GROUP

BATTERY AND CHARGING SYSTEM 14

(10000)

SECTION 14-00 Battery and Charging System—Service

VEHICLE APPLICATION

Taurus / Sable.

DESCRIPTION AND OPERATION

Charging System

The charging system consists of a generator (GEN) (10300), voltage regulator, charge indicator, storage battery, fuse links and associated wiring.

This section contains general information applicable to all charging systems and generators. For information on batteries, refer to Section 14-01. For information specific to the generator / charging system being tested or serviced, refer to the appropriate section in this group.

The generators used on these vehicles and their specific application follows:

IGR Generator With Internal Fan and Internal Regulator

This generator is used on Taurus vehicles equipped with the optional 3.0L / 3.2L SHO engine. Refer to Section 14-02B for testing and servicing of this system.

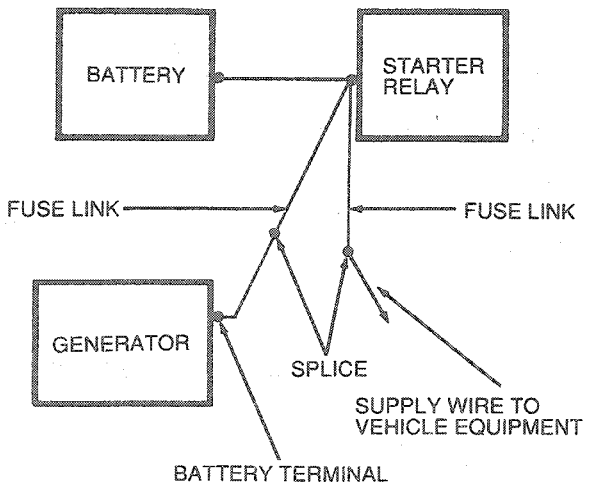
IGR Generator With Internal Fan and Rear Mounted Regulator

This generator is used on vehicles equipped with the 3.0L or 3.8L engine. Refer to Section 14-02A for testing and servicing of this system.

DESCRIPTION AND OPERATION (Continued)

Fuse Link

The fuse link is a short length of insulated wire integral with the engine compartment wiring harness. It is several wire gauges smaller than the circuit that it protects. The fuse link for the generator is a 12-gauge gray wire.



Service fuse links are brown, green or black depending on usage. All fuse links have a flag moulded on the wire or on the terminal insulator. Color identification of the flag or connector for the external voltage regulator system is brown 18-gauge wire or gray 12-gauge wire. The illustration shows a typical fuse link installation.

The fuse link is designed to burn out, thus protecting the generator and wiring when heavy reverse current flows, such as when a booster battery is connected incorrectly, or a short to ground occurs in the wiring harness.

A burned-out link may have bare wire ends protruding from the insulation, or bubbled insulation with illegible identification. If it is hard to determine if the link is burned out, perform a continuity test.

Refer to Diagnosis, for testing procedures for fuse links used in the charging system.

DIAGNOSIS

Preliminary Checks

Before performing charging or starting system tests on the vehicle, note the complaint such as: slow cranking, battery discharged or using an excessive amount of water, top of battery wet, generator warning lamp does not come on or never goes out. This information will aid in isolating the part of the system causing the symptom.

Next, visually inspect as follows:

1. Check the fuse link located between the power distribution box and the generator. Replace the fuse link if burned.
2. Make certain that the battery is OK; then turn on the headlamps or any other accessory. If the headlamps or accessory do not operate, the fuse link is probably burned out.
3. On some vehicles there are several fuse links. Use the same procedure as in Step 1 to test the fuse link that protects vehicle equipment.

To test the fuse link that protects the generator, make certain the battery is OK. Then check with a voltmeter for voltage at the BAT terminal of the generator. No voltage indicates that the fuse link is probably burned out.

4. Check battery posts and battery cable terminals for clean and tight connections. Remove the battery cables (if corroded), clean and install them securely.
5. Check for clean and tight wiring connections at the generator, voltage regulator and engine ground.
6. Check the generator belt tension. Refer to Section 03-05.

- When a relatively new battery is discharged, test for current drain. Refer to Section 14-01 for proper procedures. The following are some of the most common current drain problems:
  - — Glove compartment lamp stays on with the door closed
  - — Hood lamp stays on constantly
  - — License plate lamp or interior lamp stays on constantly
  - — Other electronic component malfunctions
- Check for secure ground connections at the engine and body. Also check for proper connections at the generator and voltage regulator.
- Check the testing equipment and instructions. If the equipment is malfunctioning or the instructions for use are incorrect, use the equipment on a vehicle you know to be operating properly.
- Only test the charging system with a fully charged, properly operating battery. Make sure cable connections are clean and secure.

DIAGNOSIS (Continued)

In order to check the charging system, the use of Rotunda Starting / Charging VAT-40 Tester 078-00005 or equivalent is suggested. Connect the tester to the battery positive and negative posts and also connect the current probe to the generator + output lead (to measure generator output). (When measuring generator output, the tester can also be connected to the battery positive or negative cable. In this case, all electrical accessories must be turned off and 10-15 amps added to the reading on the tester due to the engine operation). With the engine running at 2000 rpm, adjust the tester load bank to determine the output of the generator. The generator output should be near to, or exceed the generator rating (27°C (80°F) ambient). Checkout the charging system as indicated and service if required.

NOTE: Refer to the tester test procedure manual for complete directions on checking out the charging system.

Isolating the Concern

Battery and starting system concerns can be caused by poor charging system performance. It is also reasonable to suspect the charging system because of an overload in another area of the electrical system.

To avoid guesswork, it is necessary to isolate the battery, the charging system, and the electrical circuits to correctly identify the area where the difficulty lies. Check the battery first before performing any electrical system diagnosis. The battery must be in proper state of change and operation before the other areas of the electrical system can perform normally.

Battery Check

Check battery to see if it has the capacity and ability to accept and hold a charge. Refer to Section 14-01, Battery. If the battery is good, then the charging system should be checked to see that it performs its function of keeping the battery charged.

The battery capacity, specific gravity and cell comparison test (low-maintenance batteries only) will determine the ability of a battery to accept and hold a charge. If the battery cannot meet the specifications, replace it with a new fully charged battery before further diagnosis of other areas of the electrical system.

If the battery is found to meet the required specifications, it should be fully charged before proceeding with the diagnosis of other electrical system components.

Charging System Test

The Charging System Test should be performed before testing any of the individual charging system components. Its "road-map" type of layout should reduce confusion in determining "what to do next" and speed up diagnosis. The component tests will determine the type of component service to be performed.

Use Rotunda Digital Volt-Ohmmeter 007-00001 or equivalent and a test lamp to test the system. Special care should be given when using the ohmmeter near "hot" circuits. The component to be checked should be disconnected from the circuit or the battery terminals should be disconnected.

CAUTION: Damage to the component could occur, if the circuit is allowed to remain intact.

Rotunda Charging / Starting Analyzer 059-00002 or equivalent is available for testing the charging system. Test instructions are provided with the analyzer.

NOTE: When checking generator output current with the Rotunda Analyzer at the battery cable, add 10 to 15 amps to the reading because of charge current removed for engine operation.

DIAGNOSIS (Continued)

CHARGING SYSTEM DIAGNOSIS

CONDITION	POSSIBLE SOURCE	ACTION
• Battery Does Not Stay Charged—Engine Starts OK	• Battery. • Loose or worn generator belt. • Damaged or worn wiring or cables. • Generator. • Voltage regulator. • Other vehicle electrical systems.	• Test battery, replace if necessary. • Adjust or replace belt. Refer to Section 03-05. • Service as required. Refer to Section 18-01. • Test and / or replace components as required. • Test, replace if necessary[1]. • Check other systems for current draw. Service as required[1].
• Generator Noisy	• Loose or worn generator belt. • Bent pulley flanges. • Generator.	• Adjust tension or replace belt. Refer to Section 03-05. • Replace pulley[1]. • Service or replace generator[1].
• Lamps and / or Fuses Burn Out Frequently	• Damaged or worn wiring. • Generator / voltage regulator. • Battery.	• Service as required. Refer to Section 18-01. • Test, service, replace if necessary[1]. • Test, replace if necessary[1].
• Charge Indicator Lamp Flickers After Engine Starts or Comes On While Vehicle Is Being Driven	• Loose or worn generator belt. • Generator. • Field circuit ground. • Voltage regulator. • Lamp circuit wiring and connector.	• Adjust tension or replace. Refer to Section 03-05. • Service or replace[1]. • Service or replace wiring. Refer to Section 18-01. • Test, replace if necessary[1]. • Service as required[1].
• Charge Indicator Lamp Flickers While Vehicle Is Being Driven	• Loose or worn generator belt. • Loose or improper wiring connections. • Generator. • Voltage regulator.	• Adjust tension or replace belt. Refer to Section 03-05. • Service as required. Refer to Section 18-01. • Service or replace[1]. • Test, replace if necessary[1].
• Charge Indicator Gauge Shows Discharge	• Loose or worn generator belt. • Damaged or worn wiring (battery to generator for ground or open). • Field circuit ground. • Generator. • Voltage regulator. • Charge indicator gauge wiring and connections. • Damaged or worn gauge. • Other vehicle electrical system malfunction.	• Adjust tension or replace belt. Refer to Section 03-05. • Service or replace wiring. Refer to Section 18-01. • Service or replace wiring. Refer to Section 18-01. • Service or replace[1]. • Test, replace if necessary[1]. • Service as required[1]. • Replace gauge. Refer to Group 13. • Service as required.

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ADJUSTMENTS

Belt Adjustment

Refer to Section 03-05 for generator belt tensioning procedure.

SPECIAL SERVICE TOOLS

ROTUNDA EQUIPMENT

Model	Description
007-00001	Digital Volt-Ohmmeter
059-00002	Charging / Starting Analyzer
078-00005	Starting / Charging Tester VAT-40

TJ4475A

1 Refer to the appropriate generator Section in this Group.

SECTION 14-01 Battery

VEHICLE APPLICATION

Taurus / Sable.

TESTING

Before attempting to test a battery, it is important to give it a thorough examination to determine if it has been damaged.

Tests are made on a battery to determine the state of charge and also its capacity or ability to crank an engine. The ultimate result of these tests is to show that the battery is good, needs recharging, or must be replaced.

WARNING: BATTERIES NORMALLY PRODUCE EXPLOSIVE GASES WHICH CAN CAUSE PERSONAL INJURY. THEREFORE, DO NOT ALLOW FLAMES, SPARKS OR LIGHTED SUBSTANCES TO COME NEAR THE BATTERY. WHEN CHARGING OR WORKING NEAR A BATTERY, ALWAYS SHIELD YOUR FACE AND PROTECT YOUR EYES. ALWAYS PROVIDE VENTILATION.

WHEN LIFTING A PLASTIC-CASED BATTERY, EXCESSIVE PRESSURE ON THE END WALLS COULD CAUSE ACID TO SPEW THROUGH THE VENT CAPS, RESULTING IN PERSONAL INJURY. LIFT WITH A BATTERY CARRIER OR WITH YOUR HANDS ON OPPOSITE CORNERS.

WARNING: KEEP OUT OF REACH OF CHILDREN. BATTERIES CONTAIN SULFURIC ACID. AVOID CONTACT WITH SKIN, EYES, OR CLOTHING. ALSO, SHIELD YOUR EYES WHEN WORKING NEAR THE BATTERY TO PROTECT AGAINST POSSIBLE SPLASHING OF THE ACID SOLUTION. IN CASE OF ACID CONTACT WITH SKIN OR EYES, FLUSH IMMEDIATELY WITH WATER FOR A MINIMUM OF 15 MINUTES AND GET PROMPT MEDICAL ATTENTION. IF ACID IS SWALLOWED, CALL A PHYSICIAN IMMEDIATELY.

Battery State of Charge

Maintenance-Free Batteries

Read the battery open circuit terminal voltage with a digital voltmeter such as Rotunda Digital Volt-Ohmmeter 007-00001 or equivalent, capable of reading 1 / 100 of a volt. If open circuit voltage of battery is below 12.4 volts and the battery has passed the capacity test, charge the battery.

Low-Maintenance Batteries

Use a hydrometer such as Rotunda Battery and Anti-Freeze Tester 021-00046 or equivalent to check the specific gravities of all cells.

In order to obtain an accurate specific gravity reading, it must be corrected to the standard temperature of 26°C (78°F). The correction factor of four points (0.004) is used for each 6°C (10°F) change in temperature. Four points (0.004) are added to the indicated reading for each 6°C (10°F) increment above 26°C (78°F) and four points (0.004) are subtracted for each 6°C (10°F) increment below 26°C (78°F).

If the difference between cells is 50 points (0.050) or more, the battery is not satisfactory for service and should be replaced.

If the difference between cells is less than 50 points (0.050) and one or more cells are less than 1.225, charge the battery for 20 minutes at 35 amps and conduct the capacity test. If the battery fails, replace the battery. If it passes, add water if necessary and charge the battery.

TESTING (Continued)

If the difference between cells is less than 50 points (0.050) and all cells are above 1.225, conduct the capacity test. If the battery fails, replace the battery. If it passes, return to service.

BATTERY TESTING PROCEDURE — TEST A

TEST STEP		RESULT ▶	ACTION TO TAKE
A1	VISUAL INSPECTION		
	• Remove negative cable, then positive cable. • Check for dirty or corroded connections. • Are connections OK?	No ▶ Yes ▶	CLEAN terminals and clamps. GO to A2. GO to A2.
A2	LOOSE BATTERY POST		
	• Check for loose battery posts. • Are posts OK?	No ▶ Yes ▶	REPLACE battery. GO to A3.
A3	CRACKED BATTERY COVER		
	• Remove holddowns and shields. • Check for broken / cracked case or cover. • Is cover OK?	No ▶ Yes ▶	REPLACE battery. GO to A4.
A4	BATTERY CAPACITY AND LOAD TEST		
	NOTE: Whenever possible, test and charge battery at or near room temperature. • Use a high rate discharge tester with a variable rate control or a fused rate tester with meter compensation for different battery electrical sizes. Follow instructions supplied with tester for the battery capacity test. • Recommended discharge rate at 27°C (80°F): one-half of the cold cranking amps.	Passed the minimum load voltage and OCV above 12.40 ▶ Passed the minimum load voltage and OCV below 12.40 ▶ Failed the minimum load voltage and OCV above 12.40 ▶ Failed the minimum load voltage and OCV below 12.40 ▶ ▶ ▶	Battery OK. Battery OK but needs charging. Battery worn out. REPLACE battery. CHARGE battery for 20 minutes at 35 amps. REPEAT Step A4 (load test). Passed the minimum load voltage. Battery OK but needs charging. Failed the minimum load voltage. REPLACE battery.

Cold Cranking Amps	Discharge Rate Amps
650	325
540	270

• Voltage readings at 15 seconds for good battery (Battery Capacity Test).

Approximate Battery Temperature	Minimum Load Voltage
27°C (80°F) and above	9.6
21°C (70°F)	9.6
16°C (60°F)	9.5
10°C (50°F)	9.4
4°C (40°F)	9.3
-1°C (30°F)	9.1
-7°C (20°F)	8.9
-12°C (10°F)	8.7
-18°C (0°F)	8.5

• Wait 2 minutes and check the Open Circuit Voltage (OCV).
• Measure OCV with a digital voltmeter capable of reading 1 / 100 volt.

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TESTING (Continued)

Battery Drain Test

With Clamp-On DC Ammeter

Test Procedure

1. Turn the ignition to the OFF position and make sure there are no electrical loads. After determining that the underhood lamp is turning off properly, disconnect the bulb.
2. Clamp the meter clip securely around positive or negative battery cable (all cables if two or more lead to post).

   NOTE: Do not start vehicle with clip on cable.

Test Conclusion

The current reading (current drain) should be less than 0.05 amp. If it exceeds 0.05 it indicates a constant current drain which could cause a discharged battery. Possible sources of current drain are vehicle lamps (underhood, glove compartment, luggage compartment, etc.) that do not shut off properly.

If the drain is not caused by a vehicle lamp, remove fuses from the fuse panel, one at a time, until the cause of the drain is located. If drain is still undetermined, remove fusible links one at a time at the power distribution box to find the problem circuit.

With Voltmeter

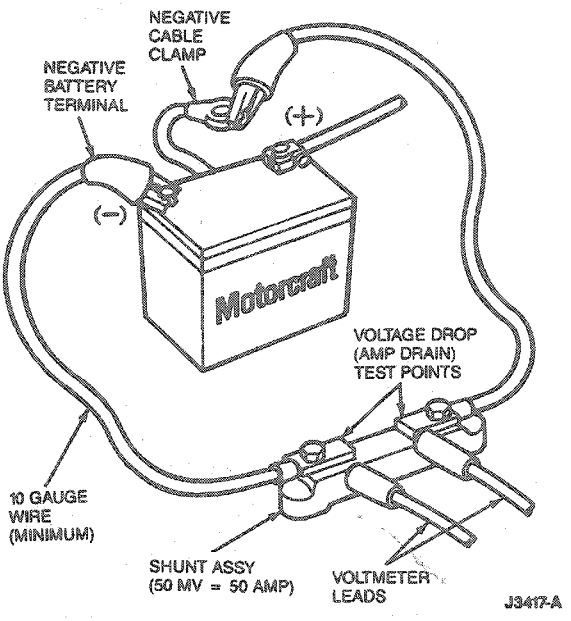
This test requires a digital volt-ohmmeter with an appropriate low voltage scale such as Rotunda Digital Volt-Ohmmeter 007-00001 or equivalent. The meter must read within 0.01 millivolt. Also required is a shunt assembly similar to that shown in the illustration.

Test Procedure

1. Turn ignition switch to the OFF position and make sure there are no electrical loads. After determining the underhood lamp is turning off properly, disconnect the bulb.
2. Check battery voltage. If voltage is under 11.5 volts, charge the battery to above 11.5.
3. Disconnect negative battery cable.

   NOTE: When the battery is disconnected and reconnected, some abnormal drive symptoms may occur while the powertrain control module (PCM) relearns its adaptive strategy. The vehicle may need to be driven 10 miles or more to relearn the strategy.
4. Connect shunt assembly as shown.

   CAUTION: Do not crank the engine, it could destroy the shunt. Also do not use the shunt to measure starting currents.
5. Set volt-ohmmeter to 200 or 300 mv scale for an accurate reading (must be within 0.01 millivolt).
6. Connect meter leads to shunt as shown. With this size shunt (50 mv = 50 amps) and meter, a direct current drain measurement can be made.



Test Conclusion

The current reading (current drain) should be less than 0.05 amp. If the reading is between 0.2 and 0.9 a possible drain may be a vehicle lamp (glove compartment, underhood, luggage compartment, etc.) that does not turn off. If the problem is not a lamp, remove the fuses from the fuse panel one at a time until the cause of the drain is located. If drain is still undetermined, remove fuses one at a time at the power distribution box to find the problem circuit.

To Test Vehicles with Major Key-Off Loads such as Air Suspension or Load Leveling

Vehicles equipped with these features will have temporary current drains that may last up to 70 minutes after ignition is switched OFF. These drains can range from 0.1 to 20 amps if the compressor is cycling. This action can often mask a problem and must be considered when evaluating test results. To test for this kind of drain proceed as follows.

1. Repeat Steps 1 through 5 of the battery drain test.
2. Turn ignition to RUN for a moment and then OFF again.
3. Disconnect major key-off load circuits.
4. Make sure illuminated entry is off, if applicable.

Test Conclusion

The current reading (current drain) should be less than 0.05 amp. If it is higher, disconnect fuses and fusible links as in the previous test to locate the problem circuit.

If the drain is less than 0.05 amps, reconnect the major key-off load circuits, turn ignition to RUN and then OFF, and wait 70 minutes to make sure they shut off properly. If current drain is still greater than 0.05 amps after 70 minutes, disconnect each of the components one at a time until the cause of the current drain is located.

TESTING (Continued)

To Check for Electronic Drains Which Shut Off When the Battery Cable is Disconnected

1. Repeat Steps 1 through 5 of the Voltmeter Drain Test.
2. Without starting engine, turn ignition switch to the RUN position for a moment and then OFF. If applicable, wait one minute for the illuminated entry lamps to turn off.
3. Connect voltmeter and read voltage.

Test Conclusion

The current reading (current drain) should be less than 0.05 amp. If it exceeds 0.05 after a few minutes, and if this drain did not show in previous tests, the drain is most likely caused by a malfunctioning electronic component. As in previous tests, remove fuses in power distribution box one at a time to locate the problem circuit.

Battery Charging

Before recharging a discharged battery, inspect and service the following conditions, if they exist:

1. Loose generator belt.
2. Pinched or grounded generator / voltage regulator wiring harness.
3. Loose harness connections at the generator and / or voltage regulator.
4. Loose or corroded connections at battery and / or engine ground.
5. Excessive battery drain due to:
   a. Hood, luggage compartment, glove compartment and courtesy lamps remaining energized (damaged or misadjusted switch, glove compartment left open, etc).
   b. Luggage compartment solenoid continuously energized on vehicles equipped with keyless entry system.
   c. Inoperative autolamp module causing approximately 2 amp drain with ignition switch in the OFF position and autolamp off.

Maintenance-Free and Low-Maintenance Batteries

Cold batteries will not readily accept a charge. Therefore, batteries should be allowed to warm up to approximately 5°C (41°F) before charging. This may require four to eight hours at room temperature depending on the initial temperature and battery size.

A battery which has been completely discharged may be slow to accept a charge initially, and in some cases may not accept a charge at the normal charger setting. When batteries are in this condition, charging can be started by use of the dead battery switch on chargers so equipped.

Completely discharged batteries, which have been discharged for a prolonged period of time (over one month) or which have an open circuit voltage of less than two volts, may show no indication of accepting a charge even when the battery switch is used. The initial charge rate accepted by batteries in this condition is so low that the ammeter on some chargers will not show any indication of charge for up to 10 minutes.

To determine whether a battery is accepting a charge follow the charger manufacturer's instructions for use of dead battery switch. If dead battery switch is the spring-loaded type, it should be held in the ON position for up to three minutes.

After releasing dead battery switch and with charger still on, measure battery voltage. If it shows 12 volts or higher, the battery is accepting a charge and is capable of being recharged. However, it may require up to two hours of charging with batteries colder than 5°C (41°F) before the charge rate is high enough to show on the charger ammeter. It has been found that all non-damaged batteries can be charged by this procedure. If a battery cannot be charged by this procedure, it should be replaced.

Once it has been determined that the battery has begun to accept a charge, it can be charged to a serviceable state or a full state of charge by one of two methods:

- The **first method** is to use the AUTOMATIC setting on chargers so equipped. This setting maintains the charging rate within safe limits by adjusting voltage and current to prevent excessive gassing and spewing of electrolyte. Approximately two to four hours will be required to charge a completely discharged battery to a serviceable state. If a full state of charge is desired, the charge can be completed by a low current rate of 3-5 amps for several hours.
- The **second method** is to use the MANUAL or constant current setting on the charger. Initially set the charging rate for 30-40 amps and maintain this setting for approximately 30 minutes or as long as there is no excessive gassing and electrolyte spewing. If gassing results, the charge rate must be reduced to a level where gassing will stop. This is particularly true for maintenance-free batteries where excessive gassing will result in non-replaceable loss of electrolyte, thus shortening battery life.

The total charge required will vary with battery size and its initial state of charge. In general, to bring a discharged battery to a serviceable state of charge, current-time input should equal the battery amp-hour capacity. For example: a 45 AH battery will require 15 amps of charge for three hours, or 9 amps of charge for five hours. If a full state of charge is desired, the charge can be completed by a low constant current of 3 to 5 amps for several hours.

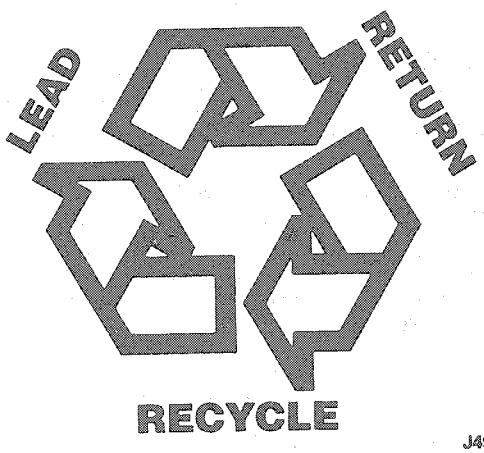
If the battery has failed, or is low in charge, it may be necessary to refer to Diagnosis, Section 14-00.

TESTING (Continued)

Jump Starting
Refer to Section 03-06.

REMOVAL AND INSTALLATION

Help Us Protect Our Environment
Ford Motor Company strongly recommends that lead-acid batteries be returned to an authorized recycling facility for disposal.



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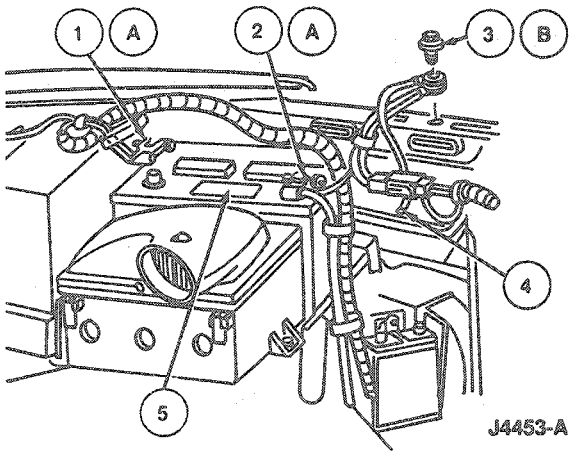
Removal

1. Remove battery cables from battery terminals (negative first).

3.0L EFI and 3.8L EFI

Battery



J4453-A

Item	Part Number	Description
1A	—	Positive Battery Terminal
2A	—	Negative Battery Terminal
3B	N803991-S39	Screw (3 Req'd)
4	2C054	Wiring Assy
5	10655	Battery
A		Tighten to 6-10 N·m (60-90 Lb-In)
B		Tighten to 3.4-4.8 N·m (31-42 Lb-In)

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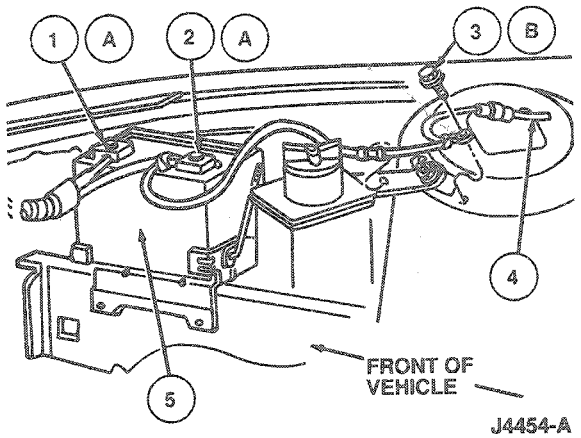
3.0L/3.2L SHO



J4454-A

Item	Part Number	Description
1A	—	Positive Battery Terminal
2A	—	Negative Battery Terminal
3B	N803991-S3	Screw
4	12A581	Wiring Harness
5	10655	Battery
A		Tighten to 7.6-10.4 N·m (68-92 Lb-In)
B		Tighten to 3.4-4.8 N·m (31-42 Lb-In)

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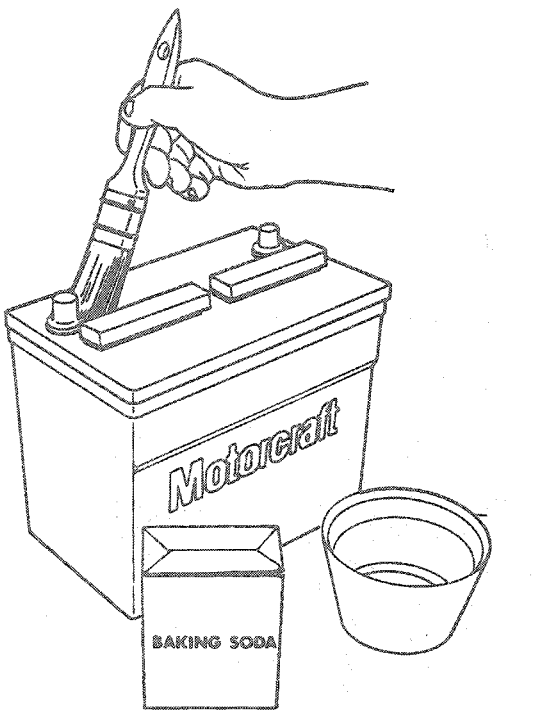
REMOVAL AND INSTALLATION (Continued)

2. Clean cable terminals using an acid neutralizing solution and terminal cleaning brush.



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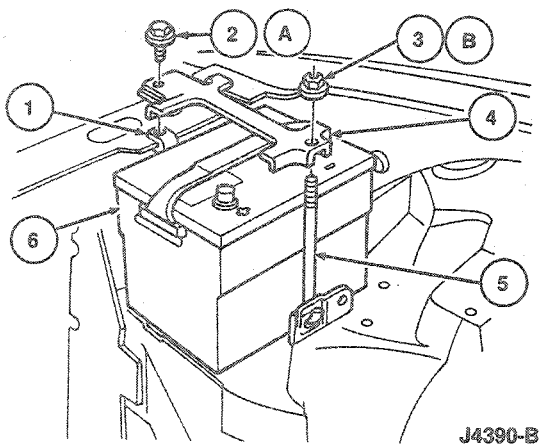
3. Remove hold-down clamps.

Battery Hold Down



J4390-B

Item	Part Number	Description
1	N623333-S2	U-Nut
2A	N606690-S2	Bolt (1 Req'd)
3B	N801521-S2	Nut (1 Req'd)
4	10755	Bracket
5	10K700	J-Bolt

(Continued)

Item	Part Number	Description
6	10655	Battery Assy
A		Tighten to 7-10 N·m (62-88 Lb-In)
B		Tighten to 3-5 N·m (27-44 Lb-In)

4. Remove battery from vehicle.

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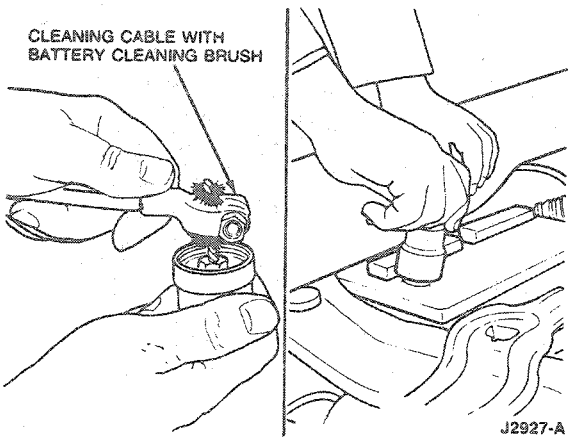
WHEN LIFTING A PLASTIC-CASED BATTERY, EXCESSIVE PRESSURE ON THE END WALLS COULD CAUSE ACID TO SPEW THROUGH THE VENT CAPS, RESULTING IN PERSONAL INJURY. LIFT WITH A BATTERY CARRIER OR WITH YOUR HANDS ON OPPOSITE CORNERS.

5. Test battery and determine if it should be:
   - Placed back in service
   - Recharged before placing back in service
   - Replaced with a Motorcraft or equivalent battery

Installation

1. Clean cable terminals and hold-down with a wire brush. Replace all cables or parts that are worn or frayed.



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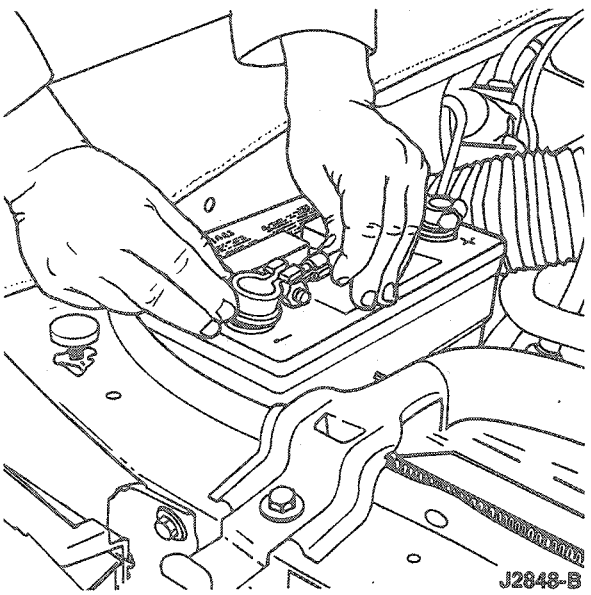
2. Clean battery tray with a wire brush and scraper.
3. Place battery in tray with positive and negative terminals in same position as previous battery. Assemble and tighten hold-down hardware so battery is secure. Do not over-tighten.

REMOVAL AND INSTALLATION (Continued)

4. Secure cables (positive first) to proper terminals. **Do not over-tighten.** Apply petroleum jelly to terminals.

   NOTE: When the battery is disconnected and reconnected, some abnormal driving symptoms may occur while the powertrain control module (PCM) relearns it adaptive strategy. The vehicle may need to be driven 10 miles or more to relearn the strategy.



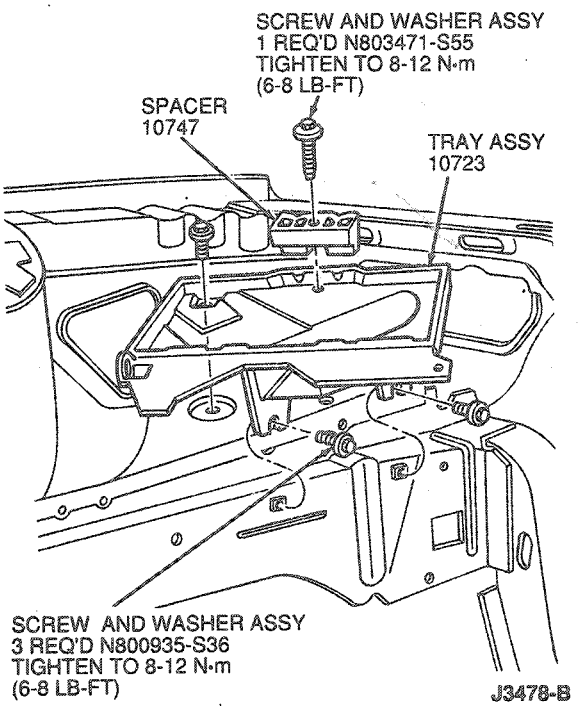
Battery Tray

Removal

1. Remove battery from vehicle as outlined.
2. Remove retaining bolts, screws and washers from battery tray.
3. Remove battery tray from vehicle.

Installation

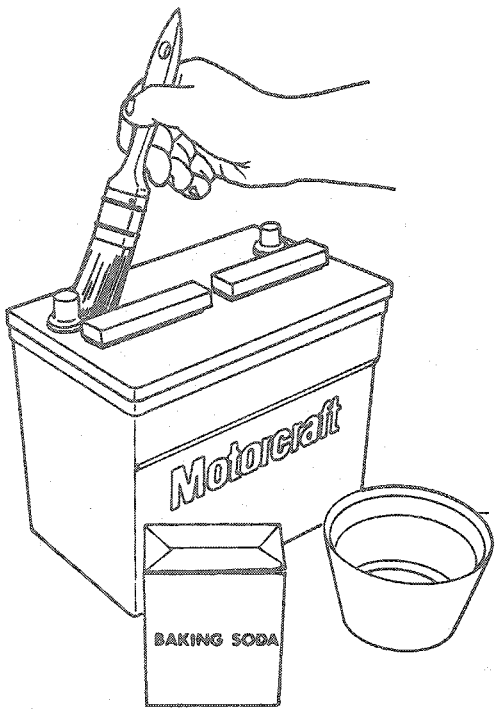
1. Position battery tray to inside fender in engine compartment.
2. Install retaining bolts and washers. Tighten each to 8-12 N·m (6-8 lb-ft).
3. Install battery in engine compartment as outlined.
4. Tighten hold-down bracket bolt to 7-10 N·m (6-7 lb-ft).



MAINTENANCE

Battery Cleaning

Keeping the battery top clean and dry reduces the need for service and extends battery life. Also, make certain the cable clamps are tightly fastened to the battery posts. If corrosion is found, disconnect the cables and clean clamps and posts with a wire brush. Neutralize the corrosion with a solution of baking soda and water. After installing cables, apply a small quantity of Premium Long-Life Grease XG-1-C or -K (ESA-M1C75-B) or equivalent to each battery post to help prevent corrosion.



J2847-A

CLEANING AND INSPECTION

Tools

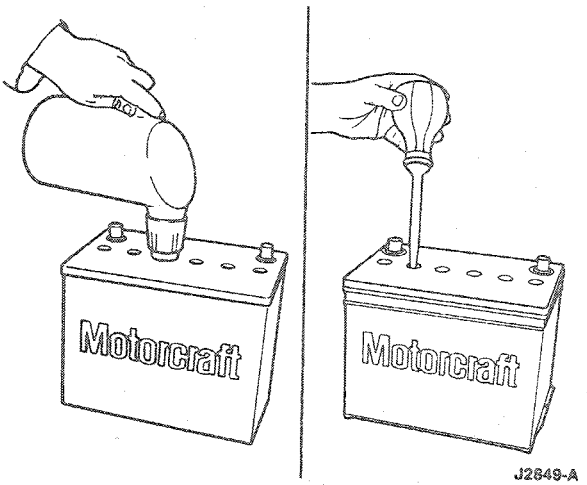
Anyone working with a battery needs the proper tools. Using the right tools will prevent damage to the battery, battery cables and hold-down bracketry.

Tools and equipment manufactured for servicing batteries have parts insulated to help prevent arcing should the tool be dropped or placed accidentally between a terminal and some other contact surface.

Battery Filling Devices

Batteries with Removable Vent Caps

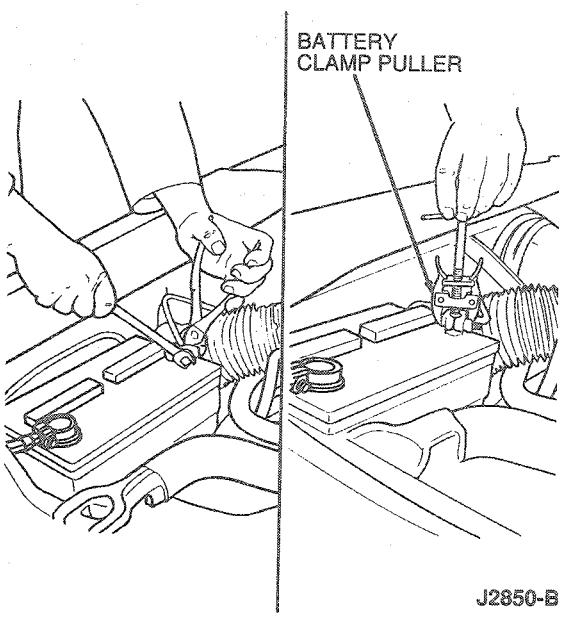
One of the most important on-vehicle services is to maintain the correct electrolyte level. Two devices are available for this purpose: a self-leveling filler which allows the battery to be filled to a predetermined level automatically, and a syringe-type filler.



J2849-A

Battery Pliers

Battery pliers have jaws specifically designed for gripping cable clamp bolts securely. Care should be taken when removing or replacing the cable clamp bolts so that the battery terminal is not subjected to any excessive lateral or twisting forces. Such forces could cause major damage to the internal components of the battery, and leakage at the terminals.



J2850-B

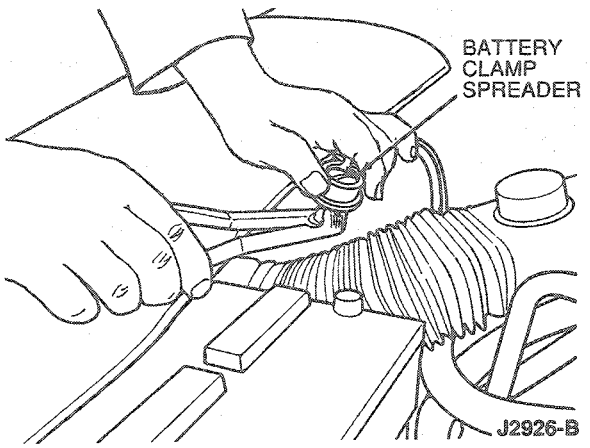
Battery Clamp Puller

Use a clamp puller to remove a cable clamp from the battery terminal. With the jaws gripping the underside of the cable clamp, pull the clamp up by means of pressure exerted against the top of the battery terminal. Proper use of this tool avoids the damaging lateral or twisting forces that result when using a pry bar or pliers.

CLEANING AND INSPECTION (Continued)

Battery Clamp Spreader

The spreader is used to expand the cable clamp after it has been removed from the terminal and the clamp bolt has been loosened. The cable clamp can then be easily placed in its correct position completely on the terminal.



Terminal Cleaning Brush

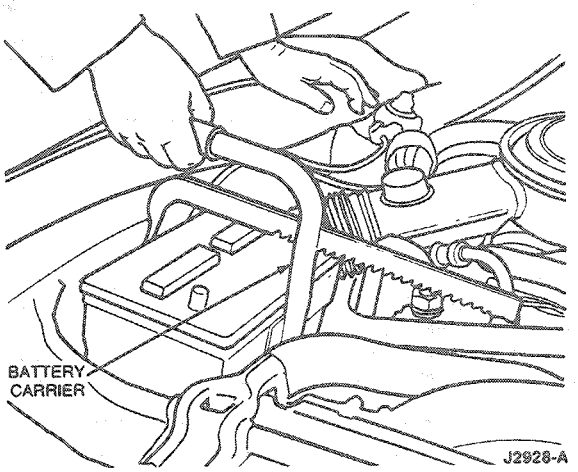
The terminal cleaning brush is designed with units to clean both the tapered battery terminal and the mating surface of the cable clamp. Refer to illustration under Battery Installation, Step 1.

Battery Carrier

Use a suitable battery carrier for lifting and transporting the battery. The illustration shows a clamp-type carrier used to grip the sidewalls of the container just below the lip of the cover. The carrier is used on the sidewalls, rather than the endwalls, since the sidewalls have additional strength from the inner cell partitions. This is particularly important with the plastic-cased battery which has endwalls that are flexible.

WARNING: BATTERIES NORMALLY PRODUCE EXPLOSIVE GASES WHICH CAN CAUSE PERSONAL INJURY. THEREFORE, DO NOT ALLOW FLAMES, SPARKS OR LIGHTED SUBSTANCES TO COME NEAR THE BATTERY. WHEN CHARGING OR WORKING NEAR A BATTERY, ALWAYS SHIELD YOUR FACE AND PROTECT YOUR EYES. ALWAYS PROVIDE VENTILATION.

WHEN LIFTING A PLASTIC-CASED BATTERY, EXCESSIVE PRESSURE ON THE END WALLS COULD CAUSE ACID TO SPEW THROUGH THE VENT CAPS, RESULTING IN PERSONAL INJURY. LIFT WITH A BATTERY CARRIER OR WITH YOUR HANDS ON OPPOSITE CORNERS.



Adding Water

Some batteries have removable vent caps and may occasionally require the addition of water. If the electrolyte level is below the level indicator in any cell, add enough pure water to bring the level up to the indicator. In batteries without a level indicator, maintain electrolyte level at 6.3 to 12.7mm (1/4 to 1/2 inch) above the plates. **Never add electrolyte ("battery acid") to the battery.** This could shorten the life of the battery.

SPECIFICATIONS

TORQUE SPECIFICATIONS

Description	N·m	Lb-In
Battery Tray Retaining Bolts	8-12	6-8 (Lb-Ft)
Battery Tray Hold-Down Bracket Bolt	7-10	6-7 (Lb-Ft)
Battery Terminal Clamps (3.0L/3.8L EFI)	6-10	60-90
Screw	3.4-4.8	31-42
Battery Terminal Clamps (3.0L/3.2L SHO)	7.6-10.4	68-92

SPECIAL SERVICE TOOLS

ROTUNDA EQUIPMENT

Model	Description
007-00001	Digital Volt-Ohmmeter
021-00046	Battery and Anti-Freeze Tester