STARTER–INTERLOCK SYSTEMS

ALL SERIES

CONTENTS

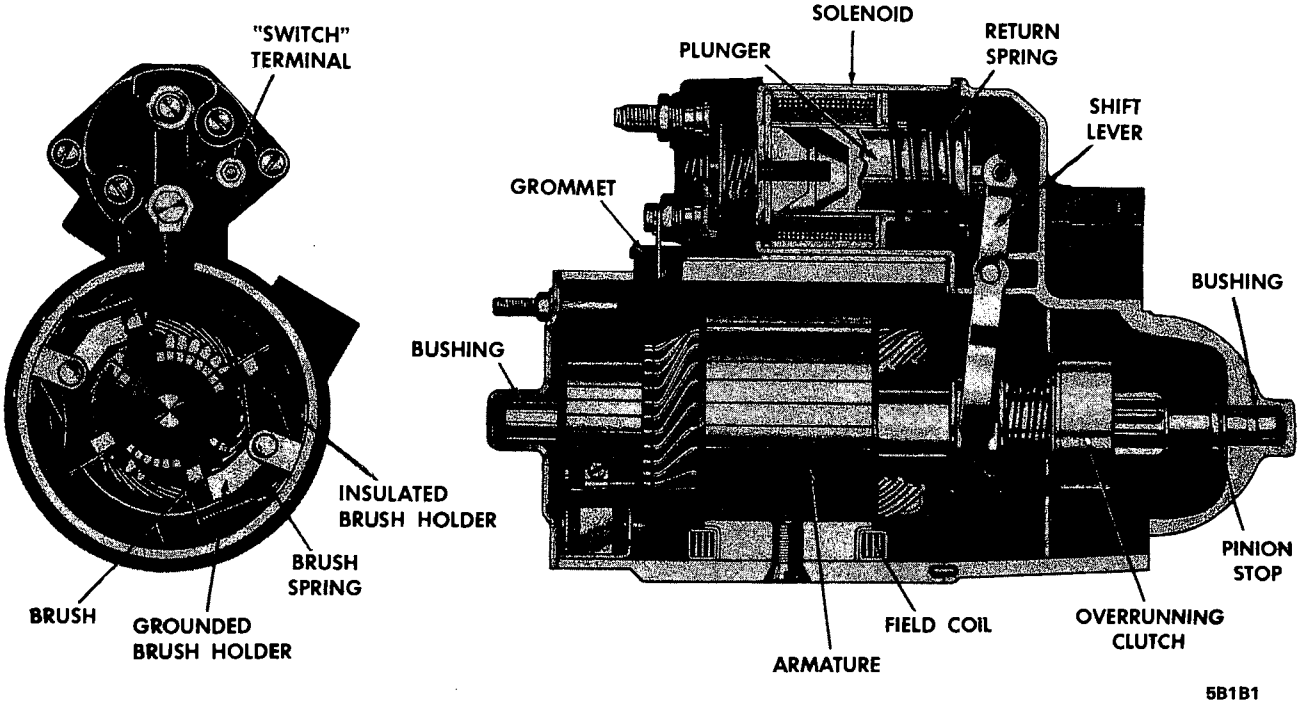


Figure 1B-1 Typical Starting Motor Assembly

DESCRIPTION AND OPERATION

The starting motor assembly is located at the lower right rear corner of the engine block on 231, 250, 350 and 455 *cu. in.* engines and at the lower left rear side on 260 and 400 cu. in. engines. It consists of a field coil, armature, a 5 roll overrunning clutch (except on 250 and 400 cu. in.), grounded and insulated brushes, shift lever, plunger and a solenoid switch assembly. Because there is no longer a need for the resistance wire in the ignition circuit, the "R" terminal of the solenoid switch has been deleted. The primary function of the starting motor is to crank the engine so that it may be started. See Figure 1B-1.

When the ignition switch is turned to "START" position, (shift lever in PARK or NEUTRAL on automatic transmission cars or in NEUTRAL with clutch pedal depressed on manual transmission cars), battery current energizes the "pull-on" and "hold-in" coils of the solenoid to activate the plunger. As the plunger is pulled inward, it operates the shift lever to engage the drive pinion with the flywheel ring gear and also closes the solenoid switch contacts which causes the starter to crank the engine. As the engine starts, the overrunning clutch begins freewheeling allowing the drive pinion to be driven by the flywheel ring gear without causing the armature speed to increase greatly. When the ignition switch is released to "ON" position, the solenoid circuit is opened, the plunger return spring causes the plunger, shift lever and drive pinion to retract thus, disengaging from the flywheel ring gear.

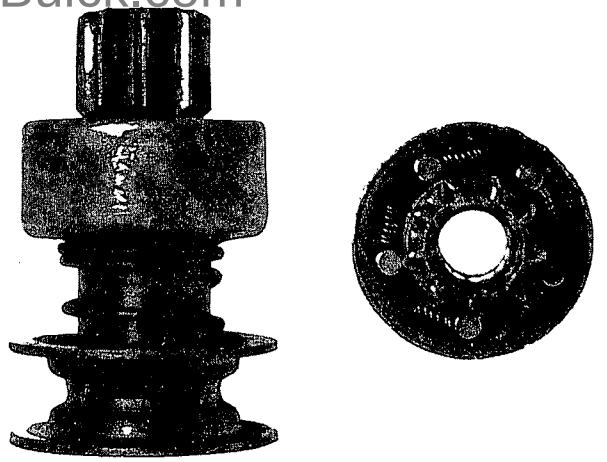


Figure 1B-2 5-Roll Clutch

DIAGNOSIS

DIAGNOSIS CHART

Condition	Possible Cause	Correction
1. Nothing happens with key in start position (Shift lever in Park or Neutral)	1. Discharged or defective battery	1. Check headlight operation. If dim or will not glow, charge battery and perform "Light Load Test". If battery does not pass this test, replace it.
	2. Poor cable wire and or connector connections	1. Inspect and correct connections at battery, solenoid, cowl connector and or ignition switch as necessary.
	3. Neutral start switch out of adjustment or defective	1. With foot brake set and key in start position, move shift lever through all ranges. If starter cranks in Reverse and Drive, position shift lever in Neutral (key off), remove Neutral start switch, pin in neutral, reinstall and attempt starting in Neutral and Park. If starter cranks in L2 and/ or L1, replace neutral start switch. If switch is not defective and the shift lever, indicator and switch are in adjustment and the starter will not crank in Neutral or Park, position shift lever in neutral and adjust transmission shift rod to lower column shift lever.

	4. Burnt out fusible link	1. Visually inspect and/or feel condition of fusible link. If burnt out, replace and recheck starting.
	5. Ignition switch malfunction	1. With foot brake set, shift lever in neutral and ignition switch "ON" determine if wipers and turn signals operate. If wipers and signals do not operate, inspect for disconnected cowl and/or ignition switch connector or a burnt out fusible. If all are OK, replace ignition switch.
	6. Solenoid malfunction	1. Connect voltmeter to solenoid "S" terminal and starter frame. Take reading when trying to start engine. If reading is 9 volts or greater, replace solenoid.
Starter clicks one at each starting attempt but will not crank.	1. Poor connections at battery and/or starter	1. Secure connections as may be required.
	2. Solenoid or starter malfunction	1. Remove starter assembly, inspect solenoid and/or starter and repair or replace as required.
Starter cranks but too slow to start engine.	1. Discharged or defective battery	1. Check headlight operation. If dim or will not glow. Charge battery and perform Light Load Test. If battery does not pass this test, replace it.
	2. Poor connections at battery and/or solenoid	1. Inspect and secure connections as necessary.
	3. Wrong starter installed on engine	1. Verify part numbers to insure correct starter useage. Replace if necessary.
	4. Defective starter	1. Remove starter, inspect bushings, etc., and repair as necessary.
	5. Low cranking voltage	1. Check cranking voltage at positive terminal of ignition coil. (Should be at least 9.5 volts). If less than 9.5 volts, check condition of battery, cables and starter connections. Correct as necessary.

		If over 9.5 volts, verify that low temperature or too heavy oil is not causing excessive engine drag.
		2. Check torque required to rotate engine at harmonic balancer bolt. Should not exceed 95 ft.lbs. with spark plugs in. If torque is OK, remove and repair starter. If torque is excessive repair engine and recheck starting.
Starter spins and or makes grinding noise, but will not crank engine	1. Dirt or corrosion on armature shaft	1. Clean armature shaft and lubricate with lithium soap grease.
	2. Defective starter drive clutch	1. Inspect drive clutch and replace if necessary.
	3. Missing teeth on engine ring gear	1. Replace engine ring gear and inspect teeth on drive pinion gear. Replace starter drive if necessary.
Starter excessively noisy when cranking	1. Improper drive pinion to ring gear clearance	1. Measure distance between tip of pinion tooth and root of two ring gear teeth with round feeler gauge at three locations around ring gear. Distance should be within .025″ to .060″. If distance is less than .025″, shim starter away from engine block at both attaching bolts. If distance is greater than .060″, shim to maximum of .030″ at outboard attaching bolt. In either case, recheck for correct clearance.
	2. Defective starter drive	1. Inspect drive and replace if necessary. Also, inspect ring gear.
	3. Worn starter bushing	1. Replace starter bushings.
	4. Defective ring gear	1. Replace ring gear. Inspect starter drive replace if necessary.

STARTER OVERHAUL

Starter Removal

"A-B-C-E and X" Series

1. Disconnect negative cable from battery.

2. On 6 cylinder inline engines, disconnect the starter support bracket.

3. Raise and suitably support car.

4. Disconnect positive cable and wires from solenoid.

5. Remove flywheel inspection cover.

6. Using care not to let starter drop, remove starter to engine attaching bolts and starter.

7. Clean exterior of starter assembly.

"H" Series (With Auto. Trans.)

1. Disconnect negative cable from battery.

2. Lift and support car in suitable stable manner.

3. Remove exhaust crossover pipe.

4. Remove flywheel cover.

5. Remove two transmission mount to transmission bolts.

6. Position adjustable support under transmission extension housing.

7. Remove right transmission support to underbody bolt, loosen left bolt and let support pivot downward.

8. Lower transmission and disconnect the oil cooler lines at transmission.

9. Remove the two starter to engine block attaching bolts while supporting starter.

10. Lower starter and remove after disconnecting the wires.

11. Reverse removal procedures for installation and add transmission fluid if necessary.

Solenoid Windings Test

1. Secure starter assembly in a vise.

2. Remove field lead attaching bolt, bend field leads away from solenoid motor terminal and ground this terminal with a heavy jumper wire.

3. Connect a 12 volt battery, a variable resistance and an ammeter of 100 amperes capacity in series with the solenoid "S" terminal.

4. Connect a heavy jumper from the solenoid base to the ground terminal of the battery and a voltmeter between the solenoid base and "S" terminal See Figure 1B-3.

5. Slowly adjust resistance until voltmeter reads 10 volts and note ammeter reading. This reading is of both windings in parallel and should be 41-47 amps.

6. Remove jumper wire from solenoid motor terminal and readjust resistance until voltmeter reads 10 volts and note ammeter reading. This reading is of the hold- in winding alone and should be 14.5 - 16.5 amps.

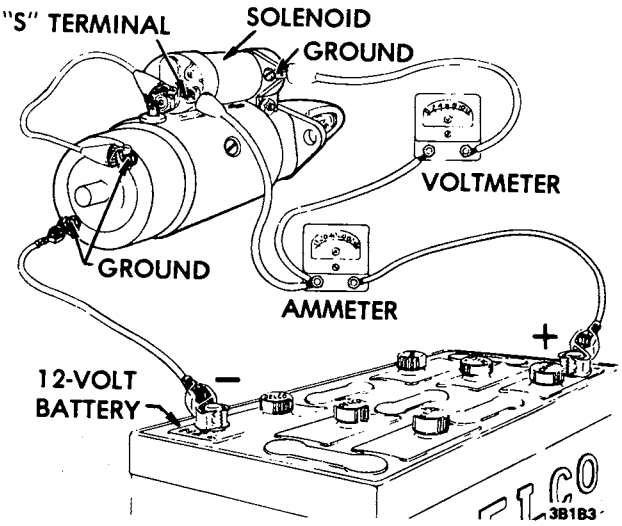


Figure 1B-3 Amperage Test of Solenoid

7. If windings do not test within specifications, the solenoid should be replaced.

Solenoid Removal

During the amperage test above, the starter was removed from the engine and the field leads were disconnected from the solenoid.

1. Remove the two solenoid to starter attaching bolts, rotate solenoid approximately 90 degrees to release retaining lip from starter and remove solenoid being careful as it is spring loaded.

Solenoid Installation

1. Position plunger return spring in solenoid, depress solenoid onto plunger and rotate to lock retaining lip into starter slot.

2. Install the two solenoid to starter attaching bolts.

3. Connect field leads of starter to motor terminal of solenoid and install bolt.

Starter Bench Test

To more accurately determine the cause of abnormal starter operation, prior to any repair, the starter should be subjected to the following no-load test;

1. Secure starter in a vise.

2. Connect the starter in series with a 12 volt battery and an ammeter capable of indicating several hundred amperes.

3. Connect into the circuit a high current carrying variable resistance (carbon pile) so that a specified voltage at the starter may be obtained. A small variation in the voltage will produce a marked difference in the current draw.

4. If an R.P.M. indicator is available, set it up to read armature R.P.M.

5. Check current draw and armature R.P.M. at 9 volts. Results should be as follows for the starters of the respective engines:

231 cu. in. - 50-80 amps @ 5500-10,500 rpm.

250 cu. in. - 50-80 amps @ 5500-10,500 rpm.

260 cu. in. - 55-80 amps @ 3500-6000 rpm.

350 cu. in. - 55-80 amps @ 3500-6000 rpm.

400 cu. in. - 65-95 amps @ 7500-10,500 rpm.

455 cu. in. - 45-80 amps @ 4000-6500 rpm.

Low no-load speed and high current draw may result from:

1. Tight, dirty or worn bearings, bent armature shaft or loose field pole screws which would allow the armature to drag.

2. Shorted armature. Check armature on growler.

3. A grounded armature or field.

Check for grounds by raising the grounded brushes and insulating them from the commutator with cardboard. If the starting motor has short field coils which are grounded to the field frame, disconnect these fields from ground. Then check with a test lamp between the insulated terminal and the frame. If lamp lights, raise insulated brushes from commutator and check fields separately to determine whether it is the armature or fields that are grounded.

Failure to operate with high current draw may result from;

1. A direct ground in the fields or terminal.

2. Frozen shaft bearings which prevent the armature from turning.

Failure to operate with no current draw may result from;

1. Open field circuit. Inspect internal connections and trace circuits with test lamp.

2. Open armature coils. Inspect armature for badly burned bars.

3. Broken or weak brush springs, worn brushes, high mica on the commutator, or other causes which would prevent good contact between the brushes and commutator. Any of these conditions will cause burned commutator bars.

Low no-load speed with low current draw indicates;

1. An open field winding. Raise and insulate ungrounded brushes from commutator and check fields with test lamp.

2. High internal resistance due to poor connections, defective leads, dirty commutator and cause listed above for burned commutator bars.

High no-load speed with high current draw indicates;

1. Shorted fields. There is no easy way to detect shorted fields, since the field resistance is already low. If shorted fields are suspected, replace the fields and check for improvement in performance.

Starter Disassembly, Cleaning and Inspection

1. Disconnect field leads from solenoid motor terminal by removing bolt.

2. Remove the two solenoid attaching bolts, rotate and remove solenoid.

3. Remove the two thru bolts, end frame and field frame assembly.

4. Pull both brush holder pivot pins, lift out each pair of brush holder assemblies and disconnect the leads and brushes.

5. Remove shift lever pivot bolt, plunger, shift lever and armature from drive housing.

6. Remove drive assembly from armature by first using a suitable tool to disengage snap ring retainer from snap ring then remove snap ring, retainer and slide drive assembly off armature shaft. See Figure 1B-4.

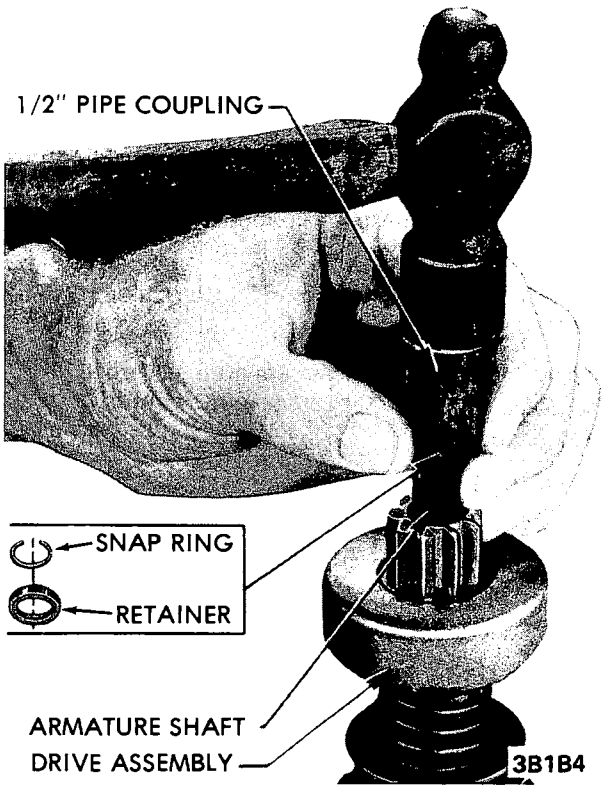


Figure 1B-4 Removing Snap Ring and Retainer

7. Clean all parts as necessary using clean cloths. The armature, field coils and drive assembly must not be cleaned by any degreasing or high temperature method.

8. Carefully inspect all parts for wear or damage and replace as may be required for reassembly.

9. Test armature on growler and turn commutator if required.

Assembly of Starter

1. Lubricate armature shaft and install drive assembly with pinion outward.

2. Slide snap ring retainer onto armature shaft with recessed side outward.

3. Install a new snap ring in groove on armature shaft using a block of hardwood and hammer to get it started onto shaft. See Figure 1B-5.

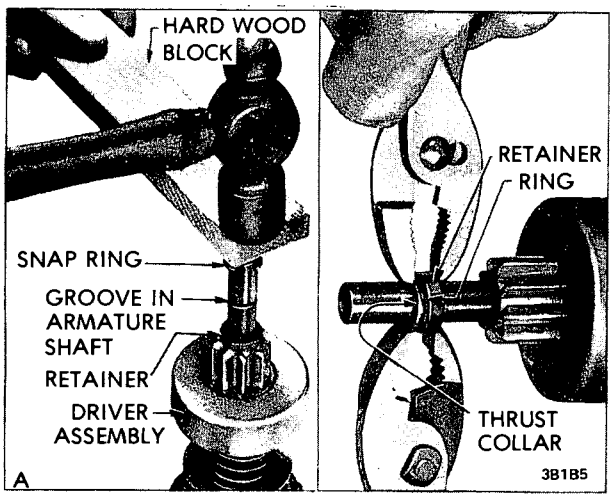


Figure 1B-5 Installing Snap Ring and Retainer

4. Slide thrust collar onto shaft, move snap- ring retainer up to snap-ring and using pliers on opposite sides of the shaft, squeeze retainer and thrust collar until the retainer is forced over the snap-ring. See Figure 1B-5.

5. Lubricate drive frame bushing and shift lever linkage and install shift linkage in drive end frame.

6. Install armature with spacers into drive and frame being sure the shift lever is in place on the drive assembly.

7. Assemble brushes and leads to brush holders. Position brush holder and spring assemblies in field frame and install pivot pins.

8. Assemble field frame, over armature, to drive end frame, spreading brush holders apart enough for brushes to clear commutator without damage to either and aligning dowel pin with hole in drive end frame.

9. Lubricate bushing in commutator end frame and install on armature shaft.

10. Install and secure thru bolts.

11. Move armature toward the commutator and frame and check end play clearance between snap-ring retainer and drive end housing using a feeler gauge. There should be .005" to .050" end play. If necessary, disassemble starter and change spacers as may be required to obtain correct end play.

12. Apply sealing compound to both sides of solenoid flange that locks into drive housing. Install solenoid with plunger return spring over plunger, depress and rotate flange into place and install the two solenoid to drive end frame bolts.

13. Connect field leads to solenoid.

Checking Pinion Clearance

Whenever the starter is disassembled and reassembled, the pinion clearance should be checked. Lack of clearance would prevent the solenoid switch from closing properly and excessive clearance would cause improper pinion engagement in the ring gear.

1. Connect a source of approximately 6 volts between the solenoid "S" terminal and ground.

CAUTION: *Do not use more than 6 volts or the starter will operate. As a further precaution to prevent motoring, connect a jumper wire from the solenoid motor terminal to ground.*

2. After energizing the solenoid, push the pinion away from the stop retainer as far as possible and use a feeler gauge to check the clearance between the pinion and retainer. See Figure 1B-6.

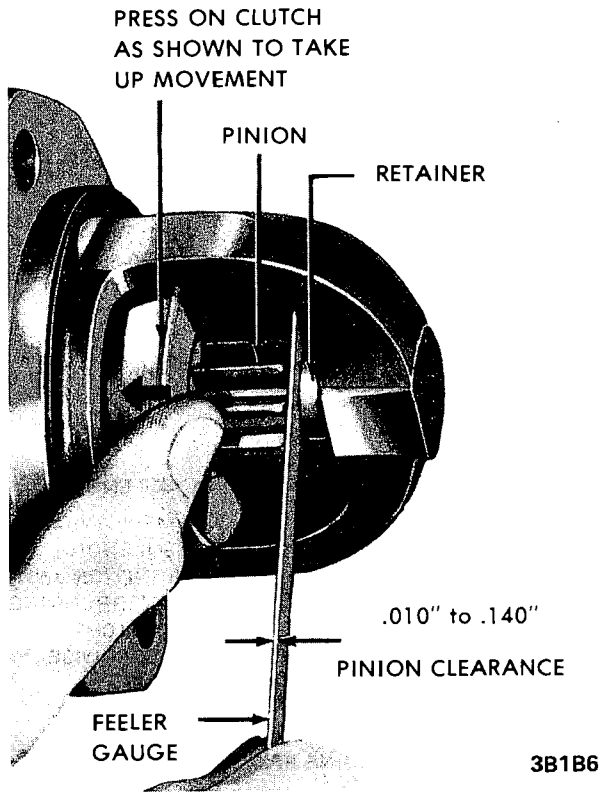


Figure 1B-6 Checking Pinion Clearance

3. If clearance is not between .010" and .140", it indicates excessive wear of solenoid linkage, shift lever mechanism or improper assembly of these parts and requires disassembly and replacement of defective parts.

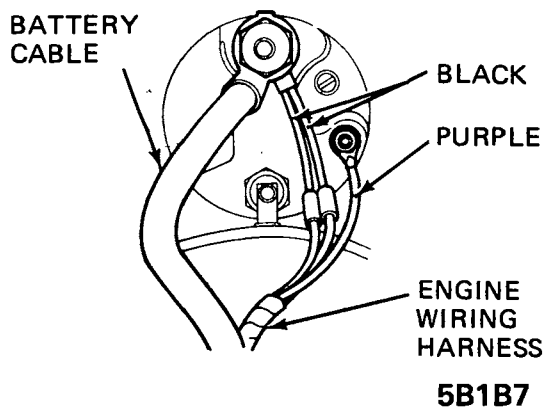


Figure 1B-7 Typical Solenoid Wire Connection

SPECIFICATIONS

STARTER SPECIFICATIONS

Starting Motor

	231 ENGINE	250 ENGINE	260 ENGINE
TYPE OF SHIFT	MECHANICAL	MECHANICAL	MECHANICAL
SHIFT ACTUATION	SOLENOID	SOLENOID	SOLENOID
SHIFT OPERATION	IGNITION SWITCH	IGNITION SWITCH	IGNITION SWITCH
TYPE OF DRIVE	OVERRUNING CLUTCH	OVERRUNNING CLUTCH	OVERRUNNING CLUTCH
ROTATION, VIEWING DRIVE END	CLOCKWISE	CLOCKWISE	CLOCKWISE
GEAR RATIO, MOTOR TO ENGINE	17.8:1	17:1	18.4:1
NO. TEETH ON RING GEAR AND DRIVE PINION	160-9	153-9	166-9
CRANKING SPEED, ENGINE RPM (NORMAL TEMPERATURE	160 APPROXIMATELY	160 APPROXIMATELY	160 APPROXIMATELY
NO LOAD TEST			
AMPERES	55-80	50-80	55-80
VOLTS	9	9	9
RPM	3500-6000	5500-10500	3500-6000
BRUSH SPRING TENSION - OUNCES	35 MINIMUM	35 MINIMUM	35 MINIMUM
ARMATURE END PLAY	.005"-.050"	.005" TO .050"	.005" TO .050"
PINION CLEARANCE IN CRANKING POSITION	.010"-.140"	.010" TO .140"	.010" TO .140"

	350 ENGINE	400 ENGINE	455 ENGINE
TYPE OF SHIFT	MECHANICAL	MECHANICAL	MECHANICAL
SHIFT ACTUATION	SOLENOID	SOLENOID	SOLENOID
SHIFT OPERATION	IGNITION SWITCH	IGNITION SWITCH	IGNITION SWITCH
TYPE OF DRIVE	OVERRUNNING CLUTCH	OVERRUNNING CLUTCH	OVERRUNNING CLUTCH
ROTATION, VIEWING DRIVE END	CLOCKWISE	CLOCKWISE	CLOCKWISE
GEAR RATIO, MOTOR TO ENGINE	17.8:1	18.4:1	18.4:1
NO. TEETH ON RING GEAR AND DRIVE PINION	160-9	166-9	166-9
CRANKING SPEED, ENGINE RPM (NORMAL TEMPERATURE)	160 APPROXIMATELY	160 APPROXIMATELY	160 APPROXIMATELY
NO LOAD TEST			
AMPERES	55-80	65-95	45-80
VOLTS	9	9	9
RPM	3500-6000	7500-10,500	4000-6500
BRUSH SPRING TENSION - OUNCES	35 MINIMUM	35 MINIMUM	35 MINIMUM
ARMATURE END PLAY	.005"-.050"	.005" TO .050"	.005" TO .050"
PINION CLEARANCE IN CRANKING POSITION	.010"-.140"	.010" TO .140"	.010" TO .140"

SOLENOID SWITCH (ALL)

MAKE . . . . . DELCO-REMY

SOLENOID SWITCH NUMBER . . . . .

ENGINE	START OF PROD.	AFTER JOBS
231-250-350-455	1114356	1114458
260	1114356	1114395
400	1114396	1114396

CURRENT DRAW OF SOLENOID WINDINGS AT 80° F.

HOLD-IN WINDING AMPS AT 10 VOLTS . . . . . 14.5 TO 16.5

BOTH WINDINGS IN PARALLEL, AMPS AT 10 VOLTS. . . . . 41 TO 47

PULL-IN WINDINGS, AMPS AT 5 VOLTS . . . . . 13 - 15.5

5B1B13

"A-B-C-E and X" Series

1. Fasten purple wire to solenoid "S" terminal.
2. Raise starter into position, install and torque bolts 35 ft.lbs.
3. Install flywheel inspection cover.
4. Secure yellow wire, fusible links and battery cable to solenoid. See Figure 1B-7.
5. Lower car and connect ground cable to battery.

"H" Series (With Auto. Trans.)

1. Reverse procedures called out in removal.

SEAT BELT/STARTER INTERLOCK SYSTEM

DESCRIPTION

The seat belt/starter interlock system is designed to prevent engine start when either the drivers seat and/or right front outboard passengers seat is occupied without having the seat belt(s) fastened.

The system includes: See Figure 1B-8.

1. Two beam type seat sensors for bucket seats or three waffle type seat sensors for all other front seats. The seat sensors are located under the seat cushion trim. See Figure 1B-9.
2. Two seat belt buckle switches for bucket seats or three seat belt buckle switches for all other front seats. The buckle switches are built into the seat belt buckles.
3. An electronic logic module which is located under the right side of the front seat cushion as shown in Figure 1B-8.

Early production cars were built with a jumper harness around portions of the logic module. A second type logic module is used on later production cars and does not require the jumper harness. The first type logic module can be used in only the early production cars while the second type logic module can be used in either early or later production cars. All service logic modules are of the second type.

4. An interlock relay which is mounted to the left of the fuse block.
5. A tone generator which plugs into a connector attached to the wiring harness above the fuse block.
6. A warning light located in the instrument cluster.

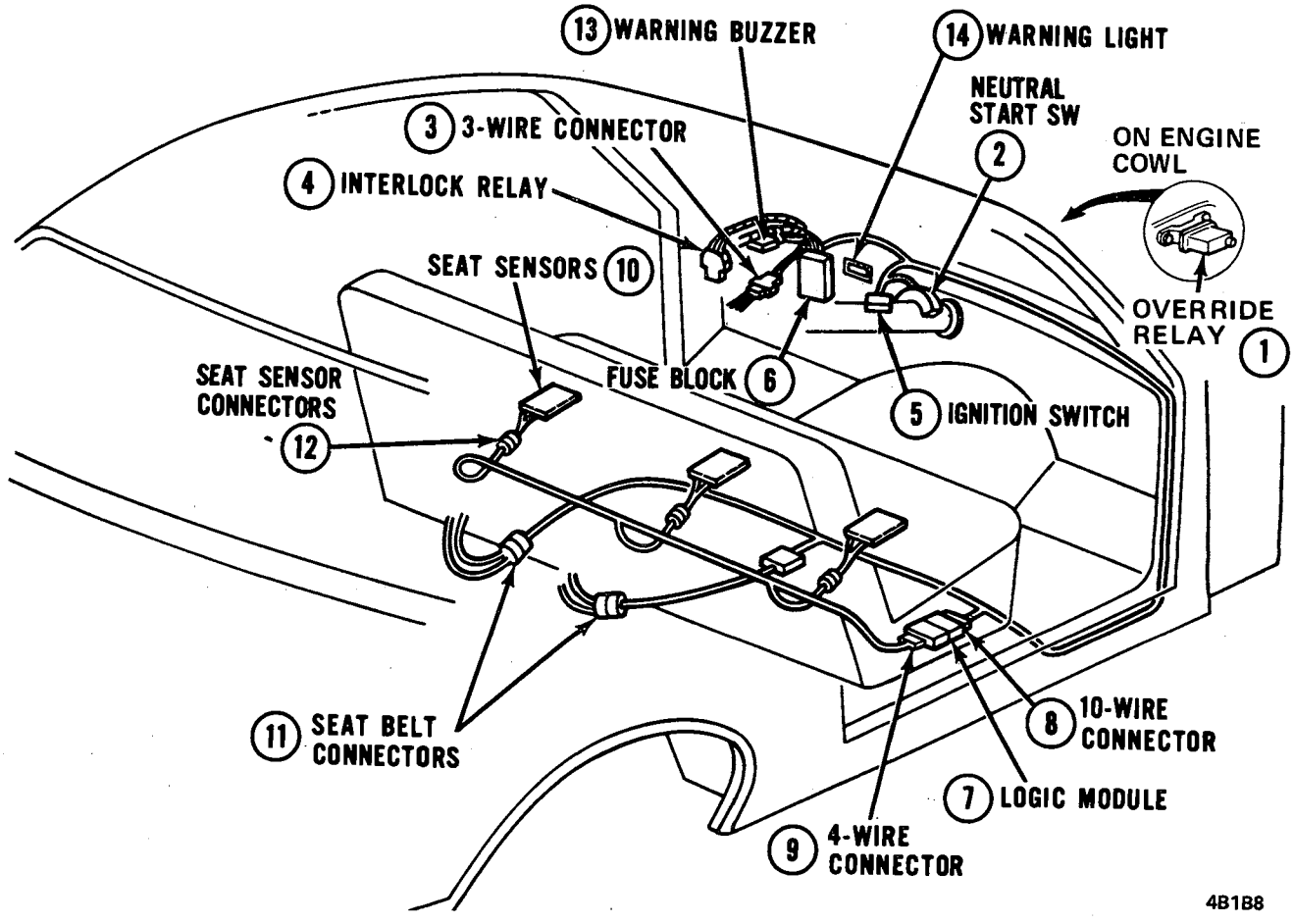


Figure 1B-8 System Components and location

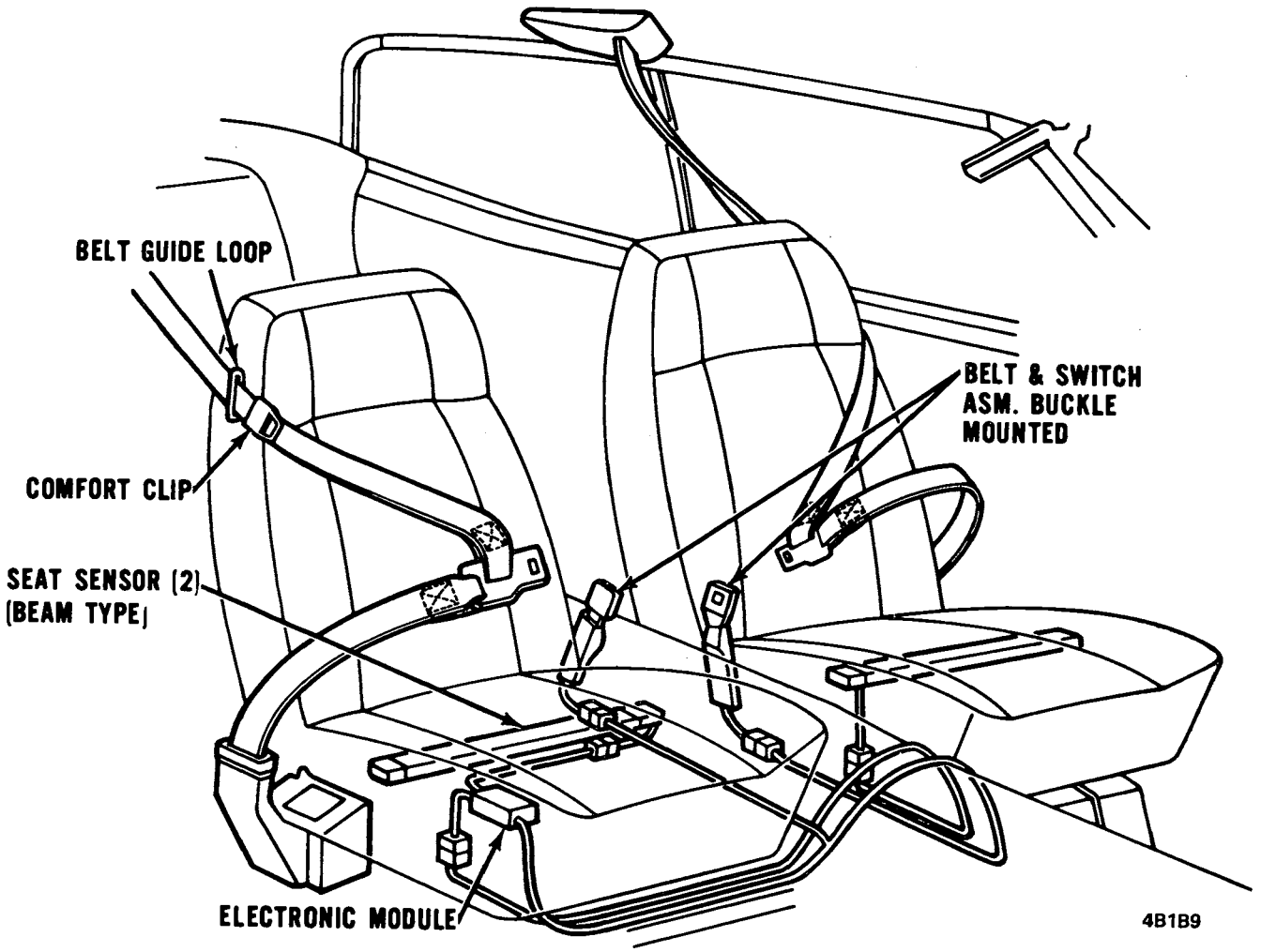


Figure 1B-9 Beam Type Seat Sensor Installation

7. An override relay located on the drivers side of the cowl in the engine compartment.

8. At the start of production an inline 3 amps fuse was installed in A-B-C and E cars as additional protection for the tone generator and was discontinued in December 1973. This fuse is located in the orange wire to the tone generator connector above the fuse block.

The first type tone generator has a white paint mark stamped on the back of it and can only be used in systems equipped with the inline 3 amp fuse.

The second type tone generator has a yellow paint marking and can be used in either system.

The "X" car system uses a buzzer instead of the tone generator thereby not requiring additional fuse protection.

OPERATION

Two things to remember are that the interlock relay is normally closed and that current is continually fed to the electronic logic module through the clock fuse.

To start the engine normally, a three step procedure must be followed in sequence:

1. Set on the seat.

2. Fasten the seat belt.

3. Turn the ignition key to start the engine.

If the right front seat position is occupied before the engine is started, that seat belt must also be buckled before the engine can be started.

If the center front seat position is occupied, it isn't necessary to fasten the center seat belt in order to start the engine since this seat position is not a part of the start mode of operation.

As the drivers seat and/or right front outboard seat is occupied, the respective seat sensor(s) informs the logic module and the interlock relay contacts are opened. By fastening the seat belts, the buckle switch(s) so inform the logic module and the interlock relay contacts are again closed. With the shift lever in "PARK" or "NEUTRAL" auto. trans. cars or in "NEUTRAL" with the clutch depressed on manual trans. cars and the ignition turned to "START", current is fed through the backup lamp and seat belt warning switch to the interlock relay and then to the solenoid to complete the start circuit.

Once the engine has been started using the correct starting procedures, it can be restarted with the seat belts unbuckled at occupied front seat positions as long as the driver

remains seated. If the driver leaves his seat, the three step procedure must again be used to start the engine.

If the seat belts are not buckled, or are buckled before the outboard seats are occupied, the logic module will cause the interlock relay contacts to open preventing current to the solenoid and also cause the warning light and tone generator to activate. The warning light and tone generator will also come on if any front seat occupant unbuckles his seat belt after the transmission is shifted to any forward drive position. The warning light and tone generator will not come on when the engine is running and a front seat belt is unbuckled if the shift lever remains in "PARK" or "NEUTRAL".

Bounce Feature

The electronic logic module has a built in bounce feature that keeps the interlock system from preventing a start when a buckled in occupant momentarily lifts off the seat and deactivates the seat sensor switch. Without the bounce feature, the logic module would sense that the occupant left the car and buckled the seat belt before being reseated. If the occupant is off the seat sensor switch for longer than five to fifteen seconds, the seat belt must be unbuckled and rebuckled before the engine will start.

Technicians Start

A technicians start consists of: (1) being sure the shift lever is in "PARK" on automatic transmission cars or in "NEUTRAL" with parking brake engaged and clutch pedal depressed are manual transmission cars, (2) reaching through the drivers window to turn the key or (3) if the choke is not set, opening the drivers door, positioning one foot on the accelerator and one hand on the ignition key and (4) depressing the accelerator pedal as required while turning the key to start the engine, without setting on the seat.

Override Relay

The override relay permits starting of the engine in the event of a failure in the interlock system. To activate the override relay, turn the ignition key to "ON", open the hood, press and release the start button on the override relay, then turn the ignition key to start the engine. The override relay will automatically remain engaged until the ignition is turned to "OFF" or "LOCK" position.

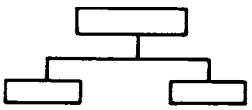
DIAGNOSIS

DIAGNOSIS CHARTS

SEAT BELT / STARTER INTERLOCK SYSTEM

Introduction

This section presents a systematic method of diagnosing and troubleshooting the seat belt/starter interlock system. The charts you will be using are different from the ones you have used before. They aren't "go –no go" decision trees or tables.



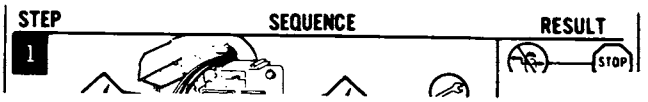
Condition	Possible Cause	Correction

Instead the new diagnosis and troubleshooting charts use pictures plus a few words to help you solve a problem,

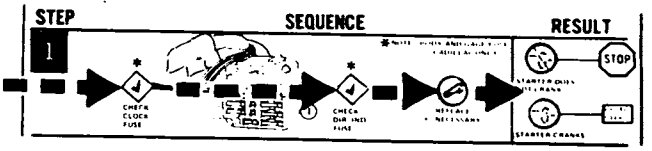
and symbols have replaced words.

How to use the charts

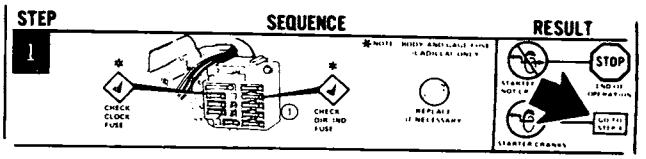
The charts are divided into three sections: step, sequence and result.



Always start at the first step and go through the complete sequence from left to right.



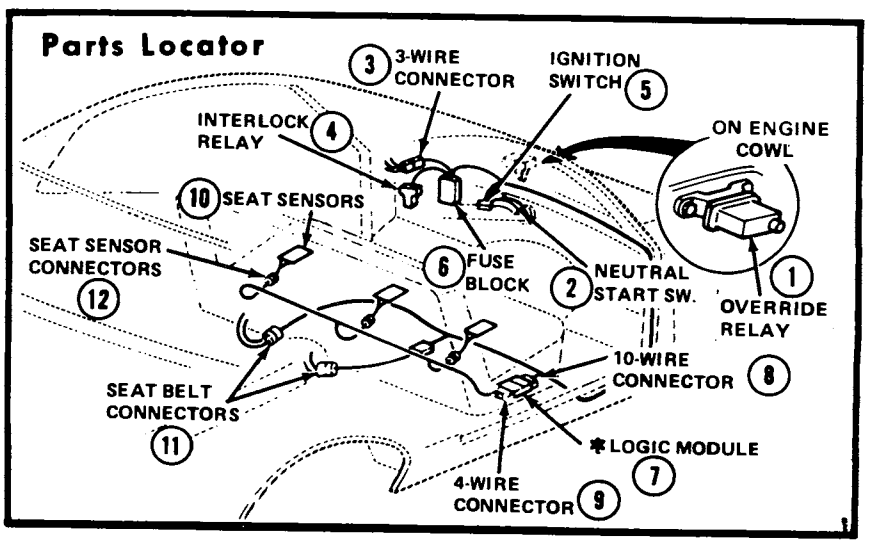
A sequence could be checking the fuses and replacing if necessary. Each sequence ends with a result and tells you the next step to go to.



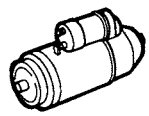
Work through each step of the diagnosis and trouble shooting charts till the system is repaired. STOP

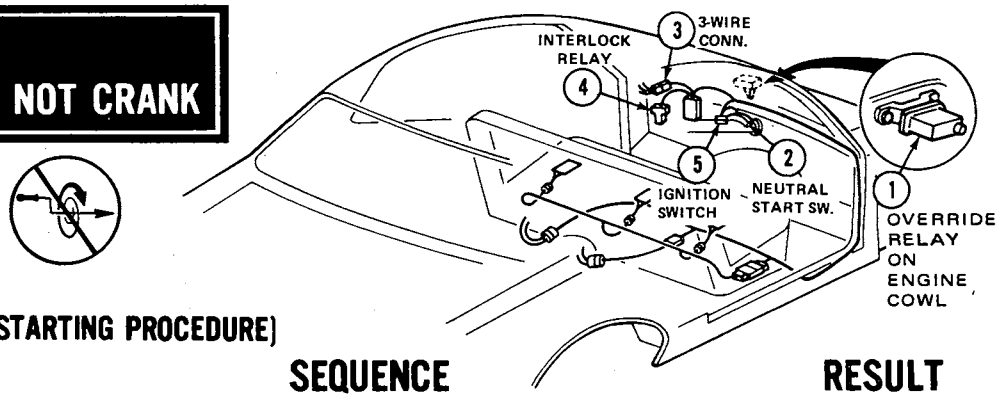
To find where parts are located in the system just look at the parts locator at the top of each chart.

Index

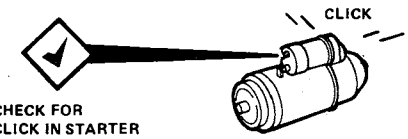
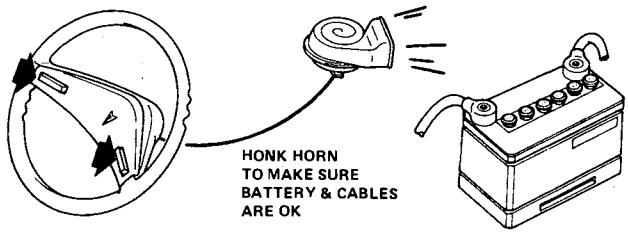
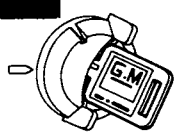
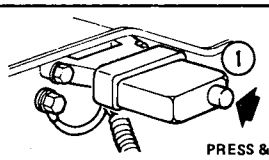
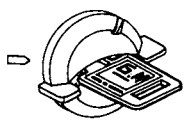
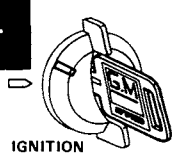
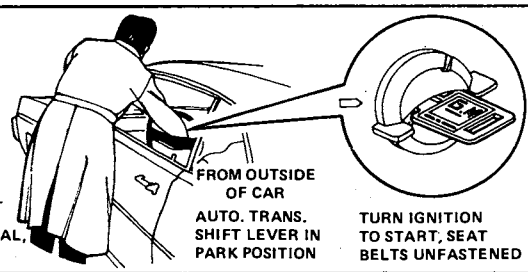
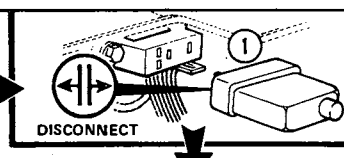


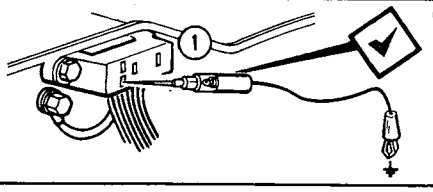
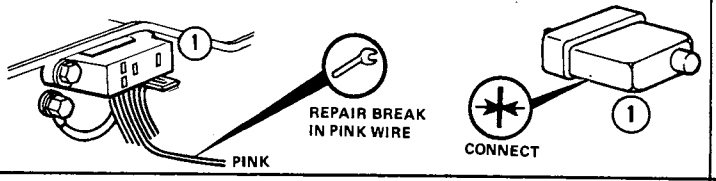
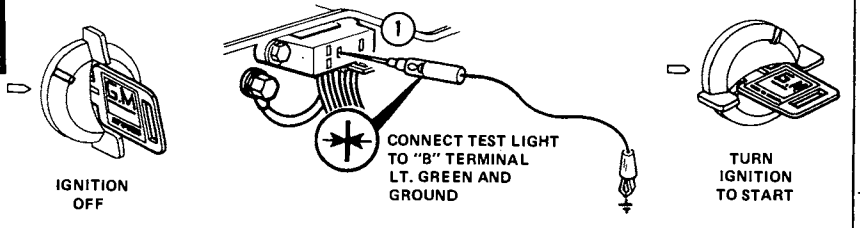
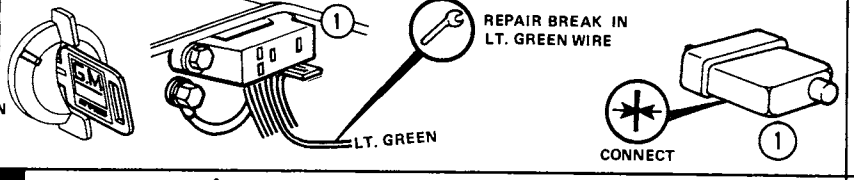
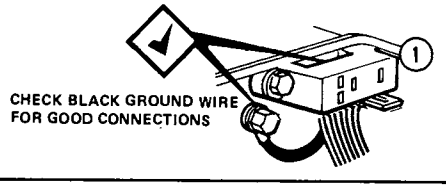
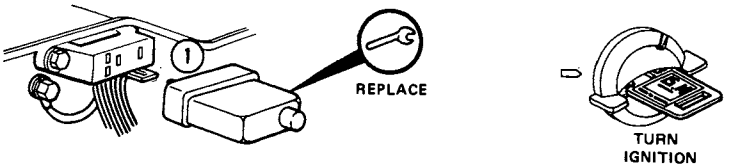
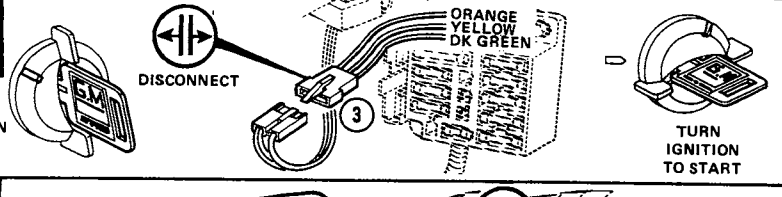
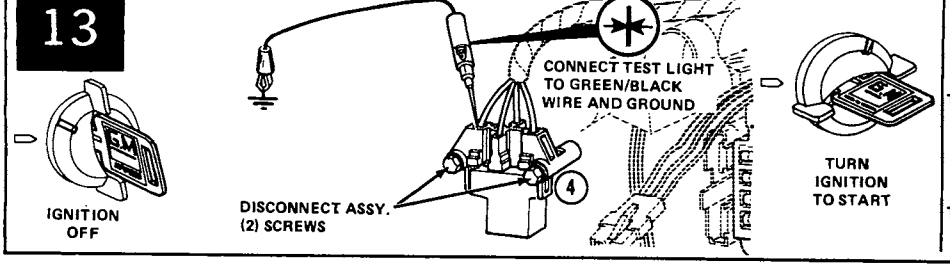
PROBLEM: starter WILL NOT CRANK

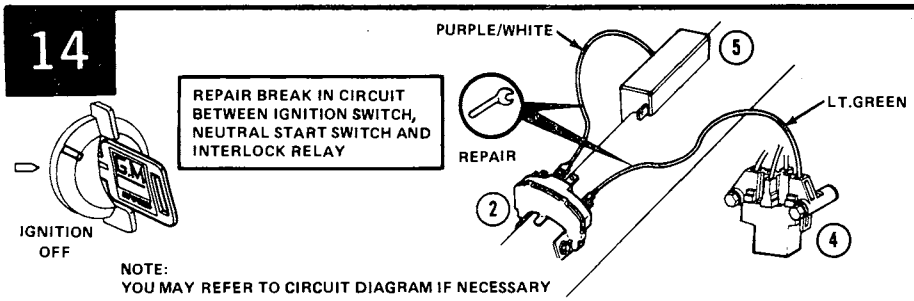
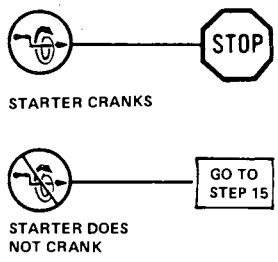
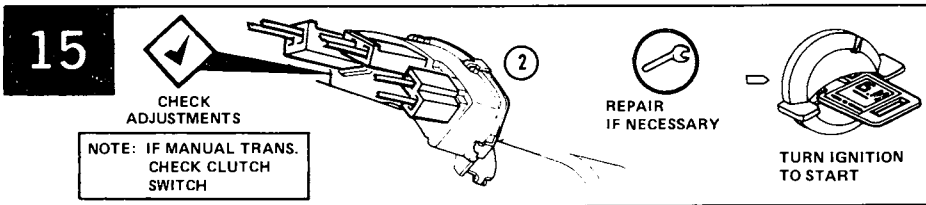
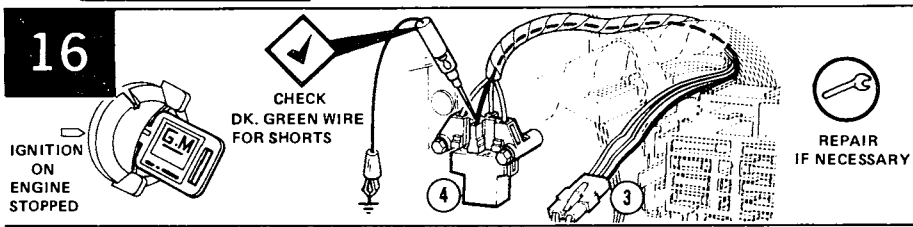
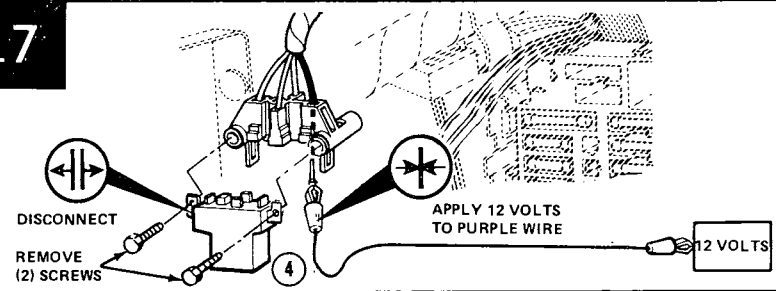
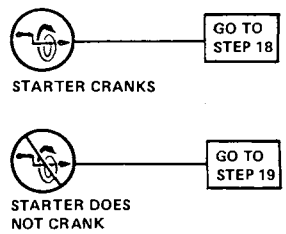
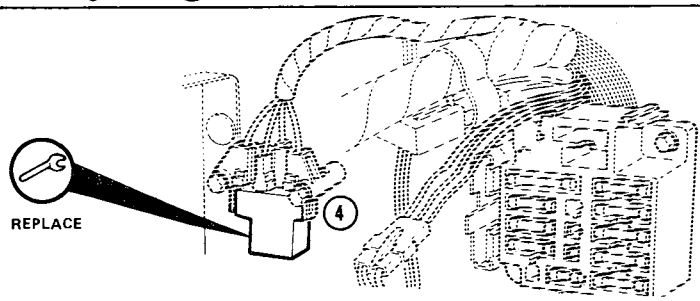
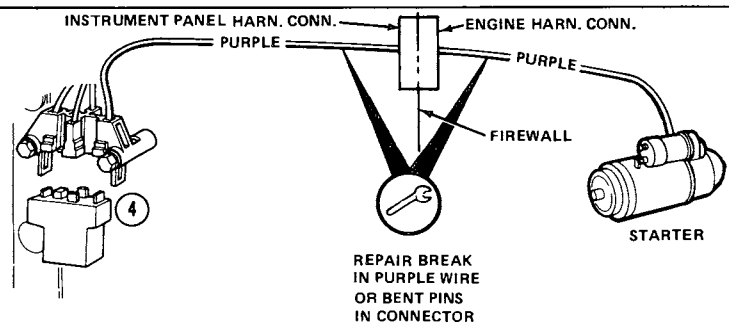




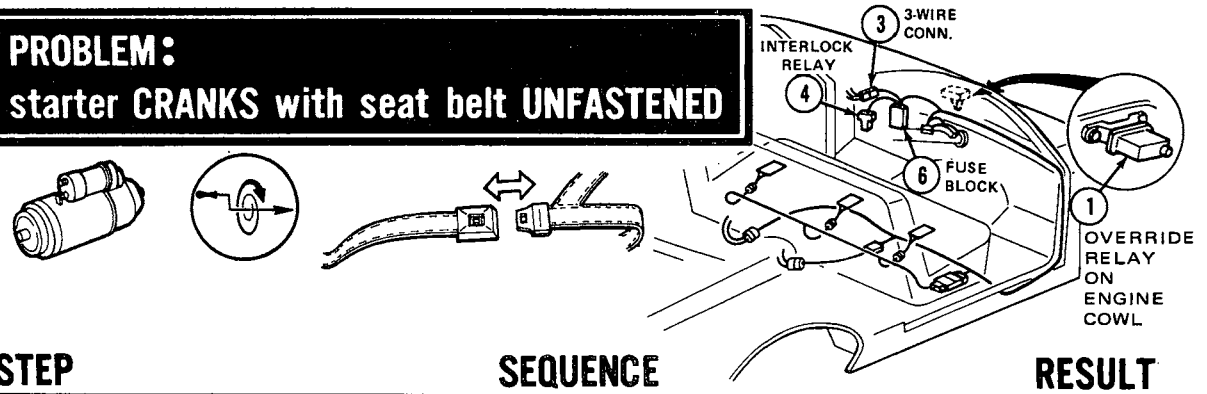
(USING CORRECT STARTING PROCEDURE)

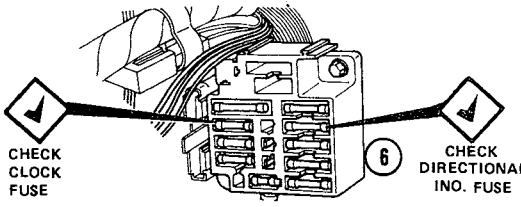
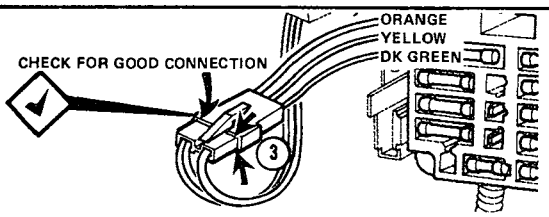
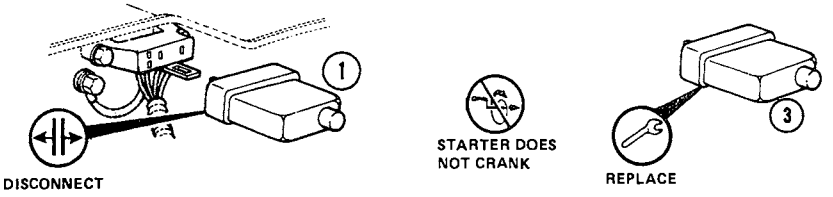
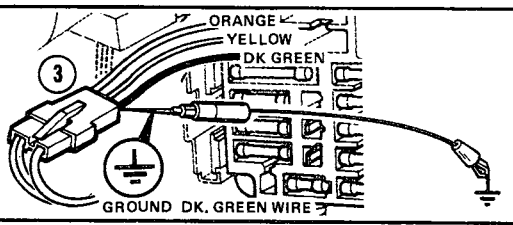
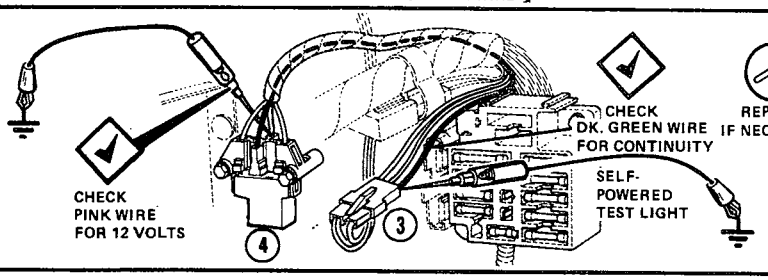
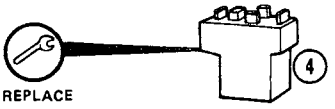
STEP	SEQUENCE	RESULT
1	 IGNITION TO START  CLICK CHECK FOR CLICK IN STARTER SOLENOID	DOES CLICK — GO TO STARTING SYSTEM DIAGNOSIS DOES NOT CLICK — GO TO STEP 2
2	 HONK HORN TO MAKE SURE BATTERY & CABLES ARE OK  REPAIR OR REPLACE IF NECESSARY	GO TO STEP 3
3	IGNITION ON  SHIFT LEVER IN PARK  PRESS & RELEASE  IGNITION TO START (WHILE SEATED)	 GO TO STEP 4 — STARTER CRANKS  GO TO STEP 5 — STARTER DOES NOT CRANK
4	 IGNITION OFF ON CARS WITH MANUAL TRANS. SET BRAKE, SHIFT LEVER IN NEUTRAL, CLUTCH DEPRESSED  FROM OUTSIDE OF CAR AUTO. TRANS. SHIFT LEVER IN PARK POSITION TURN IGNITION TO START, SEAT BELTS UNFASTENED	 GO TO SEAT BELT SYSTEM DIAGNOSIS — STARTER CRANKS  GO TO STEP 12 — STARTER DOES NOT CRANK
5	NEUTRAL START SW. 2 IF ONLY ONE TERMINAL IS HOT — ADJUST SWITCH CHECK — BOTH TERMINALS HOT IF NEITHER TERMINAL IS HOT — GO TO STARTING SYSTEM DIAGNOSIS SERVICE MANUAL IGNITION ON LEVER IN PARK  DISCONNECT APPLY 12 VOLTS TO "C" TERMINAL PURPLE WIRE 12 V	 GO TO STEP 6 — STARTER CRANKS  GO TO STARTING SYSTEM DIAGNOSIS — STARTER DOES NOT CRANK

STEP	SEQUENCE	RESULT
6	 CHECK "D" TERMINAL PINK WIRE FOR 12 VOLTS	OK → GO TO STEP 8 NOT OK → GO TO STEP 7
7	 REPAIR BREAK IN PINK WIRE PINK CONNECT	STOP
8	 IGNITION OFF CONNECT TEST LIGHT TO "B" TERMINAL LT. GREEN AND GROUND TURN IGNITION TO START	TEST LIGHT ON → GO TO STEP 10 TEST LIGHT OFF → GO TO STEP 9
9	 IGNITION OFF REPAIR BREAK IN LT. GREEN WIRE LT. GREEN CONNECT	STOP
10	 CHECK BLACK GROUND WIRE FOR GOOD CONNECTIONS REPAIR IF NECESSARY	GO TO STEP 11
11	 REPLACE TURN IGNITION TO START	STARTER CRANKS → STOP STARTER DOES NOT CRANK → GO BACK TO STEP 3 AND START OVER
12	 IGNITION OFF DISCONNECT ORANGE YELLOW DK GREEN TURN IGNITION TO START	STARTER CRANKS → GO TO SEAT SYSTEM DIAGNOSIS CHART STARTER DOES NOT CRANK → GO TO STEP 13
13	 IGNITION OFF DISCONNECT ASSY. (2) SCREWS CONNECT TEST LIGHT TO GREEN/BLACK WIRE AND GROUND TURN IGNITION TO START	TEST LIGHT ON → GO TO STEP 16 TEST LIGHT OFF → GO TO STEP 14

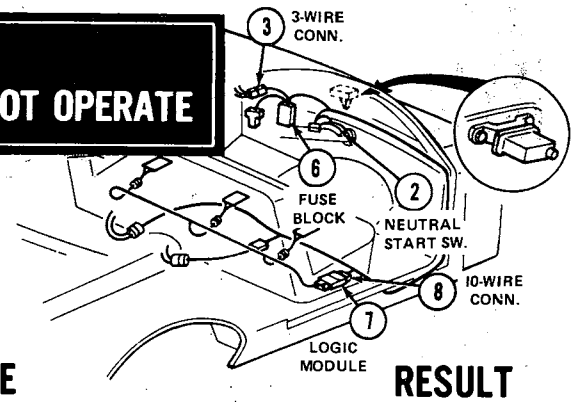
STEP	SEQUENCE	RESULT
14		
15		
16		
17		
18		
19		

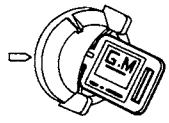
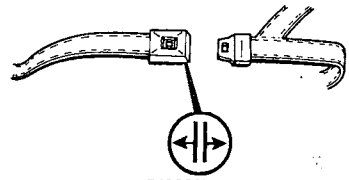
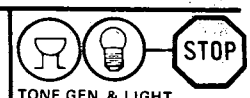
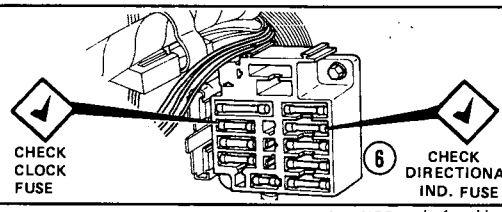
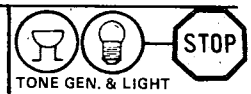
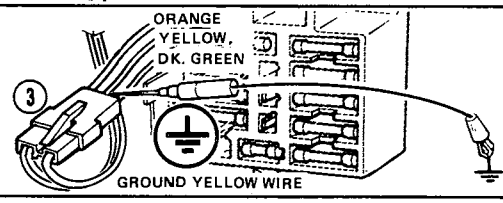
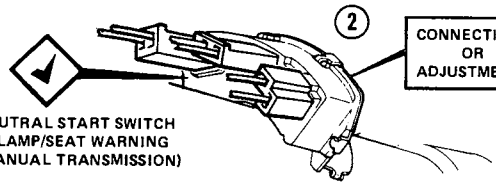
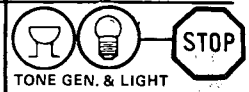
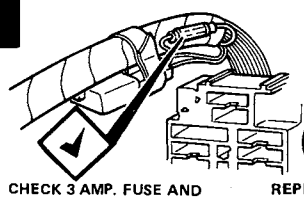
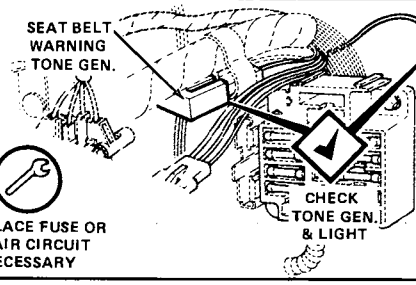
PROBLEM:
starter CRANKS with seat belt UNFASTENED



STEP	SEQUENCE	RESULT
1	 REPLACE IF NECESSARY	STARTER DOES NOT CRANK → STOP STARTER CRANKS → GO TO STEP 2
2	 REPAIR IF NECESSARY	STARTER DOES NOT CRANK → STOP STARTER CRANKS → GO TO STEP 3
3		STARTER DOES NOT CRANK → STOP STARTER CRANKS → GO TO STEP 4
4		STARTER DOES NOT CRANK → GO TO SEATBELT DIAGNOSIS CHART STARTER CRANKS → GO TO STEP 5
5	 REPAIR IF NECESSARY	STARTER DOES NOT CRANK → STOP STARTER CRANKS → GO TO STEP 6
6		STOP

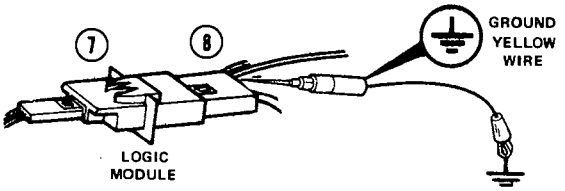
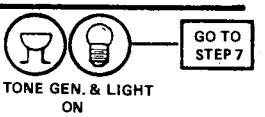
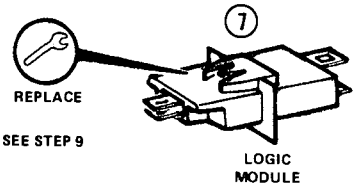
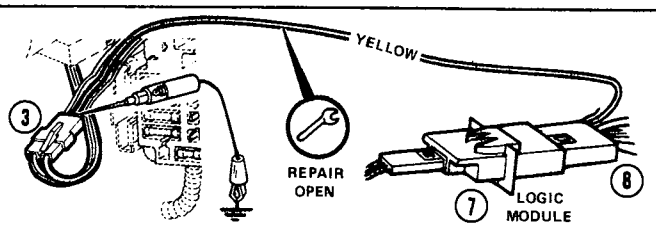
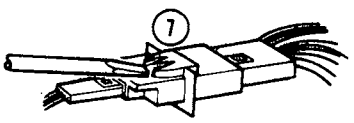
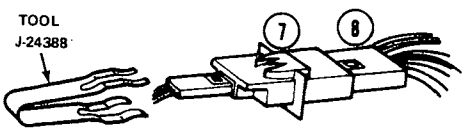
PROBLEM:
seat belt tone generator & light WILL NOT OPERATE



STEP	SEQUENCE	RESULT
1	 IGNITION ON  DISCONNECT  SHIFT LEVER IN DRIVE FOR MANUAL TRANSMISSION SEE BOXES BELOW	 TONE GEN. & LIGHT ON  TONE GEN. & LIGHT OFF
2	 CHECK CLOCK FUSE, 6, CHECK DIRECTIONAL IND. FUSE  REPLACE IF NECESSARY	 TONE GEN. & LIGHT ON  TONE GEN. & LIGHT OFF
3	 ORANGE, YELLOW, DK. GREEN, 3, GROUND YELLOW WIRE	 TONE GEN. & LIGHT ON  TONE GEN. & LIGHT OFF
4	 2, CONNECTIONS OR ADJUSTMENTS, CHECK NEUTRAL START SWITCH (BACK-UP LAMP/SEAT WARNING SWITCH-MANUAL TRANSMISSION)  REPAIR IF NECESSARY	 TONE GEN. & LIGHT ON  TONE GEN. & LIGHT OFF
5	 CHECK 3 AMP. FUSE AND COURTESY LAMP CIRCUIT FOR SHORTS  REPLACE FUSE OR REPAIR CIRCUIT IF NECESSARY  SEAT BELT WARNING TONE GEN., SEAT BELT WARNING LIGHT, CHECK TONE GEN. & LIGHT  REPLACE IF NECESSARY	 STOP

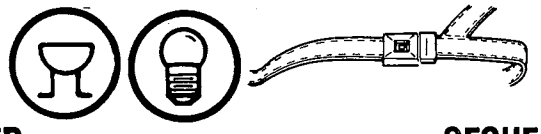
COLUMN SHIFT MANUAL TRANSMISSION

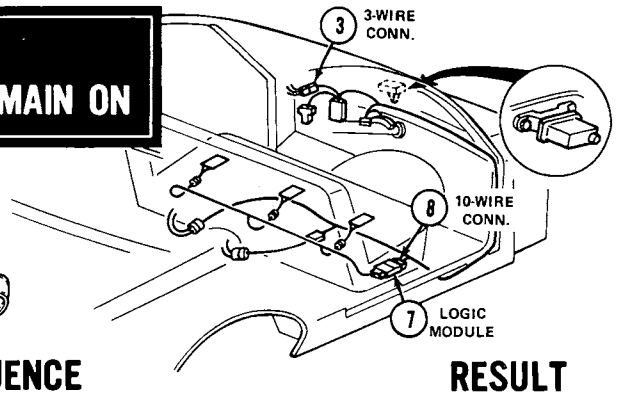
Shift out of neutral and/or clutch depressed with ignition switch to "crank" position.

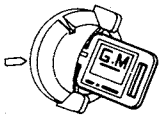
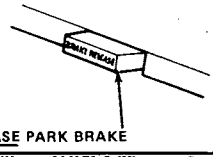
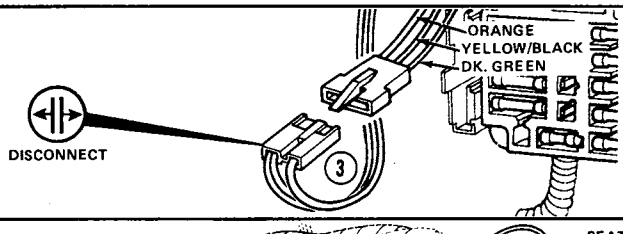
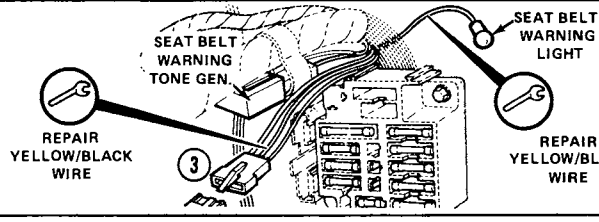
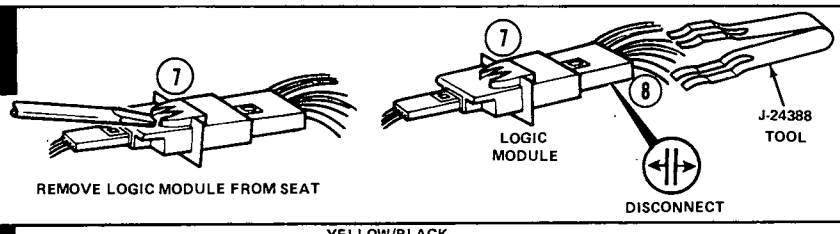
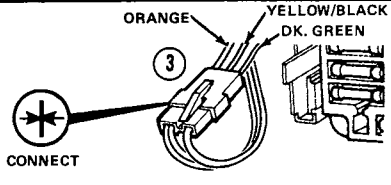
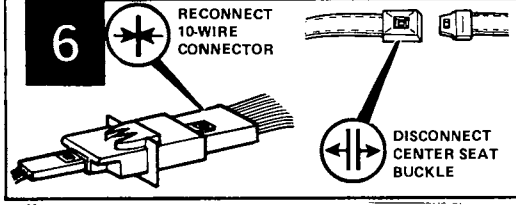
STEP	SEQUENCE	RESULT
6	REMOVE MODULE FROM SEAT SEE STEP 9 	
7	NOTE: FAILURE OF LOGIC MODULE MAY BE CAUSED BY A SHORTED INTERLOCK RELAY OR TONE GENERATOR. PERFORM TEST SHOWN ON PAGE 8-36 NOW. 	
8		
9	 REMOVING LOGIC MODULE FROM SEAT  REMOVING CONNECTORS FROM LOGIC MODULE	

PROBLEM:
seat belt tone generator & light REMAIN ON

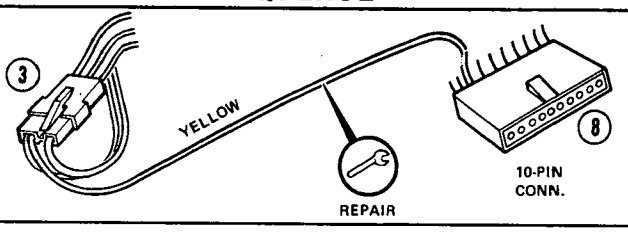
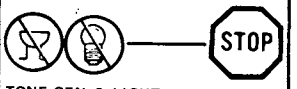
(SEAT BELTS PROPERLY FASTENED)
ENGINE STARTS NORMALLY



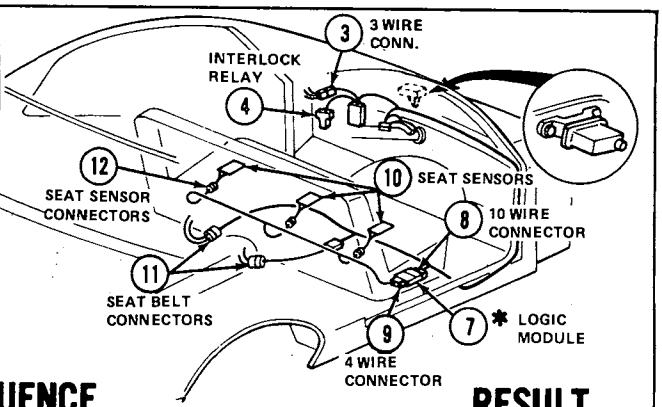


STEP	SEQUENCE	RESULT
1	 TURN IGNITION ON  NOTE: MANUAL TRANS. RELEASE PARK BRAKE  GET OUT OF CAR	 TONE GEN. & LIGHT OFF — GO TO SEAT BELT DIAGNOSIS CHART  TONE GEN. & LIGHT ON — GO TO STEP 2
2		 TONE GEN. & LIGHT ON — GO TO STEP 3  TONE GEN. & LIGHT OFF — GO TO STEP 4
3		 TONE GEN. & LIGHT ON — STOP
4		GO TO STEP 5
5		 TONE GEN. & LIGHT OFF — GO TO STEP 6  TONE GEN. & LIGHT ON — GO TO STEP 7
6		 TONE GEN. & LIGHT OFF — REPLACE BUCKLE SIDE — STOP  TONE GEN. & LIGHT ON — * REPLACE LOGIC MODULE — STOP

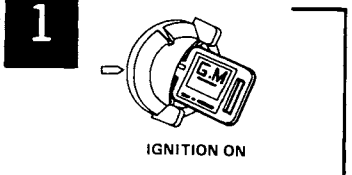
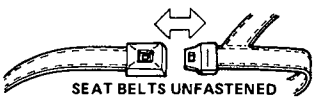
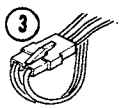
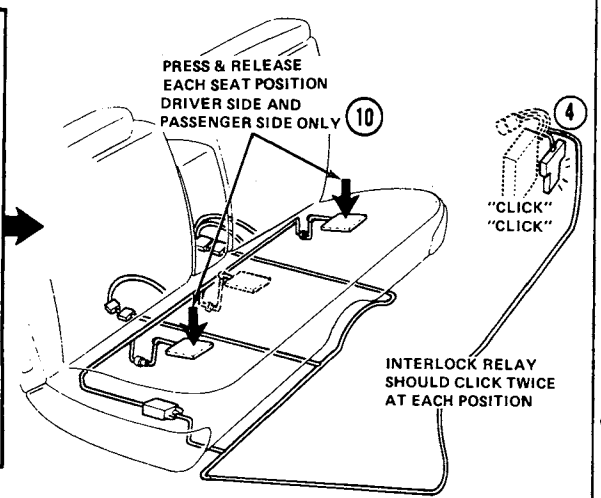
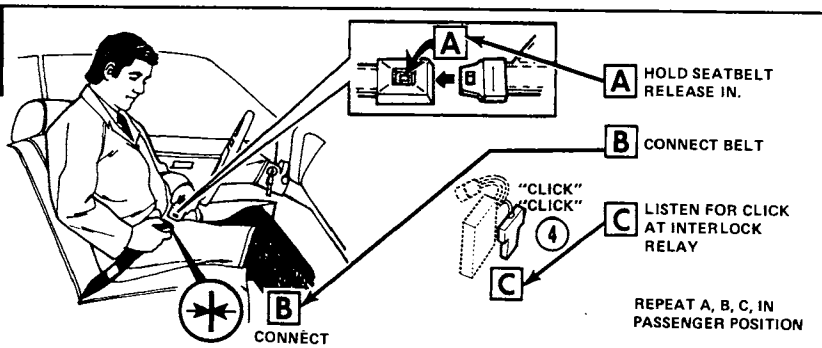
* NOTE: FAILURE OF LOGIC MODULE MAY BE CAUSED BY A SHORTED INTERLOCK RELAY OR TONE GENERATOR. PERFORM TEST SHOWN ON PAGE 1B-36 NOW.

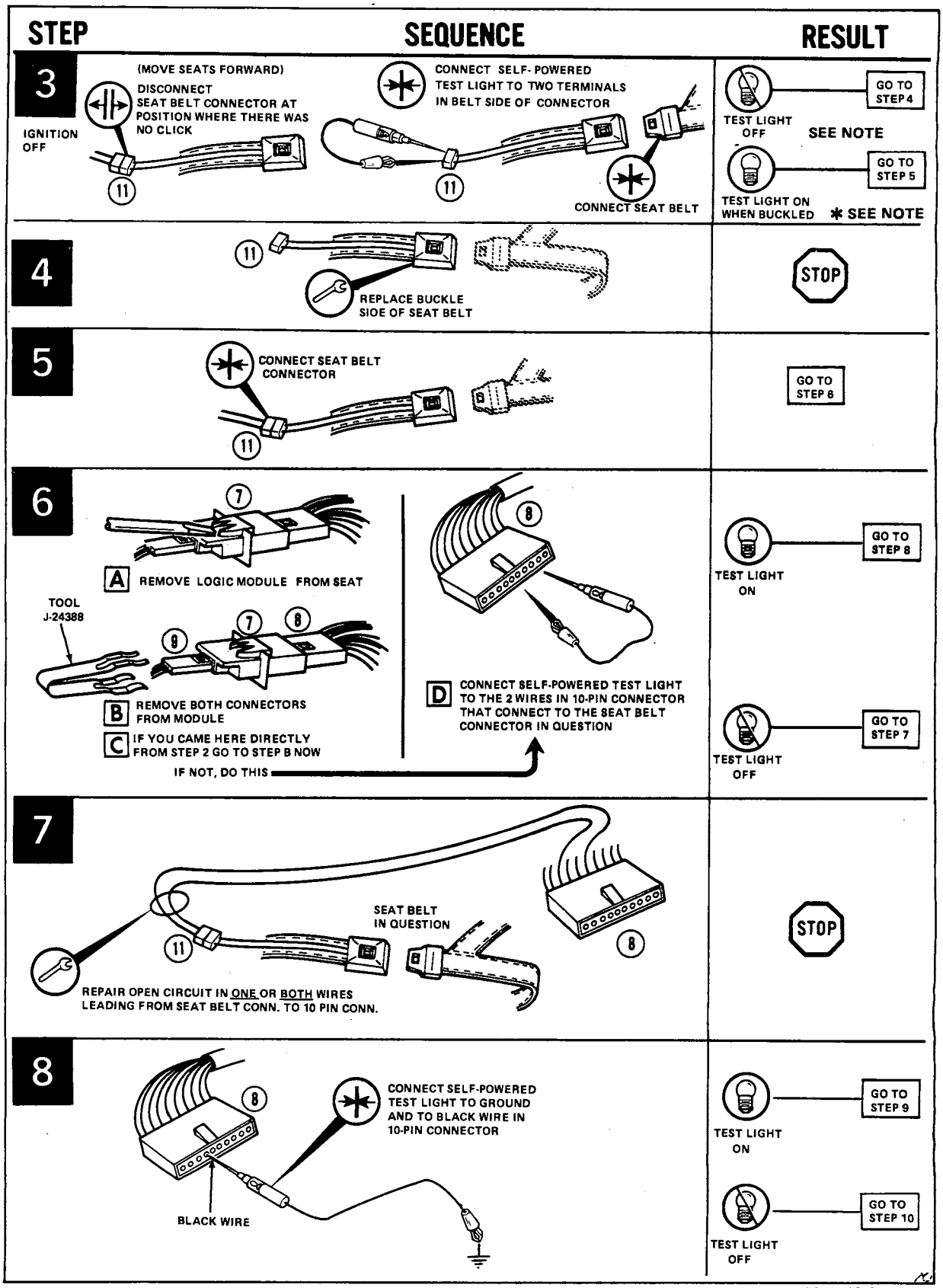
STEP	SEQUENCE	RESULT
7		 TONE GEN. & LIGHT OFF

SEAT BELT SYSTEM DIAGNOSIS

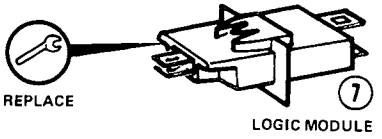
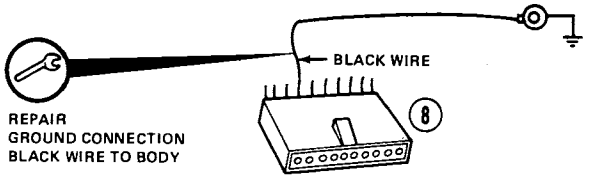
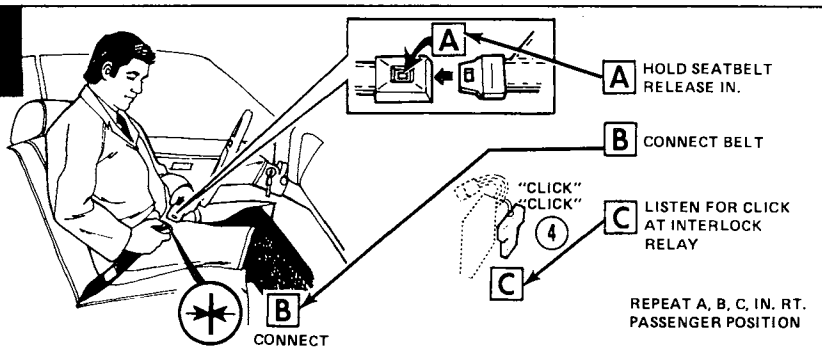
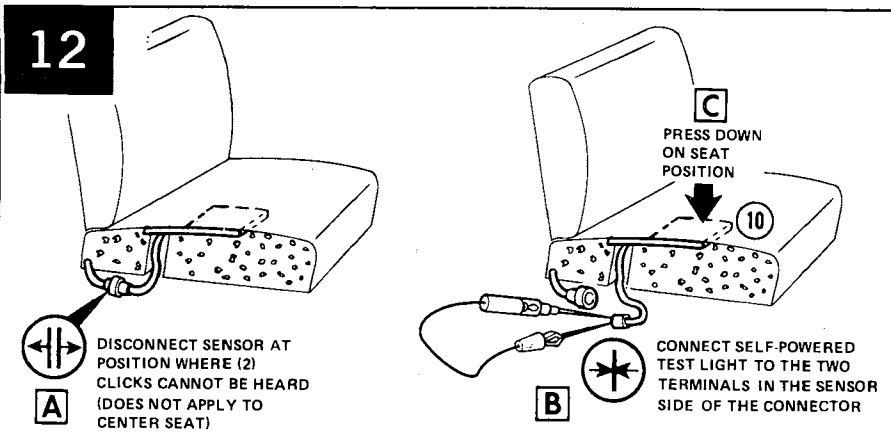
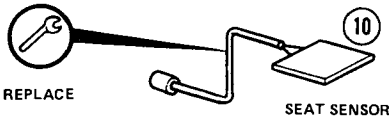


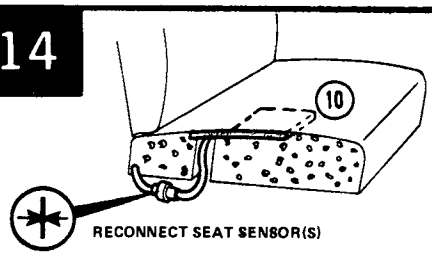
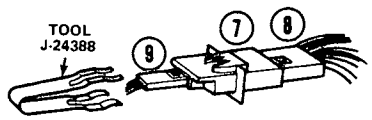
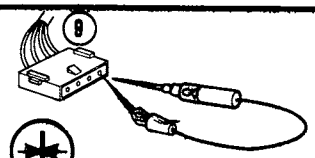
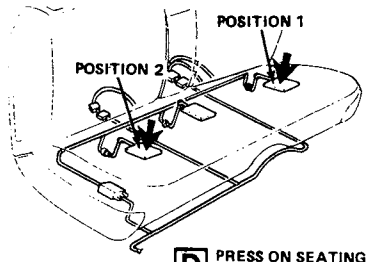
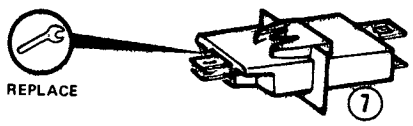
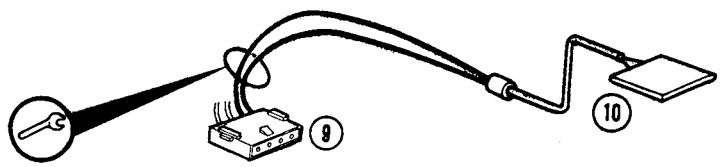
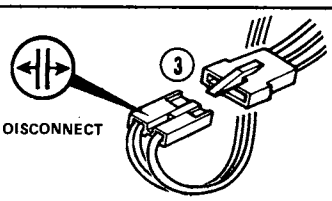
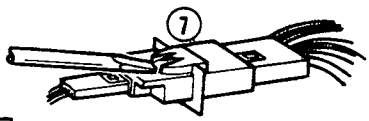
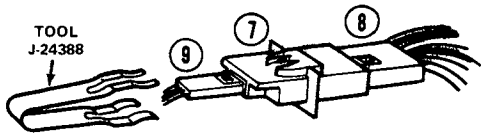
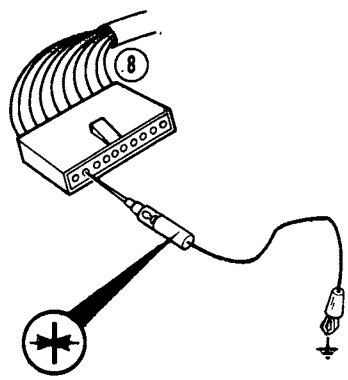
*NOTE: LOGIC MODULE IDENTIFICATION FOR STEP 3– X BODY CARS BUILT AFTER JANUARY 1, 1974 ARE EQUIPPED WITH MECHANICAL RELAY MODULES. ALL OTHER CARS EQUIPPED WITH ELECTRONIC MODULES. USE PART NUMBER IDENTIFICATION TO DETERMINE WHAT TYPE OF MODULE IS INSTALLED ON X BODY CARS. STEP 3 RESULTS ARE OPPOSITE FOR CARS EQUIPPED WITH MECHANICAL MODULE. SEE NOTE AT BOTTOM OF PAGE 1B-23 FOR INSTRUCTIONS.

STEP	SEQUENCE	RESULT
1	 IGNITION ON  SEAT BELTS UNFASTENED  3-WIRE CONN. CONNECTED  PRESS & RELEASE EACH SEAT POSITION DRIVER SIDE AND PASSENGER SIDE ONLY 10 4 "CLICK" "CLICK" INTERLOCK RELAY SHOULD CLICK TWICE AT EACH POSITION	● TWO CLICKS AT BOTH POSITIONS GO TO STEP - 2 ● TWO CLICKS AT ONE POSITION ONLY GO TO STEP - 12 ● ONLY ONE CLICK OR NO CLICK AT BOTH POSITIONS GO TO STEP - 11
2		● RELAY DOES NOT CLICK AT EITHER POSITION GO TO STEP - 6 ● RELAY DOES NOT CLICK AT ONE POSITION GO TO STEP - 3

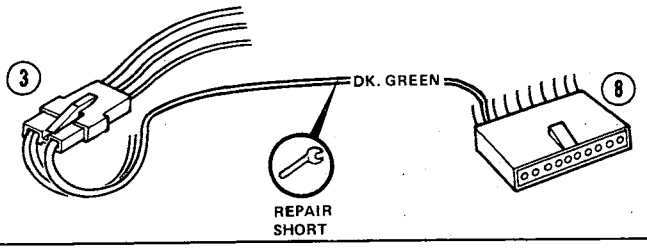
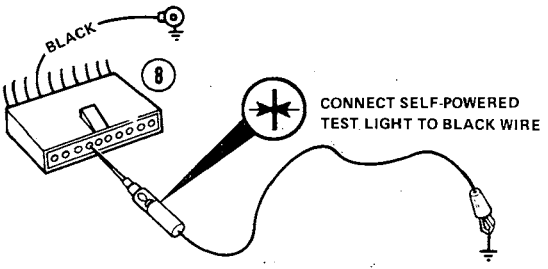
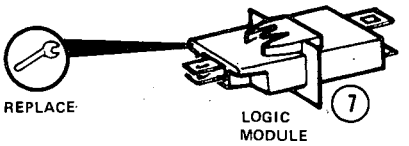
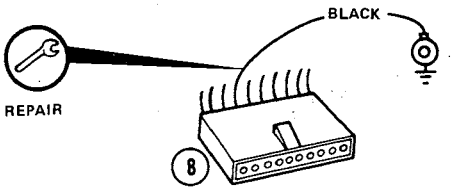


NOTE: ON CARS EQUIPPED WITH MECHANICAL MODULE; IF TEST LIGHT IS OFF GO TO STEP 5, IF TEST LIGHT IS ON WHEN BUCKLED GO TO STEP 4.

STEP	SEQUENCE	RESULT
9	NOTE: FAILURE OF LOGIC MODULE MAY BE CAUSED BY A SHORTED INTERLOCK RELAY OR TONE GENERATOR. PERFORM TEST SHOWN ON PAGE 1B-36 NOW.  	STOP
10	 	STOP
11	 	● RELAY CLICKS AT ONE POSITION GO TO STEP - 12 ● NEITHER RELAY CLICKS GO TO STEP - 17
12	 	TEST LIGHT OFF → GO TO STEP 13 TEST LIGHT ON WHEN SEAT DEPRESSED → GO TO STEP 14
13	 	STOP

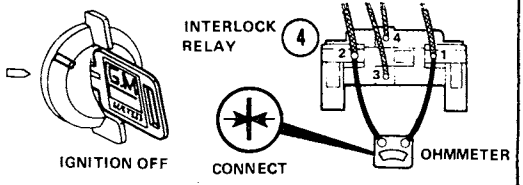
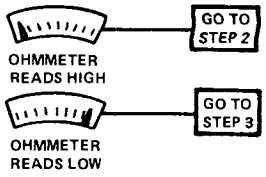
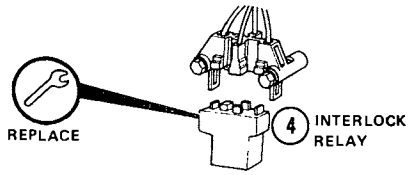
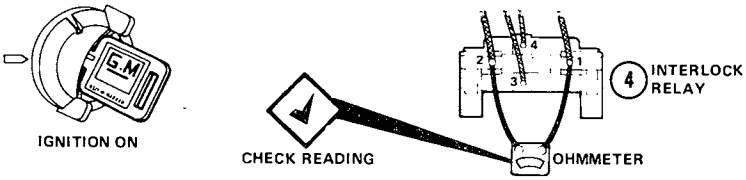
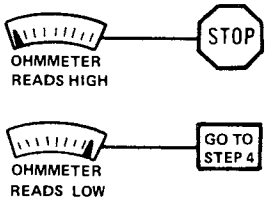
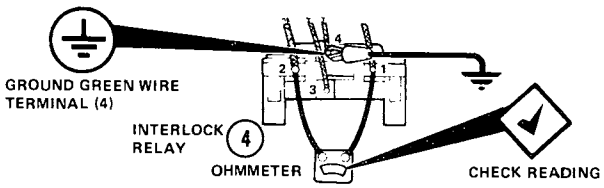
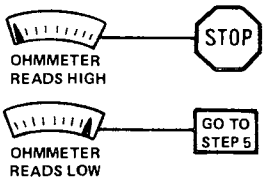
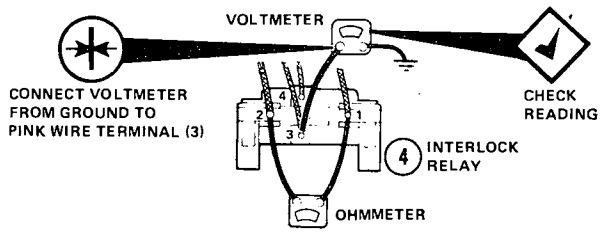
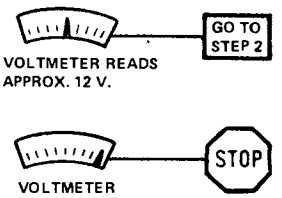
STEP	SEQUENCE	RESULT
14	 RECONNECT SEAT SENSOR(S)  A REMOVE LOGIC MODULE FROM SEAT TOOL J-24388  B REMOVE BOTH CONNECTORS FROM MODULE  C CONNECT SELF-POWERED TEST LIGHT TO BLACK WIRE AND TO WIRE LEADING TO SEAT SENSOR IN QUESTION IN 4-PIN CONNECTOR  D PRESS ON SEATING POSITION IN QUESTION	 TEST LIGHT ON — GO TO STEP 15  TEST LIGHT OFF — GO TO STEP 16
15	NOTE: FAILURE OF LOGIC MODULE MAY BE CAUSED BY A SHORTED INTERLOCK RELAY OR TONE GENERATOR. PERFORM TEST SHOWN ON PAGE 1B-36 NOW.  REPLACE LOGIC MODULE	STOP
16	 REPAIR OPEN CIRCUIT IN ONE OR BOTH WIRES FROM 4-WIRE CONN. TO SEAT SENSOR CONN.	STOP
17	 A OISCONNECT  B REMOVE LOGIC MODULE FROM SEAT TOOL J-24388  C REMOVE BOTH CONNECTORS FROM MODULE  D CONNECT SELF-POWERED TEST LIGHT TO DARK GREEN WIRE AND GROUND TO CHASSIS	 TEST LIGHT ON — GO TO STEP 18  TEST LIGHT OFF — GO TO STEP 19

12

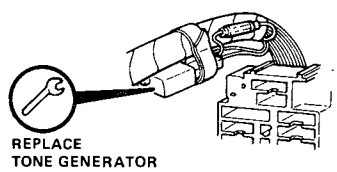
STEP	SEQUENCE	RESULT
18		STOP
19		TEST LIGHT ON → GO TO STEP 20 TEST LIGHT OFF → GO TO STEP 21
20	NOTE: FAILURE OF LOGIC MODULE MAY BE CAUSED BY A SHORTED INTERLOCK RELAY OR TONE GENERATOR. PERFORM TEST SHOWN ON PAGE 1B-36 NOW. 	STOP
21		STOP

TROUBLESHOOTING "SEAT BELT STARTER INTERLOCK CONTROL"

ON THE CAR (FRONT SEATS UNOCCUPIED SEATBELTS UNFASTENED)

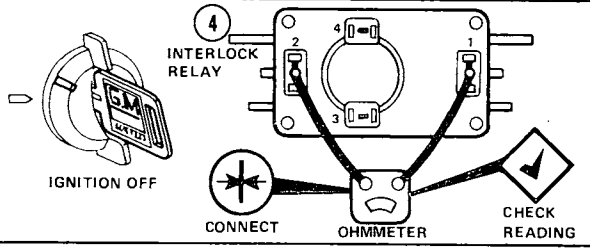
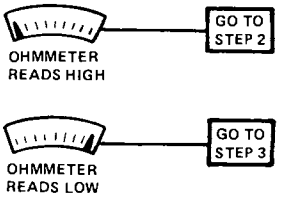
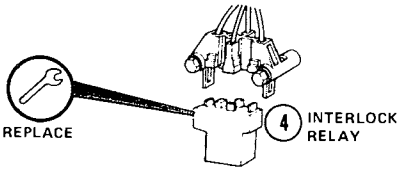
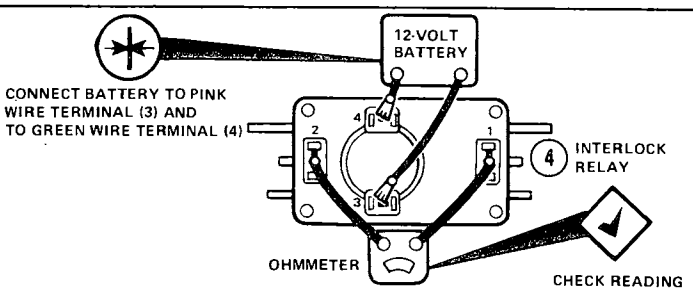
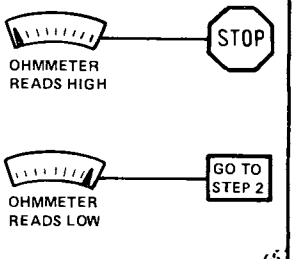
STEP	SEQUENCE	RESULT
1	NOTE: PERFORM TEST PROCEDURES UNTIL YOU COME TO A STOP. TEST TONE GENERATOR. THEN RETURN TO THE POINT IN CHARTS WHERE YOU WERE DIRECTED TO THIS PAGE. 	
2		
3		
4		
5		

TROUBLESHOOTING "TONE GENERATOR"

1	1. TONE GENERATOR IS ALWAYS ON 2. TONE GENERATOR DOES NOT COME ON AT ALL 	

TROUBLESHOOTING "SEAT BELT STARTER INTERLOCK CONTROL"

OFF THE CAR

STEP	SEQUENCE	RESULT
1	NOTE: PERFORM TEST PROCEDURES UNTIL YOU COME TO A STOP. TEST TONE GENERATOR. THEN RETURN TO THE POINT IN CHARTS WHERE YOU WERE DIRECTED TO THIS PAGE. 	
2		
3		

INTERLOCK RELAY

Replacement

1. Remove two interlock relay assembly to cowl retaining screws. See Figure 1B-10.
2. Separate interlock relay from harness connector.
3. Reverse removal procedure for installation.

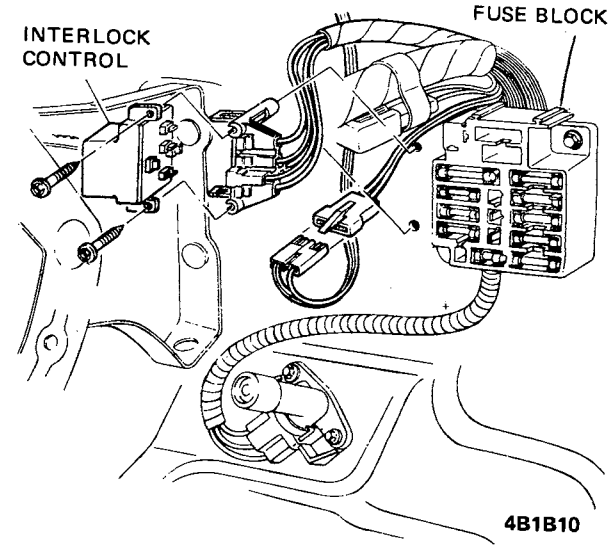


Figure 1B-10 Interlock Relay Removal (B-C-E Shown)

ELECTRONIC LOGIC MODULE

Replacement

1. Using extractor tool J-24388, reach under right end of front seat and separate the two harness connectors from logic module. See Figure 1B-11.
2. Using a small screwdriver, reach under front seat to release logic module from mounting bracket. See Figure 1B-11.
3. Reverse removal procedures for installation.

OVERRIDE RELAY

Replacement

1. Open hood, release plastic retainer and pull override relay to remove it from the standoff connector.
2. Reverse removal procedure for installation.

Refer to the Body Manual for removal and installation of seat sensor switches and of lap and shoulder belts.

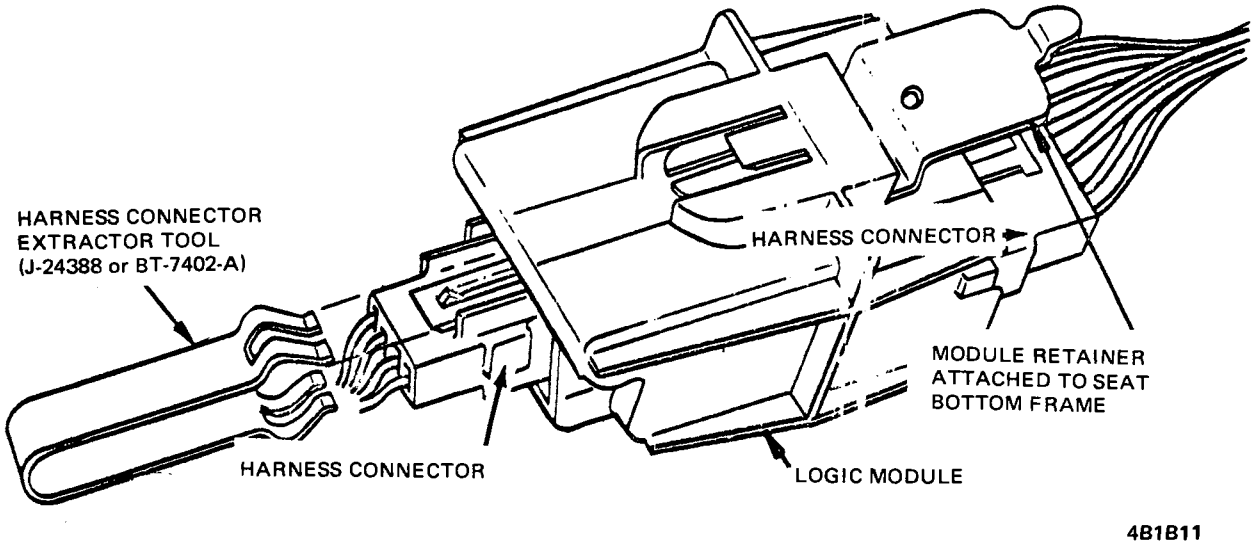


Figure 1B-11 Removing Connectors from Module

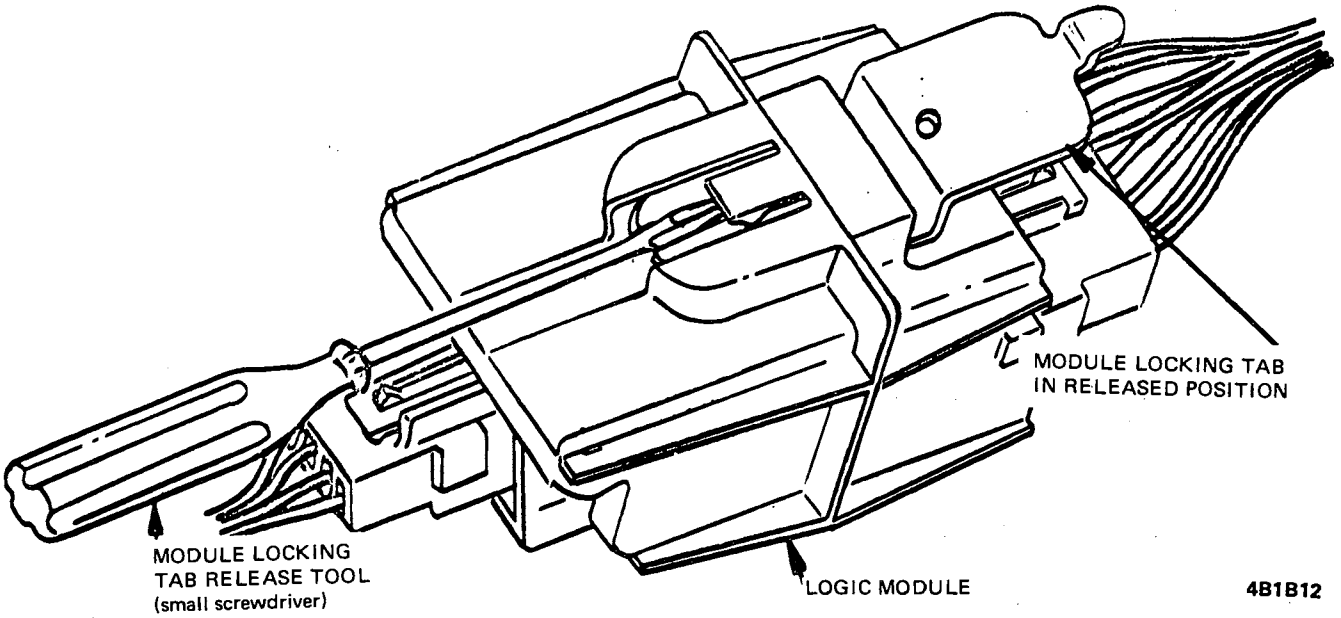


Figure 1B-12 Removing Module from Retaining Bracket