILS FOR GROUND

Disconnect the ground lead from the shunt field coil at the terminal screw. Touch each of the brush holders with a test lamp prod, while holding the other test prod against the starter frame. Two of the brush holders that are 180 degrees apart should cause the test lamp to light, as they are intentionally grounded. The other two brush holders should not cause lamp to light when tested, as they are insulated. If these insulated brush holders cause the lamp to light when tested, it indicates that the brush holders or the field coil are grounded. **Be sure the brush leads are not touching the field frame.**

If the field coils are grounded, inspect the terminal insulation. If the insulation is in good condition, test each coil separately after unsoldering the connection wire. Replace the grounded field coils. Test the shunt field coil for continuity and for any ground, then reconnect the ground lead. Replace the frame and brush holder assembly if holders are grounded.

24. REPLACING THE FIELD COILS

A pole shoe impact screwdriver, Tool C-3475, should be used to remove and install the field coils to prevent damage to the pole shoe screws and for proper tightening. Pole shoes that are loose may cause armature core to rub the pole shoes. This will decrease starter efficiency and damage the armature core.

25. SERVICING THE BUSHINGS

Inspect the armature shaft bearing surfaces and bushings for wear by placing core in vise equipped with soft jaws. Do not squeeze tightly. Try the commutator end frame, the drive end frame, and the armature support bushings for wear by placing them on shafts and checking them for side play.

Replace the commutator end frame and bushing assembly if the bushing is worn. Also, replace the drive end bushing if it is worn. The bushing should be well soaked in SAE 10W Engine Oil before it is installed.

26. SERVICING THE DRIVE UNIT

Place the drive unit on the shaft and, while holding the armature, rotate the pinion. The drive pinion should rotate smoothly in one direction (not necessarily easily), but should not rotate in the opposite direction. If the drive unit does not function properly or if the pinion is worn or burred, replace the drive unit.

27. ASSEMBLING THE STARTER

(1) Refer to Figure 6 and lubricate the armature shaft and splines with SAE 10W oil or 30W rust preventive oil.

(2) Install the stop collar (retainer) lock ring and the spacer washer.

(3) Install the shifter fork into the collar of the starter drive and position the drive end housing on the armature shaft, indexing shifting fork with a slot in the drive end housing.

(4) Install the dust shield to the drive end housing attaching screws. Install the shifter fork to the drive end frame retaining pin.

(5) Install the armature and the drive end assembly, sliding the assembly into the field frame until the end of the commutator touches the brushes. While holding the armature against the brushes with a slight pressure, push the brushes up and allow them to rest on the edge of the commutator. When all of the brushes are seated on the commutator, slide the armature into position. Make sure the end frame is positioned on the field frame dowel pins.

(6) Install the two thrust washers on the commutator end of shaft and install the commutator end head.

NOTE: Make sure that the slots in the drive head dust plate and the holes in the commutator end head line up and that the end head lines up with the indexing pins in the field frame before tightening the through bolts.

(7) Install the through bolts and tighten them securely.

(8) Install the shifter fork boot and the retainer.

(9) Install the solenoid.

(10) Connect the solenoid link with the shifter fork. Install the clevis pin but do not install the cotter pin until the solenoid plunger travel and pinion clearance have been established.

28. ADJUSTING THE STARTER DRIVE GEAR (PINION) CLEARANCE

(1) Place the starter assembly in a vise equipped with soft jaws and tighten the vise sufficiently to hold the starter.

(2) Push in on the solenoid plunger link (Fig. 9) (NOT THE FORK LEVER) until the plunger bottoms.

(3) Measure the clearance between the end of the pinion and the pin stop with the plunger seated and the pinion pushed toward the commutator end. The clearance should be 3/32 inch, plus 1/32 inch or minus 1/64 inch. Adjust for proper clearance by screwing the link in or out of plunger as required.

(4) Bend the cotter key and test the starter operation under a free-running test (Paragraph 18(a)).

29. INSTALLING THE STARTER

(1) Before installing the starter, be sure the starter and the flywheel mounting surfaces are free of dirt and oil. These surfaces must be clean to make a good electrical contact.

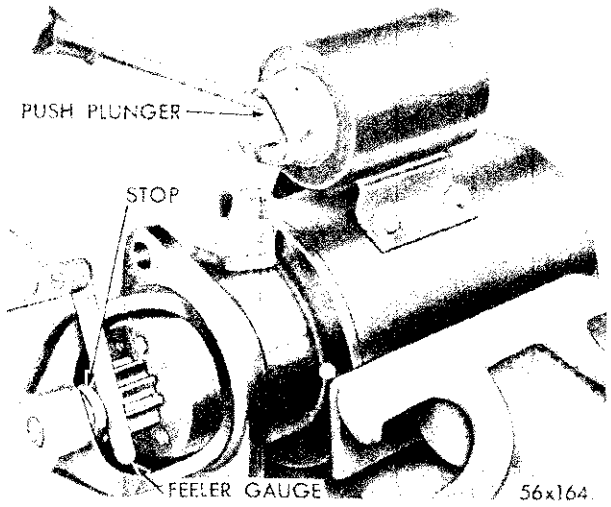


Fig. 9—Adjusting Starter Drive Pinion Clearance

(2) Install the starter from beneath the engine.

(3) Tighten the attaching bolts securely.

(4) Attach wires to the solenoid switch or the starter terminal.

(5) Install the battery cable and test the operation of the starter for proper engine cranking.

GENERATOR AND REGULATOR

SERVICE DIAGNOSIS

30. GENERATOR FAILS TO CHARGE

a. Generator belt loose.

b. Brushes sticking.

c. Open charging circuit.

d. Open circuit in field.

e. Ground in the armature wiring circuit.

f. Commutator dirty, burned or grounded.

g. Faulty soldered connections at the armature or the field terminal studs.

31. LOW UNSTEADY CHARGING RATE

a. Generator belt loose.

b. High resistance at the battery terminal posts.

c. Loose connections.

d. Poor ground between the engine and the body ground wire.

e. Resistance in the charging rate circuit.

f. Open armature windings.

g. High insulation between the commutator bars.

h. Commutator out-of-round.

32. EXCESSIVE CHARGING RATE

a. Generator regulator faulty.

b. Grounded field or a ground in the generator to the regulator wiring.

33. NOISY GENERATOR

a. Misaligned belt or pulley, or loose pulley.

b. Brushes seating improperly.

c. Worn bushing or bearing.

d. High insulation between commutator bars.

e. Field poles loose.

f. Armature shaft sprung.

34. ARCING GENERATOR BRUSHES

a. Brushes worn, loose, or have hard spots.

b. Commutator dirty, or high mica between commutator bars.

c. Excessive charging rate.

d. Armature shaft sprung.

35. REGULATOR POINTS OXIDIZED

a. Poor ground connections.

b. Improper air gap setting.

c. Shorted field in the generator.

d. High voltage setting.

36. BURNED CONTACTS

a. Regulator connected incorrectly.

b. Short between the battery terminal and the regulator field terminal.

37. CURRENT REGULATOR POINTS STUCK OR PITTED

a. Improper air gap setting.

b. Reversed generator polarity.

c. Contact point setting improper.

38. BURNED COIL WINDINGS IN REGULATOR

a. Voltage regulator setting too high.

b. Grounded generator field.

39. CIRCUIT BREAKER AND VOLTAGE REGULATOR POINTS STUCK

a. Misaligned points.

b. Poor ground connections between the generator and the regulator.

GENERATOR AND REGULATOR

SERVICE PROCEDURES

40. PREPARATION FOR TESTS

(1) Set the voltmeter selector switch to the 16 volt position.

(2) Press the voltmeter check button and adjust the zero correction until the meter reads on voltmeter checkline.

(3) Release the button, the meter should return to the black bar at the left of the scale.

NOTE: The voltmeter check push button is used to connect a constant-voltage cell across the voltmeter for the purpose of checking voltmeter accurately.

(4) Check the fan belt for proper tension. Also be sure the radio suppressor condenser (if vehicle is equipped with a radio) is connected to the armature terminal of the generator and **never** to the field terminal.

(5) Operate the engine at 1500 rpm for at least 15 minutes to bring the charging system units up to operating temperature before performing the tests.

A good generator is able to produce a current equal to its rating or more and is capable of meeting the electrical system demands and keeping the battery fully charged. A generator which does not meet specifications should be removed from the vehicle for further tests and reconditioning.

41. GENERATOR OUTPUT TEST

(1) Disconnect the battery wire from the battery (B) terminal of the regulator and connect the negative lead of the test ammeter to the battery wire that was disconnected from the regulator and the ammeter positive lead to the regulator "B" terminal (Fig. 10).

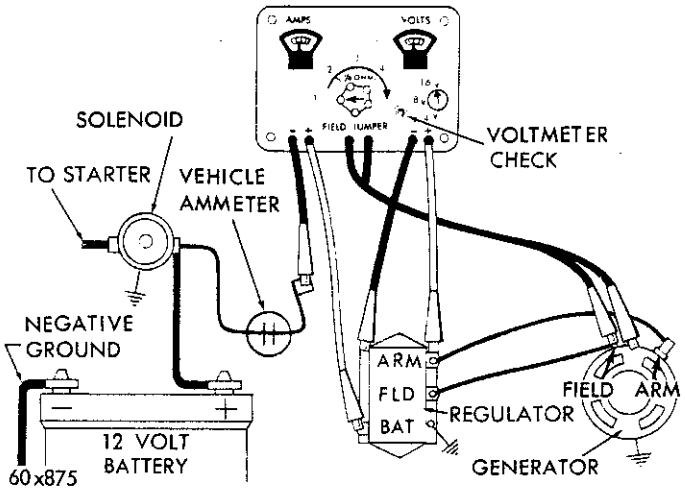


Fig. 10—Generator Output Test

(2) Connect the positive voltmeter lead to the armature terminal of the regulator and the negative voltmeter lead to the base of regulator.

(3) Connect a jumper wire from the generator "F" (field) terminal and a good ground.

(4) Turn the control knob of the tester to the number 1 position.

NOTE: When the control knob is turned to the No. 1 position, the ammeter circuit is "direct", all load resistors being shunted out. Also, the field jumper circuit is automatically closed for uncontrolled generator output in the No. 1 position.

(5) Start the engine and slowly increase the speed while observing the ammeter and tachometer. Generator should reach an output equal to the specified current regulator setting at not more than 1500 rpm.

CAUTION

Perform the test quickly to avoid generator damage. Check the generator brushes for excessive arcing or bounce while high output is being delivered. A rough, burned or dirty commutator will cause arcing and bouncing at the brushes.

If the output is not to "Data and Specifications" in step (5), check for a defective generator or cutout relay.

42. CUTOUT RELAY TEST

This test is made to determine whether or not the cutout relay closes and opens properly with respect to the generator voltage and the battery current. Unless the relay is operating within specifications, a discharged battery and/or damage to the charging system can result.

A relay which is not operating within specifications should be removed from the vehicle for further tests and adjustment.

(1) Turn the control knob of the tester to the No. 2 position. Tester should be connected, as shown in Figure 10.

NOTE: When the control knob is turned to the No. 2 position, the ammeter circuit remains "direct", but the switch in the field jumper circuit automatically opens so that the generator output is controlled by the regulator.

(2) Decrease engine speed until the voltmeter reading is below battery voltage, indicating that the output relay points are open.

(3) Very slowly increase the engine speed while observing both the voltmeter and ammeter. **Note highest voltage reading just before ammeter pointer begins to move. This is the closing voltage of the cutout relay.**

If the cutout relay fails to close, the cutout relay closing voltage is above the voltage regulator setting, or the field circuit in the regulator is faulty.

If the closing voltage is too high, spring tension, air gap is excessive.

If the closing voltage is too low, there is too little air gap, or spring tension.

If the opening amperage is too low and the closing voltage is within limits, there is insufficient point gap. If the amperage is too high, point gap is excessive.

CAUTION

The regulator must be cycled by reducing engine speed low enough for the cutout relay contacts to open and increasing engine speed to 1500 rpm before retesting after each adjustment. The regulator cover must be in place when tests are made.

(4) Increase the engine speed until ammeter reads 5 to 10 amperes, then slowly decrease the speed while observing the ammeter for the discharge current required to open the relay. Opening amperage of the relay is the greatest discharge reading just before the ammeter pointer snaps back to zero.

43. INSULATED AND GROUND CIRCUIT RESISTANCE TESTS

Any voltage loss caused by high resistance between the armature terminal of the generator and the insulated battery post, and between the generator housing and the ground battery post respectively in

these circuits will reduce the overall charge rate and can lead to eventual battery discharge. High resistance can be present in the form of poor connections or faulty or inadequate wiring.

a. Insulated Circuit Resistance Test

(1) Turn the control knob to the No. 1 position.

(2) Turn the voltmeter selector switch to the 4 volt position.

NOTE: When using the 4 volt scale, the zero corrector must be reset so that the meter pointer reads on zero at the left of the scale.

(3) Disconnect the battery wire from the regulator "B" terminal and connect the test ammeter negative lead to the battery wire that was disconnected and the ammeter positive lead to the regulator "B" terminal (Fig. 11).

(4) Connect the positive voltmeter lead to the armature terminal of the generator and the negative lead to the positive battery post.

(5) Connect a jumper wire from the generator "F" (field) terminal and a good ground.

(6) Start the engine and adjust the speed until the ammeter reads exactly 20 amperes. Reading indicated on voltmeter scale represents the voltage loss in the insulated side of the charging system.

NOTE: The voltage loss should not exceed 1 volt. If the voltage loss exceeds 1 volt, check for loose or corroded connections at armature terminal generator, armature terminal of regulator, back of ammeter or battery terminal of the starter solenoid. Also check for faulty wiring from generator to the regulator armature terminals, battery terminal of regulator to ammeter or ammeter to the starter solenoid. Burned or oxidized cutout relay contacts. Loose or corroded battery cable connections. A voltmeter reading that is higher than specified, indicates excessive resistance in this portion of the charging circuit.

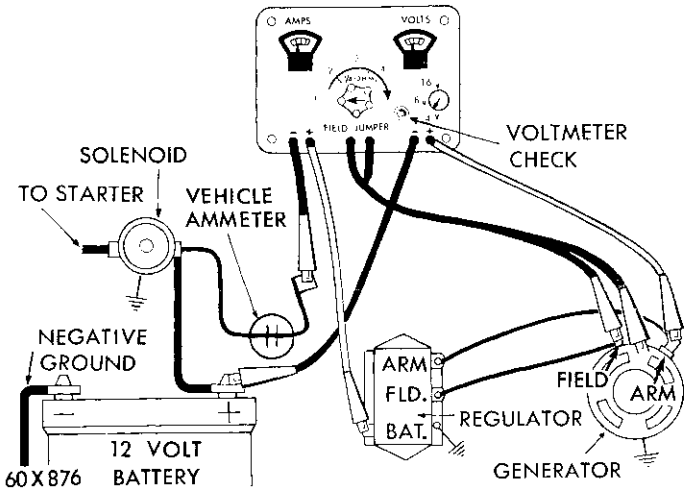


Fig. 11—Insulated Circuit Resistance Test

b. Ground Circuit Resistance Test

(1) Connect the test ammeter and jumper wire leads as outlined under "Insulated Circuit Resistance Test", Paragraph 43A.

(2) Connect the positive voltmeter lead to the battery negative ground post and the negative voltmeter lead to the generator housing (Fig. 12).

(3) Start the engine and adjust the speed until the ammeter reads exactly 20 amperes.

(4) Note the voltmeter reading. This will indicate the voltage loss in the ground side of the charging system and should be not more than .1 volt. A volt-

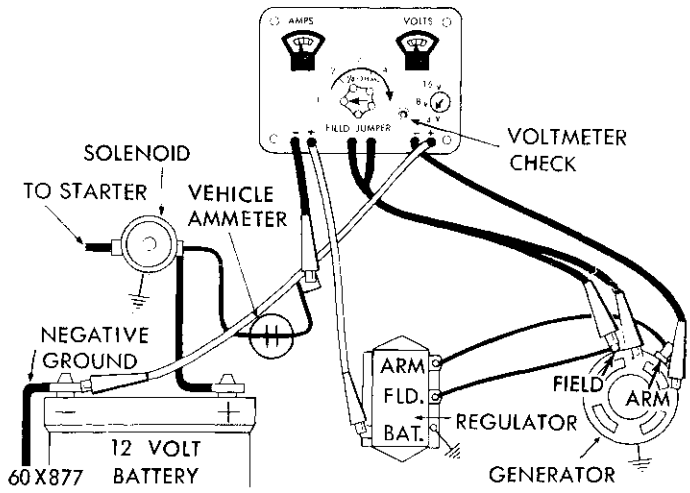


Fig. 12—Ground Circuit Resistance Test

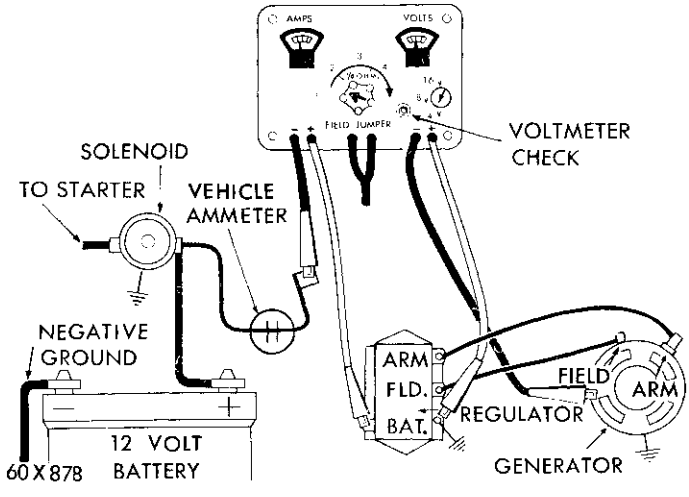


Fig. 13—Regulator Ground Circuit Resistance Test

meter reading higher than .1 volt indicates excessive resistance in this portion of the charging system. Check for loose or corroded battery cable connections or a poor electrical connection between the generator and the engine.

c. Regulator Ground Circuit Resistance Test

Excessive voltage loss between the generator housing and the regulator base will cause the cutout relay and the voltage regulator to operate at a higher than actual setting.

(1) Run the engine at idle speed.

(2) Turn the control knob to No. 2 position.

(3) Connect the test ammeter leads and jumper wire leads as outlined under "Insulated Circuit Resistance Test", Paragraph 43 (a).

(4) Connect the voltmeter positive lead to the base of regulator and the negative voltmeter lead to the generator housing (Fig. 13).

(5) Slowly increase the engine speed from idle to 1500 rpm. The voltmeter reading should not exceed .1 volt and should preferably stay on zero.

(6) If the voltage loss exceeds .1 volt, check for a loose regulator ground wire or a poor ground contact between the regulator base and a ground. Also inspect the grounding of vehicle body and engine.

44. VOLTAGE REGULATOR TEST

A regulator setting which is higher than specified can cause battery overcharge and damage to lights and accessories. A lower than specified setting can result in a discharged battery. If the voltage regulator setting is not within the specified limits or is unstable or erratic, it should be removed from the vehicle for further tests, service and adjustment.

(1) Disconnect the battery wire from the battery terminal of the regulator and connect the negative lead of the test ammeter to the battery wire that was disconnected from the regulator "B" terminal and the ammeter positive lead to the regulator "B" terminal (Fig. 14).

(2) Connect the positive voltmeter lead to regulator "B" terminal and negative voltmeter lead to the base of the regulator.

(3) Turn the control knob of the tester to the No. 3 position.

NOTE: When the control knob is turned to No. 3 position, a ¼ ohm fixed resistor is switched in series with the ammeter circuit. A ¼ ohm resistor, when placed in series with a charging circuit causes the battery to "appear" fully charged to the regulator.

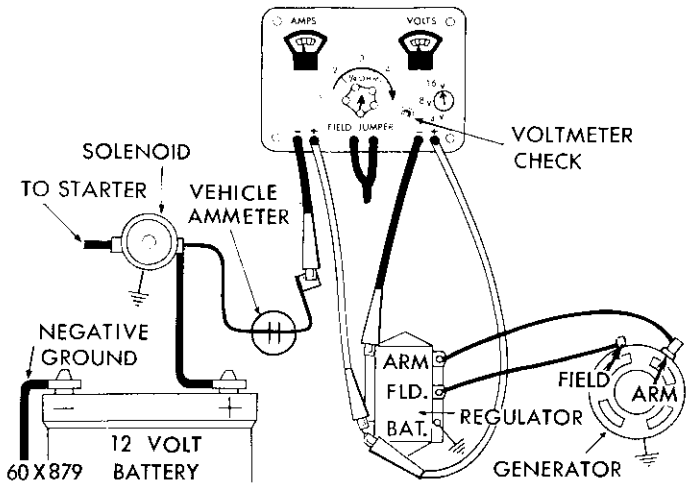


Fig. 14—Voltage Regulator Test

This forces the voltage limiter (voltage regulator) into operation so that its setting or adjustment can be checked.

(4) Reduce the engine speed until the cutout relay points open, then slowly increase engine speed to 1500 rpm.

NOTE: The regulator must be brought to operating temperature before measuring the regulator ambient temperature. To accomplish this, operate the voltage regulator for at least 15 minutes at 7 amperes.

(5) Place a reliable thermometer 2 inches from the regulator cover, but not touching the cover, to measure the temperature of the air surrounding the regulator.

(6) Note the voltmeter and temperature readings. Reading indicated on the voltmeter is the voltage regulator setting at a known temperature and should be within specifications.

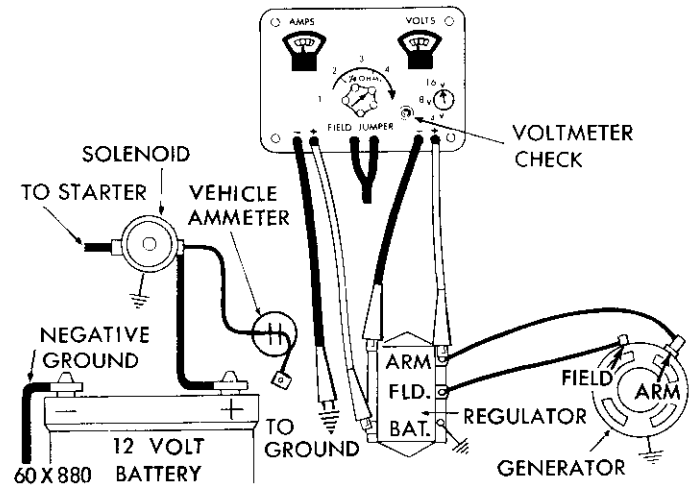


Fig. 15—Current Regulator Test

(a) If the voltage regulator setting is too high, check for excessive spring tension or armature air gap.

(b) If the voltage regulator setting is too low, check for insufficient spring tension or armature air gap.

(c) If the voltage regulator setting is erratic or unstable, check for burned or oxidized regulator contacts, improper armature air gap or broken resistor on back of regulator.

NOTE: After each adjustment, it is essential that a complete retest be made in order to determine the new values of the closing voltage and the discharge current required to open the relay contacts. Regulator cover must be in place when test is made.

45. CURRENT REGULATOR TEST

A regulator setting which is higher than specified can allow the generator to exceed its rated output and consequently damage from overheating can result. A regulator setting which is lower than specified will not allow the generator to produce the current demanded by the electrical system when loads are great and as a result the battery can become discharged. If the current regulator setting is not within the specified limits or is unstable or erratic, the regulator should be removed from the vehicle for further tests, service and adjustment.

(1) Run the engine at idle speed. Disconnect the battery wire from the battery terminal of the regulator, connect positive test ammeter lead to the "B" terminal of the regulator and negative lead to ground (Fig. 15).

(2) Connect the positive voltmeter lead to the "A" (armature) terminal of the regulator and the negative voltmeter lead to the base of the regulator.

(3) Adjust the engine speed to 2000 r.p.m.

(4) Turn the control knob of the tester to the No. 4 position and adjust the control knob for the highest possible reading on the test ammeter. The peak ammeter reading is the setting of the current regulator.

NOTE: When the control knob is rotated through the No. 4 position, a variable carbon pile resistance is inserted in series with the ammeter circuit. When connected from the battery terminal of the regulator to ground (with the "battery" wire disconnected), the resistance of the carbon pile can be reduced so that the carbon pile "appears" as a discharged battery to the regulator. This forces the current limiter (current regulator) into operation so that its setting or adjustment can be checked.

Refer to specifications for specified current regulator setting.

(5) Return the control knob to No. 3 position.

(a) If the current regulator setting is too high, check for excessive spring tension or armature air gap.

(b) If the current regulator setting is too low, check for insufficient spring tension or armature air gap.

(c) If the current regulator setting is erratic or unstable, check for burned or oxidized regulator contact, improper armature air gap or broken resistor on back of regulator.

CAUTION

The current regulator must be cycled by reducing engine speed low enough to open the cutout relay contacts after each adjustment. Retest the new setting after each adjustment, with the cover in place.

If the adjustment of the closing voltage (see "Specifications") is necessary, let the engine idle and bend the spring tension plate down to increase closing voltage or bend it up to decrease (Fig. 16). Recheck the temperature and voltage readings after making adjustments.

If the adjustment of the reverse current, or discharge current needed to open contacts is necessary, adjust the height of the stationary contact bridge by squeezing the legs of the stationary bridge (Fig. 17) or forcing them further apart with long nose pliers. Adjust the height of the bridge up to decrease

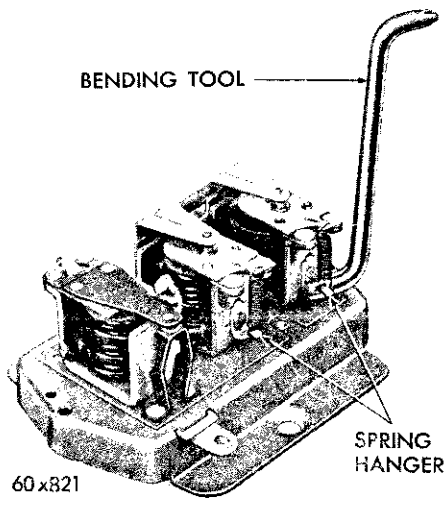


Fig. 16—Adjusting Spring Tension

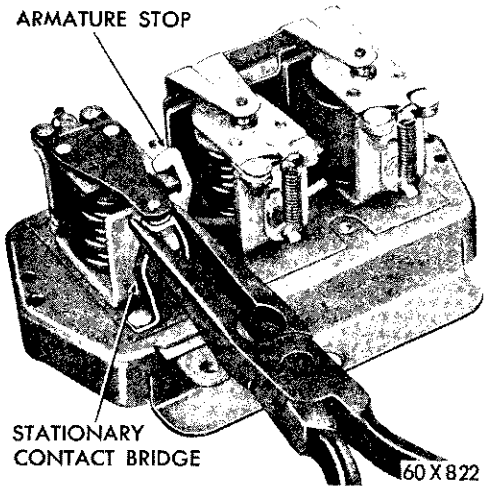


Fig. 17—Adjusting Cutout Relay Contact Clearance

gap or down to increase it. Proper clearance should be a minimum of .015 inch.

(6) After completing tests, reduce speed to idle momentarily, then stop the engine.

(7) Disconnect the tester leads and reconnect the battery wire to the regulator.

46. ADJUSTING REGULATOR AIR GAP

To check the current and voltage regulator air gaps, use the pin type gap tool gauge from Kit Tool C-828. Connect a test light from the spring hanger to the regulator base. Insert the .048 inch wire gauge between the armature and the magnet core at contact side of the stop pin (Fig. 18). Press down the armature plate. Contacts should open and test light should go out. Insert the .052 gauge in the same position and depress armature. Contacts should be closed and the test light should remain lighted if air gap is properly adjusted.

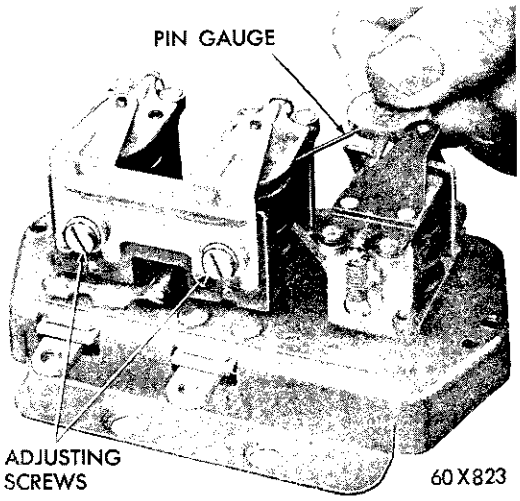


Fig. 18—Checking Regulator Air Gap

To adjust the air gap, loosen the bracket screws and raise or lower the contact point bracket until the desired clearance is obtained. Be sure these screws are tightened securely after adjustments are made. When the armature is held down so that the stop rivet rests on the magnet core, the point gap should be a minimum of .012 inch.

47. CHECKING CUTOUT RELAY AIR GAP

To check the cutout relay air gap, use the flat tool gauge .031 inch from Kit Tool C-828. Insert the gauge between the armature and the magnet core (Fig. 19). Be sure that the gauge is placed as near to the hinge as possible. With the relay armature against the upper stop, the .031 inch gauge should slide in freely, but .034 inch gauge should be too tight. Adjust air gap by bending upper stop up to increase air gap, or down to decrease it.

Be sure that the stop does not interfere with the armature movement.

48. CLEANING REGULATOR CONTACT POINTS

(1) Refer to Figure 20 and remove the regulator cover. Inspect the contact points of all three units. In normal use, the contact points will become grayed.

(2) If the contact points are dirty, clean the contact points with a strip of linen, or lintless bond tape, as shown in Figure 21. Make sure that no lint remains between contact points after cleaning.

NOTE: If the contact points are burned or pitted, replace the regulator. Never use sandpaper, emery cloth, or a file to clean.

After cleaning the contact points, recheck the armature air gaps.

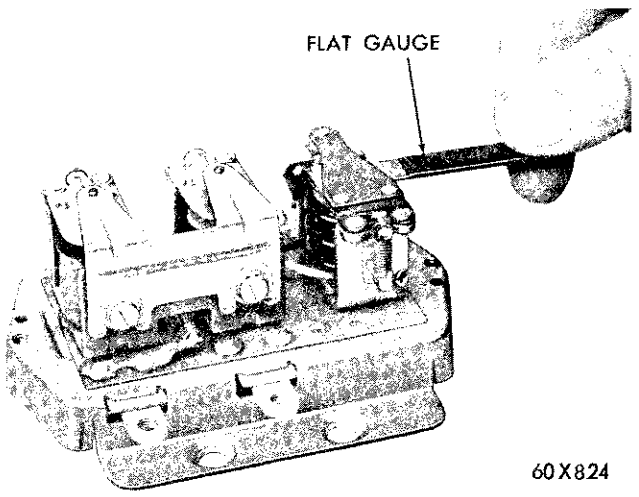
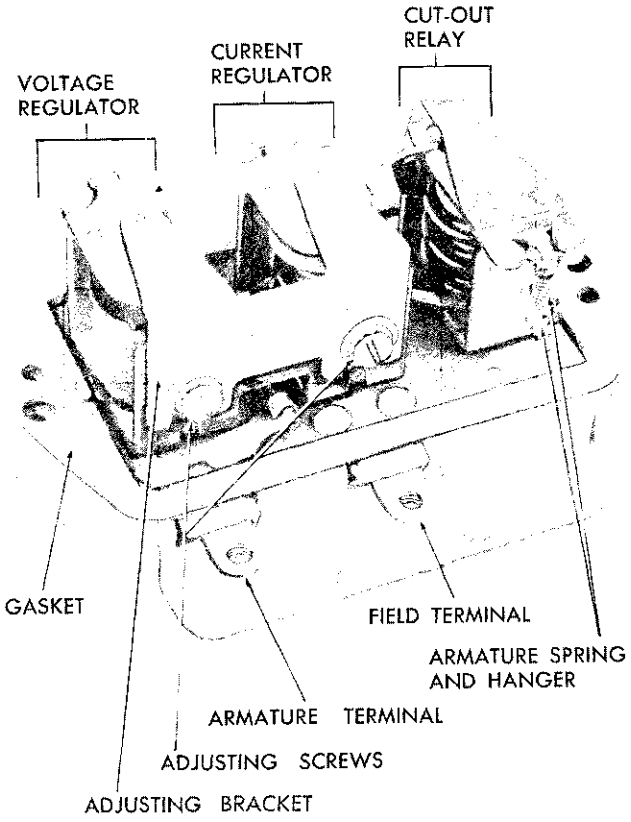


Fig. 19—Checking Cutout Relay Air Gap



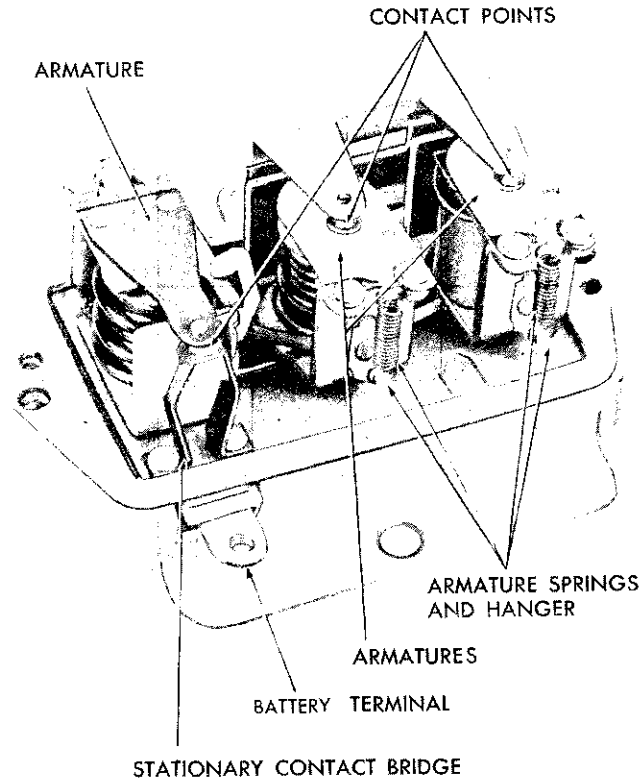


Fig. 20—Generator Regulator—Cover Removed

49. ADJUSTING CUTOUT RELAY CONTACT CLEARANCE

Adjust the contact clearance by expanding or contracting the bridge (Fig. 17). The proper clearance should be a minimum of .015 inch. Be sure to keep the contact points in alignment when adjusting the contact gap.

NOTE: Increasing the contact gap lowers the opening voltage and raises the opening reverse current.

50. GENERATOR

a. Removal

(1) Disconnect the battery negative terminal. Disconnect the wires at the generator.

(2) Loosen the generator adjusting strap bolts and the generator mounting bolts.

(3) Push the generator towards engine to relieve belt tension and remove the generator attaching bolts and the generator.

b. Disassembly (Fig. 22)

(1) On generators so equipped, remove the commutator cover band, disconnect the armature terminal field lead from insulated brush holder.

(2) Remove the commutator end head bearing cover screws, cover, gasket, bearing retainer screw, flat washer and bearing retainer washer.

(3) Raise the brushes from commutator, pull the brushes up slightly and place the end of the brush arm against the brush to hold it in place and to prevent damaging the brushes when end head is removed.

(4) Remove the two through bolts and remove commutator end head, bearing and brushes as an assembly.

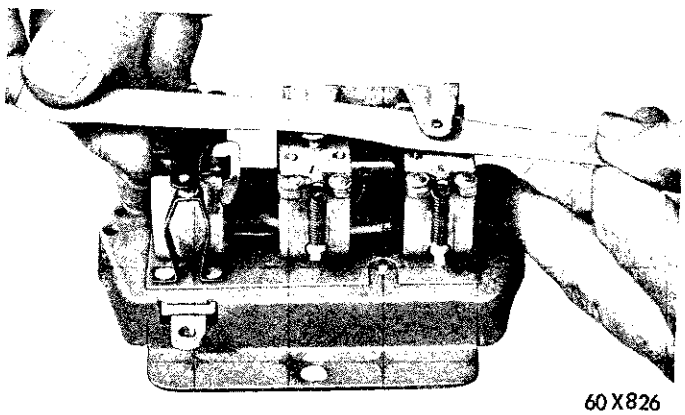


Fig. 21—Cleaning Contact Points

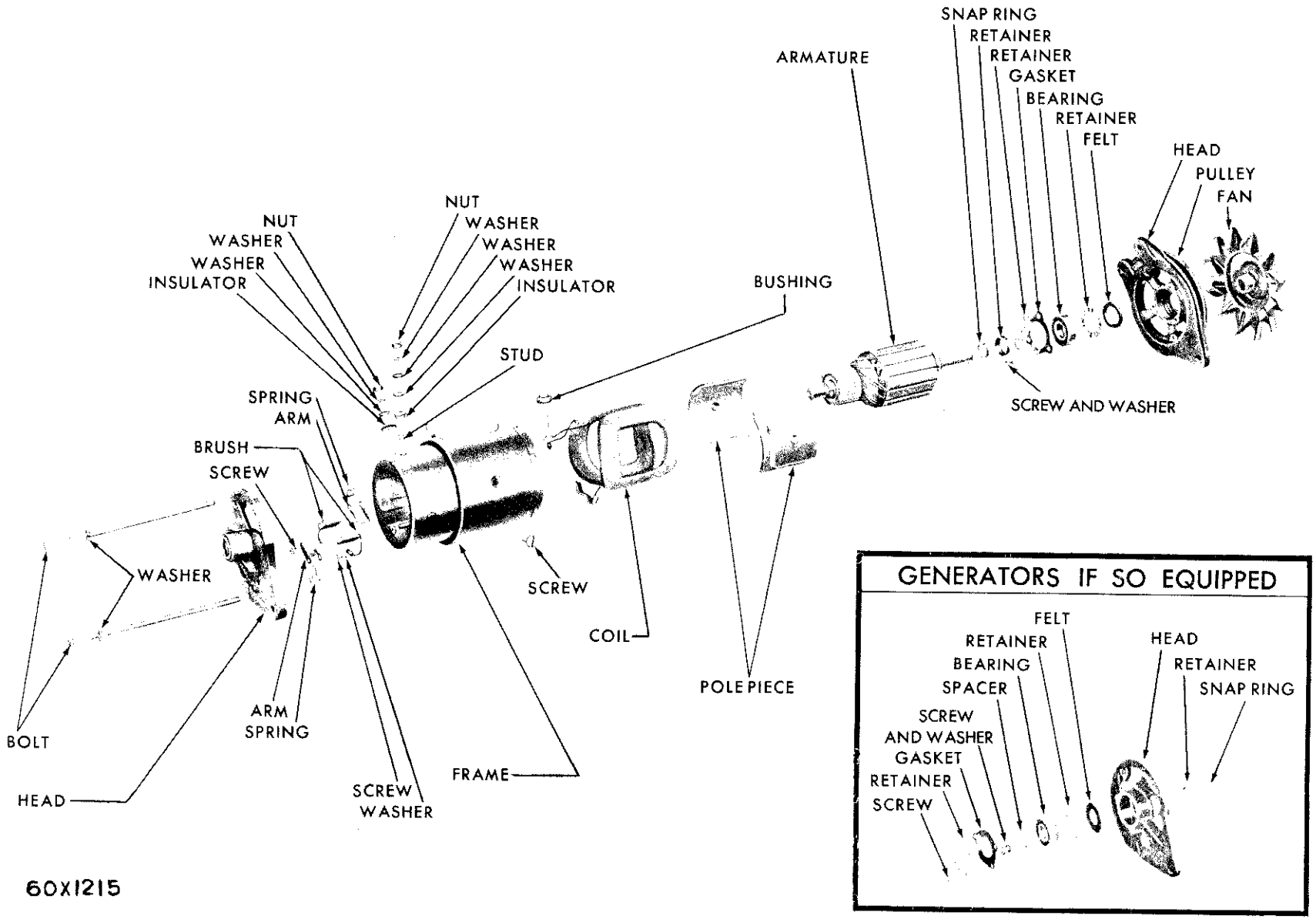


Fig. 22—Generator (Disassembled View)

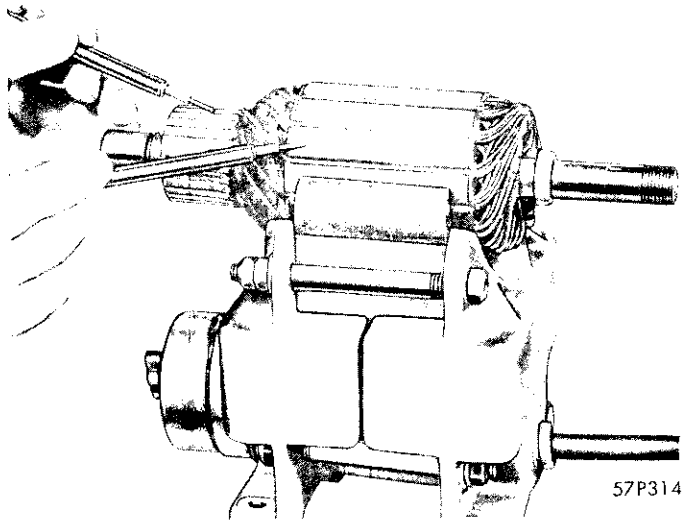


Fig. 23—Testing Armature for Ground

(5) Remove the bearing and felt from end head.

(6) Remove the grease deflector from end of armature shaft.

(7) For generators equipped with an oil impregnated bushing in the commutator end head, remove the two through bolts and remove the end and bushing as an assembly and perform operation (3) above to contain the brushes.

NOTE: The remaining disassembly operations are the same for all three types of generators.

(8) Slide the armature and drive end head assembly from the generator frame.

NOTE: The pulley should not be removed unless it is found that the drive end bearing, end frame or armature have to be replaced.

(9) Remove the pulley with the Power Steering Pump Pulley Removing Tool C-3615.

(10) The drive end bearing is a tight fit on the armature shaft, an arbor press must be used to force the armature shaft out of the bearing.

(11) After removing the armature shaft, remove the retainer screws, retainer, retainer gasket, bearing, felt and pulley spacer.

NOTE: Do not remove field coils from field frame at this time.

51. CLEANING AND INSPECTION

CAUTION

Do not immerse armature, field frame and field assembly, or bearing felts in cleaning solution. Never steam clean a generator.

Wipe above parts with a clean cloth. When cleaning the ball bearings, do not spin them with compressed air. Inspect the field coils for burned or damaged insulation. Inspect the commutator for wear and check condition of soldered coil leads. An armature that has been overheated will show signs of throwing solder and will require resoldering or replacement. Inspect the commutator for trueness.

Inspect the bearings for wear or roughness. Replace worn or rough bearings.

52. TESTING GENERATOR COMPONENTS

a. Testing Armature for Ground

Place one probe from 110 volt test lamp on armature shaft and other probe at end of any commutator bar (Fig. 23). If test lamp lights, it indicates a ground. Do not touch shaft bearing surface or commutator bar brush surface with test probe as this will pit surfaces. Replace grounded armatures.

b. Testing Armature for Short

Place the armature in a growler and, while rotating the armature, hold thin steel blade parallel to core and just on it (Fig. 24). A shorted armature will cause the steel blade to vibrate and be attracted to the core. Replace a shorted armature.

c. Checking Commutator Runout

With the armature shaft bearing surfaces resting in "V" blocks, place a dial indicator against the commutator. Rotate the armature, while taking an indicator reading. If the runout is more than .005 inch, reface the commutator.

d. Refacing Commutator

If the commutator is rough, out-of-round, burned or if the mica is even with, or extends above the sur-

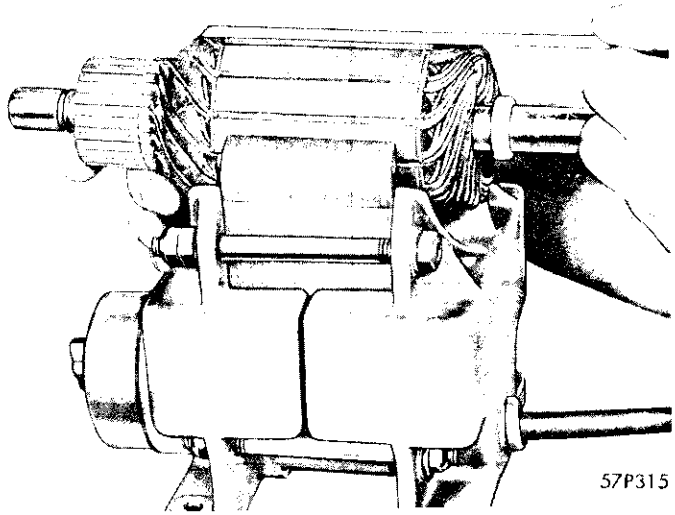


Fig. 24—Testing Armature for Short

face, the commutator should be refaced with Tool C-770. **Remove only sufficient metal to give a smooth clean surface.**

e. Undercutting Mica

Undercut mica segments to a depth of approximately 1/32 inch deep with Tool C-770. Be sure to undercut mica square, the full width of slot. After undercutting, polish the commutator with No. 00 sandpaper to remove possible burred edges.

f. Testing Field Frame Assembly for Ground

(1) Disconnect the "ARM" terminal field lead from the insulated brush holder (on units so equipped).

(2) Touch a 110 volt lamp probe to the generator "FIELD" terminal post, while holding the other probe against good ground on the field frame (be sure brush lead terminals are not touching a ground). The lamp should not light. If lamp lights, a ground exists and it will be necessary to determine whether ground is in the field coils or field terminal post.

(3) Remove the terminal post from the field frame and retest from the field lead to ground. If the lamp lights, the field coils or connecting lead is grounded.

(4) Move the connecting lead between the two coils away from the field frame. If light still burns, ground is in field coils.

(5) Touch one of the 110 volt test lamp probes to the "ARM" terminal post and the field frame. If the lamp lights, it indicates that either the terminal post or the brush holder is grounded.

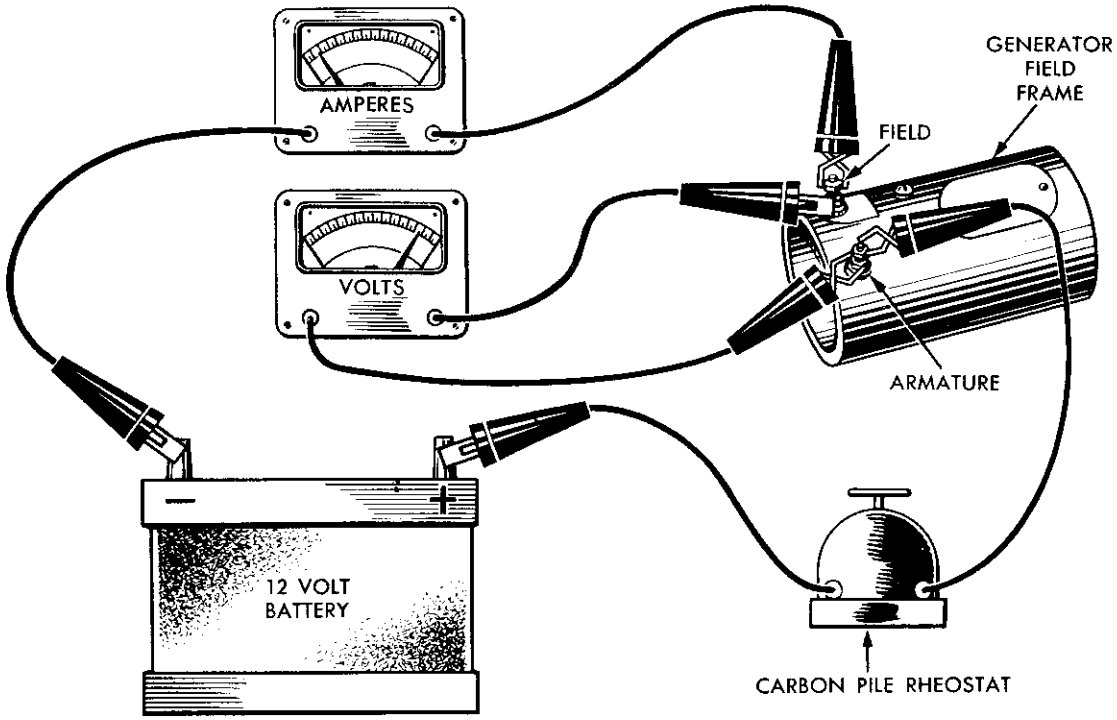
(6) Remove terminal post and retest brush holder. If the lamp still lights, the brush holder is grounded. Replace the faulty parts. It is necessary to replace the field frame if the insulated brush holder is grounded on generators that have the brush holders riveted to the field frame.

g. Commutator End Head (Brush Holders Riveted to End Frame)

Test the brush holders for a ground by connecting one probe of a test lamp to the brush holder and the other probe to the commutator end head. If the test lamp lights, the brush holder is grounded and a new end head assembly should be installed. **Do not** attempt to tighten the brush holder rivets. If the brush holders are loose on end head, the end head must be replaced.

h. Testing Field Current Draw

Test the field coils for short circuits between the windings, high resistance connections, or for im-



56x145

Fig. 25—Testing Field Current Draw (Typical)

proper coils, by connecting test equipment, as shown in Figure 25. Adjust the battery voltage to specified voltage of 10 volts with rheostat. A reading on the ammeter higher than specified indicates that coil windings are shorted, or that the wrong coils have been installed. A current reading that is less than specified indicates poor electrical connections or wrong field coils.

i. Replacing Field Coils

To replace field coils, a pole shoe impact screwdriver, such as Tool C-3475, should be used to prevent damage to screws and to assure proper tightening.

j. Servicing Generator Brushes

On generators with brush holders riveted to the field frame, it will be necessary to disassemble the generator to service the brushes; however, a visual inspection can be made by using a small mirror and a bright light. Check through the air cooling openings in the commutator end frame to determine condition of the brushes and the commutator.

Generator brushes should be examined at disassembly of the generator to make certain that they are free in the holders, seat properly and are not worn excessively.

k. Brush Inspection

Brushes which are worn to less than ½ inch in length or covered with dirt and oil, should be replaced to avoid damage to the commutator and windings. Should inspection show that the brushes are badly worn, or the commutator is rough or worn so that the mica is even with the bars, the generator should be completely dismantled, cleaned, commutator turned, mica undercut, new brushes fitted and then bench tested before installation.

l. Installing New Brushes

When new brushes are installed, they should be seated with sandpaper to obtain a correct fit against the commutator. To seat the brush against the commutator, use a strip of No. 00 sandpaper as wide as the finished surface of the commutator. Lift the brush and slide sandpaper grit side up between commutator and brush. With spring pressure against the brush, slowly turn the armature in the reverse rotation, pulling sandpaper from under brush. Repeat the operation until brushes seat at least 75 per cent over the entire contact surface. (Excessive use of sandpaper will shorten the brush life and should be avoided). Blow out all sand and carbon dust from the generator.

NOTE: Generators that have the brush holders riveted to the commutator end head should have the brush spring tension checked with the commutator end head and brushes installed on the armature. Hook a spring scale under the brush spring and pull upward. Take the scale reading—just as the spring leaves the brush. Refer to "Data and Specifications" for values.

It is difficult to measure spring tension on generators that have the brush holders riveted to the field frame; therefore, it is suggested that new springs be installed when brushes are replaced.

53. ASSEMBLING THE GENERATOR

(1) Dip the felt washers and bushings (if so equipped) in clean SAE 10 engine oil. Compress the felt slightly to remove oil before installing.

(2) Pack the ball bearing about half full with high temperature non-fiber bearing lubricant.

(3) Assemble the bearing, bearing felt, gasket, retainer and screws to drive end head.

(4) Install the retainer over snap ring before pressing bearing and end frame assembly on the shaft.

NOTE: This retainer turns with the armature shaft and the bearing inner race and prevents snap ring from tearing the felt washer. Be sure that the snap ring on the armature shaft is pressed firmly against the inner race of the bearing. Support the armature so that pressure will be applied to end of armature shaft. Install a suitable sleeve over the armature shaft so that the pressure is applied to the inner race when pressing the bearing on the armature shaft.

(5) Install the pulley spacer and pulley. Make sure that pressure is applied to the end of the armature shaft when installing the pulley. Use care when applying pressure to the pulley and end of the shaft. The maximum pressure that should be applied is 6800 pounds. More than this maximum will cause the shaft to bend and result in permanent damage.

(6) Install the armature and the drive end head assembly into the generator field frame.

(7) Align the drive end head with dowel in the field frame and push armature and frame into position.

(8) Install the grease deflector commutator end head.

(9) For generators that have the brush holders riveted to the commutator end head, slide the end head over the armature shaft, mating the dowel hole and dowel pin.

(10) Install the through bolts, making sure that the lower bolt is installed under the loop in the field connection insulation to prevent grounding of the coils by the bolt.

(11) Hold the brush arms out against spring tension and slide the brushes into the brush holders with the angle on the brushes conforming with the contour of the commutator.

(12) Connect the brushes to the field and armature leads, being sure the terminals do not touch the frame.

(13) Install the cover band.

(14) Place the felt and bearing in the commutator end frame and install the bearing on the armature shaft.

(15) Install the bearing retainer, washer, bearing screw, gasket, dust cover and attaching screws and washers.

(16) On generators having the brush holders riveted to field frame, release the brushes and make sure they are properly aligned on commutator. Connect the armature lead wire to the insulated brush holder.

(17) Position the end frame and bushing assembly and install the through bolts.

(18) Install a new felt wick in oiler cup, lubricate the bearings with 8 to 10 drops of light oil. Do not lubricate the oilite bearing.

54. MOTORING TEST

A generator that will motor freely with the specified voltage applied will, in most cases, operate properly when driven as a generator.

Connect a carbon pile rheostat and a test ammeter in series with the positive post of battery and the generator armature terminal post. Connect a jumper lead from the field terminal post to a ground. Connect a jumper lead to the battery negative post and the generator frame. This will cause the armature to rotate as a motor. Adjust the battery voltage to 10 volts. The reading on the test ammeter should be within specifications with the armature turning smoothly.

55. INSTALLATION OF GENERATOR

(1) Install the generator and mounting bolts but do not tighten.

(2) Adjust belt tension as outlined under "Accessory Belt Drives", Group 7A.

CAUTION

The condenser used for radio interference must be attached to the armature "ARM" generator terminal.

56. POLARIZING GENERATOR

The generator should be polarized before it is operated as follows:

Make sure all connections between the generator, regulator and battery have been properly tightened, then use a jumper wire to make a momentary connection between the battery terminal and the generator armature terminal.

IGNITION SYSTEM

SERVICE DIAGNOSIS

57. BURNED OR PITTED DISTRIBUTOR POINTS

(a) Dirt or oil on points.

(b) Points misaligned or gap too narrow.

(c) Defective coil.

(d) Wrong condenser or defective condenser.

(e) Generator regulator setting too high.

(f) Bushings or distributor shaft worn.

(g) Touching of points with hands during installation.

58. IGNITION COIL FAILURE

(a) Regulator setting too high.

(b) Coil damaged by excessive heat from engine.

(c) Coil case or tower cracked.

(d) Oil leak at tower.

(e) Coil tower carbon cracked.

59. CONDENSER FAILURE

(a) Normal fatigue.

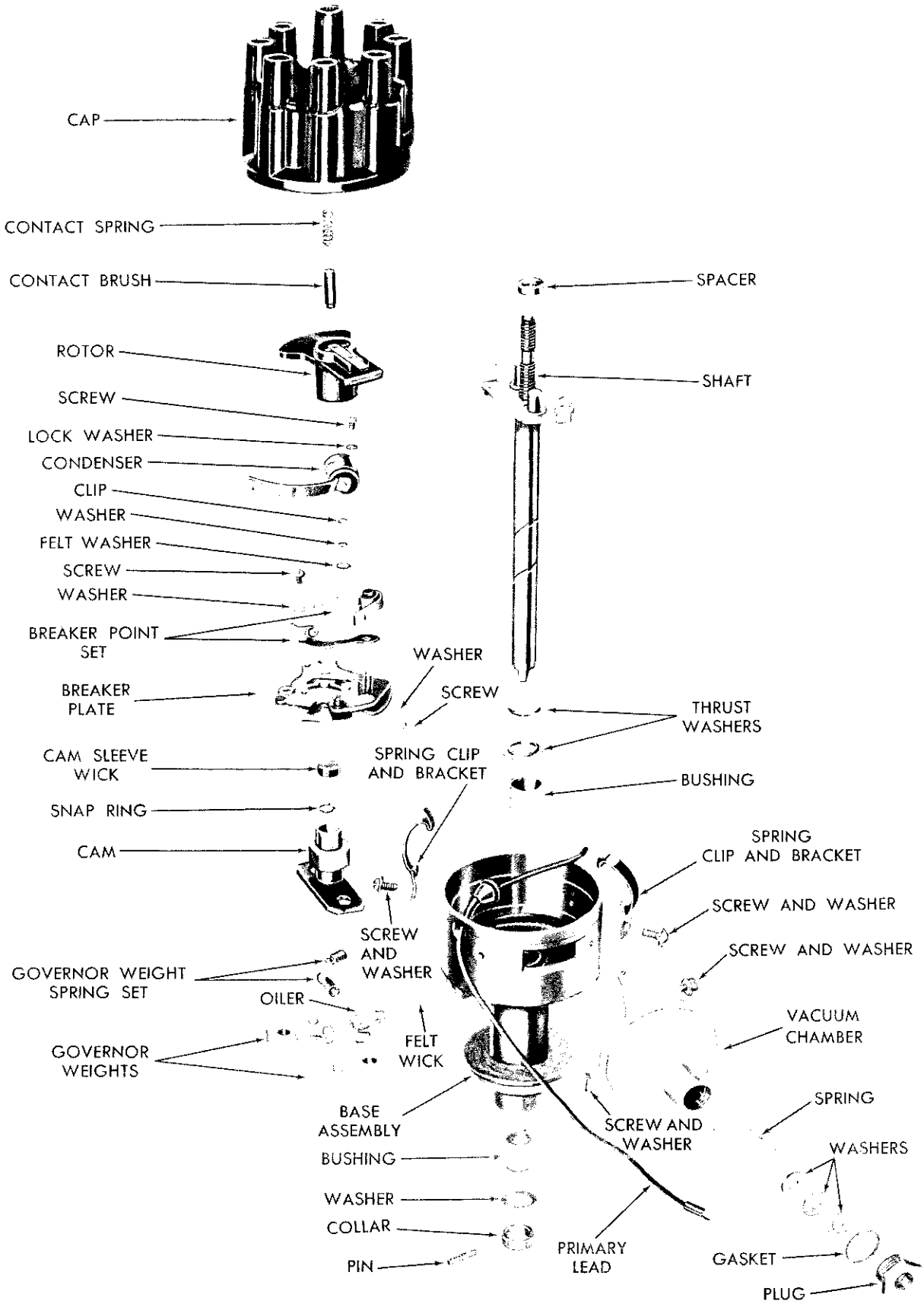


Fig. 26—Ignition Distributor (Exploded View) Single Breaker

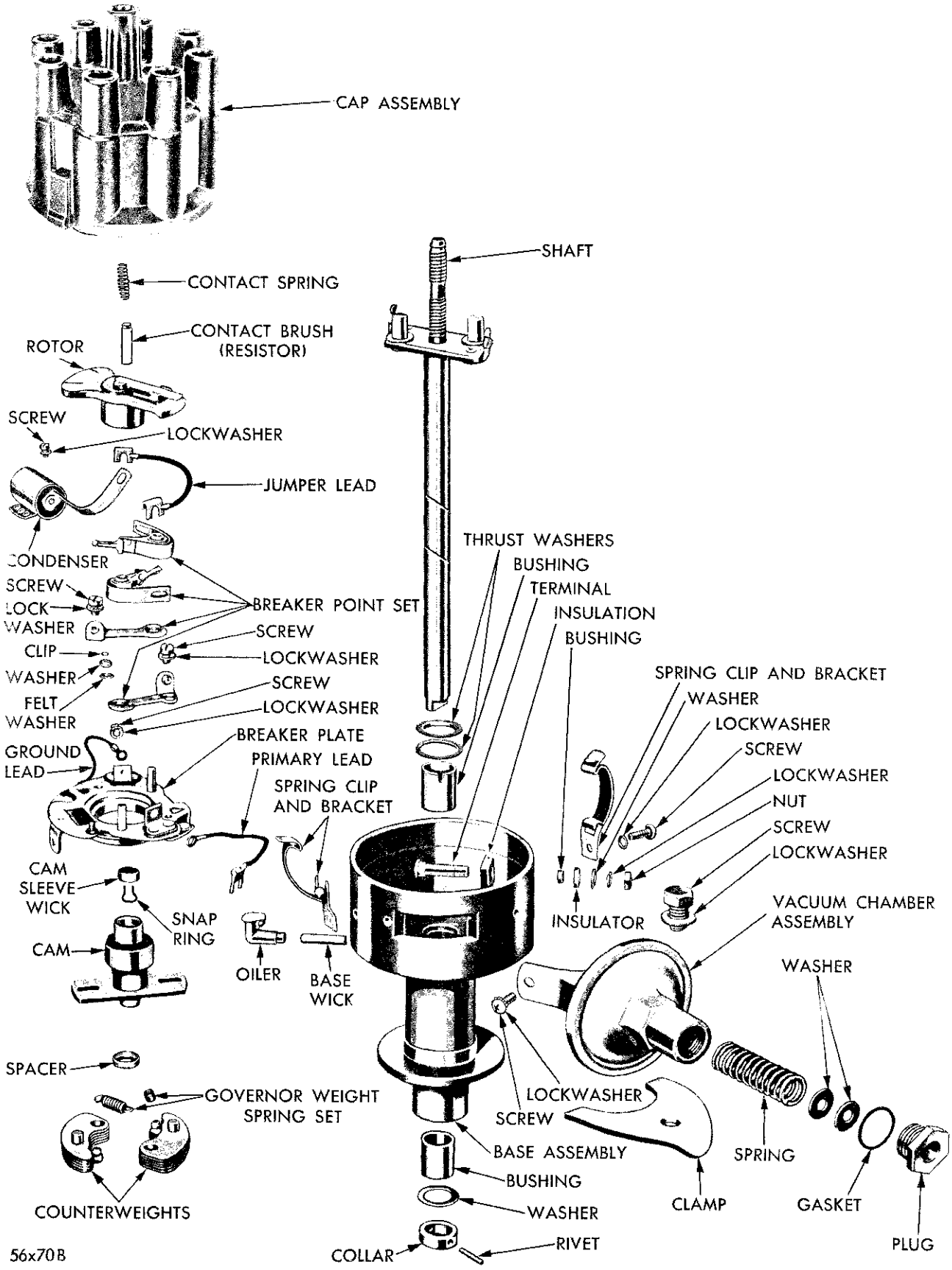


Fig. 27—Ignition Distributor (Exploded View) Double Breaker

(b) Damaged by excessive engine heat or moisture.

60. FOULED SPARK PLUGS

(a) Carburetor mixture over-rich.

(b) Excessive oil consumption.

(c) Improper plug heat range.

(d) Improper gap adjustment.

61. BURNED SPARK PLUGS

(a) Plugs loose or too tight in the cylinder head.

(b) Carburetor mixture too lean.

(c) Improper plug heat range.

(d) Improper ignition timing.

(e) Leaking head gasket or cracked cylinder head.

SERVICE PROCEDURES

The ignition system consists of two separate circuits. The battery, ammeter, ignition switch, primary winding of the iginition coil, distributor contacts and condenser, vehicle frame, and the primary wiring make up the low voltage primary circuit. The secondary high voltage circuit includes the coil secondary winding, the distributor cap and rotor, the spark plugs, the high tension wiring and the vehicle frame.

62. CHECKING THE SECONDARY CIRCUIT

The coil to distributor cap lead wire and the spark plug wires should make good, clean contact in the ignition coil and the distributor cap towers.

The ignition coil tower and the distributor cap should be wiped clean with a cloth moistened in cleaning solvent.

The insulation of the coil lead and spark plug wires will deteriorate with usage. Leakage to ground and between the wires will occur, resulting in hard starting and inefficient engine operation. Old, cracked, or damaged wires should be replaced. The secondary cables, cap and rotor should be tested, using Tool C-3296. This tester provides high voltage which is sufficient for testing secondary insulation.

The rotor and distributor cap electrodes should be inspected for burning. Replace the rotor if the electrode is burned on the top or worn too short.

63. DISTRIBUTOR RESISTANCE TEST

This test indicates the resistance of the ignition primary circuit from the distributor side of the coil, through the points and the distributor ground. Excessive resistance in this portion of the ignition system will prevent the coil from producing sufficient output for good over-all ignition. To perform test proceed as follows:

(1) Connect a jumper wire from the armature terminal to a good ground.

NOTE: Grounding armature prevents the charging system operation, thus providing a stable circuit voltage for the following ignition tests.

(2) Turn the Selector Switch to the "CALIBRATE" position and adjust Dwell Calibrator until the Dwell Meter reads on the set line (test leads separated).

(3) Leave selector switch in "CALIBRATE" position, connect tach-dwell red lead to distributor terminal of coil and black lead to a good ground.

(4) Turn the ignition switch ON. Observe the dwell meter reading. Meter pointer should be well within black bar marked "DISTRIBUTOR RESISTANCE". If the reading is zero or outside of black bar, crank engine with the starter until meter pointer moves as far to right as possible. (This will indicate that breaker points are closed.) A reading now within black indicates a normal distributor primary circuit.

If the reading is outside the black bar, high resistance is present in the distributor primary circuit.

(5) Remove the test lead from the distributor terminal of coil and connect to the following points:

(a) Distributor primary terminal (outside)

(b) Distributor primary terminal (inside)

(c) Breaker point terminal bracket (insulated bracket)

(d) Ground side of contact points.

(e) Distributor housing.

(6) Repeat test at each connection until a noticeable change occurs in the meter reading. If a bad connection or faulty lead is indicated, clean, tighten or replace as necessary and repeat test (4).

If bad points are indicated, remove distributor for complete inspection, service, testing and calibration.

64. IDLE R.P.M. TEST

The engine idle r.p.m. setting should be tested and recorded as it is when the vehicle is first brought into the shop for testing. This will assist in diagnosing complaints of engine stalling or complaints of creeping and hard shifting on vehicles equipped with automatic transmissions.

(1) Turn the selector switch to the calibrate position and adjust the dwell calibrator until the dwell meter reads on the set line (test leads separated).

(2) Connect the red lead of the test unit to the distributor primary terminal at coil and the black lead to a good ground.

(3) Turn the selector switch to the "LOBE" position corresponding with the number of lobes on the distributor cam.

(4) Turn the tachometer r.p.m. switch to the 1000 r.p.m. position.

(5) With engine at normal operating temperature (off fast idle), momentarily open the throttle and release to make sure there is no bind in the linkage and that the idle speed screw is against its stop.

(6) Note engine r.p.m. on 1000 r.p.m. scale and adjust the carburetor to specified idle speed.

65. DISTRIBUTOR POINT DWELL

The "degrees of dwell" of the distributor breaker points are the degrees of rotation through which the breaker points remain closed. This is also commonly referred to as "dwell angle" or "cam angle".

Correct distributor point dwell is essential for good ignition performance and point life.

(1) Connect the tach-dwell red lead to the distributor terminal of the coil and the black lead to a good ground.

(2) Turn the selector switch to the "LOBE" position corresponding with the number of lobes in the distributor cam.

(3) Start the engine and operate at 475 to 500 r.p.m.

(4) Observe dwell meter reading and compare to specifications. If the dwell reading is within specifications, the point gap cam rubbing block and breaker arm are all in satisfactory condition.

If dwell reading is not within specifications, incorrect point gap, defective cam, worn rubbing block or distorted breaker arm is indicated.

66. DWELL VARIATION

This test indicates the mechanical condition of the distributor. Excessive wear in distributor mechanical parts cause dwell variations which will effect ignition timing.

(1) With engine at idle speed and distributor vacuum line disconnected and with the test leads connected as in the point dwell test, turn the tachometer r.p.m. switch to the 5000 r.p.m. position.

(2) Slowly increase the engine speed to 1500 r.p.m. then slowly reduce to idle speed while observing the dwell meter reading.

If the dwell reading varies more than specified between idle speed and 1500 r.p.m., probable wear in the distributor shaft, bushings or breaker plate is indicated. Remove distributor for complete inspection and testing on a distributor tester.

NOTE: Dwell variation at speeds above 1500 r.p.m. does not necessarily indicate distributor wear.

IMPORTANT

Dwell and gap of the points must both be within their specified tolerance at the same time. If this cannot be accomplished, it is probable that the wrong points are installed or the cam lobes are badly worn.

67. IGNITION TIMING

To obtain maximum engine performance, the distributor must be correctly positioned to give proper ignition timing.

The ignition timing test will indicate the timing of the spark at the No. 1 piston at idle (only).

(1) Disconnect the vacuum line at the distributor. This will eliminate any chance of the vacuum advancing the breaker arm plate. The engine should operate on centrifugal advance only when checking the ignition timing.

(2) Connect the secondary lead of the Power Timing Light to No. 1 spark plug, red primary lead to the positive terminal of the battery and the black primary lead to the negative battery terminal.

(3) Start the engine and set the idle to 475-500 r.p.m. (transmission in neutral).

(4) Use a timing light to observe the position of timing mark on the crankshaft dampener and check against the specifications.

(5) Loosen the distributor clamp screw and rotate the distributor housing so that the specified timing mark and pointer are in alignment. (Moving distrib-

utor housing against shaft rotation advances timing and with shaft rotation retards timing.)

(6) Tighten the distributor clamp screw after the timing has been set and rechecking timing adjustment with a Power Timing Light.

(7) If the spark timing is correct, reconnect the vacuum line to the distributor. As the engine speed is increased, the timing mark should move down on the vibration dampener below the pointer if advance units are functioning.

68. DISTRIBUTOR REMOVAL

(1) Disconnect the vacuum tube on the distributor.

(2) Disconnect the primary lead wire at the coil.

(3) Unfasten the distributor cap retaining clips and lift off the distributor cap.

(4) Scribe a mark on the edge of the distributor housing to indicate No. 1 position of the rotor as reference when reinstalling the distributor.

(5) Remove the distributor hold down lock plate screw and the lock plate.

(6) Carefully lift the distributor from the engine.

69. DISASSEMBLY OF DISTRIBUTORS
(Figs. 26 and 27)

(1) Remove the distributor rotor.

(2) Remove the screws and lockwashers that hold the distributor cap clamp springs to the distributor housing and remove the clamp springs.

(3) Remove the hairpin clip and washer attaching the vacuum control unit to the breaker plate advance arm. Remove the two screws and lockwashers attaching the vacuum control unit to the distributor housing and remove the control unit.

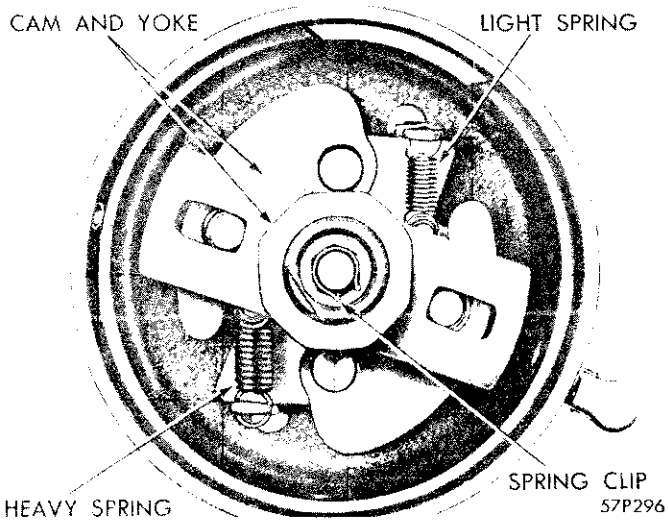


Fig. 28—Distributor Cam Installed

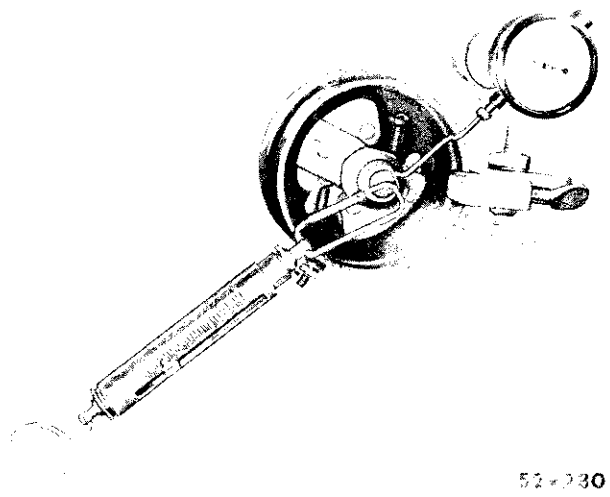


Fig. 29—Checking Distributor Shaft Side Play (Typical)

(4) On single breaker distributors, remove primary lead wire and rubber grommet as an assembly. On a double breaker distributor, remove the primary lead terminal screw and slide the primary lead off the breaker plate terminal.

(5) Remove the two screws and lockwashers attaching the breaker plate to housing and lift out the breaker plate, points and condenser as an assembly.

(6) Remove the oil wick from the distributor cam. Remove the spring clip from the oil well in cam (Fig. 28) and remove the cam and yoke assembly antirattle spring and spacer.

(7) Clamp the distributor base in a vise equipped with soft jaws and attach the dial indicator to the body of the distributor (Fig. 29) with indicator plunger resting against the distributor shaft.

(8) Hook a spring scale over the shaft and pull on a line with the plunger of the gauge. Apply a 5 pound pull and read movement of the distributor shaft on the indicator. If the side play exceeds .005 inch, replace bushings and/or shaft as follows:

(a) Remove the distributor drive collar retaining pin and slide collar off the end of the shaft.

(b) Use a fine file to clean the burrs from around the pin hole in the shaft and remove the lower thrust washer.

(c) Push shaft up and remove it through the top of the distributor body. Remove the upper thrust washers.

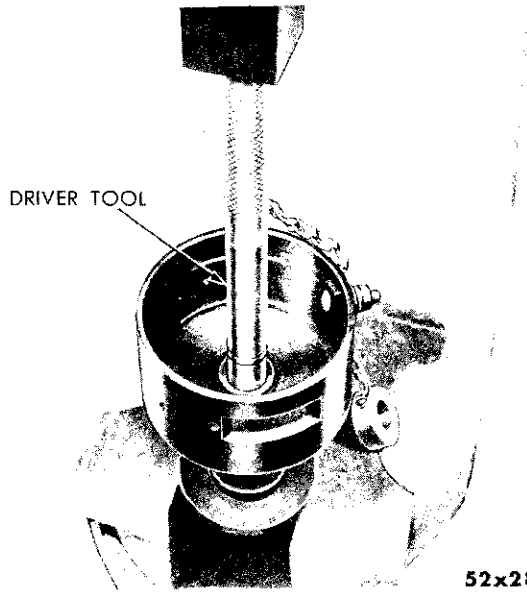


Fig. 30—Removing Drive Shaft Bushings (Typical)

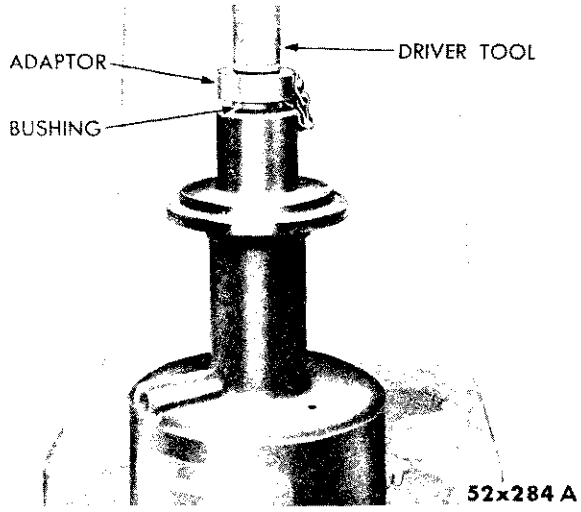


Fig. 32—Installing Lower Bushing (Typical)

(d) Remove the shaft oiler and lift out the oiler wick.

(e) Place the housing in an arbor press and use Driver Tool C-3041 to remove the upper and lower bushings from the bottom of housing (Fig. 30).

(f) Soak the new bushings in light engine oil for approximately 15 minutes.

(g) Position the new upper bushing with slot in bushing up and in line with oil hole in housing, then press the bushing into the distributor housing with Tool C-3041 and adapter (Fig. 31). The bushing will measure .094 inch from the top of housing bore when properly installed. Invert the housing and install the other bushing (Fig. 32) flush with the face of the distributor base.

(h) Insert a 3/32 inch rod through the housing oiler hole to see if the slot in the bushing indexes with the oiler hole in the housing. If the rod cannot be inserted through the housing and the bushing, drill a 1/8" hole through the upper bushing by drilling through the oil wick hole. Remove burrs caused by the drilling operation.

(i) Install the burnishing tool part of C-3041 tool set and force the burnisher through both the bushings (Fig. 33). The correct bushing diameter is .4995 to .5000 inch.

70. ASSEMBLING THE DISTRIBUTOR

(1) Check operation of centrifugal weight and check the weight springs for distortion. Lubricate the governor weights (Fig. 34).

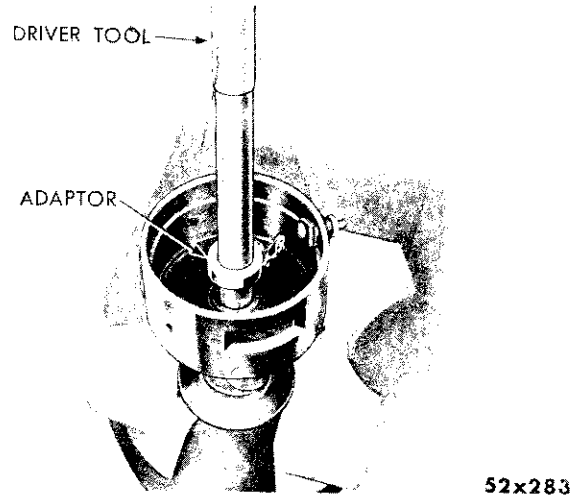


Fig. 31—Installing Upper Bushing (Typical)

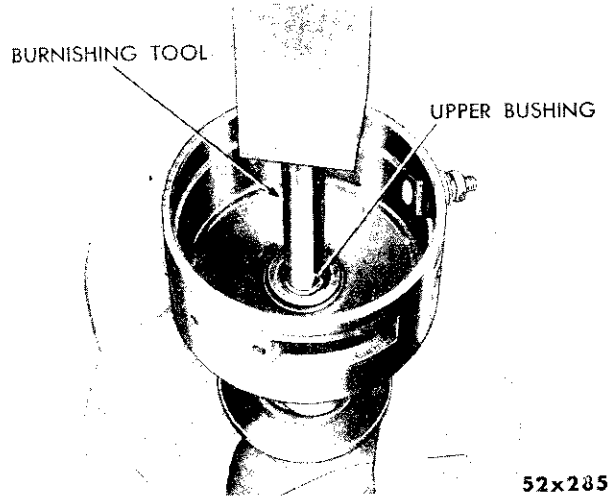


Fig. 33—Burnishing Drive Shaft Bushings (Typical)

(2) Inspect all bearing surfaces and pivot pins for roughness, binding or excessive looseness. Inspect the distributor points for evidence of burning or pitting.

(3) Install the spacer.

(4) Slide the cam and yoke on the distributor shaft, engage the weight lugs with the slots in the yoke (Fig. 35) and position anti-rattle spring. Install the cam retaining spring clip (Fig. 28).

(5) Lubricate and install the upper thrust washers on the shaft and slide the shaft into the distributor body. Position the lower thrust washer and drive the collar on the lower end of the shaft and install the retainer pin.

(6) Install the oiler wick and oiler.

(7) Install the breaker plate assembly, align the condenser lead, breaker point spring, primary lead and install the attaching screw.

(8) Install the distributor cap clamp springs, lockwashers and screws.

(9) Install the felt wick in the top of the distributor cam.

(10) Attach the vacuum control unit arm to the breaker plate advance arm and install the washer and hairpin clip. Install the vacuum unit attaching washers and screws.

(11) Check the spring tension, and adjust the contact gap.

(12) Lubricate the felt pad in the top of the distributor cap with 3 to 5 drops of light engine oil and install the rotor.

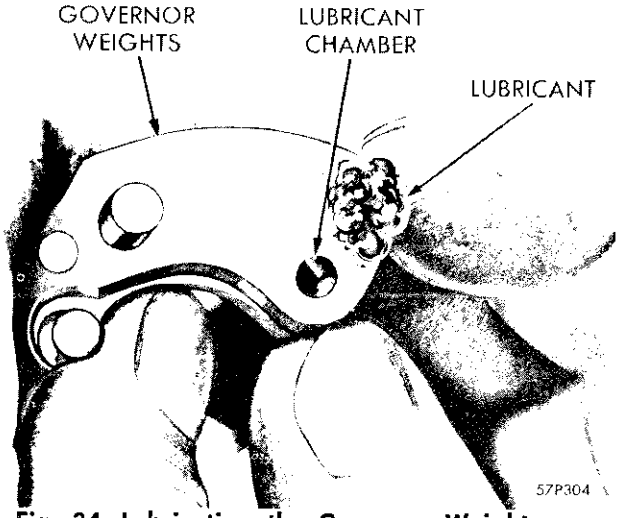


Fig. 34—Lubricating the Governor Weight

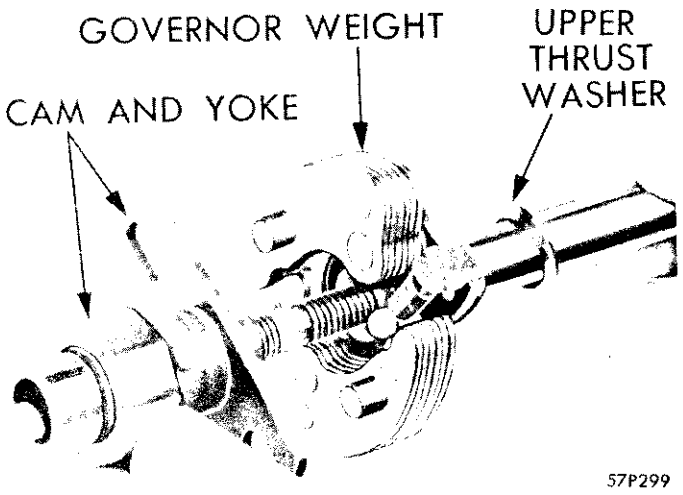


Fig. 35—Distributor Shaft Assembly

71. TESTING BREAKER ARM SPRING TENSION

(1) Hook a spring scale Tool MTU-36 on the breaker arm and pull in a straight line at right angles to the point surfaces (Fig. 36). Take a reading as the points start to separate. The spring tension should be 17 to 21.5 ounces. If not, loosen the screw which holds the end of the point spring and slide the end of the spring in or out as necessary. DO NOT pull conductor ribbon tight against the spring as this will cause the ribbon to fatigue and break. Retighten the screw and recheck the spring tension.

72. INSTALLING AND ALIGNING CONTACT POINTS

(1) Remove the old contact points and install a new set.

NOTE: Touching the contact point faces with fingers during installation will cause burning of points during operation.

(2) Align the contacts to provide center contact by bending the stationary contact bracket only. Grip bracket next to the contact and bend it away from the breaker arm and then bend it back to vertical and check alignment. It may be necessary to repeat bending process several times to provide perfect

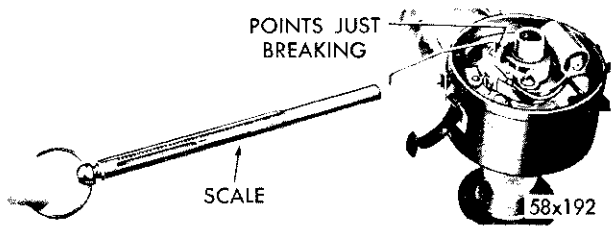


Fig. 36—Testing Breaker Arm Spring Tension

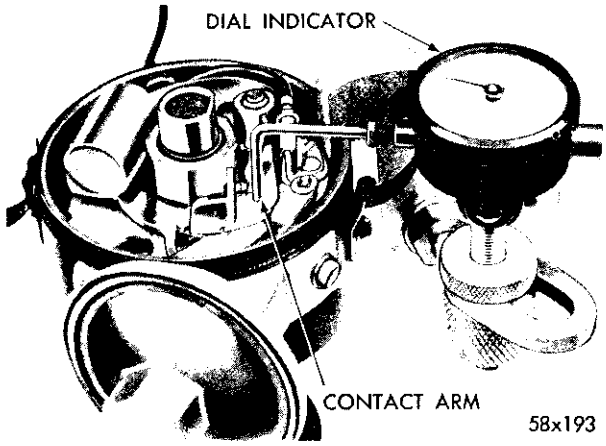


Fig. 37—Checking Point Clearance with Indicator

alignment which is necessary for efficient ignition and good contact life. **Never bend** movable arm to obtain alignment.

(3) After aligning the points, readjust the point clearance to the specifications using a dial indicator (Fig. 37).

(4) Check the dwell angle to show proper degree of closure. See Paragraph 65, "Distributor Point Dwell". The lock screw should be loosened just enough so that the stationary point can be moved with a slight drag; otherwise, it will be difficult to set the points accurately. After setting the points to correct the clearance, tighten the lock screw.

73. DISTRIBUTOR LUBRICATION

(1) Add 3 to 5 drops of SAE 10-W oil to the oiler on the outside of distributor base.

(2) Lubricate the felt pad under the rotor in the top of the distributor cam with 3 to 5 drops of SAE 10-W oil.

(3) Add a drop of oil to the breaker arm pivot pin. Operate the arm several times to allow the oil to penetrate, then wipe away the excess oil.

(4) Apply a light film of distributor cam grease to the surface of the breaker cam. **Do not overlubricate, keep oil and grease away from breaker points.**

74. CHECKING DISTRIBUTOR ADVANCE

a. Automatic Advance Curve

Check the model number on the identification plate of the distributor and refer to the specifications before making this test.

Mount the distributor assembly (less cap) in a reliable stroboscope type distributor tester and proceed with tests as follows:

(1) Install the vacuum adapter fitting in diaphragm housing and attach the tester vacuum pump hose to fitting.

(2) Turn the Tach-Dwell switch to the proper lobe position and the Motor Switch to proper rotation corresponding to the distributor being tested. Refer to "Distributor Advance Specifications" in this manual.

(3) Turn the battery switch "ON".

(4) Adjust the tester speed control to operate the distributor at 200 distributor r.p.m.

(5) Hold the distributor breaker plate in the full retard position and aline the "O" distributor tester degree ring with any one of the arrow flashes.

(6) Adjust the tester speed control to operate the distributor at speeds called for under "Specifications" and observe arrow flashes opposite tester degree ring to determine degrees of advance.

(7) If the advance is not according to specifications, corrections can be made by bending the primary and secondary spring tabs to increase or decrease the spring tension. The governor spring tabs can be reached through the access hole at the breaker plate. Rotate the shaft until the proper spring and tab lines up with the access holes. Insert a screwdriver blade through the access hole and bend the spring tab toward the distributor cam to decrease spring tension and advance the spark, or away from the distributor cam to increase the spring tension and retard the spark.

b. Vacuum Diaphragm Leak Test

With the distributor mounted in distributor tester and with the diaphragm housing attached to the distributor, make sure the diaphragm spring retaining nut and gasket are properly tightened, then proceed as follows:

(1) Install the vacuum adjuster fitting in the diaphragm housing and turn the distributor tester vacuum pump on.

(2) Place thumb over the end of the vacuum pump hose and adjust the regulator control knob to give a reading 20 inches with hose closed off to insure tester hose does not leak.

(3) Attach the vacuum pump hose to the adapter fitting on the diaphragm housing. The vacuum gauge should hold on maximum vacuum obtainable if no leaks exist.

(4) Observe breaker plate while performing the leak test to check response of breaker plate to vac-

uum advance. There should be instant response to the pull of the diaphragm, moving the plate without a drag or bind.

(5) If leakage is indicated, replace the nut and gasket and retest. If leakage is indicated, replace the diaphragm housing assembly.

c. Vacuum Advance Curve

Perform operations 1 through 5 under "Automatic Advance Curve" and proceed as follows:

(1) Turn the tester vacuum pump "ON". Adjust the vacuum pump regulator to vacuum test specifications. See "Specifications" and observe the arrow flashes on the tester degree ring to determine the degrees of advance.

(2) Adjust the vacuum advance unit by removing the diaphragm spring retainer nut and gasket and add or subtract the spring shim washers as required. If the spark advance is below specifications, remove washers, if higher, add washers.

75. INSTALLATION OF DISTRIBUTOR

(1) Position the distributor on engine. Align the rotor with marks previously scribed on the distributor housing.

(2) Engage the tongue of the distributor shaft with the slot in the distributor and the oil pump drive gear.

NOTE: If the engine has been cranked while the distributor is removed, it will be necessary to establish the proper relatonship between the distributor shaft and the No. 1 piston position as follows:

(3) Rotate the crankshaft until the number one distributor is at top of the compression stroke.

(4) Rotate the rotor to the position of the number one distributor cap terminal.

(5) Lower the distributor into the opening and install the primary terminal lead, distributor cap (make sure all high tension wires "snap" firmly in the cap towers), and distributor hold down clamp nut. Tighten the nut finger tight.

(4) Connect the secondary lead of a Power Timing Light to the No. 1 spark plug, the red primary lead to the positive terminal of the battery and the black primary lead to the negative battery terminal.

(5) Start the engine. Idle the engine at a slow idle. Rotate the distributor housing so that the specified timing mark and the pointer are in alignment. (Moving the distributor housing against the shaft rotation advances the timing and with shaft rotation retards the timing.

(6) Tighten the distributor clamp screw after the timing has been set and recheck the timing adjustment with a Power Timing Light.

(7) If the timing is correct, reconnect the vacuum lead to the distributor and remove the timing light from the engine.

76. SPARK PLUGS

Cleaning and Inspection

Remove the spark plugs. Examine the firing ends of the plugs for evidence of oil fouling, gas fouling, burned or overheating conditions. Clean and reset the gaps to .035 inch.

Oil fouling is usually identified by wet, sludgy deposits caused by excessive oil consumption.

Gas fouling is usually identified by dry, black, fluffy deposits caused by incomplete combustion.

Burned or overheated spark plugs are usually identified by a white, burned or blistered insulator nose and badly burned electrodes. Improper fuel, inefficient cooling or improper ignition timing normally are the cause.

Normal conditions are usually identified by white powdery deposits or rusty-brown to grayish-tan powdery deposits.

NOTE: When installing the spark plugs, tighten to 30 foot pounds torque.

The high tension cables should be kept clean and checked for cracked insulation and loose terminals.

77. IGNITION COIL

The ignition coil is designed to operate with an external ballast resistor. When testing the coil for output, include the resistor in tests.

Check the coil for external leaks and arcing. Always make two tests, when checking the coil. One when coil is cold, the other after coil has been warmed up.

To check the high tension circuit, pull the secondary cable out of the distributor cap. Hold the end of the cable about ¼ of an inch away from the cylinder head and crank engine with the ignition switch on. If the spark jumps the ¼ inch gap, the coil can be considered satisfactory.

LIGHTING SYSTEM

78. DUAL HEADLAMPS

The dual headlamp system consists of four sealed beam headlamps. Two headlamps are mounted in each front fender side by side in a horizontal position (Fig. 38).

The two outboard lamps are of the two filament type for low and high beam and are marked by a numeral 2 moulded in the lamp lens.

The two inboard lamps have only one filament and are marked with a numeral 1 molded in the glass.

The lamps cannot be installed wrong, as the number 1 lamps have a two blade terminal connector and the number 2 lamp has a three blade terminal connector, with a wider spacing than the two blade terminal connector.

The number 1 lamp provides the high intensity "reach" down the highway and the off focus filament in the number 2 lamp provides the "body" light which illuminates the side of the road, ditches, etc.

79. AIMING THE HEADLIGHTS

a. Pre-Aiming Instructions

(1) Check dimmer switch for faulty operation.

(2) Check high beam indicator — indicates that high beam is in operation when lighted.

(3) Check for badly rusted or defective headlamp assemblies. These must be corrected before a satisfactory adjustment can be made.

(4) Place vehicle on a level floor.

(5) Check front suspension height. Adjust to specifications as necessary.

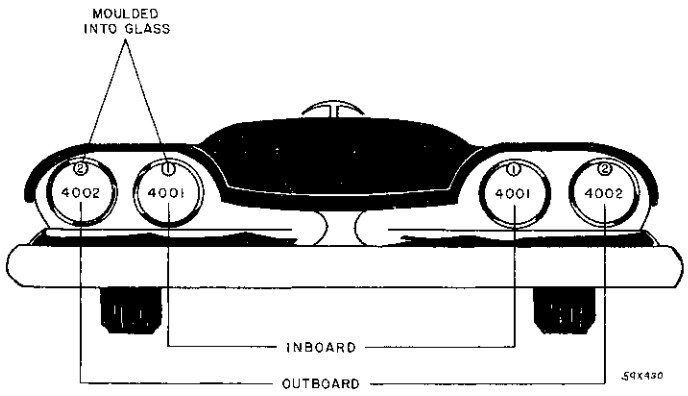


Fig. 38—Headlamp Arrangement (Typical)

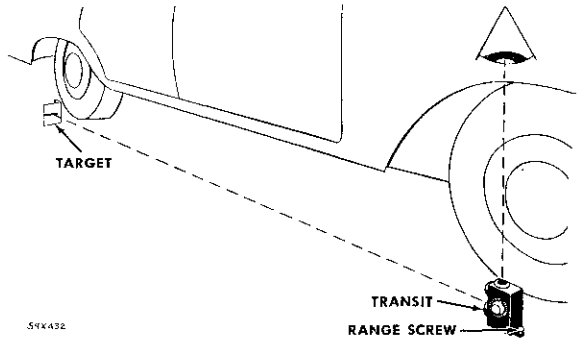


Fig. 39—Determining Slope of Floor (Typical)

(6) Check tire inflation.

(7) Rock vehicle sideways to allow vehicle to assume its normal position.

(8) If gasoline tank is not full, place a weight in the trunk of vehicle to simulate the weight of the gasoline normally carried in the tank (6¼ pounds per gallon).

(9) There should be no other load in the vehicle other than the driver or a substituted weight of approximately 150 pounds placed in the driver's position.

(10) Remove headlamp front trim panel. Do not remove the seal beam retainer rims.

(11) Thoroughly clean headlamp lenses.

(12) Check aimer calibration (Paragraph 82).

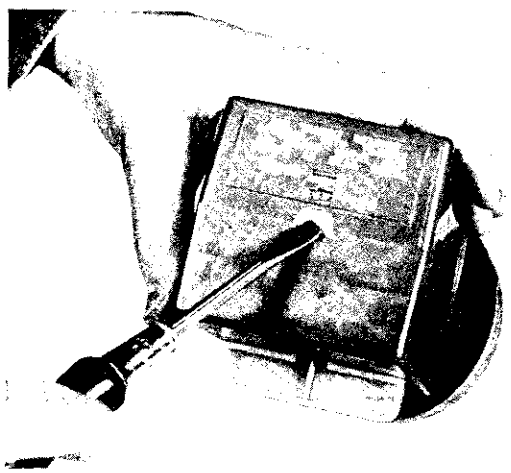


Fig. 40—Adjusting Floor Level Compensators

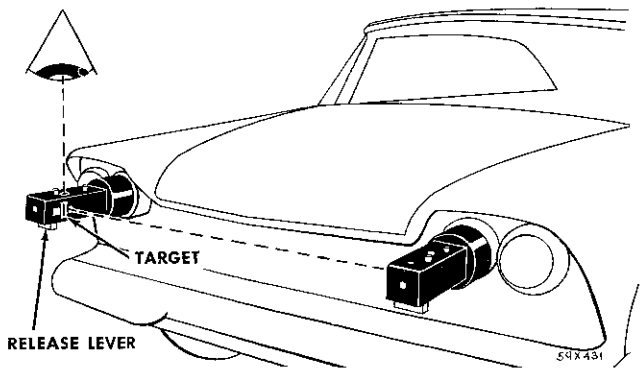


Fig. 41—Mounting and Adjusting Aimers (Typical)

b. Compensating and Mounting the Aimers

(1) For mechanical aim the slope of the floor should be known.

(2) Place transit on floor in line with vertical center line of the right front wheel (Fig. 39). Place split image target in like position at right rear wheel.

(3) Adjust range screw on transit until target split image coincides or merges into one unbroken line.

NOTE: Make sure that line of sight is perpendicular from the eye to the viewing port of the transit and that target image is centered in viewing port of transit.

(4) Turn dial on side of transit until bubble in spirit level is centered.

(5) When bubble is centered, note "plus" or "minus" reading on compensator scale. This figure indicates the degree of slope of the floor and must be transferred to each aimer as follows:

(6) With a screwdriver, turn adjusting slot of floor lever compensator in each aimer, until the correct plus or minus figure (or fractional part) appears in the proper window (Fig. 40).

c. Mounting and Adjusting the Aimers (Fig. 41)

(1) While holding an aimer in alignment with the lens of one outboard headlamp, bring aimer up to and against headlamp lens.

NOTE: Make certain that the headlamp lens pads are making full contact with the aimer mounting flange and that the aimer target is facing inboard.

(2) Push the release lever forward (to expel air from suction cup) and while holding the aimer firmly against the headlight aiming pads, slowly pull the release lever back until the spring lock engages in the slot.

(3) Mount the second aimer on the other outboard headlamp, in the same manner.

(4) On each aimer, set pointer to numeral 2 on the DOWN side of the DOWN UP scale.

(5) On each aimer position the pointer of the RIGHT LEFT scale at ZERO.

80. CHECKING HEADLAMP AIM

Follow the instructions as outlined in Paragraphs 79A and 79B and proceed as follows:

NOTE: Do not remove the headlamp rims.

a. Horizontal Check

Turn the RIGHT LEFT scale knob until the split image is in alignment. If the RIGHT or LEFT portion of scale exceeds the following values, the lamps should be aimed.

Values given represent inches at 25 feet.

	RIGHT	LEFT
No. 1 UNIT	4	4
No. 2 UNIT	4	0

b. Vertical Check

Turn DOWN-UP scale knob until the spirit level is centered. If DOWN or UP portion of the scale exceeds the following values, the lamps should be aimed.

	DOWN	UP
No. 1 UNIT	½ to 3½	0
No. 2 UNIT	½ to 3½	0

81. ADJUSTING THE HEADLAMPS (Fig. 42)

Horizontal Adjustment

(1) With the pointer of RIGHT-LEFT Scale still set at ZERO, sight through the aimer viewing port.

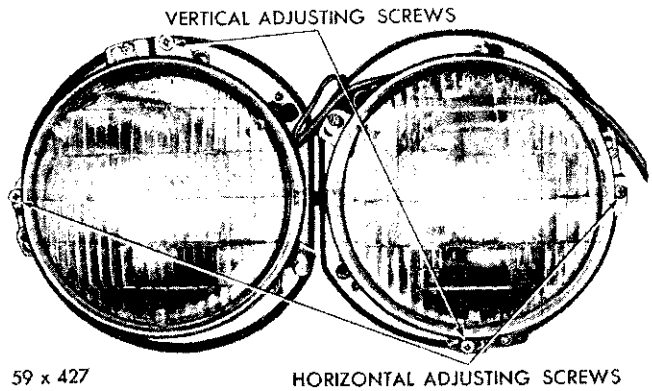


Fig. 42—Adjusting Headlamps (Typical)

Make sure that the line of sight is perpendicular from the eye to the viewing port of the aimer and that the target image is centered in the viewing port of the aimer.

(2) While sighting through the viewing port of the aimer, turn the horizontal adjusting screw on the headlamp until the split image target line merges into one unbroken line. **To remove backlash, be sure to make a final adjustment by turning headlamp horizontal adjusting screw in a clockwise direction.**

(3) Make the horizontal adjustment on the other **outboard** headlamp in the same manner.

(4) Remove aimers, from the outboard headlamps, by releasing the spring lock at the rear (bottom) of the aimer and pushing the release lever forward. **Do not attempt to remove the aimers by pulling them away from the headlamp lens—slide the suction cup downward and away from the lens.**

Vertical Adjustment

(1) Turn vertical adjusting screw on headlamp in a counter-clockwise direction to bring the bubble of the spirit level on the aimer to car side of center. Use care to avoid disturbing the installed position of the aimers. Then turn the screw clockwise until the bubble is centered for correct aim and elimination of backlash.

(2) Make the vertical adjustment on the other **outboard** unit in some manner.

(3) Recheck the target alignment on each side and readjust the horizontal aim, if necessary.

Proceed to adjust the inboard units by following the instructions as outlined for the outboard headlamps. Install headlamp trim panels.

82. CHECKING AIMER FOR CALIBRATION (Fig. 43)

(1) Using a carpenter or stone mason level of known accuracy, locate a true vertical plate glass window or smooth surface.

(2) Set DOWN-UP pointer on DOWN 2.

(3) Set RIGHT-LEFT pointer and floor level compensator at "O".

(4) Secure aimers to glass or smooth surface three

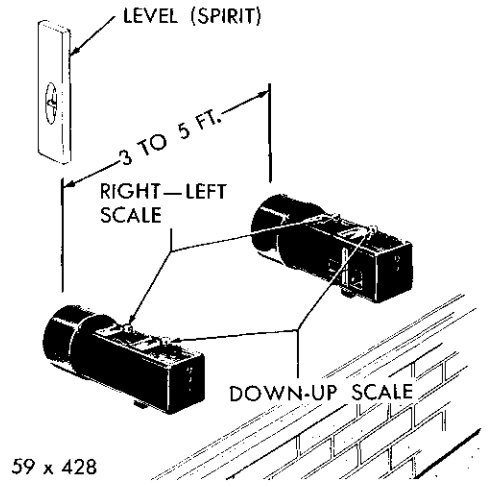


Fig. 43—Checking Aimer for Calibration

to five feet apart so that split image targets can be located in the viewing ports.

(5) If bubble is centered in vial, vertical calibration is correct. If bubble is not centered, make the down-up adjustment by rotating the level adjusting screw until the bubble is centered in the spirit level.

(6) The horizontal aim is correct if the targets on opposite aimers are aligned in viewing ports. If targets are not aligned in viewing ports, rotate mirror adjusting screw until target split image becomes aligned.

83. HEADLAMP SEALED-BEAM REPLACEMENT

Lens, filament and reflector are sealed into one unit which can be removed as follows:

(1) Remove the screws from the headlamp panel and remove the panel.

(2) Remove screw from interior retaining ring, and remove the ring.

NOTE: Do not disturb the headlight aiming screws.

(3) Pull out the sealed-beam unit and unplug the connector, pulling it straight off.

(4) Install new sealed-beam unit.

(5) Install unit retaining ring and headlamp panel.

NOTE: Each lamp in the dual headlight assembly can be removed in the above manner.

WINDSHIELD WIPERS

SERVICE DIAGNOSIS

84. WIPER OPERATES SLOWLY

a. High resistance in brush to commutator contact, or carbon deposits in slots. Check armature commutator and brushes.

b. High resistance in ground connection. Check for high resistance in ground connection and/or wiring circuit.

c. Defective control switch.

85. WIPER FAILS TO OPERATE

a. Binding linkage.

b. Defective switch. Test for defective switch by connecting a jumper wire from the ignition switch terminal post to the windshield wiper motor terminal (A) on switch.

c. Defective motor.

d. Open or grounded wiring.

86. WIPER BLADES NOT PARKING PROPERLY

a. Parking switch out of adjustment.

b. Broken link spring.

c. Link spring not releasing.

d. Link spring not engaging stop on linkage.

87. BLADES SLAP WINDSHIELD MOULDINGS

a. Improperly installed link spring trip.

b. Alignment of motor and pivots.

88. BLADES CHATTER

a. Twisted arm. **Do not attempt to straighten bent or twisted arm.**

b. Wrong type blades used.

c. Wax on glass.

89. MOTOR WILL NOT PARK

a. Follower pin in parking switch plate may be too short.

b. Parking spring in the parking switch plate is bent too low and is not breaking contact.

c. Contact spring leaf on the parking switch plate is distorted, causing excessive tension and not breaking contact.

d. Dirty or worn contact points.

SERVICE PROCEDURES

The constant control wiper motor (Fig. 44) is connected to the wiper switch and from the wiper switch "B" terminal to the "ACC" accessory terminal of the ignition-starter switch so that the wiper motor is actuated only when the ignition switch key is turned to the right or left position. The variable speed wiper motor (Fig. 44 and Fig. 45) is connected from the motor to the switch and from a circuit breaker to the ignition switch. Refer to the "Wiring Diagrams" at the back of this Electrical Group. The constant speed motor is protected by a circuit breaker built into the wiper switch. The variable speed motor is protected by a circuit breaker which is attached to the "B" terminal of the switch.

The variable speed motor has an "off glass parking" feature which is accomplished by reversing the motor and the use of parking cams at the pivot pins of the intermediate crank arm. When the switch is turned to the "off" position, the motor reverses direction and at the same time the parking cams rotate 180 degrees, lengthening the linkage slightly to park the blades against the windshield moulding. The linkage shortens when the motor runs in the wiping direction.

90. WIPER BLADE ADJUSTMENT

To properly position wiper blades, adjust the parking cam at the motor switch plate so that the blades park as low as possible. Loosen the blade arms at the pivots. Position the blades against the windshield moulding on variable speed motors and tighten pivot attaching nuts. Position blades of constant speed motors one inch from the windshield moulding.

91. WINDSHIELD WIPER REMOVAL

(1) Remove the glove compartment door.

(2) Remove the glove compartment.

(3) Remove the bolts attaching the wiper motor bracket to the cowl panel to the instrument panel brace.

(4) Disconnect the wires at the wiper motor.

(5) Disconnect the links at the pivot cranks. Clips are removed by lifting the top tab and sliding it sideways out of engagement with the groove in the pivot crank pin.

(6) Remove the spacing washer and remove the link from the pivot crank.

(7) Slide the complete wiper with the links far enough towards the left so that the right hand link will clear the glove compartment opening in the instrument panel and remove assembly, as shown in Figure 46. Use care so as not to bend the links.

92. DISASSEMBLY OF LINKS

CAUTION

Wiper motor should be operated and shut off by turning off the ignition key. The motor must not be disassembled when the cranks are in the parked position or damage to the motor switch and contact follower will occur when the cover is removed.

NOTE: When the switch plate on variable speed motors is removed, position the crank arm 180 degrees from the park position. This is done to disengage the spring follower from the tang on the switch plate.

(1) Remove the clip holding the left-hand link to the crank arm.

(2) Remove the bevel washers and link.

(3) Remove the parking cam and spring release.

(4) Remove the coil spring by spreading the ends.

(5) Disassemble the right-hand link in the same manner after removing crank arm to lever nut, spacing washers between the link crank arm and lever.

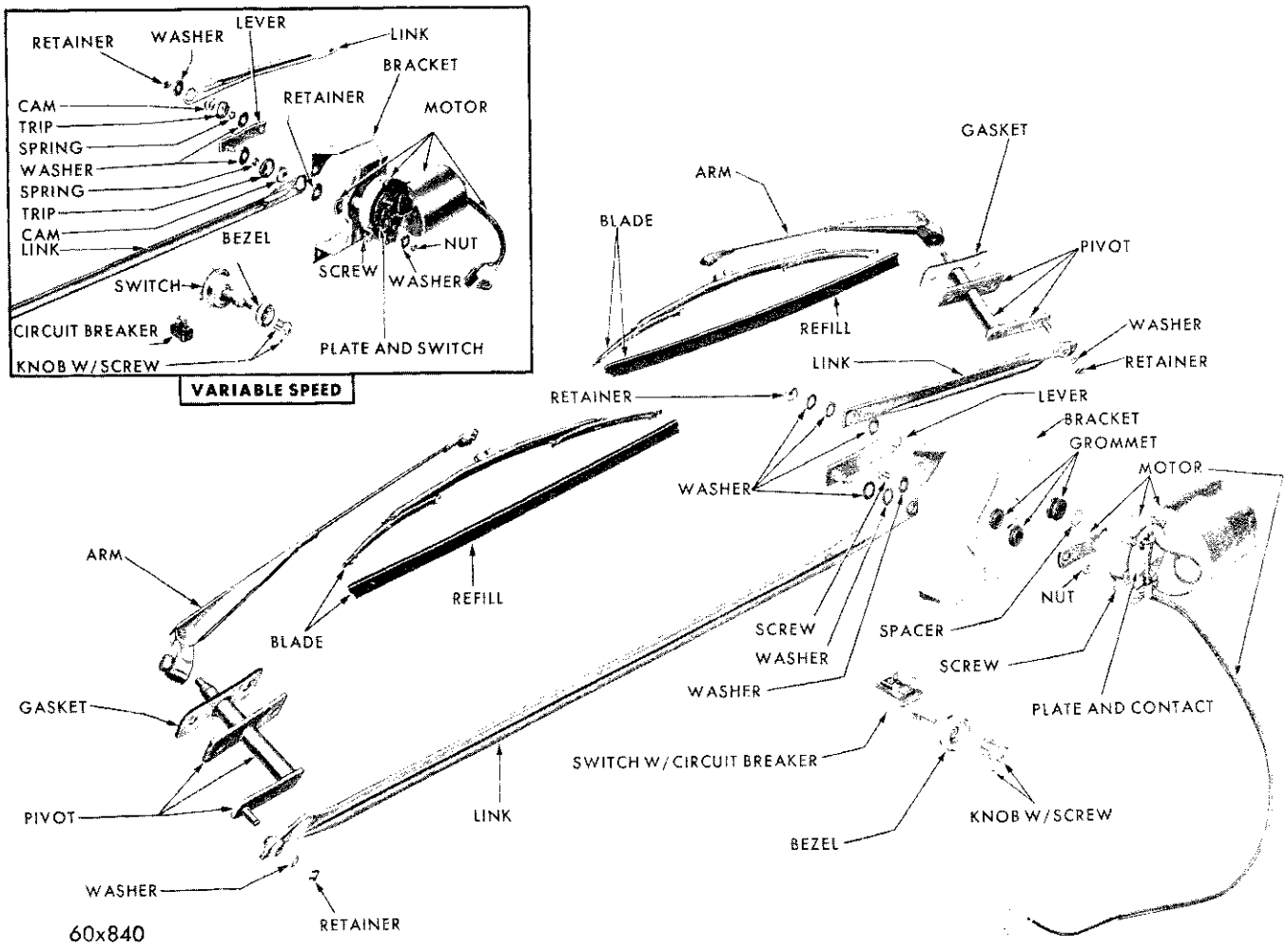


Fig. 44—Windshield Wiper (Variable and Constant Speed) (Disassembled)

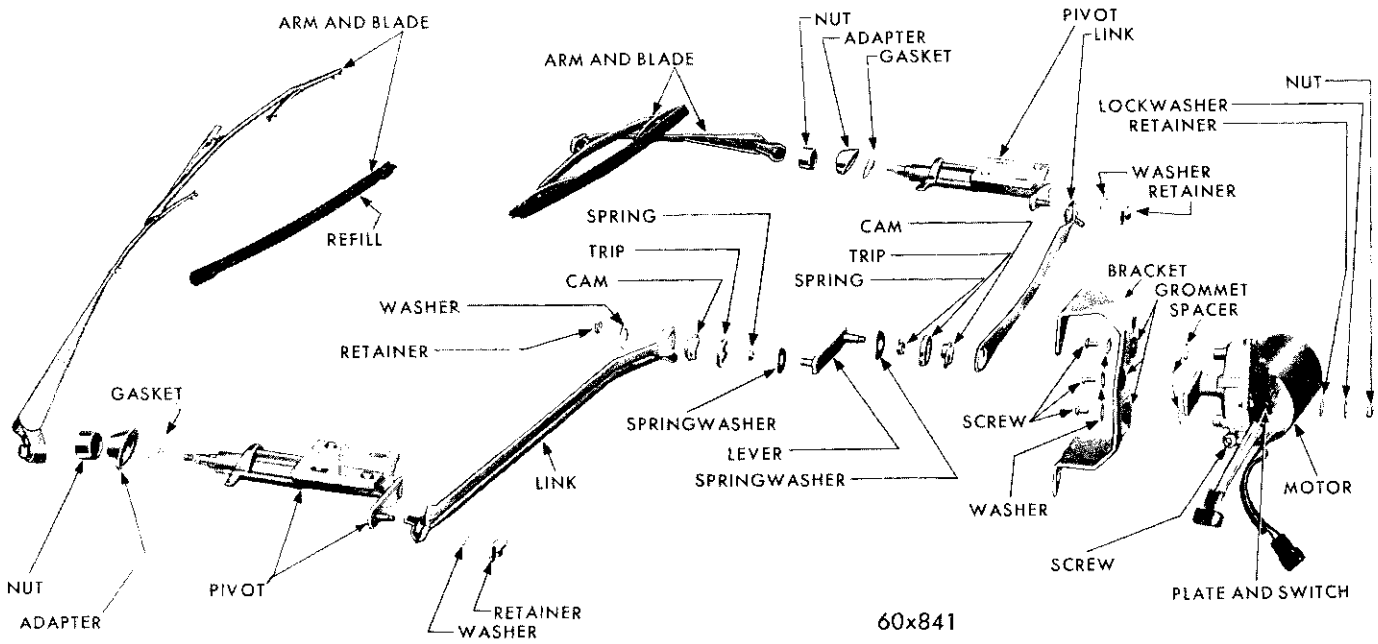


Fig. 45—Windshield Wiper (Disassembled) (Imperial Only)

93. DISASSEMBLY OF WIPER MOTOR

a. Constant Speed Motor (If So Equipped)

(1) Remove the switch plate first.

(2) Remove motor crank nut, washers and motor crank arm.

(3) Lift out nylon gear.

(4) Remove end head through bolts and carefully pull off end head.

(5) Armature can then be removed.

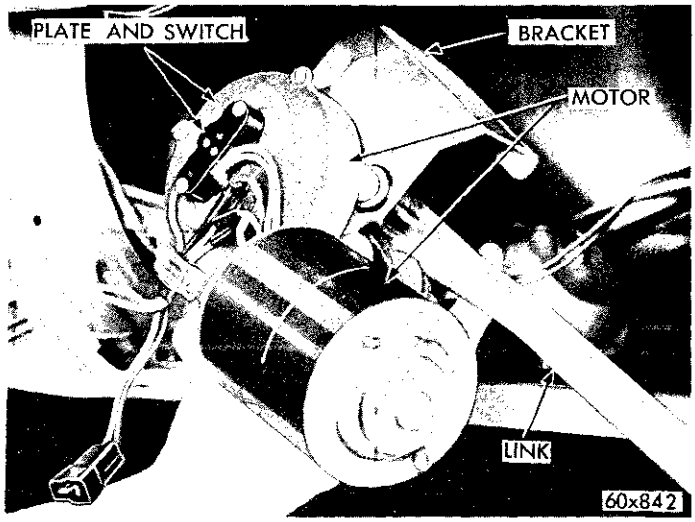


Fig. 46—Removing Windshield Wiper Motor and Link Assembly (Typical)

b. Variable Speed Motor

(1) Remove the end head through bolts and pull out the end head using care so as not to break the lead wire to the brush holder.

(2) Remove the switch plate and the cover screws.

(3) Rotate the armature in reverse so that the tang in the switch plate will disengage the gear follower to permit removal of the plate assembly.

(4) Remove the crank arm nut, washers, crank arm, gear and armature in that order.

94. INSPECTION

(1) Thoroughly inspect the motor parts for wear, corrosion or damage.

(2) Clean the armature commutator with 00 or 000 sandpaper or if necessary, turn down the commutator.

(3) Replace worn or oil soaked brushes.

(4) Check the armature and crankshaft in their respective bushings and replace worn parts if any looseness is detected. The end play in the armature shaft is controlled by a thin thrust washer in the end plate.

(5) Inspect the gears for worn or broken teeth and replace those showing damage or excessive wear.

(6) Be sure that the parking switch contact is clean and dry.

95. REFACING COMMUTATOR

If the armature commutator is rough or out of round, burned or the bakelite material is even with or extends above the surface of the commutator bars, the commutator should be turned down. Remove only enough metal to provide a clean smooth surface. Operation can be performed on a suitable lathe or by using Tool C-770, as shown in Figure 47.

96. UNDERCUTTING BAKELITE

Undercut the bakelite segments to a depth of 1/16 inch, using Tool C-770 with special blade SP-839, as shown in Figure 48. Be sure to undercut the bakelite squarely. After undercutting, polish the commutator with 00 or 000 sandpaper to remove burred edges.

CAUTION

Be sure the commutator is clean and free from oil or grease. A dirty, greasy commutator will cause a high resistance and greatly impair the efficiency of the wiper.

97. WINDSHIELD WIPER SWITCH

a. Constant Speed Motor (If So Equipped)

The switch contains a built in circuit breaker to protect the motor and is serviced only as an assembly. To test the switch, refer to the proper wiring diagram at the back of the "Electrical Group", disconnect the lead wires and remove the switch from the instrument panel. Connect a test lamp between "B" terminal of the switch and the negative battery post. Connect a jumper wire from the positive battery terminal to the "P" terminal of the switch. The lamp should light when the switch is in the "off" position and go out when the switch is turned to the "on" position.

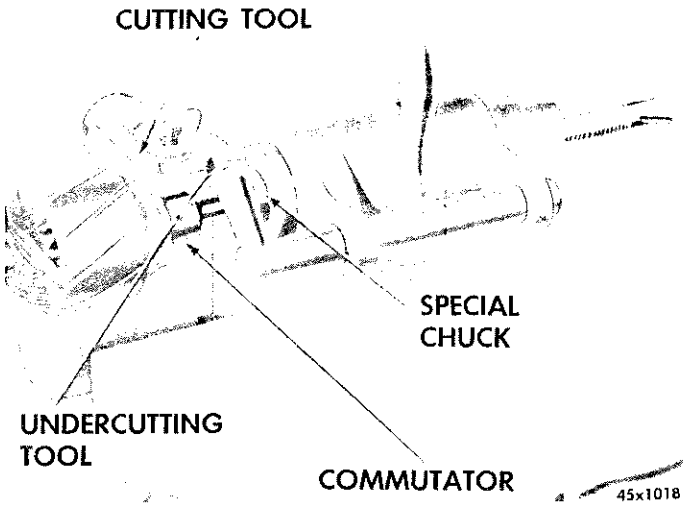


Fig. 48—Undercutting Commutator Segments

Connect the positive battery to the "R" terminal of the switch. The lamp should light when the switch is turned "on" and go out when turned "off".

b. Variable Speed Motor

The switch contains a bar resistance plate which provides a means of controlling the amount of current flow to the motor field as the switch control shaft is rotated. In addition, the switch is designed to provide a circuit to the motor to reverse the direction of the current to the field winding thus providing a means of reversing the armature. A replaceable circuit breaker is attached to the "B" terminal of the switch to protect the motor.

To test the switch, refer to the proper wiring diagram at the back of the "Electrical Group", disconnect the lead wires and remove the switch. Connect a wire from the battery positive terminal to the case

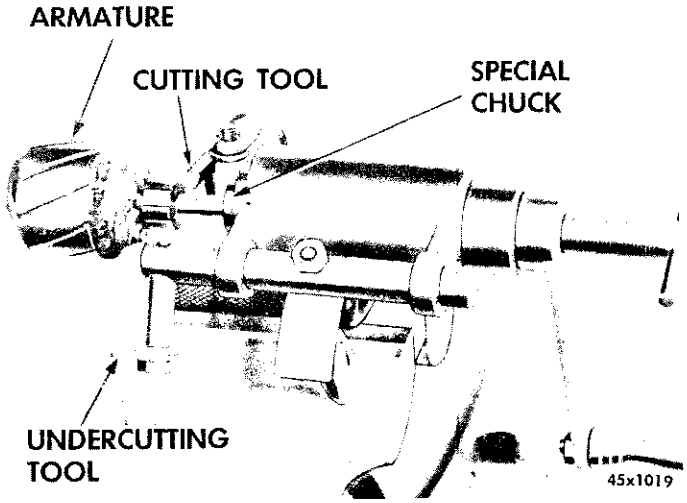


Fig. 47—Refacing Commutator

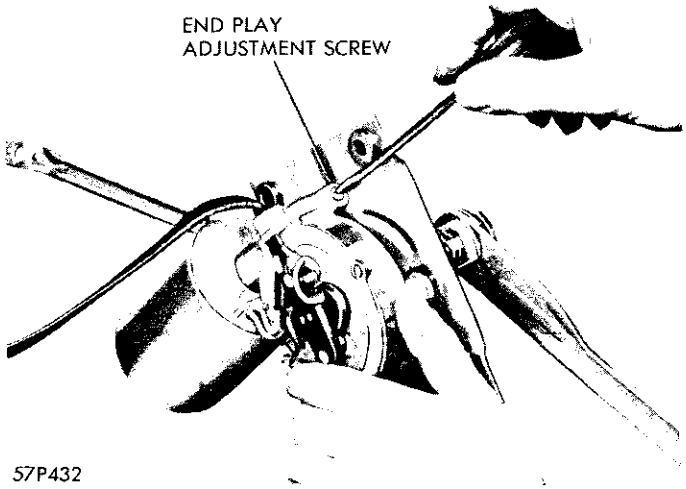


Fig. 49—End Play Adjustment

of the switch and another wire from the battery positive terminal to the "FI" terminal of the switch. Connect a test lamp between the battery negative terminal and the "B" terminal of the switch. Lamp should light when switch is turned on and gradually dim as switch is rotated clockwise. Lamp should go out when switch is turned "off". The switch is serviced only as an assembly.

98. END PLAY ADJUSTMENT

To adjust the armature shaft end play turn the adjustment screw in until it bottoms and back off ¼ turn (Fig. 49).

99. BENCH TESTING MOTOR

Before bench testing a motor, the lead wires should be inspected for opens or shorts, and for poor connections at the switch plate. Inspect and clean if required for the breaker points on the variable speed motor. Use fine grade sandpaper across the contact points.

a. Constant Speed Motor (If So Equipped)

Connect the battery positive terminal to the wiper motor ground strap. Connect the black and blue wires of the motor to the negative battery terminal. Motor should continue to run. Remove black wire with blue connected. The motor should park.

b. Variable Speed Motor

Connect the yellow wire to the motor ground strap. Connect the battery positive terminal to the motor ground strap. Connect the red and black wires to the battery negative terminal. The motor should run in the wipe direction.

To park the motor, connect the blue and yellow wire to the battery negative terminal. Connect the battery positive terminal to the motor ground strap. Connect the red wire to the motor ground strap. Momentarily touch the black wire to the yellow and blue wire. The motor should park.

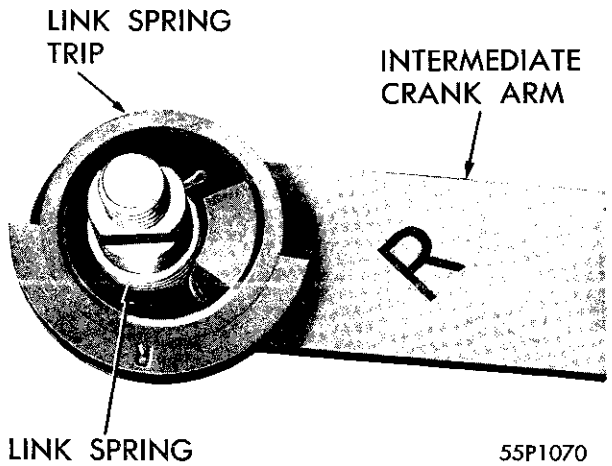


Fig. 50—Link Spring Trip Installed (Variable Speed Motor)

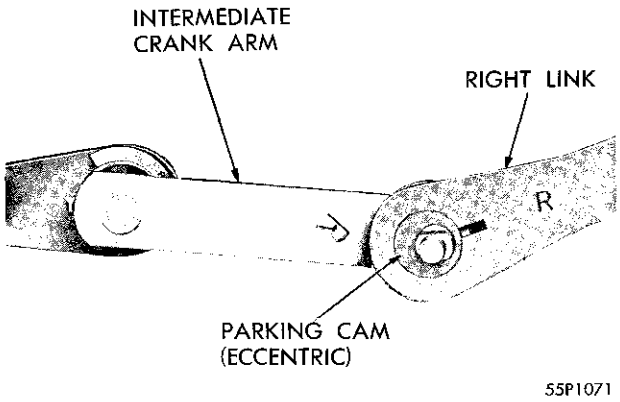


Fig. 51—Link Arm Installed (Variable Speed Motor)

100. ASSEMBLY OF WIPER MOTOR

Make sure the gear box is ½ full of long fibre grease.

Correct indexing of the contact plate (constant speed motor) or the contact follower (variable speed motor) on the nylon gear is important. After the armature, nylon gear, and crank arm are installed, index the contact plate (constant speed motor) on the nylon gear with the slot pointing in the same direction as the motor crank arm. Install the contact follower (variable speed motor) with open end pointing in same direction as motor crank arm.

101. ASSEMBLY OF WIPER LINK

Install spring washer, concave surface toward crank arm. Install the crank pivot coil spring on the pivot (springs are not interchangeable). Install the spring release (releases are not interchangeable).

Install parking cam to index with spring release and engage spring ends, between the release and parking cam in the openings at point of index (Fig. 50).

The face of the cams marked "L" and "R" must be away from the links when installed. When assembling to the left link the "L" on the left crank and on the parking cam should be seen. The cam marked "R" is installed in the same manner.

Install the spring washer, convex surface toward the cam assembly. Install the link arm with the stop projection on the link arm toward the cam assembly. Install the retaining bolt and nut (Fig. 51). Assemble the left link and cam assembly in the same manner locking in place with a clip.

102. REPLACING WIPER PIVOT

Remove the wiper blade. Disconnect the link from the pivot. Remove the pivot retaining plate pivot and gasket.

Install a new gasket and pivot. Install the retaining plate. Install the Belleville washer so the convex surface is against the head of the bolt.

Tighten the retaining bolts to 75 foot pounds torque. Install the wiper blade.

103. WINDSHIELD WIPER MOTOR INSTALLATION

(1) Enter the wiper motor, bracket and links through the glove box opening and attach the link arms to the pivot crank pins.

(2) Install the spring washer and lock clips on the crank pins.

(3) Position the mounting gasket and install the wiper motor and bracket attaching bolts. Tighten the bolts to 25 foot pounds torque.

(4) Adjust the wiper parking position by moving the cam adjustment lever which projects from the switch cover.

(5) Connect the wires at the wiper motor.

(6) Install the glove compartment and the compartment door.

HORNS

SERVICE DIAGNOSIS

104. HORNS WILL NOT BLOW

a. Improper adjustment.

b. Broken or faulty wiring.

c. Faulty horn relay.

105. HORNS BLOW CONTINUOUSLY

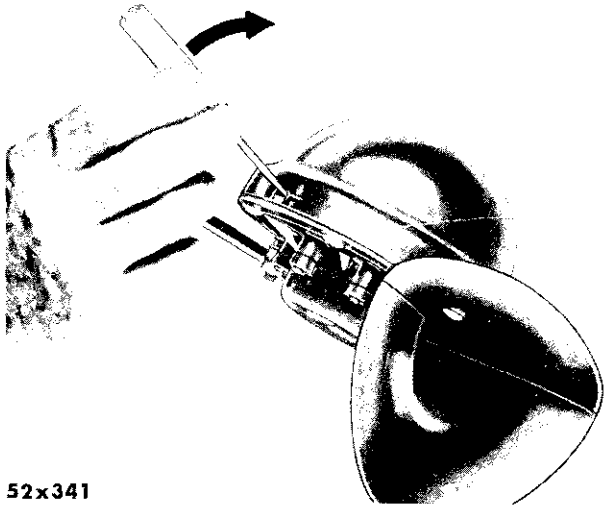
a. Shorted wiring.

b. Grounded horn button.

SERVICE PROCEDURES

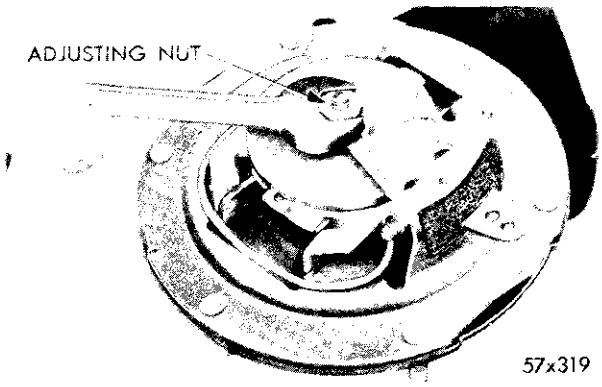
106. TESTING (ALL MODELS)

Touch a jumper wire from the relay "SW" terminal to a ground. If the horn blows, difficulty is in the horn button contact ring or in the wire from "SW" terminal to the horn button. If the horns fail to blow, connect a jumper wire from "B" to "H" terminal. If the horns operate, the relay is faulty. If the horns fail to operate, difficulty is in the wire to the horns, in the horns or wire to the horn relay "B" terminal.



52x341

Fig. 52—Removing Cover — Horn "A" (Typical)



57x319

Fig. 53—Adjusting Horn "A" (Typical)

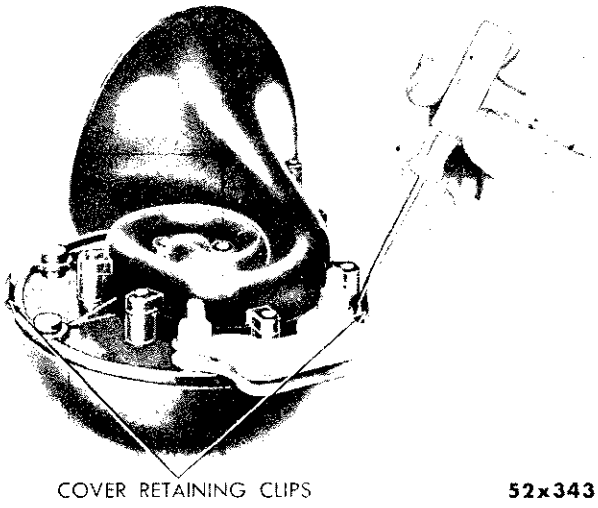


Fig. 54—Removing Cover — Horn "B" (Typical)

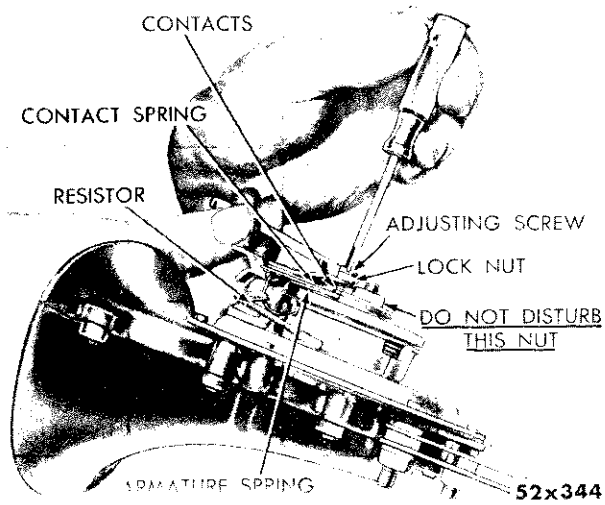


Fig. 55—Adjusting Horn "B" (Typical)

107. ADJUSTING

Horns "A" and "B"

Pry the cover off (Figs. 52 and 54), turn the adjusting nut counter-clockwise (Figs. 53 and 55) until there is no vibration. Turn the adjusting nut clockwise, approximately ¼ turn, until tone has a clear mellow sound.

THERMAL TYPE GAUGES

108. OPERATION

Thermal type gauges operate on a principle of a constant voltage being applied, and are sensitive only to changes in fuel level, oil pressure or temperature.

The constant voltage is connected in parallel to the gauges and provides the same regulated voltage to the gauges.

The constant voltage is provided through the use of a voltage regulator contained inside the fuel gauge case on Models PS-1 and PS-3, in the oil pressure gauge case on Models PC-1, 2, 3 and in the temperature gauge on Model PY-1.

The terminals on the gauge that hoses the constant voltage regulator internally is marked as follows:

"A"—is the output terminal for the controlled voltage from the regulator.

"I"—is the 12 volt input voltage terminal to the voltage regulator.

"S"—is the terminal for the connection to the sending unit.

The gauges (related to the thermal system) that do not contain the regulator will have only the controlled voltage terminal and the terminal for the connection to the sending unit.

a. Tank Unit

A float is hinged to allow the float to raise or lower dependent on the fuel level. The float connects to a variable resistance that provides a change in the resistance with any up or down motion of the float through a wiping contact in the gauge body (Fig. 56).

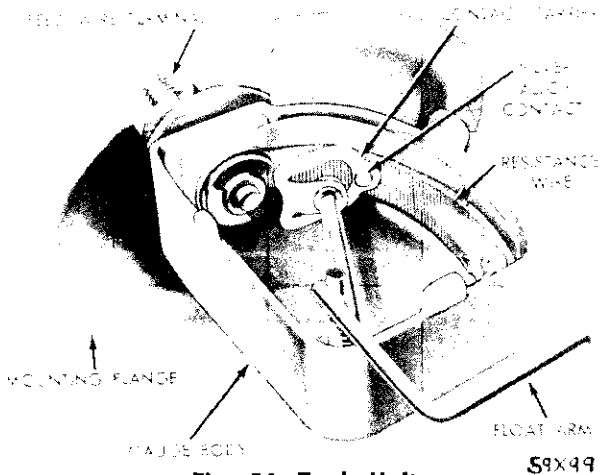


Fig. 56—Tank Unit

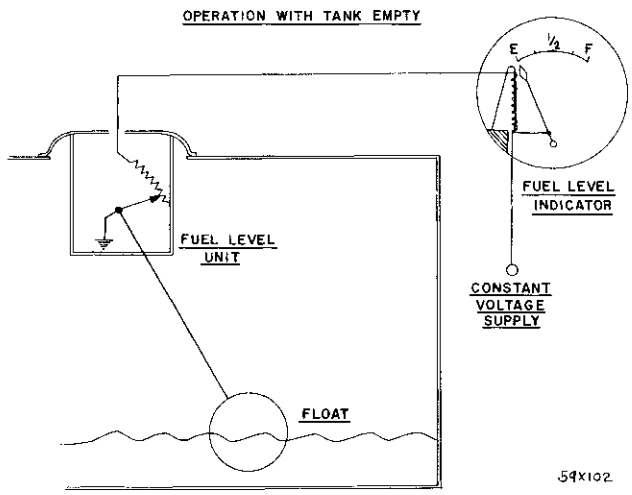


Fig. 57—Operation with the Tank Empty

b. Fuel Level Indicating System

Turning the ignition key on connects the system to the battery or charging system voltage. The function of the voltage regulator is to regulate this input voltage from the car battery or charging system to a constant voltage or approximately 5 volts D.C.

When the fuel level is low or empty, the resistance is increased which decreases the current flow and consequently positions the panel gauge pointer to low or empty (Fig. 57).

When the tank is full, the float level is at the top, the minimum resistance is in the circuit and the flow of current in the circuit is high. The panel gauge pointer will be moved across the dial to indicate a full tank (Fig. 58).

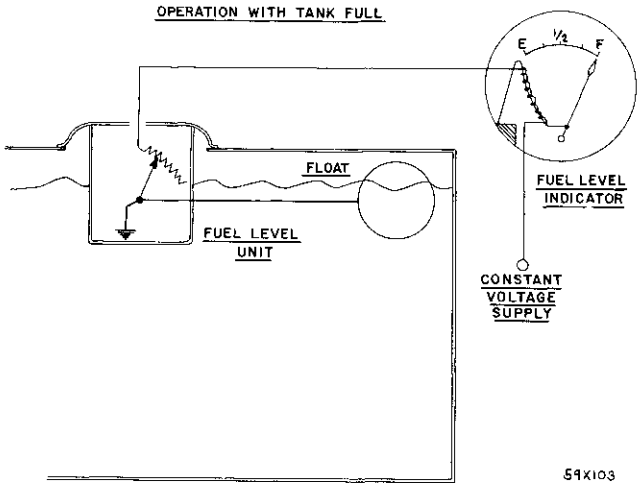


Fig. 58—Operation with the Tank Full

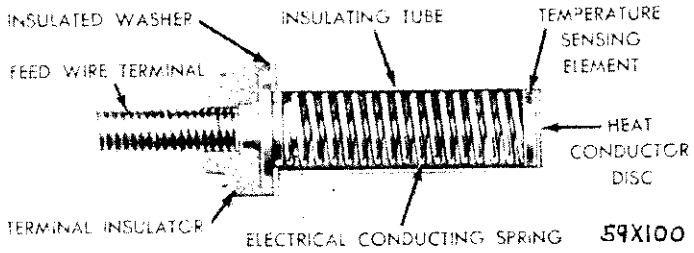


Fig. 59—Engine Temperature Sending Unit

c. Engine Temperature Sending Unit (Fig. 59)

This unit like the fuel level tank unit operates on a principle of varying resistance.

d. The Temperature Indicating System

The operation of the temperature indicating system is identical in operation with fuel system with the exception of the method of varying the resistance of the sending unit.

When the engine is cold the resistance of the disc in the temperature sending unit is high. Low temperature will be indicated (Fig. 60).

As the engine temperature increases the resistance of the temperature sending unit disc starts to decrease. A resultant increase in the current flow will occur causing the gauge pointer to indicate the increase in engine temperature (Fig. 61).

e. Oil Pressure Sending Unit (Fig. 62) (PC-1, PC-2, PC-3)

This unit consists of a spring loaded diaphragm and a variable resistance unit. The electrical circuit for the oil pressure system grounds through the pin in the diaphragm.

109. TESTING AND DIAGNOSIS

The equipment necessary to adequately test the constant voltage, fuel level or engine temperature is as follows:

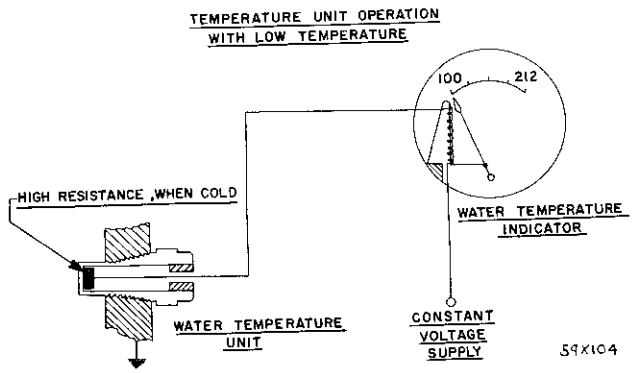


Fig. 60—Operation at Low Temperature

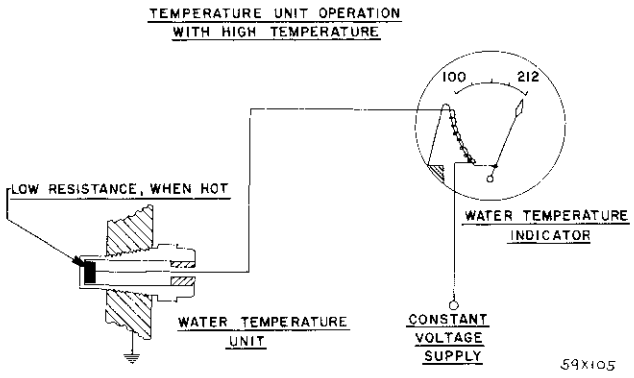


Fig. 61—Operation at High Temperature

(1) D.C. voltmeter unit such as is used in dealer service departments with a 15 volt scale or higher.

(2) A constant voltage type tank sending unit for a 1960 "P" Series gauge system known to be in good condition.

(3) Two 10 foot lengths of 16 gauge wire (insulated) with spring clips as jumper leads.

a. Condition

All gauges read high ("against the peg") after ignition switch is turned "ON".

Cause:

Defective constant voltage regulator (stuck points or an open heater coil).

Test:

(1) Test voltage at output (A) terminal of constant voltage regulator. A steady voltage of approximately 12 volts indicates regulator is malfunctioning.

A voltage regulator that is operating properly should normally have a voltage at the output terminal that is fluctuating between 0 and 7.0 volts.

It is, of course, impossible to obtain an accurate voltage reading. The fluctuating voltage reading will, however, indicate that the constant voltage regulator is functioning.

b. Condition

Gauge pointers do not move when ignition switch is turned "ON".

Cause:

Malfunctioning constant voltage regulator or an open circuit on battery side (input) of regulator.

Test:

(1) Connect a voltmeter between the constant voltage regulator input terminal and ground.

(2) Turn on the ignition switch. A reading of approximately 12 volts indicates a defective regulator. No reading indicates an open circuit in wiring to the regulator.

c. Condition

Temperature gauge or oil pressure gauge indicates normal operation. But the fuel gauge indicates a higher or lower fuel level than actually exists.

Cause:

Fuel tank sending unit or instrument panel fuel gauge is defective.

Test:

(1) Disconnect the lead wire at tank sending unit.

(2) Connect a jumper wire to the terminal of the test "Tank Sending Unit" and the disconnected lead wire.

(3) Connect the remaining jumper wire to a good ground on the test sending unit and ground the opposite end of the jumper wire to a good ground on the car.

(4) While observing the instrument panel fuel gauge, move the test sending unit to the "empty" position and turn on the ignition. The gauge should indicate empty. Move the float to the "full" position and the gauge should indicate full.

A gauge that indicates correctly at both positions proves the instrument panel gauge to be operating properly. The tank sending unit in the car should be replaced.

If the instrument panel gauge reads incorrectly at either or both positions, the instrument panel gauge should be replaced.

NOTE: Checking the system with the tank sending unit positioned for both "empty" and "full" is usually sufficient to determine the calibration in the range between these positions.

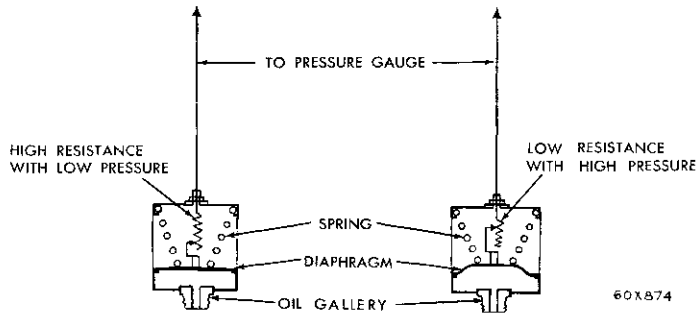


Fig. 62—Oil Pressure Sending Unit

d. Condition

Fuel gauge and oil pressure gauge indicates correctly but temperature gauge indicates higher or lower temperature than actual engine temperature.

Cause:

Defective instrument panel temperature gauge, wiring or defective temperature sending unit in engine.

Test:

(1) Disconnect the lead wire from the engine sending unit and connect the test jumper lead to the disconnected lead wire.

(2) Connect the opposite end of the test jumpers to the test fuel tank sending unit.

(3) Connect the remaining jumper lead to a good ground on the base of the test sending unit and the opposite end of the jumper to a good engine ground.

(4) While observing the instrument panel gauge, turn on the ignition switch and move the tank sending unit to the empty position. The gauge should indicate at the lowest "cold" end of the dial scale. Move the test sending unit to the "full" position and the gauge should indicate to the "hot" highest end of the dial scale.

If the temperature gauge indicated correctly, replace the engine temperature sending unit.

If the temperature gauge indicated incorrectly, replace the instrument panel gauge unit.

e. Condition

Erratic temperature gauge operation.

Cause:

Loose or dirty electrical connections.

Test:

Clean and tighten all electrical connections and recheck gauge operation.

f. Condition

Erratic operation of fuel gauge.

Cause:

Loose or dirty electrical connections or defective fuel tank sending unit.

Test:

(1) Check fuel gauge sending unit as outlined in condition (C).

(2) Clean and tighten all electrical connections.

(3) Make sure that the fuel tank sending unit is grounded to tank and that the tank is grounded to the frame.

g. Condition

No or low oil pressure (PC-1-2-3).

Cause:

Defective gauge, sending unit, wiring or engine oiling system.

Test:

Measure oil level with oil indicator stick.

(1) Disconnect the lead wire from the engine oil pressure sending unit and connect a jumper lead to the disconnected wire.

(2) Connect the opposite ends of the jumper wires to the test tank unit.

(3) Connect the remaining jumper to a good ground and to the test tank unit ground.

(4) Turn on the ignition switch and observe the oil pressure gauge pointer while moving the test tank float up and down. With the float at the low level, the gauge pointer should indicate no pressure. Moving the float towards the full position should cause the gauge pointer to move to the high pressure position.

If the oil pressure gauge indicates that it is functioning properly, replace the oil pressure sending unit.

NOTE: If after replacing the sending unit the oil pressure still does not function properly check the engine oiling system.

If the oil pressure gauge test indicates the instrument gauge is malfunctioning, replace the gauge.

CAUTION

No attempt should be made in the field to repair or calibrate any instrument panel gauge or voltage regulator units. These units should be replaced only.

No unit should be removed from the car until tests indicate that it is faulty.

NOTE: Always disconnect the battery before attempting to remove a unit from the instrument panel.

CAUTION

Never ground the tank or engine sending unit terminal or wire. The panel gauge will be damaged if you do.

ELECTRIC WINDOW LIFTS

SERVICE DIAGNOSIS

110. WINDOW WILL NOT OPERATE FROM MASTER SWITCH, BUT CAN BE OPERATED FROM THE INDIVIDUAL DOOR SWITCH

a. Faulty switch in the master switch group.

b. Break in the wire at the door opening, or at the door holding the master switch group. Avoid making a splice in the flexing sections of the wiring harness.

111. WINDOW CANNOT BE OPERATED FROM EITHER THE MASTER SWITCH OR THE INDIVIDUAL DOOR SWITCH

a. Burned out motor. Check for grounded, sticking, or defective switch. Check control wire. To check motor, check the battery feed at the circuit breaker in the left front cowl. If voltage is not present at this point, the failure is in the motor.

b. Defective circuit breaker. Check circuit breaker to determine if voltage is present at the terminal opposite the battery feed.

c. Break in the battery feed wire from the starter solenoid to the circuit breaker.

112. WINDOW WILL OPERATE IN ONE DIRECTION ONLY CONTROLLED BY EITHER THE MASTER SWITCH OR INDIVIDUAL DOOR SWITCH

a. Faulty switch, broken wire or loose connection.

b. Possibly burned out motor. To test, apply battery voltage to the motor terminals. This should cause the motor to rotate or the window to move up and down. If the motor does not rotate or the window does not operate, the motor is burned out. Check for a defective switch, or determine whether or not the switch is sticking in the up or down position.

113. CIRCUIT BREAKER "CLICKS" ON AND OFF CONTINUOUSLY AND WINDOW DOES NOT OPERATE

a. Disconnect the battery and remove wires from circuit breakers. Do not remove battery feed wire. Connect the battery and replace the feed wires, one at a time, until the grounded circuit is located. When ground is located, trace the wire to the particular door window it controls. Inspect the harness and wires behind the regulator control sector of each door for breaks or chafing.

NOTE: When checking for defective wiring, inspect the wiring harness control wires for a break behind the plate and sector or the regulator in each door.

b. A defective switch.

114. WINDOW IS OPERATED IN THE WRONG DIRECTION BY MASTER SWITCH OR INDIVIDUAL DOOR SWITCH

The lead wires are not connected to the proper terminals.

SERVICE PROCEDURES

A master switch group, on the left front door, operates all windows and the individual switches are located on their respective doors. The circuit breakers are behind the left front kick panel. The normal operating amperage draw per window is 12 to 16 amperes for all models.

115. ELECTRIC WINDOW LIFT

a. Removal

(1) Disconnect the battery and remove the garnish molding.

(2) Remove the door trim panel and disconnect the wires from switch.

(3) Remove the clips from the regulator pins holding the lower glass channel.

(4) Raise the glass manually and prop in up position.

(5) Remove the regulator attaching screws, pivot guide retaining pin and remove the motor and regulator through the opening in the door.

(6) If it is necessary to replace the gear box, remove the regulator counter-balance spring.

NOTE: Be sure to remove the counter-balance spring before disassembling the gear box.

The gear box is replaced as an assembly only and is lubricated at assembly. No further lubrication is required.

b. Installation

(1) Place the motor and regulator through the door opening and insert the pivot arm pin into guide.

(2) Install the regulator screws finger tight. DO NOT tighten at this time.

(3) Remove the window prop and lower the glass.

(4) Insert the control arms into the glass channel, using a leather washer on each side of channel and secure with a clip.

(5) Connect the wires to motor and connect the battery.

(6) Operate the window several times and stop the glass halfway.

(7) Tighten the regulator screws.

(8) Check the glass alignment.

(9) Connect an ammeter into the electrical circuit and operate the window. The ammeter reading should be constant without fluctuation as follows: approximately 14 amperes, all models except rear doors of four-door hard top models, and approximately 20 amperes for the rear doors of the four-door hard top models. If the ammeter reading fluctuates, there is a bind in the glass or in the linkage. The down stop should be adjusted so that the window is flush with the garnish molding. Install the trim panel, garnish molding, and other parts.

POWER SEATS

SERVICE DIAGNOSIS

116. ENTIRE UNIT INOPERATIVE

Remove all wires from seat switch and connect together as shown in the following test chart for the six various control operations. If the operation is normal, by connecting wires, as shown in the chart, replace switch.

POWER SEAT ELECTRICAL TEST CHART

For Forward Horizontal	For Forward Tilt	For Straight Up
Connect—Red Blue Green	Connect—Red Blue Yellow	Connect—Red Blue Yellow Brown
For Rearward Horizontal	**For Rearward Tilt**	**For Straight Down**
Connect—Red White Green	Connect—Red Blue Brown	Connect—Red White Yellow Brown

117. MOTOR INOPERATIVE

Check red wire at relay with test light. If test light does not light, check for continuity in number 10 red feed wire, faulty circuit breaker or poor connection between circuit breaker and starter relay. If test light lights, connect number 10 red feed wire with red and black or red and green wires from motor. If motor runs, relay was faulty.

118. SEAT INOPERATIVE (MOTOR RUNS)

Jump the wire from the number 10 feed wire to each solenoid terminal on the clutch assembly. Each solenoid should "click" as the jumper is connected. If solenoid does not click:

a. Check wire in harness for open circuit. Repair.

b. Possible seized solenoid armature in the coil. Replace the coil.

c. Possible burned-out solenoid. Replace the solenoid.

119. SEAT INOPERATIVE (MOTOR RUNS AND SOLENOIDS CLICK)

Check the drive unit for stripped or broken gear. Replace the drive unit if necessary.

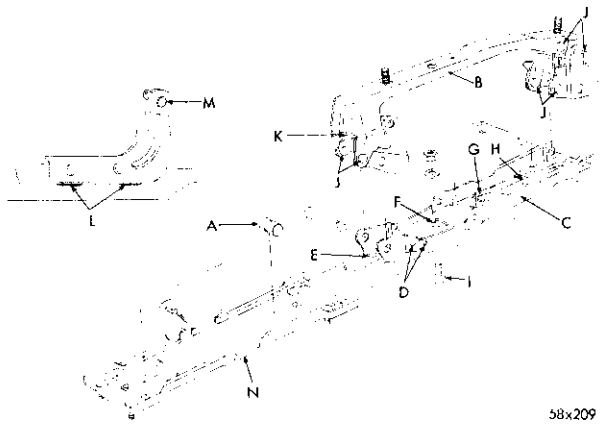


Fig. 63—Seat Guide (Disassembled View)

120. SLAVE UNIT INOPERATIVE (MOTOR, SOLENOIDS AND DRIVE UNIT O.K.)

Check for a broken drive cable. Replace as necessary.

121. EXCESSIVE FREE PLAY IN UNIT (SEAT HAS ROCKING MOTION, EXCESSIVE MOVEMENT BETWEEN SLIDE AND BASE OF TRACK ASSEMBLY)

This condition is possibly due to roller (A), (Fig. 63) being out of position.

a. Remove the power seat assembly from the vehicle.

b. Remove the seat drive tubes from the slave unit.

CAUTION

Do not run motor with drive cables and tubes disassembled or unit will be placed out of synchronization.

c. Remove the seat support (B).

d. Remove the seat slave unit from the seat track slide (C).

e. Remove the horizontal stops located on the slide at (D).

f. Separate the seat slide (C) from the base (N) by pressing the slide rearward which will allow the rollers (A) to jump the retaining rivets (E, F, G, H), thereby separating the slide from the base.

g. Remove the rivet (F) and replace with 5/16 — 18 x ½" cap screw (1) as shown to retain in the proper position. To reassemble, reverse the above sequence.

NOTE: In reassambly, a frayed drive cable may occur. Such a cable may be repaired by applying a light coating of solder and then grinding to cable size.

122. SEAT TRACK EXCESSIVELY LOOSE (CAUSED BY LOOSE RIVET JOINTS)

a. Disassemble upper track seat support (B) by removing the cotter keys and pins.

b. Remove the seat support and tighten all the riveted joints (J) by peaning with a ball peen hammer.

123. LOOSE FRONT LEVERS

a. Arc weld the front levers (K) to prevent movement between the two sections comprising the front lever assembly as shown.

124. SEAT CHUCK FORE AND AFT (CAUSED BY LOOSE HORIZONTAL RACK SUPPORT ARM TO LOWER TRACK BASE

a. Remove the seat track assembly from the vehicle and arc weld as shown (L).

b. Tighten the rack attaching pins (N) by arc welding.

c. Check for loose horizontal rack in slave unit gear train. If loose, replace slave unit.

POWER SEATS

The power seat can be moved six ways — forward, backward, upward, downward and tilt. The horizontal travel is five inches and horizontal plane of seat track is inclined eleven degrees. The vertical travel is 2 inches at front and 2 inches at rear. The available tilt is 8 degrees forward and 7½ degrees rearward from neutral.

125. OPERATION

The motor operates a gear drive train which supplies power to the slave units, located in the seat tracks, through flexible cables (Fig. 64). The control switch is on the left side of front seat and is wired through a relay to a 40 ampere circuit breaker, located next

to the window lift circuit breaker behind the left front kick panel.

The wire from the starter solenoid supplies power to the circuit breaker. On cars equipped with electric window lifts, power is supplied by a brass jumper parallel with the window lift circuit breakers. Power is supplied to the relay from the circuit breaker.

Six wires go to the switch. One used for power, two for motor field current, which also actuates the relay for motor armature current and three wires attach to solenoids controlling the movement of the front riser, rear riser and horizontal movement.

CAUTION

The wire harness should be clipped securely so wires will not be pinched when track is in the extreme forward position.

The right and left tracks are each replaced as an assembly only. They cannot be adjusted and are not interchangeable.

SERVICE PROCEDURES

126. FRONT SEAT ASSEMBLY AND ADJUSTER

a. Removal

(1) Disconnect the battery.

(2) Remove the four mounting stud nuts and tilt the complete seat back forward.

(3) Disconnect the control wires at the switch.

(4) Remove the front seat and cushion assembly.

(5) Disconnect the seat adjuster battery wire at circuit breaker in cowl.

(6) Remove the seat guide attaching stud nuts and remove the adjuster.

b. Installation

(1) Install the adjuster and stud nuts.

(2) Connect the seat adjuster battery wire to circuit breaker in cowl.

(3) Form a loop in the wires from the relay to the clip on the floor for horizontal travel.

(4) Install the front seat assembly.

(5) Connect the control wires to the switch and tighten the mounting stud nuts securely.

(6) Connect the battery.

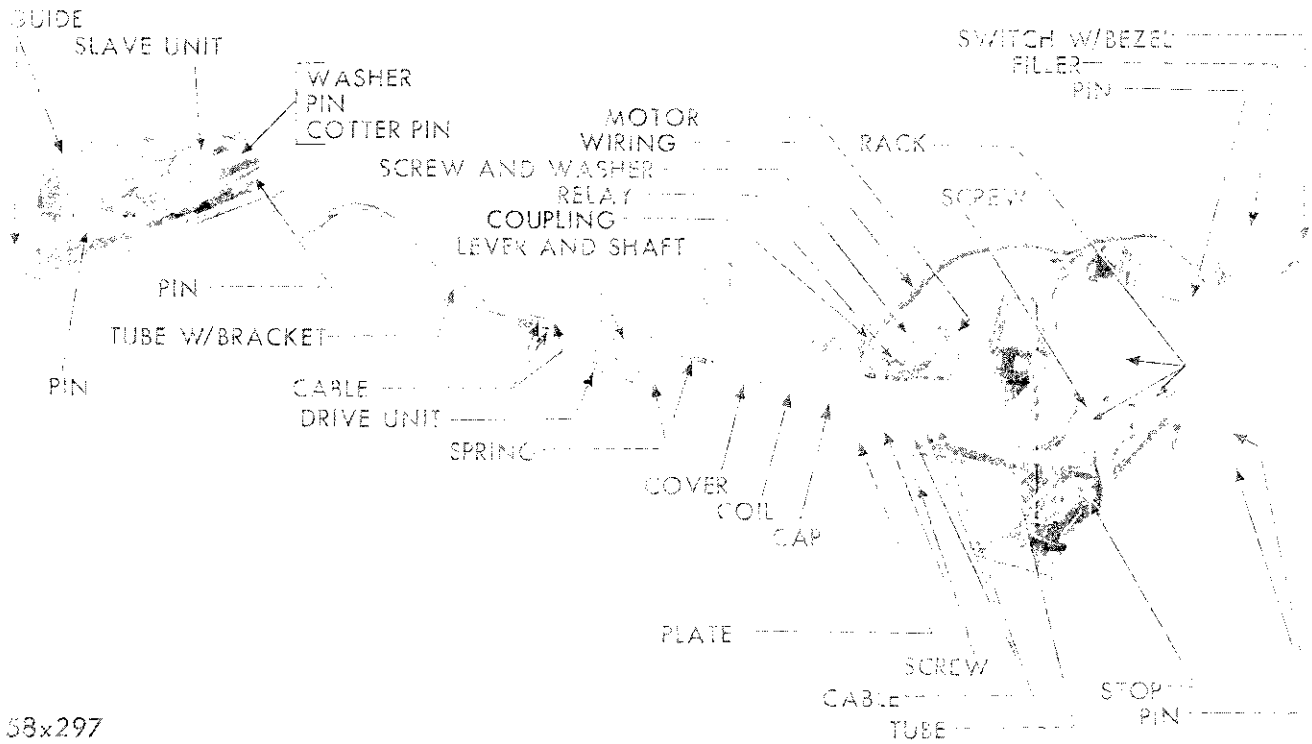


Fig. 64—Power Seat Arrangement

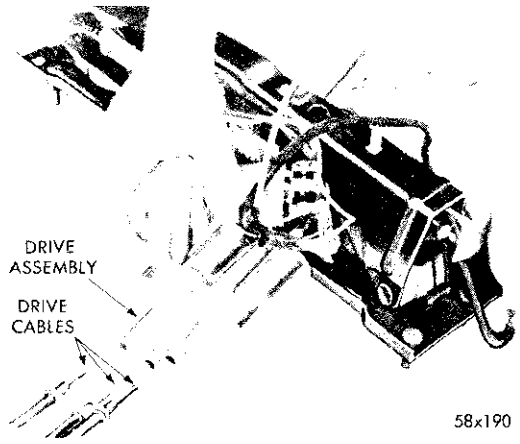


Fig. 65—Removing Left Guide and Drive Assembly

127. REMOVAL AND INSTALLATION OF FLEXIBLE CABLES

a. Removal

(1) Remove the front seat assembly.

(2) Disconnect battery wires at motor relay.

(3) Remove the retainer plate that holds the right side tubes to the drive assembly.

(4) Remove the left seat guide attaching stud nuts and remove the guide and the drive assembly (Fig. 65).

NOTE: Be careful not to bend or damage right side tubes when sliding tubes out of drive assembly.

(5) Pull the flexible cables from the right side tubes.

(6) Remove the bolts that hold the motor and drive assembly to the left guide bracket.

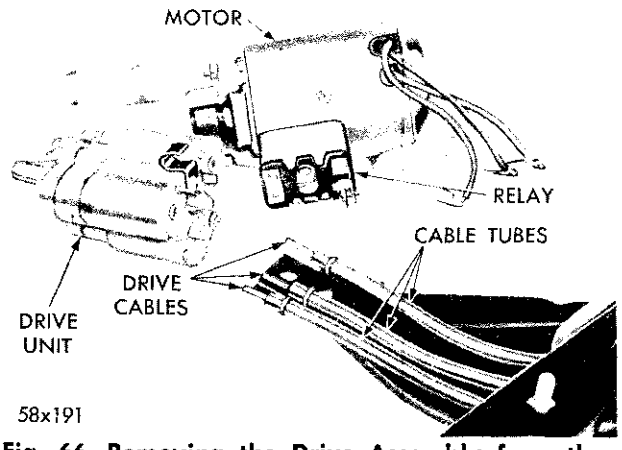


Fig. 66—Removing the Drive Assembly from the Left Slave Unit

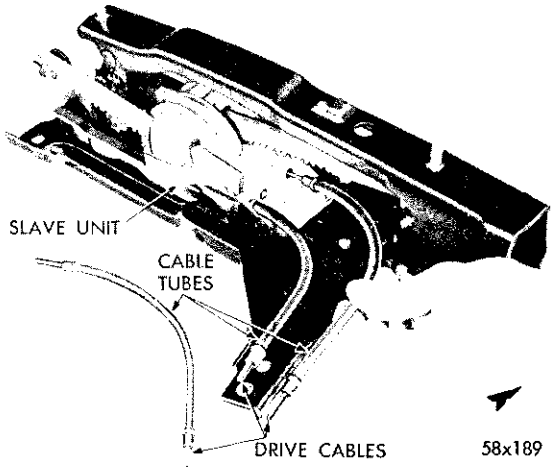


Fig. 67—Installing the Cable Tubes in the Slave Unit

(7) Remove the drive assembly with tubes from left slave unit (Fig. 66).

(8) Remove the flexible cables from the tubes.

b. Installation

(1) Place the three left cable tubes into the left slave unit (Fig. 67).

(2) With the shortest tube on the inside and longest on the outside, install the flexible cables in the tubes. Make sure the cables seat in the slave unit.

(3) Position the drive unit on the left side tubes. Make sure the flexible cables seat in the slot in the drive unit.

(4) Bolt the drive unit to the guide bracket.

(5) Place the right side flexible cables in the right side tubes.

(6) Position the left guide and drive assembly on the right side tubes. Make sure the cables seat in the drive assembly.

(7) Install the right side tubes retainer plate.

(8) Bolt the left guide assembly to the floor.

(9) Connect the wire to relay and check the operation of the seat.

CAUTION

Seat guides should be in the up and forward position when installing cables. Make sure both guides are at the same position (in alignment).

128. REMOVAL AND INSTALLATION OF MOTOR

a. Removal

(1) Disconnect the motor wires at the relay.

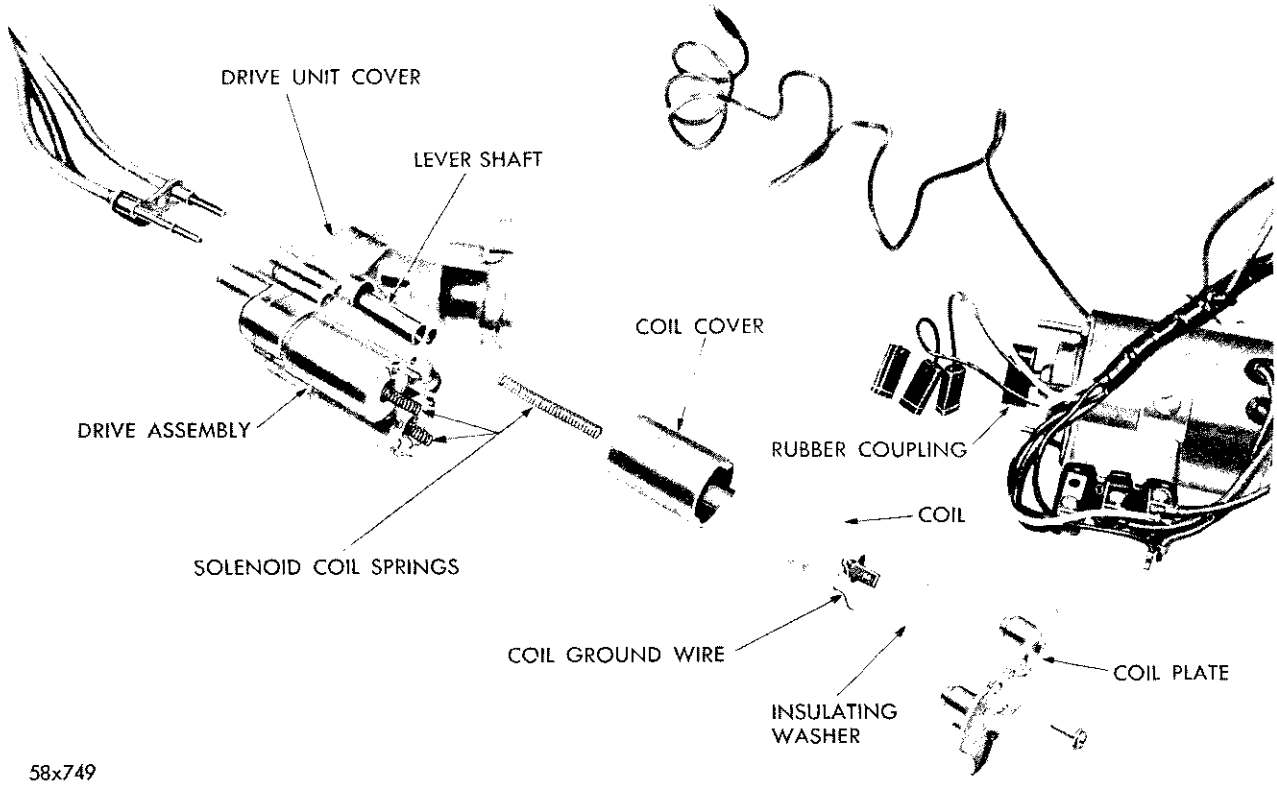


Fig. 68—Solenoid and Coil (Disassembled)

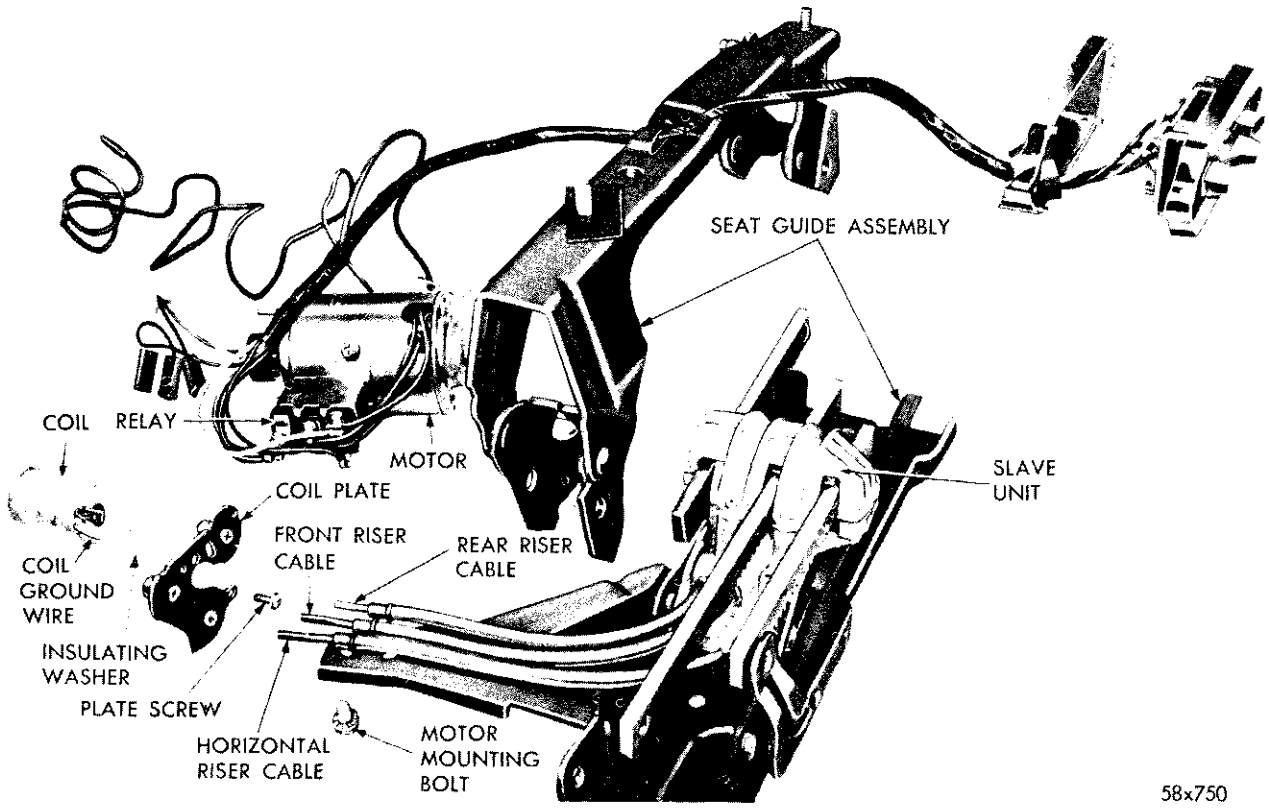


Fig. 69—Seat Track and Motor (Disassembled) (Typical View)

(2) Remove the two nuts holding the motor to the drive unit.

(3) Remove the motor from the drive unit and rubber coupling.

b. Installation

(1) Install the rubber coupling on the motor shaft (Fig. 68).

(2) Align the rubber coupling with the slot on the slave unit shaft.

(3) Install the motor and reconnect wires to the relay.

129. DRIVE UNIT AND SOLENOID ASSEMBLY

a. Disassembly

(1) Remove the drive unit from the seat assembly. Refer to Paragraph 127. "Removal and Installation of Flexible Cables."

(2) Remove the two screws holding the plate and solenoids to the drive unit (Fig. 69).

(3) Remove the plate and solenoid assembly. Be careful not to lose the three springs under the solenoid.

(4) To remove the solenoid coils, bend back on the tabs of the solenoid cover. Unsolder the coil ground wire at the cover tab and remove the coil cover from the coil.

(5) Remove the screws holding the cover on the drive unit.

(6) Remove the cover and lift out the clutch lever and shaft.

b. Assembly

(1) Install the clutch lever and shaft. Make sure the lever is properly seated on the drive collar.

(2) Install the cover and screws.

(3) Install the coil in the coil cover with the coil ground wire next to one of the cover tabs.

(4) Position the cover tabs in the slots on the coil plate.

(5) Bend over the tabs and solder the coil ground wire to the tab and plate.

(6) Install the three solenoid springs and position the solenoids over the springs.

(7) Fasten the solenoids to the drive unit.

(8) Install the drive unit. Refer to Paragraph 127, "Removal and Installation of Flexible Cables".

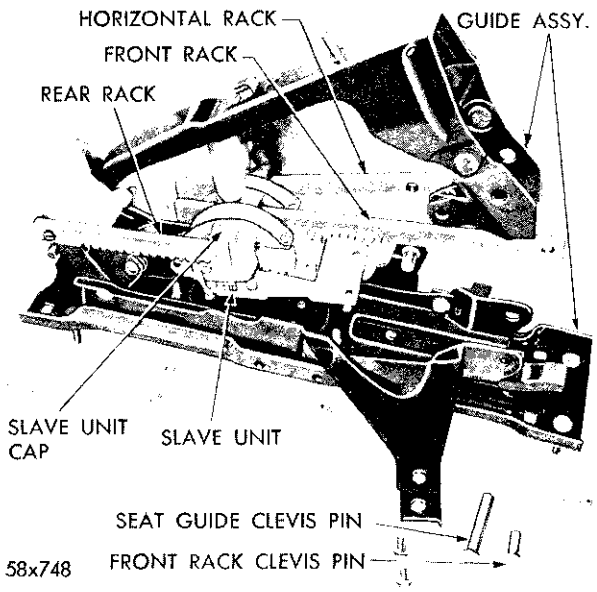


Fig. 70—Removing and Installing the Slave Unit

130. SLAVE UNIT

a. Removal (Fig. 70)

(1) Remove the drive unit and the cables. Refer to Paragraph 127. If possible the seat guide should be in the up and forward position.

(2) Remove the long clevis pin from the front of the guide (Fig. 70).

(3) Remove the front rack clevis pin.

(4) To facilitate the removal of the slave unit, remove the slave unit cap.

NOTE: Be careful not to lose the springs under the cap. The springs are between the racks and slave cap.

(5) Remove the nuts holding the slave unit to the guide.

(6) Remove the slave unit.

b. Installation

(1) Position the slave unit over the studs on the guide base.

(2) Position the racks in the slave unit so they will be in the up and forward position.

(3) Fasten the racks to the guide assembly.

(4) Position the springs on the racks and install slave unit cap.

(5) Install the slave unit mounting nuts.

(6) Install the front guide clevis pin.

(7) Install cables in slots and try operation of guide.

Install drive unit and cables. Refer to Paragraph 127, "Removal and Installation of Flexible Cables".

ELECTRIC LOCKING DOOR LOCKS

(PY-1 ONLY)

The electric door lock is operated by a push-pull double acting solenoid, attached by a connecting rod to the door lock actuating lever. By pressing the single pole double throw switch mounted on the right and left front door trim panel, a solenoid in each of the four doors is actuated, moving the lock slide member into the lock or unlock position.

All doors may be locked or unlocked either mechanically or electrically. To lock mechanically push the front door handle to the forward position and depress the rear door locking button. To lock electrically depress the switch to lock or lift upward to unlock the doors.

131. SOLENOID

a. Removal

Remove the door trim panel. Disconnect the lock to solenoid connecting rod at the solenoid. Disconnect wires and remove solenoid.

b. Installation

Fasten solenoid to door and connect up wires. Connect lock connecting rod to solenoid. The front doors connecting rod is adjustable. Adjust the rod by turning the turn buckle in or out until the solenoid will just pull the locking lever into the lock. Check to make sure the solenoid will pull the lever far enough out to unlock the door. Install the trim panel.

PANELESCENT LIGHTING

MODELS PC-1, PC-2, PC-3, PY-1 (ONLY)

132. OPERATION

Panelescent panel lighting used in all 1960 Chrysler and Imperial Models, achieves a soft uniform glow that illuminates the panel instruments without objectionable intensity or annoying glare. Light level is adjusted by means of a manually controlled knob.

Panelescent lighting has no filaments or gases, but instead is composed of laminated layers of material which glow when an alternating current is applied. A typical lamp (Fig. 71) is composed of several layers as follows:

(1) A sheet of vitreous enameling steel forms the instrument back.

(2) A layer of solid ceramic similar to porcelain is applied to the steel sheet.

(3) A layer is then added which has panelescent phosphor suspended in ceramic.

(4) A transparent electrically conducting layer is then added.

(5) A finish layer of transparent glass coating is sprayed on.

This lamp is electrically a condenser. When A/C potential is applied between the steel plate and the transparent electrically conducting layer, the electric field excites the dielectric causing a solid state, which

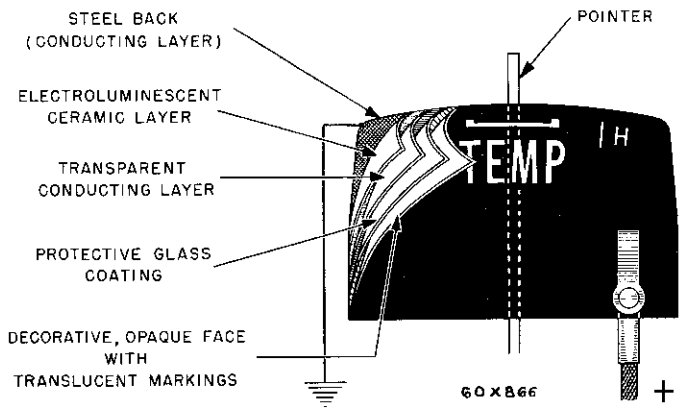


Fig. 71—Electroluminescence Panel Lighting

results in visible light. (The phosphorescent surface acts as a dielectric between the two conducting surfaces and it also has the property of glowing when excited by a high frequency high voltage current.) The layer principle is also applied to the pointers, and, as a result the instrument pointers are a light source in themselves, as are the instrument dials.

The panelescent is powered from a transistor oscillator, which connects the 12 volt D/C to 200 volts A/C at 250 cycles per second. This power pack (Fig. 72) is mounted on the cowl side panel underneath the instrument panel.

The main components of the panelescent panel lighting is composed of:

(1) The A/C power pack.

(2) The individual instrument lighting.

(3) The connecting wiring.

SERVICE DIAGNOSIS

133. SYSTEM FAILURE

a. When the system fails due to a power supply failure or to a short circuit at any part of the system, the entire instrument panel will remain unlighted. This includes a short circuit at any of the panel lamps.

b. Where an open circuit occurs at one of the lamps, only that lamp will be affected and remain lighted.

WARNING

Before connecting any test equipment, always turn the instrument panel switch "OFF". Failure to do this might result in your becoming startled by an electric shock from the high voltage in the instrument power unit. The terminals are the protective type and this should not occur unless you inadvertently touch the terminal of disconnected socket. However, due to the low wattage, it will not harm you.

To test the system to locate the cause of a failure, use testing Tool C-3764 (Fig. 73) and proceed as follows:

134. CAUSE OF FAILURE

a. First turn on the instrument panel switch and observe the instrument lighting. If any portion of the instrument panel does not light, the unlighted lamps are open and the complete instrument should be replaced.

b. If the entire panel fails to light, turn off the instrument panel switch and install the tester tool at the power pack by disconnecting the connectors and plugging in the tool connectors. Ground the black wire to a good ground on the instrument panel.

NOTE: The caps on the end of the tester indicate the high and low voltage indicator lamps. Red indicates high voltage A/C. Black indicates low voltage D/C.

c. Turn on the instrument panel light switch. If the D/C and A/C indicators both glow, it indicates the A/C power supply is operating satisfactorily.

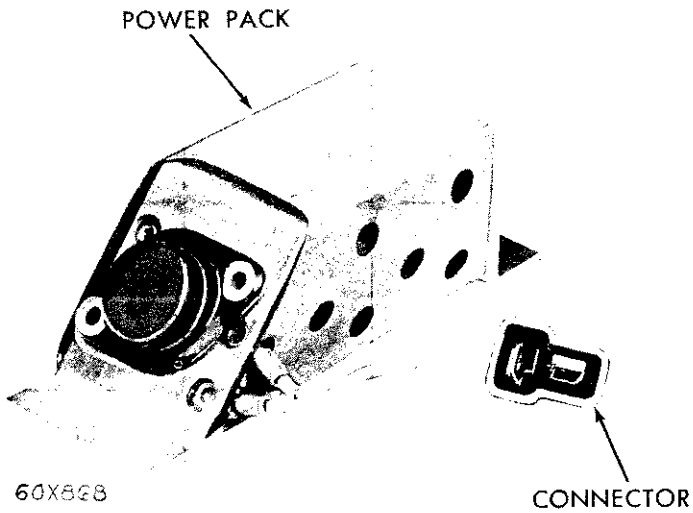


Fig. 72—Power Pack Unit

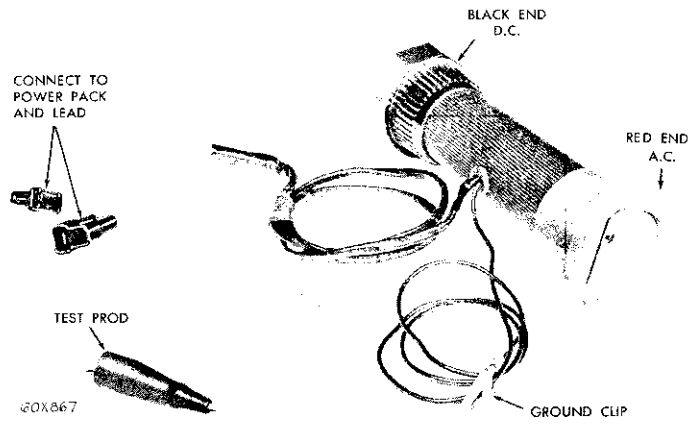


Fig. 73—Testing Tool C-3764

d. If the D/C indicator glows but the A/C does not, the power unit (Fig. 72) is not operating and should be replaced.

e. If neither the D/C or A/C indicator glows, it indicates the D/C circuit (orange lead) is incomplete. Test with D/C voltmeter to locate the failure on the D/C input side of the power unit.

f. If both the D/C and A/C indicators glow but the panel does not light up, test for a short circuited lamp by disconnecting each lamp in succession and touch the test prod on the white test lead from the tester to the terminal of each of the lamp receptacles.

A good lamp will light up when its terminal is contacted by the white lead test prod. A short circuited lamp will not light up and the instrument must be replaced.

NOTE: One shorted lamp will prevent the entire panel from lighting.

g. There is always a possibility that more than one lamp might be shorted at the same time. In this case, the panel will stay dark after the new instrument is installed. Continue to test the balance of the lamps that were not tested before to find additional short circuited lamps.

SERVICE PROCEDURE

135. REMOVAL OF DOME AND INSTRUMENT CLUSTER

NOTE: Removal of the steering wheel will facilitate the removal of the electrical instruments and eliminate any possibility of damage to the steering wheel.

a. Steering Wheel Removal

(1) Press down on the steering wheel center ornament and turn the unit ¼ turn counter-clockwise to remove the ornament.

(2) Disconnect the battery ground cable.

(3) Disconnect the horn wire at the blade terminal.

(4) Remove the three screws and bushings and remove the horn ring.

(5) Remove the rubber insulator and horn terminal plate.

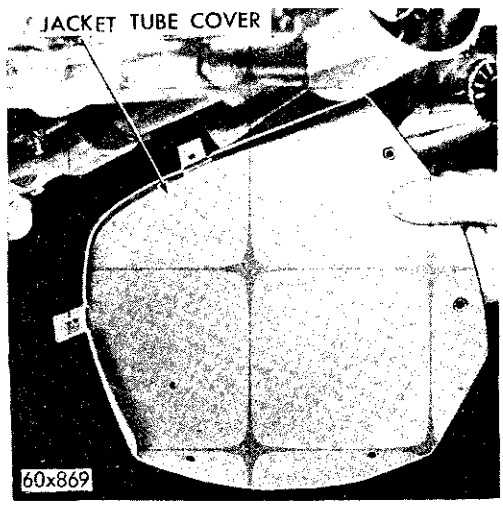


Fig. 74—Removing or Installing the Jacket Tube Cover

(6) Loosen the steering wheel nut, install the wheel Puller Tool C-3428 and loosen the steering wheel from the column tube.

(7) Remove the puller Tool C-3428, the wheel nut and steering wheel.

b. Removing the Instrument Cluster and Speedometer

(1) Remove the six steering jacket tube cover screws from underside of the jacket tube (Fig. 74).

(2) Disconnect all the wires at the terminals before loosening the cluster attaching screws.

(3) Remove the two screws (one each side of steering jacket tube) and remove the steering tube bezel (Fig. 75).

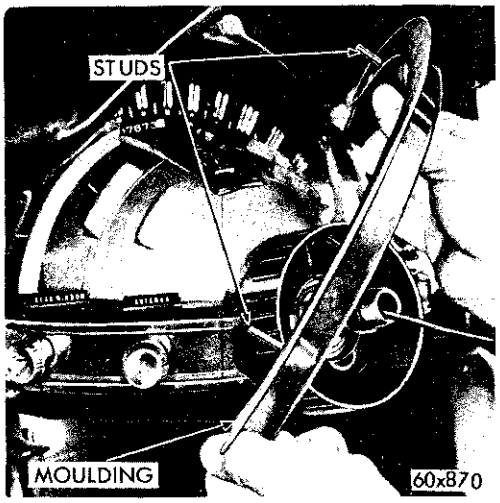


Fig. 75—Removing and Installing the Instrument Cluster Dome Moulding

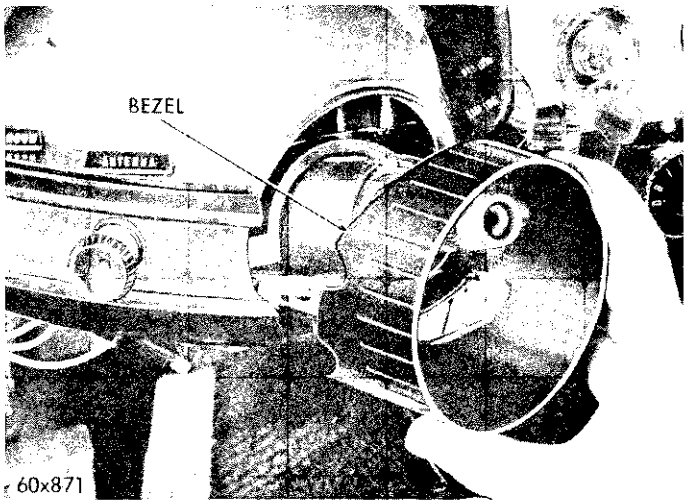


Fig. 76—Removing the Jacket Tube Bezel

(4) Remove the two self-locking nuts which retain the instrument cluster and plastic dome retainer to the instrument panel and remove the retainer (Fig. 76). These stud nuts can be reached through the opening between the panel and the jacket tube.

(5) Remove the two screws holding the junction block to the instrument panel and swing the junction block out of the way to allow for loosening of the screws attaching the astrodome supports.

(6) Carefully pull the supports away from the steering jacket tube to afford clearance and release the base of the cluster from the supports and at the same time tip the complete unit towards you to clear the back of the cluster from the instrument panel eyebrow (Fig. 77) and remove the unit from the car for further disassembly or testing.

(7) Disconnect the speedometer cable and the ornament lamp socket at the speedometer head, remove the four screws and remove the speedometer head assembly (Fig. 78).

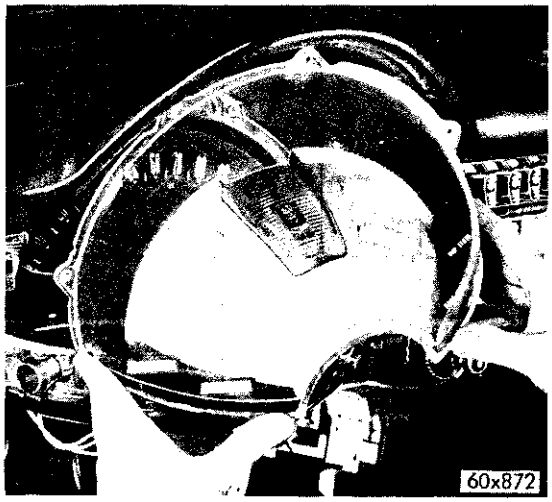


Fig. 77—Removing or Installing the Instrument Cluster and Dome

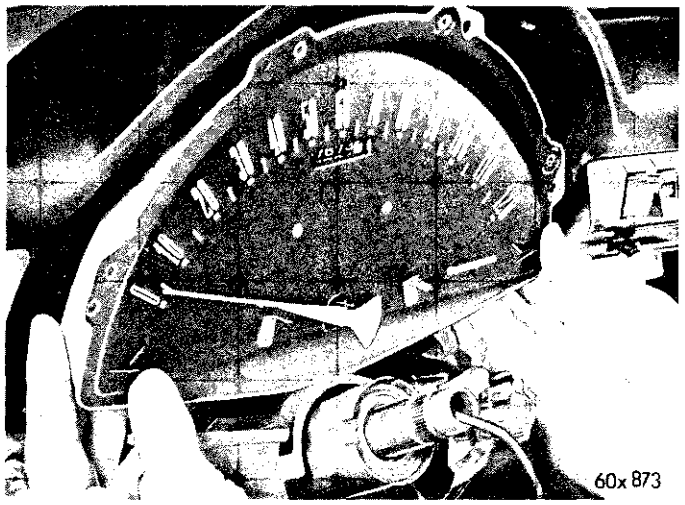


Fig. 78—Removing or Installing the Speedometer Head Assembly

(8) The plastic dome is attached to the cluster by six slotted head machine screws.

NOTE: Instruments can be removed to tester at back of cluster without removing the plastic dome (Fig. 79).

c. Instrument Cluster and Speedometer Installation Chrysler C-1, 2, 3

(1) Install the speedometer head assembly (Fig. 78) and the four attaching screws.

(2) Connect the speedometer cable at the speedometer head and snap the center ornament lamp and socket into the opening at the back of the speedometer case.

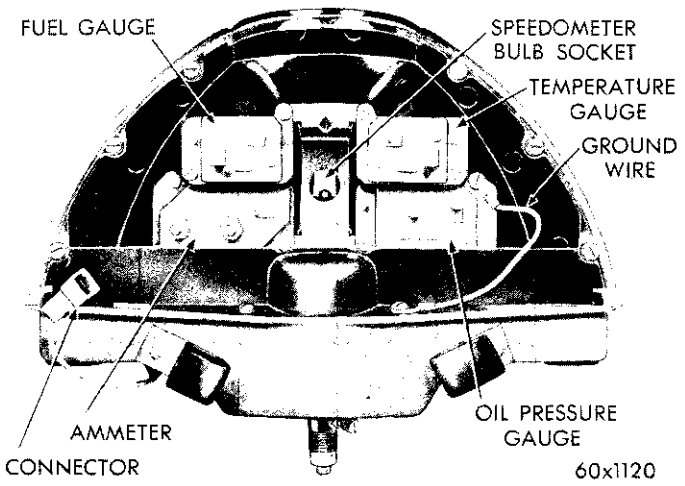


Fig. 79—Instrument the Panel Cluster — Rear View (Chrysler)

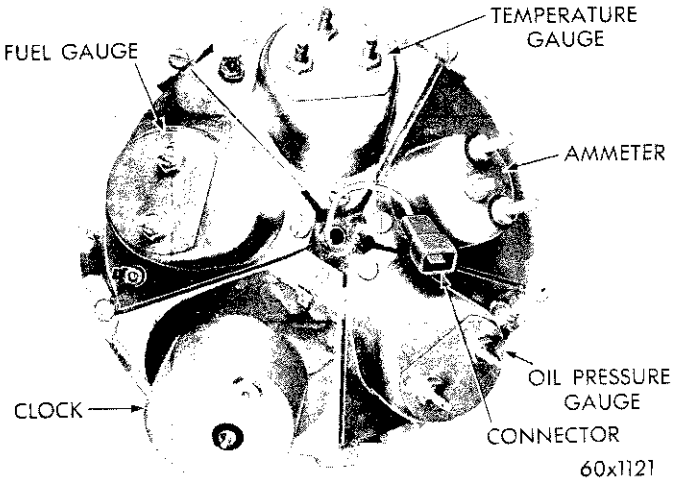


Fig. 80—Instrument Panel Cluster — Rear View (Imperial)

(3) Position the instrument cluster in the panel opening, tilt the rear of the cluster toward the front of the vehicle and carefully position the base of the cluster on the astrodome supports.

(4) Pull the astrodome supports away from the instrument panel and jacket tube support just far enough to enter the base of the cluster into position.

(5) Install the four screws attaching the plastic dome and cluster to the instrument panel.

(6) Tighten the two astrodome support screws.

(7) Attach the junction block to instrument panel and install attaching screws.

(8) Install the instrument cluster retainer (Fig. 75) and the two self-locking nuts.

(9) Connect all wires disconnected at time of removal.

(10) Install the steering tube bezel and the two bezel attaching screws (Fig. 76).

(11) Install the jacket tube cover and the cover attaching screws (Fig. 74).

d. Steering Wheel Installation

(1) Install the steering wheel and steering wheel nut. Tighten to 40 foot-pounds torque.

(2) Install the rubber insulator and the horn terminal plate.

(3) Install the horn ring, bushings and three attaching screws.

(4) Connect the horn wire at blade terminal.

(5) Install the steering wheel ornament, turn ¼ turn clockwise to lock in position.

(6) Connect the battery ground cable.

136. INSTRUMENT CLUSTER OR SPEEDOMETER (IMPERIAL)

a. Removal

(1) Disconnect the battery ground cable.

(2) Remove the chrome retainer ring retaining screw at the bottom of the retainer.

(3) Pull the bottom of the retainer forward and raise the retainer to release the upper tab located at the top of the retainer.

(4) Remove the screws attaching the instrument panel cluster.

(5) Disconnect the wire connectors at the back of the instrument cluster and the bowden wire at the clock and remove the cluster to the bench for further disassembly or testing (Fig. 80).

NOTE: The speedometer can be removed in the same manner as the instrument cluster after disconnecting the speedometer cable.

b. Installation

(1) Position the instrument cluster or speedometer and connect the wires or cable disconnected at removal.

(2) Install the cluster attaching screws.

(3) Locate the top of the retainer in the slot at the top of the cluster, pull the retainer down into position, and install the retainer bottom screw.

(4) Connect the battery ground cable.

137. SPEEDOMETER (PS-1, PS-3)

a. Removal

(1) Disconnect the battery cable.

(2) Disconnect the speedometer cable at the speedometer.

(3) Remove the transmission push button bezel.

(4) Remove the transmission control push buttons.

(5) Remove the two retainer stud nuts that hold the transmission push button housing assembly to dash, then remove housing and disconnect back-up light wires. Move the housing to one side out of way.

(6) Disconnect the three instrument panel lights.

(7) Remove the steering column dash support to cowl panel brace.

(8) Disconnect the horn and turn signal wires (from steering column) at the connector under dash.

(9) Remove the four phillips head screws that attach the speedometer to instrument panel.

IMPORTANT

Hold the speedometer while removing the last attaching screw, to avoid the possibility of dropping and scratching the lens. Also, exercise extreme care in removing the speedometer from the instrument panel opening and from under the dash. DO NOT FORCE.

(10) When the screws are removed, tilt the speedometer base toward the firewall and carefully lower the speedometer until the lens has cleared the instrument panel opening. Move the speedometer in the direction of the parking brake and at the same time roll the end toward the parking brake, downward, until the speedometer lens is straight up and down. Turn the speedometer assembly (approximately 180 degrees) until the base is toward the firewall, and lower the speedometer to remove.

b. Installation

(1) Starting at the parking brake side of the steering column, place speedometer in a vertical position with the numerals facing the steering column and the base toward the firewall.

(2) While raising the speedometer straight up from this position, turn the assembly one half turn clockwise as the base passes the lower edge of dash panel, then in the same motion, rotate the lens to the left and lower the base to place the lens and dial face in position to be inserted through the instrument panel opening.

(3) Locate the speedometer in its position with an upward rolling motion and insert the four retainer screws.

(4) Reinstall the back-up light wires to the back-up switch on the transmission push button housing.

(5) Position the transmission push button housing in instrument panel bracket and install the two retainer stud nuts.

(6) Reinstall the steering column dash support to cowl panel brace.

(7) Connect the three instrument panel lights.

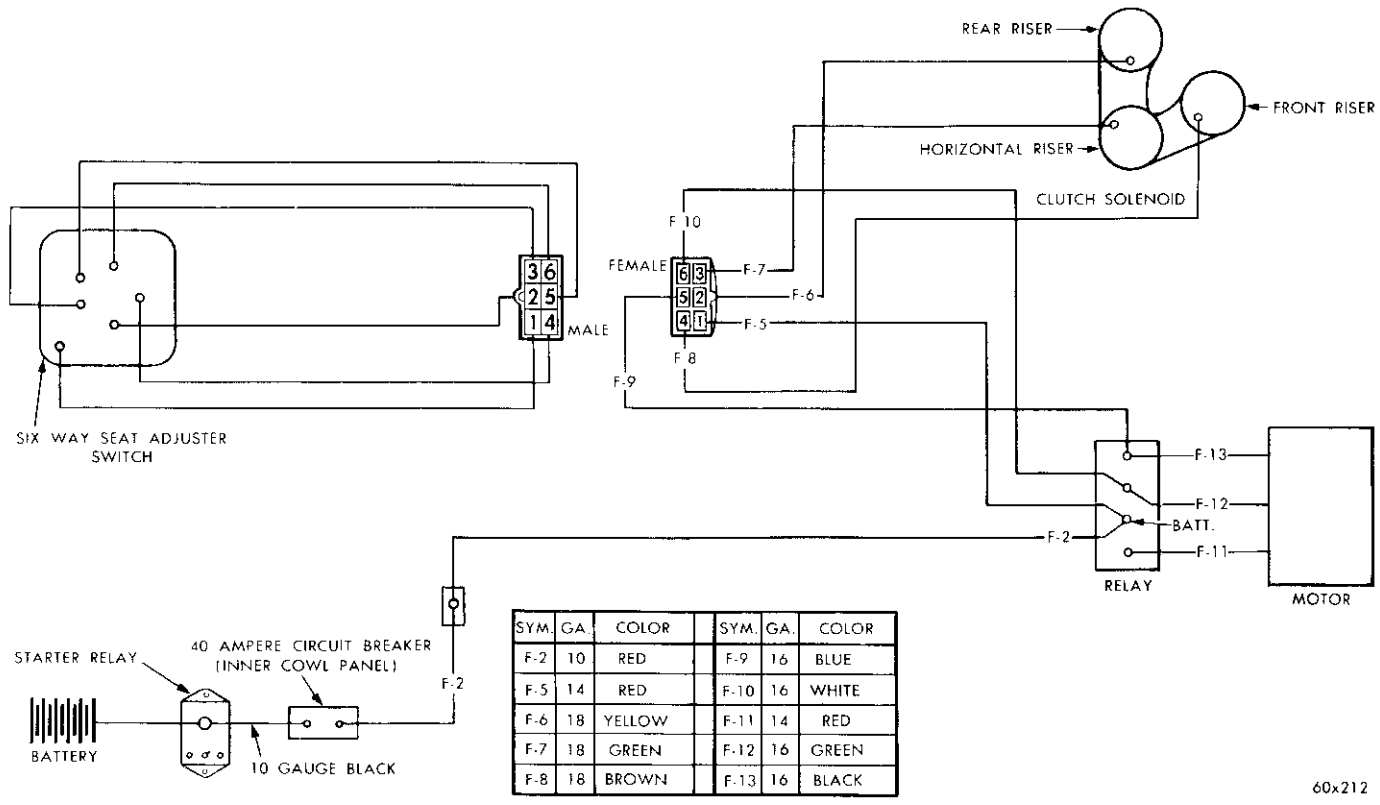
(8) Reinstall the transmission control push buttons.

(9) Reinstall the transmission push button bezel and retainer screws.

(10) Connect the speedometer drive cable.

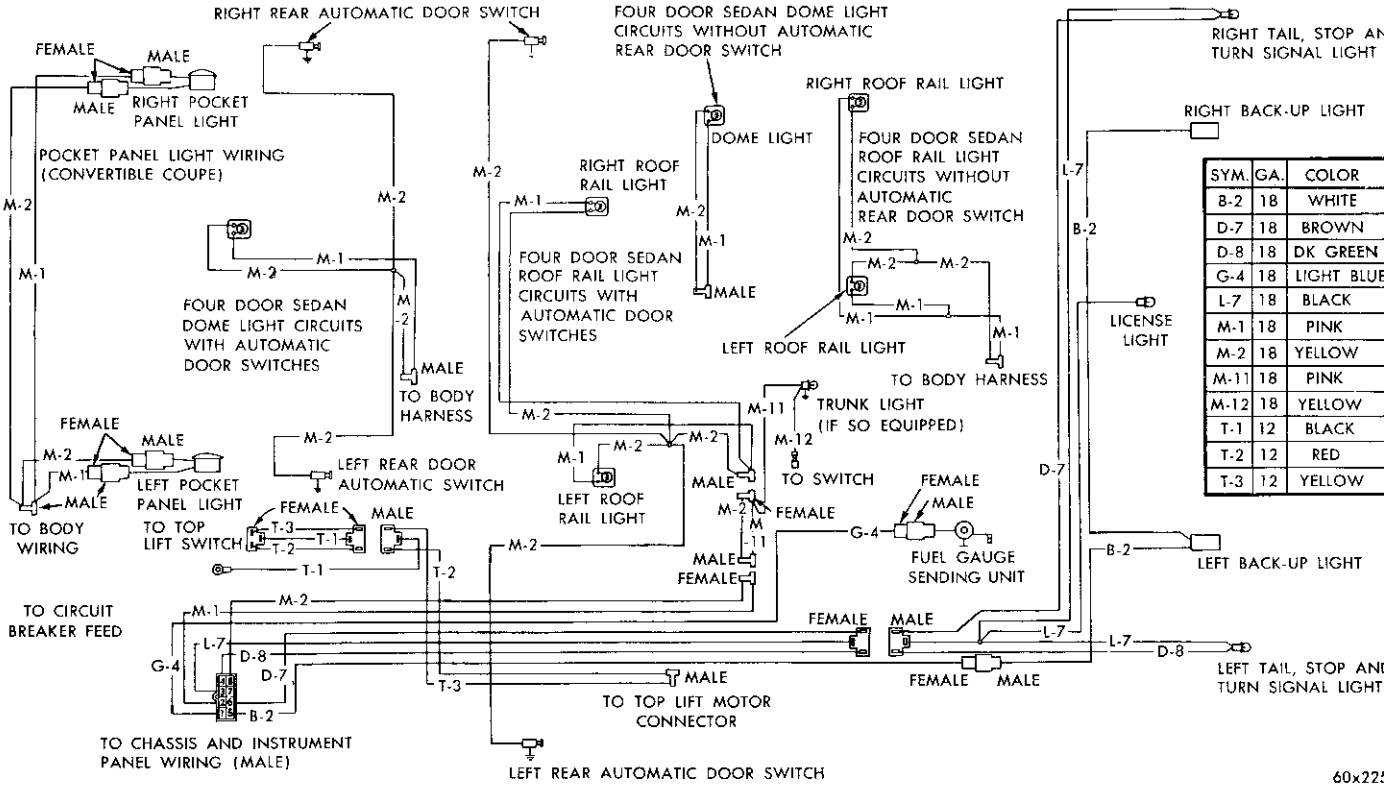
(11) Connect the battery cable.

Figures 81 through 91 show the wiring diagrams for all models.



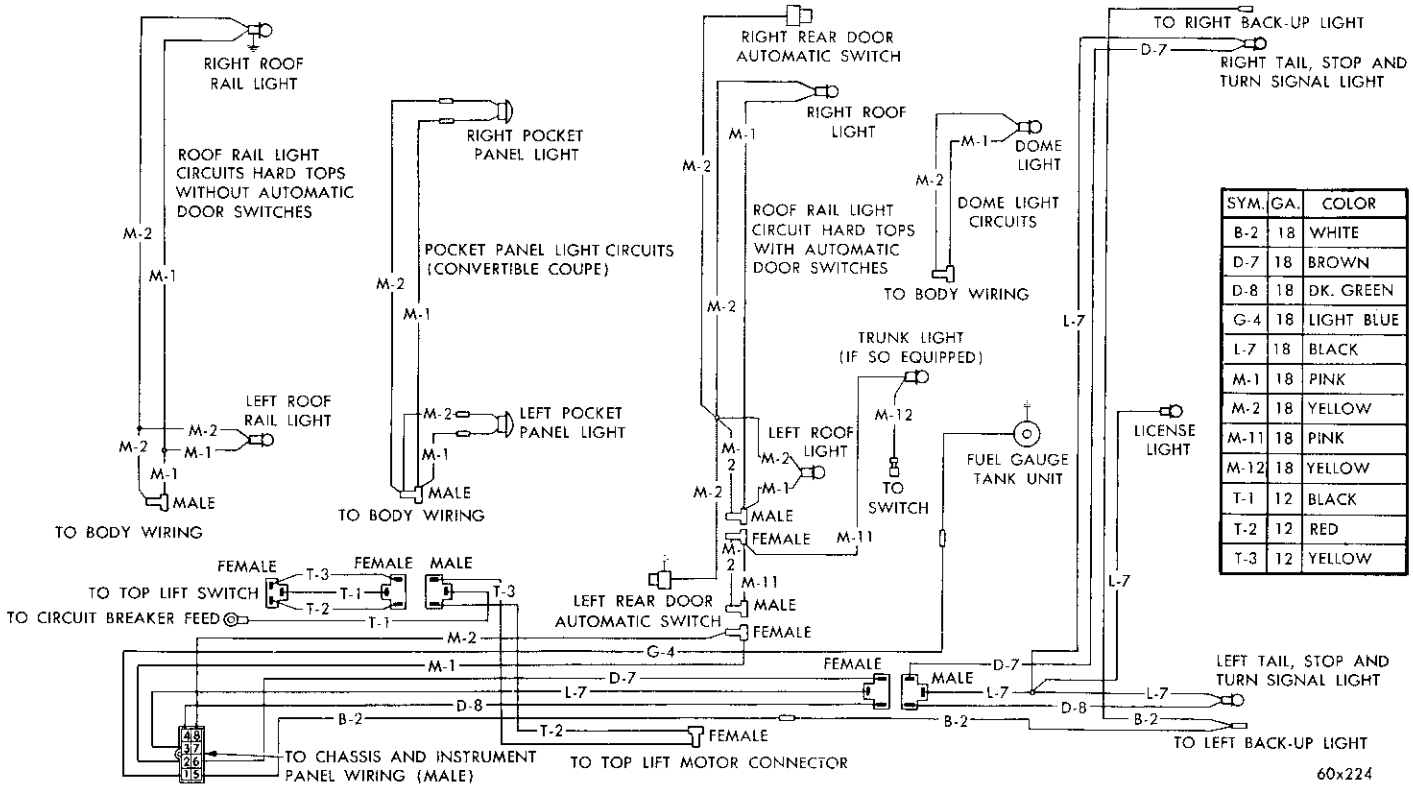
SYM.	GA.	COLOR	SYM.	GA.	COLOR
F-2	10	RED	F-9	16	BLUE
F-5	14	RED	F-10	16	WHITE
F-6	18	YELLOW	F-11	14	RED
F-7	18	GREEN	F-12	16	GREEN
F-8	18	BROWN	F-13	16	BLACK

Fig. 81—Six Way Seat Adjuster Wiring (Chrysler, Imperial & DeSoto)



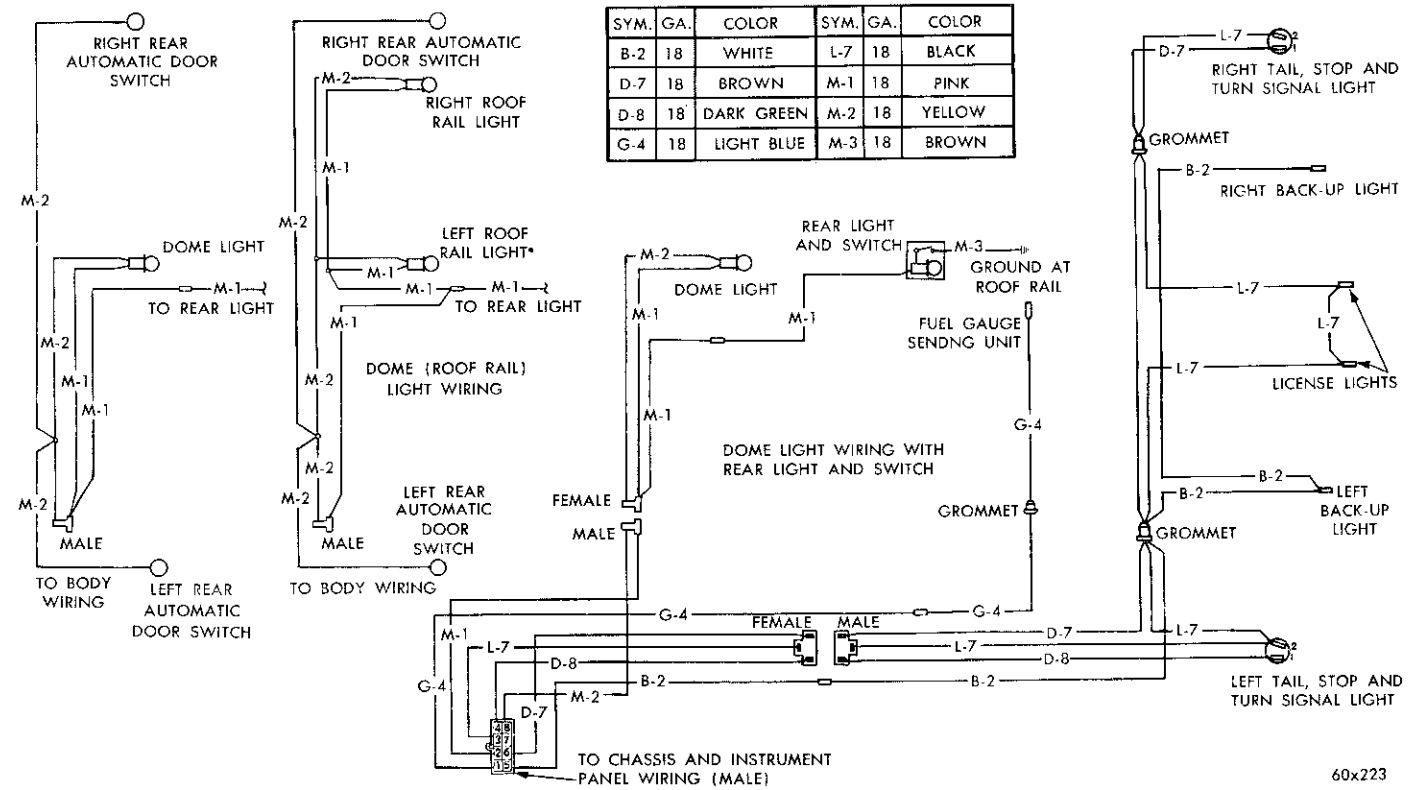
SYM.	GA.	COLOR
B-2	18	WHITE
D-7	18	BROWN
D-8	18	DK GREEN
G-4	18	LIGHT BLUE
L-7	18	BLACK
M-1	18	PINK
M-2	18	YELLOW
M-11	18	PINK
M-12	18	YELLOW
T-1	12	BLACK
T-2	12	RED
T-3	12	YELLOW

Fig. 82—Body and Dome Lamp Wiring (Chrysler Except Town and Country)



SYM.	GA.	COLOR
B-2	18	WHITE
D-7	18	BROWN
D-8	18	DK. GREEN
G-4	18	LIGHT BLUE
L-7	18	BLACK
M-1	18	PINK
M-2	18	YELLOW
M-11	18	PINK
M-12	18	YELLOW
T-1	12	BLACK
T-2	12	RED
T-3	12	YELLOW

Fig. 83—Body and Dome Lamp Wiring (DeSoto)



SYM.	GA.	COLOR	SYM.	GA.	COLOR
B-2	18	WHITE	L-7	18	BLACK
D-7	18	BROWN	M-1	18	PINK
D-8	18	DARK GREEN	M-2	18	YELLOW
G-4	18	LIGHT BLUE	M-3	18	BROWN

Fig. 84—Body and Dome Lamp Wiring (Chrysler Town and Country

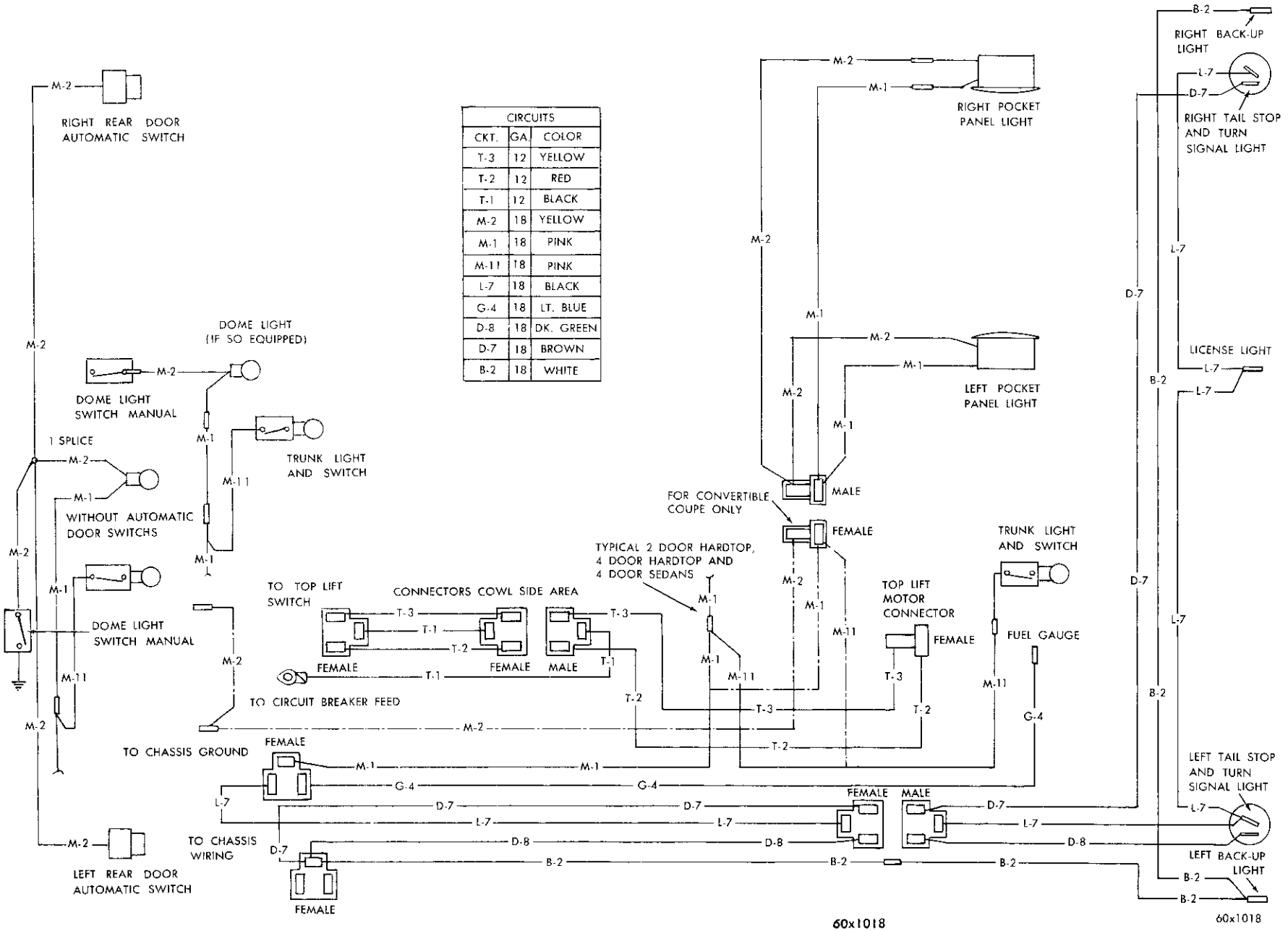


Fig. 85—Body and Dome Lamp Wiring (Imperial)

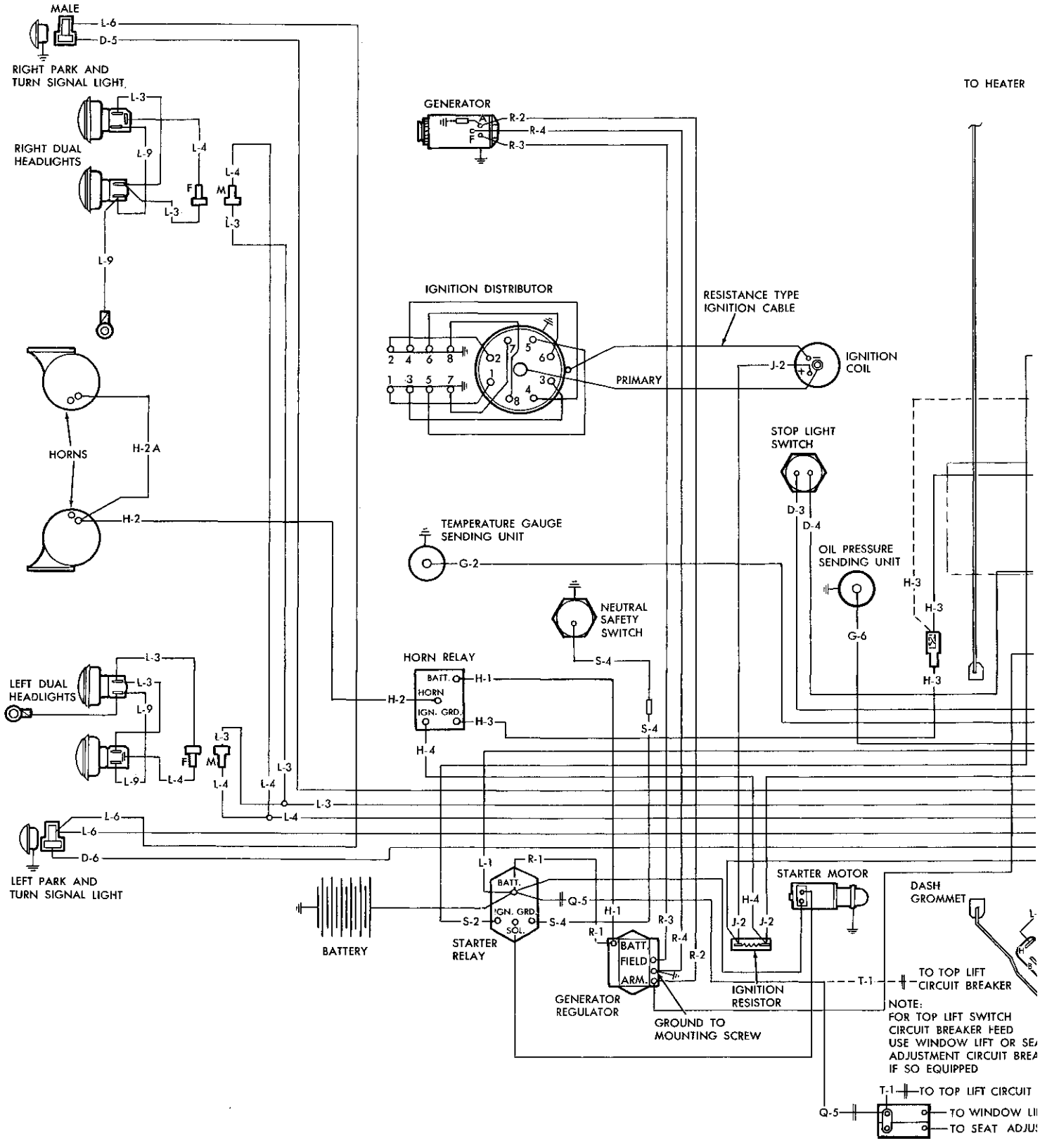
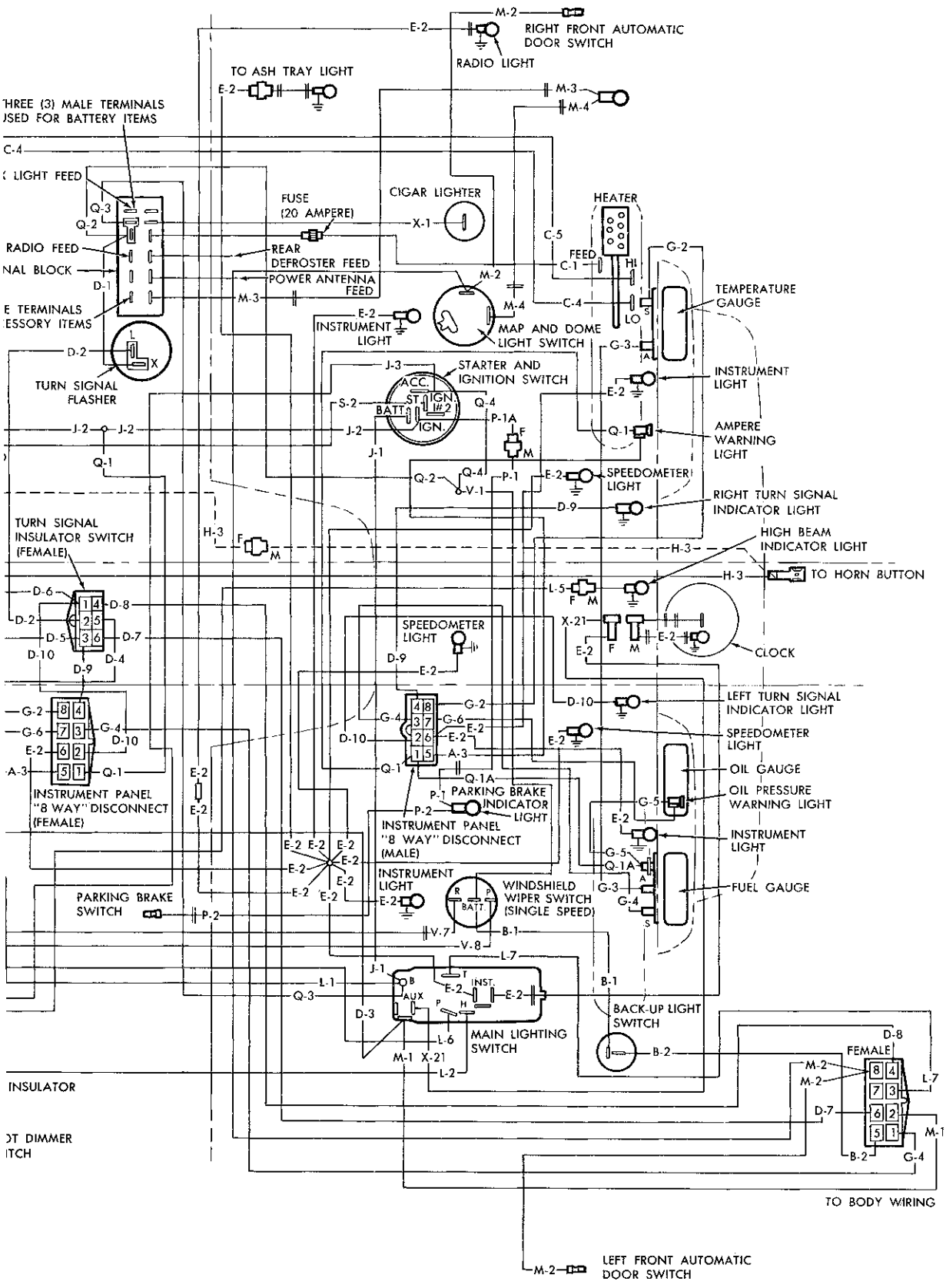


Fig. 86—Chassis and Instrument Panel Wiring (DeSoto)



CIRCUITS		
CKT.	GA.	COLOR
P-1A	16	LT. BLUE
P-1	18	LT. BLUE
P-2	18	LT. BLUE
M-2	18	YELLOW
M-1	18	PINK
L-1	12	RED
L-7	18	BLACK
L-6	18	YELLOW
L-5	18	RED
L-4	16	BLACK
L-3	16	RED
L-2	16	LT.GREEN
J-3	18	DK. BROWN
J-2	18	DK. BLUE
J-1	12	RED
H-4	18	DK. BLUE
H-3	18	BLACK
H-2A	16	DK. GREEN
H-2	14	DK. GREEN
H-1	14	VIOLET
G-5	18	DK. BLUE
G-4	18	LT. BLUE
G-3	18	BLACK
G-6	18	GRAY
G-2	18	VIOLET
S-4	16	BROWN
C-5	16	DK. GREEN
C-4	16	BROWN
C-1	16	BLACK
M-4	18	BROWN
M-3	18	PINK
T-1	10	BLACK
Q-5	10	BLACK
X-21	18	PINK
E-2	18	ORANGE
A-3	18	RED
A-2	18	DK. BLUE
D-10	18	LT. GREEN
D-9	18	TAN
D-8	18	DK. GREEN
D-7	18	BROWN
D-6	18	LT.GREEN
D-5	18	TAN
D-4	18	WHITE
D-3	18	PINK
D-2	18	RED
D-1	18	BLACK
B-2	18	WHITE
B-1	18	WHITE
V-8	16	BLUE
V-7	16	BLACK
Q-1A	18	DK. BLUE
V-1	16	BLACK
S-2	18	YELLOW
R-4	16	BROWN
R-3	18	DK. GREEN
R-2	12	RED
R-1	12	BLACK
X-1	14	BLACK
Q-4	14	BLACK
Q-3	14	RED
Q-2	14	BLACK
Q-1	18	BLACK
L-9	16	WHITE

Fig. 86—Chassis and Instrument Panel Wiring (DeSoto)

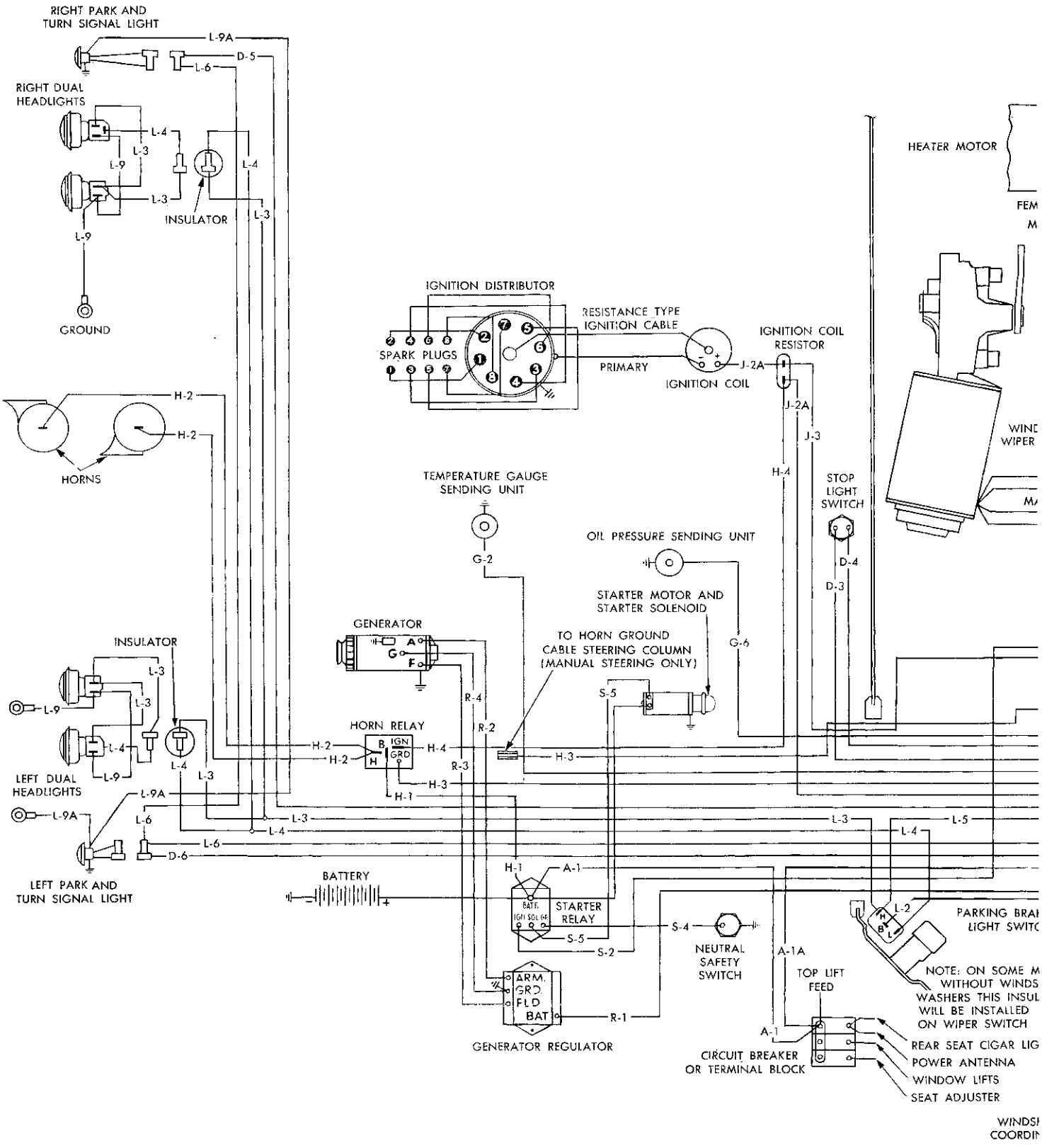
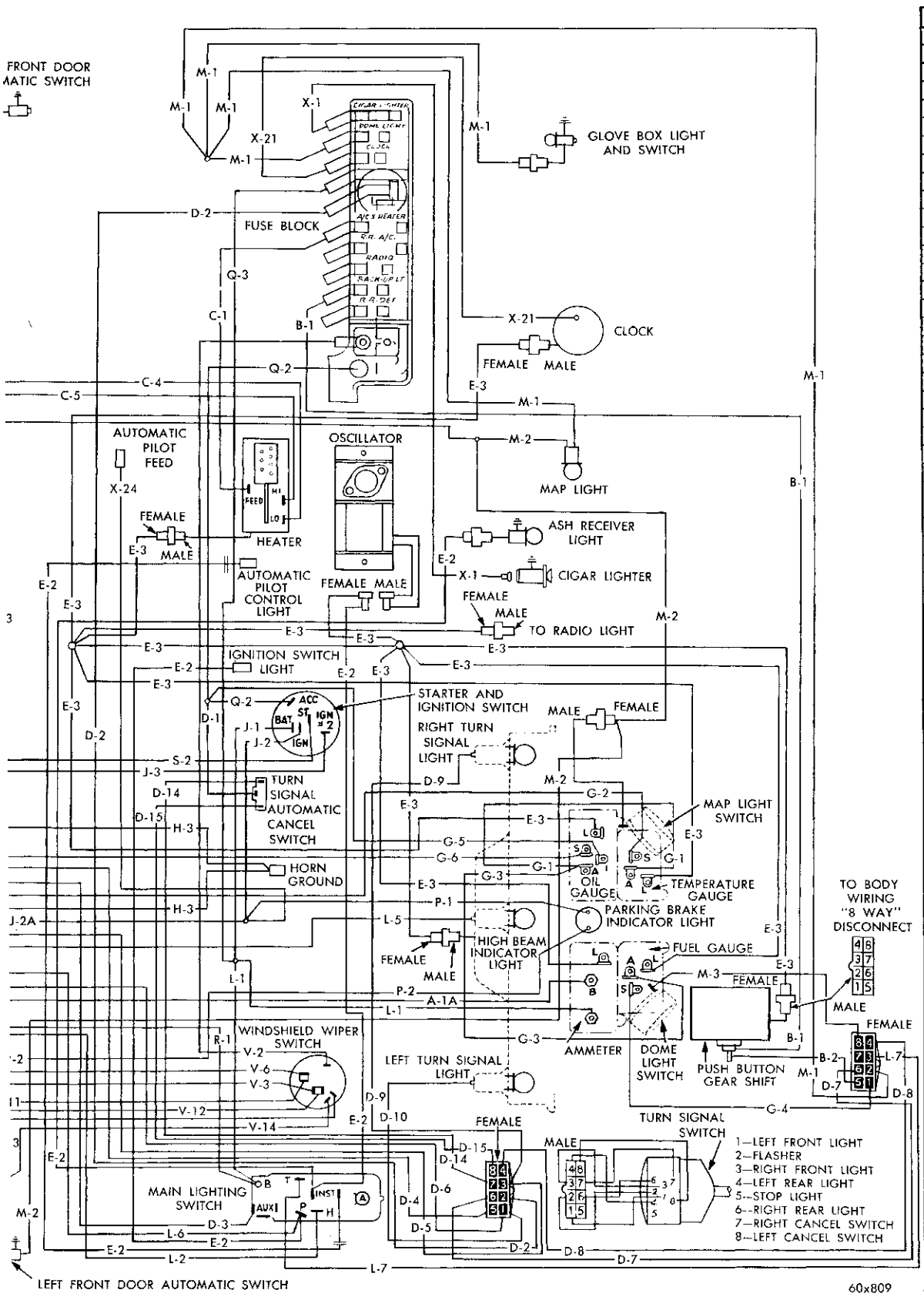


Fig. 87—Chassis and Instrument Panel Wiring (Chrysler)



SYM.	GA.	COLOR
A-1	10	RED
A-1A	12	RED
B-1	18	WHITE
B-2	18	WHITE
C-1	16	BLACK
C-4	16	BROWN
C-5	16	DK. GREEN
D-1	18	BLACK
D-2	18	RED
D-3	18	PINK
D-4	18	WHITE
D-5	18	TAN
D-6	18	LT. GREEN
D-7	18	BROWN
D-8	18	DK. GREEN
D-9	18	TAN
D-10	18	LT. GREEN
D-14	18	VIOLET
D-15	18	ORANGE
E-2	18	ORANGE
E-3	18	WHITE
G-1	18	BLACK
G-2	18	VIOLET
G-3	18	BLACK
G-4	18	LT. BLUE
G-5	18	DK. BLUE
G-6	18	ORANGE
H-1	16	VIOLET
H-2	16	DK. GREEN
H-3	16	BLACK
H-4	18	DK. BLUE
J-1	12	RED
J-2	16	DK. BLUE
J-2A	18	DK. BLUE
J-3	18	DK. BROWN
L-1	12	BLACK
L-2	16	LT. GREEN
L-3	16	RED
L-4	16	BLACK
L-5	18	RED
L-6	18	YELLOW
L-7	18	BLACK
L-9	16	WHITE
M-1	18	PINK
M-2	18	YELLOW
M-3	18	YELLOW
P-1	18	LT. BLUE
P-2	18	LT. BLUE
Q-2	12	BLACK
Q-3	14	RED
R-1	12	BLACK
R-2	12	RED
R-3	18	DK. GREEN
R-4	16	BROWN
S-2	18	YELLOW
S-4	18	BROWN
V-2	16	PINK
V-3	16	BLACK
V-4	16	RED
V-5	16	YELLOW
V-6	16	DK. BLUE
V-9	16	RED
V-10	16	YELLOW
V-11	16	DK. BLUE
V-12	16	BLACK
V-13	16	RED
V-14	16	YELLOW
X-1	16	RED
X-21	18	GRAY
X-24	16	RED

Fig. 87—Chassis and Instrument Panel Wiring (Chrysler)

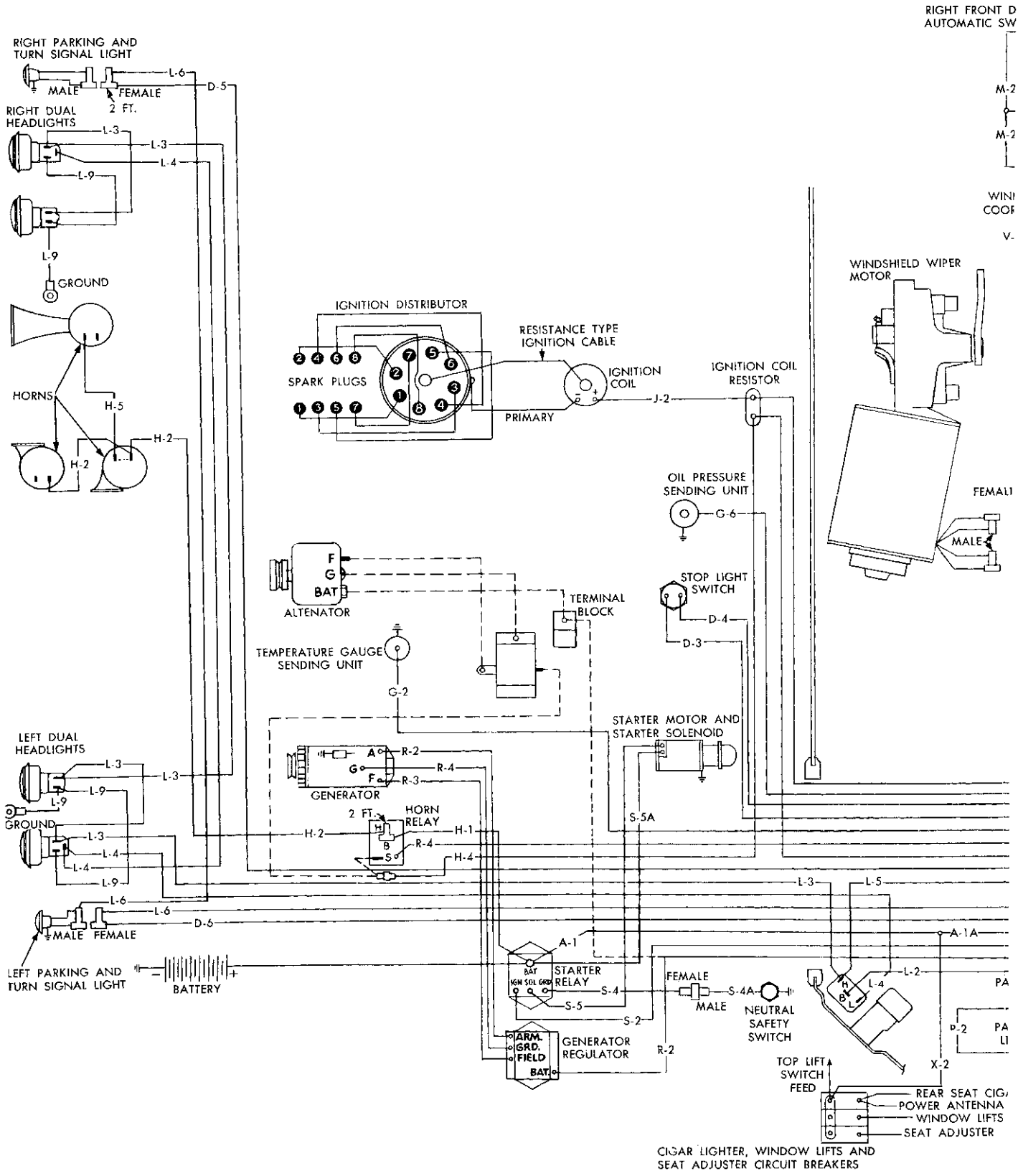
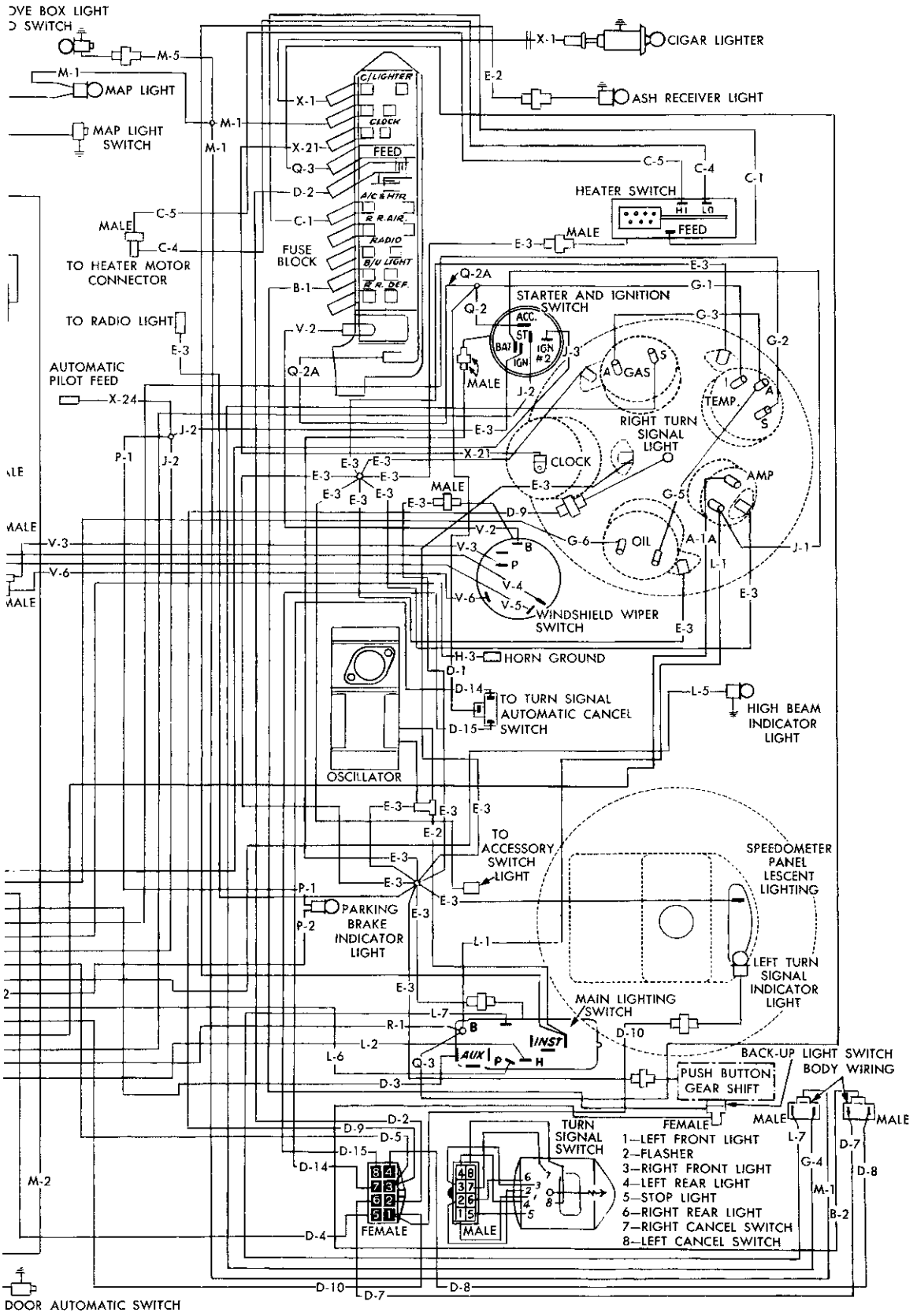


Fig. 88—Chassis and Instrument Panel Wiring (Imperial)



SYM.	GA.	COLOR
A-1	10	RED
A-1A	12	RED
B-1	18	WHITE
B-2	18	WHITE
C-1	16	BLACK
C-4	16	BROWN
C-5	16	DK. GREEN
D-1	18	BLACK
D-2	18	RED
D-3	18	PINK
D-4	18	WHITE
D-5	18	TAN
D-6	18	LT. GREEN
D-7	18	BROWN
D-8	18	DK. GREEN
D-9	18	TAN
D-10	18	LT. GREEN
D-14	18	VIOLET
D-15	18	ORANGE
E-2	18	ORANGE
E-	20	WHITE
G-1	18	BLACK
G-2	18	VIOLET
G-3	18	BLACK
G-4	18	LT. BLUE
G-5	18	BLACK
G-6	18	ORANGE
H-1	16	VIOLET
H-2	16	DK. GREEN
H-3	18	BLACK
H-4	18	DK. BLUE
H-5	14	DK. GREEN
J-1	12	RED
J-2	16	DK. BLUE
J-3	18	DK. BROWN
L-1	12	BLACK
L-2	16	LT. GREEN
L-3	16	RED
L-4	16	BLACK
L-5	18	RED
L-6	18	YELLOW
L-7	18	BLACK
L-9	16	WHITE
M-1	18	PINK
M-2	18	YELLOW
M-5	18	ORANGE
P-1	18	LT. BLUE
P-2	18	LT. BLUE
P-3	18	LT. BLUE
Q-2A	12	BLK.—WHITE
Q-2	12	BLACK
Q-3	14	RED—WHITE
R-1	12	BLACK
R-2	12	RED
R-3	18	DK. GREEN
R-4	16	BROWN
S-2	18	YELLOW
S-4	16	BROWN
S-4A	18	BROWN
S-5	12	BROWN
S-5A	4-B	BLACK
V-2	16	PINK
V-3	16	BLACK
V-4	16	RED
V-5	16	YELLOW
V-6	16	DK. BLUE
V-11	16	DK. BLUE
V-12	16	BLACK
V-13	16	RED
V-14	16	YELLOW
X-24	16	RED

Fig. 88—Chassis and Instrument Panel Wiring (Imperial)

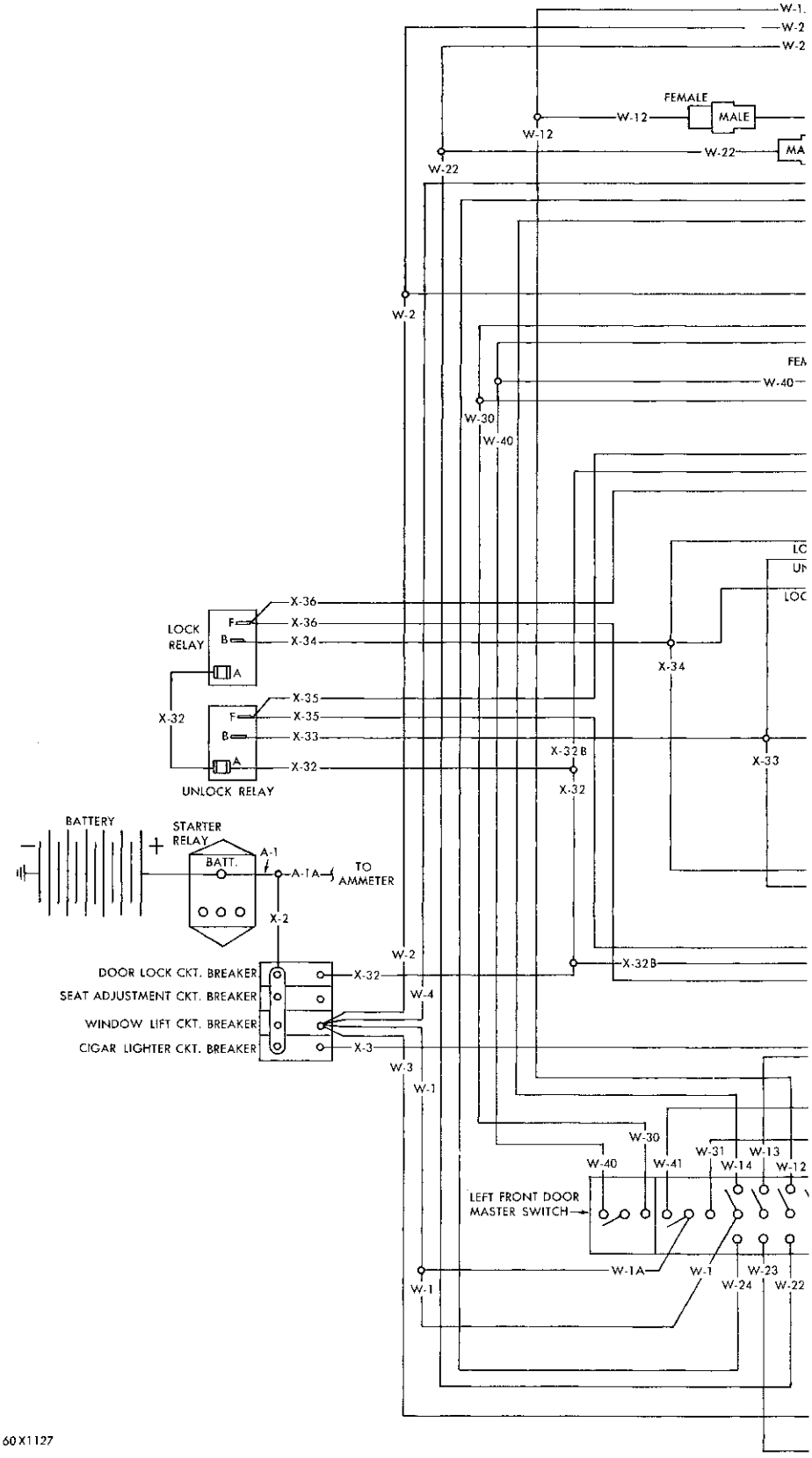
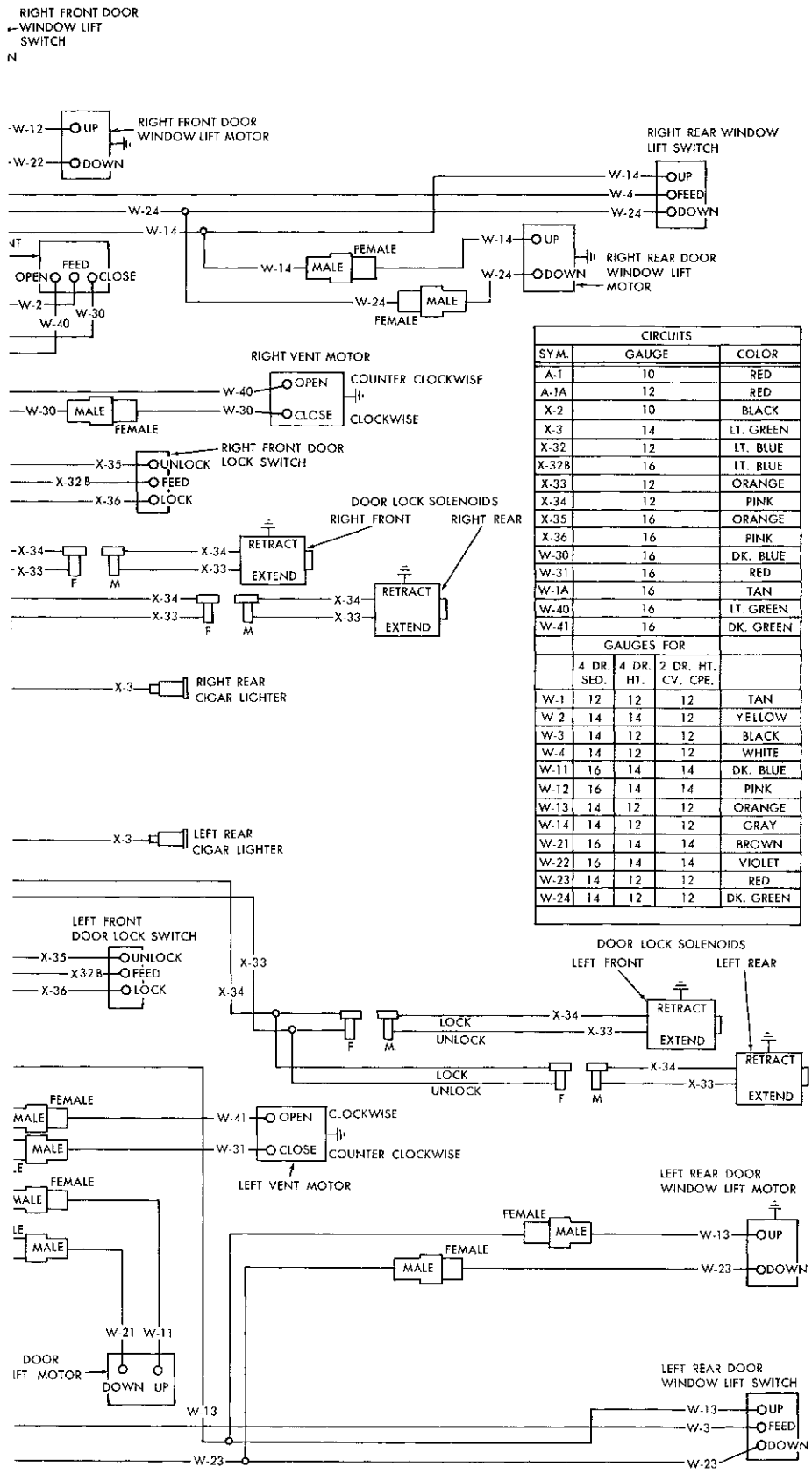


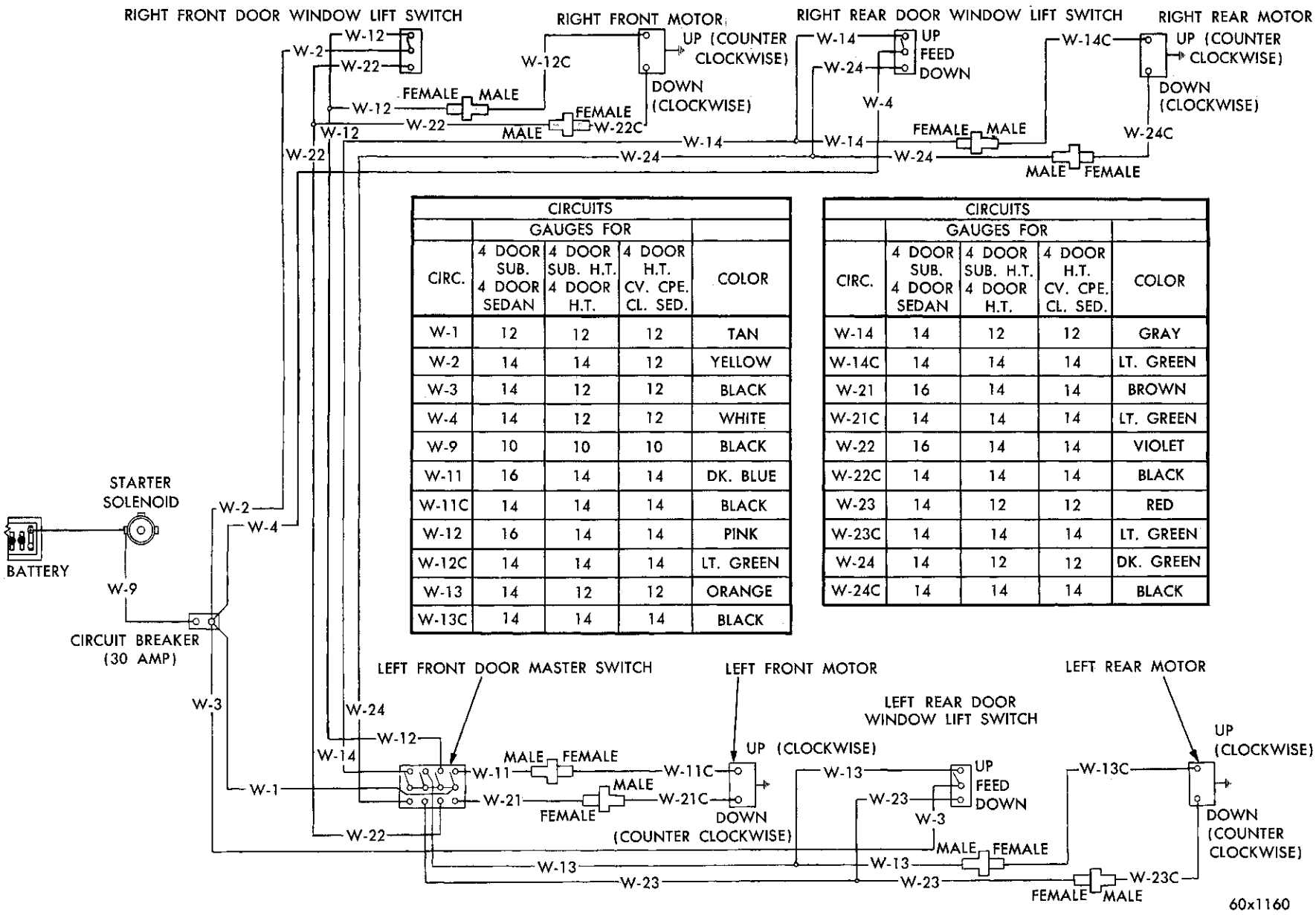
Fig. 89—Window Lift, Cigar Lighter and Electric Door Lock—Imperial (2096829)



CIRCUITS		
SYM.	GAUGE	COLOR
A-1	10	RED
A-1A	12	RED
X-2	10	BLACK
X-3	14	LT. GREEN
X-32	12	LT. BLUE
X-32B	16	LT. BLUE
X-33	12	ORANGE
X-34	12	PINK
X-35	16	ORANGE
X-36	16	PINK
W-30	16	DK. BLUE
W-31	16	RED
W-1A	16	TAN
W-40	16	LT. GREEN
W-41	16	DK. GREEN

GAUGES FOR				
	4 DR. SED.	4 DR. HT.	2 DR. HT. CV. CPE.	
W-1	12	12	12	TAN
W-2	14	14	12	YELLOW
W-3	14	12	12	BLACK
W-4	14	12	12	WHITE
W-11	16	14	14	DK. BLUE
W-12	16	14	14	PINK
W-13	14	12	12	ORANGE
W-14	14	12	12	GRAY
W-21	16	14	14	BROWN
W-22	16	14	14	VIOLET
W-23	14	12	12	RED
W-24	14	12	12	DK. GREEN

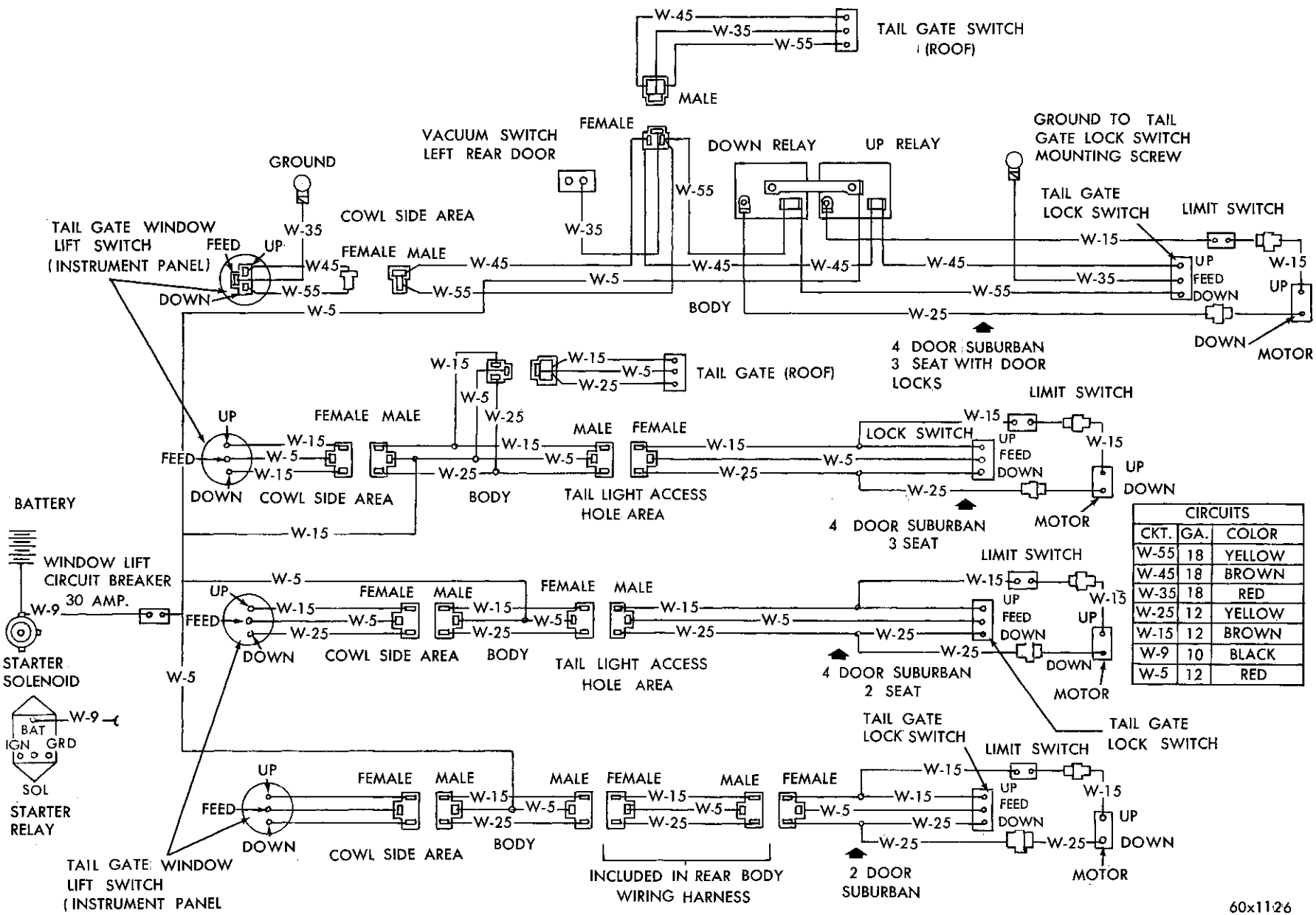
Fig. 89—Window Lift, Cigar Lighter and Electric Door Lock—Imperial (2096829)



CIRCUITS GAUGES FOR				
CIRC.	4 DOOR SUB. 4 DOOR SEDAN	4 DOOR SUB. H.T. 4 DOOR H.T.	4 DOOR H.T. CV. CPE. CL. SED.	COLOR
W-1	12	12	12	TAN
W-2	14	14	12	YELLOW
W-3	14	12	12	BLACK
W-4	14	12	12	WHITE
W-9	10	10	10	BLACK
W-11	16	14	14	DK. BLUE
W-11C	14	14	14	BLACK
W-12	16	14	14	PINK
W-12C	14	14	14	LT. GREEN
W-13	14	12	12	ORANGE
W-13C	14	14	14	BLACK

CIRCUITS GAUGES FOR				
CIRC.	4 DOOR SUB. 4 DOOR SEDAN	4 DOOR SUB. H.T. 4 DOOR H.T.	4 DOOR H.T. CV. CPE. CL. SED.	COLOR
W-14	14	12	12	GRAY
W-14C	14	14	14	LT. GREEN
W-21	16	14	14	BROWN
W-21C	14	14	14	LT. GREEN
W-22	16	14	14	VIOLET
W-22C	14	14	14	BLACK
W-23	14	12	12	RED
W-23C	14	14	14	LT. GREEN
W-24	14	12	12	DK. GREEN
W-24C	14	14	14	BLACK

Fig. 90—Electric Window Lift Wiring Diagram
(PC 1-2-3 PS 1 & 3)



CIRCUITS		
CKT.	GA.	COLOR
W-55	18	YELLOW
W-45	18	BROWN
W-35	18	RED
W-25	12	YELLOW
W-15	12	BROWN
W-9	10	BLACK
W-5	12	RED

Fig. 91—Electric Tail Gate (Chrysler) Town and Country