

# BATTERY

## CONTENTS

	page		page
<b>GENERAL INFORMATION</b>		<b>IGNITION OFF DRAW TESTS (IOD)</b> .....	4
INTRODUCTION .....	1	<b>SERVICE PROCEDURES</b>	
SAFETY PRECAUTIONS AND WARNINGS .....	1	BATTERY CHARGING .....	6
<b>DESCRIPTION AND OPERATION</b>		CHARGING COMPLETELY DISCHARGED	
BATTERY BLANKET HEATER .....	1	BATTERY .....	7
BATTERY IGNITION OFF DRAW (IOD) .....	2	VISUAL INSPECTION AND SERVICE .....	8
CHARGING TIME REQUIRED .....	2	<b>REMOVAL AND INSTALLATION</b>	
<b>DIAGNOSIS AND TESTING</b>		BATTERY .....	8
BATTERY BLANKET HEATER INSPECTION ....	2	BATTERY TRAY .....	8
BATTERY DISCHARGING .....	3	<b>SPECIFICATIONS</b>	
BATTERY LOAD TEST .....	5	BATTERY SPECIFICATIONS .....	9
BATTERY OPEN CIRCUIT VOLTAGE TEST ....	6	TORQUE .....	9

## GENERAL INFORMATION

### INTRODUCTION

The battery stores, stabilizes, and delivers electrical current to operate various electrical systems in the vehicle. The determination of whether a battery is good or bad is made by its ability to accept a charge. It also must supply high-amperage current for a long enough period to be able to start the vehicle. The capability of the battery to store electrical current comes from a chemical reaction. This reaction takes place between the sulfuric acid solution (electrolyte) and the lead +/- plates in each cell of the battery. As the battery discharges, the plates react with the acid from the electrolyte. When the charging system charges the battery, the water is converted to sulfuric acid in the battery. The concentration of acid in the electrolyte is measured as specific gravity using a hydrometer. The specific gravity indicates the battery's state-of-charge. The OE battery is sealed and water cannot be added.

The battery is vented to release gases that are created when the battery is being charged and discharged.

The battery must be completely charged, and the battery side, posts, and cable terminals must be cleaned before diagnostic procedures are performed.

## SAFETY PRECAUTIONS AND WARNINGS

### WARNING: WEAR SAFETY GLASSES.

**DO NOT ALLOW JUMPER CABLE CLAMPS TO TOUCH EACH OTHER WHEN CONNECTED TO A BOOSTER SOURCE.**

**DO NOT USE OPEN FLAME NEAR BATTERY.**

**REMOVE METALLIC JEWELRY WORN ON HANDS OR WRISTS TO AVOID INJURY BY ACCIDENTAL ARCING OF BATTERY CURRENT.**

**WHEN USING A HIGH OUTPUT BOOSTING DEVICE, DO NOT ALLOW THE DISABLED VEHICLE'S BATTERY TO EXCEED 16 VOLTS. PERSONAL INJURY OR DAMAGE TO ELECTRICAL SYSTEM CAN RESULT.**

**TO PROTECT THE HANDS FROM BATTERY ACID, A SUITABLE PAIR OF HEAVY DUTY RUBBER GLOVES, NOT THE HOUSEHOLD TYPE, SHOULD BE WORN WHEN REMOVING OR SERVICING A BATTERY. SAFETY GLASSES ALSO SHOULD BE WORN.**

## DESCRIPTION AND OPERATION

### BATTERY BLANKET HEATER

The blanket heater is used with Alaska and Canada cold weather packages. The 110 volt A.C. blanket

## DESCRIPTION AND OPERATION (Continued)

heater is used to improve the battery cold start ability. This vehicle has an electronic voltage regulator which controls battery charging. ONLY CHRYSLER approved battery blanket/block heater combination should be used. It is designed to provide optimum charging system performance in very cold ambient temperatures below  $-17.8^{\circ}\text{C}$  ( $0^{\circ}\text{F}$ ). The addition of an aftermarket battery heater or engine block heater will adversely affect battery charging and will result in battery discharge or damage.

**BATTERY IGNITION OFF DRAW (IOD)**

A completely normal vehicle will have a small amount of current drain on the battery with the key out of the ignition. It can range from 15 to 30 milliamperes after all the modules time out. If a vehicle will not be operated for approximately a 20 days, the IOD fuse should be disconnected to eliminate the vehicle electrical drain on the battery. The IOD fuse is located in the Junction Block number 5. Removing this fuse will help prevent the battery from discharging during storage.

**CHARGING TIME REQUIRED**

**WARNING: NEVER EXCEED 20 AMPS WHEN CHARGING A COLD  $-1^{\circ}\text{C}$  ( $30^{\circ}\text{F}$ ) BATTERY. PERSONAL INJURY MAY RESULT.**

The time required to charge a battery will vary depending upon the following factors.

**SIZE OF BATTERY**

A completely discharged large heavy-duty battery may require more recharging time than a completely discharged small capacity battery, refer to Battery Charging Timetable for charging times.

BATTERY CHARGING TIMETABLE

CHARGING AMPERAGE	5 AMPERES	10 AMPERES	20 AMPERES
OPEN CIRCUIT VOLTAGE	HOURS CHARGING AT $21^{\circ}\text{C}$ ( $70^{\circ}\text{F}$ )		
12.25 TO 12.49	6 HOURS	3 HOURS	1.5 HOURS
12.00 TO 12.24	10 HOURS	5 HOURS	2.5 HOURS
10.00 TO 11.99	14 HOURS	7 HOURS	3.5 HOURS
*BELOW 10.00	18 HOURS	9 HOURS	4.5 HOURS
*REFER TO CHARGING A COMPLETELY DISCHARGED BATTERY			

**TEMPERATURE**

A longer time will be needed to charge a battery at  $-18^{\circ}\text{C}$  ( $0^{\circ}\text{F}$ ) than at  $27^{\circ}\text{C}$  ( $80^{\circ}\text{F}$ ). When a fast charger is connected to a cold battery, current accepted by battery will be very low at first. In time, the battery will accept a higher rate as battery temperature warms.

**CHARGER CAPACITY**

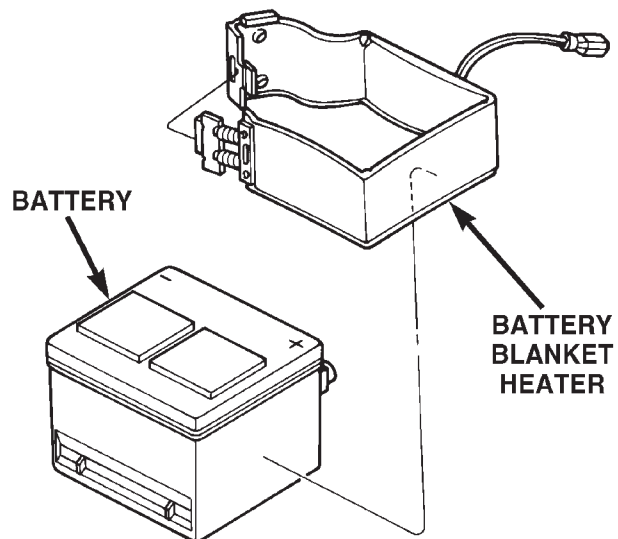
A charger which can supply only five amperes will require a much longer period of charging than a charger that can supply 20 amperes or more.

**STATE OF CHARGE**

A completely discharged battery requires more charging time than a partially charged battery. Electrolyte is nearly pure water in a completely discharged battery. At first, the charging current amperage will be low. As water is converted back to sulfuric acid inside the battery, the current amp rate will rise. Also, the specific gravity of the electrolyte will rise. Refer to Battery Charging procedures.

**DIAGNOSIS AND TESTING****BATTERY BLANKET HEATER INSPECTION**

- (1) Remove battery. Refer to battery removal.
- (2) Remove blanket heater from battery (Fig. 1).



80a7e29e

**Fig. 1 Battery Blanket Heater**

**WARNING: SERIOUS PERSONAL INJURY AND/OR ELECTRICAL BURNS COULD RESULT IF THESE PROCEDURES ARE NOT FOLLOWED.**

- (3) Clean battery blanket heater vinyl cover with a baking soda solution and wipe dry.

DIAGNOSIS AND TESTING (Continued)

- (4) Inspect blanket heater for cuts, abrasion or other damage. If heater is damaged replace. If OK, go to Step 5.
- (5) Lay heater flat and connect heater to vehicle's connector.
- (6) Connect the power cord to a 110 volt AC source for 3 minutes MAXIMUM.
- (7) Disconnect voltage source from the power cord.
- (8) Immediately feel the heater cover on the inside it should be warm to the touch. If warm, heater is OK. If not OK, go to Step 9.
- (9) Using an Ohmmeter, connect a lead across the two terminals.
- (10) Check for a resistance value of 220 to 280 Ohms. If within the resistance value range the blanket is OK. If not OK, replace blanket.
- (11) Check extension cord to vehicle for voltage. If extension cord is OK, go to Step 12. If not OK, repair as necessary.
- (12) Ensure heater receives voltage from extension cord and power cord. If OK, replace heater. If not OK, repair as necessary.

**BATTERY DISCHARGING**

**CAUSES OF BATTERY DISCHARGING**

It is normal to have up to a 30 milliamperes continuous electrical draw ON the battery. This draw will take place with the ignition in the OFF position, and the courtesy, dome, storage compartments, and engine compartment lights OFF. The continuous draw is due to various electronic features or accessories that require electrical current with the ignition OFF to function properly. When a vehicle is not used over an extended period of approximately 20 days the IOD fuse should be disconnected. The IOD fuse is located in the Power Distribution Center and disconnection of this fuse will help prevent the battery from discharge during storage. Refer to Battery Diagnosis and Testing Table and to the proper procedures.

*BATTERY DIAGNOSIS AND TESTING*

STEPS	POSSIBLE CAUSE	CORRECTION
VISUAL INSPECTION Check for possible damage to battery and clean battery.	(1) Loose battery post, Cracked battery cover or case, Leaks or Any other physical (2) Battery OK.	(1) Replace Battery (2) Check state of charge. Perform Battery Open Circuit Voltage Test.
BATTERY OPEN CIRCUIT VOLTAGE TEST	(1) Battery is above 12.40 Volts (2) Battery is below 12.40 Volts.	(1) Perform the Battery Load Test. (2) Perform Battery Charging procedure
BATTERY CHARGED	(1) Battery accepted Charge. (2) Battery will not accept charge	(1) Perform Battery Open Circuit Voltage Test. (2) Perform Charging a Completely Discharged Battery procedure.
BATTERY LOAD TEST	(1) Acceptable minimum voltage. (2) Unacceptable minimum voltage	(1) Battery is OK to put in use, perform Battery Ignition Off Draw Test. (2) Replace Battery and perform Battery Ignition Off Draw Test.
CHARGING A COMPLETELY DISCHARGED BATTERY	(1) Battery accepted charge. (2) Battery will not accept charge.	(1) Perform Battery Open Circuit Voltage Test. (2) Replace Battery.
IGNITION OFF DRAW TEST	(1) IOD is 15-30 Milliamperes. (2) IOD Exceeds 30 Milliamperes.	(1) Vehicle is normal. (2) Eliminate excess IOD draw.

**ABNORMAL BATTERY DISCHARGING**

- Corroded battery posts, cables or terminals.
- Loose or worn generator drive belt.
- Electrical loads that exceed the output of the charging system due to equipment or accessories installed after delivery.

- Slow driving speeds in heavy traffic conditions or prolonged idling with high-amperage electrical systems in use.
- Defective electrical circuit or component causing excess Ignition Off Draw (IOD). Refer to Ignition Off Draw (IOD).
- Defective charging system.

## DIAGNOSIS AND TESTING (Continued)

- Defective battery.

**IGNITION OFF DRAW TESTS (IOD)**

High battery current draw when the ignition switch in the off position will discharge a battery. After a dead battery is serviced, the vehicle Ignition Off Draw (IOD) should be checked. To determine if a high current draw condition exists, check the vehicle with a Digital multimeter that has an ammeter range from at least 10 amps down to 10 milliamps (30) milliamps is allowable.

(1) Verify all electrical accessories are OFF:

- Remove key from ignition switch
- Turn off all lamps
- Trunk compartment lamp is disconnected or removed
- Glove box lamp goes off when the door is closed
- All doors are closed
- Sun visor vanity lamps are OFF

(2) Disconnect battery negative remote cable.

**CAUTION: Do not operate any accessory that has a greater draw than the ammeter can measure.**

(3) Using a Digital multi-meter, set to 10 amps and connect leads between the battery negative remote terminal and the battery negative remote cable stud.

(a) Remove the "EATX" (20 amp min) fuses from the PDC.

(b) Wait (1) minute.

(c) If the reading is greater than 30 milliamps, go to HIGH MILLIAMPERE READING.

(d) Reinstall the EATX fuse.

(e) If the draw increases, remove the fuse again and immediately reinstall the fuse. If the draw increases again, repeat the remove and install process (2) or (3) times. If the draw continues to increase, it will be necessary to wait for up to (20) minutes to see if the draw drops. If it does not, the problem will be in the EATX module or circuit.

(f) If the draw remains under (30) milliamps, there is not a problem with an "Ignition Off Draw".

**NOTE: Each time the ammeter is disconnected and reconnected, all electronic timer functions will be reactivated**

**HIGH MILLIAMPERE READING**

**NOTE: Perform BATTERY IGNITION OFF DRAW TEST before proceeding.**

If the IOD is high, there is either a short circuit or a fault in an electronic module. There are (6) other fuses in the Power Distribution Center and Junction

Block that feed the modules with ignition off draw. Ensure that all electronic timer functions are timed out before testing any of the components.

**IN THE POWER DISTRIBUTION CENTER**

- Ignition Fuel Starter (20 Amp)
- Hazard Flasher (20 Amp)
- EATX (20 Amp min) (previously tested)
- Seat Belt (20 Amp max) (previously tested)
- Stop Lamp (20 Amp)

**IN THE JUNCTION BLOCK:**

- Daytime Running Lamps (DRL) (20 Amp)
- Horns-Cigar Lighter (20 Amp)
- Interior lamps (10 Amp) (IOD)
- Park/tail lamps-Instrument Cluster (20 Amp)

**NOTE: Do not operate any accessory that has a greater draw than the installed ammeter can measure.**

Replace fuses one at a time. The module should draw a few milliamps when the fuse is replaced. If it draws in excess of (20) milliamps (not including timed out functions) then the module should be replaced or wiring should be investigated. Refer to Group 8W-Wiring Diagrams. Check for faulty systems operations or module fault codes to help find wiring faults. Be sure you have double checked other possible IOD draws. Refer to IOD Draw Table

*IOD DRAW TABLE*

COMPONENT	AMPERAGE DRAW
STUCK RELAY	0.25 AMP
ILLUMINATED BULB	0.25 - 1 AMP
RADIO MEMORY	1 - 4 ma
BCM	6 ma (TIMED OUT)

To determine if a module draw is within acceptable range, refer to the Module Amperage Table for IOD readings.

DIAGNOSIS AND TESTING (Continued)

MODULE AMPERAGE TABLE

FUSE NO.	MODULE	INITIALIZER	TIMEOUT	DRAW DURING TIMEOUT	DRAW AFTER TIMEOUT
#4	BCM - LAMPS	RKE, DOOR AJAR, IGNITION KEY ON	0.5 MIN.	2.7 AMPS	0
#5 & #10	PCM	IGNITION KEY ON	0.5 MIN.	UP TO 4 AMPS	1.3 ma
#4	BCM - MICROPROCESSOR	DOOR AJAR, IGNITION KEY ON	1 MIN.	60 ma	7 ma
#3	EATX	IGNITION KEY ON	20 MIN.	60 ma	0.8 ma

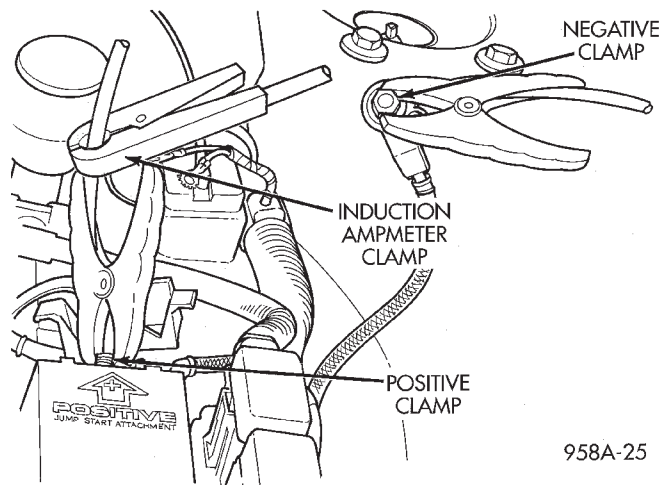
**BATTERY LOAD TEST**

A fully charged battery must have cranking capacity. To provide the starter motor and ignition system enough power to start the engine over a broad range of ambient temperatures. A battery load test will verify the actual cranking capability of the battery.

**WARNING: IF BATTERY SHOWS SIGNS OF FREEZING, LEAKING, LOOSE POSTS, OR EXCESSIVELY LOW ELECTROLYTE LEVEL, DO NOT TEST. ACID BURNS OR AN EXPLOSIVE CONDITION MAY RESULT.**

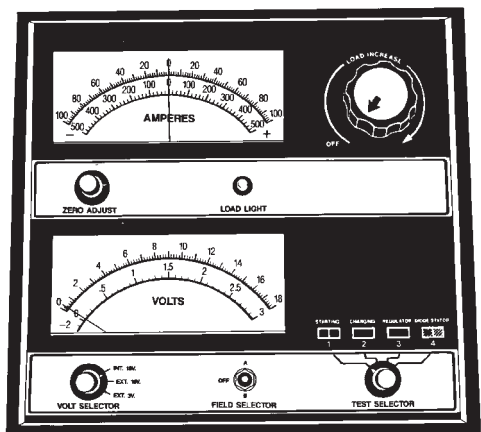
(1) Disconnect and isolate the battery negative remote cable first. Then disconnect and isolate the positive Jump Start cable.

(2) Use a suitable Volt/Ammeter/Load tester connected between remote battery terminals (Fig. 2) and (Fig. 3). Check the open circuit voltage of the battery. Voltage should be equal to or greater than 12.4 volts. If below 12.4 volts charge battery, perform the same test at the battery. Remove both battery cables the negative cable first. If the voltage is still below 12.4 perform Battery Charging procedures.



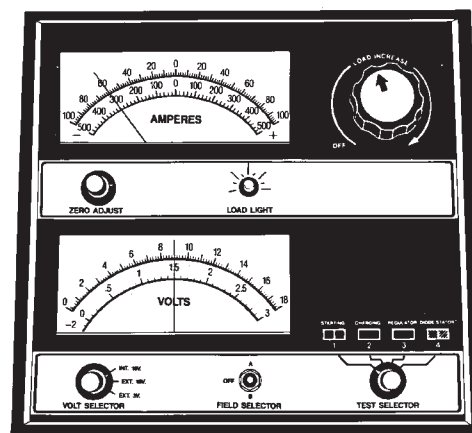
**Fig. 3 Volt-Ammeter-Load Tester Connections**

(3) Rotate the load control knob of the carbon pile rheostat to apply a 260 amp load. Apply this load for 15 seconds to remove the surface charge from the battery, and return the control knob to off (Fig. 4).



**Fig. 2 Volt-Ammeter-Load Tester**

898A-8



**Fig. 4 Remove Surface Charge from Battery**

898A-10

(4) Allow the battery to stabilize for two minutes, and then verify open circuit voltage.

DIAGNOSIS AND TESTING (Continued)

(5) Rotate the load control knob on the tester to maintain 50% (260) of the battery cold crank rating for a minimum 15 seconds (Fig. 5).

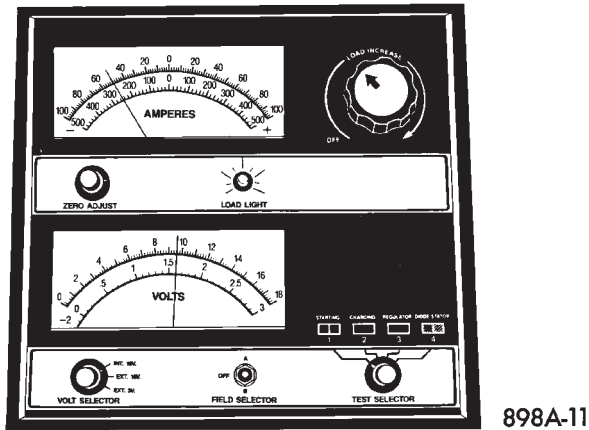


Fig. 5 Load 50% Cold Crank Rating

(6) After 15 seconds, record the loaded voltage reading and return the load control to off.

(7) Voltage drop will vary according to battery temperature at the time of the load test. Battery temperature can be estimated by the temperature of exposure over the preceding several hours. If the battery has been charged, boosted, or loaded a few minutes prior to the test, the battery would be slightly warmer. Refer to Battery Load Test Temperatures Table for proper loaded voltage reading.

BATTERY LOAD TEMPERATURE TABLE

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

(8) If battery passes load test, it is in good condition and further tests are not necessary. If it fails load test, it should be replaced.

BATTERY OPEN CIRCUIT VOLTAGE TEST

An open circuit voltage no load test shows the state of charge of a battery and whether it is ready for a load test at 50 percent of the battery's cold crank rating. Refer to Battery Load Test. If a battery

has open circuit voltage reading of 12.4 volts or greater, and will not pass the load test, replace the battery because it is defective. To test open circuit voltage, perform the following operation.

(1) Remove both battery cables, negative cable first. Connect a Volt/Ammeter/Load tester (Fig. 6) to the battery posts (Fig. 7).

(2) Allow the battery to stabilize for 2 minutes, and then verify the open circuit voltage. Refer to Battery Open Circuit Voltage table.

(3) This voltage reading will approximate the state of charge of the battery. It will not reveal battery cranking capacity.

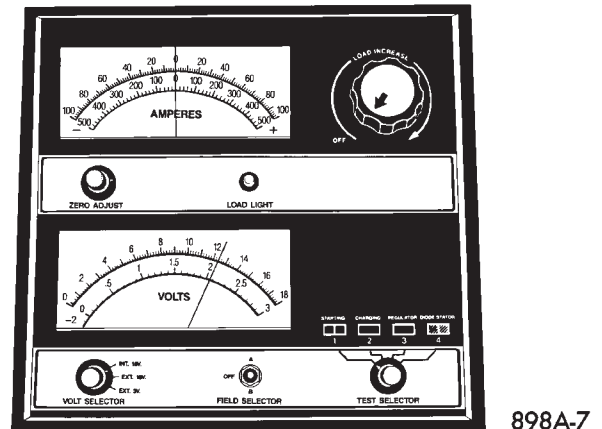


Fig. 6 Testing Open Circuit Voltage

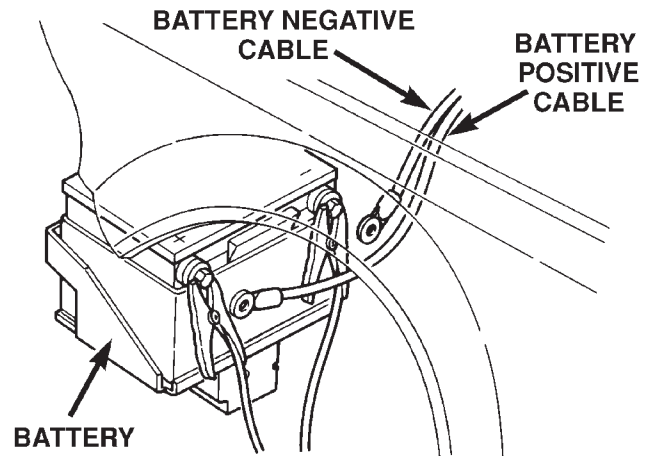


Fig. 7 Volt-Ammeter Load Tester Connections

SERVICE PROCEDURES

BATTERY CHARGING

A battery is considered fully charged when it will meet all the following requirements.

- It has an open circuit voltage charge of at least 12.4 volts (refer to Battery Open Circuit Voltage table).

SERVICE PROCEDURES (Continued)

BATTERY OPEN CIRCUIT VOLTAGE

Open Circuit Volts	Charge Percentage
11.7 volts or less	0%
12.0 volts	25%
12.2 volts	50%
12.4 volts	75%
12.6 volts or more	100%

- It passes the 15 second load test, refer to Battery Load Test Temperatures Table.

**WARNING: DO NOT ASSIST BOOST OR CHARGE A FROZEN BATTERY.**

**EXPLOSIVE GASES FORM OVER THE BATTERY, DO NOT SMOKE, USE FLAME, OR CREATE SPARKS NEAR BATTERY.**

**CAUTION: Disconnect the battery NEGATIVE cable first, before charging battery to avoid damage to electrical systems. Do not exceed 16.0 volts while charging battery. Refer to the instructions supplied with charging equipment.**

Battery electrolyte will bubble inside of battery case while being charged properly. If the electrolyte boils violently, or is discharged from the vent holes while charging, immediately reduce charging rate or turn off charger. Evaluate battery condition. Battery damage may occur if charging is excessive.

Some battery chargers are equipped with polarity sensing devices to protect the charger or battery from being damaged if improperly connected. If the battery state of charge is too low for the polarity sensor to detect, the sensor must be bypassed for charger to operate. Refer to operating instructions provided with battery charger being used.

**CAUTION: Do not overcharge Battery. Refer to Battery Charging Rate table.**

After the battery has been charged to 12.4 volts or greater, perform a load test to determine cranking capacity. Refer to Battery Load Test in this Group. If the battery will endure a load test, return the battery to use. If battery will not endure a load test, it must be replaced. Properly clean and inspect battery hold downs, tray, terminals, cables, posts, and top before completing service.

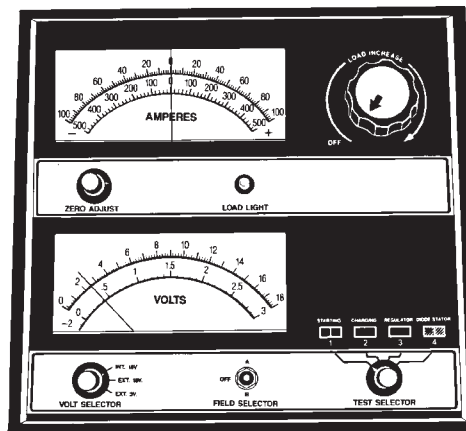
**CHARGING COMPLETELY DISCHARGED BATTERY**

The following procedure should be used to recharge a completely discharged battery. Unless procedure is properly followed, a good battery may be needlessly replaced. Refer to Battery Charging Rate table for correct charge times.

BATTERY CHARGING RATE

Voltage	Hours
16.0 volts maximum	up to 4 hours
14.0 to 15.9 volts	up to 8 hours
13.9 volts or less	up to 16 hours

- (1) Measure the voltage at remote cable terminals with a voltmeter accurate to 1/10 volt (Fig. 8). If below 10 volts, charge current will be low, and it could take some time before it accepts a current in excess of a few milliamperes. Such low current may not be detectable on amp meters built into many chargers.



**Fig. 8 Voltmeter Accurate to 1/10 Volt (Connected)**

- (2) Connect charger leads to the remote cables. Some chargers feature polarity protection circuitry that prevents operation unless charger is connected to battery posts correctly. A completely discharged battery may not have enough voltage to activate this circuitry. This may happen even though the leads are connected properly.

- (3) Battery chargers vary in the amount of voltage and current they provide. For the time required for the battery to accept measurable charger current at various voltages, refer to Battery Charging Rate table. If charge current is still not measurable after charging times, the battery should be replaced. If charge current is measurable during charging time,

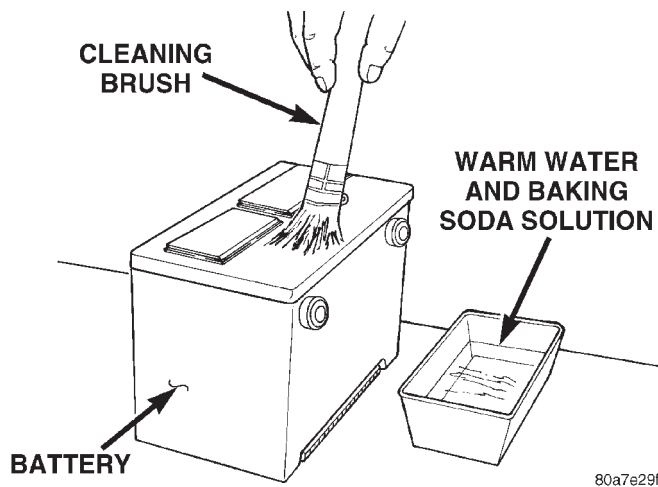
## SERVICE PROCEDURES (Continued)

the battery may be good, and charging should be completed in the normal manner.

## VISUAL INSPECTION AND SERVICE

**CAUTION:** Do not allow baking soda solution to enter vent holes, as damage to battery can result.

(1) Clean battery with a solution of warm water and baking soda. Apply solution with a bristle brush and allow to soak until acid deposits loosen (Fig. 9). Rinse with clear water and blot dry with paper toweling. Dispose of toweling in a safe manner. Refer to the WARNINGS on top of battery.



**Fig. 9 Cleaning Battery**

(2) Inspect battery case and cover for cracks or leakage. If leakage is present battery must be replaced.

(3) Inspect battery tray for damage caused by acid from battery. If acid damage is present, it will be necessary to clean area with:

- Baking soda solution
- Wire brush
- Scraper

(4) Clean battery terminals with baking soda and suitable cleaning tool.

(5) Inspect cables for damage and broken terminals. Replace damaged, frayed cables and broken terminal.

(6) Inspect battery for proper or damaged hold down ledge.

## REMOVAL AND INSTALLATION

## BATTERY

## REMOVAL

**The Battery is accessible without removing the Wheel and Tire assembly.**

(1) Make sure ignition switch is in OFF UNLOCKED position and all accessories are OFF.

**WARNING: NEVER GET UNDER A LIFTED VEHICLE IF NOT SUPPORTED PROPERLY ON SAFETY STANDS.**

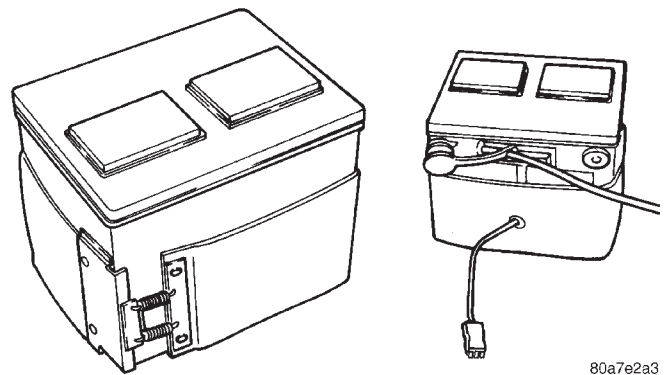
(2) Disconnect battery negative cable from remote negative terminal on left shock tower.

(3) Turn steering wheel to the **FULL LEFT** position.

(4) Twist the four plastic screws one quarter turn to release shield.

(5) Remove shield.

(6) Disconnect battery blanket heater cord, if equipped (Fig. 10).



**Fig. 10 Battery with Blanket Heater**

(7) Remove battery negative cable followed by the battery positive cable.

(8) Remove bolt attaching the battery strap to the battery hold down bracket. Remove hold down bracket bolt.

(9) Slide battery to rear of tray and lift over lip. Use care not to tip battery so that the acid will not spill out.

(10) Remove battery.

(11) Remove battery blanket heater if equipped (Fig. 10).

## INSTALLATION

For installation, reverse the above procedures. Tighten battery cables to 16 N·m (150 in. lbs.) torque.

## BATTERY TRAY

## REMOVAL

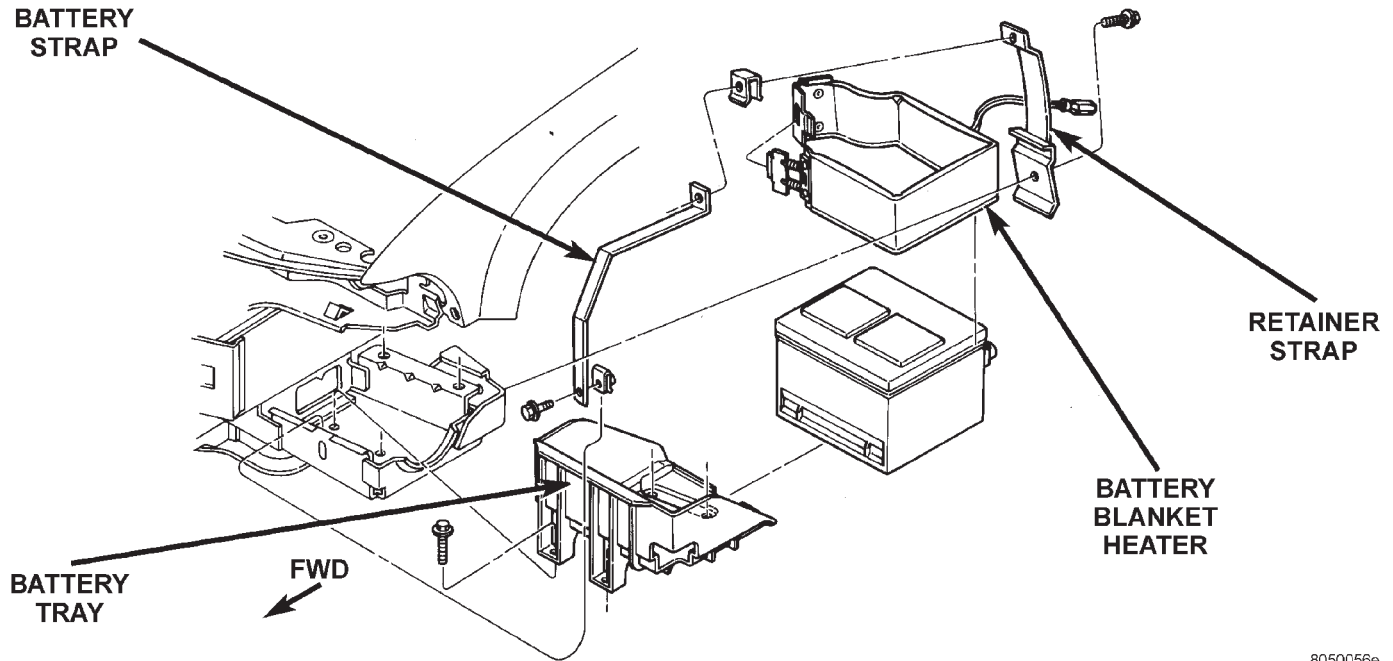
(1) Remove battery, refer to Battery Removal procedures above.

(2) Remove the battery tray attaching bolts (Fig. 11).

(3) Remove battery tray.

(4) Remove battery strap.

REMOVAL AND INSTALLATION (Continued)



8050056e

**Fig. 11 Battery Tray Removal**

**INSTALLATION**

For installation, reverse the above procedures.

**SPECIFICATIONS**

**BATTERY SPECIFICATIONS**

Load Test (Amps)	Cold Cranking Rating @ -18°C (0°F)	Reserve Capacity
260 Amp	510 Amp	110 Minutes

**COLD CRANK RATING**

The current battery can deliver for 30 seconds and maintain a terminal voltage of 7.2 volts or greater at -18° C (0° F).

**RESERVE CAPACITY RATING**

The length of time a battery can deliver 25 amps and maintain a minimum terminal voltage of 10.5 volts at 27°C (80°F).

**TORQUE**

**DESCRIPTION**

**TORQUE**

Battery Hold Down Bolt Clamp Bolt . . . . . 14 N·m  
(160 in. lbs.)

